

# **PFAS sampling in rivers and streams in Massachusetts**

## **U.S. Geological Survey - Quality Assurance Project Plan**

*Prepared By:* U.S. Geological Survey  
New England Water Science Center, Northborough, MA  
10 Bearfoot Road, Northborough, MA 01532

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*Revision:*

*Prepared For:* Massachusetts Department of Environmental Protection (MassDEP)

*USGS Project Manager:* Jennifer Savoie, [jsavoie@usgs.gov](mailto:jsavoie@usgs.gov)

Quality Assurance Project Plan for PFAS sampling in rivers and streams in Massachusetts

*Lead Organization:* Massachusetts Department of Environmental Protection (MassDEP)  
*Partner Organization:* USGS

## PFAS sampling in rivers and streams in Massachusetts

### A1. Title and Approval Page

PFAS sampling in rivers and streams in Massachusetts

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U.S. Geological Survey, New England Water Science Center, Northborough, MA

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08/12/2020

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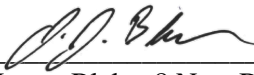
**Project Manager Signature**  
**Name/Date**

\_\_\_\_\_  
Jennifer Savoie, USGS, 10 Bearfoot Rd., Suite 6  
Northborough, MA 01532


**Project QA/QC Officer Signature**  
**Name/Date**

\_\_\_\_\_  
Jon Morrison, USGS, 101 Pitkin Street,  
East Hartford, CT 06108

**MassDEP Project Manager Signature**  
**Name/Date**

 9/24/20  
\_\_\_\_\_  
Laura Blake, 8 New Bond Street, Worcester, MA 01606

**MassDEP QA/QC Reviewer Signature**  
**Name/Date**

 9/24/20  
\_\_\_\_\_  
Richard Chase, 8 New Bond Street, Worcester, MA 01606

**QUALITY ASSURANCE PROJECT PLAN  
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## **2.0 Document Purpose**

This Quality Assurance Project Plan (QAPP) supports water quality data collection for the project titled, PFAS sampling in rivers and streams in Massachusetts. The QAPP provides details about specific Quality Assurance (QA) and Quality Control (QC) activities that will be implemented for the work described in this document. This plan describes the organizational structure, functional responsibilities, lines of authority, and required interactions for those planning, implementing, and assessing all activities conducted for this project.

To support U.S. Geological Survey (USGS) Fundamental Science Practices for the collection of scientific data, there are published requirements for the collection, management, quality assurance, and dissemination of all water-quality data activities. The New England Water Science Center (WSC) documents adherence to USGS policies and standards through the development of Quality Assurance Plan (QAP) for all water-quality activities (Appendix 1). The New England WSC QAP identifies responsibilities for ensuring that stated USGS policies and procedures are carried out. The plan also serves as a guide for all WSC personnel who are involved in water-quality activities and as a resource for identifying memoranda, publications, and other literature that describe associated techniques. This QAPP will reference relevant USGS policies and procedures from the New England WSC QAP.

## **3.0 Distribution List**

Persons listed below will receive copies of the approved QAPP and any subsequent revisions. A complete copy of the original version and all revisions, including the official, approved QA project plan, will be maintained on file by the project Manager (Jennifer Savoie) at the USGS Connecticut Office and will be available upon request.

i. Jon Morrison, USGS	(860) 291-6761	jmorriso@usgs.gov
ii. Jennifer Savoie, USGS	(508) 490-5033	jsavoie@usgs.gov
iii. Laura Blake, MassDEP	(508) 767-2876	Laura.Blake@mass.gov
iv. Richard Chase, MassDEP	(508) 767-2859	Richard.f.chase@mass.gov

## **3.1 Project Organization**

Jennifer Savoie (Project Manager – USGS) is responsible for all project activities including writing the QAPP, collecting or overseeing the collection of water-quality samples, and approving water-quality data which will be published on the USGS National Water Information System website (NWISweb). Jon Morrison (Project QA/QC Officer) is responsible for the project quality assurance and quality control activities and for technical and administrative oversight of all the project work.

**Table 1. Project participants, title, affiliated organization and primary responsibilities in the project.**

<b>Name</b>	<b>Title</b>	<b>Organization</b>	<b>Primary Responsibilities</b>
Laura Blake	Director, Watershed Planning Program (WPP)	MassDEP	Responsible for the development of the project objectives and supporting USGS in design of the project activities to meet the overall objectives within the scope of the budget. Responsible for coordination among all organizations associated with project. Review interim project summaries provided by USGS to ensure the project and data quality objectives are being met.
Richard Chase	Data & Assessments Group, WPP	MassDEP	Project support, including QAPP review and approval, QC data review, lab coordination, site selection, etc.
Jennifer Savoie	Project Manager	USGS	Responsible for working with MassDEP in the development of the project objectives and a project design that will to meet the overall objectives within the scope of the budget. Responsible for overall project management and decision making in consultation with MassDEP. Review on-going activities to ensure the project and data quality objectives are being met and provide MassDEP interim project summaries.
Jon Morrison	QA/QC Officer	USGS	Provide technical and administrative oversight of project work. Responsible for the project quality assurance and quality control activities and for technical and administrative oversight of all the project work.

#### **Massachusetts Department of Environmental Protection**

MA DEP provides point of contact for the project and facilitates collaboration across various organizations associated with this project on all project tasks. Provides technical support for selecting water quality monitoring locations and QA review of the data.

#### **United States Geological Survey (USGS)**

USGS provides field support for reconnaissance of water quality monitoring locations, and collection and analysis of water quality and flow data. The USGS also provides quality assurance oversight of data collection and analysis and publishes the data through the USGS NWISweb, which is publicly accessible.

## **4.0 Project Definition and Background**

Per- and polyfluoroalkyl substances (collectively called PFAS) are a group of man-made chemicals that include PFOA, PFOS, GenX and many other compounds. PFAS compounds have been found in rivers, fish, and groundwater in many states. There is little information on the occurrence and distribution of PFAS in Massachusetts waters and there is growing concern over the magnitude and extent of potential contamination due to known health effects of PFAS in drinking water. To provide information needed for an assessment of PFAS in rivers in Massachusetts, this project proposes to conduct a synoptic study that will include collection of water-quality data in locations upstream and downstream from selected wastewater treatment facilities (WWTF). In addition, this study includes selected stream sites that are not impacted by large municipal wastewater discharges, including stream sites where no known sources of PFAS are expected.

Municipal wastewater treatment facilities may be contributors of PFAS to riverine water resources across the state. It is prudent to study rivers where municipal wastewater is being discharged to surface water bodies, particularly when the discharge is upstream of public water supplies, in order to get information on the magnitude of PFAS concentrations downstream from, and potentially affected by discharges from these facilities. It is also important to study locations where the rivers and streams are not impacted by wastewater discharges such as locations in central and western Massachusetts.

### **Purpose of Study**

The magnitude of PFAS concentrations in Massachusetts rivers from known point and nonpoint sources is unknown and a baseline characterization is needed so that PFAS entering the environment can be quantified and managed. The objective of this cooperative project is to determine and assess PFAS concentrations in select rivers and streams in Massachusetts. Data collected during this study will be used to help State water-resource managers to characterize PFAS occurrence in rivers and streams in Massachusetts near selected WWTFs, at locations where there are suspected PFAS dischargers and where there are no known or potential point or non-point sources.

## **5.0 Project Description and Schedule**

Three sampling events (over the course of 3-4 summer-fall months) will be conducted to characterize the presence and magnitude of PFAS at 64 locations in 25 rivers and streams across Massachusetts. In this study, 25 municipal WWTFs that discharge to rivers and streams and that are primarily located upstream of drinking water supplies were selected (Figure 1). Each of the 25 WWTFs will have an associated up- and downstream sample location (with the exception of Pittsfield WWTF on the Housatonic River, which only has a downstream sampling location), totaling 49 stream sites associated with WWTFs (Appendix 2). The 15 other stream sites were selected to represent non-municipal wastewater impacted streams with a range in suspected nonpoint sources. These stream sites are distributed across the state and are shown in Figure 1 and listed in Appendix 2.

Samples will be collected by USGS staff for analysis of 24 PFAS compounds by Alpha Analytical Inc., in Mansfield, Massachusetts. Alpha Analytical Inc. will analyze the water samples using their DEP-approved method, Mass DEP Method - Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (LC/MS/MS) (Appendix 3). The 24 PFAS compounds included in this study are listed in Appendix 4. This method provides the linear concentrations for 19 of the selected PFAS

compounds and linear and branched concentrations for 5 compounds, as indicated by long-parameter name in Appendix 4. Results of analysis will first be transmitted to MassDEP who will subsequently provide the reviewed results to USGS.

In addition, field parameters including water temperature, pH, specific conductance, dissolved oxygen and turbidity will be measured at each site at the time of sample collection. Each of the three rounds of PFAS analysis will provide a snapshot of PFAS distributions in selected Massachusetts rivers and streams. The field parameter data associated with each of these snapshots will be used to better characterize general water-quality among stations and the three separate sampling events. For the PFAS samples, an archive sample will be collected as a split replicate. The archive sample will be collected, frozen, and stored at the USGS Northborough office or MassDEP for approximately 12 months in case future analyses, such as total oxidized precursor (TOP) PFAS analysis, need to be performed.

Field reconnaissance for site locations will be completed by the end of July 2020. The first round of sample collection will occur in the mid-to-late August 2020. Flow conditions permitting, the subsequent rounds of sample collection will be initiated 21 to 30 days after the previous round of sample collection was completed as baseflow conditions allow. A generalized schedule for the completion of field activities is shown in Table 2.

Sixty-four stream sites will be established and approximately 242 samples (192 environmental and 50 QAQC samples) will be collected over three to four months. To minimize the potential effects that stormwater runoff may have on PFAS compounds, sample collection will target base-flow conditions at the stream sites (August through November, or as agreed upon by USGS and MassDEP). For the purpose of this study, base-flow conditions will be defined as 3 days of generally declining streamflow and an instantaneous streamflow less than the 75<sup>th</sup> percentile of annual daily mean (Rantz and others, 1982a, b). USGS operates a network of continuous stream gage stations across the state of Massachusetts. Gages that are located within the same reach as the WWTF or stream site or in an adjacent and similar size watershed will be used to determine if the hydrologic conditions are acceptable for sample collection. The USGS gage that will be used to indicate base-flow conditions for the 64 sites are listed in Appendix 2 and shown in Figure 1. The USGS WaterWatch website ([waterwatch.usgs.gov](http://waterwatch.usgs.gov)) will be used to determine acceptable sampling conditions.

Figure 1. Map of 25 Wastewater treatment facilities, 15 stream sampling locations and nearby USGS stream gages.

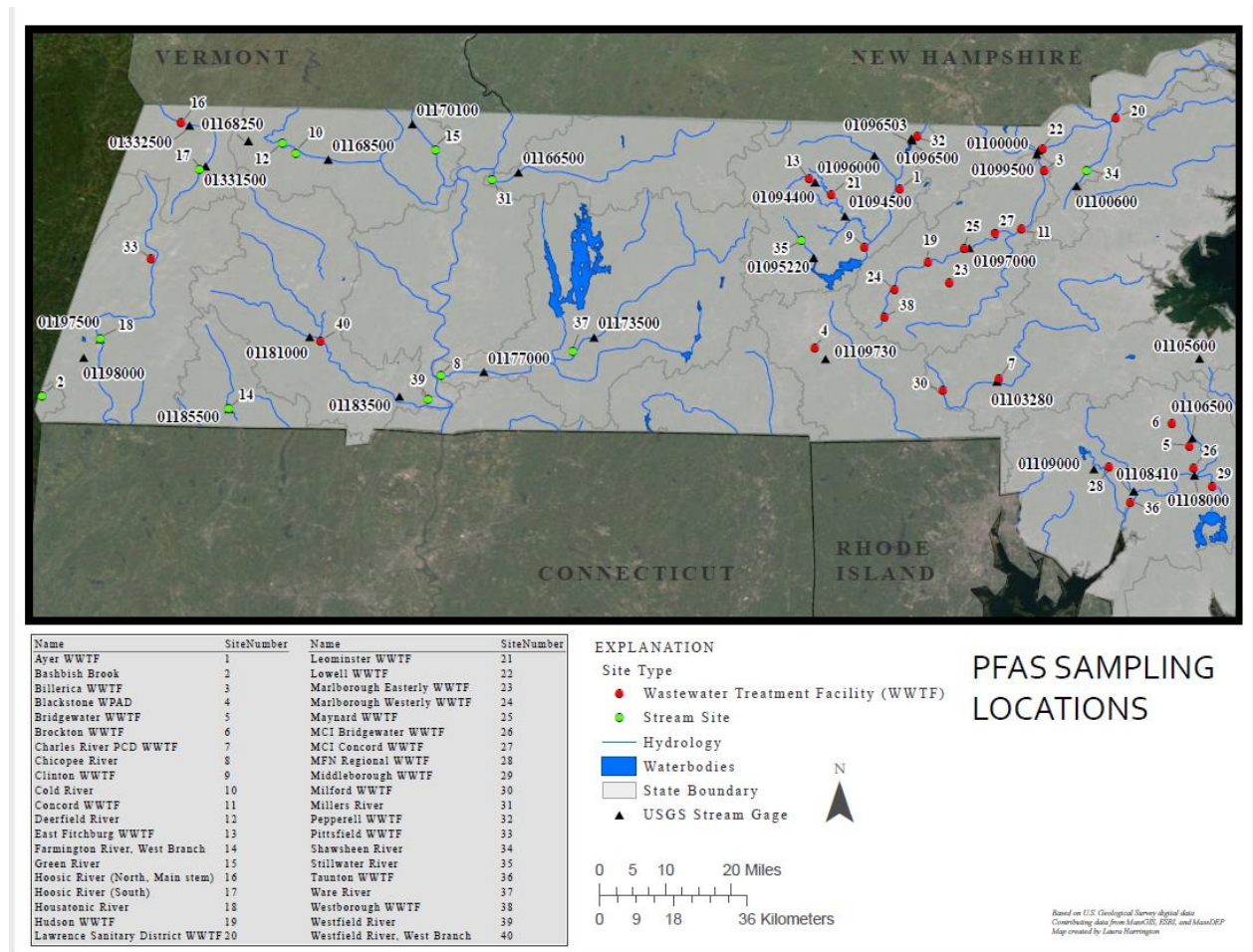




Table 2. Generalized schedule for the completion of field activities

Activities		Anticipated date of Initiation	Anticipated Date of Completion	Deliverable	Deliverable Due Date
Task 1	Field reconnaissance	6/22/2020	7/3/2020	Proposed stream site locations	7/13/2020
Task 2	QAPP preparation	6/22/2020	7/27/2020	QAPP documents	8/14/2020
Task 3	Field staff and equipment	6/13/2020	9/15/2020	NA	NA
Task 4	Round 1 of data collection	8/17/2020	8/31/2020	Analytical results will be reported directly to MassDEP from Alpha Analytical Inc	TBD
	Round 2 of data collection	9/14/2020	9/28/2020		TBD
	Round 3 of data collection	10/05/2020	10/19/2020		TBD

## **6.0 Measurements/Data Acquisition**

The surface-water collection procedures proposed for this project are based on guidance documents from several leaders in PFAS sampling including Federal, State, regional consortiums and private industry organizations (U.S. EPA, 2020; Interstate Technology Regulatory Council, 2019; New Hampshire Department of Health and Human Services, 2019; Tetra Tech, 2016). These guidance documents discuss equipment and bottle type and material selections, analytical method considerations, and numerous precautions to be aware of in sample handling. A more detailed description of the sample collection procedures proposed for the project is included in Section 6.1 Discrete Water Quality Sampling.

Analytical sensitivity for PFAS compounds is measured at the nanogram per liter level and therefore fundamental considerations outlined in the NFM for low-level analysis will be used and include: (1) collecting samples first at sites having the least contamination or lowest expected chemical concentrations; (2) handling equipment in a manner that minimizes the chance of altering ambient sample composition; and (3) handling samples in a manner that prevents contamination (USGS, 2018). All sampling equipment will be constructed of non-contaminating materials (i.e., no Teflon or equipment that has the part of the name “fluoro” in the construction material). Sample bottles will be kept inside zip-lock bags and stored in coolers (as provided by Alpha Analytical) and not allowed to contact carpet or upholstery. Personnel will not use clothing, boots or waders constructed with Gore-Tex, use PFAS-free personal care products on the day of sampling and avoid using fabric softeners on clothing. All food and beverages brought into the field will not contain aluminum foil or fast-food packaging materials. For an additional safeguard, personnel filling the bottles will don elbow-length polyethylene gloves under their nitrile gloves prior to sample collection.

Although the USGS does not currently have a published document for the collection of surface water samples for PFAS analysis most of the policies and procedures for the collection of water-quality data are described in a multi-chapter Techniques of Water-Resource Investigations (TWRI) report — the USGS National Field Manual (NFM)— will be relevant and followed to ensure the highest quality samples (USGS, 2018). Recommended workflows and guidelines for adhering to

USGS Policies on the collection, review, and archive of water-quality data are included in the New England Quality Assurance Plans and internal Standard Operating Procedure documents.

The New England WSC requires each project to develop a Data Management Plan to document and explicitly explain how the data from this project will be managed in accordance with USGS policy. Sixty-four separate electronic folders will be created on an internal New England-wide server and will serve as the repository or archive of all field activities related to the sampling location and specific sampling dates for this project. The information associated with each sample collection event will be stored in a separate folder identified by sample date. Discrete water-quality field data will be initially recorded on paper field forms (Appendix 5). All paper field forms will be scanned and electronically archived within one week of completing a sampling round.

At the end of each sampling round field technicians will enter all sampling data into the USGS National Water Information System (NWIS) database. All data files will be archived electronically with all site visit related information. Site visit information will be entered into the USGS NWIS database within one week of sample completion. This will create a sample header with field parameter data in NWIS that can be appended as Alpha Analytical Inc. results are available and approved by MassDEP and USGS.

Alpha Analytical's chain-of-custody form will be used for sample submission for this project (Appendix 6). The chain-of-custody forms will not be site-specific but will include documentation of samples for many different sites, dates, and times. These documents will be scanned and electronically filed in the project directories. The following minimum records are retained for archive: (1) Field forms and notes (2) field instrumentation calibration forms and notes (3) Chain-of-custody forms; (4) formal communications between the laboratory and New England WSC personnel; (5) any associated corrective actions; (4) laboratory data package; (6) finalized data report; (7) laboratory log books; and (8) electronic data. Alpha Analytical uses an internal data management tool called ADEx to transfer data electronically to clients. Approved results can be released in standard or custom formats. For this project, MassDEP has requested delivery of Excel-based Electronic Data Deliverable (EDD), in addition to the standard full QC lab report from Alpha.

The tool that will be used to determine if the sampling sites are in base-flow conditions is the USGS WaterWatch website (<https://waterwatch.usgs.gov/?m=real&r=ma&w=map>). The USGS WaterWatch website displays current stream flow conditions relative to the annual daily mean for that site and period of record. Each of the index gages used to determine flow conditions for this project is displayed on WaterWatch and color coded to indicate the current hydrologic conditions relative to normal conditions. USGS gages that are displayed as orange, maroon, and red meet the project definition of base flow conditions. For some sites, a steam flow in the lower end of normal flows (displayed as green) may also be acceptable conditions for sampling. In addition to base flow hydrologic conditions, this project will also avoid sampling during rain events that are likely to generate a run-off event (>2 inches in less than 24 hrs).

## **6.1 Discrete Water Quality Sampling**

The sixty-four sites selected for this study will be comprised of existing USGS and MassDEP stations and newly established stations to meet the objectives of this project. Discrete samples will be collected by trained USGS personnel at baseflow conditions and in adherence to project specific and USGS protocols for the collection of water-quality data (USGS, 2018).

The general station site-visit workflow will be as follows:

All sampling equipment will be thoroughly cleaned prior to sample collection according to the USGS NFM. All churns and 1-liter sample bottles and bottle nozzles will be cleaned with soapy water, followed by three rinses of tap water, followed by rinses of laboratory-grade deionized water until the specific conductance of the water collected through the spigot measures less than 1 microseimens per centimeter. The equipment is then transferred to the fume hood where it will be rinsed with methanol rinse and allowed to air dry. After the equipment is clean and dry it will double bagged to avoid contamination.

- 1) Depending on the width of the river, the USGS standard isokinetic, depth-integrated sampling methods or a modified version will be used to collect river and stream samples (USGS, 2018). At sites that are shallow enough to wade, samples will be collected using a DH-81 depth-integrated hand sampler. At sites that are too deep to wade, samples will be collected from bridges or from a boat using a DH-95 which will be lowered either by using a bridgeboard or a hand-line suspended sampler. At some bridge sites, where flows are less than 1.5 feet per second and too deep to wade, samples will be collected using a weighted-bottle sampler. At the larger sites (such as the Merrimack River) samples will be collected using the D-95 portable crane-suspended sampler or from a boat using the DH-95 sampler. Cross sectional sample locations for the larger rivers will be determined using GPS. For river or stream sites with cross sectional width of less than 30 feet (ft) a single vertical at the centroid-of-flow (VCF) sample will be collected and the sample water will be decanted directly into the sample bottles (provided by Alpha Analytical). At sites with cross sectional widths from 30 to 60 ft multi-vertical depth-integrated subsamples will be collected from the center and at locations equidistant from the center and the left and right banks and composited into a churn. At sites that are greater than 60 ft wide 10 equal-width increment (EWI) samples will be collected and composited into a churn.
- 2) All equipment will be field rinsed with sample water prior to sample collection. Approximately 1-liter of water will be needed for each sample. Each sample consists of a pair of 250-mL poly bottles (without any chemical preservative). One pair of 250-mL poly bottles for the environmental sample and one pair for the archive sample. The certified PFAS-free 250-mL poly sample bottles will be supplied by Alpha Analytical Inc. The volume of water collected would be doubled on sample dates that include a replicate sample. Sample bottles will be filled to the shoulder, labeled, and kept on ice in coolers until the samples can be transferred to Alpha Analytical or temporarily stored in the refrigerator at the USGS Massachusetts office. Both the USGS and Alpha Analytical labels must be readable. Archive samples will be initially stored in a freezer at the USGS Massachusetts office but will later be moved to the MassDEP for long-term (1-year) storage.
- 3) Discrete water quality field parameter measurements of specific conductance and pH will be measured in-situ using YSI 6920 V2-1 multi meters and turbidity will be measured using portable Hach 2100Q turbidity meters. Meters will be calibrated each day before field work is conducted and all calibration logs will be kept in a dedicated bound notebook located with the meters. Water temperature probes are periodically temperature tested against an NIST certified probe in the lab approximately every 3

months for accuracy. These temperature checks are logged in a bound notebook and kept in the CT or MA USGS laboratories in accordance with workflows and guideline described in the New England Water Quality Plan (Appendix 1).

## **6.2 Quality Assurance/ Quality Control**

Quality assurance/quality control (QA/QC) samples will be equally distributed among the 3 sampling rounds and will include replicates, field and equipment blanks, and samples of the laboratory deionized water system (DI system). A total of 50 quality control samples will be distributed throughout the sample collection events and be rotated among sites and sampling crews to represent a range of stream size, urban intensity, and sample collection method used. Alpha Analytical will provide full QC reports for each batch of samples analyzed.

The goal of QC sampling is to identify, quantify, and document bias and variability in data that result from the collection, processing, shipping, and handling of samples and to help identify potential sources of sample contamination related to these activities, as well as from the lab analytical steps. USGS field personnel will keep detailed notes on how the blank and replicate samples are collected and processed, to help distinguish the sources of variability that may affect the samples.

Blank samples will be collected by rinsing PFAS-free water through each piece of equipment used to collect the stream sample and then filling the 1-liter bottle and churn with PFAS-free water. The PFAS sample containers will then be filled directly from the churn. Field blanks will be collected before the environmental sample. Replicates will be collected as split pairs by collecting twice the volume normally collected for an environmental sample.

The data quality criteria proposed for this project are described in Table 3 and are intended to ensure that data are of high scientific integrity. USGS Office of Water Quality Technical Memorandum 2017.01 requires USGS projects to obtain and review appropriate laboratory-performance data and other laboratory information to assess and document that the selected laboratory can provide results of sufficient quality to meet the objectives of the project. Results of this assessment are documented in a Laboratory Evaluation Package (LEP) and are included in Appendix 7. The LEP includes 1) a description of the method and analytes; 2) a summary of Alpha Analytical scores in performance tests for accreditation; 3) a detailed comparison of Alpha Analytical's MassDEP Method to EPA Method 537.1; 4) results of a comparison test conducted by the USGS in March 2020 between Alpha Analytical and RTI Laboratory in Michigan; 5) recommended data quality criteria for this project (table 3); and 6) a conclusion in support of use of Alpha Analytical Inc., for this project. Any results that are found to be outside these proposed criteria limits will be censored or qualified. If issues with data quality are identified, the project manager will investigate and determine the cause of the problem and implement any appropriate corrective actions. Appropriate corrective actions will be determined in consultation with USGS and MassDEP regarding any decisions related to the inclusion, exclusion, or qualification of data.

Table 3. Quality assurance/quality control performance criteria.

[<, less than value shown; >, greater than value shown; ≤, less than or equal to value shown; ±, plus or minus value shown; °C, degrees Celsius; μS/cm, microsiemens per centimeter at 25 °C; NTU, nephelometric turbidity unit]

Analyte	Data Quality Indicators	Acceptance and Stabilization Criteria for measurement performance	QC Sample or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S) or Laboratory Analysis (A)
All Analytes (Appendix 4)	Precision-overall	Laboratory spike duplicate recoveries within 70 – 130%	Laboratory QC samples	A
All Analytes (Appendix 4)	Precision-overall	<u>Sample-specific extracted internal standard surrogate recoveries</u> ideally within 50-150 for analyses fortified at concentrations ≤2x the MRL, and within 70-130% for analyses fortified at >2 times the MRL	Laboratory QC samples	A
All Analytes (Appendix 4)	Precision-overall	Relative Percent Difference < 30 percent. Laboratory duplicate pairs with one result below the reporting limit and one result above the reporting limit are acceptable when the detected value is within 2x the reporting level.	Field replicates and Laboratory spike duplicates	SA
All Analytes (Appendix 4)	Accuracy/bias	No target compounds > laboratory reporting level	Field blanks and Laboratory blanks	SA
Temperature (field)	Accuracy -- Stabilization criterion for measurements	Thermistor thermometer: ± 0.2 ° C Liquid-in-glass thermometer: ± 0.5 ° C	Field QA procedures	S
Specific Conductance (field)	Accuracy -- Stabilization criterion for measurements	± 5 percent, when ≤ 100 μS/cm ± 3 percent, when > 100 μS/cm	Field QA procedures	S
pH (field)	Accuracy -- Stabilization criterion for measurements	Meter displays to 0.01: ± 0.1 unit	Field QA procedures	S
Dissolved Oxygen (field)	Accuracy -- Stabilization criterion for measurements	Amperometric method: ± 0.3 mg/L	Field QA procedures	S
Turbidity (field)	Accuracy -- Stabilization criterion for measurements	Turbidimetric method, in NTU: Repeated until three or more sample values fall within ± 10 percent	Field QA procedures	S

### 6.3 Data Review and Reporting

All field water quality data will be compiled and reviewed for completeness and entered in to the NWIS database at the end of each sampling trip by field staff. Analysis of field data will be done by the project manager at the completion of each sampling event. Laboratory data review will be done by the project manager on a monthly basis, in coordination with MassDEP. As lab data are received, field replicate and blank results from the lab will be reviewed after each sampling event to ensure that sample collection methods are meeting project data quality objectives. Field parameter data is typically available to the public within one week of sample collection. Laboratory quality control data will be reviewed for accuracy, precision and completeness by MassDEP and USGS and approved within 120 days of collection. All discrete data collected as part of the project will be

stored in the USGS NWIS database and be publicly accessible. Data collected as QA/QC (source-solution, field equipment blanks and replicates) will be stored in USGS NWIS database but will not be publicly accessible. All summaries of QA/QC data will be provided to the MassDEP. Supporting documentation such as field sheets and calibration logs will be made available to MassDEP.

## **7.0 Assessment/Oversight**

Two forms of project reviews are required for all projects conducted within the New England WSC, one technical and one administrative. A full description of the requirement for each of these reviews is included in New England WSC Memorandum number 16.02, Procedures for Project Reviews. Technical reviews are known as the 10-40-70 review process and designed to occur at specific points in the history of time-limited funded studies. Administrative reviews, typically known as quarterly project reviews, are held on a quarterly basis over the course of a fiscal year, typically in the months of November, February, April and July. Administrative reviews will include a review of planned funding and expenses and a review of planned and available staff hours. A list of the types and frequency of internal and external reviews that are required to document assessments and oversight of project management is proposed in Table 4.

Additional assessment and oversight will include meetings between MassDEP and USGS. Meetings with MassDEP will be scheduled after each sample collection round which should coincide with the 10-40-70 review process. These project-progression-based meetings will include a summary USGS project activities, report problems and corrective actions, outline the status of sample collection operations, and summarize plans for the next steps. Informal status reports and updates also will be provided to the cooperator upon request.

Table 4. Types, frequency and responsible party for USGS and MassDEP technical reviews.

Assessment	Frequency	Internal	Organization	Person(s) responsible
Data management systems review	Continually throughout the project	Internal	USGS	Jennifer Savoie
Technical reviews (10, 40, 70)	Project-progression based	Internal/External	USGS/MassDEP	Jon Morrison, Jennifer Savoie Laura Blake, Richard Chase
Administrative reviews	2x; July & November	Internal	USGS	Jon Morrison, Jennifer Savoie

On-going assessment of laboratory performance through the life of the project is described in the Laboratory Evaluation Package (LEP) (Appendix 7). On-going assessments include project field quality control samples, internal quality control data reported with each result and assessments of Alpha Analytical performance testing completed as part of Alpha Analytical accreditation.

## **8.0 Data Validation and Usability**

Quality-assurance procedures and quality-control requirements established by the USGS for water-quality data collection combined with project-specific QA/QC developed in this QAPP provide a high level of confidence that the data generated by the project will be both valid and usable. Project specific data quality objectives are described in Table 3 and in the LEP for this project (Appendix

7). Internal and external assessments and technical review ensure that required procedures are followed correctly and consistently. When issues with data quality arise or are identified, the project manager will investigate and determine the cause of the problem and implement any appropriate corrective actions. Analytical accuracy and precision will be assessed using the laboratory QC results in comparison to the acceptance criteria. Any results that are found to be outside these established QC limits will be qualified or censored.

## REFERENCES

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## Appendices

### Appendix 1. New England Water Science Center Quality Assurance Plan

New England Water Science Center Quality Assurance Plan	 NewEng_WSC_QW_QAPlan_2017.pdf
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### Appendix 2. List of 64 proposed stream locations. Excel file zipped with QAPP

### Appendix 3. Alpha Analytical


Alpha Analytical Method Report, Mass DEP Method - Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (LC/MS/MS)	 MA DEP PFAS by SPE & LC_MS_MS Isc
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### Appendix 4. List of PFAS compounds. Excel file zipped with QAPP

### Appendix 5. PFAS field form


PFAS field form	 PFAS_fieldsheet.pdf
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### Appendix 6. Custom Chain-of-custody.

PFAS Chain of custody	 AA chain_of_custody.pc
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## Appendix 7. Laboratory Evaluation Package (LEP)

LEP	 Draft_LEP_for_AlphaAnalytical_for_MA_
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