# FINAL REPORT – STATEWIDE CONTRACT #2 ILLICIT DISCHARGE DETECTION AND ELIMINATION STUDY

# VARIOUS MUNICIPALITIES, VERMONT

**FINAL REPORT**
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TABLE OF CONTENTS

LIST OF TABLES ..... v
1 INTRODUCTION ..... 1
2 METHODS ..... 3
2.1 Field Work Preparation ..... 3
2.2 Outfall Reconnaissance Inventory – Dry Weather Survey ..... 3
2.3 Water Quality Analysis Methods ..... 4
2.4 Advanced Investigation Methods ..... 5
2.4.1 Televising Sanitary and Stormlines: ..... 7
2.4.2 Smoke Testing with Vermont Rural Water Association: ..... 7
2.4.3 Environmental Canine Services (ECS) Alerts: ..... 7
3 RESULTS ..... 8
3.1 Albany Results ..... 9
3.1.1 Outfall Reconnaissance Inventory (ORI): ..... 9
3.1.2 Advanced Investigation: ..... 9
3.2 Alburgh Results ..... 10
3.2.1 Outfall Reconnaissance Inventory (ORI): ..... 10
3.2.2 Advanced Investigation (AI): ..... 10
3.3 Bakersfield Results ..... 12
3.3.1 Outfall Reconnaissance Inventory (ORI): ..... 12
3.3.2 Advanced Investigation (AI): ..... 12
3.4 Barnard Results ..... 13
3.5 Barnet Results ..... 14
3.5.1 Outfall Reconnaissance Inventory (ORI): ..... 14
3.5.2 Advanced Investigation (AI): ..... 14
3.6 Barre City Results ..... 15
3.6.1 Outfall Reconnaissance Inventory (ORI): ..... 15
3.6.2 Advanced Investigation: ..... 15
3.7 Barre Town ..... 24
3.7.1 Outfall Reconnaissance Inventory (ORI): ..... 24
3.7.2 Advanced Investigation (AI): ..... 24
3.8 Bennington Results ..... 28
3.8.1 Outfall Reconnaissance Inventory (ORI): ..... 28
3.8.2 Advanced Investigation (AI): ..... 28
3.9 Brattleboro Results ..... 34
3.9.1 Outfall Reconnaissance Inventory (ORI): ..... 34
3.9.2 Advanced Investigation (AI): ..... 34
3.10 Bristol Results ..... 36
3.10.1 Outfall Reconnaissance Inventory (ORI): ..... 36
3.10.2 Advanced Investigation (AI): ..... 36
3.11 Calais Results ..... 37
3.11.1 Outfall Reconnaissance Inventory (ORI): ..... 37
3.11.2 Advanced Investigation (AI): ..... 37
3.12 Craftsbury Results ..... 38
3.12.1 Outfall Reconnaissance Inventory (ORI): ..... 38
3.12.2 Advanced Investigation (AI): ..... 38
3.13 Danby Results ..... 39

3.13.1 Outfall Reconnaissance Inventory (ORI): ..... 39
3.13.2 Advanced Investigation (AI): ..... 39
3.14 East Montpelier Results ..... 40
3.14.1 Outfall Reconnaissance Inventory (ORI): ..... 40
3.14.2 Advanced Investigation (AI): ..... 40
3.15 East Middlebury Results ..... 48
3.15.1 Outfall Reconnaissance Inventory (ORI): ..... 48
3.15.2 Advanced Investigation (AI): ..... 48
3.16 Eden Results ..... 49
3.16.1 Outfall Reconnaissance Inventory (ORI): ..... 49
3.16.2 Advanced Investigation ..... 49
3.17 Fairfield Results ..... 50
3.17.1 Outfall Reconnaissance Inventory (ORI): ..... 50
3.17.2 Advanced Investigation (AI): ..... 50
3.18 Fayston Results ..... 52
3.18.1 Outfall Reconnaissance Inventory (ORI): ..... 52
3.18.2 Advanced Investigation (AI): ..... 52
3.19 Ferrisburgh Results ..... 54
3.19.1 Outfall Reconnaissance Inventory (ORI): ..... 54
3.19.2 Advanced Investigation (AI): ..... 54
3.20 Greensboro Results ..... 55
3.20.1 Outfall Reconnaissance Inventory (ORI): ..... 55
3.20.2 Advanced Investigation (AI): ..... 55
3.21 Hardwick Results ..... 56
3.21.1 Outfall Reconnaissance Inventory (ORI): ..... 56
3.21.2 Advanced Investigation (AI) ..... 56
3.22 Hinesburg Results ..... 57
3.22.1 Outfall Reconnaissance Inventory (ORI): ..... 57
3.22.2 Advanced Investigation (AI): ..... 57
3.23 Huntington Results ..... 59
3.23.1 Outfall Reconnaissance Inventory (ORI): ..... 59
3.23.2 Advanced Investigation (AI): ..... 59
3.24 Hyde Park Results ..... 60
3.24.1 Outfall Reconnaissance Inventory (ORI): ..... 60
3.24.2 Advanced Investigation (AI): ..... 60
3.25 Irasburg Results ..... 63
3.25.1 Outfall Reconnaissance Inventory (ORI): ..... 63
3.25.2 Advanced Investigation (AI): ..... 63
3.26 Jericho Results ..... 64
3.26.1 Outfall Reconnaissance Inventory (ORI): ..... 64
3.26.2 Advanced Investigation (AI): ..... 64
3.27 Lowell Results ..... 65
3.27.1 Outfall Reconnaissance Inventory (ORI): ..... 65
3.27.2 Advanced Investigation (AI): ..... 65
3.28 Middlesex Results ..... 66
3.28.1 Outfall Reconnaissance Inventory (ORI): ..... 66
3.28.2 Advanced Investigation (AI): ..... 66
3.29 Mount Holly Results ..... 67

3.29.1 Outfall Reconnaissance Inventory (ORI): ..... 67
3.29.2 Advanced Investigation (AI): ..... 67
3.30 Newport Town Results ..... 68
3.30.1 Outfall Reconnaissance Inventory (ORI): ..... 68
3.30.2 Advanced Investigation (AI): ..... 68
3.31 Orwell Results ..... 69
3.31.1 Outfall Reconnaissance Inventory (ORI): ..... 69
3.31.2 Advanced Investigation (AI): ..... 69
3.32 Shoreham Results ..... 70
3.32.1 Outfall Reconnaissance Inventory (ORI): ..... 70
3.32.2 Advanced Investigation (AI): ..... 70
3.33 East Wallingford Results ..... 71
3.33.1 Outfall Reconnaissance Inventory (ORI): ..... 71
3.33.2 Advanced Investigation (AI): ..... 71
3.34 Warren Results ..... 72
3.34.1 Outfall Reconnaissance Inventory (ORI): ..... 72
3.34.2 Advanced Investigation (AI): ..... 72
3.35 Washington Results ..... 73
3.35.1 Outfall Reconnaissance Inventory (ORI): ..... 73
3.35.2 Advanced Investigation (AI): ..... 73
3.36 West Fairlee Results ..... 74
3.36.1 Outfall Reconnaissance Inventory (ORI): ..... 74
3.36.2 Advanced Investigation (AI): ..... 74
3.37 Worcester Results ..... 75
3.37.1 Outfall Reconnaissance Inventory (ORI): ..... 75
3.37.2 Advanced Investigation (AI): ..... 75
4 RECOMMENDATIONS FOR FUTURE ACTION ..... 76
4.1 Albany – Future Action Recommendations: ..... 76
4.2 Alburgh– Future Action Recommendations: ..... 76
4.3 Bakersfield– Future Action Recommendations: ..... 76
4.4 Barre – Future Action Recommendations: ..... 76
4.5 Barnard – Future Action Recommendations: ..... 76
4.6 Barnet – Future Action Recommendations: ..... 76
4.7 Bennington – Future Action Recommendations: ..... 76
4.8 Brattleboro – Future Action Recommendations: ..... 76
4.9 Bristol – Future Action Recommendations: ..... 76
4.10 Calais – Future Action Recommendations: ..... 76
4.11 Craftsbury – Future Action Recommendations: ..... 76
4.12 Danby – Future Action Recommendations: ..... 76
4.13 East Montpelier – Future Action Recommendations: ..... 77
4.14 Eden – Future Action Recommendations: ..... 77
4.15 Fairfield – Future Action Recommendations: ..... 77
4.16 Fayston – Future Action Recommendations: ..... 77
4.17 Ferrisburgh – Future Action Recommendations: ..... 77
4.18 Greensboro – Future Action Recommendations: ..... 77
4.19 Hardwick – Future Action Recommendations: ..... 77
4.20 Hinesburg – Future Action Recommendations: ..... 77
4.21 Huntington – Future Action Recommendations: ..... 77

4.22 Hyde Park – Future Action Recommendations: 78
4.23 Irasburg – Future Action Recommendations: 78
4.24 Jericho – Future Action Recommendations: 78
4.25 Lowell – Future Action Recommendations: 78
4.26 Middlebury – Future Action Recommendations: 78
4.27 Middlesex – Future Action Recommendations: 78
4.28 Mount Holly – Future Action Recommendations: 78
4.29 Newport Town – Future Action Recommendations: 78
4.30 Orwell – Future Action Recommendations: 78
4.31 Shoreham – Future Action Recommendations: 78
4.32 East Wallingford – Future Action Recommendations: 78
4.33 Warren – Future Action Recommendations: 78
4.34 West Fairlee – Future Action Recommendations: 79
4.35 Worcester – Future Action Recommendations: 79
4.36 Washington – Future Action Recommendations: 79
5 PHOSPHORUS AND E. COLI LOADING 79
6 CONCLUSIONS 80
7 REFERENCES 82

LIST OF TABLES

Table 1: Summary of Assessments by Municipality ..... 2
Table 2: Water quality threshold values for determining possibility and nature of illicit discharges. ..... 6
Table 3: Summary Assessments by Municipality ..... 8
Table 4: Water Quality Analysis Data for ALB-OF-04 ..... 10
Table 5: Water Quality Analysis Data for BKR-OF-04 ..... 12
Table 6: Water Quality Analysis Data for BRT_OF_09 ..... 14
Table 7: Water Quality Analysis Data for BC560 ..... 15
Table 8: Water Quality Analysis Data for BC1100 ..... 16
Table 9: Water Quality Analysis Results for BC1510 ..... 19
Table 10: Water Quality Analysis Data for BC1630 ..... 20
Table 11: Water Quality Analysis Data for BNT_OF_01 (all) ..... 28
Table 12: Water Quality Analysis Data for BNT-OF-01 for 4/21/2016 ..... 28
Table 13: Water Quality Analysis Data for BNT-OF-01 for 6/12/2017 ..... 29
Table 14: Water Quality Analysis Data for BNT-OF-01 for 7/6/2017 ..... 29
Table 15: Water Quality Analysis Data for BNT-OF-01 for 8/9/2017 ..... 32
Table 16: Water Quality Analysis Data for BNT-OF-01 for 10/01/2018 ..... 32
Table 17: Water Quality Analysis Data for BNT-OF-01 for 11/9/2018 ..... 32
Table 18: Water Quality Analysis Data for BRT-OF-02 ..... 34
Table 19: Water Quality Analysis Data for BRT-OF-03 ..... 34
Table 20: Water Quality Analysis Data for BRS-OF-14 ..... 36
Table 21: Water Quality Analysis Data for CBY-OF-07 ..... 38
Table 22: Water Quality Analysis Data for EMT-OF-01 ..... 40
Table 23: Water Quality Analysis Data for EMT-OF-04 ..... 40
Table 24: Water Quality Analysis Data for EMT-OF-10 ..... 43
Table 25: Water Quality Analysis Data for EMT-OF-11 ..... 45
Table 26: Water Quality Analysis Data for EMT-OF-18 ..... 45
Table 27: Water Quality Analysis Data for EMT-OF-18 ..... 50
Table 28: Water Quality Analysis Data for FFD-OF-04 ..... 50
Table 29: Water Quality Analysis Data for FAY-OF-05 ..... 52
Table 30: Water Quality Analysis Data for GRN-OF-06 ..... 55
Table 31: Water Quality Analysis Data for GRN-OF-09 ..... 55
Table 32: Water Quality Analysis Data for HIN-OF-11 ..... 57
Table 33: Water Quality Analysis Data for HIN-OF-13 ..... 57
Table 34: Water Quality Analysis Data for HIN-OF-17 ..... 57
Table 35: Water Quality Analysis Data for HIN-OF-18 ..... 58
Table 36: Water Quality Analysis Data for HDP_OF_01 ..... 60
Table 37: Water Quality Analysis Data for IRA-OF-02 ..... 63
Table 38: Water Quality Analysis Data for MTH-OF-02 ..... 67
Table 39: Water Quality Analysis Data for Washington Stream Assessment (Jail Branch Tributary) ..... 73
Table 40: Water Quality Analysis Data for WFL-OF-01 ..... 74

APPENDICES

Appendix 1 – All Data Summary Tables
Appendix 2 - Mapbook

# 1 INTRODUCTION

In January 2017, Watershed Consulting Associates, LLC (Watershed) was awarded an Ecosystem Restoration Program grant (#28665) by the Vermont Department of Environmental Conservation to perform an Illicit Discharge Detection and Elimination (IDDE) study for 35 towns throughout Vermont. Participating towns include Hyde Park, Eden, Craftsbury, Greensboro, Hardwick, Albany, Lowell, Irasburg, Newport, Washington, Barre Town, East Montpelier, Middlesex, Calais, Worcester, Barnet, Warren, Fayston, Huntington, Hinesburg, Jericho, Ferrisburgh, Bristol, Middlebury, Shoreham, Orwell, Danby, East Wallingford, Mount Holly, Bennington, and Brattleboro.

The goal of this study was to find any potential non-stormwater discharges, usually waters related to sanitary sewage, entering the stormwater sewer system, trace them back to their source, and eliminate them. Doing so improves the aquatic ecosystem health of the rivers and streams in those communities, and eliminates any potential public health hazards that could be associated with non-stormwater discharges that enter untreated into natural ecosystems.

An extensive project by both volume and range, the geographic scope of work included 35 towns across 10 counties. With over 240 outfalls, 28 were located in Warren, 27 were located in Hinesburg, 18 were located in East Montpelier, and 14 were located in Bristol. All other municipalities contained 10 outfalls or fewer. Many of them are located in watersheds that drain to Lake Champlain or Lake Memphremagog, although some are located in the Connecticut and Hudson River Watersheds. From developed urban downtowns to rural backroad drainage systems, the project encompassed a wide variety of landuse scenarios.

The dry weather assessment, also referred to as the Outfall Reconnaissance Inventory or ORI, was conducted during dry weather (defined as <0.1” in the past 24 hours to the maximum extent practicable), with field tests performed on any flowing water found at the system’s pipe outlet. These tests included chemical tests for ammonia, temperature, pH, and conductivity, qualitative tests for odor, turbidity, color, and floatables, as well as non-flow-based indicators such as outfall damage, deposits or stains, abnormal vegetation, poor pool quality, and pipe benthic growth. Where any of these indicators suggested a possible illicit discharge, a sample was taken for later analysis for methylene blue active substances (MBAS, which are detergent-related). Additional samples were also obtained, where indicated by the results of other analyses, for *E. coli,* total phosphorus, or total nitrogen. Optical brighteners were tested for using unbleached cotton pads placed in an outfall and allowed to sit for 4-10 days. If any optical brighteners (substances typically associated with laundry detergent) were present, the pads would fluoresce under UV (black) light.

To identify discharges normally associated with human sewage, Watershed partnered with Environmental Canine Services (ECS) to conduct canine scent detection procedures. Following ECS quality control protocol, Watershed staff collected, packaged, and shipped samples of concern to the ECS headquarters in Otisfield, Maine. Two canines tested each of the shipped samples, negative control and positive control scenting containers, and their responses were recorded. This procedure was conducted exclusively on outfalls which had flow during dry weather and had been previously suspected of illicit discharges.

Of the 255 outfalls tested, 109 were flowing when investigated and 36 were suspected for possible illicit discharge during the ORI, or 14% of all outfalls. During the Advanced Investigation (AI) portion of the study, 15 of the 36 outfalls were confirmed to have some sort of illicit discharge.

Table 1: Summary of Assessments by Municipality

| Town | Systems Assessed | Systems with Flow | Suspected Illicit Discharge | Confirmed Illicit Discharge |
|---|---|---|---|---|
| Albany | 1 | 1 | 0 | 0 |
| Alburgh | 10 | 1 | 1 | 1 |
| Bakersfield | 4 | 2 | 1 | 0 |
| Barnet | 7 | 2 | 1 | 0 |
| Barre City | 6 | 6 | 5 | 5 |
| Barre Town | 6 | 5 | 5 | 3 |
| Bennington | 7 | 2 | 1 | 1 |
| Brattleboro | 10 | 5 | 2 | 0 |
| Bristol | 14 | 3 | 1 | 1 |
| Calais | 4 | 2 | 0 | 0 |
| Craftsbury | 7 | 2 | 1 | 0 |
| Danby | 4 | 1 | 0 | 0 |
| East Middlebury | 5 | 0 | 0 | 0 |
| East Montpelier | 18 | 5 | 4 | 3 |
| Eden | 1 | 1 | 0 | 0 |
| Fairfield | 5 | 3 | 2 | 0 |
| Fayston (Sugarbush North - Mad River) | 4 | 2 | 1 | 0 |
| Ferrisburgh | 9 | 6 | 0 | 0 |
| Greensboro + Greensboro Bend | 9 | 5 | 2 | 1 |
| Hardwick | 3 | 1 | 0 | 0 |
| Hinesburg | 27 | 6 | 4 | 0 |
| Huntington | 5 | 2 | 0 | 0 |
| Hyde Park | 4 | 1 | 1 | 0 |
| Irasburg | 3 | 1 | 1 | 0 |
| Jericho Center (Jericho) | 3 | 1 | 0 | 0 |
| Lowell | 4 | 0 | 0 | 0 |
| Middlesex | 9 | 1 | 0 | 0 |
| Mount Holly | 5 | 5 | 1 | 0 |
| Newport Town | 2 | 0 | 0 | 0 |
| Orwell | 5 | 3 | 0 | 0 |
| Shoreham | 5 | 4 | 0 | 0 |
| East Wallingford | 3 | 1 | 0 | 0 |
| Warren (Sugarbush) | 28 | 18 | 0 | 0 |
| Washington | 16 | 9 | 1 | 0 |
| West Fairlee | 1 | 1 | 1 | 0 |
| Worcester | 1 | 1 | 0 | 0 |
| **TOTAL** | **255** | **109** | **36** | **15** |

# 2 METHODS

Our general methodology for this study follows the protocols and recommendations established by the Center for Watershed Protection (CWP), as well as additional guidelines developed over the course of several other studies by the State of Vermont.

## *2.1 Field Work Preparation*

Initial preparation for the study involved obtaining the necessary field supplies for sample collection and analysis, creating a digital smartphone-based application for ORI and AI data collection in the field based on the Center for Watershed Protection's (CWP) ORI field and laboratory forms, and creating storm and sanitary sewer digital base layers to use within the smartphone app based on the most recent mapping performed by the VT DEC under the Stormwater Infrastructure Mapping Program.

Towns were individually contacted using the contact information provided by the VT DEC following its stormwater infrastructure mapping project in each of these towns, or from previous IDDE study work. Towns were made aware of the scope of work related to IDDE, the methods to be used, the regulatory issues involved, and the follow-up process should an illicit discharge be discovered. Public notifications were provided for each town to use in its outreach process (local papers, websites, social media, etc.).

## *2.2 Outfall Reconnaissance Inventory – Dry Weather Survey*

Stormwater systems were assessed during dry weather to minimize dilution by large volumes of runoff. Dry weather was defined as <0.1" precipitation in the previous 24 hours to the maximum extent practicable. There were times during the study when outfalls were assessed when precipitation had marginally exceeded this amount – this was noted on the Outfall Reconnaissance Inventory reports. Surveys during these times were kept to a bare minimum and avoided whenever possible. Only outfalls specific by VT DEC as part of the scope of work were assessed – other outfalls were not assessed. Outfalls in the public right of way or along a water body were accessed via public land. Where portions of the stormwater system were on private land, permission was obtained prior to investigating the system. If access to property was denied, infrastructure within the public right of way was assessed. Where no publicly accessible infrastructure existed, access denial was noted and the system was not analyzed.

Watershed developed a digital smartphone-based application to use for the collection, storage, analysis, and reporting of survey data. This application, developed using a third-party software platform, is based on the CWP field and laboratory forms merged into one overall interface and accessed in the field using a smartphone or tablet device. An integral part of the creation of this application was the import of all stormwater and sanitary sewer infrastructure points from the VT DEC's mapping program. Each of these features was assigned a unique alphanumeric code and color-based symbol. This enabled field staff to quickly find each outfall or other infrastructure point using the phone's built-in GPS. Using these previously-mapped points also ensured the accuracy of each point's geo-location as built-in phone GPS units are only accurate to 3-5 meters where most of the VT DEC data is sub-meter accurate.

Wherever unmapped points were found, they were either mapped using a sub-meter accurate Trimble GeoXH GPS unit, or were recorded using the phone's built-in GPS and later corrected using high-resolution aerial photos. This process was also particularly useful for unmapped points found under bridges or in a narrow urban stream reaches between taller buildings where satellite reception is poor.

At every outfall point, the basic procedure was to search for the presence or absence of flow. If there was no flow during dry weather, it was generally assumed that there was no chronic illicit discharge present unless other non-flow-based indicators such as outfall damage, deposits or stains, abnormal vegetation, poor pool quality, or pipe benthic growth were noted. If none of these indicators was present, basic time/date information was entered into the application, along with a 'No' indicator for flow and non-flow based indicators and the outfall was assigned an overall characterization of 'Unlikely'.

If flow was present, immediate analysis for temperature, pH, specific conductance, ammonia, and methylene blue active substances (MBAS, a detergent indicator) was conducted in the field. Other indicators, such as color, odor, turbidity, and floatables were noted as well. If any indicators were above established thresholds (see Table 2), a further sample was taken for analysis later that day for total chlorine (if applicable depending on municipality).

In cases where other non-flow based indicators (listed above) were present, or a sample was not otherwise able to be obtained from a flow or pool, a cotton pad was placed in the line of assumed flow to capture intermittent discharges and analyze them for the presence of optical brighteners.

Additionally, Watershed noted any non-IDDE issues at the outfall or structure such as erosion, structure damage, headwall collapses, etc.

## *2.3 Water Quality Analysis Methods*

*Temperature/pH/Specific Conductance:*
The Hannah Instruments HI98129 Combo pH and EC meter was used for all three parameters. Fresh pH and conductivity buffers were ordered at the beginning of the study from Endyne Labs in Williston, VT to ensure accuracy using standard solutions at known specific conductivity ranges.

*Ammonia:*
Ammonia was measured immediately in the field using the LaMotte Colorimeter 1500 (Model 3680-01). This unit uses Nessler's reagent for the detection of ammonia using a color reaction that is then measured by the colorimeter. The range is 0-5ppm/0.05ppm $NH_3$-N. Fresh reagents were maintained throughout the course of the study.

*Methylene Blue Active Substances (MBAS):*
The presence of detergents was determined using the Chemetrics R-9400 Detergents test which used a methylene blue active substances (MBAS) test, a method consistent with APHA Standard Methods, 21st ed., Method 5540 C (2005).

*Total Chlorine:*
Total chlorine was measured using the Hach Model CN66 Chlorine – Free and Total Color Disk Kit with a 0-3.5 mg/L range. This kit uses a powdered DPD reagent method and visual color wheel to quickly and accurately determine total chlorine concentration in samples.

*Optical Brighteners:*
Where indicated Watershed used cotton pads placed either in the potential flow path of water at the outfall or in the sump of a catchbasin where flow was anticipated. These pads were allowed to sit for a period of 4-10 days encased in a plastic-coated wire mesh pouch. After this period, pads were retrieved, rinsed, and dried, then exposed to a UV (black) light. In the presence of detergents, the pad will fluoresce to varying degrees. Watershed did not attempt to make measurements of the relative amount of fluorescence – this

test was only for presence or absence. However, fouling with other debris and dirt often made reading a result difficult. In most cases where there was generally reliable flow or pooled water in the catchbasin sump, the MBAS test was used.

## *2.4 Advanced Investigation Methods*

Using water quality thresholds established by the Center for Watershed Protection and used by the US EPA in their Illicit Discharge Detection and Elimination guidance, as well as thresholds referenced in other studies performed throughout Vermont on IDDE (**Error! Reference source not found.**), outfalls were designated for follow-up investigation based on exceedance of these thresholds. In addition to these chemical benchmarks, other criteria such as outfall damage, deposits or stains, abnormal vegetation, poor pool quality, or pipe benthic growth, as well as water color, odor, turbidity, or the presence of floatables were used to supplement assessments.

Follow-up investigation consists primarily of following any observed flow up a stormline to pin-point its source, then testing that source using the aforementioned thresholds. If multiple sources were observed coming into a main line, those sources were tested as well to attempt to bracket possible pollution inputs. Where possible, a section of a stormline was isolated as possibly containing the origin point of pollution. This section was then designated for follow-up to confirm or deny an issue's presence. Watershed communicated directly with each municipality to discuss the findings and to plan for follow-up investigation. These investigations are described below.

Table 2: Water quality threshold values for determining possibility and nature of illicit discharges.

| Test | Threshold (US EPA) | Theshold (VT Specific Studies) | Notes |
|---|---|---|---|
| *E. coli (MPN/100ml)* | 235 | 400 | Wastewater (undiluted) will have levels far exceeding 400 MPN. However E. coli can occur due to animal waste entering the storm system though open catch basins. Additionally, there is some evidence which indicates that E. coli populations can survive in anaerobic sediment conditions found in streams, ponds, or other similar environments. E. coli is a difficult indicator to use in IDDE for these reasons. |
| *Ammonia (mg/L)* | 0.1 | 0.25 | Ammonia is an indicator of decompostion of organic matter. Decomposing landscaping vegetation within catch basins under anoxic conditions can cause elevated ammonia in water. This can cause misleading results. The threshold of 0.25 mg/L is only used when other indicators are present. Othewise a value of 0.5 mg/L is the trigger for additional investigation. |
| *MBAS (mg/L)* | 0.25 | 0.2 | Anionic detergents are fairly commonly found at outfalls in low-flow conditions found during dry weather as they correlate with various outdoor washing practices (of cars, house siding, windows, and also windshield washing fluid). Higher levels (typically 0.5-0.75 mg/L or greater) can sometimes indicate wastewater discharges. |
| *Optical Brightener* | N/A | Presence | Presence of optical brighteners can indicate washwater or wastewater contaminants as brighteners are contained in some hair conditions, bleached paper products, and laundry detergents. Petroleum products will also cause fluorescence. Some studies indicate that a relatively high concentration of OB must be present for detection. We only use this test when other indicators are strongly present. |
| *Chlorine (mg/L)* | N/A | 0.06 | This test is used only in municipalities where municipal water is provided and chlorinated. This test was used very sparingly during this study as few of the towns chlorinated their water. As it degrades in the presence of organic materials, it's not a good wastewater indicator. |
| *Specific Conductance (uS/cm)* | >2000 | 600 | Specific conductance can be elevated by road deicing materials, or metals from corrosion. It can help in determining some industrial discharges but is primarily used in conjunction with other strong indicators. |

### 2.4.1 Televising Sanitary and Stormlines:

An additional method to identify illicit discharges is to use either a push or track camera, depending on pipe type and size, to obtain video of pipe cross connections, leaks, or other means by which non-stormwater discharges may be entering storm pipes. This method is most effective when combined with line flushing using dyed water. We did not use this method extensively during this study, however, as only Barre City possessed the necessary equipment. In the past, we have worked with the Vermont Rural Water Association to perform this work. However, we favored using liquid smoke testing over camera investigation during this study due to its efficiency and positivity in identifying or ruling out illicit discharge connections.

### 2.4.2 Smoke Testing with Vermont Rural Water Association:

Smoke testing using non-toxic liquid smoke was used in many of the municipalities in this study. Smoke is blown into a manhole or catchbasin structure (storm) and visual observations are made of surrounding sanitary infrastructure (manholes are opened adjacent to the storm infrastructure, building sewer gas vent stacks are scrutinized for smoke escaping, and at times buildings are entered, with permission, to check for smoke in basements or other areas). The reverse test is also often done where smoke is blown into sanitary infrastructure and the storm system is inspected, via manholes and catchbasins, for smoke intrusion. Watershed has found that this is one of the most efficient, reliable means of identifying possible illicit discharges, especially when infrastructure is poorly mapped or understood.

### 2.4.3 Environmental Canine Services (ECS) Alerts:

Environmental Canine Services (ECS) uses specially trained canines to detect the presence or absence of sanitary sewage. Watershed has used this method before in Vermont in Bennington and Pawlet with success. There are two primary methods to use with ECS. The first method is the 'ship and sniff' method where a sample is collected in a sterile 12 oz plastic bottle. The outside of the bottle is rinsed in distilled water and double-bagged in a resealable plastic bag. These samples are then shipped to ECS in Maine where they are evaluated by the canines and their handlers. A report is prepared of the results. If a dog alerts on a sample, that outfall is then flagged for additional follow-up investigation. This method provides a good screening of outfalls that, based on previous water quality parameters, may have illicit discharges to them. The second method involves bringing a canine and handler to a storm sewer system and doing on-site field investigations of structures. During the course of this study field investigation was never utilized.

## 3 RESULTS

The overall results for all towns can be seen below. These results are the same as Table 1.

Table 3: Summary Assessments by Municipality

| Town | Systems Assessed | Systems with Flow | Suspected Illicit Discharge | Confirmed Illicit Discharge |
|---|---|---|---|---|
| Albany | 1 | 1 | 0 | 0 |
| Alburgh | 10 | 1 | 1 | 1 |
| Bakersfield | 4 | 2 | 1 | 0 |
| Barnet | 7 | 2 | 1 | 0 |
| Barre City | 6 | 6 | 5 | 5 |
| Barre Town | 6 | 5 | 5 | 3 |
| Bennington | 7 | 2 | 1 | 1 |
| Brattleboro | 10 | 5 | 2 | 0 |
| Bristol | 14 | 3 | 1 | 1 |
| Calais | 4 | 2 | 0 | 0 |
| Craftsbury | 7 | 2 | 1 | 0 |
| Danby | 4 | 1 | 0 | 0 |
| East Middlebury | 5 | 0 | 0 | 0 |
| East Montpelier | 18 | 5 | 4 | 3 |
| Eden | 1 | 1 | 0 | 0 |
| Fairfield | 5 | 3 | 2 | 0 |
| Fayston (Sugarbush North - Mad River) | 4 | 2 | 1 | 0 |
| Ferrisburgh | 9 | 6 | 0 | 0 |
| Greensboro + Greensboro Bend | 9 | 5 | 2 | 1 |
| Hardwick | 3 | 1 | 0 | 0 |
| Hinesburg | 27 | 6 | 4 | 0 |
| Huntington | 5 | 2 | 0 | 0 |
| Hyde Park | 4 | 1 | 1 | 0 |
| Irasburg | 3 | 1 | 1 | 0 |
| Jericho Center (Jericho) | 3 | 1 | 0 | 0 |
| Lowell | 4 | 0 | 0 | 0 |
| Middlesex | 9 | 1 | 0 | 0 |
| Mount Holly | 5 | 5 | 1 | 0 |
| Newport Town | 2 | 0 | 0 | 0 |
| Orwell | 5 | 3 | 0 | 0 |
| Shoreham | 5 | 4 | 0 | 0 |
| East Wallingford | 3 | 1 | 0 | 0 |
| Warren (Sugarbush) | 28 | 18 | 0 | 0 |
| Washington | 16 | 9 | 1 | 0 |
| West Fairlee | 1 | 1 | 1 | 0 |
| Worcester | 1 | 1 | 0 | 0 |
| **TOTAL** | **255** | **109** | **36** | **15** |

For a more complete overview table showing all results from both the Outfall Reconnaissance Inventory and Advanced Investigation combined, please see Appendix 1: Other Towns IDDE – Results Summary Table.

## *3.1 Albany Results*

### 3.1.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Albany in July of 2017. Only one system was marked for assessment. The outfall had a small amount of flow during the dry weather assessment but preliminary analysis did not reveal water quality parameters above thresholds. Results of the initial assessment in Albany are included in Appendix 1 – All Results Summary Table.

### 3.1.2 Advanced Investigation:

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.2 Alburgh Results*

### 3.2.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted on July 27th, 2018 Watershed surveyed 10 different outfalls. Of the 10 outfalls visited, one was flowing and had discharge that warranted further investigation. We focused on this outfall during our Advanced Investigation in Alburgh. Results of the initial assessment in Alburgh are included in Appendix 1 – All Results Summary Table.

### 3.2.2 Advanced Investigation (AI):

When further investigated, the outfall was confirmed to have an illicit discharge from the town sewer. What follows is a summary of investigation leading to the confirmation of the illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.2.2.1 ALB-OF-04 - see map in Appendix 2 Mapbook*

Table 4: Water Quality Analysis Data for ALB-OF-04

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALB_OF_4 | 7/19/2017 | yes | None | 6 | 698 | 0.78 | 0.25 | NA | NA | NA | Negative |
| ALB_OF_4 | 12/12/2018 | yes | None | NA | NA | NA | NA | 45 | 0.041 | NA | NA |

The initial outfall visit at ALB-OF-4 revealed results that, while not extraordinarily high, did exceed thresholds. The outfall was submerged in stagnant water, so water quality parameters were tested at the nearest upstream catchbasin, ALB-OF-4-CB-64. While conductivity did not exceed threshold at 698 uS/cm, detergents (as MBAS) were present at a low level of 0.25 ppm and ammonia was above threshold at 0.78 mg/L. It was decided that the best way to further investigate this system would be through the use of smoke testing.

In October of 2017 Watershed, in conjunction with the Town of Alburgh and Vermont Rural Water Association conducted smoke testing at various storm and sewer points along North Main Street between Lake Street and Champlain Street. Opening a sewer manhole on the corner of N Main and Champlain Street revealed a backup in the sewer and a slight presence of smoke. After several more injections of smoke into both the sanitary and sewer lines it was concluded that a broken sewer line on North Main Street was allowing untreated sewage to flow into the storm system.

According to the Town of Alburgh the problem was fixed in November of 2018. According to wastewater treatment plant operator Jason Beaulac, the sewer pipe between 10 N Main Street and 4 N Main Street was dug up and replaced to eliminate the possibility of it leaking into the storm sewer.

A follow-up smoke test was conducted on December 1, 2018 to verify that the repair eliminated the discharge. Smoke was injected into the storm sewer downstream of the repair. No smoke was seen in the sanitary sewer infrastructure adjacent to the repair. Smoke was then injected into the sanitary sewer system downstream of the repair after clearing the storm system of smoke. Smoke did appear in the storm system at a catch basin on Main Street at the school entrance upstream of the repaired sanitary sewer.

Watershed requested that the town conduct dye testing from the sanitary sewer manhole above the catch basin where smoke was observed during the second smoke test. The town instead poured dye into toilets

and sinks at the school and at the laundromat associated with Blair's Trucking (189 N Main St). These are the most upstream systems in the town's sanitary sewer. The town then observed the storm system over the course of the following days for the presence of dye, no dye was seen in the storm system. Prior to the dying process a cotton pad was placed in the sump of catchbasin ALB-OF-4-CB-64. In the case that dye had passed over to the storm system, the pad would be stained and crossover could be proven for intermittent discharges of dye. On January 25th Watershed staff returned to retrieve the pad. It could not be found in the catch basin as it was likely washed away during a heavy flow.

Follow up testing should be conducted at this outfall to ensure all issues have been resolved. Based on our study, this issue has been identified but has not been definitively resolved.

## *3.3 Bakersfield Results*

### 3.3.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and October, 2018, Watershed surveyed four different outfalls. Of the four outfalls visited, two were flowing and one had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Bakersfield. Results of the initial assessment in Bakersfield are included in Appendix 1 – All Results Summary Table.

### 3.3.2 Advanced Investigation (AI):

Of the four systems assessed, one was suspected of having an illicit discharge. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.3.2.1 BKR-OF-4- see map in Appendix 2 Mapbook*

Table 5: Water Quality Analysis Data for BKR-OF-04

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BKR_OF_4 | 7/18/2017 | yes | NA | 8 | 268 | 0.38 | 0.25 | NA | NA | NA | NA |
| BKR_OF_4 | 9/19/2018 | no | | | | | | | | | |

The initial visit at outfall BKR-OF-4 revealed results that, while not extraordinarily high, did exceed thresholds. Elevated levels of ammonia (0.38 mg/L) and detergents (0.25ppm) called for advanced investigation. In August of 2017 Watershed, in conjunction with Vermont Rural Water Association conducted smoke testing at various connected storm points along Vermont Route 108. No smoke was observed discharging from any commercial or residential sewer vents. During a follow up visit conducted in September of 2018 the outfall showed no signs of recent flow. We suspect that the results initially observed are due in part to the open drainage system which contributes to this outfall (this would explain the elevated ammonia results) and wash off from an adjacent gas station and auto repair facility, both of which have the potential for higher than usual amounts of substances which may contain MBAS (petroleum products are known to contain MBAS, as well as windshield washing fluid or other detergents used to wash or clean cars at the auto repair shop). These substances may have built up over time in the drainage system. The flow observed during July of 2017 may have been transporting those built-up pollutants. Illicit discharge is not suspected at this location.

### *3.4 Barnard Results*

Although written into this contract, IDDE investigations were completed during a separate study, "White River Junction Illicit Discharge Detection and Elimination Study", submitted in September of 2018. No additional work was conducted in the town of Barnard.

## *3.5 Barnet Results*

### 3.5.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Barnet between August 2017 and November, 2018. Of the seven systems assessed, two were flowing and one had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Barnet. Results of the initial assessment in Barnet are included in Appendix 1 – All Results Summary Table.

### 3.5.2 Advanced Investigation (AI):

Of the three systems assessed, one was suspected of having an illicit discharge. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.5.2.1 BRT_OF_09 - see map in Appendix 2 Mapbook*

Table 6: Water Quality Analysis Data for BRT_OF_09

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_9 | 8/29/2017 | yes | None | 8.3 | 1155 | 0.42 | 1 | NA | NA | NA | NA |
| BRT_OF_9 | 9/13/2018 | yes | None | 7.9 | 1616 | 0.74 | NA | NA | 0.22 | Positive | Positive |
| BRT_OF_9_CB_33 | 9/13/2018 | yes | None | 7.5 | 1350 | 0.47 | 0.5 | NA | NA | NA | NA |
| BRT_OF_09 | 11/12/2018 | yes | none | NA | NA | NA | NA | 45 | 0.041 | NA | Negative |

An initial visit to outfall BRT-OF-09 conducted on 8/29/2017 showed levels of ammonia above threshold (0.42 mg/L) and detergents (1.0 ppm) which caused suspicion of an illicit discharge. A follow up visit revealed higher levels of ammonia (0.74 mg/L). Although flow was present at the discharge point and in its upstream catchbasin, the inlet could not be located and no flow was observed in the connected ditch line. An optical brightener pad was left in the outfall for a period of 24 days and tested positive for optical brightener. A water sample was shipped to the Environmental Canine Services for testing which also tested positive for sewage. On November 12$^{th}$, 2018 dye testing was conducted from the homes located at 347 Bimson Drive and 391 Bimson Drive. Dye was flushed in all toilets, sinks, and drains in both residences. No dye was observed discharging at the outfall and an optical brightener pad left at the outfall showed no signs of staining. Canine alerts on sewer presence is likely triggered by septic leachate entering the drainage system from onsite wastewater treatment facilities. However, dye testing was not able to confirm this, even though an OB pad trap was left at the outfall for nearly two weeks to capture any dye that emerged from the system. Smoke testing was not conducted as there is no sanitary sewer system in this area and the infrastructure and development near the outfall didn't indicate the need. As *E. coli* is lower than threshold at 45 MPN, we do not believe that this site constitutes an illicit discharge from failed septic.

## *3.6 Barre City Results*

### 3.6.1 Outfall Reconnaissance Inventory (ORI):

ORI was conducted on these outfalls during two previous IDDE studies in 2016 and 2017. Results for 2016 can be seen in the final report Detecting and Eliminating Illicit Discharges in the Stevens Branch Watershed and Stowe while results for 2017 can be seen in the final report Upper Winooski River Basin Illicit Discharge Detection and Elimination Project: Final report.

### 3.6.2 Advanced Investigation:

During advanced investigation, five outfalls were found to have an illicit discharge that was confirmed. One instance of illegal dumping was also discovered. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) confirmed to have an illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.6.2.1 BC560 - see map in Appendix 2 Mapbook*

Table 7: Water Quality Analysis Data for BC560

| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) |
|---|---|---|---|---|---|---|---|
| BC560_SW_MH_215 | 8/22/2018 | yes | 0.000 | 26.4 | 7.49 | 1140 | 0.16 |
| BC560 | 2018-09-14 | yes | 0.001 | | | | |

| Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|
| no | no | no | 0 | 2 | | | no |
| no | no | no | | | 550 | 0.11 | no |

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Previous monitoring found *E. coli* at 710 MPN, MBAS of 0.71 mg/L, chlorine of 0.11 mg/L with a positive result for optical brightener.

Watershed visited this outfall for an initial analysis on August 22, 2018. Flow was only a trickle. Ammonia was found to be 0.16 mg/L (below threshold) but detergents (as MBAS) were found to be 2.0 ppm. No chlorine was found in the sample. An optical brightener pad was placed and left for five days (removed prior to a rain event). No optical brightener was found on the pad after removing it, nor did any staining indicate a possible illicit discharge. *E. coli* was not sampled on this visit. A follow-up visit on September 14$^{th}$ for an *E. coli* sample found a bacteria level of 550 MPN and phosphorus of 0.11 mg/L.

On August 22$^{nd}$, Watershed, with the City of Barre and Vermont Rural Water Association, visited the outfall to look for the source of the possible illicit discharge in the lower portion of the drainage system using smoke testing, as well as dye and camera work. Smoke testing between the storm and sanitary sewers did not reveal any crossover, nor was smoke observed coming from the sanitary gas vents on any of the residences near the drainage system.

All buildings were entered (with homeowner permission) and dye was flushed from various sanitary sewer inlets within the houses (toilets/sinks). A different color dye was used for each house. No dye was subsequently observed in the storm sewer system.

Additionally, the City of Barre used their track camera to inspect the storm line in front of the all the houses to inspect for the dye, as well as to look for pipes coming into the storm line. Nothing suspicious was seen during this inspection.

Figure 1: Dye is seen entering a catch basin after being poured into the sanitary sewer system. This result could not be replicated despite two additional dye tests.

A return visit was made in early September to conduct additional dye testing and televising with the City of Barre of the upper portion of the storm drain system. Dye was flushed into the uppermost sanitary sewer manhole. No dye was seen in any of the upper catchbasins. However, dye was seen in one catchbasin (as indicated on the map). The City of Barre used the track camera to travel up the line to see if a pipe or crack could be seen that would allow the dye to enter. Nothing was seen. A second round of dye of a different color was flushed into the sanitary system to see if the issue could be replicated. However, no dye from this round was seen in any catchbasins.

Watershed asked the City to use the vacuum truck to clean out the water, dye, and accumulated debris from the catch basin to determine if the dye had entered through the walls the structure itself. This was accomplished and a third round of dye was flushed. However, no dye was seen in any of the catchbasins, including the one where dye had been seen before. It is not known how the dye entered the system, despite repeated dye testing, camera inspection, nor is it known where the potential illicit discharge to the outfall is originating, despite the smoke and dye work performed along with camera inspection.

The City has plans in place to completely replace the storm and sewer drainage network in this area in 2019. It is expected that this will eliminate the issue.

### *3.6.2.2 BC1100 - see map in Appendix 2 Mapbook*

Table 8: Water Quality Analysis Data for BC1100

| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) |
|---|---|---|---|---|---|---|---|
| BC1100 | 2018-09-14 | no | | | | | |
| BC1100 | 2018-10-22 | yes | 0 | 10.7 | 8.32 | 1847 | 3.86 |

| Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|
| no | | no | | | | | |
| yes - alert | no | no | 0 | 1 | 2400 | 0.72 | N/A |

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Ammonia was tested at 1.0 mg/L, with detergents (as MBAS) at 0.70 mg/L and a positive optical brightener result.

On August 24, 2018, Watershed visited the site with the City of Barre and Vermont Rural Water Association to conduct smoke and dye testing, as well as televise any pipes as necessary.

Based on the results of the previous report, it was decided to start work on Hersey Drive above Tremont Street. The previous report indicated that dye had been flushed from 17 Hersey Drive, but not from 10 Hersey drive. The report also indicated that it was possible that a leaking sewer lateral from 10 Hersey Drive was the potential cause of the issue.

The team started with injecting smoke into the catchbasin below 10 Hersey Drive. However, no smoke appeared from either 10 or 17 Hersey. However, smoke did appear from the sanitary vent pipe at 207 Elm Street (above 10 Hersey Drive). The residents were home and the City of Barre entered the home and flushed dye from the toilet and sink at the house. Dye almost immediately appeared in the catchbasin below 10 Hersey Drive. City staff member Everett Hoyte remembered that there was an old storm line extension past the end of Hersey Drive and that a catch basin was potentially buried below 207 Elm Street. The City suspected that the issue was from an improperly connected lateral into the buried catch basin.

When the City returned later in September, they dug up the catchbasin, intercepted the pipe coming from 20 Elm Street and connected it to the sanitary sewer. They then dye tested from 207 Elm Street – no dye was observed in the storm system following that dye test.

Watershed returned to the outfall on September 14, 2018 (following the repair). No flow was evident at the outfall. A second follow-up visit was conducted on October 22, 2018. There was a trickle flow at that time (barely measurable). Ammonia was above threshold at 3.67 mg/L, detergents (as MBAS) were 1.0 ppm, though no chlorine was detected. A sample obtained for *E. coli* analysis was found to be >2400 MPN. A sample sent to Environmental Canine Services for Ship and Sniff testing came back positive for human

sewage. The phosphorus concentration was found to be 0.72 mg/L. No further follow-up investigation was made following this finding as weather conditions (ice and snow) soon made further investigation infeasible. It is not known if these results indicate that there is an additional illicit discharge in the system that had been masked by the discharge from 207 Elm Street or if these results are due to a build-up within the storm drainage system of bacteria and detergents which, coupled with the extremely low flow observed at the outfall, could be falsely concentrating the pollutants to the levels seen. It seems unlikely that there is another illicit discharge to this system as no potential issues were observed in 2016 below Tremont Street and smoke testing along Hersey Drive did not indicate any additional potential sources.

This outfall may need re-assessment. However, we would recommend that the re-assessment only occur following a system cleaning (water jetting and vacuuming) by the City of Barre. Once finished, the system could be re-assessed for another possible illicit discharge. Follow-up sampling should be conducted six months to one year from last date of inspection.

#### ***3.6.2.3*** *BC1120 - see map in Appendix 2 Mapbook*

Note: No water quality results exist for this outfall or associated system as the issue of the potentially leaking sanitary sewer pipe had not been repaired at the outfall and smoke, dye, and camera testing were focused on to provide results during advanced investigation.

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. *E. coli* at the outfall was 660 MPN, though ammonia was below threshold at 0.1 mg/L, chlorine was 0.02 mg/L, MBAS was 0.0 mg/L, and optical brightener was positive. The report notes two primary issues of concern. The first is a sanitary sewer pipe flowing through stormwater manhole MH1. The sewer pipe has been observed leaking in the past (during a first IDDE study in 2006). The pipe was reportedly repaired following the 2006 study and City employee Everett Hoyte noted that, in 2015, the pipe was not leaking. The City reportedly cleared a major obstruction in the sanitary pipe which cause the pipe to surcharge an upstream manhole (but reportedly did not overflow the manhole).

The second issue is related to the detection of optical brighteners on Howard Street. In August 2016 dye testing was conducted from the sewer main near 12 and 14 Howard Street. No dye appeared in the storm drain. In September 2017, suds were observed in CB11 coming from an 8” pipe, though not from the other two pipes discharging to CB11, indicating a source of optical brightener from above CB11. However, smoke testing in 2017 conducted by Stone Environmental, the City of Barre, and Vermont Rural Water Association from CB11 did not reveal smoke crossing over into the sanitary sewer. Dye testing from 44 Pike Street (above CB11) also did not reveal anything. No dye testing was conducted from 36 Pike Street as no one was home.

As a result of this finding, Watershed, with the City of Barre, returned to the area to conduct smoke and dye testing, and televising of storm lines in October, 2018. Smoke testing was again conducted from CB11 with negative results. Dye testing was then conducted from 16, 14, 12, and 15 Howard Street. No dye appeared in the storm system. Dye testing was again conducted from 44 Pike Street with a negative result. No one was home at 36 Pike Street.

When injecting smoke into the sanitary sewer system to check for any potential crossover, smoke was observed from CB10 in trace amounts. It was thought that the issue could be related to the sanitary line crossing over the storm pipe between CB11 and CB10.

The City then called a private contractor to attempt to televise the line between CB10 and CB11 as the sanitary sewer line crosses over the storm pipe in this location. However, this line was difficult to televise as it mostly full of hard mineral deposits. The sanitary sewer line between CB10 and CB11 was also inspected for cracks or other issues. None were seen, despite televising nearly 75' of pipe.
The pipe (previously called Pipe A) discharging into CB11 where suds had been observed was not televised.

The City did not mention that this had been previously identified as a potential issue and that the preferred method of investigation would be to televise the pipe. Watershed at the time of the investigation was not aware of the follow-up work performed in 2017, relying instead on the report from February 19, 2016, versus the report on the 2017 work, published in April, 2018.

Based on our findings in this area we have the following recommendations:

- We recommend that the City re-configure the sanitary sewer pipe running through MH1 to definitively eliminate that issue.
- We recommend that the City return to CB11 with a small push-camera and investigate Pipe A. Numerous other potential sources of illicit discharge in this area have been thoroughly investigated and found to be negative. If there is indeed an illicit discharge to the system on Howard Avenue, it seems most likely to come from the aformentioned Pipe A.

### 3.6.2.4 *BC1510 - see map in Appendix 2 Mapbook*

Table 9: Water Quality Analysis Results for BC1510

| ID | Date | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? |
|---|---|---|---|---|---|---|---|
| BC1510 | 2018-08-24 | 0.018 | 20.6 | 8.29 | 1266 | 0 | no |
| BC1510 | 2018-09-14 | 0.003 | | | | | no |
| BC1510 | 2018-10-22 | 0.004 | 10.5 | 8.41 | 680 | 0.09 | no |

| Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|
| yes | no | | 0 | | | no |
| yes | yes | | | 1 | 0.69 | |
| no | no | 0 | 0.25 | 6.3 | 0.28 | no |

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Chlorine was measured at 0.14 mg/L and gray stone dust was observed in the discharge. Optical brightener was not detected.

On August 24th, 2018 Watershed visited the outfall and found no ammonia or detergents. Chlorine was not tested for. The grayish color was noted. Smoke testing with the City of Barre and Vermont Rural Water Association was also conducted on this day. Smoke testing commenced near the outfall as there is a large truck washing facility there. It was thought that the flow and the grayish-colored discharge might be attributable to the truck washing facility. However, smoke testing in this location was negative. Testing was

also conducted from the sanitary sewer to test for crossover – no crossover was observed, though it should be noted that all floor drains in the truck washing facility were noted smoking, indicating that they are connect properly to the sanitary sewer.

Additional testing was then conducted up Circle Street. No smoke crossover was noted between storm and sanitary sewer infrastructure. During inspection, it was noted that a storm sewer pipe coming on to Circle from Lewis Street was discharging turbid water, while the storm line above this pipe was dry (no flow was observed in infrastructure near Green Street and beyond). This turbid flow was followed to a business on Paddock Street, Northern Granite (official address: 10 Lewis Street). A small PVC pipe into the sump of the catchbasin on Lewis Street was the source of flow.

The City of Barre and Watershed attempted to find someone in the shop to speak with as the door was open. No one was present, however during the attempt to find someone with whom to speak, a stone cutting machine was observed using water to rinse and cool the cut. This machine discharges into a floor drain. The water looked similar to the water seen coming from the PVC pipe.

Everett Hoyte from the City later returned to dye test from the shop on August 27, 2018. Dye immediately appeared in the catchbasin from the PVC pipe. The owner of Northern Granite stated that he thought his settling tank needed to be cleaned out and would pursue this immediately.

On September 20, 2018, Watershed returned with the City of Barre to inspect the work performed on the settling tank. At this point it appeared as if the tank had been excavated and cleaned. The catchbasin was smoke tested again. No smoke appeared in the building. Smoke did appear from the overflow pipe at the outlet of the settling tank. The owner stated that typically this outlet is not used and that water is re-circulated to the saw. At the time of the inspection of the tank, no flow was observed at the outfall. We consider this issue to be resolved and that no further chronic illicit discharge is occurring. It does not appear that this facility possesses a stormwater permit of any kind. As an industrial activity, this site may require a Multi-Sector General Permit to ensure that this issue does not re-occur.

Figure 2: Smoke is seen emerging from the settling pond overflow outlet at Northern Granite after being injected into the stormwater system adjacent to the building.

### 3.6.2.5 *BC1630 - see map in Appendix 2 Mapbook*

Table 10: Water Quality Analysis Data for BC1630

| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? |
|---|---|---|---|---|---|---|---|---|
| BC1630_SW_MH_112 | 2018-08-24 | yes | | 24 | 2.69 | 1452 | 5 | no |
| BC1630_New | 2018-08-24 | yes | | | | | | no |
| BC1630 | 2018-09-14 | yes | 0.003 | | | | | no |
| BC1630 | 2018-10-22 | yes | 0.004 | 10.9 | 8.4 | 786 | 0.57 | no |

| Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|
| no | 0 | 2 | | | |
| no | | 0.25 | | | no |
| no | | | 2400 | 0.61 | |
| no | 0.2 | 0.25 | 2400 | 0.66 | |

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. The study indicated that a broken sewer lateral at 204 Hill Street was the cause of the previously observed issue, though the report notes that two other repairs had occurred in this system prior to this issue being fixed. The work was performed in September, 2016. A re-assessment in November, 2016 however, found optical brightener in the system up to MH11 on the corner of Hill and Nelson Streets.

Based on this finding, the system was re-assessed starting at the corner of Hill and Nelson Streets (as optical brightener had not been found above this point, it was assumed that the source would be somewhere above that intersection). Watershed, with the City of Barre and Vermont Rural Water Association, began by conducting initial smoke testing at MH11. No smoke was observed crossing over from storm to sanitary, nor was any smoke observed coming from sewer vent pipes on houses. The line was cleared and the reverse test was conducted with similar results – no crossover between systems. A track camera was put into the sanitary sewer pipe to observe pipe condition. The pipe was largely new and intact, based on the previous repairs from 2016. The camera was extended to the sewer service at 204 Hill Street.

Dye testing was then conducted from sewer manhole adjacent to 204 Hill Street. No dye was observed in the storm system. The team then moved up the hill to the corner of Hill Street and Woodland Drive to conduct additional smoke and dye testing. Smoke testing from this intersection was also negative for crossover from both systems. Dye testing was then conducted from the sanitary sewer manhole at the intersection of Hill and Woodland with negative results.

The team then used the track camera to inspect the sanitary sewer line for condition. Nothing was seen to indicate any potential issues other than small cracks in the vitrified clay pipes (none appeared large enough to allow for crossover from sewer to storm, which was substantiated by dye testing). The storm line was then televised to look for suspicious pipe connections. One was found in the vicinity of 210 Hill Street, though smoke testing had not indicated provenance. Dye testing was conducted from 210 Hill Street (the City of Barre dye tested from the kitchen sink and downstairs bathroom). The system was monitored for an additional 45 minutes to check for dye intrusion into the storm system but none was seen.

It was concluded from this work that no issues were present in the system above Nelson Street as indicated by the previous study. However, follow-up testing on September 14, 2019 and October 22, 2019 indicate that there may still be an issue in the system as *E. coli* was found to be greater than 2400 MPN on both tests (with total phosphorus at 0.61 mg/L and 0.66 mg/L respectively) with 0.57 mg/L ammonia, 0.25 ppm

MBAS, and 0.2 mg/L chlorine on October 22. A ship and sniff sample sent to ECS was positive for human sewage. Follow-up work on this outfall was not conducted due to the early onset of winter weather.

It is our conclusion that, while the evidence does not indicate an issue above Nelson Street as previously suspected, there does seem to be an additional issue somewhere in the system, possibly below the intersection of Nelson and Hill Streets. This system is in need of additional assessment to definitively pinpoint this problem.

#### ***3.6.2.6*** *BC790 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. The previous results indicated that optical brightener was detected at this small pipe outlet, though fluorescence was weak. Slightly elevated ammonia was noted, though detergents and chlorine were low (below threshold).

Watershed visited this outfall on two occasions. The outfall was not flowing during these two visits. Optical brightener traps were placed but not optical brightener was detected on the pads.

The City of Barre, at Watershed's request, conducted dye testing from 39 Blackwell Street and monitored the outlet pipe for five days in August, 2018. No dye was seen over the course of the monitoring period.

Based on the results of this investigation, we don't believe there to be a chronic illicit discharge to this outfall.

### 3.6.2.7 *Additional Issue - Rub-A-Dub Car Wash (775 North Main Street, Barre City, VT)*

While conducting advanced investigation in Barre City, wash water from the Rub-A-Dub Car Wash on North Main Street was observed draining from the car wash to a storm sewer catchbasin. While not an outfal formally flagged for assessment, this issue was brought to the attention of the City of Barre. They were going to follow up with the owner of the business to inform them of this issue and that it constitutes illegal dumping to the stormwater system.

Figure 3: Car wash water is seen running from the Rub-A-Dub Car Wash into a stormwater catchbasin.

## *3.7 Barre Town*

### 3.7.1 Outfall Reconnaissance Inventory (ORI):

ORI was conducted on these outfalls during two previous IDDE studies in 2016 and 2017. Results for 2016 can be seen in the final report Detecting and Eliminating Illicit Discharges in the Stevens Branch Watershed and Stowe while results for 2017 can be seen in the final report Upper Winooski River Basin Illicit Discharge Detection and Elimination Project: Final report.

### 3.7.2 Advanced Investigation (AI):

During advanced investigation, three outfalls were found to have an illicit discharge that was confirmed. One instance of illegal dumping was found. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) confirmed to have an illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.7.2.1 BT680 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. The study indicated a possible issue here due to observed levels of ammonia at 0.35 mg/L, chlorine at 0.82 mg/L, and marked petroleum odor. Optical brighteners were not found.

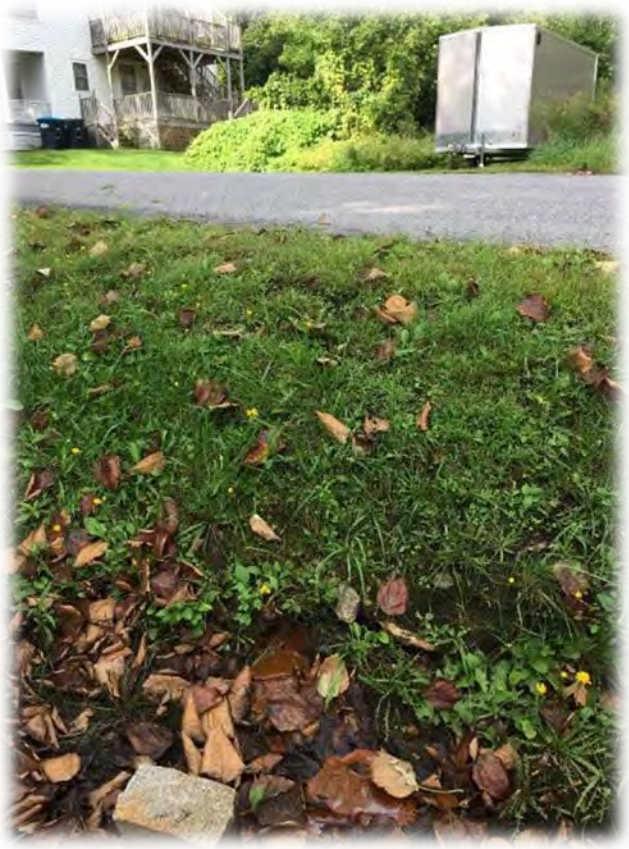

Figure 4: The reddish water indicates where the 4" PVC pipe enters the ditch from 6 Bolster Road (which can be seen in the background).

On September 4, 2018, Watershed, with the Town of Barre Engineer Harry Hinrichsen and Vermont Rural Water Association, conducted smoke testing on the system after conducting water quality sampling. Smoke was initially injected into a stormwater catchbasin on Bolster Road below the point where two different open drainage systems converge. No smoke was observed from residential sanitary sewer vent pipes or in the sanitary sewer system. Smoke was cleared from the system and blown into the sanitary system. No smoke was observed crossing over from sanitary to storm within the closed storm system.

However during testing from sanitary, smoke was seen coming from a small 4" PVC pipe that outlets to the open drainage ditch adjacent to Bolster Road. The source of this smoke was found to be some sort of drain pipe or sump pump coming from 6 Bolster Road as smoke was observed exiting from the cellar doors at that residence. No one was home at the time, so entry could not be obtained to inspect the system.

Town Engineer Harry Hinrichsen was asked to interface with the residents to see if a dye test could be conducted. Watershed followed up with Mr. Hinrichsen to see if he had made contact on several occasions

over the course of October and November and if he had been able to conduct the dye test. He indicated that he was attempting to contact the residents but had been unsuccessful in doing so. Several e-mails to Mr. Hinrichsen in December were not returned regarding this matter. It is unknown if dye testing has occurred at this point, or if the residents have been contacted.

It is our conclusion that the possible illicit discharge to this outfall is due to this pipe coming from the aforementioned residence and that definitive dye testing should be conducted.

#### 3.7.2.2 *BT2440 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Previous results saw ammonia between 0.25 and 0.35 mg/L, chlorine at 0.03 mg/L, MBAS between 0.07 and 0.16 mg/L, and *E. coli* at 987 MPN, with negative optical brightener presence.

Initial testing on September 4, 2018 saw ammonia at 0.15 mg/L, chlorine at 0.2 mg/L, and MBAS at 0.75 ppm. Based on these and prior results, smoke testing was conducted on September 4, 2018 with the Town of Barre Engineer and Vermont Rural Water Association. Smoke was initially injected into a storm catchbasin on Smith Farm Road. No smoke was seen crossing over into the sanitary sewer system and no smoke was observed from residential sanitary sewer vent pipes. Smoke was then cleared from the storm system and injected into the sanitary sewer. No smoke was seen crossing over. This procedure was repeated two more times at different junctions in the two systems to attempt to definitively any potential crossover points or other intput to the storm system. None were found.

An optical brightener trap was left at the outfall for ten days. No fluorescence was observed. An *E. coli* sample returned a result of greater than 2400 MPN, with a phosphorus concentration of 0.65 mg/L. However, during smoke testing Watershed observed several behaviors which could account for these results, despite the fact that no smoke crossover was observed between storm and sanitary. One, the area is largely residential and numerous residents were seen walking pets without plastic bags for collecting dog feces. This could contribute strongly to the *E. coli* seen at the outfall. Two, the chlorine and MBAS seen at the outfall could be attributed to vehicle washing within the area as a resident was observed washing a RV directly adjacent to a catch basin. This could lead to the high detergents observed without the presence of optical brightener. Based on the results of smoke testing and observations of behavior in the neighborhood, we don't believe there to be a chronic illicit discharge to this outfall. However, there may be intermittent discharges to this system that could be classified as an illicit discharge.

We recommend that the Town contact the owner of the RV about washing activity near stormwater infrastructure and conduct outreach regarding proper disposal of pet waste. We recommend that the Friends of the Winooski (or similar water quality advocacy group) conduct outreach in the area to inform residents of washing activities with respect to stormwater infrastructure and the need to control pet waste near drainage features.

#### 3.7.2.3 *BT2670 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Previous results saw ammonia at 0.5 mg/L, but no chlorine or MBAS. *E. coli* below threshold at 160 MPN.

Two return visits in 2016 to re-check these initial results found the outfall dry. Given the intermittent flow associated with this outfall, Watershed decided to smoke test this outfall with the Barre Town Engineer and Vermont Rural Water Association.

On September 4, 2018, smoke testing was conducted along Rudd Farm Drive. Smoke injected in the storm system did not appear in the sanitary sewer system. The system was then cleared and smoke was injected into the sanitary sewer system. Initially, smoke didn't cross over to the storm system. However, after the system had pressurized for nearly fifteen minutes, smoke did appear from a catchbasin adjacent to 5 Rudd Farm Drive. The source of the smoke appeared to be a small pipe coming into the stormwater pipe crossing under the driveway at 5 Rudd Farm Drive. The occupant of 5 Rudd Farm was home and the home was entered to inspect for smoke. None was seen. Dye testing was conducted from the house but no dye appeared in the pipe after nearly an hour. The owner of the home stated that he had a floor drain from the garage that had been connected to his sanitary service, but it had been disconnected. He stated that that drain was the pipe that the team saw in the stormwater pipe under the driveway. Watershed attempted to dye test this connection as well, but the pipe was nearly completely clogged. No dye appeared in the stormwater pipe.

The Town Engineer was advised to work with the resident to clean out the pipe, then ensure that the floor drain was no longer connected to the sanitary service in any way, and to also dye test from the house (from the sanitary service) to ensure that no dye crossed over to storm as smoke indicated could be possible. The Town Engineer was contact several times over the course of September and October to check on the status of this work, but no response was received regarding this issue. It is unknown at this time if the issue has been investigated and resolved.

A separate issue was also discovered while investigating the system. A pipe was seen running into a previously unmapped catchbasin adjacent to 1 Rudd Farm Drive. The pipe was connected to a pump running from the pool at 1 Rudd Farm Drive. It would appear that the owners pump the swimming pool into the catchbasin. The Town Engineer was advised that, unless the pool water is allowed to sit for 30 days to dechlorinate, that this is not permissible. Mr. Hinrichsen stated that he would follow up with the residents. However, despite several attempts during September and October to check on the status of this work, no respond was received. It is unknown at this time if the issue has been resolved.

No bacteria or phosphorus sampled was obtained for this outfall as flow was intermittent. It was only flowing on 9-4-18, but not again on 9-14-18 when a return trip was made to obtain the sample. As the issue has not been definitively resolved, it would require resolution before a post-repair sample and assessment could be made. We do not consider this issue to be fully resolved as there was no definitive communication from the Town of Barre regarding the status of outreach.

Figure 5: Smoke is seen coming from a catchbasin adjacent to 1 Rudd Farm Drive. There is a pipe coming from the pool in the corner of the catchbasin.

#### 3.7.2.4 *GV1 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. The primary triggers for the re-assessment were the discovery of MBAS at 0.22 mg/L with 0.2 mg/L chlorine, though no ammonia was observed and optical brighteners were inconclusive.

A return test on August 24, 2018 found no ammonia or MBAS with no chlorine or other indicators. Optical brightener testing was inconclusive as well. A follow-up assessment on September 14, 2018 for *E. coli* found only 8.5 MPN and 0.0013 mg/L total phosphorus. Given the water quality results consistently below threshold, along with the lack of sanitary sewer, or other potential onsite wastewater treatment systems in the area, we don't believe there to be any chronic illicit discharge to this outfall. In speaking with the Town Engineer regarding this issue, he stated that he has seen truck washing occur in this area, which may account for the chlorine and MBAS seen in 2016. Given the intermittent nature of that type of activity, it is difficult to assess for this, even using optical brightener traps as truck washing detergent wouldn't necessarily contain optical brighteners.

#### 3.7.2.5 *GV5 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. Ammonia was found to be high at 2.0 mg/L with MBAS at 0.30 mg/L and chlorine at 0.01 mg/L. No optical brighteners were found, but suds were noted at the outfall.

On follow-up testing on two occasions (August 24 and September 14, 2018) the outfall was found to be dry.

Smoke testing was conducted on September 4, 2018. Despite testing from both storm and sanitary sewer system, no smoke crossover was observed.

Town Engineer Harry Hinrichsen lives at 43 Hillside Avenue and stated that he frequently has observed his neighbor at 46 Hillside Avenue washing their lawnmower using soap and water directly over the catchbasin. This could explain the suds seen at the outfall in 2016, as well as the high ammonia (from grass clippings) as well as the MBAS and chlorine results. Mr. Hinrichsen stated that he frequently has to clean out the outlet as it will become clogged with grass as well. In light of this, we do not believe there to be a chronic illicit discharge at this outfall and that follow up by the Town Engineer should eliminate this issue.

#### 3.7.2.6 *GV6 - see map in Appendix 2 Mapbook*

This outfall was flagged for re-assessment based on a previous illicit discharge study performed in 2016. No ammonia or chlorine was seen here, nor was optical brightener observed, though MBAS just triggered threshold at 0.30 mg/L.

Two follow up visits on August 24 and September 4, 2018 found ammonia below threshold at 0.06 and 0.14 mg/L respectively, with MBAS at threshold at 0.25 mg/L. No chlorine was found. A follow up test for *E. coli* on September 14, 2018 found low levels at 4.1 MPN with total phosphorus at 0.01 mg/L.

Smoke testing was conducted on September 4, 2018. Despite injecting smoke into numerous points in both the storm and sanitary sewers throughout the local system, no crossover was seen. Additionally, the outfall was not flowing on this occasion.

Based on the low values seen during water quality testing and the lack of smoke crossover during smoke testing, we do not believe there to be a chronic illicit discharge at this outfall.

## *3.8 Bennington Results*

### 3.8.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between June 2017 and August 2018 Watershed surveyed seven different outfalls. Of the seven outfalls visited, two were flowing and one had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Bennington.

### 3.8.2 Advanced Investigation (AI):

During advanced investigation, one outfall was found to have an illicit discharge that was confirmed. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) confirmed to have an illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.8.2.1 BNT_OF_01 (Bennington College) - see map in Appendix 2 Mapbook*

Table 11: Water Quality Analysis Data for BNT_OF_01 (all)

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT-OF-1 | 4/21/2016 | Yes | Yes | 7.7 | 853 | 17.2 | 0.25 | 0 | N/A | 0.1 | N/A | N/A |
| CB1 | 4/21/2016 | Yes | Yes | 7.8 | 970 | 20.6 | 0.5 | 44 | N/A | 0.1 | N/A | N/A |
| MH1 | 4/21/2016 | Yes | Yes | 3 | 1004 | 3.4 | 3 | 30 | N/A | 0 | N/A | N/A |
| MH2 - East Pipe | 4/21/2016 | Yes | No | 7.7 | 647 | 0 | 0 | N/A | N/A | 0 | N/A | N/A |
| MH2 - West Pipe | 4/21/2016 | Yes | No | 7.6 | 785 | 0 | 0 | N/A | N/A | Trace | N/A | N/A |
| MH2 - Sump | 4/21/2016 | Yes | No | N/A | N/A | N/A | N/A | 2 | N/A | N/A | N/A | N/A |
| MH1 | 6/12/2017 | Yes | | 7.5 | 795 | 4.18 | 0.75 | N/A | N/A | N/A | N/A | No |
| MH2 | 6/12/2017 | Yes | | 7.2 | 680 | 0.28 | 0 | N/A | N/A | N/A | N/A | No |
| MH1 | 7/6/2017 | Yes | | 8.1 | 1120 | 2.02 | 0.25 | N/A | N/A | N/A | N/A | No |
| MH2 | 7/6/2017 | Yes | | 7.8 | 816 | 0.19 | 0 | N/A | N/A | N/A | N/A | No |
| BNT-OF-1 | 8/9/2018 | Yes | No | 8.1 | 1955 | 0.26 | 0.25 | 2400 | 0.4 | N/A | N/A | N/A |
| BNT-OF-1 | 11/9/2018 | Yes | Yes | 8.1 | 1121 | 0.99 | N/A | 2400 | 0.2 | N/A | Yes | N/A |

The issue at BNT-OF-1, an outfall associated with drainage from Bennington College, was first investigated in April 2016. The outfall, which was not mapped during the stormwater infrastructure mapping project for Bennington, was not surveyed as part of the original Bennington and Pawlet IDDE study conducted in 2015.

*April 21, 2016:*

Watershed conducted water quality testing of the system. The results were as follows:

Table 12: Water Quality Analysis Data for BNT-OF-01 for 4/21/2016

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT-OF-1 | 4/21/2016 | Yes | Yes | 7.7 | 853 | 17.2 | 0.25 | 0 | N/A | 0.1 | N/A | N/A |
| CB1 | 4/21/2016 | Yes | Yes | 7.8 | 970 | 20.6 | 0.5 | 44 | N/A | 0.1 | N/A | N/A |
| MH1 | 4/21/2016 | Yes | Yes | 3 | 1004 | 3.4 | 3 | 30 | N/A | 0 | N/A | N/A |
| MH2 - East Pipe | 4/21/2016 | Yes | No | 7.7 | 647 | 0 | 0 | N/A | N/A | 0 | N/A | N/A |
| MH2 - West Pipe | 4/21/2016 | Yes | No | 7.6 | 785 | 0 | 0 | N/A | N/A | Trace | N/A | N/A |
| MH2 - Sump | 4/21/2016 | Yes | No | N/A | N/A | N/A | N/A | 2 | N/A | N/A | N/A | N/A |

It was concluded that the issue was most likely entering the system between MH2 upstream and MH1 downstream. The outfall was then assigned to a future IDDE study (Statewide Contract #2).

Under Statewide Contract #2, Watershed conducted follow up testing of the system.

*June 12, 2017:*

Table 13: Water Quality Analysis Data for BNT-OF-01 for 6/12/2017

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MH1 | 6/12/2017 | Yes | | 7.5 | 795 | 4.18 | 0.75 | N/A | N/A | N/A | N/A | No |
| MH2 | 6/12/2017 | Yes | | 7.2 | 680 | 0.28 | 0 | N/A | N/A | N/A | N/A | No |

Watershed visited the system to conduct water quality testing to re-assess the issue and determine the best course of action for subsequent investigation.

*July 6, 2017:*

Table 14: Water Quality Analysis Data for BNT-OF-01 for 7/6/2017

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MH1 | 7/6/2017 | Yes | | 8.1 | 1120 | 2.02 | 0.25 | N/A | N/A | N/A | N/A | No |
| MH2 | 7/6/2017 | Yes | | 7.8 | 816 | 0.19 | 0 | N/A | N/A | N/A | N/A | No |

These two rounds of tests were conducted after the College had performed extensive sliplining of sanitary sewer pipes along First and Second Streets. Several manhole structures were also replaced during this time.

Note that the problem was very evident on 4-21-16 as expressed by the elevated ammonia and detergents, along with the acidic pH. The problem still seems to be present on subsequent tests with the important distinction that the severity of the issue has decreased as expressed by the substantial decrease in ammonia and detergent concentrations and the disappearance of the pH issue. This decrease in severity is likely attributable to the work the College performed.

Watershed, working with Todd Siclari from Bennington College's Facilities Department and Wayne Graham from Vermont Rural Water Association, completed extensive smoke and camera investigation of the known problem area on the College's campus on July 6, 2017. The following describes the work performed, along with the recommended follow-up steps.

Smoke testing was initiated at stormwater MH 1. Smoke was observed at CB 1 as expected, along with smoke from MH 2 and the catch basin structures above MH 2. No smoke was observed at SS MH 1, SS MH 2, or SS MH 3 (previously unmapped on SS Pipe 3).

Smoke testing was then conducted from SS MH 1. No smoke was observed in either MH 1 or MH 2. Smoke was observed, as expected, in SS MH 2 via SS Pipe 2, as well as SS MH 3 via SS Pipe 3. On inspection of stormwater CB 2, faint smoke was observed from that structure. Some smoke, though only a trace, was observed in SS MH 4 at the same time.

Smoke testing was then conducted at SS MH 5. Smoke was again observed in CB 2 and SS MH 4, though the smoke was very faint from CB 2. Smoke testing was then conducted from stormwater MH 3. Smoke was observed in greater quantities from CB 2 and SS MH 4. Smoke from SS MH 4 was stronger than the previous test from SS MH 5 which was somewhat unexpected.

The sanitary line was then televised using a small push camera. No cracks were observed in that pipe. There was however a sag in the sanitary pipe as evidenced by the presence of water in the pipe. It was noted

during this time that sanitary pipe is above the stormwater pipe. It was thought that this sag might be allowing water to leak from the sanitary to the storm pipe. When the attempt was made to televise the stormwater pipe from CB 2 to MH 3, it was discovered that that was impossible with a push camera. The bottom of the catch basin structure is a shelf with the storm pipe offset from that shelf (versus a sump with a pipe coming out the bottom in-line with the structure). Access to the pipe could not be gained so no televising was possible.

As a proxy for televising the storm line, a dye test was then conducted from SS MH 4. Over 300 gallons of water was flushed in to SS MH 4 with green dye containing optical brightener. SS MH 5 and stormwater MH 3 and MH 1 were observed simultaneously. After 15-20 minutes dye was observed in SS MH 5. No dye was observable in MH 3 due to the offset pipe configuration. Observation continued in MH 1 for nearly 30 minutes – no increase in flow was noted, nor was there any dye noted. An optical brightener pad was added to the sump of MH 1 and allowed to sit overnight. No dye staining was noted on the pad the following morning, nor was there any presence of optical brightener in the test conducted by Todd Siclari.

Concerning this area, Watershed made the recommendation that Bennington College engage the services of Skanex, a NY State based company that has confined-space entry training, a track-camera for potentially gaining access to the stormwater system's offset pipe between CB 2 and MH 3, and the ability to cut roots out of cracked pipes, as well as slipline pipes. Watershed recommended that Bennington College perform this work for both the sanitary and storm pipes at this location. It may also be prudent to consider completely replacing the structures themselves as they are very close and are constructed of brick and mortar which may be allowing for some water to bleed between the structures. This is a very precarious area in light of the fact that the sanitary pipe is located above the stormwater pipe and there are numerous large trees which may have compromised the integrity of the pipes.

It should be noted that no smoke was observed at any point from SS MH 6. It is likely that this structure and the pipe that passes through it is no longer operational.

Smoke testing was then conducted from SS MH 7 on First Street. Stormwater MH 4 was discovered to have a plastic seal under the cast iron cover. When this seal was removed, it was discovered that there was residual smoke in the sump of the manhole. The blower was set on MH 3 to clear the line, which took longer than expected in Wayne Graham's estimation. It was thought that this might be due to root intrusion or cracks in the pipe between MH 3 and MH 4 resulting in less pipe pressurization with the blower.

Once the smoke in the sump of MH 4 was cleared, additional smoke testing was conducted from SS MH 7. Smoke was observed from the vent pipes in House 1 and 2, as well as SS MH 3. Faint traces of smoke were observed in MH 4. It should be noted that the sanitary pipes are above the stormwater pipes at this location.

Dye testing was then conducted from House 1 and House 2. Dye was observed from the lateral lines coming from both those houses to SS MH 7. No dye was observed in MH 4. This was done to evaluate the possibility of a connection from the lateral pipes to the stormwater pipe. The main trunk line along First Street was sliplined previously. No evidence of dye was observed in MH 1, nor was it observed on the cotton pad placed in MH 1 and tested by Todd Siclari the following day.

It was recommended to the College that they also attempt to televise these lines to determine if there is additional cross-contamination. It may also be prudent to slipline the stormwater line in this area after televising that. Following this work, additional water quality testing of the downstream structures should take place.

It is unclear exactly where cross-contamination is coming from. The most likely area is the sagging sanitary sewer pipe above the stormwater pipe between SS MH 4 and SS MH 5. Watershed recommended dealing with this area first via sliplining of the pipe and repair of the structures.

*September 21, 2017:*
Skanex worked at the College to investigate and possibly make the repairs recommended by Watershed. Holly Andersen, Facilities Engineer at Bennington College reported the following via e-mail:
Skanex was on site today and reviewed first and second street in the locations on concern.

*"On first street, we found pipe that had shifted--the soil around it sank and cracked the pipe in half. We will be coordinating with a local site contractor to get that dug up and taken care over of what we call long weekend when the students are away. It will be repaired in the middle of October.*

*On second street, they found a few cracked pipes and recommended slip lining them. We have given them the go ahead to proceed and they will be slip lining those pipes in short order. "*

*October 23, 2017:*
Watershed checked in with Ms. Andersen on October 23, 2017 on the status of repairs and if it would be appropriate to come down to perform a follow-up assessment. Ms. Andersen replied with the following via e-mail:

*"Since last we touched base, we have completed exploratory work in the areas that Dana indicated that may be an issue. We had Skanex come back out and camera the structures and laterals on the end of first and second streets. What we found on first street were sheered pipes that will require a physical dig and replacement. On second street, we found an old clay line that should be sleeved.*

*The cost for the camera work was $3,800.*

*The estimate we received for the physical work on first street is $7,146.*
*The estimate we received for the sleeving work on second street is $22,500.*

*I would like to respectfully request that we complete both the physical work and the sleeving this coming June, for a few reasons. This will be our next opportunity for the campus to be mostly empty, making the work easier. Also, with the health center work, the student center additions, and now the Commons project, we are pretty cash poor at the moment. If we could please coordinate this work for June with your approval, we would greatly appreciate it."*

Jim Pease from VT DEC responded in an e-mail that he would have no problem with that timeline given the concerns outlined.

*August 1, 2018:*
After several e-mails throughout the early summer of 2018 to check on the status of the repairs, Ms. Andersen sent the following e-mail on August 1, 2018:

*"The site work we agreed upon, the sleeving, the repair at the man holes and dog houses as of noon today are complete."*

*August 9, 2018:*
Follow up assessment was conducted on August 9, 2018 after receiving the previous e-mail on August 1, 2018. The following results were found:

Table 15: Water Quality Analysis Data for BNT-OF-01 for 8/9/2017

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT-OF-1 | 8/9/2018 | Yes | No | 8.1 | 1955 | 0.26 | 0.25 | 2400 | 0.4 | N/A | N/A | N/A |

Note: The field team was unable to locate manhole structure MH-1 due to vegetation in the field obscuring their location. The field team did attempt to contact the Facilities department at the College for guidance but both Mr. Siclari and Ms. Andersen were absent that day.

Based on these results, it was decided to attempt to obtain an *E. coli* sample from MH1 (the downstream stormwater manhole where the issue was most evident in previous sampling).

*October 1, 2018:*
Table 16: Water Quality Analysis Data for BNT-OF-01 for 10/01/2018

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MH1 | 10/1/2018 | yes | NA | NA | NA | NA | NA | 77.5 | NA | NA | NA | NA |

An *E. coli* sample was obtained from MH1 by Mr. Siclari and delivered to Bennington's wastewater treatment plant for analysis. Gail Tiffany at the wastewater treatment plant laboratory reported that the sample contained 77.5 colonies / 100 mL sample water. This amount is below the *E. coli* threshold.

When the results were reported to VT DEC, it was decided that an additional outfall sample should be obtained to include corroborative data such as ammonia, MBAS, etc. Watershed also agreed to obtain a sample for ECS ship and sniff testing.

*November 9, 2018:*
On November 9, 2018, a follow-up assessment of the outfall was conducted. The outfall was selected for sampling, instead of any upstream infrastructure, as it was thought that this would provide an overall assessment of whether or not all potential non-stormwater discharge issues had been resolved. The following results were found:

Table 17: Water Quality Analysis Data for BNT-OF-01 for 11/9/2018

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT-OF-1 | 11/9/2018 | Yes | Yes | 8.1 | 1121 | 0.99 | N/A | 2400 | 0.2 | N/A | Yes | N/A |

Based on these results, it would appear that there is still an illicit discharge to the system, despite the extensive repair work done by the College.
As a result of this finding, this outfall was assigned to a subsequent IDDE assessment to be conducted in 2019.

*Note:*
On November 29, 2018, Jim Pease from VT DEC e-mailed Holly Andersen and Todd Siclari at Bennington College with question regarding infrastructure mapping. The e-mail read as follows:

*"I am wondering if we have the First Street area of the college' storm and sewer mapped correctly (First St.jpg). The manholes in front of "House 1" on the attached AI Summary. pdf labeled MH-4 and SS MH-7*

*do not agree with the colleges drawings. We thought MH-4 had a weir in it and it actually had both sewer and stormwater in one manhole separated by the weir. The Master Plan does not show a storm main on first St although it does show 2 CBs with no connections to a main (highlighted blue) below. Where MH-4 and SS MH-7 are it shows them both as sewer and connected (highlighted yellow). However the attached 2001 WW-8-0477 permit record plan says there is an 18" storm in the street, see below. I think we really need to figure out the First St utilities to get to the bottom of the illicit discharge problem. There is definitely confusion in this area.*

*It doesn't appear we have any funds left at this time to continue any additional sampling. I will look into something for next year but I really would like to make sure we understand what is going on first before doing any additional tests. Dana is going to provide us with a summary and chronology of what we have for testing and repairs to date. It is possible I could come down this winter to do some additional mapping depending on snow cover."*

The College did not respond to this e-mail. It is anticipated that some additional mapping may occur in the spring of 2019.

## *3.9 Brattleboro Results*

### 3.9.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2018 and November 2018, Watershed surveyed ten different outfalls. Of the ten outfalls visited, five were flowing and two had discharge that warranted further investigation. We focused on these two outfalls during our Advanced Investigation in Brattleboro.

### 3.9.2 Advanced Investigation (AI):

Of the two systems assessed, none were found to have an illicit discharge that was confirmed. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.9.2.1 BRT_OF_02 - see map in Appendix 2 Mapbook*

Table 18: Water Quality Analysis Data for BRT-OF-02

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_2 | 7/30/2018 | yes | None | 7.9 | 594 | 0.27 | | NA | NA | | NA |
| BRT_OF_2 | 9/17/2018 | yes | None | 8 | 834 | 0.43 | 0.25 | NA | NA | Negative | Negative |
| BRT_OF_2_CIN | 9/17/2018 | yes | None | 8.1 | 295 | 0.23 | 0.25 | NA | NA | Negative | NA |

An initial visit to BRT-OF-02 was conducted in September of 2018. A stream feeds through a series of driveway culverts, intercepts a catchbasin in Vermont RV Sales and Services parking area, and continues to a discharge via an open channel into Whetstone Brook. Initial water quality readings were below thresholds but follow up visits were made in order to properly bracket the system and complete more comprehensive sampling. In September of 2018 a follow up visit showed slightly elevated levels of ammonia (0.43 mg/L) and detergents (0.25 ppm) at the outfall as well as slightly elevated levels of detergents (0.25 ppm) at the storm sewer's inlet. Optical brightener pads were left at the outfall as well as the storm sewer's inlet for a total of six weeks. Samples were taken and sent to ECS for ship and sniff analysis.

The optical brightener pad at the system inlet was not found upon return and the pad at the outfall tested negative for detergents. Ship and sniff results also came back negative for both locations. From our investigation results, we conclude that there is some level of RV (or other) washing activity that is reaching the storm drainage system. The issue will be referred to DEC Enforcement.

#### *3.9.2.2 BRT_OF_03 - see map in Appendix 2 Mapbook*

Table 19: Water Quality Analysis Data for BRT-OF-03

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_3 | 7/30/2018 | no | None | | | | | | | | Negative |
| BRT_CB148 | 9/17/2018 | yes | None | 7.7 | 244 | 0.87 | 3 | NA | NA | NA | Negative |
| BRT_CB166 | 9/17/2018 | yes | None | 7.9 | 173 | 0.88 | 3 | NA | NA | Positive | Negative |

An initial visit to BRT-OF-03 was conducted in July of 2018. The outfall could not be found and is suspected to be buried in a wooded area or submerged in the receiving stormwater pond. All three of the system's catchbasins were submerged in water. No samples were taken during the initial visit.

A follow up visit conducted in September of 2018 showed elevated levels of ammonia (0.87 and 0.88 mg/L) and detergents (3.0 ppm for both) within the catchbasins. Optical brightener pads were submerged in each

catchbasin and left for a total of six weeks. Ship and sniff samples were also taken and sent to ECS for analysis. While the ship and sniff sample tested positive for sewage, all optical brightener pads tested negative for detergents.

On November 8th, 2018 Watershed returned to perform dye testing on the system. Leader Home Centers was contacted and agreed to take part in the study. Dye was flushed through their sewer system at all possible sources including toilets, sinks, and drains. Dye was also flushed directly into the sewer system at the nearest upstream sewer manhole located on Marlboro Rd in front of American Traders furniture store. No dye was observed flushing into the storm system and optical brightener pads left in the catchbasins for 15 days showed no signs of staining and had no fluorescence (the dye flushed contains fluorescing agents).

An illicit discharge is not suspected as the elevated levels of ammonia may be attributed to decaying organic matter present in the catchbasins' ponded water. ECS has stated that dumpster wash off has tested positive for sewage in the past and that this happens for many reasons including to the disposal of diapers and other debris. We believe the dumpsters adjacent to the catchbasin system may be responsible for the positive ship and sniff results. It is recommended that maintenance be performed on the stormwater pond system as well as the upstream catchbasins to ensure proper drainage and treatment is provided. We also recommend that the Town reach out to the owner regarding better dumpster runoff and leachate management (i.e. covering the dumpster with a shed roof to eliminate regular runoff, speaking with trash haulers regarding spill management and cleanup, etc.

## *3.10 Bristol Results*

### 3.10.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted on July 10th, 2017, Watershed surveyed 14 different outfalls. Of the 14 outfalls visited, three were flowing and one had discharge that warranted further investigation. We focused on this outfall during our Advanced Investigation in Bristol.

### 3.10.2 Advanced Investigation (AI):

The lone system assessed was found to have an illicit discharge that was confirmed. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.10.2.1 BRS-OF-14 - see map in Appendix 2 Mapbook*

Table 20: Water Quality Analysis Data for BRS-OF-14

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRS_OF_14 | 7/10/2017 | yes | None | 3.2 | 2012 | 1.33 | NA | NA | NA | NA | NA |
| BRS_OF_14 | 12/10/2018 | yes | None | NA | NA | NA | NA | <1.0 | 0.07 | NA | NA |

An initial visit to BRS_OF_14 revealed levels of conductivity (2012 uS/cm) and ammonia (1.33 mg/L) above threshold. While pH was very low (3.2), this is likely due to probe malfunction. Upon speaking with Michael Kenyon, the facilities manager at Mt Abraham Union High School, it was revealed that the school's swimming pool was connected to the storm system. Arrangements were made for a follow up visit to investigate the source of the connection.

In October of 2018 a follow up visit was conducted to complete dye testing from the pool perimeter's drainage system. Dye poured into the floor drain promptly flowed through the storm manhole and discharged at the outfall. An illicit discharge was confirmed.

Due to the outfall's discharge to a large commercial sand pit with no direct connection to waters of the state, the illicit discharge is of no concern as long as bacteria levels posed no public health threat. On 12/10/2018 the outfall was tested for bacteria (<1.0 MPN) and phosphorus (0.07 mg/L). All tests revealed levels well below the threshold to be considered a threat to the environment or public health. The investigation is considered resolved and no work is required on the system.

## *3.11 Calais Results*

### **3.11.1** Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Calais in August of 2017. Of the four systems assessed, only two were flowing during dry weather. Results of the initial assessment in Calais are included in Appendix 1 – All Results Summary Table.

### **3.11.2** Advanced Investigation (AI):

No contaminants were detected above threshold; therefore, no systems were designated for further investigation.

## *3.12 Craftsbury Results*

### 3.12.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 20th, 2018 and August 13th, 2018, Watershed surveyed seven different outfalls. Of the seven outfalls visited, two were flowing and one had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Craftsbury.

### 3.12.2 Advanced Investigation (AI):

During the advanced investigation, no illicit discharge was confirmed. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.12.2.1 CBY-OF-07 - see map in Appendix 2 Mapbook*

Table 21: Water Quality Analysis Data for CBY-OF-07

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CBY_OF_7 | 7/24/2017 | yes | | 8.2 | 906 | 0.2 | 0.25 | NA | NA | NA | NA |
| CBY_OF_7 | 8/13/2018 | no | | | | | | NA | NA | NA | Negative |
| CBY-OTH-4-C-OUT-13 | 8/13/2018 | no | | | | | | NA | NA | NA | Negative |

In July 2017 preliminary analysis was performed on CBY-OF-07. While no parameters were above threshold, Watershed revisited the outfall as results were near threshold values and seemed to warrant a follow-up visit. On August 13th, 2018, CBY-OF-07 and CBY-OTH-4-OUT-13 were revisited. No flow was observed at either point and optical brightener pads were left for several weeks. Upon retrieval no flow was present at either point and both OB pads tested negative. Illicit discharge is not suspected at this location.

## *3.13 Danby Results*

### **3.13.1** Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Danby on June 13th, 2018. Of the four systems assessed, only one was flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Danby are included in Appendix 1 – All Results Summary Table.

### **3.13.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.14 East Montpelier Results*

### 3.14.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 13th, 2017 and October 5th, 2018, Watershed surveyed 18 different outfalls. Of the 18 outfalls visited, five were flowing and had discharge that warranted further investigation. We focused on these five outfalls during our Advanced Investigation in East Montpelier.

### 3.14.2 Advanced Investigation (AI):

Of the five systems assessed, four were found to have flow which caused suspicion of an illicit discharge. One was found to have a confirmed illicit discharge. One site may have an ongoing issues attributable to failed septic, while one site may be subject to unregulated 'fleet washing' of RVs to a catchbasin that drains directly to a tributary. One outfall was found to not have an illicit discharge. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.14.2.1 EMT-OF-1 - see map in Appendix 2 Mapbook*

Table 22: Water Quality Analysis Data for EMT-OF-01

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_1 | 8/15/2017 | yes | NA | 7.6 | 1230 | 0.42 | 0.25 | NA | NA | NA | NA |

Preliminary testing was conducted at EMT-OF-01 during August of 2017. The outfall exhibited low flow during dry weather with both ammonia (0.42 mg/L) and detergents (0.25 ppm) having values above threshold. Advanced investigation was completed in the fall of 2018. Watershed staff performed smoke testing on the outfall and witnessed no signs of crossover from the adjacent residential or commercial properties. Sewer vents and septic access ports showed no signs of crossover smoke throughout the test. It is likely that the ammonia result seen is due to the open drainage networks that enter the closed stormwater system above this outfall. Additionally, the stormwater system is located at a high-traffic area of East Montpelier, which could be contributing to the detergents result found here. Illicit discharge is not suspected at the outfall.

#### *3.14.2.2 EMT-OF-4 - see map in Appendix 2 Mapbook*

Table 23: Water Quality Analysis Data for EMT-OF-04

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_4 | 8/16/2017 | yes | Sewage Odor | 8 | 550 | 3.34 | 0.5 | NA | NA | NA | NA |
| EMT_OF_4 | 9/14/2017 | yes | Sewage Odor | 8.2 | 497 | 1.44 | 0.25 | NA | NA | NA | NA |
| EMT_OF_4 | 10/5/2017 | yes | NA | 7.9 | | 4.26 | 0.25 | 12 | 0.005 | Positive | NA |
| EMT_OF_4_CB | 9/14/2017 | yes | NA | 8.1 | 395 | 0.54 | 0.12 | NA | NA | NA | NA |
| EMT_OF_4Stream | 9/14/2017 | yes | NA | 8 | 354 | 0.14 | 0.12 | NA | NA | NA | NA |
| EMT_OF_4Stream | 10/5/2017 | yes | NA | 8.1 | 383 | -0.02 | 0 | 13 | 0.014 | Positive | NA |
| EMT_OF_4Kelton | 9/14/2017 | yes | NA | | | 0.37 | 0 | NA | NA | NA | NA |
| EMT_OF_4Kelton | 10/5/2017 | yes | NA | 8 | 422 | 0.48 | 0 | 20 | 0.01 | Negative | NA |
| EMT_OF_4Source | 9/14/2017 | yes | Rancid Odor | 7.7 | 284 | 2.04 | 0 | NA | NA | NA | NA |
| EMT_OF_4Source | 10/5/2017 | yes | NA | 7.5 | 274 | 1.64 | 0 | >2400 | 0.093 | Positive | NA |

An initial visit to EMT-OF-04 found numerous parameters to be well above threshold, Watershed staff also observed a strong smell of sewage at the outfall. According to nearby residents, the issue is due to factors

upstream where agricultural runoff washes downstream and is discharged at the outfall. The input stream was bracketed into four segments between the source and the outfall. This allowed Watershed to better geographically understand the source of contamination. While other areas of the drainage system had ammonia levels below or slightly above threshold, the outfall ammonia readings were generally significantly higher than other areas. This indicated that a direct connection was likely.

During advanced investigation, efforts were targeted around the outfall and its nearest catchbasin.

The following description of the issue, from Ryan McCall, DEC Environmental Enforcement Officer, describes the process for confirming the illicit discharge:

*"11/6/17 - Received a map from Watershed Consulting - shows where sampling has occurred (in Docs). Hits were confirmed non animal eColi (meaning human) from dog sniff tests. Smoke test needed to determine if either home's ww system is connected to the storm DI. Calls need to be made to home owners for authorization.*

*11/30/17 - On site*
*Met with Mr Crowthers. We discussed the ecoli hits and that the state wanted to do a smoke test to rule out any thing was coming from his home or the Burroughs' home. Crowthers said we could do the smoke test if the Burroughs are OK with it. He stated that they have been messed with by Hedges (Crystal Springs) so many times that they don't know who to trust and have just been avoiding all inquiries.*

*1/1/18 - Hold for winter...*

*9/28/18 - On site - got permission from Charles Crowthers to follow Jane Burroughs lead. Will now need to coordinate smoke test with WCA and VTRW.*

*10/23/18 - On site*
*CEEO McVeigh, Dana Allen - Watershed Consulting, Wayne Graham - Vermont Rural Water Assoc., Peter and Jane Burroughs.*

*Allen and Graham brought the smoke machine and placed it over the stormwater catch basin. They ran the unit for approximately 4 minutes and smoke came out the vent stack in the Burroughs' home. This indicated a cross connection of the wastewater and stormwater systems. We evacuated the pipe of smoke and ran it again to see if we could replicate the results. Again smoke came out of the wastewater vent stack on the Burroughs' home.*

*At this point, the Burroughs appeared stressed, so we (Allen, Graham, McVeigh and I) started to brainstorm where this cross connection was located. There were two 3" pipes that came into the drop inlet that weren't coming from driveway culverts or the brook that came from the hill behind the home. Peter Burroughs stated that the upper one was definitely from the downspouts and he was shocked that there wasn't smoke coming up out of those while we were testing. This pipe was running dry currently. The lower pipe had a trickle coming out of it and Burroughs stated that this pipe was the foundation drain from his house.*

*We then ran the smoke machine directly into the septic tank with the inlet to the tank blocked and saw smoke come out of the bottom drain pipe in the stormwater drop inlet. This indicated that there was a cross connection of some type between the septic tank or leachfield and the stormwater pipe.*

*Additionally - CEEO McVeigh and I inspected the outflow of the culvert to determine if Hedges had removed the valve as directed in his NOAV. after some digging we found the valve hidden under a few rocks along with a new hose connected to the end of the unit so that the jet of water exited further downstream than in the past. This will need to be followed up with Crystal Springs Water.(16EC01191)* (Watershed Note: This issue was noted by Watershed's field team and communicated to DEC as analysis point EMT_OF_NEW but noted in e-mail correspondence that water coming from the pipe did not look to be of concern for illicit discharge).

*10/25/18 - On site*
*I received a call from Jane Burroughs at approximately 1030HRS stating that she had an excavator on site that had dug up the tank to determine where the smoke had been coming in from. She put LLoyd Farnham (excavator) on the phone and he explained that there was only the in flow from the home to the septic tank and an out flow pipe from the septic tank to a leachfield and wanted further direction how to proceed. I stated that I would be out to the site in 30 minutes.*

*Lloyd Farnham Landscaping, Carl Fuller DEC Wastewater, Chase & Chase consulting, Jane and Peter Burroughs on site.*

*When I arrived I observed that the septic tank observation hatches were open and the tank had been pumped down. I confirmed what Farnham stated about the tank only having a single pipe in and a single pipe out. We discussed what to do next. I suggested we run a dye test on the outflow of the pipe to see if it would lead to the lower discharge pipe in the storm sewer drop inlet. We dyed it and ran a garden hose in the outflow pipe for close to 10 minutes with no green dye out the bottom pipe in the drop inlet. We next decided to try to dye the system from the lowest point in the house to see if it was connected in front of the septic tank. Very shortly after we ran the dye into the Burrough's kitchen sink and plugged the outflow pipe a faint shade of green began to flow from the lower discharge pipe.*

*This was indicative of a cross connection before the septic tank, so they dug up the distribution pipe from the house to see if there was a connection. No connections between the tank and where the steel pipe leaves the house were found.*

*At this point the Burroughs wanted to know what their options were. Farnham and I stated that a scope would be a good idea and Jane called Hartigan's to get a camera over to the house.*

*Hartigan's ran a scope into the suspect pipe (bottom pipe in drop inlet) and found that the pipe ran straight out toward the leachfield and tank and not at an angle to the house. We also saw that it was crushed in a couple of spots. Hartigan had a jet hose and jetted out the pipe to see if they could open it up some.*

*We decided to try to dye test the septic tank exit pipe again. This time we let the water run for close to 15 minutes. This resulted in a large volume of green dye coming out of the pipe. It appeared the pipe was designed to function as an overflow exit point if the leachfield was to become saturated, so that it would not back up into the house.*

*Hartigan ran a camera into the exit pipe of the septic tank and found a dry well just beyond the septic tank. The dry well showed three holes leaving the tank along the top of the tank. The green dye never made it up to elevation of those holes. It appeared that there may be an underdrain or perimeter drain intercepting flow from the dry well.*

*The next step was to stop the flow from the discharge pipe. First thought was that this would need to be dug up and capped. Ultimately it was decided that a plug would be put into the pipe from the drop inlet and then the hole would be filled with hydraulic cement. Farnham called Carl Fuller to see if this would be an acceptable repair.*

*Fuller authorized the repair as a minor repair that did not need permit authorization in an email dated 10/26/18.*

*10/29/18 - Phone Call*
*I called Jane Burroughs to see if the repair had been made to the system. She stated that it had been done Friday 10/26/18 and that they were also working with Chase & Chase to design a new system in the event that the plug repair did not work and their system failed. I asked Burroughs to send me pictures of the repair and materials for repair so I could close this complaint.*

*10/29/18 - Pictures of repair sent."*

DEC Enforcement considers the issue to be resolved at this point, though they do note that the repair to the existing system will likely cause the system to fail and will require installation of a new system at that time.

### 3.14.2.3 *EMT-OF-10 - see map in Appendix 2 Mapbook*

Table 24: Water Quality Analysis Data for EMT-OF-10

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_10 | 8/5/2017 | yes | None | 8.1 | 452 | 0.22 | NA | NA | NA | NA | NA |
| EMT_OF_10 | 9/27/2018 | yes | None | 8.2 | 504 | 0.19 | 0.25 | NA | NA | Positive | NA |

Water quality results at this outfall over the course of two assessments indicate the possibility, however faint, that there may be some source of illicit discharge making it to this stormwater system outlet. During the first visit on 8/5/2017 ammonia did not trigger threshold at 0.22 mg/L. However, MBAS was not assessed during this visit. With ammonia near threshold, a return visit was necessary to assess that and other factors.

The return visit, on 9/27/18, found ammonia once again below threshold at 0.19 mg/L with MBAS at threshold at 0.25 ppm. A sample for ECS ship and sniff was obtained. Both canines alerted on this sample. Bacteria and phosphorus were not sampled for during this visit.

The source of flow was observed to be water seeping from the toe of the ditch directly above the final catchbasin above the outfall. Based on the results of the ECS alert and the source of observed flow, a possible failed septic system was suspected. The issue was brought to the attention of Carl Fuller, Regional Engineer for VT DEC. Originally, Watershed suspected that the potentially failing septic system was associated with permit WW-5-1697. However, permit plans showed the system to be removed from the drainage area that would lead to the point of observed flow. Septage is pumped uphill from the building using a force main. Ryan McCall, Environmental Enforcement Office for the region, followed up with building owner, said to be DB Design. He summarized the conversation as follows:

*"I was on site and then had a pretty extensive conversation with DB of DB design, that owns the building. The water you are seeing seeping is actually coming out of a spring box and then excess discharges into the storm DI on the up hill side of the driveway and then into a culvert that goes under the driveway and into the swale where you were picking up the seep. Don (DB) was pretty concerned if there is E.coli in that water because he uses it to wash his face, hands and brush his teeth in the facility. He stated that Black Rock has been up hill a long time and has no idea what their septic system is like, and across the drive is the warehouse for East Montpelier Home Center and he stated that there is an apartment in that building.*

*I don't believe anything is running into that swale other than what comes off of DB's property, but not sure. He stated he had his primary tank pumped this spring as part of his 3yr maintenance process and then later in the summer, his collection tank where the pumps are had an alarm go off because something got caught on the pump and set the alarm off. So he had it pumped and the main tank pumped again. He also stated that he had to have his spring box cleaned out because there was a lot of sediment build up in it, so they dug it back out and then used mud pumps to get it sucked out and in good shape."*

Figure 6: Photo with descriptions of issues found at EMT-OF-10 with possible sources of illicit discharge.

Mr. McCall then conducted additional research into the East Montpelier Home Center (WW-5-2142) apartment's wastewater system. Mr. McCall stated that he didn't believe that either of the sites were built to specifications, at least with respect to the stormwater system and that the land above the point where flow was observed is all native sandy soils. From his observations of the site, it seems more likely that septage from the East Montpelier Home Center system might be making its way to the point of flow observed during field assessment.

From these observations, it seems unlikely that the source of flow and possible failed septic is from the system associated with permit WW-5-1697. It may be possible that the source is actually the system associated with WW-5-2142. However, as this information was being uncovered, winter conditions were

setting in (Mr. McCall was summarizing these observations in December 2018). This made further investigation infeasible.

This site and system may require further assessment when conditions permit. Mr. McCall indicated that he would be looking into this issue in the spring.

### 3.14.2.4 *EMT-OF-11 - see map in Appendix 2 Mapbook*

Table 25: Water Quality Analysis Data for EMT-OF-11

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_11 | 8/15/2017 | yes | None | 8.1 | 1628 | 0.35 | 0.25 | NA | NA | NA | NA |

Initial water quality analysis presented levels of ammonia (0.35 mg/L) and detergents (0.25 ppm) above threshold. In October of 2018 Watershed staff performed smoke testing on the outfall and witnessed no signs of crossover from the adjacent residential or commercial properties. Sewer vents and septic access ports showed no signs of smoke throughout the test. Illicit discharge is not suspected at the outfall.

### 3.14.2.5 *EMT-OF-18 - see map in Appendix 2 Mapbook*

Table 26: Water Quality Analysis Data for EMT-OF-18

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_18 | 8/16/2017 | yes | Sudsy Water | 8.1 | 719 | 4.5 | 0 | NA | NA | NA | NA |

Outfall EMT-OF-18 is on the private property of Mekkelsen RV Sales and Rentals. It is a single catchbasin system that drains the back parking/storage area and is located at the entrance to the maintenance garage. The outfall is located on a hillside with wild vegetation and could not be found, a sample was instead taken from the nearest upstream catchbasin. Ammonia was well above threshold at 4.5 mg/L and although detergents exhibited the minimum water quality value, the sample appeared very sudsy.

In October of 2018 Mekkelsen RV was contacted for permission to perform advanced investigation. Bruce Mekkelsen, who owns the dealership, was contacted via phone for permission to investigate the site further. He asked for additional information on the IDDE study via e-mail. The following e-mail was sent to him on October 16, 2018:

*"Thanks for talking with me today about our study. As I explained on the phone, we're looking for non-stormwater discharges into the stormwater drainage system (basically anything other than rainwater).*
*It sounds like your floor drains in your garages are not connected to your storm drains, but that wash water from outdoor RV washing might get into the drain system. That could definitely have triggered the water quality tests we ran.*

*The parameters we test for are:*

- ***Temperature**: The water tested from the catch basin was within the range of normal.*
- ***pH**: This is a measure of alkalinity or acidity. At 8.12, the water tested was slightly alkaline, but not excessively so.*
- ***Conductivity**: This is a measure of dissolved substances in water (things like minerals and salts). At 719, the water tested was somewhat high, but not over a concerning threshold.*

- ***Ammonia**: This is a measure of how much decaying organic matter is in water. The water tested was extremely high for this at 4.5 mg/L.*
- ***Detergents**: The water observed during the water quality testing on 8-15-17 was seen to be sudsy and smelled strongly of soap. However, our test for detergents came back negative. Whether this is a limitation of the test (it can't test for all possible detergent types) or a true indicator of the absence of soap, we're not certain.*

*At this point, based on the visual observation of soap and the high ammonia values, we'd like to conduct a smoke test to see if any floor drains are potentially connected to the catch basin. This would be the quickest and most definitive way to determine if there is any cross connection. Alternatively, we could also dye test from your floor drains to see if any dye appears in the catch basin.*

*This is a voluntary screening. If you don't want us to conduct the smoke testing, we'll note the results in our report to the VT Department of Environmental Conservation (DEC) and explain that it's likely that the water quality results were triggered by RV washing outside where the washwater could have gotten into the catch basins.*

*As I mentioned on the phone, we're going to be in the area next Tuesday, October 23 to conduct smoke testing at several other locations in East Montpelier and would ideally like to stop by then. If there's a time that's better for you, our window is basically anytime from 8:30AM to 3:30PM (we have a specific site appointment at 3:30PM that we have to make). "*

Watershed also contacted VT DEC regarding the issue to gain clarity on so-called 'fleet washing' issues (formally known as 'Washwater Discharges from Vehicle Washing'). This information was sent to Mr. Mekkelsen on October 17, 2018 with the following e-mail:

*"I wanted to follow up on our conversation from yesterday. I dug into the rules concerning washing vehicles a bit more and here's what I found:*

- *DEC prefers that wash water not be collected in a closed catch basin drain system and discharged somewhere where that water and the chemicals it contains would reach waters of the State via surface runoff.*
- *They require that you either have a 'closed loop' system with no discharge where you recycle the wash water, you install a holding tank that gets pumped out and treated in a wastewater treatment plant, you discharge to a sanitary sewer (or other onsite septic waste treatment system), or you limit washings to 30 vehicles or fewer per week (and discharge to the ground surface where water will infiltrate or evaporate and not get collected in a drain system and discharged). This last also prohibits the use of phosphorus-based soaps, you can't cause erosion, and any cleaners likes acids/bases, degreasers, metal brighteners can't be used, nor can you pressure wash engines or undercarriages.*
- *If you are washing outside, you must wash on an impervious surface (pavement/concrete, or packed gravel) and then have that water sheet flow to a vegetated area where it will infiltrate or evaporate (it can be collected into a catch basin and discharged to a single point).*

*If you are currently washing in the vicinity of the catch basins on your property, you should stop. If there is an area on your property that you can was on a paved/compacted surface that then sheet flows to a vegetated area where all the water will infiltrate or evaporate (and not cause erosion or run into waters of the State (i.e. the Winooski or any tributaries), then you should wash there."*

Mr Mekkelsen replied 'Yes and thank you!' to these e-mails on October 17, 2018. No further follow up was had from him. Watershed e-mailed him again on November 13, 2018 to attempt to conduct further testing (smoke or dye) but no response was obtained. The early onset of winter conditions prevented further investigation.

At this time, we suspect that Mekkelsen RV may conduct some level of 'fleet washing' on its property. It may be prudent to visit the property and speak with Mr. Mekkelsen to educate him on the regulations and his options regarding them. In conversations and e-mails, Mr. Mekkelsen does not seem completely unwilling to participate in the process, but may require encouragement from VT DEC to do so. The issue will be referred to DEC Enforcement.

## *3.15 East Middlebury Results*

### **3.15.1** Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between June 2017 and July 2018, Watershed surveyed five different outfalls. Of the five outfalls visited, none were flowing or had discharge that warranted further investigation. Therefore, no systems were designated for further investigation. Results of the initial assessment in Jericho are included in Appendix 1 – All Results Summary Table.

### **3.15.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.16 Eden Results*

### **3.16.1** Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Eden on July 20th, 2017. One system was assessed and was flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Eden are included in Appendix 1 – All Results Summary Table.

### **3.16.2** Advanced Investigation

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.17 Fairfield Results*

### 3.17.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September 2018, Watershed surveyed five different outfalls. Of the five outfalls visited, three were flowing and two had discharge that warranted further investigation. We focused on these two outfalls during our Advanced Investigation in Fairfield.

### 3.17.2 Advanced Investigation (AI):

Of the two systems assessed, none were found to have an illicit discharge that was confirmed.

What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.17.2.1* *FFD-OF-01 - see map in Appendix 2 Mapbook*

Table 27: Water Quality Analysis Data for EMT-OF-18

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FFD_OF_1 | 7/18/2017 | yes | None | 8.6 | 1159 | 1.41 | 0.5 | NA | NA | | NA |
| FFD_OF_1 | 9/19/2018 | no | None | | | | | NA | NA | | NA |
| FFD_OF_1_CB_10 | 9/19/2018 | yes | None | 8.2 | 676 | 3.26 | 2.5 | NA | NA | Positive | NA |

In July of 2017 FFD_OF_1 was visited for the first time. Ammonia and detergent levels were above threshold with values of 1.41 mg/L and 0.5 ppm, respectively. As advanced investigation follow up, Watershed staff in conjunction with Vermont Rural Water Association performed smoke testing on the outfall and witnessed no signs of crossover from the adjacent residential or commercial properties. Sewer vents and septic access ports showed no signs of smoke discharge throughout the test.

The outfall was visited again in September of 2019 and while no discharge appeared at the outfall, samples were taken from the sump of upstream catchbasin FFD_OF_1_CB_10. Ammonia and detergents were above threshold and a sample was taken for ship and sniff analysis by Environmental Canine Services. According to ECS, the sample tested positive for sewage.

We suspect that these results are due in part to the wash off from an adjacent gas station and auto repair facility (Stone's Shell Station), both of which have the potential for higher than usual amounts of substances which may contain MBAS (petroleum products are known to contain MBAS, as well as windshield washing fluid or other detergents used to wash or clean cars at the auto repair shop). ECS has stated that dumpster washoff has tested positive for sewage in the past, this happens for many reasons including but not limited to the disposal of diapers. As opposed to the flow sample taken in 2017, the sampling done in September of 2018 was taken from the catchbasin sump which may be why it contained a greater loading of pollutants.

No illicit discharge is suspected at this outfall as smoke testing eliminated the possibility of a direct connection and it is highly likely the contaminant levels are due to a build up in the drainage system overtime.

#### *3.17.2.2* *FFD-OF-04 - see map in Appendix 2 Mapbook*

Table 28: Water Quality Analysis Data for FFD-OF-04

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FFD_OF_4 | 7/18/2017 | yes | | | | | | NA | NA | NA | NA |
| FFD_OF_4_C_IN_25 | 9/19/2018 | yes | | 7.9 | 1993 | 1.08 | 0.75 | NA | NA | NA | NA |

Preliminary analysis of FFD_OF_04 was performed in July of 2017. While flow was documented in the stream bed, no water quality parameters were tested. Watershed returned in September of 2018 to perform a water quality analysis. Ammonia and detergent levels were above threshold at 1.08 mg/L and 0.75 ppm, respectively. It is believed that a large manure pit north of the stream may have influenced the results. Further sampling and bracketing of the system was scheduled for the fall of 2018 but due to time constraints and early snowfall this was unable to be completed. This investigation is inconclusive.

## *3.18 Fayston Results*

### 3.18.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September, 2018, Watershed surveyed four different outfalls. Of the four outfalls visited, two were flowing and one had discharge that warranted further investigation. We focused on this outfall during our Advanced Investigation in Fayston.

### 3.18.2 Advanced Investigation (AI):

Of the system assessed, illicit discharge was not confirmed for this outfall, though it is possible that water quality results may be influenced by septic system leachate or other dilute septage. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.18.2.1 FAY-OF-05 - see map in Appendix 2 Mapbook*

Table 29: Water Quality Analysis Data for FAY-OF-05

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FAY_OF_5 | 9/18/2018 | yes | None | 7.8 | 25 | 0.29 | 0.25 | 870 | 0.01 | Yes | N/A |
| FAY_OF_5_STREAM_1 | 9/18/2018 | yes | None | 7.8 | 43 | 0.33 | 0.5 | N/A | N/A | Yes | N/A |
| FAY_OF_5_STREAM_2 | 9/18/2018 | yes | None | 7.7 | 60 | 0.29 | 0.25 | N/A | N/A | Yes | N/A |
| FAY_OF_5_STREAM_3 | 11/12/2018 | yes | None | 9.2 | 93 | 0.21 | 0 | 1 | N/A | Yes | N/A |
| FAY_OF_5_STREAM_4 | 11/12/2018 | yes | None | 9 | 43 | 0.25 | 0 | 6.3 | N/A | Indeterminate | N/A |
| FAY_OF_5_STREAM_5 | 11/12/2018 | yes | None | 8.9 | 42 | 0.21 | 0 | 6.3 | N/A | Indeterminate | N/A |
| FAY_OF_5_STREAM_6 | 11/12/2018 | yes | None | 9.5 | 26 | 0.21 | 0 | 0 | N/A | No | N/A |

*Of Note: This 'outfall' is actually a point on an unnamed tributary to Chase Brook located below the parking areas for Sugarbush's Mt. Ellen area.*

This point was first investigated on 9/18/18. Ammonia was above threshold at 0.29 mg/L and MBAS was 0.25 ppm. It was sampled for *E. coli* which was found to be 870 MPN with total phosphorus at 0.01 mg/L. A sample was sent to ECS for ship and sniff testing, which came back positive for human sewage.

Two other points were also tested at this time, STREAM-1 and STREAM-2 which are the two primary sub-tributaries to FAY-OF-5. Similar results were found to FAY-OF-5. STREAM-1 had ammonia at 0.33 mg/L with MBAS at 0.5 ppm and a positive alert for human sewage by ECS. STREAM-2 had ammonia at 0.29 with MBAS at 0.25 ppm and a positive alert for human sewage by ECS. Neither was sampled for *E.* coli or total phosphorus. It was hoped that this bracketing would indicate that one tributary or the other was responsible for the positive ECS alert at FAY-OF-5

Follow-up investigation was conducted on 11/18/19 on four additional points above STREAM-1 and STREAM-2.

STREAM-3 and STREAM-4 are above a small holding pond and flow to STREAM-2. Both had similar results with respect to ammonia, MBAS, and *E. coli* (ammonia was generally at or below threshold, MBAS was not present, and *E. coli* was well below threshold, which could have been a function of temperature at the time of sampling). ECS ship and sniff results were varied. STREAM-3 came back positive (for three different tests by the canines) while STREAM-4 was indeterminate (two of three tests were positive by the canines).
STREAM-5 and STREAM-6 are above STREAM-1. STREAM-5 is below a small condominium development while STREAM-6 is above it. Results for these points were largely similar with ammonia, MBAS, and *E. coli*

below threshold values and largely similar to the values seen at STREAM-1 and STREAM-2 on the same date. Regarding canine alerts, STREAM-5 came back indeterminate (two of three tests were positive) while STREAM-6 came back negative.

The results don't clearly point to a source of potential illicit discharge for this point. Given the drainage area to this point with its relatively sparse development, it seems unlikely that there is a definite point-source to which to attribute an illicit discharge. However, there is the possibility that the canines are alerting on a diffuse source of septic system leachate entering the tributary. Of the six points sampled, it seems possible that the area associated with STREAM-3 and STREAM-4 are more likely to contain a source of leachate which may be influencing results.

This area could be re-assessed using canine field investigation, given the likelihood that there is a non-point source of illicit discharge. However, the indicators of the presence of serious, chronic illicit discharge at this point are low. While we can't definitively rule that possibility out, it does not seem likely. This site may be the site of future Advanced Investigation as part of a subsequent VT DEC IDDE study.

## *3.19 Ferrisburgh Results*

### **3.19.1** Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September 2018, Watershed surveyed nine different outfalls. Of the nine outfalls visited, six were flowing but none had contaminant concentrations above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Ferrisburgh are included in Appendix 1 – All Results Summary Table.

### **3.19.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.20 Greensboro Results*

### 3.20.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted in the summer of 2018, Watershed surveyed nine different outfalls. Of the nine outfalls visited, five were flowing and two had discharge that warranted further investigation. We focused on these two outfalls during our Advanced Investigation in Greensboro.

### 3.20.2 Advanced Investigation (AI):

Of the two systems assessed, one was found to have an illicit discharge that was confirmed. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.20.2.1 GRN-OF-06 - see map in Appendix 2 Mapbook*

Table 30: Water Quality Analysis Data for GRN-OF-06

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRN_OF_6 | 7/26/2017 | yes | None | 8.3 | 1285 | 0.17 | 0.25 | NA | NA | NA | NA |

Initial water quality analysis showed detergent levels above threshold (0.25 ppm). Smoke testing was performed in October 2018 and revealed no direct connections to any adjacent infrastructure. Upon talking to staff at The Willey's Store it was revealed that mop water is frequently dumped on the pavement next to the storm system's most downstream catchbasin. The onsite staff were advised that this is in fact an illicit discharge and violates rules set forth by the Vermont DEC. Numerous phone calls were made to the store's owner and messages were left for him. No response was ever received by Watershed. While staff at the store were understanding of the need to not dump mop water into the catchbasin, the store's owner may need to be made aware of this issue. It may be prudent to have a member of VT DEC's Enforcement staff place a phone call to ensure that the message was received and is being adhered to.

#### *3.20.2.2 GRN-OF-09 - see map in Appendix 2 Mapbook*

Table 31: Water Quality Analysis Data for GRN-OF-09

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRN_OF_9 | 7/26/2017 | yes | None | 8.3 | 73 | 0.42 | 0.25 | NA | NA | NA | NA |

The GRN-OF-09 system drains the area surrounding the newly constructed Highland Center for the Arts (HCA). Advanced investigation was utilized due to values of ammonia (0.42 mg/L) and detergents (0.25 ppm) exceeding threshold. In October 2018 Watershed and Vermont Rural Water Association were granted access by the HCA to perform smoke testing at the location. Liquid smoke was injected into the system's catchbasins while Watershed team members and HCA staff observed the building interior and rooftop sanitary sewer vents for any signs of crossover. The HCA has an onsite wastewater treatment system on the hillside above it – no smoke was observed coming from any of the gas vents associated with this system. No smoke was observed anywhere on the property or in the building. Illicit discharge at this outfall is unlikely.

## *3.21 Hardwick Results*

### 3.21.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted on July 26th, 2017, Watershed surveyed three different outfalls. Of the three outfalls visited, one was flowing but did not have discharge that warranted further investigation. Therefore, no systems were designated for further investigation. Results of the initial assessment in Hardwick are included in Appendix 1 – All Results Summary Table.

### 3.21.2 Advanced Investigation (AI)

No contaminants were detected above threshold; therefore, no systems were designated for further investigation.

## *3.22 Hinesburg Results*

### 3.22.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September 2018 Watershed surveyed 27 different outfalls. Of the 27 outfalls visited, six were flowing and four had discharge that warranted further investigation. We focused on these four outfalls during our Advanced Investigation in Hinesburg.

### 3.22.2 Advanced Investigation (AI):

Of the four systems assessed, none were found to have an illicit discharge that was confirmed. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.22.2.1 HIN-OF-11 - see map in Appendix 2 Mapbook*

Table 32: Water Quality Analysis Data for HIN-OF-11

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_11 | 7/13/2017 | yes | None | 7.8 | 2451 | 0.35 | 0.25 | NA | NA | NA | NA |

HIN-OF-11 drains a large impervious area including VT Route 116, Hinesburg Community School, and H&M Service Station. Water quality results yielded above threshold values for conductivity (2451 uS/cm), ammonia (0.35 mg/L), and detergents (0.25 ppm) prompting the need for advanced investigation. Smoke testing was complete by Watershed in conjunction with Vermont Rural Water Association. Smoke was injected into both the storm system and the sanitary sewer. No cross over was found between the systems nor was any smoke observed discharging from any adjacent buildings. Illicit discharge at this outfall is considered unlikely based on the results of smoke testing.

#### *3.22.2.2 HIN-OF-13 - see map in Appendix 2 Mapbook*

Table 33: Water Quality Analysis Data for HIN-OF-13

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_13 | 7/13/2017 | yes | None | 7.7 | 1891 | 0.52 | 0.5 | NA | NA | NA | NA |

HIN-OF-13 was submerged in a saturated drainage ditch at the time of testing so all water quality sampling was done from the nearest upstream catchbasin. Following an analysis which yielded above threshold values of ammonia (0.52 mg/L) and detergents (0.5 ppm), smoke testing was pursued as the most feasible form of advanced investigation. Smoke was injected into both the storm and sanitary sewers. No crossover was observed between the two, nor was any smoke observed coming from adjacent buildings sanitary sewer gas vent pipes. Illicit discharge at this outfall is considered unlikely based on the results of smoke testing.

#### *3.22.2.3 HIN-OF-17 - see map in Appendix 2 Mapbook*

Table 34: Water Quality Analysis Data for HIN-OF-17

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_17 | 7/12/2017 | no | poor pool quality | NA | NA | NA | NA | NA | NA | NA | NA |
| HIN_OF_17 | 9/17/2018 | yes | None | 7.7 | 2107 | 0.33 | NA | NA | NA | NA | NA |
| HIN_OF_17 | 11/12/2018 | yes | None | 7.2 | 1379 | 0.12 | 0.75 | 10 | 0.04 | Positive | NA |
| HIN_OF_17_CLVO_001 | 11/12/2018 | yes | None | 7.6 | 1213 | 0.26 | 0.5 | 41 | NA | Positive | NA |
| HIN_OF_17_CB_001 | 11/12/2018 | yes | None | 7.7 | 1567 | 0.17 | 0.25 | 10 | NA | Positive | NA |

HIN-OF-17 drains a network of grass swales encircling two large commercial properties. On each visit the outfall has been partially submerged in standing water of poor quality. Samples were taken from this pool as well as the nearest catchbasin (HIN-OF-17-CB-001) and culvert inlet (HIN-OF-17-CLVO-001). On several occasions the system exceeded threshold values of conductivity, ammonia, and detergents. These results are not overly surprising given that the area and adjacent road (Route 116) are heavily used, which would lead to the higher detergents seen, as well as the high conductivity readings. Additionally, the ammonia results could be attributed to the large open drainage system with its organic matter in chronic saturated condition. Samples taken for bacteria and phosphorus remained below threshold. All three locations tested positive for sewage when samples were sent to Environmental Canine Services. We suspect this is due to the prevalence of dumpsters in the area that may run off to the open drainage system and the possibility that diapers may be disposed of within those dumpsters. Given these factors, chronic illicit discharge at this outfall is unlikely.

#### *3.22.2.4* *HIN-OF-18 - see map in Appendix 2 Mapbook*

Table 35: Water Quality Analysis Data for HIN-OF-18

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_18 | 7/17/2017 | yes | None | 8.1 | 739 | 0.49 | 0.25 | NA | NA | NA | NA |

HIN-OF-18 is a one catchbasin system that drains a small residential drainage ditch. Following an analysis which yielded high levels of ammonia (0.49 mg/L) and detergents (0.25 ppm), smoke testing was pursued as the most feasible form of advanced investigation. Smoke was injected into the storm system. No smoke was observed discharging from any of the adjacent buildings sewer vent pipes. This system is connected to a permitted system (HIN-OF-19). In conjunction with that system's testing negative for potential illicit discharge, and the smoke testing conducted at HIN-OF-18, we conclude that there is no issue at this outfall.

## *3.23 Huntington Results*

### **3.23.1** Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July and October of 2017, Watershed surveyed five different outfalls. Of the five outfalls visited, two were flowing and none had discharge that exceeded acceptable standards. Therefore, no systems were designated for further investigation. Results of the initial assessment in Huntington are included in Appendix 1 – All Results Summary Table.

### **3.23.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.24 Hyde Park Results*

### 3.24.1 Outfall Reconnaissance Inventory (ORI):

During ORI, Illicit discharge detection was performed in Hyde Park between July 2017 and September 2018. Of the four systems assessed, only one was flowing during dry weather and had discharge that warranted further investigation. We focused on this outfall during our Advanced Investigation in Hyde Park.

### 3.24.2 Advanced Investigation (AI):

The system was assessed using multiple forms of advanced investigation but no illicit discharge was confirmed. What follows is a summary of the outfall (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.24.2.1 HDP_OF_01 - see map in Appendix 2 Mapbook*

Table 36: Water Quality Analysis Data for HDP_OF_01

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HDP_OF_1 | 7/20/2017 | yes | None | 7.6 | 629 | 0.56 | 0 | NA | NA | NA | NA |
| HDP_OF_1 | 9/19/2018 | no | None | NA | NA | NA | NA | NA | NA | NA | Negative |
| HDP_OF_1_CB_6 | 9/19/2018 | yes | Sewer Odor | 7.3 | 778 | 99 | 0.25 | >2400 | 0.4 | Positive | NA |

Initial investigation was conducted on July 20th, 2017. During this visit Watershed staff discovered values of ammonia (0.56 mg/L) to be above threshold. A follow up visit to the outfall in September 2018 showed no flow at the outfall, but slight flow into an upstream catchbasin (HDP-OF-1-CB-6). Upon further investigation, a sewer odor was observed coming from the catchbasin. Water quality analysis was performed and revealed levels of ammonia (99 mg/L), detergents (0.25 ppm), and bacteria (>2400 MPN) well above the acceptable standard. Note that the ammonia value as reported here may be incorrect and the result of a transcription error. A ship and sniff sample was collected and upon analysis from Environmental Canine Services tested positive for sewage.

On October 23rd, 2018 Watershed staff returned to the location to conduct advanced investigation. Smoke was injected into the catchbasin and all nearby homes and businesses were observed for smoke, no crossover connections were found. Dye was then poured into all toilets, sinks, and drains in Round Hill Kids Child Care Center and the residence at 5169 VT-100. No dye was observed at the outfall. An optical brightener pad was left for a period of 16 days. No dye was observed on the pad nor did the pad test positive for optical brighteners. Jim Pease from VT DEC investigated the wastewater permit for this location and found that there was a septic permit issued for the property, but may actually be attributed to another building. Mr. Pease believes there to be an issue with the wastewater system here and will be conducting follow-up investigation as a result.

Figure 7: Picture of pipe from 5169 VT-100 at HDP_OF_01.

Watershed staff did observe at 5169 VT-100 that some suspect plumbing had once been connected from the residence to a large metal culvert set vertically in the lawn that seemed to function as some sort of dry well. This 'dry well' was in-line with the stormwater system for HDP_OF_01. The pipe from the residence to the 'dry well' was no longer connected, but it appears to have been connected at some point in the past to a sump where the house's sanitary sewage was also routed. Though no longe seemingly functioning, this is issue should be investigated b the Regional Wastewater Engineer.

It is not conclusively known what caused the canine alert o the sample obtained from the catch basin as smoke and dy testing were both inconclusive regarding any sort of direc connection. It may be that some septic system leachate may ente the basin as groundwater flow, as the onsite system fo the childcare center is above the catchbasin. However, dy testing and subsequent optical brightener testing did no substantiate this. This system will be subject to futur Advanced Investigation under a separate VT DEC IDDE stud as evidence suggests that there may be an ongoing illic discharge at this location.

Figure 8: Pipe entering the metal culvert 'dry well'.

Figure 9: Pipe in the basement of 5169 VT-100 cut off from the main sewage pipe.

## *3.25 Irasburg Results*

### 3.25.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and August 2018 Watershed surveyed three different outfalls. Of the three outfalls visited, one was flowing and had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Irasburg.

### 3.25.2 Advanced Investigation (AI):

The system assessed was not found to have a confirmed illicit discharge. What follows is a summary, site by site, of each of the outfalls (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.25.2.1 IRA-OF-02 - see map in Appendix 2 Mapbook*

Table 37: Water Quality Analysis Data for IRA-OF-02

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IRA_OF_2 | 8/20/2017 | yes | None | 8.4 | 1795 | 0.23 | 0.25 | NA | NA | NA | NA |
| IRA_OF_2 | 8/13/2018 | no | None | | | | | | | NA | NA |

Detergent values were above threshold during our initial investigation at 0.25 ppm. This indicated that advanced investigation might be warranted. Smoke testing was deemed the most feasible form of advanced investigation. Smoke was injected into the storm system by Vermont Rural Water Association and Watershed. No smoke was observed in any of the adjacent buildings or their sewer vents. Based on the result of smoke testing, the relatively low values seen during water quality testing (and the lack of flow on a follow-up visit), along with the lack of a municipal sanitary sewer system, we consider illicit discharge unlikely at this outfall. The water quality results seen during the initial visit are more likely due to road washoff from the heavily used section of road that drains to this system.

## *3.26 Jericho Results*

### **3.26.1** Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and August 2018, Watershed surveyed three different outfalls. Of the three outfalls visited, one was flowing but did not have discharge that warranted further investigation. Therefore, no systems were designated for further investigation. Results of the initial assessment in Jericho are included in Appendix 1 – All Results Summary Table.

### **3.26.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.27 Lowell Results*

### 3.27.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Lowell on July 20th, 2017. Of the four systems assessed, none were flowing during dry weather, therefore no systems were designated for further investigation. Results of the initial assessment in Lowell are included in Appendix 1 – All Results Summary Table.

### 3.27.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.28 Middlesex Results*

### 3.28.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Middlesex in July 2017 and July 2018. Of the nine systems assessed, only one was flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Middlesex are included in Appendix 1 – All Results Summary Table.

### 3.28.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.29 Mount Holly Results*

### 3.29.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between June 2017 and September 2018, Watershed surveyed five different outfalls. Of the five outfalls visited, five were flowing and one had discharge that warranted further investigation. We focused on this one outfall during our Advanced Investigation in Mount Holly.

### 3.29.2 Advanced Investigation (AI):

Of the five systems assessed, one is suspected of an illicit discharge. What follows is a summary of the outfall (or other infrastructure within the outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.29.2.1 MTH-OF-02 - see map in Appendix 2 Mapbook*

Table 38: Water Quality Analysis Data for MTH-OF-02

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MTH_OF_2 | 9/17/2018 | yes | None | 7.9 | 145 | 0.38 | 0.25 | NA | NA | NA | NA |
| MTH-OTH-23-OF-67 | 11/8/2018 | yes | None | 8.5 | 562 | 0.29 | 0.25 | 1 | 0.023 | Positive | NA |
| MTH-OF-01-Inlet | 11/8/2018 | yes | none | 8.9 | 110 | 0.32 | 0 | 7.4 | 0.017 | Inconclusive | NA |
| MTH-OTH-16-CB-62 | 11/8/2018 | yes | None | 8.4 | 493 | 0.29 | 0.25 | 6.2 | 0.049 | Positive | NA |

Outfall MTH-OF-02 is the daylight point for an underground stream discharging from Star Lake. Several storm systems discharge into the stream between MTH-OF-02 and the stream's headwaters, Star Lake. Between September and November of 2018 all upstream systems were analyzed to better understand the source of a possible illicit discharge to point MTH-OF-02. While all tests revealed levels of ammonia and/or detergents just above threshold, bacteria tests were below threshold. Two of the systems tested positive for the presence of sewage by Environmental Canine Services and one came back inconclusive.

Due to weather and time constraints, further investigation was not performed at this outfall. The investigation remains inconclusive.

## *3.30 Newport Town Results*

### 3.30.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Newport Town in August 2018. Of the two systems assessed, none were flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Newport Town are included in Appendix 1 – All Results Summary Table.

### 3.30.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.31 Orwell Results*

### 3.31.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between June 2017 and August 2018, Watershed surveyed five different outfalls. Of the five outfalls visited, three were flowing but none had discharge that warranted further investigation. No contaminants were detected above threshold; therefore, no systems were designated for advanced investigation. Results of the initial assessment in Orwell are included in Appendix 1 – All Results Summary Table.

### 3.31.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.32 Shoreham Results*

### **3.32.1** Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September 2018, Watershed surveyed five different outfalls. Of the five outfalls visited, four were flowing but none had discharge that warranted further investigation. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Shoreham are included in Appendix 1 – All Results Summary Table.

### **3.32.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.33 East Wallingford Results*

### **3.33.1** Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in East Wallingford between June 2017 and August 2018. Of the three systems assessed, one was flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in East Wallingford are included in Appendix 1 – All Results Summary Table.

### **3.33.2** Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.34 Warren Results*

### 3.34.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted between July 2017 and September 2018, Watershed surveyed 28 different outfalls. Of the 28 outfalls visited, 18 were flowing but none had discharge that warranted further investigation. No contaminants were detected above threshold; therefore, no systems were designated for advanced investigation. Results of the initial assessment in Warren are included in Appendix 1 – All Results Summary Table.

### 3.34.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

## *3.35 Washington Results*

### 3.35.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Washington between August and November of 2018. Of the 10 systems assessed, five were flowing during dry weather. No contaminants were detected above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Washington are included in Appendix 1 – All Results Summary Table.

### 3.35.2 Advanced Investigation (AI):

While preliminary analysis of all study outfalls did not require any advanced investigation work, an additional scope of work was requested by the Vermont DEC to investigate water quality along an unnamed tributary to the Jail Branch which flows through the town of Washington. Six points were designated for analysis, three of which bracketed the stream through the village (upstream, midstream, and downstream of the village center). The remaining points were unknown pipes discharging from private properties along the stream. These outfalls are designated WSH_OF_NEW_001, WSH_OF_NEW_002, and WSH_OF_NEW_003. Water quality results and detailed summaries for each point can be found below. A map of the sites can be found in Appendix 2 Mapbook.

Table 39: Water Quality Analysis Data for Washington Stream Assessment (Jail Branch Tributary)

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WSH - Downstream | 10/26/2018 | yes | None | 8.5 | 375 | 0.12 | 0 | 26 | <.01 | Negative | Negative |
| WSH - Midstream | 10/26/2018 | yes | None | 8.4 | 330 | 0.15 | 0 | 20 | <.01 | Negative | Negative |
| WSH - Upstream | 10/26/2018 | yes | None | 8.5 | 360 | 0.14 | 0 | 15 | <.01 | Negative | Negative |
| WSH_OF_NEW_001 | 10/26/2018 | no | None | | NA | NA | NA | NA | NA | NA | Negative |
| WSH_OF_NEW_002 | 10/26/2018 | yes | None | 8.2 | 711 | 0.13 | 0.75 | <1.0 | <.01 | Positive | Negative |
| WSH_OF_NEW_003 | 10/26/2018 | no | None | | NA | NA | NA | NA | NA | NA | Negative |

The stream points chosen for this study were done so with the intention of bracketing the more developed area of Washington's downtown. WSH-Upstream marks the point at which an increase in infrastructure and development begin, closely aligned with the intersection of VT-110 and W Corinth Rd. WSH-Midstream falls in the center of town, parallel to the Washington Fire Department. WSH-Upstream was sampled just before the stream merges with Jail Branch. All three points provided water quality results well below thresholds including negative hits on ship and sniff samples and optical brightener pads. According to this preliminary analysis, no water quality degradation is occurring as the stream flows through Washington's downtown area.

Additional Outfalls 001 and 003 contained no flow but OB pads were left for several weeks, both of which came back negative for optical brighteners. Outfall 002, a perforated underdrain, had slight flow and detergent levels above threshold (0.75 ppm). While OB pad results came back negative, the ECS ship and sniff sample was returned positive for the presence of sewage. Due to the fact that other typical indicators tested below threshold (bacteria at <1.0 MPN and ammonia at 0.13 mg/L) we believe this is not a direct illicit discharge. The canine alert is likely due to the presence of septic leachate seeping into the underdrain pipe as there appears to be septic mound directly above this pipe. This system does not appear to meet the definition of a failed septic system (septage surfacing on the ground), nor does the effluent from the pipe exceed the bacteria threshold, at least from this one test. As a result, we do not believe that this constitutes a chronic illicit discharge. However, we do recommend that the Friends of the Winooski River conduct outreach to the owner of 3018 VT-110 in Washington, VT and schedule a dye test with accompanying OB pad test to determine if the connection is from the residence.

## *3.36 West Fairlee Results*

### 3.36.1 Outfall Reconnaissance Inventory (ORI):

During the ORI, which was conducted on September 26th, 2018, Watershed surveyed one outfall in West Fairlee. During the visit, the outfall had flow during dry weather and produced a discharge that warranted further investigation. We focused solely on this outfall during our Advanced Investigation in West Fairlee.

### 3.36.2 Advanced Investigation (AI):

During advanced investigation the system was not found to have an illicit discharge that was confirmed. Due to weather and time constraints, analysis could not be finalized and may require further assessment. What follows is a summary of the site (or other infrastructure within an outfall's drainage system) suspected of possible illicit discharge. Water quality data is presented for all dates visited. Fields left blank in the table represent water quality parameters that were not tested.

#### *3.36.2.1 WFL-OF-01 - see map in Appendix 2 Mapbook*

Table 40: Water Quality Analysis Data for WFL-OF-01

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WFL_OF_1 | 9/26/2018 | yes | Color | 8.2 | 1256 | 0.21 | 1 | NA | NA | NA | NA |

Initial investigation into outfall WFL_OF_01 was conducted on September 26th, 2018. The outfall was partially submerged in sediment so samples were collected from the nearest upstream catchbasin. Very small amounts of water were flowing into the pump via a pipe connecting a lateral catchbasin. No flow was observed in the other catchbasin so it was assumed the flow was entering the pipe via an unknown underground source. Preliminary water quality analysis showed high results for detergents (1.0 ppm) and total chlorine (0.4 mg/L). High levels of chlorine can influence the outcome of detergents' test so it is believed the detergents results are skewed as a result.

Staff at B&B Cash Market were asked if any mop water or other unauthorized water is dumped from the premises into the storm system. They stated no wash water is ever discharged outside and were unaware of any other possible sources of illicit flows entering the storm system. The town was then contacted to find possible sources of chlorine to the system. It was made clear that no water lines are present in the area of this outfall and the town does not chlorinate during its treatment processes. This reduces the possibility of water pipe connections being the source of chlorine. While no source of chlorine is evident, it is possible that trace chlorine entered the catchbasin sump due to recent washings by nearby residents or the Ervine W Eastman Garage. No chronic illicit discharge is suspected at this outfall.

## *3.37 Worcester Results*

### 3.37.1 Outfall Reconnaissance Inventory (ORI):

Illicit discharge detection was performed in Worcester in September 2018. Only one system was designated for analysis in Worcester. The system produced flow during dry weather but did not yield contaminants above threshold; therefore, no systems were designated for further investigation. Results of the initial assessment in Worcester are included in Appendix 1 – All Results Summary Table.

### 3.37.2 Advanced Investigation (AI):

No contaminants were detected above thresholds; therefore, no systems were designated for further investigation.

# 4 RECOMMENDATIONS FOR FUTURE ACTION

## *4.1 Albany – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Albany.

## *4.2 Alburgh– Future Action Recommendations:*

- ALB-OF-04: Further smoke/dye testing should be completed at this outfall to ensure the issue has been resolved following repairs made by the town.

## *4.3 Bakersfield– Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Bakersfield.

## *4.4 Barre – Future Action Recommendations:*

- BC110: Follow-up sampling should be conducted six months to one year from last date of inspection.

## *4.5 Barnard – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Barnard.

## *4.6 Barnet – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Barnet.

## *4.7 Bennington – Future Action Recommendations:*

- BNT-OF-01: Given the complexity of the stormwater system at this location, the additional recommendations are included in a newly issued scope of work by the VT DEC. This work is included in "IDDE – Basin 1 & 12".

## *4.8 Brattleboro – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Brattleboro.

## *4.9 Bristol – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Bristol. The pool at the high school does discharge to one outfall, however.

## *4.10 Calais – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Calais.

## *4.11 Craftsbury – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Craftsbury.

## *4.12 Danby – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Danby.

### *4.13 East Montpelier – Future Action Recommendations:*

- EMT-OF-04: A direct connection from a residential septic tank to a stormwater catcbasin was drained, cut, and repaired. Carl Fuller authorized the repair as a minor repair that did not need permit authorization. Repairs have been verified by VT DEC enforcement and the issue is considered resolved.
- EMT_OF_NEW: This appears to be an ongoing violation associated with the Crystal Springs development and is being pursued by VT DEC Enforcement.
- EMT-OF-10: This issue may be a failed septic system entering an open drainage ditch, or other septic system leachate. This issue will be further investigated by DEC Enforcement in the spring of 2019.
- EMT-OF-18: The possibility of an illicit discharge from 'fleet washing' is suspected at this location. Further access was not granted by the property owner, Mekkelsen RV Sales and Rentals. The matter is referred to the Vermont DEC Environmental Enforcement Division.

### *4.14 Eden – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Eden.

### *4.15 Fairfield – Future Action Recommendations:*

- FFD-OF-04: Current water quality analysis was inconclusive. This area should be re-assessed during a future study.

### *4.16 Fayston – Future Action Recommendations:*

- FAY_OF_05: Water quality sampling did not conclusively confirm an illicit discharge for this analysis point. This issue may be better resolved using field investigation by Environmental Canine Services as it may be attributable to failed or failing septic within the overall watershed.

### *4.17 Ferrisburgh – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Ferrisburgh.

### *4.18 Greensboro – Future Action Recommendations:*

- GRN-OF-06: During the investigation it was discovered that The Willey's Store was intermittently discharging illicit wash water directly into the storm system via illegal dumping of mop buckets. The issue was discussed with the store's staff. Multiple phone calls to the store's owner were not returned. This issue may require follow-up by DEC Enforcement to ensure that the store's owner understands that ramifications of the actions of his employees.

### *4.19 Hardwick – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Hardwick.

### *4.20 Hinesburg – Future Action Recommendations:*

- HIN-OF-17: The outfall and its system was assessed extensively and it does not appear to be a chronic illicit discharge. However, the system may benefit from additional assessment using dye or smoke testing, which was not possible during this study.

### *4.21 Huntington – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Huntington.

### *4.22 Hyde Park – Future Action Recommendations:*

- HDP-OF-01: Despite extensive assessment at this outfall no illicit discharge could be confirmed. While water quality analysis contained parameters above the thresholds, no advanced investigation technique could locate the source of an illicit discharge. Smoke testing, dye testing, optical brightener pads, and Ship and Sniff analysis were all utilized without definitive attribution. The plumbing issue at 5169 VT-100 should be investigated by a Regional Wastewater Engineer. This system will be subject to future Advanced Investigation under a separate VT DEC IDDE study as evidence suggests that there may be an ongoing illicit discharge at this location.

### *4.23 Irasburg – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Irasburg.

### *4.24 Jericho – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Jericho.

### *4.25 Lowell – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Lowell.

### *4.26 Middlebury – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Middlebury.

### *4.27 Middlesex – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Middlesex.

### *4.28 Mount Holly – Future Action Recommendations:*

- MTH-OF-02: This outfall and its upstream stormwater system underwent extensive water quality analysis. The system was bracketed to best understand any possible sources of illicit discharge. Some water quality parameters were above threshold, though none clearly pointed to a definitive source of illicit discharge. Additional assessment may be necessary.

### *4.29 Newport Town – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Newport Town.

### *4.30 Orwell – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Orwell.

### *4.31 Shoreham – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Shoreham.

### *4.32 East Wallingford – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in East Wallingford.

### *4.33 Warren – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Warren.

### *4.34 West Fairlee – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in West Fairlee.

### *4.35 Worcester – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Worcester.

### *4.36 Washington – Future Action Recommendations:*

- No chronic illicit discharges were found or are suspected in Washington.

## 5 PHOSPHORUS AND E. COLI LOADING

Where possible, flow was measured at the time of phosphorus and *E. coli sampling.* Annual totals for phosphorus were calculated using measured flows in cubic feet per second and total phosphorus concentration in mg/L. Not all illicit discharges were sampled due to flow issues or other factors which prevented samples from being obtained.

| Infrastructure Code (Outfall) | Illicit Discharge | CFS | TP concentration (mg/L) | TP Load (lbs / year) | *E. coli* (MPN / 100ml) |
|---|---|---|---|---|---|
| ALB-OF-04 | Sanitary Sewage | 0.004 | 0.041 | 0.323 | 45 |
| BC560 | Sanitary Sewage | 0.001 | 0.011 | 0.022 | 550 |
| BC1100 | Residential Sewage | 0* | 0.72 | Unk | 2400 |
| BC1120 | Sanitary Sewage | NT | NT | Unk | NT |
| BC1510 | Stonecutting Washwater | 0.004 | 0.69 | 5.434 | 6.3 |
| BC1630 | Possible Sanitary Sewage | 0.004 | 0.66 | 5.198 | 2400 |
| Rub-A-Dub Car Wash | Car Washwater | 0* | NT | Unk | NT |
| BT680 | Residential Sewage | NT | NT | Unk | NT |
| B2670 | Pool water / Residential Floor Drain Possibly tied to Septic | NT | NT | Unk | NT |
| GV5 | Illegal dumping | NT | NT | Unk | NT |
| BNT-OF-01 | Sanitary Sewage | 0.004 | 0.2 | 1.575 | 2400 |
| BRS_OF_14 | Pool overflow | 0* | 0.07 | Unk | <1.0 |
| EMT-OF-04 | Residential Sewage | 0* | 0.005 | Unk | 12 |
| EMT-OF-10 | Possible Failed Septic | 0* | NT | Unk | NT |
| EMT-OF-18 | Fleet Washing | 0* | NT | Unk | NT |
| GRN-OF-06 | Illegal mop water dumping | 0* | NT | Unk | NT |
| HDP-OF-01 | Unknown | 0.001 | 0.4 | 0.788 | 2400 |
| WSH_OF_New_002 | Septic Leachate | 0.001 | 0.1 | 0.197 | <1.0 |
| **TOTAL TP LOAD (lbs.)** | | | | **13.536** | |
| * - flow too intermittent or sparse to measure<br>NT - Not Tested | | | | | |

# 6 CONCLUSIONS

A thorough assessment of stormwater drainage systems in each study town was conducted in an attempt to find any non-stormwater discharges to the stormwater system that could then possibly enter natural water bodies in these communities. This work was conducted during the spring, summer, and fall of 2017,

2018, and early 2019 on all mapped stormwater outfalls provided to the project team as part of the scope of work. This resulted in a total of 255 systems (or other points) visited. Of these, 109, or 43% were flowing. Further analysis of these flowing outfalls led to the designation of 36, or 14% of the total study outfalls, as suspected illicit discharges. 15 confirmed illicit discharges, or approximately 6% of the total study outfalls, were found for all study towns.

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# APPENDIX 1 – DATA SUMMARY TABLE

Table 1. Town of Albany Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABY_OF_1 | 07/20/17 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.004 | | 20.7 | 8.9 | 473 | 0.1 | no | | | no | . . . | no | . . . | | | | | | yes | Pipe broken. Erosion below outfall. | | Pipe | RCP | N/A | | 18 |

Table 2. Town of Alburgh Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALB_OF_1 | 07/19/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | RCP | Sediment | Partially | 18 |
| ALB_OF_10 | 07/19/17 | Dana Allen | Backwater between wetlands, possibly slight flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| ALB_OF_2 | 07/19/17 | Dana Allen | Pipe drains directly into lake via boat ramp. Waves flowing in and out making it difficult to determine flow. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 24 |
| ALB_OF_3 | 07/19/17 | Dana Allen | Pipe dry, some sediments deposited in pipe and at discharge | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 18 |
| ALB_OF_4 | 07/19/17 | Dana Allen | Pipe submerged in wetland, drains to catchbasin. Sample taken from upstream catchment basin | Possible (2 or more indicators present) | yes | | | | Flow | 21.8 | 6 | 698 | 0.78 | no | | | | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | RCP | Water | Fully | 18 |
| ALB_OF_5 | 07/19/17 | Dana Allen | Pipe drains into grass swale, swale is ponding and has some questionable algae | Unlikely | no | | | | | | | | | no | | | | , , , | yes | Poor pool quality, , , May or may not be considered "excessive" algae | no | | | | | no | | | Pipe | PVC | N/A | | 6 |
| ALB_OF_6 | 07/19/17 | Dana Allen | Pipe has some growth on inside of pipe, may be due to low slope | Unlikely | no | | | | | | | | | no | | | | , , , | yes | Pipe benthic growth, Brown, , | no | | | | | | | | Pipe | PVC | N/A | | 6 |
| ALB_OF_7 | 07/19/17 | Dana Allen | Pipe is wet but no flow. After looking in catchment basins, I assume all pipes on this development have very low slopes. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 6 |
| ALB_OF_8 | 07/19/17 | Dana Allen | Pipe dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 6 |
| ALB_OF_9 | 07/19/17 | Dana Allen | Three different outfalls, 2 roof drains, 1 CB outfall. All dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 6 |

Table 3. Town of Bakersfield Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BKR_OF_1 | 2017-07-18 | Dana Allen | Could not locate outfall. Dense vegetation and steep ravine may have it hidden. Checked close upstream catch basin and found to by dry with no outflow. | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . | no | | | | | yes | Possible upkeep needed around outfall | | Pipe | | | | |
| BKR_OF_2 | 2017-07-18 | Dana Allen | Pipe partially submerged, a lot of sediment sits at outfal | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . | no | | | | | yes | Large amount of sandy sediment being deposited at outfall | | Pipe | Steel | Sediment | Partially | 18 |
| BKR_OF_3 | 2017-07-18 | Dana Allen | Could not locate outfall. Upstream infrastructure does not lead us in likely direction. No infrastructure mapping. | Unlikely | no | | | | | | | | | yes | negative | negative | | . . . | no | . . . | no | | | | | no | | | Pipe | Steel | Water | Fully | |
| BKR_OF_3 | 2018-09-19 | Linda Jencyowski | Upstream CB has small pool in it but does not reach the outlet pipe. CB was sampled as well | Suspect (one or more indicators with severity of 3) | yes | Trickle | Closed Pipe | 0 | Pool | 18.1 | 8.12 | 309 | 1.15 | no | | | no | . . . | no | . . . | yes | 0 | 1 | 170 | | no | | | Pipe | Steel | Water | Fully | |
| BKR_OF_4 | 2017-07-18 | Dana Allen | Outfall drains grass swale and catch basin from across street. Outlet is crushed by large rocks | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0 | Flow | 21.8 | 8.03 | 268 | 0.38 | no | | | no | . . . | no | . . . | yes | | 0.25 | | | yes | Pipe leaves from box drain across the street. Outfall is crushed and hidden beneath layer of soil and rock. | | Pipe | Steel | Sediment | Fully | |
| BKR_OF_4 | 2018-09-19 | Linda Jencyowski | No flow present. Upstream CB dry. | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | Crushed pipe. | | Pipe | Steel | Sediment | Fully | |

Table 4. Town of Barnet Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_1 | 08/29/17 | Dana Allen | Pipe wer, no flow | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 12 |
| BRT_OF_2 | 08/29/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | Steel | N/A | | 18 |
| BRT_OF_3 | 08/29/17 | Dana Allen | Outfall not found. Believe infrastructure on map to be wrong. Pipe exits CB in different direction. Landowner was knowledgeable of infrastructure in area and said I outfall pipe is in the area. His septic tank is in the direct line where outfall pipe would be. This makes me think other missing outfall points in area may be incorrect as well | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | | Pipe | | | | |
| BRT_OF_3a | 09/18/18 | Linda Jencyowski | | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | Steel | | | |
| BRT_OF_4 | 08/29/17 | Dana Allen | Outfall not found. Spent 30 minutes looking in area. Dense brush, eroded banks, and dumped wood have prevented an inspection. Upstream CB dry | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | | | | |
| BRT_OF_4a | 09/13/18 | Sean Brennan | Outfall not found. Walked stream several times and spent a lot of time walking through dense brush. No mapped infrastructure | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | . . . | no | . . . | | | | | | no | | | Pipe | | | | |
| BRT_OF_5 | 08/29/17 | Dana Allen | Outfall not found. Pipe hidden/restricted by copious amounts of living and dead Japanese knotweed. Land owners not happy to have me mArching through vegetation. Upstream CB dry | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | | | | |
| BRT_OF_5a | 09/18/18 | Sean Brennan | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | | | | |
| BRT_OF_6 | 08/29/17 | Dana Allen | Outfall not found, hidden or buried by large amount of fallen trees. Dense branch cover makes scaling the ravine unsafe. Upstream CB dry | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | | | | |
| BRT_OF_7 | 08/29/17 | Dana Allen | Outfall inaccessible. Located down tall headwall and steep ravine. Blocked by river on other side. Upstream CB dry | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | | | | |
| BRT_OF_8 | 08/29/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 18 |

Table 5. Town of Barre City Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BC1100 | 09/18/18 | Linda Jencyowski | Stream flow filled pipe. No visible flow coming from the outfall. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Sediment | Fully | 24 |
| BC1100 | 10/22/18 | Sean Brennan | Pipe partially submerged in stream. Sample taken from nearest upstream CB. | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0 | Sump | 10.7 | 8.32 | 1847 | 3.86 | no | | | no | , , , | no | , , , | yes | 0 | 1 | 2400 | negative | no | | | Pipe | CPP | Sediment | Fully | 24 |
| BC1100 _DI_177 | 2018-08-24 | Dana Allen | Dye tested from 207 Elm Street by Everett Hoyte. Dye almost immediately observed. | Obvious | yes | Trickle | Closed Pipe | | | | | | | no | | | yes | Odor, Sewage, , Laundry odor | no | , , , | | | | | | | | | Pipe | | | | |
| BC1510 | 2018-08-24 | Dana Allen | | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0.018 | Flow | 20.6 | 8.29 | 1266 | 0 | no | | | yes | Turbidity, , Slight Cloudiness, | no | , , , | yes | | 0 | | negative | no | | | Pipe | CMP | N/A | | 20 |
| BC1510 | 2018-09-14 | Linda Jencyowski | | Unlikely | yes | Substantial | Closed Pipe | 0.003 | Flow | | | | | no | | | yes | Turbidity, , Cloudy, | yes | Outfall Damage, , , | yes | | | 1 | | no | | | Pipe | CMP | N/A | | 20 |
| BC1510 | 2018-10-22 | Sean Brennan | Cannot get a true sense of flow due to all the leaks | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0.004 | Flow | 10.5 | 8.41 | 680 | 0.09 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | 6.3 | negative | no | | MBAS less than .25 | Pipe | CMP | N/A | | 20 |
| BC1630 | 2018-09-14 | Linda Jencyowski | | Unlikely | yes | Moderate | Closed Pipe | 0.003 | Flow | | | | | no | | | no | , , , | no | , , , | yes | | | 2400 | | no | | | Pipe | CPP | N/A | | 20 |
| BC1630 | 2018-10-22 | Sean Brennan | | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0.004 | Flow | 10.9 | 8.4 | 786 | 0.57 | no | | | no | , , , | no | , , , | yes | 0.2 | 0.25 | 2400 | negative | no | | | Pipe | CPP | N/A | | 20 |
| BC1630 _SW_MH_112 | 2018-08-24 | Dana Allen | Sewage odor. Intermittent pulsing flow from pipe up Hill. Storm pipe parallels sewer. Site has been a problem in the past. Definitely intermittent flow into manhole. | Obvious | yes | Trickle | Closed Pipe | | Sump | 24 | 2.69 | 1452 | 5 | no | | | yes | Odor, Sewage, , | no | , , , | yes | 0 | 2 | | | | | | Pipe | | | | |
| BC560 | 2018-09-14 | Sean Brennan | | Unlikely | yes | Moderate | Closed Pipe | 0.001 | Flow | | | | | no | | | no | , , , | no | , , , | yes | | | 550 | | no | | | Pipe | Clay | N/A | | 15 |
| BC560 _SW_MH_215 | 2018-08-24 | Dana Allen | Didn't have ammonia or chlorine test at the time. | Possible (2 or more indicators present) | yes | Trickle | Manhole Sump | 0 | Sump | 26.4 | 7.49 | 1140 | 0.16 | no | | | no | , , , | no | , , , | yes | 0 | 2 | | negative | no | | | Pipe | | | | |
| BC790 | 2018-09-14 | Linda Jencyowski | | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0 | Flow | | | | | no | | | no | , , , | yes | Pipe benthic growth, Green, , | yes | | | | | no | | | Pipe | PVC | N/A | | 4 |

Table 6. Town of Barre Town Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BT2440 | 2018-09-04 | Sean Brennan | | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | | | | 0.15 | no | | | no | , , , | no | , , , | yes | 0.2 | 0.7548 | | negative | no | | | Pipe | CPP | N/A | | 15 |
| BT2440 | 2018-09-14 | Linda Jencyowski | Picked up OBM pad | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | | | | | no | | | no | , , , | no | , , , | yes | | | 2400 | | no | | | Pipe | CPP | N/A | | 15 |
| BT2670 | 2018-09-04 | Sean Brennan | | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | | | | 0.23 | no | | | no | , , , | no | , , , | yes | 0.2 | 0.25 | | negative | no | | | Pipe | CMP | N/A | | 12 |
| BT2670 | 2018-09-14 | Linda Jencyowski | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 12 |
| BT680 | 2018-09-04 | Sean Brennan | | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0.003 | Flow | | | | 0.09 | no | | | no | , , , | no | , , , | yes | 0 | 0.75 | | | yes | Plunge pool | | Pipe | CMP | N/A | | 18 |
| BT680 | 09/04/18 | Sean Brennan | | Obvious | yes | Trickle | | | Flow | | | | 1.3 | no | | | no | , , , | no | , , , | yes | 0 | 0.5 | | negative | | | | Pipe | | | | |
| BT680 | 2018-09-14 | Linda Jencyowski | Picked up OB pad. | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | | | | | no | | | no | , , , | yes | Outfall Damage, , , | yes | | | 31 | | no | | | Pipe | CMP | N/A | | 18 |
| BT680_UD1 | 2018-09-04 | Sean Brennan | | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | | | | 0.1 | no | | | no | , , , | no | , , , | yes | 0 | 1.5 | | | | | | Pipe | | | | |
| BTW_OTH_11_CB_46 | 09/04/18 | Dana Allen | Smoke testing. Saw smoke from 18" CPP. | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| BTW_OTH_4_CB_14 | 09/04/18 | Sean Brennan | Sample taken from CB inlet | Unlikely | yes | Trickle | | | Flow | | | | 0.14 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | | | no | | Trace detergents. Less than .25 | Pipe | | | | |
| GV1 | 2018-08-24 | Dana Allen | Surface water going into CB coming from swale, water running from hillside | Unlikely | yes | Moderate | Closed Pipe | 0 | Flow | 20.2 | 8.29 | 886 | 0 | no | | | no | , , , | no | , , , | yes | | 0 | | negative | no | | Tested total chlorine - zero | Pipe | CMP | N/A | | 18 |
| GV1 | 2018-09-14 | Linda Jencyowski | | Unlikely | yes | Moderate | Closed Pipe | 0.002 | Flow | | | | | no | | | no | , , , | no | , , , | yes | | | 8.5 | | no | | | Pipe | CMP | N/A | | 18 |
| GV5 | 2018-08-24 | Dana Allen | Dry, grass at outfall seems stabilized so constant flow seems unlikely. OB pad placed | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | no | | | Pipe | CPP | N/A | | 12 |
| GV5 | 2018-09-14 | Linda Jencyowski | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| GV6 | 2018-08-24 | Sean Brennan | All CB on sunny side drive are dry. CB on far side of SSD is backwstered from CB connected to outfall. Source of water is a plastic corrugated pipe coming down sunny side. There are no CB or MHs that I can find that this may be connected to. Mapped as water pipe. Barre road worker says area used to get drinking water from a well on the top of hill butnlast year they switched to city drinking water, maybe this well water was diverted to CB? He states that the outfall pipe and its nearest CB was redone about a month ago as they are repavkng the road now. This would rule out any connection between outfall and CB (hopefully). Contact town to see what the pipe is connected to. | Unlikely | yes | Moderate | Closed Pipe | 0 | Flow | 20.2 | 7.89 | 1856 | 0.06 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | | negative | no | | Detergents less than .25 | Pipe | CPP | N/A | | 12 |
| GV6 | 2018-09-14 | Linda Jencyowski | | Unlikely | yes | Moderate | Closed Pipe | 0 | Flow | | | | | no | | | no | , , , | no | , , , | yes | | | 4.1 | | no | | | Pipe | CPP | N/A | | 12 |

Table 7. Town of Bennington Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT_OF_1 | 2018-08-09 | Dana Allen | Could not locate manhole. Needed to sample outfall in order to make it back to endyne. Ammonia meter broken | Unlikely | yes | Moderate | Closed Pipe | | Flow | 18.1 | 8.08 | 1955 | 0.26 | yes | no | no | | . . . | | . . . | yes | | 0.25 | 2400 | | | | Less than .25 | Pipe | | | | |
| BNT_OF_1_SW_MH_17 | 2017-06-12 | Dana Allen | | Possible (2 or more indicators present) | yes | Moderate | Catchbasin Sump | | Flow | 22 | 7.75 | 795 | 4.18 | yes | no | no | yes | Turbidity, . . | no | . . . | yes | | 0.75 | | | | | | Pipe | | | | |
| BNT_OF_1_SW_MH_17 | 2017-07-06 | Dana Allen | | Suspect (one or more indicators with severity of 3) | yes | Moderate | Closed Pipe | | Flow | 26.2 | 8.08 | 1120 | 2.02 | yes | no | no | no | . . . | no | . . . | yes | | 0.25 | | negative | | | | Pipe | | | | |
| BNT_OF_1_SW_MH_19 | 2017-06-12 | Dana Allen | | Unlikely | yes | Trickle | Catchbasin Sump | | Flow | 27.5 | 7.24 | 680 | 0.28 | yes | no | no | no | . . . | no | . . . | yes | | 0 | | | | | | Pipe | | | | |
| BNT_OF_1_SW_MH_19 | 2017-07-06 | Dana Allen | | Unlikely | yes | Trickle | Manhole Sump | | Flow | 22 | 7.8 | 816 | 0.19 | yes | no | no | no | . . . | no | . . . | yes | | 0 | | | | | | Pipe | | | | |
| BNT_OF_1_SW_MH_28 | 2017-07-06 | Dana Allen | Temp is wrong | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | | Sump | 33.8 | 8.01 | 1120 | 0.89 | yes | no | no | no | . . . | no | . . . | yes | | 0.25 | | negative | | | | Pipe | | | | |
| BNT_OF_2 | 2017-06-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | | | | | | | | | Pipe | HDPE | N/A | | 15 |
| BNT_OF_3 | 2017-06-12 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | | Flow | 24.9 | 8.19 | 1330 | 0.17 | no | | | no | . . . Flow appears entirely due groundwater from upstream CB | no | . . . | yes | | 0.1 | | | | | Trace detergents but ammonia low and groundwater seeping was observed cause of flow. | Pipe | CMP | Water | Partially | 24 |
| BNT_OF_3_CB_14 | 2017-06-12 | Dana Allen | | Unlikely | yes | Moderate | Catchbasin Sump | | Flow | 29.6 | 8.02 | 1125 | | no | | | no | . . . | no | . . . | yes | | 0 | | | no | | | Pipe | | | | |
| BNT_OF_4 | 2017-06-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | RCP | N/A | | 15 |
| BNT_OF_5 | 2017-06-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | | | Pipe | CPP | N/A | | 12 |
| BNT_OF_6 | 2017-06-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | Sediment | Partially | 18 |
| BNT_OF_7 | 2017-06-12 | Dana Allen | Pipe submerged. No flow evident. Did not test water in pool. Will rely on upstream CB for results. | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . Algae present in pond but pool quality generally healthy | no | | | | | no | | | Pipe | CMP | Water | Partially | 24 |

Table 8. Town of Brattleboro Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_1 | 09/17/18 | Dana Allen | Pipe submerged, sample taken from pool | Unlikely | yes | Trickle | | 0 | Pool | 25.5 | 7.39 | 1069 | 0.27 | no | | | no | , , , | no | , , , | yes | | 0 | | | no | | | Pipe | | | | |
| BRT_OF_10 | 07/30/18 | Dana Allen | Pipe capped but water still flowing. Sample taken from leak | Unlikely | yes | Moderate | | | | 17.4 | 8.67 | 1983 | 0.09 | no | | | | , , , | no | , , , | | | | | | | | | Pipe | PVC | | | 6 |
| BRT_OF_2 | 09/17/18 | Dana Allen | Stream | Unlikely | yes | Substantial | In-Stream | 0 | | 19.6 | 7.9 | 594 | 0.27 | yes | no | no | no | , , , | no | , , , | | | | | | no | | | Pipe | CPP | Sediment | Partially | 24 |
| BRT_OF_2 | 11/05/18 | Sean Brennan | Samples also taken at upstream culvert inlet | Unlikely | yes | Substantial | In-Stream | 0 | Flow | 19.6 | 8 | 834 | 0.43 | yes | no | no | no | , , , | no | , , , | yes | | 0.25 | | negative | no | | Trace mbas | Pipe | CPP | Sediment | Partially | 24 |
| BRT_OF_2_CIN | 09/17/18 | Sean Brennan | | Unlikely | yes | Substantial | In-Stream | 0 | Flow | 22.7 | 8.1 | 295 | 0.23 | yes | no | no | no | , , , | no | , , , | yes | 0 | 0.25 | | negative | no | | | Pipe | | | | |
| BRT_OF_3 | 09/17/18 | Dana Allen | Outfall not found. Upstream catch basin back watered. Outfall likely fully submerged in wetland. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | no | | | Pipe | | | | |
| BRT_OF_3_CB_148 | 09/17/18 | Sean Brennan | No flow, taken from sump | Possible (2 or more indicators present) | yes | Trickle | Manhole Sump | 0 | Sump | 25.6 | 7.67 | 244 | 0.87 | yes | no | no | no | , , , Grass clippings | no | , , , | yes | 0 | 3 | | negative | no | | | Pipe | | | | |
| BRT_OF_3_CB_166 | 09/17/18 | Sean Brennan | No flow- sample taken from sump. | Possible (2 or more indicators present) | yes | Trickle | Catchbasin Sump | 0 | Sump | 22.5 | 7.94 | 173 | 0.88 | yes | yes | yes | no | , , , | no | , , , | yes | 0 | 3 | | negative | yes | All CBS backwatered. Outlet to pipe seems to be at lower elevation than dumps so pipe possibly clogged | | Pipe | | | | |
| BRT_OF_4 | 07/30/18 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | CMP | N/A | | 24 |
| BRT_OF_5 | 09/17/18 | Sean Brennan | | Unlikely | yes | Moderate | Closed Pipe | 0.002 | Flow | 20.6 | 7.45 | 1220 | 0.14 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | | | no | | Trace mbas, less than .25 | Pipe | CPP | N/A | | 24 |
| BRT_OF_5 | 09/17/18 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0 | | 20.8 | 7.95 | 1130 | 0.3 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CPP | N/A | | 24 |
| BRT_OF_6 | 07/30/18 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | CPP | N/A | | 12 |
| BRT_OF_7 | 07/16/18 | Dana Allen | Pipe buried and crushed by large rocks. Leads to small stream bed, bed dry, CB dry. Property owner says itflows during rain events. No ld suspected | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | | | | Pipe | Clay | Sediment | Fully | 18 |
| BRT_OF_8 | 07/16/18 | Dana Allen | Pipe dry, upstream CB dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | | | | Pipe | CPP | N/A | | 15 |
| BRT_OF_9 | 07/16/18 | Dana Allen | Pipe submerged in flowing water. Sw system also transports underground stream. New meter shows ammonia conc. In ppm not mg/l | Unlikely | yes | Moderate | In-Stream | | | 20.3 | 8.4 | 402 | 0.16 | no | | | | , , , | no | , , , | | | | | | yes | No maintenance needed. Needed space to show pic of inlet stream. | | Pipe | RCP | Sediment | Partially | 15 |
| BRT_OF_9 | 09/18/18 | Dana Allen | Flow coming from series of swales, ID unlikely | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0 | Flow | 16.4 | 8.31 | 1155 | 0.42 | yes | yes | yes | no | , , , | no | , , , | yes | | 1 | | | no | | | Pipe | CMP | N/A | | 18 |
| BRT_OF_9 | 10/23/18 | Linda Jencyowski | Flow coming from inlet to upstream cb, inlet to cab not found but drainage ditches dry. Hit on OB pad | Suspect (one or more indicators with severity of 3) | yes | Trickle | Closed Pipe | 0 | Flow | 19.9 | 7.86 | 1616 | 0.74 | no | | | no | , , , | yes | Outfall Damage, , , | yes | | | 0.22 | positive | no | | | Pipe | CMP | N/A | | 18 |
| BRT_OF_9_CB_33 | 09/13/18 | Linda Jencyowski | | Suspect (one or more indicators with severity of 3) | yes | Trickle | Catchbasin Sump | 0 | Sump | 23.5 | 7.53 | 1350 | 0.47 | no | | | no | , , , | no | , , , | yes | 0 | 0.5 | | negative | no | | | Pipe | | | | |

Table 9. Town of Bristol Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BRS_OF_1 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 12 |
| BRS_OF_10 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | Evidence of excessive outfall erosion. Needs stabilization. | | Pipe | Steel | | | 36 |
| BRS_OF_11 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 12 |
| BRS_OF_12 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | Steel | N/A | | 12 |
| BRS_OF_14 | 2017-07-10 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | | Flow | 24.1 | 3.15 | 2012 | 1.33 | no | | | no | . . . | no | . . . | yes | | | | | yes | Possibly need to daylight pipe outlet. | | Pipe | | | | |
| BRS_OF_2 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 12 |
| BRS_OF_3 | 2017-07-10 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | 19.1 | 7.91 | 702 | 0.57 | no | | | no | . . . | no | . . . | yes | | | | | | | | Pipe | CPP | N/A | | 18 |
| BRS_OF_6 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | Some erosion but could not fully assess due to vegetation | | Pipe | CPP | N/A | | 18 |
| BRS_OF_7 | 2017-07-10 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | 0.035 | | 17.3 | 8.5 | 145 | 0.08 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 45 |
| BRS_OF_8 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | Pipe outlet crushed. | | Pipe | CMP | N/A | | 12 |
| BRS_OF_9 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | yes | yes | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 24 |

Table 10. Town of Calais Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAL_OF_1 | 2018-09-07 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.001 | Flow | 20.3 | 8.16 | 83 | 0.27 | no | | | no | , , , | no | , , , | yes | 0 | 0 | | | no | | | Pipe | CMP | Sediment | Partially | 12 |
| CAL_OF_2 | 2017-08-21 | Dana Allen | Pipe well hidden, perched up from stream about 20 ft. | Unlikely | yes | Moderate | Closed Pipe | 0.002 | | 17.1 | 8.14 | 325 | 0.08 | no | | | no | , , , | no | , , , | no | | | | | | | | Pipe | CMP | N/A | | 12 |
| CAL_OF_3 | 2017-08-21 | Dana Allen | Outfall dry upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Upstream CB clogged with sediment | | Pipe | CMP | N/A | | 15 |
| CAL_OF_4 | 2017-08-21 | Dana Allen | Dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |

Table 11. Town of Craftsbury Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBY_OF_1 | 07/20/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | yes | Not sure if pipe is meant to be separated as it is. | | Pipe | CPP | N/A | | 12 |
| CBY_OF_2 | 07/20/17 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.001 | | 18.2 | 8.18 | 1372 | 0.18 | no | | | no | , , , | no | , , , | | | | | | yes | Pipe plugged due to rodent barrier. | | Pipe | CPP | N/A | | 15 |
| CBY_OF_3 | 07/20/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | | | | | | no | | | Pipe | CMP | N/A | | 24 |
| CBY_OF_4 | 07/20/17 | Dana Allen | | Unlikely | | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | | | | |
| CBY_OF_5 | 07/20/17 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0 | | 20.3 | 9.06 | 550 | 0.1 | no | | | no | , , , | no | , , , | | | | | | yes | Pipe sediment clogged. | | Pipe | CPP | Sediment | Partially | 18 |
| CBY_OF_6 | 07/20/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 12 |
| CBY_OF_7 | 2017-07-20 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | In-Stream | | Pool | 17.3 | 8.21 | 906 | 0.2 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | yes | Pipe collapsing and sediment filled. | slightly lighter than threshold | Pipe | RCP | Water | Fully | 24 |
| CBY_OF_7 | 08/13/18 | Dana Allen | No flow. Sump moist | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | Water | Fully | 24 |
| CBY_OTH_3_C_OUT_11 | 08/13/18 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | negative | | | | Pipe | PVC | N/A | | 4 |

Table 12. Town of Danby Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DNB_OF_1 | 06/13/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | yes | Outfall eroded and headwall collapsed. Pipe collapsed. Needs stabilization. | | Pipe | Clay | | | |
| DNB_OF_2 | 06/13/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | | | | | | yes | Headwall above pipe cracking. | | Pipe | Clay | N/A | | 18 |
| DNB_OF_3 | 06/13/17 | Dana Allen | | Unlikely | yes | Trickle | Open Drainage (ditch) | 0.011 | | 18 | 8.05 | 645 | 0.08 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | | | | |
| DNB_OF_4_CB_58 | 06/13/17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | | | | Pipe | | | | |

Table 13. Town of East Montpelier Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_1 | 2017-08-15 | Dana Allen | Pipe backwatered in wetland, flow present in upstream CB, sample taken in nearest upstream CB sump | Possible (2 or more indicators present) | yes | | | | Flow | 20.8 | 7.63 | 1230 | 0.42 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CPP | Water | Partially | 24 |
| EMT_OF_10 | 2017-08-15 | Dana Allen | Pipe drains wetland from across street | Unlikely | yes | Trickle | Closed Pipe | 0.001 | | 19.1 | 8.1 | 452 | 0.22 | yes | yes | yes | no | , , , | no | , , , | | | | | | no | | | Pipe | RCP | N/A | | 24 |
| EMT_OF_10 | 2018-09-07 | Dana Allen | Source of flow appears to be the bottom of the ditch across the street. | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | 17.5 | 8.19 | 504 | 0.19 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | | | yes | End of pipe is broken and collapsing. | MBAS result very faint. | Pipe | RCP | N/A | | 24 |
| EMT_OF_11 | 2017-08-15 | Dana Allen | Pipe partially submerged in wetland, sample taken from upstream CB | Possible (2 or more indicators present) | yes | Trickle | | | Sump | 21.8 | 8.05 | 1628 | 0.35 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | | | | Pipe | CPP | Water | Partially | 36 |
| EMT_OF_12 | 2017-08-15 | Dana Allen | Pipe not found, road construction has concealed upstream CB. Pipe not found along riprap on ravine, dense vegetation on unsteady terrain may be concealing pipe elsewhere | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| EMT_OF_13 | 2017-08-15 | Dana Allen | Pipe submerged in sediment , no flow. Upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Unclog pipe | | Pipe | CMP | Sediment | Partially | 18 |
| EMT_OF_14 | 2017-08-28 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| EMT_OF_15 | 2017-08-28 | Dana Allen | No flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Sediment | Partially | 12 |
| EMT_OF_16 | 2017-08-28 | Dana Allen | Pipe submerged, upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | Water | Partially | 18 |
| EMT_OF_17 | 2017-09-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | yes | Deposits/Stains, , , Orange | no | | | | | no | | | Pipe | PVC | N/A | | 18 |
| EMT_OF_18 | 2017-08-15 | Dana Allen | Pipe not found, sample taken from running upstream catchbasin. Smells like soap | Possible (2 or more indicators present) | yes | Trickle | | | Sump | 22.2 | 8.12 | 719 | 4.5 | no | | | yes | Odor, soap, , | no | , , , | yes | | 0 | | | no | | Sample had visible bubbles and smelt like soap. Ran MBAS twice and results both came up as zero. | Pipe | | | | |
| EMT_OF_2 | 2017-08-28 | Dana Allen | Bottom of pipe wet but no flow | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| EMT_OF_3 | 2017-08-28 | Dana Allen | Pipe backwatered from wetland. No flow. Upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| EMT_OF_4 | 2017-08-15 | Dana Allen | Moderate flow from pipe as well as flow spraying out of unknown pipe with ~1/2 inch diameter. Small pipe has valve. Samples taken from both points. Turned bright yellow during ammonia test. Grass swale is actually a creek, neighbor says this is coming from hill atop the hill | Suspect (one or more indicators with severity of 3) | yes | Moderate | | | Flow | 20.9 | 7.97 | 550 | 3.34 | no | | | yes | Odor, Sewage, , | no | , , , | yes | | 0.5 | | | | | | Pipe | CMP | N/A | | 18 |
| EMT_OF_4 | 2017-09-12 | Dana Allen | Moderate flow-smelly | Suspect (one or more indicators with severity of 3) | yes | Moderate | | | Flow | | | | | no | | | yes | Odor, Rancid/sour, , | no | , , , | yes | | | 12 | | | | | Pipe | CMP | N/A | | 18 |
| EMT_OF_4 | 2017-09-13 | Dana Allen | | Suspect (one or more indicators with severity of 3) | yes | Moderate | | | Flow | 14 | 8.24 | 497 | 1.44 | no | | | | , , , | | , , , | yes | | 0.25 | | | | | | Pipe | CMP | N/A | | 18 |
| EMT_OF_4 | 2017-10-04 | Dana Allen | | Suspect (one or more indicators with severity of 3) | yes | Trickle | | | Flow | 17.9 | 7.85 | 596 | 4.26 | yes | yes | yes | | , , , | | , , , | yes | | 0.25 | | | | | | Pipe | CMP | N/A | | 18 |
| EMT_OF_4_2 | 2017-09-12 | Dana Allen | unmapped pipe to stream | Unlikely | | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | Steel | N/A | | 4 |
| EMT_OF_4_CB | 2017-09-13 | Kerrie Garvey | OF4 attached to CB via culvert | Possible (2 or more indicators present) | yes | Moderate | Catchbasin Sump | | Flow | 17.9 | 8.05 | 395 | 0.54 | no | | | no | , , , | no | , , , | yes | | 0.12 | | | | | MBAS results were in between 0 and .25, very light color, rounded results to middle | Pipe | | | | |
| EMT_OF_4_Kelton | 2017-09-13 | | Original inspection cannot be found, either unsaved or hidden in other project folder. | Possible (2 or more indicators present) | yes | Moderate | | | Flow | | | | 0.37 | no | | | no | , , , | no | , , , | yes | | 0 | 20 | | no | | | Pipe | RCP | | | |
| EMT_OF_4_Kelton | 2017-10-04 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 16.8 | 8.02 | 422 | 0.48 | yes | no | no | | , , , | | , , , | yes | | 0 | | | | | | Pipe | RCP | | | |
| EMT_OF_4_Source | 2017-09-13 | Dana Allen | Source of EMT_OF_4. Water from pond Seeps through | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 18.6 | 7.73 | 284 | 2.04 | no | no | no | yes | Color,Odor, Rancid/sour, , | | , , , | yes | | 0 | 2400 | | | | | Pipe | | | | |
| EMT_OF_4_Source | 2017-10-04 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 18.1 | 7.52 | 274 | 1.64 | yes | yes | yes | | , , , | | , , , | yes | | 0 | | | | | | Pipe | | | | |
| EMT_OF_4_Stream | 2017-09-13 | Dana Allen | Stream leads to EMT_OF_4 | Possible (2 or more indicators present) | yes | Moderate | In-Stream | | Flow | 17.7 | 7.99 | 354 | 0.14 | no | | | no | , , , | no | , , , | yes | | 0.12 | 13 | | | | Lab results yielded very light blue, somewhere between 0 and .25 indicators. Rounded to middle: .12 | Pipe | | | | |
| EMT_OF_4_Stream | 2017-10-04 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 16.6 | 8.06 | 383 | -0.02 | yes | yes | yes | | , , , | | , , , | yes | | 0 | | | | | | Pipe | | | | |
| EMT_OF_5 | 2017-08-28 | Dana Allen | Stagnant water backwatered. No flow. No flow in CB | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 12 |
| EMT_OF_6 | 2017-08-29 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| EMT_OF_7 | 2017-08-29 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Apply new riprap to channel, erosion occurring | | Pipe | CPP | N/A | | 18 |
| EMT_OF_8 | 2017-08-29 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 8 |
| EMT_OF_9 | 2017-08-29 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| Emt_of_New | 2017-08-15 | Dana Allen | Water clean, neighbor states this was an old irrigation pipe | Unlikely | yes | Moderate | | | | 18.8 | 8 | 280 | 0.1 | no | | | | , , , | | , , , | no | | | | | | | | Pipe | Steel | N/A | | 0.5 |

Table 14. Town of Middlebury Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MDY_OF_1 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | yes | Pipe benthic growth, Green, , Minor | no | | | | | yes | Swale was recently cleaned. Spoke with owner about installing check dams and revegetating swale. Owner was enthusiastic about doing so. | | Pipe | CPP | N/A | | 12 |
| MDY_OF_2 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| MDY_OF_3 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| MDY_OF_3 | 2018-07-20 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | | | | |
| MDY_OF_3_CB_23 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 10 |
| MDY_OF_3_CB_24 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 15 |
| MDY_OF_4 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| MDY_OF_4_CB_2 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Resident noted that CB routinely has sediment buildup and water flows over CB rim. States that CB was previously 4" lower and didn't have those issues. Residential road before bridge flows to this single CB and causes a lot of issues. | | Pipe | CMP | N/A | | 18 |
| MDY_OF_5 | 2017-06-14 | Kerrie Garvey | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Pipe buried, clogged | | Pipe | CMP | Sediment | Fully | 15 |
| MDY_OF_5_CB_27 | 2017-06-14 | Kerrie Garvey | Outfall is buried, so assessed cb. No flow in CB. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | CB needs to be vectored. | | Pipe | CMP | Water | Partially | 15 |

Table 15. Town of Eden Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EDN_OF_1 | 07/20/17 | Dana Allen | | Unlikely | yes | Trickle | | | | 21.4 | 7.68 | 382 | 0.18 | no | | | no | . . . Brown and white bubbles present in outfall pool- | no | . . . | no | | | | | no | | | Pipe | RCP | N/A | | 18 |

Table 16. Town of Fairfield Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FFD_OF_1 | 2017-07-18 | Dana Allen | Pipe hidden deep in Japanese knotweed | Suspect (one or more indicators with severity of 3) | yes | Moderate | Closed Pipe | 0.003 | Flow | 21.5 | 8.59 | 1159 | 1.41 | no | | | no | , , , | no | , , , | yes | | 0.5 | | | yes | Japanese knotweed has taken over the area, may be cause for concerns related to erosion | | Pipe | CMP | N/A | | 18 |
| FFD_OF_1 | 2018-09-19 | Linda Jencyowski | Left OB pad. Slight sign of water down outfall but no flowing outfall. Some stagnant water in catchbasin. Sample is taken from closest catchbasin. Stagnant water in all catchbasins tied into outfall. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | negative | no | | | Pipe | CMP | N/A | | 18 |
| FFD_OF_1_CB_10 | 2018-09-19 | Linda Jencyowski | | Suspect (one or more indicators with severity of 3) | yes | Trickle | Catchbasin Sump | 0 | Sump | 19.1 | 8.21 | 676 | 3.26 | yes | yes | yes | no | , , , | no | , , , | yes | 2.2 | 2.5 | | | no | | | Pipe | | | | |
| FFD_OF_2 | 2017-07-18 | Dana Allen | Upstream catchment basin is dry | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | yes | Maintenance not needed on this outfall but adjacent swale is full of sediment and is in definite need of maintenance | | Pipe | CPP | N/A | | 18 |
| FFD_OF_3 | 2017-07-18 | Dana Allen | Substantial flow, upstream catchment basin has surface water inflowing, upstream swales are also wet. | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0 | Flow | 23.5 | 8 | 1474 | 0.79 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CPP | | | 24 |
| FFD_OF_3 | 2018-09-19 | Linda Jencyowski | No flow present. Upstream catchbasins are dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | | | 24 |
| FFD_OF_4 | 2017-07-18 | Dana Allen | This outfall is an open channel stream. No precise geometry or flow measurement were taken due to challenging stream location. | Unlikely | yes | Substantial | In-Stream | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Open Drainage (channel) | | | | |
| FFD_OF_4_C_IN_25 | 2018-09-19 | Linda Jencyowski | Ship and sniff sample taken from inlet of culvert. | Possible (2 or more indicators present) | yes | Trickle | In-Stream | 0 | Sump | 16.5 | 7.88 | 1993 | 1.08 | no | | | no | , , , | no | , , , | yes | 0 | 0.75 | | | no | | | Pipe | | | | |
| FFD_OF_5 | 2017-07-18 | Dana Allen | Could not find outfall, upstream catchment basin dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Maintenance should be done to locate outfall | | Pipe | CPP | | | 18 |

Table 17. Town of Fayston Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FAY_OF_1 | 2017-07-07 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | yes | Outfall severely eroded. | | Pipe | CMP | N/A | | 18 |
| FAY_OF_2 | 2017-07-07 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.008 | | 19 | 8.45 | 58 | 0.09 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CMP | N/A | | 15 |
| FAY_OF_4 | 2017-07-07 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | yes | Outfall eroding. | | Pipe | CMP | N/A | | 24 |
| FAY_OF_5 | 2018-09-06 | Dana Allen | Chase Brook. Sampled for ship and sniff. | Unlikely | yes | Substantial | In-Stream | 0.494 | Flow | 19.4 | 7.77 | 25 | 0.29 | | | | no | , , , | no | , , , | yes | 0 | 0.25 | | | no | | MBAS very faint. | Open Drainage (channel) | | | | |
| FAY_OF_5_STREAM_1 | 2018-09-06 | Dana Allen | Sampled for ship and sniff. | Unlikely | yes | Substantial | In-Stream | 0.247 | Flow | 19.3 | 7.77 | 43 | 0.33 | no | | | no | , , , | no | , , , | yes | 0 | 0.5 | | | no | | | Open Drainage (channel) | | | | |
| FAY_OF_5_STREAM_2 | 2018-09-06 | Dana Allen | Sampled from smaller stream flow. | Unlikely | yes | Moderate | In-Stream | 0.033 | Flow | 19.1 | 7.71 | 60 | 0.29 | no | | | no | , , , | no | , , , | yes | 0 | 0.25 | | | no | | MBAS faint. | Open Drainage (channel) | | | | |

Table 18. Town of Ferrisburgh Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FER_OF_1 | 2017-07-11 | Dana Allen | No flow, just ponding | Unlikely | yes | Trickle | Closed Pipe | 0 | Flow | 24 | 7.6 | 661 | | no | | | no | , , , | no | , , , | yes | | 0.25 | | | yes | Slightly clogged, no erosion | | Pipe | RCP | N/A | | 12 |
| FER_OF_1 | 2018-09-17 | Linda Jencyowski | Partially full of sediment but no signs of any water flow. Upstream infrastructure is totally dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | N/A | | 12 |
| FER_OF_2 | 2017-07-10 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.124 | | 24 | | 780 | 0.2 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | Water | Partially | 24 |
| FER_OF_3 | 2017-07-11 | Dana Allen | Due to position of pipe, closest catch basin was sampled | Unlikely | yes | Trickle | Catchbasin Sump | | | 22.6 | 7.95 | 756 | 0.09 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| FER_OF_4 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | N/A | | 12 |
| FER_OF_5 | 2017-07-11 | Dana Allen | In stream box culvert | Unlikely | yes | Substantial | In-Stream | | | 24 | 7.94 | 540 | 0.03 | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | N/A | | 72 |
| FER_OF_6 | 2017-07-11 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.009 | | 21 | 7.42 | 1027 | 0.2 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CMP | N/A | | 48 |
| FER_OF_7 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Pipe clogging. | | Pipe | CMP | Water | Partially | 18 |
| FER_OF_8 | 2017-07-11 | Dana Allen | Came to collect ship and sniff but outfall dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | | | | Pipe | CPP | N/A | | 18 |
| FER_OF_8 | 2017-10-04 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0.001 | Flow | 24.5 | 6.27 | 1503 | 0.3 | no | | | no | , , , | no | , , , | yes | | 0.5 | | | yes | Outfall eroding directly to Lewis Creek. | | Pipe | CPP | N/A | | 18 |
| FER_OF_9 | 2017-07-10 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | Steel | Water | Partially | 12 |

Table 19. Town of Greensboro Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRN_OF_1 | 2017-07-26 | Dana Allen | Low flow, appears to have suds. Flow appears to come from inflow pipes in most upstream CB, small PVCs, possible under drains | Unlikely | yes | Trickle | | | Flow | 20.1 | 8.25 | 400 | -0.24 | no | | | | , , , | | , , , | yes | | 0 | | | | | | Pipe | CPP | N/A | | 12 |
| GRN_OF_2 | 2017-07-26 | Dana Allen | Backwater present but no flow, upstream CB has screen to catch sediment, no flow visible | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 18 |
| GRN_OF_3 | 2017-07-26 | Dana Allen | Pipe wet but no flow present | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| GRN_OF_4 | 2017-07-26 | Dana Allen | Outfall on property with multiple no trespassing signs. Upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | | | | | | | | | Pipe | | | | |
| GRN_OF_5 | 2017-07-26 | Dana Allen | Pipe dry, ustream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | yes | Much sediment deposited in swale, rip rap recommended | | Pipe | CMP | N/A | | 12 |
| GRN_OF_6 | 2017-07-26 | Dana Allen | Pipe rusted out, water exiting upstream and trickling down to river. Could not get flow measurement, upstream CB has flow | Possible (2 or more indicators present) | yes | Moderate | | | Flow | 18.9 | 8.31 | 1285 | 0.17 | no | | | | , , , | no | , , , | yes | | 0.25 | | | | | | Pipe | CMP | N/A | | 12 |
| GRN_OF_7 | 2017-07-26 | Dana Allen | Fast moving stream | Unlikely | yes | Substantial | | | Flow | 23 | 8.7 | 168 | 0.09 | no | | | | , , , | | , , , | yes | | 0.25 | | | no | | | Pipe | | | | 80 |
| GRN_OF_8 | 2017-07-26 | Dana Allen | Outfall point low in ravine on river, sampled upstream CB. Flow is from underground stream | Unlikely | yes | Moderate | | | | 17.6 | 7.87 | 236 | 0.14 | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| GRN_OF_9 | 2017-07-26 | Dana Allen | Flow likely comes from upstream under drain, traced back to 8 inch PVC coming from building | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 23.3 | 8.33 | 73 | 0.42 | no | | | | , , , | | , , , | yes | | 0.25 | | | | | | Pipe | PVC | N/A | | 12 |

Table 20. Town of Hardwick Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HRD_OF_1 | 2017-07-26 | Dana Allen | Pipe dry. Unlikely | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| HRD_OF_2 | 2017-07-26 | Dana Allen | 2nd Upstream CB dry, immediate CB drains grass swale from across street. Was hard to get picture | Unlikely | yes | | | | | 20.1 | 7.76 | 411 | 0.01 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 18 |
| HRD_OF_3 | 2017-07-26 | Dana Allen | Could not locate pipe, upstream CB full of sediment, but no flow. Outflow pipe not visible. Path of dry riprap flows down hill to river but no outfall pipe insight. ID unlikely | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . | no | | | | | yes | Pipe likely buried | | Pipe | | | | |

Table 21. Town of Hinesburg Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_1 | 2017-07-12 | Dana Allen | Another small PVC pipe leaves through CPP. It had no flow. | Unlikely | yes | Trickle | | | | 24.4 | 7.93 | 2153 | 0.07 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| HIN_OF_10 | 2017-07-12 | Dana Allen | Pipe partially submerged in water pounded in manmade wetland treatment area | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | RCP | Water | Partially | 18 |
| HIN_OF_11 | 2017-07-12 | Dana Allen | Could not capture flow measurement due to trickle into ponder area. | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | | Flow | 22.4 | 7.75 | 2451 | 0.35 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CMP | N/A | | 24 |
| HIN_OF_12 | 2017-07-12 | Dana Allen | Map infrastructure is outdated. End of Parking lot now drains via stone path into grass swale. Remaining roof drains and catchment basins drain into the PVC pipe which also drains into grass swale | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| HIN_OF_13 | 2017-07-12 | Dana Allen | Pipe fully submerged in water and sediment. Upstream side partially submerged. Flow is not apparent but is present in upstream catchment basin where sample is collected. | Possible (2 or more indicators present) | yes | Trickle | Catchbasin Sump | | Sump | 21.1 | 7.72 | 1891 | 0.52 | no | | | no | , , , | no | , , , | yes | | 0.5 | | | yes | | | Pipe | CPP | Water | Fully | 12 |
| HIN_OF_14 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 18 |
| HIN_OF_15 | 2017-07-17 | Dana Allen | Pipe partially submerged in backwater from wetland. No indicators of flow present | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 18 |
| HIN_OF_16 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | Steel | Sediment | Partially | 12 |
| HIN_OF_17 | 2017-07-12 | Linda Jencyowski | Pipe is completely submerged. All upstream catchbasins leading to outfall have sitting water but no flow. | Possible (2 or more indicators present) | yes | Trickle | Open Drainage (ditch) | 0 | | 27.3 | 7.69 | 2107 | 0.33 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Fully | 12 |
| HIN_OF_17 | 2018-09-17 | Dana Allen | Pipe buried in water, not visible. Water full of fresh cut grass. Upstream catchment basin has backwater but no visible flow | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | , , , | yes | Poor pool quality, , , | no | | | | | yes | Pooling water in swale with much algae | | Pipe | CPP | Water | Fully | 12 |
| HIN_OF_17 | 11/12/2018 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | | | 7.23 | 1379 | 0.12 | yes | yes | yes | no | | no | | yes | | 0.75 | 10 | | | | | | | | | |
| HIN_OF_17_CLVO_001 | 11/12/2018 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | | | 7.64 | 1213 | 0.26 | yes | yes | yes | no | | no | | yes | | 0.5 | 41 | | | | | | | | | |
| HIN_OF_17CB_001 | 11/12/2018 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | | | 7.67 | 1567 | 0.17 | yes | yes | yes | no | | no | | yes | | 0.25 | 10 | | | | | | | | | |
| HIN_OF_18 | 2017-07-17 | Dana Allen | | Unlikely | yes | | Closed Pipe | | Flow | 21 | 8.08 | 739 | 0.49 | no | | | | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CMP | N/A | | 18 |
| HIN_OF_19 | 2017-07-17 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | | | 20.7 | 8.2 | 503 | 0.18 | no | | | no | , , , | no | , , , | | | | | | | | | Pipe | CPP | N/A | | 27 |
| HIN_OF_2 | 2017-07-12 | Dana Allen | Outfall not found after several walks on streambank. Upstream catchment basin has water in sump but no flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | no | | | Pipe | | | | |
| HIN_OF_2 | 2018-07-20 | Kerrie Garvey | THIS IS INSPECTION OF OF-04 in front of building please transfer ----- Outfall submerged, catchbasin backwater above pipe. Wetland is source of backwater. Picture of pipe outlet in maintenance. | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | yes | Outfall pipe | | Pipe | | | | |
| HIN_OF_2 | 2018-07-20 | Kerrie Garvey | Still cannot find, possibly buried or linked to sewer - return with manhole pick | Possible (2 or more indicators present) | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| HIN_OF_2 | 2018-09-17 | Linda Jencyowski | Indent along bank where pipe might be but no pipe was located. Assumed burried or submerged in stream. Upstream catchbasin has stagnant water in it but not flowing. Water does not appear to reach the pipe but sample collected from sump | Unlikely | yes | Trickle | Catchbasin Sump | 0 | Sump | 25.4 | 7.84 | 1147 | 0.22 | no | | | no | , , , | no | , , , | yes | | 0 | | | no | | | Pipe | | | | |
| HIN_OF_20 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| HIN_OF_21 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| HIN_OF_22 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| HIN_OF_23 | 2017-07-12 | Dana Allen | Pipe not found. Likely fully submerged in pond/wetland. Upstream catchment basins dry with few drops flowing in from another dry upstream catchment basin. Too small to sample. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Fully | |
| HIN_OF_24 | 2017-07-12 | Dana Allen | Outfall not found. Likely submerged in pond/wetland. Upstream catchment basin dry with no flow. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | | | | |
| HIN_OF_25 | 2017-07-17 | Dana Allen | Backwater in pipe from grass swale but no signs of inflow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | | | 24 |
| HIN_OF_26 | 2017-07-17 | Dana Allen | Outfall not found. Likely submerged in wetland and hidden by vegetation | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | | | |
| HIN_OF_26 | 2018-09-17 | Linda Jencyowski | Could not locate outfall. Most likely submerged in wetland. Upstream catchbasins were all checked and all had stagnant water | Unlikely | yes | Trickle | Catchbasin Sump | 0 | | 22.5 | 7.43 | 489 | 0.07 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | | | |
| HIN_OF_27 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| HIN_OF_3 | 2017-07-12 | Dana Allen | Pipe fully submerged in wetland. Upstream catchment basin has no flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | Water | Fully | 6 |
| HIN_OF_4 | 2017-07-12 | Dana Allen | Unable to find outfall. Searched extensively. Upstream catchment basins are backwatered ~1ft above outflow pipe. After talking to nearby employee we learned area recently flooded and pumps have been used in catchment basins previously. This leads us to believe pipe is buried & maintenance is required. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | no | | | Pipe | PVC | Water | Fully | 8 |
| HIN_OF_4 | 2018-09-17 | Linda Jencyowski | Outfall is completely submerged in stagnant water. All upstream catchbasins also contain stagnant water. Sample is taken from sump of outfall. | Unlikely | yes | Trickle | Closed Pipe | 0 | | 25.9 | 8.13 | 784 | 0.01 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | Water | Fully | 8 |
| HIN_OF_5 | 2017-07-17 | Dana Allen | Pipe three quarters submerged in sediment and vegetation. Pooling occurs around outfall. | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | yes | Pipe more than halfway buried in sediment and vegetation | | Pipe | RCP | Sediment | Partially | 12 |
| HIN_OF_6 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 8 |
| HIN_OF_7 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | | | 18 |
| HIN_OF_8 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| HIN_OF_9 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 4 |

Table 22. Town of Huntington Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HNT_OF_1 | 2017-07-12 | Dana Allen | Trickle flow still present. Sample taken for ship n sniff | Unlikely | yes | Moderate | | | Flow | 17.5 | 8.33 | 354 | 0.1 | no | | | no | , , , | no | , , , | yes | | 0 | | | | | | Pipe | CMP | N/A | | 18 |
| HNT_OF_1 | 2017-10-04 | Dana Allen | Point on map is in dry wooded area. This is upstream driveway culvert emptying into heavily vegetated swale leading into woods. Pooled stagnant water on both sides of culvert | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | | Flow | 21.3 | 7.68 | 369 | 1.98 | no | | | | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CMP | N/A | | 18 |
| HNT_OF_2 | 2017-07-12 | Dana Allen | Map reflects steep ravine with no structural outfall. Picture taken/data collected at nearest upstream culvert. No flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 12 |
| HNT_OF_3 | 2017-07-12 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.001 | | 21.2 | 7.7 | 66 | 0.04 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| HNT_OF_4 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Slight scouring. Sandy sediment pooled along pitfall and stream bed. | | Pipe | CMP | N/A | | 48 |
| HNT_OF_5 | 2017-07-12 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 12 |

Table 23. Town of Hyde Park Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HDP_OF_1 | 2017-07-20 | Dana Allen | Upstream CB has water flowing in from small pipe pointing uphill towards childcare. Not a mapped input | Unlikely | yes | Trickle | Closed Pipe | 0.001 | Flow | 20.9 | 7.6 | 629 | 0.56 | no | | | no | , , , | yes | Pipe benthic growth, Orange, , | yes | | 0 | | | no | | | Pipe | PVC | N/A | | 8 |
| HDP_OF_1 | 2018-09-19 | Linda Jencyowski | Small trickle of flow but not enough to sample | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | negative | no | | | Pipe | PVC | N/A | | 8 |
| HDP_OF_1_CB_6 | 2018-09-19 | Linda Jencyowski | Upstream catchbasin leading to this one is totally dry. | Obvious | yes | Trickle | Catchbasin Sump | 0 | Sump | 17.2 | 7.32 | 778 | 99 | yes | yes | yes | yes | Color,Odor, Sewage, , | no | , , , | yes | 0 | 0.25 | 2400 | | no | | Slight detergents between 0 and 0.25 | Pipe | | | | |
| HDP_OF_2 | 2017-07-20 | Dana Allen | Pipe partially buried, no flow | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Pipe almost fully submerged in the ground, no obvious flow path during storm event | | Pipe | CMP | Sediment | Partially | 15 |
| HDP_OF_3 | 2017-07-20 | Dana Allen | Pipe dry, upstream CB dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| HDP_OF_4 | 2017-07-20 | Dana Allen | Pipe contains some backwater at outlet point, no evidence of flow. Upstream catchbasins dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 24 |

Table 24. Town of Irasburg Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRA_OF_1 | 2017-07-20 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0 | | 19.8 | 8.68 | 523 | 0.19 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CPP | N/A | | 18 |
| IRA_OF_2 | 2017-07-20 | Dana Allen | Pipe broken. | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | | Flow | 18.7 | 8.37 | 1795 | 0.23 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | yes | Pipe broken at approximate outfall location. | | Pipe | Clay | N/A | | 8 |
| IRA_OF_2 | 2018-08-13 | Dana Allen | Smoke testing. Smoke coming from outlet but no water. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | Clay | N/A | | 8 |
| IRA_OF_3 | 2017-07-20 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 15 |

Table 25. Town of Jericho Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JER_OF_1 | 2017-07-17 | Dana Allen | | Possible (2 or more indicators present) | yes | Moderate | Closed Pipe | 0.001 | Flow | 22.4 | 8.08 | 196 | 0.62 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | no | | | Pipe | CPP | | | |
| JER_OF_1 | 2017-10-04 | Dana Allen | Flow is not coming from CB, flow comes from stream/wetland on other side of street. Barely flowing. | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0.001 | Flow | 16.2 | 7.6 | 315 | 0.55 | no | | | no | , , , | no | , , , | yes | | 0.25 | | | no | | Color was very light. Less than .25 | Pipe | CPP | | | |
| JER_OF_2 | 2017-07-17 | Dana Allen | Pipe contained backwater from wetland but no signs of incoming flow. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 24 |
| JER_OF_3 | 2017-07-17 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |

Table 26. Town of Lowell Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LWL_OF_1 | 2017-07-20 | Dana Allen | Not positive which pipe is SW. Maintenance definitely requires. Erosion/landslide has broken both pipes. Water flow and Japanese knotweed has made the area highly prone to erosion | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Erosion has caused 2 pipes to completely break in half. Unsure what second pipe is for. | | Pipe | CMP | N/A | | 24 |
| LWL_OF_2 | 2017-07-20 | Dana Allen | Pipe dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Erosion prone. riprap recommended, | | Pipe | RCP | N/A | | 18 |
| LWL_OF_3 | 2017-07-20 | Dana Allen | Pipe not found. Upstream catchment basins dry | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | | | | | | | | | Pipe | | | | |
| LWL_OF_4 | 2017-07-20 | Dana Allen | Pipe in side of tall retaining wall. no visible flow. Upstream CB seems to be on property with large barking dog outside | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | Steel | N/A | | 12 |

Table 27. Town of Middlesex Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MDL_OF_1 | 2017-07-21 | Dana Allen | Slight backwater, no flow | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| MDL_OF_2 | 2017-07-21 | Dana Allen | No flow | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 18 |
| MDL_OF_3 | 2017-07-21 | Dana Allen | Some backwater, no flow | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 12 |
| MDL_OF_4 | 2017-07-21 | Dana Allen | No flow | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| MDL_OF_6 | 2017-07-21 | Dana Allen | Dry | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| MDL_OF_8 | 2017-08-21 | Dana Allen | Moderate flow. Water seems to be coming in from in between two upstream CBS. Service is not good so I cannot load infrastructure layer. Investigate later | Unlikely | yes | Moderate | Closed Pipe | 0.009 | | 19 | 8.4 | 110 | 0.24 | no | | | | . . . | no | . . . | | | | | | no | | | Pipe | | | | |
| MDL_OF_9 | 2017-07-21 | Dana Allen | Outfall not found. Much granite and many old telephone polls were throw down steep ravine, possibly destroying/hiding outfall. No flow in upstream catchment basin | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | | | | |

Table 28. Town of Mount Holly Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTH_OF_1 | 2017-06-13 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.003 | | 19 | 8.25 | 940 | 0.12 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | RCP | N/A | | 24 |
| MTH_OF_2 | 2018-09-17 | Sean Brennan | Large box culvert that flows stream under roadway and house front porch. No pipes can be seen entering the stream. | Possible (2 or more indicators present) | yes | Substantial | In-Stream | 0 | Flow | 22.7 | 7.86 | 145 | 0.38 | no | no | no | no | , , , | no | , , , | yes | 0 | 0.25 | | | no | | Less than .25 detergents | Pipe | | | | |
| MTH_OF_3 | 2017-06-13 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.004 | | 20.5 | 8.3 | 258 | 0.22 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| MTH_OF_4 | 2017-06-13 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.005 | | 21.8 | 8.29 | 125 | 0.18 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 18 |
| MTH_OF_5 | 2018-09-17 | Sean Brennan | | Unlikely | yes | Moderate | Closed Pipe | 0.004 | Flow | 20.7 | 7.59 | 353 | 0.25 | yes | | | no | , , , | yes | Deposits/Stains,Pipe benthic growth, , , | yes | 0 | 0 | | | yes | Bank eroding | | Pipe | CPP | N/A | | 36 |
| MTH-OF-01-Inlet | 11/8/2018 | Sean Brennan | | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | | | | 8.93 | 110 | 0.32 | yes | yes | no | | | | | | | | 0.017 | | | | | | | | | |
| MTH-OTH-16-CB-62 | 11/8/2018 | Sean Brennan | | Possible (2 or more indicators present) | yes | Trickle | Catchbasin Sump | | | | 8.37 | 493 | 0.29 | yes | yes | yes | | | | | | | | 0.049 | | | | | | | | | |
| MTH-OTH-23-OF-67 | 11/8/2018 | Sean Brennan | | Possible (2 or more indicators present) | yes | Trickle | Catchbasin Sump | | | | 8.49 | 562 | 0.29 | yes | yes | yes | | | | | | | | 0.023 | | | | | | | | | |

Table 29. Town of Newport Town Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NPT_OF_1 | 2017-08-17 | Dana Allen | Pipe submerged in pond/wetland. Upstream CB checked, no flow. Illicit discharge unlikely. | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | Water | Partially | 12 |
| NPT_OF_2 | 2017-08-17 | Dana Allen | Pipe slightly wet but no flow. No other signs of ID | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CPP | N/A | | 18 |

Table 30. Town of Orwell Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ORW_OF_1 | 2017-06-13 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | | | 19.7 | 7.55 | 1845 | 0.09 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 6 |
| ORW_OF_2 | 2017-06-13 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | | | 22 | 8.34 | 1615 | 0.11 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| ORW_OF_4 | 2017-06-13 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | PVC | N/A | | 6 |
| ORW_OF_5 | 2017-06-13 | Dana Allen | Did not sample at outfall - water commingled with wetland water. Water observed in upstream CB$ coming from diversion ditches. | Unlikely | | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | CMP | Water | Partially | 12 |
| ORW_OF_5 | 2017-10-04 | Dana Allen | Outfall mingles with wetland, sample taken from CB. Flow seems to be coming from swale that runs along side entrance road close to gate | Unlikely | yes | Trickle | | | Flow | 14.7 | 8.37 | 1400 | -0.04 | no | | | | . . . | | . . . | yes | | 0.25 | | | | | color came back very light. less than .25 | Pipe | CMP | Water | Partially | 12 |
| ORW_OF_5 | 2018-07-20 | Dana Allen | Outfall submerged in wetland. Upstream CB has wetted sump but not enough for a sample. Source is saturated upstream swales. ID inlikely | Unlikely | no | | | | | | | | | no | | | | . . . | | . . . | | | | | | | | | Pipe | CMP | Water | Partially | 12 |
| ORW_OF_5_CB_2 | 2017-06-13 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | | Flow | 20.6 | 8.37 | 1306 | 0.32 | no | | | no | . . . | no | . . . | yes | | 0.25 | | | no | | Slightly fainter than 0.25ppm. | Pipe | | | | |

Table 31. Town of Shoreham Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SHR_OF_1 | 2017-10-04 | Dana Allen | Pipe submerged in water. No apparent flow. Sample taken from Flow in upstream CB | Unlikely | yes | Trickle | | | | 17.6 | 7.53 | 1986 | 0 | no | | | | . . . | | . . . | | | | | | | | | Pipe | CPP | N/A | | 36 |
| SHR_OF_2 | 2017-08-01 | Dana Allen | | Possible (2 or more indicators present) | yes | Trickle | | 0.15 | Flow | 20.2 | 8.21 | 440 | 0.34 | no | | | no | . . . | no | . . . | yes | | 0.25 | | | no | | | Pipe | Clay | N/A | | 36 |
| SHR_OF_2 | 2017-10-04 | Dana Allen | Large outflow pipe was backwatered with stagnant water from swale. Upstream CB has water in sump but no flow. ID unlikely | Unlikely | no | | | | Flow | | | | | no | | | | . . . | no | . . . | yes | | 0.25 | | | | | Color was very light. Less than .25 | Pipe | Clay | N/A | | 36 |
| SHR_OF_2 | 2018-07-20 | Dana Allen | Upstream CBS dry, upstream swales dry. Source of flow uncertain | Unlikely | yes | Moderate | | | | 25.2 | 8.38 | 268 | 0.17 | no | | | no | . . . | | . . . | | | | | | | | | Pipe | Clay | N/A | | 36 |
| SHR_OF_3 | 2017-08-01 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | Clay | N/A | | 12 |
| SHR_OF_4 | 2017-06-14 | Linda Jencyowski | Stagnant water from outfall. Sample collected from stagnant water. Upstream infrastructure is dry. | Unlikely | yes | Trickle | Closed Pipe | 0 | Sump | 20 | 7.84 | 1075 | 0.22 | no | | | no | . . . | no | . . . | yes | | 0 | | | no | | | Pipe | CMP | Water | Partially | 42 |
| SHR_OF_4 | 2018-09-17 | Kerrie Garvey | | Unlikely | yes | Trickle | Closed Pipe | 0.072 | | 17.1 | 6.95 | 78.8 | 0.25 | no | | | no | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | Water | Partially | 42 |
| SHR_OF_5 | 2017-08-01 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.012 | Flow | 24.2 | 7.89 | 1292 | -0.1 | no | | | no | . . . | no | . . . | yes | | 0 | | | no | | | Pipe | CMP | Water | Partially | 18 |

Table 32. Town of Wallingford Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WLF_OF_1 | 2017-06-13 | Dana Allen | Outfall moist but not flowing. No flow in upstream CB. | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | Steel | N/A | | 6 |
| WLF_OF_2 | 2017-06-13 | Dana Allen | Could not sample flow. Used upstream CB where flow was entering for analysis. Temp: 22.3 \| pH 8.1 \| Conductivity (uS/cm) 373 \| Ammonia (mg/L) 0.06. Unlikely Illicit Discharge | Unlikely | yes | Trickle | | | | | | | | no | | | no | . . . | no | . . . | no | | | | | yes | Pipe clogging. | | Pipe | CMP | Sediment | Partially | 18 |
| WLF_OF_2_CB_30 | 2017-06-13 | Dana Allen | | Unlikely | yes | Trickle | | | | 22.3 | 8.1 | 373 | 0.06 | no | | | no | . . . | no | . . . | | | | | | no | | | Pipe | | | | |
| WLF_OF_3 | 2017-06-13 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | . . . | no | . . . | no | | | | | no | | | Pipe | CMP | N/A | | 18 |

Table 33. Town of Warren Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WRN_OF_1 | 2017-07-07 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.016 | | 15.5 | 7.75 | 695 | 0.07 | no | | | no | , , , | no | , , , | | | | | | yes | Pipe clogged with sediment. | | Pipe | RCP | Sediment | Partially | 18 |
| WRN_OF_10 | 2017-07-19 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | 0.024 | | 15.4 | 8.49 | 20 | 0.04 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_11 | 2017-07-19 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | | | 16 | 8.47 | 132 | 0.15 | no | | | no | , , , | no | , , , Brown staining on pipe, may be iron oxide | no | | | | | no | | | Pipe | CPP | N/A | | 15 |
| WRN_OF_12 | 2017-07-19 | Dana Allen | Outfall flooded. Sampled from upstream CB. | Unlikely | yes | Trickle | Catchbasin Sump | | | 15.3 | 8.5 | 100 | 0.14 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | Water | Partially | 24 |
| WRN_OF_13 | 2017-07-19 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_14 | 2017-07-19 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 18 |
| WRN_OF_15 | 2017-07-19 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_16 | 2017-07-19 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_17 | 2017-07-19 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | | | 16.3 | 8.08 | 572 | 0.15 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_18 | 2017-08-25 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | | | 14.9 | 8.14 | 545 | -0.03 | no | | | no | , , , | no | , , , | no | | | | | yes | Pipe rusted out | | Pipe | CMP | N/A | | 40 |
| WRN_OF_19 | 2017-08-25 | Dana Allen | | Unlikely | yes | Moderate | | | | 17.3 | 8.4 | 136 | 0.09 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 24 |
| WRN_OF_2 | 2017-08-25 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.001 | | 15.9 | 8.4 | 1133 | 0 | no | | | no | , , , | | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 12 |
| WRN_OF_20 | 2017-07-19 | Dana Allen | | Unlikely | yes | Trickle | Closed Pipe | 0.009 | | 16.6 | 8.41 | 560 | 0.19 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 15 |
| WRN_OF_21 | 2017-08-25 | Dana Allen | No flow, a lot of sediment | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | A lot of sediment in pipe and at outfall | | Pipe | CMP | N/A | | 12 |
| WRN_OF_22 | 2018-09-06 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| WRN_OF_23 | 2017-08-25 | Dana Allen | Stream | Unlikely | yes | Substantial | Closed Pipe | | | 15.2 | 8.2 | 929 | 0.01 | no | | | no | , , , | no | , , , | | | | | | | | | Pipe | CMP | N/A | | 36 |
| WRN_OF_24 | 2017-08-25 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Bottom of pipe is completely eroded, water has created eroded channel | | Pipe | CMP | N/A | | 12 |
| WRN_OF_25 | 2017-08-25 | Dana Allen | Small stream | Unlikely | yes | Substantial | Closed Pipe | | | 16 | 8.32 | 502 | -0.01 | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 36 |
| WRN_OF_26 | 2017-08-25 | Dana Allen | Stream bed very orange | Unlikely | yes | Substantial | Closed Pipe | | | 14.4 | 7.6 | 474 | 0.1 | no | | | | , , , | yes | , , , | | | | | | | | | Pipe | CMP | N/A | | 36 |
| WRN_OF_27 | 2017-08-25 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.006 | | 16.1 | 8 | 154 | 0.06 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| WRN_OF_28 | 2017-08-25 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 36 |
| WRN_OF_3 | 2017-08-25 | Dana Allen | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 12 |
| WRN_OF_4 | 2017-07-07 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | 0.007 | | 17.1 | 7.75 | 385 | 0.06 | no | | | no | , , , | yes | Deposits/Stains, , , | | | | | | no | | | Pipe | CPP | N/A | | 12 |
| WRN_OF_5 | 2017-07-07 | Dana Allen | | Unlikely | yes | Substantial | Closed Pipe | 0.011 | | 19.1 | 7.86 | 1250 | 0.12 | no | | | no | , , , | no | , , , | | | | | | no | | | Pipe | CMP | N/A | | 18 |
| WRN_OF_6 | 2017-08-25 | Dana Allen | Pipe slightly back watered from surface water, no flow in upstream CB | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 8 |
| WRN_OF_7 | 2017-08-25 | Dana Allen | Pipe hidden under boulders | Unlikely | yes | Trickle | Closed Pipe | | | 16.7 | 8.44 | 217 | -0.01 | no | | | | , , , | | , , , | | | | | | | | | Pipe | CMP | N/A | | 12 |
| WRN_OF_8 | 2017-07-19 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.007 | | 17 | 8.9 | 108 | 0.09 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |
| WRN_OF_9 | 2017-07-19 | Dana Allen | | Unlikely | yes | Moderate | Closed Pipe | 0.009 | | 15.7 | 8.7 | 62 | 0.05 | no | | | no | , , , | no | , , , | no | | | | | no | | | Pipe | CMP | N/A | | 24 |

Table 34. Town of Washington Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WSH - DownStream* | 2018-10-26 | Sean Brennan | | Unlikely | yes | Moderate | In-Stream | 0 | Flow | 5.5 | 8.49 | 375 | 0.12 | yes | no | no | no | , , , | no | , , , | yes | | 0 | 26 | negative | no | | | Open Drainage (channel) | | | | |
| WSH - Midstream* | 2018-10-26 | Sean Brennan | | Unlikely | yes | Moderate | In-Stream | 0 | Flow | 4.9 | 8.36 | 330 | 0.15 | yes | no | no | no | , , , | no | , , , | yes | | 0 | 20 | negative | no | | | Open Drainage (channel) | | | | |
| WSH - Upstream* | 2018-10-26 | Sean Brennan | | Unlikely | yes | Moderate | Open Drainage (ditch) | 0 | Flow | 6 | 8.49 | 360 | 0.14 | yes | no | no | no | , , , | no | , , , | yes | | 0 | 15 | negative | no | | | Open Drainage (channel) | | | | |
| WSH_OF_1 | 2017-08-28 | Dana Allen | Pipe has many cracks. Possibly draining groundwater | Unlikely | yes | Trickle | | | | 17.2 | 7.35 | 544 | 0.09 | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | PVC | N/A | | 4 |
| WSH_OF_2 | 2017-08-28 | Dana Allen | | Unlikely | no | | | | | | | | | yes | yes | yes | | , , , | | , , , | no | | | | | no | | | Pipe | RCP | N/A | | 12 |
| WSH_OF_3 | 2017-08-21 | Dana Allen | Pipes in headwall but both dry. | Unlikely | no | | | | | | | | | no | | | | , , , | | , , , | no | | | | | no | | | Pipe | CPP | N/A | | 12 |
| WSH_OF_4 | 2017-08-21 | Dana Allen | Pretty sure this is outfall, infrastructure layer will not load. Will double check later | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | NA | | no | | | Pipe | PVC | N/A | | 4 |
| WSH_OF_NEW_001* | 2018-10-26 | Sean Brennan | | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | <1.0 | negative | no | | | Pipe | | | | 3 |
| WSH_OF_NEW_002* | 2018-10-26 | Sean Brennan | | Possible (2 or more indicators present) | yes | Trickle | Closed Pipe | 0 | Flow | 6.3 | 8.19 | 711 | 0.13 | yes | yes | yes | no | , , , | yes | Pipe benthic growth, , , | yes | | 0.75 | NA | negative | no | | | Pipe | | | | 4 |
| WSH_OF_NEW_003* | 2018-10-26 | Sean Brennan | | Unlikely | no | | | | | | | | | no | | | | | no | , , , | no | | | | negative | no | | | Pipe | | | | |

* - indicates outfall surveyed upon special resquest

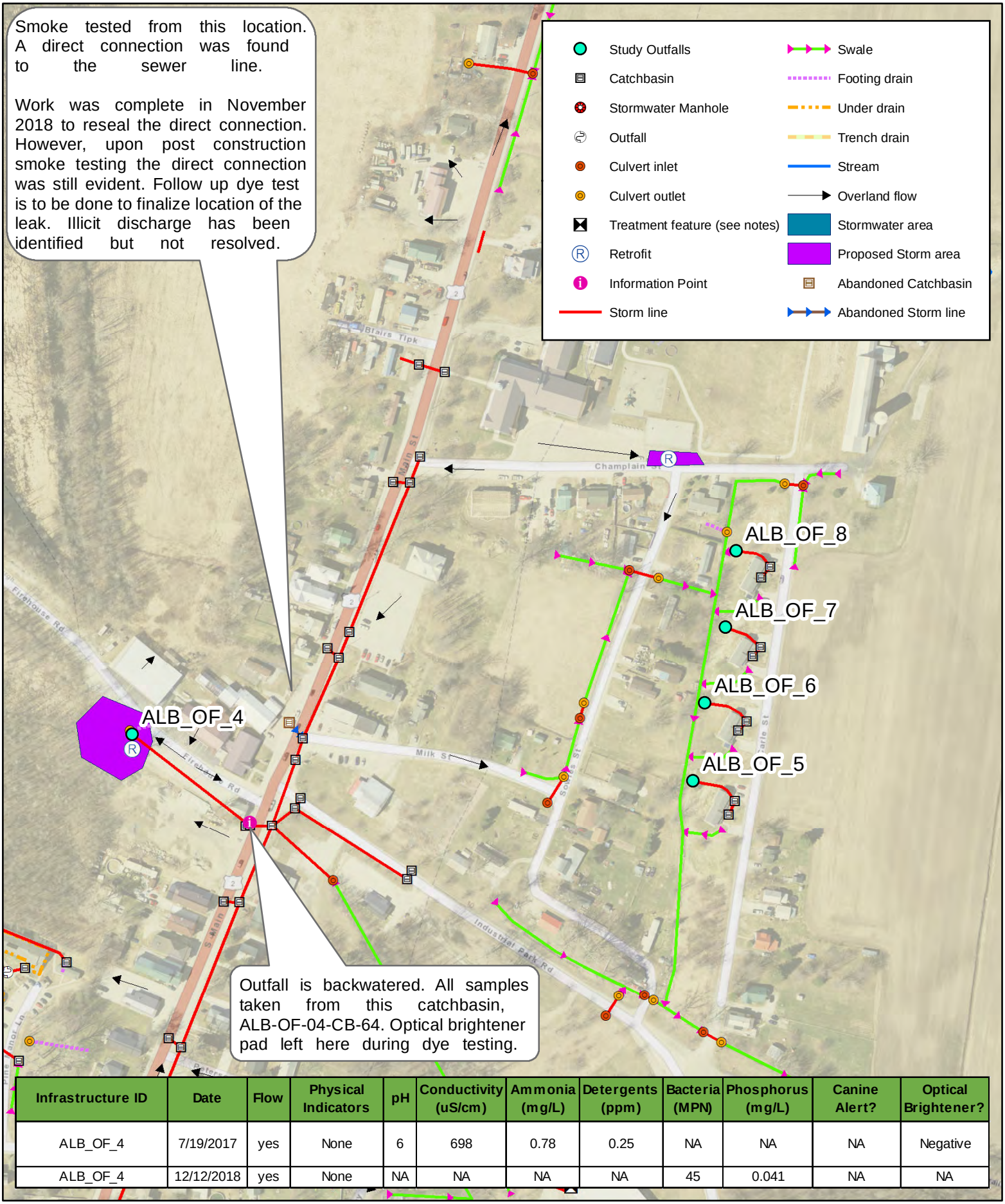
Table 35. Town of West Fairlee Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WFL_OF_1 | 2018-09-13 | Linda Jencyowski | | Suspect (one or more indicators with severity of 3) | yes | Trickle | Catchbasin Sump | 0 | Sump | 20.1 | 8.2 | 1256 | 0.21 | no | | | yes | Color, , , Photo is from detergents test. Color of water was fairly normally, slightly brown - murky | no | , , , | yes | 0.4 | 1 | | | no | | Detergents came out a green color. See photo in flow indicator section. Not enough water in sump or flowing to take e. Coli or TP | Pipe | CPP | Sediment | Partially | 15 |

Table 36. Town of Worcester Summary

| Infrastructure ID | Date | Investigator | Notes | Overall Characterization | Flow | Flow Amount | Inspection Location | Flow (CFS) | Sample Source | Temp (°C) | pH | Conductivity (um/cm) | Ammonia (mg/L) | Ship n Sniff? | Canine Alert 1? | Canine Alert 2? | Physical Indicators Present? | Physical Indicators | Non Flow Indicators | Non-Flow Related Indicators | Sample for Lab? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | OB Trap Result | Maintenance Needed? | Maintenance Notes | Lab Notes | Structure | Material | Submerged? | Submersion Amount? | Pipe Diameter (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WCR_OF_2 | 2017-08-21 | Dana Allen | Large amounts of sediment deposited at outfall. Could not see flow but could hear it. Sample taken from sump of upstream CB. | Unlikely | yes | Trickle | Catchbasin Sump | 0.001 | | 21.1 | 8.2 | 75 | 0.22 | no | | | no | , , , | no | , , , | no | | | | | yes | Great amount of sediment deposited at discharge point | | Pipe | CMP | Sediment | Partially | 36 |
| WCR_OF_2 | 2018-09-07 | Dana Allen | Infrastructure above outfall dry. | Unlikely | no | | | | | | | | | no | | | | , , , | no | , , , | no | | | | | yes | Outfall is mostly full of sediment. Erosion below outfall | | Pipe | CMP | Sediment | Partially | 36 |

# APPENDIX 2 - MAPBOOK




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALB_OF_4 | 7/19/2017 | yes | None | 6 | 698 | 0.78 | 0.25 | NA | NA | NA | Negative |
| ALB_OF_4 | 12/12/2018 | yes | None | NA | NA | NA | NA | 45 | 0.041 | NA | NA |

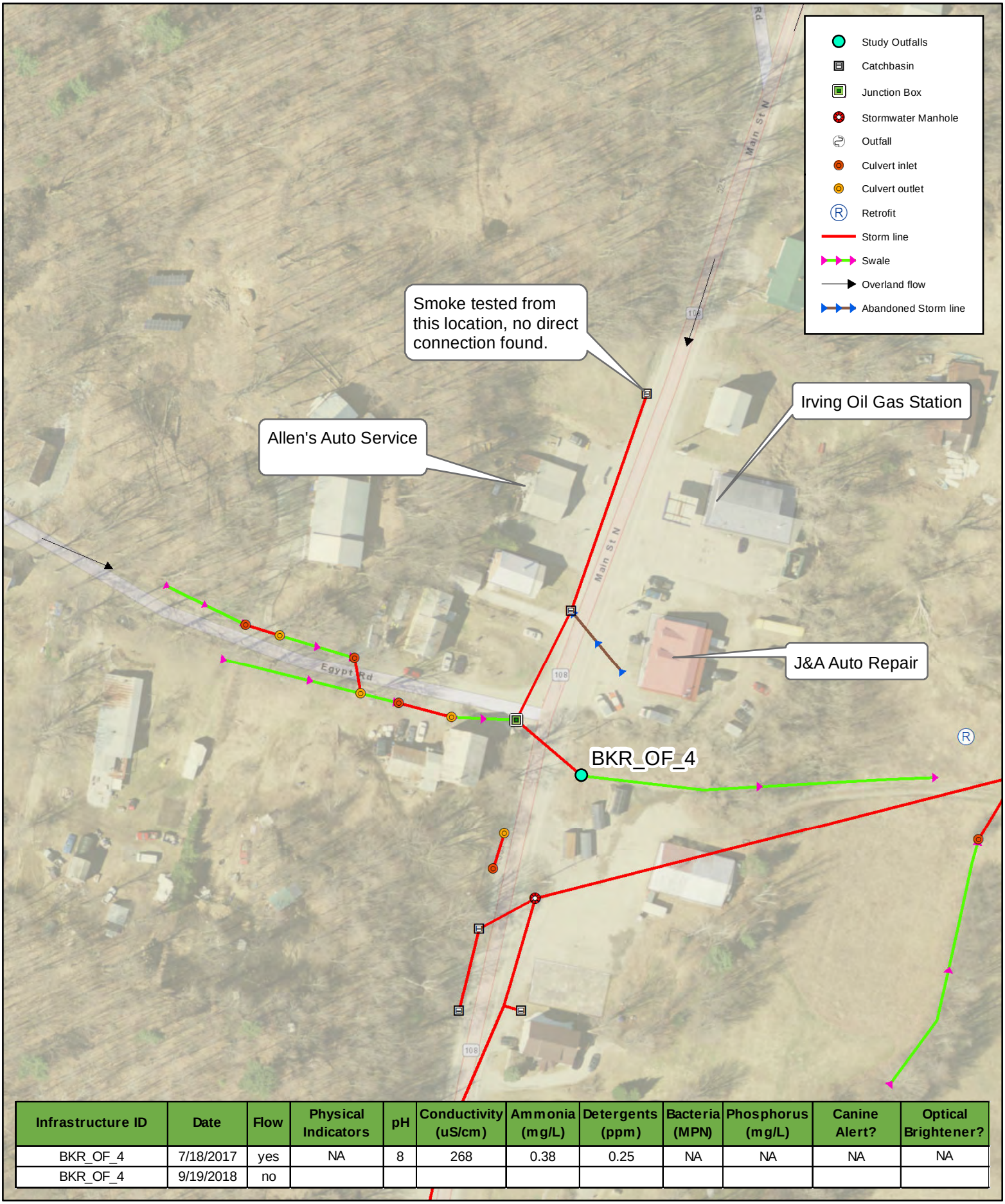
N

0 100 200 400 Feet

**ALB-OF-01**
**Advanced Investigation Map**
**Alburgh, VT**

WATERSHED CONSULTING

Map Made: 3/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BKR_OF_4 | 7/18/2017 | yes | NA | 8 | 268 | 0.38 | 0.25 | NA | NA | NA | NA |
| BKR_OF_4 | 9/19/2018 | no | | | | | | | | | |

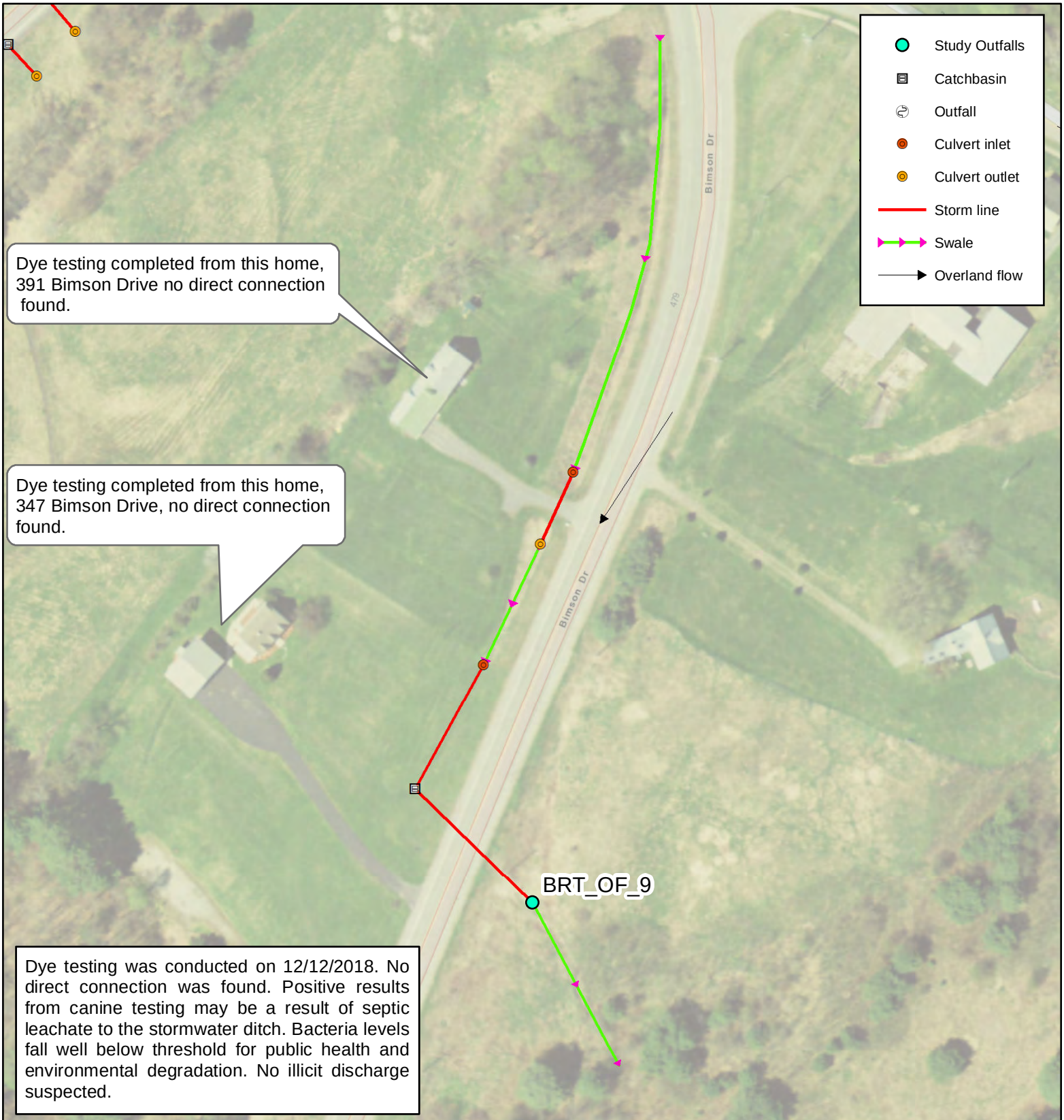
N

0 50 100 200 Feet

**BKR-OF-04**
**Advanced Investigation Map**
**Bakersfield, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




Dye testing was conducted on 12/12/2018. No direct connection was found. Positive results from canine testing may be a result of septic leachate to the stormwater ditch. Bacteria levels fall well below threshold for public health and environmental degradation. No illicit discharge suspected.

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_9 | 8/29/2017 | yes | None | 8.3 | 1155 | 0.42 | 1 | NA | NA | NA | NA |
| BRT_OF_9 | 9/13/2018 | yes | None | 7.9 | 1616 | 0.74 | NA | NA | 0.22 | Positive | Positive |
| BRT_OF_9_CB_33 | 9/13/2018 | yes | None | 7.5 | 1350 | 0.47 | 0.5 | NA | NA | NA | NA |
| BRT_OF_09 | 12/12/2018 | yes | none | NA | NA | NA | NA | 45 | 0.041 | NA | Negative |

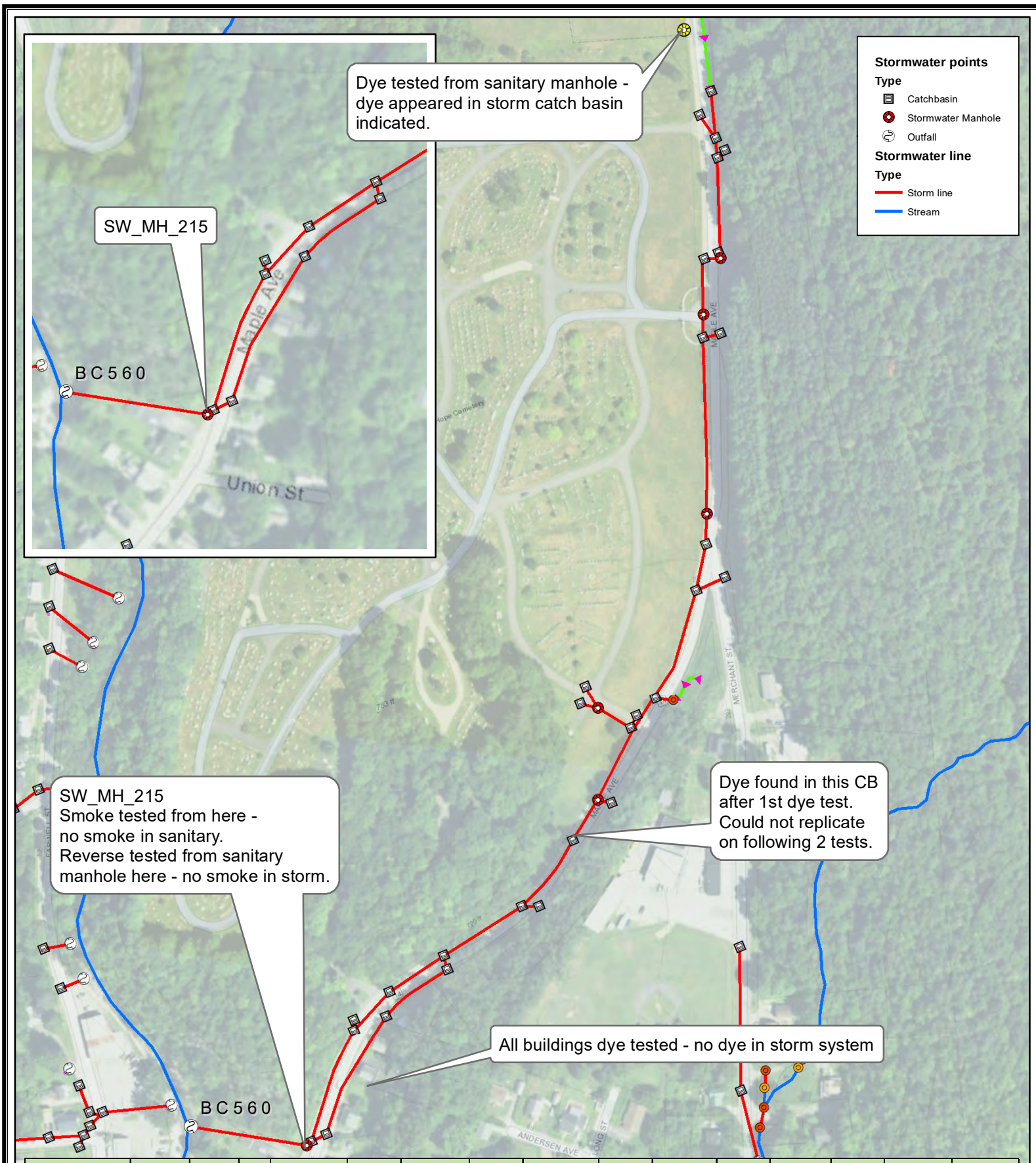
N

0 50 100 200 Feet

**BRT-OF-09**
**Advanced Investigation Map**
**Barnet, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BC560_SW_MH_215 | 2018-08-24 | yes | 0.000 | 26.4 | 7.49 | 1140 | 0.16 | no | no | no | 0 | 2 | | | no |
| BC560 | 2018-09-14 | yes | 0.001 | | | | | no | no | no | | | 550 | 0.11 | no |

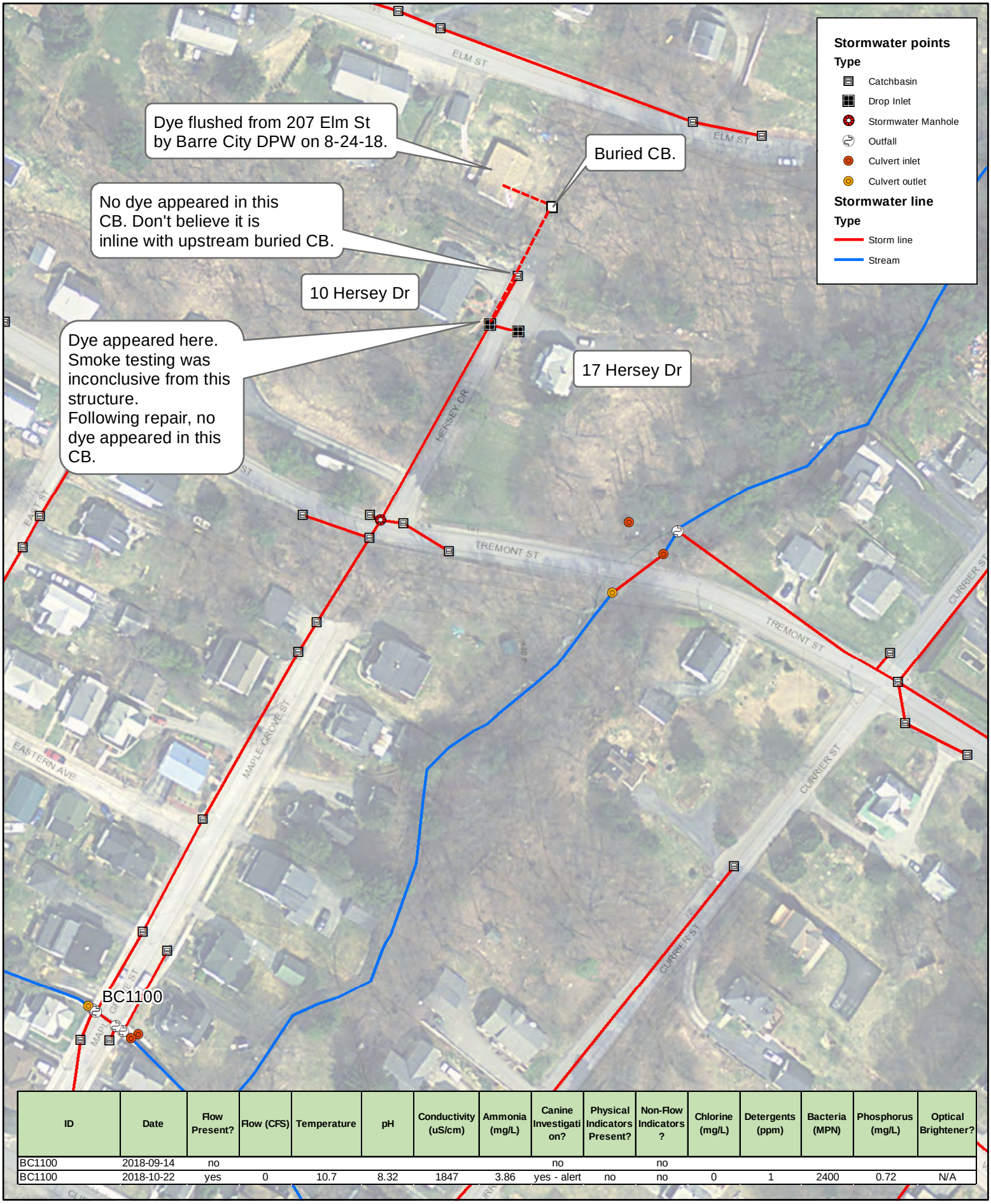
N

0 162.5 325 Feet

Advanced Investigation Map
Barre City, VT
BC560

WATERSHED CONSULTING

Map Made: 1/17/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators ? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BC1100 | 2018-09-14 | no | | | | | | no | | no | | | | | |
| BC1100 | 2018-10-22 | yes | 0 | 10.7 | 8.32 | 1847 | 3.86 | yes - alert | no | no | 0 | 1 | 2400 | 0.72 | N/A |

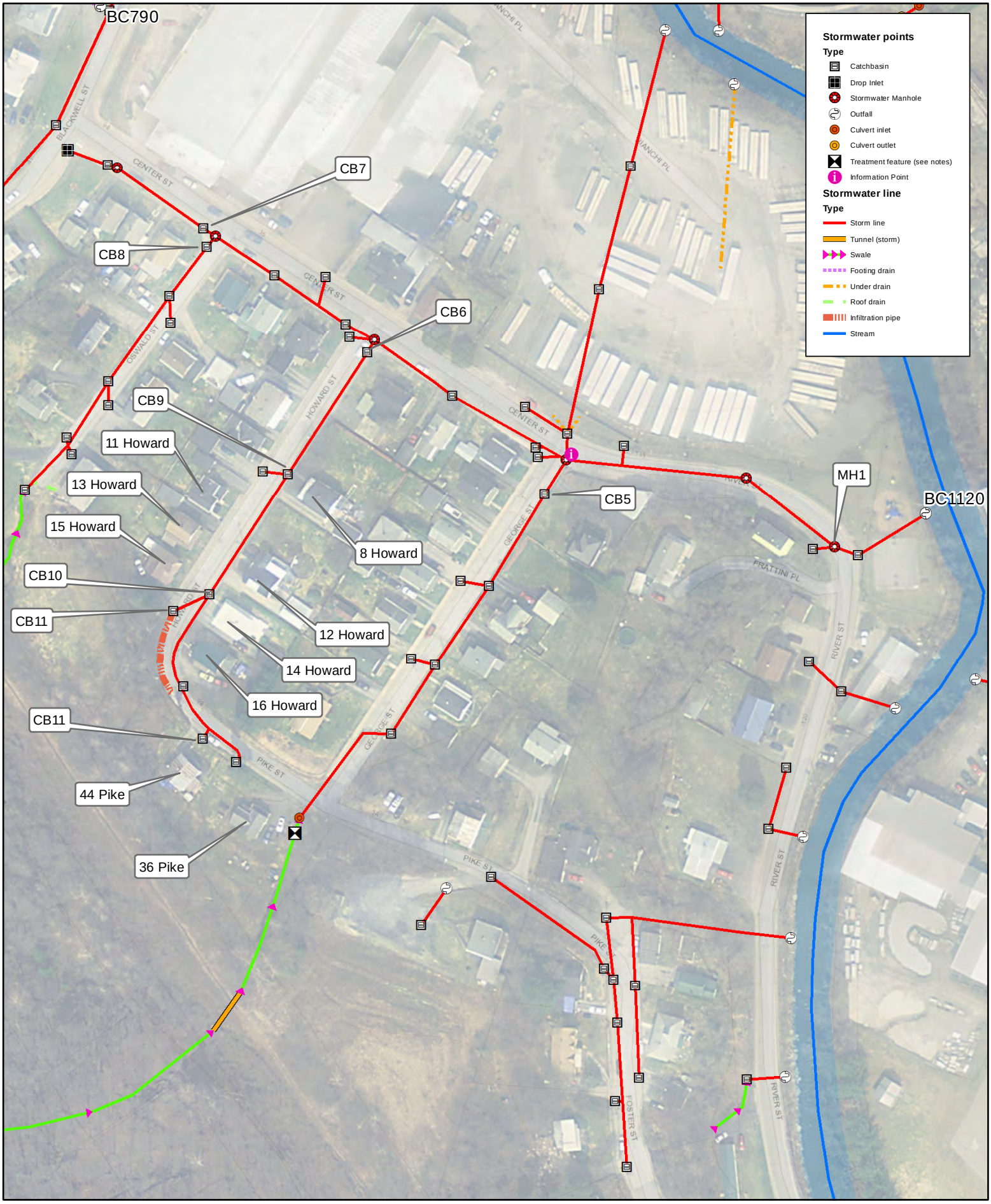
N

0 75 150 Feet

Advanced Investigation Map
BC1100
Barre City, VT

WATERSHED CONSULTING

Map Made: 1/17/2019



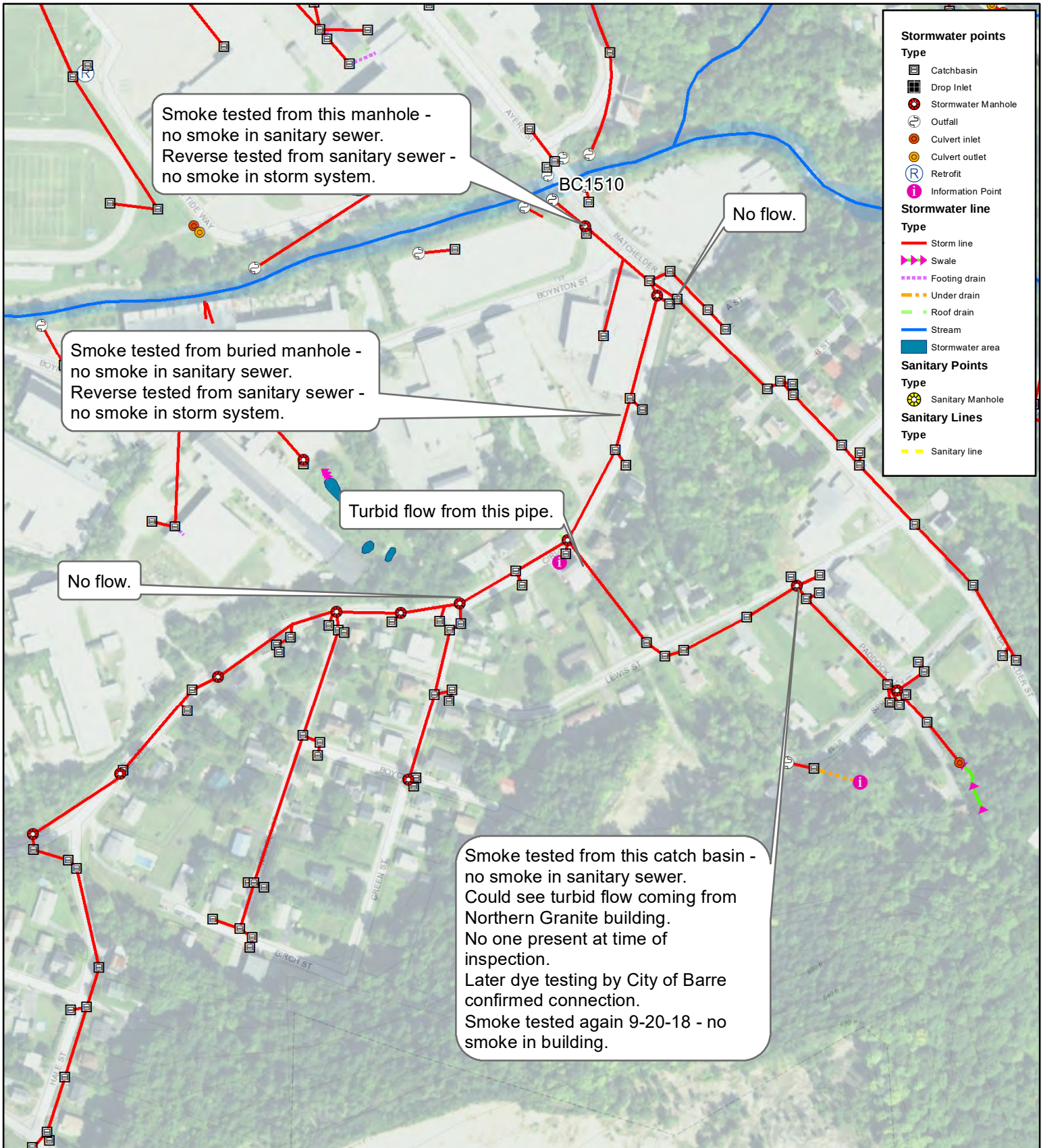

N

0 100 200 Feet

Advanced Investigation Map
Barre City, VT
BC1120

WATERSHED CONSULTING

Map Made: 1/24/2019




| ID | Date | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BC1510 | 2018-08-24 | 0.018 | 20.6 | 8.29 | 1266 | 0 | no | yes | no | | 0 | | | no |
| BC1510 | 2018-09-14 | 0.003 | | | | | no | yes | yes | | | 1 | 0.69 | |
| BC1510 | 2018-10-22 | 0.004 | 10.5 | 8.41 | 680 | 0.09 | no | no | no | 0 | 0.25 | 6.3 | 0.28 | no |

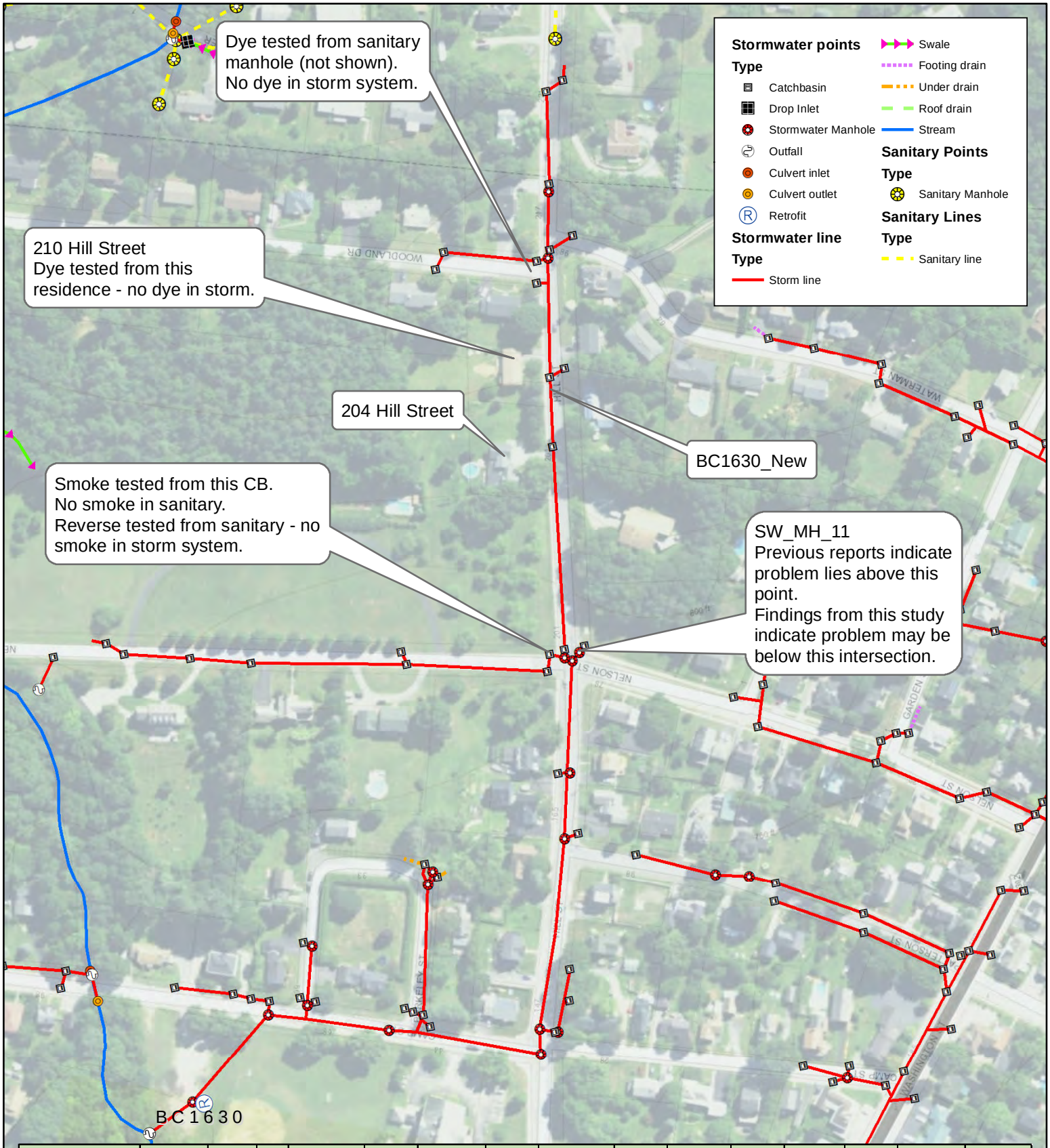
N

0 162.5 325 Feet

Advanced Investigation Map
Barre City, VT
BC1510

WATERSHED CONSULTING

Map Made: 1/17/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BC1630_SW_MH_112 | 2018-08-24 | yes | | 24 | 2.69 | 1452 | 5 | no | yes | no | 0 | 2 | | | |
| BC1630_New | 2018-08-24 | yes | | | | | | no | no | no | | 0.25 | | | no |
| BC1630 | 2018-09-14 | yes | 0.003 | | | | | no | no | no | | | 2400 | 0.61 | |
| BC1630 | 2018-10-22 | yes | 0.004 | 10.9 | 8.4 | 786 | 0.57 | no | no | no | 0.2 | 0.25 | 2400 | 0.66 | |

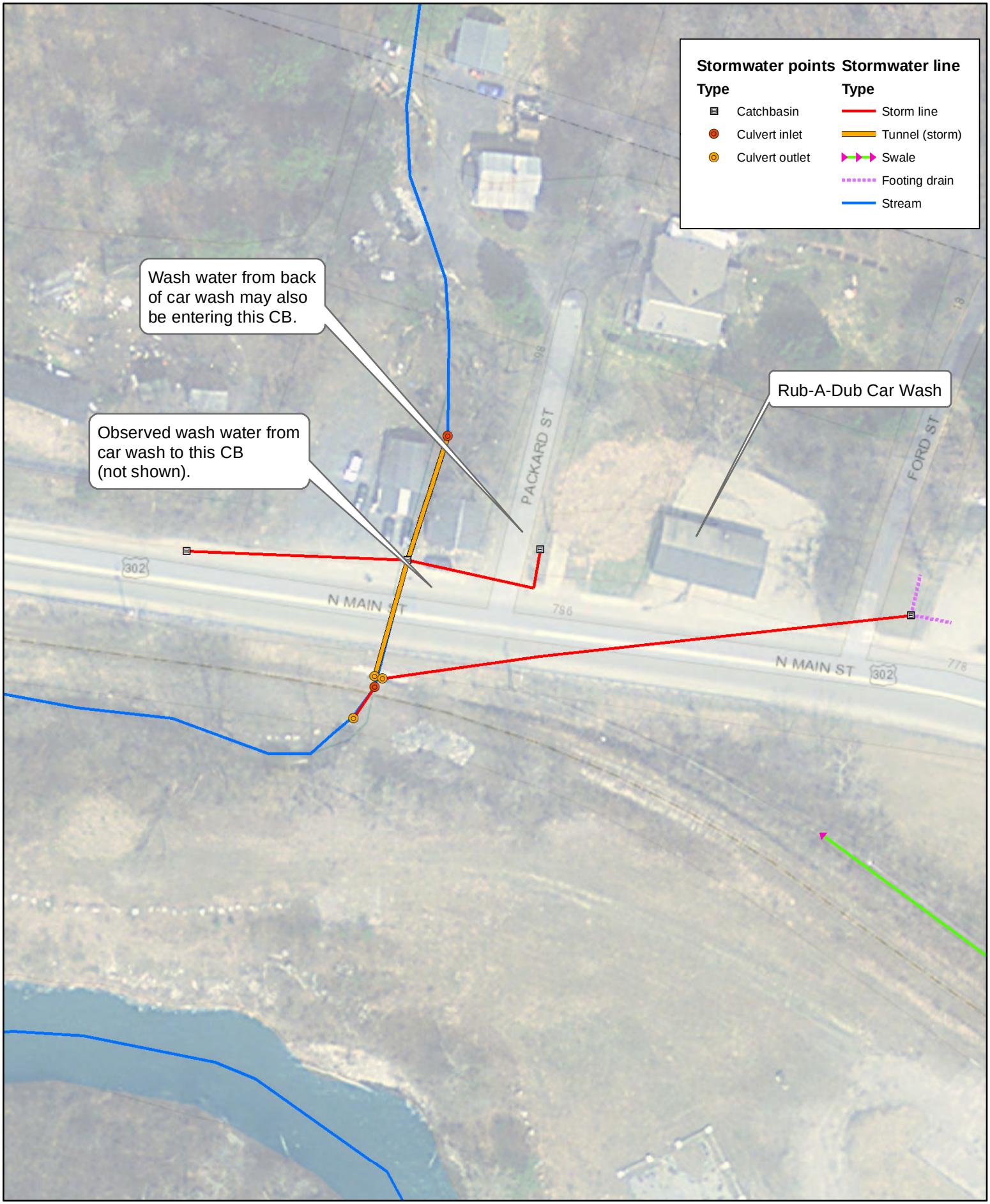
N

0 100 200 Feet

BC1630
Advanced Investigation Map
Barre City, VT

WATERSHED CONSULTING

Map Made: 1/21/2019



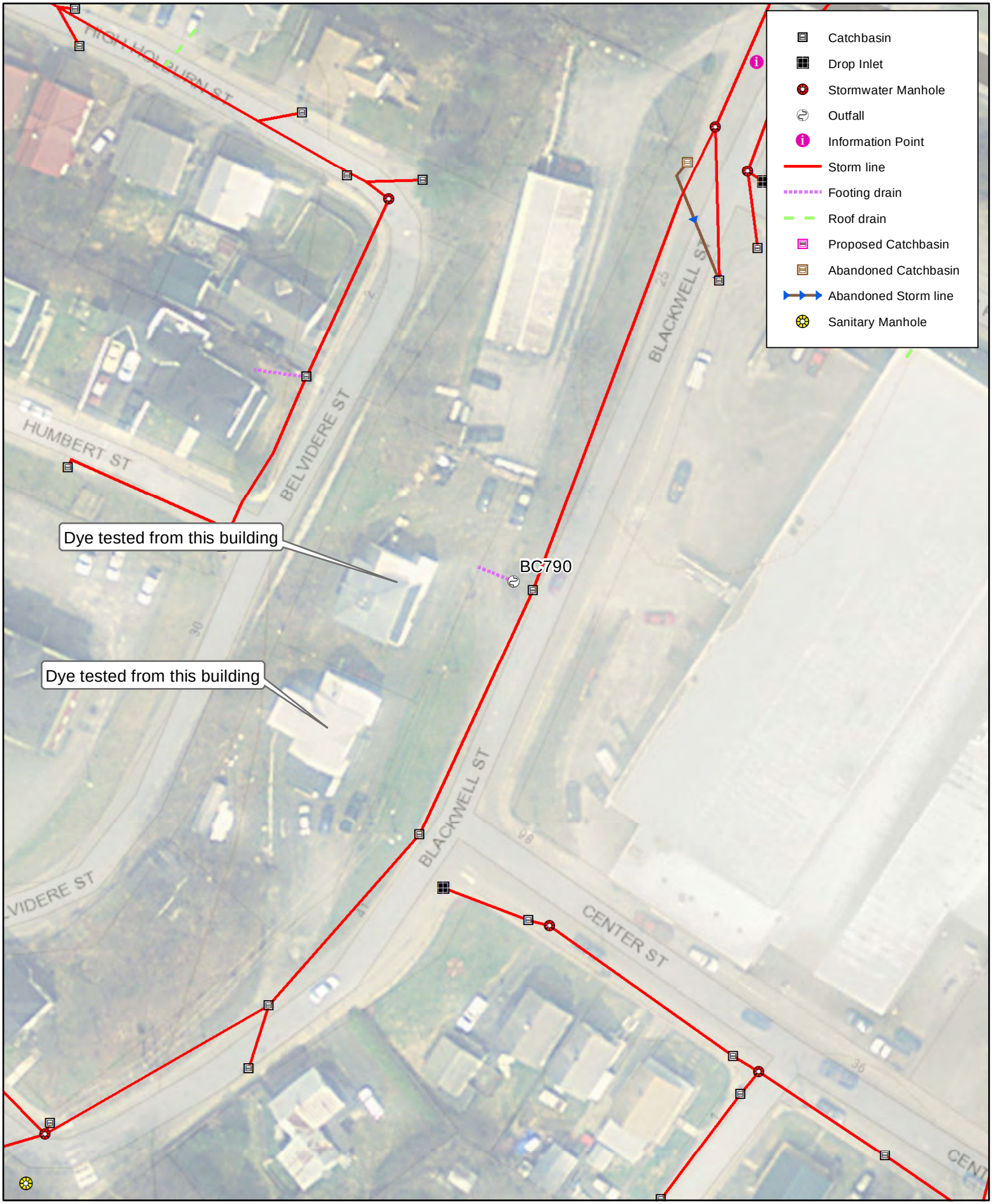

N

0 25 50 Feet

Rub-A-Dub Car Wash
Advanced Investigation Map
Barre City, VT

WATERSHED CONSULTING

Map Made: 1/21/2019



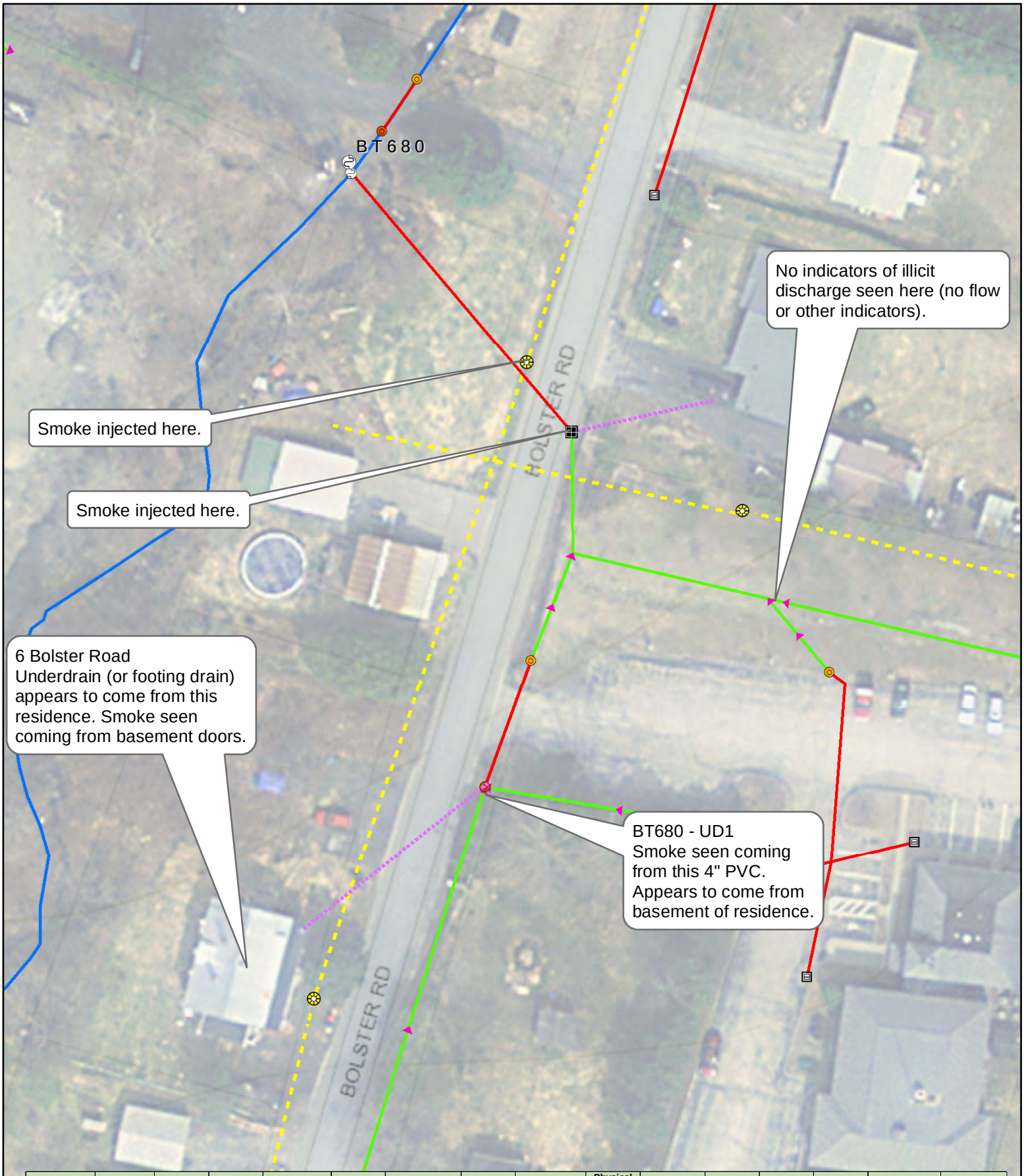

N

0 50 100 Feet

Advanced Investigation Map
BC790
Barre City, VT

WATERSHED CONSULTING

Map Made: 1/29/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BT680 | 2018-09-04 | yes | 0.003 | | | | 0.09 | no | no | no | 0 | 0.75 | 31 | 0.006 | no |
| BT680_UD1 | 2018-09-04 | yes | 0 | | | | 0.1 | no | no | no | 0 | 1.5 | N/A | N/A | N/A |

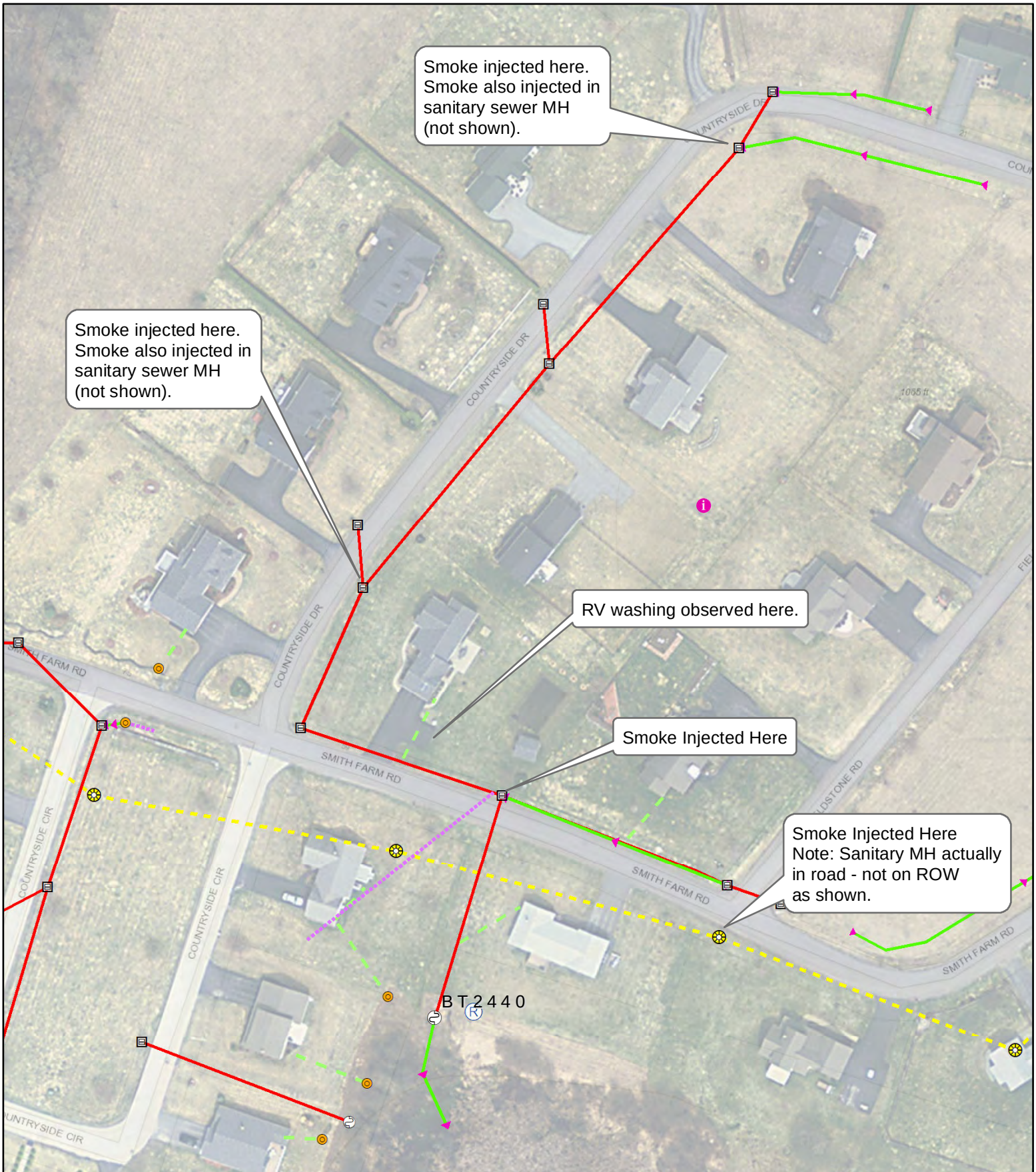
N

0 25 50 Feet

BT680
Advanced Investigation Map
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/21/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BT2440 | 2018-09-04 | yes | 0 | | | | 0.15 | no | no | no | 0.2 | 0.75 | | | |
| BT2440 | 2018-09-14 | yes | 0 | | | | | no | no | no | | | >2400 | 0.65 | no |

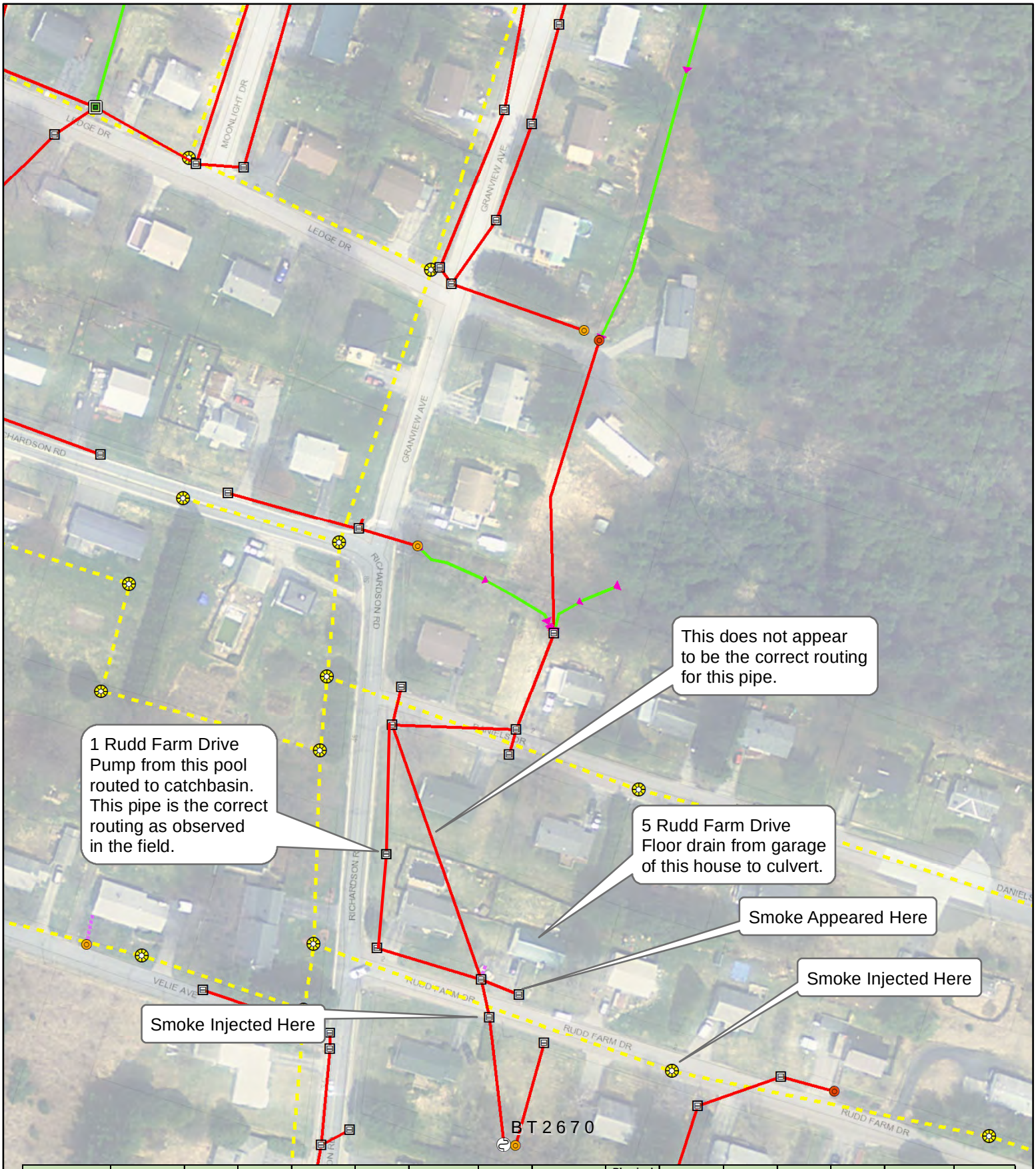
N

0 50 100 Feet

Advanced Investigation Map
BT2440
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/21/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BT2670 | 2018-09-04 | yes | 0 | | | | 0.23 | no | no | no | 0.2 | 0.25 | | | |
| BT2670_CB_46 | 2018-09-04 | no | | | | | | no | | no | | | | | |
| BT2670 | 2018-09-14 | no | | | | | | no | | no | | | | | |

N

0 50 100 Feet

Advanced Investigation Map
BT2670
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/21/2019

| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GV1 | 2018-08-24 | yes | 0 | 20.2 | 8.29 | 886 | 0 | no | no | no | | 0 | | | |
| GV1 | 2018-09-14 | yes | 0.002 | | | | | no | no | no | | | 8.5 | 0.0013 | |

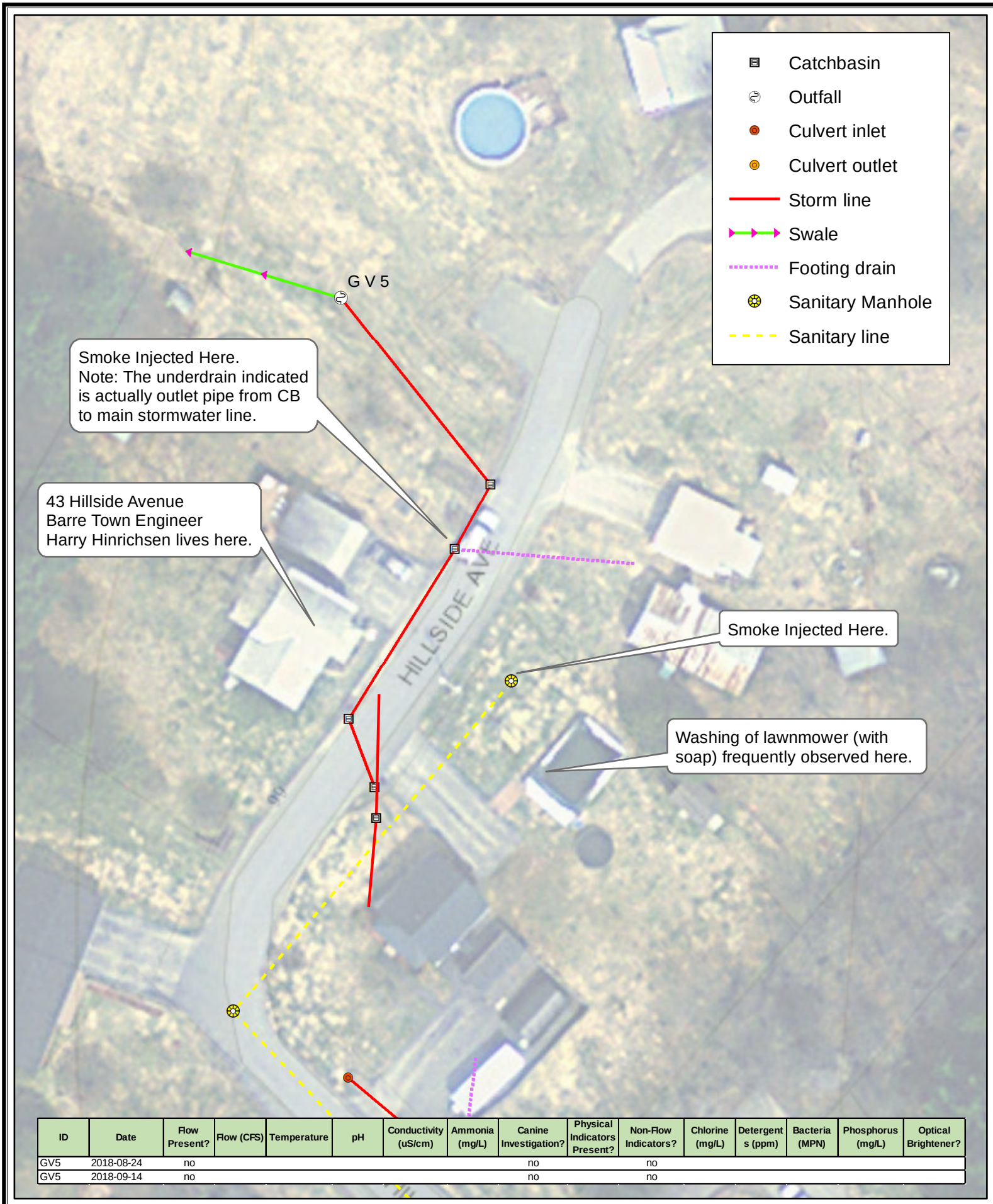
N

0 50 100 Feet

Advanced Investigation Map
GV1
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/21/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GV5 | 2018-08-24 | no | | | | | | no | | no | | | | | |
| GV5 | 2018-09-14 | no | | | | | | no | | no | | | | | |

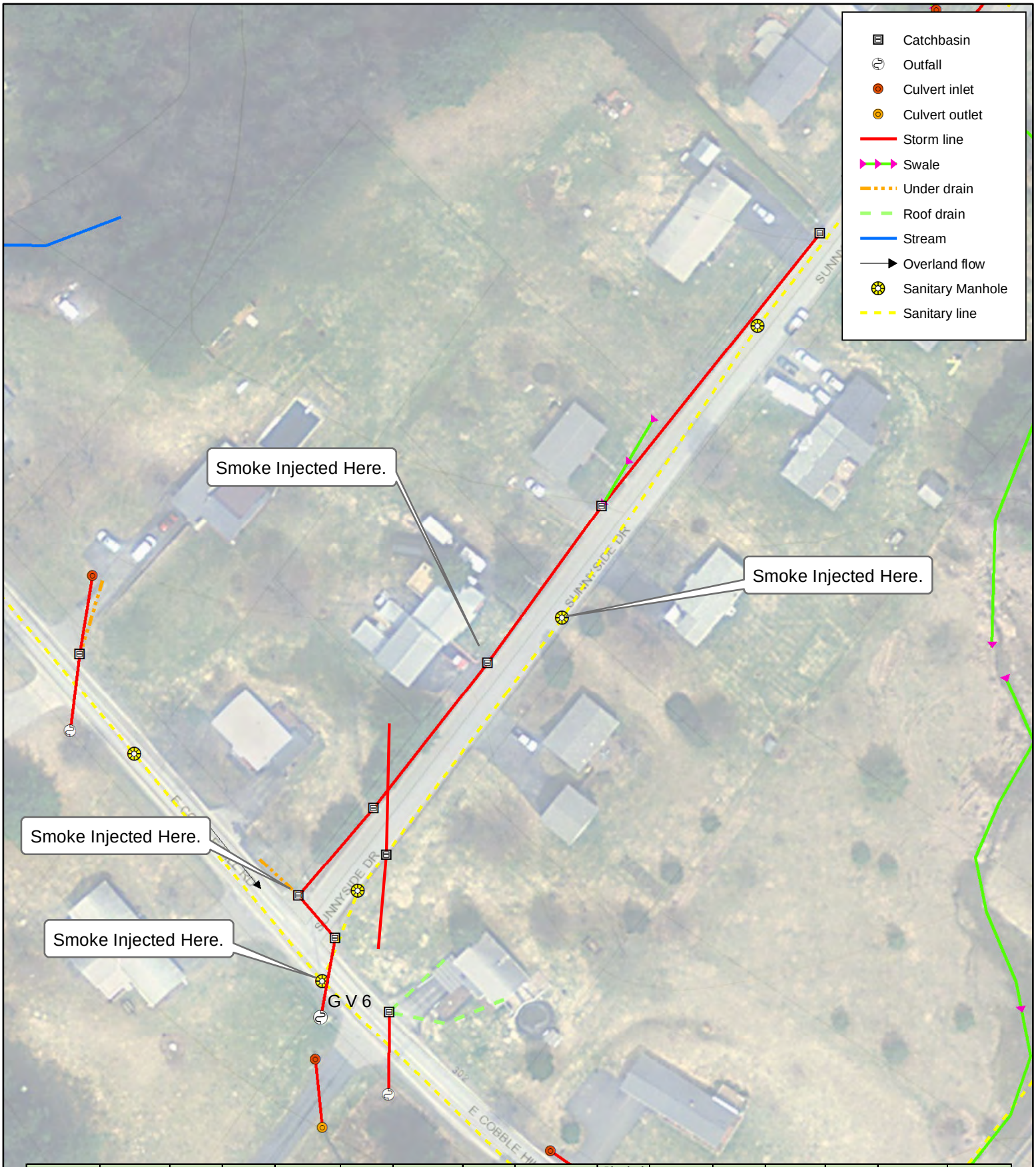
N

0 25 50 Feet

Advanced Investigation Map
GV5
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/29/2019




| ID | Date | Flow Present? | Flow (CFS) | Temperature | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Canine Investigation? | Physical Indicators Present? | Non-Flow Indicators? | Chlorine (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GV6 | 2018-08-24 | yes | 0 | 20.2 | 7.89 | 1856 | 0.06 | no | no | no | 0 | 0.25 | | | |
| GV6_CB_14 | 2018-09-04 | yes | | | | | 0.14 | no | no | no | 0 | 0.25 | | | |
| GV6 | 2018-09-14 | yes | 0 | | | | | no | no | no | | | 4.1 | 0.01 | |

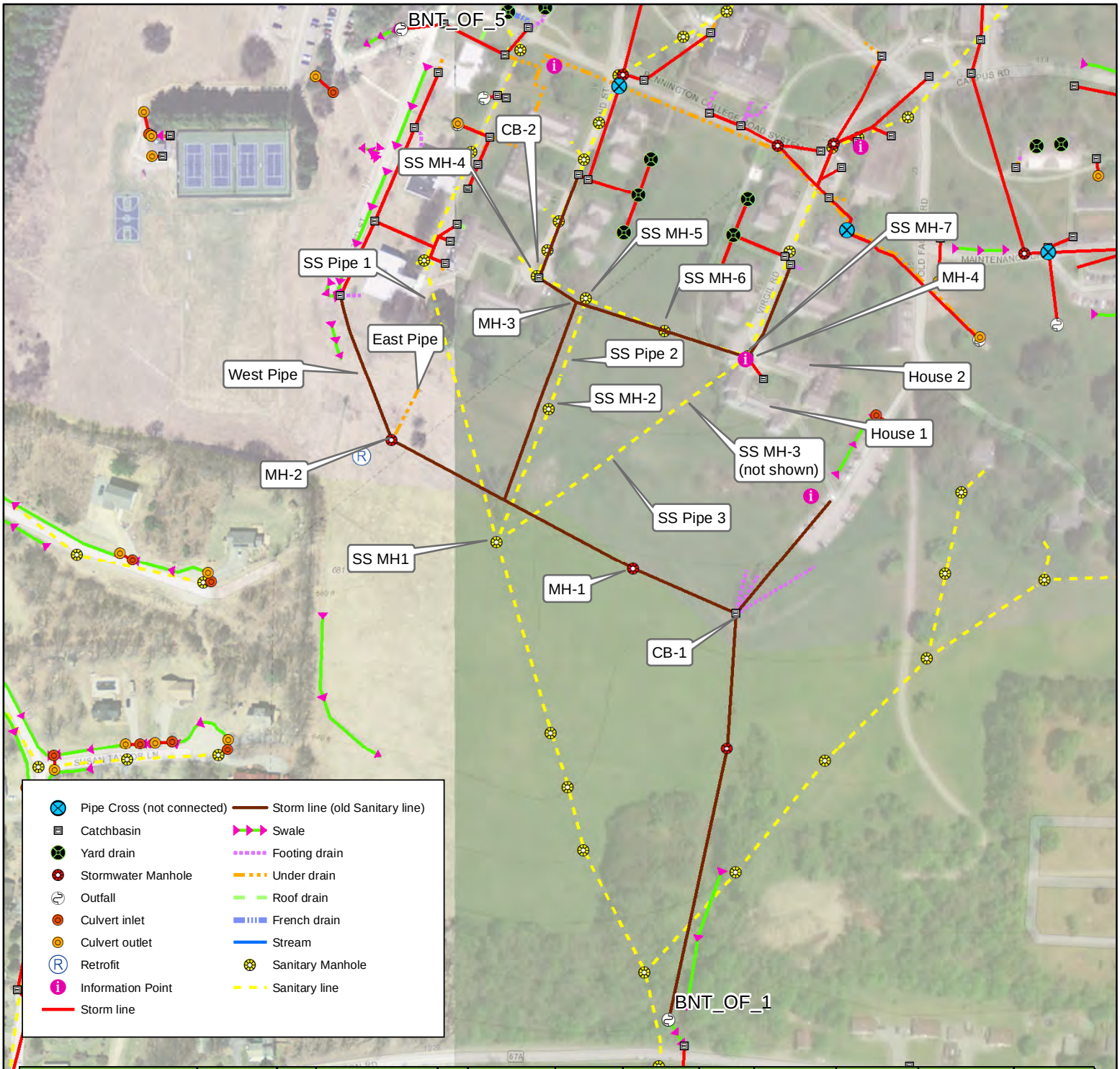
N

0 50 100 Feet

GV6
Advanced Investigation Map
Barre Town, VT

WATERSHED CONSULTING

Map Made: 1/29/2019




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Chlorine (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BNT-OF-1 | 4/21/2016 | Yes | Yes | 7.7 | 853 | 17.2 | 0.25 | 0 | N/A | 0.1 | N/A | N/A |
| CB1 | 4/21/2016 | Yes | Yes | 7.8 | 970 | 20.6 | 0.5 | 44 | N/A | 0.1 | N/A | N/A |
| MH1 | 4/21/2016 | Yes | Yes | 3 | 1004 | 3.4 | 3 | 30 | N/A | 0 | N/A | N/A |
| MH2 - East Pipe | 4/21/2016 | Yes | No | 7.7 | 647 | 0 | 0 | N/A | N/A | 0 | N/A | N/A |
| MH2 - West Pipe | 4/21/2016 | Yes | No | 7.6 | 785 | 0 | 0 | N/A | N/A | Trace | N/A | N/A |
| MH2 - Sump | 4/21/2016 | Yes | No | N/A | N/A | N/A | N/A | 2 | N/A | N/A | N/A | N/A |
| MH1 | 6/12/2017 | Yes | | 7.5 | 795 | 4.18 | 0.75 | N/A | N/A | N/A | N/A | No |
| MH2 | 6/12/2017 | Yes | | 7.2 | 680 | 0.28 | 0 | N/A | N/A | N/A | N/A | No |
| MH1 | 7/6/2017 | Yes | | 8.1 | 1120 | 2.02 | 0.25 | N/A | N/A | N/A | N/A | No |
| MH2 | 7/6/2017 | Yes | | 7.8 | 816 | 0.19 | 0 | N/A | N/A | N/A | N/A | No |
| BNT-OF-1 | 8/9/2018 | Yes | No | 8.1 | 1955 | 0.26 | 0.25 | 2400 | 0.4 | N/A | N/A | N/A |
| BNT-OF-1 | 11/9/2018 | Yes | Yes | 8.1 | 1121 | 0.99 | N/A | 2400 | 0.2 | N/A | Yes | N/A |

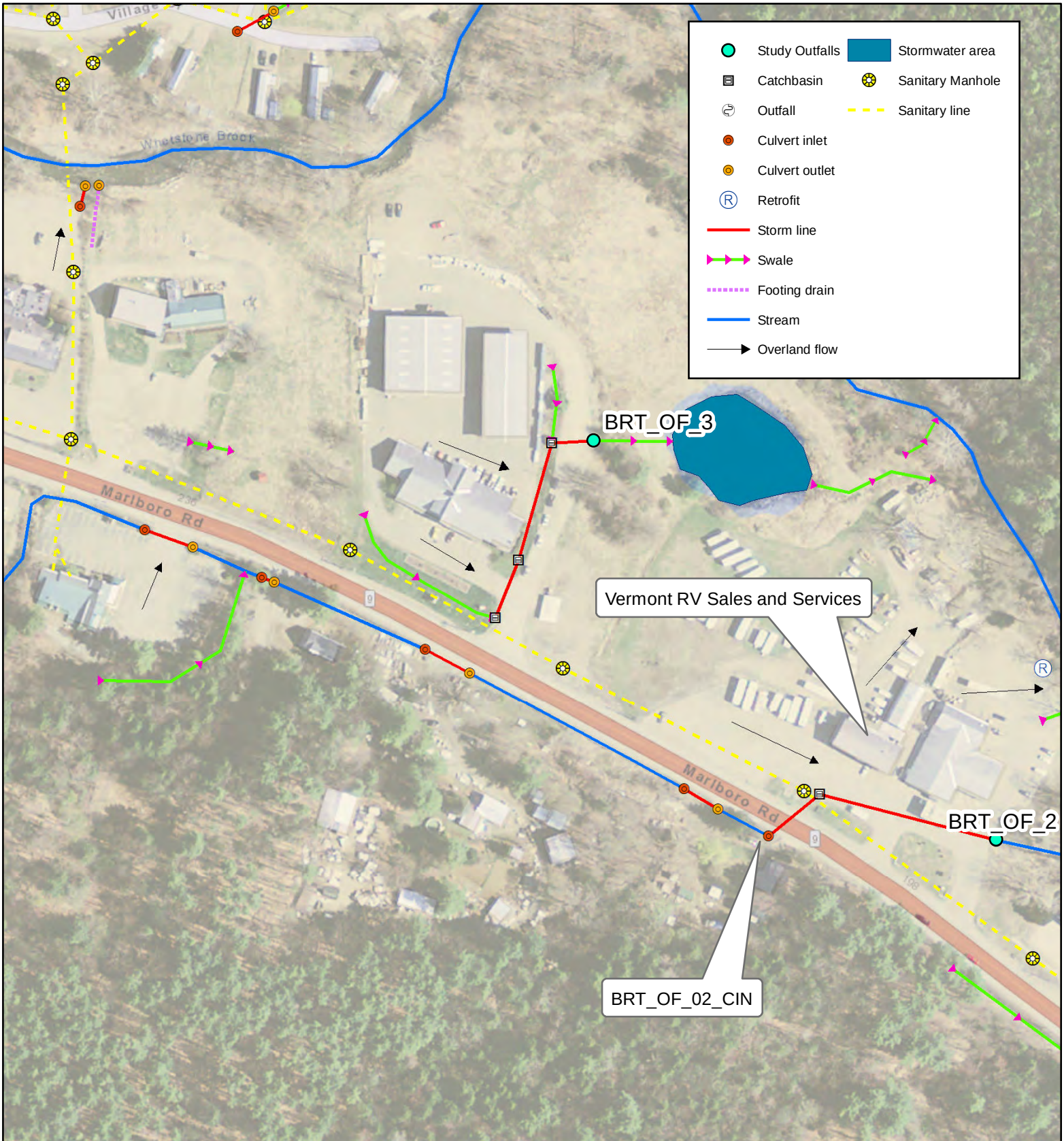
N

0 125 250 Feet

Advanced Investigation Map
BNT-OF-1 (Bennington College)
Bennington, VT

WATERSHED CONSULTING

Map Made: 12/17/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_2 | 7/30/2018 | yes | None | 7.9 | 594 | 0.27 | | NA | NA | | NA |
| BRT_OF_2 | 9/17/2018 | yes | None | 8 | 834 | 0.43 | 0.25 | NA | NA | Negative | Negative |
| BRT_OF_2_CIN | 9/17/2018 | yes | None | 8.1 | 295 | 0.23 | 0.25 | NA | NA | Negative | NA |

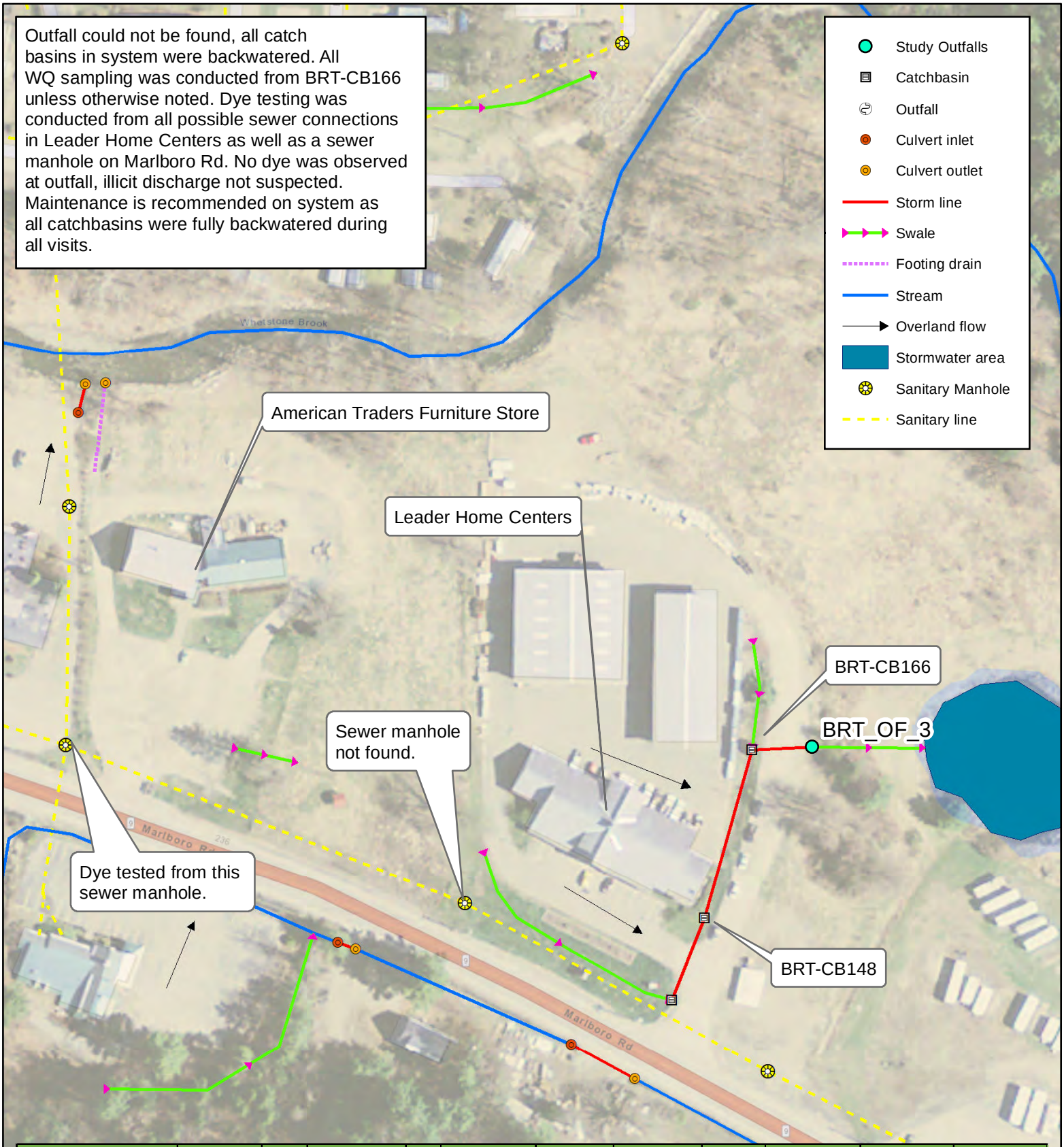
N

0 75 150 300 Feet

**BRT-OF-02**
**Advanced Investigation Map**
**Brattleboro, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRT_OF_3 | 7/30/2018 | no | None | | | | | | | | Negative |
| BRT_CB148 | 9/17/2018 | yes | None | 7.7 | 244 | 0.87 | 3 | NA | NA | NA | Negative |
| BRT_CB166 | 9/17/2018 | yes | None | 7.9 | 173 | 0.88 | 3 | NA | NA | Positive | Negative |

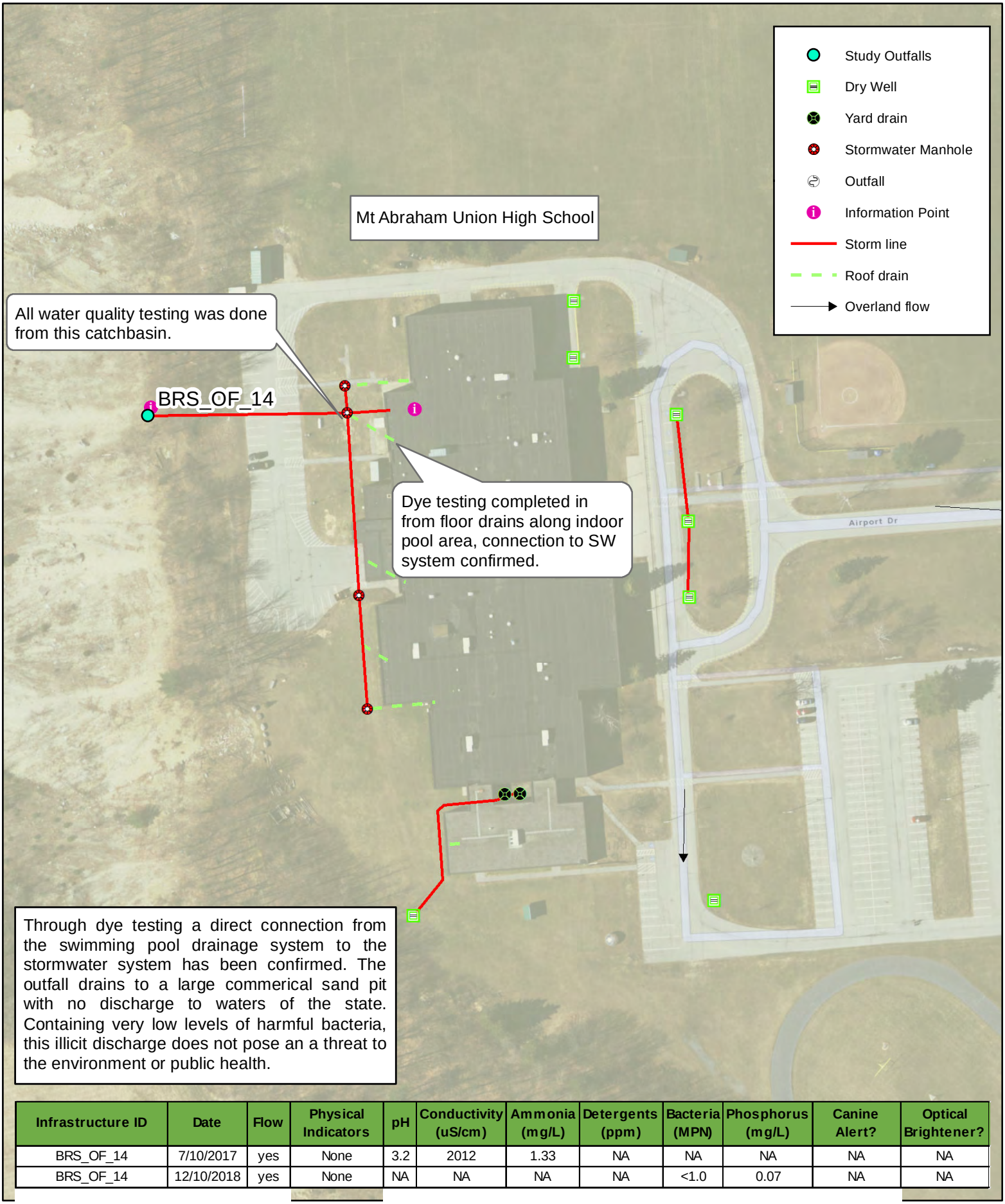
N

0 50 100 200 Feet

**BRT-OF-03**
**Advanced Investigation Map**
**Brattleboro, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




Through dye testing a direct connection from the swimming pool drainage system to the stormwater system has been confirmed. The outfall drains to a large commerical sand pit with no discharge to waters of the state. Containing very low levels of harmful bacteria, this illicit discharge does not pose an a threat to the environment or public health.

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BRS_OF_14 | 7/10/2017 | yes | None | 3.2 | 2012 | 1.33 | NA | NA | NA | NA | NA |
| BRS_OF_14 | 12/10/2018 | yes | None | NA | NA | NA | NA | <1.0 | 0.07 | NA | NA |

N

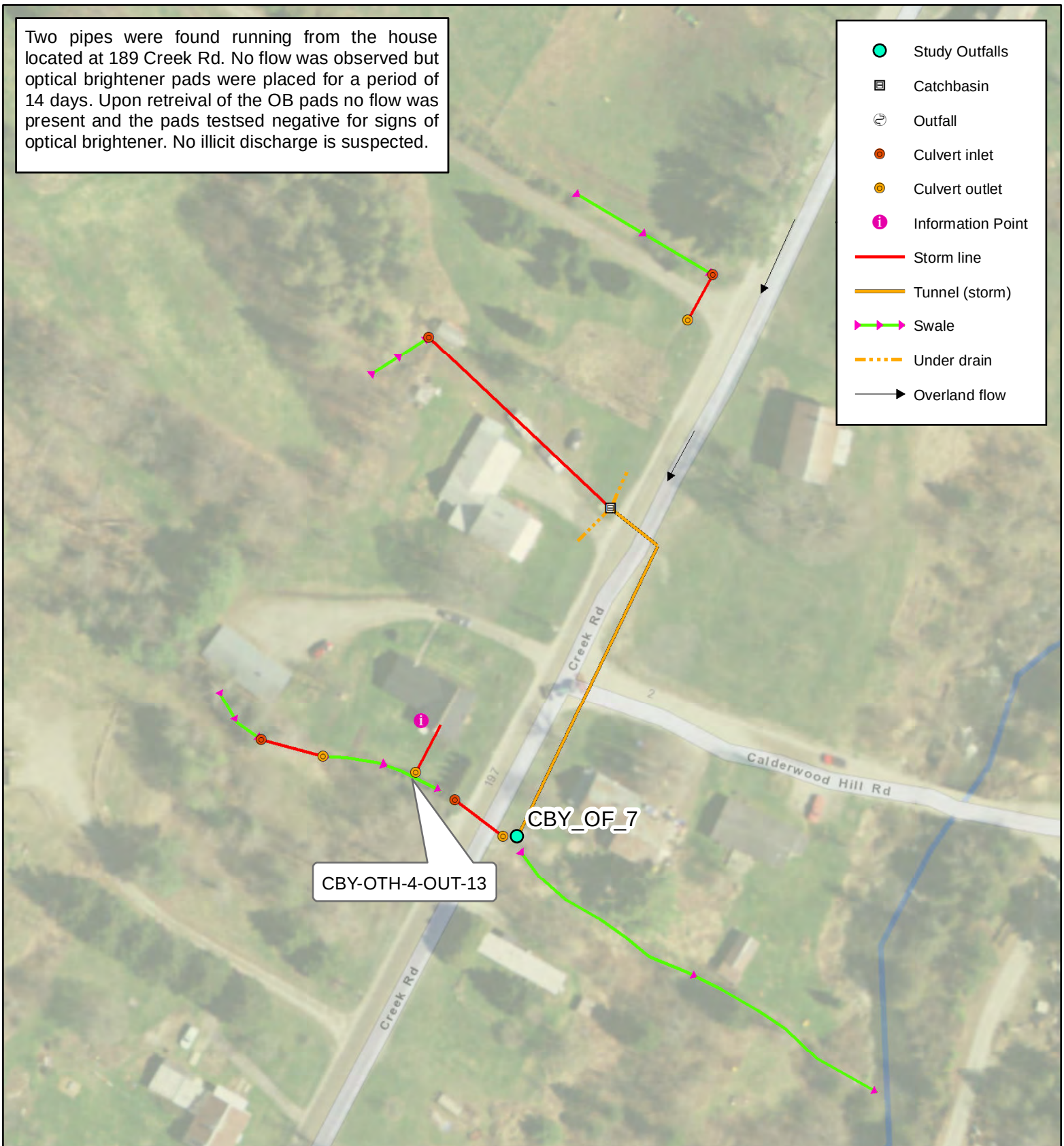
0 50 100 200 Feet

**BRS-OF-14**
**Advanced Investigation Map**
**Bristol, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018

Two pipes were found running from the house located at 189 Creek Rd. No flow was observed but optical brightener pads were placed for a period of 14 days. Upon retreival of the OB pads no flow was present and the pads testsed negative for signs of optical brightener. No illicit discharge is suspected.




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CBY_OF_7 | 7/24/2017 | yes | | 8.2 | 906 | 0.2 | 0.25 | NA | NA | NA | NA |
| CBY_OF_7 | 8/13/2018 | no | | | | | | NA | NA | NA | Negative |
| CBY-OTH-4-C-OUT-13 | 8/13/2018 | no | | | | | | NA | NA | NA | Negative |

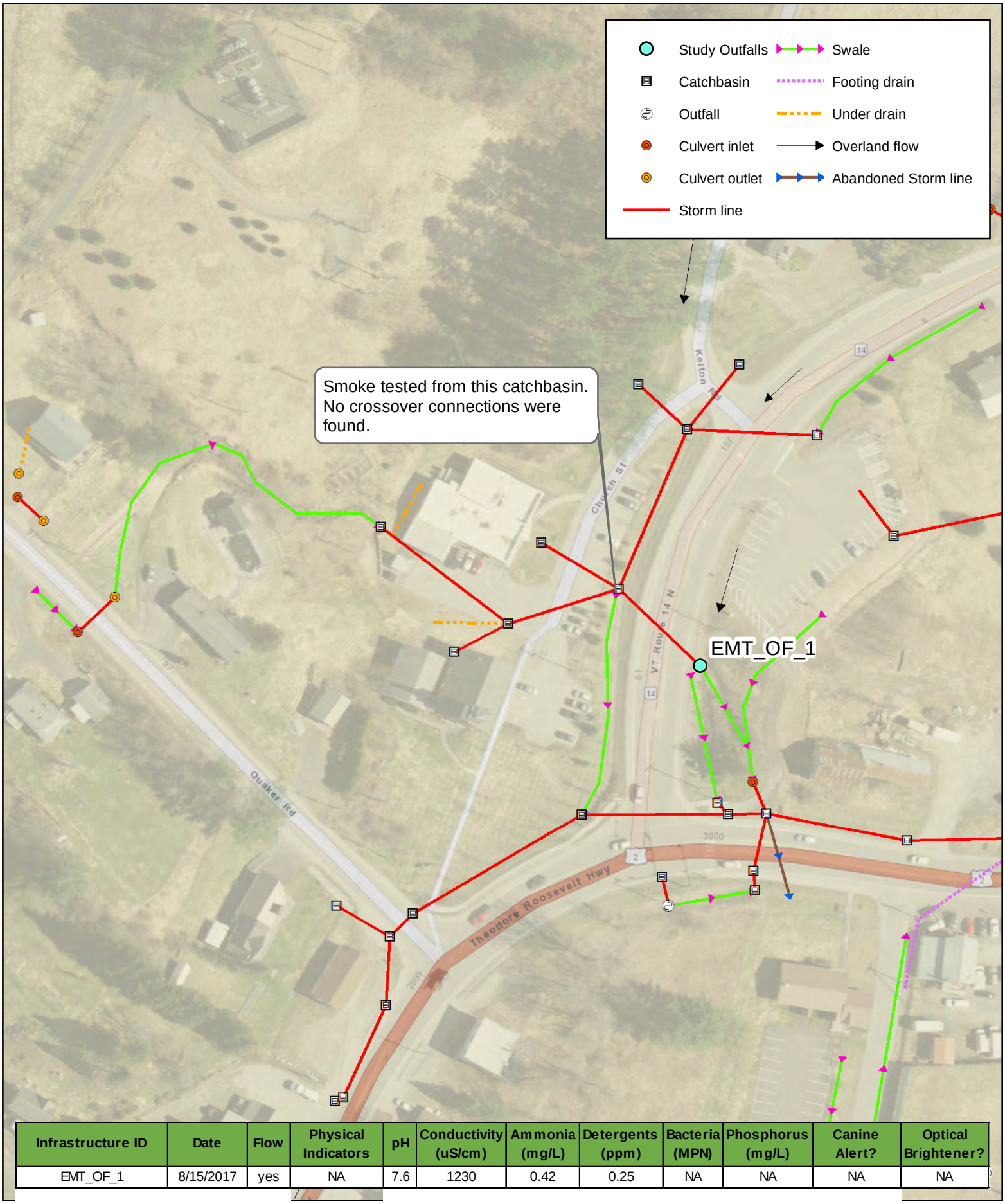
N

0 37.5 75 150 Feet

**CBY-OF-07**
**Advanced Investigation Map**
**Craftsbury, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_1 | 8/15/2017 | yes | NA | 7.6 | 1230 | 0.42 | 0.25 | NA | NA | NA | NA |

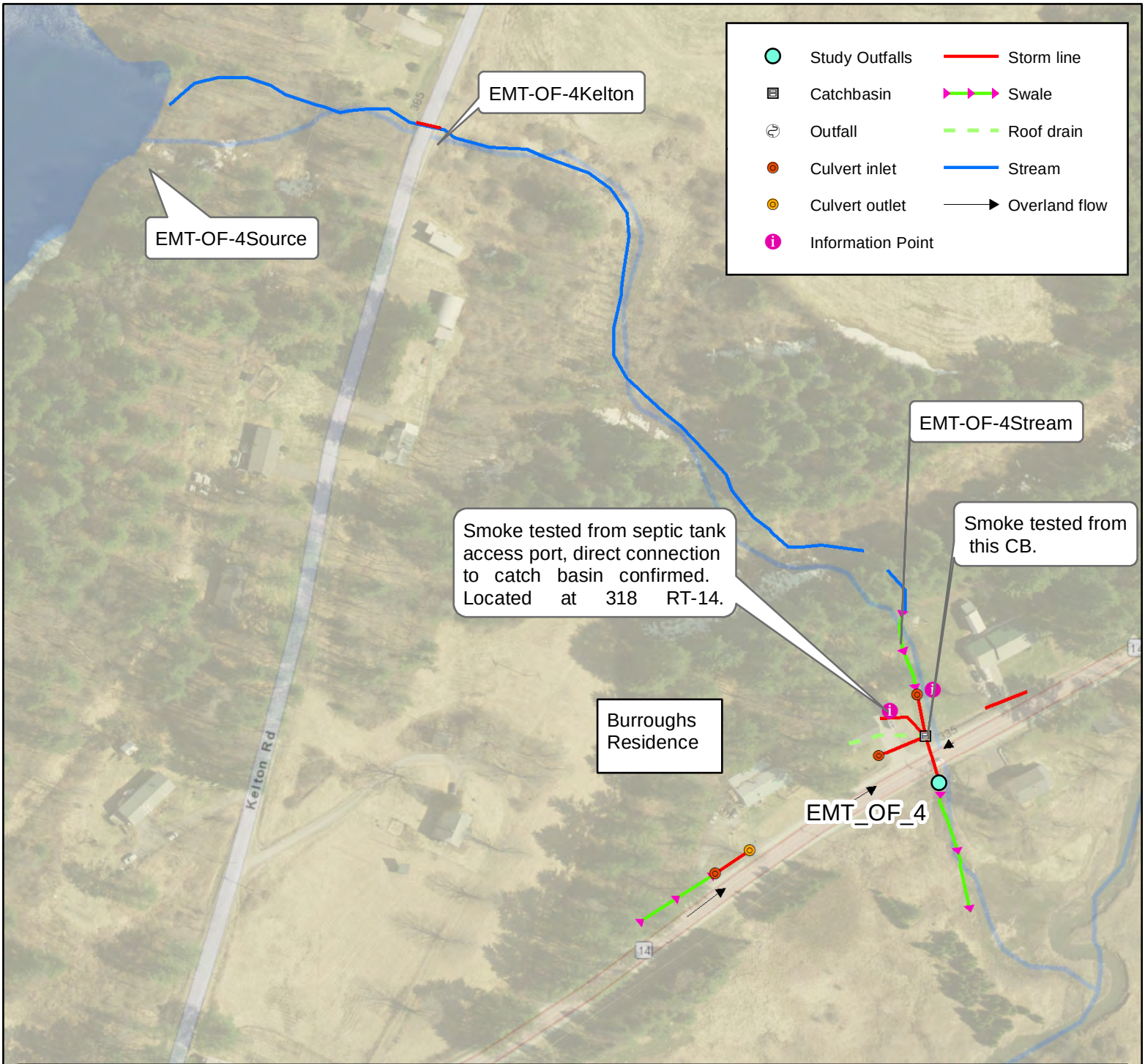
N

0 50 100 200 Feet

**EMT-OF-01**
**Advanced Investigation Map**
**East Montpelier, VT**

WATERSHED CONSULTING

Map Made: 12/17/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_4 | 8/16/2017 | yes | Sewage Odor | 8 | 550 | 3.34 | 0.5 | NA | NA | NA | NA |
| EMT_OF_4 | 9/14/2017 | yes | Sewage Odor | 8.2 | 497 | 1.44 | 0.25 | NA | NA | NA | NA |
| EMT_OF_4 | 10/5/2017 | yes | NA | 7.9 | | 4.26 | 0.25 | 12 | 0.005 | Positive | NA |
| EMT_OF_4_CB | 9/14/2017 | yes | NA | 8.1 | 395 | 0.54 | 0.12 | NA | NA | NA | NA |
| EMT_OF_4Stream | 9/14/2017 | yes | NA | 8 | 354 | 0.14 | 0.12 | NA | NA | NA | NA |
| EMT_OF_4Stream | 10/5/2017 | yes | NA | 8.1 | 383 | -0.02 | 0 | 13 | 0.014 | Positive | NA |
| EMT_OF_4Kelton | 9/14/2017 | yes | NA | | | 0.37 | 0 | NA | NA | NA | NA |
| EMT_OF_4Kelton | 10/5/2017 | yes | NA | 8 | 422 | 0.48 | 0 | 20 | 0.01 | Negative | NA |
| EMT_OF_4Source | 9/14/2017 | yes | Rancid Odor | 7.7 | 284 | 2.04 | 0 | NA | NA | NA | NA |
| EMT_OF_4Source | 10/5/2017 | yes | NA | 7.5 | 274 | 1.64 | 0 | >2400 | 0.093 | Positive | NA |

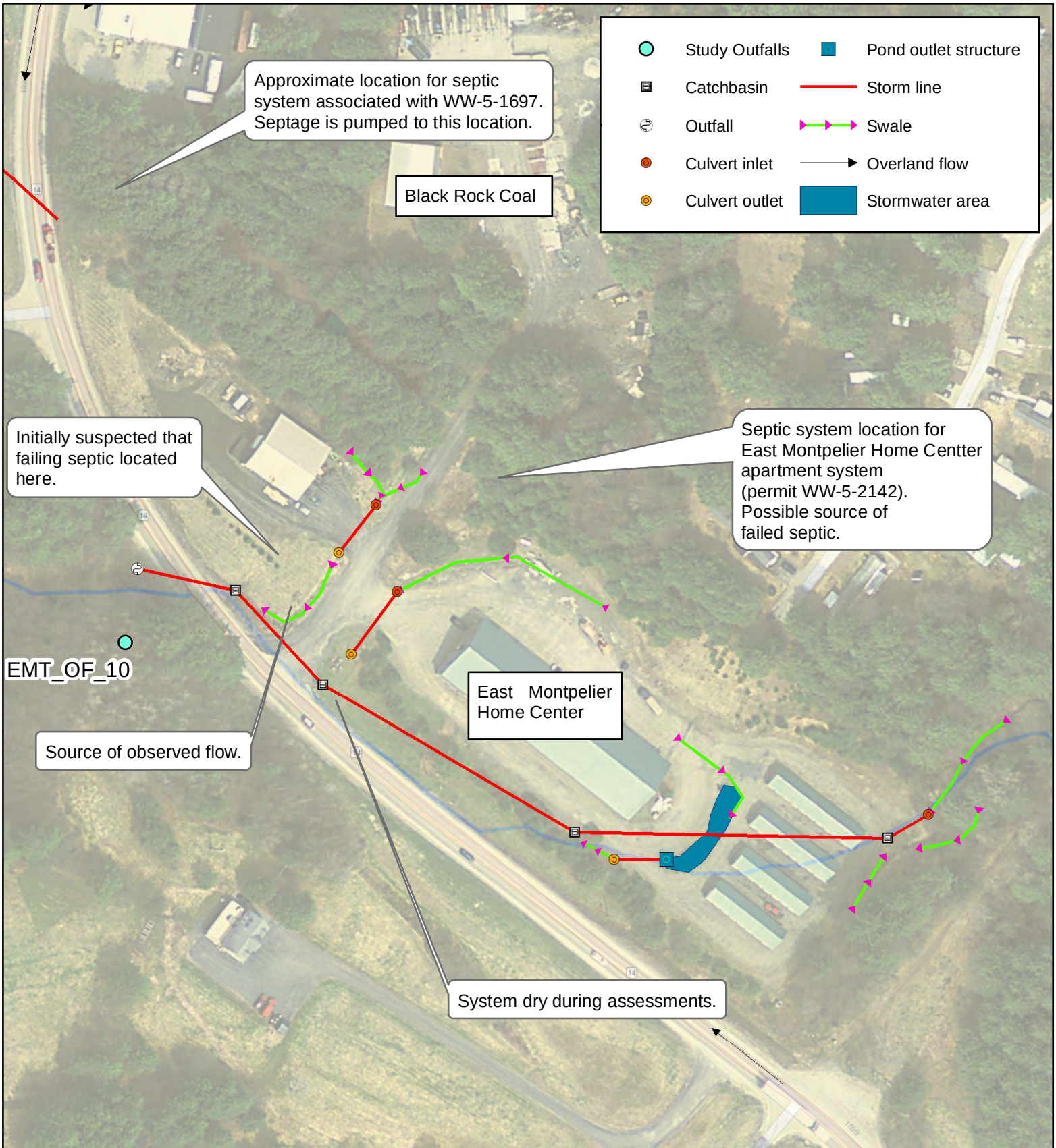
N

0 75 150 300 Feet

**EMT-OF-04**
**Advanced Investigation Map**
**East Montpelier, VT**

WATERSHED CONSULTING

Map Made: 12/17/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_10 | 8/5/2017 | yes | None | 8.1 | 452 | 0.22 | NA | NA | NA | NA | NA |
| EMT_OF_10 | 9/27/2018 | yes | None | 8.2 | 504 | 0.19 | 0.25 | NA | NA | Positive | NA |

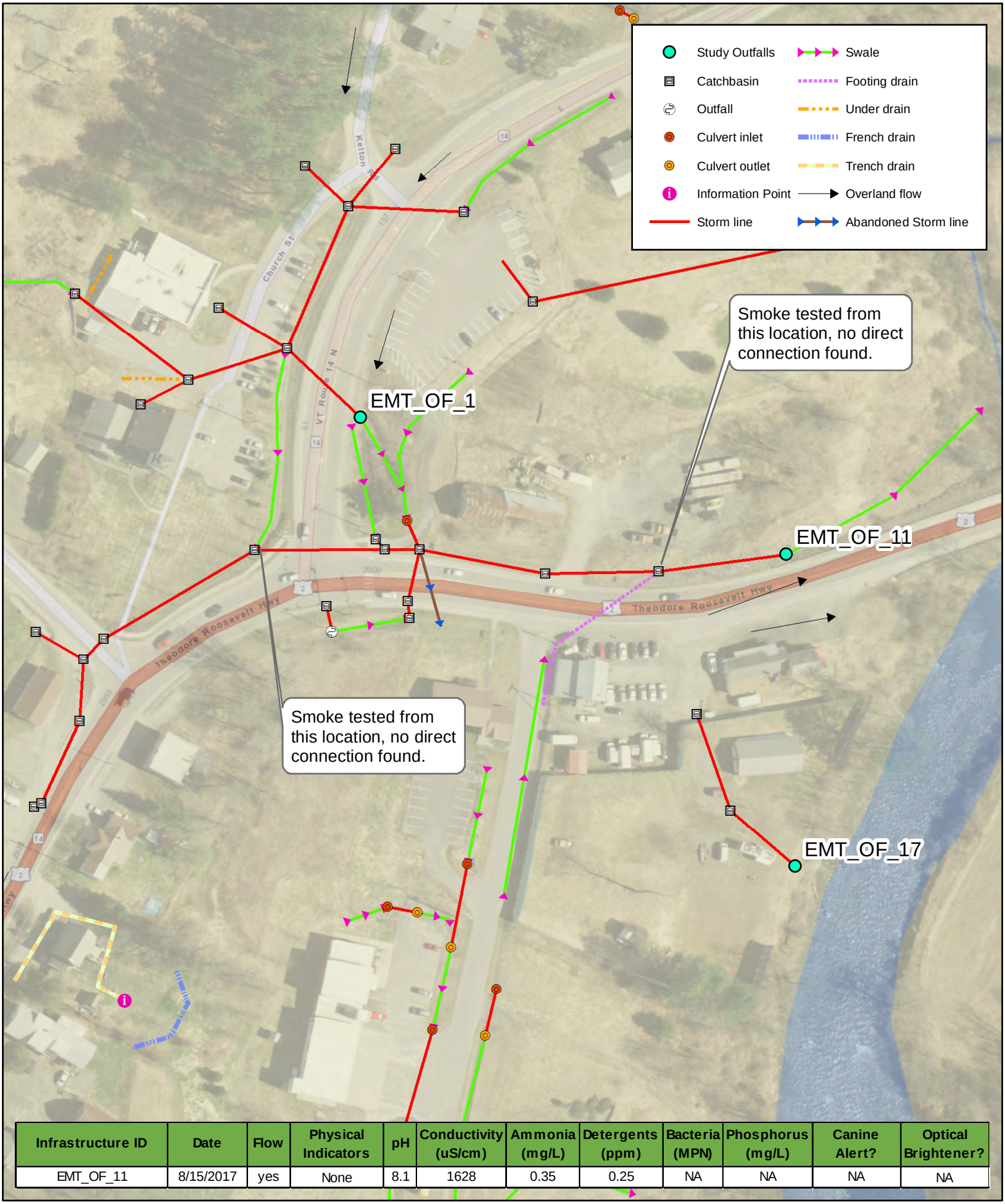
N

0 50 100 200 Feet

**EMT-OF-10**
**Advanced Investigation Map**
**East Montpelier, VT**

WATERSHED CONSULTING

Map Made: 12/17/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_11 | 8/15/2017 | yes | None | 8.1 | 1628 | 0.35 | 0.25 | NA | NA | NA | NA |

N

0 50 100 200 Feet

**EMT-OF-11**
**Advanced Investigation Map**
**East Montpelier, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EMT_OF_18 | 8/16/2017 | yes | Sudsy Water | 8.1 | 719 | 4.5 | 0 | NA | NA | NA | NA |

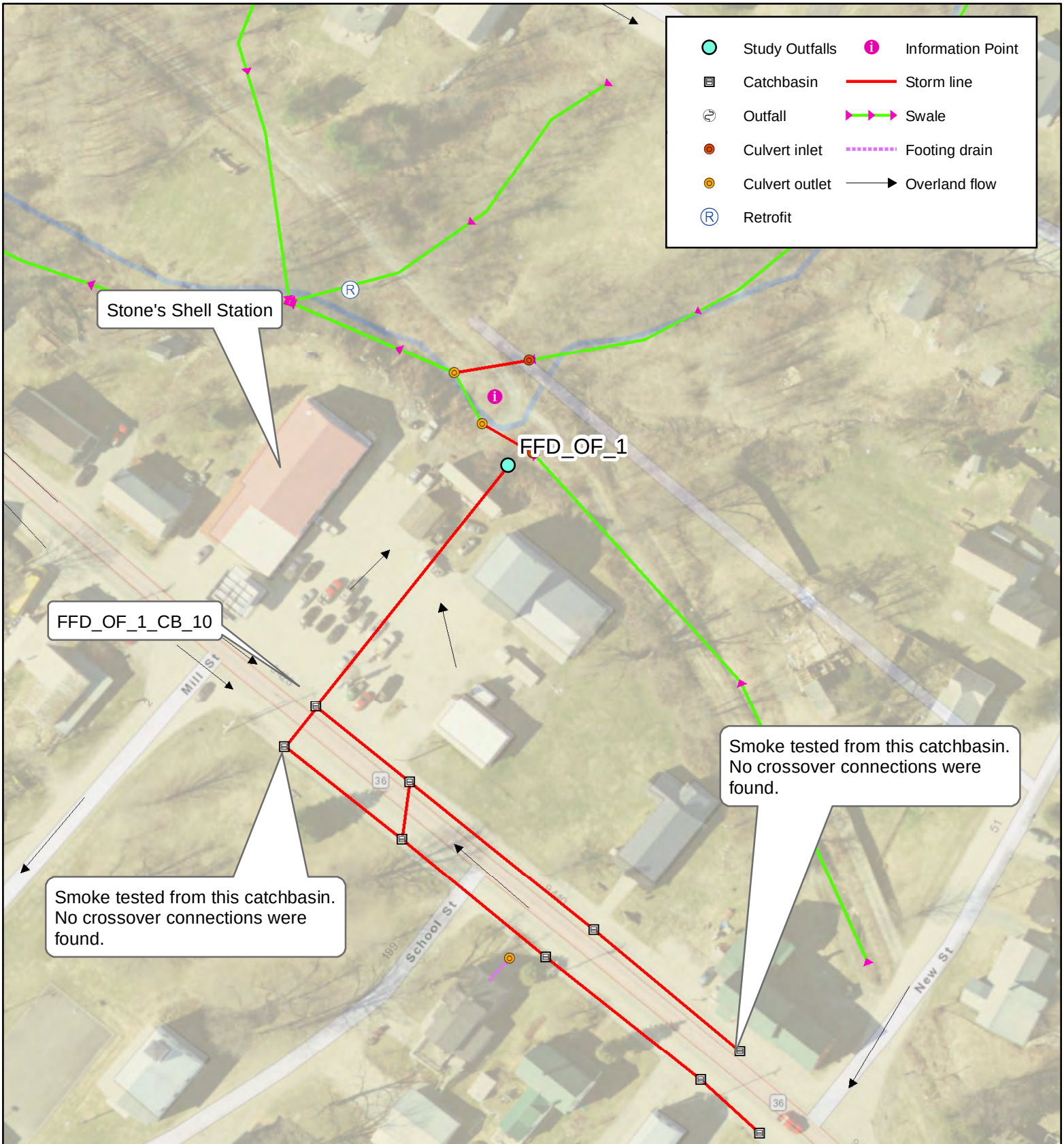
N

0 50 100 200 Feet

**EMT-OF-18**
**Advanced Investigation Map**
**East Montpelier, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FFD_OF_1 | 7/18/2017 | yes | None | 8.6 | 1159 | 1.41 | 0.5 | NA | NA | | NA |
| FFD_OF_1 | 9/19/2018 | no | None | | | | | NA | NA | | NA |
| FFD_OF_1_CB_10 | 9/19/2018 | yes | None | 8.2 | 676 | 3.26 | 2.5 | NA | NA | Positive | NA |

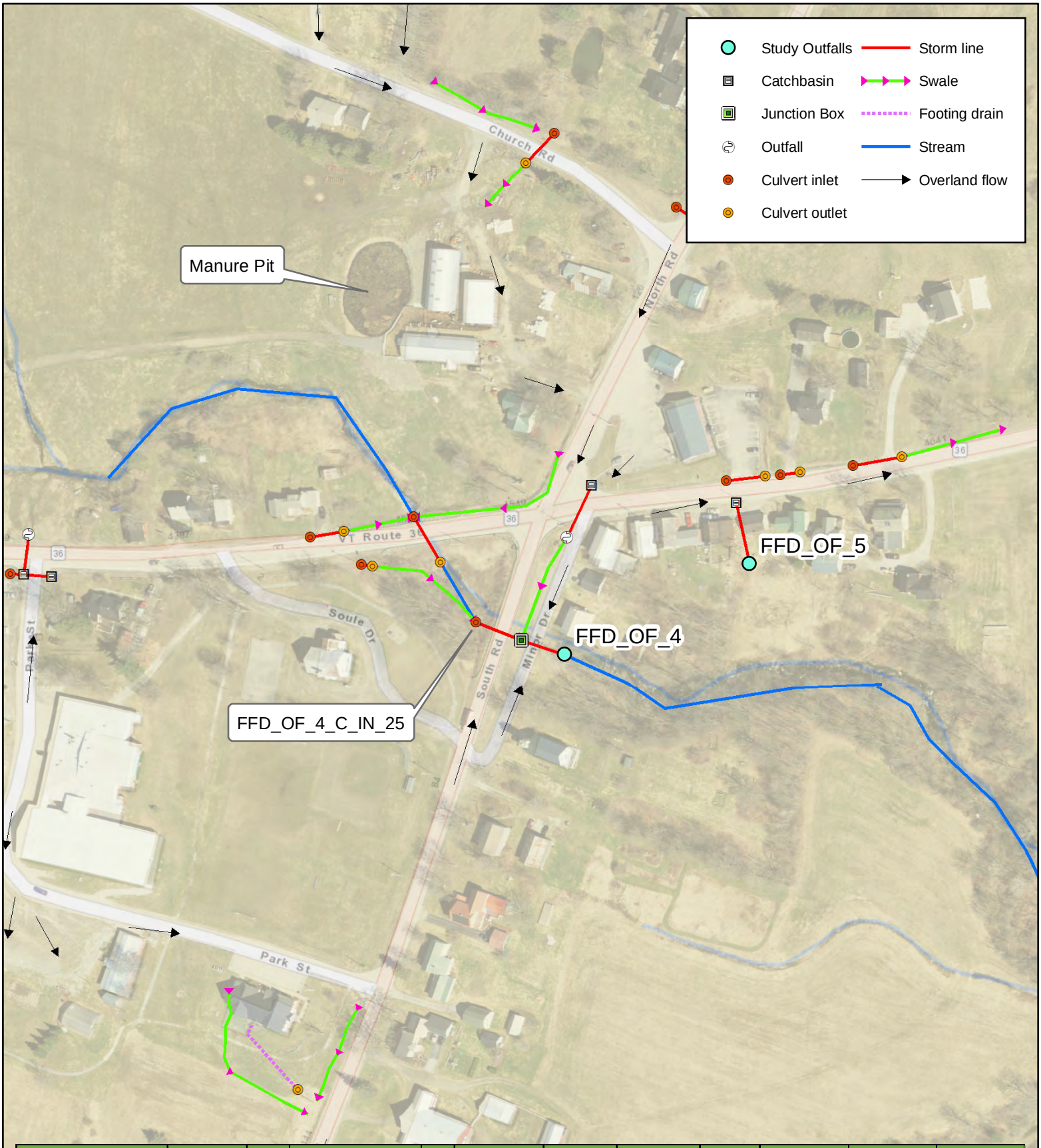
N

0 25 50 100 Feet

**FFD-OF-01**
**Advanced Investigation Map**
**Fairfield, VT**

WATERSHED CONSULTING

Map Made: 01/08/2019




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FFD_OF_4 | 7/18/2017 | yes | | | | | | NA | NA | NA | NA |
| FFD_OF_4_C_IN_25 | 9/19/2018 | yes | | 7.9 | 1993 | 1.08 | 0.75 | NA | NA | NA | NA |

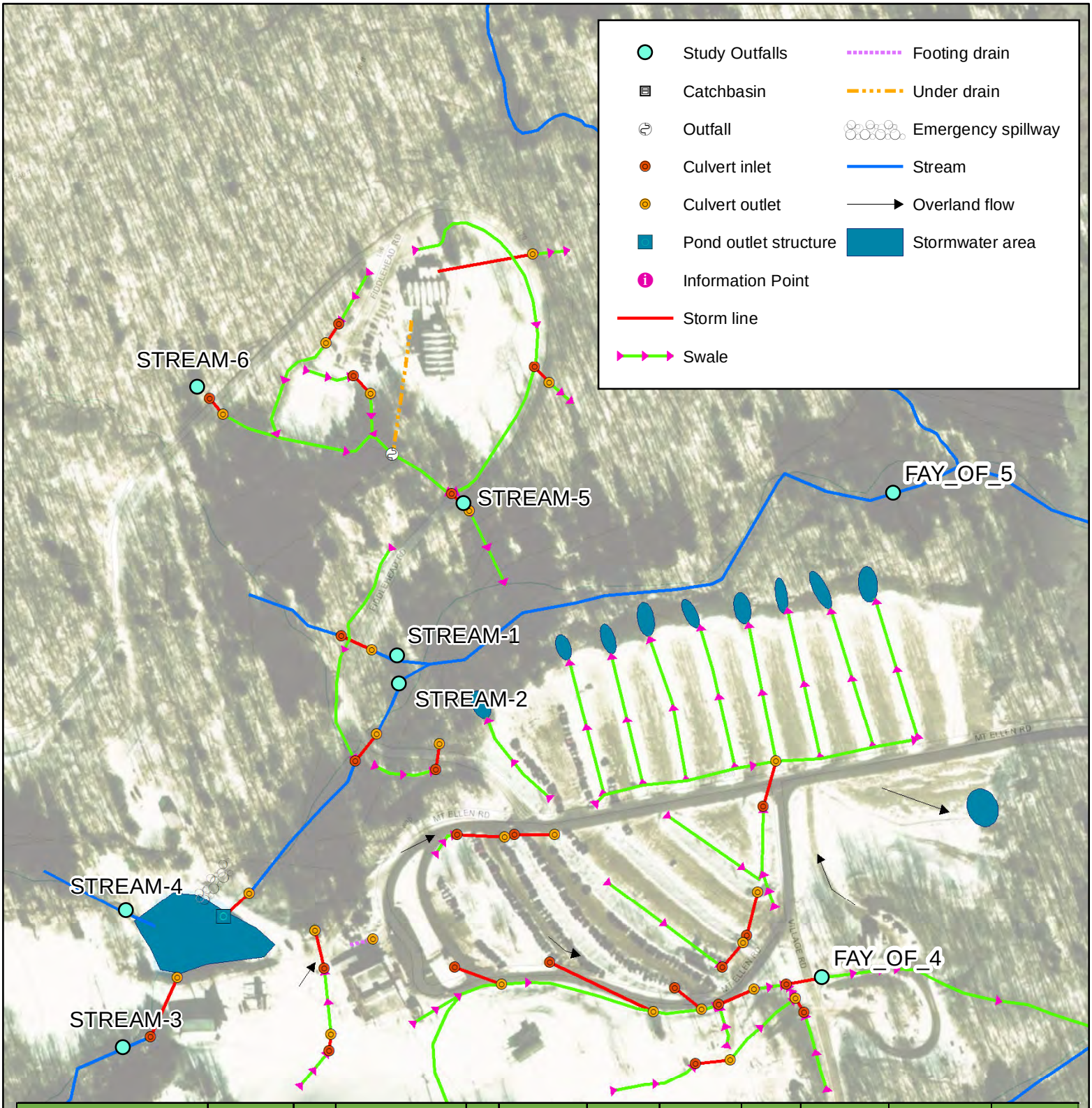
N

0 62.5 125 250 Feet

**FFD-OF-04**
**Advanced Investigation Map**
**Fairfield, VT**

WATERSHED CONSULTING

Map Made: 01/08/2019




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FAY_OF_5 | 9/18/2018 | yes | None | 7.8 | 25 | 0.29 | 0.25 | 870 | 0.01 | Yes | N/A |
| FAY_OF_5_STREAM_1 | 9/18/2018 | yes | None | 7.8 | 43 | 0.33 | 0.5 | N/A | N/A | Yes | N/A |
| FAY_OF_5_STREAM_2 | 9/18/2018 | yes | None | 7.7 | 60 | 0.29 | 0.25 | N/A | N/A | Yes | N/A |
| FAY_OF_5_STREAM_3 | 11/12/2018 | yes | None | 9.2 | 93 | 0.21 | 0 | 1 | N/A | Yes | N/A |
| FAY_OF_5_STREAM_4 | 11/12/2018 | yes | None | 9 | 43 | 0.25 | 0 | 6.3 | N/A | Indeterminate | N/A |
| FAY_OF_5_STREAM_5 | 11/12/2018 | yes | None | 8.9 | 42 | 0.21 | 0 | 6.3 | N/A | Indeterminate | N/A |
| FAY_OF_5_STREAM_6 | 11/12/2018 | yes | None | 9.5 | 26 | 0.21 | 0 | 0 | N/A | No | N/A |

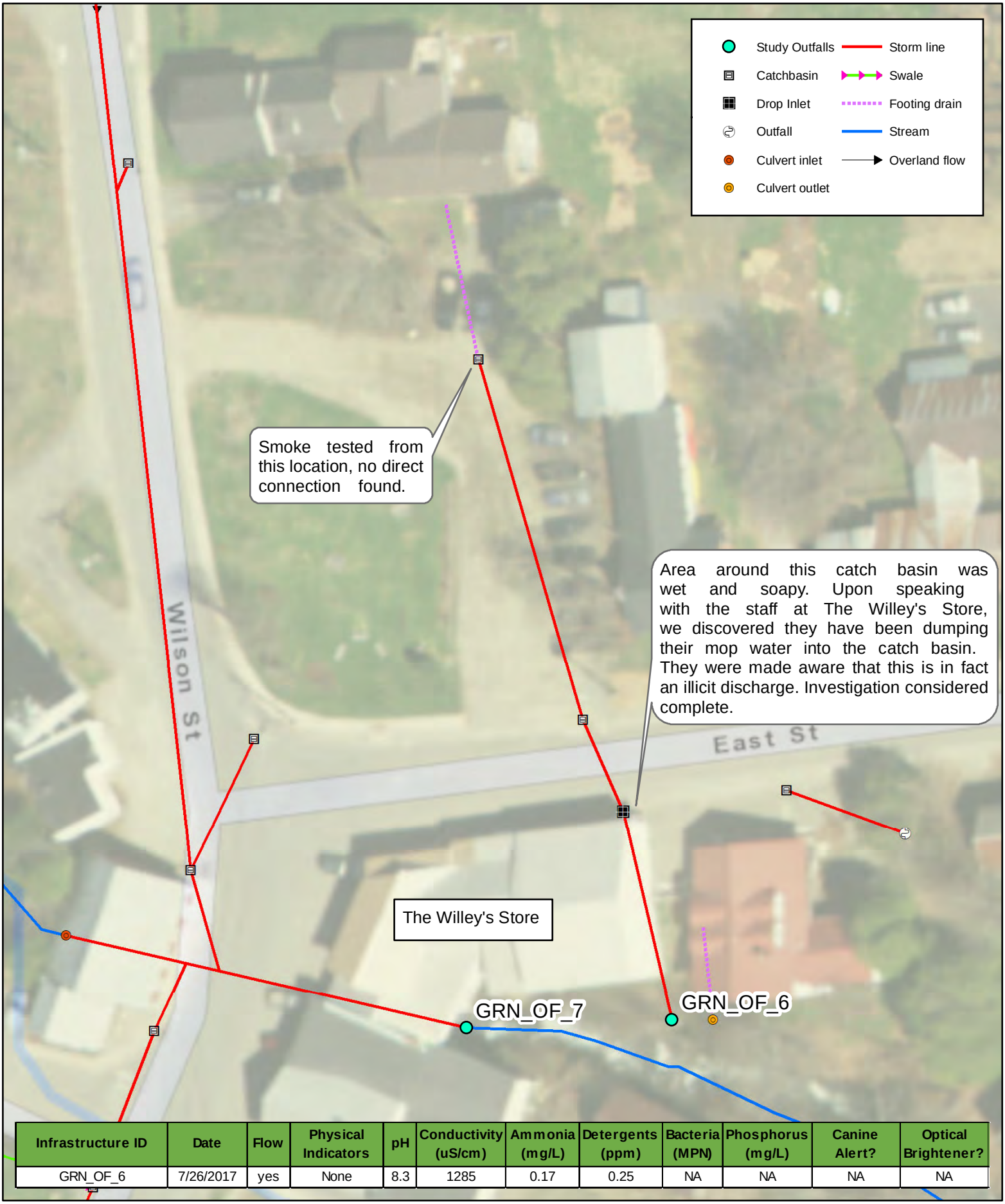
N

0 75 150 300 Feet

**FAY-OF-5**
**Advanced Investigation Map**
**Fayston, VT**

WATERSHED CONSULTING

Map Made: 12/17/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRN_OF_6 | 7/26/2017 | yes | None | 8.3 | 1285 | 0.17 | 0.25 | NA | NA | NA | NA |

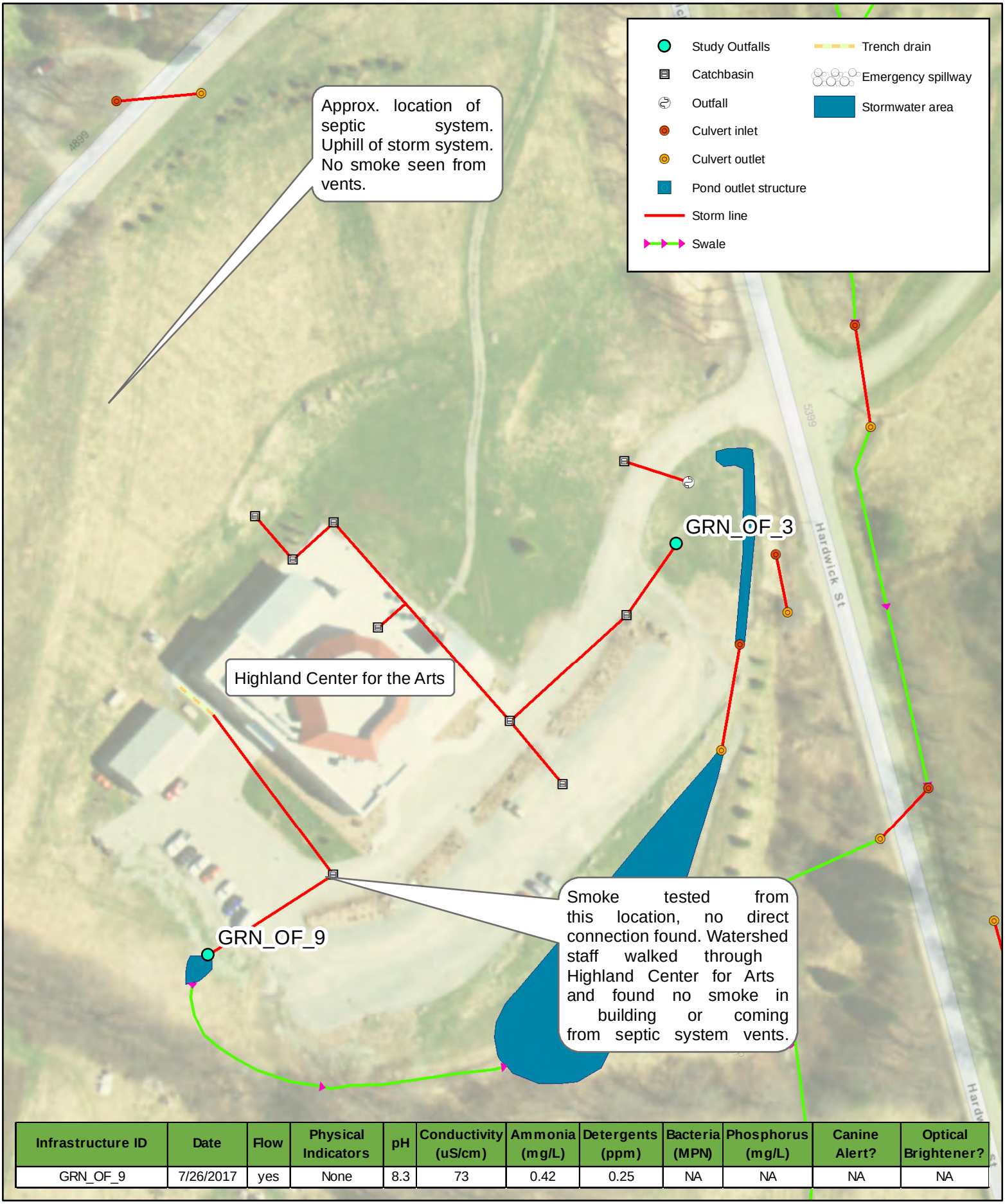
N

0 12.5 25 50 Feet

**GRN-OF-06**
**Advanced Investigation Map**
**Greensboro, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GRN_OF_9 | 7/26/2017 | yes | None | 8.3 | 73 | 0.42 | 0.25 | NA | NA | NA | NA |

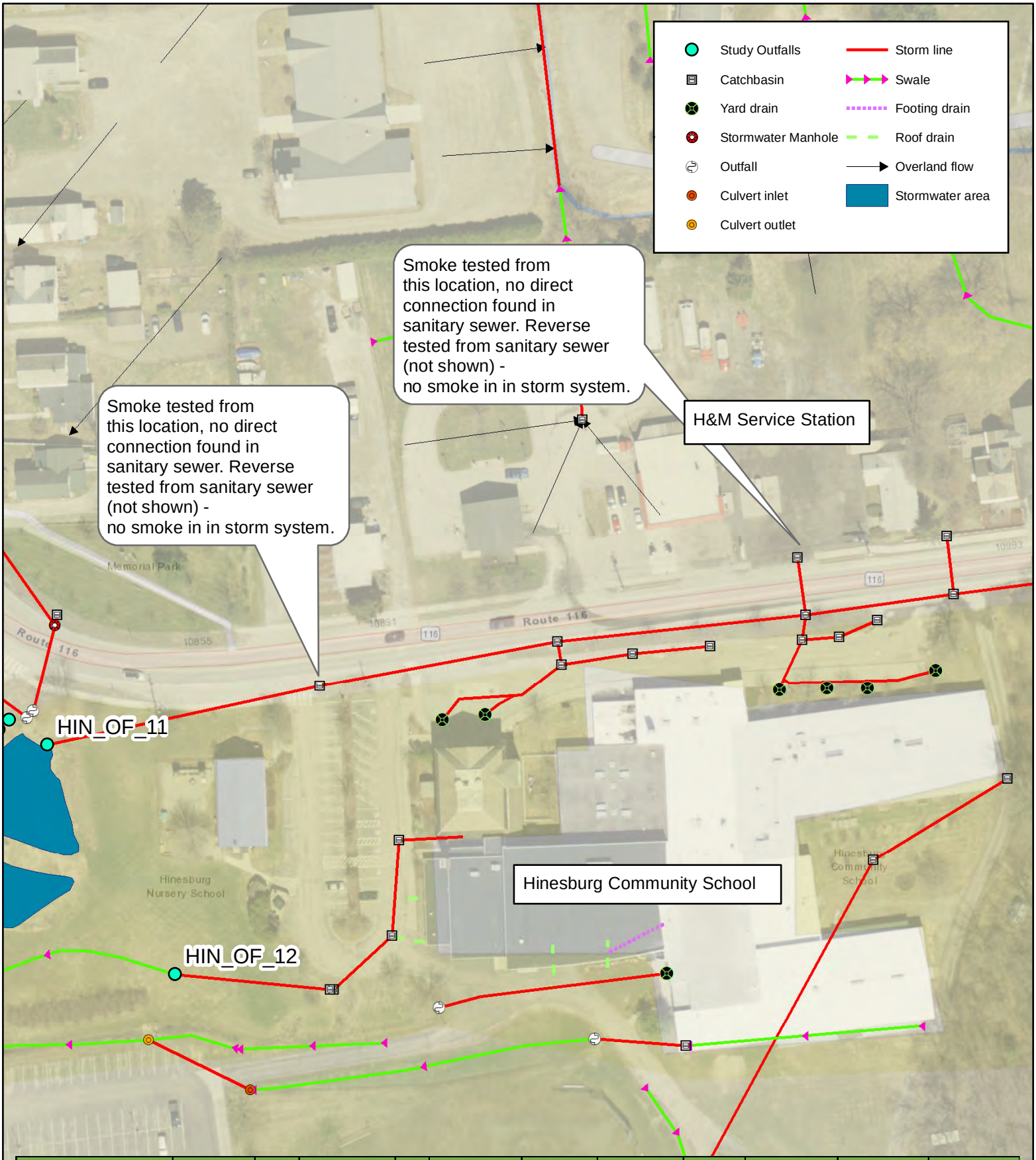
N

0 37.5 75 150 Feet

**GRN-OF-09**
**Advanced Investigation Map**
**Greensboro, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_11 | 7/13/2017 | yes | None | 7.8 | 2451 | 0.35 | 0.25 | NA | NA | NA | NA |

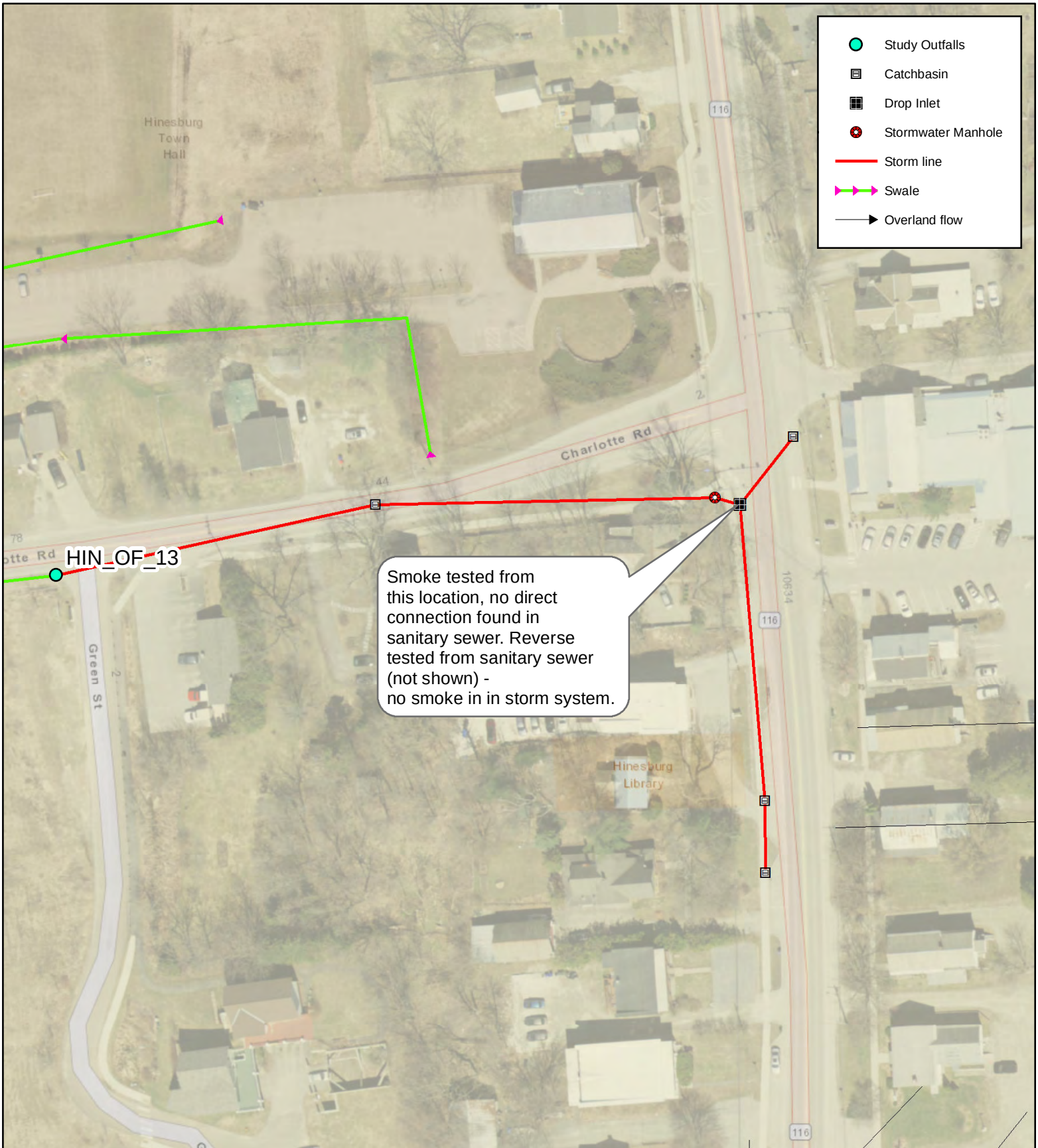
N

0 37.5 75 150 Feet

**HIN-OF-11**
**Advanced Investigation Map**
**Hinesburg, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_13 | 7/13/2017 | yes | None | 7.7 | 1891 | 0.52 | 0.5 | NA | NA | NA | NA |

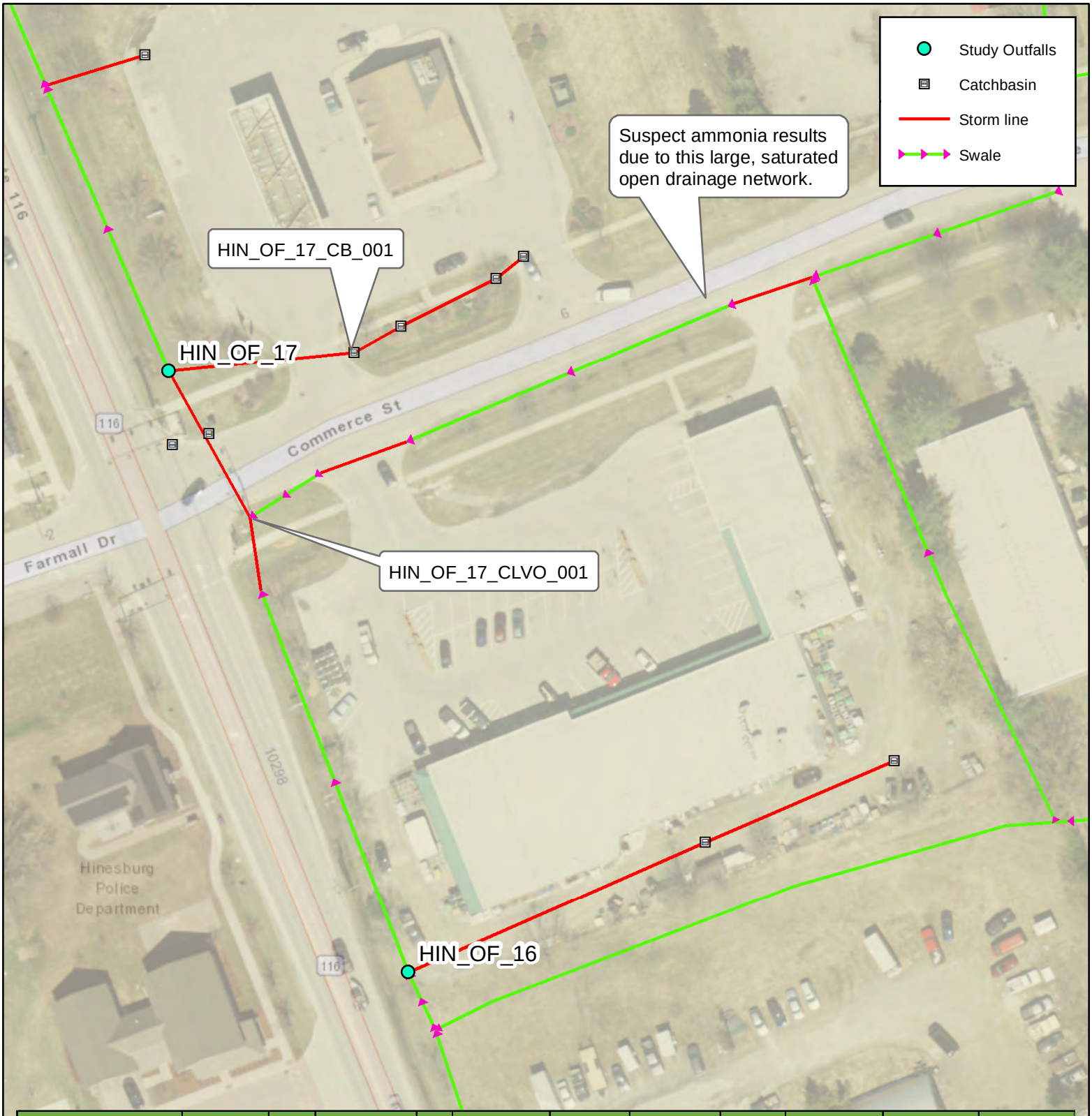
N

0 37.5 75 150 Feet

**HIN-OF-13**
**Advanced Investigation Map**
**Hinesburg, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_17 | 7/12/2017 | no | poor pool quality | NA | NA | NA | NA | NA | NA | NA | NA |
| HIN_OF_17 | 9/17/2018 | yes | None | 7.7 | 2107 | 0.33 | NA | NA | NA | NA | NA |
| HIN_OF_17 | 11/12/2018 | yes | None | 7.2 | 1379 | 0.12 | 0.75 | 10 | 0.04 | Positive | NA |
| HIN_OF_17_CLVO_001 | 11/12/2018 | yes | None | 7.6 | 1213 | 0.26 | 0.5 | 41 | NA | Positive | NA |
| HIN_OF_17_CB_001 | 11/12/2018 | yes | None | 7.7 | 1567 | 0.17 | 0.25 | 10 | NA | Positive | NA |

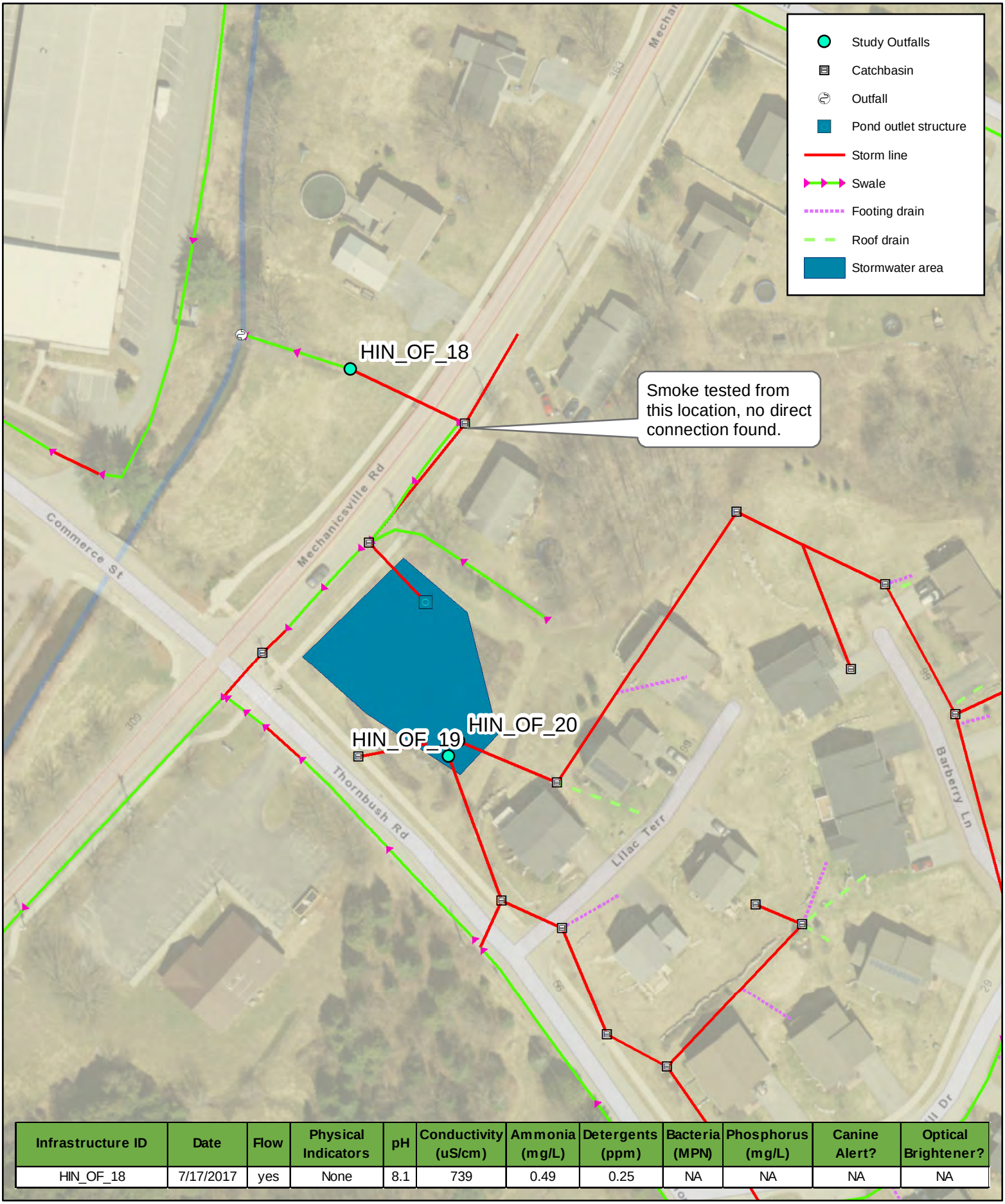
N

0 25 50 100 Feet

**HIN-OF-17**
**Advanced Investigation Map**
**Hinesburg, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HIN_OF_18 | 7/17/2017 | yes | None | 8.1 | 739 | 0.49 | 0.25 | NA | NA | NA | NA |

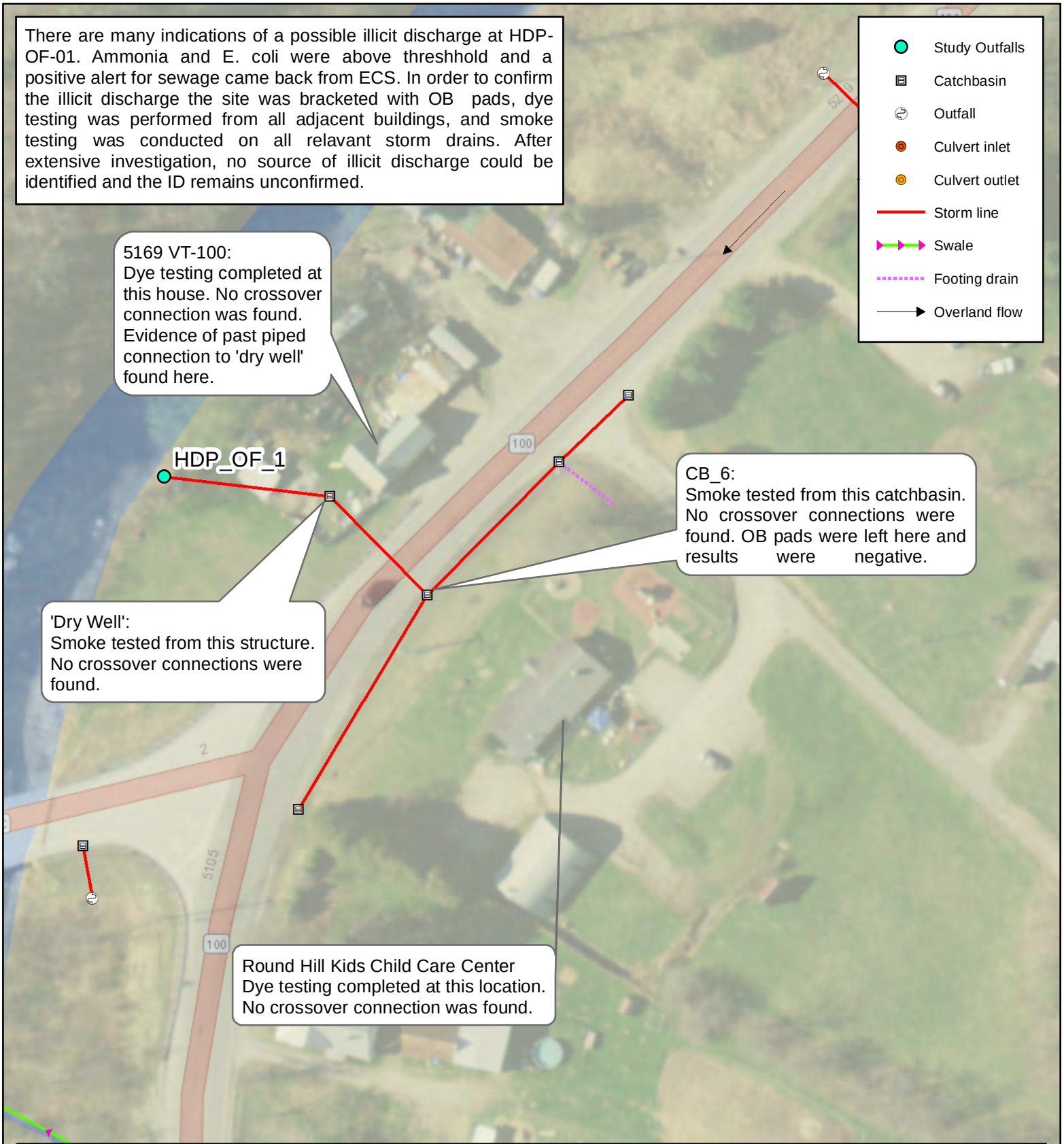
N

0 37.5 75 150 Feet

**HIN-OF-18**
**Advanced Investigation Map**
**Hinesburg, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HDP_OF_1 | 7/20/2017 | yes | None | 7.6 | 629 | 0.56 | 0 | NA | NA | NA | NA |
| HDP_OF_1 | 9/19/2018 | no | None | NA | NA | NA | NA | NA | NA | NA | Negative |
| HDP_OF_1_CB_6 | 9/19/2018 | yes | Sewer Odor | 7.3 | 778 | 99 | 0.25 | >2400 | 0.4 | Positive | NA |

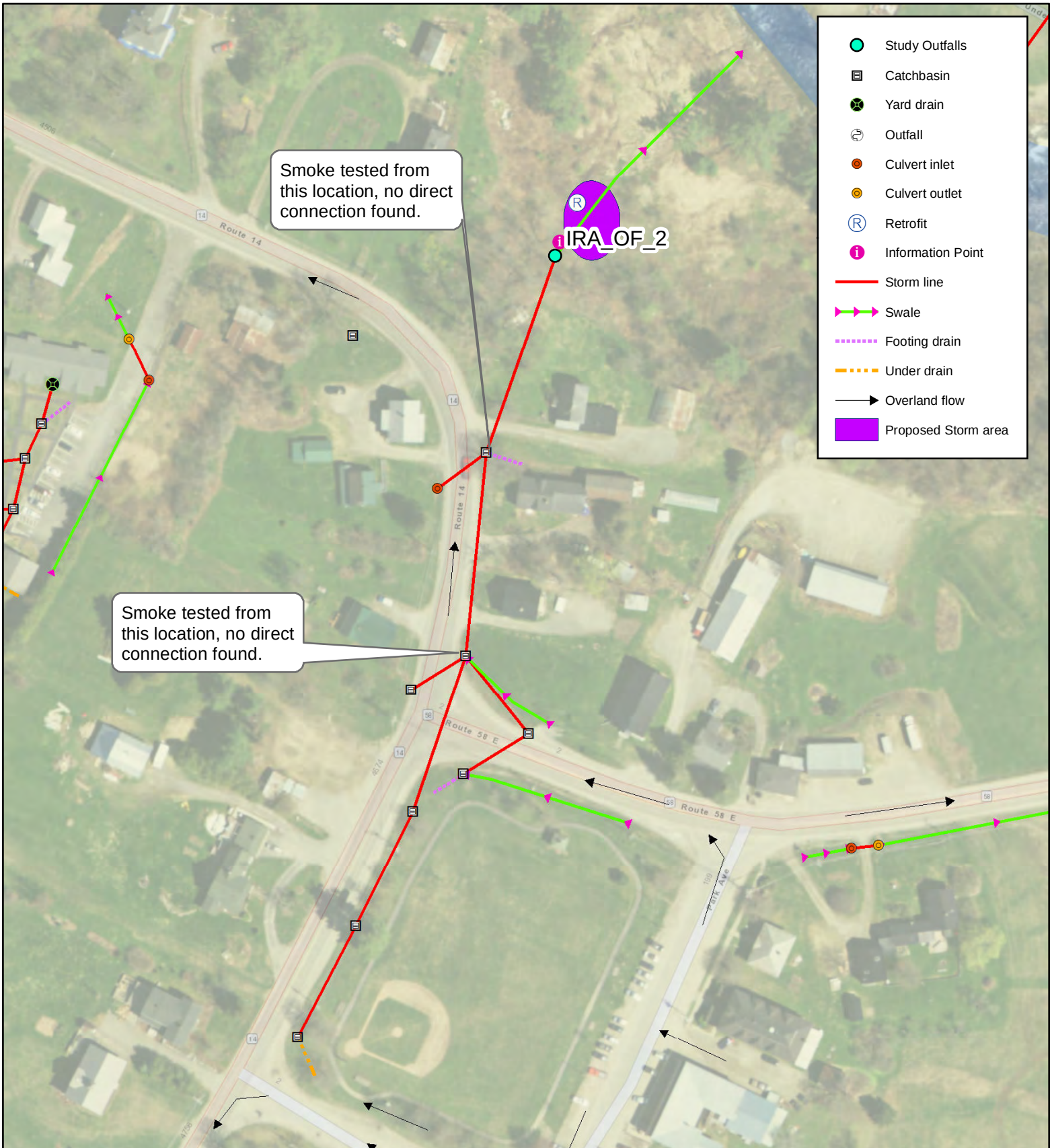
N

0 25 50 100 Feet

**HDP-OF-01**
**Advanced Investigation Map**
**Hyde Park, VT**

WATERSHED CONSULTING

Map Made: 01/07/2019




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IRA_OF_2 | 8/20/2017 | yes | None | 8.4 | 1795 | 0.23 | 0.25 | NA | NA | NA | NA |
| IRA_OF_2 | 8/13/2018 | no | None | | | | | | | NA | NA |

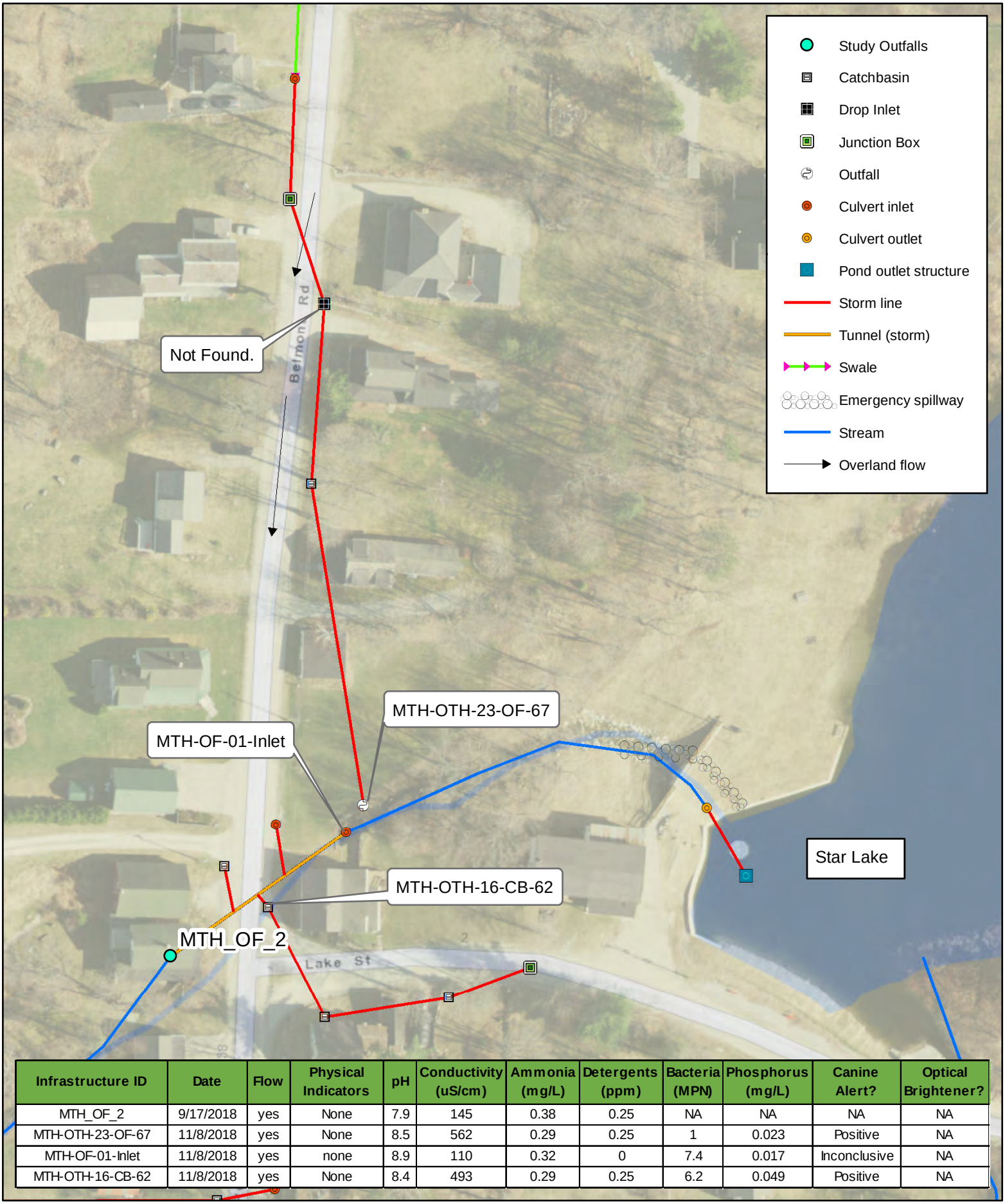
N

0 50 100 200 Feet

**IRA-OF-2**
**Advanced Investigation Map**
**Irasburg, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MTH_OF_2 | 9/17/2018 | yes | None | 7.9 | 145 | 0.38 | 0.25 | NA | NA | NA | NA |
| MTH-OTH-23-OF-67 | 11/8/2018 | yes | None | 8.5 | 562 | 0.29 | 0.25 | 1 | 0.023 | Positive | NA |
| MTH-OF-01-Inlet | 11/8/2018 | yes | none | 8.9 | 110 | 0.32 | 0 | 7.4 | 0.017 | Inconclusive | NA |
| MTH-OTH-16-CB-62 | 11/8/2018 | yes | None | 8.4 | 493 | 0.29 | 0.25 | 6.2 | 0.049 | Positive | NA |

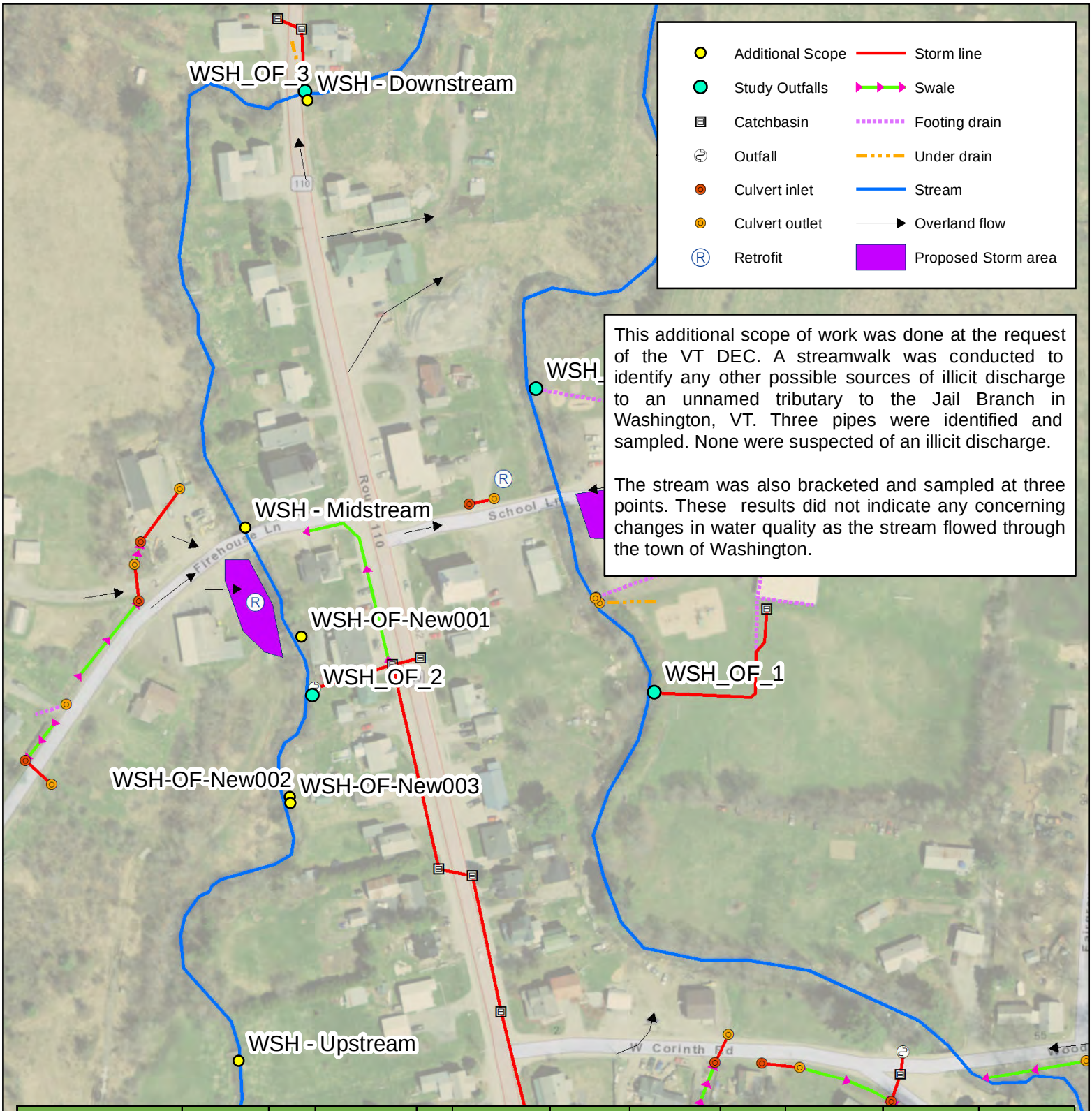
N

0 25 50 100 Feet

**MTH-OF-02**
**Advanced Investigation Map**
**Mount Holly, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018




This additional scope of work was done at the request of the VT DEC. A streamwalk was conducted to identify any other possible sources of illicit discharge to an unnamed tributary to the Jail Branch in Washington, VT. Three pipes were identified and sampled. None were suspected of an illicit discharge.

The stream was also bracketed and sampled at three points. These results did not indicate any concerning changes in water quality as the stream flowed through the town of Washington.

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WSH - Downstream | 10/26/2018 | yes | None | 8.5 | 375 | 0.12 | 0 | 26 | <.01 | Negative | Negative |
| WSH - Midstream | 10/26/2018 | yes | None | 8.4 | 330 | 0.15 | 0 | 20 | <.01 | Negative | Negative |
| WSH - Upstream | 10/26/2018 | yes | None | 8.5 | 360 | 0.14 | 0 | 15 | <.01 | Negative | Negative |
| WSH_OF_NEW_001 | 10/26/2018 | no | None | | NA | NA | NA | NA | NA | NA | Negative |
| WSH_OF_NEW_002 | 10/26/2018 | yes | None | 8.2 | 711 | 0.13 | 0.75 | <1.0 | <.01 | Positive | Negative |
| WSH_OF_NEW_003 | 10/26/2018 | no | None | | NA | NA | NA | NA | NA | NA | Negative |

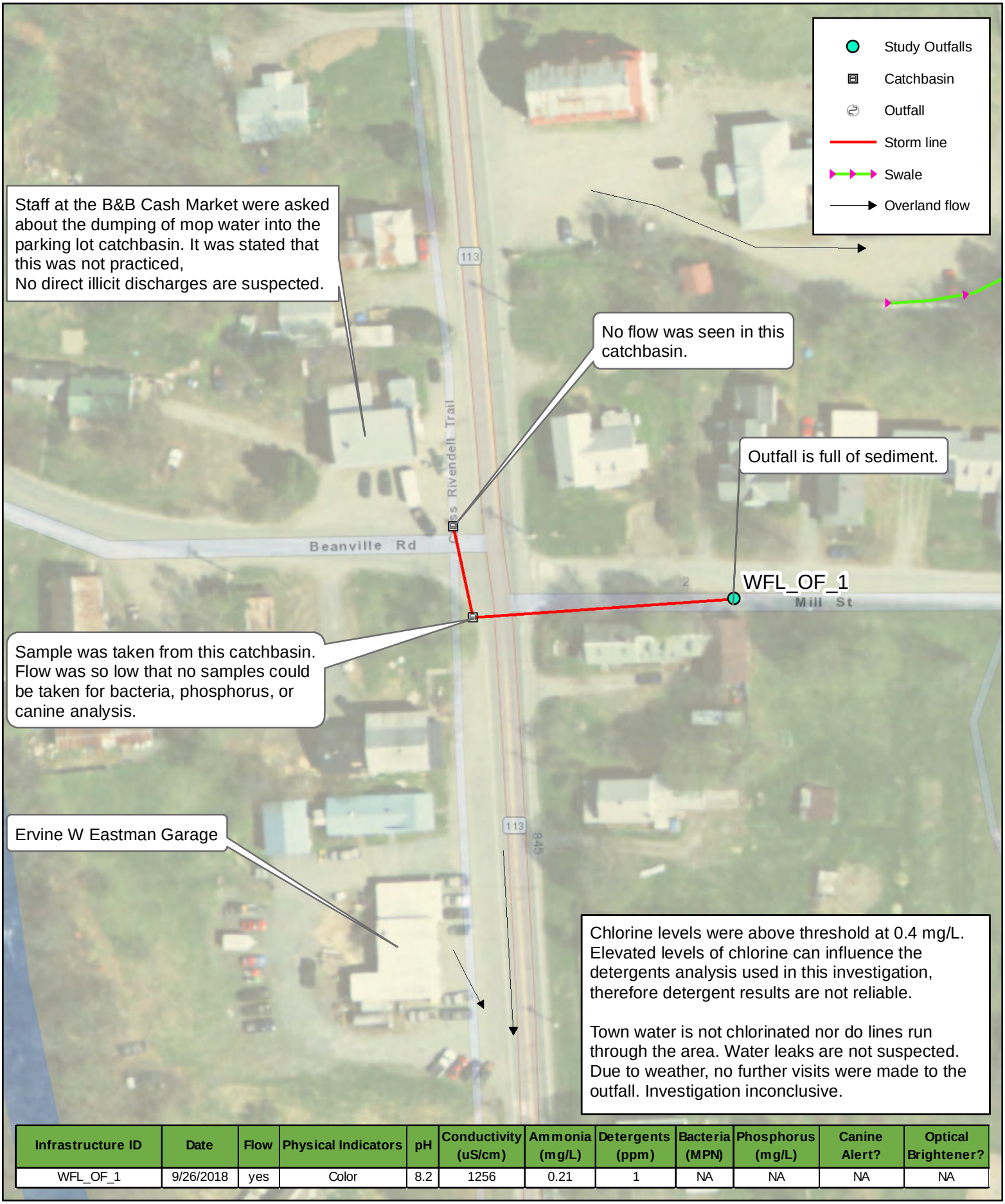
N

0 75 150 300 Feet

**Washington Stream Assessment**
**Advanced Investigation Map**
**Washington, VT**

WATERSHED CONSULTING

Map Made: 01/07/2019




Chlorine levels were above threshold at 0.4 mg/L. Elevated levels of chlorine can influence the detergents analysis used in this investigation, therefore detergent results are not reliable.

Town water is not chlorinated nor do lines run through the area. Water leaks are not suspected. Due to weather, no further visits were made to the outfall. Investigation inconclusive.

| Infrastructure ID | Date | Flow | Physical Indicators | pH | Conductivity (uS/cm) | Ammonia (mg/L) | Detergents (ppm) | Bacteria (MPN) | Phosphorus (mg/L) | Canine Alert? | Optical Brightener? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WFL_OF_1 | 9/26/2018 | yes | Color | 8.2 | 1256 | 0.21 | 1 | NA | NA | NA | NA |

N

0 25 50 100 Feet

**WFL-OF-01**
**Advanced Investigation Map**
**West Fairlee, VT**

WATERSHED CONSULTING

Map Made: 12/18/2018