Quality Assurance Project Plan

Biological Monitoring of

Streams in Orange County, NY

June 2013

Sampling and identification performed by:
Watershed Assessment Associates
28 Yates St.
Schenectady, NY 12305

for:
the Orange County Water Authority &
Orange County Planning Department
124 Main St
Goshen, NY 10924

Approval Signatures

Alene Onion – NYS DEC External Data Coordinator, Project QA Officer Date 7/8/13

Kelly Dobbins- PEERS Coordinator Date 6/26/13

J. Kelly Nolan – PEERS Participant Date 6/27/13

Christopher Fisher – PEERS Participant Date 6/27/13

Michael Greco – PEERS Participant Date 6-27-13

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Distribution List

The following individuals must receive a copy of the approved QAPP in order to complete their role in this project. Note if copy will be electronic or hard copy.

Name	Title	Organization	Document type
Alene Onion	External Data Coordinator and QA Officer	NYS DEC	Electronic
Kelly Dobbins	PEERS Coordinator	Orange County Water Authority & Planning Dept	Electronic
J. Kelly Nolan Christopher Fishel Mike Greco	PEERS Participant collecting samples	Watershed Assessment Associates	Electronic
J. Kelly Nolan Christopher Fishel Mike Greco	PEERS Participant identifying samples	Watershed Assessment Associates	Electronic

INTRODUCTION

This document was prepared to provide a quality assurance/quality control framework for professional external evaluations of rivers and streams (PEERS). This document guides the PEERS Project Coordinator and Participants to ensure that the data are of sufficient quality to meet the requirements of DEC listing and assessment purposes.

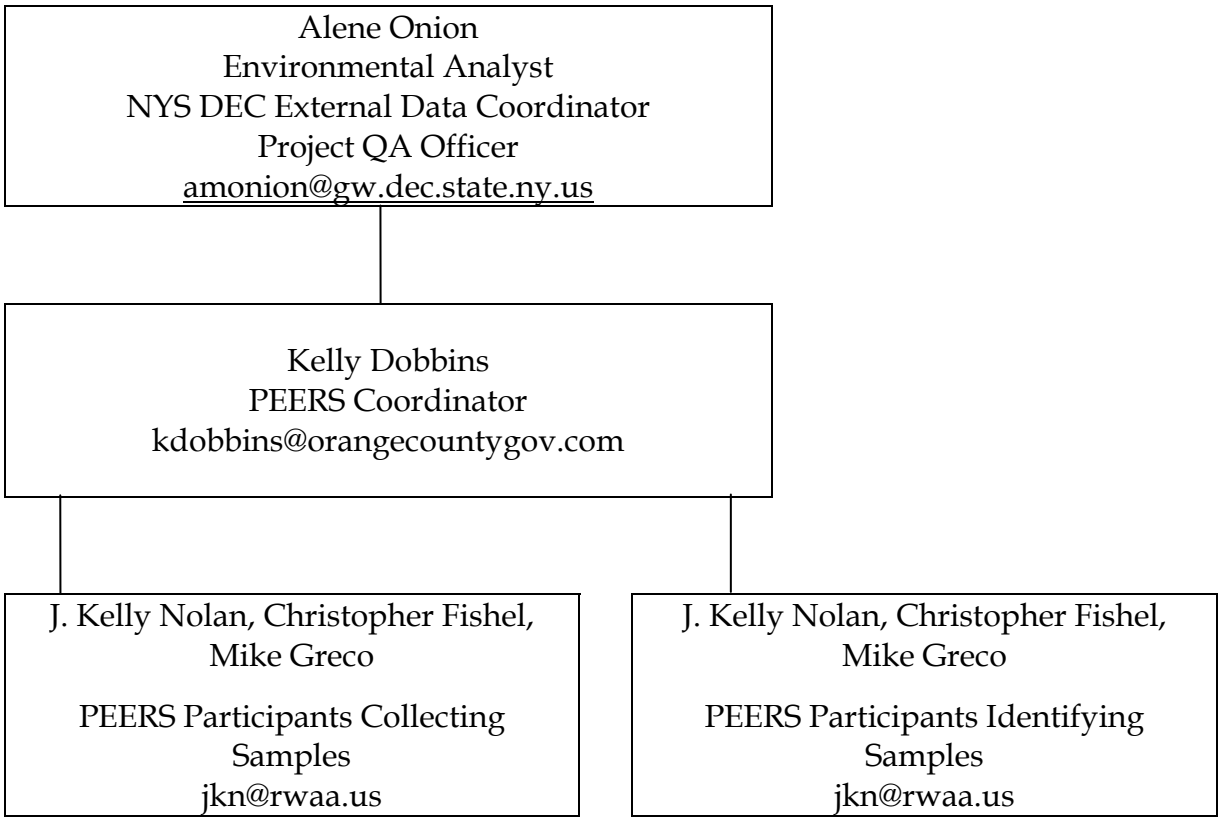
I. PROJECT MANAGEMENT

1. **Organization/Responsibilities:**

Table 1.Responsibilities and Qualifications of Participants

	Responsibilities	Qualifications
NYS DEC		
External Data Coordinator: Alene Onion	conducts all training, reviews and approves QAPPs submitted by the Monitoring Program Coordinators, maintains all documentation and records for this program, performs annual audits, manages and analyzes resulting data	Developed protocol of which this QAPP is written for.
External		
Kelly Dobbins PEERS Coordinator	writes the project QAPP, submits certification documentation for all participating PEERS Participants, coordinates sampling and identification efforts, and summarizes the results in a final report.	Active interest in water quality monitoring or watershed management, restoration, or preservation. Current serving as the chair of an organized monitoring group.
J. Kelly Nolan Mike Greco Christopher Fishel PEERS Participant(s) w/ Professional Status	conducts macroinvertebrate sampling according to this QAPP	Satisfies the requirements for professional status (see 5).
J. Kelly Nolan Mike Greco Christopher Fishel PEERS Participant(s) w/ Professional Status	conducts macroinvertebrate identification according to this QAPP	Satisfies the requirements for professional status (see 5).

Organization Chart



2. Background

2.1 Historical and Background Information

The Orange County Water Authority (OCWA) has been performed biomonitoring in streams throughout Orange County on an annual basis since 2004. During this time, the OCWA has sampled approximately 170 unique sites, some of which have also been sampled by the DEC's Stream Biomonitoring Unit.

The streams that are sampled within Orange County have a fairly wide variety of uses. Some streams are used for recreational fishing and boating, while others in urban areas might primarily be used to accept and channel stormwater or treated wastewater. No streams are used for water supply, although some, including the Wallkill River and Moodna Creek, might be hierologically-linked with shallow wells in sand and gravel deposits.

In a large and diverse County such as Orange, there is a diverse array of pollution sources, originating from both point and nonpoint sources. The County's program evaluates the potential for impacts to water quality from:

- SPDES discharges,
- agricultural runoff from crops or livestock,
- erosion from streambanks, constructions sites, or other sites with exposed soil
- urban stormwater runoff,
- compromised septic systems
- combined sewer overflows

Other sources of ecological impairment include runoff from the Black Dirt Region, which carries sediment as well as various agricultural additives into the Wallkill River and some of its tributaries.

2.2 Project Objectives

The objectives of Orange County's biomonitoring work for 2012 are to:

- establish baseline information in streams that have not been sampled
- monitor trends and document shifts from baseline conditions in streams that have already been sampled
- assess quality of streams that feed public water supply reservoirs
- identify impacted streams in need of remediation
- help characterize watershed health
- identify areas to target for conservation and restoration efforts

2.3 Intended Uses

The NYS Dept of Environmental Conservation will use the *raw data only* not analysis results. These data will be processed by members of the Stream Biomonitoring Unit in support of any of the following Division of Water programs and reporting:

1) Rotating Integrated Basin Studies (RIBS) water quality assessments.
2) Water Body Inventory and Priority Waterbody List (WI/PWL) documentation of water quality.
3) Clean Water Act Section 303(d) listing of impaired waters.
4) Clean Water Act Section 305 (b) reporting of water quality assessments.
5) State Permit Discharge Elimination System (SPDES) permit writing, compliance and enforcement determinations, setting permit limitations protective of aquatic life use support.
6) Trend Monitoring Reports which are planned at 10 year intervals.
7) Department personnel working on non point source discharges

The NYS DEC reserves the right to refuse any questionable data for any reason.

At the local level, this data will be used:

- for watershed planning efforts, primarily to characterize the health of various parts of the Quassaick Creek and Wallkill River watersheds
- to educate municipal officials and other stakeholders on the status of streams in the County and their relationship to land use
- to alert relevant parties to specific causes of impairment in order to initiate remediation
- to evaluate potential development or land use scenarios and make recommendations as to best practices
- to develop guidance for additional monitoring, planning, or restoration work

Users of the data include:

- the County Planning Department and Water Authority,
- educators at the middle school, high school, and college level
- municipalities, including their conservation advisory councils (CACs)
- watershed groups, including the Moodna Creek Watershed Intermunicipal Council, the Quassaick Creek Advisory Committee (developed to steer development of a watershed plan for the Creek), and the Quassaick Creek Watershed Alliance
- conservation groups, such as the Orange County Land Trust

3. Project/Task Description

Monitoring will occur at both new and previously-sampled sites spread throughout the County, which will serve to establish baseline conditions as well as to monitor trends. Some sites are selected based on historical information that indicated poor water quality, or based on their proximity to features that could cause water quality degradation. Two sites were chosen upstream from reservoirs that supply public drinking water (e.g. Glenmere Lake and Monhagen Lake) in order to assess the quality of the surface water entering the reservoir and determine if additional safeguards are needed.

More comprehensive sampling will occur in the Wallkill River and Quassaick Creek watersheds in 2012 in order to help characterize the health of the various subwatersheds and tributaries and gauge the condition of the watershed overall. Sites will be chosen along each primary waterbody (e.g. Wallkill River, Quassaick Creek) as well as on select tributaries. When possible, tributaries will be sampled at a location immediately before it enters the primary waterbody in order to give insights into the cumulative effect of the watershed on the tributary, and to gauge the influence of that tributary on the primary waterbody.

Sites are chosen in urban, rural, and suburban areas and will be located downstream of a variety of land uses and settings. Section II-1 includes specific detail on locations of and rationales for selecting the sites to sample.

3.1 Project Schedule

June 27, 2013	Develop procedures and select sites in collaboration with the NYS DEC External Data Coordinator
June 1, 2013	PEERS Participants collecting samples attend the Sample Collection Calibration offered by the NYS DEC
June 21, 2013	Submit QAPP to the NYS DEC External Data Coordinator NO LATER THAN ONE MONTH PRIOR TO SAMPLING
June 5, 2013	Submit qualifications and certifications for Professional Status to the NYS DEC External Data Coordinator NO LATER THAN ONE MONTH PRIOR TO SAMPLING
July 2, 2013	QAPP Approval
July 2013	Begin Field Sampling
August 2013	Complete field sampling
Oct-Dec 2013	Conduct analysis and reporting
To be determined	Scheduled field audit by the NYS DEC External Data Coordinator
March 2014	Submit Final Report to the NYS DEC External Data Coordinator
March 2014	Project End Date

4. Quality Objectives and Criteria

a. Precision and Accuracy

The precision and accuracy criteria for field chemical parameters are given in Table 2. Field chemical parameters may be collected by any instrument(s) that meet these criteria.

The accuracy criteria for macroinvertebrate identifications are given in Table 18.9 of NYSDEC SOP 208-12.

b. Representativeness

- Basin wide representativeness is not a goal of this project.
- To ensure a site selected is representative of the named Waterbody Inventory segment, sampling locations must be located in areas which maximize the upstream distance to which the assessment interpretation of the water quality data is considered valid. As such the recommended procedure for placing water quality sampling locations along Waterbody Inventory segments is to choose the most downstream suitable location. Suitable locations will have the most representative physical characteristics in comparison to the remaining upstream portion of stream segment. This should include stream width, depth, substrate composition and embeddedness, velocity, and overhead canopy cover among others. If the most downstream location is considered significantly different from the majority of the upstream reach the site location should either be moved further upstream or an additional site may be added to capture the transition in habitat characteristics.
- Site representativeness is achieved by sampling in the mainstream, rather than peripheral areas. For kick sampling, the sampling location should be a riffle with a substrate of rock, rubble, gravel, and sand. Depth should be less than one meter and current speed should be between 30-150 cm/s. Multiplates should be deployed in waters greater than 1 meter deep.

c. Comparability

Comparability between sites in different streams is achieved with consistent sampling procedures as defined by SOP 208-12.

In track down studies, where locations are sampled upstream and downstream of a potential impact, the sites must have comparable habitats. The following criteria must be satisfied when sites are compared within the same stream segment:
(Of the following criteria, all 4 apply to kick sampling. For multiplate sampling, only the current speed and canopy cover criteria are required.)

- Substrate Particle Size: The composition of the substrate determines the availability of suitable habitat for benthic organisms. Substrate type is designated by visual determination of percentage of each particle type, as listed in EPA size categories (Weber, 1973), then converted to phi values as in Cummins (1962). Mean particle size is calculated by multiplying each phi value by the percentage present and summing all values. To ensure

comparability among sites in the same stream, the mean particle size should not differ by more than 3 phi units between sites.

Table 2: Phi scale

Type	Size (diameter)	Phi scale
Bed rock or solid rock	-	-
Rock	>256 mm (10 in)	-8
Rubble	64-256 mm (2.5 – 10 in)	-6.5
Gravel	2-64 mm (1/2 – 2.5 in)	-3
Sand	0.06-2.0 mm	2
Silt	0.004 – 0.06 mm	6.5
Clay	Less than 0.004	9

Example: A stream bottom is estimated to have the following composition: 10% boulders, 40% rubble, 30% gravel, and 20% sand. These values multiplied by their respective phi values would be -0.8, -2.6, -0.9, and +0.4. The sum of these, -3.9 phi units is the median particle size.

- Substrate Embeddedness: This is the degree to which large substrate particles (boulder, rubble, or gravel) are surrounded or covered by fine sediments (sand, silt, or clay). Embeddedness is related directly to suitability of the habitat for benthic macroinvertebrates: very low values (e.g., <10%) may indicate loose, shifting substrates prone to scouring, while very high values (e.g., >80%) may indicate substrates too impermeable or compacted for most invertebrates. Embeddedness is visually estimated by observation of the relative proportion of larger particles surrounded by fine sediment. This is best done by removing a few rocks from the bottom, finding the sediment line on each rock (usually evidenced by a color change), and estimating the proportion of the rock below this line. To ensure comparability among sites in the same stream, the percent embeddedness should not differ by more than 50% among sites unless the percentage embeddedness is within a value of 20.

- Current Speed: Stream current speed, or velocity, has direct influence on the composition of the benthic macroinvertebrate community. Surface current speed is measured at the specific sampling location by timing floating objects over a fixed distance. To ensure comparability among sites in the same stream, the current speed should not differ by more than 50% among sites unless it is within 20 cm/s.

- Canopy Cover: Canopy cover is defined as the percent of the water surface directly beneath riparian vegetation or bridge structure. An average percentage is estimated for the reach extending from 50 meters upstream to 50 meters downstream of the specific sampling location. To ensure comparability among sites in the same stream, the percent canopy cover should not differ by more than 50% among sites unless the percentage is within a value of 20.

d. Completeness

The goal of this project is to submit acceptable data to the NYS DEC for at least 20 of the total 20 sites.

Table 3: Analytical Specifications and QA/QC Requirements for Water Column Samples

Parameter	Analytical Lab	Standard Method	Precision	Accuracy	Calibration			Method Detection Limit	Reporting Limit
					Initial	On-going	Blanks		
Field Parameters		Std. Methods							
Temperature	*In Situ*	2550 B	+/-1°C	+/-11.5°C	Factory-set	--	--	+/-0.1°C	+/-0.1°C
Dissolved Oxygen		4500-O G	+/-1%	+/-2%	Daily	--	--	+/- 0.1mg/L	+/-0.1 mg/L
pH field		4500-H * B	+/-.05 SU	+/-.2 SU	Weekly	--	--	+/-0.1 SU	+/-0.1 SU
Specific Conductance. field		2510 B	+/-1 us/cm	+/-1%	Weekly	--	--	+/-1 umhos/cm	+/-10 umhos/cm

5. Training Requirements/Certifications

All PEERS Participants collecting samples for this project must satisfy the requirements for professional status. Individuals collecting samples must satisfy those requirements outlined in Table 4. PEERS Participants identifying samples must satisfy those requirements outlined in Table 5. Qualifications and certifications must be submitted to the NYS DEC External Data Coordinator with the completion of this QAPP and no later than one month prior to a sampling event (see application form, Appendix D). The NYS DEC reserves the right to reject QAPPs or professional credentials if there are any quality concerns or conflict of interest.

In addition to the above requirements, those individuals collecting samples are required to attend a one day calibration session the same year sampling takes place. Each session is limited to ten participants and consists of a 2 hour field calibration. The External Data Coordinator will perform side by side collection with every participant to ensure compliance with NYSDEC SOP 208-12. Samples collected by PEERS Participants will be compared with the sample collected by the External Data Coordinator. Samples should contain at least 70% of the same macroinvertebrate orders. Any discrepancies will be identified and corrected during the calibration. If discrepancies cannot be satisfactorily resolved, the NYS DEC reserves the right to refuse data collected by any PEERS Participant.

Table 4: Requirements for Professional Status: Sample Collection

Calibration by NYS DEC	• Within the last six months attended a methods calibration held by NYS DEC
Specialized Knowledge	• Knowledge of NYSDEC macroinvertebrate field sampling procedures
Licensing	• Must hold a license to collect or possess from the NYS DEC **http://www.dec.ny.gov/permits/28633.html**
College or Practical Experience	• Completed and achieved passing marks in undergraduate core course work in limnology, aquatic biology, environmental sciences or a related discipline, • OR has two years practical experience in environmental assessment work
Practical Experience	• Two years of practical experience involving work in developing biological water quality sampling and analysis plans, quality assurance plans, and data quality objectives processes
Release of All Claims Form	• All PEERS Participants must sign the Release of all Claims form attached as Appendix E.

Table 5: Requirements for Professional Status: Laboratory Sample Identification

Certification	• Society for Freshwater Science (formerly North American Benthological Society) certified Eastern Group 1 (General Arthropods), 2 (EPT), 3 (Chironomidae), and 4 (Oligochaeta)
Specialized Knowledge	• Knowledge of NYSDEC macroinvertebrate identification procedures.
College or Practical Experience	• College-level course credit in aquatic invertebrate zoology OR two years practical experience in the identification of aquatic Macroinvertebrates • Completed and achieved passing marks in undergraduate core course work in limnology, aquatic biology, environmental sciences or a related discipline, OR has two years practical experience in environmental assessment work
Practical Experience	• Two years of practical experience involving work in developing biological water quality sampling and analysis plans, quality assurance plans, and data quality objectives processes
Release of All Claims Form	• All PEERS Participants must sign the Release of all Claims form attached as Appendix E.

6. Documentation and Records

The PEERS Project Coordinator will submit a quality assurance project plan and certification records to the External Data Coordinator at least one month prior to sampling.

The certification and education records, approved QAPPs, and signed "Release of all Claims" forms will be added as electronic pdf documents to the Stream Biomonitoring Unit Database as metadata linked to associated data records.

Once the project is completed, the PEERS Project Coordinator will compile a final report for the project. The final report will include raw data files, field assessments, and an assessment of QAQC and will be submitted to the External Data Coordinator before March 1, 2013.

The NYS DEC reserves the right to refuse any questionable data. All accepted data will be compiled into an annual summary report by the External Data Coordinator. This annual report will include a summary and discussion of the analytical results as well as a summary section on how QA/QC objectives were met.

6.1 Modifications to the Approved QAPP

Any changes to location after the QAPP is finalized are made by the PEERS Project Coordinator with consultation from the NYS DEC External Data Coordinator. If such changes are necessary they are to be made in such a manner as to not jeopardize the validity and comparability of the macroinvertebrate community data

It is likely that some of the sampling sites for this project will have to be moved because conditions are not appropriate. Should that be necessary, the DEC has provided the following guidelines for identifying an acceptable alternative site location:

The ideal location should represent the dominant physical characteristics of the stream segment being assessed. That is, the stream channel width, depth, and current velocity along with the frequency of riffles, substrate composition, canopy cover, riparian vegetation, among other physical attributes should all be to the greatest degree possible representative of the stream segment in question.

In some cases the stream may be dominated by low gradient, slow meanders, with a substrate dominated by sand and or silt. In these cases where an appropriate alternate, fast flowing, riffle dominated site is not located within the desired segment the sampling methodology may be changed to the use of a "net jab" and the corresponding biological community metrics for use in "sandy streams" applied during analysis (See NYSDEC SOP 208-209).

The macroinvertebrate net jab technique consists of jabbing the aquatic net 5 times in productive habitats. A single jab consists of aggressively thrusting the net into the target habitat for a distance of approximately 1 meter, i.e., the distance the net can be swept while standing in one place. The intended depth of the jab should be 1-2 inches to include primarily surficial materials. The initial jab is followed by 2-3 sweeps above the same area to collect dislodged organisms. Preferred

productive habitats are areas of silt and detritus, and may include woody debris and submerged macrophytes. Areas to be avoided are those characterized by clay, homogeneous sand, or algae. If the net becomes clogged by these materials, the net contents are discarded, and the sample is redone.

In instances where a kick sample or a net jab may not be appropriate due to restrictive physical characters of the stream a biological sample may not be feasible. In these situations choose the site most representative of the entire segment and perform all physical habitat assessments along with basic water chemistry information. These procedures may be conducted from the shoreline.

II. DATA GENERATION AND ACQUISITION

1. Rationale of Monitoring Design

See Figure 1. "Stream Biomonitoring Project: Sites to Sample 2012. Orange County, NY" and Table 6 of same title.

Note that, although no sites in the map or the table are located within the Moodna Creek Watershed, samples will nonetheless be taken within this area; Kelly Dobbins and Simon Gruber, who were both trained in sample collection by Kelly Nolan last August, will be collecting a small number of samples within this Watershed for analysis and reporting by Watershed Assessment Associates. Ms. Dobbins and Mr. Gruber also plan to collect samples on a tributary of the Ramapo River, downstream of the Village of Kiryas Joel, and possibly at other sites in Orange County, as well.

Similar work is also being done by trained volunteers in the Quassaick Creek Watershed. These samples, which will also be analyzed and reported on by Watershed Assessment Associates, will supplement professionally-collected data to develop a Watershed characterization in an upcoming watershed plan (funded by OC Planning Department and the NYS Department of State's Local Waterfront Revitalization Program).

All involved parties understand that this volunteer-collected data will not meet DEC's requirements and therefore not be accepted by DEC.

onitoring Project: Sites to Sample 2012. Orange County, NY

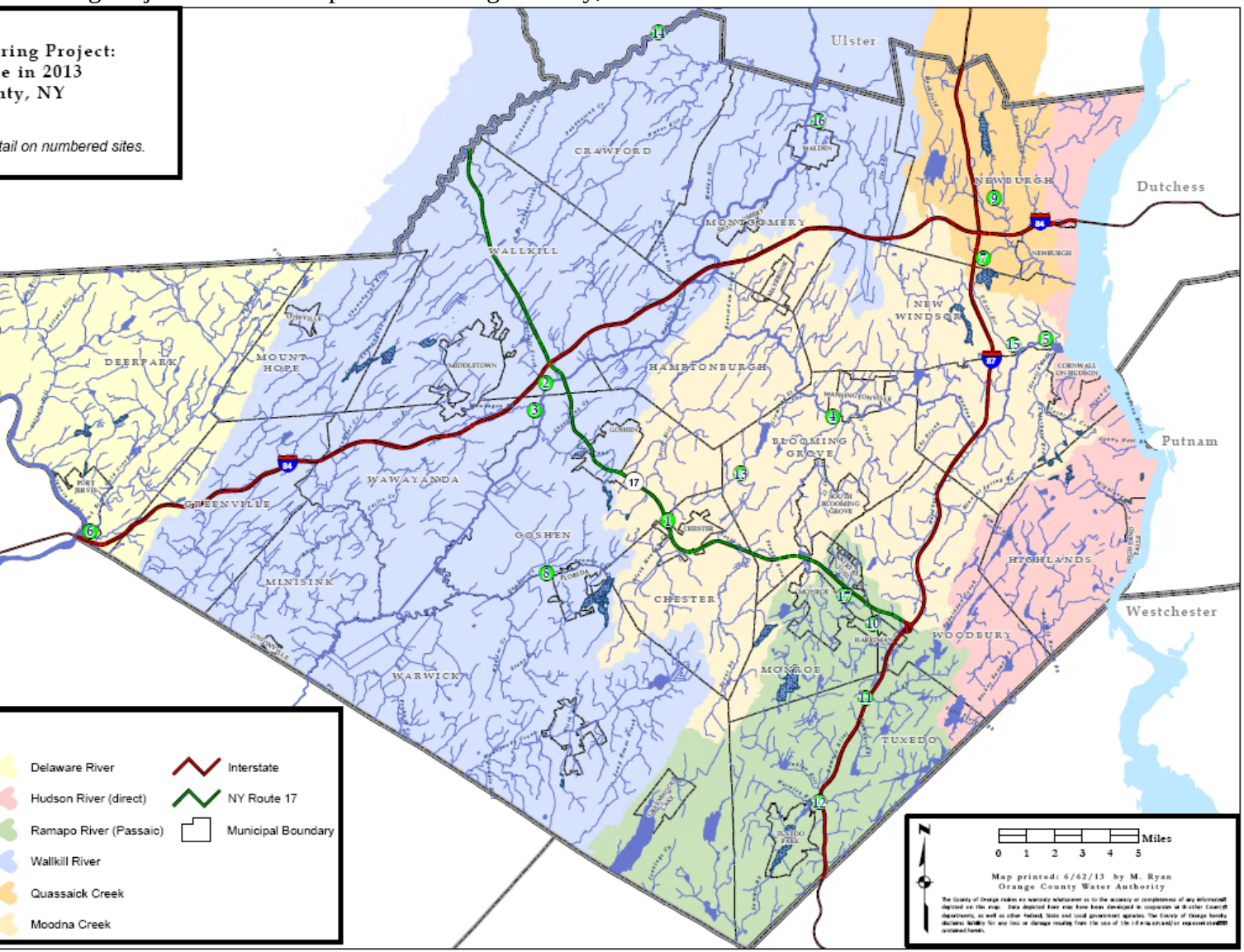


Table 6. Stream Biomonitoring Project: Sites to Sample 2012. Orange County, NY

Site Name	LATITUDE	LONGITUDE	Stream	General Location Information	Watershed	Purpose	Sampling Schedule
1	41.365961	-74.288846	Black Meadow Creek	Black Meadow Creek, at the State Route 17M bridge in Chester	Moodna	Monitoring would include impacts from the Village of Chester's commercial corridor	Jul-13
2	41.43765	-74.372867	Masonic Creek	Masonic Creek, Just above Golf Links Road (County Route 50) bridge in Wallkill	Wallkill	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13
3	41.4234	-74.38025	Monhagen Brook	Monhagen Brook, Just above Golf Links Road (County Route 50) bridge in Wawayanda	Wallkill	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13
4	41.419717	-74.175	Moodna Creek	Moodna Creek, Just below State Route 94 bridge in Washingtonville	Moodna	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13
5	41.459367	-74.027783	Moodna Creek	Moodna Creek, ~1,300 feet Above New Windsor Sewage Treatment Facility in New Windsor	Moodna	Site includes cumulative impacts from entire Moodna Creek Watershed, just before entering important tidal habitats before the Hudson River.	Jul-13
6	41.360383	-74.686467	Neversink River	Neversink River, Below East Main Street (US Route 6) bridge, immediately downstream of confluence with Mill / Clove Brook on Port Jervis/Deerpark boundary	Delaware	Good water quality in the past. Monitoring for change.	Jul-13
7	41.501602	-74.070844	Patton Brook	Patton Brook, just upstream of State Route 300 (west side of Route 300) in Newburgh (town)	Quassaick	New site meant to get baseline data. Stream feeds drinking water supply.	Jul-13

8	41.3389	-74.372367	Quaker Creek	Quaker Creek, Just above Pumpkin Swamp Road bridge (upstream of confluence with unnamed tributary) on border of Goshen and Warwick	Wallkill	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13
9	41.532624	-74.063045	Quassaick Creek	Quassaick Creek, adjacent to the Town of Newburgh Town Hall (immediately downstream of State Route 300 bridge)	Quassaick	New site meant to get baseline data.	Jul-13
10	41.311917	-74.148	Ramapo River	Ramapo River, Just below River Road bridge in Harriman	Ramapo	Slightly impacted in 2005 but not sampled since. Monitoring for change.	Jul-13
11	41.273517	-74.15315	Ramapo River	Ramapo River, at the end of Waters Street in Tuxedo	Ramapo	Slightly impacted in 2005 but not sampled since. Monitoring for change.	Jul-13
12	41.219407	-74.185343	Ramapo River	Ramapo River, ~800 feet downstream of confluence with unnamed tributary (drains We-Wah Lake) in Tuxedo	Ramapo	Monitoring for change from previous years and upstream samples (sites 10 & 11)	Jul-13
13	41.349917	-74.2403	Seeley Brook	Seely Brook at County Rte 51 northwest of Rose Ann Lane in Blooming Grove.	Moodna	Slightly impacted in 2005 but not sampled since. Monitoring for change.	Jul-13
14	41.619283	-74.29435	Shawangunk Kill	Shawangunk Kill, immediately upstream of Hardenburg Road bridge in Crawford	Wallkill	Monitoring downstream of the Pine Bush Wastewater Treatment Facility	Jul-13
15	41.456583	-74.050417	Silver Stream	Silver Stream, just southwest of Old Forge Hill Road at Provost Drive in New Windsor	Moodna	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13

16	41.57338	-74.18395	Tin Brook	Tin Brook, Just below State Route 208 bridge in Montgomery (town)	Wallkill	Slightly impacted in past. Monitoring for change.	Jul-13
17	41.326633	-74.1679	Unnamed tributary	Unnamed Tributary, Just upstream of Bakertown Road (County Route 105) bridge in Monroe (town)	Ramapo	Poor water quality in the past. Potentially impaired and in need of remediation. Monitoring for change and continued impairment.	Jul-13

2. Sampling Methods

A User Perception Survey and a Habitat Assessment will be performed at every site according to sections 9.9 and 9.10 respectively of NYS DEC SOP 208-12.

Benthic macroinvertebrates will be collected by kick sampling according to section 9.41 or by multiplate sampling according to section 9.4.3 of NYS DEC SOP 208-12. Assessment of stream reach physical habitat characteristics will be performed at every site according to section 9.10 of NYS DEC SOP 208-12.

3. Sample Custody Procedures

Individual sample containers are marked to identify each station number, collection date, sample collector and location. Containers are labeled using a waterproof label and archival/pigment ink to prevent loss due to contact with sample preservative or water. Labels should be placed on the container lid and side. A separate label is placed inside each sample container. A chain of custody of macroinvertebrate samples shall be maintained by those projects with separate laboratories performing sampling and analysis (see appendix B).

Sample containers required for preservation, transport, and storage of sample material are equivalent in size to 1 Quart, preferably plastic, and with a screw top lid. Containers meeting these specifications can be purchased through most scientific equipment suppliers. If sample containers are to be re-used they must be rinsed under regular tap water a minimum of three times.

After samples have been processed, the remaining sample material is retained for at least one full calendar year. Samples are archived in a flame resistant location and easily accessible for re-processing if needed. After one calendar year, all sample material may be disposed of. Disposal must be performed according to all applicable local laws and regulations. Typically this consists of straining all alcohol from sample material and flushing it with copious amounts of water down a sink drain before disposing of all sample material in the regular trash.

4. Analytical Methods

The NYS DEC will only accept raw data (data sheets and field sheets) from PEERS Participants. Analysis of the data will be performed by the NYSDEC External Data Coordinator in order to ensure comparbility with DEC-collected data.

Any taxonomic references used in this project that are *not* listed in table 18.12 of NYS DEC SOP 208-12 must be reported to the External Data Coordinator.

Laboratory performing analysis: Watershed Assessment Associates, 28 Yates St., Schenectady, NY 12305; contact is J. Kelly Nolan, Director of Environmental Services, phone 518-346-0225, email jkn@rwaa.us.

Subsampling and organism identification will be performed at the Watershed Assessment Associates laboratory following methodology in NYS DEC SOP 208-09 sections 9.4.1 and 9.4.3

5. Quality Control

The following measurements will be used to assess the quality of data being generated in the project.

A. Precision

A second subsample is analyzed for at least 5% of all samples. This is to assess the precision of subsampling procedures. Repeated subsamples must contain at least 75% or greater of the same macroinvertebrate orders.

B. Accuracy

To ensure accuracy of all macroinvertebrate identifications, 10% of all samples collected will be re-identified and re-enumerated "in-house" by the laboratory. An additional 10% of all samples will be re-identified and re-enumerated by a separate laboratory not owned or operated by the primary laboratory and of similar expertise with NABS certified taxonomists conducting the analysis. Outside laboratory providing QA/QC is Lotic, Inc., 2 Newell Court, Unity, ME 04988; Lotic Inc. SFS-certified taxonomist is John Tipping.

Additionally, all taxa identified in the dataset will be compared to the Benthic Macroinvertebrate Species List given in table 18.10 of NYS DEC SOP 208-12. Taxa not contained in this list are retained in separate specimen vials and submitted to the External Data Coordinator as reference.

C. Blanks

Not Applicable.

D. Representativeness and Comparability

B.

C. While in the field, samples are examined and organisms are quickly identified to the ordinal level. In the laboratory, samples that contain less than 50% of the orders seen in the field will be invalidated unless confirmed by replicate sampling or additional subsampling.

E. Completeness

The goal of this project is to process at least 20 of the total 20 samples collected..

6. Instrument/Equipment Testing, Maintenance, and Calibration Procedures

Multiprobe meters are calibrated according to NYS DEC SOP 211-11 or manufacturer's instructions. Instruments that fail calibration are not used. Macroinvertebrate samples should not be collected when functioning multiprobes are not available.

Field Cleaning - Field cleaning of equipment is necessary to prevent possible contamination by invasive species from one site to another. Field cleaning procedures are described in NYS DEC *SOP 106-10 IN DEVELOPMENT*.

When not in use, equipment should be stored in a clean environment.

7. Supplies and Consumables

Equipment used in the project is maintained in a complete and current inventory. Major items are listed in Table 6.

Table 7. Equipment Maintained
See NYSDEC SOP 208-12 section 8 as a reference for developing this equipment list.

Expendable Items	Description	Number
Alcohol	**ethanol**	10 gal.
Kick sample jars	**Polyethylene, 1 qt.**	**25**
Multiplate sample wood	**4x8' masonite**	**2sheets/yr**
Cable for sampler installing	**1/8 inch**	**120ft /yr**
Turnbuckles	**standard**	**35/yr**
Swivel snaps	**standard**	**70/yr**
Microscope slides	**standard**	**2 gross/yr**
Microscope slide coverslips	**standard**	**2 pack/yr**
Mounting media	**CMMP**	**500 ml/yr**
Kim Wipes	**standard**	**1 box/yr**
pH buffer solution	**standard**	**1 case/yr**
Forceps/probes	**standard**	**2pair/yr**
Petri dishes	**standard**	**2/yr**
Spray bottles	**standard**	**2/yr**
Labels	**standard adhesive**	**1 box/yr**
Gallon jugs for multiplate floats	**½ gallon**	**1 case/yr**
Patio blocks for multiplates	**standard**	**5/yr**
Replacement kick nets	**standard**	**2/yr**
Batteries	**AA, C, D**	4 pack each/yr
Conductivity standard	**100 and 500**	**1 gal each/yr**
Jar caps	**for 4 oz jars**	**1 box/yr**
Glass vials for sorting	**1 dram**	**1 case/yr**
Waders	**standard**	**2 pairs/yr**

Permanent Equipment	Description	Number
Dissecting microscope	Leica MX-12 8-100 power high grade	**1**
Dissecting microscopes	**Nikon SM2645 10-50 power high grade**	**8**
Dissecting microscopes	**Back-up**	**8**
Compound microscopes	**Swift Five Series high grade with 40,100,400, and 1000 (oil immersion) magnification with bright field, dark field, and phase contrast**	**8**
Microscope illuminators	**150 watt dual fiber optic light sources**	**8**
Microscope illuminators	**50 watt halogen external light sources**	**12**
Watercraft	**Manually-powered**	**3**
Fume hoods	**standard**	**2**
Dry oven for slide mounting	**standard**	**1**
Canton sorting trays	**Gridded and modified gridded, Marchant box**	**6**
Tally counters	**standard**	**4**

Sieves	**Various standard**	**4**
Safety equipment	**Standard field and laboratory; field decontamination equipment**	**3**
Meters	**YSI-556 hand held multi-parameter probes**	**2**
Meters	**Hydrolab Quanta handheld multi-parameter probe**	**1**
Computers	**Dell Precision 690 station with 3 hard drives (80, 250,500 GB linked to 5 laptop computers at laboratory workstations; 3 Panasonic Toughbook field computers-GPS capable, with topographic and street mapping; Brother laser printers**	**8 computers, 2 printers**
Samplers	**Multiple nets, multiplates, poles, storage and transportation containers**	**25**
Global positioning system unit	**WAAS enabled GPS units**	**5**
Flow meter	**standard**	**1**
Secchi disks	**standard**	**3**
Measurement instruments	**Leica DISTO laser distance measurement instrument and 100 meter fiberglass measuring tapes**	**3**
Water sampler	**DH-81 depth integrating wading water sampler**	**1**
Waterproof digital cameras	**Sealife Ecoshot**	**5**
Colorimeter	**Hach DR/890**	**1**
Two way communication radio	**Marine grade**	**3**

8. Data Management

Field data including the Monitoring parameters (location, physical and chemical) are recorded on the Field Datasheet (18.1 in NYSDEC SOP 208-12).

Once field collection is complete and samples are brought back to the laboratory each sample must be logged in. An electronic “Lab Datasheet” is created recording the sample identification information including the four letter identifier for the site, station number, collection date, sample type, and replicate number. Raw data (species identifications and numbers of individuals of each species in a sample or subsample) are recorded on a separate Lab Datasheet for each site/date collection. The format for the electronic “Lab Datasheet” is given in 18.8 of NYSDEC SOP 208-12.

Field Instrumentation calibration results, Field Datasheets, and Lab Datasheets are stored at the laboratory for at least one year.

III. ASSESSMENT AND OVERSIGHT

1. Performance and System Audits

The project is audited by the External Data Coordinator annually to determine compliance with the requirements of this QAPP. The audit is performed on site and in the laboratory to assess procedures and data management.

Field Audit
Once per sampling season, the External Data Coordinator will observe each PEERS Participant collecting samples while in the field. Any discrepancies from this document or the project specific PEERS QAPP will be noted in the final report.

Laboratory Audit
Once per year, the External Data Coordinator will observe each PEERS Participant identifying samples in the laboratory. Any discrepancies from this document will be noted in the final report.

If the participating laboratory is located outside of NY State, we will contact colleagues with comparable professional credentials in that state to perform the audit. Although this is not ideal, it is still preferable to no audit at all.

2. Corrective Action

If a PEERS participant knowingly submits false data they will be excluded from the PEERS program indefinitely. False data may include but is not limited to site location information, field data, or macroinvertebrate identifications.

Precision

Repeated subsamples must contain at least 75% or greater of the same macroinvertebrate orders. Failing this criteria, samples will be rejected. Adjustments in assessments may be made for headwater sites or sites affected by lake outlets or poor habitats (see NYSDEC SOP 208-12 Appendices 18.13 and 18.14).

Accuracy

Species identifications that are not found on the New York State species list must be sent to the External Data Coordinator. Specimens that cannot be reconciled by the Stream Biomonitoring Unit will be sent to outside experts for positive identification.

Representativeness

Kick sample and/or multiplate sample results are compared to field records of observed organisms to determine if the kick sample is representative of the fauna in the area sampled. Samples that show less than 50% of the major groups observed in the field will be invalidated unless confirmed

by replicate sampling or additional subsampling. Samples that are shown to be invalid and cannot be resolved by additional subsampling are not included in the data analysis process.

Completeness

Raw data are submitted to the External Data Coordinator. It is her responsibility to submit these data to the NY S DEC SBU database and calculate the metrics. All data entered into computer files are validated by comparison of number of individuals and number of species from each Laboratory Data Sheet. The database automatically checks the spelling and presence of an organism with its master species list before allowing import. Unrecognized taxa are referred to the user for reconciliation.

3. Reports to Management

After the above QC calculations and examinations have been performed for all media, the results will be summarized in a final report compiled by the PEERS Project Coordinator. This report shall include:

- All Field Datasheets
- All Laboratory Datasheets
- All User Perception Surveys
- All Habitat Assessments
- Summary reports from field and laboratory audits
- A summary of the data verification, validation, and usability

A copy of the final report and a copy of all datasheets must be submitted to the NYS DEC External Data Coordinator before the completion of the project as defined in section 6.5.

The NYS DEC reserves the right to refuse any questionable data.

4. Data Validation and Usability

Data Review

All data will be reviewed by the External Data Coordinator to determine its validity prior to use. Those data not meeting the previously identified criteria for precision, and accuracy values will not be used. This information will be noted in the final report.

A. Precision

Samples that are shown to be invalid (see Sections II.5.A) and cannot be resolved by additional subsampling are not included in the data analysis process.

B. Accuracy

Percent Difference in Enumeration (PDE) and Percent Taxonomic Disagreement (PTD) will be calculated for both "in-house" and external assessments as per "Data Quality, performance, and uncertainty in taxonomic identification for biological assessments" by Stribling, Pavlik, Holdsworth and Leppo (2008) and "Determining the quality of taxonomic data" by Stribling, Moulton, and Lester (2003). A goal of 85% similarity between labs and an even higher internal similarity is recommended. The External Data Coordinator will use best professional judgment to determine if the % similarity is satisfactory. The External Data Coordinator will use best professional judgment to determine if the % similarity is satisfactory.

Species identifications that are not found on the New York State species list and are not corroborated by the NYS DEC Stream Biomonitoring Unit Laboratory will not be included in the analysis process.

C. Completeness

Incomplete data sets for a single site will not be accepted by this program. Site data will be considered incomplete if any of the following data sets are missing for the site: field parameters, user perception survey, habitat assessment, macroinvertebrate sample. This will not preclude the acceptance of complete data sets from other sites.

D. Data Validation Flags

Not Applicable

E. Reporting

After the above QC calculations and examinations have been performed for all participating professional assessments, the External Data Coordinator will summarize the results in an annual summary report.

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3. EPA's Volunteer Monitoring QAPP Checklist (Reg. 2 Guide & G-5): http://www.epa.gov/region02/Monitor/volun/vol_mon_qapp_checklist.pdf
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