Quality Assurance Project Plan

University of Rhode Island Watershed Watch Fresh and Marine Waters Field Monitoring and Assays

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Prepared for: U.S. Environmental Protection Agency N.E. Region 1
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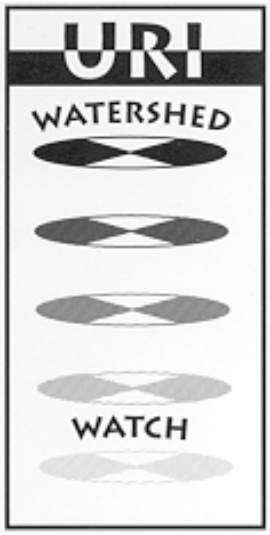
THE UNIVERSITY OF RHODE ISLAND COOPERATIVE EXTENSION

Quality Assurance Project Plan

University of Rhode Island
Fresh and Marine Waters Field Monitoring and Assays



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URI WATERSHED WATCH TECHNICAL REPORT NO. 5

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List of Abbreviations

Abbreviation	Definition
BOD	Biochemical Oxygen Demand
CA	Corrective Action
%D	Percent Difference
DI	Deionized Water
DQIs	Data Quality Indicators
DO	Dissolved Oxygen
DQO	Data Quality Objectives
EPA-NE	Environmental Protection Agency – New England District (Region 1)
g	Gram
HDPE	High Density Poly-Ethylene
L	Liter
LCS	Laboratory Control Standard (standard analyzed as a sample)
MDL	Method Detection Limit
mL	Milliliter
mg	Milligram
MS	Matrix spike
NA	Not Applicable
ppb	Parts per billion (µg/L)
ppm	Parts per million (mg/L)
ppt	Parts per thousand
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control

List of Abbreviations (continued)

Abbreviation	Definition
%RPD	Replicate Percent Difference
RIDEM	Rhode Island Department of Environmental Management
RL	Reporting Limit (Quantitation Limit)
SOP	Standard Operating Procedure
TSS	Total Suspended Solids
µg	Microgram
URIWW	University of Rhode Island Watershed Watch

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(Tables listed in Table of Contents)

LIST OF APPENDICIES

1.0 PURPOSE AND DESCRIPTION

The University of Rhode Island Watershed Watch Program (URIWW) is a Cooperative Extension Water Quality Program in the Department of Natural Resources Science, College of the Environment and Life Sciences. The program is located in the Coastal Institute building on the URI Kingston campus. Begun in 1988, the URIWW program is a statewide volunteer monitoring program with over 300 volunteers. The program focuses on providing current information on the water quality of surface water resources throughout Rhode Island, and development of long-term trends. It is a service provider to statewide and local decision-makers and is practically the sole source of long-term lake water quality data for Rhode Island. The URIWW Laboratory provides analytical services to the Rhode Island Department of Environmental Management (RIDEM) and the Environmental Protection Agency, New England District (Region 1) (EPA-NE) as well as other URI researchers. It is a resource for volunteers working with municipal boards and is linked with all Cooperative Extension water quality activities. The program encourages communities and shoreline residents to understand the need to cooperatively manage and improve the water quality of all the water bodies within a watershed. Information describing the URIWW program, fact-sheets, water quality data as well as monitoring protocols are maintained at: https://web.uri.edu/watershedwatch/ .

The purpose of this Quality Assurance Project Plan (QAPP) is to provide guidance on the field procedures and quality assurance/quality control (QA/QC) tasks performed in marine and fresh waters as part of the URIWW program. Fresh waters are considered surface waters such as lakes, ponds, rivers and streams. Marine waters include salt ponds, bays, estuaries, ocean beaches and other brackish systems. Field tasks are completed both by professional URIWW staff and trained volunteers. Field tasks may include the collection of filtered and whole water samples for laboratory analysis of fecal coliform and or enterococcus bacteria, alkalinity, pH, salinity, chlorophyll-a, chloride, ammonia-N, orthophosphate-P, nitrate + nitrite-N, total phosphorus and total nitrogen. Additionally, Secchi disk transparency and water temperature are often determined in the field using instruments, and dissolved oxygen and salinity may be determined in the field using test kits or meters. The actual suite of analytical procedures completed in the field and the actual number and type of samples collected in the field depends upon specific project requirements. This QAPP describes general collection procedures for fresh and marine samples utilized by the URIWW program and does not provide information on project-specific details or goals.

The Standard Operating Procedures (SOPs) contained in this QAPP form the basis of the various URIWW Monitoring Manuals which as of this writing include: *Lake and Pond Monitoring Manual, Narrow River Monitoring Manual, Greenwich Bay Monitoring Manual, Wadeable Streams Monitoring Manual* as well as *Salt Ponds, Bristol Harbor, Stonington Harbor*, and *Greenwich Bay* supplements to the *Lake Monitoring Manual*. The Monitoring Manuals include approved field SOPs from this QAPP as well as a Sampling Plan and water quality fact sheets. The Sampling Plan includes a monitoring schedule, a step by step sampling guide referring to the SOPs and the recommended order of completing monitoring tasks. They are on-line at https://web.uri.edu/watershedwatch/resources/training-manuals/.

This QAPP does not describe laboratory analytical procedures; this information is found in the University of Rhode Island Watershed Watch Laboratory Program QAPP. A cross-reference between the information required by EPA-NE and this QAPP is provided in the table below. Note that information found in narrative format instead of in an EPA-NE table is listed as “in narrative”.

Required Information Checklist

EPA-NE Work-sheet number	Worksheet Title	Location In URIWW Field QAPP
1	Title and approval	In narrative
2	Table of contents & document format	In narrative
3	Distribution list	In narrative
4	Project personnel sign-off sheet	All relevant personnel are included on the approval page
5a	Organizational chart	Figure 1
5b	Communication pathway	Section 1.2 in narrative
6	Personnel responsibilities and qualification	Section 1.2 and 1.2.1 in narrative
7	Special personnel training requirements	Section 1.2.2 in narrative
8a	Project scoping meeting attendance sheet, agenda	NA
8b	Problem definition/site history & background	Section 1.0 in narrative
9a	Project description	Section 1.0 in narrative
9b	Contaminants of concern	Section 2.6.1
9c	Field & QC sample summary	Section 2.6.2
10	Project schedule timeline	Section 1.3 in narrative
11a	Project quality objectives/decision statements	Section 2.0 in narrative
11b	Measurement performance criteria table	Section 2.6.3
12a	Sampling design & rationale	NA
12b	Sampling locations, methods, SOP requirements table	Section 2.6.4

EPA-NE Work-sheet number	Worksheet Title	Location In URIWW Field QAPP
13	Project sampling SOP table	Appendix A
14	Field equipment calibration	Section 2.6.5
15	Field equipment maintenance	Section 2.6.6
16	Sampling handling, tracking, custody	Section 3.0 in narrative and Section 3.2
17	Field method /SOP	Section 2.6.7
18	Field calibration	Relevant data summarized in Section 2.6.5 in Worksheet #14
19	Field maintenance	Relevant data summarized in Section 2.6.6 in Worksheet #15
20	Fixed lab. analytical , SOP reference table	NA
21	Lab instrument maintenance & calibration table	NA
22a	Field sampling QC	Section 2.6.8
22b	Field sampling QC continued	NA
23a	Field analytical QC	Section 2.6.9
23b	More field QC	NA
24a	Lab analytical QC	NA
24b	More lab analytical QC	NA
25	Non-direct measurement criteria	NA
26	Project documentation and records	Section 4.0 in narrative
27a	Assessment and response	NA
27b	Project assessment	NA
27c	Project assessment plan	NA
28	QA management reports	Section 4.0 in narrative
29a	Data evaluation process	NA

EPA-NE Work-sheet number	Worksheet Title	Location In URIWW Field QAPP
29b	Data validation summary	NA
29c	Data validation modifications	NA
30	Data usability assessment	NA

Notes:
NA – Not applicable to this QAPP. This QAPP provides information regarding general field protocols only. No project-specific information is contained in this general QAPP. No laboratory analysis information is provided in this QAPP, refer to "Quality Assurance Project Plan – University of Rhode Island Watershed Watch Laboratory Program" for laboratory specific QA/QC information.

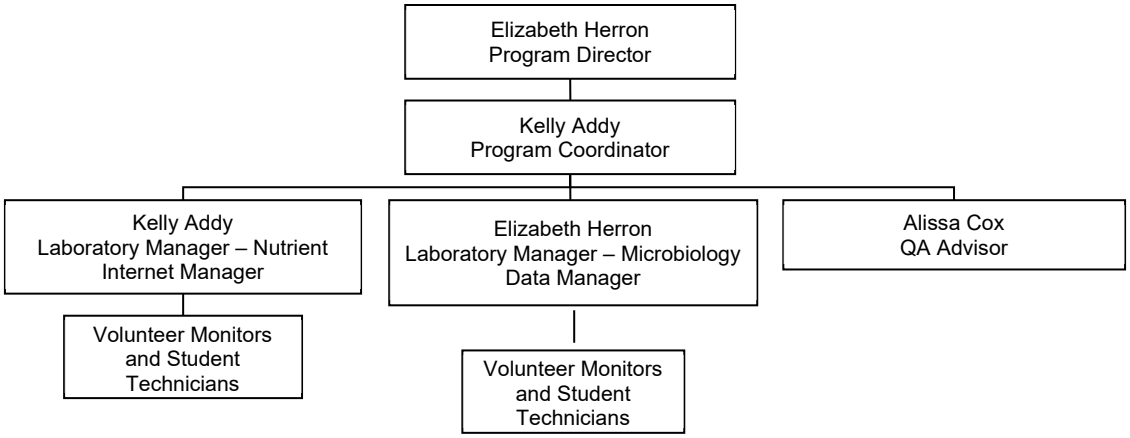
1.1 Quality Assurance Project Plan (QAPP) Objectives

The objective of this QAPP is to present the organization, objectives and specific QA/QC procedures associated with URIWW field analysis and sample collection protocols. Guidance on the field analysis procedures for the following assays is provided in this document: temperature, Secchi depth transparency, dissolved oxygen and salinity. Guidance on the field collection procedures for filtered, unfiltered, chlorophyll and bacterial samples are also included in this QAPP. Specific QA/QC criteria as well as documentation are outlined in individual Field SOPs located in Appendix A. This QAPP does not describe any laboratory analysis procedures; this information is provided in the University of Rhode Island Watershed Watch Laboratory Program QAPP.

1.2 Organization and Communication

Elizabeth Herron is the URIWW Program Director as well as the overall Laboratory and Data Manager and Laboratory Manager for microbiological analyses (figure 1). As such she is responsible for overall operation of the laboratory as well as the QA/QC of all non-nutrient related assays. She is responsible for overseeing all aspects of lab management, including supervision of student technicians, data entry and proofing, final QA/QC and formatting of all program data. Kelly Addy is the URIWW Program Coordinator and Laboratory Project Manager for nutrient and chloride analysis and also the Web Manager. She is responsible for the analysis and QA/QC of nutrient and chloride assays. She is also responsible for the development of internet content and other outreach tools. Dr. Alissa Cox will provide QA/QC guidance. Ms. Herron is primarily responsible for the supervision and training of volunteers collecting samples and data as part of the URIWW program as well as all students employed by URI Watershed Watch. All changes to the QAPP or specific SOPs will completed only after review and acceptance by Ms. Herron or Ms. Addy.

Figure 1 - University of Rhode Island Watershed Watch Laboratory Structure



1.2.1.1 Personnel Qualifications

A brief description of the experience of principal laboratory personnel is described here. Resumes of key personnel are located in Appendix B

Elizabeth Herron has more than 30 years of experience with the URIWW program, beginning by completing a QA assessment of the program to determine the representativeness of the data generated. She expanded the microbiology laboratory, updating it to current standards, enabling it to receive state-certification. She is the recipient of numerous grants and awards related to her work with URIWW. She is a former director of the North American Lake Management Society as well as a co-founding member of the Rhode Island Volunteer Monitoring Steering Committee. She has authored numerous articles and technical publications and has presented workshops, technical papers and webinars throughout the United States.

Kelly Addy is a watershed hydrologist who has over managed the Watershed Hydrology Laboratory (WHL) for over 20 years. She focuses on watershed sources and sinks of nitrogen, completing nutrient analyses for thousands of samples over the decades. She has received numerous grants and awards for her work with the WHL, including the prestigious URI College of the Environment and Life Sciences Research Staff Research and Scholarship Excellence Award in 2019. Ms. Addy has assisted URIWW throughout her career and is well associated with its practices.

Dr. Alissa Cox is a Clinical Assistant Professor of Sustainable Ecological Design, and director of the New England Onsite Wastewater Training Program in the College of the Environment and Life Sciences at URI. She has more than a decade of experience in the field of water resources, particularly focused on the impact of on-site wastewater treatment systems to Rhode Island waters. She has published numerous refereed journal articles related to her wastewater work. In addition, she has an extensive background in science and math education, which is especially valuable for assessing training procedures. As head of the Laboratory of Soil Ecology and Microbiology, she is experienced and familiar with the procedures and instruments used by URIWW.

Linda Green has over 35 years of analytical laboratory related experience and was the director of URIWW for more than 30 years from its inception in 1988. She is the recipient of numerous awards and grants related to her work with the URIWW program and has authored numerous articles and technical publications. Ms. Green has hosted workshops on QA/QC in volunteer monitoring programs and for ten years was the sole volunteer monitoring representative on the National Water Quality Monitoring Council as well as a co-founding member of the Rhode Island Volunteer Monitoring Steering Committee. She continues to consult with URIWW ensuring that this vital and extensive institutional knowledge is not lost.

1.2.2 Training

Training of volunteer monitoring personnel and student technicians is conducted by Elizabeth Herron and URIWW student staff. Training is provided on limnologic principles, water sample collection and method-specific details for the collection of basic physical and chemical parameters in the field (temperature, Secchi depth transparency, dissolved oxygen and sample collection). Training consists of classroom and field workshops conducted by Ms. Herron. The workshops provide verbal and hands-on training with the collection apparatus and the analysis of water samples. Each volunteer is provided with a copy of the relevant monitoring manual which contains written instructions for the collection and analysis of field samples. Attendance of at least one field training session is mandatory and attendance of a classroom workshop is strongly encouraged. Workshop attendance records are retained by URIWW.

Online training materials as alternatives to both the classroom and field training sessions are also available (https://web.uri.edu/watershedwatch/resources/training-videos/) to replace the in-person sessions if needed. They also serve as valuable support tools for new and experienced volunteers to use if questions arise or as reassurance. These online resources will be updated as needed to reflect program changes or as digital or other technology improves.

1.3 Schedule/Time-Line

This QAPP does not relate to a specific project, therefore no specific time-line or schedule is offered. Specific monitoring schedules are found in the specific Monitoring Manuals a described in Section 1.0 of this QAPP. A schedule for rivers & streams, including Narrow River is included below as an example of a typical monitoring schedule (figure 2). Note that most sampling activities take place from May and into October, weather permitting.

Substantive changes and updates will be transmitted to RI Department of Environmental Management annually or as they are proposed or enacted.

Figure 2 - Example of a Typical Monitoring Schedule

URI WATERSHED WATCH

2022 WATER QUALITY MONITORING SCHEDULE

RIVERS & STREAMS, including NARROW RIVER

Week Ending	Biweekly monitoring: (dissolved oxygen, temperature, chlorophyll & salinity as appropriate)	WATER COLLECTION DATES
April 23	**Equipment pick up week - Temperature, DO, chl-a filters into freezer, salinity into frig**	**Returning volunteers, please call 401-874-2905 in advance to ensure that your supplies are ready for you on the cart outside!!**
May 7	**X** – plus water collection	**FIRST WATER COLLECTION: May 3 - 7 NR Collect samples 8:00 am – 10:00 am**
May 21	Temperature, DO, chl-a filters into freezer, salinity into frig.	MEMORIAL DAY IS MAY 30th
June 4	**X** – plus water collection	**SECOND RIVER COLLECTION: June 1 - 4 NR Collect samples 7:00 am – 9:00 am**
June 18	Temperature, DO, chl-a filters into freezer, salinity into frig.	Keep an eye out for possible NRPA events www.narrowriver.org for details
July 2	Temperature, DO, chl-a filters into freezer, salinity into frig.	Participate in 2022 Secchi Dip-In (www.secchidipin.org)
July 9	**X** – plus water collection	**THIRD COLLECTION: July 6 - 9 NR Collect samples 8:00 am – 10:00 am**
July 23	Temperature, DO, chl-a filters into freezer, salinity into frig.	
August 6	Temperature, DO, chl-a filters into freezer, salinity into frig.	VICTORY DAY IS AUGUST 8th
August 13	**X** – plus water collection	**FOURTH COLLECTION: Aug. 10 - 13 NR Collect samples 6:00 am – 8:00 am**
August 27	Temperature, DO, chl-a filters into freezer, salinity into frig.	LABOR DAY IS SEPT. 5th
September 10	Temperature, DO, chl-a filters into freezer, salinity into frig.	(sorry – 2 weeks in a row again)
September 17	**X** – plus water collection	**FIFTH COLLECTION: September 14 - 17 NR Collect samples 8:00 am – 10:00 am**
October 1	Temperature, DO, chl-a filters into freezer, salinity into frig.	
October 15	Temperature, DO, chl-a filters into freezer, salinity into frig.	INDIGENOUS PEOPLES DAY IS OCTOBER 10th
October 29	**X - Return all supplies**	**SIXTH COLLECTION: Oct. 25 - 29 NR Collect samples 6:00 am – 9:00 am**

Monitoring is scheduled for every other week, but you may monitor weekly. **Monitor between 6 AM and 9 AM**, except on the water collection days. Approximate times listed are for when Narrow River monitors collect water samples (aimed toward low tide). Other rivers/streams should collect samples by 9 AM. Samples may be collected and delivered on any of the four to five days, usually Tuesday through Saturday (10 AM - 3 PM). ***It is better to collect the water samples earlier rather than later.*** After collection immediately bring the samples on ice in a cooler to the cart outside the Coastal Institute in Kingston, URI. We may not be running QC checks in the lab again due to Covid. The URI Watershed Watch lab phone number is 401-874-2905, email eherron@uri.edu, or 401-874-4552 direct to Elizabeth. *Please notify us at least 1 day in advance if you must reschedule delivery of water samples to a different date. An earlier date is much preferable to one after the designated collection period.*

Have a great season and remember to monitor safely!

2.0 FIELD QUALITY OBJECTIVES AND MEASUREMENT PERFORMANCE CRITERIA

High quality data is the goal of all URIWW field analytical and sample collection procedures. Specific data quality objectives have been set for field analytical procedures on a method basis for method detection limits (MDL), precision, accuracy, comparability and completeness. Values specific to each of these objectives are located in the tables in this section. Since this document is a general QAPP for field assays only, there are no specific if/then statements linking field criteria to project decisions.

2.1 Method Detection Limits (MDL) and Reporting Limit (RL)

The MDL is the analyte concentration where there is 99% confidence that the sample concentration is different from zero. Below the MDL it is uncertain if the concentration is not zero. The reporting limit (RL) is the value above which data have definable accuracy and precision. Each field assay has a specific MDL and RL value. These values are in worksheet 9b (see Section 2.6.1).

2.2 Precision

Precision is a measure of the degree to which two or more measurements agree as well as a measurement of random error. Precision of field assays will be assessed through the measurement of duplicate samples and subsequent calculation of the relative percent difference (%RPD) as described below.

$$\%RPD = \frac{\left| \text{Result of Replicate 1} - \text{Result of Replicate 2} \right|}{\text{Average of Result of Replicate 1 and Result of Replicate 2}} \times 100$$

Objectives for precision are in worksheets 11b and 23a, Section 2.6.3 and 2.6.9, respectively.

2.3 Accuracy

Accuracy is an evaluation of the degree to which a measured value and a known reference value or true value agree. This is a measurement of systematic error and is often referred to as “bias”. Accuracy of field analytical procedures is determined by the analysis of reference material and comparison of the resulting value to that of the accepted value. The difference between the accepted and reference value is the percent difference (%D). The %D is calculated as follows:

$$\%D = \frac{\left| \text{Known Value of Reference Material} - \text{Calculated Value of Reference Material} \right|}{\text{Known Value of Reference Material}} \times 100$$

Objectives for accuracy are in worksheet 11b, 14 and 22a (see Section 2.6.3, 2.6.5 and 2.6.8, respectively).

2.4 Comparability

All field analytical procedures and sample collection methods utilized by the URIWW program are based on procedures found in the following sources:

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 19th ed. Washington D.C.: APHA, 1995.

U.S. Environmental Protection Agency. Volunteer Stream Monitoring: A Methods Manual, EPA 841-B-97-003. Washington D.C.: Office of Water, Nov. 1997.

U.S. Environmental Protection Agency. Volunteer Lake Monitoring: A Methods Manual, EPA 440/4-91-002. Washington D.C.: Office of Water, Dec. 1991.

Carlson, R. and J. Simpson. A Coordinator's Guide to Volunteer Lake Monitoring Methods. North American Lake Management Society (NALMS), Feb. 1996.

U.S. Environmental Protection Agency. Volunteer Estuary Monitoring: A Methods Manual. 2nd ed. U.S. Environmental Protection Agency and Center for Marine Conservation, No Date Listed.

Field Test Kit Instructions from the manufacturer (LaMotte) at www.lamotte.com

2.5 Completeness

Completeness is a measure of the amount of valid data obtained from the field analytical procedures as well as a measure of the number of valid samples collected in the field compared to the number expected to be obtained under normal conditions. Working with volunteers who are donating their time necessitates realistic expectations. It is simply not possible to expect the typical completeness value of 90% applicable to professionally collected data. A completeness rate of 67% of field analytical procedures and collection of valid samples is expected. Completeness is calculated as follows:

$$\text{Completeness (Field Analytical Procedures)} = \frac{\text{Number of Valid Field Analytical Measurements}}{\text{Number of Field Analytical Measurements Planned}} \times 100$$

And

$$\text{Completeness (Collection of Field Samples)} = \frac{\text{Number of Valid Field Samples Collected}}{\text{Number of Field Samples Planned}} \times 100$$

When this level of completeness is not met, data qualifiers will be used to explain that rather than simply disregarding available field data if it otherwise meets data quality objectives.

2.6 QA/QC Tables

Tables summarizing the QA/QC objectives for each field analytical procedure performed as well as any objectives related to the collection of field samples for later analysis by the URIWW Laboratory are provided on the following pages. These tables address the Data Quality Indicators (DQIs) or the procedures to be followed to provide assurance that a field analytical procedure is returning valid results. Each DQI has a specific result that must be met before the data is considered acceptable. Maintenance and calibration procedures for each piece of equipment/instrument are provided for field analytical procedures and sample collection methods as well as preservation and required sample volume. The person(s) responsible for assessing problems relating to field analytical procedure DQIs and/or maintenance of field equipment are also listed within the tables.

2.6.1 Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table) - Worksheet #9b

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	Reporting Units	Project Action Limit (Units) (wet or dry weight)	Project Quantitation Limit (Units) (wet or dry weight)	Analytical Method		Achievable Field Analytical Limits	
				MDLs	Method RLs	MDLs	RLs
Field Analytical Procedures							
Secchi Depth	meters	NA – This is a generic QAPP for field procedures		0.1	0.1	0.1	0.1
Temperature	°C			0.0	0.0	0.0	0.0
Dissolved Oxygen	mg/L O_2			0.0	0.2	0.0	0.2
Salinity[1]	ppt			0.0	1.0	0.0	<1.0
Wind Speed	Code – See Field SOP 003			NA	NA	NA	NA
Light				NA	NA	NA	NA
Rain				NA	NA	NA	NA
State of Tide				NA	NA	NA	NA
Field Sample Collected							
Filters for chlorophyll-a analysis	NA			NA – Samples filtered in field, then kept frozen until analyzed by the URIWW Laboratory. Refer to URIWW Laboratory QAPP for QA/QC information on chlorophyll-a analysis.			
Filtered Water Sample (for chloride and dissolved nutrients: ammonia-N, orthophosphate-P and nitrate + nitrite-N[2])	NA			NA – Sample analyzed by the URIWW Laboratory. Refer to URIWW Laboratory QAPP for QA/QC information on analyses.			

EPA-NE QAPP Worksheet #9b - Rev. 10/99

Contaminants of Concern and Other Target Analytes Table (Reference Limit and Evaluation Table)

Analyte	Reporting Units	Project Action Limit (Units) (wet or dry weight)	Project Quantitation Limit (Units) (wet or dry weight)	Analytical Method		Achievable Field Analytical Limits	
				MDLs	Method RLs	MDLs	RLs
Unfiltered Water Sample (for pH, alkalinity and salinity[1])	NA			NA – Sample analyzed in the URIWW Laboratory. Refer to URIWW Laboratory QAPP for QA/QC information on analyses.			
Unfiltered Water Sample (for total nitrogen and total phosphorus[3])	NA			NA – Sample analyzed in the URIWW Laboratory. Refer to URIWW Laboratory QAPP for QA/QC information on analyses.			
Unfiltered water sample (for fecal coliform, and enterococci)	NA			NA – Samples collected in field and then analyzed in the URIWW Laboratory. Refer to URIWW Laboratory QAPP for QA/QC information on bacteria analyses.			

Notes:
[1]Salinity may be analyzed in the field using meters or in the laboratory using a salinity refractometer.
[2]Samples are analyzed jointly for nitrate-N (NO_3-N) + nitrite-N (NO_2-N) because nitrite levels are generally very low and the method for separating the two species requires several extra steps.
[3]The total nitrogen and total phosphorus analysis provides a value for all the nitrogen and phosphorus in a sample. This is in contrast to the analysis for nitrate + nitrite-N, ammonia-N, and orthophosphate-P; these analyses only provide values for specific dissolved species.

2.6.2 Field and Quality Control Sample Summary Table – Worksheet #9c

EPA-NE QAPP Worksheet #9c - Rev. 10/99

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks	Total No. of Samples to Lab
Field Analytical Procedures									
NA	Secchi Depth	Fresh and Marine waters[1]	Field SOP 005	NA	2 – (measured 4 times) Average reported	NA	NA	NA	0 –Field measurement
NA	Temperature	Fresh and Marine waters	Field SOP 006	NA	0	NA	NA	NA	0 – Field Measurement
Unfiltered Water Sample	Dissolved Oxygen	Fresh and Marine waters	Field SOP 010	Deep (Hypolimnion) or mid-depth	2 (titrate 2 aliquots of each sample = 4 measurements) Average reported	NA	NA	NA	0 – Field Measurement
				Shallow (1 meter)	1 (titrate 2 aliquots of sample = 2 measurements) Average reported				
Unfiltered Water Sample	Salinity	Fresh and Marine waters	Field SOP 015	NA	2 (measure twice with refractometer or send to lab) Average reported	NA	NA	NA	0 – Field Measurement *or* 1 bottle
NA	Wind Speed	NA	Field SOP 003	NA	NA	NA	NA	NA	0 – Field Measurement

EPA-NE QAPP Worksheet #9c - Rev. 10/99

Field and Quality Control Sample Summary Table

Medium/ Matrix	Analytical Parameter	Conc. Level	Analytical Method/ SOP Reference	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of Trip Blanks	No. of Bottle Blanks	No. of Equip. Blanks	Total No. of Samples to Lab
NA	Light	NA	Field SOP 003	NA	NA	NA	NA	NA	0 – Field Measurement
NA	Rain	NA	Field SOP 003	NA	NA	NA	NA	NA	0 – Field Measurement
NA	State of Tide	NA	Field SOP 003	NA	NA	NA	NA	NA	0 – Field Measurement
Field Samples Collected									
Filter	Chlorophyll-a	Fresh and Marine waters	Field SOP 007	NA	2 (filter 2 aliquots of each sample = 4 filters total) Average reported	0	0	0	4 filters
Filtered Water Sample	Chloride, Ammonia-N, Orthophosphate-P and Nitrate + Nitrite-N	Fresh and Marine waters	Field SOP 007	NA	0	0	0	0	1 bottle
Unfiltered Water Sample	pH, Alkalinity and Salinity	Fresh and Marine waters	Field SOP 009	NA	0	0	0	0	1 bottle
Unfiltered Water Sample	Total Nitrogen and Phosphorus	Fresh and Marine waters	Field SOP 009	NA	0	0	0	0	1 bottle
Unfiltered Water Sample	fecal coliform and enterococci	Fresh and Marine waters	Field SOP 008	NA	0	0	0	0	1 bottle

Note:
This QAPP deals with the field collection and analysis of samples only. Laboratory QA/QC is dealt with in the URIWW Laboratory QAPP. Additionally, due to the nature of the analyses performed by the laboratory there is no need to collect additional sample volume for matrix spikes, they come from the same bottle. Therefore, the MS column has been eliminated from this table. [1] Fresh water refers to fresh water (rivers, streams, ponds, lakes). Marine water refers to estuarine and marine waters.

2.6.3 Measurement Performance Criteria Table – Worksheet #11b

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table

Sampling Procedure	Field QC Sample and/or Field Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	Field SOP Number	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Field Analytical Procedures					
Secchi Depth	Complete field measurement 4 times	Not greater than 0.25 m difference between all readings	Precision	005	A
	Calibrate yearly	Less than 10%D in gradation of measurement line	Accuracy	005	A
Temperature	Calibrate yearly	Difference less than +/- 1 °C from reference	Accuracy	006	A
Dissolved Oxygen (Unfiltered Water Sample)	Duplicate titration	Difference between measurements not greater than 1 mg/L DO	Precision	010	A
	Field Sample Duplication of mid-depth or deep water samples	Difference between measurements not greater than 1 mg/L DO	Precision	010	A & S
	Analysis of known sample (LCS)[1]	Value less than +/- 1 ppm different from known value	Accuracy	010	A&S
Salinity (Unfiltered Water Sample)	Analysis of known sample (LCS) [1]	Value less than +/- 2 ppt different from known value	Accuracy	013	A&S
	Duplicate measurement	Difference between measurements not greater than 2 ppt	Precision	013	A
Wind Speed	NA	NA	NA	003	NA

EPA-NE QAPP Worksheet #11b - Rev. 10/99

Measurement Performance Criteria Table

Sampling Procedure	Field QC Sample and/or Field Activity Used to Assess Measurement Performance	Measurement Performance Criteria	Data Quality Indicators (DQIs)	Field SOP Number	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Light	NA	NA	NA	003	NA
Rain	NA	NA	NA	003	NA
State of Tide	NA	NA	NA	003	NA
Field Samples Collected					
Chlorophyll-a	Field duplicate pair	See URIWW Laboratory QAPP	Precision	007	S
	Filter each field sample twice	See URIWW Laboratory QAPP	Precision	007	S
	Sampling and processing of a sample in the laboratory[2]	Used to evaluate if persons collecting samples are processing samples correctly and the precision between samples of the same water collected by different persons.	Precision	007	007
Chloride, Ammonia-N, Orthophosphate-P and Nitrate + Nitrite-N	None (See URIWW Laboratory QAPP for QA/QC information)				
pH, Alkalinity and Salinity	None (See URIWW Laboratory QAPP for QA/QC information)				
Total Nitrogen and Phosphorus	None (See URIWW Laboratory QAPP for QA/QC information)				
fecal coliform and enterococci	None (See URIWW Laboratory QAPP for QA/QC information)				

Notes: (next page)

[1] Analysis of a known sample (LCS) is completed by volunteer monitors when they drop samples off at the URIWW Laboratory. A known sample of water is provided and the monitor is observed by a member of the URIWW Laboratory staff to ensure that they are completing the sampling and analysis procedures correctly. Ideally every volunteer monitor who regularly measures DO will process one LCS each year for DO, this is not always the case. In addition, these quality checks may not be possible due to public health or other emergencies such as Covid-19.

[2] Collection and filtration of a laboratory provided sample is completed by volunteer monitors when they drop samples off at the URIWW Laboratory. A sample of water is provided and the monitor is observed by a member of the URIWW Laboratory staff to ensure that they are completing the sampling and filtration procedures correctly. This sample is not a LCS as the URIWW Laboratory does not know the concentration of chlorophyll-a in the provided sample. Rather, after each volunteer monitor has completed the sampling exercise the samples are analyzed and the results compared to determine if there are any major differences among the volunteer monitor's samples. In addition, these quality checks may not be possible due public health or other emergencies such as Covid-19.

2.6.4 Sampling Locations, Sampling and Analysis Method/SOP Requirements Table – Worksheet #12b

EPA-NE QAPP Worksheet #12b - Rev. 10/99

Sampling Locations, Sampling and Analysis Method/SOP Requirements Table

Sampling Location & Depth	Parameter	Matrix	# Samples	Field SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
Field Analytical Procedures									
Various – Project Specific	Secchi Depth	NA	4	005	NA	NA	NA	NA	NA
	Temperature	NA	1	006	NA	NA	NA	NA	Analyze sample as soon as collected
	Dissolved Oxygen	Unfiltered Water Sample	Deep -2 (Titrated 2 times)	010	NA	60 mL	2, 60 mL glass DO bottles	Ice/4 °C	1 hour
		Unfiltered Water Sample	Shallow – 1 (titrated 2 times)	010	NA	60 mL	1, 60 mL glass DO bottle	Ice/4 °C	1 hour
	Salinity	Unfiltered Water Sample	2 (measure salinity 2 times)	015	NA	1 drop	1, 30 mL plastic bottle	none	none
	Wind Speed	NA	NA	003	NA	NA	NA	NA	NA
	Light	NA	NA	003	NA	NA	NA	NA	NA
	Rain	NA	NA	003	NA	NA	NA	NA	NA
	State of Tide	NA	NA	003	NA	NA	NA	NA	NA

EPA-NE QAPP Worksheet #12b - Rev. 10/99

Sampling Locations, Sampling and Analysis Method/SOP Requirements Table (continued)

Sampling Location & Depth	Parameter	Matrix	# Samples	Field SOP	Lab. SOP	Sample Volume	Containers (number, size and type)	Preservation	Max Holding time
Field Samples Collected									
	Chlorophyll-a	Filter	4 filters (2 water samples)	007	012	<=100 mL from each of 2 250 mL bottles	Aluminum foil packet	In closed plastic bag with desiccant chips and frozen	6 months
	Chloride, Ammonia-N, Orthophosphate-P and Nitrate + Nitrite-N	Filtered Water Sample	1	007	013, 014 & 015	60 – 125 mL	1, 125 mL white HDPE bottle	Ice/4 °C Frozen upon delivery and lab log-in	Chloride – 1 year; Ammonia-N, Orthophosphate -P and Nitrate + Nitrite-N 30 days
	pH, Alkalinity and Salinity	Unfiltered Water Sample	1	009	010 & 017	200 mL	1, 500 mL white HDPE bottle	Ice/4 °C	pH and Alkalinity - 24 hours Salinity -1 year
	Total Nitrogen and Phosphorus	Unfiltered Water Sample	1	009	016	100 mL	1, 125 – 250 mL brown glass bottle	Ice/4 °C	30 days
	fecal coliform and enterococci	Unfiltered Water Sample	1	008	007	100 mL	1, 250 – 500 mL sterile white plastic bottle	Ice/4 °C	6 hours

2.6.5 Field Sampling Equipment Calibration Table - Worksheet #14

EPA-NE QAPP Worksheet #14 - Rev. 10/99

Field Sampling Equipment Calibration Table

Equipment	Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Secchi Disk	Check gradations on calibrated line attached to Secchi Disk	Yearly	Less than 10% difference between line and reference	Replace calibrated line	URIWW Laboratory Staff	005
Thermometer	Check thermometer against NIST standard thermometer	Yearly	Less than +/- 1 °C difference between thermometer and reference	Replace or repair thermometer	URIWW Laboratory Staff	006
Deep Sampler	Check calibrated line	Yearly	Less than 10% difference between line and reference	Replace calibrated line	URIWW Laboratory Staff	012

2.6.6 Field Equipment Maintenance, Testing and Inspection Table – Worksheet #15

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Secchi Disk	Rinse with tap water after use and allow to dry	NA	Make sure line is attached securely to Secchi disk	Person(s) collecting sample	Before each use	Securely attached	Attach line securely.	005
Thermometer	Rinse with tap water after use and allow to dry	Electronic thermometers only: Make sure that thermometer turns on	Electronic thermometers: make sure probe is not damaged. Spirit thermometers: Make sure spirit is continuous in the thermometer (no breaks in internal fluid) and that the probe is not damaged.	Person(s) collecting sample	Before each use	Electronic thermometers: thermometer turns on and probe is not damaged. Spirit thermometer: Spirit is continuous and probe is not damaged.	Electronic thermometers: replace battery if probe does not turn on. If still not operational call URIWW Laboratory for a replacement thermometer. Spirit thermometer: Call URIWW Laboratory for a replacement thermometer.	006
Filter housings, syringe	Rinse with tap water after use and allow to dry	NA	Check that filter housing and syringe are not cracked or damaged.	Person(s) collecting sample	Before each use	Filter housing and syringe are not damaged.	Call URIWW Laboratory for a replacement filter housing and/or syringe.	007

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
DO test kit	Rinse all syringes and glassware with tap water after use, allow to dry	NA	•Check that enough reagent is available for the next round of sampling and that it is the correct color (color change indicates reagent needs replacement). • Make sure there is no precipitate in the reagent bottles. Precipitate indicates that reagent must be replaced. •Check that syringes and glassware are not damaged.	Person(s) collecting sample	Before each use	No equipment is damaged and enough reagents are available for next sampling round.	Call URIWW Laboratory for replacement equipment or more reagents.	010
DO test kit	Replace all reagents and clean test kit components	NA	NA	URIWW Laboratory Staff	Yearly	NA	NA	010
Shallow water sampler	Rinse with tap water after use and allow to dry	NA	Ensure that the primer bulb is not cracked and the tubing is securely attached to the sampler.	Person(s) collecting sample	Before each use	Equipment is not damaged.	Call URIWW Laboratory for replacement sampler.	011

EPA-NE QAPP Worksheet #15 - Rev. 10/99

Field Equipment Maintenance, Testing and Inspection Table

Sampling Equipment/ Instrument	Maintenance Activity	Testing Activity	Inspection Activity	Responsible Person	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
Deep water sampler	Rinse with tap water after use and allow to dry	NA	Ensure the sampler is operational, that all lines are securely attached to sampler and the weight is attached to the sampler. Also check that the internal tube that goes into the DO bottle is present. If it is not there replace it using the barrel of a round Bic® pen cut to the appropriate length.	Person(s) collecting sample	Before each use	Equipment is not damaged, line is securely attached and tube leading into the DO bottle is present.	Call URIWW Laboratory for a replacement tube or sampler and/or re-attach sampler line.	012
Salinity refractometer	Rinse glass surface and cover with de-ionized water after use, allow to dry open	NA	Check that sampling pipet is clean & undamaged. Check that enough de-ionized water is available for the next round of sampling, for cleaning and for calibration check. Ensure that enough 20 ppt salinity standard is available for calibration check.	Person(s) collecting sample	Before each use	No equipment is damaged and enough de-ionized water and calibration standard are available for next sampling round.	Call URIWW Laboratory for replacement equipment or more water or standards.	013

2.6.7 Field Analytical Method/SOP Reference Table (Test Kits and Instruments) –Worksheet #17

EPA- NE QAPP Worksheet #17 – Rev. 10/99

Field Analytical Method/SOP Reference Table

Reference Number (Field SOP Number)	Title, Revision Number and Date	Analytical Parameter	Instrument
001	Safety First, rev. 3, 10/20	None	None
002	Where We Monitor: Pin-Pointing Your Monitoring Location, rev. 3, 10/20	Location of Monitoring	None
003	Monitoring Postcard Instructions, rev. 4 10/20	Secchi Depth, Bottom Depth, Water Temperature, Dissolved Oxygen, Salinity, Wind Speed, Light, Rain, State of Tide	None
004	Handling and Transporting Water Samples, rev. 4, 10/20	None	None
005	Secchi Depth Transparency, rev. 4, 10/20	Secchi Depth	Secchi Disk
006	Water Temperature, rev. 4, 10/20	Water Temperature	Thermometer
007	Chlorophyll (Algae) And Dissolved Nutrients, rev. 5, 10/20	Chlorophyll-a, Chloride, Ammonia-N, Orthophosphate-P and Nitrate + Nitrite-N	Filter Housing and Syringe
008	Bacterial Monitoring, rev. 4, 10/20	enterococci, fecal coliform and E. coli	None
009	Collecting Unfiltered Water Samples, rev. 3, 09/20	pH, Alkalinity, TSS, Salinity, Total Nitrogen and Phosphorus	None
010	Dissolved Oxygen Monitoring, rev. 6, 10/20	Dissolved Oxygen	La Motte DO Test Kit
011	Shallow Water Sampler Operation, rev. 2, 07/12	None	Shallow Water Sampler
012	Deep Water Sampler Operation, rev. 4, 10/20	None	Deep Water Sampler

EPA- NE QAPP Worksheet #17 – Rev. 10/99

Field Analytical Method/SOP Reference Table

Reference Number (Field SOP Number)	Title, Revision Number and Date	Analytical Parameter	Instrument
014	On-line Data Entry Instructions, rev. 08/20	Secchi Depth, Bottom Depth, Water Temperature, Dissolved Oxygen, Salinity, Wind Speed, Light, Rain, State of Tide	None
015	Measuring Salinity Using a Refractometer, 01/23	Salinity	Salinity Refractometer
017	Collecting water samples from wadable stream, rev. 2 10/20	pH, TSS, Salinity, Total Nitrogen and Phosphorus, enterococci, fecal coliform and E. coli	None

2.6.8 Field Sampling QC Table – Worksheet 22a

EPA-NE QAPP Worksheet #22a - Rev. 10/99 - Field Sampling QC Table

Nutrients (whole and filtered)

Sampling SOP	Field SOP 007	Analytical Method/SOP Reference	Laboratory SOP 012
Medium/Matrix	Whole & Filtered / Fresh or Marine Waters	Sampler's Name	Student staff
Analytical Parameter	Chlorophyll-a	Field Sampling Organization	URIWW
Concentration Level (undiluted sample)	Fresh and marine samples: <2.5 ug/l – 100 ug/l P (total and dissolved) <25 ug/l – 1000ug/l N total-, nitrate+nitrite, ammonia- 1 – 40 mg/l Cl	No. of Sample Locations	1-2

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Field Duplicate Pair (raw water)	10%	See Laboratory QAPP	See Laboratory QAPP	URIWW Staff	Precision
Field Filtration Duplicate	10%	See Laboratory QAPP	See Laboratory QAPP	URIWW Staff	Precision
Sampling and processing of a **blind, purchased QC sample** in the laboratory	1 - yearly	Used to evaluate program.	See Laboratory QAPP	URIWW Staff	Accuracy
Field Blanks	4-6[1]	See Laboratory QAPP	Re-sample, perform tests in laboratory of water sources	URIWW Staff	Accuracy

[1] Field blanks will be collected each year during 4-6 water collections, by URIWW student staff, processed and analyzed for total N&P and also filtered and analyzed for dissolved nutrients. Additionally on an annual basis shallow and deep water samplers used by URIWW staff will be filled with high purity water and then analyzed for the typical suite of nutrients in that water.

EPA-NE QAPP Worksheet #22a - Rev. 10/99 - Field Sampling QC Table

Bacteria

Sampling SOP	Field SOP 008	Analytical Method/SOP Reference	Laboratory SOP 007 & 018
Medium/Matrix	Whole Fresh or Marine Waters	Sampler's Name	Various
Analytical Parameter	Fecal coliform, E. coli and/or Enterococci Bacteria	Field Sampling Organization	URIWW
Concentration Level (undiluted sample)	<1 – TNTC MPN or counts/100 ml	No. of Sample Locations	1-2

Field QC:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**
Field Duplicate Pair (raw water)	10%	See Laboratory QAPP	See Laboratory QAPP	URIWW Staff	Precision
Sampling and processing of a **blind, purchased QC sample** in the laboratory	1 - yearly	Used to evaluate program.	See Laboratory QAPP	URIWW Staff	Accuracy

EPA-NE QAPP Worksheet #22a - Rev. 10/99 - Field Sampling QC Table

Chlorophyll (algae)

Sampling SOP	Field SOP 007	Analytical Method/SOP Reference	Laboratory SOP 012
Medium/Matrix	Filter / Fresh or Marine Waters	Sampler's Name	Various
Analytical Parameter	Chlorophyll-a	Field Sampling Organization	NA
Concentration Level (undiluted sample)	Fresh and marine samples: <0.2 – 100 µg/L chlorophyll-a	No. of Sample Locations	NA

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Field Duplicate Pair (raw water)	100%	See Laboratory QAPP	See Laboratory QAPP	URIWW Staff	Precision
Field Filtration Duplicate	100%	See Laboratory QAPP	See Laboratory QAPP	URIWW Staff	Precision
Sampling and processing of a provided sample in the laboratory	1 - yearly	Used to evaluate program and if person(s) collecting samples are processing samples correctly.	Re-train person(s) collecting samples if needed	URIWW Staff	Precision

Note:
No measurement performance criteria are provided in this table as this QAPP is for general field procedures and not associated with a specific project

2.6.9 Field Analytical QC Table – Worksheet 23a

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Secchi Depth

Sampling SOP	Field SOP 005	Analytical Method/SOP Reference	NA – Field Measurement
Medium/Matrix	Fresh or Marine Waters	Sampler's Name	Various
Analytical Parameter	Secchi Depth	Field Sampling Organization	NA
Concentration Level	NA	No. of Sample Locations	NA

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Field Duplicate Measurements	100%	Not greater than 0.25 meter difference between all readings	Flag data as inconsistent	E. Herron	Precision
Calibrate measurement line	Yearly	Less than 10%D in gradation of measurement line	Replace calibrated line	URIWW Staff	Accuracy

Note:
No measurement performance criteria are provided in this table as this QAPP is for general field procedures and not associated with a specific project.

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Temperature

Sampling SOP	Field SOP 006	Analytical Method/SOP Reference	NA – Field Measurement
Medium/Matrix	Fresh or Marine Waters	Sampler's Name	Various
Analytical Parameter	Temperature	Field Sampling Organization	NA
Paramter Level	0 -100 °C	No. of Sample Locations	NA

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Calibrate	Yearly	Difference less than +/- 1 °C from reference	Replace or repair thermometer	URIWW Staff	Accuracy

Note:
No measurement performance criteria are provided in this table as this QAPP is for general field procedures and not associated with a specific project

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Dissolved Oxygen

Sampling SOP	Field SOP 010	Analytical Method/SOP Reference	NA – Field Test Kit
Medium/Matrix	Fresh or Marine Waters	Sampler's Name	Various
Analytical Parameter	Dissolved Oxygen	Field Sampling Organization	NA
Concentration Level	0 – 10 mg/L O_2	No. of Sample Locations	NA

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Duplicate Titration	100%	Results not more than 1 mg/L O_2 different	Complete a third titration and record results	Sampler	Precision
Collect field duplicate pair (deep water samples only)	100%	Results not more than 1 mg/L O_2 different	Complete a third titration and record results	Sampler	Precision
Analysis of known sample (LCS)	Yearly	Value less than +/- 1 ppm different from known value	Sampler is re-trained in how to complete analysis	E. Herron	Accuracy

Note:
No measurement performance criteria are provided in this table as this QAPP is for general field procedures and not associated with a specific project

EPA-NE QAPP Worksheet #23a - Rev. 10/99 - Field Analytical QC Table

Salinity

Sampling SOP	Field SOP 015	Analytical Method/SOP Reference	NA – Field Test Kit
Medium/Matrix	Marine Waters	Sampler's Name	Various
Analytical Parameter	Salinity	Field Sampling Organization	NA
Concentration Level	<1 – 40 ppt	No. of Sample Locations	NA

Field QC:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)
Analysis of known sample (LCS)	Prior to each day's use of refractometer	Value less than +/- 2 ppt different from known value	Refractometer is re-calibrated	Refractometer user	Accuracy

Note:
No measurement performance criteria are provided in this table as this QAPP is for general field procedures and not associated with a specific project

3.0 SAMPLE HANDLING, TRACKING AND CUSTODY REQUIREMENTS

Data collected using field analysis procedures (Secchi depth, temperature, DO, wind speed, light, rain and state of tide) are returned to the URIWW Laboratory on monitoring postcards (see Field SOP 003) or a similar document, or entered on-line. The postcard and online data entry includes the date and time of sampling, sampling location and monitor(s) name(s) as well as the field data. Monitoring postcards are collected, and information is compared for data entered by URIWW staff as well as by volunteers on-line.

Collected samples are transported to the URIWW Laboratory by the sampler, in a cooler on ice or using cold packs. Chlorophyll filters are transported between 2 cold packs. When delivering the samples to the laboratory the sampler signs their name on the sample log sheet, provides the date and time the samples were collected and alerts laboratory staff if not all the required samples were not collected. The staff person receiving the sample notes the date and time of receipt and checks off the samples received. The temperature of bacteria samples is measured with an infrared no-touch thermometer and recorded on the log sheet. Sample log sheets provided by the URIWW Laboratory act as the project chain of custody and are retained by the URIWW Laboratory in the project file (figure 3).

The sample log sheet includes the following information:

1. Project Name
2. Project Location
3. Person(s) responsible for transporting samples
4. Date and time of sample collection
5. Date and time of sample receipt
6. Sample identification name/number
7. Number and type of sample bottles
8. Temperature of bacteria sample upon receipt

A technician will be responsible for checking that the samples listed on the sample log sheet correspond correctly with the samples received. A copy of the sample log sheet will be maintained in the project file. Log sheets are also scanned and maintained as pdfs in the appropriate computer folders. Access to the computer files is password protected. Project files are maintained in the main URIWW laboratory and/or Elizabeth Herron’s office, in the URI Coastal Institute. Both locations are locked when staff are not present.

3.1 Acceptance of Expendable Laboratory supplies

All expendable laboratory supplies such as test kit reagents and sample bottles will be inspected upon arrival by Elizabeth Herron. Packages containing damaged material or packages that were open upon arrival will not be accepted. Chemicals will be marked with the date of acceptance as well as the date they are opened. Expired chemicals will be disposed of appropriately.

Figure 3 - Example sample log sheet

2020 Bristol Harbor Log Sheet: October 1st Water Collection

Check each of the bottles listed with the monitoring location.

Monitoring Location	Delivered By	Received by (Intial/date/time)	Date of Collection	Time of Collection	Unfiltered Br. Glass	Unfiltered Plastic	Bacteria Plastic	(Chl-a) Baggy	Temp C at receipt
#01 Elks Club					1	1	1	1	
#02 Bristol Harbor Inn					1	1	1	1	
#03 Silver Creek					1	1	1	1	
#04 Windmill Pt					1	1	1	1	
#05 Mill Pond					1	1	1	1	
#06 Sanroma					1	1	1	1	
#07 Bristol Yacht Club					1	1	1	1	
#08 Brito Dock					1	1	1	1	
#09 Silver Bridge					1	1	1	1	
#10 Silver East					1	1	1	1	
#11 Silver West					1	1	1	1	
#12 Herreshoff					1	1	1	1	
#14 DaPonte P/ Wood St					1	1	1	1	
#18 Annawamscutt					1	1	1	1	
#17 Kickemuit					1	1	1	1	
#19 - Golf Course A					1	1	1	1	
#20 - Golf Course B					1	1	1	1	
BCWA - Upper					1	1	1	1	
BCWA - Lower					1	1	1	1	
BCWA - Estuary					1	1	1	1	

3.2 Sample Handling System – Worksheet 16

EPA-NE QAPP Worksheet #16 - Rev. 10/99 **Sample Handling System**
SAMPLE COLLECTION, PACKAGING AND SHIPMENT
Sample Collection: Various persons Sample Packing: Person(s) responsible for sample collection Coordination of Shipment: Person(s) responsible for sample collection Type of Shipment: By car in cooler with ice packs. Generally the person responsible for sample collection or their designee.
SAMPLE RECEIPT AND ANALYSIS
Responsible Organization: University of Rhode Island Watershed Watch Laboratory (URIWW) Sample Receipt: URIWW Staff Sample Custody and Storage: URIWW Staff Sample Preparation: URIWW Staff Sample Determinative Analysis: URIWW Staff
SAMPLE ARCHIVAL
Field Sample Storage (No. of days from sample collection): Dependent upon analysis – Refer to URIWW Laboratory Program QAPP. Sample Extract/Digestate Storage (No. of days from extraction/digestion): Dependent upon analysis – Refer to URIWW Laboratory Program QAPP.
SAMPLE DISPOSAL
Responsible Organization and personnel: URIWW / URIWW Staff

4.0 PROJECT DOCUMENTATION AND RECORDS

All sample log sheets will be retained by the laboratory in the project files. All hard copy field data sheets will also be retained in the project files. Project files are maintained in the main URIWW laboratory, in the URI Coastal Institute by Elizabeth Herron. The lab is locked when staff are not present. Electronic data are stored on a password protected laboratory computer that is networked to several other password protected computers throughout the URIWW Laboratories and offices and to the URI College of Environment and Life Sciences secure servers. All laboratory data (electronic and hard copy) are retained for at least 10 years.

No general quality management reports are prepared. During the collection and analysis of field samples the volunteer or technician completing sample collection or analysis is responsible for recording any problems with meeting measurement performance criteria (Section 2.6.3) and/or instrument operational issues. Any failure of a sample to meet defined measurement performance criteria should be recorded and the data flagged for further review upon data entry and final data validation.

4.1 Data Management Process

Data generated by each analysis is internally validated by either Ms. Herron or Ms. Addy by comparing the data to criteria in the appropriate tables in Section 2.6. The data validation process starts once the data have been produced and are entered into Microsoft Excel files or online in ArcGis. After data have been entered into the appropriate file, URIWW staff complete an initial check to be sure all data were entered correctly. Then Ms. Herron checks the proofed data entered for errors, often by referring to the sample log sheets or raw data for confirmation and correct any. Outliers and inconsistencies are flagged for further review. If data collected by volunteer monitor is flagged, then the monitor maybe contacted to check that the data sent to the laboratory was correct. Data are compared to values obtained for similar samples analyzed in the past. The decision to add qualifying codes, comments or other indicators of deviations from standard practices, or to discard data will be made by Ms. Herron.

Following final compilation of all project or season data, results are reformatted into a form able to be uploaded in the Rhode Island Department of Environmental Management's water quality database. Those files are also saved as .CSV files and posted on the URIWW website (https://web.uri.edu/watershedwatch/data/historic-data/) for use by the public, researchers and other agencies. The full data management process is detailed in SOP 018 – Data Management, included in Appendix A.

Appendix A

Standard Operation Procedures
List of SOPs

Description	Field SOP Number	Revision	Date
Safety First	001	4	01/23
Where We Monitor: Pin-Pointing Your Monitoring Location	002	4	01/23
Monitoring Postcard Instructions	003	4	10/20
On-line Data Entry Instructions	014	6	01/23
Handling and Transporting Water Samples	004	4	10/20
Secchi Depth Transparency	005	5	01/23
Water Temperature	006	4	01/20
Chlorophyll (Algae) And Nutrients	007	5	10/20
Bacterial Monitoring	008	4	10/20
Collecting Unfiltered Water Samples	009	3	09/20
Dissolved Oxygen Monitoring	010	6	10/20
Shallow Water Sampler Operation	011	2	07/12
Deep Water Sampler Operation	012	4	10/20
Measuring Salinity Using a Refractometer	015	2	01/23
Collecting Water Samples from Wadable Stream	017	2	10/20
Data Management	018	1	10/20
Staff QC Visit with Volunteer	019	2	01/23

Appendix B

Resumes for Key Laboratory Personnel
List of Resumes

Elizabeth Herron, MA

Kelly Addy, MS

Alissa Cox, PhD

Linda Green, MS

Appendix C

Descriptive Information Regarding
University of Rhode Island Watershed Watch (URIWW)

In the interest of saving paper we direct those interested in descriptive information about the URI Watershed Watch program to the URI Watershed Watch Fact Sheet, # URIWW-1, which can be found at https://web.uri.edu/wp-content/uploads/sites/1667/URIWW_Factsheet.pdf