Greenpoint Community Environmental Fund (GCEF) 2014 Quality Assurance Project Plan (QAPP) Development Guide

GCEF Requirements for Data Quality Assurance (QA) and Quality Control (QC)

GCEF applicants whose projects will collect, analyze, or use primary and/or secondary environmental data[1] for the purpose of making decisions or drawing conclusions about environmental contamination and/or health outcomes will be required to submit a Quality Assurance Project Plan (QAPP) for approval by the GCEF. The grant award will be contingent upon GCEF approval of that QAPP, and the award may be withdrawn if the applicant fails to submit an approvable Plan. Subject applicants should budget time and resources to complete this task.

A QAPP is necessary to ensure that data collected, analyzed, or used in a project are of the needed and expected quality for their desired use. In general, a QAPP ensures that the quality of data collected or used by a project supports the project's intended application of these data. More specifically, a QAPP describes how an organization will structure its data quality system, defines and assigns QA and QC responsibilities, and describes the processes and procedures used to plan, implement, and assess the effectiveness of the quality system. Primary data collection, secondary data usage, derivation of uncertainty tolerance limits for data and data processing project activities funded by the GCEF must be described and documented in QAPPs.

The GCEF Approach to Data QA/QC

The GCEF uses the US Environmental Protection Agency "graded approach" in the documentation of the application of quality assurance and quality control activities to an activity-specific effort (the QAPP).

The level of detail of the QAPP is based on this *graded* approach; therefore, it varies according to the nature of the work being performed and the intended use of the data. As a result, an acceptable plan for some environmental data operations may require a qualitative discussion of the experimental process and its objectives while others may require extensive documentation to adequately describe a complex environmental program. *For a list of QAPP "Example Activities", please see page 6.*

Steps in the Development of a QAPP

If selected for funding by GCEF, development of a QAPP should be a multi-step process involving a number of people, but you may apply your specific organizational processes according to your preferences. The following is a brief summary of the process:

[1] Secondary data are data used in a project that were collected by others.

1. Assemble a project team to develop your data quality objectives and what needs to be done.
2. Reference the *"GCEF Data Quality Objectives (DQO) Process"* which follows below to assist you with this process.
3. Develop the QAPP (using the results of the DQO process) and using means of the *GCEF 2014 Example QAPP Template"* to help ensure all QAPP required elements have been addressed.

If needed, you may also reference:

- EPA Requirements for Quality Management Plans (QA/R-2) (EPA 2001) (*http://www.epa.gov/quality/qs-docs/r2-final.pdf); or*
- EPA's QAPP Requirements (EPA QA R-5) and Guidance (EPA QA G-5) documents for information on data-specific quality assurance activities. (*http://www.epa.gov/quality/qapps.html*).
    a. Review your GCEF proposal for relevant language suitable for transfer directly into the QAPP sections. Supplement each section with supporting text, as needed.
    b. The *"GCEF 2014 Example QAPP Template"* is easily adaptable for use with any project (*Appendix 1)*.
        i. Insert the appropriate information where you see these "[text]" guides.
        ii. "Notes" have been inserted into the QAPP template to guide you through each step. Additionally, you may wish to review the "Tables" templates at the end of the QAPP to assist with formulating some of the QAPP language.
        iii. If your project does not contain some of the elements requested in the template, you may insert the following language, "This activity does not apply to this project", in each applicable QAPP section. Utilize as much of the proposal language as possible. At the final development stages, you will want to remove all of the *italicized* notes and unused "Tables", etc., prior to submittal.

4. As described, if funded, a QAPP must be submitted in one complete word file (no separate attachments) for comment, revisions and approval to:

National Fish and Wildlife Foundation (NFWF) Assistant Director, NE, Eastern Partnership Office	Lynn Dwyer, NFWF	(631) 627-3488 Lynn.Dwyer@nfwf.org
New York State Office of the Attorney General (the State), Environmental Scientist	Joseph Haas	(212) 416-8481 Joseph.Haas@ag.ny.gov

5. The QAPP may be distributed for further comment and potential revision by the State and NFWF to other entities with appropriate expertise in the specific data collection QA/QC proposed by the project.
6. Once approved, NFWF and the State will sign the "Title and Approval Sheet" of the QAPP.
7. You will then print two copies of the document, countersign Title and Approval Sheet the QAPP (along with any applicable partners) and send John Wright, *john.wright@nfwf.org*, a full pdf version of the QAPP (no separate attachments). You should then distribute copies of the signed QAPP to all pertinent project partners and field staff.
8. Once the QAPP is finalized, begin work, but remember to:
    a. Document any changes in the QAPP; and if necessary, get re-approval from NFWF and the State (if changes were made to methods or other data applications) and distribute the updated version to all persons, and
    b. Review the QAPP on a systematic basis to ensure that it remains up-to-date.

Data Quality Objectives and Data Usability Assessment Process

The Data Quality Objective Process

The data quality objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs (US Environmental Protection Agency (EPA) 1994). The process provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the acceptable level of data uncertainty and decision errors for the study, and how many samples to collect. The EPA developed the DQO process as an important tool for project managers and planners to determine the type, quantity, and quality of data needed to support, determinations, recommendations and decisions. Using the DQO process, the project team ensures that the type, quantity, and quality of environmental data used in decision-making will be appropriate for the intended application and the opportunities for making an incorrect decision or determination are minimized accordingly.

The Data Quality Objectives are the result of the DQO process. DQOs are qualitative and quantitative statements that translate non-technical project goals into technical project-specific goals and guide the development of sampling and analysis plans able to cost-effectively produce the 'right kind of data'. DQOs are goal-oriented statements that establish the minimum for overall decision quality or tolerable decision error in accordance with the non-technical objectives driving the project, and are intended to clarify the study objective, define the most appropriate type of data to collect, determine the appropriate conditions from which to collect the data , and specify the acceptable limits on decision or determination errors that will serve as the basis for

establishing the quantity and quality of data needed to support the decision. DQOs express the purpose for which the data will be used along with the uncertainty tolerance limits for data, but not how the data are generated. The generation of the data is addressed on the QAPP.

The DQO process consists of six iterative steps used to develop the decision performance criteria (i.e., the DQOs) that are in turn used to develop the data collection design, and a seventh step for optimizing the design. These seven steps are described below:

- **Step One.** The Problem Statement — Concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.
- **Step Two.** Identify the Decision — Identify the questions the study will attempt to resolve and the resulting actions.
- **Step Three.** Identify the Inputs to the Decision — Identify the information that needs to be obtained and the measurements that need to be taken to resolve the decision statement.
- **Step Four.** Define the Study Boundaries — Specify the time periods and spatial area to which the decisions apply. Determine when and where data should be collected.
- **Step Five.** Develop a Decision Rule — Define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions or determinations.
- **Step Six.** Specify Tolerable Limits on Decision Errors — Define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision or determination. The objectives of establishing error tolerances are to create limits for which data can be used, which will minimize the opportunity for introducing manageable error in the decision-making process and to limit the consequences of implementing an incorrect decision or determination. Defining the appropriate limit for which data can be used includes consideration of the following:
  - Measurement Quality Objectives (MQOs) – MQOs are project-specific, analytical parameters derived from project-specific DQOs. MQOs include the QA activities that will be conducted during the project, and quality control (QC) acceptance criteria for the data quality indicators (DQIs) applicable to the applicable study or decision unit. MQOs establish the minimum for analytical performance parameters (i.e., serve to specify "how good" data must be) derived from the level of performance needed to achieve the

project goals (as expressed in the DQOs). Project MQOs are not intended to be technology- or method-specific, and generally will not specify the methods by which the data are generated. MQOs consist of quality assurance (QA) activities (i.e., calibration, data assessment and reporting, preventive maintenance, and corrective action), DQIs, and QC acceptance criteria.

- Data Quality Indicators (DQIs) – DQIs are analytical method-specific qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of the data collected. Principal DQIs include precision, accuracy (bias), representativeness, comparability, and completeness. Secondary DQIs include sensitivity, recovery, memory effects, limit of quantitation, repeatability, and reproducibility. Establishing QC acceptance criteria for the DQIs sets quantitative goals for the quality of data generated in the analytical measurement process or measurement systems (EPA 1998).
- QC Acceptance Criteria – QC acceptance criteria are method- and technology-specific protocols and specifications that demonstrate that data of known and sufficient quality are generated. QC acceptance criteria include specific limits for sensitivity, recovery, memory effects, limit of quantitation, repeatability, and reproducibility, and are designed such that if consistently met, the project MQOs will be achieved, and the resulting data will be sufficient to meet the project DQOs and support the project decisions or determinations (Crumbling 2001).

Ensuring that the MQOs, DQIs and the QC Acceptance Criteria have been properly followed is the objective of Data Validation and Data Usability Assessment.

Data validation is defined as those procedures used to determine whether the sample analysis met the predetermined performance criteria for the analytical method used. The impact of the specific performance acceptance criteria is noted by appending qualifiers on each data point, as required. These qualifiers indicate that the data may be considered estimated (i.e., 'J'), rejected (i.e., 'R'), and not detected ('U'). A data point also may be considered an estimated non-detect (i.e., 'UJ').

Data usability is the process of evaluating the data validation results and determining the confidence with which any data point may be used. Usability is determined by evaluating the data validation qualifier applied and the laboratory QC results. The concentration values may be considered to have a high degree of confidence because the method performance criteria were achieved. The concentration values considered estimates, are evaluated with respect to the

bias contributed to the value by the QC result. Bias is considered to be high or low, which means that the concentration result is likely higher or lower than the actual laboratory result indicates. Bias direction can be estimated for data quality impacts due to surrogate recoveries, matrix spike recoveries, and laboratory control sample recoveries. However, for most laboratory QC results, the degree to which bias impacts the concentration result cannot be estimated. Sample concentration results that are rejected during data validation are not used in the decision-making process and are not reported.

- **Step Seven.** Optimize the Design — Evaluate information from the previous steps and generate alternative data collection designs. Choose the most resource-effective design that meets all DQOs. The objective of optimizing the study design is to identify the most resource-effective data collection design for generating sufficient data of known and verifiable quality to satisfy the DQOs. Reviewing and evaluating the effectiveness of the data collection design is conducted by any of the methods listed below.
  - Reviewing the previous DQO products
  - Incorporating historical data into the DQO products created as a result of the previous six steps
  - Developing alternatives to the data collection design
  - Formulating mathematical expressions to solve the design problem for each data collection design alternative, which include methods for testing statistical hypotheses and defining the optimum sample size formula, statistical models that describes the relationship of the measured value to the "true value," and a cost function that relates the number of samples to the total cost of sampling and analysis.
  - Selecting the optimal sample size that satisfies the DQOs for each data collection design alternative.
  - Selecting the most resource-effective data collection design that satisfies all DQOs.

EPA QAPP Example Activities

Environmental data are any measurements or information that describe environmental processes, location, or conditions; ecological or health effects and consequences; or the performance of environmental technology. For EPA, environmental data include both primary data (i.e., information collected directly from measurements) and secondary/existing data (i.e., data that were collected for other purposes or obtained from other sources, including literature, industry surveys, models, data bases, and information systems). Example activities covered by the EPA Quality System that involve environmental data include, but are not limited to:

- Characterize and/or evaluate the states and/or conditions of environmental or ecological systems and the health of human populations;

- Characterize and/or evaluate chemical, biological, physical, or radioactive constituents in environmental and ecological systems, and their behavior and associated interfaces in those systems, including exposure assessment, transport, and fate;

- Establish the ambient conditions in air, water, sediments, soil, etc. in terms of physical, chemical, radiological, or biological characteristics;

- Determine and/or categorize radioactive, hazardous, toxic, and mixed wastes in the environment and to establish their relationships with and/or impact on human health and ecological systems;

- Quantify and/or monitor the waste and effluent discharges to the environment from processes and operations (e.g., energy generation, metallurgical processes, chemicals production), during either normal or upset conditions (i.e., operating conditions that cause pollutant or contaminant discharges);

- Develop and/or evaluate environmental technology for waste treatment, storage, remediation, and disposal; pollution prevention; and pollution control and the use of the technology to generate and/or collect data (e.g., treatability and pilot studies);

- Map environmental processes and conditions, and/or human health risk data, etc. (e.g., geographic information system);

- Support enforcement and/or compliance monitoring efforts;

- Develop or evaluate methods for use in the collection, analysis, and use of environmental data;

- Develop and/or evaluate models of environmental processes and conditions and use models to characterize environmental processes or conditions;

- Develop, revise, or use information technology and management system operations that impact the quality of the results of environmental programs (e.g., electronic databases with environmental information including data entry, handling, transmission and analysis and laboratory information management systems).

APPENDIX 1: GREENPOINT COMMUNITY ENVIRONMENTAL FUND (GCEF)

EXAMPLE TEMPLATE
QUALITY ASSURANCE PROJECT PLAN (QAPP)

[Insert Project Name, NFWF Greenpoint Community Environmental Fund Grant ID No., Grant Title]

COMPLETED PLAN PREPARED BY:

[Insert name here]

[Date]

Refer correspondence to:
(Name, organization, address, telephone, and email)

(Note: Instructions are given in bold type. Make sure to complete or revise all underlined sections and remove the underlining upon completion. Also, erase the instructions as you complete the QAPP for your specific project. Make sure to define acronyms/abbreviations when they initially appear in the text (i.e. mg/L, NTU, etc.). Make changes in other places as necessary)

Please read the entirety of this document. Do not fill in information without reading the whole document. It is necessary to fully understand the contents of this Quality Assurance Project Plan (QAPP) in order to complete the required components successfully. Every QAPP will be unique and responsive to the proposal approved by the GCEF.

1.0 PROJECT MANAGEMENT

1.1 TITLE AND APPROVAL SHEET

Project Title:

Prepared by:

Approvals:

New York State Office of the Attorney General, Joseph Haas, Environmental Scientist:

Signature: _____ Date:_____

National Fish and Wildlife Foundation, Lynn Dwyer, Assistant Director, NE, Eastern Partnership Office:

Signature: _____ Date:_____

[Add names and signatures from Principal Investigator and other key project participants]

1.2 CONTACT INFORMATION

[Please provide the name and phone number of project personnel.]

All personnel listed below will receive copies of this Quality Assurance Project Plan (QAPP), and any approved revisions of this plan.

Title	Name (Affiliation)	Phone Number/E-mail
Operation Manager		
Primary Field Sampler		
Laboratory Manager		
Laboratory Quality Assurance/Quality Control (QA/QC) Officer		
Environmental Scientist		
National Fish and Wildlife Foundation (NFWF) Assistant Director, NE, Eastern Partnership Office	Lynn Dwyer, NFWF	(631) 627-3488 Lynn.Dwyer@nfwf.org
New York State Office of the Attorney General (OAG) Environmental Scientist	Joseph Haas, OAG	(212) 416-8481 Joseph.Haas@ag.ny.gov
QA Specialist		

LABORATORY INFORMATION

[Please provide the name, contact information and documentation of state certification for the laboratory employed to conduct sample analysis.]

Name	
Address	
Phone	Contact Name
DHS Laboratory Certification No.	Expiration Date

1.3 PROJECT OBJECTIVES AND APPROACH

[Insert your condensed proposal Narrative here]

The objective of this document is to identify the quality assurance components that are necessary to implement the project activities under the **[Insert project name]**. This objective will be achieved by using accepted methodology (e.g., U.S. Environmental Protection Agency (US EPA)) to collect and/or measure, analyze and/or interpret **[Insert measurement type. i.e.: water and biota]** samples.

Required monitoring or measurements will begin **[Insert dates data or measurements will be taken, start/stop dates for this activity, etc.]** Table 1 lists the constituents that are required to be monitored.

[EXAMPLE ONLY –EDIT AS NEEDED]

Table 1 Constituents to be monitored

CONSTITUENT	UNIT
Flow	CFS (Ft^3/Sec)
PH	pH units
Temperature	^{0}F
Dissolved Oxygen	mg/L
Turbidity	NTU
Total Dissolved Solids	mg/L
Total Suspended Solids	mg/L
Chloride	mg/L
Ammonia	mg/L
Nitrate-Nitrogen	mg/L
Phosphate	mg/L
Sulfate	mg/L
Organophosphate Suite[2]	μg/L

[2] Organophosphate Suite: Bolstar, Chlorpyrifos, Demeton, Diazinon, Dichlorvos, Dimethoate, Disulfoton, Ethoprop, Fenchlorophos, Fensulfothion, Fenthion, Malathion, Merphos, Methyl Parathion, Mevinphos, Phorate, Tetrachlorvinphos, Tokuthion, Trichloronate

CONSTITUENT	UNIT
Organochlorines Suite[3]	µg/L

1.4 DATA QUALITY OBJECTIVES

The data quality objectives are listed in Table 2.

[Please complete the measurement metrics for field sampling in Table 2. Please request this information from the laboratory, if applicable.]

[3] Organochlorine Suite: 2,4' – DDD, 2,4' – DDE, 2,4'DDT, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aldrin, BHC-alpha, BHC-beta, BHC-delta, BHC-gamma, Chlordane-alpha, Chlordane-gamma, Dieldrin, Endosulfan sulfate, Endosulfan-I, Endosulfan-II, Endrin, Endrin Aldehyde, Endrin Ketone

[EXAMPLE ONLY – EDIT AS NEEDED]

Table 2 Quality Assurance Objectives for Individual Measurements

Parameter	Method	Detection Limit	Sensitivity	Precision	Accuracy	Completeness
Flow						80%
Temperature	e.g. Thermometer (-5 to 50)					80%
Dissolved Oxygen						80%
pH						80%
Turbidity						80%
Total Dissolved Solids						80%
Total Suspended Solids						80%
Chloride						80%
Ammonia						80%
Nitrate						80%
Phosphate						80%
Sulfate						80%
Toxicity						80%
Toxaphene						80%
Pyrethroids						80%

1.5 DOCUMENTATION AND RECORDS

*All records generated by this project will be stored at **[Insert name here]** main office. Records stored for this project will include all laboratory records pertinent to this project. Copies of records held by the laboratory will be provided to project manager and maintained in the project file.*

Copies of this QAPP will be distributed to all parties involved with the project, including signatories and field sampling and laboratory personnel. Any future changes or amendments to the QAPP will be held and distributed in the same fashion. Copies of previous versions of the QAPP will be clearly marked as "superseded by Revision #" so as not to create confusion.

The records of all project information and data used to complete the activities of the project will be retained for at least seven years from the date of sampling, measurement, report, or application.

2.0 DATA ACQUISITION

2.1 SAMPLING INFORMATION

Information on sample locations can be found in Appendix A. Surface water samples will be collected for chemical analyses and biological toxicity testing. Methods for sample collection in the field will be done according to standard procedures. Proper sampling techniques will be used to ensure that a representative sample is collected.

2.2 Sample Storage, Preservation and Holding Times

Sample containers will be pre-cleaned and certified to be free of contamination according to the United States Environmental Protection Agency (U.S. EPA) specification for the appropriate methods.

Sampling devices and sample bottles (that are not pre-sterilized and do not contain preservatives/fixing agents) will be rinsed three times with sample water prior to collecting each sample. For sterile bottles, whirl-paks, and sample bottles which do contain preservatives/fixing agents (e.g., acids, etc.) never rinse with sample water prior to collecting the sample. Also, never use a sample bottle containing preservatives/fixing agents for sampling; in these cases always use a sampling device to collect the sample prior to transferring the sample into the bottle.

The following table describes sample holding container, sample preservation method

and maximum holding time for each parameter.

All samples should be refrigerated or stored on ice (do not freeze) and sent to the laboratory IMMEDIATELY for proper storage and preservation.

[EXAMPLE ONLY – EDIT AS NEEDED]

Table 3 Sampling Method Requirements

Parameter	Sample Bottle	Typical Sample Volume	Preferred / Maximum Holding Times
Temperature	Plastic Bottle	150 mL	Immediately
Dissolved oxygen	Glass bottle and device to enable sampling without contact with air	150 mL	Immediately / for wet chemistry fix per protocol instructions, continue analysis within 8 hr.
pH	Plastic Bottle or sample directly	150 mL	Immediately
Turbidity	Plastic Bottle	150 mL	Immediately / store in dark for up to 24 hr.
Total Dissolved Solids	Plastic Bottle	1000 mL	7 days at 4°C, dark
Total Suspended Solids	Plastic Bottle	1000 mL (two jars)	7 days at 4°C, dark
Chloride, Sulfate	Plastic Bottle	300 mL	28 days at 4°C, dark
Ammonia	Plastic Bottle	500 mL	Immediately/8 hours if sample acidified with sulfuric acid to less than 3.0 pH
Nitrate	Plastic Bottle	150 mL	48 hours at 4°C, dark
Phosphate	Plastic Bottle	150 mL	8 hours at 4°C, dark

Pesticides and other synthetic organic compounds	1-L I-Chem 200-series amber glass bottle, with Teflon lid-liner (per each sample type)	1000 mL (one container) *Each sample type requires 1000 mL in a separate container	Keep at 4°C, dark, up to 7 days. Extraction must be performed within the 7 days; analysis must
Toxicity	Four 2.25 L amber glass bottles with Teflon lid liner	9000 mL	Refrigerate at 4°C send to lab immediately

SAMPLE IDENTIFICATION

All samples will be identified with a unique number and samples labeled with the following information.

- Sample ID
- Location ID
- Date
- Time
- Initials of sample collector
- Sample type (normal or QC)
- Preservative method (if any)

[EXAMPLES ONLY – EDIT AS NEEDED]

FIELD MEASUREMENTS

If possible (if equipment is available), water quality parameters including **[Insert project-specific information, such as flow rate, pH, dissolved oxygen, and temperature]** will be measured prior to collecting samples for laboratory analyses.

QC SAMPLE COLLECTION

Equipment blanks, field duplicates, and matrix spikes will be collected at a frequency of about 1 per 20 normal samples, or 1 per sampling event, whichever is greater. Matrix spikes will be collected as normal samples and will be spiked at the laboratory prior to sample preparation.

FIELD INSTRUMENT CALIBRATION

Routine field instrument calibration will be performed at least once per day prior to instrument use to ensure instruments are operating properly and producing accurate and reliable data. Calibration will be performed at a frequency recommended by the manufacturer.

DECONTAMINATION PROCEDURES

All field and sampling equipment that will contact samples will be decontaminated after each use in a designated area.

FIELD DOCUMENTATION

All field activities will be adequately and consistently documented to ensure defensibility of any data used for decision-making and to support data interpretation. In particular if during dry season sampling if there is no irrigation run off available for sampling this needs to be documented and supported in the annual monitoring report.

Pertinent field information, including (as applicable), the **[Insert field project-specific sampling/measurement parameters, such as width, depth, flow rate of the stream, the surface water condition, crop and cultivation practices and evidence of pesticide/fertilizer or sediment management, and location of the tributaries]** will be recorded on the field sheets.

2.3 SAMPLE CUSTODY AND DOCUMENTATION

Sample Custody will be traceable from the time of sample collection until results are reported.

DOCUMENTATION PROCEDURES

The primary field sampler will be responsible for ensuring that the field sampling team adheres to proper custody and documentation procedures. A master sample logbook or field datasheets will be maintained for all samples collected during each sampling event.

CHAIN-OF-CUSTODY FORM

When samples are transferred from one sampler to another member of the same organization or from the monitoring group to an outside professional laboratory, then a Chain of Custody (COC) form should be used. This form identifies the site name, sample location, sample number, matrix, date and time of collection, sampler's name, sampling equipment and sample type (i.e., normal field or QC sample), and method used to preserve sample (if any). It also indicates the date and time of transfer, and the name

and signature of the sampler and the sample recipient. It is recommended that when a sample leaves the custody of the monitoring group, then the Chain of Custody (COC) form used be the one provided by the outside professional laboratory. Similarly, when QC checks are performed by a professional lab, their samples will be processed under their COC procedures with their labels and documentation procedures.

[Please attach the lab chain of custody form to the end of this document, if appropriate.]

SAMPLE SHIPMENTS AND HANDLING

All sample shipments are accompanied with the COC form, which identifies the contents. The original COC form accompanies the shipment and a copy is retained in the project file.

All shipping containers will be secured with COC seals for transportation to the laboratory. The samples will be placed with ice to maintain the temperature between 2-4 degrees C. The ice packed with samples will be sealed in zip lock bags and contact each sample and be approximately 2 inches deep at the top and bottom of the cooler. Samples will be shipped to the contract laboratories according to U.S. Department of Transportation (US DOT) standard.

LABORATORY CUSTODY PROCEDURES

The following sample control activities will be conducted at the laboratory:

- Initial sample login and verification of samples received with the COC form
- Document any discrepancies noted during login on the COC
- Initiate internal laboratory custody procedure
- Verify sample preservation (e.g., temperature)
- Notify the project coordinator if any problems or discrepancies are identified
- Proper samples storage, including daily refrigerator temperature monitoring and sample security.

3.0 ANALYTICAL REQUIREMENTS

[Retain or Delete as Needed]

3.1 CHEMISTRY ANALYSES

Prior to the analyses of any environmental samples, the laboratory must have demonstrated the ability to meet the minimum performance requirements for each analytical method. Initial demonstration of laboratory capabilities includes the ability to

meet the project specified quantitation limits (QL), the ability to generate acceptable precision and recoveries, and other analytical and quality control parameters as stated in this Guide. Analytical Methods used for chemistry analyses must follow a published method (US EPA or Standard Method for the Examination of Water and Wastewater) and document the procedure for sample analyses in a laboratory Standard Operating Procedure (SOP) for review and approval. This applies to project and field personnel conducting field sampling/measurements/analysis of media not analyzed by the laboratory. Training records for field staff should be maintained under the documentation requirements noted in Section 1.4 of this QAPP.

3.2 TOXICITY TESTING

The ambient water toxicity test results must provide a reliable qualitative prediction of impacts in stream biota. At a minimum the toxicity testing will need to include the 4-day static renewal procedures described in Method for Measuring Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms (US EPA, 2002).

3.3 LABORATORY STANDARDS AND REAGENTS

All stock standards and reagents used for extraction and standard solutions will be tracked through the laboratory or the field sampling/measurement manager. Date of preparation, analyte or mixture, concentration, name of preparer, lot or cylinder number, and expiration date, if applicable, must be recorded on each working standard.

3.4 SAMPLE PREPARATION METHODS

Surface water samples will be prepared in solvent or via other extraction techniques prior to sample analyses as noted in Table 3. All procedures must follow a published method.

Ground water samples will be prepared according to published methods as noted in Table 3.

4.0 QUALITY CONTROL REQUIREMENTS

The types of quality control assessments required for this project are discussed below. Detailed procedures for preparation and analysis of quality control samples are provided in the SOPs for the sample type.

4.1 QUALITY ASSURANCE OBJECTIVES (QAOS)

Quality assurance objectives are the detailed QC specifications for precision, accuracy, representativeness, comparability, and completeness (PARC). The QAOs are then used as comparison criteria during data quality review by the group that is responsible for

collecting data to determine if the minimum requirements have been met and the data may be used as planned.

4.2 Development of Precision and Accuracy Objectives

Laboratory control spikes (LCSs) are used to determine the precision and accuracy objectives. The laboratory fortifies the LCSs with target compounds to monitor the laboratory precision and accuracy. Field duplicates measure sampling precision and variability for comparison of project data. Acceptable relative percent difference (RPD) is less than 25 for field duplicate analyses. If field duplicate sample results vary beyond these objectives, the results will be qualified.

4.3 Internal Quality Control

Internal QC is achieved by collecting and/or analyzing a series of duplicate, blank, spike, and spike duplicate samples to ensure that analytical results are within the specified QC objectives. The QC sample results are used to quantify precision and accuracy and identify any problem or limitation in the associated sample results. The internal QC components of a sampling and analyses program will ensure that the data of known quality are produced and documented. The internal QC samples, frequency, acceptance criteria, and corrective action must meet the minimum requirements presented in the following sections.

4.4 Field Quality Control

Field QC samples are used to assess the influence of sampling procedures and equipment used in sampling. They are also used to characterize matrix heterogeneity.

For basic water quality analyses, quality control samples to be prepared in the field will consist of equipment blanks, field duplicates, and matrix spikes (when applicable).

Equipment Blanks

Equipment blanks will be collected and analyzed for all analytes of interest along with the associated environmental samples. Equipment blanks will consist of laboratory-prepared blank water (certified contaminate free) processed through the sampling equipment using the same procedures used for environmental samples.

Field Duplicates

Field duplicates will be collected at the rate of 1 per 20 normal samples, or 1 per sampling event, whichever is greater. Field duplicates will be collected at the same time as environmental samples or of two grab samples collected in rapid succession, and will be analyzed along with the associated environmental samples. If the relative percent

difference (RPD) of field duplicate results in greater than 25% and the absolute difference is greater than the reporting limit (RL), both samples should be reanalyzed.

Matrix Spikes and Matrix Spike Duplicates

Matrix spikes and matrix spike duplicates will be analyzed at the rate of one pair per sample batch. Matrix spike samples are collected at the same time as the environmental samples and are spiked at the laboratory.

4.5 Laboratory Quality Control

For basic water quality analyses, quality control samples prepared in the contract laboratory will typically consist of method blanks, laboratory control samples, laboratory duplicates, and surrogate added to each sample (organic analysis).

Method Blanks

Method blanks will be prepared and analyzed by the contract laboratory with each batch of samples. If any analyte is detected in the blank, the blank and the associated samples must be re-extracted and re-analyzed.

Laboratory Control Samples and Surrogate

Laboratory control samples (LCS) will be analyzed at the rate of one per sample batch. Surrogate may be added to samples for organic analyses.

Overall, laboratory acceptance criteria are shown below.

[**Please request this information from the laboratory and complete the table.]**

Table 4 Analytical Quality Control

Laboratory QC	***Frequency/Number***	***Acceptance Limits***
Method Blank		
Reagent Blank		
Storage Blank		
Instrument Blank		
Lab. Duplicate		
Lab. Matrix Spike		

Laboratory QC	*Frequency/Number*	*Acceptance Limits*
Matrix Spike Duplicate		
Lab. Control sample		
Surrogates		
Internal Standards		
Others:		

5.0 INSTRUMENTATION AND EQUIPMENT PREVENTIVE MAINTENANCE

5.1 SAMPLE EQUIPMENT CLEANING PROCEDURES

Equipment used for sample collection must be cleaned and maintained in accordance with proper field practices.

5.2 ANALYTICAL INSTRUMENT AND EQUIPMENT TESTING PROCEDURES AND CORRECTIVE ACTIONS

All instrument and equipment testing will be performed according to manufacturer recommendations and documented in the associated equipment calibration logbook.

Laboratory instrument and equipment testing will be as prescribed under the laboratory operating manual.

5.3 INSTRUMENT CALIBRATIONS AND FREQUENCY

[Retain, Edit or Delete as Needed]

Analytical Procedures and Calibration

This section briefly describes analytical methods and calibration procedures for samples that will be collected under this project.

Analytical methods that will be used in this program will need to follow the general guidance of any of the following methods:

- *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater* (EPA-600/4-85 054)
- *U.S. EPA Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020, third edition, 1983)

- *Methods for Determination of Organic Compounds in Drinking Water* (EPA-600/4-88/039)

- *Standard Methods for the Examination of Water and Wastewater* (APHA 1998)

- *USEPA. 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition. Office of Water, Washington, D.C. EPA-821-R-02-012*

- *USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. Office of Water, Washington, D.C. EPA-821-R-02-013.*

- *USEPA. 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. Office of Research and Development, Washington, D.C. EPA-600-R-94-024.*

For this program, only linear calibration with either an average response factor or a linear regression is acceptable for organic analyses. Non-linear calibration is not allowed since using this calibration option creates a potential for poor quantitation or biased concentration of compounds at low or high concentrations (near the high and low ends of the calibration range).

Laboratories shall prepare an initial 5-point calibration curve, where the low level standard concentrations is less than or equal to the analyte quantitation limits.

6.0 DATA MANAGEMENT

Copies of field logs, a copy of COC forms, original preliminary and final lab reports, and electronic media reports will be kept for review by the **[Insert organization name].** The field crew will retain original field logs. The contract laboratory will retain COC forms. The contract laboratory will retain copies of the preliminary and final data reports.

Field data sheets are checked and signed in the field by the project **[Insert "leader", "manager", etc.]**. They will identify any results where holding times have been exceeded, sample identification information is incorrect, samples were inappropriately handled, or calibration information is missing or inadequate. Such data will be marked as unacceptable by and will not be entered into the electronic data base and/or otherwise used for project analysis, reporting or other purpose.

Independent laboratories will report their results to the project ["leader", "manager", etc.]. The leader will verify sample identification information, review the chain-of-custody forms, and identify the data appropriately in the database.

Concentrations of chemicals and toxicity endpoints, and all numerical biological parameters will be calculated as described in the referenced method document for each analyte or parameter, or a laboratory operating procedure. The data generated will be converted to a standard database format maintained by the responsible party and available for NFWF/OAG staff review when requested. This review is for QA/QC purposes only and will not be used for any other purpose. All project information will remain confidential. See Section 6.2 for additional information on this data reporting requirement.

After data entry or data transfer procedures are completed for each sample event, data will be inspected for data transcription errors, and corrected as appropriate. After the final QA checks for errors are completed, the data will be added to the final database.

6.1 DATA ASSESSMENT PROCEDURES

Data must be consistently assessed and documented to determine whether project QAOs have been met, quantitatively assess data quality and identify potential limitations on data use. Assessment and compliance with quality control procedures will be undertaken during the data collection phase of the project.

6.2 DATA TO BE INCLUDED IN QA SUMMARY REPORTS

During the project, NFWF/OAG may require periodic reporting, as noted below.

The following table summarizes the types of data to be reported and the method in which that information will be delivered to NFWF/OAG staff.

Data	Data Description	Reporting Method	Frequency
Best Management Practice (BMP) Data	Raw data from project reports in units of miles, linear feet, acres, individuals, etc.	Spreadsheet, electronically via e-mail.	Annually
Monitoring Data	Raw data on project effectiveness, ambient water quality in priority watershed, stormwater flow, project conclusion data, etc.	Raw data, reports, and/or spreadsheets, electronically on CD or via e-mail.	At NFWF/OAG Request during the closeout procedure
Geospatial Data	Google polygon maps, latitude/longitude info, watershed segment	Spreadsheet	Annually

Chesapeake Action Plan (CAP)/Chesapeake Registry	Administrative and management related data in accordance to CAP reporting requirements	Spreadsheet, electronically via e-mail.	Annually

At project completion, the field team will provide copies of the field data sheets (relevant pages of field logs) and copies of the COC forms as a representative sample subset submittal of analysis. At a minimum, sample-specific information must be provided for each sampling type to NFWF/OAG staff according to the QA Summary Report template, included as Attachment D.

6.3 REPORTING FORMAT

All results meeting data quality objectives and results having satisfactory explanations for deviations from objectives will be reported in the QA Summary Report. The final results will include the results of all field and laboratory quality control samples. Results will be reported to NFWF/OAG at project completion as noted in Section 6.2 above. Reports may be submitted electronically along with the final programmatic report.

7.0 DATA VALIDATION AND USABILITY

7.1 LABORATORY DATA REVIEW, VERIFICATION, AND REPORTING

The laboratory quality assurance manual will be used to accept, reject or qualify the data generated by the laboratory. The laboratory management will be responsible for validating the data generated by the laboratory.

The laboratory personnel will verify that the measurement process was “in control” (i.e., all specified data quality objectives were met or acceptable deviations explained) for each batch of samples before proceeding with analysis of a subsequent batch. In addition, each laboratory will establish a system for detecting and reducing transcription and/or calculation errors prior to reporting data.

Only data, which have met data quality objectives, or data, which have acceptable deviations clearly noted, will be submitted by the laboratory. When QA requirements have not been met, the samples will be reanalyzed when possible and only the results of the reanalysis will be submitted, provided they are acceptable.

7.2 Self-Assessment, Data System Audits

Periodic self-assessments and/or data system audits are implemented based on the nature and scope of project-specific data collection activities. For data users, these technical audits and assessments provide project personnel with a tool to determine

whether data collection activities are being or have been implemented as planned. They also provide the basis for taking action to correct any deficiencies that are discovered. For QAPP Categories 1-2, NFWF/OAG may request periodic self-assessments or a data system audit. For QAPP Categories 3-4, NFWF/OAG requires the implementation of one of these tools. The decision is made by the project manager and based on the frequency of project-specific data activities.

8.0 REFERENCES

[EXAMPLE ONLY]

[Edit to meet your project]

U.S. EPA 2001. Laboratory Documentation Requirements for Data Evaluation (R9QA/004.1)

U.S. EPA 1983. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, third edition

U.S. EPA 1988. Methods for Determination of Organic Compounds in Drinking Water (EPA-600/4-88/039)

USEPA.2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition. Office of Water, Washington, D.C.
EPA-821-R-02-012

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. Office of Water, Washington, D.C.
EPA-821-R-02-01

USEPA. 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. Office of Research and Development, Washington, D.C. EPA-600-R94-024.

EPA/600/R-99/080 2000. Guidance on Technical Audits and Related Assessments for Environmental Data Operations

Appendices

A) PROJECT SITE MAP(S)
B) STANDARD OPERATING PROCEDURES
C) FIELD DATA SHEET
D) QA SUMMARY REPORT

[Attach all SOPs, methods, and laboratory procedures mentioned in your QAPP. Contact your lab and have them provide a copy of the certifications they possess (e.g., U.S. EPA, State Department of Environmental Protection (DEP)/Department of Environmental Quality (DEQ), etc.)]

APPENDIX D – AT PROJECT CLOSE OUT

[Insert Project Name]

QA Summary Report - Components

This project resulted in **[Insert deliverable description]**. This work product received the required nature and scope of QAPP oversight appropriate for the intended use of the data.

The data sets, data products and other supporting QA documentation is/are maintained on file with the assigned research staff as noted in the QAPP until **[Insert date].**

All QAPP elements were met and completed according to the procedures and methods outlined therein.

GCEF QA Summary Reports will be submitted to NFWF/OAG annually and at project completion as requested. The QA Summary reports will include the following information, as appropriate –

1. QA Summary Closeout reports include the extent to which projects are implemented according to the stated scope of work and the methodologies specified in this QAPP in their final programmatic reports.
2. Significant changes to the objective, scope, or methodology of environmental data collection or use of environmental technology require the review and approval of the NFWF Director and the NFWF/OAG QA reviewer. Therefore, if needed, appropriate revisions to this QAPP will be completed and submitted to the NFWF/OAG Director for review and approval prior to implementation of changes.
3. Additionally, periodic QA Summary Reports will be submitted to NFWF/OAG annually, if requested, according to the table, below.

[EXAMPLE ONLY]

[Edit to meet your project]

The following table summarizes the types of data to be reported and the method in which that information will be delivered to the GCEF.

Data	Data Description	Reporting Method	Frequency
BMP Data	Raw data from project reports in units of miles, linear feet, acres, individuals, etc.	Spreadsheet, electronically via e-mail.	Annually
Monitoring Data	Raw data on project effectiveness, ambient water quality in priority watershed, stormwater flow, project conclusion data, etc.	Raw data, reports, and/or spreadsheets, electronically on CD or via e-mail.	At GCEF Request during the closeout procedure
Geospatial Data	Google polygon maps, latitude/longitude info, watershed segment	Spreadsheet	Annually

[Insert Project Name]	Field/Sample Log

[Insert Project Name] Site Sampling Map

[Insert geospatial map showing sampling locations by GPS location, Site Name and any other identifier.]

[EXAMPLES ONLY FOLLOW]

[Edit to meet your project]

1. FIELD SAMPLE LOG
2. FIELD DATA LOG

Operation Name: Sampling Event: DRY WET (circle one)

Date: Sampling Personnel (print and sign):

Weather Conditions: Organization:

Sample Number	Sample Collected (mark)		Sample Type	Time	Sampling Device	Sample Container
	Field Measurements	Lab Sample	(Normal/QC)	(hhmm)	(grab/other)	(glass/plastic)

If this is a dry weather sampling event and there was no irrigation discharges available for sampling please provide the information below as documentation. Please note that dry weather sampling is required to be conducted on the same day as irrigation near the end of the irrigation cycle.

Date of Irrigation	
Time of Irrigation	
Length of irrigation cycle	
Time of Sample Investigation	

[Insert Project Name] **Field Data Sheet**

Operation Name:	Address:	
Date:	Weather Conditions:	Crop Type:
Type of Irrigation:	Stream Width:	Stream Depth:
Pesticide Application Time/Type:		
Fertilizer Application Time/Type		
Location of Tributaries:	Sampling Event:	DRY / WET (Circle one)

Sample Number	Location	Flow Rate	Temperature	pH	Dissolved Oxygen	Turbidity
		cfs	^{o}F		mg/L	NTU

Sampling Personnel:

(Print) (Sign)

Organization: