IDENTIFICATION AND ASSESSMENT OF CAUSES OF IMPAIRMENT:
TROUT BROOK (MA62-07_2008(5))
Final Report - September 2018

AVON, MASSACHUSETTS

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Section 1
Introduction

The Town of Avon is proactively striving to achieve a stormwater and green infrastructure master plan that combines protection of drinking water and surface waters, education and involvement of the community, regulatory compliance, and installation of stormwater best management practices throughout the Town.

Avon applied for a grant titled “Identification and Assessment of Causes of Impairment: Trout Brook” and was generously awarded the work by the U.S. Environmental Protection Agency (EPA) and New England Interstate Water Pollution Control Commission (NEIWPCC) through the Southeast New England Program (SNEP) for Coastal Watershed Restoration Grants Program. This report:

- Summarizes the work completed under the grant,
- Provides conclusions about overall watershed water quality,
- Presents short-, mid-, and long-term structural and non-structural stormwater best management practice (BMP) solutions that will reduce pollution in-stream and in the Town’s drinking water aquifer,
- Identifies next steps.

1.1 Summary of Avon’s Stormwater Priorities

Avon has goals of improved stormwater management to protect the Town’s drinking water wells, Trout Brook, and its underlying aquifer, and to begin to meet the requirements of EPA Region 1’s latest National Pollutant Discharge Elimination System (NPDES) Phase II Small Municipal Separate Storm Sewer System (MS4) General Permit (2016 MS4 General Permit). The following provides additional detail on the problems and background that drive Avon’s stormwater priorities and initiated this project:

- Virtually all stormwater in Avon flows to Trout Brook. As documented in the Commonwealth's Integrated List of Waters, Trout Brook is listed as a Category 5 Water (Waters requiring a Total Maximum Daily Load, or “TMDL”) impaired by fecal coliform, dissolved oxygen, total suspended solids (TSS), and turbidity. In addition, there is a final TMDL for Pathogens for the Taunton River Watershed, which covers the listed segment of Trout Brook. These waterbodies do not meet designated uses of the Commonwealth’s Surface Water Quality Standards (314 CMR 4.00) or the Federal Water Quality Standards.

- More than 65% of the Town’s water supply is drawn from the Trout Brook aquifer, through which Trout Brook flows. The quality of the drinking water from Town wells...
within the Trout Brook sub-basin is of extreme importance. With the Town being in the upper reaches of the Taunton River/Narragansett Bay watershed, the stormwater catchment areas that recharge the Town’s wells are small, and therefore they are especially sensitive to the quality of the water that is recharged to groundwater.

- The Porter Public Water Supply Well has had total and fecal coliform detected above Commonwealth Drinking Water Regulations and Standards, which may be linked to the pollution in Trout Brook and groundwater. The pollution in Trout Brook and the groundwater is directly linked to stormwater and perhaps illicit connections. The Town expended nearly $100,000 to install 4-log treatment at this source in 2015. Reduction of pollutants in stormwater runoff is necessary, given the critical importance of water quality to the Town’s vital drinking water resources.

- Impervious cover and discharge of untreated stormwater from Avon are strongly suspected as the cause of the impairments in Trout Brook and the source of the total and fecal coliform detected at the Porter Public Water Supply Well. At over 23% impervious, the Town is in the top 15% of Massachusetts communities for percentage of total town area covered with impervious surfaces. The majority of impervious surface in Avon is upstream from both the Porter and Trout Brook water supplies.

- There are many land uses identified as Potential Contaminant Sources in Avon’s Source Water Assessment and Protection Report.

- There is no sanitary sewer in Town, so properties are dependent on subsurface disposal systems for wastewater.

- The Town of Avon is regulated under EPA’s NPDES Phase II Small MS4 permit program. Among other requirements of the Phase II Small MS4 General Permit, the Town must develop a complete map of the drainage system, look for and eliminate illicit discharges/illegal connections to the drainage system, and evaluate potential locations for structural stormwater Best Management Practice (BMPs) installation.

- Under the revised Water Management Act Sustainable Water Management Initiative (SWMI) the Town will be required to mitigate and minimize impacts to groundwater from well withdrawals. Mitigation can include stormwater recharge.

### 1.2 Project Goals

The purpose of this project is to define the negative impacts of stormwater runoff on the Trout Brook sub-basin and initiate a comprehensive approach to address these impacts. Stormwater runoff within the Trout Brook sub-basin is believed to adversely affect water quality and pose a risk to public health and welfare. By enhancing the understanding of the way in which the stormwater outfalls in Town affect the quality of Trout Brook and by extension, the Town’s water supply, the Town can effectively and economically address these issues. This project provides a strategic approach by comprehensive identification of pollutant sources and recommendations for structural and nonstructural BMPs to:

- **Protect** the Trout Brook sub-basin and its wildlife habitat.

- Enhance the quality of life by **improving surface water quality** to ensure public health and recreation standards are met by reducing the discharge of pollutants of concern.
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- Maintain and protect a sustainable, high-quality drinking water source for residents and industry.
- Comply with requirements of EPA’s latest Phase II Small Municipal Separate Storm Sewer System General Permit (2016 MS4 General Permit) and Massachusetts Department of Environmental Protection’s (MassDEP) Water Management Act (WMA) regulations (310 CMR 36.00) Sustainable Water Management Initiative (SWMI) framework.
- Educate the public on the impacts of stormwater and the role people play as good stewards of the environment.

1.3 Project Scope

To work towards a stormwater and green infrastructure master plan, this project consisted of a desktop- and field-based evaluation to understand potential sources of stormwater pollution, sampling and laboratory analysis to characterize concentrations of pollutants, and identification and assessment of structural and nonstructural Best Management Practices (BMPs) to reduce the sources of pollutants. Specifically, the following tasks were performed:

- Development and Approval of a Quality Assurance Project Plan (QAPP). The QAPP describes the quality assurance policy, management, structure, and procedures to implement the requirements necessary to verify, calibrate, and validate the output of the water quality samples and GIS data reviewed as part of this project.
- Catchment Delineation. Building off a recent MassDEP Water Infrastructure and Technical Assistance Program grant to map and assess the condition of the Town’s stormwater infrastructure, the catchments for priority outfalls that directly discharge to Trout Brook and abutting wetlands were delineated.
- Land-Use Surveys. A GIS-based desktop survey of the priority catchments was performed. This survey included the examination and quantification of:
  - Total area and percent area of both impervious cover and directly connected impervious cover, using the Town’s impervious cover layer
  - Length of stormwater infrastructure, using the Town’s mapped stormwater data
  - Number of drainage structures, using the Town’s mapped stormwater data
  - Miles of road for both state and town owned or operated roads (i.e. excluding private ways and private roads)
  - Municipal open space
  - Illicit Discharge Detection and Elimination (IDDE) Potential (e.g. catchments with previous complaints or known problems, known areas of failing septic systems, proximity to recreational areas, density of generating sites such as car dealers, car washes, gas stations, garden centers, and industrial areas, culverted streams)

On-the-ground investigations of catchments were completed. The goal of these investigations was to evaluate the actual nature of the catchment area and
determine whether it was likely to contribute pollutant and/or sediment loads to Trout Brook.

- **Environmental Sampling of Selected Outfalls.** Dry weather inspections of the high priority outfalls were performed. Based on the dry weather screening, the catchment delineation and land-use survey results, five outfalls were identified as the highest priority and wet weather inspections were performed on these outfalls.

- **Best Management Practices (BMPs) Screening for Selected Catchments.** Several structural and non-structural BMPs were examined to determine suitability of implementation in the five priority catchments. The assessment considered relative pollutant removal, relative costs, and relative permitting requirements of the BMPs to recommend short-, mid-, and long-term implementation.

### 1.4 Watershed-Based Planning

As part of developing the grant application and report, the Town of Avon considered EPA guidelines that promote developing and implementing Watershed-Based Plans. Watershed-Based Plans are *required* for all projects implemented with Clean Water Section 319 Nonpoint Source Management Program incremental dollars, and are *recommended* for all watershed projects, whether they are designed to protect unimpaired waters, restore impaired waters, or both.

EPA’s Guidelines list nine components required to be included in Watershed-Based Plans to restore waters impaired by nonpoint source (NPS) pollution:

a) An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan), as discussed in item (b) immediately below.

b) An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time).

c) A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

d) An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA’s Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

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1 https://www.mass.gov/guides/watershed-based-plan-information

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e) An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

f) A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

g) A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

h) A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

i) A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

As part of undertaking this grant work, the Town utilized MassDEP’s watershed-based planning tool\(^2\) to prepare a preliminary watershed-based plan. Relevant sections have been incorporated into this report and a copy of the full plan is included in Appendix A.

Avon has achieved items (a) through (c) for the Trout Brook sub-basin with this SNEP grant project but will need to further address the remaining watershed-based plan components through additional planning as discussed in Section 6.

1.5 Regulatory Drivers

There are two important regulatory drivers for the work completed under this grant project as further discussed in the following sections.

1.5.1 EPA’s Phase II Small Municipal Separate Storm Sewer System (MS4) General Permit

Through the National Pollutant Discharge Elimination System (NPDES) program, the U.S. Environmental Protection Agency (EPA) nationally regulates the discharge of stormwater runoff that is transported into local water bodies by way of the Municipal Separate Storm Sewer Systems (MS4s). EPA’s MS4 stormwater program was enacted in two phases:

- Phase I, issued in 1990, requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges.
- Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges.

\(^2\) [http://prj.geosyntec.com/MassDEPWBP](http://prj.geosyntec.com/MassDEPWBP)
Urbanized Areas (also known as “regulated areas”) are defined by the latest United States decennial census. On March 26, 2012, the Census Bureau published the final listing of urbanized areas for the 2010 census. An urbanized area encompasses a densely settled territory that consists of core census block groups, or “blocks,” that have a population of at least 1,000 people per square mile and surrounding census blocks that have an overall density of at least 500 people per square mile, or are included to link outlying densely settled territory with a densely settled urban core.\(^3\)

Figure 1-1 on the next page shows Avon’s Urbanized Area based on the 2000 and 2010 census listings. According to EPA Region 1, the area covered by both the 2000 census and the 2010 census are regulated by EPA under the MS4 program. Therefore, Avon is considered entirely regulated.

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Since the Town of Avon meets EPA’s regulatory threshold for a Phase II (small) MS4, the Town was required to obtain coverage under a NPDES permit for its stormwater discharges from the MS4 within its Urbanized Area.

In Massachusetts, the EPA Region 1 and the MassDEP jointly administer the municipal stormwater permit program and authorized Avon to discharge stormwater under the 2003 NPDES General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems, known as the “Small MS4 General Permit.” Under this permit, the Town has developed and implemented a Stormwater Management Plan (SWMP) to reduce the contamination of stormwater runoff. The Small MS4 Permit contains six elements called minimum control measures that, when implemented, should result in a significant reduction in pollutants discharged into receiving waters. The minimum control measures are:

1. Public Education and Outreach;
2. Public Involvement and Participation;
3. Illicit Discharge Detection and Elimination (IDDE) Program;
4. Construction Site Stormwater Runoff Control;
5. Stormwater Management in New Development and Redevelopment; and

EPA released a draft of a “next generation” Massachusetts Small MS4 General Permit for public comment on September 30, 2014. Following the public comment period and public hearings (which ended February 29, 2015), EPA responded to comments and finalized and promulgated the permit. The final permit was issued on April 13, 2016, and became effective on July 1, 2018. A Notice of Intent (NOI) must be submitted within 90 days of the effective date of the permit. A SWMP must be submitted within one year of the effective date of the permit.

The new General Permit is more prescriptive than the 2003 General Permit, and builds upon the regulations already in place. The new General Permit substantially increases stormwater management requirements and mandates specific timelines for compliance. A few of the new and enhanced minimum control measures that relate to this SNEP grant project are summarized in the following points:

- **Discharges to Impaired Waters related to an Approved TMDL:** Per Part 2.2.1 (pg. 18-19) of the MS4 General permit, Avon is identified as a community that contains waters subject to an approved TMDL for bacteria or pathogens (Trout Brook), and therefore must address requirements of Appendix F Part A.III to reduce the discharge. These requirements include:
  - Addressing discharges to impaired waters with or without an approved TMDL;
  - Finding and removing illicit discharges to the storm drain;
  - Assessing and identifying the use of structural best management practices (BMPs) to improve water quality.
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- Enhanced public education focused on pet waste and septic systems.
- Prioritizing catchments that discharge to the impaired waterbody in the IDDE program.

**Discharges to Impaired Waters related to Water Quality Limited Waters (i.e. impaired waterbodies on the 303(d) list):** Per Part 2.2.2 (pg. 23-240 of the MS4 General Permit, Avon is identified as a community that discharges from its MS4 to waterbodies, or their tributaries, that are impaired by total nitrogen and total phosphorus, and therefore must address the requirements of Appendix H Part I and Appendix H Part II, respectively. Mount Hope Bay (MA61-06), located between Somerset and Fall River, is impaired for total nitrogen and the Matfield River (MA62-32), located in East Bridgewater, is impaired for total phosphorus; both are within the Taunton River Watershed downstream of Avon. These requirements include:
  - Enhanced public education and outreach related to proper use and disposal of grass clippings, leaf litter, fertilizer, and pet waste.
  - BMPs in new and redevelopment should be optimized for the specific pollutant removal (i.e. nutrients).
  - Municipal employees must properly fertilize, manage, and organize waste pickup.
  - The Town must sweep streets twice annually: once in the spring, once in the fall.
  - Develop a nitrogen source identification report and a phosphorus source identification report.
  - Identify and evaluate potential structural BMPs to install to reduce the pollutant of concern (nutrients), and prepare a plan and schedule to install the BMPs. One BMP must be installed by June 30, 2024.

**Public Education and Outreach:** More specific messages and prescriptive deadlines are required as compared to the 2003 General Permit. Education must be provided to four specific audiences: (1) residents, (2) businesses, institutions (churches, hospitals), and commercial facilities, (3) developers (construction), and (4) industrial facilities. Messages now relate to proper lawn care, benefits of on-site infiltration, proper management of pet waste and septic systems, building maintenance, deicing storage and procedures, waste management, parking lot maintenance, erosion and sediment controls, etc.

**Illicit Discharge Detection and Elimination:** A prescriptive and specific iterative process to find and remove illicit discharges (i.e. any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, and is not provided an exemption under the MS4 permit (e.g. firefighting discharges) or another NPDES permit) from the storm drain system is required. This includes dry weather observation and sampling of outfalls, system-wide inspection to follow up on findings from outfall screening, written planning and prioritization, and training. Wet weather sampling is required for communities with sewer and recommended for communities with areas that have a history of widespread septic system failures and for communities with drainage that is 40 years of older.
**Stormwater Management in New Development and Redevelopment:** There are three significantly enhanced requirements in the new permit that relate to this SNEP grant project:

- For new development, retain the first inch of runoff from all impervious surfaces on site, or provide pollutant using a BMP. For redevelopment, retain the first 0.80 inches of runoff from all impervious surfaces on site or provide pollutant removal using a BMP. Offsite mitigation may be used for redevelopment projects.

- Develop a report that assesses existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist: Green roofs; Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses.

- Identify a minimum of five (5) Town-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume and pollutant loads of stormwater discharges to and from its MS4 through the reduction of impervious area. At a minimum, the permittee shall consider municipal properties with significant impervious cover (including parking lots, buildings, and maintenance yards) that could be modified or retrofitted. MS4 infrastructure to be considered includes existing street right-of-ways, outfalls and conventional stormwater conveyances and controls (including swales and detention practices) that could be readily modified or retrofitted to provide reduction in frequency, volume or pollutant loads of such discharges through reduction of impervious cover.

**Good Housekeeping and Pollution Prevention:** Develop a program to repair and rehabilitate the MS4 infrastructure. Sweep/clean municipal streets a minimum of once in the spring. Prioritize inspection and maintenance of catch basins such that the sumps never exceed 50% full.

### 1.5.2 Sustainable Water Management Initiative

The Massachusetts Department of Environmental Protection (MassDEP) revised the Water Management Act (WMA) regulations (310 CMR 36.00) in November 2014 to implement its Sustainable Water Management Initiative (SWMI) framework, which significantly changes the WMA permitting process for new permits as well as permit renewals. Compliance with the WMA under the SWMI Framework depends on several factors:

- The System Baseline withdrawal volume (reference point against which a request will be considered either an “existing” or an “increasing” withdrawal);

- Separate Major Basin Baselines if an applicant has sources in more than one major basin (i.e. not applicable to Avon);

- The Groundwater Withdrawal Category (GWC) of the Sub-basin(s) where the applicant’s sources are located, and Net Groundwater Depletion (NGD) of such Sub-basin(s);

- The Biological Category (BC) of the Sub-basin(s) where the applicant’s sources are located;
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- Whether their sources share a sub-basin with a Coldwater Fish Resource (CFR) stream;
- Which sources have Registrations and which have Permits (Avon has a combined permit and a registration that applies to all sources)
- The requested water volume.

The GWC and BC of the Sub-basins in which a community’s sources are located, in conjunction with Baseline and the requested volume, determine what permit tier designation a community will receive. The tiers in turn specify what is required during permitting. A Tier 1 permit is issued when no additional water above baseline is requested. A Tier 2 permit is issued when additional water above baseline is requested and will not result in a change in Groundwater Withdrawal Category or Biological Category. A Tier 3 permit is issued when additional water above baseline is requested and will result in a change in Groundwater Withdrawal Category or Biological Category.

The WMA regulations require all Tier 2 and Tier 3 permittees to mitigate any increases in withdrawals above baseline, commensurate with impact. The volume of impact is the amount of water withdrawal requested above the established baseline minus wastewater returns. Impact is further qualified by whether an increase in withdrawal causes a change in the sub-basin GWC or BC. Activities that occurred after 2005 that qualify as direct or indirect mitigation that continue to provide environmental benefit may be considered as part of an initial mitigation plan pending MassDEP review and approval.

A mitigation plan must be developed that includes direct and indirect efforts to offset the increase in withdrawals above the baseline. The mitigation volume = (Requested rate over baseline) – (Savings through enhanced demand management) – (all applicable wastewater adjustments).

One method of obtaining a direct mitigation credit is by disconnecting areas that drain to the municipal stormwater system and infiltrating that stormwater into the soils to recharge the aquifer instead. Stormwater recharge projects (Best Management Practices) that have been installed since 2005 can be accounted for as part of mitigation and minimization under the WMA Permit process.

Municipal projects and private redevelopment projects that occurred in wetlands jurisdictional areas may also have recharge projects that should be inventoried and accounted for as part of the WMA permit renewal.

In addition, as discussed in Section 1.5.1, as part of their Stormwater Management Program, the Town will be required by EPA to evaluate town-wide opportunities to implement stormwater recharge BMPs. As this effort progresses, this effort should be coordinated with the SWMI process. Priority should be given to recharge projects in the Taunton River Watershed and the Town should take credit for recharge implemented.

Avon’s actual annual usage from 2006 through 2016 has ranged from 0.35 to 0.44 MGD, and average around 0.40 MGD. Avon’s Baseline is 0.55 MGD. Without knowing the final 20-year water use projections prepared by the Department of Conservation and Recreation, we cannot confirm which Permit Tier Avon will be placed in by MassDEP.
Section 2
Overview of the Trout Brook Sub-basin

Trout Brook is located within the Towns of Avon and Brockton and is within the Taunton River Watershed. Figure 2-1 shows the sub-basin location within the overall watershed and the approximate extent within Avon and Brockton.

Trout Brook (Segment MA62-07) is formally defined by MassDEP as having the source northeast of Argyle Avenue and west of Conrail Line, Avon, and ending at the confluence with the Salisbury Brook forming the Salisbury Plain River, Brockton. The formal defined segment length is 3.4 miles, of which approximately 0.35 miles are within Avon. The drainage area of this segment is approximately 8.2 square miles, of which 1.44 square miles are within Avon. The sub-basin is mostly residential, forest, and industrial, and has over 25% impervious cover. Trout Brook is considered a Class B, warm water fishery under the Commonwealth’s Water Quality Standards (314 CMR 4.00).

The watershed-based plan included in Appendix A presents additional information about the entire sub-basin including:

- General Watershed Information;
- Water quality impairments, classification, and goals;
- Land use;
- Impervious cover; and
- Pollutant loading.

This project focuses solely on the portion of the Trout Brook sub-basin within the municipal limits of the Town of Avon. Figure 2-2 shows the extent of the Trout Brook sub-basin within Avon, including the extent of the MassDEP defined segment, and the main stream channels and wetlands throughout the watershed.

In addition, more than 65% of the Town’s drinking water supply is drawn from the Trout Brook aquifer. Figure 2-3 shows the locations of Avon’s drinking water supplies and wellhead protection areas (Zone I, Zone II, and IPWAs) within the Trout Brook sub-basin.
Avon, Massachusetts

FIGURE 2-3
DRINKING WATER SUPPLY WELLS IN TROUT BROOK SUB-BASIN

July 2018
2.1 Water Quality Concerns

The following sections provide information on water quality concerns specific to Trout Brook. While the focus of this SNEP grant project is to manage pollutants of concern in the Brook itself, we also must consider drinking water as the Town’s water supplies are within the aquifer underlying Trout Brook.

2.1.1 Drinking Water Quality

The quality of the drinking water from Town wells within the Trout Brook sub-basin is of extreme importance. The Porter Public Water Supply Well, which draws water from the aquifer underlying Trout Brook, had total and fecal coliform detected, which Town staff believe may be linked to stormwater pollution in Trout Brook. The Town expended nearly $100,000 to install 4-log treatment at this source in 2015.

2.1.2 Surface Water Quality

The following sections describe the surface water quality standards, impairments, and Total Maximum Daily Loads applicable to Trout Brook in Avon.

2.1.2.1 Surface Water Quality Standards

Trout Book is classified as a Class B, Warm Water Fishery, waterbody per the Massachusetts Water Quality Standards (314 CMR 4.00, effective December 6, 2013, updated August 27, 2017). Class B waters are “waters designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment (“Treated Water Supply”). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.” Note that Trout Brook is not designated as a public water supply for surface supplies.

The current numerical water quality standard for Class B waterbodies are as follows:

- **Dissolved Oxygen:** Shall not be less than 6.0 mg/l in cold water fisheries and not less than 5.0 mg/l in warm water fisheries. Where natural background conditions are lower, DO shall not be less than natural background conditions. Natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained.

- **Temperature:** Temperature shall not exceed 83°F (28.3°C) in warm water fisheries. The rise in temperature due to a discharge shall not exceed 5°F (2.8°C) in rivers and streams designated as warm water fisheries (based on the minimum expected flow for the month). Natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained. There shall be no changes from natural background conditions that would impair any use assigned to this Class, including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms.

- **pH:** Shall be in the range of 6.5 through 8.3 standard units and not more than 0.5 units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.
Section 2 Overview of the Trout Brook Sub-basin

- **Bacteria:**
  - Public Bathing Beaches: For E. coli, geometric mean of 5 most recent samples shall not exceed 126 colonies/100 ml and no single sample during the bathing season shall exceed 235 colonies/100 ml. For enterococci, geometric mean of 5 most recent samples shall not exceed 33 colonies/100 ml and no single sample during bathing season shall exceed 61 colonies/100 ml;
  - Other Waters and Non-bathing Season at Bathing Beaches: For E. coli, geometric mean of samples from most recent 6 months shall not exceed 126 colonies/100 ml (typically based on min. 5 samples) and no single sample shall exceed 235 colonies/100 ml. For enterococci, geometric mean of samples from most recent 6 months shall not exceed 33 colonies/100 ml, and no single sample shall exceed 61 colonies/100 ml.

- **Solids:** These waters shall be free from floating, suspended and settleable solids in concentrations and combinations that would impair any use assigned to this Class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

- **Color and Turbidity:** These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use assigned to this Class.

- **Oil and Grease:** These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life.

- **Taste and Odor:** None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to this Class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.

For water bodies without a TMDL for total phosphorus (TP), a default water quality goal for TP is based on target concentrations established in the Quality Criteria for Water (USEPA, 1986) (also known as the “Gold Book”). The Gold Book states that TP should not exceed 50 ug/L in any stream at the point where it enters any lake or reservoir, nor 25 ug/L within a lake or reservoir.

### 2.1.2.2 Taunton River Watershed 2001 Water Quality Assessment Report

Water quality assessment reports gather information on water withdrawals, wastewater discharges, and water quality sampling for parameters related to the Commonwealth’s Surface Water Quality Standards discussed in the previous section. This information is used to assess the designated uses (e.g. fish consumption, habitat for aquatic life, and for primary and secondary contact recreation, aesthetics) and provide recommendations for additional data collection to better assess the designated uses and meet water quality standards. Appendix C includes the excerpt of the water quality assessment report for Trout Brook. Table 2-1, below, summarizes the results of the designated use assessment.
### Table 2-1: Summary of Designated Use Assessment Results

<table>
<thead>
<tr>
<th>Designated Use</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Life</td>
<td>Not Assessed as a result of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use in this urbanized sub-basin is identified with an Alert Status because of habitat degradation, low dissolved oxygen/saturation and elevated total phosphorus concentrations.</td>
</tr>
<tr>
<td>Fish Consumption</td>
<td>Not Assessed</td>
</tr>
<tr>
<td>Primary Contact</td>
<td>Impaired</td>
</tr>
<tr>
<td></td>
<td>Cause: Fecal coliform bacterial</td>
</tr>
<tr>
<td></td>
<td>Source: Unknown</td>
</tr>
<tr>
<td></td>
<td>Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high-density area))</td>
</tr>
<tr>
<td>Secondary Contact</td>
<td>Impaired</td>
</tr>
<tr>
<td></td>
<td>Cause: Fecal coliform bacterial</td>
</tr>
<tr>
<td></td>
<td>Source: Unknown</td>
</tr>
<tr>
<td></td>
<td>Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high-density area))</td>
</tr>
<tr>
<td>Aesthetic</td>
<td>Supported for upper 2.1-mile reach (within Avon)</td>
</tr>
</tbody>
</table>

### 2.1.2.3 Impaired Waterbodies

To meet the requirements of the Clean Water Act (CWA) Section 303(d), Massachusetts assesses whether surface waterbodies attain the designated uses (e.g. habitat for aquatic wildlife, aquatic wildlife consumption, and primary and secondary recreation) for their surface water quality classification and identifies any waterbodies that are that are impaired (not expected to meet surface water quality standards and designated uses after
the implementation of technology-based controls). MassDEP must develop a plan and schedule to bring the impaired waters back into compliance with the water quality standards through a Total Maximum Daily Load (TMDL), which is further discussed in the next section.

Massachusetts develops an Integrated List of Waters, in which waters in the Commonwealth are categorized for attainment of designated uses. The Integrated List assigns each waterbody with one of five categories:

- Category 1: unimpaired and not threatened for all designated uses
- Category 2: unimpaired for some uses and not assessed for others
- Category 3: insufficient information to make assessments for any uses
- Category 4a: impaired for one or more uses with a completed TMDL
- Category 4c: impaired for one or more uses, but not by a pollutant and therefore a TMDL is not required
- Category 5: waters that are impaired or threatened for one or more uses and requiring a TMDL

Waterbodies classified as Category 4a (waterbodies with a TMDL) and Category 5 (“water quality limited” waterbodies) do not meet designated uses.

Massachusetts determined that Trout Brook does not meeting its aesthetic, primary contact recreation, secondary contact recreation, and fish and other aquatic life and wildlife uses due to a number of impairments. Therefore, Trout Brook is listed in the Commonwealth’s Final Massachusetts Year 2014 Integrated List of Waters, as a Category 5 Water (waters requiring a TMDL) with the following impairment causes:

- Fecal Coliform
- Dissolved Oxygen
- Total Suspended Solids (TSS)
- Turbidity

The Draft Massachusetts Year 2016 Integrated List of Waters continues to list the MA62-07 segment of Trout Brook in Avon as a Category 5 Water, and has added Escherichia coli as an impairment but no longer lists TSS or Turbidity as impairments. EPA’s Phase II Small MS4 General Permit requires communities to address pollutants identified in the Final Integrated List as of the effective date of the permit (i.e. July 1, 2018), which is the Final 2014 Integrated List not the Draft 2016 Integrated List, and therefore Avon must still address TSS and turbidity impairments.

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4 There are currently no Category 1 waterbodies in the Commonwealth of Massachusetts due to a Department of Public Health advisory on the consumption of fish
5 https://www.mass.gov/files/documents/2016/08/sa/14list2_0.pdf
In addition, as previously discussed in Section 1.5.1, EPA’s MS4 permit also lists Avon as having to address total nitrogen and total phosphorus impairments, as EPA’s MS4 permit requires communities to address downstream waterbodies with nutrients impairments. Mount Hope Bay (MA61-06) located between Somerset and Fall River is impaired for total nitrogen and the Matfield River located in East Bridgewater (MA62-32) is impaired for total phosphorus, both of which are within the Taunton River Watershed downstream of Avon.

### 2.1.2.4 Total Maximum Daily Load

Once a body of water is identified as a Category 5 water body on the Integrated List of Waters, MassDEP is required by the CWA to develop a “pollution budget” designed to restore the health of the impaired body of water. The process of developing this budget, generally referred to as a TMDL, includes identifying the source(s) of the pollutant from direct discharges (point sources) and indirect discharges (non-point sources), determining the maximum amount of the pollutant that can be discharged to a specific water body to meet water quality standards, and assigning pollutant load allocations to the sources.

**Trout Brook is subject to an approved TMDL for pathogens.** The Final Pathogen TMDL for the Taunton River Watershed, June 2011, (Control Number: CN 0256.0) applies to the 303(d) listed segments in this watershed including Trout Brook in Avon. Waterborne pathogens, such as disease-causing bacteria, viruses, and protozoa, can be difficult to identify and isolate, so non-pathogenic bacteria (in this case, E. coli or enterococci) are used as easily measurable indicators of contamination from sewage or feces of warm-blooded wildlife (birds and mammals).

Table 2-2 presents the waste location allocation and load allocation limits for various pathogen sources for Trout Brook.

**Table 2-2: Sources and Expectations for Limiting Bacterial Contamination in the Taunton River Watershed**

<table>
<thead>
<tr>
<th>Pathogen Source</th>
<th>Waste Load Allocation Indicator Bacteria (CFU/100 mL) (^7)</th>
<th>Load Allocation Indicator Bacteria (CFU/100 mL) (^7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater runoff Phase I and II</td>
<td>The geometric mean of all E. coli samples taken within the most recent six months shall not exceed 126 colonies per 100 ml typically based on a minimum of five samples and no single sample shall exceed 235 colonies per 100 ml (^8) Or The geometric mean of all enterococci samples taken within the most recent six months shall not exceed 33 colonies per 100 ml typically based on a minimum of five samples and no single sample shall exceed 61 colonies per 100 ml</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(^7\) For Class B waterbodies

\(^8\) The expectation for WLAs and LAs for stormwater discharges is that they will be achieved through the implementation of BMPs and other controls.
Section 2 Overview of the Trout Brook Sub-basin

<table>
<thead>
<tr>
<th>Pathogen Source</th>
<th>Waste Load Allocation Indicator Bacteria (CFU/100 mL)</th>
<th>Load Allocation Indicator Bacteria (CFU/100 mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonpoint source</td>
<td>N/A</td>
<td>The geometric mean of all E. coli samples taken within the most recent six months shall not exceed 126 colonies per 100 ml typically based on a minimum of five samples and no single sample shall exceed 235 colonies per 100 ml 8 or the geometric mean of all enterococci samples taken within the most recent six months shall not exceed 33 colonies per 100 ml typically based on a minimum of five samples and no single sample shall exceed 61 colonies per 100 ml.</td>
</tr>
</tbody>
</table>

The TMDL has identified leaking sewer pipes, illicit connections to the municipal separate storm sewer system (MS4), sanitary sewer overflows (SSOs), failing septic systems, recreational activities, and wildlife and domesticated animals as potential sources of disease-causing pathogens.

2.2 Sources of Trout Brook Water Quality Concerns

The following sections provide information on the sources of the water quality concerns discussed in the previous section.

2.2.1 Drinking Water Potential Contaminant Sources

In 2003, MassDEP created a Source Water Assessment and Protection (SWAP) report for Avon’s Water Division. This report provides an inventory of land uses and potential source of contamination within recharge areas of the Town’s public water supply wells and assesses the susceptibility of these wells to contamination from land uses, with the goal of focusing protection efforts on appropriate BMPs and drinking water source protection measures. A copy of this report is included in Appendix B.

This report identifies each of Avon’s Water Division’s water supplies as having high susceptibility to contamination. According to MassDEP, the wells are at a high risk of contamination due to the presence of at least one high threat land use within the water supply protection area and due to the types of soil in the area, which do not contain hydrogeologic barriers, such as clay, to prevent the movement of contaminants through groundwater.

Table 2 in the SWAP identifies potential contaminant sources and the associated quantity and threat. Largely, potential contaminant sources for the Avon’s drinking water wells are related to spills, leaks, or improper handling or storage of chemicals, solvents, metals, hazardous materials, and process wastes (e.g. automotive fluids, vehicle paints, batteries, fuel oil, septic systems, pesticides or herbicides, etc.).
Section 2 Overview of the Trout Brook Sub-basin

2.2.2 Sources of Pollutants of Concern in Surface Water

Table 2-1 lists common pollutants in stormwater runoff and the impacts of various pollutants on water quality. Text included in this table is from the California Stormwater Quality Association Stormwater BMP Handbook for New Development and Redevelopment.⁹

Table 2-3: Common Stormwater Pollutants and Associated Impacts on Water Quality

<table>
<thead>
<tr>
<th>Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment is a common component of stormwater, and can be a pollutant.</td>
</tr>
<tr>
<td>Sediment can be detrimental to aquatic life (primary producers, benthic</td>
</tr>
<tr>
<td>invertebrates, and fish) by interfering with photosynthesis, respiration,</td>
</tr>
<tr>
<td>growth, reproduction, and oxygen exchange in water bodies. Sediment can</td>
</tr>
<tr>
<td>transport other pollutants that are attached to it including nutrients,</td>
</tr>
<tr>
<td>trace metals, and hydrocarbons. Sediment is the primary component of</td>
</tr>
<tr>
<td>total suspended solids (TSS) and turbidity, common water quality analytic</td>
</tr>
<tr>
<td>parameters.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrients including nitrogen and phosphorous are the major plant</td>
</tr>
<tr>
<td>nutrients used for fertilizing landscapes, and are often found in</td>
</tr>
<tr>
<td>stormwater. These nutrients can result in excessive or accelerated</td>
</tr>
<tr>
<td>growth of vegetation, such as algae, resulting in impaired use of water</td>
</tr>
<tr>
<td>in lakes and other sources of water supply. For example, nutrients have</td>
</tr>
<tr>
<td>led to a loss of water clarity in Lake Tahoe. In addition, un-ionized</td>
</tr>
<tr>
<td>ammonia (one of the nitrogen forms) can be toxic to fish.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria and viruses are common contaminants of stormwater. For separate storm drain systems, sources of these contaminants include animal excrement and sanitary sewer overflow. High levels of indicator bacteria in stormwater have led to the closure of beaches, lakes, and rivers to contact recreation such as swimming.</td>
</tr>
</tbody>
</table>

Section 2 Overview of the Trout Brook Sub-basin

Oil and Grease

Oil and grease includes a wide array of hydrocarbon compounds, some of which are toxic to aquatic organisms at low concentrations. Sources of oil and grease include leakage, spills, cleaning and sloughing associated with vehicle and equipment engines and suspensions, leaking and breaks in hydraulic systems, restaurants, and waste oil disposal.

Metals

Metals including lead, zinc, cadmium, copper, chromium, and nickel are commonly found in stormwater. Many of the artificial surfaces of the urban environment (e.g., galvanized metal, paint, automobiles, or preserved wood) contain metals, which enter stormwater as the surfaces corrode, flake, dissolve, decay, or leach. Over half the trace metal load carried in stormwater is associated with sediments. Metals are of concern because they are toxic to aquatic organisms, can bioaccumulate (accumulate to toxic levels in aquatic animals such as fish), and have the potential to contaminate drinking water supplies.

Organics

Organics may be found in stormwater at low concentrations. Often synthetic organic compounds (adhesives, cleaners, sealants, solvents, etc.) are widely applied and may be improperly stored and disposed. In addition, deliberate dumping of these chemicals into storm drains and inlets causes environmental harm to waterways.

Pesticides

Pesticides (including herbicides, fungicides, rodenticides, and insecticides) have been repeatedly detected in stormwater at toxic levels, even when pesticides have been applied in accordance with label instructions. As pesticide use has increased, so too have concerns about the adverse effects of pesticides on the environment and human health. Accumulation of these compounds in simple aquatic organisms, such as plankton, provides an avenue for biomagnification through the food web, potentially resulting in elevated levels of toxins in organisms that feed on them, such as fish and birds.

Gross Pollutants

Gross Pollutants (trash, debris and floatables) may include heavy metals, pesticides, and bacteria in stormwater. Typically resulting from an urban environment, industrial sites and construction sites, trash and floatables may create an aesthetic “eye sore” in waterways. Gross pollutants also include plant debris (such as leaves and lawn-clippings from landscape maintenance), animal excrement, street litter, and other organic matter. Such substances may harbor bacteria, viruses, vectors, and depress the dissolved oxygen levels in streams, lakes and estuaries sometimes causing fish kills.
Vector Production

Vector production (e.g., mosquitoes, flies, and rodents) is frequently associated with sheltered habitats and standing water. Unless designed and maintained properly, standing water may occur in treatment control BMPs for 72 hours or more, thus providing a source for vector habitat and reproduction (Metzger, 2002).

As previously described in Section 2.1, Trout Brook is water quality impaired by the following pollutants of concern:

- **Fecal Coliform and Escherichia coli (pathogens)**
- **Total Suspended Solids (TSS) and Turbidity (solids)**
- **Total Nitrogen and Total Phosphorus (nutrients)**
- **Dissolved Oxygen**

This section discusses typical dry and wet weather sources for these pollutants.

### 2.2.2.1 Pathogens

#### Dry Weather Sources

- **Septic systems**: Failing septic systems can cause significant bacteria loads to nearby waterbodies especially when they are within 500 feet.\(^{10}\)

#### Wet Weather Sources

- **Pet waste**: Pet waste exposed to stormwater can be a major contributor of bacteria. During rain or snowmelt, pet waste is transported into the storm drain system and is discharged directly into local waterbodies.
- **Waterfowl**: Waterfowl and other wildlife tend to congregate in open spaces (fields, cemeteries), wooded areas and wetlands and can be a major contributor of bacteria. In one study, it was found that wildlife "contributed approximately one fourth of the total fecal coliform load in the watershed"\(^{11}\).
- **Farms/Livestock**: Although not applicable to Avon, it should be noted that, like wildlife, farms/livestock can contribute significant bacteria loads within a watershed. This is due to a combination of animal waste and manure applied to farmland.


Section 2 Overview of the Trout Brook Sub-basin

2.2.2.2 Solids
Solids are typically from a wet weather source:

- Exposed soils (e.g. construction sites): When exposed soils are eroded by stormwater runoff of snowmelt, these materials can easily be transported directly into waterbodies or wetlands, or into the stormwater system and then ultimately discharge into the waterbody. While sumps on catch basins provide some pollutant removal, depending on the concentration of the solids and the amount of flow, and how recently the sump was cleaned, the capacity can be exceeded allowing pollutants to discharge directly into waterbodies untreated.

- Impervious areas such as sidewalks, streets, rooftops, and driveways: Impervious areas gather sediments and solids and, when it rains or snow melts, these pollutants are washed into the drainage system or directly into a waterbody or wetland. While catch basin sumps may capture some of the solids, depending on when the sump was last cleaned, in a heavy precipitation event the materials can migrate into the drainage system and impact operability of the system along with water quality.

- Stream bank erosion: When streambanks become unstable due to vegetation loss that is either natural or due to human influence, the exposed soils are likely to be eroded due to natural stream flow. In Avon, there are segments of stream channel that are upstream of the drainage system, where pollutants could potentially enter the system downstream.

2.2.2.3 Nutrients
Sources of nutrients are the same as both pathogens and solids. In addition, there are three other significant sources of nutrients which are typically wet weather sources:

- Fertilizer: Fertilizer used on residential lawns, turf areas, and on crops contain nitrogen and can contain phosphorus. In Massachusetts, An Act Relative to the Regulation of Plant Nutrients was passed in 2012. This Act required the Department of Agricultural Resources to develop regulations that ensure that nutrients are applied in an effective manner to sufficiently maintain healthy agricultural and non-agricultural land (e.g. lawns and turf), while minimizing the impacts of the nutrients on surface and groundwater sources, with the goal of protection of human and environmental health. The regulations became effective on June 5, 2015, and limit phosphorus-containing fertilizer (it can only be applied when a soil test indicates it is needed or when a lawn is being established, patched, or renovated), and prescribe application locations (avoid impervious cover and avoid near waterbodies), timing, methods, etc.

- Grass clippings and leaf litter: Plants uptake nutrients and therefore when a lawn is mowed or leaves fall, the natural nutrients stay with them. If clippings and leaves are dumped into a wetlands or waterbody, as these decompose, the discharge nitrogen and phosphorus directly into the waterbody. In addition, when it rains, leaves and sometimes grass clippings enter the drainage system through catch basins, where they are often trapped and begin to decompose, releasing nitrogen into stormwater each time in rains or snow melts. Nutrients are discharged to waterbodies through the drainage system.
Section 2 Overview of the Trout Brook Sub-basin

- Atmospheric deposition is also a source of nutrients. When it rains, nutrients on impervious surfaces are quickly transported into the drainage system and into waterways.

2.2.2.4 Dissolved Oxygen
Dissolved oxygen (DO) is the measure of oxygen in a waterbody. Stormwater runoff often carries oxygen-demanding wastes such as sediments, nutrients, and organic matter, which require oxygen for decomposition or for chemical reactions and consequently decrease in-stream concentrations of DO. DO is also decreased by wastewater, such as failing septic systems.

Dry and wet weather sources of DO are the same as those for pathogens, solids, and nutrients and therefore are not re-listed in this section.

2.3 Characteristics of Trout Brook Sub-basin in Avon and Associated Pollutants of Concern
The following sections present the land use characteristics for the entire 919-acre Trout Brook sub-basin within Avon to begin to understand and evaluate possible sources and contributors of pollutant loading to Trout Brook.

Over the years, Avon's development and economic growth resulted in a conversion of undeveloped land (forests and pastures) to suburban/urban landscapes with increased impervious cover such as roadways, parking lots, driveways, etc., septic systems, infrastructure, and humans. All development affects water quality, whether the impact is positive or negative.

In forests and other areas with good vegetation cover and little disturbance from humans, most rainfall soaks into the soil rather than running off the ground, stream flows are fairly steady, and water quality is good. In built-up areas with pavement and buildings, little rainfall soaks into the soil, causing high runoff, stream flows with high peaks and low flows in between, and poorer water quality.12 This is demonstrated in Figure 2-4 below.13

![Figure 2-4: Land Development and the Water Cycle](http://www.ecy.wa.gov/washington_waters/images/WaterCycle.jpg)

12 Frankenberger, Dr. Jane, Assistant Professor in Agricultural and Biological Engineering. Purdue University. *Land Use and Water Quality*. URL: https://engineering.purdue.edu/SafeWater/watershed/landuse.html
13 Image from the Puget Sound Partnership. URL: http://www.ecy.wa.gov/washington_waters/images/WaterCycle.jpg
Section 2 Overview of the Trout Brook Sub-basin

2.3.1 Land Use

Land use within Trout Brook in Avon was obtained from the most recent MassGIS land use layer. Land use describes how the natural environment has been modified into a built environment. From a stormwater perspective, land uses are indicators of building density and the distinct activities that take place within that land use that have the potential to affect quality of stormwater runoff (e.g., residential land uses have activities such as walking dogs which contributes pathogens and nutrients, vehicle washing which contributes nutrients and surfactants, illegal dumping of yard waste which contributes solids and nutrients, etc.) Nearly 75% of the land use is designated as medium density residential (housing on 1/4 - 1/2 acre lots) or forest (areas where tree canopy covers at least 50% of the land. Both coniferous and deciduous forests belong to this class) within the Trout Brook sub-basin in Avon. Table 2-4 provides the breakdown of each land use category within the sub-basin. Figure 2-5 shows land use within the Trout Brook sub-basin.

Table 2-4: Trout Brook Sub-basin Land Use

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>State Land Use Code</th>
<th>Area (acres)</th>
<th>Percent of Trout Brook Sub-basin in Avon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Density Residential</td>
<td>12</td>
<td>409.2</td>
<td>44.5%</td>
</tr>
<tr>
<td>Forest</td>
<td>3</td>
<td>276.6</td>
<td>30.1%</td>
</tr>
<tr>
<td>Industrial</td>
<td>16</td>
<td>65.2</td>
<td>7.1%</td>
</tr>
<tr>
<td>Commercial</td>
<td>15</td>
<td>41.8</td>
<td>4.5%</td>
</tr>
<tr>
<td>Forested Wetland</td>
<td>37</td>
<td>37.3</td>
<td>4.1%</td>
</tr>
<tr>
<td>Urban Public/Institutional</td>
<td>31</td>
<td>17.6</td>
<td>1.9%</td>
</tr>
<tr>
<td>Non-Forested Wetland</td>
<td>4</td>
<td>15.4</td>
<td>1.7%</td>
</tr>
<tr>
<td>Cemetery</td>
<td>34</td>
<td>11.6</td>
<td>1.3%</td>
</tr>
<tr>
<td>Transportation</td>
<td>18</td>
<td>9.1</td>
<td>1.0%</td>
</tr>
<tr>
<td>Nursery</td>
<td>36</td>
<td>9</td>
<td>1.0%</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>13</td>
<td>6.4</td>
<td>0.7%</td>
</tr>
<tr>
<td>Open Land</td>
<td>6</td>
<td>5</td>
<td>0.5%</td>
</tr>
<tr>
<td>Participation Recreation</td>
<td>7</td>
<td>4.4</td>
<td>0.5%</td>
</tr>
<tr>
<td>Powerline/Utility</td>
<td>24</td>
<td>3</td>
<td>0.3%</td>
</tr>
<tr>
<td>Multi-Family Residential</td>
<td>10</td>
<td>2.9</td>
<td>0.3%</td>
</tr>
<tr>
<td>Transitional</td>
<td>17</td>
<td>2.2</td>
<td>0.2%</td>
</tr>
<tr>
<td>Very Low Density Residential</td>
<td>38</td>
<td>1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Water</td>
<td>20</td>
<td>0.9</td>
<td>0.1%</td>
</tr>
<tr>
<td>Brushland/Successional</td>
<td>40</td>
<td>0.7</td>
<td>0.1%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>919.2</td>
<td></td>
</tr>
</tbody>
</table>

2.3.2 Municipally Owned Land and Municipal Open Space

Developed or to-be developed municipally owned land is an ideal location for structural stormwater BMPs to reduce the volume of runoff and associated pollutant loads, as the Town already owns these parcels and therefore does not have to purchase or obtain an easement to install the BMP. The Town provided a municipally-owned parcel layer and a municipally-owned open space layer that was clipped to the limit of the Trout Brook sub-basin in GIS. There is a total of 152 municipally owned acres within the sub-basin on approximately 52 parcels (some of these parcels are not 100% within the sub-basin); of those, 134 acres are designated as open space parcels. Municipally Owned Land and Open Space is shown in Figure 2-6.

The following parcels are ideal opportunities for installation of structural BMPs as these sites have current impervious surfaces that could be mitigated and are owned by the Town: Town Hall, the Library, the Middle and High School, the current Police Department at Main Street and East High Street, the former police station on Fagan Drive, and the parking lot at 209 West Main Street. Site specific evaluation was completed as described in Section 3.3.

There are a few vacant parcels that may have an opportunity to manage runoff from abutting roadways. The parcels include 450 East Main Street, 180 East Main Street, 133 Main Street, the parcel at the intersection of Memorial Drive and Ladge Drive, and the parcel at the end of Everett Street. Site specific evaluation was completed for these parcels and is described in Section 3.3.

A 5.1-acre parcel located on Fellowship Circle is owned by the Avon Housing Authority and may be a prime candidate for a structural stormwater BMP. Further site-specific investigation of the drainage infrastructure was completed as described in Section 3.3 to consider if this site has the potential for installation of a BMP.

The two parcels occupied by DPW Highway Division facilities on West Main Street (Parcel IDs D4_2_10 and C4_8_23) are not ideal for installation of stormwater BMPs. This is because infiltration of stormwater runoff in proximity to oils, solvents, gas, etc. could exacerbate pollution issues rather than resolving them. These parcels are also within the Zone II drinking water protection area for the Town’s Porter Well water supply.

There is a significant amount of open space that are not ideal structural BMP locations as these locations are in close proximity to the public water supplies or are occupied by playing fields. These parcels were not further assessed in this SNEP grant project.

There is one 8.1-acre cemetery located at 80 Memorial Drive within the Trout Brook sub-basin that is not an opportune location to install a structural stormwater BMP. The cemetery is within the Zone II of the public water supplies and is in close proximity to the actual wells. Infiltration of stormwater near this type of land use may cause problems by influencing subsurface migration of historical embalming fluids to the public water supply.

A 3.9-acre parcel located at 85 Granite Street is owned by Avon Fish & Game, not by the Town. While this site may have potential for installation of structural BMPs, this parcel was not further assessed in this SNEP grant project as it would require obtaining an easement or permission for such an undertaking. It is also more cost-effective to install a BMP during redevelopment of this site.
FIGURE 2-6
MUNICIPALLY OWNED LAND AND OPEN SPACE WITHIN TROUT BROOK SUB-BASIN
Avon, Massachusetts
July 2018
2.3.3 Impervious and Directly Connected Impervious Area

Impervious cover includes all land surfaces that prevent the infiltration of water into the ground, such as paved roads and parking lots, roofs, driveways, patios, basketball courts, swimming pools, etc. Research has shown that imperviousness is a “powerful and important indicator of future stream quality and that significant degradation occurs at relatively low levels of development.”\textsuperscript{15} The relationship between total impervious area and water quality can generally be categorized as listed in Table 2-1 (Schueler et al. 2009)\textsuperscript{16} and described by Figure 2-7. The ICM predictions are general and may not fully apply to every stream, but the ICM serves as a good rule of thumb. Factors such as stream gradient, stream order, stream type, age of watershed development, prior land use, and past management practices can and will make some streams differ from these predictions.\textsuperscript{17}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure2-7.png}
\caption{Relationship Between Impervious Cover and Stream Water Quality}
\end{figure}

\begin{itemize}
\item \textsuperscript{15} Schueler, T. 2000. \textit{The Importance of Imperviousness}. The Practice of Watershed Protection. Center for Watershed Protection. Ellicott City, MD. 7-18.
\item \textsuperscript{16} http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/02/Is-Imp-Cover-Still-Important.pdf
\item \textsuperscript{17} The Impervious Cover Model and impervious cover and stream health information are from an EPA Webcast titled “The Eight Tools of Watershed Protection” by Tom Schueler of the Center for Watershed Protection.
\end{itemize}
## Table 2-5: Relationship between Impervious Area and Water Quality

<table>
<thead>
<tr>
<th>% Watershed Impervious Cover</th>
<th>Stream Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>Typically high quality, and typified by stable channels, excellent habitat structure, good to excellent water quality, and diverse communities of both fish and aquatic insects.</td>
</tr>
<tr>
<td>11-25%</td>
<td>These streams show clear signs of degradation. Elevated storm flows begin to alter stream geometry, with evident erosion and channel widening. Streams banks become unstable, and physical stream habitat is degraded. Stream water quality shifts into the fair/good category during both storms and dry weather periods. Stream biodiversity declines to fair levels, with most sensitive fish and aquatic insects disappearing from the stream.</td>
</tr>
<tr>
<td>26-60%</td>
<td>These streams typically no longer support a diverse stream community. The stream channel becomes highly unstable, and many stream reaches experience severe widening, downcutting, and streambank erosion. Pool and riffle structure needed to sustain fish is diminished or eliminated and the substrate can no longer provide habitat for aquatic insects, or spawning areas for fish. Biological quality is typically poor, dominated by pollution tolerant insects and fish. Water quality is consistently rated as fair to poor, and water recreation is often no longer possible due to the presence of high bacteria levels.</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>These streams are typical of “urban drainage”, with most ecological functions greatly impaired or absent, and the stream channel primarily functioning as a conveyance for stormwater flows.</td>
</tr>
</tbody>
</table>

Impervious area within the sub-basin was calculated using a 2007 impervious surface layer from MassGIS\(^\text{18}\), building footprints from MassGIS\(^\text{19}\), and an impervious surface layer created and provided by Town of Avon staff. All three of these layers were merged together and clipped to the sub-basin boundary.

Impervious areas that are directly connected (DCIA) to receiving waters (via storm sewers, gutters, or other impervious drainage pathways) produce higher runoff volumes and transport stormwater pollutants with greater efficiency than disconnected impervious cover areas which are surrounded by vegetated, pervious land. Runoff volumes from disconnected impervious cover areas are reduced as stormwater infiltrates when it flows across adjacent pervious surfaces.

DCIA was calculated using an EPA Region 1 methodology\(^\text{20}\) which required the total percentage of impervious area based on the associated land use designation. Land use

---


\(^{20}\) EPA, 2010. EPA’s Methodology to Calculate Baseline Estimates of Impervious Area (IA) and Directly Connected Impervious Area (DCIA) for Massachusetts Communities. [https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf](https://www3.epa.gov/region1/npdes/stormwater/ma/IA-DCIA-Calculation-Methodology.pdf)
Section 2 Overview of the Trout Brook Sub-basin

Information used in this analysis was from an aggregation of MassGIS’s Land Use 2005 datalayer into 10 different categories as required by EPA’s procedure. The total DCIA acreage was calculated by multiplying the percent DCIA by the total sub-basin area. The results of this analysis are shown in Table 2-6.

In Trout Brook, in Avon, industrial and commercial land uses have the greatest percentage of impervious area, as expected and the greatest predicted DCIA as well. Medium density residential, the greatest land use in the sub-basin, accounts for the most impervious area in Avon. Figure 2-8 shows the Impervious Area within the Trout Brook Sub-basin.

Table 2-6: Trout Brook Land Use, IA and DCIA Aggregation

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Land Use Codes</th>
<th>Total Area (acres)</th>
<th>Impervious Area (acres)</th>
<th>% Impervious Area</th>
<th>DCIA (acres)</th>
<th>% DCIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>15</td>
<td>41.80</td>
<td>29.53</td>
<td>70.65</td>
<td>17.54</td>
<td>59.38</td>
</tr>
<tr>
<td>Industrial</td>
<td>16, 18, 19, 29, 39</td>
<td>74.28</td>
<td>57.23</td>
<td>77.05</td>
<td>38.71</td>
<td>67.64</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>13, 38</td>
<td>7.43</td>
<td>2.18</td>
<td>29.34</td>
<td>12.49</td>
<td>0.27</td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>12</td>
<td>409.19</td>
<td>120.84</td>
<td>29.53</td>
<td>19.39</td>
<td>16.05</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>10, 11</td>
<td>2.92</td>
<td>1.58</td>
<td>54.29</td>
<td>0.76</td>
<td>48.27</td>
</tr>
<tr>
<td>Urban Public/Institutional</td>
<td>7, 8, 31</td>
<td>22.06</td>
<td>12.91</td>
<td>58.52</td>
<td>5.78</td>
<td>44.77</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1, 2, 35, 36</td>
<td>9.01</td>
<td>5.34</td>
<td>59.24</td>
<td>1.87</td>
<td>35.09</td>
</tr>
<tr>
<td>Forest</td>
<td>3, 40</td>
<td>277.25</td>
<td>12.01</td>
<td>4.33</td>
<td>0.02</td>
<td>0.19</td>
</tr>
<tr>
<td>Open Land</td>
<td>5, 6, 9, 17, 24, 26, 34</td>
<td>21.76</td>
<td>5.69</td>
<td>26.17</td>
<td>0.76</td>
<td>13.39</td>
</tr>
<tr>
<td>Water</td>
<td>4, 14, 20, 23, 25, 37</td>
<td>53.51</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>919.20</strong></td>
<td><strong>247.32</strong></td>
<td><strong>27%</strong></td>
<td><strong>87.56</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on this evaluation, Trout Brook in Avon can be considered Damaged by the Impervious Cover Model, as it is just over the 26% threshold of imperviousness. Even a slight decrease in impervious cover, by retrofitting areas with BMPs that both detain and retain stormwater runoff and reduce pollutants, will improve the water quality in Trout Brook.
Section 2 Overview of the Trout Brook Sub-basin

2.3.4 Roadways
Roadways consist of a significant amount of the impervious area within a watershed. Stormwater runoff from roadways contributes pollution to local wetlands and waterbodies. However, managing runoff on roadways using structural stormwater BMPs can be very challenging due to limitations on available space, the configuration of the existing drainage system, and subsurface conditions, along with safety considerations. Non-structural BMPs such as sweeping and catch basin cleaning are typically more feasible. The road dataset used for this analysis was provided by the Town and included jurisdiction classification of various roadway segments. The results are shown in Table 2-7. This shows that there are approximately 13 miles of roadway that the Town of Avon can manage primarily through non-structural controls and, where feasible, add structural controls as further discussed in Section 5 of this report. Figure 2-9 shows the roadways within Trout Brook sub-basin.

<table>
<thead>
<tr>
<th>Total Miles of Road</th>
<th>Total miles of State Road</th>
<th>Total Miles of Town Road</th>
<th>Total miles of Private Road</th>
<th>Miles of Unknown Road Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>3</td>
<td>13</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

2.3.5 Soils
Soil information was analyzed to help prioritize areas that are more advantageous for installation of infiltration BMPs. Soil data information was obtained from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) database available through MassGIS. The NRCS assigns soils to one of four hydrologic soil groups (A through D) based on estimates of runoff potential. Per the USDA NRCS Hydrologic Soil Groups of Massachusetts 2017 Soil Survey Data21, the hydrologic soil groups in Massachusetts are defined as follows:

- Group A: soils having a high infiltration rate (low runoff potential) when thoroughly wet, consisting mainly of deep, well drained to excessively drained sands or gravelly sands.

- Group B: soils having a moderate infiltration rate when thoroughly wet, consisting mainly of soils that are moderately deep to a restrictive layer, moderately well drained with textures ranging from fine sand to silt loam.

- Group C: soils having a slow infiltration rate when thoroughly wet, consisting mainly of soils with a layer that impedes the downward movement of water within 20-40 inches of the surface, or soils with fine textured layers.

- Group D: soils having a very slow infiltration rate (high runoff potential) when thoroughly wet, consisting mainly of soils that have a high water table (less than 24 inches below the ground surface) and soils that are shallow to bedrock or other nearly impervious material (less than 20 inches below the ground surface).

- Group C/D: soils having Group D conditions in their natural state and Group C conditions in a drained state.

The majority of Avon’s soils in Trout Brook are Group B or Group C soils, which have moderate to slow infiltration ability. Table 2-8 summarizes the total acreage for each soil type. Figure 2-10 shows the soils within the Trout Brook sub-basin.

Table 2-8: Summary of Hydrologic Soil Groups in the Trout Brook Sub-basin

<table>
<thead>
<tr>
<th>Unknown Hydrologic Soil Group (acres)</th>
<th>A (acres)</th>
<th>B (acres)</th>
<th>C (acres)</th>
<th>C/D (acres)</th>
<th>D (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>184</td>
<td>116</td>
<td>325</td>
<td>239</td>
<td>12</td>
</tr>
</tbody>
</table>
FIGURE 2-10
SOILS WITHIN
TROUT BROOK
SUB-BASIN
Avon, Massachusetts
July 2018

LEGEND
Soil Type

Unknown
A - Excessively Drained Or Somewhat Excessively Drained
B - Well Drained Or Moderately Well Drained
C/D - Well Drained
C - Moderately Well Drained Or Poorly Drained
D - Very Poorly Drained

Trout Brook Sub-basin
One-to-One Thoroughly Drained Or Somewhat Excessively Drained

Parcel Boundary
Town Boundary
2.3.6 Stormwater Infrastructure

Avon has made mapping and condition assessment of stormwater infrastructure a priority. Through a Water Infrastructure Planning and Technical Assistance Grant (BRP 2015-02) awarded by the Massachusetts Department of Environmental Protection (MassDEP) in 2016, Avon was able to complete additional mapping and to implement a stormwater operations and asset management system using a software package called Utility Cloud.

Prior to the Town’s recent stormwater mapping efforts, the only town-wide drainage map was a 1-800’ scale hand drawn map from 1964. The scale and notation made it difficult to distinguish between catch basins and manholes, and between pipes, streams and swales.

Avon’s DPW Director led the improved mapping effort which included combining information from various available sources, field checking the mapping, and adding mapping to a greater level of accuracy.

Interns utilized the Town’s Leica Zeno 20 sub-centimeter instrument to also obtain accurate horizontal locations (X,Y) and vertical elevations (Z) for complete field surface mapping of the drainage system structures. In addition, Avon purchased a recent fly over that provided high level orthophotos and planimetrics.

Figure 2-11 shows the Town’s existing stormwater asset inventory as of the date of this report. While the majority of catch basins have been accurately mapped, Avon continues to map connectivity. The total length of stormwater infrastructure, i.e. drain pipes and culverts, and the number of drainage structures were summarized where data was available in Table 2-9.

<table>
<thead>
<tr>
<th># of Catch Basins</th>
<th># Manholes</th>
<th># Outfalls</th>
<th>Culvert Length (feet)</th>
<th>Drain Pipe Length (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>426</td>
<td>42</td>
<td>43</td>
<td>321</td>
<td>17,978</td>
</tr>
</tbody>
</table>

2.3.7 Septic Systems

As previously discussed in Section 2.2, failing septic systems or, areas with dense septic systems and poor soils, and a high water table are locations that can cause non-point source pollution of a waterbody and contribute pollutants of concern (e.g. nitrogen, pathogens) to Trout Brook. We utilized a desktop assessment to estimate the number of likely septic systems in the sub-basin, assuming each parcel with a habitable building, per the assessor’s database, is disposing wastewater on-site. Building information from the results of this analysis yielded approximately 1,035 septic systems within the Trout Brook sub-basin. Figure 2-12 shows their parcels on which septic systems are likely and illustrates the density in areas throughout the sub-basin.

2.3.8 Dog Ownership

Town staff provided the most recent list of dog licenses, which was digitized into GIS, and found that there are 498 registered dog owners within Trout Brook sub-basin in Avon. Figure 2-13 shows their locations.
Section 3
Identification and Evaluation of Catchments

A catchment is defined by EPA as “the land area draining to a single outfall. The extent of an outfall’s catchment is determined not only by localized topography and impervious cover but also by the location of drainage structures and the connectivity of MS4 pipes.”

For the purposes of this SNEP grant report, we used catchments and their associated characteristics (both from a desktop and field-based perspective) to help prioritize areas that are the most likely sources of pollutant loads to Trout Brook to define locations for outfall sampling (Section 4) and catchments that may benefit from structural and non-structural BMP solutions (Section 5).

Catchments are also used to find and removal illegal connections to the drainage system. Under Part 2.3.4, Illicit Discharge Detection and Elimination (IDDE), of the 2016 MS4 General permit, EPA requires communities to define a catchment for each outfall that is part of the MS4. EPA requires a systematic investigation of catchments for evidence of illicit discharges, that begins with outfall sampling and moves to inspection of key junction manholes throughout the catchment.

Catchments can also be used by Avon in other practical applications such as to trace oil spills in an emergency response situation or to understand where hydrant flushing waters will discharge and their potential impact on downstream properties.

3.1 Catchment Identification

To define catchments in the Trout Brook sub-basin in Avon, we began by using drainage system mapped in the Town’s ESRI® ArcGIS system. As of the date of this report, there are 43 outfalls mapped within the Trout Brook sub-basin in Avon as previously shown on Figure 2-11. Of these:

- 22 outfalls are part of a mapped area north of Harrison Boulevard and west of East Main Street with good connectivity. One of these 22 outfalls was not actually mapped in GIS (at the intersection of Malley Avenue and Brentwood Avenue), but the piping was, so we added an identification and called it OFNew.
- 2 of these outfalls (OF180 and OF071) were in areas that we completed additional drainage system mapping during the course of the project and therefore we were able to determine connectivity of the drainage system and therefore could complete a catchment delineation to the same level as the other 22 outfalls listed in the previous bullet.
- 4 of these outfalls (OF 101, OF 103, OF108, OF 120) are actually owned by MassDOT
- 1 of these outfalls is likely owned by MassDOT (OF121).
• Some of these outfalls are, in reality, culvert outlets, with no mapped drainage connecting to them (e.g. OF102 at end of Ladge Drive, OF104 at end of East Street).

• Some of these outfalls are, in reality, culvert outlets but also are in a location where the drainage system appears to be connected directly to the culvert, and therefore the culvert location would be considered the representative outfall (e.g. Outfall OF105 off of East Spring Street).

Using topographic mapping, we found that the majority of the mapped outfalls without connected drainage system served only small portions of residential neighborhoods (e.g. OF106, OF181, and OF186), or would require significant field investigation to define (e.g. OF109, OF110, and OF139), and therefore we decided to complete catchment delineations only for the Town-owned outfalls with connected drainage or those that had been field verified. Especially for small systems, catchment delineation using topography alone does not typically correctly represent the drainage area contributing to that outfall. As more of Avon’s system is mapped, additional catchments can be delineated.

Initial catchment delineations were completed based on the Metropolitan Planning Commission’s GIS-Based Catchment Delineation and Ranking Methodology available through the Neponset Stormwater Partnership. Delineations were completed using data from the 2011 Northeast LIDAR dataset, hydrology from MassDEP, roadway centerlines from MassDOT, and right-of-way information from the Town’s parcel layer. Many of the catchment delineations were manually adjusted based on bests professional judgement and using nearby topography (i.e. the 3-foot contour layer developed by the Town in the MassDEP Asset Management Project previous discussed in Section 2.3.6). The results of this delineation process produced 24 catchments shown in Figure 3-1.

3.2 “Desktop” Evaluation of Catchments

Tighe & Bond staff completed GIS-based desktop surveys of the 24 catchments delineated using the same characteristics and associated methodology that were summarized in Section 2.3 for the entire Trout Brook sub-basin within Avon. These calculations were completed for each of the catchments individually. Characteristics of each catchment include the following:

• Land use
• Municipally owned land locations
• Total area and percent area of both impervious cover and directly connected impervious cover, using the Town’s impervious cover layer
• Miles of road for both the state and town owned or operated roads (i.e. excluding private ways and private roads)
• Soil type using USDA NRCS data
• Length of stormwater infrastructure, using the Town’s mapped stormwater data
• Number of drainage structures, using the Town’s mapped stormwater data

24 LIDAR 2011 Northeast Dataset
Section 3 Identification and Evaluation of Catchments

- Number and location of septic systems
- Dog ownership

For the “desktop” evaluation of catchments, we rank each catchment based on criteria that is explained in each of the following sections. The catchments considered highest priority are identified in dark orange shading and bold, and the catchments considered medium priority are identified in light orange shading and italics. If there is a tie, we identify both catchments as being part of the priority category.

Tables throughout this section list catchments in numerical order by catchment identification number.

Table 3-1 provides basic area information for each of the 24 catchments. Outfalls with larger catchments have a greater potential area for structural and non-structural BMP implementation and are therefore considered highest priority in regard to this characteristic.

Table 3-1: Catchment Acreage

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Area (acres)</th>
<th>% Area within Entire Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>5.5</td>
<td>0.2</td>
</tr>
<tr>
<td>OF111</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td>OF114</td>
<td>3.1</td>
<td>0.1</td>
</tr>
<tr>
<td>OF115</td>
<td>2.6</td>
<td>0.1</td>
</tr>
<tr>
<td>OF116</td>
<td>7.6</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>OF117</strong></td>
<td><strong>17.6</strong></td>
<td><strong>0.6</strong></td>
</tr>
<tr>
<td><strong>OF118</strong></td>
<td><strong>10.3</strong></td>
<td>0.4</td>
</tr>
<tr>
<td><strong>OF119</strong></td>
<td><strong>9.8</strong></td>
<td><strong>0.3</strong></td>
</tr>
<tr>
<td><strong>OF124</strong></td>
<td><strong>10.5</strong></td>
<td><strong>0.4</strong></td>
</tr>
<tr>
<td>OF126</td>
<td>2.1</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>OF127</strong></td>
<td><strong>23.1</strong></td>
<td><strong>0.8</strong></td>
</tr>
<tr>
<td>OF128</td>
<td>6.7</td>
<td>0.2</td>
</tr>
<tr>
<td>OF129</td>
<td>7.8</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>OF130</strong></td>
<td><strong>48.2</strong></td>
<td><strong>1.7</strong></td>
</tr>
<tr>
<td>OF132</td>
<td>3.7</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>OF133</strong></td>
<td><strong>21.2</strong></td>
<td><strong>0.7</strong></td>
</tr>
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<td><strong>0.5</strong></td>
</tr>
<tr>
<td>OF138</td>
<td>4.6</td>
<td>0.2</td>
</tr>
<tr>
<td>OF171</td>
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<td>0.2</td>
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<tr>
<td>OF180</td>
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<td>0.1</td>
</tr>
<tr>
<td>OFNew</td>
<td>9.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>
3.2.1 Land Use

Because our pollutants of concern are mostly related to activities that occur in residential areas, we consider the catchments with the greatest percent of residential land as being the likeliest to contribute these pollutants of concern. However, catchments with a high percent of commercial and industrial also have the potential to contribute pollution. Therefore, for this analysis, we combined residential and commercial/industrial and determined that catchments with the greatest total amount of both land uses are the highest priority. The results of this analysis are shown in Table 3-2.

Table 3-2: Catchment Land Use

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Percent Residential 1</th>
<th>Percent Commercial/Industrial</th>
<th>Percent Forest and Wetlands 2</th>
<th>Percent of other Land Use 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>55%</td>
<td>1%</td>
<td>30%</td>
<td>13%</td>
</tr>
<tr>
<td>OF111</td>
<td>70%</td>
<td>1%</td>
<td>0%</td>
<td>29%</td>
</tr>
<tr>
<td><strong>OF114</strong></td>
<td><strong>24%</strong></td>
<td><strong>51%</strong></td>
<td><strong>18%</strong></td>
<td><strong>7%</strong></td>
</tr>
<tr>
<td><strong>OF115</strong></td>
<td><strong>15%</strong></td>
<td><strong>85%</strong></td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>OF116</td>
<td>21%</td>
<td>10%</td>
<td>69%</td>
<td>0%</td>
</tr>
<tr>
<td>OF117</td>
<td>47%</td>
<td>0%</td>
<td>53%</td>
<td>0%</td>
</tr>
<tr>
<td>OF118</td>
<td>64%</td>
<td>5%</td>
<td>31%</td>
<td>0%</td>
</tr>
<tr>
<td>OF119</td>
<td>24%</td>
<td>41%</td>
<td>27%</td>
<td>9%</td>
</tr>
<tr>
<td><strong>OF124</strong></td>
<td><strong>84%</strong></td>
<td>0%</td>
<td>16%</td>
<td>0%</td>
</tr>
<tr>
<td>OF126</td>
<td>68%</td>
<td>0%</td>
<td>32%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>OF127</strong></td>
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<td><strong>99%</strong></td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>OF130</strong></td>
<td><strong>83%</strong></td>
<td>2%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>OF132</td>
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<td>59%</td>
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</tr>
<tr>
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<td>58%</td>
<td>0%</td>
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<td>32%</td>
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<td>13%</td>
<td>54%</td>
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</tr>
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<td>73%</td>
<td>0%</td>
<td>27%</td>
<td>0%</td>
</tr>
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<td><strong>OF171</strong></td>
<td><strong>0%</strong></td>
<td><strong>83%</strong></td>
<td><strong>17%</strong></td>
<td><strong>0%</strong></td>
</tr>
<tr>
<td><strong>OF180</strong></td>
<td><strong>96%</strong></td>
<td>0%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>OFNew</strong></td>
<td><strong>97%</strong></td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
</tr>
</tbody>
</table>

1 Includes both medium- and low- density residential
2 Also includes land use categories ‘forested wetland’, ‘non-forested wetland’, ‘brushland-successional’ and ‘water’.
3 Includes land use categories ‘cemetery’, ‘participation recreation’, ‘urban public/institutional’ and ‘open land’.
3.2.2 Municipally Owned Land

Catchments that have municipally owned land that is not open space would be considered the highest priority for structural BMP implementation as these are developed areas with potential space for a BMP. Catchments that have a significant amount of municipal land, even if all of it is considered open space, may have an opportunity for a BMP or could benefit from a non-structural BMP, and therefore are considered medium priority.

It also should be noted that open space areas can attract waterfowl; therefore, we also considered the catchments with the largest municipal open space as being a medium priority. The results of this analysis are shown in Table 3-3.

### Table 3-3: Municipal Open Space

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Municipal Owned Land (acres)</th>
<th>Municipal Open Space (acres)</th>
<th>Municipal Owned Land that is not Open Space (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>2.04</td>
<td>0.16</td>
<td>1.88</td>
</tr>
<tr>
<td>OF111</td>
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<td>0</td>
</tr>
<tr>
<td>OF114</td>
<td>1.44</td>
<td>1.44</td>
<td>0</td>
</tr>
<tr>
<td>OF115</td>
<td>1.07</td>
<td>1.07</td>
<td>0</td>
</tr>
<tr>
<td>OF116</td>
<td>0.59</td>
<td>0.59</td>
<td>0</td>
</tr>
<tr>
<td>OF117</td>
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<td>0</td>
</tr>
<tr>
<td>OF118</td>
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<td>0.01</td>
<td>0</td>
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<tr>
<td>OF119</td>
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<td>1.92</td>
<td>0</td>
</tr>
<tr>
<td>OF124</td>
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<td>0.01</td>
<td>0</td>
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<td>0</td>
<td>0</td>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>OF128</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>OF129</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>OF130</td>
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<td>0.01</td>
<td>0</td>
</tr>
<tr>
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</tr>
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<tr>
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<td>3.29</td>
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<td>0</td>
<td>0</td>
</tr>
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<td>0.04</td>
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</tr>
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<td>0</td>
</tr>
</tbody>
</table>
Section 3 Identification and Evaluation of Catchments

3.2.3 Impervious and Directly Connected Impervious Area

As described previously, catchments with the greatest percent of impervious area have the most potential to contribute pollution to Trout Brook and therefore are highest priority. The results of this analysis are shown in Table 3-4.

Table 3-4: Trout Brook Land Use, IA and DCIA Aggregation

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Total Area (acres)</th>
<th>IA Area (acres)</th>
<th>% IA</th>
<th>DCIA (acres)</th>
<th>% DCIA</th>
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<tr>
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<td>18.3</td>
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<td>0.4</td>
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</tr>
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<td>1.7</td>
<td>55.9</td>
<td>0.6</td>
<td>19.1</td>
</tr>
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<td>72.3</td>
<td>1.4</td>
<td>55.3</td>
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<td>0.1</td>
<td>1.0</td>
</tr>
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<td>13.8</td>
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</tr>
<tr>
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<td>6.5</td>
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<td>12.7</td>
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<td>2.9</td>
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<td>0.5</td>
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<tr>
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<td>2.6</td>
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<td>27.7</td>
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<td>13.5</td>
</tr>
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</table>
3.2.4 Roadways

Catchments with the greatest amount of town-owned roadways have the greatest potential to be managed with either structural or non-structural BMPs; these catchments are highlighted in Table 3-5.

Table 3-5: Trout Brook Roadway Summary

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Total Road Length (miles)</th>
<th>Town Road (miles)</th>
<th>Private Road (miles)</th>
<th>Unknown Road Jurisdiction (miles)</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF114</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.2</td>
<td>0.1</td>
<td></td>
<td>0.04</td>
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<td><strong>0.3</strong></td>
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<td></td>
</tr>
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<td>0.1</td>
<td></td>
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<td><strong>1.4</strong></td>
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<td></td>
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<td><strong>0.8</strong></td>
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</tr>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td><strong>1.9</strong></td>
<td></td>
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</tr>
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<td>OF132</td>
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</tr>
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</tr>
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<td></td>
<td></td>
</tr>
<tr>
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</tr>
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</tr>
</tbody>
</table>
### Section 3 Identification and Evaluation of Catchments

#### 3.2.5 Soil Data

Catchments with the greatest percentage of A or B soils are a high priority for infiltration type BMPs as these types of BMPs help manage nutrients and pathogens, key pollutants of concern in Trout Brook. Table 3-6 illustrates which catchments have the greatest percentage of A or B soils.

**Table 3-6: Soil Types**

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Hydrologic Soil Group Percentages</th>
</tr>
</thead>
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<tr>
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<td>A</td>
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</tr>
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</table>
3.2.6 Stormwater Infrastructure

Catchments that have longer, more heavily connected drainage systems have a higher potential for illicit discharges (e.g. pipes from septic systems accidentally plumbed to the MS4, pipes from laundry plumbed to the MS4, or catch basins to which pet waste or leaves/yard waste are dumped). Therefore, we considered the catchments with the most linear feet of pipe as the highest priority and those catchments have been highlighted in Table 3-7.

Table 3-7: Stormwater Infrastructure

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th># of Catch Basins</th>
<th># of Manholes</th>
<th>Culvert Length (ft.)</th>
<th>Length of Pipe (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF111</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF114</td>
<td>8</td>
<td>0</td>
<td></td>
<td>213.3</td>
</tr>
<tr>
<td>OF115</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF116</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF117</td>
<td>6</td>
<td>0</td>
<td></td>
<td>110.7</td>
</tr>
<tr>
<td>OF118</td>
<td>2</td>
<td>2</td>
<td>22.1</td>
<td>186.0</td>
</tr>
<tr>
<td>OF119</td>
<td>2</td>
<td>0</td>
<td>13.9</td>
<td>35.8</td>
</tr>
<tr>
<td><strong>OF124</strong></td>
<td><strong>14</strong></td>
<td><strong>3</strong></td>
<td></td>
<td><strong>1741.8</strong></td>
</tr>
<tr>
<td>OF126</td>
<td>4</td>
<td>1</td>
<td></td>
<td>26.7</td>
</tr>
<tr>
<td><strong>OF127</strong></td>
<td><strong>36</strong></td>
<td><strong>8</strong></td>
<td></td>
<td><strong>3514.4</strong></td>
</tr>
<tr>
<td><strong>OF128</strong></td>
<td><strong>16</strong></td>
<td><strong>1</strong></td>
<td></td>
<td><strong>1000.1</strong></td>
</tr>
<tr>
<td><strong>OF129</strong></td>
<td><strong>9</strong></td>
<td><strong>3</strong></td>
<td></td>
<td><strong>521.6</strong></td>
</tr>
<tr>
<td><strong>OF130</strong></td>
<td><strong>67</strong></td>
<td><strong>12</strong></td>
<td></td>
<td><strong>6400.6</strong></td>
</tr>
<tr>
<td>OF132</td>
<td>4</td>
<td>0</td>
<td></td>
<td>84.4</td>
</tr>
<tr>
<td>OF133</td>
<td>10</td>
<td>1</td>
<td></td>
<td>140.5</td>
</tr>
<tr>
<td><strong>OF134</strong></td>
<td><strong>5</strong></td>
<td><strong>5</strong></td>
<td></td>
<td><strong>786.9</strong></td>
</tr>
<tr>
<td><strong>OF135</strong></td>
<td><strong>4</strong></td>
<td><strong>0</strong></td>
<td></td>
<td><strong>245.4</strong></td>
</tr>
<tr>
<td><strong>OF136</strong></td>
<td><strong>11</strong></td>
<td><strong>2</strong></td>
<td></td>
<td><strong>500.6</strong></td>
</tr>
<tr>
<td>OF137</td>
<td>1</td>
<td>0</td>
<td></td>
<td>78.2</td>
</tr>
<tr>
<td>OF138</td>
<td>4</td>
<td>0</td>
<td></td>
<td>224.1</td>
</tr>
<tr>
<td><strong>OF171</strong></td>
<td><strong>13</strong></td>
<td><strong>1</strong></td>
<td></td>
<td><strong>928.5</strong></td>
</tr>
<tr>
<td>OF180</td>
<td>8</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFNew</strong></td>
<td><strong>14</strong></td>
<td><strong>1</strong></td>
<td></td>
<td><strong>620.2</strong></td>
</tr>
</tbody>
</table>

Note that each catchment has one outfall and therefore no outfall counts were listed.
3.2.7 Septic Systems

While information about septic system failures or variances was not readily available on a Town-wide basis, we consider catchments with the greatest density of septic systems a high priority as a surrogate for better detailed information. Catchments with the largest number of septic systems are highlighted in Table 3-8.

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>No. of Septic Systems</th>
<th>Density of Septic Systems (# per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>7</td>
<td>1.3</td>
</tr>
<tr>
<td>OF111</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>OF114</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>OF115</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>OF116</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>OF117</td>
<td>21</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>OF118</strong></td>
<td><strong>17</strong></td>
<td><strong>1.7</strong></td>
</tr>
<tr>
<td>OF119</td>
<td>9</td>
<td>0.9</td>
</tr>
<tr>
<td>OF124</td>
<td>16</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>OF126</strong></td>
<td><strong>5</strong></td>
<td><strong>2.4</strong></td>
</tr>
<tr>
<td><strong>OF127</strong></td>
<td><strong>62</strong></td>
<td><strong>2.7</strong></td>
</tr>
<tr>
<td><strong>OF128</strong></td>
<td><strong>19</strong></td>
<td><strong>2.8</strong></td>
</tr>
<tr>
<td><strong>OF129</strong></td>
<td><strong>13</strong></td>
<td><strong>1.7</strong></td>
</tr>
<tr>
<td><strong>OF130</strong></td>
<td><strong>86</strong></td>
<td><strong>1.8</strong></td>
</tr>
<tr>
<td>OF132</td>
<td>4</td>
<td>1.1</td>
</tr>
<tr>
<td>OF133</td>
<td>20</td>
<td>0.9</td>
</tr>
<tr>
<td>OF134</td>
<td>13</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>OF135</strong></td>
<td><strong>9</strong></td>
<td><strong>1.6</strong></td>
</tr>
<tr>
<td>OF136</td>
<td>11</td>
<td>0.7</td>
</tr>
<tr>
<td>OF137</td>
<td>8</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>OF138</strong></td>
<td><strong>11</strong></td>
<td><strong>2.4</strong></td>
</tr>
<tr>
<td>OF171</td>
<td>2</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>OF180</strong></td>
<td><strong>7</strong></td>
<td><strong>2.2</strong></td>
</tr>
<tr>
<td><strong>OFNew</strong></td>
<td><strong>22</strong></td>
<td><strong>2.4</strong></td>
</tr>
<tr>
<td>Total</td>
<td>375</td>
<td></td>
</tr>
</tbody>
</table>
3.2.8 Dog Ownership
A greater density of dog owners means a higher likelihood of pet waste entering the drainage system causing pathogens and nutrients to be discharged to Trout Brook. Therefore, we considered a greater density of dog owners in a catchment as being a high priority; these prioritized catchments are highlighted in Table 3-9.

Table 3-9: Dog Owners per Catchment

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th># of Dog Owners</th>
<th>Density of Dog Owners (# per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>OF111</strong></td>
<td><strong>2</strong></td>
<td><strong>1.5</strong></td>
</tr>
<tr>
<td>OF114</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>OF115</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>OF116</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>OF117</td>
<td>7</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>OF118</strong></td>
<td><strong>12</strong></td>
<td><strong>1.2</strong></td>
</tr>
<tr>
<td>OF119</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>OF124</strong></td>
<td><strong>9</strong></td>
<td><strong>0.9</strong></td>
</tr>
<tr>
<td>OF126</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>OF127</strong></td>
<td><strong>25</strong></td>
<td><strong>1.1</strong></td>
</tr>
<tr>
<td><strong>OF128</strong></td>
<td><strong>9</strong></td>
<td><strong>1.3</strong></td>
</tr>
<tr>
<td>OF129</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>OF130</strong></td>
<td><strong>54</strong></td>
<td><strong>1.1</strong></td>
</tr>
<tr>
<td><strong>OF132</strong></td>
<td><strong>2</strong></td>
<td><strong>0.5</strong></td>
</tr>
<tr>
<td>OF133</td>
<td>7</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>OF134</strong></td>
<td><strong>5</strong></td>
<td><strong>0.5</strong></td>
</tr>
<tr>
<td><strong>OF135</strong></td>
<td><strong>5</strong></td>
<td><strong>0.9</strong></td>
</tr>
<tr>
<td><strong>OF136</strong></td>
<td><strong>8</strong></td>
<td><strong>0.5</strong></td>
</tr>
<tr>
<td>OF137</td>
<td>6</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>OF138</strong></td>
<td><strong>3</strong></td>
<td><strong>0.7</strong></td>
</tr>
<tr>
<td><strong>OF139</strong></td>
<td><strong>1</strong></td>
<td><strong>0.3</strong></td>
</tr>
<tr>
<td><strong>OF140</strong></td>
<td><strong>14</strong></td>
<td><strong>1.5</strong></td>
</tr>
<tr>
<td>Total</td>
<td>178</td>
<td></td>
</tr>
</tbody>
</table>
3.2.9 Results of "Desktop" Evaluation of Catchments

Using the information about characteristics presented in Sections 3.2.1 through 3.2.8, we ranked each catchment based on which catchments generally have the highest likely source of pollutant loads to Trout Brook and which catchments have the greatest potential for implementation of structural and non-structural BMPs.

Using a numerical ranking system in Microsoft Excel (e.g. 1 through 24) that assumes each characteristic is weighted equally, we found the following results shown in Table 3-10. Note, if a catchment is ranked equal to another, it is assigned the same value, and the total numbering may end at less than 24.

Table 3-10: Overall Ranking of Catchments

<table>
<thead>
<tr>
<th>High Priority Catchments</th>
<th>Medium Priority Catchments</th>
<th>Low Priority Catchments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF127 &amp; OF130</td>
<td>OF115</td>
<td>OF071</td>
</tr>
<tr>
<td>OF128</td>
<td>OF135</td>
<td>OF119</td>
</tr>
<tr>
<td>OF180</td>
<td>OF118 &amp; OF 129</td>
<td>OF126 &amp; OF133</td>
</tr>
<tr>
<td>OF124 &amp; OFNew</td>
<td>OF111</td>
<td>OF132</td>
</tr>
<tr>
<td>OF138</td>
<td>OF134</td>
<td>OF117</td>
</tr>
<tr>
<td>OF114, OF137 &amp; OF 171</td>
<td>OF136</td>
<td>OF116</td>
</tr>
</tbody>
</table>

However, this does not separate the potential for pollution and the potential for structural and non-structural controls.

Considering pollution potential only, we looked at land use, total impervious cover, stormwater infrastructure, septic systems, and dog ownership. The results are shown in Table 3-11.

Table 3-11: Ranking of Catchments for Pollution Potential

<table>
<thead>
<tr>
<th>High Priority Catchments</th>
<th>Medium Priority Catchments</th>
<th>Low Priority Catchments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF128</td>
<td>OF114 &amp; OF180</td>
<td>OF133</td>
</tr>
<tr>
<td>OF127</td>
<td>OF111</td>
<td>OF117 &amp; OF136</td>
</tr>
<tr>
<td>OFNew</td>
<td>OF118</td>
<td>OF132</td>
</tr>
<tr>
<td>OF130</td>
<td>OF134</td>
<td>OF071</td>
</tr>
<tr>
<td>OF124</td>
<td>OF135</td>
<td>OF116</td>
</tr>
<tr>
<td>OF115 &amp; OF171</td>
<td>OF126 &amp; OF137</td>
<td>OF119</td>
</tr>
<tr>
<td>OF129 &amp; OF 138</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Considering potential for structural BMPs, we considered municipally owned land, impervious cover, and soils. The results are shown in Table 3-12.

Table 3-12: Ranking of Catchments for Potential for Structural BMP Installation

<table>
<thead>
<tr>
<th>High Priority Catchments</th>
<th>Medium Priority Catchments</th>
<th>Low Priority Catchments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF137</td>
<td>OF111 &amp; OF127</td>
<td>OF132</td>
</tr>
<tr>
<td>OF071</td>
<td>OF138</td>
<td>OFNew</td>
</tr>
<tr>
<td>OF114 &amp; OF180</td>
<td>OF135</td>
<td>OF116, OF126 &amp; OF129</td>
</tr>
<tr>
<td>OF136 &amp; OF171</td>
<td>OF133</td>
<td>OF117</td>
</tr>
<tr>
<td>OF115</td>
<td>OF118 &amp; OF134</td>
<td></td>
</tr>
<tr>
<td>OF119</td>
<td>OF124</td>
<td></td>
</tr>
<tr>
<td>OF130</td>
<td>OF128</td>
<td></td>
</tr>
</tbody>
</table>

It should be noted that all areas have a potential for non-structural BMPs such as street and parking lot sweeping, catch basin cleaning, alternative de-icing procedures, and public education and outreach. Therefore, we did not use this information to prioritize for implementation of non-structural BMPs.

3.3 Field Evaluation of Catchments

During June 2017, Tighe & Bond staff performed a field visit of all 24 delineated catchments and also to key municipal parcels discussed in Section 2.3.2 to better understand the on-the-ground conditions within the catchment, the sources of potential pollutants in the catchment area, as well as potential for illicit discharges (e.g. proximity to recreational areas, density of generating sites such as car dealers, car washes, gas stations, garden centers, and industrial areas, culverted streams, etc.). This field evaluation allowed us to refine the desktop evaluation and plan for outfall sampling as further discussed in Section 4 and better understand what structural and non-structural BMP opportunities are feasible as further discussed in Section 5.

Table 3-13, below, provides notes about each catchment based on our field evaluation.

Table 3-13: Summary of Field Evaluation of Catchments

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Overall Description</th>
<th>Potential Pollution Sources</th>
<th>Feasibility of Structural BMPs</th>
<th>Feasibility of Non-Structural BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF071</td>
<td>This is a residential, heavily wooded neighborhood that abuts the Town’s wellfield.</td>
<td>Nutrients from yard maintenance, solids, oil and grease, organics from illegal dumping, pathogens from pet waste. Note there is a motor store at the intersection with Memorial Drive</td>
<td>Limited space available within right of way. No municipal land. Within wellhead protection area so infiltration is not ideal.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
</tbody>
</table>
### Section 3 Identification and Evaluation of Catchments

#### Identification and Assessment of Causes of Impairment: Trout Brook Avon, Massachusetts

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Overall Description</th>
<th>Potential Pollution Sources</th>
<th>Feasibility of Structural BMPs</th>
<th>Feasibility of Non-Structural BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF111</td>
<td>Tennis courts, trees, a few residences, and parking areas and a portion of Bartlett Street.</td>
<td>Typical residential impacts.</td>
<td>Small parking area could be retrofitted with a structural BMP, such as a small rain garden or porous pavement.</td>
<td>Public education. Roadway non-structural BMPs are feasible including in parking lot for tennis courts.</td>
</tr>
<tr>
<td>OF114</td>
<td>Consists of the town’s library, including parking areas, and a portion of drainage from Pond Street which is single family private residences. This outfall discharges directly to wetlands at the headwaters of Trout Brook.</td>
<td>Typical residential impacts from Pond Street. Large parking area by library could have spills/leaks from parked cars.</td>
<td>Parking lot could be retrofitted with structural BMPs such as infiltration basins or in-line stormwater treatment.</td>
<td>Public education on Pond Street. Roadway non-structural BMPs including in the library parking lot.</td>
</tr>
<tr>
<td>OF115</td>
<td>This catchment largely consists of Town hall, which is highly impervious and discharges directly to the headwaters of Trout Brook. Catchment also contains a portion of Bartlett Street.</td>
<td>Sediment is observed on site.</td>
<td>Parking lot could be retrofitted with structural BMPs such as gravel wetland and tree box filters, porous pavement, etc.</td>
<td>Roadway non-structural BMPs are feasible in parking lot and on Bartlett Street.</td>
</tr>
<tr>
<td>OF116</td>
<td>Largely a wetlands and wooded area with some private residences. There is a large private facility with a significant parking area.</td>
<td>Sediment is observed on parking area. Potential for spills/leaks from vehicles and equipment stored on site.</td>
<td>Limited as this is a private property. Retrofits are feasible and could be required by Town if this site is redeveloped.</td>
<td>Public education.</td>
</tr>
<tr>
<td>OF117</td>
<td>This is also largely a wetlands and wooded area with a number of private residents. There is landscape materials supply area that directly abuts the catchment and could discharge to the catchment.</td>
<td>Typical residential sources. Waste from pets and potentially waterfowl. Solids, organics, oil and grease are possible from landscape.</td>
<td>Limited as this is largely private property.</td>
<td>Public education and non-structural roadway BMPs.</td>
</tr>
</tbody>
</table>
### Identification and Evaluation of Catchments

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Overall Description</th>
<th>Potential Pollution Sources</th>
<th>Feasibility of Structural BMPs</th>
<th>Feasibility of Non-Structural BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF118</td>
<td>This is also largely a wetlands and wooded area with a number of private residents. There is a small strip mall located at the intersection of West Main Street and West Spring Street that has a large amount of impervious covert.</td>
<td>Typical residential sources. Waste from pets and potential waterfowl. Potential for illegal dumping from strip mall or spills/leaks from parking.</td>
<td>Limited as this is largely private property.</td>
<td>Public education and non-structural roadway BMPs.</td>
</tr>
<tr>
<td>OF119</td>
<td>This area is commercial and highly impervious. It includes a lumber store, a manufacturing company, and the Town’s DPW yard. Smattering of low-density private residences in northern portion of catchment.</td>
<td>This site has significant potential for pollutants such as solids, oil and grease, metals, organics, and gross pollutants (e.g. trash etc.) Typical residential sources.</td>
<td>Limited feasibility as the majority of parcels are private and the municipal land is within a wellhead protection area.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible. Other BMPs for municipal good housekeeping and pollution prevention should be employed by developing and implementing a SWPPP.</td>
</tr>
<tr>
<td>OF124</td>
<td>Single family residential and wooded areas.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF127</td>
<td>Single family residential area.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
</tbody>
</table>
### Section 3 Identification and Evaluation of Catchments

<table>
<thead>
<tr>
<th>Catchment ID</th>
<th>Overall Description</th>
<th>Potential Pollution Sources</th>
<th>Feasibility of Structural BMPs</th>
<th>Feasibility of Non-Structural BMPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF130</td>
<td>Single family residential and wooded areas. Includes a MassDOT maintenance facility.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible. MassDOT is responsible for managing stormwater runoff of its site under a pending Phase I (individual) MS4 permit.</td>
</tr>
<tr>
<td>OF132</td>
<td>Single family residential and wooded areas.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF133</td>
<td>A number of private single family residences, wetlands/wooded area, and the National Fire Protection Association Fulfillment Center. Also includes Avon’s Children’s Theater.</td>
<td>The private impervious site has a significant potential for pollutants such as solids, oil and grease, metals, organics, and gross pollutants (e.g. trash etc.) Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>Catchment ID</td>
<td>Overall Description</td>
<td>Potential Pollution Sources</td>
<td>Feasibility of Structural BMPs</td>
<td>Feasibility of Non-Structural BMPs</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
<td>----------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>OF134</td>
<td>Single family residential and wooded areas.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF135</td>
<td>Single family residential and wooded areas.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF136</td>
<td>Private cul-de-sac with significant maintained lawn area, private single-family residences, and Avon Fish and Game Facility.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF137</td>
<td>Warehouse with large parking area, businesses with large parking areas, some single family private residential.</td>
<td>The private impervious site has potential for pollutants such as solids, oil and grease, metals, organics, and gross pollutants (e.g. trash etc.)</td>
<td>Limited feasibility as parcels are private.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible. Should be targeted at types of businesses.</td>
</tr>
<tr>
<td>OF138</td>
<td>Mix of private single-family residences and wooded area.</td>
<td>Typical residential sources.</td>
<td>Limited as there are no municipal parcels and</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>OF171</td>
<td>Heavily impervious area with a manufacturing facility and a few businesses with large parking areas and buildings.</td>
<td>The private impervious site has potential for pollutants such as solids, oil and grease, metals, organics, and gross pollutants (e.g. trash etc.)</td>
<td>Limited feasibility as parcels are private.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible. Should be targeted at types of businesses.</td>
</tr>
<tr>
<td>OF180</td>
<td>Medium density residential dead-end roadway. Discharges to wetlands directly</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
<tr>
<td>Catchment ID</td>
<td>Overall Description</td>
<td>Potential Pollution Sources</td>
<td>Feasibility of Structural BMPs</td>
<td>Feasibility of Non-Structural BMPs</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>OFNew</td>
<td>Medium density residential area.</td>
<td>Typical residential sources.</td>
<td>Limited space available within right of way. No municipal land.</td>
<td>Roadway non-structural BMPs are feasible. Public education is feasible.</td>
</tr>
</tbody>
</table>

In addition, during the site visits, we also looked at the Middle and High School, the current Police Department at Main Street and East High Street, the former police station on Fagan Drive, and the parking lot at 209 West Main Street, along with the municipally owned vacant parcels at 450 East Main Street, 180 East Main Street, 133 Main street, the parcel at the intersection of Memorial Drive and Ladge Drive, and the parcel at the end of Everett Street, as these locations are municipally owned and may be candidates for installation of structural BMPs. We also visited the 5.1-acre parcel located on Fellowship Circle that is owned by the Avon Housing Authority. We found the following:

- **Middle and High School**: Significant impervious area available to retrofit and an ideal location from an education perspective. However, pavement was largely in good condition and therefore significant cost would be necessary to complete structural BMP retrofits at this site. In the future, when Avon improves this site, structural BMPs should be considered.

- **Police Department at Main Street and East High Street**: This site has significant impervious area but much of it is relatively flat and appears to be in good condition. In addition, sites such as this have a high potential pollution source (oils and grease, etc.) and therefore it is not ideal to install infiltration BMPs on the site. This is this is improved, BMPs should be considered at that time.

- **The former police station on Fagan Drive**: This site is an excellent candidate for BMP installation as it is in the process of being redeveloped. Since our site visits during June 2017, plans to redevelop this site have evolved and BMPs are being considered.

- **Parking lot at 209 West Main Street**: Given the small size of this parking lot and flat slope, installation of BMPs would be expensive and should be postponed until site is redeveloped.

- **Currently vacant parcels (450 East Main Street, 180 East Main Street, 133 Main Street, parcel at the intersection of Memorial Drive and Ladge Drive, and the parcel at the end of Everett Street)**: Drainage could be redirected to these sites for sub-surface infiltration, however, much of the abutting drainage appears to be owned by MassDOT and therefore is not a municipal issue.

- **Avon Housing Authority Fellowship Circle**: Given the available space, this site is an excellent candidate for stormwater BMPs. In addition, it is a visible site that would provide a public education benefit. Survey and design would be necessary to define the specific BMP solutions.
Section 4
Water Quality Assessment

As previously discussed in Sections 2.1 and 2.2, there are water quality concerns specific to Trout Brook. Trout Brook is a water quality impaired waterbody and has the following pollutants of concern:

- Fecal Coliform and Escherichia coli (pathogens)
- Total Suspended Solids (TSS) and Turbidity (solids)
- Total Nitrogen and Total Phosphorus (nutrients)
- Dissolved Oxygen

In addition, prior to installation of treatment, there were detections of total and fecal coliform bacteria in the Towns’ Porter Water Supply Well, which draws water from the aquifer underlying Trout Brook.

4.1 Selection of Outfalls

The stated goal of the SNPE grant was to identify five to ten priority catchments, and therefore five to ten priority outfalls, for dry weather and wet weather screening and sampling, to help characterize pollutants in each catchment.

While we prioritized catchments as described in Section 3, we also recognized that many of the 24 catchments delineated are in a series (i.e. one catchment flows into another). Given we were only planning to screen a limited number of outfalls through this SNPE grant project, our approach, for sampling only, was to select outfalls that are direct dischargers to Trout Brook, or its wetlands. We considered these as a primary outfall representing many upstream catchments. This led us to select the following two outfalls that capture the majority of the delineated catchments:

- **OF130**, which is a direct discharge to Trout Brook captures upstream drainage areas including OF133, OF171, OF137, OF136, OF138, and OF132; and
- **OF124**, which is a direct discharge to Trout Brook captures upstream drainage areas including OF126, OF128, OF124, OF127, OF129, OF134, and OF135.

In addition, based on our field visit, Town Hall (OF115) and the Library (OF114) are two high priority locations for installation of structural BMPs as described in Section 3.2.9. Coupled with the fact that these are parcels within municipal control for installing structural BMPs and that these sites are highly visible to Avon’s residents, we decided to sample at these priority locations. In the case of the former police station (OF106), while this site was not evaluated or prioritized in Section 3.2, because of the site visit described in Section 3.3 and that potential redevelopment is a cost-effective time to install structural treatment BMPs, we also decided to complete sampling at an outfall that captures runoff from this site.

This selection captures all of the catchments with a high priority for potential pollution except OFNew. However, as discussed in Section 3.3, OFNew is a medium density residential area with potential pollution sources that are typical of residential...
Section 4 Water Quality Assessment

There is limited available space to install structural BMPs in roadways and right of ways, and there are no municipal parcels. A BMP could be installed at the outfall location prior to discharge to the wetlands. Roadway non-structural BMPs and public education are feasible within the OFNew catchment. This catchment is almost identical in nature to OF130 and OF124, and their upstream catchments, and therefore sampling was not determined to be as critical as the other outfalls selected.

For dry weather observations, because time permitted during our day of field work, we also visited outfalls throughout the sub-basin including the following:

- OF104
- OF105
- OF111
- OF122
- OF123
- OF126
- OF128
- OF132
- OF133
- OF134
- OF136
- OF138
- Four outfalls not originally mapped but labeled as UNK-1, UNK-2, UNK-3, and UNK-4 (included on Figure 4-1)

These additional dry weather inspections were performed to help Avon address EPA’s MS4 General Permit requirements and make the most use out of Town budgets. The results of these dry weather observations also can help guide future investigations (i.e. looking for indicators that can exist even at non-flowing outfalls (deposits/stains, smells, benthic growth, vegetation, if there is trash/pet waste bags/large amounts of silt/sand coming from the outfall, etc.)).

4.2 Quality Assurance Project Plan

As the goal of this project is to characterize the stormwater runoff entering Trout Brook by taking dry and wet weather samples and ultimately use that information to assess the suitability of structural BMPs to mitigate the effects of stormwater runoff in Trout Brook, stringent sampling procedures had to be followed to confirm that the data generated was scientifically valid. Therefore, a Quality Assurance Project Plan (QAPP) was written and followed the guidance outlined in the NEIWPCC Guide for Development and Approval of Quality Assurance Project Plans and the EPA’s R-5 Checklist for Review of Quality Assurance Project Plans. The QAPP describes the quality assurance policy, management, structure, and procedures to implement the requirements necessary to verify, calibrate, and validate the output of the water quality samples and GIS data reviewed as part of this project.

Components of the QAPP include but are not limited to:

- Sampling methods
- Sample Handling and Custody
- Analytical Methods
Section 4 Water Quality Assessment

- Quality Control
- Data Management
- Verification and Validation Methods

The QAPP was reviewed by EPA and NEIWPC to confirm that the data generated as part of this project is scientifically valid. The procedures outlined in the QAPP were followed during sampling.

4.3 Screening of Stormwater Outfalls

The goal of screening outfalls during dry weather and wet weather is to characterize pollutant concentrations and begin to identify potential sources of these pollutants.

EPA’s MS4 General Permit requires all regulated communities such as Avon to complete dry weather outfall inventory and screening with the ultimate goal of finding and removing illicit connections (i.e. connections not entirely composed of stormwater or not an allowable non-stormwater discharge) to the stormwater system. Sampling for all outfalls is defined by the Permit in Section 2.3.4 and parameters that apply to water quality impairments only are defined by the Permit in Appendix G. The final MS4 General Permit does not require wet weather screening for communities that do not have sewer, such as Avon, which is a change from the draft MS4 General Permit that was publicly available at the time of submittal of the SNEP grant project application.

4.3.1 Screening Parameters

Screening parameters were selected based on the draft MS4 General Permit that was publicly available at the time of submittal of the SNEP grant project application. Since then, EPA’s MS4 General Permit has been revised and finalized and pH and Total Sodium are no longer required to be tested at each outfall. During our review of the final MS4 General Permit effective July 1, 2018, we noted that waterbodies impaired by turbidity must include analysis of turbidity in their sampling. Note that the grant application did not identify turbidity as a screening parameter despite the turbidity impairment described in Section 2.1.3.2 of this SNEP grant report and therefore this parameter was not included in the QAPP or the laboratory analysis.

Samples were analyzed using field instrumentation and test kits for the following parameters:

- Temperature
- Conductivity
- Salinity
- Dissolved Oxygen
- pH
- Chlorine

Additionally, the samples were analyzed at a laboratory for the following:

- Ammonia
- Surfactants
Section 4 Water Quality Assessment

- Total Nitrogen
- Total Phosphorus
- Total Sodium
- Fecal coliform
- E. coli
- Total Suspended Solids
- BOD5

4.3.2 Sampling Methods
As defined in the QAPP, samples were collected according to procedures defined in the EPA New England Bacterial Source Tracking Protocol (January 2012). Samples were collected in new, clean, sample bottles from the laboratory. The samples were collected from the center of the flow out of the pipe and precautions were taken to avoid collecting pooled or in-stream water.

Field analysis was performed with the multiparameter sampling meter and Hach Pocket Colorimeter II, directly in water collected from the flow from the outfall (i.e. from a plastic cup only used once and then recycled). In between sampling sites, the multiparameter sampling meter probe was rinsed with distilled water and then triple rinsed at the new outfall with the water to be sampled. The sample beaker for the Hach Pocket Colorimeter II was rinsed with distilled water and triple rinsed at the next sample location in between samples. Samples were labeled and preserved appropriately, and stored on ice before they were turned over to the laboratory for analysis.

Sampling was completed in accordance with the QAPP except were deviations are noted under Section 4.4 and 4.5.

4.4 Dry Weather Screening
Per the QAPP and 2016 MS4 General Permit, dry weather conditions are when no more than 0.1 inches of rain has fallen within the previous 24 hours. Utilizing the KMQE weather station at the Blue Hill Meteorological Observatory in East Milton, Massachusetts, the previous 24-hour and 72-hour rainfalls were examined. Two days were identified as meeting dry weather condition standards, August 22 and August 24. Table 4-1 describes the previous days’ rainfall.

Table 4-1: August 22 and 24, 2017 Rainfall Conditions

<table>
<thead>
<tr>
<th>Day</th>
<th>24-hour Precipitation (in.)</th>
<th>72-hour Precipitation (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuesday, August 22</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Thursday, August 24</td>
<td>0</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Dry weather conditions are required when performing dry weather inspections. Dry weather inspections include recording asset information (outfall material, shape, dimensions, condition etc.), as well as checking for physical indicators of illicit discharges in flowing and non-flowing outfalls. For all flowing outfalls, qualitative (odor, abnormal
vegetation, etc.) and quantitative analyses are performed. These analyses were performed in accordance with the QAPP. Field sheets are included in Appendix D.

On Tuesday, August 22, 2018, Tighe & Bond staff conducted dry weather inspections at nine outfalls within the Trout Brook catchment. No outfalls were found to be flowing and none had physical indicators of illicit discharges. On Thursday, August 24, 2018, 12 outfalls were visited. One outfall was found to be flowing. Due to the fact the outfall was submerged, the next upstream structure (a drain manhole) was opened and the flow entering the manhole was sampled. While this outfall does receive contributions from the MS4, based on stormwater mapping and field investigation, this outfall also functions more as a culverted stream draining the upstream wetlands system, and therefore it is not surprising the outfall was flowing during such a dry event. Figure 4-1 shows the locations where dry weather outfall screening and sampling within the Trout Brook sub-basin occurred.

Table 4-2 contains the results of the analyses performed on the dry weather sample and how these results compare to established action thresholds. A copy of the laboratory report is included in Appendix E.

### Table 4-2: Summary of Dry Weather Sampling Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Action Thresholds</th>
<th>Units</th>
<th>Dry Weather Results 8/24/17-OF130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>&gt; 200</td>
<td>CFU/100mL</td>
<td>&lt;1</td>
</tr>
<tr>
<td>E. Coli</td>
<td>&gt; 235</td>
<td>MPN/100mL</td>
<td>&lt;1.0 MPN/100mL</td>
</tr>
<tr>
<td>BOD5</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;3.0</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>&gt; 25</td>
<td>mg/L</td>
<td>&lt;2.0</td>
</tr>
<tr>
<td>Nitrite</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;0.25</td>
</tr>
<tr>
<td>Nitrate</td>
<td>---</td>
<td>mg/L</td>
<td>5.8</td>
</tr>
<tr>
<td>TKN</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>&gt; 1.0</td>
<td>mg/L</td>
<td>5.8</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>&gt; 0.024</td>
<td>mg/L</td>
<td>0.04</td>
</tr>
<tr>
<td>Surfactants</td>
<td>≥ 0.25</td>
<td>mg/L</td>
<td>0.12</td>
</tr>
<tr>
<td>Ammonia</td>
<td>≥ 0.5</td>
<td>mg/L</td>
<td>&lt;0.20</td>
</tr>
<tr>
<td>Total Sodium</td>
<td>---</td>
<td>mg/L</td>
<td>75</td>
</tr>
<tr>
<td>Temperature</td>
<td>≥ 83</td>
<td>°F</td>
<td>66</td>
</tr>
<tr>
<td>Conductivity</td>
<td>&gt; 1,000</td>
<td>uS/cm</td>
<td>679</td>
</tr>
<tr>
<td>Salinity</td>
<td>&gt; 0.5</td>
<td>ppt</td>
<td>0.3</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>&lt; 5.0</td>
<td>mg/L</td>
<td>8.9</td>
</tr>
<tr>
<td>pH</td>
<td>&lt; 6.5 and &gt; 8.3</td>
<td>SU</td>
<td>7.47</td>
</tr>
<tr>
<td>Chlorine</td>
<td>≥ 0.02</td>
<td>mg/L</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Notes:
1. 314 CMR 4.00: Massachusetts Surface Water Quality
2. EPA Ambient Water Quality Criteria Recommendations
3. EPA General Permit for Stormwater Discharges from Small MS4 in Massachusetts
5. Total Nitrogen result for ALL wet and dry weather samples is the summation of Nitrite, Nitrate and TKN results
6. Trout Brook is classified as a Class B Warm Water Fishery per the Taunton River Watershed 2001 Water Quality Assessment Report Subwatersheds
Note that, per the QAPP, in the event that only one outfall is sampled on a given day, a duplicate sample will be eliminated and the laboratory split shall serve as the quality control sample. As shown on the Chain of Custody in Appendix E, a laboratory split sample was requested, however, the laboratory did not run this sample despite receiving sufficient volume. By the time results were received on September 6, 2017, too many days had passed such that the hold times for many of the parameters has been exceed and the laboratory split could not be completed. Therefore, in the context of the QAPP, these data are not acceptable as they do not meet quality control objectives. However, in the context of the MS4 General Permit requirements, this sampling addresses compliance.

Although chlorine, total phosphorus, and total nitrogen exceeded the action thresholds established, the levels of bacteria, surfactants and ammonia were below the reporting limits established by the MS4 General Permit and therefore do not meet EPA’s criteria for a likely wastewater input.

Elevated phosphorus levels could be due to runoff from residential lawn watering with recent fertilizer applications. Other potential sources of nitrogen and phosphorus in stormwater runoff include yard waste and leaf litter and pet waste. Although these are non-point sources, stormwater exiting the outfall will contain higher concentrations of these as compared to in-stream concentrations due to the natural mixing and uptake by plants. Because this outfall also drains a wetlands system upstream, as shown in Figure 4-1, there may also be natural sources of nutrients. Additionally, a single grab sample is not representative of typical conditions and further sampling should be performed at this site to understand if these concentrations are typical of this outfall.
4.5 Wet Weather Screening

Per the 2016 MS4 General Permit, wet weather sampling shall be conducted “during or after a storm event of sufficient depth or intensity to produce a stormwater discharge” and per the QAPP, wet weather was defined as “rainfall sufficient to produce runoff at the outfall”. Using the aforementioned definitions and forecast predictions, September 19, 2017, was chosen as the day to perform wet weather inspections as Tropical Storm Jose was predicted to be just off the coast of Massachusetts for approximately 12 hours prior to sampling as well as during sampling, which should have produced heavy rainfall across the region for that period.

Utilizing the KMQE weather station at the Blue Hill Meteorological Observatory in East Milton, Massachusetts, and the KOWD weather station at Norwood Memorial Airport in Norwood, Massachusetts, the rainfall during the sampling period was recorded. Wet weather inspections were performed between 9 AM and 1 PM on September 19, 2017. Table 4-3 provides the precipitation that fell between 1 AM and 1 PM on September 19.

### Table 4-3: September 19, 2017 Precipitation

<table>
<thead>
<tr>
<th>Weather Station Location</th>
<th>12-hour Precipitation (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMQE- East Milton, MA</td>
<td>0.09</td>
</tr>
<tr>
<td>KOWD- Norwood, MA</td>
<td>0.17</td>
</tr>
</tbody>
</table>

The Norwood (KOWD) weather station is approximately eight miles northwest of Avon and the East Milton (KMQE) weather station is approximately 6.5 miles north-northwest of Avon. Based on these values and the stations’ proximity to Avon, the total rainfall in Avon that occurred on this date is within the wet weather range and should have been sufficient to produce runoff at the outfall. However, during our field visit, precipitation ended prior to field staff being able to sample all five locations. The contract between the consultant and the Town specified only one day of sampling was to be completed, and therefore another day of wet weather sampling could not be completed without additional cost. Because wet weather sampling for Avon is no longer required by the 2016 MS4 General Permit, and a single grab sample is not representative of typical conditions an outfall, we decided not to complete a second round of wet weather sampling.

Wet weather inspections include recording asset information (outfall material, shape, dimensions, condition etc.), as well as checking for physical indicators of illicit discharges in flowing and non-flowing outfalls. Appendix D includes copies of the field sheets. For all flowing outfalls, qualitative (odor, abnormal vegetation, etc.) and quantitative analyses are performed. These analyses were performed in accordance with the QAPP.

On Tuesday, September 19, 2017, Tighe & Bond staff conducted wet weather inspections at five outfalls within the Trout Brook catchment. Three outfalls were found to be flowing. Two of these outfalls were partially submerged in the receiving water therefore the next upstream structure (a drain manhole) was opened and the flow entering the manhole was sampled. Figure 4-2 shows the locations where wet weather outfall screening and sampling within the Trout Brook sub-basin occurred. Laboratory results are included in Appendix E. Table 4-4 contains the results of the analyses performed on the wet weather samples and how these results compare to established thresholds.
FIGURE 4-2
WET WEATHER OUTFALL SCREENING AND SAMPLING IN TROUT BROOK SUB-BASIN
Avon, Massachusetts
July 2018

LEGEND
Outfalls
✓ Visited
✓ Sampled and Visited
Manholes
Catch Basins
Sewers
Drain Inlets
Drainage Ditches
Town Boundary
Building
Trout Brook Sub-basin
Drain Pipes
Parcel Boundary

Based on MassGIS Color Orthophotography (2015-2016)
### Table 4-4: Summary of Wet Weather Sampling Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Action Thresholds</th>
<th>Units</th>
<th>9/19/17-OF130</th>
<th>9/19/17-OF124</th>
<th>9/19/17-OF114</th>
<th>9/19/17-OF114-DUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>&gt; 200&lt;sup&gt;1&lt;/sup&gt;</td>
<td>CFU/100mL</td>
<td>11</td>
<td>TNTC</td>
<td>TNTC</td>
<td>TNTC</td>
</tr>
<tr>
<td>E. Coli</td>
<td>&gt; 235&lt;sup&gt;1&lt;/sup&gt;</td>
<td>MPN/100mL</td>
<td>&lt;1.0 MPN/100mL</td>
<td>1553.1 MPN/100mL</td>
<td>727</td>
<td>920.8</td>
</tr>
<tr>
<td>BOD5</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;3.0</td>
<td>10</td>
<td>11</td>
<td>8.4</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>&gt; 25</td>
<td>mg/L</td>
<td>2.8</td>
<td>20</td>
<td>21</td>
<td>58</td>
</tr>
<tr>
<td>Nitrite</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;0.25</td>
<td>&lt;0.25</td>
<td>&lt;0.25</td>
<td>&lt;0.25</td>
</tr>
<tr>
<td>Nitrate</td>
<td>---</td>
<td>mg/L</td>
<td>5.4</td>
<td>1.9</td>
<td>0.62</td>
<td>1.1</td>
</tr>
<tr>
<td>TKN</td>
<td>---</td>
<td>mg/L</td>
<td>&lt;0.50</td>
<td>2.5</td>
<td>1.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Total Nitrogen&lt;sup&gt;2&lt;/sup&gt;</td>
<td>&gt; 1.0&lt;sup&gt;2&lt;/sup&gt;</td>
<td>mg/L</td>
<td>5.4</td>
<td>4.4</td>
<td>2.32</td>
<td>3.3</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>&gt; 0.025&lt;sup&gt;2&lt;/sup&gt;</td>
<td>mg/L</td>
<td>0.06</td>
<td>0.23</td>
<td>0.19</td>
<td>0.2</td>
</tr>
<tr>
<td>Ammonia</td>
<td>≥ 0.25&lt;sup&gt;2&lt;/sup&gt;</td>
<td>mg/L</td>
<td>0.17</td>
<td>0.97</td>
<td>0.5</td>
<td>0.52</td>
</tr>
<tr>
<td>Total Sodium</td>
<td>≥ 0.5&lt;sup&gt;2&lt;/sup&gt;</td>
<td>mg/L</td>
<td>&lt;0.20</td>
<td>2.2</td>
<td>0.63</td>
<td>0.62</td>
</tr>
<tr>
<td>Field Analysis (Water Quality Meter)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>≥ 83</td>
<td>°F</td>
<td>64.9</td>
<td>67.7</td>
<td>68.7</td>
<td>73</td>
</tr>
<tr>
<td>Conductivity</td>
<td>&gt; 1,000</td>
<td>uS/cm</td>
<td>660</td>
<td>153</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td>&gt; 0.5</td>
<td>ppt</td>
<td>0.3</td>
<td>0.1</td>
<td>&lt;0.1</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>&lt; 5.0&lt;sup&gt;1,6&lt;/sup&gt;</td>
<td>mg/L</td>
<td>3.89</td>
<td>5.55</td>
<td>5.71</td>
<td></td>
</tr>
<tr>
<td>Chlorine</td>
<td>≥ 0.02&lt;sup&gt;7&lt;/sup&gt;</td>
<td>mg/L</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>ph</td>
<td>&lt; 6.5 and &gt; 8.3&lt;sup&gt;1&lt;/sup&gt;</td>
<td>SU</td>
<td>6.27</td>
<td>6.73</td>
<td>6.84</td>
<td></td>
</tr>
</tbody>
</table>
For OF130, the wet weather and dry weather sampling results are comparable. This indicates that the outfall may not have had any runoff impacting it at the time of sampling. This would be due to the size of OF130’s drainage area as well as the rainfall totals in the time prior to sampling were less than anticipated. Due to both wet and dry weather samples having high nitrogen levels, further sampling should be performed and potential sources and/or causes should be further evaluated. At this time, it is not believed this outfall is impacted by an illicit connection.

Phosphorus, ammonia and surfactant levels found at OF124 were elevated. This may be from wet weather induced sanitary input from a failing septic system. Follow up sampling should be performed at this location.

OF114 has elevated levels of bacteria, high TSS but, low nitrogen levels. The TSS levels could be due to the rain. However, a potential sanitary sewer input from a failing septic system is possible. Follow up sampling should be conducted.

In summary, elevated levels of phosphorus and nitrogen could be due to nearby septic systems or runoff from residential lawn watering with recent fertilizer applications. Other potential sources of phosphorus in stormwater runoff include soil erosion, yard waste and leaf litter, pet waste, and certain soaps and detergents.

Additionally, as samples were acquired during a wet weather event, it is expected to see elevated levels of these parameters. This is due to the nature of wet weather sampling. The resulting runoff from a rain event carries pollutants that can be found on impervious (litter, deicing materials, oils/grease, etc.) and pervious (pesticides, fertilizer, decaying leaf matter, etc.) surfaces. Even higher pollutant concentrations are expected during the beginning stages of a storm due to the “first flush”; built-up contaminants are picked up and transported during the initial rainfall. As these samples were collected during the beginning stages of the storm, this phenomenon may account for some of the exceedances seen.

Furthermore, a single grab sample is not representative of typical conditions and further sampling should be performed.

As required by the QAPP, because less than ten samples were collected during wet weather sampling, one field duplicate was collected and analyzed. The required laboratory split was not noted on the Chain of Custody by field staff and therefore was not completed. Per QAPP quality control procedures, the results of this duplicate should be analyzed for relative percent difference (RPD) according to the following formula:

\[
RPD = \frac{|D1 - D2|}{(D1 + D2)(0.5)} \times 100\%
\]

where:

\[
\begin{align*}
RPD &= \text{Relative Percent Difference} \\
D1 &= \text{measured value of the first duplicate} \\
D2 &= \text{measured value of the second duplicate}
\end{align*}
\]
Section 4 Water Quality Assessment

For example, using the results obtained for total sodium, the RPD was calculated as follows:

$$RPD = \frac{|9 - 8.2|}{(9 + 8.2)(0.5)} \times 100\% = 9.3\%$$

This process was followed for the parameters sampled in the laboratory and the RPD results are as follows:

Table 4-5: RPD Calculation Results

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Required Precision</th>
<th>Calculated Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>30% RPD for log 10 transformed data</td>
<td>*</td>
</tr>
<tr>
<td>E. Coli</td>
<td>30% RPD for log 10 transformed data</td>
<td>3.5%</td>
</tr>
<tr>
<td>BOD5</td>
<td>Field Dup 30% RPD</td>
<td>26.8%</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>Field Dup 30% RPD</td>
<td>93.7%</td>
</tr>
<tr>
<td>Nitrite plus Nitrate</td>
<td>Field Dup 30% RPD</td>
<td>43.2%</td>
</tr>
<tr>
<td>TKN</td>
<td>Field Dup 30% RPD</td>
<td>25.6%</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>Field Dup 30% RPD</td>
<td>5.1%</td>
</tr>
<tr>
<td>Surfactants</td>
<td>Field Dup 30% RPD</td>
<td>3.9%</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Field Dup 30% RPD</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total Sodium</td>
<td>Field Dup 30% RPD</td>
<td>9.3%</td>
</tr>
</tbody>
</table>

*Fecal coliform results are TNTC and therefore the RPD cannot be calculated.

As shown in Table 4-5, the RPD for TSS and Nitrite plus Nitrate exceed the required precision and therefore these data are not acceptable within the context of the QAPP but are acceptable for compliance with the MS4 General Permit.

Duplicate measurements of the water quality parameters measured in the field (i.e. temperature, specific conductance, salinity, dissolved oxygen, pH, and chlorine) were not completed and therefore precision cannot be calculated for these parameters as required by the QAPP. This was an oversight by Field Staff. As previously explained, the contract between the consultant and the Town specified only one day of sampling was to be completed, and therefore another day of wet weather sampling could not be completed without additional cost. Because wet weather sampling for Avon is no longer required by the 2016 MS4 General Permit, and a single grab sample is not representative of typical conditions at an outfall, we decided not to complete a second round of wet weather sampling which would have addressed this error. Because of this, the data are not considered acceptable within the context of the QAPP but are acceptable for compliance with the MS4 General Permit.
Section 5
Best Management Practices for Selected Catchments

Tighe & Bond assessed the following Best Management Practices to determine their suitability in addressing Trout Brook’s various pollutants of concern (Fecal Coliform and Escherichia coli (pathogens), Total Suspended Solids (TSS) and Turbidity (solids), Total Nitrogen and Total Phosphorus (nutrients), and Dissolved Oxygen).

Structural- Pretreatment
- Sediment forebays
- Deep sump catch basins

Structural- Treatment
- Rain gardens/Bioretention
- Constructed stormwater wetlands
- Extended dry detention basin
- Media filters
- Wet basins
- Tree box filter
- Street planter

Structural- Infiltration
- Infiltration trench
- Infiltration basin

Structural- Other
- Green roofs
- Pervious pavement
- Riparian restoration
- Roadway reconfiguration

Non-Structural
- Public education and outreach
- Altered de-icing procedures
- Street sweeping
- Catch basin cleaning
- Local fertilizer regulation/bylaw

During this preliminary evaluation, the relative pollutant removal, relative costs and relative permitting requirements of these BMPs were considered in order to recommend short-, mid- and long-term implementations.
5.1 Overview of BMP Alternatives

Trout Brook’s pollutants of concern, including fecal coliform, dissolved oxygen, total suspended solids and turbidity, pose a unique problem when determining the most effective BMPs due to the variety of pollutants. To assist the Town in maximizing potential pollutant reduction, a large variety of BMPs were examined with the goal in mind of providing a unique and effective solution to this exceptional problem.

5.1.1 Structural BMP Alternatives

The following table provides a brief description and overview of the structural BMPs examined as part of the preliminary evaluation.

<table>
<thead>
<tr>
<th><strong>Table 5-1: Structural BMP Summary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best Management Practice</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>Sediment Forebay</strong></td>
</tr>
<tr>
<td><strong>Deep sump catch basin</strong></td>
</tr>
<tr>
<td><strong>Rain Gardens/Bioretention</strong></td>
</tr>
</tbody>
</table>
### Best Management Practice Description

| Description |
|-------------|---------------------------------------------------------------|
| **Infiltration Trench** | Infiltration trenches are gravel-filled excavations that are used to collect runoff from impervious surfaces and infiltrate the runoff into the native soil. Some systems are designed to filter runoff and reduce clogging by routing water across grassed buffer strips. |
| **Street Planters** | Street planters are typically placed along sidewalks or parking areas. They consist of concrete boxes filled with an engineered soil that supports vegetative growth. Beneath the soil is a gravel bed that provides additional storage as the captured runoff infiltrates into the existing soil below. Street planters also can be designed with underdrains to avoid ponding on sites with inadequate infiltration capacity. |
| **Green Roofs** | Green roofs (also known as vegetated roofs or ecoroofs) are vegetated detention systems placed on roof surfaces that capture and temporarily store rainwater in a soil medium. They typically have a waterproof membrane, a drainage layer, and a lightweight growing medium populated with plants that absorb and evaporate water. |
| **Tree Box Filter** | Tree box filters are open bottom barrels containing porous soil/media, an underdrain in crushed gravel and a tree. Stormwater from surrounding impervious area is directed to the tree box and filters through the media to the ground. Excess stormwater flows into the underdrain where it is directed to a storm drain or surface water. |

---

1. [Source](#)
### Best Management Practice Description

<table>
<thead>
<tr>
<th>Best Management Practice</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Sediment Forebay**     | Sediment forebays consist of a small pool or pit with a berm or weir and are located where stormwater discharges into a BMP. This small pool and berm slows the stormwater discharge and allows for solids to settle out of suspension prior to discharging to the primary BMP.  

**Construct Stormwater Wetlands** | Constructed stormwater wetlands store runoff in shallow depressions that contain wetland plants maximizing the removal of pollutants from stormwater runoff through wetland vegetation uptake, retention and settling.  

**Wet Basin** | Wet basins utilize a permanent pool to assist sedimentation; stormwater enters the pool and will remain there until displaced by more stormwater providing time for solids to settle out.  

**Pervious Pavement** | Permeable pavement and paver systems are excavated areas filled with gravel and paved over with a permeable concrete or asphalt mix. They may also be overset with a layer of pavers. Rainfall passes through the pavement or pavers into the gravel storage layer below where it can infiltrate at natural rates into the site’s native soil.  

**Media Filters** | Media filters are composed of two-chambered underground concrete vaults; larger particles settle out in the first chamber and then flows through a specific filter media in the second before it is discharged. The filter media varies depending on the targeted pollutants.  

There are a variety of proprietary media filters available. |
## Best Management Practice: Infiltration Basin
Infiltration basins contain stormwater until the water exfiltrates through the permeable soils the basin is built upon.  

![Infiltration Basin Image](image)

## Best Management Practice: Extended Dry Detention Basin
Extended dry detention basins are basins that hold stormwater for a minimum of 24 hours to allow solids to settle. Depending on flow, the runoff that enters the basin will either infiltrate or will exit via an overflow device if the basin’s capacity is met.

![Extended Dry Detention Basin Image](image)

## Best Management Practice: Riparian Restoration
Riparian restoration is the act of restoring the natural vegetative buffer zone around a river or stream. Utilizing diverse native plants, trees, and shrubs to reestablish the natural area around the river will reduce erosion and provide a number of ecological and water quality benefits.

## Best Management Practice: Roadway Reconfiguration
By reconfiguring roadways and reducing impervious area, the volume of roadway runoff and contaminants associated with it is reduced. Additionally, by incorporating structural BMPs (i.e. bioretention basin in a cul-de-sac) into roadways, the volume of runoff is not only reduced but also treated.

1. Massachusetts Stormwater Handbook, Volume 2, Chapter 2
2. Photo from Massachusetts Stormwater Handbook, Volume 2, Chapter 2
Section 5 Water Quality Assessment

5.1.2 Non-structural BMP Alternatives
The following table provides a brief description and overview of the non-structural BMPs examined as part of the preliminary evaluation.

Table 5-2: Non-Structural BMP Summary

<table>
<thead>
<tr>
<th>Best Management Practice</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Altered de-icing Methods</strong></td>
<td>Altered de-icing methods includes the minimization of the use and proper storage of chemicals and materials (e.g. sand) as well as utilizing new technologies and practices (e.g. pre-storm brining, speed-calibrated spreading, etc.) to reduce the volume of this material applied to surfaces with the overall goal of introducing less of this material to stormwater and the drainage system.</td>
</tr>
<tr>
<td><strong>Public Education and Outreach</strong></td>
<td>Targeted public education campaigns that focus on personal/residential best management practices like the utilization of rain barrels, reducing the use of fertilizers and pesticides, or properly disposing of pet waste, can have a significant impact on the water quality in a community.</td>
</tr>
<tr>
<td><strong>Street Sweeping</strong></td>
<td>The process of utilizing mechanical street sweepers to reduce the volume of salt, sand, and litter that can be washed into the drainage system during precipitation events.</td>
</tr>
<tr>
<td><strong>Catch Basin Cleaning</strong></td>
<td>The removal of debris, sediment and litter from catch basins reducing pollutant loading and clogging of the system.</td>
</tr>
</tbody>
</table>

1. Pennsylvania Stormwater Handbook

5.2 Preliminary Screening of BMPs
A number of structural and non-structural BMPs were examined with the goal of choosing the most appropriate BMPs in terms of relevant removal of pollutant of concern, relative cost and relative permitting requirements of each BMP.
### 5.2.1 Structural BMPs

#### Table 5-3: Preliminary Evaluation of Structural BMPs

<table>
<thead>
<tr>
<th>BMP</th>
<th>Target Pollutants</th>
<th>Pollutant Removal Efficiency</th>
<th>Relative Cost</th>
<th>Maintenance Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain Garden/Bioretention swale</td>
<td>TSS, TN, TP, Metals, Fecal Coliform</td>
<td>TSS: 90% TN: 30-50% TP: 30-90% Metals: 40-90%</td>
<td>$</td>
<td>Inspect BMP monthly, clear gross solids monthly, remove sediment as needed</td>
</tr>
<tr>
<td>Infiltration Trench</td>
<td>TSS, TN, TP, Metals, Fecal Coliform</td>
<td>TSS: 80% (with pretreatment) TN: 40-70% TP: 40-70% Metals: 85-90% Pathogens: Up to 90%</td>
<td>$</td>
<td>Inspection of the trench and removal of debris and sediment every 6 months and after every major storm</td>
</tr>
<tr>
<td>Pervious Pavement</td>
<td></td>
<td>TSS: 80%</td>
<td>$-$$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Porous Asphalt</td>
<td>TSS: 80%</td>
<td>$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Porous Concrete</td>
<td>TSS: 80%</td>
<td>$$</td>
<td>Inspect BMP annually, vacuum sediment twice-four times per year or as needed</td>
</tr>
<tr>
<td></td>
<td>Porous Pavers</td>
<td>TSS: 76%-99%</td>
<td>$$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resin Bound Porous Gravel</td>
<td>TSS: 80%</td>
<td>$$$</td>
<td></td>
</tr>
<tr>
<td>Green Roofs</td>
<td>N/A</td>
<td>N/A</td>
<td>$$$</td>
<td>Minimal to regular maintenance (dependent on type of green roof)</td>
</tr>
</tbody>
</table>

Identification and Assessment of Causes of Impairment: Trout Brook Avon, Massachusetts
## Generic Tree Box

<table>
<thead>
<tr>
<th>Filter Type</th>
<th>Pollutants</th>
<th>TSS Removal</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filterra ®</td>
<td>TSS, TP, TN, Copper, Zinc, Hydrocarbons</td>
<td>TSS: 82%</td>
<td>$</td>
</tr>
<tr>
<td>Silva Cell ®</td>
<td>TSS, TP, TN, Metals, Hydrocarbons</td>
<td>TSS: Variable&lt;sup&gt;5&lt;/sup&gt;</td>
<td>$-$$</td>
</tr>
<tr>
<td>Storm Treat ®</td>
<td>TSS, TP, TN, FC, Hydrocarbons</td>
<td>TSS: 74%</td>
<td>$$</td>
</tr>
</tbody>
</table>

### Sediment Forebay

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>TSS Removal</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS, TP, TN, Metals, Pathogens</td>
<td>TSS: 80% (w/pretreatment) TN: 20-55% TP: 40-60% Metals: 20-85% Pathogens: Up to 75%</td>
<td>$$</td>
</tr>
</tbody>
</table>

### Media Filters

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>TSS Removal</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS, targeted pollutants</td>
<td>Variable, dependent upon filter media</td>
<td>$-$$</td>
</tr>
</tbody>
</table>

### Jellyfish Filter ®

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>TSS Removal</th>
<th>Cost Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS, TP, TN, Metals</td>
<td>TSS: 89% TN: 51% TP: 59%</td>
<td>$$</td>
</tr>
</tbody>
</table>

---

<sup>5</sup> Inspect BMP twice/year, clear gross solids as needed, remove sediment as needed.

<sup>6</sup> Inspect monthly and clean four times/year or as needed.

<sup>7</sup> Biannual inspections during growing and non-growing seasons during first 3 years, yearly cleaning out of forebays and cleaning out of basin/wetland system every 10 years or as needed.

<sup>8</sup> Variable, dependent on manufacturer’s specifications.

<sup>9</sup> Inspect BMP annually, vacuum sediment quarterly.
### Section 5 Water Quality Assessment

<table>
<thead>
<tr>
<th>Extended Dry Detention Basin</th>
<th>TSS, TP, TN, Metals</th>
<th>TSS: 50% (w/pretreatment)</th>
<th>$</th>
<th>Remove trash, debris and sediment at least twice/year.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Basins</td>
<td>TSS</td>
<td>TSS: 80% (w/pretreatment)</td>
<td>$</td>
<td>Inspect basin and inspect forebay, remove sediment and other maintenance at a minimum twice/year</td>
</tr>
<tr>
<td>Infiltration Basin</td>
<td>TSS</td>
<td>TSS: 80% (w/pretreatment)</td>
<td>$$</td>
<td>Preventative and general maintenance performed twice/year. Cleaning of pretreatment devices minimally twice/year and after every major storm.</td>
</tr>
</tbody>
</table>

1. Target pollutants are those pollutants that the BMP has been specifically designed to remove and does not include every pollutant that the BMP can remove.
   a. TSS- Total Suspended Solids
   b. TN- Total Nitrogen
   c. TP- Total Phosphorus
2. Typical pollutant removal efficiency per MassDEP Stormwater Handbook
3. For the purpose of this analysis, cost has been evaluated on a relative basis not on project specific cost estimates.
4. Typical requirements per MassDEP Stormwater Handbook or per manufacturer’s recommendations.
5. Varies depending on design of accompanying tree trench or other stormwater BMP.
6. EPA’s MS4 General Permit requirement
Riparian Restoration
The repairing of the natural buffer zone between waterways and the built-up environment can have a number of ecological and water quality benefits. With the stabilization of the bank, bank erosion will be reduced which in turn will reduce sediment deposits downstream. Also, the increased buffer area allows for more pollutant uptake by the vegetation therefore reducing the volume of pollutants reaching the stream. Additionally, the areas become more visually appealing and will improve biodiversity as the habitat can sustain more life.

Roadway Reconfiguration
Roadway runoff contains a variety of pollutants and one way to reduce the pollutants entering the drainage system is to reduce the volume of runoff. One way to do this is to reconfigure roadways to reduce the amount of impervious surface and/or incorporate structural BMPs to further reduce runoff and/or treat the runoff prior to discharge. This is a challenging proposition when faced with limited right of ways, impacts on private property, and other obstacles (street trees, walls, fences, etc.). Reduction in impervious area is also challenging given it competes with the complete streets design ideals (i.e. bike lanes, parking, sidewalks, etc.)

5.2.2 Non-Structural BMPs
While the pros and cons of structural BMPs are more easily quantifiable than non-structural BMPs, non-structural BMPs still provide many recognizable benefits to the Town.

Public Education and Outreach
Public education and outreach can result in a reduction in the discharge of pollutants in stormwater runoff and therefore a significant water quality benefit. As required by the MS4 General Permit, education includes reaching four targeted audiences: (1) residents, (2) businesses, institutions (churches, hospitals), and commercial facilities, (3) developers (construction), and (4) industrial facilities. Messaging is specific to each audience and overall relate to proper lawn care, benefits of on-site infiltration, proper management of pet waste and septic systems, building maintenance, deicing storage and procedures, waste management, parking lot maintenance, erosion and sediment controls, etc. In addition, to address the TMDL and impairments described in Section 2.1.2, an enhanced education program that focuses on pet waste and septic systems to address pathogens and focuses on proper use and disposal of grass clippings, leaf litter, fertilizer, and pet waste to address nutrients will be beneficial.

Street Sweeping
Removing sediment and litter directly from the roadway will prevent the sediment and litter from entering the drainage system during precipitation events, reducing Total Suspended Solids, turbidity and other pollutants of concern. Under the MS4 General Permit, the Town must sweep streets twice per year (once in spring and once in fall) throughout the Taunton River Watershed to reduce nutrients. Sweeping helps reduce a number of stormwater pollutants.

Catch Basin Cleaning
Similar to street sweeping, by removing the sediment trapped within catch basins, the volume of sediment and other pollutants reaching waterways will be reduced. Additionally, this practice will reduce flooding, clogging and other conveyance issues as the drainage system may experience. EPA’s MS4 General Permit requires communities to keep all
catch basin sumps less than 50% full to maintain the ability of these structures to provide their intended function. This BMP helps manage a number of stormwater pollutants.

**Altered De-Icing Procedures**
Reducing the amount of sand in de-icing mix can help reduce the transport of sediment and other attached pollutants to waterbodies and wetlands. However, an increased amount of sodium chloride and other deicing chemicals is not beneficial to surface water and groundwater quality as these chemicals have been detected at concerning levels in various locations throughout New England, even above the recommended secondary maximum contaminant level for drinking water. Reducing overall quantity of de-icing material by using calibrating spreaders, using pre-brining when applicable, and installing spreaders that are paced to distribute evenly with vehicle speed can improve deicing. Most communities in Massachusetts are moving to using these methods as they save on cost, and therefore this is not a high propriety BMP to implement.

**Local Fertilizer Regulation/Bylaw**
Communities on Cape Cod and the Islands in Massachusetts have successfully managed nutrients by enacting local regulations and/or bylaws that regulate the application of fertilizer. Typically, this local code includes requirements for residents to have a soil test of their lawn completed. The results will be used to guide the specific nitrogen load to apply for best results. Phosphorus is prohibited from being included in fertilizer in the Commonwealth of Massachusetts and therefore a local regulation would only restrict nitrogen. The local code would specify the application timing (i.e. not right before a rain event) and season, along with penalties. This BMP has good potential to manage nitrogen, a pollutant of concern.

### 5.3 Secondary Screening for Structural BMPs
A site specific secondary screening is necessary for each BMP installation project to understand permitting requirements and other environmental issues that may impact the desirability of implementing the BMP including:

- Is the site within a FEMA flood zone?
- Is the site within a wellhead protection area?
- Is the site within NHESP Priority or Estimated Habitat?
- Is the site within close proximity to a certified or potential vernal pool (100 feet)?
- Is the site in protected open space?
- Is the site in a Massachusetts Historical Commission inventoried area or site?
- Is the site within wetlands jurisdiction?
- Is the site within close proximity to a parcel with contamination (100 feet)?
- Is the site located near or on a property listed on, or eligible for listing on, the National Register of Historic Places?
- Are there any local permitting implications?

Prior to construction, other components that make the project more desirable or feasible, but cannot easily be considered using GIS, must be evaluated. Overall understanding of the level of community support for the different types and locations of the BMPs, and the Town’s ability to construct, access, and maintain the BMP will need to be further considered by Town staff with input from the community and private
partners. Prior to constructing any BMPs, the Town will evaluate the following questions to consider other factors influencing implementation:

- How extensive is the level of coordination needed to implement the BMP?
- What is the level of community support for the BMP, both community-wide and in the neighborhood?
- Is the proposed location of the BMP within a known flood-prone area? Does this area contribute to flooding problems downstream in the watershed?
- Will this installation of the BMP enhance or preserve existing natural vegetation?
- Will the project cultivate educational opportunities?
- Will overhead or underground utilities need to be relocated for installation?
- How extensive are maintenance requirements and does the Town have the ability to complete maintenance?
- Will the project improve aesthetics for the area?
- Will the project improve wildlife habitat?
- Does this project overlap with another planned improvement to a building, parking area, or infrastructure on the site?

5.4 Summary and Considerations

The follow sections discuss the short-, mid-, and long-term recommendations for Best Management Practices (BMPs) suitable and cost-effective to address Trout Brook’s various pollutants of concern (Fecal Coliform and Escherichia coli (pathogens), Total Suspended Solids (TSS) and Turbidity (solids), Total Nitrogen and Total Phosphorus (nutrients), and Dissolved Oxygen).

5.4.1 Short-Term Recommendations

Based on the evaluation completed, in the short-term Avon should focus its efforts on non-structural BMPs, as these are the most feasible and cost-effective at addressing pollutants of concern sub-basin wide:

- Targeted public education on pet waste, septic systems, yard waste management, and fertilizer;
- Street sweeping all municipally owned and operated roadways twice per year; and
- Routine catch basin cleaning such that sumps are maintained at less than 50% full.

In addition, as the Town completes drainage improvements, the Town should replace catch basins with deep sump structures where they do not exist as this is a cost-effective way to reduce solids which typically have other attached pollutants, and consider ways to reduce total impervious area through reconfiguration.

Other structural BMPs should be considered for roadway work, including infiltration trenches, tree box filters, rain gardens, street planters, and media filters, if space and
sub-surface conditions allow. The Brentwood Subdivision is currently being planned for complete street upgrades and structural BMPs should be incorporated into this design.

As the Town continues to plan to rehabilitate the parking lot at Town Hall, staff should consider installing these BMPs and continuing to pursue grant funding for the work. In addition, as the former Police Station is planned to be redeveloped, the site should be fully designed to include BMPs that address pollutants of concern. These sites are both highly impervious areas. Town Hall is a direct discharger of TSS and Turbidity to Trout Brook.

The most cost-effective BMPs that address the pollutants of concern (solids, pathogens and nutrients, and dissolved oxygen) are rain gardens, infiltration trenches, infiltration basins, and constructed wetlands.

5.4.2 Mid-Term Recommendations

Avon should review its local code and revise it as appropriate to encourage new and redevelopment projects to install BMPs that address pollutants of concern. Avon can elect to regulate any land disturbance appropriate the community and is not limited to one acre or greater set as the minimum threshold by EPA in the MS4 General Permit. Avon should develop a report that assesses existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist: green roofs; Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses, and modify local code as applicable depending on the results of this report.

Avon should also consider whether a fertilizer regulation/bylaw is appropriate and, if so, pursue development of such a local regulatory mechanism to help manage nutrients.

5.4.3 Long-Term Recommendations

Avon should incorporate in its capital planning and roadway work a long-term written plan to retrofit portions of the community to address pollutants of concern and drinking water well protection. This effort will be necessary to complete the nitrogen source identification report and the phosphorus source identification reports required by EPA’s MS4 General Permit. This would include a series of maps, conceptual designs for structural BMPs, roadway reconfiguration, and riparian restoration, along with cost estimates, all backed by a robust public education and outreach program.
Section 6
Conclusions and Recommendations

Work completed under this grant titled “Identification and Assessment of Causes of Impairment: Trout Brook”, generously awarded by EPA and NEIWPCC through the SNEP Coastal Watershed Restoration Grants Program to the Town, has helped Avon further develop their stormwater and green infrastructure master plan. Specifically, this grant allowed Avon to:

- **Delineate stormwater catchments** by building off a recent MassDEP Water Infrastructure and Technical Assistance Program grant to map and assess the condition of the Town’s stormwater infrastructure, the catchments for priority outfalls that directly discharge to Trout Brook and abutting wetlands were delineated.

- **Survey catchment characteristics** in both a desktop based and field based format and prioritize catchments for outfall sampling and BMP implementation.

- **Complete inspections and sampling of selected outfalls to characterize pollution.**

- **Screen Best Management Practices (BMPs)** to determine suitability of implementation in the five priority catchments. The assessment considered relative pollutant removal, relative costs, and relative permitting requirements of the BMPs to recommend short-, mid-, and long-term implementation.

Protection of drinking water quality is of extreme importance. The Porter Public Water Supply Well, which draws water from the aquifer underlying Trout Brook, had total and fecal coliform detected, which Town staff believe may be linked to stormwater pollution in Trout Brook.

In addition, restoring Trout Brook to meeting its Surface Water Quality standards is critical. As previously described in Section 2.1, Trout Brook is water quality impaired by Fecal Coliform and Escherichia coli (pathogens), Total Suspended Solids (TSS) and Turbidity (solids), Total Nitrogen and Total Phosphorus (nutrients) and Dissolved Oxygen.

Our desktop and field evaluation found that pollutants of concern are largely coming from residential areas and a limited number of target businesses and commercial/industrial facilities. Dry weather sampling did not indicate the likelihood of an illicit discharge, but it did indicate the presence of nutrients which may be naturally occurring given the layout of the drainage system including wetlands areas. Additionally, wet weather sampling showed that there may be failing septic systems in the catchments due to sampling results.

**Non-structural BMPs are the most cost-effective solution to address pollutants of concern.** Avon has limited land on which to install cost-effective structural stormwater BMPs in the watershed. There are limited opportunities in roadways and the right of way, as well. For BMPs to be cost-effective, they need to be installed when a site is being developed or redeveloped, whether it be Town-owned or private land. However, structural BMPs reduce a quantifiable amount of pollutants of concern and are important to the overall strategy to reduce pollution in stormwater runoff.
Implementing next steps described in Section 6.2 will allow Avon to effectively and economically achieve the Town’s goals to protect the Trout Brook sub-basin and its wildlife habitat, enhance the quality of life by improving surface water quality to ensure public health and recreation standards are met by reducing the discharge of pollutants of concern, maintain and protect drinking water source for residents and industry, comply with regulatory requirements, and educate the public on the impacts of stormwater and the role people play as good stewards of the environment.

6.1 Next Steps for Avon

Avon should continue its efforts to implement a stormwater and green infrastructure master plan. This plan should include further planning efforts, additional investigations, implementation of non-structural BMPs, and design and construction of structural BMPs.

6.1.1 Further Planning

Develop written Stormwater Management Plan: Avon should coordinate further development of its stormwater and green infrastructure master plan with the Stormwater Management Plan (SWMP) required by EPA’s Phase II Small MS4 General Permit. The SWMP is a written document that describes how Avon will comply with the permit requirements and must be completed by June 30, 2019. This includes developing an illicit discharge detection and elimination program to find and remove non-stormwater discharges to local waterbodies from the MS4.

Finalize Watershed-Based Plan for Trout Brook: As previously explained in Section 1.4 of this Report, Avon has completed a portion of a Watershed-Based Plan for the Trout Brook sub-basin with this SNEP grant project but will need to further address the remaining watershed-based plan components through additional planning. These components are:

   d) An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA’s Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

   e) An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

   f) A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

   g) A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

   h) A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-
based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.

i) A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

**Develop written Nitrogen and Phosphorus Source Identification Reports:** Avon should develop the Nitrogen and Phosphorus Source Identification Reports required by EPA’s Phase II Small MS4 General Permit. These reports are due by June 30, 2022 and generally describe the potential sources of nutrients in Avon, clarification on how the IDDE program has identified and removed sources, and identification of specific retrofit opportunities for structural BMP installation.

**Incorporate in its capital planning and roadway work a long-term written plan to retrofit portions of the community to address pollutants of concern and protect drinking water wells.** This effort will be necessary to complete the nitrogen source identification report and the phosphorus source identification reports required by EPA’s MS4 General Permit. This would include a series of maps, conceptual designs for structural BMPs, riparian restoration, and roadway reconfiguration, along with cost estimates, all backed by a robust public education and outreach program.

### 6.1.2 Additional Investigation

The Town of Avon should perform additional investigation to supporting findings from this report. Table 6-1 summarizes the recommended additional investigation actions. The following describes these actions in greater detail.

**Table 6-1: Summary of Additional Investigation Recommendations**

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Pollutant of Concern Addressed</th>
<th>Implementation Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action #1: Resample outfalls</td>
<td>All</td>
<td>Short Term</td>
</tr>
<tr>
<td>Action #2: Catchment Investigations</td>
<td>All</td>
<td>Short Term</td>
</tr>
<tr>
<td>Action #3: Drainage System Map &amp; Catchment Delineation</td>
<td>All</td>
<td>Initiate in Short Term, Ongoing implementation</td>
</tr>
<tr>
<td>Action #4: Site Specific Structural BMP Screening</td>
<td>Site-specific</td>
<td>Short Term</td>
</tr>
<tr>
<td>Action #5: Optional Septic System Tracking</td>
<td>Pathogens</td>
<td>Initiate in Short Term, Ongoing implementation</td>
</tr>
</tbody>
</table>

**Additional Investigation Action #1: Resample outfalls to understand results previously described in Sections 4.4 and 4.5 of this report.**

- Resample outfall OF130 during *dry weather* to understand if elevated chlorine, total phosphorus, and total nitrogen previously found are still present, which may be from runoff from residential lawn watering with recent fertilizer applications, yard
waste, leaf litter and pet waste, or natural sources of nutrients from the upstream wetlands.

- Resample outfall OF124 during wet weather to understand if elevated phosphorus, ammonia and surfactant levels previously found are still present, which may be from wet weather induced sanitary input from a failing septic system.
- Resample outfall OF114 during wet weather to understand if the elevated levels of bacteria previously found are still present, which would indicate a sanitary sewer input from a failing septic system is possible.

For each sampling round, complete the Outfall Reconnaissance Inventory/Sample Collection Field Sheet included in Appendix B of the QAPP. At a minimum, samples must be analyzed for the following parameters per the MS4 General Permit:

- Surfactants
- Ammonia
- E. coli
- Chlorine
- Temperature
- Conductivity
- Salinity
- Pollutants of Concern for Avon:
  - DO
  - Temperature
  - BOD5
  - Total Phosphorus
  - Total nitrogen
  - TSS and Turbidity
  - Fecal coliform
  - E. coli

**Additional Investigation Action #2: For these three outfalls (OF 114, 124, and 130), also complete catchment investigations in accordance with EPA MS4 General Permit.** The catchment investigation procedure generally includes:

- Developing a written systematic procedure that includes (1) a review of mapping and historic plans and records for the catchment; (2) a manhole inspection methodology; and (3) procedures to isolate and confirm sources of illicit discharges.
- Completing the manhole inspections, which an investigation that involves systematically and progressively observing, sampling, and evaluating key junction manholes (per Appendix A of the EPA MS4 General Permit, key junction manholes “are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program”) in the MS4 to narrow the location of suspected illicit discharges to an isolated pipe segment between two manholes, locate evidence of illicit discharges that may not be evident at the outfall under all circumstances, and confirm or identify potential system vulnerability factors. The manhole inspection methodology may either start...
from the outfall and work up the system or start from the upper parts of the catchment and work down the system or be a combination of both practices. During either dry weather or during wet weather (precipitation sufficient to produce runoff and sometimes high groundwater periods), key junction manholes shall be opened and inspected for visual and olfactory evidence of illicit connections (e.g., excrement, toilet paper, gray filamentous bacterial growth, or sanitary products present). If flow is observed, sample the flow at a minimum for ammonia, chlorine and surfactants. Additional indicator sampling (e.g. bacteria) may assist in determining potential sources.

- Depending on results, isolate the drainage area for more detailed investigations, inspection of additional manholes along the alignment to refine the location of potential contaminant sources, and methods such as caulk dams, targeted internal plumbing inspections, dye testing, video inspections, or smoke testing to isolate and confirm the sources.
- When the source of an illicit discharge is identified and confirmed, exercise authority as necessary to require its removal.
- Within one year following removal, complete confirmatory screening (dry and wet weather screening).
- Report to EPA on the procedure and results of the catchment investigation effort.

**Additional Investigation Action #3**: Complete additional mapping of the MS4 to further connectivity and improve overall structure location and define catchments. The MS4 General Permit requires the map to be updated in two phases. The first phase mapping, to be completed by July 1, 2020, must include the following:

- Outfalls and receiving waters;
- Open channel conveyances (swales, ditches, etc.);
- Interconnections with other MS4s and other storm sewer systems;
- Municipally-owned stormwater treatment structures;
- Waterbodies (identified by name and all use impairments as identified on the most recent Massachusetts Integrated List of Waters report); and
- Initial catchment delineations. As previously discussed in Section 3, catchment is defined by EPA as “the land area draining to a single outfall”.

The second phase map, to be completed by July 1, 2028, must include the following:

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/- 30 feet)
- Pipes
- Manholes
- Catch basins
- Refined catchment delineations

The MS4 Permit also recommends other elements to be included in the map (e.g. pipe size, material, and age, privately owned treatment structures, etc.) As shown in the maps included in Section 2.3.6, there are numerous catch basins and drain manholes that do
not clearly connect to a stormwater outfall location, and/or outfall locations are not identified.

**Additional Investigation Action #4: Conduct site specific secondary screening for parcels potentially under consideration for structural BMP installation.** As previously discussed in Section 2.3.2, a number of Town-owned parcels were identified as possible locations for structural BMPs. Site visits were completed as described in Section 3.3, which identified overall potential feasibility of BMP installation, but additional on-site existing conditions need to be verified including existing utilities and grading, permitting requirements need to be determined, specific BMP types and locations need to confirmed, and stakeholder input needs to be obtained.

**Additional Investigation Action #5 (Optional): Improve tracking and inspections of septic systems.** Tracking could include using a Microsoft Excel spreadsheet (e.g. create a database) that notes system location, date of installation, date of Title V inspection, date(s) of pumping, property sale, etc. This would require Board of Health staff to complete a rigorous review of files and input information into the database. Town staff could consider hiring a summer intern to complete this work. Once a database is developed, review collected information to begin to understand failure rates and identify problem areas. Based on results, increase the frequency of inspection system inspections for older systems and high groundwater areas or areas with high density of systems. This would require updates to local code to accommodate the increased inspection requirements.

### 6.1.3 Non-Structural BMPs

The following non-structural BMPs should be incorporated into the stormwater and green infrastructure master plan. Table 6-2 summarizes the non-structural BMPs recommended. The following describes the recommendations in greater detail.

**Table 6-2: Summary of Non-structural BMPs**

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Pollutant of Concern Addressed</th>
<th>Implementation Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP #1: Public Education &amp; Outreach</td>
<td>Pathogens, Total Phosphorus, Total Nitrogen</td>
<td>Develop short term, ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
</tr>
<tr>
<td>BMP #2: Street Sweeping Program</td>
<td>Dissolved oxygen, Turbidity, TSS, Total Phosphorus, Total Nitrogen</td>
<td>Develop short term, ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
</tr>
<tr>
<td>BMP #3: Catch Basin Cleaning Program</td>
<td>Dissolved oxygen, Turbidity, TSS</td>
<td>Develop short term, ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
</tr>
<tr>
<td>BMP #4: Reduction of Impervious Cover</td>
<td>Dissolved oxygen, Turbidity, TSS, Total Phosphorus, Total Nitrogen</td>
<td>Mid-term</td>
</tr>
<tr>
<td>BMP #5: Operation &amp; Maintenance Procedures</td>
<td>All</td>
<td>Develop short term, ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
</tr>
<tr>
<td>BMP #6: Stormwater Pollution Prevention Plans</td>
<td>Site-specific</td>
<td>Develop short term, ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>implementation</td>
</tr>
</tbody>
</table>
Section 6 Summary and Recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Pollutant of Concern Addressed</th>
<th>Implementation Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP #7: Optional: Fertilizer Bylaw</td>
<td>Nitrogen</td>
<td>Develop mid-term, long-term implementation</td>
</tr>
</tbody>
</table>

**Non-Structural BMP #1:** Develop and implement a robust public education and outreach program for:

- Residents;
- Businesses, institutions (churches, hospitals), and commercial facilities,
- Developers (construction), and
- Industrial facilities.

In accordance with EPA’s Small MS4 General Permit. This includes specific targeted public education on pet waste, septic systems, yard waste management, and fertilizer, among other topics.

**Non-Structural BMP #2:** Develop and fund a street sweeping program that sweeps all Town-owned and operated streets twice per year. Town staff should review Avon’s street sweeping practice and examine deficiencies in their approach. For example, many operators sweep too quickly reducing effectiveness; the most effective sweep speed is around 5 miles per hour. However, the Town should review available data for their sweeper and establish a written Standard Operating Procedure (SOP) to insure the sweepers are operating at an ideal speed that collects the most particulate matter.

**Non-Structural BMP #3:** Develop and implement a routine catch basin cleaning program that keeps sumps less than 50% full. This will reduce the amount of sediment that enters local waterways thus addressing Trout Brook’s dissolved oxygen, TSS and turbidity impairments.

**Non-Structural BMP #4:** Investigate feasibility of reducing impervious cover throughout Town by review of local bylaw sand regulations related to development and redevelopment and feasibility of implementing redevelopment standards. Pollutants of concern (bacteria, phosphorus, TSS, etc.) are directly associated with stormwater runoff. Reduction of impervious cover will reduce the amount of stormwater runoff and reduce pollutant loading to local waterbodies. Coordinate this with any roadway reconfiguration program.

**Non-Structural BMP #5:** Develop written operation and maintenance procedures for municipal activities (per Permit Section 2.3.7.a.ii) and existing stormwater infrastructure (per Permit Section 2.3.7.a.iii.1) as required by the MS4 General Permit. Applicable facilities include parks and open space, buildings and facilities where pollutants are exposed to stormwater runoff, vehicles and equipment, and MS4 infrastructure.

**Non-Structural BMP #6:** Develop Stormwater Pollution Prevention Plans (SWPPPs) for all applicable municipal facilities. In Avon, we understand this would apply to the Highway Garage located at 491 West Main Street. A SWPPP includes the following components:

- Pollution Prevention Team
- Description of the facility and identification of potential pollutant sources
Section 6 Summary and Recommendations

- Identification of stormwater controls
- Management practices including:
  - Minimizing or preventing exposure of pollutants to rain/stormwater runoff
  - Good housekeeping
  - Preventative maintenance
  - Spill prevention and response
  - Erosion and sediment control
  - Management of runoff
  - Preventing exposure of salt storage piles/piles containing salt to precipitation
  - Employee training
  - Maintenance of control measures

Non-Structural BMP #6: Optional - Local Fertilizer Regulation/Bylaw. Consider enacting local regulations and/or bylaws that regulate the application of fertilizer. Typically, this local code includes requirements for residents to have a soil test of their lawn completed. The results will be used to guide the specific nitrogen load to apply for best results. Phosphorus is prohibited from being included in fertilizer in the Commonwealth of Massachusetts and therefore a local regulation would only restrict nitrogen. The local code would specify the application timing (i.e. not right before a rain event) and season, along with penalties.

6.1.4 Structural BMPs
The Town of Avon should proceed with undertaking structural BMPs to supporting findings from this report. Table 6-3 summarizes the structural BMP recommendations. The following describes these actions in greater detail.

Table 6-3: Summary of Structural BMPs

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Pollutant of Concern Addressed</th>
<th>Implementation Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural BMP #1: Catch Basin Replacement Program</td>
<td>Total phosphorus, total nitrogen, TSS</td>
<td>Long term</td>
</tr>
<tr>
<td>Structural BMP #2: Roadway Structural BMPs</td>
<td>Dissolved oxygen, Turbidity, TSS, Total Phosphorus, Total Nitrogen</td>
<td>Long term</td>
</tr>
<tr>
<td>Structural BMP #3: Municipal Parcel Structural BMPs</td>
<td>Dissolved oxygen, Turbidity, TSS, Total Phosphorus, Total Nitrogen</td>
<td>Long term</td>
</tr>
</tbody>
</table>

Structural BMP #1: Enact a catch basin replacement program that is coupled with road work to install structures with deep sumps. A deep sump is defined by MassDEP in the Stormwater Handbook Volume 2 as the sump depth is at least four feet times the diameter of the outlet pipe; the minimum sump depth is four feet. This BMP specifically reduces solids and can help address nutrients, metals, bacteria, and other common stormwater pollutants.

Structural BMP #2: Consider other structural BMPs for roadway work, including infiltration trenches, tree box filters, rain gardens, street planters, and media filters, if space and sub-surface conditions allow. See Section 5.1 for discussion on these BMPs.
These BMPs should be optimized for nutrient removal, specifically pathogens, total phosphorus and total nitrogen. Count any infiltration BMPs as credit under the WMA SWMP framework.

**Structural BMP #3:** As municipal parcels are redeveloped, plan to install cost-effective BMPs that address the pollutants of concern (solids, pathogens, nutrients, and dissolved oxygen) such as rain gardens, infiltration trenches, infiltration basins, and constructed wetlands. See Section 5.1 for discussion on these BMPs. See Section 3.3 for additional discussion on potential feasible sites for installation, including for the following sites:

- **Middle and High School:** Significant impervious area available to retrofit and an ideal location from an education perspective. However, pavement was largely in good condition and therefore significant cost would be necessary to complete structural BMP retrofits at this site. In the future, when Avon improves this site, structural BMPs should be considered.

- **Police Department at Main Street and East High Street:** This site has significant impervious area but much of it is relatively flat and appears to be in good condition. In addition, sites such as this have a high potential pollution source (oils and grease, etc.) and therefore it is not ideal to install infiltration BMPs on the site. This is this is improved, BMPs should be considered at that time.

- **The former police station on Fagan Drive:** This site is an excellent candidate for BMP installation as it is in the process of being redeveloped. Since our site visits during June 2017, plans to redevelop this site have evolved and BMPs are being considered.

- **Parking lot at 209 West Main Street:** Given the small size of this parking lot and flat slope, installation of BMPs would be expensive and should be postponed until site is redeveloped.

- **Avon Housing Authority Fellowship Circle:** Given the available space, this site is an excellent candidate for stormwater BMPs. In addition, it is a visible site that would provide a public education benefit. Survey and design would be necessary to define the specific BMP solutions.

- **Currently vacant parcels (450 East Main Street, 180 East Main Street, 133 Main Street, parcel at the intersection of Memorial Drive and Ladge Drive, and the parcel at the end of Everett Street):** Drainage could be redirected to these sites for subsurface infiltration, however, much of the abutting drainage appears to be owned by MassDOT and therefore is not a municipal issue.

- **Town Hall and the Library** are two high priority locations for installation of structural BMPs as described in Section 3.2.9. These are parcels within municipal control for installing structural BMPs and are highly visible to Avon’s residents.
Appendix A
MassDEP Watershed Based Plan
WATERSHED-BASED PLAN

Trout Brook

April 3, 2018

Prepared By:
Town of Avon

Prepared For:
MassDEP
Department of Environmental Protection
Contents

Element A: Nonpoint Source Pollution Causes and Sources
Element B: Pollutant Load Reductions Needed / Water Quality Goals
Element C: Management Measures to Achieve Water Quality Goals
Element D: Technical and Financial Assistance Needed
Element E: Public Information and Education
Elements F & G: Implementation Schedule and Interim Measurable Milestones
Elements H & I: Progress Evaluation Criteria and Monitoring

References/Appendix
Element A: Identify Causes of Impairment & Pollution Sources

Element A: Identify the causes and sources or groups of similar sources that need to be controlled to achieve the necessary pollutant load reductions estimated in the watershed based plan (WBP).

1. General Watershed Information

Table A-1: General Watershed Information

<table>
<thead>
<tr>
<th>Watershed Name (Assessment Unit ID):</th>
<th>Cary Brook; Malfardar Brook; Searles Brook; Trout Brook (MA62-07)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Basin:</td>
<td>Taunton River</td>
</tr>
<tr>
<td>Watershed Area (within MA):</td>
<td>3760.9 (ac)</td>
</tr>
</tbody>
</table>
Figure A-1: Watershed Boundary Map (MassGIS, 2007; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.

General watershed information:


The following reports are available:

- Final Pathogen TMDL for the Taunton River Watershed June 2011
- Taunton River Watershed 2001 Water Quality Assessment Report
USE ASSESSMENT
AQUATIC LIFE
Habitat and Flow
ESS conducted instream habitat evaluations at four sites along Trout Brook in June/July 2002. The stations (upstream to downstream) were located at Studley Avenue, off of North Montello Street, Brockton (Station TB4); near East Ashland Street, Brockton (Station TB2); near Court Street, Brockton (Station TB3); and near Crescent Street (Route 27), Brockton (Station TB1). The habitat assessment scores were generally low ranging from 86 to 114/200. Channel flow status was the only habitat variable that consistently scored in the suboptimal range at all four sites evaluated. Instream habitat in this brook was limited as a direct result of development, poor instream cover, significant channel alteration, some sediment deposition, moderately unstable banks and little to no riparian zones (ESS 2003).

Toxicity
Effluent
One modified acute and chronic whole effluent toxicity test was conducted on the Avon Custom Mixing, Inc. treated sanitary effluent (Outfall #001) using both Ceriodaphnia dubia and Pimephales promelas. No acute or chronic toxicity to either test organism was detected in the August 2004 test. No other whole effluent toxicity testing reports have been submitted to MassDEP.

Chemistry – water
Between June and November 2002, the following four stations were sampled by ESS along this segment of Trout Brook as part of their NPS study (ESS 2003).
- TB4 – Studley Avenue, off of North Montello Street, Brockton (n=3 sampling events).
- TB2 – East Ashland Street, Brockton (n=5 sampling events).
- TB3 – Court Street, Brockton (n=3 sampling events).
- TB1 – Crescent Street (Route 27), Brockton (n=5 sampling events).

Results of these surveys are summarized below).

Dissolved Oxygen and % Saturation
The concentration of dissolved oxygen at the four stations monitored (day surveys only) ranged from 2.6 to 7.9 mg/L with eight of the fourteen measurements <5.0 mg/L. Percent saturation ranged from 30.8 to 85.9 and 11 of the 14 measurements were less than 60% saturation.

Temperature
The highest temperature measured in Trout Brook was 28.8°C (Station TB4) on the 1 August 2002.

pH
The pH in Trout Brook ranged from 6.0 to 7.8 SU at the four stations monitored. Only three of the 16 measurements were less than 6.5 SU.

Specific Conductance
Specific conductance ranged from 134.4 to 481.0 μmhos/cm (n=16).

TSS
The TSS concentrations ranged from 2.0 to 27 mg/L at the four stations sampled in Trout Brook. It should be noted that the highest concentrations (23 to 27 mg/L) were measured in the lower reach of the brook near Court Street and Crescent Street (Stations TB3 and TB1).

TKN
The concentration of TKN ranged from 0.3 to 2.6 mg/L (n=16).

Total Phosphorus
Total phosphorus concentrations ranged from 0.04 to 0.20 mg/L, however, it should be noted that the highest concentrations were consistently measured in the lower reach of the brook near Court Street and Crescent Street (stations TB3 and TB1). Only one of the 16 measurements was <0.05 mg/L.

The Aquatic Life Use is not assessed for Trout Brook as a result of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use in this urbanized subwatershed is identified with an Alert Status because of
habitual degradation, low dissolved oxygen/saturation and elevated total phosphorus concentrations.

PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS
Fecal coliform and E.coli samples were collected at four sampling stations in Trout Brook between June and November 2002 during both dry and wet weather events. From upstream to downstream these stations are summarized as follows (ESS 2003):
TB4 – Studley Avenue, off of North Montello Street, Brockton
TB2 – East Ashland Street, Brockton
TB3 – Court Street, Brockton
TB1 – Crescent Street (Route 27), Brockton

Samples were also collected from three tributaries to Trout Brook (Stations SEB1 and SEB2 on Searles Brook, Station MAB1 on Malfardar Brook, and Stations CB1 and CB2 on Cary Brook).

ESS 2003 bacteria data
Station Fecal Coliform data range (cfu/100 mL) Geometric Mean (cfu/100 mL) E.coli bacteria data range (cfu/100 mL) Geometric Mean (cfu/100 mL) Number of Samples
TB4 1,100 – 9,600* NA 1,000 – 8,400 NA 3
*Both samples collected during the primary contact season exceeded 2,000 cfu/100 mL.
TB2 120 and 16,000* 1,829 70 and 10,000 1,344 5
*60% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.
TB3 4,200 – 48,000* NA 4,000 – 22,000 NA 3
*All of the samples collected during the primary contact season exceeded 2,000 cfu/100mL.
TB1 1,200 - 64,000* 8,020 1,200 - 55,000 6,643 5
*80% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.

NB: Elevated bacteria counts in Trout Brook are representative of both dry and wet weather sampling conditions. Elevated bacteria counts were also documented in the three tributaries (ESS 2003).

No objectionable oils, odors, or other objectionable conditions were identified by ESS at the two most upstream sampling locations in Trout Brook (Station TB4) near Studley Avenue, off of North Montello Street, and near East Ashland Street, Brockton (Station TB2). Further downstream, however, near Court Street, Brockton (Station TB3), sewage and chemical odors were noted and the water column was described as opaque. No objectionable conditions (odors, oils, other deposits) were noted by ESS at the most downstream sampling location in Trout Brook near Crescent Street (Route 27), Brockton (Station TB1) (ESS 2003).

The Primary and Secondary Contact Recreational uses are assessed as impaired because of elevated bacteria counts. The Aesthetics Use is assessed as support upstream from East Ashland Street (upper 2.1 mile reach) but is assessed as impaired downstream from East Ashland Street (lower 1.3 mile reach) because of objectionable conditions reported by ESS.

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)
Avon Custom Mixing Services, Inc., a manufacturer of elastomeric compounds (rubber products), is authorized to discharge from its facility, Division of Chase and Sons, to Trout Brook. Although the NPDES permit #MA0026883 was issued November 2001, the company appealed the permit. Their permit appeal was denied in August 2002. Under the conditions of their permit, the facility is authorized to discharge 0.0015 MGD of treated sanitary effluent from its wastewater treatment facility and 0.15 MGD of combined non-contact cooling water and stormwater discharge from Outfall 002. Whole effluent toxicity limits are C-NOEC>21% and LC50>100% with a monitoring frequency of four times a year using both Ceriodaphnia dubia and Pimephales promelas. According to MassDEP Northeast Regional Office, the facility has occasional violations of their fecal coliform bacteria and ammonia limits (Ahsan 2005).

The former Hybripac Inc. in Avon was issued an emergency exclusion for their groundwater remediation project in 1997, which is no longer in effect (Pellerin 1997).

Warm Water Fishery

Report Recommendations:
RECOMMENDATIONS
Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).
Conduct monitoring (biological, habitat and water quality) to evaluate impacts to Trout Brook from potential sources of pollution and to better assess the status of the Aquatic Life Use.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the Primary and Secondary Contact Recreational uses.

Literature review information:

3. Water Quality Impairments

Known water quality impairments, as documented in the Massachusetts Department of Environmental Protection (MassDEP) 2012 Massachusetts Integrated List of Waters, are listed below. Impairment categories from the Integrated List are as follows:

Table A-2: 2012 MA Integrated List of Waters Categories

<table>
<thead>
<tr>
<th>Integrated List Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unimpaired and not threatened for all designated uses.</td>
</tr>
<tr>
<td>2</td>
<td>Unimpaired for some uses and not assessed for others.</td>
</tr>
<tr>
<td>3</td>
<td>Insufficient information to make assessments for any uses.</td>
</tr>
</tbody>
</table>
| 4                        | Impaired or threatened for one or more uses, but not requiring calculation of a Total Maximum Daily Load (TMDL), including:  
                          | 4a: TMDL is completed  
                          | 4b: Impairment controlled by alternative pollution control requirements  
                          | 4c: Impairment not caused by a pollutant - TMDL not required |
| 5                        | Impaired or threatened for one or more uses and requiring preparation of a TMDL. |

Table A-3: Water Quality Impairments
### 4. Water Quality Goals

Water quality goals may be established for a variety of purposes, including the following:

a.) For **water bodies with known impairments**, a [Total Maximum Daily Load](https://www.massdep.state.ma.us/ma/62-07-Trout_Brook) (TMDL) is established by MassDEP and the United States Environmental Protection Agency (USEPA) as the maximum amount of the target pollutant that the waterbody can receive and still safely meet water quality standards. If the waterbody has a TMDL for total phosphorus (TP) or total nitrogen (TN), or total suspended solids (TSS), that information is provided below and included as a water quality goal.

b.) For **water bodies without a TMDL for total phosphorus** (TP), a default water quality goal for TP is based on target concentrations established in the [Quality Criteria for Water](https://www.epa.gov/water-quality/quality-criteria-water) (USEPA, 1986) (also known as the “Gold Book”). The Gold Book states that TP should not exceed 50 ug/L in any stream at the point where it enters any lake or reservoir, nor 25 ug/L within a lake or reservoir. For the purposes of developing WBPs, MassDEP has adopted 50 ug/L as the TP target for all streams at their downstream discharge point, regardless of which type of water body the stream discharges to.

c.) **Massachusetts Surface Water Quality Standards** (314 CMR 4.00, 2013) prescribe the minimum water quality criteria required to sustain a waterbody’s designated uses. target is a Class ‘B’ waterbody. The water quality goal for fecal coliform bacteria is based on the Massachusetts Surface Water Quality Standards.

#### Table A-4: Surface Water Quality Classification by Assessment Unit ID

<table>
<thead>
<tr>
<th>Assessment Unit ID</th>
<th>Waterbody</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA62-07</td>
<td>Trout Brook</td>
<td>B</td>
</tr>
</tbody>
</table>

d.) **Other water quality goals set by the community** (e.g., protection of high quality waters, in-lake phosphorus concentration goal to reduce recurrence of cyanobacteria blooms, etc.).
Table A-5: Water Quality Goals

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Goal</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus (TP)</td>
<td>Total phosphorus should not exceed: --50 ug/L in any stream --25 ug/L within any lake or reservoir</td>
<td>Quality Criteria for Water (USEPA, 1986)</td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td><strong>Class B Standards</strong></td>
<td>Massachusetts Surface Water Quality Standards</td>
</tr>
<tr>
<td></td>
<td>• Public Bathing Beaches: For E. coli, geometric mean of 5 most recent samples shall not exceed 126 colonies/100 ml and no single sample during the bathing season shall exceed 235 colonies/100 ml. For enterococci, geometric mean of 5 most recent samples shall not exceed 33 colonies/100 ml and no single sample during bathing season shall exceed 61 colonies/100 ml; • Other Waters and Non-bathing Season at Bathing Beaches: For E. coli, geometric mean of samples from most recent 6 months shall not exceed 126 colonies/100 ml (typically based on min. 5 samples) and no single sample shall exceed 235 colonies/100 ml. For enterococci, geometric mean of samples from most recent 6 months shall not exceed 33 colonies/100 ml, and no single sample shall exceed 61 colonies/100 ml.</td>
<td>(314 CMR 4.00, 2013)</td>
</tr>
</tbody>
</table>

**Note:** There may be more than one water quality goal for bacteria due to different Massachusetts Surface Water Quality Standards Classes for different Assessment Units within the watershed.

5. Land Use Information

A. Watershed Land Uses

Table A-6: Watershed Land Uses

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area (acres)</th>
<th>% of Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>45.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Commercial</td>
<td>250.77</td>
<td>6.7</td>
</tr>
<tr>
<td>Forest</td>
<td>912.53</td>
<td>24.3</td>
</tr>
<tr>
<td>High Density Residential</td>
<td>315.51</td>
<td>8.4</td>
</tr>
<tr>
<td>Highway</td>
<td>25.57</td>
<td>0.7</td>
</tr>
<tr>
<td>Industrial</td>
<td>227.01</td>
<td>6</td>
</tr>
<tr>
<td>Land Use Type</td>
<td>Area (ha)</td>
<td>Impervious Cover (%)</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>62.29</td>
<td>1.7</td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>1721.59</td>
<td>45.8</td>
</tr>
<tr>
<td>Open Land</td>
<td>174.01</td>
<td>4.6</td>
</tr>
<tr>
<td>Water</td>
<td>26.12</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Figure A-2: Watershed Land Use Map (MassGIS, 2007; MassGIS, 2009b; MassGIS, 1999; MassGIS, 2001; USGS, 2016)

Ctrl + Click on the map to view a full sized image in your web browser.

B. Watershed Impervious Cover

There is a strong link between impervious land cover and stream water quality. Impervious cover includes land surfaces that prevent the infiltration of water into the ground, such as paved roads and parking lots, roofs, basketball courts, etc.

*Impervious areas that are directly connected (DCIA) to receiving waters (via storm sewers, gutters, or other impervious drainage pathways) produce higher runoff volumes and transport stormwater pollutants with greater efficiency than disconnected impervious cover areas which are surrounded by vegetated, pervious land. Runoff volumes from disconnected impervious cover areas are reduced as stormwater infiltrates when it flows across adjacent pervious surfaces.*
An estimate of DCIA for the watershed was calculated based on the Sutherland equations. USEPA provides guidance (USEPA, 2010) on the use of the Sutherland equations to predict relative levels of connection and disconnection based on the type of stormwater infrastructure within the total impervious area (TIA) of a watershed. Within each subwatershed, the total area of each land use were summed and used to calculate the percent TIA.

The relationship between TIA and water quality can generally be categorized as follows (Schueler et al. 2009):

<table>
<thead>
<tr>
<th>% Watershed Impervious Cover</th>
<th>Stream Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10%</td>
<td>Typically high quality, and typified by stable channels, excellent habitat structure, good to excellent water quality, and diverse communities of both fish and aquatic insects.</td>
</tr>
<tr>
<td>11-25%</td>
<td>These streams show clear signs of degradation. Elevated storm flows begin to alter stream geometry, with evident erosion and channel widening. Streams banks become unstable, and physical stream habitat is degraded. Stream water quality shifts into the fair/good category during both storms and dry weather periods. Stream biodiversity declines to fair levels, with most sensitive fish and aquatic insects disappearing from the stream.</td>
</tr>
<tr>
<td>26-60%</td>
<td>These streams typically no longer support a diverse stream community. The stream channel becomes highly unstable, and many stream reaches experience severe widening, downcutting, and streambank erosion. Pool and riffle structure needed to sustain fish is diminished or eliminated and the substrate can no longer provide habitat for aquatic insects, or spawning areas for fish. Biological quality is typically poor, dominated by pollution tolerant insects and fish. Water quality is consistently rated as fair to poor, and water recreation is often no longer possible due to the presence of high bacteria levels.</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>These streams are typical of “urban drainage”, with most ecological functions greatly impaired or absent, and the stream channel primarily functioning as a conveyance for stormwater flows.</td>
</tr>
</tbody>
</table>
6. Pollutant Loading

The land use data (MassGIS, 2009b) was intersected with impervious cover data (MassGIS, 2009a) and United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils data (USDA NRCS and MassGIS, 2012) to create a combined land use/land cover grid. The grid was used to sum the total area of each unique land use/land cover type.

The amount of DCIA was estimated using the Sutherland equations as described above and any reduction in impervious area due to disconnection (i.e., the area difference between TIA and DCIA) was assigned to the pervious D soil category for
that land use to simulate that some infiltration will likely occur after runoff from disconnected impervious surfaces passes over pervious surfaces.

Pollutant loading for key nonpoint source pollutants in the watershed was estimated by multiplying each land use/cover type area by its pollutant load export rate (PLER). The PLERs are an estimate of the annual total pollutant load exported via stormwater from a given unit area of a particular land cover type. The PLER values for TN, TP and TSS were obtained from USEPA (Voorhees, 2016b) (see documentation provided in Appendix A) as follows:

\[ L_n = A_n \times P_n \]

Where \( L_n \) = Loading of land use/cover type \( n \) (lb/yr); \( A_n \) = area of land use/cover type \( n \) (acres); \( P_n \) = pollutant load export rate of land use/cover type \( n \) (lb/acre/yr)

### Table A-8: Estimated Pollutant Loading for Key Nonpoint Source Pollutants

<table>
<thead>
<tr>
<th>Land Use Type</th>
<th>Pollutant Loading¹</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Phosphorus</td>
<td>Total</td>
<td>Total</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>(TP) (lbs/yr)</td>
<td>Nitrogen (TN) (lbs/yr)</td>
<td>Suspended Solids (TSS) (tons/yr)</td>
<td></td>
</tr>
<tr>
<td>Agriculture</td>
<td>28</td>
<td>183</td>
<td>3.64</td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>333</td>
<td>2,849</td>
<td>35.65</td>
<td></td>
</tr>
<tr>
<td>Forest</td>
<td>155</td>
<td>867</td>
<td>32.79</td>
<td></td>
</tr>
<tr>
<td>High Density Residential</td>
<td>377</td>
<td>2,431</td>
<td>36.82</td>
<td></td>
</tr>
<tr>
<td>Highway</td>
<td>28</td>
<td>216</td>
<td>14.50</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>315</td>
<td>2,693</td>
<td>33.69</td>
<td></td>
</tr>
<tr>
<td>Low Density Residential</td>
<td>16</td>
<td>159</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Medium Density Residential</td>
<td>910</td>
<td>7,558</td>
<td>107.44</td>
<td></td>
</tr>
<tr>
<td>Open Land</td>
<td>69</td>
<td>595</td>
<td>13.83</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,232</td>
<td>17,551</td>
<td>280.61</td>
<td></td>
</tr>
</tbody>
</table>

¹These estimates do not consider loads from point sources or septic systems.
Element B: Determine Pollutant Load Reductions Needed to Achieve Water Quality Goals

Element B of your WBP should:
Determine the pollutant load reductions needed to achieve the water quality goals established in Element A. The water quality goals should incorporate Total Maximum Daily Load (TMDL) goals, when applicable. For impaired water bodies, a TMDL establishes pollutant loading limits as needed to attain water quality standards.

1. Estimated Pollutant Loads

Table 1 lists estimated pollutant loads for the following primary nonpoint source (NPS) pollutants: total phosphorus (TP), total nitrogen (TN), total suspended solids (TSS). These estimated loads are based on the pollutant loading analysis presented in Section 4 of Element A.

2. Water Quality Goals

Water quality goals for primary NPS pollutants are listed in Table 1 based on the following:

- TMDL water quality goals (if a TMDL exists for the water body);
- For all water bodies, including impaired waters that have a pathogen TMDL, the water quality goal for bacteria is based on the Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2013) that apply to the Water Class of the selected water body.
- If the water body does not have a TMDL for TP, a default target TP concentrations is provided which is based on guidance provided by the USEPA in Quality Criteria for Water (1986), also known as the “Gold Book”. Because there are no similar default water quality goals for TN and TSS, goals for these pollutants are provided in Table 1 only if a TMDL exists or alternate goal(s) have been optionally established by the WBP author.
- According to the USEPA Gold Book, total phosphorus should not exceed 50 ug/L in any stream at the point where it enters any lake or reservoir. The water quality loading goal was estimated by multiplying this target maximum phosphorus concentration (50 ug/L) by the estimated annual watershed discharge for the selected water body. To estimate the annual watershed discharge, the mean flow was used, which was estimated based on United States Geological Survey (USGS) “Runoff Depth” estimates for Massachusetts (Cohen and Randall, 1998). Cohen and Randall (1998) provide statewide estimates of annual Precipitation (P), Evapotranspiration (ET), and Runoff (R) depths for the northeastern U.S. According to their method, Runoff Depth (R) is defined as all water reaching a discharge point (including surface and groundwater), and is calculated by:

\[ P - ET = R \]
A mean Runoff Depth R was determined for the watershed by calculating the average value of R within the watershed boundary. This method includes the following assumptions/limitations:

a. For lakes and ponds, the estimate of annual TP loading is averaged across the entire watershed. However, a given lake or reservoir may have multiple tributary streams, and each stream may drain land with vastly different characteristics. For example, one tributary may drain a highly developed residential area, while a second tributary may drain primarily forested and undeveloped land. In this case, one tributary may exhibit much higher phosphorus concentrations than the average of all streams in the selected watershed.

b. The estimated existing loading value only accounts for phosphorus due to stormwater runoff. Other sources of phosphorus may be relevant, particularly phosphorus from on-site wastewater treatment (septic systems) within close proximity to receiving waters. Phosphorus does not typically travel far within an aquifer, but in watersheds that are primarily unsewered, septic systems and other similar groundwater-related sources may contribute a significant load of phosphorus that is not captured in this analysis. As such, it is important to consider the estimated TP loading as "the expected TP loading from stormwater sources."

Table B-1: Pollutant Load Reductions Needed

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Existing Estimated Total Load</th>
<th>Water Quality Goal</th>
<th>Required Load Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>2232 lbs/yr</td>
<td>1122 lbs/yr</td>
<td>1109 lbs/yr</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>17551 lbs/yr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>281 ton/yr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td>Class B. <strong>Class B Standards</strong>&lt;br&gt;• Public Bathing Beaches: For E. coli, geometric mean of 5 most recent samples shall not exceed 126 colonies/100 ml and no single sample during the bathing season shall exceed 235 colonies/100 ml.&lt;br&gt;• Enterococci, geometric mean of 5 most recent samples shall not exceed 33 colonies/100 ml and no single sample during bathing season shall exceed 61 colonies/100 ml;&lt;br&gt;• Other Waters and Non-bathing Season at Bathing Beaches: For E. coli, geometric mean of samples from most recent 6 months shall not exceed 126 colonies/100 ml (typically based on min. 5 samples) and no single sample shall exceed 235 colonies/100 ml.</td>
<td></td>
</tr>
</tbody>
</table>

*MSWQS for bacteria are concentration standards (e.g., colonies of fecal coliform bacteria per 100 ml), which are difficult to predict based on estimated annual loading.*

**Class B Standards**

- Public Bathing Beaches: For E. coli, geometric mean of 5 most recent samples shall not exceed 126 colonies/100 ml and no single sample during the bathing season shall exceed 235 colonies/100 ml.
- Enterococci, geometric mean of 5 most recent samples shall not exceed 33 colonies/100 ml and no single sample during bathing season shall exceed 61 colonies/100 ml.
- Other Waters and Non-bathing Season at Bathing Beaches: For E. coli, geometric mean of samples from most recent 6 months shall not exceed 126 colonies/100 ml (typically based on min. 5 samples) and no single sample shall exceed 235 colonies/100 ml.

**Final Pathogen TMDL for the Taunton River Watershed June 2011**
For enterococci, geometric mean of samples from most recent 6 months shall not exceed 33 colonies/100 ml, and no single sample shall exceed 61 colonies/100 ml.

<table>
<thead>
<tr>
<th>TMDL Pollutant Load Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>No TMDL Pollutant Load Criteria Data Found</td>
</tr>
</tbody>
</table>

Pollutant load reduction information:
Element C: Describe management measures that will be implemented to achieve water quality goals

Element C: A description of the nonpoint source management measures needed to achieve the pollutant load reductions presented in Element B, and a description of the critical areas where those measures will be needed to implement this plan.

Table C1 presents the proposed management measures as well as the estimated pollutant load reductions and costs. The planning level cost estimates and pollutant load reduction estimates were based off information obtained in the following sources and were also adjusted to 2016 values using the Consumer Price Index (CPI) (United States Bureau of Labor Statistics, 2016):

- Geosyntec Consultants, Inc. (2014);
- Geosyntec Consultants, Inc. (2015);
- King and Hagen (2011);
- Leisenring, et al. (2014);
- King and Hagen (2011);
- MassDEP (2016a);
- MassDEP (2016b);
- University of Massachusetts, Amherst (2004);
- Voorhees (2015);
- Voorhees (2016a);
- Voorhees (2016b);

Table C-1: Proposed Management Measures, Estimated Pollutant Load Reductions and Costs

<table>
<thead>
<tr>
<th>Structural BMPs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BMP TYPE</strong></td>
<td>BIORETENTION AND RAIN GARDENS</td>
</tr>
<tr>
<td><strong>BMP SIZE (storm depth; inches)</strong></td>
<td>1.00</td>
</tr>
<tr>
<td><strong>DRAINAGE AREA (acres)</strong></td>
<td>1.50</td>
</tr>
<tr>
<td><strong>BMP LOCATION</strong></td>
<td>Town Hall</td>
</tr>
<tr>
<td><strong>LAND USE, COVER TYPE (in drainage area)</strong></td>
<td>% OF DRAINAGE AREA</td>
</tr>
<tr>
<td>COMMERCIAL, Impervious</td>
<td>100</td>
</tr>
<tr>
<td><strong>ESTIMATED POLLUTANT LOAD REDUCTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>TN (lbs/yr)</td>
<td>16.85402</td>
</tr>
<tr>
<td>TP (lbs/yr)</td>
<td>1.99964</td>
</tr>
<tr>
<td>TSS (lbs/yr)</td>
<td>560.42773</td>
</tr>
<tr>
<td><strong>ESTIMATED COST ($)</strong></td>
<td>49,489</td>
</tr>
</tbody>
</table>
No Additional BMP Data Found
Element D: Identify Technical and Financial Assistance Needed to Implement Plan

**Element D:** Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

Table D-1 presents the funding needed to implement the management measures presented in this watershed plan. The table includes costs for structural and non-structural BMPs, operation and maintenance activities, information/education measures, and monitoring/evaluation activities.

**Table D-1: Summary of Funding Needed to Implement the Watershed Plan.**

<table>
<thead>
<tr>
<th>Management Measures</th>
<th>Location</th>
<th>Capital Costs</th>
<th>Operation &amp; Maintenance Costs</th>
<th>Relevant Authorities</th>
<th>Technical Assistance Needed</th>
<th>Funding Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural and Non-Structural BMPs (from Element C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIORETENTION AND RAIN GARDENS</td>
<td>Town Hall</td>
<td>$49,489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information/Education (see Element E)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring and Evaluation (see Element H/I)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Funding Needed:**

**Funding Sources:**
Element E: Public Information and Education

**Element E: Information and Education (I/E) component of the watershed plan used to:**

1. Enhance public understanding of the project; and
2. Encourage early and continued public participation in selecting, designing, and implementing the NPS management measures that will be implemented.

**Step 1: Goals and Objectives**
The goals and objectives for the watershed information and education program.

Often high bacteria levels are the result of improper disposal of pet waste. Provide information on residential BMPs (i.e. rain barrels, rain gardens, reducing impervious area, etc.) and/or providing incentives for residents to implement their own BMPs can reduce runoff and pollutants associated with it.

**Step 2: Target Audience**
Target audiences that need to be reached to meet the goals and objectives identified above.

Pet owners, general public

**Step 3: Outreach Products and Distribution**
The outreach product(s) and distribution form(s) that will be used for each.

Installation of pet waste disposal stations and the distribution of pet waste bags. Distribution of flyers and mailings pertaining to proper disposal of pet waste and residential BMPs that can be implemented on private property.
**Step 4: Evaluate Information/Education Program**

*Information and education efforts and how they will be evaluated.*

<table>
<thead>
<tr>
<th>Number of brochures distributed, number of and utilization of pet waste bags and disposal stations.</th>
</tr>
</thead>
</table>

**Other Information**

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
</table>
Elements F & G: Implementation Schedule and Measurable Milestones

**Element F:** Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

**Element G:** A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

Table FG-1: Implementation Schedule and Interim Measurable Milestones

<table>
<thead>
<tr>
<th>A. Structural &amp; Non-Structural BMPs</th>
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<td>BIORETENTION AND RAIN GARDENS Town Hall</td>
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<tr>
<td>Design</td>
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<td>Installation</td>
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<td>6/30/2020</td>
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<table>
<thead>
<tr>
<th>B. Public Education &amp; Outreach</th>
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<tr>
<td>Install Pet Waste Disposal Stations w/pet waste bags</td>
<td></td>
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<tr>
<td>Install three at known dog walking areas</td>
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<td>6/30/2020</td>
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<tr>
<td>Mailings- Proper Pet Waste Disposal</td>
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<td></td>
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<tr>
<td>Distribute one mailing to all pet owners</td>
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<tr>
<td>6/30/2019</td>
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<td>Mailings- Residential BMPs</td>
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<tr>
<td>Mail at least one mailing to every household</td>
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<td>6/30/2020</td>
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<table>
<thead>
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<th>C. Monitoring</th>
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</thead>
<tbody>
<tr>
<td>No Data Found</td>
<td></td>
<td></td>
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</table>
Scheduling and milestone information:
Elements H & I: Progress Evaluation Criteria and Monitoring

**Element H:** A set of criteria used to determine (1) if loading reductions are being achieved over time and (2) if progress is being made toward attaining water quality goals. Element H asks "**how will you know if you are making progress towards water quality goals?**" The criteria established to track progress can be direct measurements (e.g., E. coli bacteria concentrations) or indirect indicators of load reduction (e.g., number of beach closings related to bacteria).

**Element I:** A monitoring component to evaluate the effectiveness of implementation efforts over time, as measured against the Element H criteria. Element I asks "**how, when, and where will you conduct monitoring?**"

The water quality target concentration(s) is presented under Element A of this plan. To achieve this target concentration, the annual loading must be reduced to the amount described in Element B. Element C of this plan describes the various management measures that will be implemented to achieve this targeted load reduction. The evaluation criteria and monitoring program described below will be used to measure the effectiveness of the proposed management measures (described in Element C) in improving the water quality of Gulf Pond.

**Indirect Indicators of Load Reduction**

Regularly check on pet waste stations to determine their utilization. Dispose of any pet waste bags.

**Project-Specific Indicators**

---

**TMDL Criteria**
**Direct Measurements**

Implement an outfall screening and sampling program to compare water quality screening criteria before and after implementation of BMPs. Sampling will include testing for fecal coliform, e.coli, 5-day BOD, Total Suspended Solids, Salinity, D.O., pH, chlorine, Nitrates/Nitrites, among others. Monitor bacteria concentrations in Town's wells.

**Adaptive Management**
References

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USEPA. (2010). "EPA's Methodology to Calculate Baseline Estimates of Impervious Area (IA) and Directly Connected Impervious Area (DCIA) for Massachusetts Communities."

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Voorhees, Mark, USEPA. (2016b). "FW: Description of additional modelling work for Opti-Tool Project" Message to Chad Yaindl, Geosyntec Consultants. 23 April 2015. E-mail.

Water Quality Assessment Reports

"Taunton River Watershed 2001 Water Quality Assessment Report"

TMDL

No TMDL Found
## Appendix A – Pollutant Load Export Rates (PLERs)

<table>
<thead>
<tr>
<th>Land Use &amp; Cover1</th>
<th>PLERs (lb/acre/year)</th>
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<tr>
<td></td>
<td>(TP)</td>
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<tr>
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</tr>
<tr>
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<tr>
<td>AGRICULTURE, HSG C</td>
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<tr>
<td>AGRICULTURE, IMPERVIOUS</td>
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</tr>
<tr>
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<td>0.03</td>
</tr>
<tr>
<td>COMMERCIAL, HSG B</td>
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</tr>
<tr>
<td>COMMERCIAL, HSG C</td>
<td>0.21</td>
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<td>COMMERCIAL, IMPERVIOUS</td>
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<tr>
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<td>FOREST, HSG B</td>
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<tr>
<td>FOREST, HSG C</td>
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</tr>
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<td>HIGHWAY, HSG D</td>
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<tr>
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<td>OPEN LAND, HSG B</td>
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</tr>
<tr>
<td>OPEN LAND, HSG C</td>
<td>0.12</td>
</tr>
<tr>
<td>OPEN LAND, HSG D</td>
<td>0.12</td>
</tr>
<tr>
<td>OPEN LAND, IMPERVIOUS</td>
<td>1.52</td>
</tr>
</tbody>
</table>

\(^1\)HSG = Hydrologic Soil Group
Appendix B
Source Water Assessment Plan
What is SWAP?
The Source Water Assessment and Protection (SWAP) program, established under the federal Safe Drinking Water Act, requires every state to:
• inventory land uses within the recharge areas of all public water supply sources;
• assess the susceptibility of drinking water sources to contamination from these land uses; and
• publicize the results to provide support for improved protection.

Susceptibility and Water Quality
Susceptibility is a measure of a water supply's potential to become contaminated due to land uses and activities within its recharge area.
A source's susceptibility to contamination does not imply poor water quality.
Water suppliers protect drinking water by monitoring for more than 100 chemicals, disinfecting, filtering, or treating water supplies, and using source protection measures to ensure that safe water is delivered to the tap.
Actual water quality is best reflected by the results of regular water tests. To learn more about your water quality, refer to your water supplier's annual Consumer Confidence Reports.

Introduction
We are all concerned about the quality of the water we drink. Drinking water wells may be threatened by many potential contaminant sources, including storm runoff, road salting, and improper disposal of hazardous materials. Citizens and local officials can work together to better protect these drinking water sources.

Purpose of this report:
This report is a planning tool to support local and state efforts to improve water supply protection. By identifying land uses within water supply protection areas that may be potential sources of contamination, the assessment helps focus protection efforts on appropriate Best Management Practices (BMPs) and drinking water source protection measures.

Refer to Table 3 for Recommendations to address potential sources of contamination. Department of Environmental Protection (DEP) staff are available to provide information about funding and other resources that may be available to your community.

This report includes the following sections:
1. Description of the Water System
2. Land Uses within Protection Areas
3. Source Water Protection Conclusions and Recommendations
4. Appendices

Table 1: Public Water System Information

<table>
<thead>
<tr>
<th>PWS Name</th>
<th>Avon Water Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWS Address</td>
<td>65 East Main Street</td>
</tr>
<tr>
<td>City/Town</td>
<td>Avon, Massachusetts 02322</td>
</tr>
<tr>
<td>PWS ID Number</td>
<td>4018000</td>
</tr>
<tr>
<td>Local Contact</td>
<td>John Tereault</td>
</tr>
<tr>
<td>Phone Number</td>
<td>(508)588-0414</td>
</tr>
</tbody>
</table>
What is a Protection Area?

A well’s water supply protection area is the land around the well where protection activities should be focused. Each well has a Zone I protective radius and a Zone II protection area.

Glossary

Aquifer: An underground water-bearing layer of permeable material that will yield water in a usable quantity to a well.

Hydrogeologic Barrier: An underground layer of impermeable material (i.e. clay) that resists penetration by water.

Recharge Area: The surface area that contributes water to a well.

Zone I: The area closest to a well; a 100 to 400 foot radius proportional to the well’s pumping rate. This area should be owned or controlled by the water supplier and limited to water supply activities.

Zone II: The primary recharge area for the aquifer. This area is defined by hydrogeologic studies that must be approved by DEP. Refer to the attached map to determine the land within your Zone II.

Section 1: Description of the Water System

<table>
<thead>
<tr>
<th>Zone II #: 225</th>
<th>Susceptibility: High</th>
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<tr>
<td>Well Names</td>
<td>Source IDs</td>
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<tr>
<td>Memorial Well #1</td>
<td>4018000-01G</td>
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<tr>
<td>GP Well #2</td>
<td>4018000-02G</td>
</tr>
<tr>
<td>Theater GP Well #3</td>
<td>4018000-04G</td>
</tr>
<tr>
<td>Connolly Road Well #4</td>
<td>4018000-05G</td>
</tr>
<tr>
<td>Troutbrook Wells #7 &amp; #8</td>
<td>4018000-06G</td>
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<table>
<thead>
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<th>Zone II #: 507</th>
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<tbody>
<tr>
<td>Well Names</td>
<td>Source IDs</td>
</tr>
<tr>
<td>Porter Well</td>
<td>4018000-03G</td>
</tr>
</tbody>
</table>

The Avon Water Division (Avon) maintains and operates six (6) public water supply sources. Avon’s sources are located within the Taunton River Basin. The Porter Well (03G) wellhead protection area is located entirely in Avon; the Memorial Well #1 (01G), inactive GP Well #2 (02G), Theater Well #3 (04G), Connolly Road Well #4 (05G), and Troutbrook Wells #7 & #8 (06G) wellhead protection area is located in Avon, Brockton, and Holbrook. These wells are located in aquifers with a high vulnerability to contamination due to the absence of hydrogeologic barriers (i.e. clay) that can prevent contaminant migration. Please refer to the attached map to view the boundaries of the Zone II.

For current information on monitoring results and treatment, please contact the Public Water System contact person listed above in Table 1 for a copy of the most recent Consumer Confidence Report. Drinking water monitoring reporting data are also available on the web at http://www.epa.gov/safewater/ccr1.html.

Section 2: Land Uses in the Protection Areas

The Zone IIs for Avon are primarily a mixture of forest and residential land uses, with a small portion consisting of industrial and commercial activities (refer to attached map for details). Land uses and activities that are potential sources of contamination are listed in Table 2, with further detail provided in the Table of Regulated Facilities and Table of Underground Storage Tanks in Appendix B.

Key Land Uses and Protection Issues include:

1. Activities in Zone I
2. Chemical and Hazardous Materials Storage and Use
3. Road and Maintenance Depots
4. Residential Land Uses
5. Transportation Corridors
6. Oil or Hazardous Material Contamination Sites
7. Comprehensive Wellhead Protection Planning

The overall ranking of susceptibility to contamination for the Memorial Well #1, GP Well #2, Theater GP Well #3, Connolly Road Well #4, Troutbrook Wells #7 & #8, and Porter Well is high, based on the presence of at least one high threat land use within the water supply protection areas, as seen in Table 2.
1. Activities in Zone Is – The Zone I for all of Avon’s wells is a 400 foot radius around each wellhead, except for the Troutbrook Wells #7 & #8 tubular wellfield, for which the Zone I is a 250-foot radius around each well. Massachusetts drinking water regulations (310 CMR 22.00) require public water suppliers to own the Zone I, or control the Zone I through a conservation restriction. Only water supply activities are allowed in the Zone I. However, many public water supplies were developed prior to the Department’s regulations and contain non-water supply activities such as homes and public roads. The following activities are located in the Zone Is for Avon’s wells: Memorial Well #1 (01G) and GP Well #2 (02G) contain several commercial buildings and parking for numerous cars, a local road, and residential properties; Porter Well (03G) contains residential properties, commercial buildings and parking for numerous cars, and a local road; Theater GP Well #3 (04G) contains a portion of a commercial building; Connolly Road Well #4 (05G) contains a local road and residential property; Troutbrook Wells #7 & #8 (06G) contain a very small portion of a railroad right-of-way. Rights-of-way are a potential source of contamination because of the possibility of chemical releases during track maintenance or the over-application or improper handling of herbicides used during rights-of-way maintenance.

Zone I Recommendations:
- To the extent possible, remove all non-water supply activities from the Zone Is to comply with DEP’s Zone I requirements.
- Use BMPs for the storage, use, and disposal of hazardous materials such as water supply chemicals and maintenance chemicals.
- Do not use or store pesticides, fertilizers or road salt within the Zone I.
- Keep any new non-water supply activities out of the Zone I.
- Work with the local Conservation Commission to make sure the wetland/stream resource areas are properly delineated in the field prior to the application of pesticide and that the supplier review the Yearly Operating Plan (YOP) from the railroad. These plans are approved directly by the Department of Food and Agriculture, with copies being sent to the local Conservation Commission.

2. Chemical and Hazardous Materials Storage and Use – Many large and small businesses use hazardous materials, produce...
hazardous waste products, and/or store large quantities of hazardous materials in Underground Storage Tanks (USTs)/Aboveground Storage Tanks (ASTs). Although many facilities within the watershed use best management practices (BMPs), hazardous materials and waste can be unexpectedly released through spills, leaks or improper handling or storage, and become potential sources of contamination. Hazardous materials should never be disposed of to a septic system or floor drain leading directly to the ground.

**Hazardous Materials Storage and Use Recommendations:**

- Educate local businesses on BMPs for protecting water supplies, and encourage them to use BMPs for handling, storing and disposing of hazardous waste. Distribute the fact sheet “Businesses Protect Drinking Water” available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common business issues.
- Work with local businesses to register those facilities that are unregistered generators of hazardous waste or waste oil. Partnerships between businesses, water suppliers, and communities enhance successful public drinking water protection practices.
- Educate local businesses on Massachusetts floor drain requirements. See brochure “Industrial Floor Drains” for more information.
- Continue to plan and prepare for spills by communicating with municipalities and facilities in the Ipswich River watershed, and by conducting drills.

**Hazardous Materials Storage and Use Recommendations:**

- Educate local businesses on BMPs for protecting water supplies, and encourage them to use BMPs for handling, storing and disposing of hazardous waste. Distribute the fact sheet “Businesses Protect Drinking Water” available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common business issues.
- Work with local businesses to register those facilities that are unregistered generators of hazardous waste or waste oil. Partnerships between businesses, water suppliers, and communities enhance successful public drinking water protection practices.
- Educate local businesses on Massachusetts floor drain requirements. See brochure “Industrial Floor Drains” for more information.

(Continued on page 7)
### Potential Source of Contamination vs. Actual Contamination

The activities listed in Table 2 are those that typically use, produce, or store contaminants of concern, which, if managed improperly, are potential sources of contamination (PSC).

It is important to understand that a release may never occur from the potential source of contamination provided facilities are using best management practices (BMPs). If BMPs are in place, the actual risk may be lower than the threat ranking identified in Table 2. Many potential sources of contamination are regulated at the federal, state, and/or local levels, to further reduce the risk.

#### Table 2: Land Use in the Protection Areas (Zones I and II)

For more information, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area

<table>
<thead>
<tr>
<th>Land Uses</th>
<th>Quantity</th>
<th>Threat</th>
<th>Zone II</th>
<th>Potential Contaminant Sources</th>
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<tr>
<td>Body Shops</td>
<td>3</td>
<td>H</td>
<td>225</td>
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<td>Gas Stations</td>
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<td>Leaks, spills, improper handling, or over-application of pesticides; historic embalming fluids (such as arsenic)</td>
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<td>225, 507</td>
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<td>Land Uses</td>
<td>Quantity</td>
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<td>Potential Contaminant Sources</td>
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<td>Septic Systems/Cesspools</td>
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<td>225, 507</td>
<td>Hazardous chemicals: microbial contaminants, and improper disposal</td>
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<td>2</td>
<td>M</td>
<td>225</td>
<td>Spills, leaks, or improper handling of materials stored in tanks</td>
</tr>
<tr>
<td>Oil or Hazardous Material Sites</td>
<td>10</td>
<td>--</td>
<td>225, 507</td>
<td>Tier Classified Oil or Hazardous Materials Sites are not ranked due to their site-specific character. Individual sites are identified in Appendix B.</td>
</tr>
<tr>
<td>Road and Maintenance Depots</td>
<td>2</td>
<td>M</td>
<td>507</td>
<td>Spills, leaks, or improper handling or storage of deicing materials, automotive fluids, fuel storage, and other chemicals</td>
</tr>
<tr>
<td>Schools, Colleges, and Universities</td>
<td>1</td>
<td>M</td>
<td>507</td>
<td>Spills, leaks, or improper handling or storage of fuel oil, laboratory, art, photographic, machine shop, and other chemicals</td>
</tr>
<tr>
<td>Small Quantity Hazardous Waste Generators</td>
<td>3</td>
<td>M</td>
<td>225, 507</td>
<td>Spills, leaks, or improper handling or storage of hazardous materials and waste</td>
</tr>
<tr>
<td>Stormwater Drains/Retention Basins</td>
<td>Numerous</td>
<td>L</td>
<td>225, 507</td>
<td>Debris, pet waste, and chemicals in stormwater from roads, parking lots, and lawns</td>
</tr>
<tr>
<td>Transmission Line Rights-of-Way</td>
<td>1</td>
<td>L</td>
<td>225, 507</td>
<td>Construction and corridor maintenance, over-application or improper handling of herbicides</td>
</tr>
<tr>
<td>Transportation Corridors</td>
<td>2</td>
<td>M</td>
<td>225, 507</td>
<td>Accidental leaks or spills of fuels and other hazardous materials, over-application or improper handling of pesticides</td>
</tr>
<tr>
<td>Underground Storage Tanks</td>
<td>3</td>
<td>H</td>
<td>225</td>
<td>Spills, leaks, or improper handling of stored materials</td>
</tr>
<tr>
<td>Very Small Quantity Hazardous Waste Generators</td>
<td>1</td>
<td>L</td>
<td>225, 507</td>
<td>Spills, leaks, or improper handling or storage of hazardous materials and waste</td>
</tr>
<tr>
<td>Waste Transfer/Recycling Stations</td>
<td>1</td>
<td>M</td>
<td>225</td>
<td>Improper management, seepage, and runoff of water contacting waste materials</td>
</tr>
</tbody>
</table>

**Table 2 Notes:**
1. When specific potential contaminants are not known, typical potential contaminants or activities for that type of land use are listed. Facilities within the watershed may not contain all of these potential contaminant sources, may contain other potential contaminant sources, or may use Best Management Practices to prevent contaminants from reaching drinking water supplies.
2. For more information on regulated facilities, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area information about these potential sources of contamination.
3. For information about Oil or Hazardous Materials Sites in your protection areas, refer to Appendix C: Tier Classified Oil and/or Hazardous Material Sites.

* **THREAT RANKING** - The rankings (high, moderate or low) represent the relative threat of each land use compared to other PSCs. The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated by the PSC; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.
3. Road and Maintenance Depots - Potential sources of contamination in state and municipal facilities can result from accidental dumping, spills, leaks, vehicle washing operations, or from wastewater treatment. Waste management and product storage pose the greatest threats with a wide variety of potentially harmful contaminants.

**Road and Maintenance Depots Recommendations:**
- Institute Best Management Practices - The New England Environmental Assistance Team provides municipalities in New England with information on how to comply with environmental requirements, and how to prevent pollution. For more information about this EPA sponsored program visit their website at http://www.epa.gov/region1/steward/neat/muni/index.html.
- Encourage road and maintenance depots to develop best management practices to ensure proper salt storage, proper maintenance of facilities and good housekeeping practices.
- Adequately size salt pile structure to allow for the loading and unloading of salt within the structure. Review the Department of Environmental Protection’s Drinking Water Program Guidelines On Deicing Chemical (Road Salt) Storage at http://www.state.ma.us/dep/brp/dws/files/saltgui.doc.
- Encourage proper storage of materials at these facilities. Appendix A contains a fact sheet titled *DPWs Protect Drinking Water.*

4. Residential Land Uses – Approximately 36% of the combined Zone IIs consist of residential areas, all of which are served by private septic systems. If managed improperly, activities associated with residential areas can contribute to drinking water contamination. Common potential sources of contamination include:

- **Septic Systems** – Improper disposal of household hazardous chemicals to septic systems is a potential source of contamination to the groundwater because septic systems lead to the ground. If septic systems fail or are not properly maintained they can be a potential source of microbial contamination.
- **Household Hazardous Materials** - Hazardous materials may include automotive wastes, paints, solvents, pesticides, fertilizers, and other substances. Improper use, storage, and disposal of chemical products used in homes are potential sources of contamination.
- **Heating Oil Storage** - If managed improperly, Underground and Aboveground Storage Tanks (USTs and ASTs) can be potential sources of contamination due to leaks or spills of the fuel oil they store.
- **Stormwater** – Catch basins transport stormwater from roadways and adjacent properties to the ground. As flowing stormwater travels, it picks up debris and contaminants from streets and lawns. Common potential contaminants include lawn chemicals, pet waste, and contaminants from automotive leaks, maintenance, washing, or accidents.

**Residential Land Use Recommendations:**
- Educate residents on best management practices (BMPs) for protecting water supplies. Distribute the fact sheet “Residents Protect Drinking Water” available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common residential issues.
- Work with planners to control new residential developments in the water supply protection areas.
- Promote BMPs for stormwater management and pollution controls.

5. Transportation Corridors - Transportation corridors and other paved and unpaved local roads cross through the water supply protection areas. Spills from vehicular accidents are a major concern. In addition, roadway construction, maintenance, and typical highway use can all be potential sources of contamination.

---

**What is a Zone III?**
A Zone III (the secondary recharge area) is the land beyond the Zone II from which surface and ground water drain to the Zone II and is often coincident with a watershed boundary. The Zone III is defined as a secondary recharge area for one or both of the following reasons:

1. The low permeability of underground water bearing materials in this area significantly reduces the rate of groundwater and potential contaminant flow into the Zone II.
2. The groundwater in this area discharges to a surface water feature such as a river, rather than discharging directly into the aquifer.

The land uses within the Zone III are assessed only for sources that are shown to be groundwater under the direct influence of surface water.

**Benefits of Source Protection**
Source Protection helps protect public health and is also good for fiscal fitness:
- Protects drinking water quality at the source
- Reduces monitoring costs through the DEP Waiver Program
- Treatment can be reduced or avoided entirely, saving treatment costs
- Prevents costly contamination clean-up
- Preventing contamination saves costs on water purchases, and expensive new source development

Contact your regional DEP office for more information on Source Protection and the Waiver Program.
Accidents can lead to spills of gasoline and other potentially dangerous transported chemicals. Roadways are frequent sites for illegal dumping of hazardous or other potentially harmful wastes. De-icing salt, automotive chemicals and other debris on roads are picked up by stormwater and wash into catch basins.

**Transportation Corridor Recommendations:**
- Wherever possible, ensure that drains discharge stormwater outside of the Zone I.
- Identify stormwater drainage systems along transportation corridors. If maps aren’t yet available, work with state and local officials to investigate mapping options such as the upcoming Phase II Stormwater Rule requiring some communities to complete stormwater mapping.
- Work with local emergency response teams to ensure that any spills within the Zone IIs can be effectively contained. Review storm drainage maps with emergency response teams.
- Work with the Town and State to best manage stormwater in the Zone IIs. Best management practices include street sweeping, vegetative swales, and regular catch basin inspection, cleaning and maintenance.

6. **Presence of Oil or Hazardous Material Contamination Sites** – The Zone IIs for Avon’s wells contain DEP Tier Classified Oil and/or Hazardous Material Release Sites indicated on the map as Release Tracking Numbers 4-0000048, 4-0000318, 4-0000421, 4-0012357, 4-0015693, 4-0015811, 4-0016138, 4-0016152, 4-0016198, 4-0016272, 4-0017002, and 4-0017394. Refer to the attached maps and Appendix B for more information on these sites.

**Oil or Hazardous Material Contamination Sites Recommendation:**
- Monitor progress on any ongoing remedial action conducted for the known oil or contamination sites.

7. **Protection Planning** – Protection planning protects drinking water by managing the land area that supplies water to a well or reservoir. Currently, the Town of Avon does not have water supply protection controls. A Wellhead Protection Plan coordinates community efforts, identifies protection strategies, establishes a timeframe for implementation, and provides a forum for public participation. There are resources available to help communities develop a plan for protecting drinking water supply wells.

**Protection Planning Recommendations:**
- Coordinate efforts with local officials to compare local wellhead protection controls with current MA Wellhead Protection Regulations 310 CMR 22.21 (2). If there are no local controls or they do not meet the current regulations, adopt controls that meet 310 CMR 22.21(2). For more information on DEP land use controls see http://mass.gov/dep/brp/dws/protect.htm.
- Coordinate efforts with the Towns of Brockton and Holbrook to include Avon’s source protection areas in local wellhead protection controls. For more information on DEP land use controls see http://mass.gov/dep/brp/dws/protect.htm.
- If local controls do not regulate floor drains, be sure to include floor drain controls that meet 310 CMR 22.21(2).
- Work with town boards to review and provide recommendations on proposed development within your water supply protection areas. To obtain information on build-out analyses for the town, see the Executive Office of Environmental Affairs’ community preservation web site, http://commpres.env.state.ma.us/.

Other land uses and activities within the Zone II are included in Table 2. Refer to Table 2 and Appendix A for more information about these land uses.

Identifying potential sources of contamination is an important initial step in protecting your drinking water sources. Further local investigation will provide more in-depth information and may identify new land uses and activities that are
### Table 3: Current Protection and Recommendations

<table>
<thead>
<tr>
<th>Protection Measures</th>
<th>Status</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Zone I</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the Public Water Supplier (PWS) own or control the entire Zone I?</td>
<td>NO</td>
<td>To the extent possible, remove prohibited activities in Zone I to comply with DEP’s Zone I requirements. Investigate options for gaining ownership or control of the Zone I.</td>
</tr>
<tr>
<td>Are the Zone Is posted with “Public Drinking Water Supply” Signs?</td>
<td>YES</td>
<td>Additional economical signs are available from the Northeast Rural Water Association (802) 660-4988.</td>
</tr>
<tr>
<td>Are the Zone Is regularly inspected?</td>
<td>YES</td>
<td>Continue daily inspections of drinking water protection areas.</td>
</tr>
<tr>
<td>Are water supply-related activities the only activities within the Zone I?</td>
<td>NO</td>
<td>Monitor prohibited activities in Zone I, and investigate options for removing these activities.</td>
</tr>
<tr>
<td><strong>Municipal Controls (Zoning Bylaws, Health Regulations, and General Bylaws)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the municipality have local controls that meet Wellhead Protection Regulations 310 CMR 22.21(2)?</td>
<td>NO</td>
<td>Work with the Planning Board and the Selectmen to develop bylaws that meet land use controls required by 310 CMR 22.21(2). Refer to <a href="http://www.state.ma.us/dep/brp/dws/">www.state.ma.us/dep/brp/dws/</a> for model bylaws and health regulations, and current regulations.</td>
</tr>
<tr>
<td>Do neighboring communities protect the water supply protection areas extending into their communities?</td>
<td>NO</td>
<td>Work with the towns of Brockton and Holbrook to encourage them to adopt local controls that include Dedham-Westwood’s wellhead protection areas.</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the PWS have a wellhead protection plan?</td>
<td>Updating</td>
<td>The Town of Avon is in the process of developing a comprehensive water management plan that will address water/wastewater issues. Refer to “Developing a Local Wellhead Protection Plan” available at: <a href="http://www.state.ma.us/dep/brp/dws/">www.state.ma.us/dep/brp/dws/</a>.</td>
</tr>
<tr>
<td>Does the PWS have a formal “Emergency Response Plan” to deal with spills or other emergencies?</td>
<td>YES</td>
<td>Supplement plan by developing a joint emergency response plan with fire department, Board of Health, DPW, and local and state emergency officials. Coordinate emergency response drills with local teams.</td>
</tr>
<tr>
<td>Does the municipality have a wellhead protection committee?</td>
<td>YES</td>
<td>Board of Water Commissioners and task force comprised of Fire Dept., Water Dept., Board of Health, and Building Inspector</td>
</tr>
<tr>
<td>Does the Board of Health conduct inspections of commercial and industrial activities?</td>
<td>YES</td>
<td>For more guidance see “Hazardous Materials Management: A Community’s Guide” at <a href="http://www.state.ma.us/dep/brp/dws/files/hazmat.doc">www.state.ma.us/dep/brp/dws/files/hazmat.doc</a></td>
</tr>
<tr>
<td>Does the PWS provide watershed protection education?</td>
<td>YES</td>
<td>Increase residential outreach through bill stuffers and coordination with local groups. Aim additional efforts at commercial/industrial uses within the Zone II.</td>
</tr>
</tbody>
</table>
potential sources of contamination. Once potential sources of contamination are identified, specific recommendations like those below should be used to better protect your water supply.

Section 3: Source Water Protection Conclusions and Recommendations

Current Land Uses and Source Protection:
As with many water supply protection areas, the system Zone IIs contain potential sources of contamination. However, source protection measures reduce the risk of actual contamination, as illustrated in Figure 2.

Avon is commended for taking an active role in promoting source protection measures in the Water Supply Protection Areas through:
- Conducting weekly inspections of the Zone IIs and reporting new activities that may impact wells
- Weekly inspections are also used to check on existing activities, especially those sites that may be potential sources of contamination
- Providing wellhead protection information through municipal newsletter
- Developing an overlay district for water supply protection

Source Protection Recommendations:
To better protect the sources for the future:
- Continue to inspect the Zone I regularly, and when feasible, remove any non-water supply activities.
- Continue to educate residents on ways they can help you to protect drinking water sources.
- Work with emergency response teams to ensure that they are aware of the stormwater drainage in your Zone II and to cooperate on responding to spills or accidents.
- Partner with local businesses to ensure the proper storage, handling, and disposal of hazardous materials.
- Develop and implement a Wellhead Protection Plan.

Conclusions:
These recommendations are only part of your ongoing local drinking water source protection. Additional source protection recommendations are listed in Table 3, the Key Issues above, and Appendix A.

DEP staff, informational documents, and resources are available to help you build on this SWAP report as you continue to improve drinking water protection in your community.

Grants and loans are available through the Drinking Water State Revolving Loan Fund, the Clean Water State Revolving Fund, and other sources. For more information on grants and loans, visit the Bureau of Resource Protection’s Municipal Services web site at: http://mass.gov/dep/brp/mf/mfpubs.htm.

The assessment and protection recommendations in this SWAP report are provided as a tool to encourage community discussion, support ongoing source protection efforts, and help set local drinking water protection priorities. Citizens and community officials should use this SWAP report to spur discussion of local drinking water protection measures. The water supplier should supplement this SWAP report with local information on potential sources of contamination and land uses. Local information should be maintained and updated periodically to reflect land use changes in the Zone IIs. Use this information to set priorities, target inspections, focus education efforts, and to develop a long-term drinking water source protection plan.

Section 4: Appendices

A. Protection Recommendations
B. Regulated Facilities within the Water Supply Protection Area
C. Table of Tier Classified Oil and/or Hazardous Material Sites within the Water Supply Protection Areas
D. Additional Documents on Source Protection

Additional Documents:
To help with source protection efforts, more information is available by request or online at mass.gov/dep/brp/dws including:
1. Water Supply Protection Guidance Materials such as model regulations, Best Management Practice information, and general water supply protection information.
2. MA DEP SWAP Strategy
3. Land Use Pollution Potential Matrix
4. Draft Land/Associated Contaminants Matrix

For More Information
Contact Anita Wolovick in DEP’s Wilmington Office at (978) 661-7768 for more information and assistance on improving current protection measures.

Copies of this report have been provided to the public water supplier, board of health, and the town.
APPENDIX B – Table of Tier Classified Oil and/or Hazardous Material Sites within Avon’s Water Supply Protection Areas

DEP’s datalayer depicting oil and/or hazardous material (OHM) sites is a statewide point data set that contains the approximate location of known sources of contamination that have been both reported and classified under Chapter 21E of the Massachusetts General Laws. Location types presented in the layer include the approximate center of the site, the center of the building on the property where the release occurred, the source of contamination, or the location of an on-site monitoring well. Although this assessment identifies OHM sites near the source of your drinking water, the risks to the source posed by each site may be different. The kind of contaminant and the local geology may have an effect on whether the site poses an actual or potential threat to the source.

The DEP’s Chapter 21E program relies on licensed site professionals (LSPs) to oversee cleanups at most sites, while the DEP’s Bureau of Waste Site Cleanup (BWSC) program retains oversight at the most serious sites. This privatized program obliges potentially responsible parties and LSPs to comply with DEP regulations (the Massachusetts Contingency Plan – MCP), which require that sites within drinking water source protection areas be cleaned up to drinking water standards.

For more information about the state’s OHM site cleanup process to which these sites are subject and how this complements the drinking water protection program, please visit the BWSC web page at http://www.state.ma.us/dep/bwsc. You may obtain site-specific information two ways: by using the BWSC Searchable Sites database at http://www.state.ma.us/dep/bwsc/sitelist.htm or you may visit the DEP regional office and review the site file. These files contain more detailed information, including cleanup status, site history, contamination levels, maps, correspondence and investigation reports, however you must call the regional office in order to schedule an appointment to view the file.

The table below contains the list of Tier Classified oil and/or Hazardous Material Release Sites that are located within your drinking water source protection area.

Table 1: Bureau of Waste Site Cleanup Tier Classified Oil and/or Hazardous Material Release Sites (Chapter 21E Sites) - Listed by Release Tracking Number (RTN).

<table>
<thead>
<tr>
<th>RTN</th>
<th>Release Site Address</th>
<th>Town</th>
<th>Contaminant Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-0017002</td>
<td>3-5 and 7 East Main St.</td>
<td>Avon</td>
<td>Hazardous Material</td>
</tr>
<tr>
<td>4-0016198</td>
<td>3-5 East Main St.</td>
<td>Avon</td>
<td>Hazardous Material</td>
</tr>
<tr>
<td>4-0015811</td>
<td>57 Littlefield St.</td>
<td>Avon</td>
<td>Oil And Hazardous Material</td>
</tr>
<tr>
<td>4-0000421</td>
<td>100 Ladge Dr.</td>
<td>Avon</td>
<td>Oil And Hazardous Material</td>
</tr>
<tr>
<td>4-0017394</td>
<td>100 Ladge Dr.</td>
<td>Avon</td>
<td>Hazardous Material</td>
</tr>
<tr>
<td>4-0016138</td>
<td>138 Wilder St.</td>
<td>Brockton</td>
<td>Oil</td>
</tr>
<tr>
<td>4-0016152</td>
<td>138 Wilder St.</td>
<td>Brockton</td>
<td>Hazardous Material</td>
</tr>
<tr>
<td>4-0016272</td>
<td>138 Wilder St.</td>
<td>Brockton</td>
<td>Hazardous Material</td>
</tr>
<tr>
<td>4-0000048</td>
<td>1093 Montello St.</td>
<td>Brockton</td>
<td>--</td>
</tr>
<tr>
<td>4-0015833</td>
<td>75 Bodwell St.</td>
<td>Avon</td>
<td>Oil</td>
</tr>
<tr>
<td>3-0014978</td>
<td>55 High St and 99 Spring St.</td>
<td>Holbrook</td>
<td>Oil And Hazardous Material</td>
</tr>
<tr>
<td>4-0011748</td>
<td>1126 North Montello St.</td>
<td>Brockton</td>
<td>Oil</td>
</tr>
</tbody>
</table>

For more location information, please see the attached map. The map lists the release sites by Release Tracking Number (RTN).
Appendix C
Excerpts from Taunton River Water Quality Assessment Report
TROUT BROOK (SEGMENT MA62-07)
Location: Source northeast of Argyle Avenue and west of Conrail Line, Avon to the confluence with the Salisbury Brook forming the Salisbury Plain River, Brockton.
Segment Length: 3.4 miles
Classification: Class B, Warm Water Fishery

The drainage area of this segment is approximately 6.9 square miles. Land-use estimates (top three) for the subwatershed:
- Residential..... 59.2%
- Forest ............ 13.9%
- Open land..... 12.2%

The impervious cover area for this subwatershed is 25.6%.

This segment is on the Massachusetts Year 2002 Integrated List of Waters – Category 5 for not meeting water quality criteria for siltation, organic enrichment/low DO, and pathogens (MassDEP 2003).

WMA WATER WITHDRAWAL SUMMARY (APPENDIX G, TABLE G5)

<table>
<thead>
<tr>
<th>Facility</th>
<th>WMA Permit Number</th>
<th>WMA Registration Number</th>
<th>Source (G = ground)</th>
<th>Authorized Withdrawal (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avon Water Department</td>
<td>9P42501801</td>
<td>42501801</td>
<td>4018000-01G to 4018000-06G</td>
<td>0.45 reg, 0.16 perm, Total = 0.61</td>
</tr>
</tbody>
</table>

NPDES WASTEWATER DISCHARGE SUMMARY (APPENDIX G, TABLE G3)
Avon Custom Mixing Services, Inc., a manufacturer of elastometric compounds (rubber products), is authorized to discharge from its facility, Division of Chase and Sons, to Trout Brook. Although the NPDES permit #MA0026883 was issued November 2001, the company appealed the permit. Their permit appeal was denied in August 2002. Under the conditions of their permit, the facility is authorized to discharge 0.0015 MGD of treated sanitary effluent from its wastewater treatment facility and 0.15 MGD of combined non-contact cooling water and stormwater discharge from Outfall 002. Whole effluent toxicity limits are C-NOEC>21% and LC50>100% with a monitoring frequency of four times a year using both Ceriodaphnia dubia and Pimephales promelas. According to MassDEP Northeast Regional Office, the facility has occasional violations of their fecal coliform bacteria and ammonia limits (Ahsan 2005).

The former Hybripac Inc. in Avon was issued an emergency exclusion for their groundwater remediation project in 1997, which is no longer in effect (Pellerin 1997).

USE ASSESSMENT
AQUATIC LIFE
Habitat and Flow
ESS conducted instream habitat evaluations at four sites along Trout Brook in June/July 2002. The stations (upstream to downstream) were located at Studley Avenue, off of North Montello Street, Brockton (Station TB4); near East Ashland Street, Brockton (Station TB2); near Court Street, Brockton (Station TB3); and near Crescent Street (Route 27), Brockton (Station TB1). The habitat assessment scores were generally low ranging from 86 to 114/200. Channel flow status was the only habitat variable that

consistently scored in the suboptimal range at all four sites evaluated. Instream habitat in this brook was limited as a direct result of development, poor instream cover, significant channel alteration, some sediment deposition, moderately unstable banks and little to no riparian zones (ESS 2003).

**Toxicity**

**Effluent**

One modified acute and chronic whole effluent toxicity test was conducted on the Avon Custom Mixing, Inc. treated sanitary effluent (Outfall #001) using both *Ceriodaphnia dubia* and *Pimephales promelas*. No acute or chronic toxicity to either test organism was detected in the August 2004 test. No other whole effluent toxicity testing reports have been submitted to MassDEP.

**Chemistry – water**

Between June and November 2002, the following four stations were sampled by ESS along this segment of Trout Brook as part of their NPS study (ESS 2003).

- TB4 – Studley Avenue, off of North Montello Street, Brockton (n=3 sampling events).
- TB2 – East Ashland Street, Brockton (n=5 sampling events).
- TB3 – Court Street, Brockton (n=3 sampling events).
- TB1 – Crescent Street (Route 27), Brockton (n=5 sampling events).

Results of these surveys are summarized below.

**Dissolved Oxygen and % Saturation**

The concentration of dissolved oxygen at the four stations monitored (day surveys only) ranged from 2.6 to 7.9 mg/L with eight of the fourteen measurements <5.0 mg/L. Percent saturation ranged from 30.8 to 85.9 and 11 of the 14 measurements were less than 60% saturation.

**Temperature**

The highest temperature measured in Trout Brook was 28.8°C (Station TB4) on the 1 August 2002.

**pH**

The pH in Trout Brook ranged from 6.0 to 7.8 SU at the four stations monitored. Only three of the 16 measurements were less than 6.5 SU.

**Specific Conductance**

Specific conductance ranged from 134.4 to 481.0 µmhos/cm (n=16).

**TSS**

The TSS concentrations ranged from 2.0 to 27 mg/L at the four stations sampled in Trout Brook. It should be noted that the highest concentrations (23 to 27 mg/L) were measured in the lower reach of the brook near Court Street and Crescent Street (Stations TB3 and TB1).

**TKN**

The concentration of TKN ranged from 0.3 to 2.6 mg/L (n=16).

**Total Phosphorus**

Total phosphorus concentrations ranged from 0.04 to 0.20 mg/L, however, it should be noted that the highest concentrations were consistently measured in the lower reach of the brook near Court Street and Crescent Street (stations TB3 and TB1). Only one of the 16 measurements was <0.05 mg/L.

The *Aquatic Life Use* is not assessed for Trout Brook as a result of the lack of instream biological data (response type indicators of in-stream water quality conditions). This use in this urbanized subwatershed is identified with an Alert Status because of habitat degradation, low dissolved oxygen/saturation and elevated total phosphorus concentrations.
**PRIMARY AND SECONDARY CONTACT RECREATION AND AESTHETICS**

Fecal coliform and *E. coli* samples were collected at four sampling stations in Trout Brook between June and November 2002 during both dry and wet weather events. From upstream to downstream these stations are summarized as follows (ESS 2003):
- TB4 – Studley Avenue, off of North Montello Street, Brockton
- TB2 – East Ashland Street, Brockton
- TB3 – Court Street, Brockton
- TB1 – Crescent Street (Route 27), Brockton

Samples were also collected from three tributaries to Trout Brook (Stations SEB1 and SEB2 on Searles Brook, Station MAB1 on Malfardar Brook, and Stations CB1 and CB2 on Cary Brook).

<table>
<thead>
<tr>
<th>Station</th>
<th>Fecal Coliform data range (cfu/100 mL)</th>
<th>Geometric Mean (cfu/100 mL)</th>
<th><em>E. coli</em> bacteria data range (cfu/100 mL)</th>
<th>Geometric Mean (cfu/100 mL)</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB4</td>
<td>1,100 – 9,600*</td>
<td>NA</td>
<td>1,000 – 8,400</td>
<td>NA</td>
<td>3</td>
</tr>
<tr>
<td>TB2</td>
<td>120 and 16,000*</td>
<td>1,829</td>
<td>70 and 10,000</td>
<td>1,344</td>
<td>5</td>
</tr>
<tr>
<td>TB3</td>
<td>4,200 – 48,000*</td>
<td>NA</td>
<td>4,000 – 22,000</td>
<td>NA</td>
<td>3</td>
</tr>
<tr>
<td>TB1</td>
<td>1,200 - 64,000*</td>
<td>8,020</td>
<td>1,200 - 55,000</td>
<td>6,643</td>
<td>5</td>
</tr>
</tbody>
</table>

*Both samples collected during the primary contact season exceeded 2,000 cfu/100 mL.*

*60% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.*

*All of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.*

*80% of the samples collected during the primary contact season exceeded 2,000 cfu/100 mL.*

NB: Elevated bacteria counts in Trout Brook are representative of both dry and wet weather sampling conditions. Elevated bacteria counts were also documented in the three tributaries (ESS 2003).

No objectionable oils, odors, or other objectionable conditions were identified by ESS at the two most upstream sampling locations in Trout Brook (Station TB4) near Studley Avenue, off of North Montello Street, and near East Ashland Street, Brockton (Station TB2). Further downstream, however, near Court Street, Brockton (Station TB3), sewage and chemical odors were noted and the water column was described as opaque. No objectionable conditions (odors, oils, other deposits) were noted by ESS at the most downstream sampling location in Trout Brook near Crescent Street (Route 27), Brockton (Station TB1) (ESS 2003).

The *Primary and Secondary Contact Recreational* uses are assessed as impaired because of elevated bacteria counts. The *Aesthetics Use* is assessed as support upstream from East Ashland Street (upper 2.1 mile reach) but is assessed as impaired downstream from East Ashland Street (lower 1.3 mile reach) because of objectionable conditions reported by ESS.
### Trout Brook (MA62-07) Summary Table

<table>
<thead>
<tr>
<th>Designated Uses</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Life</td>
<td>NOT ASSESSED*</td>
</tr>
<tr>
<td>Fish Consumption</td>
<td>NOT ASSESSED</td>
</tr>
<tr>
<td><strong>Primary Contact</strong></td>
<td>IMPAIRED</td>
</tr>
<tr>
<td>Cause: Fecal coliform bacteria</td>
<td></td>
</tr>
<tr>
<td>Source: Unknown</td>
<td>(Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))</td>
</tr>
<tr>
<td><strong>Secondary Contact</strong></td>
<td>IMPAIRED</td>
</tr>
<tr>
<td>Cause: Fecal coliform bacteria</td>
<td></td>
</tr>
<tr>
<td>Source: Unknown</td>
<td>(Suspected Sources: Discharges from municipal separate storm sewer systems, illicit connections/hookups to storm sewers and municipal (urbanized high density area))</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>SUPPORT upper 2.1 mile reach</td>
</tr>
<tr>
<td></td>
<td>IMPAIRED lower 1.3 mile reach</td>
</tr>
<tr>
<td>Causes: Visual turbidity and total suspended solids</td>
<td></td>
</tr>
<tr>
<td>Sources: Unknown</td>
<td>(Suspected Source: Illicit connections/hookups to storm sewers)</td>
</tr>
</tbody>
</table>

* Alert Status issues identified, see details in use assessment

**RECOMMENDATIONS**

Review and implement appropriate recommendations from the ESS Nonpoint Source Pollution Assessment Report and Management Plan (ESS 2003).

Conduct monitoring (biological, habitat and water quality) to evaluate impacts to Trout Brook from potential sources of pollution and to better assess the status of the *Aquatic Life Use*.

Continue to conduct bacteria sampling to evaluate effectiveness of nonpoint source pollution control activities and other actions (i.e., illicit connection identification/remediation) and to assess the status of the *Primary and Secondary Contact Recreational uses*. 
Appendix D
Outfall Reconnaissance Inventory/Sample Collection Field Sheets
Dry Weather Outfall Reconnaissance
Inventory/Sample Collection Field Sheets
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: 

Outfall ID: UNK-1 LOCATION: End of Polygon Dr

Today's date: 8/22/17 Time (Military): 10:50

INVESTIGATORS: 886

TEMPERATURE (°F): 77 RAINFALL (IN.): LAST 72 HOURS: 0 LAST 24 HOURS: 0

Photo # and short description: Photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries): 
☐ Residential 
☐ Commercial/Institutional
☐ Open Space - Field
☐ Open Space - Wooded

Other:

Notes (e.g., origin of outfall, if known):

potentially culverted intermittent stream connecting to UNK-2

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCIP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>☐</td>
<td></td>
<td>24&quot;</td>
<td>☐ No</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>☐ Partially</td>
</tr>
<tr>
<td>☐</td>
<td>Box</td>
<td></td>
<td>☐ Fully</td>
</tr>
<tr>
<td>☐</td>
<td>Triple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION: ☐ Good ☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal)

☐ Other

OUTLET STRUCTURE: ☐ Headwall ☐ Riprap ☐ Flared End ☐ No Outfall Protection ☐ Other

In-Stream (applicable when collecting samples): ☐ Yes ☐ No

Maintenance/Repair Needed? ☐ No ☐ Yes (See Section 8 for more description)

Flow Present? ☐ Yes ☐ No

Flow Description: ☐ Trickle ☐ Moderate ☐ Substantial

If No, Skip to Section 5

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow VOLUME</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
**Outfall Reconnaissance Inventory Field Sheet**

**Section 4: Physical Indicators for Flowing Outfalls Only**

Are Any Physical Indicators Present in the flow? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>☐</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>☐</td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>☐</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables</td>
<td>☐</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible Suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, Suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

**Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls**

Are physical indicators that are not related to flow present? ☑ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>☐</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam</td>
<td>Heavy sedimentation deposits □ Other:</td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>☐</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>☐</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td>☐</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Flow Quality</td>
<td>☐</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>☑ Brown □ Orange □ Green</td>
<td>Other:</td>
<td>Slime, algae, algae growth</td>
</tr>
</tbody>
</table>

**Section 6: Overall Outfall Characterization as an Illicit Discharge**

☑ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

**Section 7: Data Collection**

1. **Sample for the Lab?**
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD₅ □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia

2. If yes, collected from:
   □ Flow □ Pool

3. Intermittent flow trap recommended?
   □ Yes □ No

**Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs?)**

**NONE**
**OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET**

### Section 1: Background Data

- **Subwatershed:**
- **Outfall ID:** CF 106
- **Location:** End of Eugen Dr

**Today’s date:** 8/20/17

**Investigators:**

- **Temperature (°F):** 77
- **Rainfall (in.):** Last 72 Hours: 0
- **Time (Military):** 10:40

**Photo #s and short description:** Photo taken

**Land Use in Drainage Area (Check all that apply):**
- [ ] Industrial (Known Industries):________
- [x] Residential
- [ ] Open Space – Field
- [ ] Open Space – Wooded
- [ ] Commercial/Institutional
- [ ] Other:________

**Notes (e.g., origin of outfall, if known):**

### Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>8&quot;</td>
<td>In Water:</td>
</tr>
<tr>
<td>D/I/Cl</td>
<td>Box</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td></td>
<td>Partially</td>
</tr>
</tbody>
</table>

**PIPE CONDITION:**
- [ ] Good
- [ ] Cracked
- [ ] Clogged with Debris
- [ ] Crushed
- [ ] Deteriorated (concrete)
- [ ] Corroded (metal)
- [ ] Other

**OUTLET STRUCTURE:**
- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [ ] No Outfall Protection
- [ ] Other

**In-Stream (applicable when collecting samples):**
- [ ] Yes
- [ ] No

**Maintenance/Repair Needed:**
- [ ] Yes
- [ ] No

**Flow Present?**
- [ ] Yes
- [ ] No

**Flow Description:**
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial

If No, Skip to Section 5

### Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
</tr>
<tr>
<td>Time to Fill</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 USHs/cm)</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH₃) (≥ 0.5 mg/l)</td>
<td></td>
</tr>
<tr>
<td>Chlorine (≥ Reporting Limit)</td>
<td></td>
</tr>
</tbody>
</table>

**EQUIPMENT**
- [ ] Bottle
- [ ] Watch with second hand
- [ ] YSI Meter or Thermometer
- [ ] YSI Meter
- [ ] YSI Meter
- [ ] YSI Meter
- [ ] MBAS Test Kit (CHEMetrics K-9400)
- [ ] Test Strips
- [ ] Hach Pocket Colorimeter II
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow?  □ Yes  □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td>□ 1 – Faint</td>
</tr>
<tr>
<td>COLOR</td>
<td>□</td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness</td>
</tr>
<tr>
<td>FLOATABLES (Does Not Include Trash!!)</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present?  □ Yes  □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILLICIT DISCHARGE
□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. SAMPLE FOR THE LAB?
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD,
   □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   □ Yes – Chlorine □ No
2. If yes, collected from:
   □ Flow □ Pool
3. Intermittent flow trap recommended?
   □ Yes □ No

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure remains)? □ NONE
Section 1: Background Data

<table>
<thead>
<tr>
<th>SUBWATERSHED:</th>
<th>Outfall ID:</th>
<th>LOCATION:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Today's date:</th>
<th>Time (Military):</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/20/17</td>
<td>1130</td>
</tr>
</tbody>
</table>

| INVESTIGATORS: | |
|----------------|-----------------
| 8/20/17        | 1130             |

<table>
<thead>
<tr>
<th>TEMPERATURE (°F):</th>
<th>RAINFALL (IN.):</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LAST 72 HOURS:</th>
<th>LAST 24 HOURS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Photo #s and short description: *photo taken*

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial (Known Industries):
- ☑ Residential
- ☐ Commercial/Institutional
- ☐ Open Space – Field
- ☐ Open Space – Wooded
- ☐ Other: ______________________________________

Notes (e.g., origin of outfall, if known):

> potentially diverted stream connecting to WW-1

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions: 24</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>SLOPE (DEGREES)</td>
<td></td>
</tr>
<tr>
<td>DI/Cl</td>
<td>Box</td>
<td>Flat</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION

- ☑ Good
- ☐ Cracked
- ☐ Clogged with Debris
- ☐ Crushed
- ☐ Deteriorated (concrete)
- ☐ Corroded (metal)
- ☐ Other

OUTLET STRUCTURE

- ☐ Headwall
- ☑ Riprap
- ☐ Flared End
- ☐ No Outfall Protection
- ☐ Other

In-Stream (applicable when collecting samples)

- ☑ Yes
- ☐ No

Maintenance/Repair Needed?

- ☑ Yes
- ☐ No

(See Section 8 for more description)

Flow Present?

- ☑ Yes
- ☐ No

Flow Description

- ☑ Trickle
- ☑ Moderate
- ☐ Substantial

(If present)

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
<td>Bottle</td>
</tr>
<tr>
<td>VOLUME</td>
<td></td>
<td>Liter</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td>pph</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
# Outfall Reconnaissance Inventory Field Sheet

### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td>Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>2 – Easily detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>3 – Noticeable from a distance</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td>Clear □ Brown □ Gray □ Yellow</td>
<td>1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clear □ Brown □ Gray □ Yellow</td>
<td>2 – Clearly visible in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clear □ Brown □ Gray □ Yellow</td>
<td>3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td>See severity</td>
<td>1 – Slight cloudiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See severity</td>
<td>2 – Cloudy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See severity</td>
<td>3 – Opaque</td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!</td>
<td></td>
<td>Sewage (Toilet Paper, etc.) □ Suds</td>
<td>1 – Few/slight; origin not obvious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sewage (Toilet Paper, etc.) □ Suds</td>
<td>2 – Some; indications of origin (e.g., possible suds or oil sheen)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sewage (Toilet Paper, etc.) □ Suds</td>
<td>3 – Some; origin clear (e.g., obvious oil sheen, masts, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>□</td>
<td>None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>□</td>
<td>Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td>□</td>
<td>Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>Brown □ Orange □ Green □ Other</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

### Section 7: Data Collection

1. **SAMPLE FOR THE LAB?**
   - Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD₅ □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   - Yes – Chlorine □ No

2. If yes, collected from:
   - Flow □ Pool

3. Intermittent flow trap recommended?
   - Yes □ No

### Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure remains)?

*Note*
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: [Blank]

Outfall ID: [Blank] Location: School Sp

Today's Date: 8/22/17 Time (Military): 12:21

INVESTIGATORS: [Blank]

TEMPERATURE (°F): 84

RAINFALL (IN.): 0

LAST 72 HOURS: 0

LAST 24 HOURS: 0

Photo #s and short description: [Blank]

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries):

☐ Residential

☐ Commercial/Institutional

Other: [Blank]

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Single</td>
<td>Diameter/Dimensions: 24&quot;</td>
<td>In Water: ☑ No</td>
</tr>
</tbody>
</table>
| PVC      | Elliptical | ☑ Double | Partially
| DD/Cl    | Box   | ☑ Triple | Fully |
| Other:   | Other: | ☑ Other: [Blank] | |

PIPE CONDITION:

☐ Good ☑ Cracked ☑ Clogged with Debris ☐ Crushed ☑ Deteriorated (concrete) ☑ Corroded (metal)

☐ Other

OUTLET STRUCTURE:

☐ Headwall ☑ Riprap ☑ Flared End ☑ No Outfall Protection ☑ Other

In-Stream (applicable when collecting samples):

☐ Yes ☑ No Maintenance/Repair Needed?: ☑ No ☑ Yes (See Section 8 for more description)

Flow Present?: ☑ Yes ☑ No If No, Skip to Section 3

Flow Description:

☐ Trickle ☑ Moderate ☑ Substantial (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow VOLUME</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>PH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEmetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
### Outfall Reconnaissance Inventory Field Sheet

#### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>☐</td>
<td>☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas</td>
<td>☐ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ Sulfide ☐ Other:</td>
<td>☐ 2 – Easily detected</td>
</tr>
<tr>
<td>Color</td>
<td>☐</td>
<td>☐ Clear ☐ Brown ☐ Gray ☐ Yellow</td>
<td>☐ 1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>☐ Green ☐ Orange ☐ Red ☐ Other:</td>
<td>☐ 2 – Clearly visible in sample bottle</td>
</tr>
<tr>
<td>Turbidity</td>
<td>☐</td>
<td>See severity</td>
<td>☐ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Floatables</td>
<td>☐</td>
<td>☐ Sewage (Toilet Paper, etc.) ☐ Suds-</td>
<td>☐ 1 – Slight cloudiness</td>
</tr>
<tr>
<td>- Does Not Include Trash!!</td>
<td></td>
<td>☐ Petroleum (oil sheen) ☐ Other:</td>
<td>☐ 2 – Cloudy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>☐ 3 – Opaque</td>
</tr>
</tbody>
</table>

#### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>☐</td>
<td>☐ None ☐ Grease/Oil ☐ Paper/Trash ☐ Foam</td>
<td>Heavy sedimentation deposits ☐ Other</td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>☐</td>
<td>☐ Little or No Distress ☐ Moderate Distress ☐ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>☐</td>
<td>☐ Excessive ☐ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td>☐</td>
<td>☐ Little or No Erosion ☐ Small Areas of Erosion ☐ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>☐</td>
<td>☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen</td>
<td>☐ Excessive Algae ☐ Other:</td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>☐</td>
<td>☐ Brown ☐ Orange ☐ Green ☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>

#### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

#### Section 7: Data Collection

1. **Sample for the Lab?**
   - Yes – E. Coli ☐ Yes – Fecal Coliform ☐ Yes – TSS ☐ Yes – BOD₅ ☐ Yes – Total Phosphorus ☐ Yes – Surfactants ☐ Yes – Ammonia
   - Yes – Chlorine ☐ No
2. If yes, collected from: ☐ Flow ☐ Pool
3. Intermittent flow trap recommended? ☐ Yes ☐ No

#### Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

- Sediment/debris plants to be removed

---

Note: The image contains a table that outlines various indicators for flow and non-flowing outfalls, along with checkboxes for each, and spaces for comments. The text is intended to be read naturally, with handwritten notes added in some areas.
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

**SUBWATERSHED:**

Today's date: **8/22/17**

Outfall ID: **Unk-1**

Location: **Sehoo St**

**INVESTIGATORS:**

Temperature (°F): **84**

Rainfall (in.): Last 72 Hours: **0**

Photo # and short description: **Photo taken**

Land Use in Drainage Area (Check all that apply):

- [ ] Industrial (Known Industries):
- [X] Residential
- [ ] Commercial/Institutional

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] RCP</td>
<td>[ ] Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>[ ] PVC</td>
<td>[ ] Elliptical</td>
<td></td>
<td>[X] No</td>
</tr>
<tr>
<td>[ ] DI/CI</td>
<td>[ ] Box</td>
<td></td>
<td>[ ] Partially</td>
</tr>
<tr>
<td>[ ] Other:</td>
<td>[ ] Other:</td>
<td></td>
<td>[ ] Fully</td>
</tr>
</tbody>
</table>

- Cracked
- Clogged with Debris
- Crushed
- Deteriorated (concrete)
- Corroded (metal)

PIPE CONDITION [X] Good

OUTLET STRUCTURE

- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [ ] No Outfall Protection
- [ ] Other

Maintenance/Repair Needed? [ ] No [X] Yes (See Section 8 for more description)

In-Stream (applicable when collecting samples)

- [ ] Yes
- [X] No

Flow Present? [X] Yes

Flow Description [ ] Trickle

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 UMHOS/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td>ng/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBA5 Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (≥ Reporting Limit)</td>
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<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
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</thead>
<tbody>
<tr>
<td><strong>ODOR</strong></td>
<td>□</td>
<td>Sewage □ Rancid/sour □ Petroleum/gas □ Sulfide □ Other:</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td><strong>COLOR</strong></td>
<td>□</td>
<td>Clear □ Brown □ Gny □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td><strong>TURBIDITY</strong></td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td><strong>FLOATABLES</strong></td>
<td>□</td>
<td>Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible Suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, Suda, or floating sanitary materials)</td>
</tr>
</tbody>
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### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPOSITS/STAINS</strong></td>
<td>□</td>
<td>None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td><strong>SURROUNDING VEGETATION</strong></td>
<td>□</td>
<td>Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td><strong>ABNORMAL VEGETATION IN OUTFALL</strong></td>
<td>□</td>
<td>Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td><strong>EROSIBILITY</strong></td>
<td>□</td>
<td>Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td><strong>POOR POOL QUALITY</strong></td>
<td>□</td>
<td>Odors □ Suds □ Colors □ Floatables □ Oil Sheen □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td><strong>PIPE BENTHIC GROWTH</strong></td>
<td>□</td>
<td>Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

### Section 7: Data Collection

1. **SAMPLE FOR THE LAB?**
   - Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD₅ □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
2. If yes, collected from: □ Flow □ Pool
3. Intermittent flow trap recommended? □ Yes □ No

### Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs?)

---

*Comment: Residents at house stated when it rains, everything sheet flows to UFW.*
### Section 1: Background Data

- **Subwatershed:**
  - Outfall ID: 0F-125
  - Location: School St

- **Today's date:** 8/20/17
- **Temperature (°F):** 84
- **Rainfall (in.):** Last 72 hours: 0
  - Last 24 hours: 0
- **Photo #:** Taken

#### Land Use in Drainage Area (Check all that apply):
- Industrial (Known Industries): 
- Residential
- Commercial/Institutional

#### Notes (e.g., origin of outfall, if known):

### Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>KCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Clay</td>
<td>Triple</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Pipe Condition
- Good
- Cracked
- Clogged with Debris
- Crushed
- Deteriorated (concrete)
- Corroded (metal)

#### Outlet Structure
- Headwall
- Skew
- Flared End
- No Outfall Protection
- Other

#### In-Stream (applicable when collecting samples)
- Yes
- No

#### Maintenance/Repair Needed?
- Yes
- No (See Section 5 for more description)

### Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td></td>
<td>TIME TO FILL</td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Temperature</td>
<td>8°F</td>
<td>YSI Meter or Thermometer</td>
<td></td>
</tr>
<tr>
<td>Conductivity (&lt; 2,000 umhos/cm)</td>
<td>unmos/cm</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td>ppt</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>mg/l</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td>NTU</td>
<td>Test Strips</td>
<td></td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
<td></td>
</tr>
</tbody>
</table>
**Outfall Reconnaissance Inventory Field Sheet**

### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>☐</td>
<td>Sewage  ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:</td>
<td>☐ 1 – Faint ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>Color</td>
<td>☐</td>
<td>Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:</td>
<td>☐ 1 – Faint colors in sample bottle ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Turbidity</td>
<td>☐</td>
<td>See severity</td>
<td>☐ 1 – Slight cloudiness ☐ 2 – Cloudy ☐ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables (Does Not Include Trash!)</td>
<td>☐</td>
<td>Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:</td>
<td>☐ 1 – Few/slight; origin not obvious ☐ 2 – Some; indications of origin (e.g., possible Suds or oil sheen) ☐ 3 – Some; origin clear (e.g., obvious oil sheen, Suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>☐</td>
<td>None ☐ Grease/Oil ☐ Paper/Trash ☐ Foam ☐ Heavy sedimentation deposits ☐ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>☐</td>
<td>Little or No Distress ☐ Moderate Distress ☐ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>☐</td>
<td>Excessive ☐ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td>☐</td>
<td>Little or No Erosion ☐ Small Areas of Erosion ☐ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>☐</td>
<td>Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>☐</td>
<td>Brown ☐ Orange ☐ Green ☐ Other</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely ☑ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

### Section 7: Data Collection

1. **Sample for the Lab?**
   - Yes – E. Coli ☐ Yes – Fecal Coliform ☐ Yes – TSS ☐ Yes – BOD₅ ☐ Yes – Total Phosphorus ☐ Yes – Surfactants ☐ Yes – Ammonia
2. If yes, collected from: Flow ☐ Pool
3. Intermittent flow trap recommended? ☐ Yes ☐ No

### Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? 

**NONE**
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: ✑ OBS

Today's date: 8/22/17

Outfall ID: 0E15

LOCATION: Town Hall

INVESTIGATORS:

Time (Military): 1415

TEMPERATURE (F): 87

RAINFALL (IN.):

LAST 72 HOURS:

LAST 24 HOURS:

Photo #s and short description: photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries): ________________

☐ Residential

☐ Commercial/Institutional

Other: ____________________________

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions: ~12</td>
<td>In Water: ☑ No, Fully</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>With Sediment: ☑ No, Partially</td>
</tr>
<tr>
<td>DI/CI</td>
<td>Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION

☐ Good ☐ Cracked ☑ Clogged with Debris ☑ Crushed ☑ Deteriorated (concrete) ☑ Corroded (metal)

☐ Other: partially crushed/gapped

OUTLET STRUCTURE

☐ Headwall ☐ Riprap ☑ Flared End ☑ No Outfall Protection ☑ Other

In-Stream (applicable when collecting samples)

☐ Yes ☐ No ☑ No Outfall Protection

Maintenance/Repair Needed?

☐ No ☑ Yes (See Section 8 for more description)

Flow Present?

☐ Yes ☑ No

If No, Skip to Section 5

Flow Description

☐ Trickle ☑ Moderate ☑ Substantial (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

PARAMETER (Threshold Level) | RESULT | UNIT | EQUIPMENT
---|---|---|---
Flow | VOLUME | Liter | Bottle
| TIME TO FILL | | Sec | Watch with second hand
| TEMPERATURE | | °F | YSI Meter or Thermometer
| CONDUCTIVITY (> 2,000 umhos/cm) | umhos/cm | YSI Meter
| SALINITY | ppt | YSI Meter
| DISSOLVED OXYGEN | mg/l | YSI Meter
| PH | | YSI Meter
| SURFACTANTS (≥ 0.25 mg/l) | mg/l | MBAS Test Kit (CHEMetrics K-9400)
| AMMONIA (NH3) (≥ 0.5 mg/l) | NTU | Test Strips
| CHLORINE (> Reporting Limit) | mg/l | Hach Pocket Colorimeter II
### Outfall Reconnaissance Inventory Field Sheet

**Section 4: Physical Indicators for Flowing Outfalls Only**

Are any physical indicators present in the flow?  
☐ Yes  ☐ No  
*(If No, Skip to Section 5)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
</table>
| Odor                 | ☐                | □ Sewage  □ Rancid/sour  □ Petroleum/gas  
                      |                  | □ Sulfide  □ Other:                | ☐ 1 – Faint  ☐ 2 – Easily detected  ☐ 3 – Noticeable from a distance |
| Color                | ☐                | □ Clear  □ Brown  □ Gray  □ Yellow  
                      |                  | □ Green  □ Orange  □ Red  □ Other:  | ☐ 1 – Faint colors in sample bottle  ☐ 2 – Clearly visible in sample bottle  ☐ 3 – Clearly visible in outfall flow |
| Turbidity            | ☐                | See severity                        | ☐ 1 – Slight cloudiness  ☐ 2 – Cloudy  ☐ 3 – Opaque |
| Floatables -Does Not Include Trash!! | ☐ | □ Sewage (Toilet Paper, etc.)  □ Suds  
                      |                  | □ Petroleum (oil sheen)  □ Other:   | ☐ 1 – Few/slight; origin not obvious  ☐ 2 – Some; indications of origin (e.g., possible Suds or oil sheen)  ☐ 3 – Some; origin clear (e.g., obvious oil sheen, Suds, or floating sanitary materials) |

**Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls**

Are physical indicators that are not related to flow present?  
☐ Yes  ☐ No  
*(If No, Skip to Section 6)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>
| Deposits/Stains      | ☐                | □ None  □ Grease/Oil  □ Paper/Trash  □ Foam  
                      |                  | □ Heavy sedimentation deposits  □ Other:   |          |
| Surrounding Vegetation | ☐               | □ Little or No Distress  □ Moderate Distress  □ High Distress |
| Abnormal Vegetation in Outfall | ☐ | □ Excessive  □ Inhibited |
| Erobority            | ☐                | □ Little or No Erosion  □ Small Areas of Erosion  □ Many Eroded Areas |
| Poor Pool Quality    | ☐                | □ Odors  □ Colors  □ Floatables  □ Oil Sheen  
                      |                  | □ Suds  □ Excessive Algae  □ Other:   |
| Pipe Benthic Growth  | ☐                | □ Brown  □ Orange  □ Green  □ Other:   |

**Section 6: Overall Outfall Characterization as an Illicit Discharge**

☐ Unlikely  ☐ Potential (presence of two or more indicators)  ☐ Suspect (one or more indicators with a severity of 3)  ☐ Obvious

**Section 7: Data Collection**

1. **Sample for the Lab?** 
   ☐ Yes – E. Coli  ☐ Yes – Fecal Coliform  ☐ Yes – TSS  ☐ Yes – BODs  ☐ Yes – Total Phosphorus  ☐ Yes – Surfactants  ☐ Yes – Ammonia  
   ☐ No

2. If yes, collected from:  
   ☐ Flow  ☐ Pool

3. Intermittent flow trap recommended?  
   ☐ Yes  ☐ No

**Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?**

Potentially replace pipe in future (cracked/partially crushed)
**Section 1: Background Data**

<table>
<thead>
<tr>
<th>Subwatershed:</th>
<th>Outfall ID:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Town Library</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Today's date:</th>
<th>Outfall ID:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/20/17</td>
<td></td>
<td>Town Library</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investigators:</th>
<th>Time (Military):</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.E.</td>
<td>12:35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature (°F):</th>
<th>Rainfall (in.):</th>
<th>Last 72 Hours:</th>
<th>Last 24 Hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Photo #s and short description:**

- Photo Town

**Land Use in Drainage Area (Check all that apply):**

- ☐ Industrial (Known Industries): ___________________________
- ☐ Residential: ___________________________
- ☐ Commercial/Institutional: ___________________________
- ☐ Open Space – Field: ___________________________
- ☐ Open Space – Wooded: ___________________________
- ☐ Other: ___________________________

**Notes (e.g., origin of outfall, if known):**

---

**Section 2: Outfall Description**

<table>
<thead>
<tr>
<th>Material</th>
<th>Shape</th>
<th>Dimensions (in.)</th>
<th>Submerged</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>DLI</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pipe Condition:**

- ☐ Good
- ☐ Cracked
- ☐ Clogged with Debris
- ☐ Crushed
- ☐ Deteriorated (concrete)
- ☐ Corroded (metal)

**Outlet Structure:**

- ☐ Headwall
- ☐ Riprap
- ☐ Flared End
- ☐ No Outfall Protection
- ☐ Other

**In-Stream (applicable when collecting samples):**

- ☐ Yes
- ☐ No

**Maintenance/Repair Needed:**

- ☐ Yes
- ☐ No
- ☐ Yes (See Section 8 for more description)

**Flow Present?**

- ☐ Yes
- ☐ No

**Flow Description:**

- ☐ Trickle
- ☐ Moderate
- ☐ Substantial

---

**Section 3: Quantitative Characterization**

<table>
<thead>
<tr>
<th>Parameter (Threshold Level)</th>
<th>Field Data for Flowing Outfalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>RESULT</td>
</tr>
<tr>
<td>Time to Fill</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td></td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td></td>
</tr>
<tr>
<td>Chlorine (≥ Reporting Limit)</td>
<td></td>
</tr>
</tbody>
</table>

**Parameter (Threshold Level):**

- Flow
- Volume
- Time to Fill
- Temperature
- Conductivity (> 2,000 umhos/cm)
- Salinity
- Dissolved Oxygen
- pH
- Surfactants (≥ 0.25 mg/l)
- Ammonia (NH3) (≥ 0.5 mg/l)
- Chlorine (≥ Reporting Limit)

**Unit:***

- Liter
- Sec
- °F
- umhos/cm
- ppt
- mg/l
- YSI Meter or Thermometer
- YSI Meter
- YSI Meter
- YSI Meter
- MBAS Test Kit (CHEMetrics K-9400)
- Test Strips
- Hach Pocket Colorimeter II

**Equipment:***

- Bottle
- Watch with second hand
- YSI Meter or Thermometer
- YSI Meter
- YSI Meter
- YSI Meter
- YSI Meter
- MBAS Test Kit (CHEMetrics K-9400)
- Test Strips
- Hach Pocket Colorimeter II
# Outfall Reconnaissance Inventory Field Sheet

## Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow?  [ ] Yes  [ ] No  
*(If No, Skip to Section 5)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Odor</strong></td>
<td></td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td>□ 2 – Easily detected</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td></td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td>□ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td><strong>Turbidity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Floatables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- DOES NOT INCLUDE TRASH!</td>
<td></td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds</td>
<td>□ 1 – Slight cloudiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Petroleum (oil sheen) □ Other:</td>
<td>□ 2 – Cloudy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 3 – Opaque</td>
</tr>
</tbody>
</table>

## Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present?  [ ] Yes  [ ] No  
*(If No, Skip to Section 6)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deposits/Stains</strong></td>
<td></td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td><strong>Surrounding Vegetation</strong></td>
<td></td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td><strong>Abnormal Vegetation in Outfall</strong></td>
<td></td>
<td></td>
<td>□ Excessive □ Inhibited</td>
</tr>
<tr>
<td><strong>Erodibility</strong></td>
<td></td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td><strong>Poor Pool Quality</strong></td>
<td></td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td><strong>Pipe Benthic Growth</strong></td>
<td></td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

## Section 6: Overall Outfall Characterization as an Illicit Discharge

[ ] Unlikely  [ ] Potential (presence of two or more indicators)  [ ] Suspect (one or more indicators with a severity of 3)  [ ] Obvious

## Section 7: Data Collection

1. **SAMPLE FOR THE LAB?**
   - [ ] Yes – E. Coli
   - [ ] Yes – Fecal Coliform
   - [ ] Yes – TSS
   - [ ] Yes – BOD₅
   - [ ] Yes – Total Phosphorus
   - [ ] Yes – Surfactants
   - [ ] Yes – Ammonia

2. If yes, collected from:
   - [ ] Flow
   - [ ] Pool

3. Intermittent flow trap recommended?
   - [ ] Yes
   - [ ] No

## Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?  **NONE**
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

**SUBWATERSHED:**

- **Today's date:** 8/22/17
- **Outfall ID:** CP 119
- **Location:** Town Library
- **Investigators:** 863
- **Temperature (°F):** 87
- **Rainfall (in.):** Last 72 hours: 0
- **Time (Military):** 1431
- **Last 24 Hours:** 0
- **Photo #s and short description:** Photo taken

**Land Use in Drainage Area (Check all that apply):**

- [ ] Industrial (Known Industries): __________________________
- [ ] Residential
- [ ] Commercial/Institutional
- [ ] Open Space – Field
- [ ] Open Space – Wooded

**Other:**

**Notes (e.g., origin of outfall, if known):**

Catch basin closest to covered bridge

Section 2: Outfall Description

**MATERIAL**

- [ ] RCP
- [ ] CMP
- [ ] Circular
- [ ] Single

- [ ] PVC
- [ ] HDPE
- [ ] Elliptical
- [ ] Double

- [ ] D1/CI
- [ ] Clay
- [ ] Box
- [ ] Triple

- [ ] Other: __________
- [ ] Other: ________
- [ ] Other: ________

**SHAPE**

- [ ] Diameter/Dimensions: 12

**DIMENSIONS (IN.)**

- [ ] Slope (Degrees):
- [ ] Flat
- [ ] Moderate
- [ ] Steep

**SUBMERGED**

- [ ] In Water:
- [ ] No
- [ ] Partially
- [ ] Fully

- [ ] With Sediment:
- [ ] No
- [ ] Partially
- [ ] Fully

**PIPE CONDITION**

- [ ] Good
- [ ] Cracked
- [ ] Clogged with Debris
- [ ] Crushed
- [ ] Deteriorated (concrete)
- [ ] Corroded (metal)
- [ ] Other

**OUTLET STRUCTURE**

- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [ ] No Outfall Protection
- [ ] Other

**In-Stream (applicable when collecting samples):**

- [ ] Yes
- [ ] No

**Maintenance/Repair Needed?**

- [ ] Yes (See Section 8 for more description)
- [ ] No

**Flow Present?**

- [ ] Yes
- [ ] No

**Flow Description**

- [ ] Trickle
- [ ] Moderate
- [ ] Substantial

- [ ] If No, Skip to Section 5

Section 3: Quantitative Characterization

**FIELD DATA FOR FLOWING OUTFALLS**

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td><strong>RESULT</strong></td>
</tr>
<tr>
<td>VOLUME</td>
<td><strong>UNIT</strong></td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td><strong>EQUIPMENT</strong></td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>Liter</td>
</tr>
<tr>
<td></td>
<td>Sec</td>
</tr>
<tr>
<td></td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 mhos/cm)</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>SALINITY</td>
<td>umhos/cm</td>
</tr>
<tr>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>ppt</td>
</tr>
<tr>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (&lt; 0.25 mg/l)</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (&gt; 0.5 mg/l)</td>
<td>NTU</td>
</tr>
<tr>
<td></td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>mg/l</td>
</tr>
<tr>
<td></td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow?  □ Yes □ No  (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td>□ Sewage    □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide   □ Other:</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td>□ Clear     □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green     □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td>See severity □ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opague</td>
<td></td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!!</td>
<td></td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present?  □ Yes □ No  (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td></td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td></td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td></td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Endorsibility</td>
<td></td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Erosion Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td></td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td></td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: Overall Outfall Characterization as an Illicit Discharge
[Unlikely] □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. Sample for the Lab?
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD₅ □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   □ No

2. If yes, collected from:
   □ Flow □ Pool

3. Intermittent flow trap recommended?
   □ Yes □ No

Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? **NONE**
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed: Location: Panu St.

Today's date: 8/24/17 Outfall ID: 0F132 Time (Military): 1254

Investigators: 8EC

Temperature (°F): 78 Rainfall (in): Last 72 Hours: 0.04 Last 24 Hours: 0

Photo #s and short description: Photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries):_________________________ ☐ Open Space – Field

☐ Residential ☐ Open Space – Wooded

☐ Commercial/Institutional Other:_________________________

Notes (e.g., origin of outfall, if known):

May be on or off if CV is discharged into culvert? Unrelated dwelle? MS4 OR

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑ RCP</td>
<td>☑ Circular</td>
<td>Diameter/Dimensions: 12</td>
</tr>
<tr>
<td>☑ PVC</td>
<td>☐ Elliptical</td>
<td></td>
</tr>
<tr>
<td>☑ HDPE</td>
<td>☐ Double</td>
<td></td>
</tr>
<tr>
<td>☑ DI/CI</td>
<td>☐ Box</td>
<td></td>
</tr>
<tr>
<td>☑ Clay</td>
<td>☐ Triple</td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td>☐ Other:</td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td>☐ Other:</td>
<td></td>
</tr>
<tr>
<td>☐ Other:</td>
<td>☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION

☑ Good ☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal)

☐ Other

OUTLET STRUCTURE

☑ Headwall ☐ Riprap ☐ Flared End ☐ No Outfall Protection ☐ Other

In-Stream (applicable when collecting samples)

☐ Yes ☐ No Maintenance/Repair Needed? ☑ No ☐ Yes (See Section 8 for more description)

Flow Present?

☐ Yes ☐ No If No, Skip to Section 5

Flow Description ☐ Trickle ☐ Moderate ☐ Substantial (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>Volume</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td>Sec</td>
<td>YSI Meter or Thermometer</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>°F</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td>umhos/cm</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>SALINITY</td>
<td>ppm</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>mg/l</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
<td></td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td>NTU</td>
<td>Test Strips</td>
<td></td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
<td></td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>☐</td>
<td>Sewage ☐ Rancid/sour ☐ Petroleum/gas</td>
<td>☐ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sulfide ☐ Other:</td>
<td></td>
</tr>
<tr>
<td>COLOR</td>
<td>☐</td>
<td>Clear ☐ Brown ☐ Gray ☐ Yellow</td>
<td>☐ 1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green ☐ Orange ☐ Red ☐ Other:</td>
<td></td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>☐</td>
<td>See severity</td>
<td>☐ 1 – Slight cloudiness</td>
</tr>
<tr>
<td>FLOATABLES -DOES NOT INCLUDE TRASH!!</td>
<td>☐</td>
<td>Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:</td>
<td>☐ 1 – Few/slight; origin not obvious</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? ☐ Yes ☐ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>☐</td>
<td>None ☐ Grease/Oil ☐ Paper/Trash ☐ Foam</td>
<td>Heavy sedimentation deposits ☐ Other</td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>☐</td>
<td>Little or No Distress ☐ Moderate Distress ☐ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>☐</td>
<td>Excessive ☐ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>☐</td>
<td>Little or No Erosion ☐ Small Areas of Erosion ☐ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>☐</td>
<td>Odors ☐ Colors ☐ Floatables ☐ Oil Sheen</td>
<td>Excessive Algae ☐ Other:</td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>☐</td>
<td>Brown ☐ Orange ☐ Green ☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE
☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection
1. SAMPLE FOR THE LAB?
☐ Yes – E. Coli ☐ Yes – Fecal Coliform ☐ Yes – TSS ☐ Yes – BOD5 ☐ Yes – Total Phosphorus ☐ Yes – Surfactants ☐ Yes – Ammonia
☐ Yes – Chlorine ☐ No
2. If yes, collected from:
☐ Flow ☐ Pool
3. Intermittent flow trap recommended?
☐ Yes ☐ No

Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? ________________________________
Section 1: Background Data

Subwatershed: [Blank]

Outfall ID: [Blank]

Today’s date: 6/24/17

Time (Military): [Blank]

Investigators: [Blank]

Location: [Blank]

Temperature (°F): 78

Rainfall (in.): [Blank]

Last 72 hours: 0.04

Last 24 hours: 0

Photo #s and short description: [Blank]

Land Use in Drainage Area (Check all that apply):

- Industrial (Known Industries):
- Residential
- Commercial/Institutional
- Other: [Blank]

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions: 12</td>
<td>In Water: [Blank]</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Pipe</td>
<td>Box</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other: Pipe</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pipe Condition

- Good
- Cracked
- Clogged with Debris
- Crushed
- Deteriorated (concrete)
- Corroded (metal)
- Other [Blank]

Outlet Structure

- Headwall
- Riprap
- Flared End
- No Outfall Protection
- Other [Blank]

In-Stream (applicable when collecting samples)

- Yes
- No

Maintenance/Repair Needed?

- Yes
- No (See Section 8 for more description)

Flow Present?

- Yes
- No

Flow Description

- Trickle
- Moderate
- Substantial

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
</tr>
<tr>
<td></td>
<td>Time to Fill</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
</tr>
<tr>
<td></td>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
</tr>
<tr>
<td></td>
<td>Salinity</td>
</tr>
<tr>
<td></td>
<td>Dissolved Oxygen</td>
</tr>
<tr>
<td></td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td>Surface Tensities (≥ 0.25 mg/l)</td>
</tr>
<tr>
<td></td>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
</tr>
<tr>
<td></td>
<td>Chlorine (≥ Reporting Limit)</td>
</tr>
</tbody>
</table>
### Outfall Reconnaissance Inventory Field Sheet

#### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas □ Sulfide □ Other:</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>Color</td>
<td>□</td>
<td>□ Clear □ Brown □ Gray □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Turbidity</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible sud or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

#### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? □ Yes □ No

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodedibility</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

#### Section 6: Overall Outfall Characterization as an Illicit Discharge

□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

#### Section 7: Data Collection

1. Sample for the Lab?
   - Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD5 □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   - Yes – Chlorine □ No

2. If yes, collected from: □ Flow □ Pool

3. Intermittent flow trap recommended? □ Yes □ No

#### Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? ___________________________
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

<table>
<thead>
<tr>
<th>SUBWATERSHED</th>
<th>Outfall ID:</th>
<th>LOCATION:</th>
<th>Time (Military):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>05133</td>
<td>Pour Sr.</td>
<td>13:41</td>
</tr>
</tbody>
</table>

Today's date: 8/24/17

Investigators: 8/24/17

<table>
<thead>
<tr>
<th>TEMPERATURE (°F):</th>
<th>RAINFALL (IN.):</th>
<th>LAST 72 HOURS:</th>
<th>LAST 24 HOURS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td></td>
<td>0.04</td>
<td>0</td>
</tr>
</tbody>
</table>

Photo #s and short description:

Land Use in Drainage Area (Check all that apply):

- Residential
- Commercial/Institutional
- Open Space – Field
- Open Space – Wooded

Other:

Notes (e.g., origin of outfall, if known):
- Overgrown, needs cleaning, needs the incoming flow

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>DEIC</td>
<td>Box</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td></td>
<td>Fully</td>
</tr>
</tbody>
</table>

PIE CONDITION

- Good
- Cracked
- Clogged with Debris
- Crushed
- Deteriorated (concrete)
- Corroded (metal)
- Other

OUTLET STRUCTURE

- Headwall
- Riprap
- Flared End
- No Outfall Protection
- Other

In-Stream (applicable when collecting samples)

- Yes
- No

Maintenance/Repair Needed?

- No
- Yes (See Section 8 for more description)

Flow Present?

- Yes
- No (If No, Skip to Section 3)

Flow Description

- Trickle
- Moderate
- Substantial

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow VOLUME</td>
<td>RESULT</td>
<td></td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td></td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td></td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>PH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
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<td>MBAS Test Kit (CHEMetrics K-9400)</td>
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<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td></td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td></td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
### Outfall Reconnaissance Inventory Field Sheet

#### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
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<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ODOR</strong></td>
<td>☐</td>
<td>Sewage ☐ Rancid/sour ☐ Petroleum/gas</td>
<td>☐ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sulfide ☐ Other:</td>
<td>☐ 2 – Easily detected</td>
</tr>
<tr>
<td><strong>COLOR</strong></td>
<td>☐</td>
<td>Clear ☐ Brown ☐ Gray ☐ Yellow</td>
<td>☐ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green ☐ Orange ☐ Red ☐ Other:</td>
<td></td>
</tr>
<tr>
<td><strong>TURBIDITY</strong></td>
<td>☐</td>
<td>See severity</td>
<td>☐ 1 – Slight cloudiness</td>
</tr>
<tr>
<td><strong>FLOATABLES</strong></td>
<td>☐</td>
<td>Sewage (Toilet Paper, etc.) ☐ Suds</td>
<td>☐ 2 – Cloudy</td>
</tr>
<tr>
<td>-DOES NOT INCLUDE TRASH!!</td>
<td></td>
<td>Petroleum (oil sheen) ☐ Other:</td>
<td>☐ 3 – Opaque</td>
</tr>
</tbody>
</table>

#### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEPOSITS/STAINS</strong></td>
<td>☐</td>
<td>None ☐ Grease/Oil ☐ Paper/Trash ☐ Foam</td>
<td>Heavy sedimentation deposits ☐ Other</td>
</tr>
<tr>
<td><strong>SURROUNDING VEGETATION</strong></td>
<td>☐</td>
<td>Little or No Distress ☐ Moderate Distress ☐ High Distress</td>
<td></td>
</tr>
<tr>
<td><strong>ABNORMAL VEGETATION IN OUTFALL</strong></td>
<td>☐</td>
<td>Excessive ☐ Inhibited</td>
<td></td>
</tr>
<tr>
<td><strong>ERODIBILITY</strong></td>
<td>☐</td>
<td>Little or No Erosion ☐ Small Areas of Erosion ☐ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td><strong>POOR POOL QUALITY</strong></td>
<td>☐</td>
<td>Odors ☐ Colors ☐ Floatables ☐ Oil Sheen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suds ☐ Excessive Algae ☐ Other:</td>
<td></td>
</tr>
<tr>
<td><strong>PIPE BENTHIC GROWTH</strong></td>
<td>☐</td>
<td>Brown ☐ Orange ☐ Green ☐ Other:</td>
<td></td>
</tr>
</tbody>
</table>

#### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

#### Section 7: Data Collection

1. **SAMPLE FOR THE LAB?**
   - ☐ Yes – E. Coli
   - ☐ Yes – Fecal Coliform
   - ☐ Yes – Chlorine
   - ☐ Yes – TSS
   - ☐ Yes – BOD
   - ☐ Yes – Total Phosphorus
   - ☐ Yes – Surfactants
   - ☐ Yes – Ammonia

2. If yes, collected from: ☐ Flow ☐ Pool

3. Intermittent flow trap recommended? ☐ Yes ☐ No

#### Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

*Handwritten note: Residents clean out "brook*
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED:

Outfall ID: C1140
LOCATION: Highland St

Today's date: 8/24/17
Time (Military): 12:40

INVESTIGATORS: [Signature]
TEMPERATURE (°F): 78
RAINFALL (IN.): LAST 72 HOURS: 0.04 LAST 24 HOURS: 0

Photo #6 and short description: [Photo taken]

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries):
☐ Residential
☐ Commercial/Institutional
☐ Open Space - Field
☐ Open Space - Wooded

Other: ____________________________

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Clay</td>
<td>Triple</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION

☐ Good ☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal)
☐ Other

OUTLET STRUCTURE

☐ Headwall ☐ Riprap ☐ Flared End ☐ No Outfall Protection ☐ Other

In-Stream (applicable when collecting samples)

☐ Yes ☐ No ☐ No (See Section 8 for more description)

Flow Present?

☐ Yes ☐ No ☐ If No, Skip to Section 5

Flow Description

☐ Trickle ☐ Moderate ☐ Substantial (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>Time to Fill</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>Chlorine (&gt;) Reporting Limit</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow?  □ Yes  □ No  (If No, Skip to Section 3)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>□</td>
<td>□ Sewage  □ Rancid/sour  □ Petroleum/gas  □ Sulfide  □ Other:</td>
<td>□ 1 – Faint  □ 2 – Easily detected  □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>Color</td>
<td>□</td>
<td>□ Clear  □ Brown  □ Gray  □ Yellow  □ Green  □ Orange  □ Red  □ Other:</td>
<td>□ 1 – Faint colors in sample bottle  □ 2 – Clearly visible in sample bottle  □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Turbidity</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness  □ 2 – Cloudy  □ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.)  □ Suds  □ Petroleum (oil sheen)  □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious  □ 2 – Some; indications of origin (e.g., possible sudsy or oil sheen)  □ 3 - Some; origin clear (e.g., obvious oil sheen, suddies, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present?  □ Yes  □ No  (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>□</td>
<td>□ None  □ Grease/Oil  □ Paper/Trash  □ Foam  □ Heavy sedimentation deposits  □ Other:</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>□ Little or No Distress  □ Moderate Distress  □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>□</td>
<td>□ Excessive  □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Abrasion</td>
<td>□</td>
<td>□ Little or No Erosion  □ Small Areas of Erosion  □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>□ Odors  □ Colors  □ Floatables  □ Oil Sheen  □ Suds  □ Excessive Algae  □ Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>□ Brown  □ Orange  □ Green  □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE
□ Unlikely  □ Potential (presence of two or more indicators)  □ Suspect (one or more indicators with a severity of 3)  □ Obvious

Section 7: Data Collection
1. Sample for the Lab?
   □ Yes – E. Coli  □ Yes – Fecal Coliform  □ Yes – TSS  □ Yes – BOD5  □ Yes – Total Phosphorus  □ Yes – Surfactants  □ Yes – Ammonia
   □ Yes – Chlorine  □ No

2. If yes, collected from:
   □ Flow  □ Pool

3. Intermittent flow trap recommended?
   □ Yes  □ No

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? __________________________
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: Location: School Street

Today’s date: 08/04/17 Time (Military): 08:54

INVESTIGATORS:

TEMPERATURE (°F): 66

RAINFALL (IN.): LAST 72 HOURS: 0.04 LAST 24 HOURS: 0

Photo #s and short description: photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries):
☐ Residential
☐ Commercial/Institutional
☐ Other:

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions: 12 (in)</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>SLOPE (DEGREES):</td>
<td>Partially</td>
</tr>
<tr>
<td>DECI</td>
<td>Box</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other: Concrete</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION

☐ Good ☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal)

OUTLET STRUCTURE

☐ Headwall ☐ Riprap ☐ Flared End ☐ No Outfall Protection ☐ Other

In-Stream (applicable when collecting samples)

☐ Yes ☐ No ☐ Yes (See Section 8 for more description)

Maintenance/Repair Needed?

☐ No ☐ Yes (See Section 8 for more description)

Flow Present?

☐ Yes ☐ No If No, Skip to Section 5

Flow Description

☐ Trickle ☐ Moderate ☐ Substantial (If present)

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLUME</td>
<td>RESULT</td>
</tr>
<tr>
<td>Flow</td>
<td>Time to Fill</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>*F</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 UMQS/cm)</td>
<td>umhos/cm</td>
</tr>
<tr>
<td>SALINITY</td>
<td>ppt</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>mg/l</td>
</tr>
<tr>
<td>pH</td>
<td></td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td>mg/l</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td>NTU</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>mg/l</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Odor</strong></td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td>□ 2 – Easily detected</td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td>□</td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td>□ 2 – Clearly visible in sample bottle</td>
</tr>
<tr>
<td><strong>Turbidity</strong></td>
<td>□</td>
<td>See severity</td>
<td>□ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td><strong>Floatables</strong></td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds.</td>
<td>□ 1 – Slight cloudiness</td>
</tr>
<tr>
<td>- Does Not Include Trash!!</td>
<td></td>
<td>□ Petroleum (oil sheen) □ Other:</td>
<td>□ 2 – Cloudy</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deposits/Stains</strong></td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam</td>
<td>□ Heavy sedimentation deposits □ Other</td>
</tr>
<tr>
<td><strong>Surrounding Vegetation</strong></td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td><strong>Abnormal Vegetation in Outfall</strong></td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td><strong>Erosibility</strong></td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td><strong>Poor Pool Quality</strong></td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen</td>
<td>□ Excessive Algae □ Other:</td>
</tr>
<tr>
<td><strong>Pipe Benthic Growth</strong></td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE

☑ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection

1. **Sample for the Lab?**
   - □ Yes – E. Coli
   - □ Yes – Fecal Coliform
   - □ Yes – TSS
   - □ Yes – BOD5
   - □ Yes – Total Phosphorus
   - □ Yes – Surfactants
   - □ Yes – Ammonia
   - □ Yes – Chlorine
   - □ No

2. If yes, collected from:
   - □ Flow
   - □ Pool

3. Intermittent flow trap recommended?
   - □ Yes
   - □ No

Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Filled with debris/overgrown, needs cleaning

_
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED:  
Outfall ID: 0F1055  LOCATION: East Spring Street

Today's date: 8/24/17  Time (Military): 0908

INVESTIGATORS: 8820

TEMPERATURE (°F): 60  RAINFALL (IN.): 0.04  LAST 24 HOURS: 0

Photo #6 and short description: photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries): 
☐ Residential
☐ Commercial/Institutional

☐ Open Space – Field
☐ Open Space – Wooded

Other: ____________________________

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ RCP</td>
<td>☐ CMP</td>
<td>☐ Circular</td>
<td>Diameter/Dimensions: 360</td>
</tr>
<tr>
<td>☐ PVC</td>
<td>☐ HDPE</td>
<td>☐ Elliptical</td>
<td>In Water: No</td>
</tr>
<tr>
<td>☐ DI/Cl</td>
<td>☐ Clay</td>
<td>☐ Box</td>
<td>Partially</td>
</tr>
<tr>
<td>☐ Other:</td>
<td>☐ Other:</td>
<td>☐ Other:</td>
<td>Fully</td>
</tr>
</tbody>
</table>

SLOPE (DEGREES)

☐ Flat  ☐ Moderate  ☐ Steep

With Sediment:

☐ No  ☐ Partially  ☐ Fully

PIPE CONDITION

☐ Good  ☐ Cracked  ☐ Clogged with Debris  ☐ Crushed  ☐ Deteriorated (concrete)  ☐ Corroded (metal)

☐ Other

OUTLET STRUCTURE

☐ Headwall  ☐ Riprap  ☐ Flared End  ☐ No Outfall Protection  ☐ Other

In-Stream (applicable when collecting samples)

☐ Yes  ☐ No  ☐ Maintenance/Repair Needed? ☐ No  ☐ Yes (See Section 8 for more description)

Flow Present?

☐ Yes  ☐ No  If No, Skip to Section 5

Flow Description

☐ Trickle  ☐ Moderate  ☐ Substantial  (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
<td>Bottle</td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td>Liter</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Time To Fill</td>
<td></td>
<td>Sec</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>°F</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
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<tr>
<td>Dissolved Oxygen</td>
<td></td>
<td>mg/l</td>
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<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas □ Sulfide □ Other:</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>COLOR</td>
<td>□</td>
<td>□ Clear □ Brown □ Gny □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>FLOATABLES -DOES NOT INCLUDE TRASH!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/obscure; origin not obvious □ 2 – Some; indications of origin (e.g., possible suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? □ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE
[ ] Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. SAMPLE FOR THE LAB?
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD5 □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   □ Yes – Chlorine □ No
2. If yes, collected from: □ Flow □ Pool
3. Intermittent flow trap recommended? □ Yes □ No

Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure improvements)? ____________________________
# OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

## Section 1: Background Data

**SUBWatershed:**

<table>
<thead>
<tr>
<th>Today's date:</th>
<th>Outfall ID:</th>
<th>Location:</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/3/117</td>
<td>00104</td>
<td>East Street</td>
</tr>
</tbody>
</table>

**INvestigators:**

<table>
<thead>
<tr>
<th>Temperature (F): 70</th>
<th>Rainfall (in.):</th>
<th>Last 72 Hours: 0.04</th>
<th>Last 24 Hours: 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Photo #s and short description:** photo taken (1014 - 1015)

**Land Use in Drainage Area (Check all that apply):**

- [ ] Industrial (Known Industries): __________________
- [x] Residential
- [ ] Commercial/Institutional
- [ ] Other: __________________________

**Notes (e.g., origin of outfall, if known):** runoff from roadway

## Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCF</td>
<td>Circular</td>
<td>Diameter/Dimensions: 24 (long)</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>SLOPE (DEGREES)</td>
<td>Partially</td>
</tr>
<tr>
<td>HDPE</td>
<td>Double</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>CI</td>
<td>Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Other: Cut</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PIPE CONDITION**

- [x] Good
- [ ] Cracked
- [ ] Clogged with Debris
- [ ] Crushed
- [ ] Deteriorated (concrete)
- [ ] Corroded (metal)
- [ ] Other: ______

**OUTLET STRUCTURE**

- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [x] No Outfall Protection
- [ ] Other: ______

**In-Stream (applicable when collecting samples):**

- [ ] Yes
- [ ] No

**Maintenance/Repair Needed?**

- [ ] No
- [x] Yes (See Section 8 for more description)

**Flow Present?**

- [x] Yes
- [ ] No

**Flow Description**

- [ ] Trickle
- [ ] Moderate
- [ ] Substantial

---

## Section 3: Quantitative Characterization

### FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>Volume</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td></td>
<td>Time to Fill</td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAT Test Kit (CHEmetrics K-9400)</td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the outfall? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>□</td>
<td>Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sulfide □ Other:</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>□</td>
<td>Clear □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables (Does not include Trash!!)</td>
<td>□</td>
<td>Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? □ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>□</td>
<td>None □ Grease/Oil □ Paper/Trash □ Foam</td>
<td>□ Heavy sedimentation deposits □ Other</td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>□</td>
<td>Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td>□</td>
<td>Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>Odors □ Colors □ Floatables □ Oil Sheen</td>
<td>□ Suds □ Excessive Algae □ Other:</td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: Overall Outfall Characterization as an Illicit Discharge
□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. Sample for the Lab?
□ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD \(_5\) □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
□ Yes – Chlorine □ No
2. If yes, collected from: □ Flow □ Pool
3. Intermittent flow trap recommended? □ Yes □ No

Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure repairs?)

_needs more clarity_
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

<table>
<thead>
<tr>
<th>SUBWATERSHED:</th>
<th>Outfall ID:</th>
<th>LOCATION:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0F130</td>
<td>Cross St</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Today's date:</th>
<th>Time (Military):</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/24/11</td>
<td>1039</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INVESTIGATORS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10/21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMPERATURE (°F):</th>
<th>RAINFALL (IN.):</th>
<th>LAST 72 HOURS:</th>
<th>LAST 24 HOURS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>0.04</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Photo #s and short description: Photo taken

Land Use in Drainage Area (Check all that apply):

- [ ] Industrial (Known Industries): ____________
- [ ] Residential
- [ ] Commercial/Institutional
- [ ] Open Space – Field
- [ ] Open Space – Wooded
- [ ] Other: ____________

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
<th>PIPE CONDITION</th>
<th>OUTLET STRUCTURE</th>
<th>In-Stream (applicable when collecting samples)</th>
<th>Maintenance/Repair Needed?</th>
<th>Flow Present?</th>
<th>Flow Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] RCP</td>
<td>[ ] Circular</td>
<td>Diameter/Dimensions: 42</td>
<td>In Water: [ ] No</td>
<td>[ ] Good</td>
<td>[ ] Headwall</td>
<td>[ ] Yes</td>
<td>[ ] No</td>
<td>[ ] Yes</td>
<td>[ ] Yes</td>
</tr>
<tr>
<td>[ ] PVC</td>
<td>[ ] Elliptical</td>
<td></td>
<td>Partially</td>
<td>[ ] Cracked</td>
<td>[ ] No</td>
<td>[ ] No</td>
<td>[ ] No</td>
<td>[ ] No</td>
<td>[ ] Trickle</td>
</tr>
<tr>
<td>[ ] HDPE</td>
<td>[ ] Box</td>
<td></td>
<td>Fully</td>
<td>[ ] Clogged with Debris</td>
<td>[ ] No</td>
<td>[ ] Flared End</td>
<td>[ ] No</td>
<td>[ ] No</td>
<td>[ ] Substantial</td>
</tr>
<tr>
<td>[ ] DICI</td>
<td>[ ] Single</td>
<td></td>
<td></td>
<td></td>
<td>[ ] Other</td>
<td></td>
<td>[ ] No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Clay</td>
<td>[ ] Triple</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ ] Other</td>
<td>[ ] Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Note: Opened upstream pH 4

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Temperature</td>
<td>18.87</td>
<td>°C</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td>0.449</td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Salinity</td>
<td>0.3</td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>8.9</td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>7.47</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEmetrics K-9400)</td>
</tr>
<tr>
<td>Ammonia (NH₃) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td>0.06</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>

Water coming down Cross St.
## Outfall Reconnaissance Inventory Field Sheet

### Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? [ ] Yes [X] No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td>See severity</td>
<td></td>
</tr>
<tr>
<td>Floatables</td>
<td>[X] Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? [ ] Yes [X] No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/ Stains</td>
<td>[X] Yes</td>
<td>None: Grease/Oil: Paper/Trash: Foam: Heavy sedimentation deposits: Other:</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>[X] Yes</td>
<td>Little or No Distress: Moderate Distress: High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>[X] Yes</td>
<td>Excessive: Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erosibility</td>
<td>[X] Yes</td>
<td>Little or No Erosion: Small Areas of Erosion: Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>[X] Yes</td>
<td>Odors: Color: Floatables: Oil Sheen: Suds: Excessive Algae: Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>[X] Yes</td>
<td>Brown: Orange: Green: Other:</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

[ ] Unlikely [ ] Potential (presence of two or more indicators) [ ] Suspect (one or more indicators with a severity of 3) [ ] Obvious

### Section 7: Data Collection

1. Sample for the lab? [ ] Yes – E. Coli [ ] Yes – Fecal Coliform [ ] Yes – TSS [ ] Yes – BOD$_5$ [ ] Yes – Total Phosphorus [ ] Yes – Surfactants [ ] Yes – Ammonia

2. If yes, collected from: [ ] Flow [ ] Pool

3. Intermittent flow trap recommended? [ ] Yes [ ] No

### Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? ___________________________
Section 1: Background Data

SUBWATERSHED: 

Outfall ID: 0428  LOCATION: Malay Ave

Today's date: 8/24/17  Time (Military): 16:4

INVESTIGATORS: GSC

TEMPERATURE (°F): 77  RAINFALL (IN.): LAST 72 HOURS: 0.04  LAST 24 HOURS: 0

Photo #6 and short description: Photo taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries): _______________________

☐ Residential

☐ Commercial/Institutional

☐ Other: _______________________

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>HDPE</td>
<td>Elliptical</td>
<td>18”</td>
<td>No</td>
</tr>
<tr>
<td>Clay</td>
<td>Box</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Other:</td>
<td>Other: ____</td>
<td>SLOPE (DEGREES)</td>
<td>Fully</td>
</tr>
</tbody>
</table>

PIPE CONDITION  ☑ Good  ☑ Cracked  ☑ Clogged with Debris  ☑ Crushed  ☑ Deteriorated (concrete)  ☑ Corroded (metal)

OUTLET STRUCTURE:

☐ Headwall  ☑ Riprap  ☑ Flared End  ☑ No Outfall Protection  ☑ Other

In-Stream (applicable when collecting samples):

☐ Yes  ☑ No  ☑ Maintenance/Repair Needed? ☑ No  ☑ Yes (See Section 8 for more description)

Flow Present?: ☑ Yes  ☑ No  

Flow Description: If No, Skip to Section 5 (checked upstream CB) (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to Fill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>°F</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td></td>
<td>umhos/cm</td>
</tr>
<tr>
<td>Salinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surfactants (&gt; 0.25 mg/l)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (NH3) (&gt; 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EQUIPMENT

- Bottle
- YSI Meter or Thermometer
- YSI Meter
- YSI Meter
- MBAS Test Kit (CHEMetrics K-9400)
- Test Strips
- Hach Pocket Colorimeter II
### Outfall Reconnaissance Inventory Field Sheet

#### Section 4: Physical Indicators for Flowing Outfalls Only

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>☐</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td></td>
</tr>
<tr>
<td>COLOR</td>
<td>☐</td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>☐</td>
<td></td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>FLOATABLES -DOES NOT INCLUDE TRASH!!</td>
<td>☐</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible sudrs or oil sheen) □ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

#### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>☐</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>☐</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>☐</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>☐</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>☐</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>☐</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

#### Section 6: Overall Outfall Characterization as an Illicit Discharge

Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

#### Section 7: Data Collection

1. **Sample for the Lab?**
   - Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD5 □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   - Yes – Chlorine □ No

2. If yes, collected from:
   - Flow □ Pool

3. Intermittent flow trap recommended?
   - Yes □ No

#### Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

<table>
<thead>
<tr>
<th>SUBWATERSHED</th>
<th>Outfall ID:</th>
<th>LOCATION:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OF126</td>
<td>PECUEY ST</td>
</tr>
</tbody>
</table>

| Today's date: | 8/24/17 |
| Time (Military): | 131 |

| TEMPERATURE (°F): | 77 |
| RAINFALL (IN.): | LAST 72 HOURS: | 0.04 |
| LAST 24 HOURS: | 0 |

Photo #s and short description: **[photo taken]**

Land Use in Drainage Area (Check all that apply):

- [ ] Industrial (Known Industries):
- [ ] Residential
- [ ] Commercial/Institutional
- [ ] Other:

Notes (e.g., origin of outfall, if known):

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>[ ] No</td>
</tr>
<tr>
<td>DECI</td>
<td>Box</td>
<td></td>
<td>[ ] Partially</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td>[ ] Fully</td>
</tr>
</tbody>
</table>

PIPE CONDITION

- [ ] Good
- [ ] Cracked
- [ ] Clogged with Debris
- [ ] Crushed
- [ ] Deteriorated (concrete)
- [ ] Corroded (metal)
- [ ] Other:

OUTLET STRUCTURE

- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [ ] No Outfall Protection
- [ ] Other

In-Stream (applicable when collecting samples)

- [ ] Yes
- [ ] No

Maintenance/Repair Needed?

- [ ] No
- [ ] Yes (See Section 8 for more description)

Flow Present?

- [ ] Yes
- [ ] No

Flow Description

- [ ] Trickle
- [ ] Moderate
- [ ] Substantial

If No, Skip to Section 5

(checked upon review) OBS

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD VOLUME</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td></td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
### Outfall Reconnaissance Inventory Field Sheet

**Section 4: Physical Indicators for Flowing Outfalls Only**

Are any physical indicators present in the outfall? □ Yes □ No  
((If No, Skip to Section 5))

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>□</td>
<td>□ Sewage  □ Rancid/sour  □ Petroleum/gas  □ Sulfide  □ Other:</td>
<td>□ 1 – Faint  □ 2 – Easily detected  □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>COLOR</td>
<td>□</td>
<td>□ Clear  □ Brown  □ Gray  □ Yellow  □ Green  □ Orange  □ Red  □ Other:</td>
<td>□ 1 – Faint colors in sample bottle  □ 2 – Clearly visible in sample bottle  □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness  □ 2 – Cloudy  □ 3 – Opaque</td>
</tr>
<tr>
<td>FLOATABLES -DOES NOT INCLUDE TRASH!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.)  □ Suds  □ Petroleum (oil sheen)  □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious  □ 2 – Some; indications of origin (e.g., possible sudsy or oil sheen)  □ 3 – Some; origin clear (e.g., obvious oil sheen, sudsy, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

**Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls**

Are physical indicators that are not related to flow present? □ Yes □ No  
((If No, Skip to Section 6))

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>□</td>
<td>□ None  □ Grease/Oil  □ Paper/Trash  □ Foam  □ Heavy sedimentation deposits  □ Other:</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>□</td>
<td>□ Little or No Distress  □ Moderate Distress  □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>□</td>
<td>□ Excessive  □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>□</td>
<td>□ Little or No Erosion  □ Small Areas of Erosion  □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>□</td>
<td>□ Odors  □ Colors  □ Floatables  □ Oil Sheen  □ Suds  □ Excessive Algae  □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>□</td>
<td>□ Brown  □ Orange  □ Green  □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

**Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE**

□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

**Section 7: Data Collection**

1. **SAMPLE FOR THE LAB?**
   □ Yes – E. Coli  □ Yes – Fecal Coliform  □ Yes – TSS  □ Yes – BOD₃  □ Yes – Total Phosphorus  □ Yes – Surfactants  □ Yes – Ammonia
   □ Yes – Chlorine  □ No

2. If yes, collected from: □ Flow □ Pool

3. Intermittent flow trap recommended? □ Yes □ No

**Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?**

__________________________________________________________________
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: ___________________________ Outfall ID: 0F124

Today’s date: 8/24/17 Location: West Main St

Time (Military): 11:41

INVESTIGATORS: ___________________________

TEMPERATURE (°F): 77 RAINFALL (IN.): LAST 72 HOURS: 0.04 LAST 24 HOURS: 0

Photo #s and short description: photos taken

Land Use in Drainage Area (Check all that apply):

☐ Industrial (Known Industries): ___________________________

☐ Residential

☐ Commercial/Institutional

Other: ___________________________

Notes (e.g., origin of outfall, if known):

- Headwall vol 2 outlets (-34” + 43” ?), potentially OF smaller, culvert: larger

- Area = Recessed w/ Uncooked gaskets

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC</td>
<td>Single</td>
<td>Diameter/Dimensions: 24”</td>
<td>In Water:</td>
</tr>
<tr>
<td>HDPE</td>
<td>Circular</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Clay</td>
<td>Elliptical</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other:</td>
<td>Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION: Good

☐ Cracked ☐ Clogged with Debris ☐ Crushed ☐ Deteriorated (concrete) ☐ Corroded (metal)

☐ Other

OUTLET STRUCTURE: Headwall

☐ Riprap ☐ Flared End ☐ No Outfall Protection ☐ Other

In-Stream (applicable when collecting samples): Yes ☐ No ☐ Maintenance/Repair Needed? ☐ No ☐ Yes (See Section 8 for more description)

Flow Present?: Yes ☐ No

☐ Trickle ☐ Moderate ☐ Substantial (If present)

Flow Description: If No, Skip to Section 3 (Check only one box)

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
</tr>
<tr>
<td>Temperature</td>
<td>°F</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td>umhos/cm</td>
</tr>
<tr>
<td>Salinity</td>
<td>ppt</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>mg/l</td>
</tr>
<tr>
<td>pH</td>
<td></td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td>mg/l</td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td>NTU</td>
</tr>
<tr>
<td>Chlorine (≥ Reporting Limit)</td>
<td>mg/l</td>
</tr>
</tbody>
</table>
## Outfall Reconnaissance Inventory Field Sheet

### Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow?  
- Yes  
- No  

(If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td></td>
<td>- Sewage</td>
<td>□ 1 - Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Rancid/sour</td>
<td>□ 2 - Easily detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Petroleum/gas</td>
<td>□ 3 - Noticeable from a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sulfide</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other:</td>
<td></td>
</tr>
<tr>
<td>COLOR</td>
<td></td>
<td>- Clear</td>
<td>□ 1 - Faint colors in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Brown</td>
<td>sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Gray</td>
<td>□ 2 - Clearly visible in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Yellow</td>
<td>sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Green</td>
<td>□ 3 - Clearly visible in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Orange</td>
<td>outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Red</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other:</td>
<td></td>
</tr>
<tr>
<td>TURBIDITY</td>
<td></td>
<td></td>
<td>□ 1 - Slight cloudiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 2 - Cloudy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 3 - Opaque</td>
</tr>
<tr>
<td>FLOATABLES</td>
<td></td>
<td>See severity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Sewage (Toilet Paper, etc.)</td>
<td>□ 1 - Few/slight; origin</td>
</tr>
<tr>
<td>-DOES NOT INCLUDE</td>
<td></td>
<td></td>
<td>not obvious</td>
</tr>
<tr>
<td>TRASH!!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Suds</td>
<td>□ 2 - Some; indications of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Petroleum (oil sheen)</td>
<td>origin (e.g., possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other:</td>
<td>possible Suds or oil sheen)</td>
</tr>
</tbody>
</table>

### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present?  
- Yes  
- No  

(If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td></td>
<td>- None</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Grease/Oil</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Paper/Trash</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Foam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Heavy sedimentation deposits</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td></td>
<td>- Little or No Distress</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Moderate Distress</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td></td>
<td>- Excessive</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td></td>
<td>- Little or No Erosion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Small Areas of Erosion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td></td>
<td>- Odors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Colors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Floatables</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Oil Sheen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Suds</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Excessive Algae</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td></td>
<td>- Brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Orange</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Other</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

- Unlikely  
- Potential (presence of two or more indicators)  
- Suspect (one or more indicators with a severity of 3)  
- Obvious

### Section 7: Data Collection

1. SAMPLE FOR THE LAB?
   - Yes – E. Coli
   - Yes – Fecal Coliform
   - Yes – TSS
   - Yes – BOD5
   - Yes – Total Phosphorus
   - Yes – Surfactants
   - Yes – Ammonia

2. If yes, collected from:
   - Flow
   - Pool

3. Intermettent flow trap recommended?
   - Yes  
   - No

### Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
### Section 1: Background Data

**Subwatershed:**

- Outfall ID: 0F134
- Location: Page 3f

**Today's date:** 8/24/17

**Temperature (°F):** 78

**Rainfall (in):** Last 72 Hours: 0.04

**Photo #s and short description:** Photos taken

**Land Use in Drainage Area (Check all that apply):**
- [ ] Industrial (Known Industries): __________________________
- [x] Residential
- [ ] Commercial/Institutional

**Other:**

**Notes (e.g., origin of outfall, if known):**

---

### Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DICI</td>
<td>Box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td></td>
<td>With Sediment:</td>
</tr>
</tbody>
</table>

**PIPE CONDITION**
- [ ] Good
- [ ] Cracked
- [ ] Clogged with Debris
- [ ] Crushed
- [ ] Deteriorated (concrete)
- [ ] Corroded (metal)

**OUTLET STRUCTURE**
- [ ] Headwall
- [ ] Riprap
- [ ] Flared End
- [ ] No Outfall Protection
- [ ] Other

**In-Stream (applicable when collecting samples)**
- [ ] Yes
- [ ] No

**Maintenance/Repair Needed?**
- [ ] Yes (See Section 8 for more description)
- [ ] No

**Flow Present?**
- [ ] Yes
- [ ] No

**Flow Description**
- [ ] Trickle
- [ ] Moderate
- [ ] Substantial

---

### Section 3: Quantitative Characterization

**FIELD DATA FOR FLOWING OUTFALLS**

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow VOLUME TIME TO FILL</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>YSI Meter</td>
<td></td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td>□ Sewage</td>
<td>□ Rancid/sour □ Petroleum/gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide</td>
<td>□ Other:</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td>□ Clear</td>
<td>□ Brown □ Gray □ Yellow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green</td>
<td>□ Orange □ Red □ Other:</td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible sudsy or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, sudsy, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? □ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF PRESENT</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td></td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td></td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td></td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td></td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td></td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td></td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: Overall Outfall Characterization as an Illicit Discharge
[ ] Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. Sample for the Lab?
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BOD₃ □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia

2. If yes, collected from: □ Flow □ Pool

3. Intermittent flow trap recommended? □ Yes □ No

Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)
Wet Weather Outfall Reconnaissance
Inventory/Sample Collection Field Sheets
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: Outfall ID: OF 117 LOCATION: Town Hall
Today's date: 9-14-17 Time (Military):
INVESTIGATORS: Other: ____________________________
TEMPERATURE (°F): 65 RAINFALL (IN.): LAST 72 HOURS: LAST 24 HOURS:
Photo #s and short description:
Land Use in Drainage Area (Check all that apply):
□ Industrial (Known Industries): ____________________________
□ Residential
□ Commercial/Institutional
□ Open Space – Field
□ Open Space – Wooded
Notes (e.g., origin of outfall, if known):
- no flow
- no physical indicators of illicit discharge
- no noteworthy items

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ RCP</td>
<td>□ CMP</td>
<td>□ Single</td>
<td>□ Diameter/Dimensions: In Water:</td>
</tr>
<tr>
<td>□ PVC</td>
<td>□ HDPE</td>
<td>□ Elliptical</td>
<td>□ No</td>
</tr>
<tr>
<td>□ DI/CI</td>
<td>□ Clay</td>
<td>□ Box</td>
<td>□ Partially</td>
</tr>
<tr>
<td>□ Other: ______</td>
<td>□ Other: ______</td>
<td>□ Triple</td>
<td>□ Fully</td>
</tr>
<tr>
<td>□ Other: ______</td>
<td>□ Other: ______</td>
<td>□ Other: ______</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>With Sediment:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Partially</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Fully</td>
</tr>
</tbody>
</table>

PIEVE CONDITION
□ Good □ Cracked □ Clogged with Debris □ Crushed □ Deteriorated (concrete) □ Corroded (metal)
□ Other: ______________________________________

OUTLET STRUCTURE
□ Headwall □ Riprap □ Flared End □ No Outfall Protection □ Other: ______________________________________

In-Stream (applicable when collecting samples)
□ Yes □ No Maintenance/Repair Needed?
□ No □ Yes (See Section 8 for more description)

Flow Present?
□ Yes □ No If No, Skip to Section 5
Flow Description □ Trickle □ Moderate □ Substantial (If present)

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEMPERATURE (&gt;83 °F)</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 uS/cm)</td>
<td></td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY (&gt; 0.5 ppt)</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN (&lt;5.0 mg/L)</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH (&lt;5)</td>
<td></td>
<td>su</td>
<td>YSI Meter</td>
</tr>
</tbody>
</table>
# Outfall Reconnaissance Inventory Field Sheet

## Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow?  [ ] Yes  [ ] No  (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Check if Present</th>
<th>Description</th>
<th>Relative Severity Index (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td></td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas □ Sulfide □ Other:</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>Color</td>
<td></td>
<td>□ Clear □ Brown □ Gray □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>Turbidity</td>
<td></td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>Floatables</td>
<td></td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible sud or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, sud, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

## Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present?  [ ] Yes  [X] No  (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Check if Present</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td></td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other:</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td></td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td></td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Erodibility</td>
<td></td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td></td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td></td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

## Section 6: Overall Outfall Characterization as an Illicit Discharge

[X] Unlikely  [ ] Potential (presence of two or more indicators)  [ ] Suspect (one or more indicators with a severity of 3)  [ ] Obvious

## Section 7: Data Collection

1. Sample for the Lab?
   - [ ] Yes – E. Coli
   - [ ] Yes – Fecal Coliform
   - [ ] Yes – TSS
   - [ ] Yes – BOD
   - [ ] Yes – Total Phosphorus
   - [ ] Yes – Surfactants
   - [ ] Yes – Ammonia

2. If yes, collected from:
   - [ ] Flow
   - [ ] Pool

3. Intermittent flow trap recommended?
   - [ ] Yes
   - [ ] No

## Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
OUTFALL RECONNAISSANCE INVENTORY/SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

<table>
<thead>
<tr>
<th>SUBWATERSHED:</th>
<th>Outfall ID: 05/06</th>
<th>LOCATION: Fagan Dr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today's date:</td>
<td>9-19-17</td>
<td>Time (Military): 14 55</td>
</tr>
<tr>
<td>INVESTIGATORS:</td>
<td>SEGALAS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMPERATURE (°F):</th>
<th>RAINFALL (IN.):</th>
<th>LAST 72 HOURS:</th>
<th>LAST 24 HOURS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Photo #s and short description:

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial (Known Industries): 
- ☑ Residential
- ☐ Commercial/Institutional
- ☐ Open Space – Field
- ☑ Open Space – Wooded
- Other: 

Notes (e.g., origin of outfall, if known):
- No physical indicators of illicit discharge
- No noteworthy items

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>With Sediment:</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>PVC/HDPE</td>
<td>Triple</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td></td>
<td>Fully</td>
</tr>
</tbody>
</table>

PIPE CONDITION
- ☑ Good
- ☐ Cracked
- ☐ Clogged with Debris
- ☐ Crushed
- ☐ Deteriorated (concrete)
- ☐ Corroded (metal)
- Other: 

OUTLET STRUCTURE
- ☑ Headwall
- ☐ Riprap
- ☐ Flared End
- ☐ No Outfall Protection
- ☐ Other: 

In-Stream (applicable when collecting samples): ☑ Yes ☐ No

Maintenance/Repair Needed? ☑ Yes ☐ No (See Section 8 for more description)

Flow Present? ☐ Yes ☑ No

Flow Description ☑ Trickle ☐ Moderate ☐ Substantial

If No, Skip to Section 5

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD DATA FOR FLOWING OUTFALLS</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td></td>
<td>°F</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 uMhos/cm)</td>
<td></td>
<td>uMhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td></td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td></td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td></td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>
Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas □ Sulfide □ Other:</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td>COLOR</td>
<td>□</td>
<td>□ Clear □ Brown □ Gray □ Yellow □ Green □ Orange □ Red □ Other:</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>FLOATABLES</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds □ Petroleum (oil sheen) □ Other:</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible sudis or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, Suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? □ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposits/Stains</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td>----------</td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td>----------</td>
</tr>
<tr>
<td>Abnormal Vegetation in Outfall</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td>----------</td>
</tr>
<tr>
<td>Erodibility</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td>----------</td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td>----------</td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td>----------</td>
</tr>
</tbody>
</table>

Section 6: Overall Outfall Characterization as an Illicit Discharge
□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection
1. Sample for the lab?
   □ Yes – E. Coli □ Yes – Surfactants □ Yes – Fecal Coliform □ Yes – Total Phosphorus □ Yes – TSS □ Yes – BODs □ Yes – Surfactants □ Yes – Ammonia □ Yes – Chlorine □ No
2. If yes, collected from:
   □ Flow □ Pool
3. Intermittent flow trap recommended?
   □ Yes □ No

Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
Section 1: Background Data

SUBWATERSHED:  
Today's date: 9-19-17  
Outfall ID: OF 130  
LOCATION:  
INVESTIGATORS:  
TEMPERATURE (F): 65  
RAINFALL (IN.):  
LAST 72 HOURS:  
LAST 24 HOURS:  
Photo #s and short description:  
Land Use in Drainage Area (Check all that apply):  
☐ Industrial (Known Industries):  
☐ Residential  
☐ Commercial/Institutional  
☐ Open Space – Field  
☐ Open Space – Wooded  
Other:  
Notes (e.g., origin of outfall, if known):  
- Sampled from upstream manhole; outlet partially submerged in receiving water.

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td>D/CI</td>
<td>Other:</td>
<td></td>
<td>Fully</td>
</tr>
<tr>
<td>Other:</td>
<td>Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION  
☐ Good  
☐ Cracked  
☐ Clogged with Debris  
☐ Crushed  
☐ Deteriorated (concrete)  
☐ Corroded (metal)  
☐ Other

OUTLET STRUCTURE  
☐ Headwall  
☐ Riprap  
☐ Flared End  
☐ No Outfall Protection  
☐ Other

In-Stream (applicable when collecting samples):  
☐ Yes  
☐ No  
Maintenance/Repair Needed?:  
☐ No  
☐ Yes (See Section 8 for more description)

Flow Present?  
X Yes  
☐ No  
If No, Skip to Section 5

Flow Description  
☐ Trickle  
☐ Moderate  
☐ Substantial  
(If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOLUME</td>
<td>18.26</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>78.5°</td>
<td>C</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 umhos/cm)</td>
<td>0.660</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td>0.3</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>3.89</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>6.27</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>0</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>

this is in mS therefore it is 660 umhos/cm
**Outfall Reconnaissance Inventory Field Sheet**

### Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow?  □ Yes  □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>□</td>
<td>□ Sewage</td>
<td>□ 1 - Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Rancid/sour</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Petroleum/gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide</td>
<td>□ 2 - Easily detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Other:</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>□</td>
<td>□ Clear</td>
<td>□ 3 - Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Gray</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green</td>
<td>□ 1 - Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Orange</td>
<td>□ 2 - Clearly visible in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Red</td>
<td>□ 3 - Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Other:</td>
<td></td>
</tr>
<tr>
<td>Turbidity</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>See severity</td>
<td></td>
</tr>
<tr>
<td>Floatables -Does Not Include Trash!!</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.)</td>
<td>□ 1 - Few/Slight, origin not obvious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Suds</td>
<td>□ 2 - Some; indications of origin (e.g., possible suds or oil sheen)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Petroleum (oil sheen)</td>
<td>□ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

### Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present?  □ Yes  □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeposITS/Stains</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>Surrounding Vegetation</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>Abnormal Vegetation</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>Outfall</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>Erosibility</td>
<td>□</td>
<td>□ Odors □ Suds □ Colors □ Floatables □ Oil Sheen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Excessive Algae □ Other</td>
<td></td>
</tr>
<tr>
<td>Poor Pool Quality</td>
<td>□</td>
<td>□ Brown □ Orange □ Greent □ Other</td>
<td></td>
</tr>
<tr>
<td>Pipe Benthic Growth</td>
<td>□</td>
<td>□ Brown □ Orange □ Greent □ Other</td>
<td></td>
</tr>
</tbody>
</table>

### Section 6: Overall Outfall Characterization as an Illicit Discharge

□ Unlikely  □ Potential (presence of two or more indicators)  □ Suspect (one or more indicators with a severity of 3)  □ Obvious

### Section 7: Data Collection

1. **Sample for the Lab?**
   - □ Yes - E. Coli
   - □ Yes - Fecal Coliform
   - □ Yes - TSS
   - □ Yes - BODs
   - □ Yes - Total Phosphorus
   - □ Yes - Surfactants
   - □ Yes - Ammonia
   - □ Yes - Chlorine
   - □ No

2. If yes, collected from:
   - □ Flow
   - □ Pool

3. Intermittent flow trap recommended?  □ Yes  □ No

### Section 8: Any Non-Illlicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
Section 1: Background Data

SUBWATERSHED: 
Outfall ID: 0124 
LOCATION: Woman Street

Today's date: 9-19-17 
Time (Military): 12:25

INVESTIGATORS: 

TEMPERATURE (°F): 65
RAINFALL (IN.): LAST 72 HOURS: 
LAST 24 HOURS:

Photo #s and short description:

Land Use in Drainage Area (Check all that apply):

□ Industrial (Known Industries): ____________________
□ Residential
□ Commercial/Institutional
□ Open Space – Field
□ Open Space – Wooded
□ Other: ____________________

Notes (e.g., origin of outfall, if known):

"Sampled for upstream DML, outlet fenced in inaccessible...see field map sketch"

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimension:</td>
<td></td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>In Water:</td>
<td></td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td>□ No</td>
<td></td>
</tr>
<tr>
<td>DI/CI</td>
<td>Tripe</td>
<td>□ Partially</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Other:</td>
<td>□ Fully</td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION
□ Good □ Cracked □ Clogged with Debris □ Crushed □ Deteriorated (concrete) □ Corroded (metal)
□ Other: ____________________

OUTLET STRUCTURE
□ Headwall □ Riprap □ Flared End □ No Outfall Protection □ Other: ____________________

In-Stream (applicable when collecting samples)
□ Yes □ No
Maintenance/Repair Needed?
□ No □ Yes (See Section 8 for more description)

Flow Present?
□ Yes □ No If No, Skip to Section 5
Flow Description □ Trickle □ Moderate □ Substantial (If present)

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>FIELD</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>VOLUME</td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>Time to Fill</td>
<td></td>
<td>See</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>Temperature</td>
<td>19.81</td>
<td>°C</td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>Conductivity (&gt; 2,000 umhos/cm)</td>
<td>0.153</td>
<td>umhos/cm</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Salinity</td>
<td>0.1</td>
<td>ppt</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>5.55</td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>6.73</td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>Surfactants (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>Ammonia (NH3) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>Chlorine (&gt; Reporting Limit)</td>
<td>0.01</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>

this is in mS. therefore it is 153 umhos/cm
### Outfall Reconnaissance Inventory Field Sheet

**Section 4: Physical Indicators for Flowing Outfalls Only**

Are Any Physical Indicators Present in the flow?  ✔ Yes  ☐ No  *(If No, Skip to Section 5)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ODOR</strong></td>
<td>☐</td>
<td>□ Sewage  □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other</td>
<td>□ 2 – Easily detected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See severity</td>
<td>□ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td><strong>COLOR</strong></td>
<td>☐</td>
<td>□ Clear  □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td>□ 2 – Clearly visible in sample bottle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td><strong>TURBIDITY</strong></td>
<td>☐</td>
<td></td>
<td>□ 1 – Slight cloudiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 2 – Cloudy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 3 – Opaque</td>
</tr>
<tr>
<td><strong>FLOATABLES</strong> -DOS NOT INCLUDE TRASH!!</td>
<td>☐</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds</td>
<td>□ 1 – Few/slight; origin not obvious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Petroleum (oil sheen) □ Other:</td>
<td>□ 2 – Some; indications of origin (e.g., possible Suds or oil sheen)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ 3 - Some; origin clear (e.g., obvious oil sheen, Suds, or floating sanitary materials)</td>
</tr>
</tbody>
</table>

**Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls**

Are physical indicators that are not related to flow present?  ☐ Yes  ✔ No  *(If No, Skip to Section 6)*

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK if Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>☐</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam □ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>☐</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>☐</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERODIBILITY</td>
<td>☐</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>☐</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen □ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>☐</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

**Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE**

☐ Unlikely  ✔ Potential (presence of two or more indicators)  ☐ Suspect (one or more indicators with a severity of 3)  ☐ Obvious

**Section 7: Data Collection**

1. **SAMPLE FOR THE LAB?**
   - ☐ Yes – E. Coli  ✔ Yes – Fecal Coliform  ☐ Yes – TSS  ☐ Yes – BODs  ☐ Yes – Total Phosphorus  ☐ Yes – Surfactants  ✔ Yes – Ammonia
   - ☐ Yes – Chlorine  ☐ No
   - ☐ Total Nitrate  ☐ Nitrite  ☐ Total Sodium
2. If yes, collected from:  ☐ Flow  ☐ Pool
3. Intermittent flow trap recommended?  ☐ Yes  ☐ No

**Section 8: Any Non-Ilicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?**

*due to amount of salt/road debris nearby, removal and cure required.*
OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

SUBWATERSHED: [Blank]  Outfall ID: [Blank]  LOCATION: Library
Today's date: 9-19-17  Time (Military): 1315
INVESTIGATORS: S. Collins

TEMPERATURE (°F): 65  RAINFALL (IN.): LAST 72 HOURS: LAST 24 HOURS:
Photo #s and short description:

Land Use in Drainage Area (Check all that apply):
☐ Industrial (Known Industries):
☐ Residential
☐ Commercial/Institutional
☐ Open Space – Field
☐ Open Space – Wooded
Other:

Notes (e.g., origin of outfall, if known):
- When I first arrived, OR & US contained scum; does not appear to be natural form.
- Mental interference w/receiving info

Section 2: Outfall Description

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SHAPE</th>
<th>DIMENSIONS (IN.)</th>
<th>SUBMERGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP</td>
<td>Circular</td>
<td>Diameter/Dimensions:</td>
<td>In Water:</td>
</tr>
<tr>
<td>PVC</td>
<td>Elliptical</td>
<td>Double</td>
<td>☐ No</td>
</tr>
<tr>
<td>HDPE</td>
<td>Box</td>
<td>Triple</td>
<td>☐ Partially</td>
</tr>
<tr>
<td>DI/Cl</td>
<td>Other: ☐ Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PIPE CONDITION
☐ Good  ☐ Cracked  ☐ Clogged with Debris  ☐ Crushed  ☐ Deteriorated (concrete)  ☐ Corroded (metal)
☐ Other

OUTLET STRUCTURE
☐ Headwall  ☐ Riprap  ☐ Flared End  ☐ No Outfall Protection  ☐ Other

In-Stream (applicable when collecting samples)
☐ Yes  ☐ No  ☐ No Outfall Protection  ☐ Other

Maintenance/Repair Needed:
☐ No  ☐ Yes (See Section 8 for more description)

Flow Present?
☐ Yes  ☐ No  ☐ If No, Skip to Section 5
Flow Description
☐ Trickle  ☐ Moderate  ☐ Substantial (If present)

Section 3: Quantitative Characterization

<table>
<thead>
<tr>
<th>PARAMETER (Threshold Level)</th>
<th>RESULT</th>
<th>UNIT</th>
<th>EQUIPMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOLUME</td>
<td></td>
<td>Liter</td>
<td>Bottle</td>
</tr>
<tr>
<td>TIME TO FILL</td>
<td></td>
<td>Sec</td>
<td>Watch with second hand</td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>20.4°C</td>
<td></td>
<td>YSI Meter or Thermometer</td>
</tr>
<tr>
<td>CONDUCTIVITY (&gt; 2,000 UMHO/s/cm)</td>
<td>0.073</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SALINITY</td>
<td>0</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>5171</td>
<td>mg/l</td>
<td>YSI Meter</td>
</tr>
<tr>
<td>pH</td>
<td>6.84</td>
<td></td>
<td>YSI Meter</td>
</tr>
<tr>
<td>SURFACTANTS (≥ 0.25 mg/l)</td>
<td></td>
<td>mg/l</td>
<td>MBAS Test Kit (CHEMetrics K-9400)</td>
</tr>
<tr>
<td>AMMONIA (NH₃) (≥ 0.5 mg/l)</td>
<td></td>
<td>NTU</td>
<td>Test Strips</td>
</tr>
<tr>
<td>CHLORINE (&gt; Reporting Limit)</td>
<td>0.11</td>
<td>mg/l</td>
<td>Hach Pocket Colorimeter II</td>
</tr>
</tbody>
</table>

This is in mS, therefore it is 73 umhos/cm
Section 4: Physical Indicators for Flowing Outfalls Only
Are Any Physical Indicators Present in the flow? □ Yes □ No (If No, Skip to Section 5)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF Present</th>
<th>DESCRIPTION</th>
<th>RELATIVE SEVERITY INDEX (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODOR</td>
<td>□</td>
<td>□ Sewage □ Rancid/sour □ Petroleum/gas</td>
<td>□ 1 – Faint □ 2 – Easily detected □ 3 – Noticeable from a distance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Sulfide □ Other:</td>
<td></td>
</tr>
<tr>
<td>COLOR</td>
<td>□</td>
<td>□ Clear □ Brown □ Gray □ Yellow</td>
<td>□ 1 – Faint colors in sample bottle □ 2 – Clearly visible in sample bottle □ 3 – Clearly visible in outfall flow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Green □ Orange □ Red □ Other:</td>
<td></td>
</tr>
<tr>
<td>TURBIDITY</td>
<td>□</td>
<td>See severity</td>
<td>□ 1 – Slight cloudiness □ 2 – Cloudy □ 3 – Opaque</td>
</tr>
<tr>
<td>FLOTABLES</td>
<td>□</td>
<td>□ Sewage (Toilet Paper, etc.) □ Suds</td>
<td>□ 1 – Few/slight; origin not obvious □ 2 – Some; indications of origin (e.g., possible suds or oil sheen) □ 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)</td>
</tr>
<tr>
<td>-DOES NOT INCLUDE TRASH!!</td>
<td></td>
<td>□ Petroleum (oil sheen) □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls
Are physical indicators that are not related to flow present? □ Yes □ No (If No, Skip to Section 6)

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>CHECK IF Present</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEPOSITS/STAINS</td>
<td>□</td>
<td>□ None □ Grease/Oil □ Paper/Trash □ Foam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Heavy sedimentation deposits □ Other</td>
<td></td>
</tr>
<tr>
<td>SURROUNDING VEGETATION</td>
<td>□</td>
<td>□ Little or No Distress □ Moderate Distress □ High Distress</td>
<td></td>
</tr>
<tr>
<td>ABNORMAL VEGETATION IN OUTFALL</td>
<td>□</td>
<td>□ Excessive □ Inhibited</td>
<td></td>
</tr>
<tr>
<td>ERRATICITY</td>
<td>□</td>
<td>□ Little or No Erosion □ Small Areas of Erosion □ Many Eroded Areas</td>
<td></td>
</tr>
<tr>
<td>POOR POOL QUALITY</td>
<td>□</td>
<td>□ Odors □ Colors □ Floatables □ Oil Sheen</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Suds □ Excessive Algae □ Other:</td>
<td></td>
</tr>
<tr>
<td>PIPE BENTHIC GROWTH</td>
<td>□</td>
<td>□ Brown □ Orange □ Green □ Other:</td>
<td></td>
</tr>
</tbody>
</table>

Section 6: OVERALL OUTFALL CHARACTERIZATION AS AN ILICIT DISCHARGE
□ Unlikely □ Potential (presence of two or more indicators) □ Suspect (one or more indicators with a severity of 3) □ Obvious

Section 7: Data Collection

1. SAMPLE FOR THE LAB?
   □ Yes – E. Coli □ Yes – Fecal Coliform □ Yes – TSS □ Yes – BODs □ Yes – Total Phosphorus □ Yes – Surfactants □ Yes – Ammonia
   □ Yes – Chlorine □ No
   /* TEFLUORALUMINUM / TOTAL SODIUM */
   2. If yes, collected from: □ Flow □ Pool (potential interference with H20)
   3. Intermittent flow trap recommended? □ Yes □ No

Section 8: Any Non-I illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?
Appendix E
Dry and Wet Weather Sampling Outfall
Laboratory Reports
Enclosed are the analytical results and Chain of Custody for your project referenced above. The sample(s) were analyzed by our Warwick, RI laboratory unless noted otherwise. When applicable, indication of sample analysis at our Hudson, MA laboratory and/or subcontracted results are noted and subcontracted reports are enclosed in their entirety.

All samples were analyzed within the established guidelines of US EPA approved methods with all requirements met, unless otherwise noted at the end of a given sample's analytical results or in a case narrative.

The Detection Limit is defined as the lowest level that can be reliably achieved during routine laboratory conditions.

These results only pertain to the samples submitted for this Work Order # and this report shall not be reproduced except in its entirety.

We certify that the following results are true and accurate to the best of our knowledge. If you have questions or need further assistance, please contact our Customer Service Department.

Approved by:

Melissa A. Manamon
QA/QC Officer
<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SAMPLE RESULTS</th>
<th>DET. LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
<th>DATE/TIME ANALYZED</th>
<th>ANALYST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform (MF)</td>
<td>&lt;1</td>
<td>1</td>
<td>CFU/100 ml</td>
<td>SM9222D 19-21ed</td>
<td>8/24/2017 16:20</td>
<td>DMC</td>
</tr>
<tr>
<td>E. Coli</td>
<td>&lt;1.0</td>
<td>1.0</td>
<td>MPN/100 ml</td>
<td>SM9223B 19-21ed Enum</td>
<td>8/24/2017 15:00</td>
<td>DMC</td>
</tr>
<tr>
<td>BOD 5</td>
<td>&lt;3.0</td>
<td>3.0</td>
<td>mg/l</td>
<td>SM5210B 21ed</td>
<td>8/25/2017 10:54</td>
<td>ERG</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>&lt;2.0</td>
<td>2.0</td>
<td>mg/l</td>
<td>SM2540D 18-21ed</td>
<td>8/28/2017 16:15</td>
<td>MFH</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>&lt;0.25</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>8/26/2017 1:11</td>
<td>SAS</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>5.8</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>8/26/2017 1:11</td>
<td>SAS</td>
</tr>
<tr>
<td>TKN (as N)</td>
<td>&lt;0.50</td>
<td>0.50</td>
<td>mg/l</td>
<td>SM4500NOrg-D 18-21ed</td>
<td>8/29/2017 16:30</td>
<td>KLE</td>
</tr>
<tr>
<td>Total Nitrogen (as N)</td>
<td>5.80</td>
<td>0.50</td>
<td>mg/l</td>
<td>CALCULATION</td>
<td>8/26/2017 1:11</td>
<td>SAS</td>
</tr>
<tr>
<td>Total Phosphorus (as P)</td>
<td>0.04</td>
<td>0.02</td>
<td>mg/l</td>
<td>SM4500P-B,E 18-21ed</td>
<td>9/1/2017 9:00</td>
<td>DEL</td>
</tr>
<tr>
<td>Surfactants (MBAS)</td>
<td>0.12</td>
<td>0.10</td>
<td>mg/l</td>
<td>SM5540C 18-21ed</td>
<td>8/25/2017 17:00</td>
<td>TSB</td>
</tr>
<tr>
<td>Ammonia (as N)</td>
<td>&lt;0.20</td>
<td>0.20</td>
<td>mg/l</td>
<td>EPA 350.1</td>
<td>8/30/2017 8:25</td>
<td>KLE</td>
</tr>
</tbody>
</table>

**Sample Number:** 001  
**Sample Description:** 8/24/17 - OF130  
**Sample Type:** GRAB  
**Sample Date / Time:** 8/24/2017 @ 11:15

Microbiological analysis performed at our Hudson, MA laboratory location. Refer to page 1 for physical address and certification numbers.

Surfactants (MBAS) - Calculated as LAS, mol wt. 342.
<table>
<thead>
<tr>
<th>Date Collected</th>
<th>Time Collected</th>
<th>Field Sample Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/24/17</td>
<td>11:32</td>
<td>G7 0</td>
</tr>
</tbody>
</table>

**Client Information**
- **Company Name**: Tiggle + Bond
- **Address**: University Ave., Suite 104
- **City / State / Zip**: Westwood, MA 02090
- **Telephone**: 781-708-9835
- **Contact Person**: Stephanie Collins

**Project Information**
- **Project Name**: AVON
- **P.O. Number**: 10121024
- **Project Number**: 10121024
- **Report To**: Email report to these addresses: scollins@tigglebond.com

**Relinquished By Signatures**
- **Date**: 8/24/17
- **Time**: 11:32
- **Name**: [Signature]

**Received By Signatures**
- **Date**: 8/24/17
- **Time**: 1:33
- **Name**: [Signature]

**Project Comments**
- **MCP Data Enhancement QC Package?**: Yes
- **Temp. Upon Receipt**: 72°F

**Containers**: P=Poly, G=Glass, AG=Amber Glass, V=Vial, St=Sterile
**Preservatives**: A=Ascorbic Acid, NH4=NH4Cl, H=HCl, M=MeOH, N=HNO3, NP=None, S=H2SO4, SB=NaHSO4, SH=NaOH, T=Na2SO4, Z=ZnOAc
**Matrix Codes**: GW=Groundwater, SW=Surface Water, WW=Wastewater, DW=Drinking Water, S=Soil, SL=Sludge, A=Air, B=Bulk/Solid, WP=Wipe, O=Other

**Lab Use Only**
- **Sample Pick-Up Only**: ✔️
- **RIAL sampled; attach field hours**: ✔️
- **Shipped on ice**: ✗
- **Workorder No.**: 1708-193284

**Notes**
- 24-hour pH
- 24-hour temperature
- DO
- E. coli
- Total Coliform
- MPN
- Metal analysis
- pH
- Temperature
- TSS
- BOD5
- COD
Enclosed are the analytical results and Chain of Custody for your project referenced above. The sample(s) were analyzed by our Warwick, RI laboratory unless noted otherwise. When applicable, indication of sample analysis at our Hudson, MA laboratory and/or subcontracted results are noted and subcontracted reports are enclosed in their entirety.

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We certify that the following results are true and accurate to the best of our knowledge. If you have questions or need further assistance, please contact our Customer Service Department.

Approved by:

Melissa A. Manamon
QA/QC Officer

Laboratory Certification Numbers (as applicable to sample's origin state):
Warwick RI * RI LAI00033, MA M-R1015, CT PH-0508, ME RI00015, NH 2070, NY 11726
Hudson MA * M-MA1117, RI LAO00319
### Sample Number: 001

**Sample Description:** OF130

**Sample Type:** GRAB

**Sample Date / Time:** 9/19/2017 @ 11:30

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SAMPLE RESULTS</th>
<th>DET. LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
<th>DATE/TIME ANALYZED</th>
<th>ANALYST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform (MF)</td>
<td>11</td>
<td>1</td>
<td>CFU/100 ml</td>
<td>SM9222D 19-21ed</td>
<td>9/19/2017 18:27</td>
<td>AOO</td>
</tr>
<tr>
<td>E. Coli</td>
<td>&lt;1.0</td>
<td>1.0</td>
<td>MPN/100 ml</td>
<td>SM9223B 19-21ed Enum</td>
<td>9/19/2017 18:44</td>
<td>AOO</td>
</tr>
<tr>
<td>BOD 5</td>
<td>&lt;3.0</td>
<td>3.0</td>
<td>mg/l</td>
<td>SM5210B 21ed</td>
<td>9/19/2017 20:26</td>
<td>MA</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>2.8</td>
<td>2.0</td>
<td>mg/l</td>
<td>SM2540D 18-21ed</td>
<td>9/22/2017 21:00</td>
<td>MFH</td>
</tr>
<tr>
<td>Surfactants (MBAS)</td>
<td>0.17</td>
<td>0.10</td>
<td>mg/l</td>
<td>SM5540C 18-21ed</td>
<td>9/20/2017 22:15</td>
<td>TSB</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>&lt;0.25</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 19:40</td>
<td>MMM</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>5.4</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 19:40</td>
<td>MMM</td>
</tr>
<tr>
<td>Ammonia (as N)</td>
<td>&lt;0.20</td>
<td>0.20</td>
<td>mg/l</td>
<td>SM 4500- NH3 B, H</td>
<td>9/25/2017 21:00</td>
<td>KLE</td>
</tr>
<tr>
<td>TKN (as N)</td>
<td>&lt;0.50</td>
<td>0.50</td>
<td>mg/l</td>
<td>SM4500NOrg-D 18-21ed</td>
<td>9/20/2017 16:00</td>
<td>KLE</td>
</tr>
<tr>
<td>Total Phosphorus (as P)</td>
<td>0.06</td>
<td>0.02</td>
<td>mg/l</td>
<td>SM4500P-B,E 18-21ed</td>
<td>9/26/2017 9:00</td>
<td>DEL</td>
</tr>
<tr>
<td>Total Metals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>88</td>
<td>2.5</td>
<td>mg/l</td>
<td>EPA 200.7</td>
<td>9/25/2017 19:48</td>
<td>AJD</td>
</tr>
<tr>
<td>ICP Digestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9/22/2017 9:30</td>
<td>AGJ</td>
</tr>
</tbody>
</table>

Surfactants (MBAS) - Calculated as LAS, mol wt. 342.

### Sample Number: 002

**Sample Description:** OF124 CB2

**Sample Type:** GRAB

**Sample Date / Time:** 9/19/2017 @ 12:25

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SAMPLE RESULTS</th>
<th>DET. LIMIT</th>
<th>UNITS</th>
<th>METHOD</th>
<th>DATE/TIME ANALYZED</th>
<th>ANALYST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform (MF)</td>
<td>TNTC</td>
<td>1</td>
<td>CFU/100 ml</td>
<td>SM9222D 19-21ed</td>
<td>9/19/2017 18:27</td>
<td>AOO</td>
</tr>
<tr>
<td>E. Coli</td>
<td>1553.1</td>
<td>1.0</td>
<td>MPN/100 ml</td>
<td>SM9223B 19-21ed Enum</td>
<td>9/19/2017 18:44</td>
<td>AOO</td>
</tr>
<tr>
<td>BOD 5</td>
<td>10</td>
<td>6.0</td>
<td>mg/l</td>
<td>SM5210B 21ed</td>
<td>9/19/2017 20:22</td>
<td>MA</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>20</td>
<td>2.0</td>
<td>mg/l</td>
<td>SM2540D 18-21ed</td>
<td>9/23/2017 14:13</td>
<td>MFH</td>
</tr>
<tr>
<td>Surfactants (MBAS)</td>
<td>0.97</td>
<td>0.10</td>
<td>mg/l</td>
<td>SM5540C 18-21ed</td>
<td>9/20/2017 22:15</td>
<td>TSB</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>&lt;0.25</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 19:55</td>
<td>MMM</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>1.9</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 19:55</td>
<td>MMM</td>
</tr>
<tr>
<td>Ammonia (as N)</td>
<td>2.2</td>
<td>1.0</td>
<td>mg/l</td>
<td>SM 4500- NH3 B, H</td>
<td>9/25/2017 21:00</td>
<td>KLE</td>
</tr>
<tr>
<td>TKN (as N)</td>
<td>2.5</td>
<td>0.50</td>
<td>mg/l</td>
<td>SM4500NOrg-D 18-21ed</td>
<td>9/20/2017 16:00</td>
<td>KLE</td>
</tr>
<tr>
<td>Total Phosphorus (as P)</td>
<td>0.23</td>
<td>0.02</td>
<td>mg/l</td>
<td>SM4500P-B,E 18-21ed</td>
<td>9/26/2017 9:00</td>
<td>DEL</td>
</tr>
<tr>
<td>Total Metals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>19</td>
<td>2.5</td>
<td>mg/l</td>
<td>EPA 200.7</td>
<td>9/25/2017 15:26</td>
<td>AJD</td>
</tr>
<tr>
<td>ICP Digestion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9/22/2017 16:17</td>
<td>DDP</td>
</tr>
</tbody>
</table>

Surfactants (MBAS) - Calculated as LAS, mol wt. 342.
## R.I. Analytical Laboratories, Inc.
### Laboratory Report

**Tighe & Bond**  
**Work Order #:** 1709-20287  
**Project Name:** PROJECT# 101121-004 AVON

### Sample Information

| Sample Number: | 003  | Sample Description: | 9-19-17 - OF114 - DUP  | Sample Type: | GRAB  | Sample Date / Time: | 9/19/2017 @ 13:05 |

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SAMPLE RESULTS</th>
<th>DET. LIMIT</th>
<th>UNITS METHOD</th>
<th>DATE/TIME ANALYZED</th>
<th>ANALYST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform (MF)</td>
<td>TNTC</td>
<td>1</td>
<td>CFU/100 ml</td>
<td>SM9222D 19-21ed</td>
<td>9/19/2017 18:27 AOO</td>
</tr>
<tr>
<td>E. Coli</td>
<td>920.8</td>
<td>1.0</td>
<td>MPN/100 ml</td>
<td>SM9223B 19-21ed Enum</td>
<td>9/19/2017 18:44 AOO</td>
</tr>
<tr>
<td>BOD 5</td>
<td>8.4</td>
<td>6.0</td>
<td>mg/l</td>
<td>SM5210B 19-21ed</td>
<td>9/19/2017 20:24 MA</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>58</td>
<td>2.0</td>
<td>mg/l</td>
<td>SM2540D 18-21ed</td>
<td>9/23/2017 14:13 MFH</td>
</tr>
<tr>
<td>Surfactants (MBAS)</td>
<td>0.52</td>
<td>0.10</td>
<td>mg/l</td>
<td>SM5540C 18-21ed</td>
<td>9/20/2017 22:15 TSB</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>&lt;0.25</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 20:09 MMM</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>1.1</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 20:09 MMM</td>
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<tr>
<td>Ammonia (as N)</td>
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<td>0.20</td>
<td>mg/l</td>
<td>SM 4500- NH3 B, H</td>
<td>9/28/2017 13:02 KLE</td>
</tr>
<tr>
<td>TKN (as N)</td>
<td>2.2</td>
<td>0.50</td>
<td>mg/l</td>
<td>SM4500NOrg-D 18-21ed</td>
<td>9/20/2017 16:00 KLE</td>
</tr>
<tr>
<td>Total Phosphorus (as P)</td>
<td>0.20</td>
<td>0.02</td>
<td>mg/l</td>
<td>SM4500P-B,E 18-21ed</td>
<td>9/26/2017 9:00 DEL</td>
</tr>
<tr>
<td>Sodium</td>
<td>9.0</td>
<td>2.5</td>
<td>mg/l</td>
<td>EPA 200.7</td>
<td>9/25/2017 15:29 AJD</td>
</tr>
<tr>
<td>ICP Digestion</td>
<td></td>
<td></td>
<td></td>
<td>EPA 200.7</td>
<td>9/22/2017 16:17 DDP</td>
</tr>
</tbody>
</table>

Surfactants (MBAS) - Calculated as LAS, mol wt. 342.

---

| Sample Number: | 004  | Sample Description: | 9-19-17 - OF114  | Sample Type: | GRAB  | Sample Date / Time: | 9/19/2017 @ 13:15 |

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SAMPLE RESULTS</th>
<th>DET. LIMIT</th>
<th>UNITS METHOD</th>
<th>DATE/TIME ANALYZED</th>
<th>ANALYST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform (MF)</td>
<td>TNTC</td>
<td>1</td>
<td>CFU/100 ml</td>
<td>SM9222D 19-21ed</td>
<td>9/19/2017 18:27 AOO</td>
</tr>
<tr>
<td>E. Coli</td>
<td>727.0</td>
<td>1.0</td>
<td>MPN/100 ml</td>
<td>SM9223B 19-21ed Enum</td>
<td>9/19/2017 18:44 AOO</td>
</tr>
<tr>
<td>BOD 5</td>
<td>11</td>
<td>3.0</td>
<td>mg/l</td>
<td>SM5210B 19-21ed</td>
<td>9/19/2017 20:28 MA</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>21</td>
<td>2.0</td>
<td>mg/l</td>
<td>SM2540D 18-21ed</td>
<td>9/25/2017 10:11 TAC</td>
</tr>
<tr>
<td>Surfactants (MBAS)</td>
<td>0.50</td>
<td>0.10</td>
<td>mg/l</td>
<td>SM5540C 18-21ed</td>
<td>9/20/2017 22:15 TSB</td>
</tr>
<tr>
<td>Nitrite (as N)</td>
<td>&lt;0.25</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 20:23 MMM</td>
</tr>
<tr>
<td>Nitrate (as N)</td>
<td>0.62</td>
<td>0.25</td>
<td>mg/l</td>
<td>EPA 300.0</td>
<td>9/19/2017 20:23 MMM</td>
</tr>
<tr>
<td>Ammonia (as N)</td>
<td>0.63</td>
<td>0.20</td>
<td>mg/l</td>
<td>SM 4500- NH3 B, H</td>
<td>9/25/2017 21:00 KLE</td>
</tr>
<tr>
<td>TKN (as N)</td>
<td>1.7</td>
<td>0.50</td>
<td>mg/l</td>
<td>SM4500NOrg-D 18-21ed</td>
<td>9/21/2017 15:30 KLE</td>
</tr>
<tr>
<td>Total Phosphorus (as P)</td>
<td>0.19</td>
<td>0.02</td>
<td>mg/l</td>
<td>SM4500P-B,E 18-21ed</td>
<td>9/27/2017 10:00 DEL</td>
</tr>
<tr>
<td>Sodium</td>
<td>8.2</td>
<td>2.5</td>
<td>mg/l</td>
<td>EPA 200.7</td>
<td>9/25/2017 15:32 AJD</td>
</tr>
<tr>
<td>ICP Digestion</td>
<td></td>
<td></td>
<td></td>
<td>EPA 200.7</td>
<td>9/22/2017 16:17 DDP</td>
</tr>
</tbody>
</table>

Surfactants (MBAS) - Calculated as LAS, mol wt. 342.
## Chain of Custody Record

### Field Sample Identification

<table>
<thead>
<tr>
<th>Date Collected</th>
<th>Time Collected</th>
<th>Container Code</th>
<th>Number of Containers &amp; Type Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-19-17</td>
<td>11:30</td>
<td>OF 130</td>
<td>G7 6</td>
</tr>
<tr>
<td>9-19-17</td>
<td>12:05</td>
<td>OF 124 C32</td>
<td>G6 6</td>
</tr>
<tr>
<td>9-19-17</td>
<td>13:05</td>
<td>9/19/17 - OF 114 - DWP</td>
<td>G6 6</td>
</tr>
<tr>
<td>9-19-17</td>
<td>13:15</td>
<td>9/19/17 - OF 114</td>
<td>G6 6</td>
</tr>
</tbody>
</table>

### Client Information

- **Company Name:** Tighe & Bond
- **Address:** 1 University Ave.
- **City/State/Zip:** Westwood, MA 02090
- **Phone:** 781-708-9835
- **Fax:**
- **Contact Person:** Stephanie Collins

### Project Information

- **Project Name:** AVON
- **Project Number:** 101121-004
- **Report To:**
- **Email address:** scollins@tighebond.com

### Relinquished By Signatures

- **Date:** 9/19/17
- **Time:** 15:45
- **Received By Signatures Date:** 9/19/17
- **Time:** 17:27

### Project Comments

- **Circle if applicable:** GW-1, GW-2, GW-3, S-1, S-2, S-3
- **MCP Data Enhancement QC Package:** Yes

### Turn Around Time

- Normal: 5 Business days. Possible surcharge:
- Rush: Date Due: 

### Lab Use Only

- Sample Pick-Up Only
- RIAL sampled; attach field hours
- Shipped on ice

### Work Order No.

- 1307-00282

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**Matrix Codes:**
- GW = Groundwater
- SW = Surface Water
- WW = Wastewater
- DW = Drinking Water
- S = Soil
- SL = Sludge
- A = Air
- B = Bulk/Solid
- WP = Wipe

**Preservatives:**
- A = Ascorbic Acid
- NH4 = NH4Cl
- H = HCl
- M = MeOH
- N = HNO3
- P = None
- S = H2SO4
- SB = NaHSO3
- SH = NaOH
- T = Na2SO4
- Z = ZnOAc

**Temp. Upon Receipt:** 60°C