

**Taunton River Watershed Alliance
Sample Collection & Analysis Quality Assurance Project Plan**

Revision 0

October 7, 2019

Approval Period: Three Years to October 7, 2022

For Volunteer Monitoring in the Taunton River Watershed

Prepared by:

**Environmental Strategies & Management, Inc.
273 West Main Street
Norton, MA 02766**

Prepared for:

**Taunton River Watershed Alliance
P.O. Box 1116
Taunton, MA 02780**

Reviewed by:

**Massachusetts Department of Environmental Protection
Division of Watershed Management
8 Bond Street
Worcester, MA 01606**

Approvals Signature (required prior to project start):

_____ Date: _____
Project Manager

_____ Date: _____
QA Officer

_____ Date: _____ MassDEP
Project Manager/Officer

_____ Date: _____
MassDEP QA Manager/Representative

ACKNOWLEDGEMENTS

This QAPP for Bacteria Monitoring has been financed with State Capital Funds from the Massachusetts Department of Environmental Protection (MassDEP) under a Watershed Monitoring Grant. The QAPP was written by Environmental Strategies and Management, Inc. under contract with the Taunton River Watershed Alliance (TRWA). Reviewers included Stephen Silva, Craig Heffernan and Joseph Callahan, TRWA, and Therese Beaudoin, MassDEP.

For more information, contact Therese Beaudoin, MassDEP, Therese.Beaudoin@mass.gov

The contents do not necessarily reflect the views and policies of MassDEP, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

CONTENTS

1.0 INTRODUCTION.....	4
2.0 PROJECT ORGANIZATION AND RESPONSIBILITY	4
<i>2.1 Project Organization</i>	<i>4</i>
<i>2.2 QAPP Distribution List</i>	<i>5</i>
3.0 PROBLEM DEFINITION, PROJECT DESCRIPTION, & TIMELINE.....	6
4.0 SAMPLING DESIGN AND SITE FIGURES.....	6
5.0 SAMPLING AND ANALYTICAL METHOD REQUIREMENTS	7
6.0 METHODS AND SOP REFERENCE TABLE.....	8
7.0 LAB EQUIPMENT CALIBRATION AND CORRECTIVE ACTION	9
8.0 SAMPLING CUSTODY AND HANDLING REQUIREMENTS	9
9.0 ANALYTICAL SENSITIVITY AND PROJECT CRITERIA.....	10
10.0 FIELD QUALITY CONTROL REQUIREMENTS	11
11.0 LABORATORY QUALITY CONTROL REQUIREMENTS	11
13.0 DATA MANAGEMENT AND DOCUMENTATION	12
14.0 ASSESSMENT AND RESPONSE ACTIONS	13
15.0 FIELD DATA EVALUATION.....	13
16.0 LABORATORY DATA EVALUATION	14
17.0 DATA USABILITY AND PROJECT EVALUATION	14

ATTACHMENTS

- Attachment A – Laboratory SOPs and Chain of Custody
- Attachment B – TRWA Monitoring Program Sampling Instructions and Field Forms
- Attachment C – Sampling Location Map, List and Timeline

REVISION HISTORY

Revision	Changes	Date
0	Original Document	10/7/2019

1.0 INTRODUCTION

A Quality Assurance Project Plan (QAPP) outlines the procedures a monitoring program will use to ensure that the samples participants collect and analyze, the data they store and manage, and the reports they write are of high enough quality to meet project needs.

This QAPP has been prepared in accordance with the Volunteer Monitoring Guide to Quality Assurance Project Plans (EPA, September 1996) for TRWA's volunteer monitoring program. The QAPP serves as a guide for TRWA's team of water quality monitoring volunteers in the collection of samples from waters within the Taunton River Watershed. The data will be used to assist MassDEP in increasing the availability of credible bacteria data for the assessment of primary and secondary contact recreation in waters of the Taunton River Watershed. The QAPP contains baseline requirements to be met for various levels of data collection, as well as common objectives, parameters, methods and approaches for surface water biological monitoring.

Once approved, this QAPP will be valid for a three year period and will be reviewed, updated, and submitted for approval at the end of each period.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 Project Organization

This program will have an organized structure for effective communication and completion of tasks as shown in the table below.

Table 1. Project Organization

Name(s)	Project Title/Responsibility
<i>Joseph Callahan</i>	Project Manager – Oversees all aspects of project that incorporate the monitoring program including: fiscal management, project objectives, data uses, program changes, etc.
<i>TRWA Board of Directors</i>	Technical Advisory Committee – Program oversight and advice.
<i>Stephen Silva</i>	Monitoring Program Coordinator (a.k.a. Monitoring Coordinator) – Volunteer recruitment and training, coordination with TAC (as applicable). Produces monitoring report. Produces or oversees outreach efforts in coordination with project manager.
<i>Stephen Silva</i>	Lab Coordinator – Makes arrangements with any lab(s) used to perform analyses according to QAPP. Ensures correct procedures are used, holding times are met, and adequate documentation is provided.

<i>Craig Heffernan</i>	Field Coordinator – Responsible for training and supervising volunteers in field work; ensures field forms are properly filled out, samples and forms are transported to laboratories as needed; and performs QC checks to make sure procedures are followed or corrected as needed (in collaboration with project QC officer).
Name(s)	Project Title/Responsibility
<i>Stephen Silva</i>	Data Management Coordinator – Maintains the data systems for the program, performs/oversees data entry, and checks entries for accuracy against field and lab forms.
<i>Joseph Callahan</i>	QA Officer – Runs QA/QC program, ensures that all elements of the project follow QA procedures in the QAPP. Typical duties include: observing volunteers/lab personnel, reviewing and maintaining copies of data sheets and QC records, reviewing draft reports, conducting program review in concert with Monitoring Coordinator, and recommending program changes if needed to ensure compliance with program goals and quality objectives.
<i>TRWA Water Quality Monitoring Team</i>	Volunteers – Conduct sampling, perform field analyses, and assist in laboratory analyses and/or data entry.
<i>Rick McCormack – Veolia Katherine Wall – Microbac Lab Manager</i>	Contract Analytical Lab Manager(s)/Director(s) - Responsible for transport to Microbac laboratory in Dayville, CT and analytical procedures performed under contract (or other arrangement) with TRWA.
<i>Therese Beaudoin, MassDEP</i>	Agency Project Contact – Oversees grant administration and ensures reporting requirements are met.
<i>Suzanne Flint, MassDEP</i>	MassDEP Quality Assurance Officer – Reads QA reports, and confers with program QA officer on <i>quality control</i> issues that arise during the course of a monitoring program.

2.2 QAPP Distribution List

QAPP Recipient	Title	Organization	Telephone	Email Address
Joseph Callahan	Project Manager	TRWA/ES&M	508-243-4116	jcallahan@esm-inc.com
Stephen Silva	Monitoring Program Coordinator, Lab Coordinator, Data Management Coordinator	TRWA	508-824-7345	Steve124@gmail.com

Craig Heffernan	Field Coordinator	TRWA	508-828-1101	Heffer51@gmail.com
Joseph Callahan	QA Officer	TRWA/ES&M	508-243-4116	jcallahan@esm-inc.com
Katherine Wall	Lab Manager	Microbac	800-334-0103	Katie.wall@microbac.com
Therese Beaudoin	Agency Project Contact, MassDEP QA Officer	MassDEP	508-792-7650	therese.beaudoin@mass.gov
Suzanne Flint	MassDEP QA Officer	MassDEP	508-792-7650	Suzanne.flint@mass.gov

3.0 PROBLEM DEFINITION, PROJECT DESCRIPTION & TIMELINE

The TRWA strives to protect and monitor the waters within the Taunton River Watershed. The aim of the project described in this QAPP is for the TRWA to assist MassDEP in increasing the availability of credible bacteria data for the assessment of primary and secondary contact recreation in waters within the Taunton River Watershed. This is accomplished by conducting a program of monitoring and surface water sampling that is performed monthly through October 2019. 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. Surface water samples are analyzed for enterococci bacteria, phosphates and nitrates on a monthly basis. After the monitoring program is completed, a final dataset of data collected in 2019 shall be submitted to MassDEP.

4.0 SAMPLING DESIGN AND SITE FIGURES

A map including sample locations in the Taunton River Watershed as well as a list of specific sample locations and dates of sampling are included in Attachment C.

Sampling locations have been selected to obtain an extensive view of surface water conditions in the watershed. We have selected four sites on the main stem of the of the Taunton River: two in the lower river (Berkley-Dighton Bridge TNT-01 and Taunton Plain Street TNT-02) to characterize lower river ambient water quality before the river enters Mount Hope Bay; and two sites in the upper river in Bridgewater BED-01 and further upstream at Cherry Street CHE-01 to characterize upper river conditions. We have 16 other sites on important tributary rivers and streams including 2 upstream sites on two major tributaries, the Three Mile River and the Mill River, to characterize conditions of these urban rivers further upstream.

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
Chickamucksetset Brook Bridge, Berkley St., Berkley	Chickamuck-Sett Brook	N41°49' 58.7/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' 34.2	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' 04.6	FBR 01
Highstone St., E. Taunton	Thompson Brook	N41°51' 46.4/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' 24.9	NEM 01

5.0 SAMPLING AND ANALYTICAL METHOD REQUIREMENTS

Samples will be collected as per the directives listed in the TRWA 2019 Monitoring Program - Sampling Instructions, included as Attachment B. As detailed in Attachment B, grab samples are collected by lowering a clean sample bucket (or sample bottle using a pole sampler) into the midpoint of the river/stream to fill with water. The filled bucket is pulled up and gently dumped out to provide a rinse with river water. The bucket is then lowered again to collect the sample for laboratory analysis. The time of sample collection is written on the bottles and chain of custody used for analysis. Sample bottles are filled in the following order: enterococci bacteria, nitrate, total phosphorous, dissolved oxygen, and total suspended solids and ph.

Duplicate and blank samples are taken at the last site the sampler visits that day. Duplicate samples are collected from the same bucket used for the original sample. Field blanks are collected for enterococci, nitrate, and total phosphorous only. The sample bucket is thoroughly rinsed out using deionized (blank) water and dumped out. Remaining deionized water is then poured into the bucket to collect blanks. A detailed summary of the samples to be collected and analyses performed is included in the following table:

Parameter	Matrix	(Number of Samples including required field QC)*	Analytical Method / (Analytical SOP**)	(Sampling SOP)	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/ analysis)
Enterococci Bacteria	Surface Water	24 samples (including 2 duplicates and 2 field blanks)	USEPA Method 1600	TRWA Monitoring Program Sampling Instructions	Pre-sterilized containers with secure lids; min. 100mL	4°C +/- 0.5°C	Samples should be analyzed preferably within 2 hours of collection but always within a maximum of 6 hours transport time followed by 2 hour lab process time
Total Phosphorus	Surface Water	24 samples (including 2 duplicates and 2 field blanks)	USEPA Method 365.1	TRWA Monitoring Program Sampling Instructions	100 ml HDPE	4°C, H2SO4 (2mL concentrated H2SO4 per L)	2 Months
Parameter	Matrix	(Number of Samples including required field QC)*	Analytical Method / (Analytical SOP**)	(Sampling SOP)	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/ analysis)
Nitrate	Surface Water	24 samples (including 2 duplicates and 2 field blanks)	USEPA Method SM 4500NO3-F	TRWA Monitoring Program Sampling Instructions	50 ml Plastic	4°C	48 Hours

6.0 METHODS AND SOP REFERENCE TABLE

Analytical Method Reference	
SOP Reference	Document Title
MICROBAC SOP MB-10, rev 2, 10/12	Enterococci by Membrane Filter Method 1600
MICROBAC SOP WC-26, rev 3, 1/14	Phosphorous Automated (All Forms) Method 365.1
MICROBAC SOP WC-47, rev 4, 2/16	Determination of Nitrate & Nitrite SM4500 NO3-F
Field Sampling SOPs	
SOP Reference	Document Title
TRWA 1	TRWA 2019 Monitoring Program Sampling Instructions

7.0 LAB EQUIPMENT CALIBRATION AND CORRECTIVE ACTION

Calibration and corrective actions to be undertaken are outlined in the laboratory SOPs included as Attachment A.

8.0 SAMPLING CUSTODY AND HANDLING REQUIREMENTS

All samples will be tracked from collection, to shipment, to laboratory receipt, and laboratory custody using a standard laboratory chain of custody.

Labels which contain the following information will be filled out on dry labels with ball point pen before sample collection and affixed to each sample containers:

- Sample number
- Sample Location
- Name of Sampler
- Analyses to be performed
- Preservation

At time of sampling, date and time of collection will be filled out on dry labels immediately prior to sampling.

A Chain of Custody is maintained for all samples. The Chain of Custody form is signed by all individuals responsible for sampling, sample transport, and laboratory receipt. The original Chain of Custody form accompanies the samples until the project is complete. The original Chain of Custody is kept in the permanent project files.

Example Sample Label

PROJECT NAME	
SAMPLE ID	SAMPLE DATE
SAMPLED BY	SAMPLE TIME
PRESERVATIVE	<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE
ANALYSIS REQUESTED	

Total Phosphorus	EPA 365.1	-	0.100 mg/L	20	90-110%
Nitrate	SM 4500 NO3-F	-	0.4 mg/L	20	90-110%

* All sites except TNT-01 and TNT-02 which are Class SB and compared to the geometric mean of 35 enterococci colonies per 100 mL.

10.0 FIELD QUALITY CONTROL REQUIREMENTS

Matrix and Parameter	QC Sample	Frequency	Acceptance Criteria	Corrective Action
Surface Water, all parameters	Field Duplicate	10% of total number of samples collected	Meets Data Quality Objectives	Results will be rejected or qualified.
Surface Water, all parameters	Field Blank	10% of total number of samples collected	Meets Data Quality Objectives	Results will be rejected or qualified.

11.0 LABORATORY QUALITY CONTROL REQUIREMENTS

A summary of quality control requirements taken by Microbac is included below. More details of quality control procedures can be found in the SOPs included as Attachment A.

Analysis	Matrix and Parameter	QC Sample	Frequency	Acceptance Criteria	Corrective Action
Enterococci	Water	Blank	One per batch or 20 samples	All below DL	Positive results for any blank in a run invalidates all samples in the run
Enterococci	Water	Lab Control Sample	Two per month	All below 10 colonies per 100 mg/L	Identify source of problem, Re-prep/Re-analyze LCS prior to analysis of samples

Total Phosphorus	Water	Lab Reagent Blank	One per batch or per 20 samples	All compounds below DL	Assess contamination from lab equipment Identify source of problem & take corrective action
Total Phosphorus	Water	Lab Fortified Blank	One per batch or per 20 samples	90-110% Refer to SOP sec 9.4	Rerun all the samples in a batch including LCS and blank to assess the analytical system
Nitrate	Water	Lab Reagent Blank	One per batch or per 20 samples	All compounds below DL	Assess contamination from lab equipment Identify source of problem & take corrective action
Nitrate	Water	Lab Fortified Blank	One per batch or per 20 samples	90-110% - Refer to SOP sec 9.3.2	Remake and rerun the LCS and blank to assess the analytical system

13.0 DATA MANAGEMENT AND DOCUMENTATION

Field Documents and Records

A daily site visit form will be used to document the work activities conducted. Personnel on-site, site visitor names, arrival and departure times and date fields are included on the form. The site visit form will be used as a cover sheet for the field package, which will document the sampling procedures. The site visit form is generated by the field crew and is turned into the TRWA Monitoring Program Coordinator. All field notes are scanned to create a digital version, and original versions are kept on-file at TRWA.

The Monitoring Program Coordinator is responsible for performing a QA check to ensure that the notes are accurate and that all field work is well documented. If data appears to be missing or inaccurate, the field crew will be asked to provide an explanation prior to scanning and filing the field notes. The original notes themselves will be stored in the project file for review by the Project Manager. Other data, such as surface water depth measurements, water quality parameters, etc., will be converted into tabular form and included within reports.

Laboratory Documents and Records

Laboratory reports will include project narratives that explain qualified data, analytical result sheets, and a QA/QC section. The QA/QC section will include results of any quality control samples requested by TRWA and/or run by the laboratory. The analytical results will document the analytical method used, the preparation and analysis dates, the analytical results, the reporting limits, and other pertinent information.

Data is stored on Microsoft Excel files in TRWA's office. Copies are also kept on the Monitoring

Program Coordinator's computer, backed up to a hard drive, and on the TRWA website. Veolia (Taunton's wastewater treatment operator) and our program partners in the watershed also get copies of the monthly reports. TRWA produces an annual summary of results for posting on its website.

Post Laboratory Data Manipulation

The laboratory will submit an electronic data deliverable (EDD), in the form of a Microsoft Excel file, along with the analytical report. This will minimize manual data entry. The EDD will be spot-checked to ensure accuracy, and transferred into the site's Microsoft Access database. Analytical result tables will be created using Access and will be tabulated within pertinent site reports. The tables will include the results of any field duplicates collected. Electronic versions of the original laboratory reports will be included as appendices. Paper copies of laboratory reports are not routinely printed by TRWA, but electronic versions are maintained within the project's files.

14.0 ASSESSMENT AND RESPONSE ACTIONS

The TRWA Project Manager will visit the site at least once at the origination of the project, and will then make periodic site visits to oversee the field staff and ensure that work is being conducted in accordance with the QAPP. Periodic project management visits will be scheduled approximately once per every seven field events. The field staff will receive verbal feedback from the Project Manager and the Water Quality Monitoring Program Coordinator, and the Water Quality Monitoring Program Coordinator will be responsible for dealing with follow up and corrective actions.

Reports that are submitted to State and Federal agencies are drafted by TRWA staff and/or TRWA subcontractor and are reviewed by the Project Manager and/or the Quality Assurance Officer prior to their release.

All labwork is reviewed by the Lab Coordinator, who will complete a cover page to append to the laboratory report. Any inconsistencies will be addressed with the laboratory during the review process.

15.0 FIELD DATA EVALUATION

The TRWA Water Quality Monitoring Program Coordinator will prepare work packages containing an instructional cover sheet and all pertinent blank forms to be filled out by the field crew. The field crew will fill out all forms contained within the field package, and will return the package in its entirety to the Monitoring Program Coordinator. The Monitoring Program Coordinator is responsible for reviewing the field packages to determine if there are any notable findings or trends which may impact the site model. Significant findings will be reported to the Project Manager and the entire project team.

A member of the TRWA staff and/or TRWA subcontractor will be assigned responsibility for preparing the applicable investigation report. All field notes and field packages will be reviewed by the staff member preparing the report, to ensure that all findings, observations and trends are properly documented.

16.0 LABORATORY DATA EVALUATION

The TRWA Lab Coordinator will maintain responsibility for laboratory data evaluation. The Lab Coordinator will keep records regarding project-specific criteria, such as required method detection limits and field sampling requirements. When a laboratory package is received, it will be reviewed for completeness and for compliance with this project specific QAPP and the relevant site-specific addendum. The laboratory will be consulted if any data appears to be missing or if any questions arise. The Lab Coordinator will review the project narrative, which documents any problems related to preservation, handling, and analysis. The field and lab QC results will be approved, and a cover sheet describing findings will be prepared and appended to each laboratory report. A spreadsheet will be kept with all of the site's cover sheets and one main page cataloging all laboratory data collected.

17.0 DATA USABILITY AND PROJECT EVALUATION

This section outlines data usability criteria for work completed under this QAPP.

Data Management and Documentation

A field form is completed on a daily basis to document all field activities. All entries are made with permanent ink, and corrections are made using a single line through the mistake with the initials and date of the individual who made them. Entries include sampling location, time, date, weather conditions, parameters measured, and any problems encountered during sample collection activities. Analytical results are tabulated for review by the Monitoring Program Coordinator and/or Project Manager, and for inclusion in site reports. Relevant standards are included in the table for reference.

Contract Laboratories

Analytical samples are recorded in a permanently bound laboratory notebook, specific for each instrument. A brief narrative is included at the end of each analytical run that includes any problems encountered with the standards, samples, blanks or QC samples. If any corrective action is taken, it will be noted in narrative in the instrument notebook. The Microbac Laboratory Quality Manual in Appendix D provides more detail.

The following deliverables will be provided by the laboratory:

- Data Results Sheets
- Method Blank Results
- Surrogate Recoveries and Acceptance Limits
- Matrix Spike/Matrix Spike Duplicate Results and Acceptance Limits

- Spike/Duplicate Results and Acceptance Limits
- Laboratory Control Sample Results and Acceptance Limits
- Project Narrative which contains all observations and deviations

The following will be maintained by the laboratory:

- All raw data including chromatograms
- Copies of Instrument Logbooks • Copies of internal chains of custody.
- PE sample results.
- ICP Serial Dilution Results
- ICP Interference Check Sample Results

All reports are generated as a PDF file. Electronic data deliverables are also provided in an excel format.

Response Actions

Any deficiencies found during the field audit or problems encountered during this investigation require corrective action. The Field Coordinator will be notified immediately if any problems are encountered in the field. Minor adjustments to the sampling design, such as moving a sampling location to avoid an obstruction, may proceed with notification to the field manager and documentation in the field logbook. Major problems will require notification to the Project Manager prior to proceeding. Any corrective actions which modify the approved QAPP will first be approved by MADEP before work begins.

The laboratory must maintain its certification with the state of Massachusetts throughout the course of each project. (See the Microbac Laboratory Quality Manual in Appendix D for a description of the routine audits in which the lab participates). The lab is required to notify consultant's Project Manager of any problems / discrepancies.

Data Review Process

Data results will be reviewed following a Tier I approach. EPA New England Environmental Data Review Program Guidance and applicable portions of the EPA New England Environmental Data Review Supplement for Regional Data Review Elements and Superfund Specific Guidance/Procedures 4/13, will be followed.

Analyte concentrations will be checked against contaminant levels in equipment/rinseate blanks and method/reagent blanks to identify possible sources of false positives.

A review of all QC analyses will be performed to assess the data quality. Any encountered deviations not documented in the narrative will be rectified with the laboratory.

The data package completeness check and assessment of each QC parameter provided with the data package deliverables will be provided in the final reports.

Data Validation Tier

According to EPA Guidance on Data Verification and Data Validation (EPA QA/G8, November 2002), data validation is an analyte and sample specific process that extends the evaluation of data beyond method procedural or contractual compliance to determine the analytical quality of a specific data set. Data validation criteria are based upon the measurement quality objectives developed in this plan. Data validation will apply to both the laboratory analytical process and the field sample collection methods. A focused Tier I data validation will be conducted which will include review of the following:

- The laboratory analytical methods (Enterococci, TP, and Nitrates);
- Chain of custody;
- Case narrative;
- Field and sample identifications (IDs) cross-reference;
- Holding time;
- Preservation and cooler receipt;
- Laboratory blank data (method blanks, preparation blanks); • Spike data (including MS/MSD); and
- Laboratory control samples (LCS).

This is applicable to all parameters/matrices analyzed during project conducted under this project specific QAPP. In addition to the Tier I data validation, TRWA will review and validate the results of any field blanks, field duplicates and organic matrix spikes/matrix spike duplicates

Data Usability

In order to ensure that the data collected during assessments completed under this QAPP is scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use, all data from Massachusetts sites will be collected in accordance with US EPA and MassDEP guidance.

The surface water data collection activities completed during assessments of Massachusetts sites under this QAPP will be collected, analyzed, and reported in accordance with the Massachusetts Surface Water Quality Standards (314 CMR 4). Laboratory prepared Data Certification Summaries will be required for all lab reports. In addition, Lab Results Quality Review forms will be completed by the TRWA for each lab report. Any project specific method modifications, non-conformances, or observations will be detailed in the Project Narrative section of the laboratory reports.

Sample results will be evaluated to define the extent of contamination, to the extent possible, in down gradient, and former and existing source areas at the project site. Data will be reviewed to meet the precision and accuracy criteria documented in the Analytical Precision and Accuracy Criteria table included in each project specific QAPP addendum. Surface water sample results will also be compared to the Massachusetts Surface Water Quality Standards based on Clean Water Act (CWA) and EPA guidance that protects the nation's surface waters. The EPA has provided guidance on the particular components of a recommended QA/QC and data reporting

program that may be used by parties in evaluating surface water quality for educational/stewardship objectives.

Data usability will also be assessed relative to the PARCCS (precision, accuracy, representativeness, comparability, completeness, and sensitivity) parameters as discussed below:

Precision, Accuracy, and Bias: The data for all MS/MSD and laboratory duplicate results, if available, from the project will be reviewed. All appropriate RSDs and % recovery results and averages will be reviewed. The precision and accuracy of data will be assessed against the criteria presented in the Analytical Precision and Accuracy table in Section 9.0. The data usability assessment will be documented in the final report. Any bias in the data will be noted. In addition, any observations, conclusions, and/or limitations on the use of the data based on the precision, accuracy and bias will be reported. In addition, the precision and accuracy of the laboratory are evaluated by reviewing the Laboratory Control Sample (LCS) to confirm that results are within the QC limits of the methodology used.

Representativeness: Representativeness will be assessed by qualitatively comparing the field monitoring data from each of the surface water sampling locations in the same stream segment and establishing if there is any uniformity across the site. Also, representativeness will be established by the locations of these sampling points.

Comparability: Comparability refers to obtaining consistent sampling and analysis between locations and sampling events. Comparability will be assessed quantitatively by comparing the analytical results of field duplicates collected from specific monitoring locations using the same sampling procedures in consecutive sampling events. Site conditions and other site-specific factors will be considered in this assessment.

Completeness: A completeness criteria of 90% for analytical data will be specified. The results of the completeness assessment will be documented in the final report. If the QAQC results for any critical samples (as determined through the development of the conceptual site model) do not meet the data usability evaluation, whether or not the 90% completeness goal has been achieved, these samples will be collected and analyzed again. Completeness is measured by the percentage of sites monitored each month. If completeness is not met for the project, then a discussion will be provided in the final report on the effects that the lack of completeness has on the usability of the remaining data for that month.