

2014 ADDENDUM

to update the

**Quality Assurance Project Plan for
Rhode Island Ambient River Monitoring Program**

State of Rhode Island and Providence Plantations

Rhode Island Department of Environmental Management (DEM)

Office of Water Resources

October, 2014

RIDEM Project Manager:

Mark Nimiroski

Signature/Date:

Mark Nimiroski 11/19/2014

RIDEM Project QA Manager:

Connie Carey

Signature/Date:

Connie Carey Nov 19, 2014

2014 ARM QAPP ADDENDUM

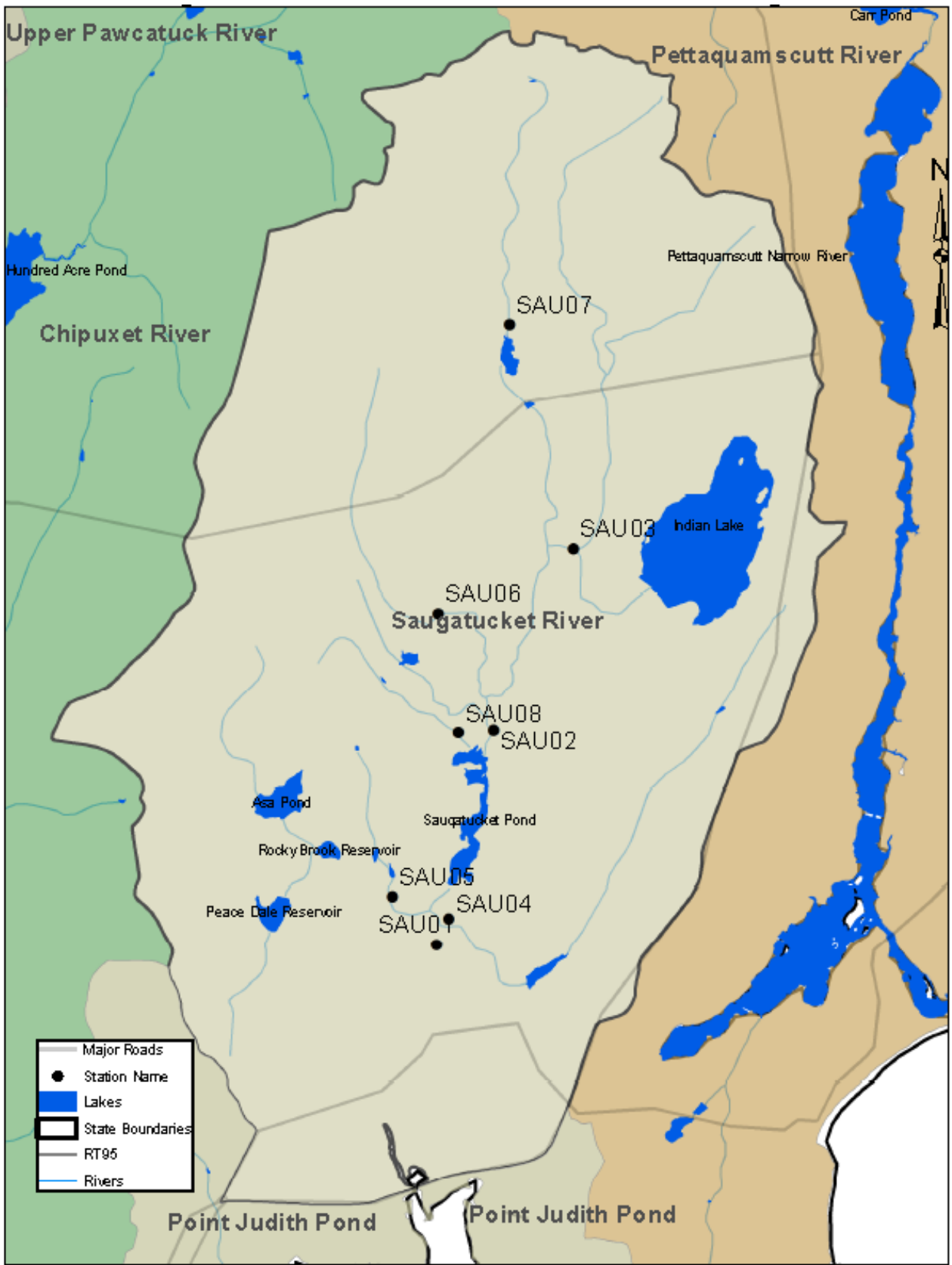
This document and attachments serve as an update to amend the RI Ambient River Monitoring Program Quality Assurance Project Plan (QAPP; RIDEM 2010) to reflect any changes to procedures for the 2014 sampling season. Attachments include specific tables and figures that are new to this addendum, are no longer in use, or have been edited from previous versions of the QAPP or the addenda as listed below:

1. Edited Figure 2. Sample submission form/chain of custody for 2014.
 - a. Individual dissolved or total metals were added to the form. Metals are listed singly, as either dissolved or total.
 - b. Test SM48 mTEC has been added. This test provides data for the ARM program for assessment of source waters to shell fishing areas. Water is filtered with a membrane, and colonies are counted after incubating over a 24 hour period at a prescribed temperature. (RIDOH SOP SM48 mTEC).
 - c. Test SM43: Coliphage has been added. Coliphage are viruses that infect bacteria. This test is conducted to help determine whether wastewater is present and is the cause of high bacteria counts. (RIDOH SOP SM43 Coliphage).
 - d. Bacteria bottle sterilization date was added to the bottom of the form. Bacteria bottles are sterilized by RIDOH personnel and reused. In order to track potential QA/QC problems, the sterilization date is recorded.
2. Figure 6. Training documentation form is no longer in use. Appendix I: Training Passport is the new form used for documentation.
 - a. The ARM training program and documentation have been redesigned, and the changes are documented in Appendix I. The training passport is a simplification of the required materials into self-directed and supervisor led training modules. The form itself is used as documentation of training. This document was used as a draft in 2014 and will be finalized and used for new RIDEM seasonal employees in 2015.
3. New Figure 11a. Map of 2014 Ambient River Monitoring Stations in the Saugatucket River Watershed.
4. New Figure 11b. Map of 2014 Ambient River Monitoring Stations in the Ten Mile River Watershed.
5. New Figure 11c. Map of 2014 Ambient River Monitoring Stations on Aquidneck Island and in the towns of Tiverton and Little Compton.
 - a. The ARM program has not routinely monitored Tiverton, Little Compton or Aquidneck Island, so many new stations were established in these areas. Streams that are visible on maps at a 1:100,000 scale were given priority, as well as smaller streams that drain to waters with sensitive designated uses (e.g. shellfishing, drinking water source).
6. New Figure 11d. Map of 2014 Ambient River Monitoring Stations in the Woonasquatucket River Watershed.
7. Edited Table 15. 2014 Parameters analyzed by HEALTH- New bacterial tests described above have been added to this summary table.
 - a. A new fecal coliform test (RIDOH SM48 mTEC).
 - b. A new test for bacteriophage (RIDOH SM43-Coliphage).
8. Edited Table 16. 2014 Holding Times and Measurement Performance Criteria.
9. New Table 18. New table of RI Ambient River Monitoring (ARM) Stations 2014 with water chemistry suites analyzed by HEALTH

10. Edited Appendix H: Addendum for Numeric Nutrient Criteria Development Fieldwork to be Conducted in Coordination with the Ambient River Monitoring Program has been updated for 2014.
11. New Appendix J. Standard Operating Procedures for Measurement of Dissolved Oxygen, Temperature, Conductance, pH and Nitrate using a handheld YSI Professional Plus instrument. Note: This document has been in use as a draft from August 2011 season to October 2012, and was finalized in October 2012. Available at : <http://www.dem.ri.gov/pubs/sops/wrw34.pdf>
12. Detection limits for total phosphorus (TP) have been lowered. In order to assist efforts to develop numeric nutrient criteria, TP reporting limits were lowered from 0.020 mg/L to 0.010 mg/L. This change primarily affected laboratory procedures (see Table 15). The only change to the ARM collection procedures was the bottle used for TP sample collection. The 500 mL pre-acidified bottle for TP collection has been replaced with an unpreserved bottle to help achieve the lower TP reporting limit. On site collection of the water sample for TP remains the same as in previous years.
13. RIDOH employs a contract laboratory to complete tests for Total Kjeldahl Nitrogen (TKN) and ammonia. Beginning in 2012 the contract laboratory for these analyses was changed from ESS to New England Testing Laboratory. There were no changes in method, SOP procedures, holding times, or detection limits on these tests.
14. Each monthly sampling event referred to in Table 18 as May, June, July, August, or September are targeted to occur in the month listed. Because ARM focuses on dry weather conditions, it is not always possible to complete a sampling event before the end of the month.

<input checked="" type="checkbox"/> ICED FOR TRANSPORT	Sample Submission Form/Chain of Custody Rhode Island Department of Health Laboratories 50 Orms Street, Providence, RI 02904	Sample Submission Number				
Legal Sample						
Client: DEM <input type="checkbox"/> Collected by DEM						
KEY for PWS Sample Submission						
A: Client ID#: DEM WRE ARM	C: Station ID	D: Type = Grab / Composite				
B: Water System Name						
A. Client ID#: <<DEM>>	Run #: <<RUN>>	Mail Report To: RIDEM-OWR Room 200				
B. Water System Name: <<CONTACT>>	Street: 235 Promenade St	City: Providence, RI				
	Report To (Agency/Person) Mark Nimiroski x 7546					
Collected By: _____	Collected Date: _____	Time: _____				
Source# _____	<input checked="" type="checkbox"/> Station ID WON01	<input type="checkbox"/> Type Grab				
Collection Point Address: Woonasquatucket River at Old Forge Rd.						
Name	Street	City				
FIELD TESTS:						
(Circle One)	Orig#: _____	pH: _____				
Sample Type: (GRAB / COMPOSITE)	Temp: _____	CL Residual: _____				
Inorganics Lab	Metals and Minerals	Organics Lab	Sanitary Microbiology			
Inorganic Tests	Metals for New Systems	PE4-CARB (531.1)	SM2 - MF Total Coliform			
<input checked="" type="checkbox"/> WL1 Turbidity	___ WL66 Full Set (200.8)	PE12-Pest/PCB (608)	SM3 - SPC			
<input checked="" type="checkbox"/> WL4 True Color	___ WL75 Antimony	PE14-EBD/DBCP (504)	SM34 - Coliform (TCR)			
<input checked="" type="checkbox"/> WL7 Total Suspended Solids	___ WL76 Arsenic	PE21-HERB/(515.3)				
___ WL11 Cyanide (335.4)	___ WL77 Barium	PE22-Pest/PCB+ (508)	<input checked="" type="checkbox"/> SM37 Freshwater-			
<input checked="" type="checkbox"/> WL12 Total Phosphorus	___ WL78 Beryllium	PE31-Pest/PCB+ (505)	Enterolert			
<input checked="" type="checkbox"/> WL13 pH	___ WL79 Cadmium	PE40-Endrin (505)	SM37 - Enterolert			
<input checked="" type="checkbox"/> WL16 Nitrate (353.2)	___ WL81 Chromium	PE _____	SM38 - A1 MPN			
<input checked="" type="checkbox"/> WL17 ortho-phosphate	___ WL82 Iron	TO2-THM (524.2)	SM43 - Coliphage			
___ WL18 Alkalinity (2320B)	___ WL83 Lead	TO3-PWW/DC(524.2)	SM48 - MTEC			
<input checked="" type="checkbox"/> WL20 Chloride (300.0)	___ WL84 Nickel	TO4-PET HCS & TO3	SM1 - MPN			
___ WL21 Fluoride (300.0)	___ WL85 Selenium	TO11-UFVOC (524603)	# of Tubes ___ Dil. ___ Thru ___			
<input checked="" type="checkbox"/> WL22 Hardness (2340B)	___ WL86 Silver	TO12-WQVOC(524.2)				
___ WL41 Specific Conductance	___ WL87 Thallium	TO14-USR Fee B/N Ext				
___ WL56 Nitrite (353.2)	___ WL88 Zinc	TO17-PET HC & TO12				
<input checked="" type="checkbox"/> WL Ammonia - N (NETL)		TO19-Total B/TR (625)				
<input checked="" type="checkbox"/> WL Total Kjeldahl - N (NETL)		TO27-AGR SVDC (525.2)				
___ WL41 Specific Conductance		TO40-WQ SBMI (525.2)				
	Metals Routine Set	TO _____				
DEM Total Metals	___ WL68 Full Set (200.8)					
___ WL62A Total Aluminum	___ WL78 Beryllium					
___ WL62Fe Total Iron - DEM	___ WL81 Chromium					
___ WL62 Total Metals (C1,Cd,Pb&Zn)	___ WL84 Nickel					
For individual metals check below	___ WL76 Arsenic					
Total Copper ___ WL62 TOT Cu	___ WL85 Selenium	TO32 Chlorophyll a - (446) DEM				
Total Cadmium ___ WL62 TOT Cd	___ WL79 Cadmium					
Total Lead ___ WL62 TOT Pb	___ WL75 Antimony					
Total Zinc ___ WL62 TOT Zn	___ WL77 Barium					
	___ WL87 Thallium					
DEM Dissolved Metals	___ WL38 Mercury (245.1)					
<input checked="" type="checkbox"/> WL62Fe Dissolved Iron	___ WL65 Lead & Copper(200.8)					
<input checked="" type="checkbox"/> WL62A Dissolved Aluminum	Minerals					
<input checked="" type="checkbox"/> WL62 Metals Diss (C1,Cd,Pb&Zn)	___ WL87 Minerals Full Set(200.8)					
For individual metals check below	___ WL89 Magnesium					
Diss Copper ___ WL62 DISS Cu	___ WL70 Potassium					
Diss Cadmium ___ WL62 DISS Cd	<input checked="" type="checkbox"/> WL71 Sodium					
Diss Lead ___ WL62 DISS Pb	___ WL72 Calcium					
Diss Zinc ___ WL62 DISS Zn	___ WL73 Sodium Composite (200.8)					
Must Be Completed For Legal Sample	Container	Preservative Added		Special Instructions		
Test Code	Number	Type	By Lab	By Collector		
Chain of Custody						
Relinquished By	Date	Time	Received By	Date	Time	Comments
Revised: 6/19/2013						
Entero Bottle Sterilization Date: _____						

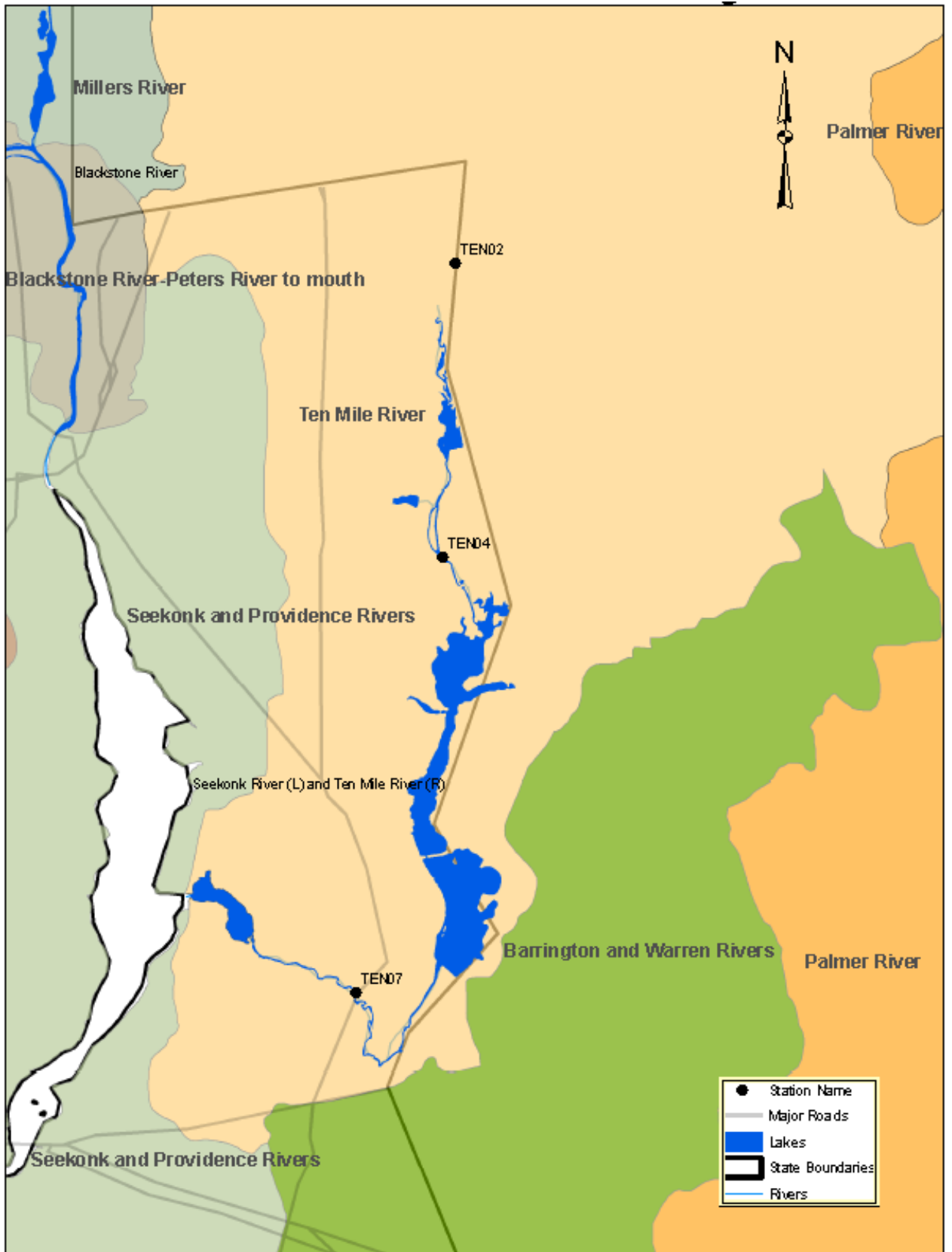
Figure 2. Sample Submission Form/Chain of Custody



Prepared by: Mark Nimiroski, NEIWPCC

0 0.25 0.5 1 Miles

Figure 11a. Map of 2014 Ambient River Monitoring Stations in the the Saugatucket Watershed.



Prepared by: Mark Nimiroski, NEIWPC

Figure 11b. Map of 2014 Ambient River Monitoring Stations in the Tenmile Watershed.

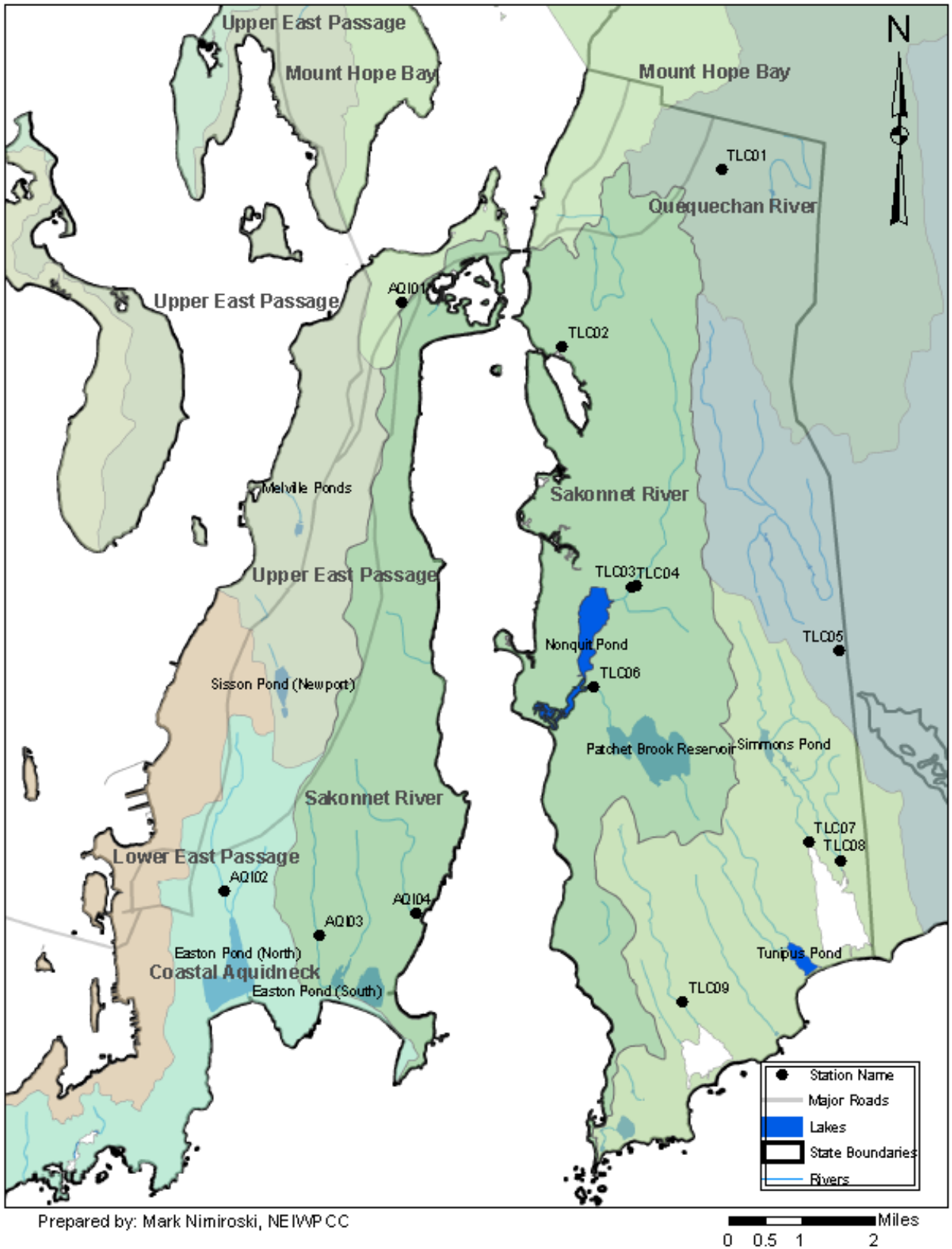


Figure 11c. Map of 2014 Ambient River Monitoring Stations in Aquidneck Island and the towns of Tiverton and Little Compton.

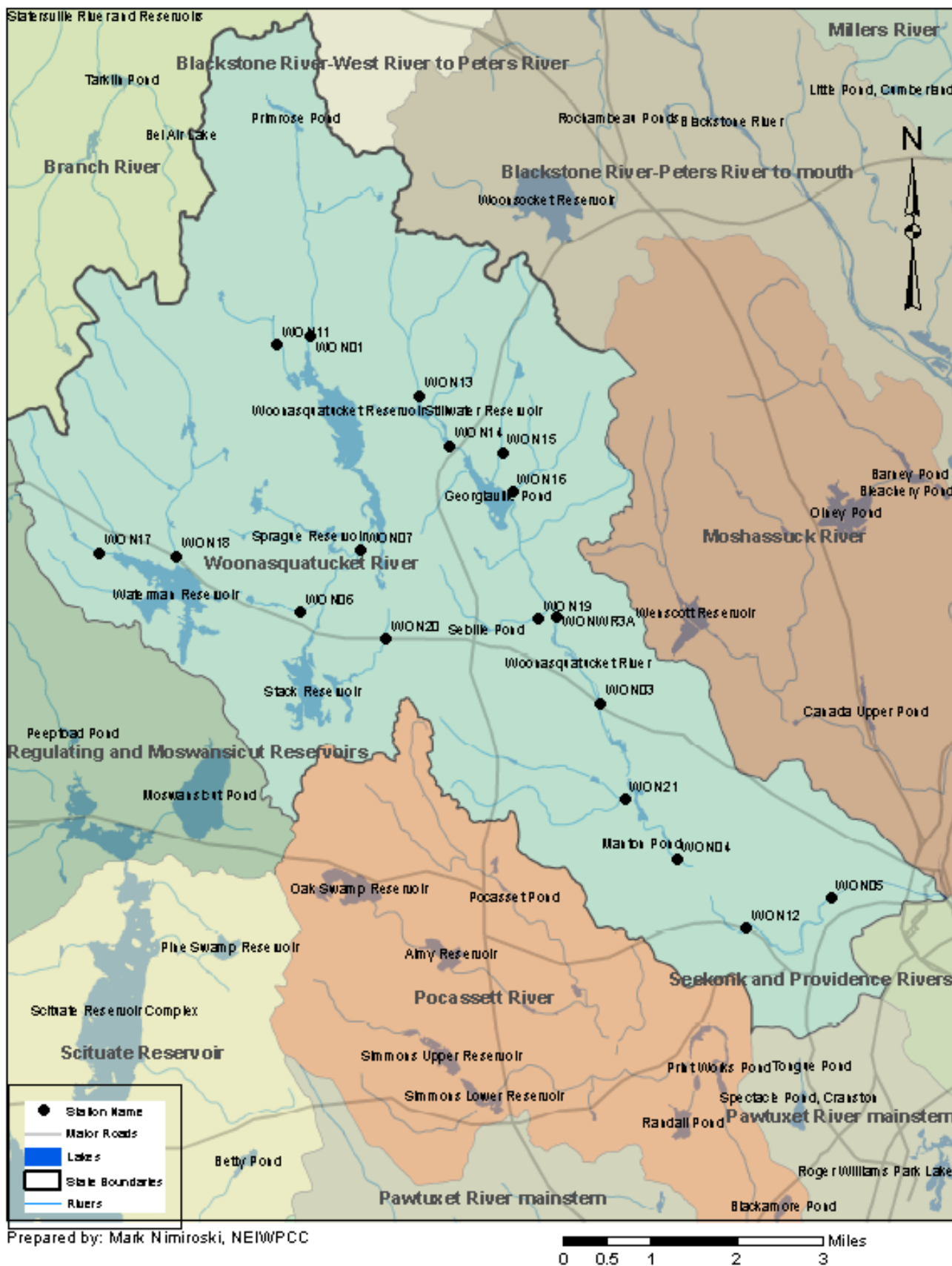


Figure 11d. Map of 2014 Ambient River Monitoring Stations in the Woonasquatucket Watershed.

Table 15. 2014 Parameters analyzed by HEALTH

Chemical parameters, analytical methods and Standard Operating Procedure Documents followed by RI State Health Laboratories to analyze water samples for the RIDEM Ambient River Monitoring Program.

	<u>Abbreviation</u>	<u>Units</u>	<u>Method</u>	<u>Standard Operating Procedure Document</u>
Conventionals				
Chloride	Cl	mg/L	EPA 300.0 Rev. 2.1 Ion Chromatography Lachet	RIDOH SOP WL20 rev. 3 Chloride
Hardness	--	mg/L	Standard Method 2340B Hardness by Calculation	RIDOH SOP WL22 rev. 4 Hardness
pH	pH	pH units	SM 4500-H+ B Electrode Orion Instrument model 720 A	RIDOH SOP WL13 rev. 6 PH
Sodium	Na	mg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1
Total Suspended Solids	TSS	mg/L	SM2540 D Gravimetric	RIDOH SOP WL 7 SOLIDS rev. 3 TSS
True Color	--	CU	Observation relative to standard	RIDOH SOP WL04 rev. 7
Turbidity	--	NTU	EPA 180.1 Nephelometric Turbidimeter	RIDOH SOP WL1 Turbidity
Nutrients				
Total ammonia ^A	NH ₃ -N (total)	mg/L	EPA 350.1 Rev. 2.0 Semi-automated Colorimetry	NETL Laboratory SOP 40_0024L
Total Kjeldahl Nitrogen ^A	TKN	mg/L	EPA 351.2 Semi-automated Colorimetry	NETL Laboratory SOP 40_0019B Total Kjeldahl Nitrogen
Nitrate-Nitrite as Nitrogen, Dissolved	NO ₂ + NO ₃ -N	mg/L	EPA 353.2 Rev. 2.0 Autoanalyzer – Lachet	RIDOH SOP WL16 rev. 4 nitrate & RIDOH SOP WL56 rev. 5 nitrite
Ortho-phosphate	PO ₄ -P	mg/L	Lachat method 10-115-01-1-F plus EPA 365.3	RIDOH SOP currently in draft Ortho-phosphate
Total Phosphorus	TP	mg/L	SM 4500 P B.5 & E Persulfate Digestion and Ascorbic Acid Method	RIDOH SOP WL12 rev. 3 Total Phosphorus
Chlorophyll <i>a</i>	Chl <i>a</i>	mg/L	EPA 446.0 Rev. 1.2 Spectrophotometry	RIDOH SOP TO32
Pathogens				
Enterococci	Entero	MPN/100 mL	EPA/821/R-97-004	RIDOH SOP SM 37 Enterolert
Fecal	Fecal	CFU/100ml	EPA/821/R-97-004	RIDOH SOP SM48 Modified mTEC
Bacteriophage	Coliphage	PFU/100ml	USEPA, Method 1601 EPA 821-R-01-030, April 2001.	RIDOH SOP SM43 Coliphage: Procedure for Determining Male-specific Bacteriophage in Seawater, Wastewater and Shellfish Samples
Metals				
Cadmium	Cd (dissolved)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1
Copper	Cu (dissolved)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1
Lead	Pb (dissolved)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1
Zinc	Zn (dissolved)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1
Total Aluminum	Al (total)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 2
Total Iron	Fe (total)	µg/L	EPA 200.8 ICP-MS	RIDOH SOP WL ICPMS rev. 1

^A Samples are analyzed by a laboratory certified in RI to test these parameters in non-potable water.

Note: Dissolved Oxygen, water temperature, conductivity, specific conductance, and salinity are measured in the field using YSI instrumentation. Total Nitrogen is reported as the addition of the following fractions: (NO₃-N) + (TKN)

Table 16. 2014 Holding Times and Measurement Performance Criteria

Sample holding times, lab quantitation limits, and method detection limits of each parameter analyzed by RI State Health Laboratories for the RIDEM Ambient River Monitoring Program.

<u>Parameter*</u>	<u>Abbreviation</u>	<u>Units</u>	<u>Max holding time</u>	<u>Quantitation Limit (QL)</u>	<u>Method Detection Limit (MDL)</u>
Conventionals					
Chloride	Cl	mg/L	28 days	0.2	0.02
Hardness	--	mg/L	6 months	–	–
pH	pH	pH units	immediately	–	–
Sodium	Na	mg/L	6 months	1	0.05
Total Suspended Solids	TSS	mg/L	7 days	1.0	–
True Color	–	CU	48 hours	–	–
Turbidity	–	NTU	48 hours	0.2	–
Nutrients					
Total ammonia ^A	NH ₃ -N (total)	mg/L	7 days	0.05	0.02
Total Kjehldahl Nitrogen ^A	TKN	mg/L	28 days	0.2	–
Nitrate-Nitrite as Nitrogen, Dissolved	NO ₃ -N	mg/L	2 days	0.05	0.01
Ortho-phosphate	PO ₄ -P	mg/L	48 hours	0.02	0.01
Total Phosphorus	TP	mg/L	28 days	0.02	0.01
Chlorophyll <i>a</i>	Chl <i>a</i>	mg/l	24 hours (unfiltered) 21 days (filtered)	0.1	0.046
Pathogens					
Enterococci	Entero	Enterococci per 100 mL	6 hours	< 1	–
Fecal	Fecal	CFU/100m l	6 hours	< 1	–
Bacteriophage	Coliphage	PFU/100ml	6 hours	< 1	–
Metals					
Cadmium	Cd	µg/L	6 months	1.0	0.07
Copper	Cu	µg/L	6 months	1.0	0.17
Lead	Pb	µg/L	6 months	1.0	0.03
Zinc	Zn	µg/L	6 months	20	0.95
Total Aluminum	Al (total)	µg/L	6 months	10	2.52
Total Iron	Fe (total)	µg/L	6 months	20	2.28

Table 18. Ambient River Monitoring Stations 2014: Water Chemistry Suites^A analyzed by HEALTH

Station ID, river name, GPS location, dates and chemistry parameter suites to be collected at each station for 2014 RIDEM – ARM Program.

Station ID	River Name	Latitude	Longitude	Sampling event				
				May	June	July	August	September
AQI01	Founders Brook	41.62872	-71.24558	P1	S1	P1	S1	S1
AQI02	Bailey's Brook & Tribs	41.51081	-71.29326	P1	S1+dCu/Al	P1	S1+dCu/Al	S1+dCu/Al
AQI03	Maidford River	41.50201	-71.26807	P1	S1+dPb	P1	S1+dPb	S1+dPb
AQI04	Little Creek	41.50634	-71.24206	P1	S1	P1	S1	S1
SAU01	Saugatucket River & Tribs	41.44773	-71.49679	P1	S1+dFe	P1	S1+dFe	S1+dFe
SAU02	Saugatucket River & Tribs	41.46468	-71.49081	P1	S1+dFe	P1	S1+dFe	S1+dFe
SAU03	Fresh Meadow Brook & Tribs	41.47908	-71.48243	P1	S1+Chl a1	P1+Chl a1	S1+Chl a1	S1+Chl a2
SAU04	Indian Run Brook & Tribs	41.44983	-71.49554	P1	S1+dCu/Zn+Chl a1	P1+Chl a1	S1+dCu/Zn+Chl a1	S1+dCu/Zn+Chl a2
SAU05	Rocky Brook & Tribs	41.45158	-71.50143	P1	S1+Chl a1	P1+Chl a1	S1+Chl a1	S1+Chl a2
SAU06	Mitchell Brook	41.47398	-71.49661	P1	S1+dFe+Chl a1	S1+dFe+Chl a1	S1+Chl a1	S1+dFe+Chl a2
SAU07	Saugatucket River & Tribs	41.49685	-71.48914	P1	S1+dCu/Zn/Fe+Chl a1	P1+Chl a1	S1+dCu/Zn/Fe+Chl a1	S1+dCu/Zn/Fe+Chl a2
SAU08	Saugatucket River & Tribs	41.46452	-71.49452	P1	S1	P1	S1	S1
TEN02	Ten Mile River	41.89028	-71.34006	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
TEN04	Ten Mile River	41.86632	-71.34154	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
TEN07	Ten Mile River	41.83087	-71.35104	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
TLC01	Sucker Brook	41.65499	-71.16038	P1	S1+dCu	P1	S1+dCu	S1+dCu
TLC02	Sin and Flesh Brook	41.61963	-71.20295	P1	S1	P1	S1	S1
TLC03	Borden Brook	41.57175	-71.83530	P1	S1+dM+dFe	P1	S1+dM+dFe	S1+dM+dFe

Chl a 1= sampled from natural substrate

Chl a 2= sampled from artificial and natural substrate

M (dissolved or total) = Cadmium, Copper, Lead and Zinc (Iron and Aluminum only sampled where indicated)

P1 = enterococci

P2 = enterococci and Fecal coliform.

S1 = Conventionals, nutrients, enterococci

S4 = Conventionals & nutrients

For complete list of parameters, see Table 15

Table 18. (cont'd) Ambient River Monitoring Stations 2014 : Water Chemistry Suites^A analyzed by HEALTH

Station ID, river name, GPS location, dates and chemistry parameter suites to be collected at each station for 2014 RIDEM – ARM Program.

Station ID	River Name	Latitude	Longitude	Sampling event				
				May	June	July	August	September
TLC04	Quacket Creek	41.57156	-71.18472	P1	S1+dM+dFe	P1	S1+dM+dFe	S1+dM+dFe
TLC05	Adamsville Brook	41.55875	-71.12948	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
TLC06	Pachet Brook	41.55165	-71.19471	P2	S1	P2	S1	S1
TLC07	Cold Brook	41.52037	-71.13772	P2	S1+Chl a1	P2+Chl a1	S1+Chl a1	S1+Chl a2
TLC08	East of Cold Brook	41.51664	-71.12908	P2	S1+Chl a1	P2+Chl a1	S1+Chl a1	S1+Chl a2
TLC09	Dundery Brook	41.48835	-71.17143	P1	S1+Chl a1	P1+Chl a1	S1+Chl a1	S1+Chl a2
WON01	Woonasquatucket River & Tribs	41.92085	-71.55265	P1	S1+dM+dFe/Al+Chl a1	P1+Chl a1	S1+dM+dFe/Al+Chl a1	S1+dM+dFe/Al+Chl a2
WON03	Woonasquatucket River & Tribs	41.85920	-71.48740	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
WON04	Woonasquatucket River & Tribs	41.83286	-71.47033	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
WON05	Woonasquatucket River	41.82652	-71.43583	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
WON06	Stillwater River & Tribs	41.87452	-71.55488	P1	S1	P1	S1	S1
WON07	Stillwater River & Tribs	41.88494	-71.54135	P1	S1	P1	S1	S1
WON11	Latham Brook & Tribs	41.91943	-71.56013	P1	S1+dM+dF+Chl a1e	P1	S1+dM+dFe	S1+dM+dFe
WON12	Woonasquatucket River & Tribs	41.82140	-71.45470	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al
WON13	Unnamed Tribs to Stillwater Pond	41.91089	-71.52803	P1	S1+Chl a1	P1+Chl a1	S1+Chl a1	S1+Chl a2
WON14	Woonasquatucket River & Tribs	41.90259	-71.52146	P1	S1+dM+dFe/Al	P1	S1+dM+dFe/Al	S1+dM+dFe/Al

Chl a 1= sampled from natural substrate

Chl a 2= sampled from artificial and natural substrate

M (dissolved or total) = Cadmium, Copper, Lead and Zinc (Iron and Aluminum only sampled where indicated)

P1 = enterococci

P2 = enterococci and Fecal coliform.

S1 = Conventionals, nutrients, enterococci

S4 = Conventionals & nutrients

For complete list of parameters, see Table 15

Table 18. (cont'd) Ambient River Monitoring Stations 2013: Water Chemistry Suites^A analyzed by HEALTH

Station ID, river name, GPS location, dates and chemistry parameter suites to be collected at each station for 2014 RIDEM – ARM Program.

Station ID	River Name	Latitude	Longitude	Sampling event				
				May	June	July	August	September
WON15	Harris Brook	41.90139	-71.50945	P1	S1+Chl <i>a</i> 1	P1+Chl <i>a</i> 1	S1+Chl <i>a</i> 1	S1+Chl <i>a</i> 2
WON16	Tribs To Georgiaville Pond	41.89473	-71.50713	P1	S1+Chl <i>a</i> 1	P1+Chl <i>a</i> 1	S1+Chl <i>a</i> 1	S1+Chl <i>a</i> 2
WON17	Cutler Brook & Tribs	41.88452	-71.60003	P1	S1+Chl <i>a</i> 1	P1+Chl <i>a</i> 1	S1+Chl <i>a</i> 1	S1+Chl <i>a</i> 2
WON18	Nine Foot Brook & Tribs	41.88398	-71.58247	P1	S1	P1	S1	S1
WON19	Hawkins Brook & Tribs	41.87344	-71.50132	P1	S1+Chl <i>a</i> 1	P1+Chl <i>a</i> 1	S1+Chl <i>a</i> 1	S1+Chl <i>a</i> 2
WON20	Reaper Brook	41.87008	-71.53555	P1	S1	P1	S1	S1
WON21	Assapumpset Brook & Tribs	41.84303	-71.48194	P1	S1+dM+ dFe	P1	S1+dM+ dFe	S1+dM+ dFe
WONWR3A	Woonasquatucket River & Tribs	41.87368	-71.49713	P1	S1+dM+ dFe/Al	P1	S1+dM+ dFe/Al	S1+dM+ dFe/Al

Chl *a* 1= sampled from natural substrate

Chl *a* 2= sampled from artificial and natural substrate

M (dissolved or total) = Cadmium, Copper, Lead and Zinc (Iron and Aluminum only sampled where indicated)

P1 = enterococci

P2 = enterococci and Fecal coliform.

S1 = Conventionals, nutrients, enterococci

S4 = Conventionals & nutrients

For complete list of parameters, see Table 15

APPENDIX H

ADDENDUM FOR NUMERIC NUTRIENT CRITERIA DEVELOPMENT FIELDWORK TO BE CONDUCTED IN COORDINATION WITH THE AMBIENT RIVER MONITORING PROGRAM

Task Description

This addendum is intended to describe supplemental fieldwork conducted in conjunction with the current Ambient River Monitoring (ARM) program for the purpose of numeric nutrient criteria development. This fieldwork initiative will be incorporated into the ARM program for the current rotation cycle 2011-2014.

Project Organization

The fieldwork conducted for numeric nutrient criteria was undertaken by RIDEM/OWR permanent, contractual, and seasonal personnel. Jane Sawyers, Project Manager for numeric nutrient criteria development, served as the Supplemental Nutrient Fieldwork Team Leader and was in charge of organizing sample and field data collection for the supplemental fieldwork only.

Background

The U.S. Environmental Protection Agency (EPA) has directed all states and territories to strengthen narrative criteria for nutrients by development of specific numeric nutrient criteria. EPA guidance further recommends that acceptable levels of total phosphorus (TP), total nitrogen (TN), chlorophyll *a* (chl *a*), and turbidity in rivers and streams be established (USEPA 2000). The preferred approach is to develop criteria that reflect local conditions and protect specific uses of surface waters. A review of data available to support nutrient criteria development for Rhode Island rivers and streams revealed an information gap on the primary production response to nutrients, especially benthic algae and some of the important associated habitat parameters. Recognizing that numeric nutrient criteria development requires appropriate biological response and habitat data, RIDEM planned a data collection effort in coordination with the rotating basin schedule of the ARM program. The collection of benthic algae and associated habitat data will occur in a select number of the wadeable ARM sites each year of the entire rotation 2011-2014.

It has been the experience of some states that the relationship between elevated nutrient concentrations and biological response does not produce a threshold that allows for the identification of numeric nutrient criteria. Furthermore, several New England states have been challenged with how to appropriately address water bodies that exhibit elevated nutrient concentration without reaching nuisance or adverse levels of conventional biological response parameters (NEIWPC 2011). Therefore, Rhode Island planned to collect a number of benthic algal response variables and habitat measurements to address the potential biological and management issues in stream nutrient criteria development. Data will be collected on diatom taxonomy, benthic chl *a*, percent algal cover, substrate composition, and canopy cover by densiometer.

Based on observations of flow and benthic algae and plant growth in the 2011 Supplemental Nutrient Fieldwork, more extensive sampling is required to assess biological response to nutrients. At some sites, plant growth appeared to be the dominant primary production. Therefore, assessment of plant growth was added to the 2012 and 2013 Supplemental Nutrient Fieldwork and SOP-WR-W-36 was updated to reflect this change. The additional fieldwork to assess plant growth was continued in 2014. Furthermore, due to forecasts and impacts of Hurricane Irene in 2011, artificial substrates were removed early, and natural substrate sampling did not occur until September. At some sites, biological growth appeared to be heaviest during the September sampling period in 2011, and flows were high enough for more appropriate placement of artificial substrates. Therefore, beginning in 2012 and continuing through the 2013 and 2014 field seasons, chl *a* sampling from natural substrates was conducted over several months to determine the maximum benthic primary growth time period, and artificial substrate deployment was moved to August. Natural substrate was sampled once per month June through September for chlorophyll *a*, and artificial deployment began in mid to late August with collection in mid-September. The sampling event in September included collection of diatom taxonomy samples as well.

For 2014, RIDEM/OWR measured taxonomic identification of diatoms, chl *a* abundance of benthic algae, coverage of benthic algae, coverage of plants, and percent coverage of aquatic macrophytes, stream canopy by densiometer, and low-gradient habitat in wadeable streams. The major change for the 2014 field season was the discontinuation of the viewing bucket procedure for substrate availability and microalgae and macroalgae, due to issues with low water and colored waters.

Methods

Site Selection

Sites for numeric nutrient criteria development were selected from the list annually generated by the ARM Project Team as described in Section II.1 of the ARM QAPP. From this list, only wadeable sites were reviewed for numeric nutrient criteria development fieldwork. Approximately 20 sites are selected per year, depending on funding and staff availability. Based on geographic analysis of the streams by RIDEM, an approximately equal division of high and low gradient sites are selected. Since the statistical analysis of the nutrient and response data necessitates a range of nutrient conditions, the historical data available from RIDEM's water quality database, WQUAL, was consulted for sites historically high and low in both TP and TN. From this information, sites encompassing the range of possible conditions were selected prior to the field season.

Sampling Methods

The procedures performed at the numeric nutrient criteria sites are documented in SOPs and the EPA Habitat Assessment Field Data Sheet-Low Gradient Streams, which are included in this addendum. The included SOPs are listed in the table below:

Table 1. Standard Operating Procedures for Numeric Nutrient Criteria Fieldwork

SOP #	Title	Appendix
SOP-WR-W-35	Standard Operating Procedure for Stream Canopy Measurements by Densimeter	Appendix J
SOP-WR-W-36	Standard Operating Procedure for Measurement of Benthic Algae Cover by Viewing Bucket and Modified Pebble Count	Appendix K
SOP-WR-W-37	Standard Operating Procedure for Collection of Benthic Algae from Natural and Artificial Substrates	Appendix L

Four site visits to each of the selected nutrient criteria sites were required in late June through September. Unlike the water quality sampling described in the ARM QAPP, the supplementary sampling does not require dry weather prior to sampling. However, if large, scouring flows are expected, field sampling is not conducted. The Supplemental Nutrient Fieldwork Team Leader, Jane Sawyers, consults with ARM Field Data Collection Team Leader, Mark Nimiroski, and any field staff that recently visited the selected sites regarding conditions of the selected nutrient sites.

All sampling events employed section 5.2.8 of SOP-WR-W-37 for chl *a* only. The sampling event in July for the supplemental fieldwork included the procedures described in SOP-WR-W-35 and SOP-WR-W-36 Section 5.3.9 only. Additionally, at low gradient sites only, the sampling event in September included completion of the EPA Habitat Assessment Field Data Sheet-Low Gradient Streams. The sampling event in August included the implementation of Sections 5.2.1 through 5.2.6 of SOP-WR-W-37, placement of the artificial substrates. The sampling event in September completed Sections 5.2.7 through 5.2.9 of SOP-WR-W-37, retrieval of the artificial substrates. The procedures completed for each sampling even are summarized below:

Table 2. Numeric Nutrient Criteria Fieldwork Schedule 2014

Month	Natural Substrate Chl	Natural Substrate Diatoms	Artificial Substrate Chl	Artificial Substrate Diatoms	Pebble Count	Densimeter
June	X					
July	X				X	X
August	X		Deploy	Deploy		
September	X/ESS	X/ESS	X	X	ESS	ESS

Beginning in 2013, the opportunity arose to have the ARM biological contractor, ESS Group, Inc., complete selected numeric nutrient criteria fieldwork at some ARM stations. This allowed for duplication of effort at sites sampled by RIDEM and for more ARM stations to be evaluated by numeric nutrient criteria fieldwork. ESS Group completed natural substrate sampling for chl *a* and diatom taxonomy, pebble count, and densimeter surveys using RIDEM SOP methods. This additional effort by ESS Group was continued in 2014, but only to duplicate efforts at sites already being sampled by RIDEM.

Data Quality Objectives and Measurement Performance Criteria

Data Quality Objectives

The supplemental fieldwork operated under the data quality objectives stated in the ARM QAPP. The relevant quality assurance procedures of the ARM QAPP were used to verify the use of proper, consistent field procedures, handling measures, laboratory analyses, and database management activities:

- Standard Operating Procedures (SOPs) were implemented during sampling and field data collection (see Addendum Appendices).
- EPA-approved, standardized methods were adhered to for all chemical analysis procedures;
- Qualified, trained scientists performed the sample collection and laboratory analyses;
- Chain of Custody forms were completed when handling samples and transferring custody from field crew to both the RIDOH Laboratories as well as the authorized state vendor for analytical laboratory services. (Figure 1, 2; ARM QAPP Figure 2);
- One trip blank (sample bottles filled with DI water in the lab) for each day of sampling were transported by each field crew ensure there is no contamination of sampling containers in the field during transportation;

CHAIN OF CUSTODY	
ESS Group, Inc.	
10 Hemingway Dr., 2nd Floor, East Providence, RI 02915	
Phone: 401-330-1204	
Sample Type: Natural Substrate Diatom Taxonomy	ESS Job Number: R298-013

Sample ID	Date	Total Volume (mL)*
✓ WON01	8/28/2014	145
✓ WON01-DUPLICATE	8/28/2014	140
✓ WON17	8/28/2014	155
✓ WON13	8/28/2014	149
✓ WON13-DUPLICATE	8/28/2014	130
✓ TLC08	9/4/2014	112
✓ TLC09	9/4/2014	135
✓ SAU03	9/4/2014	130
✓ SAU04	9/4/2014	163
✓ SAU05	9/4/2014	155
✓ WON15	9/5/2014	142
✓ WON16	9/5/2014	170
✓ WON19	9/5/2014	95
Total Samples		13

*Each sample preserved with 3 mL 10% buffered formalin

Released by: *M. Lipt*
 Received by: *Jose Saugers*

Date/Time: 9/23/14 1452
 Date/Time: 9/23/14 1452

Figure 1. ESS Group, Inc. Chain of Custody

The methods employed do not require calibration. The methods also do not require electronic instruments. All field equipment was inspected as required in the respective SOPs. At a minimum, equipment was inspected by the field analyst prior to a sampling event and annually by the Numeric Nutrient Criteria Development Project Manager, Jane Sawyers.

Inspection for Supplies and Consumables

The inspection of supplies occurred as stated in the ARM QAPP, except that Jane Sawyers performed the duties of the Project Manager and Supplemental Nutrient Fieldwork Team Leader for the supplemental fieldwork only. The samples sent to the contracted laboratory for diatom taxonomy required a preservative, and the artificial substrate cleaning process required acetone and bleach. The Numeric Nutrient Criteria Development Project Manager, Jane Sawyers, will ensure that the preservative and cleaning supplies were received by RIDEM were not damaged in shipment (i.e. no leaking contents; lid securely attached).

Non-direct Measurements

The supplemental fieldwork did not require dry conditions as described in the ARM QAPP. However, extreme high and low flows were a concern for the artificial substrate deployment. As described earlier, Jane Sawyers consulted with staff that had been to the sites recently regarding high flows. The USGS website for real-time stream data was also consulted: <http://waterdata.usgs.gov/nwis/rt>

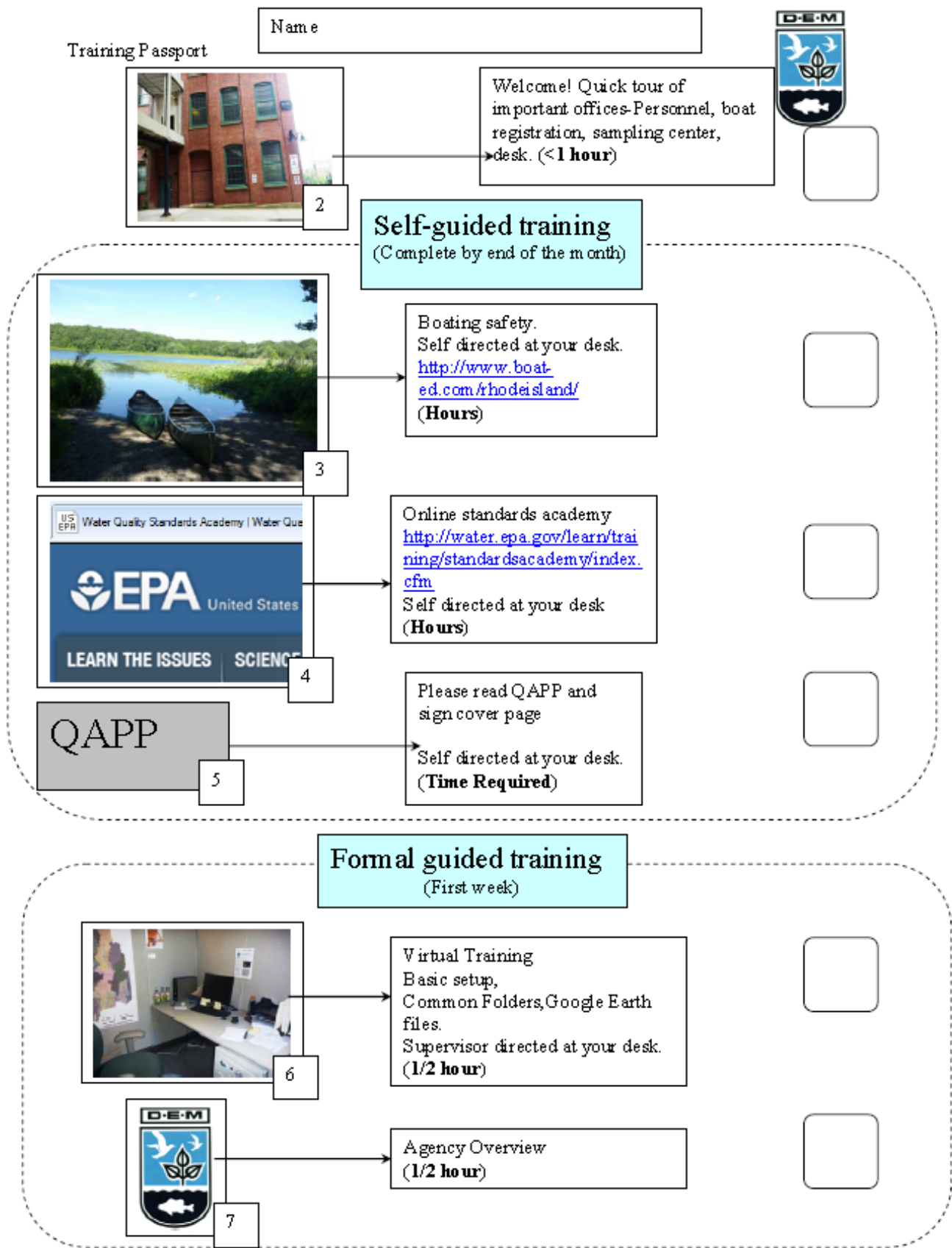
Data Validation and Usability

As Project Manager of the numeric nutrient criteria project, Jane Sawyers completed all requirements stated in the ARM QAPP Sections III.1 through Sections III.3 for data generated from the supplementary fieldwork only.

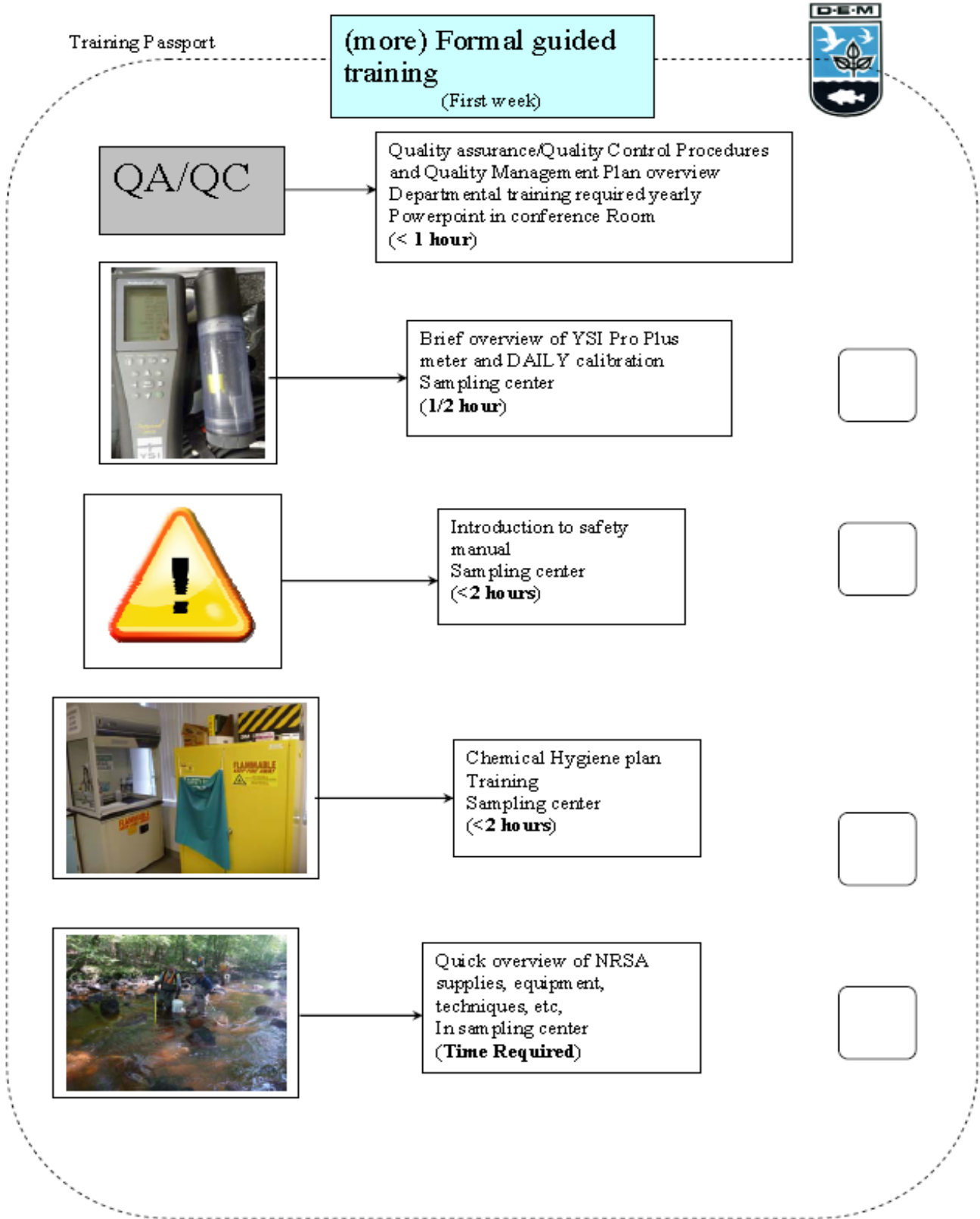
Assessment and Oversight

As Project Manager of the numeric nutrient criteria project, Jane Sawyers completed all requirements stated in the ARM QAPP Sections IV.1 through Sections IV.2 for data generated from the supplementary fieldwork only.

APPENDIX I: Training Passport



APPENDIX I: Training Passport



APPENDIX I: Training Passport

Training Passport



(more) Formal guided training



Field training ARM sampling
Gearing up in sampling center
and heading to the field
Full day



Invasives identification
Powerpoint and
sampling center
(Time Required)



Nutrients program
overview
Powerpoint
(1/2 hour)

In-Depth Training
(To be determined)



Practical Boating
Training
(1 day)

APPENDIX I: Training Passport

Training Passport



(more) In-Depth Training
(To be determined)



YSI Pro Plus FULL calibration
In sampling center
1/2 hour



Invasives Program
Powerpoint
(1 1/2 hours)



Nutrient Criteria specific training.
(Time Required)

DELIVERABLES:	
QAPP signature page	
Boating safety training certificate	
Online standards academy	
Safety questionnaire	
Emergency contact information	
Electrofishing training certificate?	
Chemical Hygiene training log	