Detecting and Eliminating Illicit Discharges in Basins 1 and 12

PROJECT NO.

18-151

PREPARED FOR:

Jim Pease / *Environmental Scientist*
VT Department of Environmental Conservation
1 National Life Drive, Main Building, 2nd Floor
Montpelier, VT 05620-3522
Jim.Pease@vermont.gov
802.490.6116

SUBMITTED BY:

David Braun / *Senior Water Resources Scientist*
Stone Environmental, Inc.
535 Stone Cutters Way
Montpelier, VT 05602
dbraun@stone-env.com
802.229.5379

Detecting and Eliminating Illicit Discharges in Basin 1 and Basin 12: Final Report

Cover photo: Laundry suds at a stormwater outfall in Arlington.

Contents

Table of Figures

Table of Tables

1. Introduction

The goal of the Basins 1 and 12 Illicit Discharge Detection and Elimination Project was to improve water quality by identifying and eliminating contaminated, non-stormwater discharges from entering stormwater drainage systems and discharging to waterways and tributaries in Basin 1 and Basin 12. The project was funded and administered by the Vermont Department of Environmental Conservation (DEC).

Eight towns and villages in Basin 1 participated in this project, including Arlington, Dorset, Manchester, Pownal, Shaftsbury, Stamford, Sunderland, and Woodford, as well as Bennington College. Four towns and villages in Basin 12 participated in the project, including Dover, Readsboro, Whitingham, and Wilmington. The geographic scope of the project included the entire extents of the municipal closed drainage systems in these towns and villages, as well as infrastructure surrounding the Mount Snow Resort, and the former Hermitage Club. In addition to the closed stormwater system assessments, nine streams were assessed for wastewater contamination in unsewered areas of Dover, Wilmington, Woodford, and Manchester. Prior to these assessments, DEC prepared stormwater infrastructure mapping for all of the municipalities, which was used to plan the assessment.

From June to September 2019, Stone assessed stormwater outfalls and certain manholes and catchbasins in each participating municipality for the presence of illicit discharges. A total of 338 stormwater drainage systems were assessed. Of the total, 280 systems were assessed at the outfall, while 58 systems were assessed in structures upstream from the mapped outfall location because the outfall either could not be located, was inaccessible, or was inundated by the receiving waterbody. Field tests were performed for ammonia, free chlorine, optical brighteners (i.e., fluorescent whitening dyes contained in most laundry detergents), and common anionic detergents [using the methylene blue active substances (MBAS) method]. In addition, Stone measured specific conductance. Of the 338 systems assessed, 106 were flowing, trickling, or dripping with sufficient volume to collect a water sample when inspected. Contaminants indicating a possible illicit discharge were detected in 25 stormwater drainage systems (Table 1).

Table 1. Summary of Assessments by Location

Town	Systems Assessed	Systems Assessed at Outfall	Systems Flowing	Suspected Illicit Discharges
Arlington	35	27	10	4
Dorset	12	10	2	0
Dover	51	44	23	6
Manchester	108	88	37	7
Pownal	19	14	5	1
Readsboro	22	21	5	1
Shaftsbury	11	9	1	1
Stamford	1	0	0	0
Sunderland	5	5	3	2
Whitingham	16	14	6	1
Wilmington	45	36	13	1
Bennington College	13	12	1	1
Total	**338**	**280**	**106**	**25**

Flowing streams in unsewered areas were assessed at 26 locations. *E. coli*, ammonia, optical brightener, and specific conductance were measured. Of the 26 stream locations, elevated concentrations of *E. coli* were detected in four locations.

This report summarizes the initial illicit discharge assessments we performed in Basin 1 and Basin 12. In addition, two stormdrains on the Bennington College Campus were investigated in detail. A summary of the se Bennington College advanced investigations is appended to this report.

2. Methods

2.1. Preparation for the Assessment

Preparation for the illicit discharge assessment included obtaining and assembling necessary equipment and supplies; preparing an electronic survey field data form, field maps, a Health and Safety Plan, and other documents; and contacting each of the participating municipalities to gather information and plan the project in detail. Large-format field maps were prepared by overlaying DEC's stormwater infrastructure mapping on the best available orthophotography. These maps were annotated in the field. The initial communications with each municipality provided an opportunity to collect four types of information:

1. Contact information for municipal managers and public works personnel.
2. General schedules of road work and wastewater and stormwater collection system projects (to avoid conflict with construction activities).
3. Locations of any known, suspected, or potential cross connections, combined sewer overflows, and sanitary sewer overflows.
4. In-house capabilities of the Public Works or Highway Department to inspect pipelines and perform other advanced investigation techniques.

2.2. Dry Weather Survey

Stormwater drainage systems were assessed during dry weather to minimize dilution from stormwater runoff. Dry weather was defined as negligible rainfall (less than 0.1 inches), beginning at approximately 12:00 p.m. the previous day. Stormwater drainage systems with ten or fewer inlets were typically assessed only at the outfall. Within larger stormwater drainage systems, catchbasins and junction manholes were also assessed to account for any effects of dilution. Stormwater structures were accessed along the public right-of-way or from the receiving waterbody, as appropriate. Where access permission was obtained, stormwater structures located on private property were also assessed, particularly if these structures were connected to a municipal drainage system.

Every outfall or other stormwater structure assessed was assigned a unique identifying code. A visual inspection was made of the condition of each discharge point and the area immediately below each discharge point. If present, dry-weather flows were observed for color, odor, turbidity, and floatable matter. Obvious deficiencies in the structure, such as severe corrosion, were noted. Dry weather flows were sampled by hand, using a telescoping pole, or other similar method as appropriate. At catchbasins and manholes located at junctions in the storm sewer, samples were collected independently from each in-flowing pipe, when possible. Field data were entered on an electronic survey assessment form with the use of a mobile device and the position of each structure was geolocated.

In order to identify potential illicit discharges from laundry facilities, leaking sanitary sewers, and cross-connections, each dry weather discharge was tested for ammonia, methylene blue active substances (common detergents), and the presence of optical brighteners. Specific conductance was measured as an indication of the dissolved solids content. To detect treated municipal water leakage, samples were also analyzed for free chlorine concentration.

With few exceptions, structures that were not flowing at the time of the initial inspection were assumed not to have illicit connections and no further assessment of these structures was performed. Our general procedure is to provide additional assessment of non-flowing structures only if there is associated evidence of contamination, such as suds, odors, or certain deposits.

2.3. Water Analysis Methods

The ammonia concentration was tested using Aquacheck ammonia test strips. Samples were tested for methylene blue active substances using CHEMetrics test kit K-9400, a method consistent with American Public Health Association Standard Methods, 21st ed., Method 5540 C (2005). Free chlorine analysis was conducted with powdered DPD reagent (Hach Method 8167, equivalent to USEPA method 330.5) and a portable Hach DR/900 colorimeter. Specific conductance was measured using an Oakton model conductivity meter, according to Stone Environmental Standard Operating Procedure (SOP) SEI-5.23.3 (Appendix A).

Optical brightener monitoring was performed at outfalls and selected catchbasins and manholes that were flowing at the time of inspection, in accordance with Stone Environmental SOP SEI-5.52.2 (Appendix A). To test for optical brightener, a cotton pad was placed in the flow stream for a period of 4–10 days, after which the pad was rinsed, dried, and viewed under a long-wave ultraviolet light ("black light"). Florescence of the pad (see example in Figure 1) indicates the presence of optical brightener. Pads are held in a sleeve of vinyl window screen, affixed to the rim of the outfall pipe or secured with fishing line to a rock or other anchor. At catchbasins and manholes located at junctions in the storm sewer, pads were deployed in incoming pipes if possible, but were often hung from the catchbasin grate or manhole rung into the sump. An advantage of optical brightener monitoring is that some intermittent or dilute wastewater discharges can be detected due to the multiple-day exposure of the pad, whereas grab sampling may miss these contaminants.

Figure 1. Positive optical brightener monitoring pad under fluorescent (left) and UV (right) lamps

Table 2, below, lists the water quality tests that Stone performed at all discharge points and selected catchbasins and manholes that were flowing at the time of inspection.

Table 2: Water Quality Tests Performed at Flowing Structures

Parameter	Sample Container	Analytical Method
Ammonia	Plastic vial	Aquacheck ammonia test strips
MBAS detergents (anionic surfactants)	Plastic vial	APHA Standard Methods, 21st ed., Method 5540 C (2005)
Free chlorine	Glass jar	By DPD, Hach Method 8167 (EPA 330.5)
Specific conductance	Glass jar	Stone SOP SEI-5.23.3
Optical brightener	Cotton test pads	Stone SOP SEI-5.52.2

Stone's IDDE experience has provided us an understanding of constituent concentrations likely to indicate the presence of an illicit discharge. These benchmark concentrations are summarized below in Table 3.

Table 3: Benchmark Levels for Determining Illicit Discharges

Test	Benchmark	Remarks
E. coli	>= 235 *E. coli*/100 mL	Undiluted municipal wastewater can have *E. coli* levels an order of magnitude or higher than this benchmark. Pet waste and wildlife sources also cause elevated *E. coli* levels.
Ammonia	>= 0.25 mg/L	In the absence of other wastewater indicators, follow-up investigation is performed when the ammonia concentration is 0.50 mg/L or higher. If other wastewater indicators are present, then the 0.25 mg/L benchmark is used. Decomposing vegetation under anoxic conditions can release ammonia to water, which can cause misleading results.
Detergents (methylene blue active substances)	>=0.20 mg/L	Detection of low concentrations (0.10-0.30 mg/L) of anionic detergents is common at stormwater outfalls. Most detections are not correlated with other wastewater indicators and do not lead to a definite source. These detections may be attributable to outdoor washing. However, concentrations as low as 0.20 mg/L have occasionally led us to significant wastewater sources that might otherwise have been missed; therefore, this is a useful test to trigger additional sampling or investigation.
Optical brightener	presence	Presence usually indicates contamination by sanitary wastewater or washwater. Exposure of the test pad for 4 -10 days means that diluted and intermittent discharges can be detected. Unfortunately, petroleum fluoresces at the same wavelength as optical brighteners. Optical brightener testing in catchbasins and manholes has proven to be our most effective method to bracket sources of contamination in storm sewers.
Free chlorine	>=0.10 mg/L	The field test used for free chlorine analyses is sufficiently sensitive to detect municipal tapwater sources diluted by groundwater or runoff approximately 3- to 10-fold, depending on the strength of the tapwater chlorine residual. Chlorine is a good indicator of tapwater leaks and graywater sources. Chlorine is degraded in the presence of organic materials; therefore, it is not a good wastewater indicator.
Specific conductance	>1000 µS/cm	Specific conductance is not a reliable indicator of wastewater contamination. Road salt and metals from pipe corrosion often result in levels in the 1,000-10,000 µS/cm range, whereas flows contaminated with wastewater generally have specific conductance in the 600-1,000 µS/cm range. Although infrequent, this measurement has proven most useful in identifying certain industrial discharges.

Section 3 presents the findings of the initial assessment in each town or village, and recommendations for follow-up sampling and advanced investigation based on the nature and extent of contamination identified.

2.4. Stream Assessment

Stone conducted stream sampling to assess wastewater contamination in unsewered areas of Dover, Manchester, Wilmington, and Woodford, where facilities and houses have septic systems and there is limited stormwater infrastructure. Stone selected 26 sampling locations across 9 streams, primarily at road crossings of low order streams (Table 4). DEC reviewed and approved the proposed stream sampling locations.

Table 4. Stream Sampling Locations

Stream	Town	Investigation Point
Negus	Dover	IP01
Cheney	Dover	IP02, IP03
Ellis	Dover	IP04, IP05
Binney	Wilmington	IP06, IP07, IP08, IP09
Rose	Wilmington	IP10, IP11, IP12, IP13, IP14
City	Woodford	IP17, IP27
Munson	Manchester	IP18, IP19, IP20, IP21, IP22, IP28
Bromley	Manchester	IP23, IP24, IP25
Cold	Wilmington	IP26

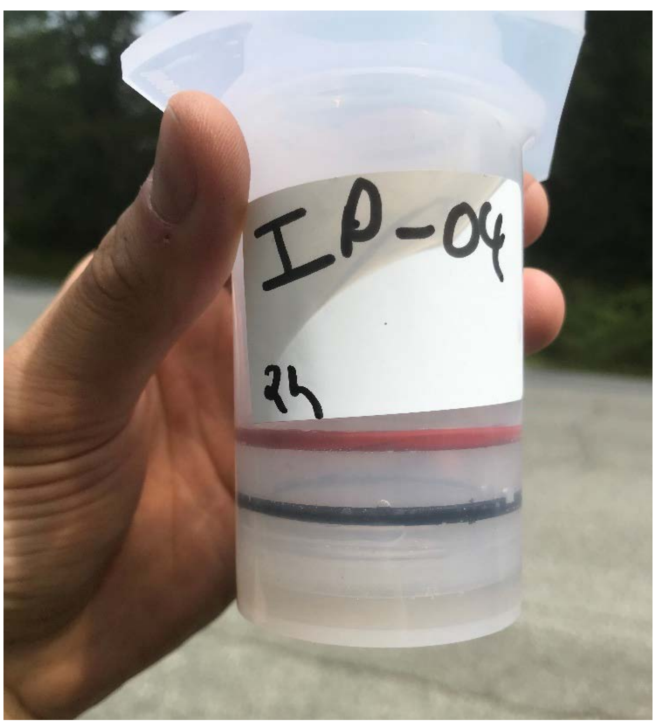


Figure 2. Mobile Water Kit 2.0 test, Ellis Brook, Dover, VT

E. coli was assessed at each stream location by one of two methods. An in-field *E. coli* detection method, Mobile Water Kit 2.0, was used at half the sites (Figure 2). The Mobile Water Kit 2.0 method involves adding a sample to a 100-mL vial containing a prepared hydrogel solution, filtering the sample by depressing a plunger with a built-in filter into the vial, discarding the filtrate, holding the residual under ambient conditions, and observing any color change approximately hourly for 4-6 hours. A violet or pink color indicates presence of *E. coli* and the intensity of the color is proportional to the *E. coli* concentration.

We observed no positive tests using the Mobile Water Kit 2.0 method. Due to our concern about the potential inaccuracy of this method in this application, water samples collected at the remaining sites were submitted to VAEL for *E. coli* analysis using Standard Methods 9223B Colilert Quanti-tray.

In addition to *E. coli* analysis, the ammonia concentration was tested, optical brightener monitoring was performed, and specific conductance was measured at the stream locations, as described in Section 2.3. Results of the stream assessment are presented in Section 4.

3. Initial Assessment Results

3.1. Arlington

Stone assessed 35 systems in Arlington in July 2019. Of the 35 systems, 10 were either flowing or dripping during dry weather. Complete results of the initial assessment in Arlington are provided in Appendix B, Table 1. Of the 35 systems assessed, an illicit discharge was indicated in four systems. These systems and the evidence suggesting their contamination are summarized as follows:

- AR010: Optical brightener was detected at the outfall.
- AR080: Optical brightener, suds, and a laundry odor were detected at the outfall. A high concentration of MBAS (3.0 mg/L) was also measured at the outfall.
- AR180: Optical brightener was detected at the outfall.
- AR200: Optical brightener, suds, and a wastewater odor were detected at the outfall. An exceedingly high concentration of ammonia (6.0 mg/L) and a high concentration of MBAS (2.9 mg/L) were measured at the outfall, as well as elevated specific conductance (1,002 μS/cm).

3.2. Dorset

Stone assessed 12 systems in Dorset in July 2019. Of the 12 systems, two were flowing during dry weather. Complete results of the initial assessment in Dorset are provided in Appendix B, Table 2. No contaminants were detected above levels of concern and there were no indications of an illicit discharge in any system.

3.3. Dover

Stone assessed 51 systems in Dover between July and August 2019. Of the 51 systems, 23 were either flowing or dripping during dry weather. Complete results of the initial assessment in Dover are provided in Appendix B, Table 3. Of the 51 systems assessed, a potential illicit discharge was indicated in six systems. These systems and the evidence suggesting their contamination are summarized as follows:

- DO090: An elevated concentration of free chlorine (0.30 mg/L) was measured at the outfall.
- DO150: A low concentration of free chlorine (0.12 mg/L) was measured at the outfall.
- DO220: An elevated concentration of ammonia (0.50 mg/L) was measured at the outfall.
- DO230: A low concentration of free chlorine (0.16 mg/L) was measured at the outfall.
- DO320: A low concentration of ammonia (0.25 mg/L) and high specific conductance (1812 μS/cm) were measured at the outfall. An oil sheen was also observed.
- DO430: Elevated concentrations of free chlorine (0.18 mg/L) and MBAS (0.3 mg/L) and high specific conductance (2270 μS/cm) were measured at the outfall. These may be attributable to construction and earth moving activities in the drainage area.

3.4. Manchester

Stone assessed 108 systems in Manchester between June and September 2019. Of the 108 systems, 37 were either flowing or dripping during dry weather. Complete results of the initial assessment in Manchester are provided in Appendix B, Table 4. Of the 108 systems assessed, a potential illicit discharge was indicated in seven systems. These systems and the evidence suggesting their contamination are summarized as follows:

- MN150: An elevated concentration of ammonia (0.30 mg/L) and moderately high specific conductance (1,467 μS/cm) were measured in the flowing sump of the first catchbasin (CB1) upstream of the outfall.
- MN240: An elevated concentration of ammonia (0.40 mg/L) was measured in the flowing sump of the first catchbasin (CB1) upstream of the outfall.
- MN460: Suds were observed in the flowing sump of the first catchbasin (CB1) upstream of the outfall.
- MN580: An elevated concentration of free chlorine (0.11 mg/L) was measured at the outfall.
- MN680: Suds were observed at the outfall.
- MN1000: An elevated concentration of ammonia (0.40 mg/L) was measured at the outfall.
- MN1020: An oil sheen was observed in the discharge pool below the outfall.

3.5. Pownal

Stone assessed 19 systems in Pownal in July 2019. Of the 19 systems, five were flowing during dry weather. Complete results of the assessment in Pownal are provided in Appendix B, Table 5. A potential illicit discharge was indicated in one system. This system and the evidence suggesting its contamination are summarized as follows:

- PO140: An elevated concentration of ammonia (0.50 mg/L) and moderately high specific conductance (1,367 μS/cm) were measured at the outfall. An oily sheen was also observed.

3.6. Readsboro

Stone assessed 22 systems in Readsboro in July 2019. Of these 22 systems, five were flowing during dry weather. Complete results of the assessment in Readsboro are provided in Appendix B, Table 6. Of the 22 systems assessed, a potential illicit discharge was indicated in one system. This system and the evidence suggesting its contamination are summarized as follows:

- RE010: An elevated concentration of ammonia (0.25 mg/L) was measured at the outfall. In addition, an oily sheen was observed at the outfall and the outfall and nearby structures were coated in an oily substance.

3.7. Shaftsbury

Stone assessed 11 systems in Shaftsbury in July 2019. Of these 11 systems, one was flowing during dry weather. Complete results of the assessment in Shaftsbury are provided in Appendix B, Table 7. Of the 11 systems assessed, a potential illicit discharge was detected in one system. This system and the evidence suggesting its contamination is summarized as follows:

- SH080: Optical brightener and a wastewater odor were detected at the outfall. An elevated concentration of ammonia (0.50 mg/L) was also measured.

3.8. Stamford

Stone assessed one system in Stamford in July 2019. This system was dry during the initial assessment (Appendix B, Table 8). No illicit discharge was detected in this system.

3.9. Sunderland

Stone assessed five systems in Sunderland in July 2019. Of these five systems, three were flowing during dry weather. Complete results of the assessment in Sunderland are provided in Appendix B, Table 9. Of the five systems assessed, a potential illicit discharge was indicated in two systems. These systems and the evidence suggesting their contamination are summarized as follows:

- SU040: Optical brightener was detected at the outfall.
- SU050: Optical brightener was detected at the outfall.

3.10. Whitingham

Stone assessed 16 systems in Whitingham in July 2019. Of these 16 systems, six were flowing during dry weather. Complete results of the assessment in Whitingham are provided in Appendix B, Table 10. A potential illicit discharge was indicated in one system. This system and the evidence suggesting its contamination are summarized as follows:

- WH050: Elevated concentrations of free chlorine (0.30 mg/L) and MBAS (0.4 mg/L) and high specific conductance (2,180 μS/cm) were measured in the flowing sump of the first catchbasin (CB1) upstream of the outfall.

3.11. Wilmington

Stone assessed 45 systems in Wilmington in July and August 2019. Of these 45 systems, 13 were either flowing or dripping during dry weather. Complete results of the assessment in Wilmington are provided in Appendix B, Table 11. Of the 45 systems assessed, a potential illicit discharge was indicated in two systems. These systems and the evidence suggesting their contamination are summarized as follows:

- WL140: An elevated concentration of ammonia (0.35 mg/L) was measured at the outfall.

3.12. Bennington College

Stone assessed 13 systems at Bennington College in September 2019. Of these 13 systems, only one was flowing during dry weather. Complete results of the initial assessment at Bennington College are provided in Appendix B, Table 12. Of the 13 systems assessed, a potential illicit discharge was indicated in one system:

- BTN-160: Exceedingly high specific conductance (3,120 μS/cm) was measured at the outfall.

4. Stream Assessment Results

Stone assessed 9 streams at 26 locations in unsewered areas of Dover, Manchester, Wilmington, and Woodford in September 2019. Samples were collected during periods of dry weather and low streamflow. Complete results of the stream assessment are provided in Appendix C.

4.1. Negus Brook

Stone assessed Negus Brook in Dover at one location. Neither ammonia nor optical brightener were detected. *E. coli* was not detected using the MWK 2.0 method. Based on these results, no illicit discharge was indicated in this stream.

4.2. Cheney and Ellis Brooks

Stone assessed Cheney and Ellis Brooks in Dover at four locations. Cheney Brook is a tributary of Ellis Brook. Neither ammonia nor optical brightener were detected. *E. coli* was not detected using the MWK 2.0 method. Based on these results, no illicit discharge was indicated in either stream.

4.3. Rose and Binney Brooks

Stone assessed Rose and Binney Brooks in Wilmington at nine locations. Rose Brook is a tributary of Binney Brook. Neither ammonia nor optical brightener were detected. At four locations, the MWK 2.0 method was used, and no *E. coli* were detected. At five locations, *E. coli* samples were analyzed by VAEL and negligible concentrations (1-15 MPN/100 mL) were found. Based on these results, no illicit discharge was indicated in either stream.

4.4. City Stream

Stone assessed City Stream in Woodford at two locations. Neither ammonia nor optical brightener were detected. *E. coli* samples were analyzed by VAEL. A low concentration (24 MPN/100 mL) was measured at IP17 and a slightly elevated concentration (201 MPN/100 mL) was measured at IP27. Based on these results, we recommend City Stream be resampled in the area of IP27 to establish whether more investigation might be needed.

4.5. Munson Brook

Stone assessed Munson Brook in Manchester at six locations. A map of the Munson Brook stream sampling locations is included in Appendix D. Of the six locations assessed, a potential illicit discharge was indicated at three locations. Each of these locations is on a separate branch of Munson Brook, which suggests there are multiple sources of *E. coli* in this watershed. These locations were:

- IP18: An *E. coli* sample analyzed by VAEL had an elevated concentration of *E. coli,* 248 MPN/100 mL. Neither ammonia nor optical brightener were detected.
- IP20: An *E. coli* sample analyzed by VAEL had an exceedingly high concentration of *E. coli,* greater than 2,420 MPN/100 mL. Neither ammonia nor optical brightener were detected.

- IP22: An *E. coli* sample analyzed by VAEL had an elevated concentration of *E. coli,* 1,203 MPN/100 mL. Neither ammonia nor optical brightener were detected.

A map of the Munson Brook stream sampling locations is included in Appendix D.

4.6. Bromley Brook

Stone assessed Bromley Brook in Manchester at three locations. Neither ammonia nor optical brightener were detected. *E. coli* samples were analyzed by VAEL and low concentrations (6-57 MPN/100 mL) were found. Based on these results, no illicit discharge was indicated in this stream.

4.7. Cold Brook

Stone assessed Cold Brook in Wilmington at one location. Neither ammonia nor optical brightener were detected. *E. coli* was not detected using the MWK 2.0 method. Based on these results, no illicit discharge was indicated in this stream.

5. Conclusions

A thorough assessment was made of stormwater drainage systems in eight towns in Basin 1 and four towns in Basin 12. Outfalls on Bennington College property were also assessed. A total of 338 systems were assessed. Based on water quality data and Stone's observations during the dry weather survey a potential illicit discharge was indicated in 25 systems.

Nine streams were assessed at 26 locations. Elevated *E. coli* concentrations were measured at three locations on Munson Brook.

Stone recommends additional sampling and advanced investigations in the locations indicated in this report to confirm and correct illicit discharges to the stormwater systems and streams we assessed in Basins 1 and 12.

6. References

American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 21st edition, Washington D.C., 2005.

Hach Company. Hach Method #8167. Loveland, CO.

Stone Environmental, Inc., SEI SOP 5.23.3: Maintenance and Calibration of the pH/Con 10 Meter. February 24, 2003.

Stone Environmental, Inc., SEI SOP 6.38.0: Optical Brightener Testing, September 11, 2008.

Appendix A. Stone Environmental SOPs

STANDARD OPERATING PROCEDURE

SEI-5.23.3

MAINTENANCE AND CALIBRATION OF THE pH/CON 10 METER

SOP Number: SEI-5.23.3 Date Issued: 5/14/99
Revision Number: 3 Date of Revision: 2/24/03

1.0 OBJECTIVE

This standard operating procedure (SOP) explains the calibration and maintenance of the Oakton pH/Con 10 meter and the Cole-Parmer pH/Con 10 meter. The meters are identical except for the distributor's names. The meter is manufactured by Cole-Parmer and distributed by Cole-Parmer and Oakton. The operator's manual should be referred to for the applicable procedures described below. The pH/Con 10 meter is used for measuring the pH, specific conductance, and temperature of water. The pH/conductivity meters generate and measure data, and thus must meet the requirements of 40 CFR part 160 subpart D.

2.0 POLICIES

1. According to 40 CFR Part 160, Subpart D, Section 160.61, Equipment used in the generation, measurement, or assessment of data and equipment used for facility environmental control shall be of appropriate design and adequate capacity to function according to the protocol and shall be suitable located for operation, inspection, cleaning, and maintenance.
2. Personnel will legibly record data and observations in the field to enable others to reconstruct project events and provide sufficient evidence of activities conducted.

3.0 SAFETY ISSUES

1. If necessary and appropriate, a site-specific health and safety plan shall be created for each study site. A template for creating a proper health and safety plan is provided on the SEI network.
2. If necessary and appropriate, all chemicals are required to be received with Material Safety Data Sheets (MSDS) or appropriate application label. These labels or MSDS shall be made available to all personnel involved in the sampling and testing.

4.0 PROCEDURES

4.1 Equipment and Materials

1. The pH/Con 10 meter, pH/conductivity/ temperature probe. The probe cable has a notched 6-pin connector to attach to probe meter.
2. If necessary and appropriate, standard solutions (e.g., standard pH 4.0 and 7.0, conductivity standards)

3. Clean beakers or other appropriate containers
4. Log or other appropriate medium to record calibration.

4.2 Meter Set-up and Conditioning

1. The pH/Con 10 meter uses a combination pH/conductivity/temperature probe. The probe cable has a notched 6-pin connector to attach the probe meter. Keep connector dry and clean.
2. To connect the probe, line up the notches and 6-pins on the probe connector with the holes in the connector located on the top of the meter. Push down and the probe connector will lock into place.
3. To remove probe, slide up the metal sleeve on the probe connector. While holding onto metal sleeve, pull probe away from the meter. Do not pull on the probe cord or the probe wires might disconnect.
4. Be sure to decontaminate the probe prior to use. The probe shall be tripled rinsed with distilled or deionized water. Further decontamination and cleaning procedures may be called for in special situations or outlined in approved protocols or work plans. This will be documented in field notes or in an appropriate logbook.
5. Be sure to remove the protective rubber cap of the probe before conditioning, calibration, or measurement. If the probe is clean, free of corrosion, and the pH bulb has not become dehydrated, simply soak the probe in tap water for ten minutes before calibrating or taking readings to saturate the pH electrode surface to minimize drift. Wash the probe as necessary in a mild detergent solution. If corrosion appears on the steel pins in the conductivity cell, use a swab soaked in isopropyl alcohol to clean the pins. Do not wipe the probe; this causes a build-up of electrostatic charge on the glass surface. If the pH electrode has dehydrated, soak it for 30 minutes in a 2M-4M KCI boot solution prior to soaking in tap water.
6. Wash the probe in deionized water after use and store in pH 4.0 standard solution or an approved boot solution (per the manufacturer's instruction).

4.3 pH Calibration

1. The meter is capable of up to 3-point pH calibration to ensure accuracy across the entire pH range of the meter. At the beginning of each day of use, perform a 2 or 3-point calibration with standard pH buffers 4.00, 7.00, and 10.00. Calibration standards that bracket the expected sample range should be used. Never reuse buffer solutions; contaminants in the solution can affect the calibration.
2. Press the MODE key to select pH mode. The pH indicator appears in the upper right corner of the display.

3. Dip the probe into the calibration buffer. The end of the probe must be completely immersed into the buffer. Stir the probe gently to create a homogeneous buffer solution. Tap probe to remove any air bubbles.
4. Press CAL/MEAS to enter pH calibration mode. The primary display will show the measured reading while the smaller secondary display will indicate the pH standard buffer solution.
5. Press □ or □ keys to scroll up or down until the secondary display value is the same as the pH buffer value (pH 4.00, 7.00 or 10.00).
6. Wait for the measured pH value to stabilize. The READY indicator will display when the reading stabilizes. After the READY indicator turns on, press ENTER to confirm calibration. A confirming indicator (CON) flashes and disappears. The meter is now calibrated at the buffer indicated in the secondary display.
7. Repeat steps 3, 5, and 6 using a second or third pH standard
8. Press CAL/MEAS to return to pH measurement mode.

4.4 Conductivity Calibration

1. Select a conductivity standard with a value near the sample value expected. The meter should be calibrated by the user(s) at the beginning of each day of use.
2. Pour out two separate portions of your calibration standard and one of deionized water into separate clean containers.
3. Press MODE key to select Conductivity. The ΦS or mS indicator will appear on the right side of the display.
4. Rinse the probe with deionized water, and then rinse the probe in one of the portions of calibration standard Record the calibration standard on the per-use maintenance form or other appropriate medium.
5. Immerse the probe into the second portion of calibration standard. The meter's auto-ranging function selects the appropriate conductivity range (four ranges are possible). Be sure to tap the probe to remove air bubbles. Air bubbles will cause errors in calibration.
6. Wait for the reading to stabilize. The READY indicator lights when the reading is stable. Press the CAL/MEAS key. The CAL indicator appears above the primary display. The primary display shows the measured reading and the secondary display shows the temperature. Record the initial calibration standard on the per-use maintenance form or other appropriate medium.
7. Press the □ or □ keys to scroll to the value of your conductivity standard Press and hold the □ or □ keys to scroll faster. The meter automatically compensates for temperature differences using a factor of 2.00% per BC.

8. Press ENTER key to confirm calibration. Upon confirmation, the CON indicator appears briefly. The meter automatically switches back into Measurement mode. The display now shows the calibrated, temperature compensated conductivity value. However, if the calibration value input into the meter is different from the initial value displayed by more than 20%, the ERR annunciator appears in the lower left corner of the display

4.5 Temperature Calibration/Verification

1. The built-in temperature sensor is factory calibrated. Therefore, no additional calibration is necessary. However, the temperature may be verified against another working thermometer. However, if errors in temperature readings are suspected or if a replacement probe is used. Refer to the operating instructions if temperature calibration is necessary.

4.6 General and Annual Maintenance

Individual users are responsible for the calibration, cleaning, repair, and maintenance of the instrument.

Routine inspection and maintenance schedules vary from each piece of equipment. Typically, there are minor maintenance needs each piece of equipment will need to undergo prior to use in the field (such as cleaning or conditioning). Always consult the manufacturer=s instructions for general maintenance.

Specific per use maintenance needs for the pH /Con 10 meter include but are not limited to:

1. Inspect probe for physical damage and debris
2. Inspect meter for physical damage and debris
3. Clean probe w/ mild detergent
4. Rinse probe in distilled water
5. Clean conductivity pins with isopropyl alcohol (if necessary)
6. Condition probe
7. Calibrated to pH 7.0
8. Calibrated to pH 4.0
9. Calibrated to pH 10.0

The pH /con 10 meter shall be stored in a clean dry place, usually the padded box that it came in. Care should be given to keep the instrument from dust and contamination.

Wash the probe in distilled water after use, and store in pH 4 solution.

All maintenance, repairs, and calibrations are to be documented on an equipment maintenance log or other appropriate medium. Follow the checklist provided on the equipment maintenance log for regular use maintenance needs. Any maintenance must include documentation of whether the maintenance was routine and followed the SOP or not.

Equipment logs shall be brought to the field for documenting use and calibration. The logs will be returned to the office after each field use and filed in the equipment records filing cabinet.

In the event of failure due to breakage or loss of parts, an attempt will be made to repair or replace the necessary parts by the field personnel who discover the malfunction. All repairs will be documented in field notes and/or on a non-routine maintenance log. If the instrument is rendered "out of service" or "broken", it should be tagged as such. If further repair is necessary, return the instrument to the manufacturer following proper shipping procedures.

Non-routine repairs must include documentation of the nature of the defect, how and when the defect was discovered, and any remedial action taken in response to the defect.

5.0 RESPONSIBILITIES

1. All personnel will legibly record data and observations (including phone conversations) in accordance with this SOP to enable others to reconstruct project events and provide sufficient evidence of activities conducted.
2. Prior to use and after use, all equipment will be appropriately cleaned, decontaminated, calibrated (if necessary) and stored in accordance with the manufacturer's instructions and this SOP.

6.0 DEFINITIONS

1. *Decontamination* – Procedures followed to ensure cross contamination does not occur between sampling points or that potential contamination of equipment does not pose a hazard to sampling personnel.
2. *EPA* the U.S. Environmental Protection Agency.
3. *FIFRA* the Federal Insecticide, Fungicide, and Rodenticide Act as amended.
4. *Maintenance* – Actions performed on equipment to standardize and/or correct the accuracy and precision of a piece of equipment to ensure that the equipment is operating within the manufacturer's specifications and standard values.
5. *Study* means any experiment at one or more test sites, in which a test substance is studied in a test system under laboratory conditions or in the environment to determine or help predict its effects, metabolism, product performance (pesticide efficacy studies only as required by 40 CFR 158.640) environmental and chemical fate, persistence, or residue, or other characteristics in humans, other living organisms, or media. The term "study" does not include basic exploratory studies carried out to determine whether a test substance or a test method has any potential utility.

7.0 REFERENCES

40 CFR Part 160 Good Laboratory Practice Standards, August 1989.

8.0 TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

None

9.0 AUTHORIZATION

Revisited by: ______________________________ Date: __________

Michael Nuss, Staff Scientist

Approved by: ______________________________ Date: __________

Christopher T. Stone, President

10.0 REVISION HISTORY

Revision number 1:

1. Changed title and references to Oakton in Sections 1.0 and 2.0 to enable this standard operating procedure to apply to both the Oakton pH/Con 10 meter and the Cole-Parmer pH/Con 10 meter, as these are identical meters.
2. Added instructions about cleaning and re-hydrating the probe to Section 3.1.
3. Added Section 9.0.
4. Reformatted.
5. Minor word editing.

Revision number 2:

1. Changed the title.
2. Removed sections 7.0 (Measurement) and 8.0 (Maintenance/Repairs).
3. Added section called (General and Annual Maintenance).
4. Minor editing.
5. Reformatted.

Revision number 3:

1. Minor wording edits in Section 1.0, Objective.
2. Updated style to match SEI Style Guide – font and text. Reformatted using MS Word
3. Added standardized section headers: 2.0 Policies, 3.0 Safety, 5.0 Responsibilities, 6.0 Definitions, 7.0 References, 8.0 Tables, Diagrams, Flowcharts and Validation data. Authorization moved to Section 9.0, andSection10.0 Revision History.
4. Deleted section on logs being given to the QAU.
5. Other minor wording edits.

STANDARD OPERATING PROCEDURE

SEI-6.38.1

OPTICAL BRIGHTENER TESTING

SOP Number: SEI-6.38.1	Date Issued: 9/11/08
Revision Number: 1	Date of Revision: 3/18/13

1.0 OBJECTIVE

Optical brighteners are a class of fluorescent dyes used in almost all laundry detergents. Many paper products also contain optical brighteners. When optical brightener is applied to cotton fabrics, they will absorb ultraviolet (UV) rays in sunlight and release them as blue rays. These blue rays interact with the natural yellowish color of cottons to give the garment the appearance of being “whiter than white”. Optical brightener dyes are generally found in domestic wastewaters that have a laundry effluent component. Because optical brighteners absorb UV light and fluoresce in the blue region of the visible spectrum, they can be detected using a long wave UV light (a “black” light).

Optical brightener monitoring can be used to indicate the presence of wastewater in stormwater drainage systems, streams, and other water bodies. Since optical brighteners are removed by adsorption onto soil and organic materials as effluent passes through soil and aquifer media, optical brightener monitoring may also be used to identify incompletely renovated wastewater effluent in groundwater at wastewater dispersal sites.

To test for optical brightener, a cotton pad is placed in a flow stream for a period of 4-10 days, after which the pad is rinsed, air dried, and viewed under a long-range UV light. Florescence indicates the presence of optical brightener. Optical brighteners may be monitored in a wide range of structures and flow streams. For example, monitoring pads may be placed in stormwater outfall pipes, within catchbasins and manholes, or in any other man-made or natural water conveyance. Optical brightener pads may be placed in dry pipes or other dry structures to monitor possible intermittent flow streams. However, the more common application is to monitor discharge points that are flowing under dry weather conditions.

2.0 POLICIES

1. According to Stone’s Corporate Quality Management Plan, Stone shall have standard operating procedures in writing setting forth study methods that management is satisfied are adequate to ensure the quality and integrity of the data generated in the course of a study.
2. Personnel will legibly record data and observations in the field to enable others to reconstruct project events and provide sufficient evidence of activities conducted.

3.0 SAFETY ISSUES

1. If necessary and appropriate, a site-specific health and safety plan shall be created for each study site. A template for creating a proper health and safety plan is provided on the SEI network.
2. Care must always be taken when approaching a sampling location. Do not, under any circumstances, place yourself in danger to collect a sample.
3. If necessary and appropriate, all chemicals are required to be received with Material Safety Data Sheets (MSDS) or appropriate application labels. These labels or MSDS shall be made available to all personnel involved in the sampling and testing.

4.0 PROCEDURES

4.1 Equipment and Materials

1. Untreated cotton pad measuring approximately 10 cm by 10 cm (e.g., VWR cat no. 21902-985 or equivalent).
2. Fiberglass or nylon screen to enclose the cotton pad (sewn or stapled).
3. Monofilament fishing line (approximately 20 to 50 lb. test).
4. Binder clips of various sizes.
5. Field notebook, sample collection form, or other acceptable medium for recording field data.
6. Protective gloves if contamination is suspected in the water to be sampled, or if cold weather may be hazardous with wet hands.

4.2 Sampling Procedure and Sample Handling

4.2.1 Optical Brightener Pad Assembly

To assemble an optical brightener monitoring pad, place an untreated cotton pad measuring approximately 10 cm by 10 cm (e.g., VWR cat no. 21902-985) in an envelope made of a screen material. A light fiberglass screen is preferred. The pad may be folded in half to double its thickness. Sew, staple, or otherwise secure all open sides of the screen envelope to enclose the pad.

4.2.2 Optical Brightener Pad Placement

1. Secure the pad at the monitoring point using high test nylon fishing line (20 - 50 lb. test), a binder clip, or both. The pad may be attached to any convenient anchor, provided the pad is as well exposed to the flow stream as possible and the anchor point appears stable enough to resist the force of high flow events. When sampling culverts or stormwater outfall pipes, the pad may be clipped directly to the inner rim of the outfall. The pad should lie flat against the bottom surface of the pipe. The pad may also be hung from a catchbasin grate or manhole rung.

2. If a suitable anchor is not present, a heavy object may be placed in the flow stream or channel to anchor the pad. For example, a pad may be anchored in a stream by tying it to a concrete block.
3. Two or more optical brightener monitoring pads may be placed at monitoring points if appropriate. If more than a single pad is used, the pads should be anchored so that they do not become entangled.
4. Record the date each pad is deployed and any other relevant information in a field logbook or on a specified sample collection form.

4.2.3 Optical Brightener Pad Retrieval and Handling

1. After a 4-10 day period of exposure, optical brightener pads should be collected. The collection of each pad should be recorded in a field logbook or on a specified sample collection form.
2. Any object inserted in a pipe or other structure to anchor the pad should be removed.
3. Pads should be placed in individually labeled, re-sealable plastic bags. The sample label should indicate the monitoring point identification.
4. The pad should be removed from the screen envelope using scissors to cut open the envelope. The pad should be gently rinsed using cold tap water. Lightly squeeze out excess water with a clean hand. Do not wring out the pad. When processing the pads be aware that you may spread dye from one pad to another with your hands. Wear disposable gloves.
5. The pad should then be returned immediately to the labeled bag.
6. Pads should be air dried. The pad may be hung on a line to dry within the labeled bag. If a re-sealable plastic bag is used, cut the bottom corners of the bag to allow airflow to the pad.

4.3 Optical Brightener Analysis

1. When the pad is dry, expose the pad under a high-quality long-range UV light in a room that is completely dark. A non-exposed and an exposed pad are used as controls and compared to each test pad as it is exposed to the UV light.
2. There are three qualitative results: Positive, Negative, and Indeterminate. A pad will very definitely glow (fluoresce) if it is positive. If it is negative it will be noticeably drab and similar to the control pad. All other tests are indeterminate. Pads may be sorted into the basic categories: positive test, negative test, and indeterminate. Further, for positive tests, the pads may be sorted into categories by the relative strength of the fluorescence. A pad that is fluoresces brightly over most or all its surface may be considered a strongly positive test, whereas a pad on which fluorescence appears patchy or faint may be considered a weakly positive test. Indeterminate results generally dictate that the test be repeated.
3. In some instances, only a portion of the pad or simply the outer edge will fluoresce after being exposed to optical brightener. This can be caused by many factors but is usually the result of an uneven exposure to the dye in the flow stream due to sedimentation or the way the pad was

positioned in the water. Regardless, as long as a portion of the pad fluoresces, it should be considered positive.

4. Since paper and cotton dust is so pervasive, it is common to see fluorescent fibers or specks on the test or control pads. These should be ignored and not used to indicate a positive result.
5. With the lights back on, record the identification number and the test result for each pad.
6. It is advisable to have a second reader perform the pad observations independently. The results are then compared. Any conflicting interpretations may be resolved though repeated observation of the pad in question, or a by a third observer.

5.0 RESPONSIBILITIES

1. All personnel will legibly record data and observations (including phone conversations) in accordance with this SOP to enable others to reconstruct project events and provide sufficient evidence of activities conducted.

6.0 DEFINITIONS

1. *Study* means any experiment at one or more test sites, in which a test substance is studied in a test system under laboratory conditions or in the environment to determine or help predict its effects, metabolism, product performance (pesticide efficacy studies only as required by 40 CFR 158.640) environmental and chemical fate, persistence, or residue, or other characteristics in humans, other living organisms, or media. The term “study” does not include basic exploratory studies carried out to determine whether a test substance or a test method has any potential utility.

7.0 REFERENCES

40 CFR Part 160 Good Laboratory Practice Standards, August 1989.

MASS Bay Program. 1998. An Optical Brightener Handbook. http://www.thecompass.org/8TB/pages/SamplingContents.html

8.0 TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

None

9.0 AUTHORIZATION

Revisited by: ______________________________ Date: __________

Dave Braun, Project Scientist/Water Quality Specialist

Approved by: ______________________________ Date: __________

Christopher T. Stone, President

10.0 REVISION HISTORY

Revision number 1:

1. Minor clarifications and rewording throughout.
2. Changed 4-8-day pad exposure period to 4-10-day exposure period.
3. Changed description of indeterminate results.
4. Added use of binder clips to secure pads.
5. Updated procedure for processing exposed pads.

Appendix B. Assessment Data Tables

Table 1: Arlington Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	Temp. (°C)	OB results	Comments
AR010	7/3/2019	DC	Stormwater tunnel	NA	Concrete	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.2	0.06	796	0.1	21.4	positive	Line draining Rte. 7 North/Church St. is dry. Flow coming from CB draining culvert outlet in front of art gallery. All CBs south of Russell St. are wet/no flow. All CBs on East Arlington Rd. line are dry. All flow is from the stream (3 CBs flowing in total)
AR020	7/3/2019	DC	Outfall	16	Concrete	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	NA	
AR030	7/3/2019	DC	Outfall	24	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	NA	System is dry
AR040	7/3/2019	DC	Outfall	16	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Line is dry
AR050-CB1	7/3/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	System is dry. Cannot locate outfall (either in thick vegetation or behind fence in a cow pasture).
AR060-CB1	7/3/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	System is dry. Cannot access outfall on private property. Can see outfall from bridge to confirm dry, but cannot estimate pipe size or material.
AR070	7/3/2019	DC	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	NA	Dry
AR080	7/3/2019	DC	Outfall	18	Corrugated black plastic	Trickling	NA	Free flow	None	Suds, laundry odor	Suds	None	None	0.0	0.02	647	3.0	22.7	positive	Ran MBAS twice (> 3.0 mg/L). Definite suds and laundry odor. No signs of recent outdoor washing in area. All CBs are wet, no flow. Barely trace of suds in CB1. CB2 has footing drain that is dripping, no suds. CB3 is dry, no suds.
AR090	7/3/2019	DC	Outfall	32	Corrugated black plastic	Flowing	0.15	Free flow	None	Clear, no odor	None	None	None	0.0	0.00	889	0.2	19.9	negative	
AR090-CB7	7/3/2019	DC	Catch Basin	NA	NA	NA	NA	NA	NA	Clear, no odor	None	None	None	0.0	0.02	1621	0.1	21.6	NA	No flow above CB7. The top 3 CBs of Center Lane are dry. No flow apparent in culvert line into CB5. Culvert under road to MH reported to be broken.
AR100	7/3/2019	DC	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Dry
AR110	7/3/2019	DC	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Dry
AR120	7/3/2019	DC	Outfall	14	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Dry
AR130	7/3/2019	DC	Outfall	24	Concrete	Wet (no flow)	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	NA	Very small, wet, no flow pool at outlet.
AR140-CB1	7/3/2019	DC	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Cannot access outfall on private property. No flow in system.
AR150	7/3/2019	DC	Outfall	12	Corrugated black plastic	Flowing	0.1	Free flow	None	Clear, no odor	None	Iron staining	None	0.0	0.02	1553	0.0	20	negative	Slight iron staining. Small footing drain (dry) of unclear origin immediately below outfall. No flow in any CBs.
AR160	7/3/2019	DC	Outfall	14	Corrugated metal	Dripping	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	NA	Insufficient drip to collect sample.
AR170	7/9/2019	DC	Outfall	20	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	
AR180	7/9/2019	DC	Outfall	24	Concrete	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.04	571	0.1	17.6	positive	
AR190	7/9/2019	DC	Outfall	4	Smooth plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Unclear if this is outfall. 4" smooth plastic pipe crushed/destroyed in area in retaining wall. No other pipes located. All CBs are dry.
AR200	7/9/2019	DC	Outfall	20	Corrugated black plastic	Flowing	0.1	Free flow	None	Greyish flow, slight WW odor	Suds	None	None	6.0	0.00	1002	2.9	20.7	positive	Outfall dry on arrival. Began flowing while inspecting. Flowed for ~2 minutes. All flow from mainline of CB2. CB1 is off-line. Grey colored discharge and slight wastewater odor. Unclear what source is. Suds came at the end of the flow.
AR210-CB1	7/9/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall in thick vegetation. Unclear from map where exactly it is. All CBs are dry.
AR220	7/9/2019	DC	Outfall	20	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	
AR230-CB1	7/9/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Cannot access outfall under bridge in stream. System is dry.
AR240	7/9/2019	DC	Outfall	18	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	System is dry. Outfall is at top of swale not midway through as mapped.
AR250	7/9/2019	DC	Outfall	18	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	System is dry. Outfall cannot be accessed on bridge, but is visible. Size is approximation.
AR260-CB1	7/9/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Cannot access outfall behind fence on private property. System is dry.
AR270	7/9/2019	DC	Outfall	18	Corrugated black plastic	Flowing	0.1	Free flow	None	Clear, no odor	None	None	None	0.0	0.00	610	0.0	20.5	negative	Swale downstream of outfall has heavy iron staining.
AR280	7/9/2019	DC	Outfall	26	Corrugated black plastic	Flowing	0.2	Free flow	None	Clear, no odor	None	None	None	0.0	0.02	736	0.1	17.3	negative	Pad set in CB1. If stream rises at all the outfall will be surcharged. Swale at top of system has iron staining and floc.
AR290	7/9/2019	DC	Outfall	16	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	
AR300-CB1	7/9/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Cannot access outfall, fenced off. CBs are dry.
AR310	7/9/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	
AR320	7/9/2019	DC	Outfall	46	Corrugated metal	Flowing	1.75	Free flow	None	Clear, no odor	None	None	None	0.0	0.00	377	0.0	18.1	negative	
AR330	7/9/2019	DC	Outfall	52	Concrete	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	NA	Outfall not flowing. It is partially surcharged by the swale it discharges into.
AR340	7/9/2019	DC	Outfall	28	Corrugated metal	Flowing	0.25	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.04	1404	0.11	16.6	negative	
AR350-CB1	7/9/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	NA	Stormwater line is dry. Trickle coming from the culvert that joins into the sump prior to outfall. Did not sample as all flow is from culvert coming from the woods. No stormwater flow.

Table 2: Dorset Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
DR010	7/3/2019	RD	Outfall	35	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.3	0.00	371	0.0	negative	
DR020	7/3/2019	RD	Outfall	18	Corrugated metal	Flowing	0.25	Free flow	None	Clear, iron deposits, orange foam	Foam in pool	Iron staining	None	0.0	0.01	451	0.0	negative	Lots of iron stained foam.
DR030-CB1	7/3/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	NA	None	Fully obstructed	NA	NA	NA	NA	NA	Catch basin is completely full of dirt.
DR040	7/3/2019	RD	Outfall	29	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DR050-CB1	7/3/2019	RD	Catch Basin	22	Corrugated metal	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	System is dry. Outfall measurement taken from the outlet pipe in CB1 sum
DR060	7/5/2019	RD	Outfall	12	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	
DR070	7/5/2019	RD	Outfall	22	Corrugated metal	Dry	NA	Free flow	None	Dry	None	Sediment	None	NA	NA	NA	NA	NA	
DR080	7/5/2019	RD	Outfall	16	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Dry	None	Iron staining	None	NA	NA	NA	NA	NA	
DR090	7/5/2019	RD	Outfall	30	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DR100	7/5/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	
DR110	7/5/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DR120	7/5/2019	RD	Outfall	14	Corrugated metal	Wet (no flow)	NA	Free flow	None	Sediment present	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Halfway filled with sediment.

Table 3: Dover Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
DO010	7/30/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	System is dry. Wastewater treatment plant under construction.
DO020	7/30/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	System is dry. Outfall on private property, but visible from bridge. Size and material are estimated.
DO030-CB1	7/30/2019	DC	Catch Basin	NA	NA	Wet (no flow)	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall in private property. No flow in system.
DO040	7/30/2019	DC	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	No flow in system.
DO050	7/30/2019	DC	Outfall	18	Corrugated black plastic	Dripping	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	Insufficient drip to collect sample. CB1 is dry.
DO060	7/30/2019	DC	Outfall	12	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot estimate size. Outfall is partially crushed and set back into bank.
DO070	7/30/2019	DC	Outfall	NA	Unknown	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	Outfall is surcharged in a small pool and outlet of pipe is recessed into bank. Cannot measure size or material. No flow
DO080-CB1	7/30/2019	DC	Catch Basin	NA	NA	Wet (no flow)	NA	NA	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, walked river bank. Likely recessed in riprap. No flow in CBs.
DO090	7/30/2019	DC	Outfall	NA	Unknown	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.30	315	0.1	negative	Outfall buried in riprap, cannot access. Collected sample from trickle exiting riprap. All flow is from swale into CB2. Tested Cl2 twice.
DO100	8/15/2019	RD	Outfall	34	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	No flow, no odor	None	Sediment	None	NA	NA	NA	NA	NA	
DO110	8/15/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	gully	Dry	None	None	None	NA	NA	NA	NA	NA	
DO120	8/15/2019	RD	Outfall	34	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Pipe is crushed, diameter is estimated.
DO130	8/15/2019	RD	Outfall	8	Smooth plastic	Dry	NA	Free flow	None	Dry	None	Sediment	None	NA	NA	NA	NA	NA	
DO140	8/15/2019	RD	Outfall	26	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DO150	8/15/2019	RD	Outfall	23	Concrete	Flowing	0.1	Free flow	None	Slightly cloudy, iron floc in sample, no odor	None	None	None	0.0	0.12	560	0.2	negative	Outfall broken 4 feet in bank, most flow is under outfall with some flowing out outfall.
DO160-CB1	8/15/2019	RD	Catch Basin	4	Smooth plastic	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. Pipe continues where outfall is marked. CB1 is dry. Defunct golf course.
DO170	8/15/2019	RD	Outfall	16	Corrugated metal	Flowing	NA	Partially submerged/surcharged	None	Clear, no odor	None	Sediment	Partially obstructed	0.3	0.03	311	0.1	negative	Outfall half full of sediment.
DO180-CB1	8/16/2019	RD	Catch Basin	10	Smooth plastic	Wet (no flow)	NA	NA	NA		None	None	Fully obstructed	NA	NA	NA	NA	NA	Cannot locate outfall, possibly under rip rap. Type and diameter taken from inside CB1.
DO190	8/16/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	None	NA	NA	NA	NA	NA	
DO200	8/16/2019	RD	Outfall	22	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Turbid pond	None	Sediment	None	NA	NA	NA	NA	NA	Fenced in area. Turbid at CB1, no visible flow from a distance.
DO210	8/16/2019	RD	Outfall	30	Corrugated black plastic	Flowing	0.25	Free flow	None	Turbid iron stain, no odor	None	Iron staining	None	0.0	0.08	112.6	0.1	negative	
DO220	8/16/2019	RD	Outfall	30	Corrugated metal	Flowing	0.1	Free flow	None	Clear with iron clumps	None	Other	Partially obstructed	0.5	0.02	521	0.2	negative	Outfall is intentionally plugged with hay bales.
DO230	8/16/2019	RD	Outfall	12	Corrugated black plastic	Flowing	Unknown	Free flow	Small gully	Clear, no odor	None	None	None	0.0	0.16	452	0.2	negative	Measured Cl2 twice (0.17 and 0.16 mg/L).
DO240	8/16/2019	RD	Outfall	31	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DO250	8/16/2019	RD	Outfall	23	Corrugated metal	Flowing	1.5	Partially submerged/surcharged	None	Clear, no odor	None	Iron staining	None	0.0	0.04	89.7	0.0	negative	Small swale created from sediment deposits.
DO260	8/16/2019	RD	Outfall	25	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	Iron staining	None	NA	NA	NA	NA	NA	
DO270	8/16/2019	RD	Outfall	24	Corrugated black plastic	Flowing	0.125	Free flow	None	Clear, iron staining present	None	Iron staining	None	0.3	0.05	360	0.0	negative	
DO280	8/16/2019	RD	Outfall	18	Corrugated metal	Dry	NA	Free flow	Ditch	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Outfall half full sediment.
DO290	8/16/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DO300	8/16/2019	RD	Outfall	30	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Iron staining	None	NA	NA	NA	NA	NA	
DO310	8/16/2019	RD	Outfall	42	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	Iron staining	None	0.3	0.06	199.5	0.0	negative	
DO320	8/20/2019	RD	Outfall	30	Corrugated black plastic	Flowing	8	Partially submerged/surcharged	None	Heavy iron, lots of oily sheen	Sheen	Iron staining	None	0.3	0.03	1812	0.1	negative	Lots of oily sheen splotches flowing from outfall, lots of iron bacteria.
DO330	8/20/2019	RD	Outfall	8	Corrugated metal	Flowing	0.25	Free flow	None	Heavy iron, no odor	None	Iron staining	None	0.3	0.00	1011	0.0	negative	
DO340	8/20/2019	RD	Outfall	29	Concrete	Flowing	0.125	Free flow	None	Clear, no odor	None	Sediment	Partially obstructed	0.0	0.09	840	0.0	negative	Outfall half full of sediment.
DO350	8/20/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	None	Clear, no odor	None	Iron staining	None	0.0	0.09	1459	0.2	negative	
DO360	8/20/2019	RD	Outfall	30.5	Corrugated black plastic	Flowing	0.1	Free flow	Large gully	Clear, no odor	None	Iron staining	Partially obstructed	0.0	0.06	385	0.0	negative	Partially obstructed by landscaping debris. Original OB pad was indeterminate.Second pad = negative.
DO370	8/20/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	None	NA	NA	NA	NA	NA	
DO380	8/20/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
DO390	8/20/2019	RD	Outfall	23.5	Corrugated black plastic	Flowing	0.125	Free flow	None	Clear, no odor	None	Iron staining	None	0.0	0.07	520	0.0	negative	
DO400-CB1	8/20/2019	RD	Catch Basin	NA	Corrugated black plastic	Wet (no flow)	NA	NA	None		None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, possibly submerged. CB1 is wet, no flow.
DO410	8/20/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.5	Free flow	None	Iron staining	Sheen	Iron staining	Partially obstructed	0.0	0.07	338	0.1	negative	Outfall is half full of sediment.
DO420	8/20/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	None	Clear, no odor	Sheen	Iron staining	None	0.0	0.03	446	0.1	negative	
DO430	8/23/2019	RD	Outfall	7.5	Smooth plastic	Flowing	0.125	Free flow	Small gully	Clear, no odor	None	Iron staining	None	0.0	0.18	2270	0.3	negative	Construction near CB1 on building on other side of street, excavation occurring.
DO440	8/23/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Free flow	None		None	None	None	NA	NA	NA	NA	NA	
DO450-CB1	8/23/2019	RD	Catch Basin	NA	Smooth plastic	Wet (no flow)	NA	NA	None		None	None	Fully obstructed	NA	NA	NA	NA	NA	Cannot locate outfall. CBs are wet, no flow.
DO460	8/23/2019	RD	Outfall	30	Corrugated metal	Flowing	0.25	Free flow	None	Slightly cloudy, iron color, no odor	None	Iron staining	None	0.0	0.04	1016	0.2	negative	
DO470	8/23/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	Wash out	Clear, no odor	None	Iron staining	None	0.3	0.03	293	0.0	negative	
DO480-CB1	8/23/2019	RD	Catch Basin	12	Corrugated metal	Flowing	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	Partially obstructed	0.0	0.06	235	0.0	negative	Sampled and padded CB1. Seems to have a ground drain with a sump pump that discharges into CB1. High flow periodically from 4-in PVC pipe.
DO490	8/23/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	None	Iron color, slightly cloudy, no odor	None	Iron staining	None	0.3	0.00	422	0.1	negative	
DO500	8/23/2019	RD	Outfall	15	Corrugated metal	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.06	482	0.1	negative	Pipe is damaged, flow undercutting pipe.
DO510	8/23/2019	RD	Outfall	6	Smooth plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	

Table 4: Manchester Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
MN010-CB1	6/4/2019	RD	Catch Basin	24	Concrete	NA	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.02	829	0.2	negative	Outfall is surcharged. Collected sample from flowing sump of CB1. CB under construction.
MN020	6/4/2019	RD	Outfall	26	Corrugated metal	Trickling	NA	Partially submerged/surcharged	None	Iron staining	None	Iron staining	None	0.0	0.01	848	0.1	negative	Discharges into small pool. Little flow at outlet. No flow from Elm St. line, trickle downhill from Highland.
MN030-CB1	6/4/2019	RD	Catch Basin	NA	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Outfall likely buried in riprap, cannot locate. System is dry.
MN040	6/4/2019	RD	Outfall	NA	Unknown	Wet (no flow)	NA	Submerged	Deep stagnant hole	Stagnant	None	None	None	NA	NA	NA	NA	NA	Outfall is submerged several feet in a stagnant pool. No flow in system.
MN050	6/4/2019	RD	Outfall	3	Smooth plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Upstream CBs are dry.
MN060	6/4/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Dry
MN070	6/4/2019	RD	Outfall	14	Corrugated black plastic	Flowing	0.1	Free flow	None	Clear, no odor	None	None	None	0.0	0.03	403	0.1	negative	
MN080	6/11/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN090	6/4/2019	RD	Outfall	16	Corrugated metal	Flowing	0.25	Free flow	Small gully	Clear, no odor	None	None	None	0.0	0.07	1003	0.2	negative	Original pad OB was indeterminate. Second OB pad = negative.
MN100-CB1	6/4/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Dry	None	None	None	NA	NA	NA	NA	NA	No flow in system, can't access outfall under bridge.
MN110-CB1	7/16/2019	RD	Catch Basin	NA	Corrugated metal	Dry	NA	NA	NA	Dry	None	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall, muddy swale where it should be, possibly buried. CB1 is dry.
MN110-CB9	6/4/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Clear, no odor	None	None	None	0.0	0.05	660	0.2	negative	Sampled the first online catchbasin.
MN120-CB1	6/4/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Wet, no flow. No flow in system. Cannot access outfall under bridge.
MN130	6/4/2019	RD	Outfall	NA	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall on private property. Outfall is visibly dry. CB1 is also dry.
MN140-CB1	6/11/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 is dry. All other CBs have been paved over.
MN150-CB1	6/4/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	No odor, pollen laden foam	None	None	None	0.3	0.01	1467	0.1	negative	Outfall submerged under bridge. Sampled flowing sump of CB1.
MN160	6/4/2019	DC	Outfall	28	Smooth plastic	Flowing	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.05	587	0.2	negative	Outfall partially submerged, but flowing (cannot estimate flow).
MN170	6/4/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Dry
MN180	6/4/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN190	6/4/2019	RD	Outfall	12	Corrugated black plastic	Wet (no flow)	NA	Free flow	Small gully	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN200	6/4/2019	RD	Outfall	18	Corrugated metal	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN210	6/10/2019	RD	culvert outlet	NA	Concrete	Wet (no flow)	NA	Submerged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, likely submerged.
MN220	6/10/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN230	9/17/2019	DC	Outfall	16	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Dry
MN240-CB1	6/10/2019	RD	Catch Basin	NA	NA	NA	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.4	0.03	778	0.1	negative	Corrugated metal outfall is partially submerged. CB1 trickling.
MN250	6/10/2019	RD	Outfall	14	Smooth plastic	Flowing	2	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.04	554	0.1	negative	
MN260	6/10/2019	RD	Outfall	14	Smooth plastic	Flowing	1	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.00	585	0.0	negative	
MN270	6/10/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN280	6/10/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN290	6/10/2019	RD	Outfall	13	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall, but can be clearly seen.
MN300	6/10/2019	RD	Outfall	16	Corrugated metal	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN310	6/10/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN320	6/10/2019	RD	Outfall	22	Corrugated metal	Flowing	2	Partially submerged/surcharged	None	Clear, flowing slowly	None	None	None	0.0	0.00	1020	0.1	negative	
MN330	6/10/2019	RD	Outfall	12	Corrugated metal	Flowing	0.5	Free flow	None	Clear, no odor	None	None	None	0.1	0.06	623	0.1	negative	Cl diluted 50/50 with 0.02 tap water. Had issues with meter at full strength.
MN340	6/18/2019	RD	Outfall	25	Corrugated metal	Dry	NA	Free flow	Large gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN350	6/18/2019	RD	Outfall	7.75	Smooth plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Unmapped outfall. Origin is unclear.
MN360	6/18/2019	RD	Outfall	25	Corrugated metal	Dry	NA	Free flow	Gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN370	6/18/2019	RD	Outfall	17.75	Corrugated metal	Trickling	NA	Free flow	Gully	Clear, no odor	None	None	None	0.0	0.00	919	0.2	negative	
MN380-CB1	6/18/2019	RD	Catch Basin	NA	NA	NA	NA	Free flow	None	Dry	None	None	Fully obstructed	NA	NA	NA	NA	NA	
MN390-CB1	6/18/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Dry	None	None	Fully obstructed	NA	NA	NA	NA	NA	Outfall is buried, cannot access.
MN400	6/18/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN410	6/18/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	Gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN420	6/18/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN430	6/18/2019	RD	Outfall	15	Corrugated metal	Wet (no flow)	NA	Free flow	Gully	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN440	6/18/2019	RD	Outfall	15	Concrete	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN450	6/19/2019	RD	Outfall	24	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN460-CB1	6/19/2019	RD	Catch Basin	NA	NA	Trickling	NA	Free flow	None	Clear, no odor	Suds	None	None	0.0	0.00	458	0.0	negative	Collected sample from CB1. Flow was trickling into sump but no outflow from sump.
MN470	6/19/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN480	6/19/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN490	6/19/2019	RD	Outfall	8	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN500	6/19/2019	RD	Outfall	15	Corrugated metal	Dripping	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	Insufficient flow to collect sample.
MN510-CB1	6/19/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Clear, no odor	None	None	None	0.0	0.02	795	0.0	negative	Cannot locate outfall. Trickle into CB1. Construction on Main Street
MN520	6/19/2019	RD	Outfall	12	Corrugated black plastic	Flowing	0.75	Free flow	Small gully	Clear, no odor	None	None	None	0.2	0.02	915	0.1	negative	Recently paved. Original OB pad was indeterminate. Second pad = negative.
MN530	6/19/2019	RD	Outfall	18	Corrugated black plastic	Flowing	1.75	Partially submerged/surcharged	Small gully	Stream, clear	None	None	None	0.1	0.02	1179	0.0	negative	Construction on Main St.
MN540	6/19/2019	RD	Outfall	8	Smooth plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN550	6/19/2019	RD	Outfall	15	Corrugated metal	Wet (no flow)	NA	Partially submerged/surcharged	None	Oily sheen on standing water	Sheen	Iron staining	None	NA	NA	NA	NA	NA	
MN560	6/19/2019	RD	Outfall	12	Corrugated black plastic	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.05	882	0.0	negative	
MN570	6/19/2019	RD	Outfall	12	Corrugated black plastic	Flowing	1	Free flow	None	Clear, no odor	None	Sediment	None	0.0	0.04	1675	0.1	negative	
MN580	6/24/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.25	Free flow	Undercut	Clear, no odor	None	None	None	0.0	0.11	649	0.1	negative	
MN590	6/24/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.13	Free flow	Small gully	Clear, no odor	None	Sediment	None	0.0	0.04	459	0.0	negative	
MN600	6/24/2019	RD	Outfall	11.75	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	
MN610	6/24/2019	RD	Outfall	17.5	Corrugated metal	Flowing	0.25	Free flow	Small pool	Clear, no odor	None	None	None	0.0	0.07	670	0.0	negative	
MN620	6/24/2019	RD	Outfall	12	Corrugated metal	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	Partially obstructed	NA	NA	NA	NA	NA	
MN630	6/24/2019	RD	Outfall	14.5	white corrugated plastic	Flowing	1.5	Free flow	None	Clear, no odor	None	None	None	0.0	0.03	752	0.0	negative	
MN640	6/24/2019	RD	Outfall	14.5	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN650	6/24/2019	RD	Outfall	17.75	Corrugated metal	Dry	NA	Free flow	Large gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN660	6/24/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. System is dry.
MN670	6/24/2019	RD	Outfall	17.5	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN680	6/24/2019	RD	Outfall	15	Corrugated black plastic	Flowing	1	Free flow	None	Clear, suds	Suds	None	None	0.0	0.03	863	0.2	negative	
MN690	6/24/2019	RD	Outfall	12	Concrete	Flowing	2	Free flow	None	Clear, no odor	None	Iron staining	None	0.0	0.03	435	0.1	negative	
MN700-CB1	6/27/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, possibly buried, CB1 is wet/no flow.
MN710	6/27/2019	RD	Outfall	18	Corrugated metal	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.3	0.10	1016	0.2	negative	

Table 4: Manchester Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
MN720-CB2	6/27/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Clear, no odor	None	None	NA	0.1	0.07	1154	0.2	negative	Cannot locate outfall. CB1 is wet/no flow. Flowing at CB2.
MN730	6/27/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	Large gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN740	6/27/2019	RD	Outfall	18	Concrete	Flowing	1.5	Free flow	None	Clear, no odor	None	Iron staining	None	0.3	0.05	887	0.0	negative	
MN750	6/27/2019	RD	Outfall	24	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN760	6/27/2019	RD	Outfall	24	Concrete	Flowing	10	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	0.03	771	0.1	negative	
MN770	6/27/2019	RD	Outfall	42	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN780	6/27/2019	RD	Outfall	12	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN790	6/27/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	Outfall half filled with sediment.
MN800	6/27/2019	RD	Outfall	12	Corrugated metal	Wet (no flow)	NA	Submerged	None	Stagnant	None	None	None	NA	NA	NA	NA	NA	
MN810	7/2/2019	RD	Outfall	14	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN820	7/2/2019	RD	Outfall	18	Corrugated metal	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	
MN830	7/2/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN840	7/2/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
MN850	7/2/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	Small gully	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN860	7/2/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 is wet/no flow.
MN870	7/2/2019	RD	Outfall	23.5	Corrugated black plastic	Flowing	1	Free flow	None	Clear, no odor	None	None	None	0.3	0.03	1377	0.2	negative	Flow is combined with MN880 outfall. MN870 CB1 and CB2 are wet/no flow. Flow can be heard but not seen at CB1.
MN880-CB1	7/2/2019	RD	Catch Basin	NA	NA	NA	NA	NA	None	Clear, no odor	None	None	None	0.0	0.05	740	0.1	negative	Combined outfall with MN870-CB1
MN890	7/2/2019	RD	Outfall	22.5	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
MN900	7/2/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	
MN910	7/2/2019	RD	Outfall	24	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN920	7/2/2019	RD	Outfall	15	Corrugated black plastic	Flowing	1	Free flow	Small pool	Clear, no odor	None	None	None	0.0	0.03	1477	0.2	negative	
MN930-CB1	7/2/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. Catchbasin is dry. Fresh pavement.
MN940	7/2/2019	RD	Outfall	18	Corrugated black plastic	Trickling	NA	Free flow	Large pool	Clear, no odor	None	None	None	0.0	0.04	889	0.0	negative	
MN950	7/2/2019	RD	Outfall	20	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN960	7/2/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
MN970	7/2/2019	RD	Outfall	16	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	Iron staining	None	0.3	0.02	827	0.2	negative	On driving range of golf course.
MN980	7/3/2019	RD	Outfall	18	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	
MN990	7/3/2019	RD	Outfall	8	Smooth plastic	Dry	NA	Free flow	Small washout	Dry	None	None	None	NA	NA	NA	NA	NA	
MN1000	7/3/2019	RD	Outfall	12	Corrugated black plastic	Dripping	NA	Free flow	None	Clear, no odor	None	Sediment	None	0.4	0.00	802	0.0	negative	
MN1010	7/3/2019	RD	Outfall	20	Corrugated black plastic	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.03	350	0.1	negative	
MN1020	7/3/2019	RD	Outfall	15	Corrugated black plastic	Flowing	0.25	Free flow	Pool	clear, oil sheen on pool	Sheen	None	None	0.0	0.00	598	0.1	negative	Oily film in outfall pool.
MN1030	7/3/2019	RD	Outfall	15	Corrugated black plastic	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.0	0.07	976	0.0	negative	
MN1040	7/3/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
MN1050	7/3/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
MN1060	7/3/2019	RD	Outfall	14	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	Sediment	Partially obstructed	NA	NA	NA	NA	NA	3/4 obstructed with sediment.
MN1070-CB1	9/17/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall on private property. All CBs are dry.
MN1080-CB1	9/17/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall (incorrectly mapped). All CBs are dry.

Table 5: Pownal Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
PO010	7/8/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	NA	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall and CB1, CB2 is dry.
PO020-CB1	7/8/2019	RD	Catch Basin	12	Corrugated metal	NA	NA	NA	NA	Wet, no flow	NA	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall, likely buried in sinkhole. CB1 is wet, no flow.
PO030	7/8/2019	RD	Outfall	26	Concrete	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Nearly fully obstructed with stone and gravel. Diameter is estimated.
PO040-CB1	7/8/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall in thick brush. Wet, no flow.
PO050	7/8/2019	RD	Outfall	24	Corrugated black plastic	Wet (no flow)	NA	Free flow	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
PO060	7/8/2019	RD	Outfall	NA	NA	NA	NA	NA	NA	Unknown	NA	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall, water in the pond is too turbid to see if pipe is submerged. Cannot locate CBs or the swale at west side of yard.
PO070	7/8/2019	RD	Outfall	36	Corrugated black plastic	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.05	876	0.0	negative	
PO080	7/8/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
PO090	7/8/2019	RD	Outfall	20	Corrugated metal	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Half filled with sediment.
PO100	7/8/2019	RD	Outfall	32	Concrete	Flowing	3	Submerged	None	Slightly turbid	None	Iron staining	None	0.0	0.08	344	0.0	negative	Square cement outfall with steel grate.
PO110-CB1	7/8/2019	RD	Catch Basin	NA	Concrete	NA	NA	NA	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 wet, no flow.
PO120	7/8/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
PO130	7/8/2019	RD	Outfall	18	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	Partially obstructed	NA	NA	NA	NA	NA	Half full of sediment. Grate broken at CB1.
PO140	7/8/2019	RD	Outfall	18	Corrugated black plastic	Trickling	NA	Free flow	None	Oily sheen, sediment and iron	Sheen	Oily	None	0.5	0.04	1367	0.2	negative	
PO150	7/8/2019	RD	Outfall	30	rectangular stone tunnel	Flowing	3	Free flow	channel to river	Clear, no odor	None	None	None	0.3	0.04	281	0.0	negative	
PO160	7/8/2019	RD	Outfall	12.5	smooth metal	Flowing	0.25	Free flow	None	Clear, no odor	None	Sediment	None	0.3	0.06	947	0.0	negative	
PO170	7/8/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
PO180	7/8/2019	RD	Outfall	18	Smooth plastic	Dry	NA	Free flow	gully	Dry	None	None	None	NA	NA	NA	NA	NA	
PO190-CB1	7/8/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA		None	None	None	NA	NA	NA	NA	NA	System is dry. Cannot locate outfall. Residents complained about a deep sinkhole that was filled, but is sinking again under asphalt.

Table 6: Readsboro Assessment Table

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
RE010	7/16/2019	RD	Outfall	15	Corrugated black plastic	Trickling	NA	Free flow	None	Clear, no odor, iron floc, possibly oil	Sheen	Oily	None	0.3	0.06	89.2	0.0	negative	Heavy iron, plus possible oil coating on pipe. Second unmarked outfall next to it has same coating. Oil sheen spots in sample.
RE020	7/16/2019	RD	Outfall	6	Corrugated metal	Trickling	NA	Free flow	None	Clear, no odor	None	Iron staining	None	0.0	0.05	147.2	0.0	negative	Iron staining; unmarked outfall coming from Mack Bros propane.
RE030	7/16/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE040	7/16/2019	RD	Outfall	17	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE050	7/16/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	Unmapped outfall.
RE060	7/16/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE070	7/16/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE080	7/16/2019	RD	Outfall	12	Concrete	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE090	7/16/2019	RD	Outfall	20	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE100	7/16/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE110	7/16/2019	RD	Outfall	6.5	heavy iron pipe with flange	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Unclear if this is the outfall, but it is in the mapped location.
RE120-CB1	7/16/2019	RD	Catch Basin	NA	Concrete	Dry	NA	NA	NA	Dry	NA	None	NA	NA	NA	NA	NA	NA	Cannot locate outfall. Very steep loose bank. CB1 is dry.
RE130	7/16/2019	RD	Outfall	18	Corrugated metal	Flowing	0.5	Free flow	None	Clear, no odor	None	None	None	0.0	0.07	71.4	0.0	negative	
RE140	7/16/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.75	Free flow	None	Clear, no odor	None	None	None	0.3	0.06	164.6	0.0	negative	
RE150	7/16/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE160	7/16/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE170	7/16/2019	RD	Outfall	16	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	Fully obstructed	NA	NA	NA	NA	NA	Buried by backfill but found outfall. Outfall is dry, diameter is estimated
RE180	7/16/2019	RD	Outfall	18	Corrugated metal	Flowing	0.5	Free flow	None	Iron staining, no odor	None	Iron staining	None	0.3	0.02	286	0.0	negative	Iron staining
RE190	7/16/2019	RD	Outfall	6	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	Unmapped outfall next to RE180.
RE200	7/16/2019	RD	Outfall	24	Corrugated metal	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE210	7/16/2019	RD	Outfall	12	Concrete	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	
RE220	7/16/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	NA	None	None	NA	NA	NA	NA	NA	

Table 7: Shaftsbury Assessment Table

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
SH010	7/9/2019	RD	Outfall	22	Corrugated metal	Wet (no flow)	NA	Free flow	Small channel	Wet, no flow	None	None	Partially obstructed	NA	NA	NA	NA	NA	Outfall half filled with sediment
SH020-CB1	7/9/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Outfall located on private property. CB1 is dry.
SH030	7/9/2019	RD	Outfall	NA	unknown	Wet (no flow)	NA	Submerged	Plant debris	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	
SH040	7/9/2019	RD	Outfall	18	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
SH050	7/9/2019	RD	Catch Basin	NA	NA	NA	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	CB1 is dry. Additional pipe entering CB2 (wet, no flow). Cannot locate outfall.
SH060-CB1	7/9/2019	RD	Catch Basin	6	Corrugated metal	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 is dry. Outfall diameter and material taken from CB1 outlet pipe.
SH070	7/9/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
SH080	7/9/2019	RD	Outfall	22	Corrugated metal	Flowing	0.5	Free flow	Small gully	Clear bubbles (not sudsy), slight WW odor	Clear bubbles	None	Partially obstructed	0.5	0.05	695	0.2	positive	End of outfall is half crushed.
SH090	7/9/2019	RD	Outfall	18	Corrugated metal	Wet (no flow)	NA	Free flow	Small gully	Wet, no flow	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Half full of sediment. No flow in pipe.
SH100	7/9/2019	RD	Outfall	18	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Dry
SH110	7/9/2019	RD	Outfall	16	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Dry

Table 8: Stamford Assessment Table

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
SM010-CB1	7/15/2019	RD	Catch Basin	NA	NA	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Outfall buried in riprap. Assessed first upstream CB.

Table 9: Sunderland Assessment Table

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
SU010	7/5/2019	RD	Outfall	18	Corrugated metal	Dry	NA	Free flow	small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
SU020	7/5/2019	RD	Outfall	12	Smooth plastic	Wet (no flow)	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	
SU030	7/5/2019	RD	Outfall	26	Concrete	Flowing	17.5	Partially submerged/surcharged	None	Iron staining	None	Iron staining	None	0.0	0.00	345	0.0	negative	
SU040	7/5/2019	RD	Outfall	18	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.0	0.14	639	0.1	positive (weak)	
SU050	7/5/2019	RD	Outfall	24	Concrete	Flowing	1	Free flow	None	Clear, no odor	None	None	None	0.0	0.08	729	0.0	positive (weak)	

Table 10: Whitingham Assessment Table

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
WH010	7/25/2019	RD	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WH020	7/25/2019	RD	Outfall	16	Corrugated metal	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	NA	396	0.0	negative	
WH030-CB1	7/25/2019	RD	Catch Basin	16	Corrugated metal	Flowing	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	NA	415	0.1	negative	CB1 is flowing, outfall is surcharged in river.
WH040	7/25/2019	RD	Outfall	40	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.3	NA	820	0.0	negative	
WH050-CB1	7/25/2019	RD	Catch Basin	18	Corrugated black plastic	Trickling	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	0.0	NA	2180	0.4	negative	Outfall is surcharged, no flow. Sample taken from sump of CB1.
WH060-CB1	7/25/2019	RD	Catch Basin	NA	NA	Wet (no flow)	NA	NA	NA	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. Sample taken from CB1.
WH070	7/25/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.13	Free flow	None	Clear, no odor	None	None	None	0.3	NA	256	0.0	negative	
WH080	7/25/2019	RD	Outfall	12	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Outfall located under a bridge. Size is estimated.
WH090	7/25/2019	RD	Outfall	12	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Outfall located under a bridge. Size is estimated.
WH100	7/25/2019	RD	Outfall	4	Smooth plastic	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.3	NA	283	0.1	negative	
WH110	7/25/2019	RD	Outfall	15	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Size is estimated.
WH120	7/25/2019	RD	Outfall	4	Vitrified clay	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WH130	7/25/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WH140	7/25/2019	RD	Outfall	NA	NA	NA	NA	NA	NA	Dry	None	None	Fully obstructed	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 completely obstructed with dirt.
WH150	7/25/2019	RD	Outfall	12	Concrete	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	CB1 is wet/no flow. No flow at outlet.
WH160	7/25/2019	RD	Outfall	12	Corrugated metal	Wet (no flow)	NA	Partially submerged/surcharged	None	Wet, no flow	None	None	None	NA	NA	NA	NA	NA	Outfall is crushed. CB1 is wet/no flow. Diameter is estimated.

Table 11: Wilmington Assessment Data

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
WL010	7/29/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	None	Clear, no odor	None	None	None	0.0	0.07	1099	0.0	negative	
WL020	7/29/2019	RD	Outfall	22	Corrugated metal	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.1	0.05	1104	0.0	negative	Groundwater seep flowing from driveway into CB1. Padded CB1. Outlet size is estimated. Also sampled source of seep (WL450-SEEP).
WL030	7/29/2019	RD	Outfall	24	Corrugated black plastic	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.3	0.04	93.6	0.0	negative	
WL040-CB1	7/29/2019	RD	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Could not access outfall. CB1 is dry.
WL050	7/29/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL060-CB1	7/29/2019	RD	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Could not access outfall.
WL070	7/29/2019	RD	Outfall	16	Concrete	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
WL080	7/29/2019	RD	Outfall	36	Concrete	Flowing	0.125	Free flow	None	Iron staining, no odor	None	Iron staining	None	0.0	0.06	295	0.1	negative	
WL090-CB1	7/29/2019	RD	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall under bridge. System is dry.
WL100-CB1	7/29/2019	RD	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall under bridge.
WL110-CB1	7/29/2019	RD	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot access outfall under bridge.
WL120	7/29/2019	RD	Outfall	15	Corrugated black plastic	Wet (no flow)	NA	Free flow	Large gully	Dry	None	None	None	NA	NA	NA	NA	NA	
WL130	7/29/2019	RD	Outfall	14	Concrete	Trickling	NA	Free flow	None	Clear, no odor	None	None	None	0.0	0.09	1387	0.2	negative	Could not reach outfall to place pad. Padded CB1 (wet, no flow).
WL140	7/30/2019	RD	Outfall	17.5	Corrugated black plastic	Flowing	0.125	Free flow	None	Iron floc, no odor	None	Iron staining	None	0.4	0.06	437	0.1	negative	Could not access outfall, sampled with pole. Padded CB1.
WL150	7/30/2019	RD	Outfall	17.5	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL160-CB1	7/30/2019	RD	Catch Basin	NA	NA	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall.
WL170	7/30/2019	RD	Outfall	10	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	Outfall being buried with debris and partially crushed.
WL180-CB1	7/30/2019	RD	Catch Basin	NA	NA	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, buried under brush pile. CB1 is dry.
WL190-CB1	7/30/2019	RD	Catch Basin	NA	NA	Wet (no flow)	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall, no flow in CB1.
WL200	7/30/2019	RD	Outfall	15	Corrugated metal	Dry	NA	Free flow	Pothole	Dry	None	None	None	NA	NA	NA	NA	NA	
WL210	7/30/2019	RD	Outfall	10	Corrugated black plastic	Dry	NA	Free flow	Small gully	Dry	None	None	None	NA	NA	NA	NA	NA	
WL220	7/30/2019	RD	Outfall	24	Corrugated metal	Flowing	1	Partially submerged/surcharged	None	Iron floc, no odor	None	Iron staining	Partially obstructed	0.3	0.03	665	0.0	negative	Half full of sediment
WL230	7/30/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.125	Free flow	None	Scummy film, collects in blotches. No odor	Scum, brown bubbles	None	None	0.3	0.05	1432	0.0	negative	
WL240	7/30/2019	RD	Outfall	15	Corrugated black plastic	Flowing	0.125	Free flow	None	No odor, bubbles color of motor oil, but no sheen	Brown floating scum bubbles	None	None	0.0	0.08	1649	0.1	negative	Bubbles are the color of used motor oil, but no petroleum sheen present.
WL250	7/30/2019	RD	Outfall	15	Corrugated metal	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Outfall partially filled in from road sediment
WL260	7/30/2019	RD	Outfall	24	Corrugated metal	Trickling	NA	Free flow	None	Clear, no odor	None	None	Partially obstructed	0.1	0.06	790	0.0	negative	1/4 full sediment
WL270	7/30/2019	RD	Outfall	24	Corrugated metal	Dripping	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL280	8/5/2019	RD	Outfall	18	Concrete	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	No sample collected from stagnant water
WL290	8/5/2019	RD	Outfall	16	Concrete	Wet (no flow)	NA	Free flow	None	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	
WL290-CB1	8/5/2019	RD	Catch Basin	NA	Corrugated metal	Dry	NA	NA	NA	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. CB1 is dry. Material type determined from outlet of CB1.
WL300	8/5/2019	RD	Outfall	18	Corrugated black plastic	Flowing	0.25	Partially submerged/surcharged	None	Slightly cloudy, no odor	None	Sediment	None	0.3	0.08	252	0.1	negative	Construction near CB1 on building on other side of street, excavation occurring.
WL310-CB1	8/6/2019	RD	Catch Basin	NA	Corrugated metal	Wet (no flow)	NA	Free flow	NA	Clear, no odor	None	None	None	NA	NA	NA	NA	NA	Could not reach outfall due to steep embankment.
WL320	8/6/2019	RD	Outfall	12	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	Half obstructed with riprap.
WL330	8/6/2019	RD	Outfall	18	Corrugated grey plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL340	8/6/2019	RD	Outfall	20	Corrugated metal	Dry	NA	Free flow	None	Dry	None	None	Partially obstructed	NA	NA	NA	NA	NA	3/4 obstructed with sediment.
WL350	8/6/2019	RD	Outfall	18	Corrugated metal	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Almost completely obstructed by sediment.
WL360	8/6/2019	RD	Outfall	30	Concrete	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL370	8/6/2019	RD	Outfall	6	Smooth plastic	Flowing	0.25	Free flow	None	Clear, no odor	None	None	None	0.0	0.04	250	0.0	negative	
WL380	8/6/2019	RD	Outfall	14	Smooth plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
WL390	8/6/2019	RD	Outfall	16	Corrugated black plastic	Wet (no flow)	NA	Partially submerged/surcharged	None	Clear, no odor	None	None	Partially obstructed	NA	NA	NA	NA	NA	Vegetation is obstructing the outfall, causing pooling.
WL400	8/6/2019	RD	Outfall	23	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Sediment	None	NA	NA	NA	NA	NA	
WL410	8/6/2019	RD	Outfall	18	Corrugated black plastic	Dripping	NA	Free flow	Small gully	Clear, no odor	None	Iron staining	None	NA	NA	NA	NA	NA	Insufficient flow to collect sample.
WL420	8/6/2019	RD	Outfall	21	Corrugated metal	Dry	NA	Free flow	Small gully	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Half full of sediment.
WL430	8/6/2019	RD	Outfall	15	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Iron staining	None	NA	NA	NA	NA	NA	Significant iron staining.
WL440	8/6/2019	RD	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	Iron staining	None	NA	NA	NA	NA	NA	
WL450-SEEP	7/29/2019	RD	Seep	NA	NA	Flowing	0.125	NA	None	Iron staining on pavement, no odor	None	Iron staining	None	0.0	0.10	1243	0.0	NA	Highway Dpt. believes seep is a spring. Confirmed there is sewer but no town water at this location.

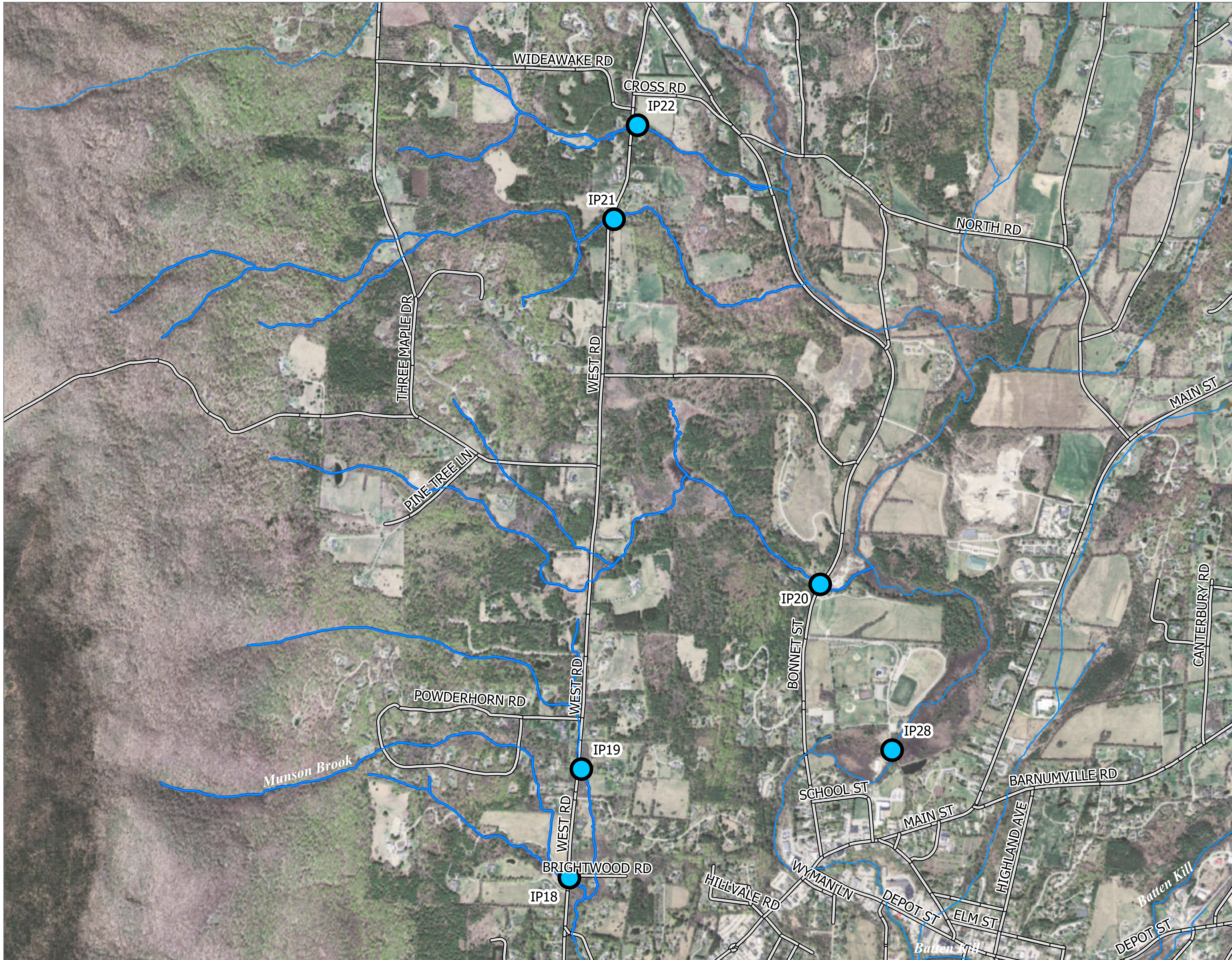
Table 12: Bennington College Assessment

IDDE ID	Date	Inspector	Structure Type	Inner Diameter (in.)	Material (Outfall Only)	Flow	Flow depth (in.)	Outfall position	Erosion at outfall	Discharge Characteristics	Floatables	Deposits/ Staining	Obstructions	Ammonia (mg/L)	Free Chlorine (mg/L)	Sp. Cond. (µS/cm)	Corrected MBAS (mg/L)	OB results	Comments
BTN-152	9/17/2019	DC	Outfall	16	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-153	9/17/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-154	9/17/2019	DC	Outfall	8	Concrete	Dry	NA	Free flow	None	Dry	None	Sediment	Partially obstructed	NA	NA	NA	NA	NA	Approximately 3/4 blocked with sediment.
BTN-157	9/17/2019	DC	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-158	9/17/2019	DC	Outfall	16	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-159	9/17/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-160	9/17/2019	DC	Outfall	40	Cast iron inside concrete tunnel	Trickling	NA	Free flow	None	Grey buildup present, no odor	None	None	None	0.0	0.03	3120	0.2	negative	Bennington College staff indicated an HVAC system could be present.
BTN-161	9/17/2019	DC	Pond outlet	NA	NA	Dry	NA	Free flow	None	Clear, no odor in pond	None	None	None	NA	NA	NA	NA	NA	Did not assess pond. Water level is below height of outlet.
BTN-164-CB1	9/17/2019	DC	Catch Basin	NA	NA	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	Cannot locate outfall. Both CBs are dry.
BTN-165	9/17/2019	DC	Outfall	18	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-1000	9/17/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-1010	9/17/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	
BTN-1020	9/17/2019	DC	Outfall	12	Corrugated black plastic	Dry	NA	Free flow	None	Dry	None	None	None	NA	NA	NA	NA	NA	

Appendix C. Stream Assessment Data

Investigation Point ID	Stream	Town	Date Sampled	*E. coli* Quanti-Tray (MPN/100 mL)	*E. coli* MWK Result (#/100 mL)	Ammonia (mg/L)	Specific Conductance (µS/cm)	OB Result
IP01	Negus	Dover	9/5/2019	NA	Not detected	0.0	187	Negative
IP02	Cheney	Dover	9/5/2019	NA	Not detected	0.0	185	Negative
IP03	Cheney	Dover	9/5/2019	NA	Not detected	0.0	132	Negative
IP04	Ellis	Dover	9/5/2019	NA	Not detected	0.0	778	Negative
IP05	Ellis	Dover	9/5/2019	NA	Not detected	0.0	990	Negative
IP06	Binney	Wilmington	9/9/2019	7	NA	0.0	193	Negative
IP07	Binney	Wilmington	9/9/2019	11	NA	0.0	131	Negative
IP08	Binney	Wilmington	9/9/2019	15	NA	0.0	153	Negative
IP09	Binney	Wilmington	9/9/2019	6	NA	0.0	71	Negative
IP10	Rose	Wilmington	9/9/2019	1	NA	0.0	93	Negative
IP11	Rose	Wilmington	9/5/2019	NA	Not detected	0.0	996	Negative
IP12	Rose	Wilmington	9/5/2019	NA	Not detected	0.0	50	Negative
IP13	Rose	Wilmington	9/5/2019	NA	Not detected	0.0	90	Negative
IP14	Binney	Wilmington	9/5/2019	NA	Not detected	0.0	210	Negative
IP17	City	Woodford	9/9/2019	24	NA	0.0	46	Negative
IP18	Munson	Manchester	9/12/2019	248	NA	0.0	279	Negative
IP19	Munson	Manchester	9/12/2019	11	NA	0.0	689	Negative
IP20	Munson	Manchester	9/12/2019	>2420	NA	0.0	419	Negative
IP21	Munson	Manchester	9/12/2019	96	NA	0.0	382	Negative
IP22	Munson	Manchester	9/12/2019	1203	NA	0.0	385	Negative
IP23	Bromley	Manchester	9/12/2019	57	NA	0.0	274	Negative
IP24	Bromley	Manchester	9/12/2019	25	NA	0.0	276	Negative
IP25	Bromley	Manchester	9/12/2019	6	NA	0.0	264	Negative
IP26	Cold	Wilmington	9/5/2019	NA	Not detected	0.0	779	Negative
IP27	City	Woodford	9/12/2019	201	NA	0.0	182	Negative
IP28	Munson	Manchester	9/12/2019	185	NA	0.0	435	Destroyed

Appendix D. Munson Brook Sampling Locations



LEGEND

- Points of Interest for Basins 1 and 12 IDDE
- Streams

Roads - Public (VTrans)

- Roads - Public (VTrans)
- Road Names

Source: Esri World Imagery, VCGI, ANR

Path: O:\PROJ-18\WRM\18-151 Basins 1 and 12 IDDE\GIS\MapDocuments\Munson Brook Figure.aprx
Vicinity Map Landscape Exported: 10/17/2019 12:22 PM by hcox

Munson Brook Sample Locations

Basins 1 and 12 IDDE

Prepared For
Jim Pease, VTDEC

STONE ENVIRONMENTAL

Appendix E. Bennington College Advanced Investigations

Bennington College has done extensive work to eliminate sources of wastewater entering its stormdrains. The College sliplined its leaking sanitary sewer mains on 1st and 2nd Streets in 2017. In 2018, the College sliplined a section of sewer main between manholes SSMH-4 and SSMH-5 and chemically grouted sanitary manholes SSMH-4 and SSMH-7. Leaking sanitary laterals from the Stoke and Franklin dorms to manhole SSMH-7 were replaced in 2018 also.

Stone investigated two stormdrains, BNT-OF-1 and BNT-OF-151, on August 2 and September 19, 2019. Todd Siclari, the Bennington College Buildings and Grounds Systems Manager, and his staff worked with Stone directly during the on-site investigations and coordinated with us on testing throughout fall 2019. This investigation was undertaken due to concerns that the BNT-OF-1 stormdrain might still be contaminated despite the College's sewer improvements. Stone observed wastewater contamination of the BNT-OF-1 stormdrain immediately, although flows were small. In investigating BNT-OF-1, Stone inadvertently identified a problem further up 1st Street, in system BNT-OF-151; therefore, we also investigated this system.

BTN-OF-1

The BTN-OF-1 system drains the lower portion of 1st Street and 2nd Street. Flow in this system discharges to a swale at North Bennington Road, passes through a culvert under the road, and flows to the Walloomsac River.

Stormwater manhole MH-4 (Figure 1) is located at the cul-de-sac at the end of 1st Street. When visited on August 2, 2019, MH-4 had a small pool of water and a slow trickle of flow through the structure. A sample collected from the pool had an offensive (wastewater/fish) odor and a high ammonia concentration, 4-5 mg/L.

Figure 1. System BTN-OF-1 on 1st Street

Through repeated smoke testing, we determined there is a connection between the sanitary sewer on 1st Street and storm manhole MH-4. Smoke blown in SSMH-7 appeared quickly in MH-4, diffusing through the bricks above and also entering through the incoming 15" VC stormdrain. Since the sewer main has been sliplined, we suspected that one or both of the sewer laterals connecting the Swan or Wooley dorms to the sewer main were leaking into the underlying stormdrain. Alternately, it is possible there is an imperfection in the lining allowing wastewater to leak out into the stormdrain.

The system was revisited on September 19, 2019. Stormwater manhole MH-4 had a definite wastewater odor. There was more water in the manhole than on August 2, 2019 although flow was still minimal. We inspected the basement/crawl spaces of the Wooley and Swan dorms. Wooley and Swan have very similar sanitary piping layouts in crawl spaces under each dorm (they are mirror images of one another). Each dorm has a 4-inch diameter sewer pipe penetrating the foundation about 40 feet from the exterior wall of the building and aligned toward 1st Street. There is an appropriate cleanout on both sewer pipes. There are no sewer pipes penetrating the exterior foundation wall in the center of the building, which connects Wooley and Swan.

Figure 2. Dye in stormwater MH-4 after flushing in Woolley dorm

Red dye was flushed in the Swan dorm and green dye was flushed in the Wooley dorm. Dye did not appear in storm MH-4 in the first ~20 minutes. Green dye was observed in MH-4 when rechecked about 2 hours later (Figure 2). No red dye was observed; however, given the weakness of the red dye relative to the green dye, the red dye could have been present and overwhelmed by the green dye.

The green dye in storm MH4 confirmed that the sewer lateral from the Wooley dorm is leaking into the underlying stormdrain. Given that the sewer lateral for the Swan dorm appears to have been constructed at the same time and in the same manner as the lateral serving Wooley, it is likely that this lateral is also deficient.

The dye test results at the Wooley dorm are consistent with the smoke test results on August 2, which demonstrated a connection (direct or indirect) between the sanitary and storm sewer piping.

Recommendations: We recommend that Bennington College replaces or repairs the sewer laterals to both the Wooley and Swan dorms. Video of the sewer laterals from Wooley and Swan could help the College mark the location where the laterals meet the 1st Street sewer main and identify bad joints or pipe sections for repair (assuming repair is feasible). Bennington College has engaged a New York firm, Scanex Pipe Services, to perform additional video inspection. Although a report from Scanex is not available at this time, video inspection apparently showed that at least one of the laterals was broken.

BTN-OF-151

The BTN-OF-151 system drains the upper portion of 1st Street and discharges to a stormwater pond in the southeast corner of the campus (Figure 3).

There was a trickle of flow and a faint wastewater odor in the stormwater manhole on 1st Street in front of the library ("1st St. storm MH") when this system was first investigated on August 2, 2019. An optical brightener pad deployed in this manhole by Todd Siclari was positive.

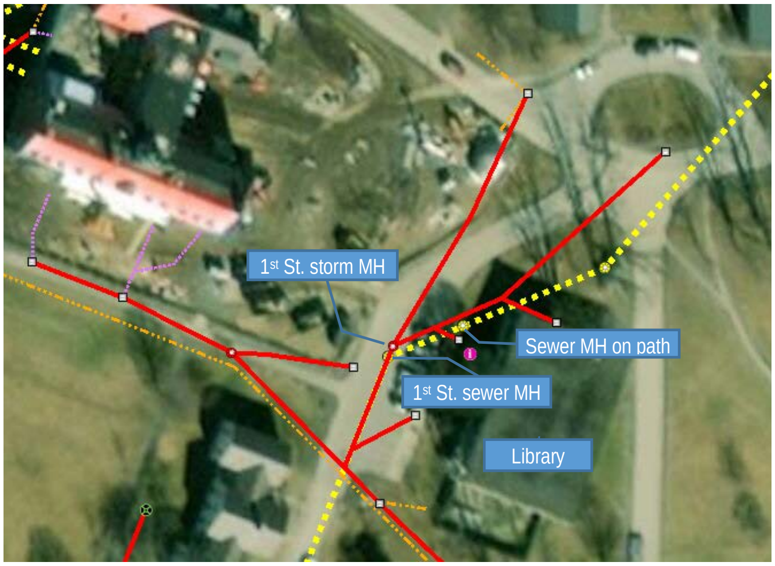


Figure 3. System BTN-OF-151 (outfall not shown)

On September 19, 2019 sinks and toilets throughout the library were dye tested. Some of the results were a little confusing. It turns out that the bathrooms on the 1st level are connected to the lower pipe in the sanitary manhole next to the library path ("Sewer MH on path"), whereas the 3rd floor lounge bathroom and the second floor librarian bathroom and sink are connected with the upper pipe in this same manhole. The sink in the basement utility room is not connected to this manhole at all, as had been assumed. Dye poured in this sink was observed in the sanitary manhole on 1st Street ("1st St. sewer MH").

After the first round of dye testing, during which green dye was added to the second-floor sink in the librarian's office and the basement utility sink, green dye was eventually observed staining the sediments in the 1st St. storm MH. The only explanation we can find for the presence of both wastewater and green dye in 1st St. storm MH after dye testing the librarian's sink on the second floor is that flow is leaking from the sewer pipe connecting the Sewer MH on path to the 1st St. sewer MH. The stormdrain and sanitary sewer piping appear to run very close together and at a similar elevation. The persistent trickle of flow in the storm manhole during dry weather suggests a slow leak from the sanitary sewer pipe allows wastewater to cross into the stormdrain. Furthermore, the length of the sanitary sewer pipe on 1st Street was sliplined up to the 1st St. sewer MH, meaning that the section of sanitary sewer we suspect is leaking was not sliplined.

Finally, smoke testing demonstrated a diffuse connection through the manhole wall between the 1st St. sewer MH and the 1st St. storm MH. Looking downhill down 1st Street, smoke was observed in the 1st St. sewer MH emanating from the corner above the outlet pipe, in the 1:00 position. Smoke was also observed in the 1st St. storm MH in the 11:00 position above the outlet pipe.

Recommendations: Stone recommends that Bennington College continue sliplining of the 1st Street sanitary sewer up from the 1st St. sewer MH to the next upstream manhole by the library path (or further). Hydraulic cement or other sealing material should also be applied around the sliplined outlet pipe in the 1st St. sewer MH to eliminate this pathway.