ILLICIT DISCHARGE DETECTION AND ELIMINATION MANUAL

The City of Haverhill, Massachusetts

March 2008

ILLICIT DISCHARGE DETECTION AND ELIMINATION MANUAL

Haverhill

Robert E. Ward, P.E.
Deputy DPW Director Water/Wastewater
Phone: 978-374-2382 Fax: 978-521-4083
rward@haverhillwater.com

Special Thanks to Mr. Harry Stark, RS,Ohio MPA, Project Director hstark@ccbh.net

Support for the IDDE Manual Project has been provided by Ohio Environmental Protection Agency, Office of Environmental Education

Ohio EPA Environmental Education Fund Lazarus Government Center P.O. Box 1049 Columbus, Ohio 43214-1049 614-644-2873

City of Haverhill IDDE Manual
March 2008

Acknowledgements

This guidance manual was developed by the Cuyahoga County Board of Health (CCBH) as part of an Ohio EPA Environmental Education Fund Grant project. The Cuyahoga County District Board of Health has been serving the cities, villages and townships of Cuyahoga County since 1919. As Ohio's largest health district by population, and one of the nation's largest, the Board of Health provides a broad range of quality driven public health programs and services.
The CCBH's Watershed Protection Unit was developed and designed to protect public health and our water quality resources from the impact of point source and non-point source pollution. The Watershed Protection Unit stresses the utilization of watershed based planning within the Cuyahoga County Board of Health as well as collaborative efforts with partnering agencies.

This manual was written by Harry Stark, RS, MPA with assistance from Laura Travers, Pam Sawchyn, Jill Lis RS, and other CCBH staff. The CCBH would also like to thank the following people who contributed their time and expertise in the development of this manual.

Cathy Becker, North Olmsted Assistant City Engineer Dan Bogoevsky, Ohio EPA Chris Courtney, the C.W. Courtney Company Ken Dombrowski, Wade Trim Kyle Dreyfuss-Wells, Executive Director for the Chagrin River Watershed Partners Jeff Duke, Northeast Ohio Regional Sewer District Jeff Filarski, Chagrin Valley Engineering LTD Tom Krezcko, Beachwood Staff Engineer Mary Maciejowski, Northeast Ohio Regional Sewer District Brian Mader, Steve Hovancsek and Associates Francine Toth, Lake County General Health District

A special thanks to the Northeast Ohio Regional Sewer District (NEORSD) for providing the Illicit Discharge Detection and Elimination Manual Outfall Database and Users Manual for this project. The database is located within the CD-ROM.

Along with these contributors, a number of reference documents were used in the development of this manual. These include:

- The Ohio EPA Phase II Storm Water Rules and Regulations (3745-39-03)
- Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments by the Center of Watershed Protection and Robert Pitt, University of Alabama, 2004
- Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities by the New England Interstate Water Pollution Control Commission, 2003
- Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine
- US EPA Phase II Storm Water Rules and Regulations
- US EPA Phase II Fact Sheets on Illicit Discharge Detection and Elimination Program

Table of Contents

Table of Contents (continued)

List of Tables

List of Figures

Introduction

This manual serves as a guide for the Phase II Storm Water designated community of Haverhill, Massachusetts. The purpose of this manual is to assist these communities in developing their illicit discharge detection and elimination (IDDE) programs required by the EPA's Phase II Storm Water program. This manual profiles the Illicit Discharge Detection and Elimination minimum control measure, which is one of six measures operators of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit.

The City of Haverhill, Massachusetts, with permission has adopted this manual from Ohio Illicit Discharge Detection and Elimination Manual 2005 and kept most of its contents intact. Where appropriate and to eliminate confusion, City of Haverhill staff deleted all non-applicable section from Ohio Illicit Discharge Detection and Elimination Manual 2005.

I .1 Background of Phase II

Although the quality of the nation's waters has improved greatly since the passage of the Clean Water Act in 1972, many water bodies are still impaired by pollution. According to the U.S. Environmental Protection Agency, the top causes of impairment include siltation, nutrients, bacteria, metals, and oxygen-depleting substances. Polluted storm water runoff, including runoff from urban/suburban areas and construction sites are leading sources of impairment. To address this problem, EPA has put into place a program that regulates certain storm water discharges.

In 1990, the EPA promulgated Phase I of its storm water program under the National Pollutant Discharge Elimination System (NPDES) permit provisions of the Clean Water Act. Phase I addressed storm water runoff from "medium" and "large" municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, construction activity that would disturb five or more acres of land, and 10 categories of industrial activity. To further reduce the adverse effects of storm water runoff, the EPA instituted its Storm Water Phase II Final Rule on December 8, 1999.

The Phase II Storm Water program is part of EPA's NPDES program. EPA Region I is responsible for the Storm Water regulations for Massachusetts.

The Phase II program regulates discharges from small MS4s located in "urbanized areas" (as delineated by the Census Bureau in the most recent census) and from additional small MS4s designated by the permitting authority.

The EPA's Storm Water Phase II Final Rule states that this storm water management program must include the following six minimum control measures:

1. Public education and outreach on storm water impacts
2. Public involvement and participation
3. Illicit discharge detection and elimination (IDDE)
4. Construction site storm water runoff control
5. Post-construction storm water management in new development and redevelopment
6. Pollution prevention and good housekeeping for municipal operations

I. 2 Why Are Illicit Discharge Detection and Elimination Efforts Necessary?

Discharges from MS4s can often include wastes and wastewater from non-storm water sources, including illicit discharges, which can enter the system through various means. The result of this is untreated discharges that contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving water bodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. Now, more than ever, it is necessary to create an awareness of what illicit discharges are doing. This will allow operators and citizens to determine the types and sources of these discharges entering their water bodies. This manual can help establish the legal, technical, and educational means needed to prevent and eliminate these discharges.

I. 3 What Are Some Guidelines for Developing and Implementing This Measure?

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated, small MS4 operators gain a thorough awareness of their systems and position themselves to take necessary action on eliminating illicit discharges. This awareness will allow them to determine the types and sources of illicit discharges entering their system and establish the legal, technical, and educational means needed to eliminate these discharges.

I.4 Finding, Fixing, and Preventing Illicit Discharges

The purpose of an IDDE program is to find, fix and prevent illicit discharges, and develop a series of techniques to meet these objectives. This manual describes the major tools used to build a local IDDE program.

I. 5 City of Haverhill's Stormwater Committee

The City's Stormwater Management Plan SWMP contains BMP # 2-5 to Establish Haverhill's Stormwater Committee (HWC).
The following members are currently, (March 2008) included on this Committee:
Robert Ward, P.E. Superintendent/Engineer Water/ Wastewater
William Pillsbury, Planning Director
Fred Haffty, Facility Manger Wastewater Treatment
Paul Jessel, Collection System Supervisor
John D'Aoust, Facility Manger Water Treatment
Mary D'Aoust, Water Treatment Chemist
John Pettis, III P.E. City Engineer
Robert Moore, Conservation Agent
Margret Toomey, City Clerk
Bonnie Dufrense, Board of Health Clerk
Les Godin, Health Inspector

This Committee meets regularly the Third Thursday of the month to discuss and make decisions regarding Haverhill SWMP. The HWC has reviewed the Haverhill SWMP and has made changes. Final approval of the IDDE Manual will be at its March 13, 2008 meeting. Included in **Appendix H:** is the submitted SWMP with NOI for your review.

Section 1: Illicit Discharge Detection and Elimination

What is an Illicit Discharge?

Figure 1: Designated MS4 outfall location

1.1 What is an Illicit Discharge

An **illicit discharge** is defined by the US EPA's Phase II Storm Water Regulations as "any discharge to an MS4 (Municipal Separate Storm Sewer System) that is not composed entirely of storm water..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges have been considered "illicit" because MS4s are not designed to accept, process, or discharge such non-storm water wastes.

In most communities, the MS4 is directly connected to a waterbody and does not receive any type of treatment prior to its discharge to receiving water bodies of the United States. Because of this non-treatment, it is vital that only storm water be discharged from these MS4s.

The general permit received by Phase II regulated communities requires that those communities develop an illicit discharge detection and elimination (IDDE) program. This program will assist communities in meeting their requirement set forth in their general NPDES permit. This guidance manual is designed to

assist designated communities in establishing their IDDE program.

1.2 Types of Illicit Discharges

For any IDDE program to be successful, it is important to clearly understand the different types of illicit discharges so that individuals can take the necessary steps for elimination. This includes frequency of discharge and surrounding land use issues. Once an IDDE program is established and a community can investigate the frequency of discharge and land use issues associated with these discharges, then the possibility exists to trace the illicit discharge back to its source and eliminate it. Illicit discharges can be separated into three (3) categories based on frequency of discharge:

1 **Transitory Illicit Discharge:** These are typically a one-time event. They can result from spills, dumping, and line breaks. These types of discharges are often the most difficult to investigate and trace back to its source. Methods for reducing this type of discharge are to educate the public on storm water and illicit discharge, establishment of a "hotline" telephone number for the public to call if any discharges are observed, and education of the community's investigative responses to sources of illicit discharge.

2 **Intermittent Illicit Discharge:** These are typically discharges that occur occasionally. They can occur several hours per day, week or over the course of a year. They can happen as the result of line breaks or cross connections. Again, the establishment of a "hotline" telephone number for the public to call if any discharges are observed is recommended.

3 **Continuous Illicit Discharge:** These direct connections into the MS4 can be from sanitary sewers, cross connections, infrastructure problems with a sanitary sewer system, or malfunctioning household sewage treatment systems (HSTS). This type of discharge is the easiest to find, investigate, trace and eliminate from the MS4. These types of discharges also have the greatest impact because of the constant pollutant loading into a water body.

Table 1-1: LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *TRANSITORY OR INTERMITTENT* ILLICIT DISCHARGES

Land Use	Likely Source Locations	Condition/Activity that Produces Discharge
Residential	· Apartments · Multi-family · Single Family Detached	· Car Washing · Driveway Cleaning · Dumping/Spills · Equipment Wash-downs · Lawn/Landscape Watering · Septic System Maintenance · Swimming Pool Discharges · Laundry Wastewater · Improper Plumbing (garage floor drains)
Commercial	· Campgrounds/RV Parks · Car Dealers/Rental Car Co. · Car Washes · Commercial Laundry · Gas Stations/Auto Repair Shops · Marinas · Nurseries and Garden Centers · Oil Change Shops · Restaurants · Swimming Pools · Service Garages	· Building Maintenance (power washing) · Dumping/Spills · Landscaping/Grounds Care (irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (power washing) · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing · Wash-down of Greasy Equipment & Grease Traps
Industrial	· Auto Recyclers · Beverages and Brewing · Construction Vehicle Washouts · Distribution Centers · Food Processing · Garbage Truck Washouts · Marinas, Boat Building and repair · Metal Plating Operations · Paper and Wood Products · Petroleum Storage and Refining · Printing	· All Commercial Activities · Industrial Process Water or Rinse Water · Loading and Un-loading Area Wash-downs · Outdoor Material Storage (fluids)
Municipal	· Airports · Landfills · Maintenance Depots · Municipal Fleet Storage Areas · Ports · Public Works Yards · Streets and Highways	· Building Maintenance (power washing) · Dumping/Spills · Landscaping/Grounds Care (irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (power washing) · Road Maintenance · Emergency Response · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing

SOURCE: Modified from *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection, 2004, p. 12, Table 2.

Table 1-2: LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *CONTINUOUS* ILLICIT DISCHARGES	
Land Use	**Condition or Activity that Produces Discharge**
Residential	· Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain · Failed septic systems discharging to storm drain system
Commercial/Industrial	· Failed sanitary sewer infiltrating into storm drain · Process water connections into storm drain · Sanitary sewer connection into storm drain
Municipal	· Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain

Source: Table from *Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine,* Casco Bay Estuary Partnership.

The tables outlined above examine the likely source locations that contribute illicit discharges to an MS4. Land use can predict the potential for these discharges. By understanding the possible discharges emanating from land use activities, it allows for the IDDE program manager to thoroughly utilize this knowledge in identifying illicit discharges and their potential sources. Industrial facilities are regulated by additional permits through the EPA.

1.3 Mode of Entry

Illicit discharges can also be classified based on how they enter the storm drain system. This entry can be direct or indirect.

Direct entry means that the discharge is directly connected to the storm drainpipe system via a pipe. This type of entry will produce discharges that are either continuous or intermittent. Direct entry usually occurs when there are sewage cross-connections, or where there are industrial and commercial cross-connections.

Indirect entry means that flows, which are generated outside the storm drain system, enter through storm drain inlets or by infiltrating through the joints of the pipe. Generally, indirect modes of entry produce intermittent or transitory discharges. This type of entry can include groundwater seepage into the storm drain pipe, spills, dumping, outdoor washing activities, and irrigation from landscaping or lawns that reaches the storm drain system.

1.4 What are the Elements of an Effective IDDE Program?

EPA states that the following must be incorporated in an IDDE Program, (see this web address for EPA's Program) **www.epa.gov/npdes/pubs/fact2-5.pdf**

- Develop a storm sewer system map showing the location of all outfalls, and the names and location of all surface waters of the state that receive discharges from those outfalls, this also must include the location of all home sewage treatment systems (HSTS) that discharge directly into an MS4;

- To the extent allowable under law, effectively prohibit, through ordinance or other regulatory mechanism, non-storm water discharges into your storm sewer system and implement appropriate enforcement procedures and actions;

- Develop and implement a plan to detect and address non-storm water discharges, including illegal dumping, to your system, including a program for dry weather inspections;

- Inform public employees, businesses, and the general public of hazards associated with illegal discharges;

- Develop a list of occasional and incidental non-storm water discharges that will not be addressed as an illicit discharge. This can include charity car washes.

1.5 Does This Measure Need to Address All Illicit Discharges?

No. The IDDE program does not need to address all illicit discharges unless you identify them as significant contributors of pollutants to your small MS4. Under the EPA rules for Phase II Storm Water, these include:

- water line flushing
- landscape irrigation
- diverted stream flows
- rising ground waters
- uncontaminated ground water infiltration
- uncontaminated pumped ground water
- discharges from potable water sources
- foundation drains
- air conditioning condensation
- irrigation water
- springs
- water from crawl space pumps

- footing drains
- lawn watering
- individual residential car washing
- flows from riparian habitats and wetlands
- dechlorinated swimming pool discharges
- street wash water
- Discharges or flows from fire fighting activities are excluded from the effective prohibition against non-storm water and need only be addressed where they are identified as significant sources of pollutants to surface waters of the state.

Section 2: Mapping / Inventory

2.1 What is an MS4?

According to the EPA Region I, the definition of an MS4 does not solely refer to municipally-owned storm sewer systems, but rather, is a term of art with a much broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. An MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, gutters and ditches. The regulatory definition of an MS4 is provided below:

Municipal Separate Storm Sewer System (MS4) – A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.

(ii) Designed or used for collecting or conveying stormwater;

(iii) Which is not a combined sewer; and

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Basically, when the field crew is performing the inventory of MS4 outfalls, a good understanding is needed as to the community and the outfalls possibly located within a water body. Most people know that a storm sewer outfall is an MS4 outfall. However, you must remember that ditches and catch basins are considered MS4s as well.

Figure 2: Storm Sewer MS4 outfall Figure 3: Ditch MS4 outfall

2.2 Mapping

The City of Haverhill has contracted with the Engineering firm CDM, who submitted the Notice of Intent (NOI), on July 8, 2003, and finalize the Stormwater Management Plan. As part of CDM's contact a Geographic Information System, GIS was develop. The City was able to obtain a grant for $670,000 through the State Revolving Fund (SRF) to fund the development of the Geographic Information System and submit the City's NOI.

Limited work was done in Haverhill, regarding Stormwater system. CDM obtained aperture cards, (a form of microfilm); from the City Engineer's Office, (over 20,000) and the aperture cards were scanned through an outside vendor. City Personnel were able to design a Microsoft Access database and link to these scan images to the City Engineer's Database. This database was utilized by CDM to develop the GIS Storm Water Layer, which was completed in July 2007.

Utilizing GIS City Personnel were able to obtain the Attribute Table for all storm water out falls. GIS list these as unique numbers from 602 to 1226, 624 storm water outfalls have been identified. Twenty of these outfalls are Combine Sewer Overflows.

EPA's NPDES requirements for small MS4s state that one of the first mandatory elements of the IDDE program is to "develop a storm sewer system map showing the location of all outfalls and the names and location of all surface waters of the state that receive discharges from those outfalls**".**

Figure 4: Map showing MS4 outfall locations.

2.3 Review Available Information

In order to develop a map, communities need to collect any existing information on their storm sewer system. The following is a list of possible resources that communities should collect and review when developing a comprehensive database for their storm sewer system. Identifying outfall locations may help prioritize areas that may have high priority outfalls.

- Review city records – city records can include a variety of maps as detailed below as well as information obtained regarding complaints filed with the community on possible illicit discharges emanating from a possible MS4 outfall.
- Zoning map
- Drainage maps
- Subdivision maps
- Department of transportation maps
- Storm drain maps
- Age of infrastructure and development – this information is important when determining

and prioritizing areas with possible illicit discharges. Older areas of infrastructure will have a higher priority.

- Location of septic systems, both household and commercial – this information is important when prioritizing illicit discharge locations and should be given a high priority.
- Identify water bodies and watersheds within the community – this information will provide the community a sense of where they exist within a larger watershed as well as the water bodies that they contain.
- Water quality information – this will assist the community in evaluating areas within their community that have impaired water bodies, as well as areas with high bacterial counts.
- Review data from local health departments on locations of HSTS that discharge to an MS4. These systems must be included on the map along with the MS4 outfall locations.

Once the community has compiled this information, it is necessary to perform field activities to locate the MS4 outfall locations as well as verify the information compiled in the review of any documents the community used.

2.4 Mapping the Storm Sewer System

Once a community has compiled the available information on their storm sewer systems, then it is necessary to perform field activities. The field survey will be necessary to create a map or to verify and update an existing map. These field activities will serve a number of purposes. This includes:

- Provide data to the community as to the location of their MS4 outfall locations.
- Provide data on possible areas of illicit discharges.
- Provide data as to the condition of the water bodies within the community. This can include possible areas that can cause flooding problems (water bodies with excessive amounts of trees and debris obstructing the flow of water) during periods of high water flow. It allows for the prioritization of areas in regards to possible illicit discharges by the observance of pollution in a specific area.

The field survey will include a number of steps. These basic steps are expanded upon in the next section and include:

- Contact regional partners to see if a numbering system already exists for the outfalls in your location. Include the Board of Health, Sewer District, County Engineer, Soil and Water Districts.
- Survey of all water bodies located within a community on foot or by boat to look for all outfalls in a waterbody.
- Note the locations of the outfalls on a map.
- Assign a number or code for each outfall that will be easy to understand and logical. (Reference to IDDE Outfall Database – Outfall Identification and Stream Naming Convention document in **Appendix A**).
- Fill out a survey sheet for each outfall located.

It is vital that when performing the field inventory that the public is aware of the process. The public is very aware of what is happening in their community and it is important to keep them informed during this process. This is done in a variety of ways: letters/postcards to homeowners, newsletters, and community webpage.

Personnel safety is also extremely important during this process. Walking or boating water bodies can be potentially very hazardous and safety precautions must be utilized during this phase of your IDDE program. Wearing safety vests, carry a first aid kit, being careful while walking a water body due to algae growth (makes the rocks extremely slippery) and dark water (can contain unexpected deep holes and other items, which could cut the surveyor's leg). Safety in the field is vital.

Typical surveys will be done with two field staff (if available). All field staff should carry appropriate ID's. Also, be aware of possible confined space locations when entering culvert pipes and follow confined space protocols for your location. Remember, like the mapping component, during the field investigations, there will be remote areas that the field staff will be inspecting. If injury occurs, the extra field staff is a necessity. Also, be aware of the locations where field inspections will occur because specific locations may present specific sources of safety concerns. Inform storm water manager or appropriate personnel where field surveys will be conducted on any particular day for follow up if required.

2.5 Field Survey

Figure 5: Field survey of outfall locations

The field survey includes a number of processes to accurately provide the desired information that the community needs in order to effectively develop an IDDE program. Attached to this document in **Appendix B** is a field form that can be used during the field surveys and is located within the attached database. The field survey begins by compiling all information that the community has obtained on their storm sewer systems as well as information as to the locations of their MS4 outfall locations. This information can be in the form of a map or in written comment. Once this information is obtained, it is vital to bring the information along during the field survey to verify the information or to locate the outfall locations. Equipment for successful field surveys includes:

Existing paper maps – important to mark them in the field with the locations of the outfalls. It also allows the field crew the ability to know where they are in relation to specific areas within the community as they walk the water bodies.

- Field / survey sheets (located in Appendix B and C)
- Digital camera
- GPS unit
- Clip boards and pens
- Tape measure
- Waders (either chest or hip)
- Water proof flash light
- First aid kit
- Cell phone or hand held radio
- Cones/safety vests

2.5.1 Field Surveys Best Conducted

Field surveys are best conducted during low flows of the surface waterways to ensure that all MS4s are observable. During high water conditions, some MS4s may be covered and therefore missed during the inventory phase. During a field survey, the field crew must be aware of how to properly perform the field survey. The survey must be organized in a manner as to accurately obtain the information the community needs for their mapping component of their IDDE program. The first step is to utilize the field maps and plan a course of action as to effectively walk or boat the water bodies within the community. The field surveys of these water bodies can be performed in a variety of ways, including:

- Performing the survey in a section of the community (southeast, northeast, etc).
- Performing the surveys on one waterbody as it traverses through the community. This can include just walking the main branch first and then follow-up with the tributaries at a later date, or to walk the main branch and walk the tributaries as you come upon them in the field.
- Utilizing all of the above.

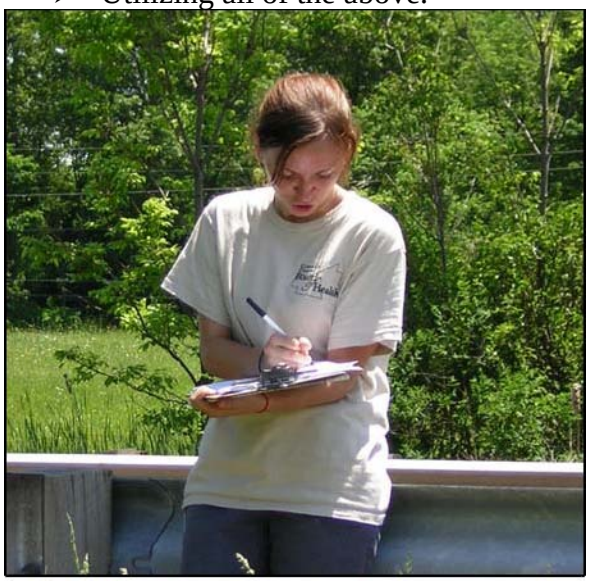


Figure 6 and 7: Field surveys of outfall locations.

2.5.2 Field Surveys Methodology

Once you develop your methodology, make sure all staff is familiar with the process that will be performed during the activity in the field. It is difficult to have one methodology for every community. This methodology depends on the community and how the water bodies traverse that community. In some circumstances, it is easier to walk the main branch of a stream and at a later date walk the tributaries. This is preferred if the main branch is a long stream that is difficult to reach. Likewise, if the main branch is somewhat shorter in length and is easy to access, it is much better to walk a stream's main branch, and then as a tributary comes into that stream is located, to walk that tributary to its source or to the community boundary.

Once a methodology is selected, all staff must realize that this can change once the field survey is started. Methodologies created in the office are not always the same once fieldwork starts. All must be flexible to change once the field survey does begin.

The field survey begins by deciding where a creek will be entered by the survey crew and the utilization of the outfall site numbering system. Typically, this should be done by walking the waterbody upstream, since the numbering system developed by the Northeast Ohio Regional Sewer District is designed to go upstream from the downstream location.

Downstream is defined as to where the stream is flowing.
Upstream is defined as where the stream is flowing from. If at all possible, walking upstream allows for the accurate numbering of the outfalls while in the field.

2.5.3 Stormwater Outfall Categorization

The City of Haverhill has adopted the following naming categorization. Utilizing GIS with the unique identification number, City personnel assign the first letters of the water body name to each Identification number. Here are some examples:

Unique Identification number 604 Merrimack River Outfall new ID **MR604**
Unique Identification number 605 Little River new ID **LR605**
Unique Identification number 606Detention Pond Inlet new ID **DPI606**
Unique Identification number 607Detention Pond Outlet new ID **DPO606**

Table 2-1 list the City's current water bodies and the corresponding water body acronym.

Table 2-1 City of Haverhill Outfall Identifications

ReceivingWaterAcronym	ReceivingWaterBody
ACMB	Abrams Creek - Main Branch
BB	Bradley Brook
BZB	Buzell Brook
CB	Creek Brook
CC	Cottles Creek
CL	Crystal Lake
DPI	Detention Pond Inlet
DPO	Detention Pond Outlet
FB	Fishing Brook
FP	Frey's Pond
JC	Johnston's Creek
JP	Johnsons Pond
KL	Kenoza Lake
LR	Little River
MB	Millvalle Brook
MR	Merrimack River
PB	Peabody Brook
PL	Pentucket Lake
SB	Snow Brook
TS	Tilton Swamp
UNK	Unknown
WL	Wetland
WMB	West Meadow Brook

The numbering of outfall locations is very important with the overall IDDE program. Having a rationale in place in the numbering of your outfall locations will enable future follow-ups and easy determination as to the location of these outfall locations.

For additional examples, please refer to the IDDE Outfall Database – Outfall Identification and Stream Naming Convention document in **Appendix A.**

2.5.4 MS4 Outfall Survey Duties

Once in the waterbody, the survey crew will walk or boat until they come upon a MS4 outfall location. When the outfall is located, the survey crew will perform the following for the outfall location:

- Take a photograph of the outfall and indicate the number of the photo on the survey form.

- Take GPS coordinates of the outfall – important in the mapping of the outfall locations. The GPS coordinates can be exported to different mapping systems that can plot these points on a map of the community.

Figure 9: Measuring size of outfall

Fill out the necessary information on the field form (see **Appendix B** for example of field form), including:

- Date
- Observer
- Community
- Waterbody
- Watershed / Sub watershed
- Location (address if possible, street name, etc)
  Latitude and Longitude
- Elevation
- Side of stream the outfall is located on (river left, river right – always face downstream when determining the side of the water body the outfall is on for consistency).

Shape of outfall

- Circular
- Elliptical
- Egg
- Rectangular
- Other

Outfall Material

- RCP (Reinforced Concrete Pipe)
- CMP (Corrugated Metal Pipe)
- VCP (Vitrified Clay Pipe)
- PVC (Polyvinyl Chloride Pipe)
- Other

Size of outfall

- Condition of outfall
- Good
- Fair
- Poor
- N/A
- Measurement of bottom of outfall to the top of the waterbody level, in feet

Type of outfall

- MS4
- Other
- Unknown
- Household septic discharge
- Commercial septic discharge

Observe any noticeable pollution condition or other observances that may indicate possible illicit discharges that may be emanating from this outfall.

Note:
It is always desirable to perform dry weather inspections and sampling at the same time as the field survey. However, due to the weather conditions of days that we have dry weather (**minimum 72 hours of no rainfall over 0.1 inches**); it is necessary to perform the field surveys whenever possible and then to follow-up with dry weather inspections and sampling at a later date. Once the outfalls have been identified and mapped, it is easier to perform dry weather inspections and sampling because the locations are now mapped and easier to locate.

Figures 10: Example of Outfall Materials

RCP (Reinforced Concrete Pipe)

CMP (Corrugated Metal Pipe)

VCP (Vitrified Clay Pipe)

PVC (Polyvinyl Chloride Pipe)

Section 3: Inspection and Developing Priority Areas

Another mandatory requirement of a Phase II IDDE program is to "develop and implement a plan to detect and address non-storm water discharges, including illegal dumping, to your system". EPA recommends that this plan include the following components:

1 Locate priority areas within your community
2 Trace the source of an illicit discharge
3 Remove the source of the illicit discharge
4 Program evaluation and assessment

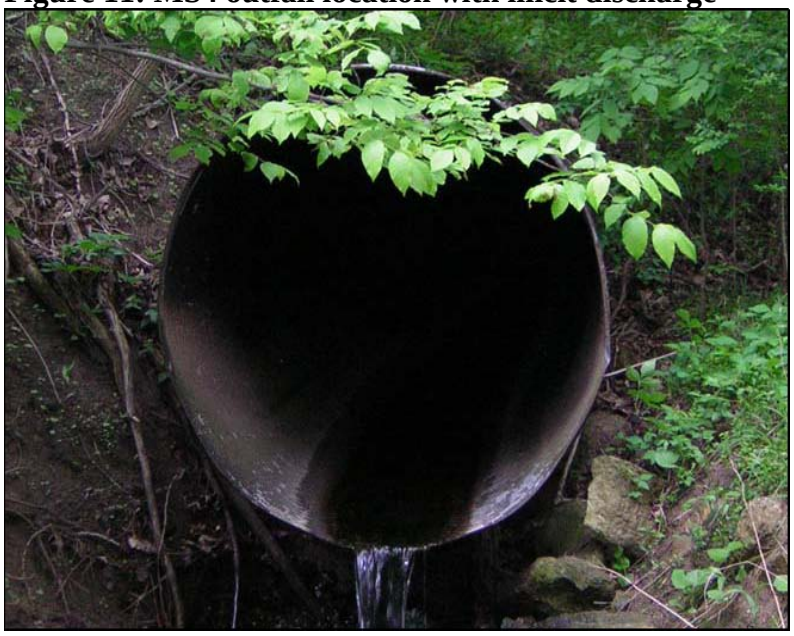
Locating priority areas within your community will be the focus of this Section. The remaining components will be focused in the following Sections.

3.1 Developing Priority Areas

Developing Priority Areas is vital to any community IDDE program. This process can be broken down into three fundamental steps:

1 Use all available information to identify the potential hot spots of the community
2 Conduct dry weather field screenings to locate non-storm water discharges
3 Conduct water quality sampling and analysis to determine what non-storm water discharges are present.

Figure 11: MS4 outfall location with illicit discharge



The first step in locating priority areas is to identify possible hot spots within your community. These hot spots are areas where there is a potential for illicit discharges to occur. These can be broken down into a list of commonly high probability locations where illicit discharges may be occurring.

Figure 12: Dry weather field inspection

1. Locations where there have been repeated problems in the past. This includes locations with known water quality data, as well as locations where numerous complaints have been received. These areas should be known to community officials as well as other agencies that collaborate on specific problem areas. For example: the Northeast Ohio Regional Sewer District (NEORSD) works on many sanitary sewer problems that can impact an MS4 within a community. The NEORSD would be an agency that should be contacted for such information. Likewise, the local health department, EPA office, county engineer, municipal engineer or a variety of other agencies should be contacted when compiling this information.

2. Older areas of a community may indicate possible locations where there will be illicit discharges detected. These locations in a community may have a higher percentage of illegal connections and/or have deteriorating sewer lines leading to infiltration problems from the older infrastructure found in that area.

3. The commercial and/or industrial areas of the community will tend to have a higher percentage of illicit discharges as well. Historically, these locations have significant numbers of illegal connections and have discharges with a high potential to affect water quality (Tuomari, 1999 and Pitt et al., 1993).

3.2 Haverhill's Priority Areas

The City of Haverhill has only one lake where swimming is allowed, which is Lake Saltonstall. Currently, there are no known Stormwater outfalls that discharge Lake Saltonstall. Base upon limited recreation uses the following criteria has been develop to assign a priority level to each outfall. The following are the priority criteria:

1. **High Priorities are as follows:**
    (1) Outfalls directly to the Merrimack River, Little River or other tributary that could reach the Merrimack or Little River within in 4 days
    (2) Public Drinking Water Supply Watersheds of Crystal Lake, Kenoza Lake, and Millville Pond, outfalls directly to these Watersheds or tributaries that could reach the Watersheds within in 4 days

2. **Medium Priority** is for the outfalls that may reach the Merrimack River or Little River or the Watersheds but the time-frame is not really known.

3. **Low Priority** is for the outfalls that do not discharge to the Merrimack River, Little River, their tributaries or the Watersheds.
    (1) Detention pond inlet
    (2) Detention pond outlets
    (3) Discharges into unknown wetlands

3.2.1 Merrimack River Uses

The Merrimack River is formed by the confluence of the Pemigewasset and Winipesauke Rivers at Franklin, New Hampshire and discharges to the Atlantic Ocean near Newburyport, Massachusetts. The main stem is about 116 miles in length with about 74 miles in New Hampshire and 42 miles in Massachusetts. The lower 22 miles of the river are tidal.

Over the past several decades significant improvements have been made to the overall water quality of the Merrimack River due to Federal, state, local community, and private investment in water pollution control facilities. However, there are remaining water quality and fish and wildlife habitat concerns related to Combined Sewer Overflows (CSO), storm drains and non-point source discharges, anadromous fish passage, future water supply needs.

The Merrimack River below Haverhill to the ocean at Salisbury/Newburyport is classified as a Class SB river and has a multitude of uses. The river supports both fresh water fisheries and anadromous fish. There are no public swimming beaches on the Merrimack River in this segment; however, the river is used for boating, jet skiing, water skiing, and canoeing. A shellfish resource exists on the Merrimack River below the I-95 bridge in Salisbury, but this area has been closed for many years from bacteria contamination.

In addition to the shellfish resource in the Merrimack River, the City of Haverhill is considering the Merrimack River as a drinking water supply. Any illicit connection into an outfall to the Merrimack River could lead to continuing shell fish bed closures and impair Haverhill's drinking water supply. All outfalls that could reach the Merrimack River within 4-days were categorized has a high priority.

Base upon the above priority criteria there are **163 High Priority** Outfall (Including 20 CSO Outfalls), **369 Medium Priority Outfall**, and **92 Low Priority Outfall** for a total of 624 outfalls. See Appendix A that list all 624 Stormwater and CSO outfalls with the appropriate Stormwater Identification number.

3.2.2 Field Identification

Currently, GIS list each outfall, which City personnel assign a specific street address as well as assigning high, medium, and low priority. Haverhill's Stormwater Committee has decided to permanently mark each outfall with a PVC type post similar to those used by gas companies to mark their cross-country gas mains. Red shall be for high priority, **yellow** shall be for medium priority and green shall be for low priority. Included on this post shall be the outfall identification number. This should allow residents and field staff an easier way to locate each outfall.

3.3 Detection / Inspections

Once the community has established their list of priority areas, then inspections must be conducted on all of the community's known MS4 outfall locations. Dry weather inspections are the required inspection protocol that communities must perform on their MS4 outfall locations. Dry weather inspections are a visual inspection of the outfall location. **Dry weather is defined as a minimum of 72 hours of no rainfall (0.1" or less) within an area**. During this type of visual inspection, there are a number of recommendations required to perform an effective dry weather screening process.

Always notify the public during any field component of your IDDE program. Examples include letters/postcards to residents, community webpage and community newsletters. As mentioned in the mapping Section, it is important that the public is very aware of what is occurring in a community and keeping them informed of what is occurring will benefit the IDDE program. A better-informed citizenry may assist in finding an illegal discharger, as well as helping with the educational component of the program.

3.3.1 Safety Detection / Inspections

As mentioned in the previous Section, safety in the field is vital. Typical surveys should be performed with two field staff (if available). Remember, like the mapping component, during the field investigations there will be remote areas that the field staff will be inspecting. If injury occurs, the extra field staff is a necessity. Also, be aware of the locations where field inspections will occur because specific locations may present specific sources for safety concerns.

3.3.2 Inspection

Utilize the information that you obtained from your mapping component. Print out completed inventory forms, inspection forms and a map indicating where the outfalls are and have them numbered on this map. This will allow for ease of locating known MS4 outfall locations. The field form will have the photo of the outfall, location of the outfall, side of stream, etc. This information is imperative when in the field. When the field staff finds the outfall, it is important to know which outfall is being inspected.

During this visual inspection, fill out the field inspection form. The following is a list of observations needed for this component, and are listed on the field format:

- Outfall number
- Date
- Time
- Crew staff

- Time of last rain
- Pipe flow (none, <1/4 pipe, <1/2/ pipe, etc)

Comment section for:

- Odor, color, turbidity, floatable matter

The above information is for dry weather visual inspections only. The field form also encompasses a sampling section for water quality sampling work that is conducted on an outfall.

3.4 Physical Indicators

As mentioned above, during dry weather visual inspections, it is important to indicate the conditions observed at an outfall location. This includes flow, odor, color, turbidity and if floatables are present at the location. The information that you obtain from the physical characteristics observed are indicators and cannot be fully relied upon by themselves. Floatables are the best physical indicator. Floatables can consist of sewage, suds, and oil sheens. These are the most common. The observation of sewage at an outfall location indicates that there is a severe problem with that MS4 and should be looked at as to where the source for the sewage is emanating from. Suds can indicate a variety of things. Some suds are naturally formed by the movement of the water. If the suds are located at a water drop off and break up quickly, this may only be water turbulence related. If the suds have a fragrant odor, this can indicate the presence of laundry water or wash water in the waterbody. Oil sheens need to be looked at to try and determine the source of the oil sheen. Some oil sheens are common and occur naturally by in-stream processes. This occurs when an iron bacteria forms a sheet-like film. This can be determined by looking at the sheen and seeing if it cracks when disturbed. Synthetic oil sheens, on the other hand, will swirl when disturbed. If this occurs, then the sheen is from an oil source.

Remember, when dry weather flows are observed at an outfall, the flow is considered non-storm water related. This flow can be an illicit discharge, but it may also be a flow being generated from another action that is not considered illicit (refer to Section 1). Likewise, if no flow is observed at an outfall, it does not mean that there is no problem at that specific outfall. In Section 1, different types of illicit discharges (continuous, intermittent and transitory) were discussed. The continuous flows are the easiest to locate. The other two are not. That is why it is important to observe the area at each outfall's location for any type of observable pollution problem that may be the result of a transitory or intermittent illicit discharge.

It is extremely important for IDDE program managers to recognize that during field inspections, the outfall is observed as a snapshot in time. An effective IDDE program utilizes long-term dry weather inspections. This involves regular inspections of outfalls in a community. These inspections will be consistent with the aforementioned protocol. The inspections can be done once a year but on a continuous basis over time. This will ensure that each outfall is being monitored routinely and that if changes occur at that location, action can then be implemented.

3.5 Water Quality Sampling

An effective IDDE program will utilize water quality sampling and testing as a tool. When dry-weather flows are observed, it will be difficult to determine if there is a problem with that flow. Obvious problems, such as strong sewage odor, or the presence of raw sewage or toilet paper, will indicate that there is a bacterial problem at that location emanating from sanitary sewers, cross connections or septic systems. However, in most circumstances, water that is observed during dry weather conditions will not

have those visual clues. That is why water quality testing and sampling is a vital component for an IDDE program.

Certain water quality parameters can serve as indicators of the likely presence or absence of a specific type of discharge. Some of these parameters can be measured in the field with specific instrumentation and field sample kits, while still others will need to be analyzed at a laboratory.

There are a large number of water quality parameters that can be measured in an IDDE program. The most commonly used and useful parameters are summarized in Table 31, which focuses on those parameters suggested in Pitt et al. (1993), the New England Interstate Water Pollution Control IDDE Manual and the EPA's Phase II regulations

Figure 13: Taking a water sample at an MS4 outfall location during dry weather flow

Table 3-1: Water Quality Test Parameters And Uses		
Water Quality Test	**Use of Water Quality Test**	**Comments**
Conductivity	Used as an indicator of dissolved solids	- Pitt et al. 1993 suggested parameter; EPA Phase II regulations recommended parameter - Typically measured in the field with a probe
Bacteria (fecal coliform, *E. coli* and/or *enterococci*)	Used to indicate the presence of sanitary wastewater	- Used by NHDES
Ammonia	High levels can be an indicator of the presence of sanitary wastewater	- Pitt et al. 1993 suggested parameter; EPA Phase II regulations recommended parameter
Surfactants	Indicate the presence of detergent (e.g., laundry, car washing)	- Pitt et al. 1993 suggested parameter; EPA Phase II regulations recommended parameter
pH	Extreme pH values (low or high) may indicate commercial or industrial flows; not useful in determining the presence of sanitary wastewater (which, like uncontaminated base flows, tends to have a neutral pH, i.e., close to 7)	- Pitt et al. 1993 suggested parameter; EPA Phase II regulations recommended parameter - Typically measured in the field or lab with a probe
Temperature	Sanitary wastewater and industrial cooling water can substantially influence outfall discharge temperatures. This measurement is most useful during cold weather.	- Pitt et al. 1993 suggested parameter - Measured in the field with a thermometer or probe
Hardness	Used to distinguish between natural and treated waters	- Pitt et al. 1993 suggested parameter
Total Chlorine	Used to indicate inflow from potable water sources; not a good indicator of sanitary wastewater because chlorine will not exist in a "free" state in water for long	- Pitt et al. 1993 suggested parameter
Fluoride	Used to indicate potable water sources in areas where water supplies are fluoridated	- Pitt et al. 1993 suggested parameter
Potassium	High levels may indicate the presence of sanitary wastewater	- Pitt et al. 1993 suggested parameter
Optical Brighteners (Fluorescence)	Used to indicate presence of laundry detergents (which often contain fabric whiteners, which cause substantial fluorescence)	-Pitt et al. 1993 suggested parameter -Used by City of Winooski, VT
Dissolved Oxygen	Low DO can indicate sewage problem	-Toth, Lake County Health
Phosphorus	High phosphorus can indicate sewage and/or possible illegal gray water connections	-Toth, Lake County Health

Source: Table Modified from *Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities,* New England Interstate Water Pollution Control Commission

The above table indicates that there are a number of water quality parameters that can be used to look for specific problems in communities. When deciding on what water quality parameters to use, the IDDE program manager must be aware of the community makeup and the possible sources of illicit discharges as well as how much money is available to complete water quality sampling. It is not necessary to do lab analysis on every sample. It is very possible to operate a successful IDDE program on a shoestring budget. That is why developing a priority list and hot spot locations are very important in determining the specific parameters to test.

Haverhill's Stormwater Committee has determined that the Merrimack and Little Rivers are water bodies that are not nutrient impaired. Therefore, water quality samples will not be conducted for ammonia and phosphorus. Other Stormwater outfall samples will be evaluated on case-by-case bases.

3.6 Water Quality Testing

When developing your IDDE program protocol for sampling, it is important to have a monitoring plan in place. This can be utilization of Standard Methods reference documents as well as a Quality Assurance Management Plan (QAMP). An example QAMP is included in the appendix. This was designed utilizing the US EPA QAMP model documents available at: **www.epa.gov/quality/qmps.html**. These plans will provide for proper quality assurance and quality control of proper sampling procedures. This will be important to validate your data. This will include proper calibration of field equipment and meters, how to properly take samples and keep them cold for the proper amount of time until delivered to the lab, and it will indicate how you will ensure the samples are valid (field blanks and replicate samples).

Also, it is important to take into account the resources that a community has and what they can allow for the IDDE sampling portion of their program. During the sampling phase, utilizing a meter to obtain some of this information is a worthwhile endeavor. There are a series of meters that can be used for temperature, pH, and conductivity. The lab analysis of samples is where there can be a high cost for communities. When determining what you want to sample for, look at the community as a whole and what are the problems of that specific community. In many circumstances, the problems lay with infrastructure, where you have older sanitary and storm sewer lines and there are infiltration problems from the sanitary to the storm sewer. In most cases, the first sampling parameter should be for bacteria. Fecal coliform is an indicator organism found in the intestines of warm-blooded mammals. When it is found in high quantities, this is an indicator of a bacterial problem.

The dry weather inspections and the water quality testing will provide valuable information for an effective IDDE program. By establishing a consistent protocol in these inspection strategies, the community will acquire data that is necessary in order to have an effective IDDE program. By performing long-term dry weather inspections, a long-term protocol will be set in place to view MS4 outfalls and ensure they are not discharging pollutants into the surface waters of the state. Likewise, the sampling component will provide valuable data for communities' IDDE programs.

Sampling is a vital component and communities need to start addressing this component sooner rather than later. By starting a sampling protocol and continuing this protocol on a yearly basis, the community will develop baseline data as to their outfall discharges. It will allow the communities work efficiently on problem areas by directing their resources wisely by utilizing the sampling data. It will also allow communities to look at their MS4s over a long period of time to observe improvements in problem areas.

There is no single indicator parameter that is perfect. Table 3-2 summarizes the parameters that meet most of the indicator criteria, compares their ability to detect different flow types, and reviews some of the challenges that may be encountered when measuring them.

"The Data in Table 3-2 are based on research by Pitt conducted in Alabama, and therefore, the percentages shown to distinguish "hits" for specific flow types should be viewed as representative and may shift for each community. Also, in some instances, indicator parameters were "downgraded" to account for regional variation or dilution effects. For example, both color and turbidity are excellent indicators of sewage based on discharge fingerprint data, but both can vary regionally depending on the composition of clean groundwater." (Center for Watershed Protection and Pitt, 2004)

Table 3-2: Indicator Parameters Used to Detect Illicit Discharges

	Discharge Types It Can Detect				
Parameter	Sewage	Wash water	Tap Water	Industrial or Commercial Liquid Wastes	Laboratory/Analytical Challenges
Ammonia	#	*	x	*	Can change into other nitrogen forms as the flow travels to the outfall
Boron	*	*	x	N/A	
Chlorine	x	x	x	*	High Chlorine demand in natural waters limits utility to flows with very high chlorine concentrations
Color	*	*	x	*	
Conductivity	*	*	x	*	Ineffective in saline waters
Detergents-Surfactants	#	#	x	*	Reagent is a hazardous waste
E. coli Enterococci Total Coliform	*	x	x	x	24-hour wait for results. Need to modify standard monitoring protocols to measure high bacteria concentrations
Fluoride1	x	x	#	*	Reagent is a hazardous waste exception for communities that do not fluoridate their tap water
Hardness	*	*	*	*	
pH	x	*	x	*	
Potassium	*	x	x	#	May need to use two separate analytical techniques, depending on the concentration
Turbidity	*	*	x	*	

Can almost always (>80% of samples) distinguish this discharge from clean flow types (e.g., tap water or natural water). For tap water can distinguish from natural water.
* Can sometime (>50% of samples) distinguish this discharge from clean flow types depending on regional characteristics, or can be helpful in combination with another parameter
x Poor indicator. Cannot reliably detect illicit discharges, or cannot detect tap water.
N/A Data are not available to assess the utility of this parameter for this purpose.
Data Source: Pitt (this study)
1 Fluoride is a poor indicator when used as a single parameter, but when combined with additional parameter (such as detergent, ammonia and potassium), it can almost always distinguish between sewage and wash water.

SOURCE: ***Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*****, Center for Watershed Protection**

3.7 Quality Assurance Management Plans and Project Plans (QAMP/QAPP)

Appendix D has information on the development of a QAMP or QAPP. These plans are extremely important in ensuring that when water samples are obtained, that there is a consistent and approved protocol used. This is to ensure that the data you collect is accurate. This should include where to collect samples, when to collect, how to collect, calibration of equipment (meters), storage of samples, chain of custody, and transportation of samples to lab. It is best to develop your QAMP/QAPP by utilizing organizations that have experience in this type of quality control processes. This can include EPA, local health departments, and sewer districts. It is also important to have all field staff properly trained for sample collecting.

3.7.1 Equipment for Water Sampling

When performing water quality sampling, it is important to have adequate equipment. This includes, but is not limited to:

- Cooler
- Ice
- Bottles: These will depend on the parameter being sampled for. The lab that you utilize for analysis may provide you the bottle that is required. Keep bottles in a safe environment to prevent cross contamination from occurring.
- Labels for bottles: In many circumstances, the lab will have the bottles pre-labeled. If not, get the labels that the lab recommends for labeling the bottles.
- Permanent marker for bottles
- Field forms
- Latex gloves
- Meters: depends on what parameters and what type of meter purchased for use.
- Test kits

Whenever a water sample is taken at an MS4 outfall location, fill out the inspection form from **Appendix C** and make sure the time of sample is indicated. This is important when delivering samples to the lab. It is not recommended to analyze the samples yourself, unless you have a lab available. It is better to use a lab that has a QA/QC policy in place and one that routinely performs this type of analysis for consistency purposes.

3.8 Special Monitoring

Some of the monitoring that will be required will involve different techniques. If an outfall location shows physical signs of a problem, but no flow is observed, then that illicit discharge is either an intermittent or a transitory discharge. These do not flow continuously and may be difficult to observe.

Once an outfall is determined to have a possible illicit discharge associated with it and no flow is observed, then an alternate inspection and sampling program must be used. This can include the following:

3.8.1 Odd Hours of Monitoring:

Perform inspections either later in the evening or early morning hours or on the weekends. Since many types of intermittent discharges probably occur when households are home, then the inspection needs to be performed during these times as well. Make sure that if samples are collected during odd times, the lab needs to be notified to ensure they can accept and analyze the sample since there are specific holding times for each type of parameter.

3.8.2 Sampling at the Outfall Plunge Pool:

A sample would be collected directly from the plunge pool below the outfall, if one were present. An upstream sample must also be taken to compare the results. This can be affected by dilution and time so it is not always that accurate and effective.

Section 4: Tracing For the Source of an Illicit Discharge

4.1 Tracing Techniques

Once an illicit discharge has been identified and detected, the next step is to locate the source of that discharge. The development of a plan to locate and address illicit discharges is required under the Phase II Storm Water Rules. “EPA recommends that the plan include the following five components:”

1 Locate the priority areas
2 Sample or screen the outfall
3 Trace the source of an illicit discharge
4 Remove the source of the illicit discharge
5 Program evaluation and assessment

The information that is received from the mapping and the inspection protocols established by a community will be valuable in this component (see previous Sections). During the inspection process, illicit discharges may be located and detected. Once these outfall locations are determined to have an illicit discharge, then the community must start its tracing protocol to determine where the source of the illicit discharge is emanating from. Once located, this discharge must be eliminated from the community’s MS4 system.

There are a number of different techniques that can be utilized to trace for an illicit discharge. Each technique listed must be fully understood and their limitations must be understood as well.

Figure 14: Removing storm drain lid

4.1.1 Visual Inspections/Manholes and Storm Drain Network

Once a dry weather flow has been observed and it has been determined to be an illicit discharge, a key tracing technique involves dry weather inspections along the specific MS4 conveyance system. Typically, if the conveyance system is an open ditch, this is an easier process then if it was within an enclosed storm drain network. The inspection process utilizing this method needs to start at the initial detection location (the MS4 outfall where the illicit discharge has been observed and noted).

The next step is to work "upstream" from this location – that is moving up the storm drainage system to the first manhole. Check this manhole to see if there is evidence of flow. You may wish to sample each manhole, but looking for flow, since the flow has already been determined to have an illicit discharge, it is the more cost effective and faster method suggested. If flow is observed at this manhole, move to the next upstream manhole. Keep moving upstream until no flow or low flow is observed. Keep in mind that as you move upstream, there may be junction lines entering that main storm drainage system at other locations. Utilize the storm drainage maps for the community to determine if this is the case. In these circumstances, you will need to check these manholes as well.

During this inspection process, key observations are necessary, including:

- Presence of flow
- Odors
- Colors/clarity
- Stains or deposits on bottom of structure
- Oil sheen, scum or foam on any standing water

During this process, sampling can be utilized to assist in this tracing process. Once areas are determined to have possible illicit source flows, sampling these individual locations and manholes can assist in directing where the source of the illicit discharge is located. Specific parameters can be used when looking for the illicit discharge. Refer to Section 3, Table 3-1 for sample parameters that can be used for specific sources of illicit discharges. Typically, you will use the same parameter that was used when the initial sample was taken to determine if an illicit discharge was present at that flow.

Once the area has been determined where the potential illicit discharge source is located, the utilization of dye testing will assist in determining the exact location of the illicit discharge. Permission is required on private property prior to starting a dye test procedure. Access to the building is required. Once permission is granted, the dye testing will begin.

Note: before any dye test is conducted, it is a good idea to notify the appropriate district office of the Ohio EPA Division of Emergency and Remedial Response that a dye test is being conducted as well as the local community fire department and other community personnel. The dye needs to be put into the suspect location. This is done by pouring the dye into sinks, toilets, etc and then flushed through the drainage system. The storm drains and sanitary sewers need to be monitored to observe where the dye discharges. This procedure is effective in determining direct connections sanitary lines to storm lines.

Dye Testing **Figure 15: Dye at outfall location**

4.2 Televising/Video Inspection

Another method in determining where the illicit discharge source is located once an area has been determined to contain the discharge, is televising the storm line. Video cameras can be used by either pushing or using a mobile video unit. Both cameras will provide detailed information as to where the infiltration or connection is located within the MS4 system.

4.3 Indicator Monitoring / Sampling

When dry weather flow is observed at an outfall location, and the sample reveals that there is a problem with this flow, further monitoring can be done to assist in the location of the illicit discharge. As manholes are opened and dry weather flow is observed, samples can be taken and analyzed. During this process, we are looking for a pattern within the sample analysis, depending on the parameter sampled for. During this type of tracing, the monitoring will allow the field crew to determine if the dry weather flow observed is the source of the flow at the outfall location. There can be circumstances where dry weather flow occurs and it is not “illicit” due to its source (drinking water line break, fire hydrant flushing, etc: refer to Section 1: Does This Measure Need to Address All Illicit Discharges?). This flow can combine with an illicit source in the storm drainage system making it difficult to trace. By monitoring the water observed, it will assist in the tracing of the illicit source discharging into the storm drainage system.

Automatic Samplers can also be used during the investigation of intermittent flows. These samplers can be placed at specific locations within the storm drainage system of a community. These samplers can be triggered by dry weather flows. This type of sampling and monitoring is not the best method for most communities due to the cost of the sampling equipment. This type of monitoring can be effective however, in areas with a large intermittent discharge problem and a very complex storm drainage system. These samplers will provide the date and time the sample was collected which will assist the community in locating the source of this discharge.

4.4 Smoke Testing

This method should be used during special circumstances when a good storm sewer map is not available for a location and there are known problems of connection issues. Smoke is introduced into the storm drainage system and will emerge at locations that are connected to that system. It is recommended that qualified personnel be used for this method to ensure accurate test results.

"Notifying the public about the date and purpose of smoke testing before starting is critical. The smoke used is non-toxic, but can cause respiratory irritation, which can be a problem for some residents. Residents should be notified one week prior to testing, and should be provided the following information" (Hurco Technologies, Inc., 2003):

- Date testing will occur and reason for smoke testing
- Precautions they can take to prevent smoke from entering their homes or businesses
- What they need to do if smoke enters their home or business, and any health concerns associated with the smoke
- A number residents can call to relay any particular health concerns (e.g., chronic respiratory problems)

4.5 Optical Brightener Monitoring (OBM) Traps

OBM traps can be used to assist in tracing intermittent flows that result from wash water with detergent. Detergents contain optical brighteners that can be detected at high concentrations. However, this method usually only picks up highly concentrated discharges. The OBM method may be used as a simple indicator for the presence or absence of intermittent flows or to detect the most concentrated flows.

These traps usually contain unbleached cotton pads or a fabric swatch placed inside of a wire mesh trap. These traps are anchored inside of an outfall using wire that is secured to the pipe itself. Rocks can also be used to hold the trap in place.

These traps will be retrieved after 24-48 hours of dry weather. They need to be removed prior to having contact with storm water. When placed under a fluorescent light, an OBM trap will indicate if it has been exposed to detergents. (Guidelines for n

Section 5: Elimination of an Illicit Discharge

5.1 Developing And Implementing An Effective IDDE Program

Developing and implementing an effective IDDE program requires the successful removal of an illicit discharge once located. Under EPA Phase II rules, you must "to the extent allowable under law, effectively prohibit, through ordinance or other regulatory mechanism, non-storm water discharges into your storm sewer system and implement appropriate enforcement procedures and actions".

5.1.1 Model Ordinance

There has been a model illicit discharge ordinance developed by a collaborative effort of the Chagrin River Watershed Partners, Inc., the Cuyahoga County Board of Health and the Lake County General Health District. This ordinance has been approved by the Ohio EPA and is located in **Appendix E**. This model ordinance allows for the regulatory mechanisms for communities to address these illicit discharges and comply with the Ohio EPA Phase II requirements. The City of Haverhill Stormwater Committee, HSWC has adopted and made changes to the Ordinance in Appendix E. The Ordinance is presented in Appendix E. This manual shall be update to reflect the actual date the City Council pass this Ordinance.

5.2 Illicit Discharge Has Been Identified

Once an illicit discharge has been identified, communities must then determine who is responsible for the removal of the discharge. Ultimately, it is the property owner or the municipality.

- Internal Plumbing Connection: Generally, it is the building owner.
- Service Lateral: This is also generally the building owner. However, in some circumstances, communities may fix the problem and share in the cost with the building owner depending on the policy and procedures communities have developed.
- Infrastructure Failure: This type of discharge is the community's responsibility if within the dedicated right of way.
- Transitory Discharge: Again, the building owner is responsible to correct.
- Educating residents on habits (illegal dumping, etc).

Typically, the timeframe established for the repair of these illicit discharges is established within the community's enforcement procedures. During the enforcement of these illicit discharges, the communities must provide clear guidance in both their ordinance and with their direction to the responsible party for what actions need to be taken to correct the problem.

Once the removal of the illicit discharge has occurred, it must be confirmed to ensure the correction has been made. For example, this can be confirmed by dye testing internal plumbing fixtures if the source was from an internal or service lateral line source.

There are various methods that can be used to remove an illicit discharge and to fix the problem. Table 5-1 gives an overview of the technique, when to use and the description.

Table 5-1: Methods to Eliminate Discharges			
Technique	**Application**	**Description**	**Estimated Cost**
Service Lateral Disconnection, Reconnection	Lateral is connected to the wrong line	Lateral is disconnected and reconnected to appropriate line	$2,500-$5,000
Cleaning	Line is blocked or capacity diminished	Flushing (sending a high pressure water jet through the line); pigging (dragging a large rubber plug through the lines); or rodding	$1/linear foot
Excavation and Replacement	Line is collapsed, severely blocked, significantly misaligned, or undersized	Existing pipe is removed, new pipe placed in same alignment; Existing pipe abandoned in place, replaced by new pipe in parallel alignment	For 12" line, $100-$150/linear foot
Manhole Repair	Decrease ponding; prevent flow of surface water into manhole; prevent groundwater infiltration	Raise frame and lid above grade; install lid inserts; grout, mortar or apply shortcrete inside the walls; install new precast manhole	Vary widely, from $250 to raise a frame and cover to ~ $4,000 to replace manhole
Corrosion Control Coating	Improve resistance to corrosion	Spray-or brush-on coating applied to interior of pipe.	< $10/linear foot
Grouting	Seal leaking joints and small cracks	Seals leaking joints and small cracks.	For a 12" line, ~ $36-$54/linear foot
Pipe Bursting	Line is collapsed, severely blocked, or undersized	Existing pipe used as guide for inserting expansion head; expansion head increases area available for new pipe by pushing existing pipe out radially until it cracks; bursting device pulls new pipeline behind it	For 8" pipe, $40-$80/linear foot
Slip Lining	Pipe has numerous cracks, leaking joints, but is continuous and not misaligned	Pulling of a new pipe through the old one.	For 12" pipe, $50$75 /linear foot
Fold and Formed Pipe	Pipe has numerous cracks, leaking joints	Similar to slip lining but is easier to install, uses existing manholes for insertion; a folded thermoplastic pipe is pulled into place and rounded to conform to internal diameter of existing pipe	For 8-12" pipe, $60-$78/linear foot
Inversion Lining	Pipe has numerous cracks, leaking joints; can be used where there are misalignments	Similar to slip lining but is easier to install, uses existing manholes for insertion; a soft resin impregnated felt tube is inserted into the pipe, inverted by filling it with air or water at one end, and cured in place.	$75-$125/linear foot

SOURCE: Modified from *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection, 2004

If the illicit discharge is emanating from outside of your community or jurisdiction, it is important that you notify the community where the discharge is coming from. This should be done in a letter format where you can document that it was sent. The letter should include where the illicit discharge was detected and where it was traced to by your community. Keep records of what your community did, and ask the neighboring community/jurisdiction to inform you when the correction has been made. Include all of your documentation with your annual Phase II Storm Water Report to the EPA.

5.3 Preventing Illegal Dumping

One source of illicit discharge to a community's MS4 system is illegal dumping. This is often difficult to identify and locate. Because of the potential problem that this type of discharge presents, it is important to develop an Illegal Dumping Prevention Program as part of your IDDE Program.

The US EPA has developed an *Illegal Dumping Prevention Guidebook* that provides key information and procedures in addressing this type of illicit discharge. The guidebook can be located at: **www.epa.gov/region5/illegaldumping/** Strategies for preventing illegal dumping include:

- Site maintenance and controls: This includes cleaning up areas where illegal dumping has occurred and to utilize specific controls to prevent further dumping. These controls can include signage or restriction of the area.
- Targeted Enforcement: Utilization of an ordinance that prohibits illegal dumping.
- Education and Involvement: As with components I and II of the Phase II program, community outreach and involvement is vital to any successful IDDE program. This includes a variety of programs that can assist the community in meeting their requirements under this component of Phase II.
- Educate general public, municipal employees and businesses about water quality issues and how illegal dumping has a direct impact on these water quality issues.
- Provide for effective ways to dispose of waste
- Provide a way for citizens to get involved in reporting and preventing illegal  dumping, such as storm drain marking that indicates:
- No dumping – drains directly to lake, creek, or other water body
- Develop materials/brochures for the public and businesses. This should include businesses that handle hazardous materials as well as restaurants, auto repair shops and others that may have an impact on possible sources of an illicit discharge.
- Develop an anonymous mechanism that can be used by the public, businesses and municipal employees to report illicit discharges.
- Create a service department self-inspection program to detect possible sources of illicit discharges and illegal connections.

Section 6: Evaluation of your IDDE Program

A successful IDDE Program involves a program evaluation and assessment. EPA recommends that the IDDE Program have procedures for program evaluation and assessments. IDDE programs should be evaluated at the end of each year to assess if it has been effective and most of all, efficient.

6.1 Evaluating the Program

To effectively evaluate your program, a number of questions need to be asked and analyzed.

6.1.1 Evaluate priority areas within your community:

a. Were these areas identified initially?
b. Are these areas still appropriate to be a priority area?
c. Have illicit discharges been located in these areas?

6.1.2 Detection Program

a. Is the program effective? Need to reassess the program by determining what has been achieved. Look at number of outfalls inventoried, the number visually inspected, the number that had dry weather flows and look at the overall percentages of these flows as part of your overall storm sewer system for your community.
b. Cost effectiveness: What aspects of the program had the highest quality of effectiveness in relationship to cost?
c. Number of illicit discharges detected utilizing each detection method (will assist to see what method is more effective).

6.1.3. Tracing Program

a. What techniques were used?
b. Were these methods successful?
c. What techniques that were not used would be beneficial for next year?
d. How many illicit sources were identified and eliminated?

6.1.4 Other

a. If using water quality sampling, resample areas within community to determine effectiveness of the removal of illicit discharges.
b. Determine how much time was spent by employees and expenses to determine overall cost for achieving a given result.

6.2 Establish a Tracking and Reporting System

It is important that a tracking system be developed. This system is to track, report and respond to illicit discharge problems. This tracking system enables the community to measure the IDDE program effectiveness and assists with the evaluation of the overall IDDE program.

Section 7: Education to Public Employees, General Public and Businesses

The EPA requires that communities must inform public employees, businesses and the general public of hazards associated with illegal discharges and improper disposal of waste. This Section provides some suggestions as to how to provide this information to the targeted audience.

7.1 Public Employees

The Phase II Storm Water rules require that municipal employees be trained on pollution prevention techniques. This is located under minimum control measure number 6: “Pollution Prevention/Good Housekeeping for Municipal Operations”.

Part of this training can include the prevention of non-storm water discharges from entering the storm sewer system from municipal operations. Public employees can play an important role as partners in the detection and/or prevention of illicit discharges.

Service department employees can look for signs of illegal dumping in catch basins and other locations. Building inspectors can ensure that illegal connections to the storm sewer system do not take place during construction projects. Staff whose jobs keep them outside and mobile can help spot illegal dumpers. Fire and police department personnel who respond to hazardous material spills can help keep these spills out of the storm sewer system and adjacent water bodies.

7.2 General Public

The general public must be made aware and educated on environmental and water quality issues. During this outreach stage, it is important to get the public engaged and involved in the process. Some examples of what can be done by the general public include:

- Print and distribute outreach materials. This should include information on water pollution, storm water problems, what is an illicit discharge, and what the community is doing about illicit discharges.
- Develop a program to encourage the public to report illicit discharges/dumping when they are observed. This can include a dedicated “hotline” for the public to call when they observed situations that are impacting the community’s MS4 system.
- Develop citizen volunteers to conduct storm drain stenciling projects at storm drains. It is important that citizens be trained. Many local Soil and Water Conservation Districts can perform this training and assist the community in public involvement activities. All volunteers should sign a liability form.
- The community should develop a household hazardous waste disposal/recycling program. This can be done in conjunction with other communities or coordinated through the County Solid Waste Management District.

7.3 Businesses

It is also important to educate local businesses to show how they can have an impact on water pollution. Here are some steps you can take to reach out to businesses.

- Develop a brochure and/or presentations to inform businesses about water pollution, storm water and illicit discharges. It is important to have partners assist on this project including the local Chamber of Commerce.
- Provide contractors and developers information on illegal connections.

References

Casco Bat Estuary Partnership, Aquarion Engineering Services, and Edelstein Associates. Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine.

Center for Watershed Protection and Robert Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.

Cuyahoga County Board of Health, 2005. Quality Assurance Management Plan.

Cuyahoga County Board of Health, 2003. Illicit Discharge Detection and Elimination Field Requirements.

New England Interstate Water Pollution Control Commission, 2003. Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities.

Northeast Ohio Regional Sewer District, 2003. Stormwater Outfall Database.

Ohio EPA, 2004. 3745-39-03, Ohio EPA NPDES requirements for small MS4s.

Haverhill

Robert E. Ward, P.E.
Superintendent/Engineer Water/Wastewater
Phone: 978-374-2382 Fax: 978-521-4083
rward@haverhillwater.com

Appendix A IDDE Outfall Database - Outfall Identification and Stream Naming Convention

IDDE Outfall Database -Outfall Identification and Stream Naming Convention

Conclusions

The City of Haverhill, Massachusetts is 32 miles north of Boston, which share a border with New Hampshire. Haverhill is 36 square miles the same geographical size as Boston. The highest point in Haverhill is at elevation 300-feet USGS with the lowest at elevation 5 feet.

Two main rivers bisect Haverhill the Merrimack River and Little River.

"*The Merrimack River is formed by the confluence of the Pemigewasset and Winnipesaukee Rives at Franklin, New Hampshire and discharges to the Atlantic Ocean near Newburyport, Massachusetts. The main stem is about 116 miles in length with about 74 miles in New Hampshire and 42 miles in Massachusetts. The lower 22 miles of the river are tidal.*" The previous sentence was taken from the Fact Sheet Merrimack River Comprehensive Water Shed Study conducted by the US Army Corps of Engineer's, copy and paste this link **http://www.nae.usace.army.mil/projects/ma/merrimack/merrimack.htm** to view this report.

The Merrimack River, which flows from a Westerly to Easterly direction has a 7Q10 flow of 649 million gallons per day, (MGD). The river in Haverhill is 800-feet in width. Near the entrance into the ocean, clam flat beds have begun to be re-open to commercial shell fishing. However, every time it rain these shell fish beds are close due to bacteria contamination.

The Little River has it origin in New Hampshire flows from the North to South direction. The Little River is quite smaller than the Merrimack River and flows into the City's downtown district. After the floods of 1928 and 1932, the Us Army Corps of Engineers constructed an 18-foot diameter concrete conduit to protect down town businesses from flooding. The Little River discharges into the Merrimack River through the concrete conduit at the City downtown district.

The Merrimack River and Little Rivers make up the largest and critical Rivers in the City. Therefore, all know Stormwater out falls that are connected directly into these rivers are rated as high priority. In addition, if the City staff feels that a brook or streams tributary flow could reach either the Merrimack or Little River these are also place as a high priority.

The City of Haverhill has recently finished a Geographic Information System, (GIS).Currently there exists 624 Stormwater outfalls with 20 of these Combine Sewer Overflows, (CSO). The attribute table was change from a numerical identification to a more descriptive name.

The outfall identification scheme presented here is unlikely to describe every situation, which may arise when assigning identification numbers while performing an outfall inventory. The attempt was made to cover some of the more common predicaments that arise during such an exercise. The key to developing additional naming schemes for use in cases not foreseen and covered in this guide is consistency. In addition, it is important to document the method used for naming streams and numbering outfalls, including procedures for naming newly discovered, newly constructed, and newly acquired streams and outfalls.

The City of Haverhill has adopted the following naming categorization. Utilizing GIS with the unique identification number. City personnel assign the first letters of the water body name to each Identification number. Here are some examples:

Unique Identification number 604 Merrimack River Outfall	**New ID**: **MR604**
Unique Identification number 605 Little River	**New ID**: **LR605**
Unique Identification number 606Detention Pond Inlet	**New ID**: **DPI606**
Unique Identification number 607Detention Pond Outlet	**New ID**: **DPO607**

See the Table A-1 below that list the City's current water bodies and the corresponding water body acronym.

Table A-2 below the Column **Object ID** is the GIS unique identification. Column OutfallID is the City of Haverhill naming categorization.

Table A-1 City of Haverhill Outfall Stream Acronym

ReceivingWaterAcronym	ReceivingWaterBody
BB	Bradley Brook
BZB	Buzell Brook
CB	Creek Brook
CC	Cottles Creek
CL	Crystal Lake
DPI	Detention Pond Inlet
DPO	Detention Pond Outlet
FB	Fishing Brook
FP	Frey's Pond
JC	Johnston's Creek
JP	Johnsons Pond
KL	Kenoza Lake
LR	Little River
MB	Millvalle Brook
MR	Merrimack River
PB	Peabody Brook
PL	Pentucket Lake
SB	Snow Brook
TS	Tilton Swamp
UNK	Unknown
WL	Wetland
WMB	West Meadow Brook

Table A-2 List All Known Outfalls With Their Identification And Priority

OBJECT ID	OutfallID	Priority	DischargeA	Receiving_stream	PermitNa_1
752	BB0752	High	1151 RIVER ST	Bradley Brook	
874	BB0874	High	WEST LOWELL AVE At bridge near Forest St	Bradley Brook	
640	CL0640	High	15 DANRICH CT	Crystal Lake	
641	CL0641	High	5 DANRICH CT	Crystal Lake	
698	CL0698	High	15 MAYFLOWER LN	Crystal Lake	
699	CL0699	High	3 MAYFLOWER LN	Crystal Lake	
700	CL0700	High	3 MAYFLOWER LN	Crystal Lake	
701	CL0701	High	NORTH BROADWAY	Crystal Lake	
707	CL0707	High	5 DANRICH CT	Crystal Lake	
1036	DPI1036	High	5 HARBOR DR	Detention Pond Inlet	
1126	DPI1126	High	22 RAINBOW DR	Detention Pond Inlet	
1127	DPI1127	High	22 RAINBOW DR	Detention Pond Inlet	
1128	DPI1128	High	22 RAINBOW DR	Detention Pond Inlet	
1124	DPO1124	High	38 GLEN MEADOW RD	Detention Pond Outlet	
637	FB0637	High	843 HILLDALE AV	Fishing Brook	
638	FB0638	High	843 HILLDALE AV	Fishing Brook	
639	FB0639	High	843 HILLDALE AV	Fishing Brook	
919	FP0919	High	324 NORTH AV	Frey's Pond	

1179	JP1179	High	134 HOYT RD	Johnsons Pond	
1180	JP1180	High	133 HOYT RD	Johnsons Pond	
769	KL0769	High	259 KENOZA AV	Kenoza Lake	
930	KL0930	High	MILL ST	Kenoza Lake	
936	KL0936	High	131 AMESBURY RD	Kenoza Lake	
1178	KL1178	High	256 CONCORD ST	Kenoza Lake	
1230	KL1230	High	259 KENOZA AV	Kenoza Lake	
1231	KL1231	High	259 KENOZA AV	Kenoza Lake	
620	LR0620	High	Winter Street	Little River	CSO
844	LR0844	High	11 WHITTIER PL	Little River	
875	LR0875	High	ROSEMONT ST	Little River	
876	LR0876	High	At Lift Station Bridge	Little River	
877	LR0877	High	165 ROSEMONT ST	Little River	
879	LR0879	High	ROSEMONT ST	Little River	
880	LR0880	High	ROSEMONT ST	Little River	
931	LR0931	High	CB at Winter Street and Little River	Little River	
932	LR0932	High	CB at Winter Street and Little River	Little River	
933	LR0933	High	54-inch CSO pipe into Little River	Little River	CSO
934	LR0934	High	21-inch overflow pipe into Little River	Little River	
952	LR0952	High	HILLDALE AV	Little River	
963	LR0963	High	18 ALVANOS DR	Little River	
966	LR0966	High	10 PEPPERCORN LN	Little River	
967	LR0967	High	5 GENOA WY	Little River	
979	LR0979	High	590 PRIMROSE ST	Little River	
993	LR0993	High	99 NEWARK ST	Little River	
994	LR0994	High	59 CALUMET ST	Little River	
995	LR0995	High	42 NEWARK ST	Little River	
1098	LR1098	High	24 SAINT BOTOLPH ST	Little River	
1099	LR1099	High	60 SAINT BOTOLPH ST	Little River	
1100	LR1100	High	42 TAYLOR ST	Little River	
1101	LR1101	High	56 TAYLOR ST	Little River	
1102	LR1102	High	Bennington Street at Railroad	Little River	
1103	LR1103	High	Bennington Street at Railroad	Little River	
1115	LR1115	High	1 JEFFERY LN	Little River	
1116	LR1116	High	HILLDALE AV	Little River	
1118	LR1118	High	10 PRIMROSE WY	Little River	
1119	LR1119	High	10 PRIMROSE WY	Little River	
1120	LR1120	High	36 SAWYER ST	Little River	
1132	LR1132	High	21 GREENHILL FARM RD	Little River	
1144	LR1144	High	94 ATLANTA ST	Little River	
1145	LR1145	High	106 ATLANTA ST	Little River	
1149	LR1149	High	26 CONCORDIA DR	Little River	
1150	LR1150	High	100 MONTCLAIR RD	Little River	
1232	LR1232	High	93 ESSEX ST	Little River	CSO
1233	LR1233	High	9 LOCKE ST	Little River	CSO
968	LRO968	High	9 SPINNAKER CR	Little River	

296	MR0296	High	MARGIN ST	Merrimack River	CSO
606	MR0606	High	Bates Bridge	Merrimack River	CSO
607	MR0607	High	WATER ST	Merrimack River	CSO
608	MR0608	High	135 WATER ST	Merrimack River	CSO
609	MR0609	High	SOUTH MAIN ST	Merrimack River	CSO
611	MR0611	High	123 RAILROAD AV	Merrimack River	CSO
612	MR0612	High	163 SOUTH ELM ST	Merrimack River	CSO
613	MR0613	High	SOUTH PROSPECT ST	Merrimack River	CSO
614	MR0614	High	SOUTH LINCLON STREET	Merrimack River	CSO
615	MR0615	High	FERRY ST	Merrimack River	CSO
616	MR0616	High	WATER ST	Merrimack River	CSO
619	MR0619	High	RIVER ST	Merrimack River	CSO
621	MR0621	High	170 WASHINGTON ST	Merrimack River	CSO
623	MR0623	High	RIVER ST	Merrimack River	CSO
625	MR0625	High	WATER ST	Merrimack River	CSO
642	MR0642	High	420 RIVER ST	Merrimack River	
648	MR0648	High	15 PARKRIDGE RD	Merrimack River	
649	MR0649	High	15 PARKRIDGE RD	Merrimack River	
650	MR0650	High	15 PARKRIDGE RD	Merrimack River	
651	MR0651	High	15 PARKRIDGE RD	Merrimack River	
662	MR0662	High	PARKRIDGE RD	Merrimack River	
676	MR0676	High	45 MARINA DR	Merrimack River	
748	MR0748	High	RIVER ST	Merrimack River	
749	MR0749	High	Western Avenue Across Street	Merrimack River	
750	MR0750	High	RIVER ST	Merrimack River	
751	MR0751	High	WESTERN AV	Merrimack River	
753	MR0753	High	RIVER ST	Merrimack River	
754	MR0754	High	RIVER ST	Merrimack River	
755	MR0755	High	1150 RIVER ST	Merrimack River	
770	MR0770	High	715 RIVER ST	Merrimack River	
771	MR0771	High	715 RIVER ST	Merrimack River	
772	MR0772	High	RIVER ST	Merrimack River	
833	MR0833	High	139 BRADLEY AV	Merrimack River	
834	MR0834	High	770 WEST LOWELL AV	Merrimack River	
836	MR0836	High	RIVER ST	Merrimack River	
839	MR0839	High	COFFIN AV	Merrimack River	
843	MR0843	High	2 WHARF LN	Merrimack River	
845	MR0845	High	9 AHERN CR	Merrimack River	
856	MR0856	High	WATER ST	Merrimack River	
857	MR0857	High	WATER ST	Merrimack River	
858	MR0858	High	WATER ST	Merrimack River	
868	MR0868	High	218 RIVER ST	Merrimack River	
869	MR0869	High	1410 RIVER ST	Merrimack River	
870	MR0870	High	176 WATER ST	Merrimack River	
871	MR0871	High	237 WATER ST at river	Merrimack River	
872	MR0872	High	205 WATER ST at river	Merrimack River	
873	MR0873	High	185 Water Street at river	Merrimack River	
920	MR0920	High	76 MERRIMACK ST	Merrimack River	
921	MR0921	High	MARGIN ST	Merrimack River	
922	MR0922	High	110 RIVER ST	Merrimack River	

923	MR0923	High	258 RIVER ST	Merrimack River	
924	MR0924	High	2 WASHINGTON SQ	Merrimack River	
925	MR0925	High	WATER ST	Merrimack River	
926	MR0926	High	RIVERSIDE AV	Merrimack River	
927	MR0927	High	RIVERSIDE AV	Merrimack River	
928	MR0928	High	RIVERSIDE AV	Merrimack River	
929	MR0929	High	RIVERSIDE AV	Merrimack River	
958	MR0958	High	SOUTH MAIN ST	Merrimack River	
982	MR0982	High	RIVER-RV RD	Merrimack River	
991	MR0991	High	70 WASHINGTON ST	Merrimack River	
992	MR0992	High	70 WASHINGTON ST	Merrimack River	
1009	MR1009	High	116 Bank Road	Merrimack River	
1010	MR1010	High	108 bank Road	Merrimack River	
1057	MR1057	High	PARKRIDGE RD	Merrimack River	
1058	MR1058	High	15 PARKRIDGE RD	Merrimack River	
1060	MR1060	High	2 MARINA DR	Merrimack River	
1062	MR1062	High	269 EAST BROADWAY	Merrimack River	
1064	MR1064	High	18 ETHEL AV Across Bank Road	Merrimack River	
1065	MR1065	High	Near Bank Road and River street	Merrimack River	
1066	MR1066	High	26 ETHEL AV Closer to Revere Street	Merrimack River	
1109	MR1109	High	WATER ST	Merrimack River	
1121	MR1121	High	258 BRANDY BROW RD	Merrimack River	
1122	MR1122	High	258 BRANDY BROW RD	Merrimack River	
1138	MR1138	High	747 River Street Across Street	Merrimack River	
1139	MR1139	High	759 River Street Across Street	Merrimack River	
1140	MR1140	High	765 River Street Across Street	Merrimack River	
1141	MR1141	High	715 River Street Across Street	Merrimack River	
1151	MR1151	High	COVE RD	Merrimack River	
1152	MR1152	High	COVE RD	Merrimack River	
1153	MR1153	High	LINCOLN AV	Merrimack River	
1164	MR1164	High	WATER ST	Merrimack River	
1165	MR1165	High	WATER ST	Merrimack River	
1224	MR1224	High	312 RIVER ST	Merrimack River	
978	PB0978	High	236 SALEM ST	Peabody Brook	
891	PL0891	High	MAIN ST	Pentucket Lake	
1129	PL1129	High	70 GALE AV	Pentucket Lake	
1181	PL1181	High	35 LUCAS DR	Pentucket Lake	
1182	PL1182	High	CROSBY ST	Pentucket Lake	
1222	PL1222	High	244 NORTH AV	Pentucket Lake	
846	SB0846	High	373 NORTH AV	Snow Brook	
1117	SB1117	High	33 Clyedale Avenue	Snow Brook	
961	UNK0961	High	1046 MAIN ST	Unknown	
1033	UNK1033	High	851 THOMPSON`S RD	Unknown	
1034	UNK1034	High	851 THOMPSON`S RD	Unknown	
1035	UNK1035	High	851 THOMPSON`S RD	Unknown	

1108	UNK1108	High	41 Naples road	Unknown	
1191	UNK1191	High	AMESBURY RD	Unknown	
867	WMB0867	High	200 FOREST ST	West Meadow Brook	
1051	WMB1051	High	182 Forest Street at bridge	West Meadow Brook	
847	BZB0847	Low	93 LEXINGTON AV	Buzell Brook	
959	BZB0959	Low	37 LINCOLNSHIRE DR	Buzell Brook	
980	BZB0980	Low	100 WINCHESTER ST	Buzell Brook	
981	BZB0981	Low	100 WINCHESTER ST	Buzell Brook	
1146	CB1146	Low	RESEARCH DR at Computer Druve	Creek Brook	
1147	CB1147	Low	Computer Drive near end	Creek Brook	
1148	CB1148	Low	Computer Drive closer to Broadway	Creek Brook	
632	DPI0632	Low	BROADWAY/SARAH J CR	Detention Pond Inlet	
634	DPI0634	Low	2 AHERN CR	Detention Pond Inlet	
636	DPI0636	Low	6 KEITH LN	Detention Pond Inlet	
643	DPI0643	Low	261 NECK RD	Detention Pond Inlet	
654	DPI0654	Low	62 AGAWAM AV	Detention Pond Inlet	
655	DPI0655	Low	SARAH J CR	Detention Pond Inlet	
656	DPI0656	Low	SARAH J CR	Detention Pond Inlet	
659	DPI0659	Low	10 PETERS LN	Detention Pond Inlet	
697	DPI0697	Low	10 PAMELA LN	Detention Pond Inlet	
732	DPI0732	Low	SARAH J CR	Detention Pond Inlet	
841	DPI0841	Low	1 SRYBNY AV	Detention Pond Inlet	
849	DPI0849	Low	15 WARD HILL AV	Detention Pond Inlet	
851	DPI0851	Low	148 WARD HILL AV	Detention Pond Inlet	
852	DPI0852	Low	148 WARD HILL AV	Detention Pond Inlet	
853	DPI0853	Low	148 WARD HILL AV	Detention Pond Inlet	
854	DPI0854	Low	148 WARD HILL AV	Detention Pond Inlet	
912	DPI0912	Low	2 SABER WY	Detention Pond Inlet	
913	DPI0913	Low	2 SABER WY	Detention Pond Inlet	
914	DPI0914	Low	2 SABER WY	Detention Pond Inlet	
915	DPI0915	Low	2 SABER WY	Detention Pond Inlet	
940	DPI0940	Low	6 Brook Street	Detention Pond Inlet	
941	DPI0941	Low	Brook Street ST	Detention Pond Inlet	
942	DPI0942	Low	Vincent Avenue near wetland	Detention Pond Inlet	
943	DPI0943	Low	6 Brook Street	Detention Pond Inlet	
944	DPI0944	Low	6 Brook Street	Detention Pond Inlet	
945	DPI0945	Low	6 Brook Street	Detention Pond Inlet	
946	DPI0946	Low	6 Brook Street	Detention Pond Inlet	
947	DPI0947	Low	6 Brook Street	Detention Pond Inlet	
948	DPI0948	Low	6 Brook Street	Detention Pond Inlet	
956	DPI0956	Low	1200 BOSTON RD	Detention Pond Inlet	
960	DPI0960	Low	176 LINCOLN AV	Detention Pond Inlet	
965	DPI0965	Low	11 HALEY RD	Detention Pond Inlet	
969	DPI0969	Low	14 DAWN CR	Detention Pond Inlet	
970	DPI0970	Low	17 DAWN CR	Detention Pond Inlet	
971	DPI0971	Low	26 DAWN CR	Detention Pond Inlet	
1001	DPI1001	Low	61 Lincolnshire Drive	Detention Pond Inlet	
1003	DPI1003	Low	2 NOTTINGHAM LN	Detention Pond Inlet	

1004	DPI1004	Low	21 LINCOLNSHIRE DR	Detention Pond Inlet	
1007	DPI1007	Low	7 KENILWORTH LN	Detention Pond Inlet	
1008	DPI1008	Low	LINCOLNSHIRE DR	Detention Pond Inlet	
1041	DPI1041	Low	15 INNISFREE DR	Detention Pond Inlet	
1056	DPI1056	Low	19 WAINWRIGHT AV	Detention Pond Inlet	
1067	DPI1067	Low	19 RYAN PATRICK WY	Detention Pond Inlet	
1069	DPI1069	Low	17 AMY LYNNE LN	Detention Pond Inlet	
1074	DPI1074	Low	9 AMY LYNNE LN	Detention Pond Inlet	
1075	DPI1075	Low	29 PEAR TREE RD	Detention Pond Inlet	
1081	DPI1081	Low	77 RUSSETT HILL RD	Detention Pond Inlet	
1084	DPI1084	Low	36 TWIN BROOK CR	Detention Pond Inlet	
1085	DPI1085	Low	36 TWIN BROOK CR	Detention Pond Inlet	
1087	DPI1087	Low	7 BOWDOIN DR	Detention Pond Inlet	
1094	DPI1094	Low	BOXFORD RD	Detention Pond Inlet	
1095	DPI1095	Low	BOXFORD RD	Detention Pond Inlet	
1107	DPI1107	Low	12 DORIAN DR	Detention Pond Inlet	
1110	DPI1110	Low	15 PAULA LN	Detention Pond Inlet	
1131	DPI1131	Low	Hadley West Drive at Lowell Avenue	Detention Pond Inlet	
1133	DPI1133	Low	36 PEOPLE PL	Detention Pond Inlet	
1134	DPI1134	Low	1 WOODLANDS PARK DR	Detention Pond Inlet	
1142	DPI1142	Low	55 EMILY ST	Detention Pond Inlet	
1156	DPI1156	Low	51 ORCHARD HILL RD near wetland	Detention Pond Inlet	
1162	DPI1162	Low	6 WEST PARISH RIDGE RD	Detention Pond Inlet	
1190	DPI1190	Low	194 WHITTIER RD at Middle Road	Detention Pond Inlet	
1197	DPI1197	Low	20 COMPUTER DR	Detention Pond Inlet	
1229	DPI1229	Low	218 BOXFORD RD	Detention Pond Inlet	
657	DPO0657	Low	SARAH J CR	Detention Pond Outlet	
658	DPO0658	Low	5 HARBOR DR	Detention Pond Outlet	
696	DPO0696	Low	10 PAMELA LN	Detention Pond Outlet	
835	DPO0835	Low	28 BRADLEY AV	Detention Pond Outlet	
842	DPO0842	Low	15 SRYBNY AV	Detention Pond Outlet	
972	DPO0972	Low	26 DAWN CR	Detention Pond Outlet	
1080	DPO1080	Low	3 AMY LYNNE LN	Detention Pond Outlet	
1082	DPO1082	Low	77 Russett Hill Road	Detention Pond Outlet	
1106	DPO1106	Low	12 DORIAN DR	Detention Pond Outlet	
1154	DPO1154	Low	BOXFORD RD from Overlook Circle	Detention Pond Outlet	
1217	DPO1217	Low	Kathy Drive at end	Detention Pond Outlet	
1225	DPO1225	Low	458 GROVELAND ST	Detention Pond Outlet	
712	FB0712	Low	3 HANNAN RIDGE RD	Fishing Brook	
1023	JC1023	Low	5 STRAWBERRY LN	Johnston's Creek	
1024	JC1024	Low	15 STRAWBERRY LN	Johnston's Creek	
1025	JC1025	Low	16 STELYANI DR	Johnston's Creek	
1026	JC1026	Low	10 KALI WY	Johnston's Creek	
1027	JC1027	Low	28 STELYANI DR	Johnston's Creek	
1028	JC1028	Low	14 KALI WY	Johnston's Creek	
1029	JC1029	Low	14 KALI WY	Johnston's Creek	
1030	JC1030	Low	22 KALI WY	Johnston's Creek	

1031	JC1031	Low	22 KALI WY	Johnston's Creek	
1227	KL1227	Low	KENOZA ST	Kenoza Lake	
1192	MB1192	Low	377 KENOZA ST	Millvalle Brook	
837	TS0837	Low	AMESBURY RD	Tilton Swamp	
838	TS0838	low	141 AMESBURY RD	Tilton Swamp	
937	TS0937	Low	183 AMESBURY RD Across st	Tilton Swamp	
938	TS0938	Low	230 AMESBURY RD	Tilton Swamp	
983	TS0983	Low	36 AMESBURY RD	Tilton Swamp	
984	TS0984	Low	145 Newton Road	Tilton Swamp	
985	TS0985	Low	Newton Road	Tilton Swamp	
986	TS0986	Low	Newton Road	Tilton Swamp	
987	TS0987	Low	NEWTON RD	Tilton Swamp	
988	TS0988	Low	176 NEWTON RD	Tilton Swamp	
989	TS0989	Low	NEWTON RD and Gile Street	Tilton Swamp	
990	TS0990	Low	200 NEWTON RD	Tilton Swamp	
664	UNK0064	Low	93 LEXINGTON AV	Unknown	
626	UNK0626	Low	1 NORTHSIDE B1	Unknown	
627	UNK0627	Low	2 HALEY RD	Unknown	
628	UNK0628	Low	1022 AMESBURY RD	Unknown	
630	UNK0630	Low	1 BRANDON RD	Unknown	
631	UNK0631	Low	6 HOLLY LN	Unknown	
633	UNK0633	Low	767 Broadway	Unknown	
644	UNK0644	Low	254 AMESBURY RD	Unknown	
645	UNK0645	Low	254 AMESBURY RD	Unknown	
652	UNK0652	Low	148 WARD HILL AV	Unknown	
653	UNK0653	Low	148 WARD HILL AV	Unknown	
660	UNK0660	Low	PARKRIDGE RD	Unknown	
661	UNK0661	Low	PARKRIDGE RD	Unknown	
663	UNK0663	Low	1 HAY MEADOW CR	Unknown	
665	UNK0665	Low	33 CHRISTIAN CR	Unknown	
666	UNK0666	Low	33 CHRISTIAN CR	Unknown	
667	UNK0667	Low	30 DANIELLE DR	Unknown	
668	UNK0668	Low	30 DANIELLE DR	Unknown	
669	UNK0669	Low	9 CHRISTIAN CR	Unknown	
670	UNK0670	Low	10 CHRISTIAN CR	Unknown	
671	UNK0671	Low	6 CHRISTIAN CR	Unknown	
672	UNK0672	Low	36 HANOVER ST	Unknown	
673	UNK0673	Low	66 ORANGE ST	Unknown	
674	UNK0674	Low	29 BRANDON RD	Unknown	
691	UNK0691	Low	31 HAMMOND FARM RD	Unknown	
692	UNK0692	Low	11 HAMMOND FARM RD	Unknown	
693	UNK0693	Low	78 CRYSTAL CT	Unknown	
694	UNK0694	Low	73 BAILEY`S CT	Unknown	
695	UNK0695	Low	57 BAILEY`S CT	Unknown	
702	UNK0702	Low	45 COACHMANS LN	Unknown	
703	UNK0703	Low	38 COACHMANS LN	Unknown	
704	UNK0704	Low	1204 BROADWAY	Unknown	
705	UNK0705	Low	1204 BROADWAY	Unknown	
706	UNK0706	Low	1196 BROADWAY	Unknown	

708	UNK0708	Low	31 HAMMOND FARM RD	Unknown	
709	UNK0709	Low	41 BAILEY`S CT	Unknown	
710	UNK0710	Low	41 BAILEY`S CT	Unknown	
711	UNK0711	Low	49 BAILEY`S CT	Unknown	
725	UNK0725	Low	34 GLENVIEW RD	Unknown	
726	UNK0726	Low	34 GLENVIEW RD	Unknown	
727	UNK0727	Low	55 GLENVIEW RD	Unknown	
728	UNK0728	Low	17 FIRE SIDE LN	Unknown	
729	UNK0729	Low	17 FIRE SIDE LN	Unknown	
730	UNK0730	Low	19 INDIAN ROCK RD	Unknown	
731	UNK0731	Low	9 SILVER BIRCH LN	Unknown	
756	UNK0756	Low	704 WEST LOWELL AV	Unknown	
773	UNK0773	Low	33 SCOTLAND HEIGHTS RD	Unknown	
774	UNK0774	Low	23 SCOTLAND HEIGHTS RD	Unknown	
775	UNK0775	Low	23 SCOTLAND HEIGHTS RD	Unknown	
776	UNK0776	Low	12 SCOTLAND HEIGHTS RD	Unknown	
777	UNK0777	Low	12 SCOTLAND HEIGHTS RD	Unknown	
779	UNK0779	Low	80 Beechwood Drive	Unknown	
780	UNK0780	Low	97 BEECHWOOD DR	Unknown	
781	UNK0781	Low	29 Beechwood Drive	Unknown	
782	UNK0782	Low	5 NELLIE AV	Unknown	
783	UNK0783	Low	29 STEPHAN AV	Unknown	
784	UNK0784	Low	29 STEPHAN AV	Unknown	
787	UNK0787	Low	14 STEPHAN AV	Unknown	
788	UNK0788	Low	770 WEST LOWELL AV	Unknown	
791	UNK0791	Low	840 WEST LOWELL AV	Unknown	
848	UNK0848	Low	27 WOODROW AV	Unknown	
850	UNK0850	Low	50 FOUNDATION AV	Unknown	
855	UNK0855	Low	148 WARD HILL AV	Unknown	
859	UNK0859	Low	3 Dogwood Drive	Unknown	
860	UNK0860	low	57 Bechwood Drive	Unknown	
861	UNK0861	Low	11 Beechwod Drive	Unknown	
862	UNK0862	Low	61 Beechwood Drive back yard	Unknown	
863	UNK0863	Low	Near Juniperwood Drive	Unknown	
864	UNK0864	Low	2 Juniperwood Drive across st	Unknown	
865	UNK0865	Low	15 Juniperwood Drive at bridge	Unknown	
866	UNK0866	Low	595 North Broadway near wetland	Unknown	
878	UNK0878	Low	866 AMESBURY RD	Unknown	
881	UNK0881	Low	148 WARD HILL AV	Unknown	
882	UNK0882	Low	110 AVCO RD	Unknown	
883	UNK0883	Low	SOUTH MAIN ST	Unknown	
885	UNK0885	Low	8 GLINES ST	Unknown	
887	UNK0887	Low	851 EAST BROADWAY	Unknown	
888	UNK0888	Low	996 WEST LOWELL AV	Unknown	

889	UNK0889	Low	188 LAKE ST	Unknown	
890	UNK0890	Low	132 LAKE ST	Unknown	
892	UNK0892	Low	261 NECK RD	Unknown	
893	UNK0893	Low	261 NECK RD	Unknown	
894	UNK0894	Low	261 NECK RD	Unknown	
895	UNK0895	Low	261 NECK RD	Unknown	
896	UNK0896	Low	261 NECK RD	Unknown	
897	UNK0897	Low	261 NECK RD	Unknown	
898	UNK0898	Low	SHELLY RD	Unknown	
899	UNK0899	Low	225 NECK RD	Unknown	
900	UNK0900	Low	225 NECK RD	Unknown	
901	UNK0901	Low	225 NECK RD	Unknown	
902	UNK0902	Low	SHELLY RD	Unknown	
903	UNK0903	Low	SHELLY RD	Unknown	
904	UNK0904	Low	SHELLY RD	Unknown	
905	UNK0905	Low	39 SHELLY RD	Unknown	
906	UNK0906	Low	SHELLY RD	Unknown	
907	UNK0907	Low	SHELLY RD	Unknown	
908	UNK0908	Low	39 SHELLY RD	Unknown	
909	UNK0909	Low	111 NECK RD	Unknown	
910	UNK0910	Low	111 NECK RD	Unknown	
911	UNK0911	Low	111 NECK RD	Unknown	
916	UNK0916	Low	2 MARINA DR	Unknown	
917	UNK0917	Low	2 MARINA DR	Unknown	
918	UNK0918	Low	9 MARINA DR	Unknown	
935	UNK0935	Low	477 AMESBURY RD	Unknown	
939	UNK0939	Low	6 Tudor Court	Unknown	
949	UNK0949	Low	108 BROOK ST	Unknown	
950	UNK0950	Low	2 ARTHUR ST	Unknown	
951	UNK0951	Low	23 VICTOR ST	Unknown	
953	UNK0953	Low	741 SOUTH MAIN ST	Unknown	
954	UNK0954	Low	SOUTH MAIN ST	Unknown	
955	UNK0955	Low	741 SOUTH MAIN ST	Unknown	
957	UNK0957	Low	BOSTON RD	Unknown	
962	UNK0962	Low	1314 MAIN ST	Unknown	
964	UNK0964	Low	PLAISTOW RD	Unknown	
973	UNK0973	Low	19 DIANA DR	Unknown	
996	UNK0996	Low	SOUTH MAIN ST	Unknown	
997	UNK0997	Low	377 BROADWAY at Monument St	Unknown	
998	UNK0998	Low	370 BROADWAY at 495 Ramp	Unknown	
999	UNK0999	Low	1194 MAIN ST	Unknown	
1000	UNK1000	Low	55 LINCOLNSHIRE DR	Unknown	
1002	UNK1002	Low	1 SHERWOOD DR	Unknown	
1005	UNK1005	Low	195 KINGSBURY AV	Unknown	
1006	UNK1006	Low	183 KINGSBURY AV	Unknown	
1011	UNK1011	Low	297 LAKE ST	Unknown	
1012	UNK1012	Low	297 LAKE ST	Unknown	
1013	UNK1013	Low	370 BROADWAY at 495 Ramp	Unknown	

1014	UNK1014	Low	426 CHADWICK RD	Unknown	
1015	UNK1015	Low	426 CHADWICK RD	Unknown	
1016	UNK1016	Low	426 CHADWICK RD	Unknown	
1017	UNK1017	Low	BOXFORD RD at Chadwick Rd	Unknown	
1019	UNK1019	Low	14 ETHEL AV	Unknown	
1020	UNK1020	Low	18 ETHEL AV	Unknown	
1021	UNK1021	Low	26 BARD ST	Unknown	
1022	UNK1022	Low	22 BARD ST	Unknown	
1032	UNK1032	Low	551 EAST BROADWAY	Unknown	
1037	UNK1037	Low	1 WOODLANDS PARK DR	Unknown	
1038	UNK1038	Low	1 WOODLANDS PARK DR	Unknown	
1039	UNK1039	Low	1 WOODLANDS PARK DR	Unknown	
1040	UNK1040	Low	1 WOODLANDS PARK DR	Unknown	
1043	UNK1043	Low	23 LILACWOOD CR	Unknown	
1044	UNK1044	Low	11 JUNIPERWOOD DR	Unknown	
1045	UNK1045	Low	15 Laurelwood Circle at rear	Unknown	
1046	UNK1046	Low	15 Laurelwood Circle at rear	Unknown	
1047	UNK1047	Low	41 Beechwood Drive across st	Unknown	
1048	UNK1048	Low	63 Beechwood Drive at end of driveway	Unknown	
1049	UNK1049	Low	BOXFORD RD at Souh Cross Road	Unknown	
1050	UNK1050	Low	BOXFORD RD at South Cross Road	Unknown	
1052	UNK1052	Low	10 HOLLY LN	Unknown	
1053	UNK1053	Low	10 HOLLY LN	Unknown	
1054	UNK1054	Low	HYATT AV 270 feet from Holly Lane	Unknown	
1063	UNK1063	Low	74 CRYSTAL CT	Unknown	
1071	UNK1071	Low	31 WHITNEY ST	Unknown	
1076	UNK1076	Low	9 PEAR TREE RD	Unknown	
1077	UNK1077	Low	CHADWICK RD at Towne Hill Road	Unknown	
1078	UNK1078	Low	CHADWICK RD at Towne Hill Road	Unknown	
1083	UNK1083	Low	73 RUSSETT HILL RD	Unknown	
1088	UNK1088	Low	2 JAMES AV	Unknown	
1089	UNK1089	Low	16 DAMON AV	Unknown	
1091	UNK1091	Low	151 ORCHARD HILL RD	Unknown	
1092	UNK1092	Low	151 ORCHARD HILL RD	Unknown	
1093	UNK1093	Low	Orchard Hill Rd	Unknown	
1096	UNK1096	Low	122 ORCHARD HILL RD	Unknown	
1097	UNK1097	Low	162 ORCHARD HILL RD across street	Unknown	
1104	UNK1104	Low	12 DORIAN DR	Unknown	
1105	UNK1105	Low	12 DORIAN DR	Unknown	
1111	UNK1111	Low	21 CRYSTAL CT	Unknown	
1112	UNK1112	Low	111 FOREST ST	Unknown	
1113	UNK1113	LOW	11 Dogwood Circle at rear	Unknown	

1123	UNK1123	Low	36 HYATT AV	Unknown	
1130	UNK1130	Low	2 CASABLANCA CT	Unknown	
1135	UNK1135	Low	9 SOLITAIRE DR	Unknown	
1136	UNK1136	Low	436 SALEM ST	Unknown	
1137	UNK1137	Low	436 SALEM ST	Unknown	
1143	UNK1143	low	50 FERRY RD	Unknown	
1155	UNK1155	Low	196 BOXFORD RD Across Street	Unknown	
1157	UNK1157	Low	471 KENOZA ST at Bridge	Unknown	
1158	UNK1158	Low	86 LINCOLNSHIRE DR at Rear	Unknown	
1159	UNK1159	Low	Johnathan Dustin Lane at end	Unknown	
1160	UNK1160	Low	Johnathan Dustin Lane at end	Unknown	
1166	UNK1166	Low	3 FRANZONE DR	Unknown	
1167	UNK1167	Low	561 AMESBURY RD	Unknown	
1168	UNK1168	Low	194 WHITTIER RD	Unknown	
1169	UNK1169	Low	949 AMESBURY RD	Unknown	
1170	UNK1170	Low	22 LAWRENCE RD	Unknown	
1171	UNK1171	Low	130 CARLETON ST	Unknown	
1172	UNK1172	Low	77 WHITTIER RD	Unknown	
1173	UNK1173	Low	WHITTIER RD	Unknown	
1174	UNK1174	Low	495 KINGSBURY AV	Unknown	
1175	UNK1175	Low	495 KINGSBURY AV	Unknown	
1176	UNK1176	Low	495 KINGSBURY AV	Unknown	
1177	UNK1177	Low	619 SOUTH MAIN ST	Unknown	
1183	UNK1183	Low	11 OXFORD AV	Unknown	
1184	UNK1184	Low	1 KNIPE RD	Unknown	
1185	UNK1185	Low	OXFORD AV	Unknown	
1186	UNK1186	Low	152 CARLETON ST	Unknown	
1188	UNK1188	Low	End of Sixteenth Avenue	Unknown	
1189	UNK1189	Low	End of Sixteenth Avenue	Unknown	
1204	UNK1204	Low	9 PATRICIA ANN DR	Unknown	
1205	UNK1205	Low	10 PATRICIA ANN DR	Unknown	
1206	UNK1206	Low	10 PATRICIA ANN DR	Unknown	
1207	UNK1207	Low	5 PATRICIA ANN DR	Unknown	
1208	UNK1208	LOW	1 BRICKETT HILL CR	Unknown	
1209	UNK1209	Low	1 BRICKETT HILL CR	Unknown	
1210	UNK1210	Low	1 BRICKETT HILL CR	Unknown	
1211	UNK1211	Low	1 BRICKETT HILL CR	Unknown	
1212	UNK1212	Low	1 BRICKETT HILL CR	Unknown	
1213	UNK1213	Low	1 BRICKETT HILL CR	Unknown	
1214	UNK1214	Low	1 BRICKETT HILL CR	Unknown	
1215	UNK1215	Low	1 BRICKETT HILL CR	Unknown	
1216	UNK1216	Low	1 BRICKETT HILL CR	Unknown	
1218	UNK1218	Low	7 SCARLET CR	Unknown	
1219	UNK1219	Low	25 SUNRISE DR	Unknown	
1220	UNK1220	Low	15 YELLOW BRICK RD	Unknown	
1221	UNK1221	Low	12 RIVERBANK CR	Unknown	
1223	UNK1223	Low	5 CARRIAGE HILL RD	Unknown	
1226	UNK1226	Low	123 FREEMONT ST	Unknown	

1228	UNK1228	Low	KENOZA ST	Unknown	
1234	UNK1234	Low	140 EVERGREEN DR	Unknown	
1072	WMB0172	Low	21 AMY LYNNE LN	West Meadow Brook	
797	WMB0797	Low	132 WEST MEADOW RD	West Meadow Brook	
798	WMB0798	Low	132 WEST MEADOW RD	West Meadow Brook	
799	WMB0799	Low	132 WEST MEADOW RD	West Meadow Brook	
800	WMB0800	Low	132 WEST MEADOW RD	West Meadow Brook	
801	WMB0801	Low	132 WEST MEADOW RD	West Meadow Brook	
802	WMB0802	Low	132 WEST MEADOW RD	West Meadow Brook	
803	WMB0803	Low	132 WEST MEADOW RD	West Meadow Brook	
804	WMB0804	Low	132 WEST MEADOW RD	West Meadow Brook	
805	WMB0805	Low	132 WEST MEADOW RD	West Meadow Brook	
806	WMB0806	Low	132 WEST MEADOW RD	West Meadow Brook	
807	WMB0807	Low	132 WEST MEADOW RD	West Meadow Brook	
808	WMB0808	Low	132 WEST MEADOW RD	West Meadow Brook	
809	WMB0809	Low	132 WEST MEADOW RD	West Meadow Brook	
810	WMB0810	Low	132 WEST MEADOW RD	West Meadow Brook	
811	WMB0811	Low	132 WEST MEADOW RD	West Meadow Brook	
812	WMB0812	Low	132 WEST MEADOW RD	West Meadow Brook	
813	WMB0813	Low	132 WEST MEADOW RD	West Meadow Brook	
814	WMB0814	Low	132 WEST MEADOW RD	West Meadow Brook	
815	WMB0815	Low	132 WEST MEADOW RD	West Meadow Brook	
816	WMB0816	Low	132 WEST MEADOW RD	West Meadow Brook	
817	WMB0817	Low	132 WEST MEADOW RD	West Meadow Brook	
818	WMB0818	Low	132 WEST MEADOW RD	West Meadow Brook	
819	WMB0819	Low	132 WEST MEADOW RD	West Meadow Brook	
820	WMB0820	Low	132 WEST MEADOW RD	West Meadow Brook	
821	WMB0821	Low	132 WEST MEADOW RD	West Meadow Brook	
822	WMB0822	Low	132 WEST MEADOW RD	West Meadow Brook	
823	WMB0823	Low	132 WEST MEADOW RD	West Meadow Brook	
824	WMB0824	Low	132 WEST MEADOW RD	West Meadow Brook	
825	WMB0825	Low	132 WEST MEADOW RD	West Meadow Brook	
826	WMB0826	Low	132 WEST MEADOW RD	West Meadow Brook	
827	WMB0827	Low	132 WEST MEADOW RD	West Meadow Brook	
828	WMB0828	Low	132 WEST MEADOW RD	West Meadow Brook	
829	WMB0829	Low	132 WEST MEADOW RD	West Meadow Brook	
830	WMB0830	Low	132 WEST MEADOW RD	West Meadow Brook	
831	WMB0831	Low	132 WEST MEADOW RD	West Meadow Brook	
832	WMB0832	Low	132 WEST MEADOW RD	West Meadow Brook	
1073	WMB1073	Low	3 AMY LYNNE LN	West Meadow Brook	
741	WMBO741	Low	132 WEST MEADOW RD	West Meadow Brook	
742	WMBO742	Low	132 WEST MEADOW RD	West Meadow Brook	
743	WMBO743	Low	132 WEST MEADOW RD	West Meadow Brook	
744	WMBO744	Low	132 WEST MEADOW RD	West Meadow Brook	
745	WMBO745	Low	132 WEST MEADOW RD	West Meadow Brook	
746	WMBO746	Low	132 WEST MEADOW RD	West Meadow Brook	
747	WMBO747	Low	132 WEST MEADOW RD	West Meadow Brook	
768	CC0768	Mediium	4 POWDERMILL RD	Cottles Creek	
785	BB0785	Medium	685 WEST LOWELL AV	Bradley Brook	
786	BB0786	Medium	681 WEST LOWELL AV	Bradley Brook	
789	BB0789	Medium	749 WEST LOWELL AV	Bradley Brook	

790	BB0790	Medium	749 WEST LOWELL AV	Bradley Brook	
884	CB0884	Medium	25 COMPUTER DR	Creek Brook	
974	CB0974	Medium	2 MORNINGSIDE DR	Creek Brook	
975	CB0975	Medium	2 MORNINGSIDE DR	Creek Brook	
976	CB0976	Medium	11 MORNINGSIDE DR	Creek Brook	
977	CB0977	MEdium	11 MORNINGSIDE DR	Creek Brook	
1193	CB1193	Medium	45 RESEARCH DR	Creek Brook	
1194	CB1194	Medium	10 CREEK BROOK DR	Creek Brook	
1195	CB1195	Medium	10 CREEK BROOK DR	Creek Brook	
1196	CB1196	Medium	10 CREEK BROOK DR	Creek Brook	
1198	CB1198	Medium	9 CREEK BROOK DR	Creek Brook	
1199	CB1199	MEdium	RESEARCH DR	Creek Brook	
1200	CB1200	Medium	RESEARCH DR	Creek Brook	
1201	CB1201	Medium	RESEARCH DR	Creek Brook	
1202	CB1202	Medium	RESEARCH DR	Creek Brook	
1203	CB1203	Medium	10 CREEK BROOK DR	Creek Brook	
767	CC0767	Medium	7 POWDERMILL RD	Cottles Creek	
792	CC0792	Medium	49 POWDERMILL RD	Cottles Creek	
793	CC0793	Medium	13 POWDERMILL RD	Cottles Creek	
794	CC0794	Medium	12 POWDERMILL RD	Cottles Creek	
795	CC0795	Medium	12 POWDERMILL RD	Cottles Creek	
796	CC0796	Medium	12 POWDERMILL RD	Cottles Creek	
675	CL0675	Medium	43 OLD YANKEE RD	Crystal Lake	
677	CL0677	Medium	68 OLD YANKEE RD	Crystal Lake	
678	CL0678	Medium	15 GATES FARM CR	Crystal Lake	
679	CL0679	Medium	5 GATES FARM CR	Crystal Lake	
680	CL0680	Medium	14 FOX RUN DR	Crystal Lake	
681	CL0681	Medium	3 SAWMILL RIDGE RD	Crystal Lake	
682	CL0682	Medium	5 CHIPPER LN	Crystal Lake	
683	CL0683	Medium	22 SAWMILL RIDGE RD	Crystal Lake	
684	CL0684	Medium	21 SAWMILL RIDGE RD	Crystal Lake	
685	CL0685	Medium	22 SAWMILL RIDGE RD	Crystal Lake	
686	CL0686	Medium	68 OLD YANKEE RD	Crystal Lake	
687	CL0687	Medium	5 CHIPPER LN	Crystal Lake	
688	CL0688	Medium	2 FAIRVIEW FARM RD	Crystal Lake	
689	CL0689	Medium	12 RED MAPLE RD	Crystal Lake	
690	CL0690	Medium	12 RED MAPLE RD	Crystal Lake	
1059	DPI1059	Medium	22 PARKRIDGE RD	Detention Pond Inlet	
1090	DPI1090	Medium	26 FAIRWAY DR	Detention Pond Inlet	
1125	DPI1125	Medium	22 RAINBOW DR	Detention Pond Inlet	
635	DPO0635	Medium	6 AHERN CR	Detention Pond Outlet	
1018	DPO1018	Medium	Danielle Dr neat lift station	Detention Pond Outlet	
1042	DPO1042	MEdium	15 INNISFREE DR	Detention Pond Outlet	
1061	DPO1061	Medium	17 MARINA DR	Detention Pond Outlet	
1068	DPO1068	Medium	19 RYAN PATRICK WY	Detention Pond Outlet	
1070	DPO1070	Medium	13 AMY LYNNE LN	Detention Pond Outlet	
1079	DPO1079	Medium	9 AMY LYNNE LN	Detention Pond Outlet	
1086	DPO1086	Medium	36 TWIN BROOK CR	Detention Pond Outlet	
1114	DPO1114	Medium	17 DAWN CR	Detention Pond Outlet	
713	FB0713	Medium	9 PARSONAGE HILL RD	Fishing Brook	
714	FB0714	Medium	9 PARSONAGE HILL RD	Fishing Brook	

715	FB0715	Medium	9 PARSONAGE HILL RD	Fishing Brook	
716	FB0716	Medium	16 PARSONAGE HILL RD	Fishing Brook	
717	FB0717	Medium	15 PARSONAGE HILL RD	Fishing Brook	
718	FB0718	Medium	15 PARSONAGE HILL RD	Fishing Brook	
719	FB0719	Medium	23 PARSONAGE HILL RD	Fishing Brook	
720	FB0720	Medium	23 PARSONAGE HILL RD	Fishing Brook	
721	FB0721	Medium	21 PARSONAGE HILL RD	Fishing Brook	
722	FB0722	Medium	19 PARSONAGE HILL RD	Fishing Brook	
723	FB0723	Medium	26 PARSONAGE HILL RD	Fishing Brook	
724	FB0724	Medium	26 PARSONAGE HILL RD	Fishing Brook	
778	MR0778	Medium	49 HILL ST	Merrimack River	
629	UNK0629	Medium	17 HAWKES AV	Unknown	
646	UNK0646	Medium	220 NECK RD	Unknown	
647	UNK0647	Medium	220 NECK RD	Unknown	
840	UNK0840	Medium	Whittier Road	Unknown	
886	UNK0886	Medium	759 EAST BROADWAY	Unknown	
1055	UNK1055	Medium	90 GREENLAWN AV	Unknown	
1161	WMB1161	Medium	18 WEST PARISH RIDGE RD	West Meadow Brook	
1163	WMB1163	Medium	17 WEST PARISH RIDGE RD	West Meadow Brook	
733	WMBO733	Medium	132 WEST MEADOW RD	West Meadow Brook	
734	WMBO734	Medium	132 WEST MEADOW RD	West Meadow Brook	
735	WMBO735	Medium	132 WEST MEADOW RD	West Meadow Brook	
736	WMBO736	Medium	800 BROADWAY	West Meadow Brook	
737	WMBO737	Medium	800 BROADWAY	West Meadow Brook	
738	WMBO738	Medium	800 BROADWAY	West Meadow Brook	
739	WMBO739	Medium	800 BROADWAY	West Meadow Brook	
740	WMBO740	Medium	800 BROADWAY	West Meadow Brook	
757	WMBO757	Medium	132 WEST MEADOW RD	West Meadow Brook	
758	WMBO758	Medium	132 WEST MEADOW RD	West Meadow Brook	
759	WMBO759	Medium	LAKE ST West Meadow Road Near Christian Circlr	West Meadow Brook	
760	WMBO760	Medium	132 WEST MEADOW RD	West Meadow Brook	
761	WMBO761	Medium	132 WEST MEADOW RD	West Meadow Brook	
762	WMBO762	Medium	132 WEST MEADOW RD	West Meadow Brook	
763	WMBO763	Medium	132 WEST MEADOW RD	West Meadow Brook	
764	WMBO764	Medium	132 WEST MEADOW RD	West Meadow Brook	
765	WMBO765	Medium	132 WEST MEADOW RD	West Meadow Brook	
766	WMBO766	Medium	132 WEST MEADOW RD	West Meadow Brook	

Appendix B
Inventory Form

General Location Information	
Receiving Stream:	
Stream Segment:	
Watershed:	
Community:	
County:	
Parcel:	
State Plane N:	
State Plane E:	
CRGS N:	
CRGS E:	**Outfall Photograph**
Latitude:	
Longitude:	
Elevation (ft):	
Location Description:	
Storm Sewer Map Information	
Outfall on Map: ☐ Yes ☐ No	
Map ID/Number:	
Map Source:	
Outfall Located on (facing downstream)	
Pipe Characteristics	
Pipe Shape: ☐ Circular ☐ Elliptical ☐ Egg ☐ Rectangular ☐ Other, describe:	**Location Map**
Pipe Height (in):	
Pipe Width (in):	
Pipe Material: ☐ RCP ☐ PVC ☐ VCP ☐ Cast Iron ☐ CMP ☐ Other, describe:	
Pipe Condition: ☐ Good ☐ Poor ☐ Fair ☐ N/A	
Height from Invert to Stream Flow Level (ft):	**Additional Details**
Outfall Type/Ownership	**Comments**
Outfall Type:	
Owner:	
Authority:	
Other ID:	
NPDES Permit:	

Appendix C

Inspection Form

	Receiving Stream:	Location Description:
	Community:	

Inspection Information	
Project:	
Inspection Date: Time: Type:	
Agency:	
Department:	
Crew Leader:	
Crew Member:	
Crew Member:	
Time of Last Rain: ☐ < 24 Hrs. ☐ < 48 Hrs. ☐ < 72 Hrs. ☐ > 72 Hrs.	
Pipe Flow: ☐ None ☐ < 1/4 Pipe. ☐ < 1/2 Pipe ☐ < 3/4 Pipe ☐ Full ☐ Trickle	
Pipe Submergence: ☐ None ☐ < 1/4 Pipe. ☐ < 1/2 Pipe ☐ < 3/4 Pipe ☐ Full	**Inspection Image**
Comments:	

Sampling Information	**Analytical Results**
Sample Collected: ☐ Yes ☐ No	Lab Analysis ID:
Sample ID:	Analyzed By:
Description:	Fecal Coliform: (Colonies/100 ml)
Est. Flow (Gpm):	E. Coli: (Colonies/100 ml)
Est. Method:	Ammonia (mg/l):
Comments:	Temperature (C):
	PH:
Sampling Strategy:	Conductance (us):
	Phosphorus (mg/l):
	Dis. Oxygen (mg/l):
	Other Parameters/Results

Recommendations

Action Required: ☐ No ☐ Perform Problem Source Investigation

Comments:

Appendix D: City of Haverhill Stormwater Sampling Quality Assurance Management Plan

Table of Contents

Table of Contents

Section 1: Introduction

The following are department responsibilities for implementing this program.

The following individuals shall be the responsible for this program
Collection System Supervisor shall be the program manager with the Wastewater Facility Manager as a backup. Here after program manager shall represent Collection System Supervisor.

The Lab Technician shall be responsible for lab analysis, lab equipment, and backup Wastewater Pretreatment Coordinator for data entry.

Field Technicians responsible for calibration field equipment.

Wastewater Pretreatment Coordinator and support staff shall be responsible for data input into the Access Water Quality Database. Wastewater Pretreatment Coordinator will be responsible for training. The Water Chemist shall be a backup.

This program results and procedures was approved by the Haverhill Stormwater Coordinator and the Stormwater Committee HSWC on March 13, 2008.

1.1 Implementation

Standard Operating Procedures (SOP) are documents that describe the officially approved procedures for performing certain routine tasks. SOPs must be used it is necessary to ensure comparability among activities performed on different occasions or by different individuals. The HSWC will utilize SOPs whenever appropriate in the water quality programs. These SOPs have been developed and published within this document under Standard Operating Procedures for Water Quality Programs.

1.2 Assessment and Response

Assessments of activities are used to verify that measurement systems are operating appropriately and that the data generated by these systems are appropriate for their intended use. Assessments will be performed on the water quality equipment to ensure equipment is operating as designed. Assessments will also be performed on the staff performing water quality monitoring activities by the observance of water quality monitoring techniques while in the field by the program manager of the water quality program, and other peer reviewers.

All assessments will be performed annually to ensure the QA Plan is being followed as desired. Possible types of assessments will include a quality systems audit by the program manager, peer reviews, performance evaluations, data quality assessments and surveillance.

1.3 Documents and Records

The information generated from the water quality monitoring activities will be provided as data documents and records. These documents and records will consist of:

- Blank water quality lab analysis results on a form shall be stored as a PDF document accessible to every appropriate staff.
- Computer database for all water quality chemical sampling results;
- Field Log books for equipment supplied by the Program Manager and stored in the Wastewater Treatment Plant Front Office accessible to all staff.

The program manager of the water quality programs will be responsible for assessing the completed forms filled out by the field staff once the work is completed to ensure that the documents accurately reflect the completed work.

All paper documents will be kept in appropriate water quality files in the Wastewater Treatment Plant Front Office. Staff will have access to these files at all times. When appropriate the information from these forms will be entered into the HSWC's water quality database.

The water quality results on these forms will be published annually in a water quality program summary for the work performed that calendar year.

The computer database is an Access database that the HSWC staff has the ability to access at all times. This database shall be stored in the following director: \\wwtp-2003\Office\Manager\Stormwater

This database has the ability to generate reports and to provide all pertinent information on a given monitoring location (lab analysis results, location, GPS coordinates, photos, maps, investigation information, correspondence information, city, and watershed). This database was developed by the Northeast Ohio Regional Sewer District (NEORSD) and changed by Haverhill's Wastewater Staff, HWWS to reflect Haverhill's outfalls with permission from Northeast Ohio Regional Sewer District NEORSD.

All staff that will be utilizing this database will be appropriately trained. The program manager and one office support staff will have administration access to making changes to the database. This will allow for the integrity of the information to remain viable. Both the program manager and the office support staff personnel will be trained by the Program Manager.

1.4 Procurement of Services

Contractual services involving the acquisition or analysis of environmental data shall be planned and controlled to ensure that these services meet applicable technical and QA requirements.

1 Laboratory Services for water quality data shall be obtained through the City of

Haverhill's Wastewater Quality Lab, unless deemed necessary by the program manager, to obtain services from another approved water quality lab.

2 A Memorandum of Understanding must be obtained with any community who desires to contract with the HSWC for Phase II Storm Water Activities to be conducted on behalf of that community.

1.5 Procurement of Equipment and Supplies

The procurement of equipment and supplies for water quality monitoring operations shall be planned and controlled to ensure that the quality of obtained goods are documented and meets the technical requirements of the EPA and the City of Haverhill Division of Public Works. Procurement of goods shall in all instances abide by the policies of the City of Haverhill Quality assurance specifications shall be clearly indicated in purchase orders or related procurement documents.

Purchase of equipment and supplies shall be initiated by **Lab Technician** in accordance with the City and State procument policy. For purchases of $5,000.00, three quotations must be obtained, but it is the discretion of the division to have supporting justification to ensure that accountability and best prices are obtained**. Laboratory must be informed at least one week in advance that Stormwater sampling will commence, to ensure that all suppliers are in stock.**

The following materials are required to carry out Haverhill's IDDE Program
Fecal Supplies order from North Central Lab (NCL) 1-800-648-7836 cust #19440

- Sterile coliform 100 mL sample containers with sodium thiosulfate tablet to neutralize chlorine #BC 170 $50/case 100
- Buffered sterile dilution water for coliform dilutions. Each bottle contains 99 mL phosphate buffer/magnesium chloride cat #B55R $65/case of 66 bottles

All media, plates, filters etc. from Millipore 1-800-645-5476

- m-F-C with rosolic acid cat#MHAOOOP2F
- 47mm Petri Dishes cat#PD20047SO
- 0.45 um 47mm gridded filter paper cat#HAWG047S6

1.6 Accuracy

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured one. The accuracy of chemical measurements will be checked by performing quality assurance checks on the samples taken. This will include duplicate samples as well as blanks during field monitoring events. See quality assurance section.

1.7 Training Requirements

To qualify as a sample collector, training must be completed. Training will teach the monitor how to accurately select a sampling site, collect and record data. The

methodology outlined for the parameters included in this QAPP must be followed completely. One training session will need to be conducted. The training for chemical data collection will entail review of parameters to be collected, safety, how to follow the sample collection methodology, how to properly record the data and proper sample handling.

1.8 Documentation and Records

All data that is recorded as part of the chemical sampling of a project will be provided on the appropriate forms provided by the HSWC. There will be one form per sample location. After each sample site is sampled, the collector will document all information and sample results on the form, sign, date and time before next location is sampled.

Section 2: Storm Water Program

2.1 Outfall Survey and Documentation of Locations

The City of Haverhill Storm Water Program provides for the survey of Municipal Separate Storm Sewer Systems (MS4s). The HSWC Stormwater Coordinator is responsible for the consistent application of MS4 documentation within those communities who contract for this service.
The HSWC Stormwater Coordinator will identify all possible MS4 outfall locations within the community by:

- Utilizing a city storm sewer map for outfall locations and field assess them for accuracy;
- Walk the open creeks and streams of the city to identify all possible MS4 outfall locations;
- Walk all open ditches and identify areas where they connect with surface waters of the state.

During this survey, the Program Manager shall assign the Field Technicians the following activities:

- Number the MS4 outfall with a city unique numbering system obtaining identifications from the City's GIS and input into (set up by database) obtained Northeast Ohio Regional Sewer District NEORSD;
- Digital photograph MS4 outfall;
- Utilize a dry erase board in the field: number location on board and include in picture for identification purposes;
- Utilize a GPS unit to get coordinates of MS4 outfall location;
- Mark hard copy of city storm sewer map for approximate location of outfall;

Once completed, all information will be entered into water quality database and shared with the community. Install appropriate field identification markers as indicated below:

2.2 Field Identification

Currently, GIS list each outfall, which City personnel assign a specific street address as well as assigning high, medium, and low priority. Haverhill's Stormwater Committee has decided to permanently mark each outfall with a PVC type post similar to those used by gas companies to mark their cross-country gas mains. Red shall be for high priority, yellow shall be for medium priority and green shall be for low priority. Included on this post shall be the outfall identification number. This should allow residents and field staff an easier way to locate each outfall and obtain the correct outfall identification number

2.3 Visual Observations of MS4 Outfalls During Dry Weather

Visual screening of outfalls during dry weather periods will identify if there is a possible illicit discharge within that MS4 system. Dry weather is defined as less than 0.1" of rain in past 72 hours. If the visual observation indicates that the outfall is flowing at this time, then a sample will need to be obtained. All flow conditions shall require a sample be collected.

2.4 Safety Considerations

When performing physical or biological assessments on a water body, safety considerations are necessary. The following are the safety issues to be followed:

- **Before** sampling occurs, notify Wastewater Office 978-374-2382 as to who is doing the field sampling where sampling sites and the estimated time for completion for each sample location. Call Wastewater after sampling is completed for each sample location.
- Monitor with at least one partner,
- Never attempt to wade into swift or high water conditions,
- Always get landowner permission to be on their property,
- Carry an emergency contact number and, a City Nextel cell phone
- Walk cautiously over stream bottoms, as it may be slippery or uneven,
- Do not monitor during severe weather conditions,
- Have a first aid kit with you at remote sites,
- Secure your personal belongings in a safe place before entering the water,
- Keep bug repellent, sunscreen, etc available for use if necessary
- Notify Haverhill Police Department the areas you will be inspecting or sampling
- Wear City ID at all times.

2.5 Dry Weather Sampling

Fecal Coliform Sampling Procedure

The majority of all MS4 outfall sample analysis will be for fecal coliform. The data collected from this monitoring will allow the City the ability to prioritize the MS4s in which illicit discharge source identification is required.

1 Sample bottles will be obtained from Haverhill Wastewater Laboratory HWWL

2 Sample bottles are 100-milliliter sterile plastic containers. With sodium thiosulfate added as a dechlorinating agent.

3 Grab samples are collected only during dry weather. Sample technicians shall wear disposable gloves.

4 Bottles must be labeled with time, date and sample location just before sample is taken. They are placed in a cooler filled with ice packs (less than 10 degrees Celsius), and transported to HWWL for analysis no later than four hours after collection. Ice packs (in lab freezer) and coolers will be stored in the lab.

5 Immediately after collection, put each bottle into a zipper plastic bag and place in cooler with freezer packs. Temperature must be equal to or less than 10 degrees Celsius.

6 Field Technician collects a random duplicate at each sampling session (ex: once every four location)-for quality control.

7 Transport to HWWL for analysis **no later than four hours** after collection.

8 Field Technicians fill out a laboratory field inspection sheet supplied by the, HWWL indicating the location of each sample, the time it was collected, what tests will be run (in this case, fecal coliform), the sampler's name, and the time the samples reached the laboratory. **LABORATORY MUST BE NOTIFIED IMMEDIATELY UPON ARRIVAL.**

9 Each Field Technician collects duplicates and a blank sample once per month for quality control.

10 Laboratory analyzes samples using fecal coliform membrane filter procedure as described in Method 9222 D of Standards Methods for the Examination of Water and Wastewater (18th Edition).

11 Field Technician will sample no more than four samples per day for three hours per day. The samples will be preserved on ice in a cooler and then transported to the WWTP lab for immediate analysis. The sampling will begin at 8:00 AM and end no later than 11:00 AM.

SECTION 3: EQUIPMENT MAINTENANCE AND CALIBRATION

SEASONAL RESPONSIBILITIES

All equipment manuals are available in the HWWL, or in the Wastewater Chemist office. The Lab Technician will ensure all equipment is functioning properly as follows:

3.1FIELD RESPONSIBILITIES

The **Lab Technician** will inspect all equipment and verify all necessary parts are present each time equipment is returned to the HWWL. Field technicians will be required to sign out equipment on sheets in the HWWL Wastewater Laboratory prior to taking equipment into the field. All replacement parts are located in the City of Haverhill Wastewater Treatment Plant laboratory. Contact the Lab Technician when a question arises as to maintenance or equipment locations.

3.2 Inspection / Acceptance Requirements for Supplies and Consumables

All supplies will be received from approved sources and inspected prior to use by Lab Technician. The following list of supplies will be available at the HWWL laboratory:

1 Fecal Coliform supplies:
   a. Presterilized 100mL sterile plastic sample bottles with sodium thiosulfate
   b. One zip lock plastic bag for each sample
   c. Cooler with freezer packs (<10 C)

2 De-ionized Water: Supplied by HWWL

3 Dissolved Oxygen
   a. YSI 55 DO meter
   b. Instruction manual for YSI meter
   c. DO Membranes
   d. DO Membrane solution KCL solution

4 pH :
   a. Cole Parmer IQ Scientific ph Meter # 59540-22
   b. 4 and 7 buffers

5 Latex Rubber Gloves

3.3 Data Acquisition Requirements (Non – Direct Measurements)

Rainfall data is obtained from rain gauges at wastewater treatment plant. The program manager defines dry weather as at least 72 hours with less than 0.1 inch of precipitation. Contact Collection System Supervisor, or Wastewater Facility Manager to obtain the rainfall information.

3.4 Data Management:

1 Field Technicians fill in the sampling information into the field logbook for each outfall, which is sample. After all samples are collected and before samples are brought to the HWWL, the Field Technician shall fill in all appropriate information onto an inspection form sheet for each Stormwater outfall sampled. The inspection form shall be given to HWWL with the appropriate fecal sample(s). Each inspection form shall be sign by the Field Technician.

2 The **Lab Technician** receives pH and DO reports on sampling from field technicians on a form designed for this information. The form will have a check box to indicate that a fecal sample was obtained and a space to record results. Once fecal results are recorded the completed form is given to **Wastewater Pretreatment Coordinator, (or other trained support staff**), who will input the data into the Access Database. Once data is input the **Wastewater Pretreatment Coordinator, (or other trained support staff**), shall sign stating that the field sheet was inputted into the Access database with the date of the input. After this is completed, the original form shall be filed into the file cabinet located in Wastewater Treatment Plant Front Office.

3 Blank field sheets are stored on the wastewater server in a PDF document in the following directory: \\wwtp-2003\Office\Manager\Stormwater

SECTION 4: CHEMICAL PARAMETERS

4.1 Program Management Project Description

The HWWL will perform chemical monitoring in areas throughout the county to serve a variety of purposes. Different projects will vary according to the purpose of the data. Criteria for determining a project's design will include the following:

- Tributaries receiving effluent from HWPCF
- Previous studies conducted nuisance complaints
- Stream corridors previously not monitored or assessed
- Storm sewer outfall studies
- Grant objectives

Monitoring activities will take place during the recreational season from May through October. The information generated from these projects will be provided to the appropriate agency as well as local community officials. Problem areas will be identified and forwarded to those agencies for the proper follow-up investigations and remediation.

4.2 Monitoring Overview

Table 1.1 summarizes possible monitoring designs, including the parameters tested, the methods used, precipitation, frequency of monitoring, and quality control requirements.

Table A.1.1 PROJECT SCOPE

Parameter	Method	Precipitation	Monitoring Frequency	Quality Control
Temperature	Field			
Dissolved Oxygen	Field			
pH	Field			

Table 1.2 identifies the schedule of major activities associated with a given project.

Table A.1.2 PROJECT SCHEDULE

Activity	Date
Training (including quality control)	
Check equipment	
Initiate Monitoring	
Initiate data entry	
Review data with technical advisors	

4.3 CHEMICAL SAFETY

The pH will be monitored utilizing a pH meter. The pH calibration solutions of 4.0, 7.0 will be the only chemicals these samplers will be using while in the field. It is very important when working with these chemicals to know the proper handling techniques and possible hazards.

Even though the chemicals are used in very small amounts and are, for the most part, considered non-hazardous, they still can be potentially harmful to you and/or the environment.

Following the guidelines below will ensure your safety and well-being. Know your equipment, sampling instructions, and procedures before going out into the field.

Enclosed in each pH kit are Material Safety Data Sheets (MSDS) for each of the chemicals. These sheets are provided by the chemical company and contain very specific information on the chemical and the proper first aid if someone ingests the chemical, or if it comes in contact with someone's eyes or skin.

Read the MSDS sheet for each chemical that you will be handling to familiarize yourself with the potential hazards. Know where your MSDS sheets are located when monitoring in the field.

- Keep all equipment and chemicals away from small children.
- Avoid contact between chemical reagents and skin, eye, nose, and mouth.
- Wash hands directly after using the chemical tests and before eating.
- Wear goggles and rubber gloves when handling chemicals.
- Know chemical cleanup and disposal procedures. Wipe up all spills when they occur.
- Close all containers tightly after use. Do not switch caps.
- Do not expose chemicals or equipment to temperature extremes or long-term direct sunshine and store in a climate-controlled environment (inside house or office).

4.4 Accuracy

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured one. The accuracy of chemical measurements will be checked by performing quality assurance checks on the samples taken. This will include duplicate samples as well as blanks during field monitoring events. pH: this could include reading known standards as samples during field monitoring events to check meter calibration

while in use. Fecal Coliform: sampling twice from same location (one time only). Test will be run as duplicate. Bottle must be clearly marked “duplicate.”

4.5 Training Requirements

To qualify as a sample collector, training must be completed. Training will teach the monitor how to accurately select a sampling site, collect and record data. The methodology outlined for the parameters included in this QAPP must be followed completely. One training session will need to be conducted. The training for chemical data collection will entail review of parameters to be collected, safety, how to follow the sample collection methodology, how to properly record the data and proper sample handling.

Before Field Technicians are deployed into the field, the Wastewater Chemist shall conduct a training session so that each field Technician fully understands their roll for collecting storm water samples.

There will be one field sheet per sample location. As each site is sampled, the collector will document all information and sample results into the Field Technician Log Book, and on the form, sign, date and time before next location is sampled.

- An additional section on this form would be filled in by the lab and would contain time received, time filtered, dilutions used, and fecal colonies per 100 mL.

- It should also have a box for the analyst to sign or initial. This form would be the lab official result and would go to Program Manager after 24 hours. I would call this form “Fecal Coliform Testing”.

The Lab Technician shall log the cultures into a spiral bound workbook specific to this purpose.

Section 5: Measurement / Data Acquisition

5.1 Sampling Process Design

The project manager and field staff will all be included in choosing the sample site locations. All MS4 outfalls will be visited and where appropriate sampled. The following criteria will be used in site selection:

- Safe access
- Permission to cross private property, where applicable
- Sample is representative of the part of the water body of interest
- Location compliments or supplements historical data

The Program Manager and Field Technician will all be included in choosing the sample site locations. A map will be used to identify where data has previously been collected, if applicable, and where new sites should be located. You must be able to obtain landowner permission to use private property as a sampling site prior to sampling that location.

Each site will be located using a Global Positioning Unit (GPS) to record the latitude and longitude. Where possible, river mile of the site will be included in the sample site description along with the name of the map that was used. The full sample site description should always be used: example: Merrimack River MR1139

5.2 Sampling Methods Requirements

5.2.1 Fecal Coliform

Stormwater outfall field equipment and procedures:

1 100 milliter presterilized, disposable plastic bottles with sodium thiosulfate added will be available in the HWWL.

2 The Field Technician picks up the bottles and HWWL field sheet at the laboratory 40 South Porter Street, Haverhill Ma. 01835), and transports them in their vehicle to the selected sample sites.

3 The Field Technician shall wear disposable gloves to prevent contamination of the sample, and collect grab samples by opening the bottle and filling it with the sample source. The Field Technician shall stand downstream from the collection point so as not to contaminate the sample. The employee shall change gloves after each sample.

4 **The Field Technician shall not touch the inside of the bottle or the cap or allow it to become in any way contaminated Cap bottle tightly.**

5 The Field Technician shall label the bottle with the location, time of day, and date of

collection, and place each bottle in a plastic zip lock bag then place it in a cooler filled with ice packs (<10 Celsius) inside their vehicle.

6 The Field Technician shall transport the sample to HWWL for analysis no later than four hours after collection of the first sample.

7 ***No more than 4 (four) samples in one day; samples must reach lab by 11AM.; laboratory must be notified that sampling is being done and when samples have arrived.***

8 Upon reaching HWWL, the Field Technician will complete the laboratory field sheet indicating their name, date and the time they delivered the samples to the laboratory and what tests will be run (in this case, fecal coliform).

~~9~~ HWWL **personnel will refrigerate all samples if testing cannot begin at once>**

10 HWWL personnel ***will*** analyze the samples using the fecal coliform membrane filter procedure as described in Method 9222 D of Standard Methods for the Examination of Water and Wastewater (18th Edition)

FECAL COLIFORM LABORATORY PROCEDURE FOR STORMWATER SAMPLING

PRINCIPLE:

1 The MF procedure uses enriched lactose medium and incubation temperature of 44.5 +/- .2 C for selectivity. It gives 93% accuracy in differentiating between coliforms found in feces of warm-blooded animals and those from other environmental sources. Because incubation temperature is critical, submerge waterproof (plastic bag enclosures) in a water bath for incubation at elevated temperature.

REFERENCE: Standard Methods 9222D

1 APPARATUS:

a. Gable top water bath incubator with temperature tolerance of 44.3 to 44.7 C, outfitted with certified thermometer;
b. Autoclavable glass filtering apparatus
c. UV light box for sterilizing filtering apparatus.

MATERIALS: See section 1.6 for procurement of supplies and section 3.2 consumables.

a. MF-C media (check expiration date) 47mm plastic culture dishes with absorbent pads

b. Sterile membrane filters type HA with a rated pore size of .45 microns (certified by manufacturer and approved for NPDES permit testing)
c. Sterile phosphate buffered dilution water with sodium thiosulfate added (dechlorinating agent)
d. Plastic whirlpack bags
e. Zip lock plastic bags for transporting fecal bottles
f. Sterile buffered dilution water.

2 QA/QC:

a. Water bath temperature is recorded daily on log with adjustment noted. Temperature must be within 44.3/44.7 C.
b. Dilution water blank must be run each time a sample or set of samples is run. Duplicate samples will be run once at each sampling event.
c. Autoclave indicating tape and recording chart used with each autoclave run.

SAMPLE COLLECTION: See section 2.5 Dry weather Sampling and section 5.2.1 Sampling Methods

1 PROCEDURE:

a. Hold sample at <10 C. Filter sample within 4 hours after collection. Sample must be well mixed just prior to filtering. Sample dilutions are 1:1000, and 1:10,000

b. Label three Petri dishes as blank: 1:100 and 1:1000. Sample site and date must be written on each plate
c. Mix sample well and pipette 1.0 mL into 99mL bottle of sterile dilution water. Invert 20/25 times. This is the 1:100 dilution
d. Pipette 1.0 mL of the 1:100 dilution into a 99mL bottle of dilution water. This is the 1:1000 dilution
e. Expel contents of MFC media vials onto each of the three-labeled dishes. After pad has absorbed media there will be a small amount of excess. Tip dish and allow excess to run out onto paper towel.
f. Attach tubing to pump and filter apparatus.
g. Remove membrane filter from package using sterile forceps and place into filter apparatus; replace glass funnel and clamp on; switch pump on.
h. For each site: FILTER IN THIS ORDER: ***(? Use 1:10,000)***
    i. 100 mLs sterile buffered dilution water as a blank
    ii. 1:1000 dilution, then rinse funnels with 100 mLs sterile dilution water and filter until all traces of water are gone.
    iii. 1:100 dilution and rinse funnel as above. As each is filtered, place the membrane filter onto each of the appropriately labeled dishes.
    iv. Flask must be emptied after each set of sample.
    v. Filter apparatus must be sterilized between sample sets using the UV light box.

i. Place all plates into a plastic whirlpak bag PAD SIDE UP and submerge below water level in 44.5 C water bath. Incubate for 24 hours +/- 2 hours. Incubate within ½ hour of filtering.
j. Rinse funnel and holder with very hot water and place in ultraviolet light box for two minutes.
k. Record results as fecal colonies/100 mL sample as described in section 4.6 Documentation and records.
l. ***DISPOSAL:*** sample bottles may be emptied directly down the sink drain, recapped, and disposed of in the trash. Culture plates showing fecal colonies should be flooded with alcohol, covered, resealed in incubator bag, and disposed of in the trash.

NEW PUMP INSTRUCTIONS DECEMBER 2002

1 TURN PUMP OFF AND WAIT FOR PRESSURE GUAGE TO FALL TO ZERO
2 Detach all tubing to flasks and empty large flask
3 Detach tubing to pump
Written and revised by C.Pynn 2/14/08

5.2.1.1CHECKLIST

- 100-milliliter sterile sample bottles ~~preserved~~ with sodium thiosulfate added.
- Disposable gloves
- Cooler –freezer packs
- Plastic zip lock bags
-

5.2.2.1 Escherichia coliform (*E. coli*)

- The sample collection method for *E. coli* is identical to that described for fecal coliform above, except that a different sampling bottle is used.
- Sample bottles are washed, dried, autoclaved, and labeled at HWWL as described above. However, bottles used for *E. coli* do *NOT* contain a preservative.

5.2.2.2 Checklist

- 500 or 1000 milliliter Nalgene plastic bottles
- Disposable gloves
- Cooler
- Ice pack

5.2.3 Dissolved Oxygen, Temperature, YSI Model 55

Dissolved oxygen meter: YSI 55 for DO and temperature

YSI Model 55 meter is calibrated for dissolved oxygen each day before use by the field technician, and recalibrated if there is a significant change in elevation of more than 100 feet. See Section 5.5 YSI MODEL 55 HANDHELD DO METER for proper calibration procedures.

5.2.4 pH: Cole Parmer IQ Scientific ph Meter # 59540-22

5.3 Sample Custody Procedures

Many water quality-monitoring tests do not require specific custody procedures since they are conducted at the sampling site by the sampler. These include those parameters measured by equipment; including pH, dissolved oxygen, temperature, and flow. These parameters are recorded on the monitoring form, which is completed and signed by the field technician.

When the samples are analyzed by the HWWL, a manifest form provided by HWWL must be used. The form will be filled out with sample bottle identification, sample site description, time of collection, and what parameters must be analyzed. Both the field technician and a representative from the HWWL will sign the form when the samples are delivered to the laboratory.

5.4 Quality Control Requirements

Quality control samples will be taken to ensure valid data is collected. Depending on the parameter, quality control samples will consist of blanks, In addition, quality control sessions (calibration exercises) will be held twice a year to verify the proper working order of equipment, and determine whether the data quality objectives are being met.

5.4.1 Blanks, Duplicates and Standardization

Blanks and duplicates are used to ensure that samples are free of cross contamination and that the sample collector is following proper procedures. The specific type and frequency of quality control samples will vary according to the design of the specific project. Table A.1.1 in Section A.1.1 (Project Description) can be used to pinpoint these specifics. Duplicate Samples: After a project designated number of samples, the field technician will fill two separate bottles for each parameter tested with water from the same site. The second bottle will be marked with the sample site id followed by DS.

Blanks and duplicates are used to ensure that samples are free of cross contamination and that the field technician is following proper procedures. The specific type and frequency of quality control samples will vary according to the design of the specific project. Table A.1.1 in Section A.1.1 (Project Description) can be used to pinpoint these specifics.

The field blank will also consist of distilled water. A bottle of distilled water will be taken into field and after a number of samples designated in the project description, the collector will pour 100 ml of distilled water into the 100 ml autoclaved Nalgene plastic bottle and place in the ice water cooler. The field technician will mark on the bottle that it is the field blank.

5.5 Instrument / Equipment Inspection, Calibration and Maintenance

The Lab Technician or designated HWWL staffs personnel will inspect all equipment and verify all necessary parts are present each time equipment is returned to the HWWL Field technicians will be required to sign out equipment on sheets in the HWWL prior to taking equipment into the field. All replacement parts are located in the HWWL. Each field technician shall inspect all equipment prior to use in the field each day as follows:

5.5.1 YSI MODEL 55 HANDHELD DO METER 6-12-00

Probe is stored and calibrated in calibration chamber on upper right hand side of instrument. The bottom of chamber is fitted with a small sponge or cotton ball wet with distilled water. Check to make sure the sponge stays wet. Do not jam probe into chamber.

CALIBRATION:

1. Press on, wait 5 minutes
2. Press up and down arrow keys together and release
3. Press enter; lower right will display 100 (cal)
4. Press enter; 0.0 will display (salinity)
5. Press enter; mg/L and degree C will display
6. Meter is now calibrated and ready for use.
7. Rinse probe with clean tap water when finished. Do not leave dirty or covered with algae.

Turn off. Instrument is battery operated

CLEANING PROBE:

1 A dirty silver anode will cause slow response and may be cleaned using the following procedure:
2 Remove the guard and the membrane.
3 Soak the probe overnight in 3% household ammonia or soak for 4-5 minutes in 14% household ammonia.
4 Rinse probe well with distilled water, and then let it sit for 30 minutes in distilled water.

5 Replace electrolyte and membrane.

TO CHECK ZERO

1. Replace membrane and electrolyte
2. Submerse probe in a solution of sodium sulfite (about ½ teaspoon in 250 mLs distilled water).
3. Wait for mg/L on meter to drop to approximately 0.0 mg/L.
4. Rinse probe well with distilled water, then allow remaining in distilled water for at least ½ hour before calibrating.

TO REPLACE MEMBRANE

1. Slide off O-ring and old membrane; rinse electrode tip with distilled water and wipe dry.
2. Peel off one standard membrane (use 5775 ONLY). These are located in the drawer directly under this instrument. Then follow printed directions on reverse of this sheet. Use bottle of KCL electrolyte presently in use for the BOD probe. This will be in the BOD drawer containing the cap membranes for that probe.

Revised 3-2-06
Carol Pynn

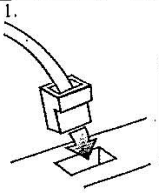
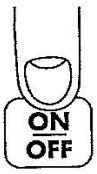
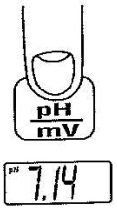
5.5.2 pH: Cole Parmer IQ Scientific ph Meter # 59540-22

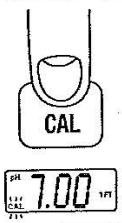
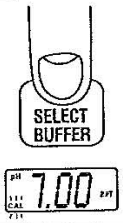
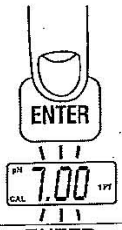
- Check batteries
- Check probes for debris
- Calibrate with 4 and 7 buffer solutions before each day's use.

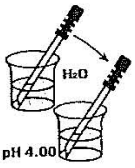
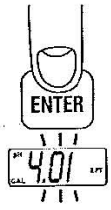
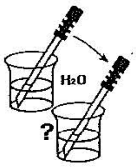
MODEL IQ150 pH Meter

Getting Started

TWO-POINT CALIBRATION--QUICK REFERENCE GUIDE

1.	2.	3.	4.
			
Connect probe to meter.	Put probe in first calibrating buffer.	Press **ON/OFF** to turn on meter.	If necessary, press **pH** until pH icon is seen on the display.

5.	6.	7.	8.
			
Press **CAL**.	If necessary, press **SELECT BUFFER** until display matches first buffer value.	Press **ENTER** and wait until the large number display stops flashing.	When complete, meter will display the next stored buffer value. **2PT** will be displayed.

9.	10.	11.	12.
			
Rinse probe in deionized water and place in second calibrating buffer.	If necessary, press **SELECT BUFFER** until display matches second buffer value.	Press **ENTER** and wait until the large number display stops flashing.	Rinse probe in deionized water and place in sample.

5.6 Data Management:

4 Field Technicians fill in the sampling information into the field logbook for each outfall, which is sample. After all samples are collected and before samples are brought to the HWWL, the Field Technician shall fill in all appropriate information onto an inspection form sheet for each Stormwater outfall sampled. The inspection form shall be given to HWWL with the appropriate fecal sample(s). Each inspection form shall be sign by the Field Technician.

5 The **Lab Technician** receives pH and DO reports on sampling from field technicians on a form designed for this information. The form will have a check box to indicate that a fecal sample was obtained and a space to record results. Once fecal results are recorded the completed form is given to **Wastewater Pretreatment Coordinator, (or other trained support staff**), who will input the data into the Access Database. Once data is input the **Wastewater Pretreatment Coordinator, (or other trained support staff**), shall sign stating that the field sheet was inputted into the Access database with the date of the input. After this is completed, the original form shall be filed into the file cabinet located in Wastewater Treatment Plant Front Office.

6 Blank field sheets are stored on the wastewater server in a PDF document in the following directory: \\wwtp-2003\Office\Manager\Stormwater

5.7 Inspection / Acceptance Requirements

Upon receipt, buffer solutions, standards, and reagents used in the field will be inspected by the Lab Technician or designated **laboratory** staff for leaks, broken seals, and expiration dates. All other sampling equipment will be inspected for broken or missing parts, and will be examined to ensure proper operation.

Section 6: Data Management

The field Technician is responsible for collecting and recording the data accurately on the data sheet. Field data sheets will be checked and signed in the field by the field Technician. The field Technician will be responsible for verification of data and for having copies of the data sheets for reference. These copies can then be stored in a folder or three ring binders.

The Lab Technician will identify any results where holding times have been exceeded, sample identification information is incorrect, samples were inappropriately handled, or calibration information is missing or inadequate. Inspection Form under Comments shall be used for field calibrating pH and Do Meters. Such data will be marked as unacceptable and will not be entered into the computer database.

Data entry begins within a week after the field Technician turns in the data sheets to. As the data is entered into the computer database, the data sheets will be checked and examined for accuracy. If a problem exists, the field Technician will be contacted.

6.1 Assessment and Oversight

After the approval of the QAMP, it will be circulated to all employees of the HWWL who will be performing water quality activities as part of the project.

The project manager will conduct a field performance and systems audit of employees through verification of complete data sheets and field shadowing to ensure that methods are being followed. The HWWL Lab Technician is responsible for equipment and will have equipment repaired and/or replaced when necessary.

6.2 Reports to Management

An annual project status report will be produced by the Pretreatment Coordinator or other support staff who was involved in training and will be given to the HSWC and IDDE Program Manager. This report will include:

- Number of employees trained in a given year
- Number of retrained employees in a given year,
- Problems with data collection and documentation,
- Corrective actions needed or taken,
- Significant quality assurance problems and recommendations.

Section7: Data Validation and Usability

7.1 Data Review, Verification, and Validation

The Lab Technician will validate the data for fecal coliform testing this project. Data recorded on approved data sheets are the acceptable data. Data sheets that do not contain sample site location, date and time of collection and signature of Field Technician will not be accepted. To analyze the data accurately, these are the minimum requirements that are needed. Data will be compared to previous year's data to identify any problems that may be recorded in the data.

7.2 Validation and Verification Methods

As data is entered into the database, Pretreatment Coordinator will place a check mark or date of entry and initials on each data sheet to verify data entry has occurred. The Program Manager shall check the datasheets and data entry to verify that information is collected and entered into the Access Water Quality database correctly. The Program Manager shall train the Pretreatment Coordinator, Lab Technician, and other support staff on the procedures to input the data. The annual report shall be produce by the Pretreatment Coordinator or other support staff with assistance from the Program Manager. Data entered into the database will be printed out and placed in the projects file at the Wastewater Treatment Plant front Office.

7.3 Reconciliation with User Requirements

The project manager and the Lab Technician will evaluate the actual data with the user requirements on a monthly basis. After the project manager and the Lab Technician validate the data, they will review the quality objectives and criteria outlined in this quality assurance plan, to ensure that the data complies with the defined program criteria. This review of data will be conducted in November of each year. If a dataset does not comply with the quality objectives and criteria, then that dataset will be discarded. The accepted data are considered the final dataset. Once the final dataset is confirmed by the project manager, the annual reports will be produced.

Appendix E

Illicit Discharge Ordinance

MODEL ORDINANCE FOR
ILLICIT DISCHARGE & ILLEGAL CONNECTION CONTROL

PLEASE NOTE
This model was developed to assist communities in implementing a storm water management program to control and eliminate illicit discharges.

This model was reviewed by the **Ohio** EPA and complies with **Ohio** EPA's Phase II Storm Water Management requirements to prohibit illicit discharges to storm water systems and to implement appropriate enforcement procedures and actions to detect and eliminate such illicit discharges.

Ohio EPA's Phase II Program requires Phase II designated entities to develop and implement a program to detect and eliminate illicit discharges. This includes the adoption of regulations to provide the Phase II designated entity the necessary authority to carry out this program. This model ordinance is intended to provide communities with a template for that regulation.

All areas highlighted in ***bold/italics*** must be adjusted for your community.

This model is a collaborative effort of the Chagrin River Watershed Partners, Inc., Chagrin Valley Engineering, Ltd. representing several CRWP member communities, the Cuyahoga County Board of Health, and the Lake County General Health District.

WHEREAS, illicit discharges to **Haverhill** separate storm sewer system create water quality risks to public health, safety, and general welfare; and,

WHEREAS, illicit discharges may necessitate repair of storm sewers and ditches; damage to public and private property; and may damage water resources by reducing water quality; and,

WHEREAS, there are watershed-wide efforts to reduce illicit discharges to the **Merrimack and Little Rivers** and to protect and enhance the unique water resources of the **Merrimack and Little Rivers** watershed***(s)***; and,

Delete?? WHEREAS, Haverhill is a member of the ***[insert names of watershed organizations or utilities in which the community is participating]*** and recognizes its obligation as a part of these ***watersheds/organizations*** to control illicit discharges and to protect water quality within its borders; and,

WHEREAS, 40 C.F.R. Parts 9, 122, 123, and 124, and **Ohio [Check Mass Code]** Administrative Code 3745-39 require designated communities, including **Haverhill**, to develop a Storm Water Management Program that, among other components, requires **Haverhill** to prohibit illicit discharges to their storm water system and to implement appropriate enforcement procedures and actions to detect and eliminate such illicit discharges; and,

WHEREAS, Article XVIII, Section 3 of the **[Check Mass Code] Ohio** Constitution grants municipalities the legal authority to exercise all powers of local self-government and to adopt and enforce within their limits such local police, sanitary, and other similar regulations, as are not in conflict with general laws.

NOW, THEREFORE BE IT ORDAINED by the Council of ***Haverhill***, county of ***Essex***, State of Massachusetts, that:

SECTION 1: Codified Ordinance ***Section XXXX Illicit Discharge and Illegal Connection Control*** is hereby adopted to read in total as follows:

SECTION XXXX
Illicit Discharge and Illegal Connection Control

XXXX.01 PURPOSE AND SCOPE

The purpose of this regulation is to provide for the health, safety, and general welfare of the citizens of **Haverhill** through the regulation of illicit discharges to the municipal separate storm sewer system (MS4). This regulation establishes methods for controlling the introduction of pollutants into the MS4 in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process as required by the Massachusetts Environmental Protection Agency (Massachusetts EPA). The objectives of this regulation are:

A. To prohibit illicit discharges and illegal connections to the MS4.

B. To establish legal authority to carry out inspections, monitoring procedures, and enforcement actions necessary to ensure compliance with this regulation.

XXXX.02 APPLICABILITY

This regulation shall apply to all residential, commercial, industrial, or institutional facilities responsible for discharges to the MS4 and on any lands in **Haverhill**, except for those discharges generated by the activities detailed in Section XXXX.07 (A)(1) to (A)(3) of this regulation.

XXXX.03 DEFINITIONS

The words and terms used in this regulation, unless otherwise expressly stated, shall have the following meaning:

A. Best Management Practices (BMPs): means schedules of activities, prohibitions of practices, general good house keeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to storm water. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

B. Community: means **Haverhill**, its designated representatives, boards, or commissions.

C. Environmental Protection Agency or United States Environmental Protection Agency (USEPA): means the United States Environmental Protection Agency, including but not limited to the Massachusetts Environmental Protection Agency (Massachusetts EPA), or any duly authorized official of said agency.

D. Floatable Material: in general this term means any foreign matter that may float or remain suspended in the water column, and includes but is not limited to, plastic, aluminum cans, wood products, bottles, and paper products.

E. Hazardous Material: means any material including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

F. Illicit Discharge: as defined at 40 C.F.R. 122.26 (b)(2) means any discharge to an MS4 that is not composed entirely of storm water, except for those discharges to an MS4 pursuant to a NPDES permit or noted in Section XXXX.07 of this regulation.

G. Illegal Connection: means any drain or conveyance, whether on the surface or subsurface, that allows an illicit discharge to enter the MS4.

H. Municipal Separate Storm Sewer System (MS4): as defined at 40 C.F.R. 122.26 (b)(8), municipal separate storm sewer system means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1 Owned or operated by a State, city, town, borough, county, parish, district, municipality, township, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over sewage, industrial wastes, including special districts under State law such as a sewer district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges to waters of the United States;

2 Designed or used for collecting or conveying storm water;
3 Which is not a combined sewer; and
4 Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 C.F.R. 122.2.

I. National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit: means a permit issued by the EPA (or by a State under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

J. Off-Lot Discharging Home Sewage Treatment System: means a system designed to treat home sewage on-site and discharges treated wastewater effluent off the property into a storm water or surface water conveyance or system. [**Haverhill does not have this type of system**]

K. Owner/Operator: means any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or on the owner's behalf.

L. Pollutant: means anything that causes or contributes to pollution. Pollutants may include, but are not limited to, paints, varnishes, solvents, oil and other automotive fluids, non-hazardous liquid and solid wastes, yard wastes, refuse, rubbish, garbage, litter or other discarded or abandoned objects, floatable materials, pesticides, herbicides, fertilizers, hazardous materials, wastes, sewage, dissolved and particulate metals, animal wastes, residues that result from constructing a structure, and noxious or offensive matter of any kind.

M. Storm Water: any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

N. Wastewater: The spent water of a community. From the standpoint of a source, it may be a combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions.

XXXX.04 DISCLAIMER OF LIABILITY

Compliance with the provisions of this regulation shall not relieve any person from responsibility for damage to any person otherwise imposed by law. The provisions of this regulation are promulgated to promote the health, safety, and welfare of the public and are not designed for the benefit of any individual or for the benefit of any particular parcel of property.

XXXX.05 CONFLICTS, SEVERABILITY, NUISANCES & RESPONSIBILITY

A. Where this regulation is in conflict with other provisions of law or ordinance, the most restrictive provisions, as determined by **Haverhill**, shall prevail.

B. If any clause, section, or provision of this regulation is declared invalid or unconstitutional by a court of competent jurisdiction, the validity of the remainder shall not be affected thereby.

C. This regulation shall not be construed as authorizing any person to maintain a nuisance on their property, and compliance with the provisions of this regulation shall not be a defense in any action to abate such a nuisance.

D. Failure of **Haverhill** to observe or recognize hazardous or unsightly conditions or to recommend corrective measures shall not relieve the site owner from the responsibility for the condition or damage resulting there from, and shall not result in **Haverhill**, its officers, employees, or agents being responsible for any condition or damage resulting there from.

XXXX.06 RESPONSIBILITY FOR ADMINISTRATION

Haverhill shall administer, implement, and enforce the provisions of this regulation. **Haverhill** may contract with **Haverhill's** Board of Health to conduct inspections and monitoring and to assist with enforcement actions.

XXXX.07 DISCHARGE AND CONNECTION PROHIBITIONS

A. Prohibition of Illicit Discharges. No person shall discharge, or cause to be discharged, an illicit discharge into the MS4. The commencement, conduct, or continuance of any illicit discharge to the MS4 is prohibited except as described below:

1. Water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated ground water infiltration; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; air conditioning condensate; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; individual residential car washing; flows from riparian habitats and wetlands; dechlorinated swimming pool discharges; street wash water; and discharges or flows from fire fighting activities. These discharges are exempt until such time as they are determined by **Haverhill** to be significant contributors of pollutants to the MS4.

2. Discharges specified in writing by **Haverhill** as being necessary to protect public health and safety.
3. Discharges from off-lot household sewage treatment systems permitted by the Board of Health for the purpose of discharging treated sewage effluent in accordance with **Ohio** Administrative Code 3701-29-02(6) until such time as the **Ohio** Environmental Protection Agency issues a NPDES permitting mechanism for residential 1, 2, or 3 family dwellings. These discharges are exempt unless such discharges are deemed to be creating a public health nuisance by **Haverhill's** Board of Health.
4. In compliance with the **Haverhill** Storm Water Management Program, discharges from all off-lot household sewage treatment systems must either be eliminated or have coverage under an appropriate NPDES permit issued and approved by the Massachusetts Environmental Protection Agency. When such permit coverage is available, discharges from off-lot discharging household sewage treatment systems will no longer be exempt from the requirements of this regulation.

B. Prohibition of Illegal Connections. The construction, use, maintenance, or continued existence of illegal connections to the MS4 is prohibited.

1 This prohibition expressly includes, without limitation, illegal connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

2 A person is considered to be in violation of this regulation if the person connects a line conveying illicit discharges to the MS4, or allows such a connection to continue.

XXXX.08 MONITORING OF ILLICIT DISCHARGES AND ILLEGAL CONNECTIONS

A. Establishment of an Illicit Discharge and Illegal Connection Monitoring Program: The **Haverhill** shall establish a program to detect and eliminate illicit discharges and illegal connections to the MS4. This program shall include the mapping of the MS4, including MS4 outfalls and home sewage treatment systems; the routine inspection of storm water outfalls to the MS4, and the systematic investigation of potential residential, commercial, industrial, and institutional facilities for the sources of any dry weather flows found as the result of these inspections.

B. Inspection of Residential, Commercial, Industrial, or Institutional Facilities.

1. **Haverhill** shall be permitted to enter and inspect facilities subject to this regulation as often as may be necessary to determine compliance with this regulation.

2. **Haverhill** shall have the right to set up at facilities subject to this regulation such devices as are necessary to conduct monitoring and/or sampling of the facility's storm water discharge, as determined by **Haverhill**.

3. **Haverhill** shall have the right to require the facility owner/operator to install monitoring equipment as necessary. This sampling and monitoring equipment shall be maintained at all times in safe and proper operating condition by the facility owner/operator at the owner/operator's expense. All devices used to measure storm water flow and quality shall be calibrated by **Haverhill** to ensure their accuracy.

4. Any temporary or permanent obstruction to safe and reasonable access to the facility to be inspected and/or sampled shall be promptly removed by the facility's owner/operator at the written or oral request of **Haverhil**l and shall not be replaced. The costs of clearing such access shall be borne by the facility owner/operator.

5. Unreasonable delays in allowing **Haverhill** access to a facility subject to this regulation for the purposes of illicit discharge inspection is a violation of this regulation.

6. If **Haverhill** is refused access to any part of the facility from which storm water is discharged, and **Haverhill** demonstrates probable cause to believe that there may be a violation of this regulation, or that there is a need to inspect and/or sample as part of an inspection and sampling program designed to verify compliance with this regulation or any order issued hereunder, or to protect the public health, safety, and welfare, **Haverhill** may seek issuance of a search warrant, civil remedies including but not limited to injunctive relief, and/or criminal remedies from any court of appropriate jurisdiction.

7. Any costs associated with these inspections shall be assessed to the facility owner/operator.

XXXX.09 ENFORCEMENT

A. Notice of Violation. When **Haverhill** finds that a person has violated a prohibition or failed to meet a requirement of this regulation, **Haverhill** may order compliance by written Notice of Violation. Such notice must specify the violation and shall be hand delivered, and/or sent by registered mail, to the owner/operator of the facility. Such notice may require the following actions:

1. The performance of monitoring, analyses, and reporting;

2. The elimination of illicit discharges or illegal connections;

3. That violating discharges, practices, or operations cease and desist;

4. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property; or

5. The implementation of source control or treatment BMPs.

   B. If abatement of a violation and/or restoration of affected property is required, the Notice of Violation shall set forth a deadline within which such remediation or restoration must be completed. Said Notice shall further advise that, should the facility owner/operator fail to remediate or restore within the established deadline, a legal action for enforcement may be initiated.

   C. Any person receiving a Notice of Violation must meet compliance standards within the time established in the Notice of Violation.

D. Administrative Hearing: If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, shall schedule an administrative hearing to determine reasons for non-compliance and **Haverhill** to determine the next enforcement activity. Notice of the administrative hearing shall be hand delivered and/or sent registered mail.

Note: Communities need to determine appropriate body to hear this, such as Board of Zoning Appeals, Planning Commission, or other legislative body.

E. Injunctive Relief: It shall be unlawful for any owner/operator to violate any provision or fail to comply with any of the requirements of this regulation pursuant to O.R.C. 3709.211. If a owner/operator has violated or continues to violate the provisions of this regulation, ***Haverhill*** may petition for a preliminary or permanent injunction restraining the owner/operator from activities that would create further violations or compelling the owner/operator to perform abatement or remediation of the violation.

XXXX.10 REMEDIES NOT EXCLUSIVE

The remedies listed in this regulation are not exclusive of any other remedies available under any applicable federal, state or local law and it is in the discretion of Haverhill to seek cumulative remedies.

Appendix F

IDDE Manual Outfall Database
(Included on the attached CD-ROM)

Overview

This Outfall Database was originally developed for internal use only by the Northeast Ohio Regional Sewer District. It was adapted to share with northeast Ohio communities in 2003 to support NPDES Phase II Permit requirements and further adapted to share as part of the IDDE Manual. The Outfall Database was developed as a desktop-based application for use with Microsoft Access V. 2000 or later.

To start – please copy the entire contents of the CD to a desktop or server. The file, IDDE_OutfallDatabaseV1.mdb will start the application. Please note, after copying from the CD to a desktop or server; please ensure to remove the Read-Only property from all of the files.

Directory Structure:

This CD contains several files and directories that are needed by certain functions within the Outfall Database. The Outfall Database CD is organized as follows:

- **\IDDEManual_OutfallDB\ -** This is the root directory. Within this directory is the Outfall Database file – IDDE_OutfallDatabaseV1.mdb. The user could change the name of the file as necessary after initial use.

- **IDDEManual_OutfallDB\Documentation\ -** This subdirectory can be used to store Outfall Database Documentation-related files. Any .PDF format files stored in this directory will be automatically linked to the Storm Sewer Map function in the Outfall Database Main Menu. Users can add additional subdirectories as necessary for file storage. There are several support documents included in this subdirectory, such as blank inspection forms, a comprehensive Outfall Database user guide and a stream naming convention guide.

- **IDDEManual_OutfallDB\Extra –** This subdirectory contains files that are needed to properly run the Outfall Database. ***Do not erase this subdirectory or any of the files in this subdirectory.***

- **\IDDEManual_OutfallDB\Images -**This subdirectory is currently empty, but is used assorted Images related to the outfalls. See the Users Guide for more info regarding this subdirectory. Users do not have to create any subdirectories as the Outfall Database will create outfall-specific subdirectories as necessary.

- **\IDDEManual_OutfallDB\Storm Sewer Maps\ -** This subdirectory can be used to store Storm Sewer Map-related files. Any .PDF format files stored in this directory will be automatically linked to the Storm Sewer Map function in the Outfall Database Main Menu. Users can add additional subdirectories as necessary for file storage.

- **\IDDEManual_OutfallDB\Watershed Maps\ -**This subdirectory can be used to store Watershed Map-related files. Any .PDF format files stored in this directory will be automatically linked to the Storm Sewer Map function in the Outfall Database Main Menu. Users can add additional subdirectories as necessary for file storage.

Disclaimer:

This database was adapted to share with communities to support NPDES Phase II Permit requirements as part of the IDDE Manual. The District makes no warranties, expressed or implied, with respect to the use of this outfall database to support NPDES Phase II Permit requirements or for any other specific purpose. The District and its employees expressly disclaim any liability that may result from the use of this database.

For More Information regarding the Outfall Database - Contact:

Mary Maciejowski or Jeffrey Duke (maciejowskim@neorsd.org or dukej@neorsd.org) Northeast Ohio Regional Sewer District 3900 Euclid Avenue Cleveland, Ohio 44115-2506
(216) 881-6600

Appendix G

IDDE Field Guide

APPENDIX H: HAVERHILL'S NOI

corrected NOI

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Watershed Management

BRP WM 08A NPDES Stormwater General Permit

Notice of Intent for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)

11/04 0847
Transmittal Number

Facility ID (if known)

A. Instructions

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Submission of this Notice of Intent constitutes notice that the entity named at item B1. of this form intends to be authorized by the DEP General Permit issued jointly with EPA for stormwater discharges from the small municipal separate storm sewer system (MS4), in the location identified at item B2. of this form. Submission of the Notice of Intent also constitutes notice that the party identified at item B1. has read, understands and meets the eligibility conditions of Part I.B. of the NPDES Small MS4 General Permit, agrees to comply with all applicable terms and conditions of the NPDES Small MS4 General Permit, and understands that continued authorization to discharge is contingent on maintaining eligibility for coverage. **In order to be granted coverage, all information required on BRP WM 08A, including the Stormwater Management Program Summary and Time Frames form, must be completed. Please read the permit and make sure you comply with all requirements, including the requirement to develop and implement a stormwater management program.**

B. Applicant Information

1. Small MS4 Operator/Owner Information:

John J. Guerin, Jr.
Name

City Hall, 4 Summer Street, Room 100
Mailing Address

Haverhill
City/Town

Massachusetts 01830
State

(978) 374-2300
Telephone Number

Email (if available)

2. Municipality Name

Haverhill, Massachusetts
City/Town

3. Legal Status:

☐ Federal ☒ City/Town ☐ State ☐ Tribal ☐ Private

☐ Other public entity: Specify Public Entity

4. Other regulated MS4(s) within municipal boundaries:

5. Based on the instructions provided in Part I of the NPDES Small MS4 General Permit, have the eligibility criteria for "listed species" and critical habitat been met?

☒ yes ☐ pending ☐ no

6. Based on the instructions provided in Part I of the NPDES Small MS4 General Permit, have the eligibility criteria for protection of historic properties been met?

☒ yes ☐ pending ☐ no

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Watershed Management

BRP WM 08A NPDES Stormwater General Permit

Notice of Intent for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)

Transmittal Number

Facility ID (if known)

Note: Section C may be duplicated to accommodate a larger list of receiving waters

C. Names of (Presently Known) Receiving Waters

Receiving Water: Name	No. of Outfalls Number	Listed as Impaired?	Impairment Specify
Merrimack River	Unknown	☒ Yes ☐ No	Prior. Pol., Nut., Pathogens
Little River	Unknown	☒ Yes ☐ No	Pathogens and alterations
Lake Saltonstall	Unknown	☒ Yes ☐ No	Metals
West Meadow Brook	Unknown	☐ Yes ☒ No	
Creek Brook	Unknown	☐ Yes ☒ No	
Peck's Pond	Unknown	☐ Yes ☒ No	
Fishing Brook	Unknown	☐ Yes ☒ No	
Lake Pentucket	Unknown	☐ Yes ☒ No	
Frye's Pond	Unknown	☐ Yes ☒ No	
Snow's Brook	Unknown	☐ Yes ☒ No	
Tilton's Swamp	Unknown	☐ Yes ☒ No	
Kenoza Basin	Unknown	☐ Yes ☒ No	
Peabody Brook	Unknown	☐ Yes ☒ No	
Cottles Creek	Unknown	☐ Yes ☒ No	
East Meadow River	Unknown	☐ Yes ☒ No	
Chadwick's Pond	Unknown	☐ Yes ☒ No	
Kenoza Lake	Unknown	☐ Yes ☒ No	
Johnson's Creek	Unknown	☐ Yes ☒ No	
Millvale Reservoir	Unknown	☐ Yes ☒ No	
Crystal Lake	Unknown	☐ Yes ☒ No	
Sister's Pond	Unknown	☐ Yes ☒ No	
Johnson's Pond	Unknown	☐ Yes ☒ No	
Camp Brook	Unknown	☐ Yes ☒ No	

D. Stormwater Management Program Summary

1. Public Education:

BMP ID #	Specify Best Management Practice	Responsible Dept./Person Name	Specify Measurable Goal
1-1	Designate Stormwater Coordinator	Mayor	Official designation of Stormwater Coordiantor
1-2	Add Stormwater information to City's website	Stormwater Coordinator	Incorporation of Stormwater Page
1-3	Coordinate Outreach with local watershed organizations	Stormwater Coordinator	Identification of groups. Annual contact
1-4	Develop and distribute informational brochures	Stormwater Coordinator	Development and dissemination of 2 brochures
1-5	Install and maintain signage	Stormwater Coordinator	Develop list of future sign locations
1-6	Distribute pet waste brochure with dog licenses	City Clerk	Brochures to all dog licensees

2. Public Participation:

BMP ID #	Specify Best Management Practice	Responsible Dept./Person Name	Specify Measurable Goal
2-1	Comply with state public notice guidelines	City Clerk and Dept. Heads	Comply with state guidelines
2-2	Household hazard waste day	IPP Coordinator	Annual collection day held
2-3	Motor oil collection days	Highway Dept.	Collection days held

D. Stormwater Management Program Summary (Cont.)

2-4 BMP ID #		
Establish a Stormwater hotline Specify Best Management Practice	Stormwater Coordinator Responsible Dept./Person Name	Establishment of hotline Specify Measurable Goal
2-5 BMP ID #		
Establish a Stormwater Committee Specify Best Management Practice	Mayor Responsible Dept./Person Name	Establishment of the committee Specify Measurable Goal
2-6 BMP ID #		
Stencil catchbasins Specify Best Management Practice	Stormwater Coordinator Responsible Dept./Person Name	Contact groups. Stencil 50/yr Specify Measurable Goal

3. Illicit Discharge Detection and Elimination:

3-1 BMP ID #		
Map outfalls and receiving waters Specify Best Management Practice	City Engineer & Stormwater Coordinator Responsible Dept./Person Name	Completed map Specify Measurable Goal
3-2 BMP ID #		
Review & revise, if necessary, City bylaw Specify Best Management Practice	Stormwater Coordinator Responsible Dept./Person Name	Completed review. Modifications if needed. Specify Measurable Goal
3-3 BMP ID #		
Continue dry-weather screening of outfalls Specify Best Management Practice	Stormwater Coordinator Responsible Dept./Person Name	Complete first round of screening Specify Measurable Goal
3-4 BMP ID #		
Develop program for detection and elimination of illicit connections Specify Best Management Practice	Stormwater Coordinator, Board of Health, Wastewater Responsible Dept./Person Name	Procedures developed Specify Measurable Goal

4. Construction Site Runoff Control:

4-1 BMP ID #		
Review ordinance requiring stormwater plan for sites greater than 1 acre. Modify as necessary. Specify Best Management Practice	Stormwater Coordinator, Conservation Commission, City Eng., Planning Dept., Water & Wastewater Dept. Responsible Dept./Person Name	Completed review. Modified if needed. Specify Measurable Goal

D. Stormwater Management Program Summary (Cont.)

4-2 BMP ID #		
Develop procedure for receipt and consideration of public comment Specify Best Management Practice	Stormwater Coordinator, Conservation Commission, City Eng., Planning Dept., Water & Wastewater Dept Responsible Dept./Person Name	Completed review. Modified if needed. Specify Measurable Goal
4-3 BMP ID #		
Site inspections of stormwater control and materials management Specify Best Management Practice	Stormwater Coordinator, Conservation Commission, City Eng., Planning Dept., Water & Wastewater Dept Responsible Dept./Person Name	Regular inspections Specify Measurable Goal

5. Post Construction Runoff Control:

5-1 BMP ID #		
Develop ordinance requiring runoff controls for new and re-development Specify Best Management Practice	Stormwater Coordinator, Conservation Commission, City Eng., Planning Dept., Water & Wastewater Dept Responsible Dept./Person Name	Completed review. Modifications if needed. Specify Measurable Goal
5-2 BMP ID #		
Recommend a BMP manual Specify Best Management Practice	Stormwater Coordinator, Conservation Commission, City Eng., Planning Dept., Water & Wastewater Dept Responsible Dept./Person Name	Manual selected Specify Measurable Goal

6. Municipal Good Housekeeping:

6-1 BMP ID #		
Continue catchbasin cleaning Specify Best Management Practice	Wastewater Dept., Stormwater Coordinator, Planning Dept. Responsible Dept./Person Name	Continuation with current program Specify Measurable Goal
6-2 BMP ID #		
Continue street sweeping Specify Best Management Practice	Highway Department, Stormwater Coordinator Responsible Dept./Person Name	Continuation with current program Specify Measurable Goal

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Watershed Management

BRP WM 08A NPDES Stormwater General Permit

Notice of Intent for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)

Transmittal Number

Facility ID (if known)

D. Stormwater Management Program Summary (Cont.)

6-3 BMP ID #		
Adopt operating procedures for catch basin and street sweeping residuals disposal Specify Best Management Practice	Highway Dept., Stormwater Coordinator Responsible Dept./Person Name	Compete review. Modifications if needed. Specify Measurable Goal
6-4 BMP ID #		
Minimize salt usage. Maintain salt storage area Specify Best Management Practice	Highway Dept., Stormwater Coordinator Responsible Dept./Person Name	Continuation with current program Specify Measurable Goal
6-5 BMP ID #		
Develop and implement inlet cleaning at ponds Specify Best Management Practice	Stormwater Coordinator Responsible Dept./Person Name	Development of program Specify Measurable Goal
6-6 BMP ID #		
Develop and implement employee training program Specify Best Management Practice	Highway Dept., Stormwater Coordinator Responsible Dept./Person Name	2-hrs annually of training per relevant employees Specify Measurable Goal

7. BMPs for Meeting TMDL: **NOT APPLICABLE TO HAVERHILL**

Specify Best Management Practice	Responsible Dept./Person Name	Specify Measurable Goal

E. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

John J. Guerin, Jr., Mayor
Printed Name

Signature

7/8/03
Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Watershed Management
BRP WM 08A NPDES Stormwater General Permit Notice of Intent
for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s)
F. Storm Water Management Program TIME FRAMES

Transmittal Number
Facility ID (if known)
Page 7 of 7

	PERMIT YEAR ONE				PERMIT YEAR TWO				PERMIT YEAR THREE				PERMIT YEAR FOUR				PERMIT YEAR FIVE			
BMP ID #	Spring 03	Summer 03	Fall 03	Winter 03-04	Spring 04	Summer 04	Fall 04	Winter 04-05	Spring 05	Summer 05	Fall 05	Winter 05-06	Spring 06	Summer 06	Fall 06	Winter 06-07	Spring 07	Summer 07	Fall 07	Winter 07-08
#1-1		x																		
#1-2					x															
#1-3		x			x				x				x				x			
#1-4			x							x										
#1-5						x														
#1-6			x																	
#2-1																				
#2-2													x				x			
#2-3																				
#2-4			x																	
#2-5				x				x				x				x				x
#2-6					x															
#3-1						x				x				x				x		
#3-2		x																		
#3-3																				
#3-4																				
#4-1		x																		
#4-2		x																		
#4-3																				
#5-1		x																		
#5-2				x																
#6-1																				
#6-2																				
#6-3				x																
#6-4																				
#6-5								x												
#6-6																				

APPENDIX I: Revision to this Manual

This section is reserved to document revision to Haverhill's IDDE manual.