STANDARD OPERATING PROCEDURES
for the
TRWA/ VWNA
VOLUNTEER MONITORING PROGRAM

Funded and staffed by:

Taunton River Watershed Alliance (TRWA)
Veolia Water North America (VWNA)

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TABLE OF CONTENTS

1. PROJECT DESCRIPTION

A. The TRWA/Veolia Water North America (VWNA) Water Quality Monitoring Project

The Taunton River Watershed Alliance is a non-profit alliance of concerned individuals, businesses, and organizations who are dedicated to protecting and restoring the Taunton River watershed – its tributaries, wetlands, floodplains, river corridors and wildlife. The Watershed Alliance conducts water quality monitoring at sites along the Taunton River and its tributaries. Volunteers play a critical role in water quality sampling. The TRWA's network of volunteers gives concerned residents an effective vehicle for "doing something real" to protect our rivers. VWNA provides contract operation and privatization of water and wastewater treatment facilities and related systems. In 1998, VWNA entered into a twenty-year contract with the City of Taunton to operate and maintain their wastewater treatment plant and manage and administer a pollution prevention program including collaborating with the TRWA on a watershed monitoring project that contract has continued to be renewed.

B. Scope of this Document

This SOP describes procedures employed by the TRWA/ VWNA volunteer monitoring program. The background information, general safety, and water sampling information are described. Supplementary information, instruction sheets, and blank forms are provided on the TRWA website and listed in the Appendix. The laboratory SOP is located on site at the Taunton Wastewater Treatment Plant this SOP is posted on the TRWA website. In 2019 TRWA received MassDEP approval of its Quality Assurance Project Plan (QAPP) for its most environmentally significant sampling parameters: nitrate, total phosphorus, and enterococci bacteria.

C. Purpose for Sampling

The Taunton River Watershed Basin is in the heart of the fastest growing area of Massachusetts. It has the largest remaining wetland in the state (Hockomock Swamp) and is home to many species of plants and animals. This sampling program monitors the water quality of a portion of the Taunton River to assess the impact of residential, agricultural, and industrial sprawl on water quality which affects the species indigenous to this basin.

D. Intended Use of Data

The monitoring data is forwarded monthly from VWNA to the TRWA. The TRWA uses the scientific data gathered to establish a baseline of knowledge from which changes to the watershed can be measured. Monitoring data is also forwarded to the City of Taunton Department of Public Works and has been critical in pinpointing areas where sewage outbreaks had occurred. Also, areas of high nutrient readings are available to local communities, MassDEP and EPA to help determine the cause or water quality impairment and help determine what remedial actions are possible.

2. TECHNICAL DESIGN

A. Sampling Strategy

Sampling is performed monthly, on the second Tuesday, between the hours of 5:30 a.m. and 8:00 a.m. Samples must be dropped off to the Taunton wastewater treatment plant laboratory by 08:30 a.m. Monthly sampling was picked because it is frequent enough to include wet-weather events, dry spells, and temperature variations. The second Tuesday of the month was chosen because there are few national holidays celebrated on this day. The samples are collected in the morning because during photosynthesis, which occurs in the daytime, plants release more oxygen than is used by respiration and decomposition, raising oxygen levels. However, at night, with no photosynthesis oxygen levels are depleted. By sampling in the early morning, water quality can be assessed during a time when the river would be under the greatest oxygen stress. Early sampling also provides time for drop off and pick up of contract analysis samples and for the Taunton WWTP lab to perform those analysis performed in house.

B. Sampling Locations

A total of twenty sites and a duplicate are sampled at this time. Samples are taken close/from bridges, normally at public access, due to safety considerations and accessibility for parking. These sites were chosen to cover a representative area of the City's waterways as well as significant tributaries up and downstream which affect the health of the Taunton River watershed. The Taunton River is tidal up to Route 24 – aquatic life including fish and wildlife migrate up and downstream. The better the water quality throughout the watershed the greater the aquatic life diversity which = greater ecological, recreational and economic value of the Taunton River watershed and estuary.

STREET/BRIDGE LOCATION	RIVER	GPS Location	ID
CENTER ST., BERKLEY BRIDGE	TAUNTON RIVER	N41°50' 5.7/W71°06' 29.5	TNT 01
PLAIN ST., TAUNTON	TAUNTON RIVER	N41°53' 9.7/W71°05' 20.5	TNT 02
BEDFORD ST., RT. 18, BRIDGEWATER	TAUNTON RIVER	N41°56' 12/W70°57' 56	BED 01 (TNT 03)
CHERRY ST., BRIDGEWATER	TAUNTON RIVER	N41°58' 42.3/W70°54' 44	CHE 01 (TNT 04)
ROUTE 79, ASSONET R., BRIDGE	ASSONET RIVER	N41°47' 37.9/W71°04' 3.6	ASO 01
SEGREGANSETT RIVER BRIDGE, HORTON ST., DIGHTON	SEGREGANSETT RIVER	N41°50' 47/W71°09' 51.8	SEG-01
CHICKAMUCKETSETT BROOK BRIDGE, BERKLEY ST., BERKLEY	CHICKAMUCK-SETT BROOK	N41°49' 58.2/W71°06' 24	BER 01
SOMERSET AVE., ROUTE 138 TAUNTON	THREE MILE	N41°51' 19.9/W71°06' 56	TMR 01
COHANNET ST., ROUTE 44 TAUNTON	THREE MILE	N41°53' 11.4/W71°08'	TMR 02
CRANE ST., NORTON	THREE MILE	N41°56' 48.3/W71°09' 38	TMR 03
INGELL ST., TAUNTON	MILL RIVER	N41°53' 46/W71°04' 55.4	MIL 01
WASHINGTON ST., TAUNTON	MILL RIVER	N41°54' 11.7/W71°05' 51	MIL02
WHITTENDON ST., TAUNTON	MILL RIVER	N41°55' 24/W71°06' 21.5	MIL03
ROUTE 44, RAYNHAM	FORGE RIVER	N41°54' 18.2/W71°03' 34	FORGE
MIDDLEBOROUGH AVE., TAUNTON	COTLEY RIVER	N41°52' 58/W71°01' 27.8	COT-01
RIVER ST., E. TAUNTON	FURNACE BROOK	N41°53' 35/W71°00' 04.7	FBR 01
HIGHSTONE ST., E. TAUNTON	THOMPSON BROOK	N41°51' 46/W70°58' 40.8	TBR 01
HAYWARD ST., BRIDGEWATER	TOWN RIVER	N41°59' 51/W70°57' 13.2	TWH 01

HIGH ST., BRIDGEWATER	MATFIELD RIVER	N41°59' 58/W70°56' 16.1	MAT 01
MURDOCK ST., MIDDLEBOROUGH	NEMASKET RIVER	N41°56' 1.0/W70°55' 24	NEM 01

C. Sampling Design

Volunteers make careful visual observations about the basic conditions of the river (i.e. color, odor, etc.). Volunteers take in situ measurements for temperature. Volunteers collect and store for transportation (place in an insulated cooler with a cold pack) samples for enterococci bacteria, nitrate-nitrogen, total phosphorus, dissolved oxygen, total suspended solids, and pH (DO, pH and TSS are measured at the WWTP lab; enterococci, nitrate and phosphorus samples are sent following chain of custody protocols to a state certified contract laboratory for analysis). If a smart phone of camera is available volunteers take pictures of unusual conditions such as algae and weed blooms or fish kills.

Samples and field data sheets are delivered by volunteers to the Taunton Wastewater Treatment Plant laboratory. At the drop off site, chain-of-custody forms are completed and custody of the samples is transferred to the laboratory technician. At time of pick-up the contract lab currier signs for the enterococci, nitrate, and total phosphorus samples. **ALL CHAIN OF CUSTODY FORMS MUST BE COMPLETED AND SIGNED BY THE VOLUNTEER SAMPLE COLLECTOR**. Both Veolia and TRWA maintain copies of chain of custody forms and contract lab analysis reports.

D. Monitoring Parameters

The TRWA/ VWNA monitoring program testing focuses on physical, biological, and chemical water quality indicators. The parameters tested are as follows:

Nitrate Nitrogen (**NO3-N)** – Nitrogen found in water or soil as organic nitrogen, ammonia (NH3), nitrite (NO2) and nitrate (NO3). Like phosphorus, nitrogen is a necessary part of the life cycle. Most plants, animals, and microorganisms require some amount of nitrogen for growth and reproduction. Like phosphorus, nitrogen is a limiting nutrient particularly in estuaries where freshwaters and salt waters mix (Taunton River below route 24 and Mount Hope Bay are tidal and classified as SB waters by the Commonwealth or Massachusetts). Excess nitrates will result in excessive growth of algae and aquatic plants. The decomposition of these aquatic plants depletes oxygen from the water (the process of decomposition requires oxygen). This may result in "choking" the river or estuary due to low DO levels or habitat destruction by macro-algae and weed proliferation. Nitrates above low levels are toxic to beneficial sea grasses. Excessive amounts of nitrates can come from sewage treatment plants, animal manure, run off from fertilized lawns, agricultural farming, industrial discharges and stormwater runoff which carries low concentration but high volume (hence significant mass loads) of nitrogen and phosphorus to the watershed. Nitrates from land sources end up in rivers more quickly than nutrients like phosphorus. This is because they dissolve in water more readily than phosphorus, which has an attraction for soil particles. Nitrates because they dissolve in water flow with groundwater to rivers and streams when applied as fertilizers at rates higher than lawns and crops require for growth. Nitrates serve as an indicator of sewage pollution during dry weather. Past TRWA monitoring consistently measures nitrate levels above state water quality criteria (TN – 0.45 mg/l;

NO3>0.4 mg/l) as interpreted by EPA and MassDEP in Taunton watershed NPDES permit Fact Sheets.

Total Phosphorus (Total P) – Phosphorus occurs in water in several forms called phosphates. The total phosphorus test measures all of the forms of phosphates. Phosphates are necessary for biological growth, yet it is the nutrient that is in the shortest supply in most fresh waters. For this reason, it is referred to as a "limiting" nutrient (meaning it limits the amount of biological growth). A small increase in the level of phosphorus may result in an undesirable chain of events including excessive growth of aquatic plants, low dissolved oxygen and death of certain aquatic animals. Phosphates enter the water both naturally and from humans. It naturally occurs in soil and rocks. It is introduced from human activities such as wastewater treatment plant discharges, runoff from fertilized lawns and crop land, failing septic systems, impervious surface deposition stormwater wash-off), road salt (which incorporates phosphorus compounds as anti-caking agents), and commercial cleaning operations. Past TRWA monitoring periodically measures total phosphorus (TP) levels above state water quality criteria (TP – 0.100 mg/l) as interpreted by EPA and MassDEP in Taunton watershed NPDES permit Fact Sheets. Levels of TP often exceed the EPA Gold Book criterion (TP – 0.05 mg/l) recommended for lakes and impoundments and EPA's Ecoregion VIII recommendation for rivers and streams (TP – 0.01 mg/l).

Enterococci Bacteria – Enterococci bacteria are indicators of the presence of fecal contamination from warm blooded animals (human or animal). National studies conducted under the Beach Act found the best correlation between bacteria levels and swimmer illness for enterococci, and E. coli bacteria. Subsequently MassDEP revised its water quality standards to change its class B bacteria criteria from fecal coliform to enterococci for Class SB and B waters; or alternately, E. coli for B waters. The water quality criterion for enterococci is 61 colonies per 100 ml as a single sample maximum (SSM); and 33 colonies/100ml as a geometric mean of all samples taken in the last six months. For SB waters the criteria are: SSM – 104 colonies/100 ml and Geo Mean for the last six months of samples – 35 colonies/100ml. TRWA samples in both SB (TNT-01 and TNT-02) and B (remainder of watershed) waters. Past TRWA monitoring periodically measured violations of the former fecal coliform criterion. In 2019 we changed our program to monitor using one of the currently approved bacteria indicator enterococci and found many violations of the state standards. We will be looking for trends and sources using the future sampling data.

Temperature – Temperature determines how much oxygen the water can hold and the rate at which many biochemical reactions can occur. Warmer water can hold less oxygen. Aquatic organisms are dependent on certain temperature ranges for their optimal health. The rivers and streams of the Taunton River watershed are classified as Class B warm water fisheries except for the main stem of the Taunton River below the Route 24 bridge which is Class SB. The temperature of Class B warm water fisheries shall not exceed 83°F (28.3°C). The temperature in Class SB waters shall not exceed 85°F (29°C) nor a maximum daily mean of 80°F (26.7°C). Past TRWA monitoring measures rising water temperatures during summer but almost never measures a criteria violation.

DO (Dissolved Oxygen) – The river system both produces and consumes oxygen. It gains oxygen from the atmosphere and from plants as a result of photosynthesis. Oxygen is consumed during respiration by aquatic animals, decomposition of organic matter, and various chemical reactions. Oxygen is measured in its dissolved form as dissolved oxygen. If more DO is consumed than is produced, dissolved oxygen levels decline. The DO criterion of Class B warm waters and SB is greater than 5.0 mg/l to support life. Past TRWA monitoring almost never measures values less than

the 5.0 mg/l criterion because we measure relatively shallow surface waters of flowing streams and rivers. TRWA's most downstream main stem sampling site is at the Berkley/Dighton Bridge. The watershed locations where DO violations occur and are regularly measured by continuous DO measurement by MassDEP are in the upper estuary, particular the deep area south of the Braga Bridge. MassDEP has done continuous summer monitoring (every 15 minutes) for dissolved oxygen, nitrate-N, chlorophyll-a, blue green algae, temperature, pH, specific conductivity and salinity at 1 meter below the surface and 0.5 meter from the bottom since 2017. MassDEP measures DO criteria violations over 30% or the time in dry years and over 20% of the time in wet years concurrent with high chlorophyll-a, algae, and nitrate levels consistent with a nitrogen over enriched estuary.

pH – The pH measures the acidity or alkalinity of water on a scale of 1.0 – 14.0 with 7 being neutral. 1.0 would be the most acidic and 14 would be the most basic or alkaline. The acidity affects the rate of biochemical reactions in the water. The pH of a Class B stream should be 6.5 – 8.3 and not more than 0.5 units outside the natural range. A pH outside of this range reduces diversity in the river because it stresses the physiological systems of most organisms and can reduce reproduction. Low pH may allow toxic elements to precipitate out of solution and become available for uptake by aquatic plants and animals. High pH may indicate CO2 uptake from the water by algae or plant blooms. Multiple instream samples along a river taken over a short time period may sometimes track a bloom. Past TRWA monitoring indicates results on the low side of the criteria range with some values slightly below most likely due to the natural swamp and bog character of the watershed.

Total Suspended Solids (TSS) – Total suspended solids (TSS) is usually used for direct measurement of wastewater treatment plant effluent discharges to detect plant upsets and resulting loss of solids. TRWA is using TSS as an indicator of water clarity. TSS measures the level of sediment contained in a sample. Suspended solids include silt and clay particles, plankton, algae, fine organic debris and other particulate matter. A high TSS (>25 mg/l) might interfere with sunlight penetrating through the water to the bottom. This may slow photosynthesis by aquatic plants. Sources of solids are construction sites not practicing required sediment control best management practices, industrial discharges, sewage plant upsets, fertilizers, road runoff, soil erosion, and increase in river sediment bed load after storms. Past TRWA monitoring seldom measures TSS levels of concern. After high rain events we sometimes measure 10 to 20 mg/l values at a few locations. In the future to conserve in-house lab resources, when samples are analyzed for DO and pH the Veolia lab personnel will inspect samples for visible turbidity and measure TSS only in samples with visible sediment turbidity.

E. Quality Control

In 2019, TRWA received MassDEP approval of its Quality Assurance Project Plan (QAPP) for its most ecologically important samples which are: nitrate, total phosphorus, and enterococci bacteria. For these samples we collect duplicate and blank samples for every ten samples collected. Since TRWA samples 20 sites per month we do 2 sets of duplicates and blank samples at two rotating locations per month (see blank monthly results summary form for NO3, TP, and Enterococci on the TRWA website http://savethetaunton.org/ under the home page monitoring tab).

For our samples used for water property characterization but not criteria assessment purposes: water temperature, dissolved oxygen, pH and total suspended solids we do two duplicate samples and no blank samples per month for a quality check (see blank monthly results summary form for temperature, DO, pH, and TSS on the TRWA website http://savethetaunton.org/ under the home page monitoring tab). TRWA's historical monitoring results indicates that doing full MassDEP recommended QA for

these parameters would provide little useful additional information so we have not requested MassDEP QA review and approval for DO, pH and temperature sampling.

Following the sampling event and analytical analysis, the results from the MassDEP approved contract lab used for nitrate, total phosphorus, and enterococci analysis including their QA results are forwarded to Veolia. Veolia immediately forwards these results by email to TRWA. After review by TRWA the results are put in our monthly results tracking table and posted on the TRWA website typically within a month of sample collection.

The Veolia Taunton waste water treatment plant (WWTP) lab an NPDES regulated facility does the analysis for dissolved oxygen (DO), pH, total suspended solids (TSS), and reports the temperature results measured in the field and reported on the Field and Chain of Custody information sheets. After completing the monthly analysis for these parameters, the Veolia Taunton laboratory manager reviews the results and immediately forwards these results by email to TRWA. After review by TRWA these results are put in our monthly results tracking table on the TRWA website.

3. PROJECT ORGANIZATION AND RESPONSIBILITY

Analytical Lab Manager(s)/Director(s):

Rick McCormack
Veolia Water – Taunton
825 West Water Street
Taunton, MA 02780
508-823-3582, FAX 508-880-7566
richard.mccormack@veolia.com

Katherine Wall
Microbac Lab Manager
Microbac Laboratories, Inc.
61 Viens Drive
Dayville, CT 06241

TRWA Monitoring Program Coordinator:

Stephen Silva
124 Titicut Rd
Raynham, MA 02676
508-824-7345; Cell: 508-280-3991
steve124@gmail.com

TRWA Quality Assurance Officer:

Joseph Callahan
1 Faria Farm Road
Berkley, MA 02779
508-880-6653; Cell: 508-243-4116

thecallahans36@comcast.net

The field sampling program coordinators check each sample site directly for safety and accessibility and assist with training sessions for community volunteer samplers the last Saturday of the month before each years sampling program is scheduled to begin and as needed throughout the year.

The laboratory coordinating sampling team sample drop-off, contract lab sample pick-up, and performing the analyses for DO, pH, TSS, and field team temperature results reporting is:

Veolia Water North America
Taunton Wastewater Treatment Facility
825 West Water St.
Taunton, MA 02780
Lab Manager and QA Officer: Richard McCormack
508- 823-3582

The contract lab used for nitrate, total phosphorus, and enterococci analysis is:

Microbac Laboratories, Inc.
61 Louisa Viens Drive
Dayville, CT 06241
Quality Assurance Officer: Melisa A. Montgomery

4. FIELD SAMPLING TABLE

Sample Matrix: River water for all samples.

In Situ Measurement

Analyte/ Parameter	Sampling Method	Sample Container (P) Plastic or Glass (G)	Volume needed (ml)	Method of preservation	Maximum Hold Time
Temperature	170.1 (a) Field Thermometer	Measure from 1000 ml. TSS sample bottle.	Approx. 1000 mls.	None required	Analyze Immediately

Discrete Samples

Analyte/ Parameter	Sample Matrix	Sample Container (P) Plastic or Glass (G)	Total # of samples collected at each site	Volume needed (ml)	Method of preservation	Maximum Hold Time
Enterococci	River water	P (100 ml)	1	100 ml	Cool to 4^{o}C	6 hours
Nitrate-Nitrogen	River water	P (120 ml)	1	120	Cool to 4^{o}C	48 hours

Total Phosphorus	River water	P (250 ml)	1	250	H2SO4 by lab	48 hours
Dissolved Oxygen	River water	G (Wheaton BOD bottle)	1	300	Cool to 4^{o}C	Non-Preserved 2 hours
pH	River water	P	1	1000 (TSS)	Cool to 4^{o}C	6 hours
TSS	River water	P	1	1000	Cool to 4^{o}C	7 days

Quality Control/Quality Assurance Samples, Duplicate <u>and</u> Blank Samples for Every Ten Samples - Two of Each per Month* at Rotating Locations Based on TRWA's 20 Sample per Month Sampling Program

Analyte/ Parameter	Sample Matrix	Sample Container (P) Plastic or Glass (G)	Total # of samples collected at each site*	Volume needed (ml)	Method of preservation	Maximum Hold Time
Enterococci	River water	P (100 ml)	1 (Dup + Bl)	100 ml	Cool to 4^{o}C	6 hours
Nitrate-Nitrogen	River water	P (120 ml)	1 (Dup + Bl)	120	Cool to 4^{o}C	48 hours
Total Phosphorus	River water	P (250 ml)	1 (Dup + Bl)	250	H2SO4 by lab	48 hours

Quality Control/Quality Assurance Samples, Two Duplicate Samples (no Blanks) per Month for TRWA Samples Used for Water Property Characterization but <u>Not</u> Criteria Assessment Purposes

Analyte/ Parameter	Sample Matrix	Sample Container (P) Plastic or Glass (G)	Total # of samples collected at each site*	Volume needed (ml)	Method of preservation	Maximum Hold Time
Dissolved Oxygen	River water	G (Wheaton BOD bottle)	1(Dup)	300	Cool to 4^{o}C	Non Preserved 2 hours
pH	River water	P	1(Dup)	1000 (TSS)	Cool to 4^{o}C	6 hours
TSS	River Water	P	1(Dup)	1000	Cool to 4^{o}C	7 days

As described in Section 2 (E), duplicate samples are collected by each sampling team on a rotating basis. If it is your turn to collect a duplicate sample, field duplicates are to be taken from the same container of river water sample (e.g., sample bucket of river water collected) at the same time as the original regular sample. Duplicate samples and blank samples are collected at the last site you visit for the day as shown on the blank monthly analysis reporting table on the website and on each month's sample reporting page. If you are also scheduled to collect blank samples for enterococci, nitrate, and total phosphorus analysis after your regular samples and duplicates are collected;

- rinse your sample collection container thoroughly two times using about half of your deionized (blank) water on all sides and dump out (a clean sampling bucket or container is important),
- pour the remaining half of your blank water into your sampling container, and
- fill the blank enterococci, nitrate, and total phosphorus blank analysis bottles from your blank water rinsed sampling container. [Note we don't do blanks for DO, pH/TSS].

Sample bottles for Nitrate Nitrogen, Total Phosphorus and Enterococci Bacteria are provided by the Veolia contract laboratory, Microbac Laboratories Inc. of Dayville, CT. The labels on the bottles are to be filled out by the sample collectors as follows:

Client – Veolia Taunton
Date Collected
Time Collected
Sample ID
Analysis Required
An example of how to fill out sample bottle labels is in on the Water Quality Monitoring page of the TRWA website http://savethetaunton.org/water-quality-monitoring/.

5. SAMPLE PROCEDURES AND CHAIN OF CUSTODY

A. Safety

There are many safety precautions that must be followed both in the field and in the lab. Potentially hazardous situations exist in any field sampling situation. Volunteer samplers are encouraged to always sample in pairs. Since most of the sampling locations are off bridges (plastic bucket tied to a rope) or near bridge embankments, and the sampling times are in the early morning hours, it is advisable to wear high-visibility clothing. Be aware that embankments may be slippery and/or icy. Proper footwear is recommended. Sampling is done in all weather conditions except snow, but if there is lightning in the area, sampling must be avoided. Standard lab safety procedures are followed during all laboratory analyses.

In the event of a cancellation due to inclement weather or lab schedule issue, Steve will notify each volunteer. If you, the volunteer, are unable to collect your samples, for whatever reason, please notify Steve by phone/cell (508-280-3991) or e-mail (steve124@gmail.com) at least 2 hours prior to the sampling event. If you can't reach Steve call the wastewater treatment plant Rick McCormack at 508-823-3582.

B. List of Sampling Equipment

TRWA/Veolia Provided
Sample grabber or Plastic Bucket with rope
Thermometer
Gloves
Field paperwork (Field Sheet / Chain-of-Custody Form)
Clipboard
Pens
Cooler(s)
Cold pack(s)
One clear plastic cylindrical screw top container from Microbac for each sampling site for enterococci
Two plastic bottles from Microbac for each sampling site for nitrate and total phosphorus samples
One Wheaton (glass) BOD bottle for each sample site for the dissolved oxygen sample
One 1000 ml plastic bottle for each sampling site for pH/TSS sample
Assigned duplicate and blank bottles and of deionized water for field blanks as described above

Volunteer Provided
Flashlight
Emergency Telephone Numbers
First Aid Kit
Cell Phone

All sampling equipment is provided by VWNA at the Taunton Wastewater Treatment Plant and TRWA. Veolia will provide sample containers for each sample location. Each volunteer monitor will be given one set of sample containers for each sample location, a clipboard with pen, field data and chain of custody sheets, a thermometer, a cooler with a blue ice pack, a sample grabber if needed, plastic bucket with a rope, and a pair of latex or nitrile gloves. Sample collectors are requested to provide their own flashlight, first aid kit and cell phone.

Monthly, when the samples are collected and delivered to the laboratory, the sample bottles for next month (including extra bottles for duplicate samples and blanks as needed along with deionized (blank) water) will be given to the collector to replace the relinquished samples. Any paperwork is replenished by VWNA as needed.

After analyses are complete, all used sample bottles are cleaned in the laboratory dishwasher using Sparkleen Laboratory Detergent, a non-phosphate detergent manufactured to clean laboratory glassware or replaced by the contract lab.

Volunteers are requested to not use the buckets or coolers for any other purpose. Buckets should be rinsed with tap water and river water only and air dried. Sampling buckets should be rinsed with river water at each sampling site at time of sample collection before sample collection.

C. Sampling Preparation

Sampling preparation is the most important part of a successful sampling event. Careful attention must be given to both equipment and handling in order to collect a valid sample. Sampling site(s) and type(s) of samples will determine the equipment needed and the method of collection. A standard sampling checklist is specified above. Sampling preparation procedures are as follows:

1. Two days prior to the event contact your sampling partners to confirm the sample date and meeting time and place. Contact back-up team members or back teams if needed.

2. The night before the event, place the ice packs into the freezer.

3. Either the night before or the morning of the event notify someone other than your partner of your intended sampling locations and approximate departure and return time.

4. Go over the sample checklist and the field sheet to determine what will be used for each site.

5. The morning of the sampling event, place the ice packs into the cooler along with empty sample bottles.

6. Check your vehicle to make sure it is properly stocked with all necessary equipment and

paperwork.

IMPORTANT: In the event that you are unable to collect a sample please notify your sampling team back-ups or Steve Silva at 508-280-3991 or the Wastewater Treatment Plant at 508-823-3582

D. Sample Collection

Each of the sample containers provided by the Veolia Quality Assurance Officer is labeled with an identification number. Each sampling location has been assigned a three letter - two number I.D. or unique name. This I.D. correlates with the name of the river and sequential location from the mouth. All river samples are grab samples from running water.

1. Park your vehicle in a safe secure location. Prepare the equipment necessary for the site being sampled. Set aside the appropriately labeled sample containers. Have the thermometer, the field sheet on the clipboard, and a pen on hand. Leave the cooler in your car. Set all test equipment in a bucket to carry to the sample site.

2. Assess your situation to ensure safety and ease of sample collection. You should have adequate space for yourself and all of the sampling equipment.

3. Observe the sample location for water uses (swimming, fishing, boating, etc.). Observe the color of the water and notice if any odors are present. Make note of any plant or algal growth. Log this information onto the field sheet. Take photos of algae blooms or unusual conditions.

4. Use the sample grabber or bucket to retrieve each of the following samples. Insert the container into the grabber and immerse in the river or more commonly use a rope and plastic bucket.

    a. Set the sample container into the grabber and immerse into the river or more commonly immerse the bucket into the river using a rope from a bridge to collect river water. Rinse with river water and dump. Take sample of river water. Break the paper label seal on the top and fill the Microbac supplied small cylindrical clear plastic container with the screw on cover. These will be used for <u>enterococci bacteria (EN)</u> analysis.
    b. Fill the Microbac supplied plastic bottle, <u>non-preserved</u> the smaller of the two small rectangular bottles from: the sample bucket of water, the river directly, or pour from the larger bottle used to collect samples with the grabber. This sample will be used for <u>nitrate-nitrogen (NO3)</u> analysis.
    c. Fill the Microbac supplied plastic bottle, preserved with <u>sulfuric acid</u> the larger of the two small rectangular bottles from: the sample bucket of water, the river directly, or pour from the larger bottle used to collect samples with the grabber. This sample will be used for <u>total phosphorus (TP)</u> analysis<u>.</u>
    d. Set the one-liter plastic bottle into the grabber for the TSS analysis or pour water from the bucket directly into the one-liter plastic bottle. Fill to the shoulder of the bottle only.

5. Place the Wheaton glass BOD bottle into the sample grabber and gently immerse it into the river. Fill the bottle completely underwater carefully and do not entrain any air bubbles. Put the stopper into the bottle. Or more commonly immerse the bottle directly into the bucket filled with water not entraining any air bubbles. Set the bottle into the cooler.

6. Measure the water temperature from the large plastic bottle collected for TSS and pH or the bucket. Read the water temperature to the nearest 0.5 C° degree. Record this onto the field sheet along with the site # and time.

7. Place these sample bottles into the bucket to carry to the cooler with the ice packs.

8. Be sure to complete the field data sheet and chain of custody form for that sample site.

9. Continue on to your next sample site, repeating Steps 1 – 8 at each sample location.

** If you are collecting any duplicate samples collect the duplicate when collecting the original sample at the last location you visit for the day as described above. If collecting blanks, at this same location, after samples and duplicates are collected; rinse your sample collection container (e.g. bucket) thoroughly two times on all sides using about half of your deionized (blank) water, pour the remaining deionized (blank) water into the rinsed container or bucket and collect the blank water samples for enterococci, nitrate, and total phosphorus analysis from the container or bucket.

E. Documentation

Documentation is an integral part of any sampling program. The validity of samples collected and data obtained both in the field and the laboratory is ensured through documentation and record keeping. All information must be complete and accurate. Documentation includes the field sheet and the chain-of-custody record. The overall success of a monitoring program depends on its capability to produce valid data through the use of accepted sampling procedures and protocol, and its ability to substantiate such data through documentation. This begins with properly trained personnel and continues with sampling preparation, the sampling event, transfer of sample custody, laboratory analyses, equipment cleaning and data management.

1) WATER QUALITY MONITORING FIELD TEST SHEET

The Field Sheet is a permanent record of the information gathered during the sampling round. It is also the Chain of Custody. A blank field sheet is included on the TRWA website (see Appendix A). The chain of custody (COC) must always be completed. The COC is the legal document that follows the sample from collection through to final analysis. The data on the field sheet includes:

- Unique site identification number (e.g. TNT-01) or Duplicate Sample (DUP 1 or DUP 2) or Blank Sample (Bank 1 or Blank 2) designation
- Name of Sampling Personnel
- Date and Time of Sample Collection
- Water Temperature
- pH reading (done at Veolia lab)
- Water Clarity or other notes on water appearance, color, odor or tide level (see comments below)
- Requested Analysis

- Comments or any observations, such as algae or excessive weed growth presence, weather, water odor, water color, oil slicks. Unusually large groups of wildlife.
- Relinquished by: Name of person who relinquishes sample to laboratory personnel
- Date/Time: Date and Time that lab person receives the sample
- Received by: Lab person receiving sample accepts transfer by signing.

F. Sample Transport

Every sample collected, regardless of type, should be handled in the same manner. Once the sample is collected, place it upright into the cooler. When all samples are collected at the site carry the bucket to your vehicle and place it securely in the cooler containing a blue cold pack. Once all of your sample sites are collected, drive directly to the laboratory conducting the tests and deliver the samples to the laboratory manager or technician.

G. Transfer of Custody

All of the samples that are collected are analyzed by the laboratory specified in this document. When delivering the samples to the laboratory, place the cooler on the lab counter and unload the sample containers. Group the sample bottles by site and line up the bottles so that the ID is visible. The chain-of-custody form and sample label should be checked for completion and accuracy. The laboratory technician signs off on the chain of custody and receives all samples. The lab technician will prepare the chain of custody for the samples which are forwarded to Veolia's contract lab (Microbac) for analysis. These samples are the nitrate-nitrogen, total phosphorus, and enterococci bacteria samples. All samples are placed into the laboratory refrigerator until analysis or pick up by Microbac.

FOR SAFETY AND HEALTH REASONS, NO CHILDREN UNDER THE AGE OF 14 ARE ALLOWED IN THE WASTEWATER TREATMENT PLANT LABORATORY.

6. ANALYTICAL PROCEDURES

This monitoring program uses the procedures specified below:

Analyte/parameter	Analytical Method
Temperature	Field Thermometer
pH	Calibrated meter at Veolia lab
Dissolved Oxygen	Calibrated DO Meter, Standard Methods 4500
Total Suspended Solids (TSS)	SM 2540 D at Veolia lab
Enterococci Bacteria	EPA Method 1600 by Microbac Laboratories, Inc.
Nitrate-Nitrogen	SM4500NO3-F. Analysis conducted by contract laboratory, Microbac Laboratories, Inc.
Total Phosphorus	365.1. Analysis conducted by contract laboratory, Microbac Laboratories, Inc.

7. Collection of Supplies

Collect necessary sampling supplies for the following month at the sample drop-off, at the Taunton Wastewater Treatment Plant

8. Sample Analysis

Samples are analyzed for nitrate, total phosphorus and total coliform by Microbac, Dayville, CT a MassDEP certified laboratory using EPA approved methods and as describer in TRWA's MassDEP approved Quality Assurance Project Plan (QAPP).
https://www.microbac.com/locations/connecticut-dayville

Analysis for dissolved oxygen, total suspended solids, and pH is performed by the Veolia Taunton laboratory at the Taunton Wastewater Treatment Plant laboratory an NPDES permit regulated facility using EPA approved methods.

TRWA sampling volunteers measure temperature, at the time of sample collection and report the results on the Water Quality Monitoring Field and Chain of Custody Sheet. The temperature results are included in the spreadsheet of monthly results for dissolved oxygen, total suspended solids, pH, and time of sample collection provided to TRWA monthly by the Veolia Taunton laboratory manager.

9. Duplicate and Blank 2020 Sample Collection Locations by Month

Month	Site No.	Duplicate and Blank Locations by Month	DUP #		BL #
April	COT-01	Cotley R., Middleboro Ave, Taunton	DUP 1		BL 1
	BER-01	Chuckamucksett Brk. Br, Berkley St.	DUP 2		BL 2
May	FBR-01	Furnace Brk., River St., E. Taunton	DUP 1		BL 1
	TMR-02	Three Mile R. Br, Rt 44, Cohannet St.	DUP 2		BL 2
June	TNT-02	Taunton R. Br, Plain St., Taunton	DUP 1		BL 1
	ASO-01	Assonet R. Bridge, Rt 79	DUP 2		BL 2
July	BED-01/TNT-03	Taunton R., Rt 18, Bedford St., Bridgewater	DUP 1		BL 1
	SEG	Segregansett R. Br, Brook St. Dighton	DUP 2		BL 2
August	TNT-02	Taunton R. Br, Plain St., Taunton	DUP 1		BL 1
	MAT-01	Matfield R., Br, High St., Bridgewater	DUP 2		BL 2
Sept.	COT-01	Cotley R., Middleboro Ave, Taunton	DUP 1		BL 1
	MIL-01	Mill R., Ingell St., Taunton	DUP 2		BL 2
Oct.	NEM-01	Nemasket R., Murdock St., Middleboro	DUP 1		BL 1
	TMR-02	Three Mile R. Br, Rt 44, Cohannet St.	DUP 2		BL 2

APPENDIX A – Water Quality Monitoring Forms and Tools on the TRWA Website

- Google Map of Monitoring Locations/Wastewater Treatment Plants/MassDEP Continuous Monitoring Buoys
- One-page summary of nitrate, total phosphorus, and enterococci sampling procedures along with procedures for collecting duplicate and blank samples
- Blank monthly results reporting form for nitrate, total phosphorus, and enterococci indicating the locations where duplicate and blank samples are to be collected each month (lower section of spreadsheet pages)
- Blank monthly results reporting form for dissolved oxygen, total dissolved solids, pH, and temperature indicating the location where duplicates samples are to be collected each month (lower section of spreadsheet pages)
- Blank Water Quality Monitoring Field and Chain of Custody Sheet
- Instructions and an example of how to fill out the Microbac contract laboratory sample bottle labels for Enterococci, Nitrate, and Total Phosphorus
- Massachusetts Water Quality Standards excerpts from – 314 CMR: DIVISION OF WATER POLLUTION CONTROL: excerpts from 405: Class B and SB Water Quality Criteria, Narrative Nutrient Criteria, 403: Application of Standards for Establishment of Effluent Limitations, and 406: Basin Classification