Quality Assurance Project Plan

Water Quality Monitoring of

Saw Mill River
Westchester County

August 17, 2020

Riverkeeper, Inc.
20 Secor Road
Ossining, NY 10562

The Sarah Lawrence College Center for the Urban River at Beczak
35 Alexander Street
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Approval Signatures

Meredith Streeter – NYSDEC Program Manager — Date 8/21/2020

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Keleigh Reynolds – NYSDEC PEERS Program Coordinator — Date 8/21/2020

Gavin Lemley – NYSDEC Project QA Officer — Date 8/23/2020

Jennifer Epstein – PEERS Project Coordinator, Riverkeeper Water Quality Program Scientist — Date 8/20/20

Dan Shapley – Riverkeeper Water Quality Program Director — Date 8/20/20

Ryan Palmer – SLC CURB Director — Date 8/20/20

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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. All PEERS Participants collecting samples will receive all QAPPs and SOPs referenced in this document as a ZIP folder.

Name	Title	Organization	Document type
Meredith Streeter	Program Manager	NYSDEC	Electronic
Brian Duffy Keleigh Reynolds	PEERS Program Coordinator and QA Officer	NYSDEC	Electronic
Gavin Lemley	Project QA Officer	NYSDEC	Electronic
Lewis McCaffrey	NYS DEC Assistant QA Officer	NYSDEC	Electronic
Jennifer Epstein	PEERS Project Coordinator	Riverkeeper	Electronic
Katie Lamboy	PEERS Participant Collecting Samples	SLC CURB	Electronic
Ryan Palmer	PEERS Participant Collecting Samples	SLC CURB	Electronic
Sebastian Pillitteri	PEERS Participant Collecting Samples	Riverkeeper	Electronic
Dan Shapley	Riverkeeper WQ Program Director	Riverkeeper	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

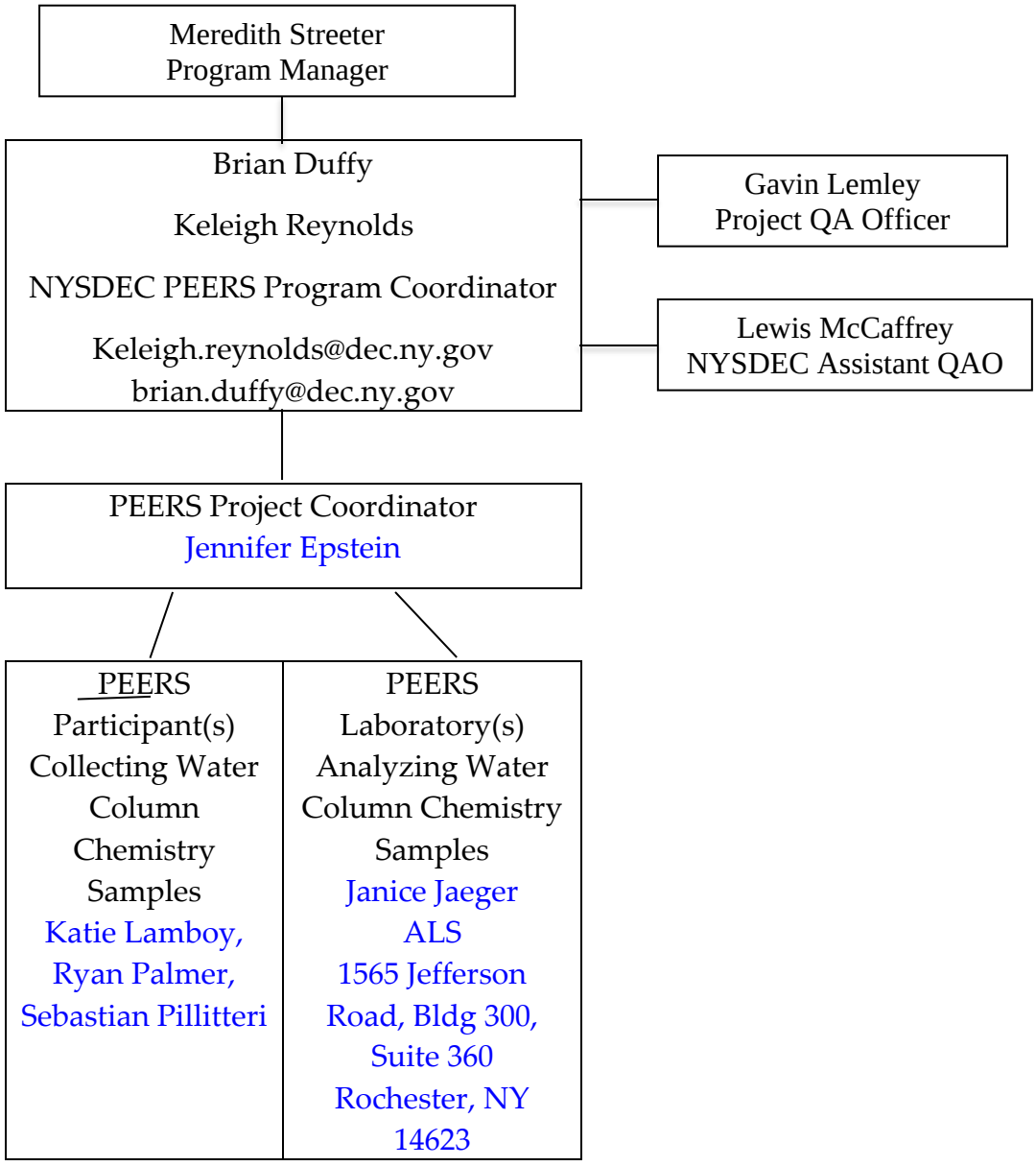
1. **Organization/Responsibilities:**

Table 1: Responsibilities and Qualifications of Participants

The responsibilities for participants in this project are provided in Table 1.

	Responsibilities	Qualifications
NYS DEC		
Program Manager: Meredith Streeter	Oversight of PEERS program and coordination with statewide waters monitoring programs	
PEERS Program Coordinators: Brian Duffy Keleigh Reynolds	The PEERS Program Coordinators implement the PEERS program including but not limited to writing each project specific PEERS QAPP in collaboration with the PEERS Project Coordinators, conducting the spring training/calibration, performing annual audits, maintaining all documentation and records for the department, and managing and analyzing resulting data for the department.	
External		
Jennifer Epstein PEERS Project Coordinator	The PEERS Project Coordinator implements their own PEERS project including writing the project specific QAPP in collaboration with the PEERS Program Coordinator, submitting documentation of professional status, coordinating sampling efforts, training participants collecting water chemistry samples, coordinating laboratory analyses, and summarizing the results in a final report.	Satisfies the requirements given in section I.5
Katie Lamboy, Ryan Palmer, Sebastian Pillitteri PEERS Participants collecting samples	The PEERS Participants are responsible for collecting water column chemistry and/or biological (macroinvertebrate) samples.	Water column chemistry and biological sampling certification and experience described in section I.5
ALS 1565 Jefferson Road, Bldg 300, Suite 360 Rochester, NY 14623LS PEERS Laboratory Analyzing Water Column Chemistry Samples	The PEERS Laboratory(s) is responsible for analyzing water column chemistry samples	Satisfies the requirements in section I.5

Organization Chart



2. Background

The purpose of this project is a collaboration between the New York State Department of Environmental Conservation (NYSDEC) Stream Section and self-funded stream monitoring projects outside the NYSDEC. Under PEERS, the intent is to ensure external data is collected to satisfy NYSDEC Quality Assurance (QA) criteria and may be used to augment the NYSDEC Streams Section's Water Column Chemistry and/or Biological (macroinvertebrate) datasets.

In order to minimize exposure while continuing to execute the core mission of Division of Water (DOW) monitoring efforts in light of COVID-19, modifications to certain protocols were developed that incorporate social distancing recommendations. E Standard operating procedure (SOP) with specific reference to social distancing and COVID-19 (SOP#101-20.COV – Appendix B, SOP#210-20.COV- Appendix E, SOP#211-

20.COV – Appendix F) contain the suffix .COV and are accessible through an attached ZIP file. For general Health and Safety concerns related to COVID-19 and social distancing refer to DOW Guidance for Field Work During COVID-19 Pandemic (SOP #603-20).

PEERS is meant to support objectives of the DOW by providing water quality data used for updates to assessment status, reporting to USEPA, and data for temporal and spatial trends analysis across NYS.

The Saw Mill River flows approximately 22 miles from suburban Chappaqua, NY, to the Hudson River at Yonkers, NY. The river's namesake highway, the Saw Mill River Parkway, parallels it for much of its course. Trunk lines which transport wastewater to the Yonkers Joint Wastewater Treatment Plant--the largest discharge to the Hudson River Estuary north of New York City, according to Hudson River Estuary Program data (NYS DEC, 2017), also run parallel to the Saw Mill River. In addition to channel modifications involved with construction of sewer and transportation infrastructures, the Saw Mill River has been modified in multiple locations for flood control.

For the purpose of its water monitoring obligations, NYSDEC has divided the stream into three Waterbody Inventory/Priority Waterbodies List (WI/PWL) segments:

- Saw Mill River, Lower, and tribs (1301-0007)
- Saw Mill River, Middle, and tribs (1301-0100)
- Saw Mill River, Upper, and tribs (1301-0101)

The most recent sampling data cited in NYSDEC's WI/PWL are from 2002-2003 or older, depending on location. However, volunteer groups, non-profit organizations, government agencies, and researchers have completed a variety of water quality sampling and research, including analysis of nutrients, dissolved oxygen, turbidity, metals, macroinvertebrates and fecal indicator bacteria (Carbonaro, 2007; Fiordaliso and Hersh, undated; Nardi et al., 2018; Riverkeeper, 2019). Most of these projects have explored either or both of two patterns that were reported by NYSDEC based on 1992 macroinvertebrate data (Bode et al., 1993) and a 1984 USGS sediment study (Rogers, 1984): (1) that water quality degrades from upstream to downstream, and (2) that urban stormwater runoff, industrial discharges, and wastewater inputs in and around Yonkers are the causes of poor water quality in the lowermost reach of the stream.

Riverkeeper and The Sarah Lawrence College Center for the Urban River at Beczak (SLC CURB) have been sampling the Saw Mill River for *Enterococcus*, an indicator of sewage contamination, since 2015. Sampling has been conducted approximately twice per month, from May to October. Samples have been collected by volunteers and processed at SLC CURB (not ELAP certified) using the EPA-approved IDEXX Enterolert system. When geometric mean values are calculated for all samples collected over the duration of the study (2015-2019, 54 samples), sites in Pleasantville (Saw Mill River, Upper, and tribs [1301-0101]), Greenburgh (Saw Mill River, Upper, and tribs [1301-0101]) and Yonkers (Saw Mill River, Lower, and tribs [1301-0007]) had the highest geometric means of 15 sites sampled (Table 2; Riverkeeper, 2019). While fecal indicator

bacteria do not necessarily indicate the same pollution sources as macroinvertebrates, it is interesting to note that the pattern shown by *Enterococcus*—that of high counts in both the upper and lower watershed—is different from the pattern of gradually declining water quality from upstream to downstream, revealed by NYSDEC RIBS macroinvertebrate data (Bode et al., 1993). A five-year (2008-2012) study of pathogen indicators and water chemistry conducted by Groundwork and Manhattan College with funding from the EPA Urban Waters program, also showed poor water quality in some parts of the upper watershed (Saw Mill River Coalition, 2012).

Table 2: Geometric Means of Enterococcus Counts at Selected Sampling Sites

Site Name	River Mile	WI/PWL Segment	Geometric Mean of Enterococcus Counts (Most Probable Number)	Number of Samples
Yonkers- Walsh Road	1.11	Saw Mill River, Lower, and tribs (1301-0007)	711.3	54
Greenburgh- Rum Brook Park ballfields	10.41	Saw Mill River, Upper, and tribs (1301-0101)	623.2	53
Pleasantville- Pleasantville Road	18.84	Saw Mill River, Upper, and tribs (1301-0101)	736.9	53

The Riverkeeper/SLC CURB and Groundwork studies, as well as other work completed by volunteer, academic researchers and non-profit groups, demonstrate that there are threats to water quality in the middle and upper Saw Mill River watershed, and that conditions may have deteriorated since NYSDEC last conducted macroinvertebrate sampling in those segments (in 1992). In the lower Saw Mill River watershed, more recent macroinvertebrate data are available, but are nonetheless approaching 20 years old, and they lack contemporaneous information from elsewhere in the watershed. In addition, Groundwork Hudson Valley and the City of Yonkers have recently completed multiple restoration projects in the lower Saw Mill River, the most notable of which was the “daylighting” of a section near the river’s mouth, which brought the river out of an underground pipe and back into communication with downtown Yonkers. This project

will provide updated water quality data on the Saw Mill River and will not include macroinvertebrate community sampling.

The PEERS Program is intended to support objectives of the DOW by providing water quality data used for updates to assessment status, reporting to USEPA, and data for temporal and spatial trends analysis across NYS and this project aligns with those objectives.

3. Project/Task Description

PEERS is a collaboration between the NYSDEC Streams Section and self-funded stream sampling projects external to the NYSDEC. PEERS sampling projects may include any combination of the parameters sampled at RIBS screening or routine network locations (see RIBS QAPP, 2020) and are not limited in the minimum or maximum number of samples they may collect. The steps below describe one complete cycle in any PEERS project. The schedule for these tasks is given in Table 3.

- A project specific quality assurance project plan (QAPP) is completed before sampling begins by the PEERS Program Coordinators and PEERS Project Coordinator using the attached PEERS Project QAPP Template (Appendix G) and appropriate NYSDEC QA guidance documents.
- Also before sampling begins, the PEERS Project Coordinator and PEERS Participants collecting samples attend a field demonstration and calibration session. These are all conducted by the NYSDEC PEERS Program Coordinators *except* the training for PEERS Participants Collecting Water Column Chemistry Samples which may be conducted by the PEERS Project Coordinator. The PEERS Program Coordinators audit at least one training session conducted by the PEERS Project Coordinator.
- PEERS Participants perform field sampling according to the project specific QAPP. The PEERS Program Coordinators audit at least one sampling event for each PEERS Project. If discrepancies are observed, the PEERS Program Coordinators may do a second audit later in the sampling season.
- PEERS Laboratory(s) analyze Water Column Chemistry samples and/or identify macroinvertebrates in the biological samples as per NYSDEC QA documents. The PEERS Program Coordinators audit each laboratory identifying macroinvertebrate samples while samples are being processed. Laboratories processing water column chemistry samples are audited as part of the ELAP program.
- The PEERS Project Coordinator submit data files and a final report summarizing all quality assurance assessments to the WAVE/PEERS Coordinator by February 1 of the following year.
- The PEERS Program Coordinators add these data to the Stream Monitoring and Assessment Section database qualifying its usability or lack thereof.

The study area is the Saw Mill River watershed (Figure 1). We will sample two locations in each WI/PWL segment of the Saw Mill River, four times per season (April-October). We plan to sample for two consecutive years. SLC CURB has received a grant from the Westchester Community Foundation to cover the first year of sampling; however, we have yet not obtained funding to cover the second year of sampling. By providing uniform, recent data from multiple locations in each segment of the river, we will enable updates of the waterbody assessment and allow comprehensive comparison with past data. At each sampling

location, we will collect: (1) in situ data using a multi-parameter probe, (2) water samples for laboratory analysis, and (3) information about trash.

Sampling will take place between August and October in 2020 and between May and October in 2021. The field demonstration/calibration session and field audit will be scheduled once the QAPP is approved, in keeping with the milestones listed in Table 3.

Table 3: Project Schedule

Task	Completion Date
Finalized PEERS Project QAPP(s)	Before sampling begins
Field demonstration and Calibration Session(s)	Before sampling begins
Sample Collection	Water Column Chemistry Samples are collected April - October
Field Audits	At least once per sampling season
Final Reports submitted by PEERS Project Coordinators	March after sampling
Data added to the Streams Section Database and Metrics Calculated	May after sampling

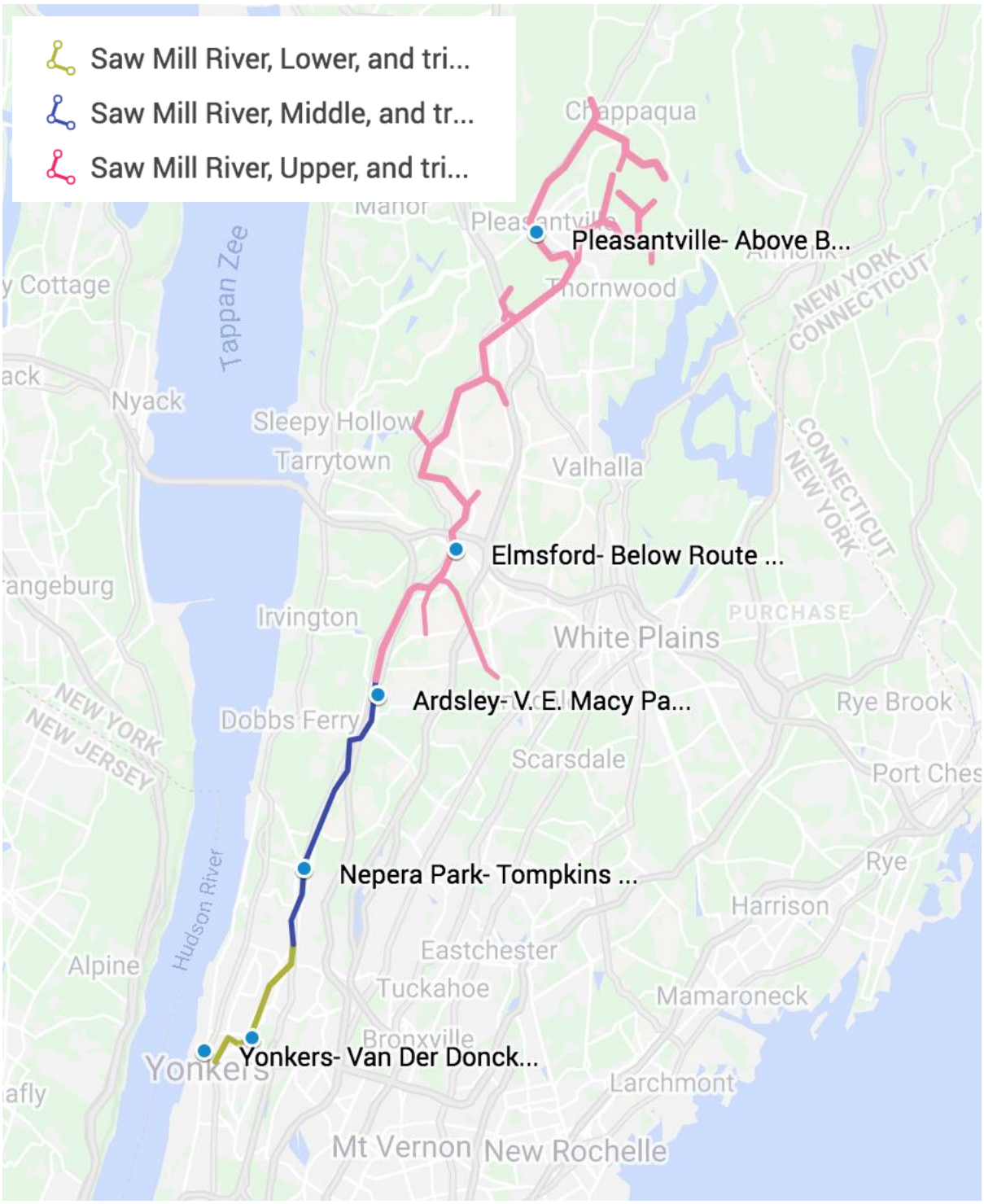


Figure 1. Location of proposed sampling locations on the three WI/PWL segments of the Saw Mill River.

4. Quality Objectives and Criteria

Data quality requirements for this project are as follows

1. Precision and Accuracy

    a. Water Column Chemistry analyses are all drawn from 40CFR 136 EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Wastewater and Sewage Sludge, Final Rule. Specific analyses as well as detection limits, precision and accuracy of each analysis are listed in Table 4.

Table 4. Water Chemistry Analytical Specifications

Parameter	Analytical Lab	Standard Method	Precision	Accuracy	Calibration	Blanks	Method Detection Limit	Quantitation Limit
Ammonia	ALS	D6919-09	^	± 25%	~	Every 10	0.004 mg/L	0.01 mg/L
TKN	ALS	EPA 351.2	^	± 25%	~	Every 10	0.098 mg/L	0.1 mg/L
Nitrate	ALS	EPA 353.2	^	± 25%	~	Every 10	0.02 mg/L	0.05 mg/L
Nitrite	ALS	E353.2	^	± 25%	~	Every 10	0.007 mg/l	0.05 mg/L
Total Nitrogen	ALS	calculated	^	N/A	~	~	~	~
Total Phosphorus	ALS	EPA 365.1	^	± 25%	~	Every 10	0.004 mg/L	0.005 mg/L
Turbidity	ALS	EPA 180.1	^	N/A	~	Every 10	0.06 NTU	0.1 NTU
Alkalinity	ALS	SM 2320B	^	N/A	~	Every 10	1.8 mg/L	2.0 mg/L
Hardness	ALS	SM 2340C	^	± 25%	~	Every 10	NA	2.0 mg/L
Chloride	ALS	EPA 300.0	^	± 25%	~	Every 10	0.041 mg/L	0.2 mg/L
Magnesium	ALS	EPA 200.7	^	± 25%	~	Every 10	0.068 mg/L	1 mg/L
Chlorophyll a	ALS	SM 10200 H	^	N/A	~	Every 20	N/A	0.4 ug/L

^ Precision is calculated using the following equation: %RPD > (0.9465x^-0.344)100 +5, where: x = sample / detection limit
%RPD = [diff(lab duplicate pair)/av(lab duplicate pair)]*100. See SOP 110-19: Data Validation and Verification for more details
~ calibrated by analytical laboratory

2. Site Selection and Representativeness

The site locations provide information from multiple locations in each stream segment. By sampling in each segment of the waterbody, the data will be representative of the watershed overall. The land use and river characteristics at the sampling sites are typical of their respective segments and the watershed overall. Grab samples will be collected into a churn which are considered representative due to the relatively small stream size according to the Standard Operating Procedure: Collection of Ambient Water Quality for RIBS Program Sampling (SOP #210-20.COV). We will ensure that collected samples accurately represent the waterbody by adhering to the collection procedures, sample preservation, and sample handling protocols outlined in this QAPP.

3. Completeness

The goal of this project is to sample and analyze at least 80% of the proposed sites and 8 samples validated per PWL segment over two years.

5. Training Requirements/Certifications

Certification/Education and Experience Requirements

Each of the following roles require distinct certification, education, and experience:

- PEERS project coordination
- Water Column Chemistry sampling
- Water Column Chemistry analysis
- Biological (macroinvertebrate) sampling
- Identification of biological samples

These roles may be performed by the same or separate individuals. The requirements for each role are outlined in Table 1.

Qualifications and certifications are submitted to the NYSDEC PEERS Program Coordinator before the PEERS Project QAPP is approved (see application form, Appendix H). The NYSDEC reserves the right to reject QAPPs or professional credentials if there are any quality concerns or conflicts of interest.

Training Requirements

PEERS Project Coordinators and PEERS Participants are required to attend a training/calibration session for field sampling techniques. Credentials required for each participant are described in Table 5.

The PEERS Program Coordinator conducts all training/calibration sessions for PEERS Project Coordinators and PEERS Participants Collecting Biological Samples. These sessions are held before sampling begins and within the same year as sampling will occur

The PEERS Project Coordinators train PEERS Participants in Water Column Chemistry Sampling techniques before sampling begins and within the same year as sampling occurs. This practice follows the "train the trainer" model (for Water Column Chemistry sampling only).

The field training and calibration session consist of both a demonstration of field techniques outlined in the PEERS Project QAPP and a calibration of these techniques.

- To calibrate Water Column Chemistry sampling, the PEERS Program Coordinator observes the PEERS Project Coordinator and PEERS Participants Collecting Water Column Chemistry Samples complete the field sampling procedures using a practice set of sample bottles and paper work. Any discrepancies are identified and corrected during the calibration. If discrepancies cannot be satisfactorily resolved, the NYSDEC reserves the right to refuse data collected by any PEERS Participant.

The PEERS Project QAPP Template has been developed to ensure that the PEERS Project QAPP adheres to the requirements of this document.

Dates for all calibration/training events for this project:
Friday July 31, 2020 (10-12 AM), Location: to be determined

The PEERS Project Coordinator and PEERS Participants listed above will serve as sampling team leaders. Additional participants will receive field training and calibration on the sampling days.

Health and Safety
For health and safety guidance, refer to health and safety sections within SOPs #210-20.COV, 211-20.COV, and 101-20.COV, provided in Appendices E, F, and B, respectively. Health and safety liability for the PEERS program are addressed under the Release of all Claims form (Appendix I).

In order to minimize exposure while continuing to execute the core mission of the RIBS Program in light of COVID-19, modifications to certain protocols were developed that incorporate social distancing recommendations.

Table 5: Credentials for PEERS Project Coordinators and Participants

PEERS Project Coordinator	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 water quality sampling and analysis plans, quality assurance plans, and data quality objectives processes

	Calibration by NYSDEC	• Attend a field training and calibration session in the same year sampling takes place held by the WAVE/PEERS Coordinator
	Release of All Claims Form	• All PEERS Participants who collect samples must sign the Release of all Claims form attached as Appendix I.
PEERS Participant Collecting Samples	Calibration by NYSDEC	• Attend a field training and calibration session in the same year sampling takes place held by the WAVE/PEERS Coordinator
	Licensing	• If macroinvertebrates are collected, must hold a license to collect or possess from the NYSDEC **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 two years practical experience in environmental assessment work
	Release of All Claims Form	• All PEERS Participants who collect samples must sign the Release of all Claims form attached as Appendix I.
PEERS Laboratory Samples	Certification	• If macroinvertebrates are collected: Society for Freshwater Science certified Eastern Group 1 (General Arthropods), 2 (EPT), 3 (Chironomidae), and 4 (Oligochaeta) • If water chemistry collected: Certification from the NYS Dept. of Health Environmental Laboratory Approval Program for the analyses required in the specific PEERS project

6. Documentation and Records

PEERS Project QAPP

- Each PEERS Project QAPP and Credentials are approved before sampling begins and are added as electronic pdf documents to the Stream Biomonitoring Unit Database as metadata linked to associated data records.
- Any changes to a PEERS Project QAPP after it is finalized are approved by the PEERS Program Coordinator and are recorded in a Memo To File.
- All quality assurance documents are maintained electronically on a secure NYSDEC server, at L:\DOW\Statewide Monitoring\QAQC\

Sampling Site Locations

- The PEERS Program Coordinator assigns sampling locations an alpha-numeric "Station_ID" consistent with RIBS QAPP (2020) (described in section II.3 of this document).
- Site coordinates are recorded in decimal degrees, and maintained in each PEERS Project QAPP until the project is completed and the locations are added to the Annual Data File (see below).

Forms

- Copies of field and laboratory sheets originate in the SOPs as follows but should be completed electronically as described below:
  - SOP #210-20.COV, Standard Operating Procedure: Collection of Water Column Samples for the Rotating Integrated Basin Studies (RIBS) Program (Appendix E)
  - SOP #208-19, Biological Monitoring of Surface Waters in New York
  - All sampling forms have been converted by NYSDEC to electronic format and are available through Survey123. All data collected through Survey123 uploads to the NYSDEC Enterprise ArcGISonline cloud storage for record review prior to inclusion in the NYSDEC data system.
- All PEERS Project Coordinators and PEERS Participants are required to complete and sign the Release of All Claims Form (Appendix I)

Analytical Laboratory Results

Complete data packages are required for the PEERS program to provide data validation capability. Data packages are delivered to the PEERS Program Coordinator, in accordance with the requirements of the NYSDEC Prescribed Analytical Protocols (2016; ftp://ftp.dec.state.ny.us/dow/2016LabIFB/PAP-5/2016%20PAP-5%20Exhibit%20B%20(Reporting).pdf).

Annual Data File/Final Report and Record Retention

The PEERS Project Coordinator will be responsible for recordkeeping and submission of field records to NYSDEC through Survey123. Screenshots will be uploaded by the PEERS Project Coordinator and maintained on a Google Drive folder as backup. Water quality data will be submitted as MS excel or .csv format to the PEERS Program Coordinator as a complete project data file after receipt of each year's data and summary of the project including any deviations from this QAPP.

Once the project is completed, the PEERS Project Coordinator compiles a final project report at the completion of sampling. The project report shall include data files and field notes, and an assessment of QA/QC and are submitted to the PEERS Program Coordinator before March of the following year.

The NYSDEC PEERS Program Coordinators will produce a data report on the PEERS Project which will include data with qualifying flags describing any limitations in the way the data may be used. All qualified data are compiled into an annual data file by the NYSDEC PEERS Program Coordinators and uploaded to the Stream Section Database.

Records and documents are maintained in a manner that ensures compliance with all applicable statutory, regulatory, requirements. Legally, all records from statewide ambient water quality monitoring fall under Records Disposition Authorization Number 17099 and are to be retained for at least 10 years as specified by the Department's Records Retention Documents found at http://internal.dec.state.ny.us/ogc/ogc80.html.

II. DATA GENERATION AND ACQUISITION

1. Rationale of Monitoring Design

The central goal of this PEERS project is to update the NYSDEC WI/PWL for the Saw Mill River, and project sampling locations were selected with that goal as the priority. The following factors were considered when selecting sampling locations:

- distributing sampling sites near the upstream and downstream ends of each segment;
- retaining locations previously sampled by NYSDEC; and
- assessing the impact of habitat restoration projects in Yonkers.

The sites at Yonkers- Centre Street, Nepera Park- Tompkins Avenue, Elmsford- Below Route 119 Bridge, and Pleasantville- Above Bedford Rd Bridge were sampled by the NYSDEC RIBS program in 1992-2002. The sites at Yonkers- Centre Street and Yonkers- Van Der Donck Park are located upstream of and within, respectively, the daylighted portion of the Saw Mill River. The location at Ardsley- V. E. Macy Park ballfields was selected because it is located near the upstream boundary of the Middle segment.

Sampling Sites

Locations to be sampled under this project QAPP are listed in Table 6 and shown in Figure 1.

Table 6. Site information for Saw Mill River PEERS survey

Site ID	Site Name	Latitude	Longitude	DEC Stream Segment
13-SAW-0.2	Yonkers- Van Der Donck Park	40.935345	-73.900253	Saw Mill River, Lower, and tribs (1301-0007)

13-SAW-1.4	Yonkers- Centre Street (sampled by NYS DEC RIBS program in 1992, 1998, 1999, 2002)	40.938237	-73.884835	Saw Mill River, Lower, and tribs (1301-0007)
13-SAW-4.8	South County Trail Boat Access at Farragut Avenue	40.98295	-73.86567	Saw Mill River, Middle, and tribs (1301-0100)
13-SAW-7.9	Ardsley- V. E. Macy Park ballfields	41.020558	-73.845492	Saw Mill River, Middle, and tribs (1301-0100)
13-SAW-10.8	Elmsford- Below Route 119 Bridge (sampled by NYS DEC RIBS program in 1992)	41.055164	-73.820820	Saw Mill River, Upper, and tribs (1301-0101)
13-SAW-18.4	Pleasantville- at Pleasantville rd. (sampled by NYS DEC RIBS program in 1992)	41.130525	-73.794833	Saw Mill River, Upper, and tribs (1301-0101)

2. Sampling Methods

All samples at each sampling site on each date, will have *in situ* measurements of temperature, pH, conductivity, and dissolved oxygen collected using a multi-parameter probe. Samples for laboratory analysis of ammonium, Total Kjeldahl Nitrogen, nitrate-nitrite, nitrate, nitrite, total nitrogen, total phosphorus, turbidity, alkalinity, hardness, chloride, magnesium, and chlorophyll *a* will also be collected. These parameters were selected based on the NYSDEC RIBS "screening" parameters list. (DEC RIBS QAPP, April 2020). The methods required to collect these samples are described in the SOPs #101.20.COV - Sample Handling, Transport, and Chain-of-Custody, #103-19 - Equipment Decontamination/Cleaning, #210-20.COV - Ambient Water Quality Samples for RIBS program sampling, #211.20.COV - Use, Calibration, Maintenance and Storage of multi-probe meters. All referenced SOPs are provided in Appendices B-F and as a PEERS ZIP file. Field sheet for the collection of water column samples can be collected as hard copy or using an iPad and Survey123 published web-form prepopulated with site information (Appendix J).

Quality Control

Quality control sampling locations will be determined through discussion with the NYSDEC PEERS Program Coordinator. The following quality control samples will be collected on each sampling date: equipment blank and matrix spikes (Section II.5). Use of Survey123 will increase transfer of site information and in-situ data and reduce transcription error. All values will be screenshot to ensure data are not lost.

Schedule

Sites will be sampled four times between August and October in 2020 and April and October in 2021 for a total of eight samples (Table 7). Sampling events will be spaced approximately evenly throughout the season in order to capture a range of seasonality and flow conditions. Wet weather sampling events will be noted as such. Wet weather is defined as when greater than 0.25 inches of rain as predicted by the NOAA Quantitative Prediction Forecast (http://www.wpc.ncep.noaa.gov/qpf/qpf2.shtml), cumulative, over the study area on the day of sampling following a minimum antecedent dry period of 72 hours. The PEERS project coordinator will develop the 2021 sampling schedule in consultation with the PEERS Program Coordinator prior to March, 2021.

Table 7: 2020 sampling schedule and quality assurance samples to be collected according to week. 2021 will be determined prior to March 2021.

	Equipment Blank	Matrix Spike/Matrix Spike Duplicate
24-Aug	x	
14-Sep	x	x
28-Sep	x	
12-Oct	x	x

3. Sample Custody Procedures

A. Sample IDs and Chain of Custody Procedures

All sample handling, transport, and custody procedures are detailed in RIBS QAPP (2020) and are consistent with the procedures outlined in NYSDEC-DOW SOP #101-20, Sample Handling, Transport, and Chain of Custody. Appendix K includes a project chain of custody.

Sample IDs are generated by the PEERS Program Coordinator consistent with the standard detailed in the RIBS QAPP (2020) and repeated here for clarity. The ID consists of the following components, in this exact order, and separated by a "-" (for example: 12-LHUD_T2-1.3-WS-EB):

- Basin Number (ex: 12)
- LOCATION ID (ex: LHUD_T2)
- River mile (ex: 1.3)
- Matrix medium abbreviation (ex: WS)
- Quality Control Identifiers (ex: EB)

The PEERS Program Coordinator supplies the PEERS Project Coordinator with pre-printed sample labels and Chain of Custody (COC) forms with all the necessary fields completed *except* the date and time of sampling, and the name and signature of the sampler. Specific requirements and templates for the sample labels and COCs are given in the RIBS QAPP (2020) and repeated below for clarification:

- Sample labels are printed on waterproof labels to identify the stream name, sample ID, parameter to be assessed, and collection date.
- The Chain of Custody (COC) necessarily includes:

- Site ID(s)
- Collection time(s)/date(s)
- A list of specific analyses to be performed for each sample
- Time and date of relinquishment to the laboratory/courier
- Preservation or acidification used (if applicable)

The Chain of Custody (COC) are completely and legibly completed by the PEERS Participants. Upon arrival at the laboratory, the COC is signed by the laboratory manager. These forms are used to establish an intact continuous record of the physical possession, storage and disposal of collected samples and aliquots. The COC follows each sample that comes into the laboratory for analysis. This is necessary to preserve the traceability of samples and identify individuals who physically handled individual samples through the life cycle of the sample.

B. Water Column Chemistry Specific Custody Procedures

All containers from the same site are grouped together in the same cooler. Each cooler has a COC exclusive to its contents.

Samples are delivered to the appropriate analytical laboratory for analysis within twenty-four hours of sampling by courier service (UPS), pick up by the laboratory or delivery by sampling staff. Upon arrival at the laboratory, samples must be refrigerated at <6ºC until all analyses are completed. Processing and analysis of samples begins immediately upon receipt.

Upon receipt at the analytical laboratory, the time of sample receipt and start of analysis along with any problems encountered with equipment or samples are recorded, and subsequently reported in the data package. Complete information on laboratory procedures is contained in the PAP (2016; ftp://ftp.dec.state.ny.us/dow/2016LabIFB/PAP-5/2016%20PAP-5%20Exhibit%20B%20(Reporting).pdf).

4. Analytical Methods

Sample analyses will be performed by ALS Laboratories in Rochester, NY following methods according to the NYSDEC RIBS QAPP (2020), Table 3, Section I.4.

The NYSDEC only accepts macroinvertebrate data (macroinvertebrate identifications and field sheets) from PEERS Projects. Analysis of the data using NYSDEC methods and metrics is performed by Stream Section Database.

The quality control for PEERS is designed to establish and maintain standards that will ensure the validity of the data. All the quality control measures below adhere to requirements of the RIBS QAPP (2020) with frequencies specifically tailored for PEERS Projects.

A. Quality Control for Water Column Chemistry Samples

All chemical analyses are performed at laboratories certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP). In addition to the requirements of the ELAP program, the following measurements are used to assess the quality of water column chemistry data being generated in the project:

i. Accuracy

Matrix spike samples are collected by all PEERS Projects to assess the accuracy of water column chemistry analyses. These samples are spiked in the laboratory with a known concentration of analyte and processed along with other samples. The percent recovery of the spiked analyte is the observed accuracy of the laboratory analysis and is used to assess compliance with the accuracy criteria established in section I.4 of this document.

Matrix spike samples are collected at least once per sampling week and correspond to at least ten percent (10%) of all samples collected. Matrix spike sampling is included in each PEERS Project schedule.

ii. *Precision (matrix duplicates)*

Matrix duplicates are collected by all PEERS Projects to assess the precision of the water column chemistry analyses. Duplicate samples are processed equivalently and compared to assess compliance with precision criteria established in section I.4. of this document. Duplicate analyses are conducted for both inorganic and conventional parameters.

Matrix duplicates are collected at least once per sampling week and correspond to at least ten percent (10%) of all samples collected. Matrix duplicate sampling is included in each PEERS Project schedule.

iii. *Blanks*

Equipment blank samples are collected by all PEERS Projects to assess potential contamination by field sampling techniques. To collect an equipment blank, the sampler uses deionized water sent from the laboratory through all the steps and equipment required to collect a water column chemistry sample. Equipment blank samples are analyzed for the same parameters examined in standard samples.

Equipment blanks are collected at least once per week and correspond to at least ten percent (10%) of all samples collected. Equipment blank sampling is included in each PEERS Project schedule.

iv. *Representativeness*

Representativeness in water column samples is attained by selection of proper sampling equipment to obtain an integrated sample of water from a cross section of the waterbody, as well as from different depths.

v. *Completeness*

Completeness is a measure of the number of intended samples versus samples collected and analyzed, expressed as a percentage. PEERS Projects are considered complete if at least eighty percent (80%) of samples are collected and analyzed.

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

Multiprobe meters are calibrated according to NYSDEC SOP 211-20.COV (Appendix F) or manufacturer's instructions. Calibration and instrument check frequencies prescribed in SOP 211-16 must always be followed. Instruments that fail calibration are not used.

Field Cleaning - Field cleaning of equipment (including waders) is necessary to prevent possible contamination by invasive species from one site to another. When not in use, equipment should be stored in a clean environment.

Equipment and supplies are listed in Tables 8 and 9, respectively.

Table 8: Equipment List

Item	Description	Number
Water Sample Equipment	Churn Splitter - Loan from DEC	1
Multiprobe meter	YSI ProDSS probe with sensors to measure temp, conductivity, DO, turbidity, pH	1

6. Supplies and Consumables

Supplies and consumables should be kept in temperature-controlled area (ie indoors) and not in vehicles for aside from sampling events. Supplies and consumables described in Table 9, where applicable, should be used prior to specified expiration dates. This includes calibration standards and spare batteries. Care should be taken to note expiration dates when purchasing these items and the amount purchased should not exceed the volume needed within the sampling season (ie purchase sufficient quantity for each year only). DI water should be refreshed prior to each sampling event.

Table 9: Consumables List

Item	Quantity	Size
Water Chemistry Supplies		
Sample bottle labels	1	Set
Nitrile Disposable gloves	1	Box
Kimwipes	1	Box
Packing tape	1	Roll
DI water	1	gallon

DI water	1	1L squirt bottle
In Situ Measurement Supplies		
Calibration standards for multiprobe meter	varies	varies
Spare batteries for multiprobe meter	1 set	varies

7. Data Management

The PEERS Program Coordinator reviews all data produced by PEERS Projects satisfying the below format requirements. If all data validation and usability checks are satisfied, these data are uploaded to the Stream Section Database. In some cases, established data qualifiers may be applied for values that are known to be suspicious, less than the reported value, or affected by QA/QC blank. The database automatically calculates the metrics for each sampling site once the data are uploaded.

A. Water Column Chemistry Data Format

Sample collection information (station, collection date, time) and field parameter measurements (temperature, dissolved oxygen, pH, conductivity) are recorded on the Water Chemistry Field Sheet in Survey123.

Water column results and supporting documentation from contract laboratories are reported electronically by the PEERS Project Coordinator (in MS excel or other similar editable spreadsheet format) to the NYSDEC PEERS Program in a complete data document either on CD, email or via a link to the laboratory secure data repository. These data documents include summaries of data validation conducted by the analytical laboratory.

III. ASSESSMENT AND OVERSIGHT

1. Performance and System Audits

Every PEERS Project is audited at two stages: sample collection and sample analysis. This may result in as many as 4 audits per PEERS Project if the biological sample collection and analysis is performed separately from the water column chemistry sample collection and analysis.

Field Audit

The PEERS Program Coordinator observes all field methods employed by each PEERS Project at least once per sampling season. Any discrepancies from this document or the PEERS Project QAPP are discussed. If the PEERS Program Coordinator feels these are significant, she may schedule a second audit later in the sampling season. The NYSDEC reserves the right to refuse data collected by any PEERS Project if quality concerns are significant.

Laboratory Audit

Once per year, the PEERS Program Coordinator will observe each PEERS laboratory processing biological samples. Any discrepancies from this document are discussed. The NYSDEC reserves the right to refuse data collected by any PEERS Project if quality concerns are significant.

If the PEERS Laboratory processing biological samples is located outside of NY State, the PEERS Program Coordinator will make an effort to contact colleagues with comparable professional credentials in that state to perform the audit.

PEERS Laboratories analyzing water column chemistry samples are audited annually as part of the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP). This program involves semi-annual performance evaluation samples and annual onsite audits.

2. Corrective Action

The PEERS Project Coordinator will thoroughly brief the NYSDEC PEERS Program Coordinator before implementing any changes, to identify emerging or unanticipated problems, and take corrective action, if necessary. The PEERS Program Coordinator will institute and document any corrective actions. Corrective actions should be implemented prior to the next sampling event.

Deviation from intended plans and procedures should be noted by the person observing the deviation and reported to project staff responsible for the operation or analysis in question. The appropriate project personnel shall (1) develop a corrective action plan to ensure that future sampling, analyses, etc. are conducted in accordance with the QA procedures presented in this QAPP; (2) rerun procedures in the appropriate manner and re-analyze samples, if sufficient sample material is available and holding times are not exceeded; and (3) report all problems and deviations to the NYSDEC PEERS Program Coordinators, who will also be consulted during the development of any proposed corrective action plans. All deviations from intended plans and procedures are to be recorded in the appropriate field or laboratory Failure to implement corrective actions may result in suspension of sampling.

For PEERS laboratories, Exhibits D and E of the PAP contain the procedures the laboratory is to follow when problems are encountered in the chemical analysis of samples (2016; ftp://ftp.dec.state.ny.us/dow/2016LabIFB/PAP-5/2016%20PAP-5%20Exhibit%20B%20(Reporting).pdf).

3. Reports to Management

The PEERS Project Coordinators submits monthly reports to the NYSDEC PEERS Program Coordinators. This report includes number of samples collected, quality assurance samples collected, and a summary of field observations made by the PEERS Project Coordinator or Participants.

NYSDEC Final Progress Report
The PEERS Program Coordinator will perform a full data validation review on all PEERS data according to SOP 110-19: Data Validation and Verification. This evaluation together with the analysis of the completeness, precision, and accuracy of the projects will provide a level of confidence to the data set and to the interpretations and conclusions drawn from the data. All accepted data are added to the NYSDEC Stream Section database.

The PEERS Program Coordinator will prepare a final progress report on the PEERS Project which will summarize QA problems encountered and describe any limitations in the way the data may be used.

The deliverables are electronic and shared with all project partners and other interested parties.

4. Data Validation and Usability

Data generated by PEERS projects are reviewed at two stages. First, the PEERS Laboratory(s) analyzing samples follows specific laboratory protocols to assure the quality and validity of the data. Second, the PEERS Program Coordinator performs a data validation review, evaluating the completeness, precision, and accuracy for the PEERS Program according to SOP 110-19: Data Validation and Verification.

A. Water Column Chemistry Data Validation

Laboratory(s) analyzing water column chemistry samples perform the following QA evaluations as per the RIBS QAPP (2020):

1) *Analysis Precision* – is assessed as a relative percent difference (RPD) between the matrix duplicate samples (see equation below). Precision criteria for the PEERS project are given in section I.4 of this document.
    a. Relative Percent Difference = [(sample-duplicate)/sample]*100
2) *Analysis Accuracy* - is assessed by comparing matrix spike samples with the spiked value (see equation below). The result may be positive (+) or negative (-) indicating the direction of sample bias where "+" is biased high and "-" is biased low. Accuracy criteria for the PEERS project are given in section I.4 of this document.
    a. Accuracy = observed value – true value
3) *Blanks* - method blanks are analyzed and compared to the method detection limits given in section I.4 of this document.

These QC samples are analyzed at a frequency of 1 per analytical batch as required by the PAP Exhibit E (2016; ftp://ftp.dec.state.ny.us/dow/2016LabIFB/PAP-5/2016%20PAP-5%20Exhibit%20B%20(Reporting).pdf). Those data not meeting the previously identified criteria for

precision, accuracy and blank values are re-analyzed where possible, or flagged by the laboratory if additional sample material is not available. An indication as to why flagged data did not meet the minimum QA criteria are provided.

All water column chemistry data are reviewed by the PEERS Program Coordinator to determine its validity prior to use and distribution. If data validity cannot be verified, these data are qualified in the final data set using data flags. Typical data qualifiers (flags) are presented in RIBS QAPP (2020). This information is noted in the final Progress Report.

B. Reporting

After the above QC calculations and examinations have been performed, the results are summarized in the Annual Progress Report by the PEERS Program Coordinator as per section III.3 of this document.

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APPENDICES A-G, I – included separately as a PEERS zip file

Appendix A. Quality Assurance Project Plan 2020: Rotating Integrated Basin Studies Program

Appendix B: NYSDEC SOP 101-20.COV

Appendix C: NYSDEC SOP 103-19

Appendix D: NYSDEC SOP 208-19

Appendix E: NYSDEC SOP 210-20.COV

Appendix F: NYSDEC SOP 211-20.COV

Appendix G: PEERS Project QAPP Template

Appendix H. Training Certification Template

This form is to certify that you have:

Read the QA documents relevant to your role
Understand how to apply the QA documents (QAPPs and SOPs) to your work
Know where to locate a copy of the current QA documents (QAPPs and SOPs)
Have undergone field training conducted by NYSDEC PEERS coordinator

I _____ certify that I have read and understood QA documentation
name

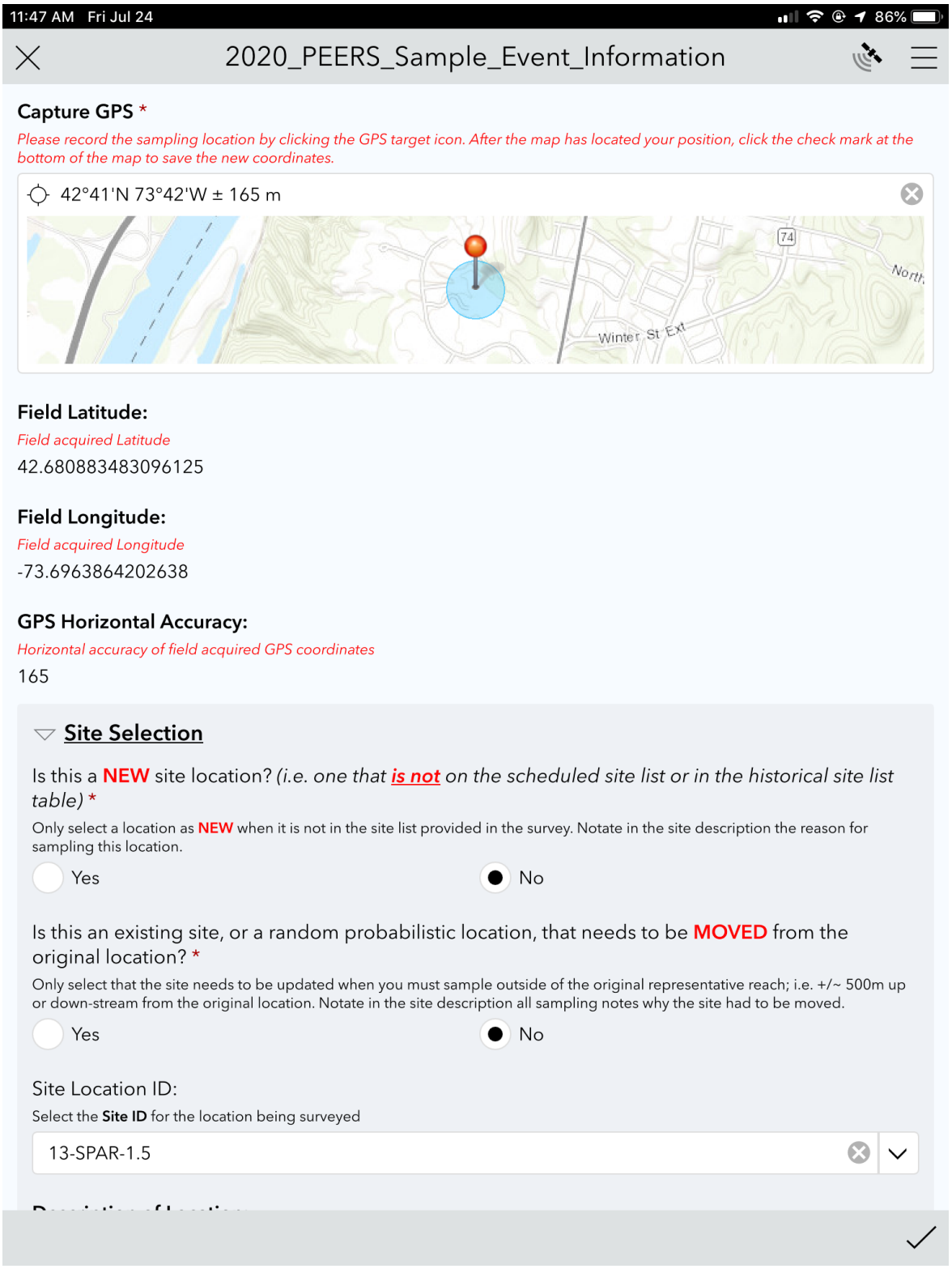
described above and associated with this project.

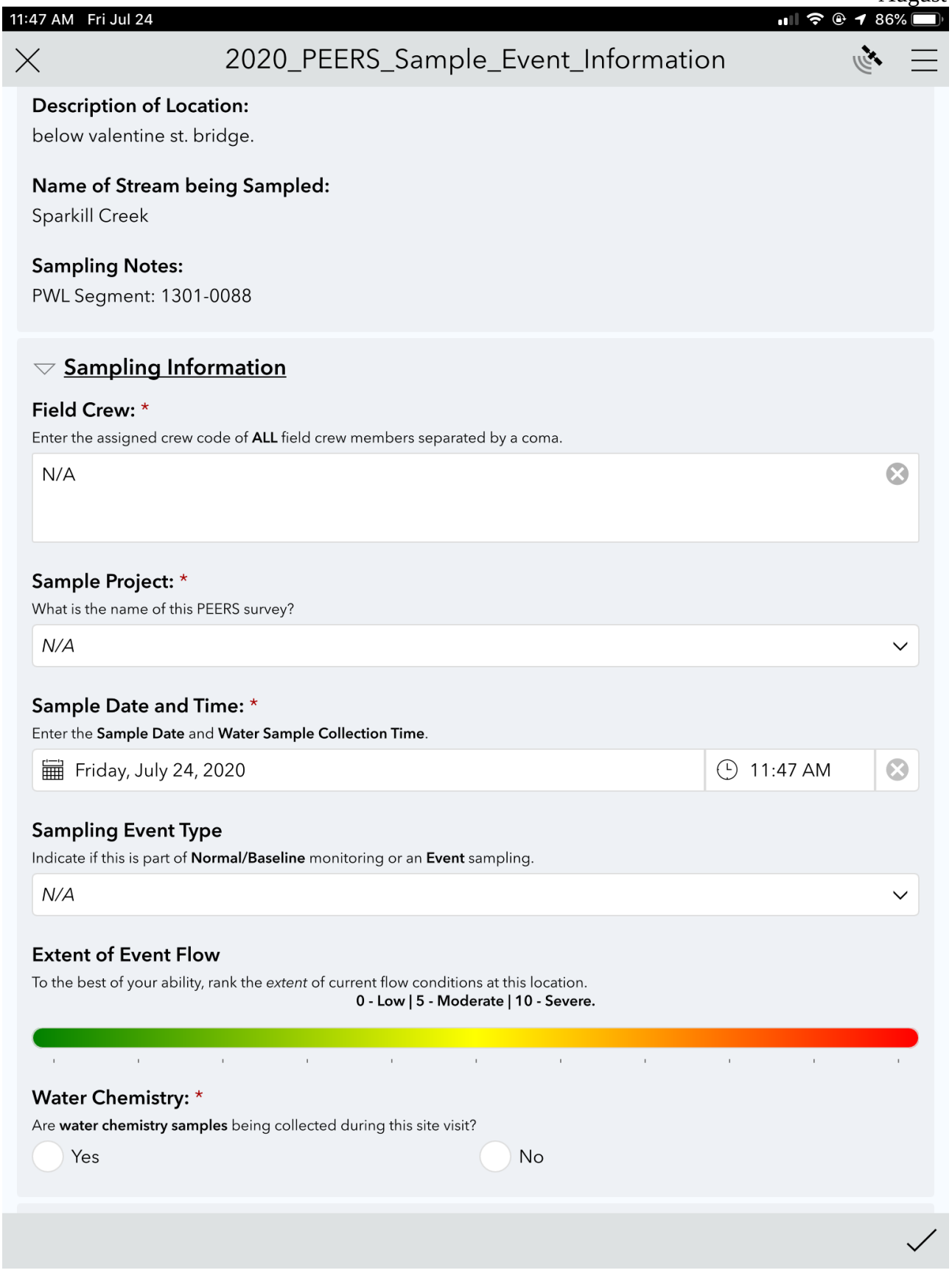
Signature: _____ Date: _____

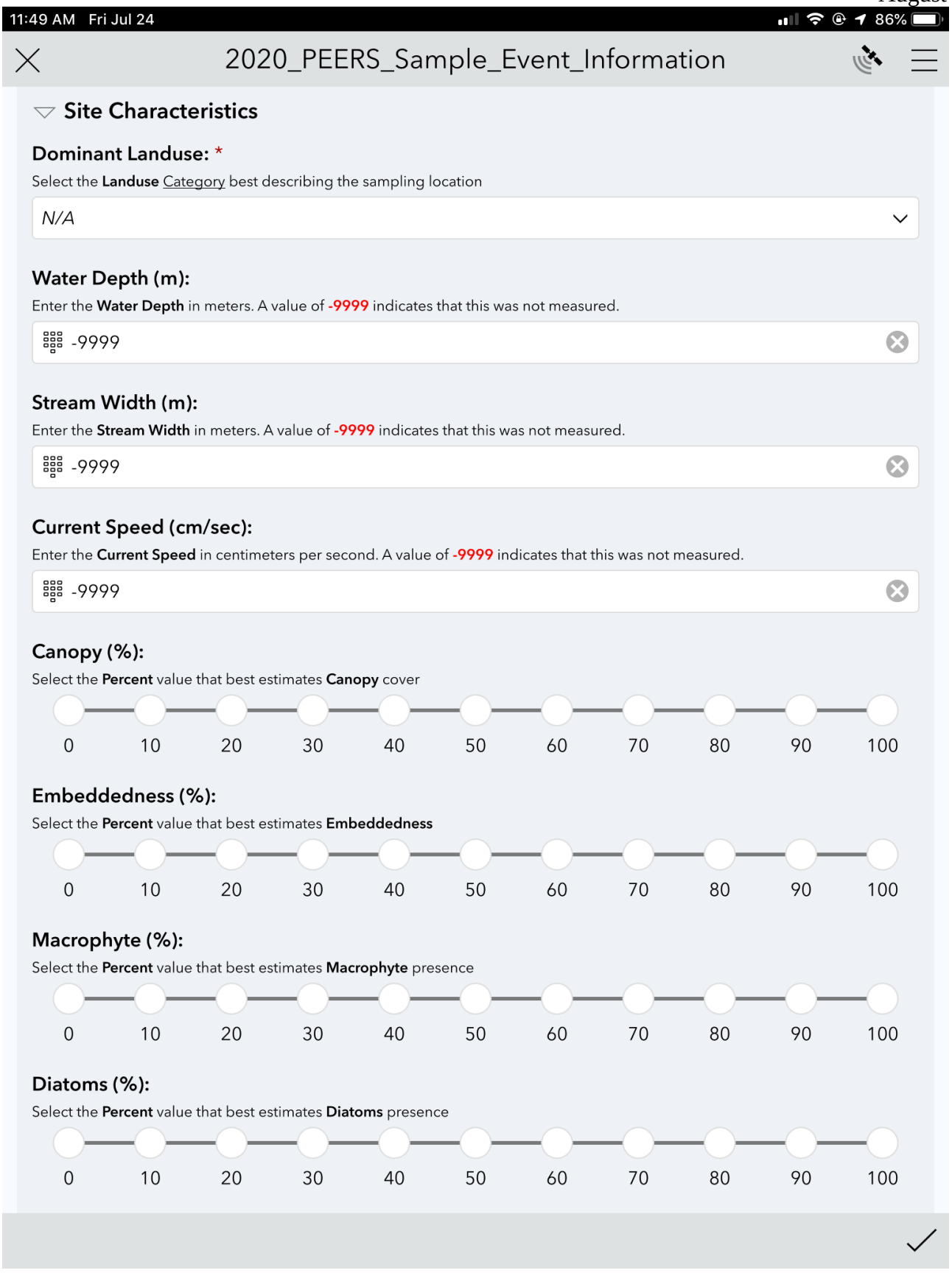
This signed document should be sent to the NYSDEC PEERS coordinator

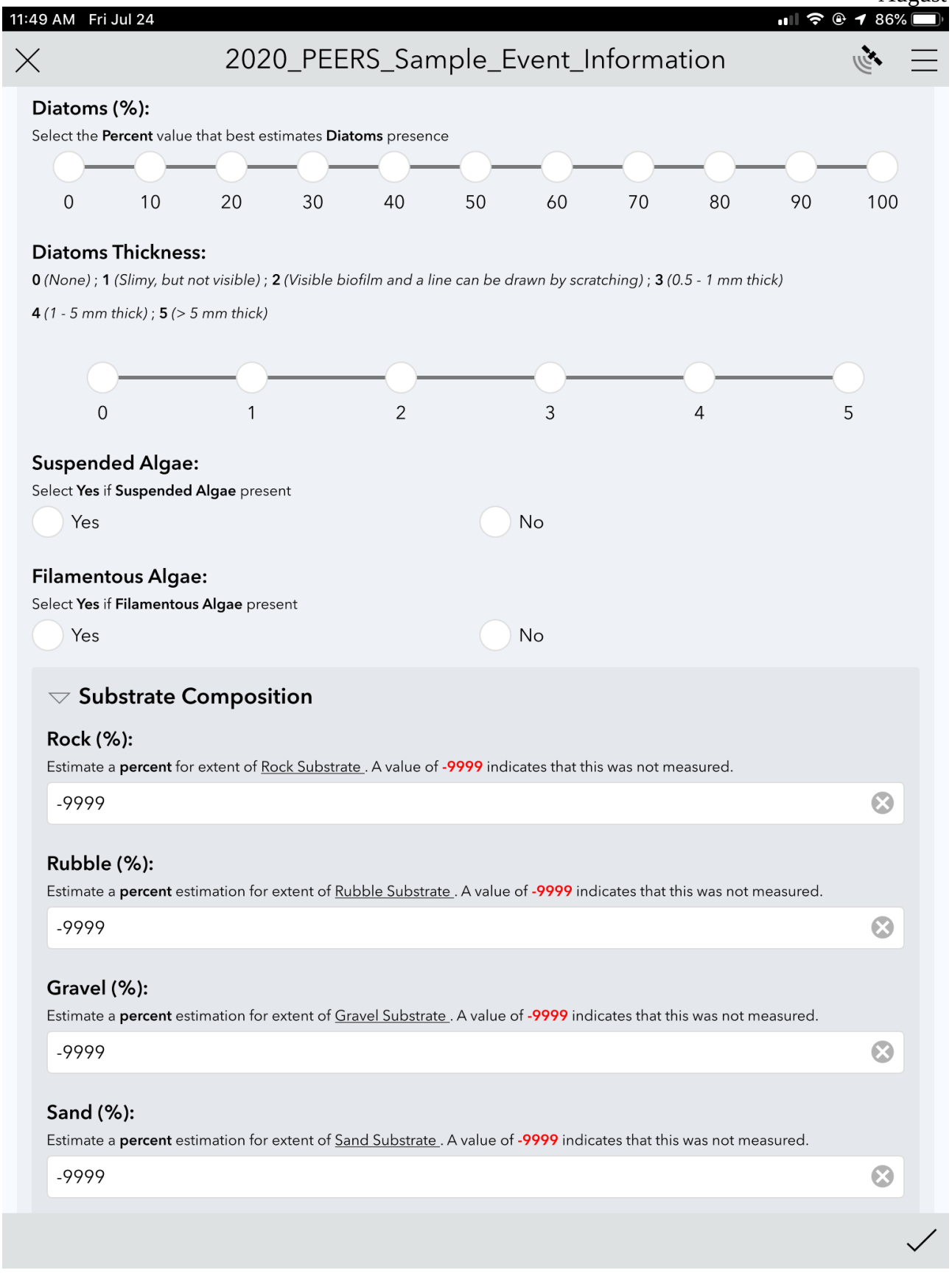
Appendix I. Release of all Claims Form

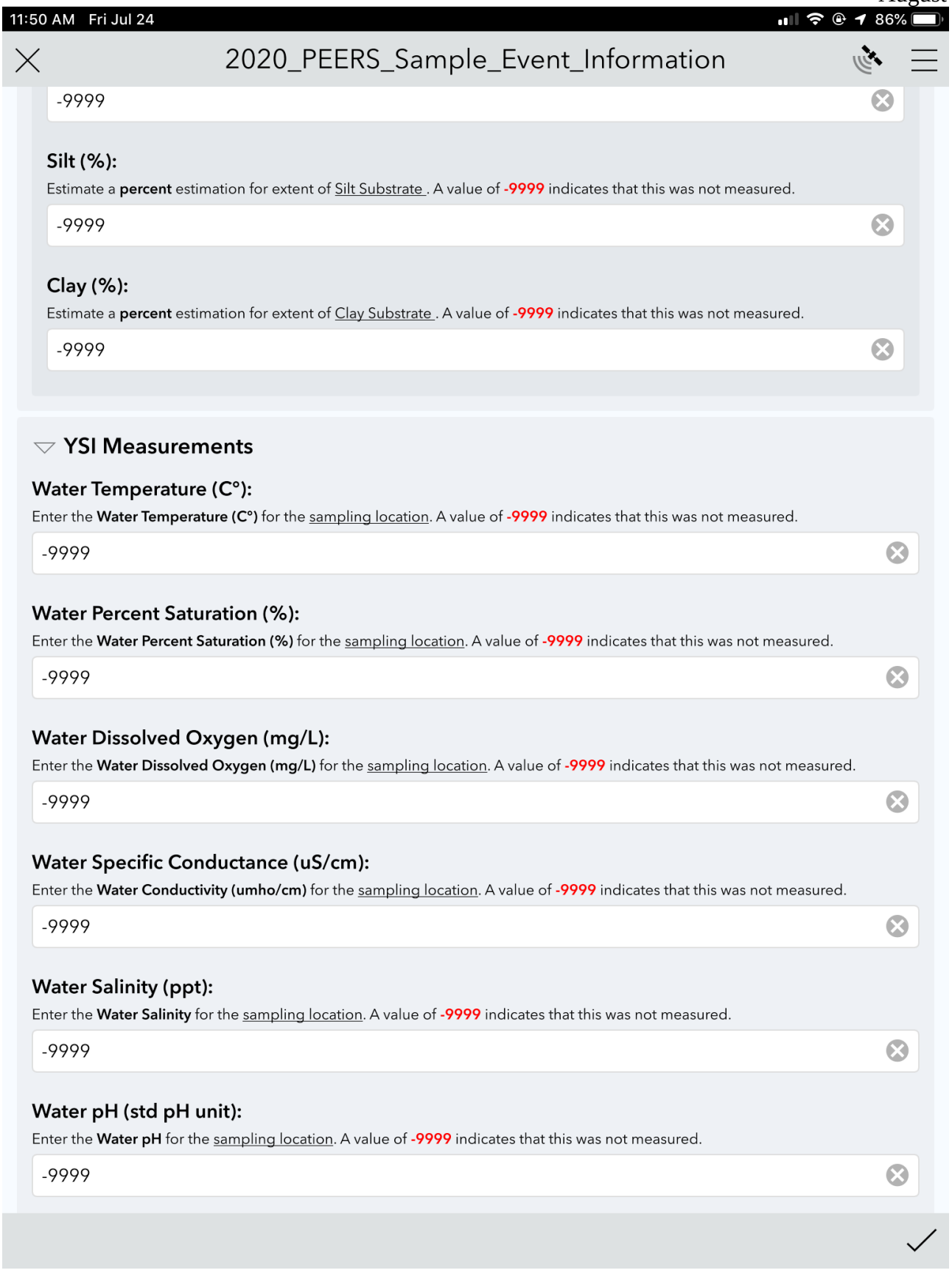
Appendix J. Survey123 Field Form

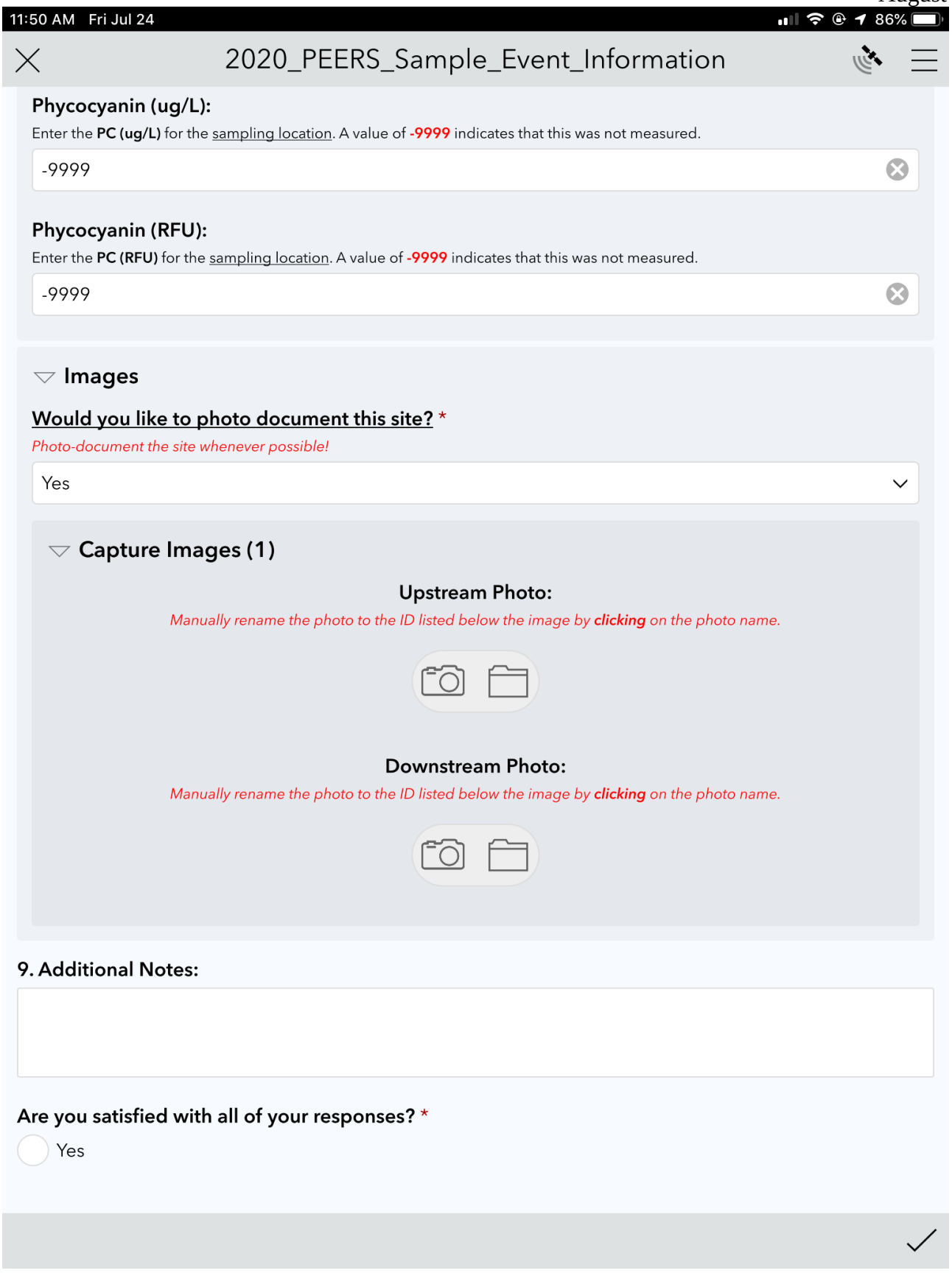



11:47 AM Fri Jul 24
86%
2020_PEERS_Sample_Event_Information
Description of Location:
below valentine st. bridge.
Name of Stream being Sampled:
Sparkill Creek
Sampling Notes:
PWL Segment: 1301-0088
Sampling Information
Field Crew: *
Enter the assigned crew code of ALL field crew members separated by a coma.
N/A
Sample Project: *
What is the name of this PEERS survey?
N/A
Sample Date and Time: *
Enter the Sample Date and Water Sample Collection Time.
Friday, July 24, 2020
11:47 AM
Sampling Event Type
Indicate if this is part of Normal/Baseline monitoring or an Event sampling.
N/A
Extent of Event Flow
To the best of your ability, rank the extent of current flow conditions at this location.
0 - Low | 5 - Moderate | 10 - Severe.
Water Chemistry: *
Are water chemistry samples being collected during this site visit?
Yes
No


11:49 AM Fri Jul 24
86%
2020_PEERS_Sample_Event_Information
Site Characteristics
Dominant Landuse: *
Select the Landuse Category best describing the sampling location
N/A
Water Depth (m):
Enter the Water Depth in meters. A value of -9999 indicates that this was not measured.
-9999
Stream Width (m):
Enter the Stream Width in meters. A value of -9999 indicates that this was not measured.
-9999
Current Speed (cm/sec):
Enter the Current Speed in centimeters per second. A value of -9999 indicates that this was not measured.
-9999
Canopy (%):
Select the Percent value that best estimates Canopy cover
0 10 20 30 40 50 60 70 80 90 100
Embeddedness (%):
Select the Percent value that best estimates Embeddedness
0 10 20 30 40 50 60 70 80 90 100
Macrophyte (%):
Select the Percent value that best estimates Macrophyte presence
0 10 20 30 40 50 60 70 80 90 100
Diatoms (%):
Select the Percent value that best estimates Diatoms presence
0 10 20 30 40 50 60 70 80 90 100


11:49 AM Fri Jul 24
86%
2020_PEERS_Sample_Event_Information
Diatoms (%):
Select the Percent value that best estimates Diatoms presence
0 10 20 30 40 50 60 70 80 90 100
Diatoms Thickness:
0 (None) ; 1 (Slimy, but not visible) ; 2 (Visible biofilm and a line can be drawn by scratching) ; 3 (0.5 - 1 mm thick)
4 (1 - 5 mm thick) ; 5 (> 5 mm thick)
0 1 2 3 4 5
Suspended Algae:
Select Yes if Suspended Algae present
Yes
No
Filamentous Algae:
Select Yes if Filamentous Algae present
Yes
No
Substrate Composition
Rock (%):
Estimate a percent for extent of Rock Substrate . A value of -9999 indicates that this was not measured.
-9999
Rubble (%):
Estimate a percent estimation for extent of Rubble Substrate . A value of -9999 indicates that this was not measured.
-9999
Gravel (%):
Estimate a percent estimation for extent of Gravel Substrate . A value of -9999 indicates that this was not measured.
-9999
Sand (%):
Estimate a percent estimation for extent of Sand Substrate . A value of -9999 indicates that this was not measured.
-9999


11:50 AM Fri Jul 24
86%
2020_PEERS_Sample_Event_Information
-9999
Silt (%):
Estimate a percent estimation for extent of Silt Substrate . A value of -9999 indicates that this was not measured.
-9999
Clay (%):
Estimate a percent estimation for extent of Clay Substrate . A value of -9999 indicates that this was not measured.
-9999
YSI Measurements
Water Temperature (C°):
Enter the Water Temperature (C°) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Water Percent Saturation (%):
Enter the Water Percent Saturation (%) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Water Dissolved Oxygen (mg/L):
Enter the Water Dissolved Oxygen (mg/L) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Water Specific Conductance (uS/cm):
Enter the Water Conductivity (umho/cm) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Water Salinity (ppt):
Enter the Water Salinity for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Water pH (std pH unit):
Enter the Water pH for the sampling location. A value of -9999 indicates that this was not measured.
-9999


11:50 AM Fri Jul 24
86%
2020_PEERS_Sample_Event_Information
Phycocyanin (ug/L):
Enter the PC (ug/L) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Phycocyanin (RFU):
Enter the PC (RFU) for the sampling location. A value of -9999 indicates that this was not measured.
-9999
Images
Would you like to photo document this site? *
Photo-document the site whenever possible!
Yes
Capture Images (1)
Upstream Photo:
Manually rename the photo to the ID listed below the image by clicking on the photo name.
Downstream Photo:
Manually rename the photo to the ID listed below the image by clicking on the photo name.
9. Additional Notes:
Are you satisfied with all of your responses? *
Yes

CHAIN OF CUSTODY

Page _1_ of _1_

CHAIN OF CUSTODY

Project Name**: PEERS**	Case Code:	SDG: ([Monday's MMDDYY][team code][matrix code])
Contract No.:	Sampler Collector:	Sampler Phone No.:
Project Coordinator:	**Report to Project Manager:**	**Bill to Project Manager:**
Address:	**Address:**	**Address:**
Phone:	**Phone:**	**Phone:**
Email:	**Email:**	**Email:**

Matrix Codes:
WW = Wastewater
GW = Groundwater
W = Ambient Water
SE = Sediment
SL = Sludge
T = Tissue
O = Other __DI WATER____

Analyses Ordered (list)

Preservative Codes:
(Please include in ( ) on "Analyses Ordered" line):
1 = Cool to < 6°C
2 = 0.008% $Na_2S_2O_3$
3 = H_2SO_4 to pH < 2
4 = HNO_3 to pH < 2
5 = NaOH to pH > 12
6 = 5 mL/L 12N HCl
7 = 5 mL/L BrCl
8 = HCl to pH < 2
9 = H_3PO_4 to pH < 2
10 = Protect from light
11 = Freeze to < -10°C
12 = Other _____

SITE ID ([2-dig. basin]-[stream identifier]-[rivermile]) e.g., "06-DILA-5.4", or "14-WDEL-16.2"	**Collection Date** (MM/DD/YY)	**Collection Time** (HH:MM)	**Matrix Code**	**Equip. Blank (EB)**	**Sequential Duplicate (SEQ)**	**MS/MSD**	**# Containers**					Location Info/ NYSDEC Notes	Lab Sample ID/ Lab Notes
13-SAW-0.2													
13-SAW-1.4													
13-SAW-4.5													
13-SAW-7.9													
13-SAW-10.8													
13-SAW-18.4													

Special Analysis Instructions:

Laboratory Reporting Instructions:
"sample_name" to be reported as**: "SITE ID-collection date (MMDDYYYY)-Matrix Code-[Quality Control Code if noted (EB/FB/SEQ)]"** (dashes included)
EXAMPLES: "13-ROND-9.9-10102018-W" (normal field sample)
"13-WALK-18.6-10102018-W-EB" (equipment blank sample)

Relinquished by Sampler:	Date:	Time:	Received by:	Date:	Time:	Laboratory Receipt Notes:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:	Sample Temp.: _____°C Properly Preserved: Y / N Samples Intact: Y / N