1. Title and Approval

1. Your Specific Project Under the "VT DEC Laboratory Services Grants Project - 2014" :

ADDISON COUNTY WATER QUALITY MONITORING PROGRAM 2015 (137-01)
(Your Project's Name)

ADDISON COUNTY RIVER WATCH COLLABORATIVE
(Name of Your Organization)

March 9, 2015
(Date)

Project Leader Signature/Date: ____

Project QA Coordinator Signature/Date: ____________________________________

Project QAPP Prepared by: VTDEC (w/ 2015 revisions, Kristen Underwood)

Approval by*:*

____

Jim Kellogg
VTDEC Project Contact

____

Date

B. Generic Volunteer-Based Water Quality Monitoring Project QAPP:

Vermont General Quality Assurance Project Plan for Volunteer, Educational and Local Community Monitoring and Reporting Activities

(Project Name)

VT Department of Environmental Conservation

(Responsible Agency)

May 1, 2006

(Date)

QAPP Prepared by: Lee Steppacher & Diane Switzer, EPA New England
Modified Neil Kamman, VTDEC.

2. Table of Contents

INSTRUCTIONS: Change page numbers and appendices as needed for your project. Insert information for any pages of additional information you attach (e.g., maps, manuals, written procedures, etc.)

3. Distribution List

1. Names and telephone numbers of those receiving copies of this QAPP.

i. Jim Kellogg, VT DEC, Watershed Management Division, Biomonitoring and Aquatic Studies Section, 1 National Life Drive, Main Building, 2nd Floor Montpelier, VT 05602-3522
802-490-6146, Jim.Kellogg@state.vt.us

ii Ethan Swift, VT DEC, Water Quality Division, Monitoring, Assessment, & Planning Program, 450 Asa Bloomer State Office Building, 88 Merchants Row, Rutland, VT 05701-5903
802-786-2503, ethan.swift@state.vt.us

iii. Matt Witten, ACRWC Coordinator, 1355 Shaker Hill Road, Starksboro, VT 05487
802-434-3236, mwitten@gmavt.net

iv Kevin Behm, ACRPC, 14 Seminary Street, Middlebury, VT, 05753
802-388-3141, kbehm@sover.net

v Kristen Underwood, South Mountain R&CS, 2852 South 116 Rd, Bristol, VT 05443
802-453-3076, southmountain@gmavt.net

INSTRUCTIONS: please fill in the following section with the names and contact information (i.e.,address, phone #, email address) of those involved with your project who should be familiar with your QAPP. This should include the project leader, field/sampling leader and quality assurance leader.

4. Project/Task Organization

A. Table 4a - VT Department of Environmental Conservation - Key People and Their Responsibilities.

Project Title/Responsibility	**Name**
Project Coordinator for VTDEC	Jim Kellogg
Volunteer Monitoring Coordinator for VTDEC-WQD	Amy Picotte
LaRosa Laboratory Director	Dan Needham

B. Table 4b - Key Project People and Their Responsibilities

INSTRUCTIONS: Please fill in the name and affiliation (if not from your organization) of the person that best corresponds to the title and description in the left column. Note that one person may have more than one responsibility and may be listed more than once, however, the person responsible for QA should not be the project leader, if possible. If you are not using a laboratory, put an N/A (Not Applicable) in the name space. Add other key people as needed.

Project Title/Responsibility	**Name/Affiliation**
Project Leader – directly responsible for all project aspects.	Matt Witten, ACRWC
Project Volunteer Coordinator – responsible for overseeing all of the activities of volunteers, including recruiting, maintaining training and participation records, etc.	Matt Witten, ACRWC
Project Field/Sampling Leader – responsible for training and supervising volunteers in field work, filling out field forms, and performing QC checks to make sure procedures are followed or corrected, as needed.	Matt Witten, ACRWC
Project QA Coordinator – responsible for ensuring that procedures in field and laboratory are performed in accordance with this QAPP and keeps other leaders informed of project status in relation to QAPP. Works with other leaders in conducting QC checks on sampling and analysis techniques. Maintains log of QA and QC checks.	Kristen Underwood, ACRWC
Project Laboratory Contact – makes arrangements with any laboratory that is used to perform sample analysis according to QAPP. Ensures correct procedures are used, holding times are met and laboratory provides complete documentation.	Ethan Swift, VTDEC
Project Data Management Coordinator – Maintains the data systems for the organization, performs data entry, and checks entries for accuracy against field and laboratory forms.	Kristen Underwood, ACRWC

5. Background of LaRosa Volunteer Laboratory Services Grants Project

The Vermont Department of Environmental Conservation (VTDEC), through the LaRosa Analytical Laboratory, has made available to interested lake, river, and watershed associations grants for sample analyses for the upcoming field season. The purpose of this program is to help volunteer associations and monitoring groups to implement new and/or on-going surface water monitoring projects, for waters in need of water quality assessment.

What are laboratory services?

One of the most costly items involved in a monitoring program is laboratory analysis. VTDEC recognizes that the cost of laboratory services hinders the widespread application of volunteer surface water quality monitoring in Vermont. Analytical services provided under this grant program are essentially 'slots' for tests to be run at the LaRosa Laboratory, free of charge to grantees. The LaRosa Laboratory is a full-service analytical facility with complete capabilities for routine water quality monitoring tests. Examples of such tests include: phosphorus, nitrogen, chlorophyll-a, total suspended solids, *E. coli*, turbidity, alkalinity, conductivity, pH, priority pollutants and metals; and numerous other compounds. More information about the LaRosa facility services is available online (internet address below).

Who is eligible?

Volunteer associations across Vermont. Such associations include river, lake, and watershed groups, secondary-level educational groups, and water quality and conservation committees associated with local municipalities. Post-secondary academic institutions and statewide not-for-profit non-governmental organizations are eligible provided that the projects are either: designed jointly with a local association to assess current water quality conditions; or, structured to address a water quality problem of statewide importance.

What are the eligible project types?

Many project types are eligible for this program. Waters under evaluation should be of interest to the local association sponsoring the project, and should also be of interest to VTDEC. Waters of interest to VTDEC include impaired and state priority waters, waters on which minimal or no monitoring has been performed in the past, waters with significant public swimming use, waters where a suspected water quality problem needs further assessment, and waters where the causes of known problems remain undiagnosed. Proposals for projects exceeding one field season in duration will be accepted, although subsequent years will be approved only subject to continued availability of state funding for this program. Please note that participants in this program shall share with VTDEC ownership of all laboratory data produced by individual projects.

6. Individual Project Purpose/Task Description

Attach a map in Part C, to identify waterbodies being sampled and sampling sites. If you are unable to locate sampling sites until the project is initiated, please explain your circumstances below.

Instructions - For parts A and B below, please check the boxes that apply to your project and add specific information as needed. Include all pertinent background information, including a brief summary of previously collected data, that help support the purpose of your project. The summary can either be in table format or a brief narrative.

A. Objectives of Projects

The principal objectives of projects under this QAPP are to 1) provide a perspective on the range of water quality conditions across Vermont; 2) describe water quality conditions of individual waterbodies; 3) establish a database for waterbodies for use in documenting future changes in water quality; and, 4) educate and involve local residents in waterbody protection.

General guidelines for projects under this QAPP are:

- Data should be collected during summer months at regular intervals, but not in severe weather, such as thunderstorms or high winds (safety always comes first). Projects addressing *E. coli* should be designed specifically to address either dry-only weather conditions, or segregate between wet and dry weather conditions. Antecedent weather conditions must be recorded for all *E. coli* sampling events.

- If some data will be collected every week, and other data will only be collected only once during the sample season or appropriate index period (e.g., low flow, high temperature, etc.) such should be noted in Section 10B, Sample Design Logistics, in this QAPP.

- Data will be analyzed, summarized and interpreted on an annual basis. Projects will be required to report to VTDEC at the completion of the project.

- Information should be presented to the local community in a suitable format, be it a press release, public meeting or another event.

- Data that meets project quality objectives may be entered into VTDEC's Water Quality data management system and may also be entered into EPA's national water quality data storage system, STORET.

Instructions: Please place a checkmark beside the uses which are applicable for your project's data.

B. Intended Uses of Data

The data generated by projects under this Generic QAPP will serve at least one of the following uses, as specified in project proposals and workplans.

- ❑ X Track phosphorus concentrations and/or loadings
- ❑ Identify the presence, density and spread of nuisance aquatic species
- ❑ X Describe water quality conditions at specific locations
- ❑ X Document the presence and severity of localized problems (e.g. bacteria as pathogen indicators)
- ❑ X Identify sources of local problems
- ❑ X Evaluate sedimentation and erosion problems
- ❑ Evaluate habitat & embeddedness with regard to aquatic life use
- ❑ X Educate school children and local communities about water quality, and any problems and improvements.
- ❑ X Evaluate the effectiveness of restoration projects and other management activities
- ❑ ____
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The Collaborative will continue with our sentinel and rotational monitoring schedule. In 2015, the Middlebury River and lower Otter Creek will continue a two-year rotation of more focused study. Two new stations have been added in the headwaters of the Middlebury River watershed to complement five stations added last year. The result is a total of seven new rotational stations in this focus watershed designed to evaluate baseline water quality conditions in the North Branch, Middle Branch, South Branch and Halnon tributaries. Three of these sites are co-located with existing biomonitoring sites (VTANR BASS). Alkalinity has been added as a new requested parameter for these seven new stations. Monitoring in both the Middlebury River (lower watershed) and Otter Creek has been expanded relative to last past years, in order to capture rotational sites that have been monitoring historically. The number of sites in Lewis Creek and Lemon Fair River has been decreased compared to year 2013, reflecting that these watersheds have now transitioned to sentinel status.

C. Map of Area and Waterbody

For individual projects under this generic QAPP, a map is to be provided here that identifies waterbody and sample sites.

Instructions: Insert the map for your project here.

See Attachment 1 for a map of watersheds and sample sites monitored by the Addison County River Watch Collaborative.

D. Table 6a - Project Timetable

Instructions: Fill in the following table with the correct dates for your project. If your project does not include any of the listed activities, note why. If there are activities not listed, add them to the table. If you have already completed a timetable you may attach it in lieu of this one.

Activity	Projected Start Date	Anticipated Completion Date
Project Planning Meeting	January and February, 2015	
Fill out and submit this QAPP to VTDEC	March 17, 2015	
QAPP Approved by VTDEC	April 1, 2015 or ASAP	
Training Volunteers/Samplers	Spring samplers trained. Train new samplers – Sat, March 28, 2015	
Sampling Begins	Spring: April 8, 2015 Summer: June 3, 2015	
Sampling Ends	September 2, 2015	
Analytical Results Evaluated * Check/Correct Errors Due to Math Miscalculations or Transferring Data from Field/Lab Forms * Confirm Useable Data * Separate Un-useable Data	Ongoing, beginning when sampling results received from LaRosa lab	By Jan 2016
Data Entered into Project Database	Ongoing, beginning when sampling results received from LaRosa lab	Feb 2016
QC Review of Database	Fall 2015	Feb 2016
Data Summarized	EOY 2015	March 2016
Submit Final Report	EOY 2015	Spring 2016
Presentation(s) of Information at Local Meeting (s) or other venue(s)		ongoing

7. Project Quality Objectives

Instructions: Please check to ensure that you can meet the accuracy and precision requirements, and if you cannot please indicate and explain. Check the appropriate boxes on the left for parameters to be sampled in your project. If you plan to use a different field or laboratory method add your information to this table and provide the written procedures when submitting this completed project QAPP.

A. Data Precision, Accuracy, Measurement Range Requirements

Table 7a – Field Analysis Protocols for Water Samples

Parameter	Field Analysis Method	Method Reference[1]	Accuracy[2]	Precision[2]
Transparency	Secchi Disk	Vermont Lay Monitoring Program Manual, 2000	--	+/- 0.1 meter
Dissolved Oxygen	Winkler Method w/ Azide Modification	Testing the Waters; Chemical & Physical Signs of a River, River Network,1996	+/- 0.5 mg/l	+/- 0.5 mg/l
Dissolved Oxygen by Meter	DO Meter or multiprobe	*Standard Methods for the Examination of Water and Wastewater*, 20 ed., 4500-O G. Membrane Electrode Method	+/- 0.5 mg/l	+/- 0.5
XTemperature	Alcohol Thermometer	Testing the Waters; Chemical & Physical Signs of a River, River Network,1997	+/- 1.0º C	+/- 1.0º C
pH	pH Meter or multiprobe	*Standard Methods*, etc.,20th ed., 4500-H^+B Electrode Method	± 0.2 S.U	± 0.2 S.U.
Conductivity	Conductivity Meter or multiprobe	*Standard Methods*, etc.,20th ed., 4500-H^+B Electrode Method	± 0.5%	± 0.5%

Footnotes:

1– An example of methods that meet the precision and accuracy of LCBP projects under this QAPP are listed. Other methods which meet data quality objectives may be used upon approval of the LCBP. The full citations for each of these publications are:
APHA, AWWA & WEF. Standard Methods for the Examination of Water and Wastewater, prepared and published jointly by the American Public Health Association, American Water Works Association and Water Environment Federation, 20th ed., 1998
Behar, Sharon. Testing the Waters; Chemical & Physical Vital Signs of a River, published by River Network, 1997
Vermont Agency of Natural Resources. Vermont Lay Monitoring Program Manual; 2000, by Water Quality Division, Vermont Dept. of Env. Conservation.

2– Accuracy of field protocols will generally not be measured in the field, but at training and quality control check sessions. Accuracy and Precision measures given are generic. Individual protocols may themselves provide more accurate and precise measures than expressed here.

Table 7b – Laboratory Analysis Protocols for Water Samples :

Parameter	Reporting Limit [A]	Accuracy[B] (% Recovery)	Estimated Precision for Field Duplicates [C] (RPD)	Laboratory Precision (RPD)	Analytical Method Reference[B]
Chlorophyll-*a*	0.5 ug/l	--	≤15%	10%	EPA 445.0
X Total and dissolved phosphorus	5 µg/l	85-115%	≤30%	15% [B]	*Std. Methods* (21st ed.) 4500-P H
X E. coli [D, E]	1 MPN /100ml	N/A	125% (<25cfu) 50% (>25 mpn)	125% (<25cfu) 75% (>25 mpn)	*Std. Methods* (21st ed.) 9223 (Colilert)
X Total Suspended Solids	1 mg/l	80-120%	≤15%	≤ 15%	*Std. Methods* (21st ed.) 2540D
X Turbidity	0.2 NTU	N/A	≤ 15%	≤15%	EPA 180.1
X Alkalinity	1 mg/l	N/A	≤5% (>20 mg/l) <15% (<20 mg/l)	≤5% (>20 mg/l) <15% (<20 mg/l)	*Std. Methods* (21st ed.) 2320B
X Total nitrogen (persulfate digestion)	0.1 mg/l	85%-115%	≤20%	≤10%	*Std. Methods* (21st ed.) 4500-N C
Total NOx	0.05 mg/l	85%-110%	≤10%	≤5%	EPA 353.2

(A) - Reporting Limit is the minimum reported value (lowest standard in calibration curve or MDLx3)
(B) - Section 5.0, Vermont Dept. of Conservation Laboratory QA Plan, 1999
(C) - Generated by the analysis of field duplicates
(D) -Section 5.0, Vermont Dept. of Conservation Laboratory QA Plan, 1999
(E) - EPA's New England Regional Laboratory recommends that all samples resulting in Too Numerous To Count (TNTC) growth, defined as greater than 200 colonies on the membrane filter, be recorded as "TNTC."
(F) -As a quality control check on bacteria counts, if two or more analysts are available, each should count colonies on the same membrane plate for about 10% of the samples, and agree on the # of colonies within 10%.

Instructions: ***For the following sections (B,C,D), which address data representativeness, comparability and completeness, the VTDEC maintains a minimum goal of 80%. On rare occasions a project requires higher goals and this may be a point of discussion during review of your QAPP. If you think your project might be unable to meet the minimum goal, please provide the information in the lines provided below each element.***

B. Data Representativeness

Samples collected at locations and depths described in this QAPP will reflect conditions of individual waterbodies and tributaries in Vermont. To ensure representativeness, all samples will be collected, preserved and analyzed according to the procedures in this QAPP, and within the specified holding times. Those results not meeting the project quality objectives of this program will be flagged and reviewed to determine if appropriate quality controls are in place. They should be discussed in the data report and may be excluded from entry into VTDEC's long-term water quality data archive.

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C. Data Comparability

All samples for each specific parameter will be collected and analyzed using the respective procedures described in this QAPP to ensure that comparisons between different sample sites, sample dates, depths and projects can be appropriately made.

If a project compares historical data with the data generated under this QAPP, the historical data should have used SOPs that provide the same data quality as defined here.

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NOTE: The information in Table 7c – Project Completeness (below) about field samples, and field and lab duplicate samples collected is not needed for the QAPP submission, however please review it so you will be able to submit it at the end of the project.

D. Data Completeness

At least **80%** of the anticipated number of samples will be collected, analyzed and determined to meet data quality objectives for the project to be considered successful. Individual projects may have different completeness goals, which will be presented in the table below. The data report for each project will contain information, similar to that presented below, containing the number of samples meeting the data quality objectives and the resulting calculation of "Percent Complete".

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Table 7c - Project Completeness

Parameter			Number of Samples Anticipated Primary	QC	Total	Number of Valid Samples Collected & Analyzed Primary	QC	Total	Percent Complete
Chlorophyll-*a*			-	-	-				
Phosphorus	Total	*Spring*	50	12	62				
		Summer	100	24	124				
	Dissolved	*Spring*	18	4	22				
		Summer	36	8	44				
E. coli		*Summer*	108	24	132				
Total Suspended Solids		*Spring*	8	4	12				
		Summer	16	8	24				
Transparency			-	-	-				
Alkalinity		*Summer*	28	8	36				
pH			-	-	-				
Turbidity		*Spring*	50	12	62				
		Summer	100	24	124				
Total Nitrogen		*Spring*	20	4	24				
		Summer	40	8	48				
Total Nox			-	-	-				
Si, dissolved			-	-	-				
Dissolved Oxygen			-	-	-				
Conductivitiy			-	-	-				
Temperature		*Spring/Summer*	158						

* Percent Complete = (# of Valid Samples Collected and Analyzed) / (# of Samples Anticipated) * 100
First number indicates primary samples / Second number indicates QC samples.

8. Training Requirements and Certification

A. Training Logistical Arrangements

Instructions: Make changes as needed to the table below to reflect your project. Note however that what is contained in this table is, for the most part, considered minimal training.

The Project Leader will arrange volunteer training sessions and keep a record of each volunteer's training needs and accomplishments. Project Leaders are encouraged to discuss their training needs with the VTDEC-WQD Volunteer Coordinator.

Table 8a - Training Process

Type of Volunteer Training	Frequency of Training/Certification
Initial Orientation to the Project	Once
Training in Sampling and Analysis	One full training session for each new volunteer & annual refresher training before each sampling season begins New volunteers must also shadow an experienced volunteer for a minimum of 1 event before carrying out solo sampling.
On-site Visit by Project QA Coordinator	Once during sampling season
Other:	

9. Documentation and Records

Instructions: Add any additional information on documentation and records, if applicable.

Documentation for each project will include 1) sample forms 2) field sheets and 3) written assessments from on-site visits of Project Leader & QA Coordinator (see Section 8A). The Project Leader will maintain a record of each volunteer's training and participation in projects. Field data sheets will be filled out by the Sampling Volunteer and maintained by the Project Leader. Example field sheets are included in Appendix B. Each group will attach a copy of their field sheets to the individual project's version of this QAPP they submit. All samples submitted for laboratory analysis will be accompanied by VTDEC's sample submission form (Appendix B).

See Attachment 2a –
VTDEC / Addison County River Watch Collaborative Field Data Sheet.

10. Sampling Process Design

A. Rationale for Selection of Sampling Sites

Instructions: There are a number of acceptable sampling designs depending on the purpose of your project. Please review the descriptive information, adding project specific information as needed in the space provided. On the following table check the appropriate box(es) and insert the numbers that reflect your project sampling design. Submit an additional map or diagram which locates all sampling sites and important landmarks, if map under #6 does not show this. If you have this information prepared in another format, it can be substituted here.

SAMPLE SITE DESCRIPTION – Please provide a general description of each sample site, and note the approximate location on the submitted map .

Site #	Description
	See Attachment 3 – **ACRWC Sampling Site Locations & Rationale - 2015**

PHYSICAL HABITAT & SURROUNDING FEATURES – Characteristics of the physical habitat, land use in the immediate area, or specific features like point source discharges, may help determine where sample sites are located (e.g., macroinvertebrate sampling may take place only in riffle areas). Where this is the case, please describe the rationale for site selection. The intensity of the description will depend on individual projects, and must meet the requirements necessary to use the data for the project's purpose.

Site #	Habitat/Surrounding Features
	See Attachment 3

LOCATIONAL DATA – The latitude/longitude of each sample site will be recorded using a Global Positioning System. If this is not available, map coordinates including the map datum from which the coordinates were derived must be provided. This information does not need to be submitted as part of the QAPP, but the information must be included in the project data report.

Site #	DD.mmmmm North	DD.mmmmm West
	See Attachment 3	

LAKES/PONDS WATER QUALITY– Generally, each Lake/Pond will be sampled for water quality parameters at the deepest spot. For some projects, sampling will take place at the center of the lake, regardless of whether it is the deep hole, depending on the specific purpose of the monitoring event and the parameters being assessed.
If sampling for your project will vary from any of these designs, please describe it below.

Not applicable

RIVERS/STREAM WATER QUALITY – Wadeable stream samples will generally be collected offshore, near the center of the stream. Water quality samples will be taken from just below surface to near bottom. Individual grab samples, composited grab samples or a core sample can be collected from the water column. Specific projects will designate the type of sample, which must be in accordance with quality control requirements and the purpose of each project.

Depending on the bottom substrate, water quality samples from deep rivers should be collected at mid-depth, but no closer than 0.5 meter from the sediment interface. If the substrate is very soft/silty a greater distance may be designated so as not to contaminate the water sample or the sampling device.

Instructions: Please check the types of samples that will be collected for your project. If your sampling method(s) differ from the description, please describe what you intend to do.

For this specific project, the samples will be collected by:

- ❑ **X** Individual grab samples that will be analyzed separately
- ❑ Time composite samples – the same volume is collected at constant time intervals (e.g., 4 hours apart) at the same site, and combined to form a composite sample for that site
- ❑ Core samples – a single sample collected vertically in the water column across a series of depths.

If sampling for your project will vary from this design, please describe it below.

Instructions: Please fill in and modify the following table as appropriate for your project. If you have a separate summary of this information, you can attach it in place of this table.

Table 10a – Overview of Types of Waterbody, Sample Site(s) & Sample Depth(s)

River channel sampling will be conducted in six watersheds: Lewis Creek, New Haven River, Middlebury River, Otter Creek, Little Otter Creek, and Lemon Fair River.

Sample sites and their locations are identified in Attachment 3.

At baseflow, all scheduled sites are wadeable. At moderate to high flows, some sites are considered deep-water. At each site, volunteers will strive to collect the grab sample from the thalweg (deepest part of the channel), about one foot below the surface (unless this depth is too close to the bottom of the channel and would stir up sediments, in which case the sample would be collected mid-depth). Volunteers will access the thalweg by wading directly into the channel, taking care to minimize disturbance of bottom sediments, and will collect the sample from upstream of their position. If flow or other conditions render wading unsafe, volunteers will utilize a pole sampler to sample a position in the channel cross section that is as close as possible to the thalweg. The pole will be extended to plunge the sampling vessel into the water column to fill the vessel at a point as close as possible to one foot below the surface.

B. Summary of Sample Collection

Individual projects will identify the number of samples, sampling frequency and specific sampling method for each parameter in accordance with their objectives. During sample collection, all sample apparatuses are to be rinsed 3x in sample water prior to collection of the actual sample. Filtration apparatuses and bottle rinse guidelines are shown in Table 11a. **(See Attachment 4 – ACRWC Sampling Schedule – 2015)**.

Table 10b – Sample Collection

	Type of Sample/ Parameter	**Total Number of Samples (Indicate if this is for the project or per week, etc.)**	**Sampling Frequency (How often – once/weekly/bi-weekly?)**	**Sampling Method (Grab, Discrete-depth sampler, depth-integrating core sampler, meter)***
Biological	*E. coli*			
Chemical	Chlorophyll-*a*			
	Total and Dissolved Phosphorus			
	Transparency			
	Dissolved Oxygen			
	Temperature			
	pH			
	Alkalinity			
	Total Nitrogen (oersulfate digestion)			
	Total NOx			
	Si, dissolved			
Physical	Secchi Disk Transparency			
	Total Suspended Solids			
	Turbidity			
Meters used for data collection (please list make/model of meter(s) or multiprobe(s)	Multiprobe model:			
	pH meter model:			
	Conductivity meter model:			
	Turbidity meter model:			
	DO meter model:			

*) see Appendix A, please list sampler type (e.g., Kemmerer, Van Dorn, Hose etc.).

11. Sampling & Analysis Methods

Field and laboratory analytical methods are provided in Section 7, and Field Sampling Methods are listed in Section 10 and in Appendix A. The table below presents containers, preservation and holding times used for projects under this QAPP.

INSTRUCTIONS: If your sampling methods are listed in Appendix A, <u>please list the specific protocols you are using in the table above</u>. If your sampling protocol is different from the descriptions in Sections 7 and 10 or the examples in Appendix A, please attach your protocol(s) to this QAPP.

Check off the appropriate parameters in the table below.

Table 11a –Sample Containers, Preservation & Holding Times [A]

Parameter/Measure	Container	Field Rinse	Preservation	Hold Time [B]
X Total / Dissolved Phosphorus	75 ml glass tube, w/ Teflon cap.[C]	NO RINSE, 3X rinse of filtration apparatus w/ sample water or DI	Cool to 4°C. Dissolved phosphorus filtered using *new* 0.45 *u* filter membrane	28 day
X *E. coli*	200ml sterile plastic round	NO RINSE	Cool to 4°C	6 hour
Chlorophyll-*a*	Filter - Gelman GF-F, 47mm diam.	NO RINSE of filter, 3X Rinse of filtration apparatus w/ sample water or DI	Freeze, Dark	21 day
X Total Suspended Solids	1 liter plastic, round	3x rinse with sample	Cool to 4°C	7 day
X Turbidity	250 ml plastic square	3x rinse with sample	Cool to 4°C	48 hour
X Total Nitrogen (oersulfate digestion)	50 ml polycarbonate centrifuge tube	3x rinse with sample	Cool to 4°C , acidified within 48h with conc. H_2SO_4 to pH <2	28 day
Total NOx	125 ml plastic square	3x rinse with sample	Cool to 4°C, acidified within 24h with conc. H_2SO_4 to pH <2	28 day
Si, dissolved	50 ml polycarbonate centrifuge tube	3x rinse with filtrate or with DI	Cool to 4°C, filtered using *new* 0.45 *u* filter membrane	28 day
X Alkalinity	250 ml plastic square	3x rinse with sample	Cool to 4°C	14 day
DO - Meter	(*in situ*)	3x rinse of probe	None	Direct Analysis

Parameter/Measure	**Container**	**Field Rinse**	**Preservation**	**Hold Time** [B]
pH Meter	(*in situ*)	3x rinse of probe	None	Direct Analysis
X Temperature - Thermometer [D] or meter	(*in situ*)	NO RINSE	None	Direct Analysis
Conductivity meter	(*in situ*)	3x rinse of probe	None	Direct Analysis
Turbidity meter	(*in situ*)	3x rinse of probe	None	Direct Analysis

Footnotes:

A – A copy of some field SOPs are attached as Appendix A.
B – Holding times are in accordance with the Code of Federal Regulations, title 40 (Protection of Environment), part 136, section 3 (or 40CFR136.3), and are defined in the VTDEC LaRosa Laboratory Qualuty Assurance Project Plan.
C – The VT DEC analyzes the entire sample volume in the sampling container, so no acidification is needed. Extra containers of sample will be needed to allow the VT DEC lab to analyze spiked samples.
D – **Mercury thermometers absolutely shall not be used in the field**.

12. Sample Handling and Custody Procedures

Instructions: Please attach copy of your project specific field sampling form here.

All samples collected in conjunction with the project will be accompanied by a field sampling form identifying at minimum the sample location, date, time, and collector. In addition, a laboratory sample submission form must accompany all samples submitted to the laboratory. Sample field forms, and a laboratory submission form, are in Appendix B.

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13. Analytical Methods Requirements

Information for this section is included in Tables 7a and 7b.

14. Quality Control Requirements

Instructions: For sections A, B, and C, check only those that are applicable to your project. The goal for quality control checks is 10% replication and blank analysis. Please note if your goal varies from this.

A. Field QC Checks

At least one (1) Field Duplicate and one (1) Field Blank will be submitted for every tenth (10^{th}) sample collected. Additional types of field quality control samples needed will depend on the parameter and the collection method, and are at the discretion of the Project Field/Sampling Leader and Project QA Coordinator.

- ❑ **X Field Duplicate (required)** – a check on water quality, sampling & analysis consistency. This is a replicated sample collected at the same point in time and space so as to be considered identical. A field duplicate is a second sample from a second sampling event, collected immediately after the first sampling. Otherwise put, these separate samples are said to represent the same population and are carried through *all steps* of the sampling and analytical procedures in an identical manner. They are used to assess precision of the total method, including sampling, analysis, and site heterogeneity.

- ❑ **X Field Blanks (required)** – This checks for contamination (Accuracy/Bias) in the field, by processing laboratory-supplied de-ionized water through the sampling train. This checks for contamination introduced from the laboratory-supplied sample container(s) or from field sources.

- ❑ **X Matrix Spike (required only for phosphorus)** - This allows the laboratory to perform analytical replication that separates variability in sampling from variability in analytical processing. A spike is a second sample bottle, filled from the same sample collection as the first sample. For grab samples, there is no functional difference between a field duplicate and a matrix spike.

- ❑ **Equipment Blanks** – measures contamination (accuracy/bias) – a sample of water, free of measurable contaminants is poured over or through decontaminated field sampling equipment that is considered ready to collect or process an additional sample. The purpose of this is to assess the adequacy of the decontamination process and whether equipment needs special cleaning to make sure it doesn't have something that contaminates the sample or influence the results.

- **Field Split Samples** – Two or more representative subsamples are taken from one environmental sample in the field and sent to two different labs for analysis. Prior to splitting, the environmental sample is well-mixed to correct for sample inhomogeneity that would adversely impact sample data comparability. Field splits are used to assess sample handling procedures from field to laboratory and interlaboratory comparability and precision.

- **Equipment Calibration Checks** – A check on a meter's accuracy – the verification of the initial calibration that is required at certain times during the sampling day or while analyzing a large number of samples. Checking to see if a pH meter is maintaining its calibration would involve taking a reading of standard solutions (e.g., pH buffers of 4, 7, or 10, etc.)

For projects that include long term repetitive sampling at several sites, the site at which a field quality control sample is collected may change so there may be at least one duplicate sample at each sample location during the course of the project.

B. Laboratory QC Checks

Laboratory QC samples may include any of the following, depending on the parameter, and are handled by the LaRosa Laboratory as described in the LaRosa Laboratory Quality Assurance Plan.

15. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The Project QA Coordinator is responsible for ensuring equipment and instruments are maintained according to standard operating procedures and manufacturer requirements. In preparing for a sampling event, equipment will be inspected and tested by the sampler prior to its intended use. A maintenance log will be maintained by the Project QA Coordinator for all mechanical and electronic equipment. Any equipment that does not meet the requirements necessary for producing data in accordance with the data quality objectives of specific projects, will not be used for sample collection or analysis. Additional equipment (non-mechanical and non-electrical), including pole samplers, buckets, rope, thermometers etc. should be maintained according to the standard operating procedure.

Table 15a - Equipment for Project

Equipment Type	Manufacturer	Inspection Frequency	Type of Inspection
DO Meter	See Table 10b		
Multiprobe model:			
pH meter model:			
Conductivity meter model:			
Turbidity meter model:			
GPS Unit			
Flow Meter			.

16. Instrument Calibration and Frequency

***Instructions: Please complete the table below*.**

The Project Leader will ensure that all field instruments are checked for good working order prior to the day of sample collection, preferably at least 24 hours prior to sampling. On the day of sample collection, or on a routine schedule as defined below, equipment will be calibrated and checked for accuracy before any samples are collected in accordance with the standard operating procedures. The recalibration of meters will be verified by recording each meter's reading of a standard used (or against a calibration instrument). If the amount of drift in instrument readings is not acceptable, data will be flagged as suspect. Calibration checks and readings of standards will be recorded on field sheets or another form set up for that purpose. All documentation regarding instrument calibration will be maintained by the Project Leader or their designated individual.

Table 16a - Equipment Calibration

Equipment Type	Calibration Frequency	Standard or Calibration Instrument Used
Alcohol Thermometer	Before each sample event	Ice bath
USGS Pygmy Current Meter	Before and after each day's use	Spin test per manufacturer's instructions.
pH meter	Before each day's use	per manufacturer's instructions.
Conductivity meter	Before each day's use	per manufacturer's instructions.

17. Inspection/Acceptance Requirements

The Project Leader will ensure that all equipment, instruments and supplies are clean and maintained according to the standards and conditions required to meet project objectives. Sample containers will be of the appropriate size, precleaned for the parameter for which the sample will be analyzed, and supplied by the LaRosa laboratory. Appropriate containers must be used. Containers that are not supplied by the LaRosa laboratory are considered suspect and samples will be rejected, unless lot certification of bottles is provided along with the sample submission. Other materials, such as pole samplers, nets, gloves, rinse bottles, sampling apparatus, buckets, line, etc., will be kept clean and stored properly so as to prevent contamination that interferes with producing samples and analytical results that meet project objectives.

18. Data Acquisition Requirements

External data (data that is not generated by the project but is to be used as part of the project - e.g., meteorological data, flow data) will be used in accordance with the objectives stated in Section 6B of this QAPP, and should have sufficient documentation that it is at least equivalent to the data quality generated as part of this project (see Section 7).

19. Data Management

The generation of accurate data with accompanying documentation, such as field sheets and quality control sample results, is the responsibility of the individual Project Field/Sampling Leader. On a daily basis, field data sheets are inspected and signed by the people performing the sampling before leaving a site or completing a sampling “run”. Field sheets are given to the Project Field/Sampling Leader after the sampling event for review. Within 72 hours, the Leader will contact any sampler(s) whose field sheets contain significant errors or omissions.

The lab manager reviews analytical results, and identifies questionable data with regard to results or documentation, as described in the LaRosa Laboratory QA Plan. The Project Leader and the Project QA Coordinator review all field and lab data to determine usability in the project.

All environmental data generated by projects funded by VTDEC under this project will be submitted to the VTDEC in a commonly used format (such as Microsoft EXCEL© or ACCESS©) and may be uploaded to STORET , the national water quality data storage system.

The data generated under the laboratory services grants project is the joint property of the VTDEC and the project leads.

20. Assessment and Response Actions

For each project funded, there will be an on-site visit by the Project Leader or Project QA Coordinator to observe field sampling and field analysis procedures. Generally, this will be done near the beginning of the project. This is in addition to training procedures described in Section 8. A written checklist should be used for the assessments, maintained by the Project Leader, and copies will be provided with the data report. The Project Leader and Project QA Coordinator will determine if field work follows the written procedures or if corrective action is necessary, including additional training or protocol revisions. Please refer to Section 22 for additional evaluations and response actions regarding data evaluations.

21. Reports

Written final project reports will be submitted to the VTDEC for all funded projects. These need not be excessively long, but should document data results, quality assurance findings, and any specific local actions suggested by the data results. The reports may vary in content according to the type of project and the expected uses of the information. VTDEC strongly encourages project leads to plan at least one presentation of their project and its results to the local community.

In addition to a written report, data and metadata (information about the data) will be provided as described in Section 19 above and Sections 22 through 24 below.

22. Data Review, Validation, and Verification

All data are reviewed by the individual Project Leader, Project QA Coordinator and Project Data Management Coordinator to determine if data meet QAPP requirements.

Data Analysis QC Checks will include:

- Data entry checks by a second person
- Calculation of measures of data quality.

To validate and verify project data, the Project QA Coordinator will compare computer entries to field or laboratory data sheets; look for data gaps and unexpected, or nonsensical results; inspect field forms and information; review field quality control checks and resulting information; and review graphs, tables and other presentations of data, as needed. Graphing data results with time, by parameter, is a useful way to observe problem data points (i.e., outliers).

Errors in data entry will be corrected. Data that are outside the expected range will be flagged for further review, or rejected. A second field sample and/or laboratory aliquot will be taken, if possible, to verify the condition and a determination of necessary corrections, if any, will be made. VTDEC should be contacted if assistance is needed to identify sources of errors. Problems with data quality will be discussed in the draft and final reports to the VTDEC. The Percent Complete table presented in Section 7 will be filled in and included with the data report.

23. Validation and Verification Methods

The following simple measures of data quality should be calculated, and included in the final report:

1) To screen for contamination, the average blank concentration, by parameter, should be calculated. This average value should be as close as practical to the Reporting Limit listed in Table 7b.

2) To assess the precision of results, the "Mean Relative Percent Difference" between field duplicate samples should be calculated. The average RPD should be less than or equal to the Estimated Precision listed in Table 7b. This simple measure is calculated as follows:

$RPD_{\text{field duplicate pair 1}}$ = absolute value ($sample_1$ - $sample_2$) / average ($sample_1$ and $sample_2$);

and,

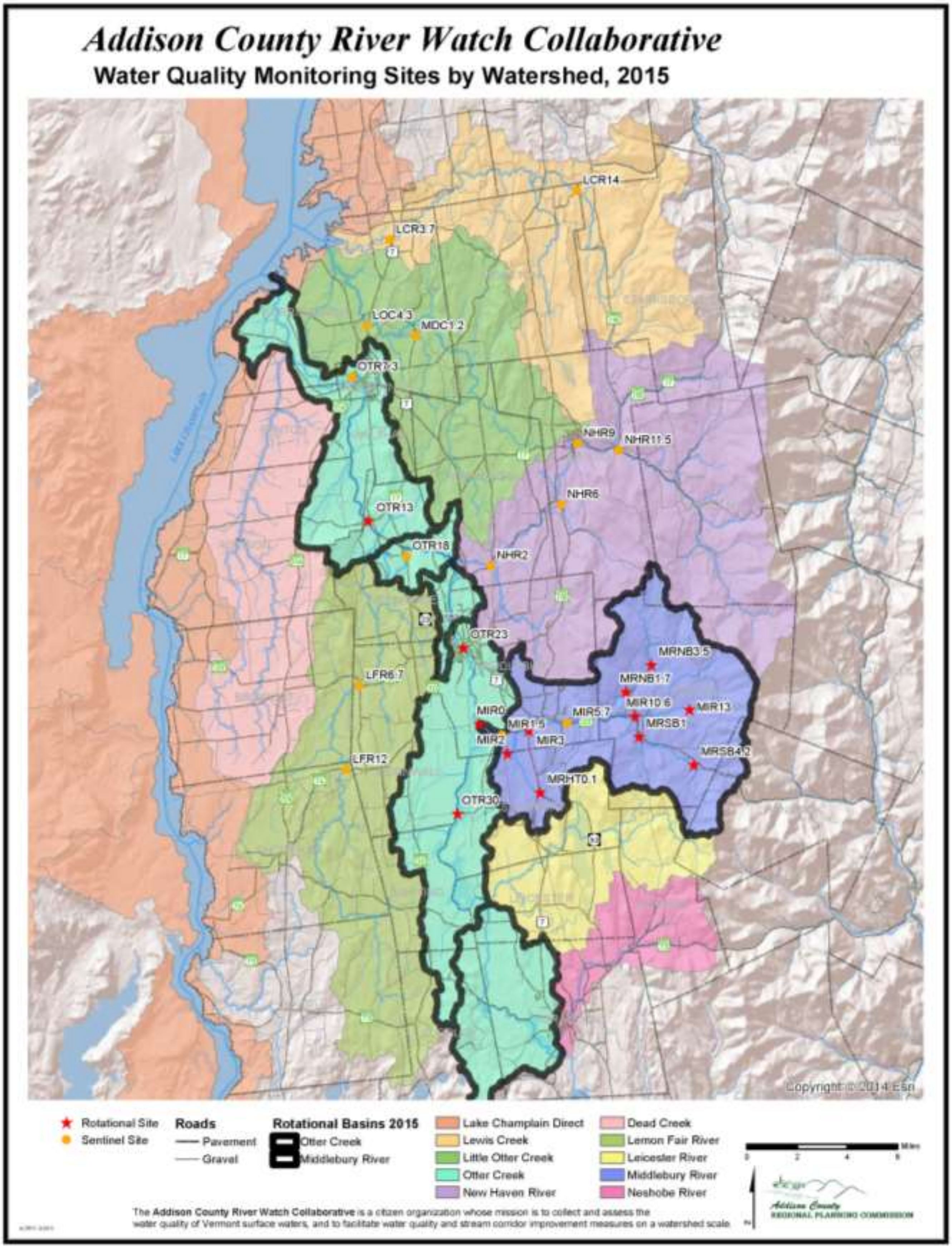
The Mean RPD for "n" duplicate pairs = average ($RPD_{\text{pair 1}}$ + $RPD_{\text{pair 2}}$ + ... + $RPD_{\text{pair n}}$)

24. Reconciliation with Project Quality Objectives (PQOs)

As indicated above, mean blank concentrations and mean relative percent differences will be compared to data quality objectives established in Table 7b.

Hard copies of Generic QAPP Appendices are available from the VTDEC.

Map of ACRWC sampling stations - 2015



VTDEC/Addison County Riverwatch Collaborative Field Data Sheet

Sample submitted by: Addison County River Watch Collaborative	**ACRWC Contact:** Matt Witten	**Date Samples Collected:**
Lab Report to: Kellogg, Swift	**Phone:** 802-434-3236	**Chain of Custody: (sign/date)**
Program #: 137 **Activity Code #:** 1	**Email:** mwitten@gmavt.net	

Samplers' Names	**Previous 3 days weather**	**Today's weather**

See codes below

Analysis Requested

DEC log-in code	**Sample ID**	**Type**	**Sample Time**	**Air temp**	**H2O temp**	**Water Level**	**Water Color**	**% Algal growth**	**TP**	**DP**	**TSS**	**Tur b**	**E. coli**	**TN**	**AL K**	**Comments**
		DUP = duplicate BLK = Blank SPK = Lab Spike				H2O Level: a) Very low b) Low c) Medium d) High e) Very high	H2O Color: a) Clear b) Cloudy c) Foam d) Muddy (brown) e) Silty (gray) f) tea g) Green h) Un-natural	Algal growth: < 25% 25- 50% 50-75% > 75%								

Site Types: R = Rotational; S = Sentinel; O = Other (special project)

Project Name: Addison County River Watch Collaborative

Project Number: **137-01**

Sample Year: 2015

Type	River Name	Site ID	Site Location	Site Lat	Site Lon	Site Comments/Rationales
S	Lewis Creek	LCR3.7	Old Route 7 Bridge	44.247953	-73.231202	Downstream of US Rt 7; near USGS streamflow gage
S	Lewis Creek	LCR14	Tyler Bridge	44.277097	-73.081485	Swimming/ recreation site; d/s from farms, Hollow Bk
S	Lemon Fair River	LFR6.7	Route 125 bridge.	43.990959	-73.252514	Site surrounded by pasture with very little riparian buffer.
S	Lemon Fair River	LFR12	Downstream of Route 74 bridge	43.942435	-73.262336	Downstream of area that is pastured into Lemon Fair
S	Little Otter Creek	LOC4.3	Route 7 Bridge	44.198145	-73.249263	At US Rt 7; site of USGS streamflow gaging station
S	Mud Creek	MDC1.2	Wing Rd./Middlebrook Rd. (South)	44.192534	-73.210043	Just upstream of mouth of Mud Creek; downstream of dairy pasture
R	Middlebury River	MIR0	Mouth of Middlebury River	43.969682	-73.156592	Recreation Site
S	Middlebury River	MIR1.5	Shard Villa Road Bridge	43.963134	-73.138246	Recreation Site
R	Middlebury River	MIR2	Blake Roy Road Bridge	43.952941	-73.134027	Downstream of farms
R	Middlebury River	MIR3	Route 7 Access	43.966132	-73.117100	Downstream of E. Middlebury Village
S	Middlebury River	MIR5.7	Midd. Gorge @ Rte 125 Bridge	43.970260	-73.086273	Recreation Site; Upstream of E. Middlebury Village
R	North Branch MR	MRNB1.7	Dugway Road Bridge	43.988825	-73.039691	Baseline Monitoring - Recreation site
R	North Branch MR	MRNB3.5	Norton Farm Rd Bridge	44.004442	-73.019520	Baseline Monitoring
R	Middlebury River (Midd Br)	MIR10.6	Natural Turnpike Road	43.974927	-73.032350	Baseline Monitoring
R	Middlebury River (Midd Br)	MIR13	Wagon Wheel Rd Bridge	43.978600	-72.988900	Baseline Monitoring
R	South Branch MR	MRSB1	Goshen Road Bridge	43.963081	-73.029126	Baseline Monitoring site; co-located with BASS So Br MR Stn 1.0
R	South Branch MR	MRSB4.2	Brook Road Bridge	43.947019	-72.985386	Baseline Monitoring site; co-located with BASS So Br MR Stn 4.2
R	Halnon Brook MR	MRHT0.1	Upstream of Route 7 crossing	43.930000	-73.107000	Baseline Monitoring site; co-located with BASS Halnon Brook Stn 2.5
S	New Haven River	NHR2	Muddy Branch confluence (just below)	44.060634	-73.148449	Bracket Muddy Branch tributary
S	New Haven River	NHR6	Route 116 Bridge, Sycamore Park	44.096148	-73.092454	Swimming and recreation site
S	New Haven River	NHR9	South St. Bridge	44.131417	-73.079891	100 yds. below downtown Bristol's septic system
S	New Haven River	NHR11.5	Bartlett's Falls Pool	44.127648	-73.046841	State-significant swimming and recreation site
S	Otter Creek	OTR7.3	Vergennes Falls / below outfall	44.168667	-73.260904	E.coli testing at the request of Vergennes Town Manager to monitor E.coli upstream and downstream of sewage treatment plant.
R	Otter Creek	OTR13	Route 17 Bridge	44.086043	-73.246625	Upstream farmland
S	Otter Creek	OTR18	Twin Bridges Picnic Area	44.065573	-73.215858	Accessible site downstream of Midd. Sewage Treatment Plant. Upstream of Lemon Fair River confluence.
R	Otter Creek	OTR23	Frog Hollow (below footbridge)	44.013353	-73.170211	Immediately below Otter Creek Falls and Middlebury town center
R	Otter Creek	OTR30	Salisbury Covered Bridge (Swamp Road)	43.917934	-73.173615	Southernmost site; downstream farmland.

Site Types: R = Rotational; S = Sentinel; O = Other (special project)
ACRWC proposed 2015 sampling dates are: Spring: April 8, May 6; Summer: June 3, July 1, August 5, September 2 (Wednesdays)
No E.coli samples will be collected during Spring events (April, May), only during Summer events (June, July, Aug, Sept)

Project Name: Addison County River Watch Collaborative

Project Number: **137-01**

Sample Year: **2015**

				Spring Schedule (Apr, May)					Summer Schedule (Jun, Jul, Aug, Sep)						
									PARAMETERS						
Type	**River Name**	**Site ID**	**Site Location**	**TP**	**DP**	**TN**	**Turbidity**	**TSS**	***E.coli***	***ALK***	**TP**	**DP**	**TN**	**Turbidity**	**TSS**
S	Lewis Creek	LCR3.7	Old Route 7 Bridge	X			X		X		X			X	
S	Lewis Creek	LCR14	Tyler Bridge	X			X		X		X			X	
S	Lemon Fair River	LFR6.7	Route 125 bridge.	X	X		X	X	X		X	X		X	X
S	Lemon Fair River	LFR12	Downstream of Route 74 bridge	X	X		X	X	X		X	X		X	X
S	Little Otter Creek	LOC4.3	Route 7 Bridge	X	X		X	X	X		X	X		X	X
S	Mud Creek	MDC1.2	Wing Rd./Middlebrook Rd. (South)	X	X		X	X	X		X	X		X	X
R	Middlebury River	MIR0	Mouth of Middlebury River	X		X	X		X		X		X	X	
S	Middlebury River	MIR1.5	Shard Villa Road Bridge	X		X	X		X		X		X	X	
R	Middlebury River	MIR2	Blake Roy Road Bridge	X		X	X		X		X		X	X	
R	Middlebury River	MIR3	Route 7 Access	X		X	X		X		X		X	X	
S	Middlebury River	MIR5.7	Midd. Gorge @ Rte 125 Bridge	X		X	X		X		X		X	X	
R	North Branch MR	MRNB1.7	Dugway Road Bridge	X			X		X	X	X			X	
R	North Branch MR	MRNB3.5	Norton Farm Rd Bridge	X			X		X	X	X			X	
R	Middlebury River (Midd Br)	MIR10.6	Natural Turnpike Road	X			X		X	X	X			X	
R	Middlebury River (Midd Br)	MIR13	Wagon Wheel Rd Bridge	X			X		X	X	X			X	
R	South Branch MR	MRSB1	Goshen Road Bridge	X			X		X	X	X			X	
R	South Branch MR	MRSB4.2	Brook Road Bridge	X			X		X	X	X			X	
R	Halnon Brook MR	MRHT0.1	Upstream of Route 7 crossing	X			X		X	X	X			X	
S	New Haven River	NHR2	Muddy Branch confluence (just below)	X			X		X		X			X	
S	New Haven River	NHR6	Route 116 Bridge, Sycamore Park						X						
S	New Haven River	NHR9	South St. Bridge	X			X		X		X			X	
S	New Haven River	NHR11.5	Bartlett's Falls Pool						X						
S	Otter Creek	OTR7.3	Vergennes Falls / below outfall	X	X	X	X		X		X	X	X	X	
R	Otter Creek	OTR13	Route 17 Bridge	X	X	X	X		X		X	X	X	X	
S	Otter Creek	OTR18	Twin Bridges Picnic Area	X	X	X	X		X		X	X	X	X	
R	Otter Creek	OTR23	Frog Hollow	X	X	X	X		X		X	X	X	X	
R	Otter Creek	OTR30	Swamp Road Bridge	X	X	X	X		X		X	X	X	X	
			Total # sites per event	25	9	10	25	4	27	7	25	9	10	25	4
			Total # Field QC samples per event	6	2	2	6	2	6	2	6	2	2	6	2