Sampling and Analysis Plan

Investigation of PFAS Levels in Freshwater Fish at Selected Rivers and Lakes in Massachusetts

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Prepared for

Massachusetts Department of Environmental Protection
Watershed Planning Program

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ACRONYMS

CA SWRCB	California State Water Resources Control Board
COC	chain-of-custody
DPH	Department of Public Health
EPA	United States Environmental Protection Agency
ERG	Eastern Research Group, Inc.
FEP	fluorinated ethylene propylene
G	gram
HASP	health and safety plan
HDPE	high density polyethylene
LDPE	low density polyethylene
MassDEP	Massachusetts Department of Environmental Protection
MI EGLE	Michigan Department of Environment, Great Lakes, and Energy
mm	millimeter
Normandeau	Normandeau Associates, Inc.
PCP	personal care products
PDC	pulsed direct current
PFAS	per- and polyfluoroalkyl substances
PPE	personal protective equipment
ppt	parts per trillion
SAP	sampling and analysis plan
SOP	standard operating procedures
USGS	United States Geological Survey
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control

This document was finalized in June of 2022. Changes to sampling protocols implemented during Phase 1 and Phase 2 sampling activities are indicated in bold red text; strikethroughs indicate deleted text. This updated version was prepared in March of 2023.

1.0 Introduction

In this project, the Massachusetts Department of Environmental Protection (MassDEP) will investigate per- and polyfluoroalkyl substances (PFAS) concentrations in freshwater fish and surface waters in selected lakes and rivers in Massachusetts. The resulting PFAS measurement data will provide data to meet the following primary project objective: **to characterize the nature and extent of PFAS contamination in water and edible tissues of freshwater fish from rivers and lakes across the Commonwealth in a manner that will allow assessment of public health risks associated with consuming freshwater fish.** This project's Quality Assurance Project Plan (QAPP) lists primary and secondary data uses anticipated for the measured PFAS concentrations.

This sampling and analysis plan (SAP) provides detailed information on the specific steps that field sampling crews will take when collecting, processing, and transporting samples and the specific steps that the analytical laboratory will take when measuring PFAS concentrations in those samples. This project's QAPP, on the other hand, provides more general information about the sampling activity (e.g., roles and responsibilities of team members, rationale for selecting waterbodies to sample, approach for selecting fish species to sample, etc.).

1.1 Background

In 2020, MassDEP jointly funded a U.S. Geological Survey (USGS) water quality study to evaluate the presence of PFAS in selected Massachusetts' rivers and streams. USGS field crews conducted three rounds of sampling at each of 64 sites in 27 rivers from August to November 2020 and analyzed the samples for 24 individual PFAS. Sampling sites were located upstream or downstream of discharges from 24 wastewater treatment facilities and at 16 other stream sites, including sites downstream of suspected nonpoint and industrial sources and at sites not associated with suspected PFAS sources. PFAS were detected in all 27 of the rivers sampled, including those not impacted by suspected PFAS sources. Individual PFAS concentrations ranged from not detected to 109 parts-per-trillion (ppt), and the sum of all 24 PFAS found at each individual sampling location ranged between 0.3 and 399 ppt. The highest concentrations were observed downstream of wastewater effluent discharges, but PFAS were also found in rivers upstream of these discharges. The lowest concentrations were observed in rivers located in less populated areas. Multiple sources, including municipal/industrial wastewater discharges and non-point pollution, may contribute to riverine PFAS concentrations. The purpose of this project is to characterize PFAS in water and edible tissues of freshwater fish from rivers and lakes across the Commonwealth in a manner that will allow assessment of public health risks associated with consuming freshwater fish.

This SAP was developed following U.S. Environmental Protection Agency (EPA) guidance on environmental sampling design and fish collection [EPA 2000, 2002a, 2002b, 2006, 2019] as well as following MassDEP and other agency guidelines for monitoring for PFAS in fish and other environmental matrices [ITRC 2020; MassDEP 2018; MI EGLE 2018; CA SWCRB 2020]. This SAP provides a framework for best practices for data collection, data analysis, and quality assurance (QA)/quality control (QC) to ensure efficient and consistent sample collection of fish tissue and surface water samples and the generation of high-quality sampling results.

1.2 Sampling Plan

MassDEP has contracted with Eastern Research Group, Inc. (ERG) to collect this project's surface water and composite fish tissue samples. Adult finfish sampling will be performed and paired with surface water grab samples taken from the same waterbodies. An ERG subcontractor, Normandeau Associates, Inc. (Normandeau), will perform the sampling at 50 waterbodies (both lakes and rivers) across Massachusetts in two phases. PG environmental, a sister company of ERG, will assist with overseeing sampling activities. Phase 1 sampling will be completed at five waterbodies in June 2022. Phase 2 sampling will be completed at 45 waterbodies during the 2023 state fiscal year.

All surface water and composite fish tissue samples will be analyzed for PFAS by Eurofins laboratory in Lancaster, PA using EPA draft Method 1633. The final list of waterbodies for sampling under Phase 1 and Phase 2 are documented in Section 3.1.1 of the QAPP.

1.2.1 Fish Tissue Composite Sampling

The number of fish per composite and the number of composites per waterbody will depend on the success of the catch and the sampling design described in the QAPP. The field sampling crews will attempt to collect enough fish for composite samples for two species at river locations and three species at lake locations. Sections 3.1.2 and 3.1.3 of the QAPP describe how field personnel will determine which fish species to collect from a given waterbody and how the collected fish will be grouped into composite samples. Fish collected in the field will be brought back to Normandeau's Bedford, NH facility for processing (e.g., filleting and preparation of composite samples) prior to shipment to the MassDEP contracted laboratory (i.e., Eurofins) for homogenization and analysis of PFAS using EPA draft Method 1633.

Fish collection field methodologies are discussed further in Section 3.0. Sample documentation and shipment is described in Section 4.0.

1.2.2 Surface Water Sampling

Two types of surface water samples will be collected. First, at all 50 waterbodies considered for this project, one unfiltered surface water grab sample will be collected in the immediate vicinity of the location where fish are initially collected. Second, at the subset of waterbodies that are lakes with beach access for recreational users, an additional unfiltered surface water grab sample will be collected within 20 feet of the shore. These samples will be analyzed using EPA draft Method 1633.

Surface water field methodologies are documented in Section 3.0. Sample documentation and shipment is described in Section 4.0.

1.3 Project Team

Table 1 provides contact information for the key personnel involved in collecting field samples or analyzing them in the laboratory. Additional details on roles and responsibilities for the project team can be found in Section 2.1 of the QAPP.

Table 1. Project Team Contact List

Name	Organization	Role	Email	Phone
Richard Chase	MassDEP	Project Lead	richard.f.chase@mass.gov	508-767-2859

Name	Organization	Role	Email	Phone
Rebecca DeVries	ERG	ERG Project Manager	rebecca.devries@erg.com	201-669-9974
John Wilhelmi	ERG	ERG Deputy Project Manager	john.wilhelmi@erg.com	617-823-7985
Kortney Kirkeby	PG	Field Sampling Coordinator	kortney.kirkeby@pgenv.com	720-789-8047
Corey Francis	Normandeau	Field Sampling Lead	cfrancis@normandeau.com	603-637-1173
Kerri Sachtleben	Eurofins	Laboratory Manager	kerri.sachtleben@et.eurofinsus.com	717-556-7376

2.0 Project Data Quality Objectives

2.1 Project Objectives and Problem Definition

Section 2.3 of the QAPP describe the project's principal objective, which is to characterize the nature and extent of PFAS contamination in water and edible tissues of freshwater fish from rivers and lakes across the Commonwealth in a manner that will allow assessment of public health risks associated with consuming freshwater fish.

Section 2.3 of the QAPP also describes the anticipated uses of this project's data. For fish tissue, the principal use of the sampling data will be to assess human exposures and risks associated with consuming freshwater fish. A secondary use of the fish tissue data is derivation of species-specific PFAS bioaccumulation factors. For surface water, the principal use of the sampling data will be to derive species-specific PFAS bioaccumulation factors. A secondary data use will be to inform public health evaluations due to incidental ingestion during recreational activities.

Refer to the QAPP for further details on this project's objectives and the problem definition.

2.2 Data Management

This project will produce data on PFAS concentrations in fish tissue and surface waters across the state. Eurofins will generate these data using EPA draft Method 1633 and for samples collected from 50 waterbodies. Sections 2.8 and 3.7 of the QAPP describe how those data will be managed and how final data sets will be provided to MassDEP for use by the Department and other agency partners.

3.0 Field Methods and Procedures

This section describes all steps the field sampling crews will take to collect fish and surface water samples in the field and then prepare those samples for shipment to the analytical laboratory. Refer to Section 5.0 of this SAP for steps that Eurofins will take to measure PFAS concentrations in the samples.

3.1 Permit and Permit Notifications

The field sampling crew cannot begin fish collection activity until a Scientific Collection Permit has been issued by the Commonwealth of Massachusetts. With approval from the project team, a permit application was submitted to the MA DFW by Normandeau for Phase 1 sampling activities. The permit will be updated to include all Phase 2 waterbodies upon completion of Phase 1. All final and amended Scientific Collection Permits will be included in Appendix A of this working/final SAP. Throughout sample collection, the field sampling crew will comply with all Massachusetts fishing requirements, keep a copy

of the Scientific Collection Permit on hand, and remain in compliance with the Scientific Collection Permit.

The field sampling crew will take the following additional steps to ensure compliance with all requirements applicable to fish collection:

- The field sampling crew will notify Environmental Police (1-800-632-8075) and local law enforcement authorities (e.g., police departments) before sampling any waterbody in Massachusetts, as required in the Scientific Collection Permit. The field sampling crew will also notify the Massachusetts Division of Fisheries and Wildlife (MassWildlife) and include specific locations where sampling is to be conducted. To notify MassWildlife, the field sampling crew will email Todd Richards, Assistant Director of Fisheries, at todd.richards@mass.gov. Additional notifications may be necessary if any of the selected waterbodies are in state parks, national seashores, or other such jurisdictions.
- The field sampling crew will adhere to all EPA biosecurity protocols described in "Standard Protocols for Maintaining Biosecurity During Biological and Water Quality Surveys" (Appendix B). Before field work, the field sampling crew will review those protocols, as well as Normandeau's Biosecurity Plan Disinfection Standard Operating Procedures (Appendix C).
- The sampling crew will use the "Biological Survey of Water: Fish Sampling Log (Appendix D)," to record all fisheries data relevant to this project's sampling. The field sampling crew may contact Todd Richards (MassWildlife, contact information noted above) for more specific information on completing these forms. The field sampling crew will provide completed forms to ERG, who will then compile them and make them available to MassWildlife. ERG will ask Todd Richards to specify the appropriate MassWildlife contact for receiving these completed forms.

3.2 PFAS-Specific Sample Collection Considerations

Due to the ubiquitous nature of PFAS in consumer products and the very low PFAS concentrations that this project is targeting, cross contamination of PFAS is a critical consideration and must be avoided at all steps of sample collection and processing. This section discusses precautions the field sampling crew will take to minimize the potential for cross contamination (and the "false positives" that could result).

PFAS-specific sample collection considerations are based on Commonwealth and other agency guidance for collecting environmental samples of PFAS [ITRC 2020; MassDEP 2018; MI EGLE 2018]. The PG Field Sampling Coordinator will screen all field sampling materials and equipment to ensure they are "PFAS-free" before these items are used in the field, with ample time ahead of sampling to procure replacements, if needed. All field sampling crew members will be trained in precautions to avoid PFAS cross contamination, as outlined in Table 2.

Table 2. PFAS-Specific Sampling Precautions

Clothing precautions
• Use life jackets made of PFAS-free materials such as polyethylene foam and nylon shell fabric. • Ensure waders are made from PFAS-free materials (such as Neoprene). Do not use waders made of Gore-Tex or other known PFAS-containing materials. • Avoid clothing and boots that have been advertised as being waterproof, water-repellant, or dirt/stain resistant, unless it is confirmed they are made of PFAS-free materials such as polyvinyl chloride, polyurethane, or rubber (e.g., PVC rain coats, rubber boots). • Keep clothing and personal protective equipment (PPE) dust--free.

- Wear old, well laundered clothing. Specifically, during sampling activities, field sampling crew members will only be permitted to wear clothing that has been washed at least six times without the use of fabric softener.

Personal Hygiene and Personal Care Products Precautions

- Do not handle or apply personal care products (PCP) in the sampling area. Specifically, field sampling crew members will be instructed to avoid the use of lotions, moisturizers, and cosmetics before and during sampling. Approved sunscreens and insect repellent will be made available.
- Do not handle or apply PCPs while wearing PPE that will be present during sampling.
- Move at least 25 feet away from the sampling area and staging area and remove PPE if applying PCPs becomes necessary. Use PFAS-free sunscreens and insect repellants when necessary. Wash hands thoroughly after the handling or application of PCPs and when finished, put on a fresh pair of powderless nitrile gloves.

Food Precautions

- Do not handle, consume, or otherwise interact with pre-wrapped food, carry-out food, or other food items in the sampling and staging areas.
- When staff require a break to eat or drink, they should first remove gloves, coveralls, and any other PPE, if worn, while in the staging area and then move to a designated area for food and beverage consumption.
- After eating or drinking, staff will wash their hands and put on a fresh pair of powderless nitrile gloves at the staging area, before returning to the sampling area.

Glove Changes

Frequently change powderless nitrile gloves any time there is an opportunity for cross contamination of the sampling including, but not limited to, the following activities:

- Each time sampling equipment is handled.
- Prior to sample collection.
- After handling any sample.
- After handling any non-dedicated sampling equipment, contact with non-decontaminated surfaces, or when judged necessary by field personnel.
- During and after decontamination of non-dedicated sampling equipment.

Sample Collection Precautions

- Ensure that no dust or fibers can fall into the sample bag.
- Avoid all contact with the inside of the sample bag.
- When the sample is collected and sealed, place the sample bag in a second individual sealed plastic bag and place the sample bag in the shipping container packed only with ice.
- The sample team will not conduct any sub-sampling in the field.
- All water used for the final rinse when decontaminating equipment will be certified PFAS-free water provided by MassDEP from the MassDEP-WPP-Worcester facility. Note that MassDEP sent two samples of this water to Eurofins in May 2022 for confirmatory analysis. None of the 40 PFAS measured under draft EPA method 1633 were detected in those samples. Assuming the MassDEP decontamination water remains PFAS-free, this water will continue to be used for field blanks and decontamination for duration of the project. If this situation changes, an alternate source will be established and tested prior to use.

Compounds and Equipment to Avoid

- Polytetrafluoroethylene, including trademarks Teflon® and Hostaflon®, which can be found in many items, including but not limited to the lining of some hoses and tubing, some wiring, certain kinds of gears, and some objects that require the sliding action of parts. Instead, use

products that contain high density polyethylene (HDPE), silicone, polypropylene, or other PFAS-free alternatives.
- Polyvinylidene fluoride, which includes the trademark Kynar®, which can be found in many items, including but not limited to tubing, films/coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries.
- Polychlorotrifluoroethylene, including trademark Neoflon®, which can be found in many items, including but not limited to valves, seals, gaskets, and food packaging.
- Ethylene-tetrafluoro-ethylene, including trademark Tefzel®, which can be found in many items, including but not limited to wire and cable insulation and covers, films for roofing and siding, liners in pipes, and some cable tie wraps.
- Fluorinated ethylene propylene (FEP), including trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, which can be found in many items, including but not limited to wire and cable insulation and covers, pipe linings, and some labware.
- Low density polyethylene (LDPE) items that will come into direct contact with the sample media. LDPE can be found in many items, including but not limited to containers and bottles, plastic bags, and tubing. However, LDPE may be used if an equipment blank has confirmed it to be PFAS-free. LDPE does not contain PFAS in the raw material but may contain PFAS cross contamination during manufacturing.
- Pipe thread compounds and tape.
- Avoid most soaps (except Alconox or Liquinox) and tap water. When cleaning or decontaminating equipment, use PFAS-free water provided by MassDEP.
- Do not use gel packs, blue ice, or other chemical ice; use non-chemical ice or frozen water bottles.

Equipment / Supplies Precautions

- Any equipment that contacts the fish samples will be screened and known to be PFAS-free.
- Avoid regular/thick size markers (Sharpie® or otherwise).
- Do not use Post-it Notes.
- Do not use waterproof field books.
- Do not use plastic clipboards, notebooks, or binders; use aluminum clipboards instead.

Miscellaneous Allowable Materials

- Materials that are either made of HDPE, polypropylene, silicone, or acetate.
- PFAS-free LPDE bags for fish tissue sample collection provided by the laboratory.
- Powderless nitrile gloves.

3.3 Field Equipment

The field sampling crew will bring to each waterbody all materials and equipment needed for fish and surface water sampling. They will develop a checklist of materials and equipment, have the Field Sampling Coordinator confirm that none of the items raise concern for PFAS cross-contamination, and start acquiring materials and equipment well in advance of the first sampling date.

The field team will acquire and maintain, at minimum, the following equipment:

- Appropriate scientific collection permits (see Section 3.1 and Appendix A)
- Electrofishing equipment
- Handheld water conductivity meter
- Handheld GPS device

- Dip nets with insulated handles
- Polarized sunglasses
- Ice buckets/livewells
- Coolers (provided by Eurofins)
- Ice (contained in plastic [polyethylene] bags [double bagged] in the coolers)
- Fish measuring board and tape measure
- Aluminum clip boards
- Printed copies of fish sampling logs on PFAS-free paper
- Printed copies of river and lake field forms on PFAS-free paper
- Plain paper for additional notes
- Ball point pens
- Paper towels
- PFAS-free life jackets
- Powderless nitrile gloves
- PFAS-free waders/rubber boots (made with polyurethane or polyvinyl chloride)
- Elbow-length, PFAS-free rubber gloves
- LPDE bags for fish tissue samples (provided by Eurofins)
- 500mL HDPE wide-mouth bottles for surface water samples (provided by Eurofins)
- Sample labels for fish tissue (provided by Eurofins)
- Sample labels for surface water (provided by MassDEP)
- Trash bags
- Camera or cell phone for taking photographs
- Printed copy of Normandeau's Health and Safety Plan
- PFAS-free water for decontamination (provided by MassDEP)

3.4 Sampling Locations

Section 3.1.1 of the QAPP outlines the process for selecting the river and pond/lake locations to be sampled for this project. That section also includes a final list of sampling locations for Phase 1 and a proposed list for Phase 2 sampling.

3.5 Targeted Fish Species and Number of Fish to Collect

Individual fish will be collected in the field and then transported to Normandeau's Bedford facility where they will be processed and prepared as composite samples for laboratory analysis. Typically, a composite sample of fish will be comprised of between three and five similarly sized adult fish of the same species that are filleted and analyzed together as one composite sample.

Sampling activities at a given waterbody are expected to result in collection of multiple species of fish. Section 3.1.2 of the QAPP presents the fish species that are being considered for this study while Section 3.1.3 outlines minimum fish sizes for this study, accounting for state minimum size requirements (applicable to chain pickerel and smallmouth/largemouth bass), as well the minimum size fish likely kept by recreational anglers for consumption. Section 3.1.4 of the QAPP describes the process that field sampling crews will use to determine which species of fish (and how many fish of that species) will be collected at a given waterbody. In brief, no more than three species will be used for samples from lakes and no more than two species will be used for samples from rivers. A maximum of three composite samples will be analyzed per species in Phase 1, while a maximum of two per species will be analyzed in Phase 2.

During sampling, the field sampling crew will separate collected fish by species—a task that will be performed by a crew member familiar with the taxonomy of fish species in Massachusetts. The field sampling crew will document the number of similarly sized adult fish, by species, and these numbers will be used to select the species for sampling.

~~**Only the species listed in Table 3 will be considered, as these are the species included on the Scientific Collection Permit.**~~
The species listed in Table 2 will be considered for collection.

Table 3. Targeted Fish Species

Largemouth bass	White Perch	Yellow Bullhead
Smallmouth bass	Yellow Perch	Black Bullhead
Black crappie	Brook Trout	Chain Pickerel
Bluegill	Rainbow Trout	Common Carp
Pumpkinseed	Brown Bullhead	**Redbreast**
American Eel	**White Suckers**	**Brown Trout**

The maximum number of fish species for PFAS measurements will be three species for lakes and two species for rivers. If field sampling crews collect fish from more than three species shown in Table 10 in a waterbody, the fish species with the greatest numbers of similarly sized adult fish will be selected for PFAS measurement. The rationale for this decision is that the fish species in Table 10 caught in greatest numbers, to first and rough approximation, can be assumed to be the fish species most likely to be consumed. For every waterbody, the field sampling datasheets will document the range of fish species collected, the species selected for analysis (up to three for lakes and up to two for rivers), and the rationale for this selection (which will generally be that these species had the greatest numbers of similarly sized adult fish). This species selection protocol will be applied in Phase 1.

In Phase 2, the field team will continue to collect the species that are most frequently caught at each waterbody, but with additional consideration of species diversity. During this phase, the team will continue to collect sport fish most often caught and kept by recreational anglers (to meet the primary objective of this study) but will also collect other species in order to gather information on both pelagic (including trout) and benthic species. For the latter, the field teams will attempt to collect composite samples at each waterbody for a species that has not been caught at many of the previously sampled waterbodies. At a lake, for example, this might mean that the field crew collects fish for the two species caught in the greatest quantity, and then fish for a third species that has not well represented in the program's previous sampling efforts. This process will be revisited early in Phase 2. **In addition, the permit was revised in Phase 2 to allow for more than two and three species to be caught at rivers and lakes, respectively, so long as the total number of fish caught did not exceed 30 fish per river or 45 fish per lake.**

Because stocked fish are commonly consumed and that measuring PFAS in those species is consistent with the projects principal goal – i.e., characterizing the nature and extent of PFAS contamination in water and edible tissues of commonly consumed freshwater fish, sampling techniques to capture these cold-water fish will be applied as needed.

With species selected, the field sampling crew will estimate the length of the collected fish. Any fish outside the desired size range will be returned to the waterbody. "Similarly sized adult fish" will be defined to include all fish of the same species in which the smallest individual within a composite sample is not less than 75 percent of the length of the largest individual. Length will be roughly estimated in the field to ensure these criteria are met; measurements will be recorded when the fish are processed in Normandeau's Bedford facility. Fish length measurements will not be made in the field to minimize handling of fish and reduce the potential for cross-contamination.

Note that field teams will only keep fish that meet the state's minimum size requirements. Of the species listed in Table 3, only chain pickerel (15 inches) and largemouth/smallmouth bass (12 inches) have minimum size requirements. In addition to the legal requirements mentioned above, the field crew will only keep fish that are of the minimum size generally kept by recreational anglers. For example, and as a general guideline, the field crew will collect bluegill, pumpkinseed, yellow perch, and white perch that are at least six inches long. For brown bullhead, the field crew will only keep fish that are minimum of eight inches long.

Based on the number of similarly sized fish collected per species, the field sampling crew will use Table 4 (also included in the QAPP as Table 11) to determine how many fish to keep for composite samples. Based on that determination, the field sampling crew will place the individual fish that are to be kept in PFAS-free LDPE bags provided by the laboratory (or PFAS-free plastic wrap or new, coating-free aluminum foil - depending on fish size) and then place all bagged fish of the same species for a given composite sample into a larger LDPE plastic bag. The fish samples will be processed and prepared as composite samples at Normandeau's Bedford facility.

Table 4. Protocol for Selecting Fish for Composite Samples

Number of Similarly Sized Adult Fish Caught for a Single Species	Number of Individual Fish for Composite Samples*		
	Composite Sample #1	Composite Sample #2	Composite Sample #3 (Phase 1 only)
1	Fillet from fish #1^	No sample	No sample
2	**Fillets from fish #1-2**	No sample	No sample
3	Fillets from fish #1-3	No sample	No sample
4¥	Fillets from fish #1-4	No sample	No sample
5	**Fillets from fish #1-3**	**No Fillets from fish #4-5**	No sample
6	Fillets from fish #1-3	Fillets from fish #4-6	No sample
7	Fillets from fish #1-4	Fillets from fish #5-7	No sample
8	Fillets from fish #1-4	Fillets from fish #5-8	No sample
9	Fillets from fish #1-3	Fillets from fish #4-6	Fillets from fish #7-9
10	Fillets from fish #1-4	Fillets from fish #5-7	Fillets from fish #8-10
11	Fillets from fish #1-4	Fillets from fish #5-8	Fillets from fish #9-11
12	Fillets from fish #1-4	Fillets from fish #5-8	Fillets from fish #9-12
13	Fillets from fish #1-5	Fillets from fish #6-9	Fillets from fish #10-13
14	Fillets from fish #1-5	Fillets from fish #6-10	Fillets from fish #11-14
15	Fillets from fish #1-5	Fillets from fish #6-10	Fillets from fish #11-15
>15	Follow the previous row for the first 15 fish and return additional fish to the waterbody		

* Up to three composite samples may be collected per species under Phase 1. During Phase 2, a maximum of two composites will be collected per species.
^ This program is focused on composite sampling. If insufficient fish are caught to create a composite sample for three different species, an individual fish sample will be collected instead.
¥ ERG consulted with DEP when four fish of one species were collected from a waterbody. In some cases, these fish were processed into two composites such that the first composite was composed of fillets from fish #1-2 and the second composite was composed of fillets from fish #3-4. These determinations were made on a case-by-case basis.

Note that the field sampling crew will generally stop sampling in a waterbody if they catch the maximum number of fish for PFAS measurements. For Phase 1, up to three composites could be collected per species. For a given lake this resulted in a maximum number of 45 fish, which would include 15 similarly sized adult fish of three different species. For a given river, the maximum number of fish was 30, which would include 15 similarly sized adult fish of two different species. In Phase 2, two composites will be collected per species. This means that a maximum of 30 fish will be collected at lake locations and a maximum of 20 in rivers. The field sampling crew will stop sampling if these quantities are caught, even if they have been sampling for less than four hours.

The field sampling crew will limit the fish sampling duration at a waterbody to four hours, even if the maximum number of fish is not caught. At the end of the four hours, the field sampling crew will number the similarly sized adult fish of a given species and use Table 4 to determine whether fillets will be sent to the laboratory from individual fish or from composites. The strategy behind the approach is to submit as many composite samples as possible within the limits prescribed.

3.6 Sample Collection Methods

This section describes the process by which the field sampling crew will collect fish and surface water samples for this project. Fish samples will be primarily collected with electrofishing techniques. Also, hook and line or trot lines will be used when conditions do not allow for electrofishing or specific species are sought. For example, at deeper water bodies (i.e., with a maximum depth of greater than around 20 feet), the field crew will begin by using hook and line or trot lines for the first two hours of sampling, after which they will switch over to electrofishing. This will help ensure that the team collects a variety of species, including species from deeper waters. Surface water samples will be collected as grab samples. Additional details for each medium are provided in Sections 3.6.1 and 3.6.2, respectively. Any site-specific exceptions to protocol will be documented by the field sampling crew and promptly communicated to MassDEP.

Prior to departure:
The field sampling crew will confirm that all instruments (e.g., handheld water conductivity meter) are operating properly and prepare all necessary equipment and supplies. All meters will be calibrated according to manufacturer specifications. The field sampling crew will check the quality of batteries and the oil/gas supply in the electrofishing unit before deploying to the field. The field sampling crew will also ensure that they have the necessary sample collection materials (e.g., HDPE 500mL sample bottles for surface water, LDPE bags for fish provided by the laboratory, ice for storage, adequate PFAS-free water for decontamination of equipment used in the field).

Upon arrival at waterbody sampling location:
The field sampling crew will set up a clean staging area or other appropriately clean surface, where they can organize sample containers and sampling equipment. Crew members will place an HDPE sheet placed on the ground or another appropriately clean surface at the staging area. The field sampling crew will not step on or otherwise contaminate the clean working surface.

The field sampling crew will don PPE, such as life jackets, powderless nitrile gloves, waders/rubber boots, and rubber gloves, as appropriate. The crew will only use PFAS-free PPE approved by the Field Sampling Coordinator (Section 3.3). The field sampling crew will be prepared to make in-field adjustments depending on site access restrictions, site conditions, and weather.

All personnel will adhere to Normandeau's Health and Safety Plan (HASP). At the start of each sampling day and prior to sample collection, the field sampling crew will step through the "tailboard" safety form included in the HASP. Field staff will don chest waders, elbow-length gloves, and polarized sunglasses immediately after.

Determining appropriate electrofishing voltage:
For sites where electrofishing will occur, the field sampling crew will measure and record the water conductivity. They will then determine the appropriate electrofishing voltage using guidelines in Table 5.

Table 5. Conductivity and Electrofishing Voltage

Water Conductivity Range (µs/cm)	Electrofishing Voltage (V)
150-500	200-300
500-800	150-200
800-1,000	120-180
>1,000	100-150

3.6.1 Fish Sample Collection

Electrofishing is the most effective and preferred method for collecting fish and will be the preferred fish sample collection method for this project, with exceptions as noted above where other methods are needed to capture specific species of interest (e.g., hook and line or trot lines to collect species in deeper waters). All field sampling crew members will be trained/experienced in electrofishing safety precautions and unit operation procedures. Procedures will involve pulsed direct current electrofishing and a two-person team (one operator and one "dip-netter"). For safety, field sampling crew members are required to wear insulated gloves.

Wherever possible, electrofishing will be conducted from a motorboat. At waterbodies that do not allow outboard motor use, electrofishing will be conducted from a cartop boat or raft. If the field team is not allowed to conduct electrofishing at a certain waterbody or is unable to successfully catch the desired minimum number of fish by electrofishing, other methods such as hook-and-line angling may be used. The field sampling crew will document the type of fishing that was used on the field forms.

Note that the field sampling crew members are highly experienced and qualified in fish collection. Despite this expertise and experience, there is no guarantee that sampling at a given waterbody will yield the desired numbers of fish. It is estimated that the field sampling crew will spend no more than four hours fish sampling at each waterbody, regardless of the number of fish caught.

In addition to the considerations listed in Table 2, the field team will adhere to the following procedures when collecting fish samples at each site:

1. Mobilize to the location of sample collection. At lakes and ponds, the targeted areas for fish sampling are generally shallow abatements or point bars where one would be expected to catch sportfish. Within rivers, commonly targeted sampling areas include pools, riffles, banks, and other structures.
2. One field sampling crew member will place the electrofisher in the water.
3. A second team member will collect fish with a dip net with an insulated handle and place the collected fish in live wells. Aim to collect three to 15 fish similarly sized fish per species for up to two species at river sampling locations and three species at lake sampling locations. A minimum of three fish is required for a single composite sample (and a maximum of five). For purposes of this project, "similarly sized adult fish" will be defined to include all fish of the same species in which the smallest individual within a composite sample is not less than approximately 75 percent of the length of the largest individual. In some circumstances, this criterion may need to be slightly relaxed to collect a sufficient number of fish; any such exceptions will be documented and communicated to MassDEP. Any fish not meeting the specifications for keeping fish in the waterbody will be immediately returned to the waterbody. Measurements will be estimated in the field to confirm that these criteria are met. Length will be recorded at Normandeau's Bedford facility when the fish are processed.
4. If sufficient fish are not captured on the first electrofishing attempt, increase the voltage of the electrofisher and/or increase the sampling area and repeat the previous steps. This process may need to be repeated multiple times. If a sufficient number of fish still are not caught, move to another location in the waterbody and repeat the previous steps. Note that the duration and cycle of electrofishing is based on catch rate, which will vary in an unpredictable manner from one waterbody to the next. If electrofishing is unsuccessful, use hook-and-line angling.
5. Remove selected fish of the same species and similar size from the live well and place in PFAS-free bags provided by the laboratory, keeping different species separate and keeping individual bags under 30 pounds of ice. Label the bags with the name of the waterbody, the date, and the species. Note that three to five smaller fish will be placed into a single bag. If fish are large, they may need their own bag, in which case the field sampling crew will place the individually bagged fish (bagged and sealed) into a larger garbage bag. All species will be stored in a single large cooler.
6. Dispatch all fish not selected for sampling in a humane manner.
7. Complete the top portion of the Fish Sampling Log (Appendix D) and record the location(s) where fish were collected using a handheld GPS device. If sampling areas are widely dispersed, the crew may consider recording supplemental GPS points.
8. Before departing the site, pack bags of fish under ice in coolers for transport to Normandeau's Bedford facility. Also, inspect the location to ensure that no trash is left behind.

3.6.2 Surface Water Grab Sample Collection

At every waterbody, a surface water grab sample will be collected in the immediate vicinity of the fish collection site. Plus, at lake sites with "beach areas" (as defined in Section 3.1.6 of QAPP), a nearshore surface water sample will also be collected.

The field team will adhere to the following procedures when collecting surface water samples at each site, in addition to the PFAS considerations listed in Table 2. Sample bottles (i.e., two 500mL HDPE bottles per sample) will be labeled prior to sample collection (see Section 4.4.2)

1. Collect a single grab sample from the immediate vicinity of where the first fish samples are collected. This sample will be collected from the boat used in the field. At lakes/ponds with recreational beach areas, collect an additional surface water sample within 20 feet of the shore at a depth of approximately 0.5 feet – corresponding to depths most likely used for wading of the most sensitive receptor (i.e., a toddler). When collecting "beach samples", plan to collect those samples as the first activity upon arriving to the site and during early morning hours when the "beach areas" are likely to be least crowded.
2. For each sampling location, fill two pre-labeled 500mL HDPE sample jars to approximately 90 percent full (to about 450 mL).
    - Remove the collection bottle cap only immediately before collecting the sample, making sure not to touch the inside of the cap or the inside of the sample bottle.
    - Submerge the bottle inverted to a depth of approximately 0.5 feet.
    - Recap the bottle underwater.
    - Remove the bottle from the water, uncap it, and pour off enough water to allow adequate headspace for mixing and then recap the bottle tightly. Field teams should ensure that the sample bottle is filled to just below the neck of the bottle (see Figure 1 for a diagram of the sample in the sample bottle), so that there is air left in the top of the sample bottle.
    - Place samples in a cooler with ice.
3. Store samples at 0 to 6°C and protected from light. This can be accomplished by packing the sampling bottles in ice and placing them in a cooler.
4. Complete the River or Lake Field Form, as appropriate, prior to departing the site. See Section 4.0 for details on how to populate those forms. Forms are included in Attachment E.
5. Upon returning to Normandeau's Bedford facility, immediately place the samples in the freezer.
6. Ship fully frozen samples via FedEx overnight to Eurofins as soon as practical with sufficient ice to maintain the sample temperature below 6°C during transport. The laboratory will confirm that the sample temperature is 0 to 6°C upon receipt. Due to the potential for shipping delays and to reduce the risk of samples arriving at temperatures >6°C, samples will not be shipped on Fridays. Instead, they will be stored in a freezer at Normandeau's Bedford facility and shipped the following Monday.

3.6.3 Post Sampling Activities

Following sampling activities, the field sampling crew will immediately follow the decontamination procedures listed below in Section 3.7. After completing sampling activities at a waterbody, the field sampling crew will return to Normandeau's Bedford facility, where they will prepare the fish (e.g., fillet, prepare composite samples) for shipment to the analytical laboratory. If the team is not able to process the fish samples on the same day that they are collected, the samples will be stored in a refrigerator for processing the following morning. The field sampling lead will alert the ERG Project Manager of sampling progress and document any issues encountered. The ERG Project Manager will provide updates to the MassDEP Project Manager, as appropriate.

Normandeau's staff will adhere to the following procedures when processing the fish and preparing composite samples:

1. Put on nitrile powderless gloves.
2. Decontaminate all equipment with PFAS-free decon water, including the measuring board, scale, cutting board, and all knives that will be used to fillet the fish.
3. Remove the first group of fish from the field sample bag, which will have been stored in either a cooler from the field or in a refrigerator overnight. The first group of fish will be all fish from a given species.
4. Assign the first fish a sample code on the Fish Sampling Log (Appendix D). Then measure that fish for total length in millimeters (mm) and weight in grams (g) and record this information on the log. Record the species, sex, sample type, and collection method-gear, as well as any additional comments (e.g., lesions, mutations, etc.).
5. Place the first fish on the cutting board. Fillet one side of fish by running the fillet knife along the spine from head to tail. Run the knife along rib cage. Remove flesh from skin and place the fillet in a pre-labeled LDPE sample bag provided by the laboratory.
6. Repeat steps 4-6 until all individual fish for a composite sample are filleted and combined in the same sample bag. Label the composite sample, as described in Section 4.4.
7. Repeat steps 4-6 until all fish for a given species have been processed into composite samples.
8. Wash the knife, measuring board, cutting board, and scale. For this, wash all equipment with Alconox soap (made with PFAS-free decon water) and then triple rinse with PFAS-free decon water. Let the equipment air dry and then change gloves before moving on to the next species.
9. Repeat steps 3-8 until all fish are processed and prepared into composite samples for the second species. Repeat this process for the third species, if necessary.
10. Seal composite fillets for storage in the freezer.

Note that all composite samples from a given waterbody will be kept together for storage in the freezer. Samples will be frozen for 24-hours prior to shipment to the lab.

After processing the fish samples and before leaving the Normandeau facility:
The field sampling crew will confirm that all field instruments are operating properly and prepare equipment and supplies for the next sampling event. All meters will be calibrated according to manufacturer specifications. The field sampling crew will turn on the electrofishing unit to check the quality of batteries, and they will check the unit's oil and gas supply.

3.7 Post-Sampling Decontamination Procedures

Prior to mobilization between sampling sites, the field sampling crew will decontaminate sampling equipment in a predesignated area on plastic (HDPE) sheeting. The field sampling crew will store clean bulky equipment on plastic sheeting in uncontaminated areas. The field sampling crew will store cleaned small equipment in plastic bags. If storing any materials for more than a few hours, the field sampling crew will cover such materials with HDPE sheeting. PFAS-free cleaning solutions to be used can include Alconox®, Liquinox®, and Citranox® for equipment decontamination, followed by adequate rinsing with PFAS-free water – which will be provided by MassDEP. Decon 90® will not be used. Sampling equipment will be scrubbed using a polyethylene or polyvinyl chloride brush to remove particulates.

The field sampling crew will rinse parts of equipment coming in direct contact with samples with PFAS-free water supplied by MassDEP before and after use. Disposable equipment intended for one-time use will be packaged for off-site disposal.

The field sampling crew will adhere to all EPA biosecurity protocols in "Standard Protocols for Maintaining Biosecurity During Biological and Water Quality Surveys" (Appendix B). Before field work, the field sampling crew will review and adopt applicable procedures in the SOP titled "Normandeau Associates, Inc. Biosecurity Plan Disinfection Procedures" (Appendix C). Field teams will also adhere to Normandeau's Health and Safety Plan (Appendix G).

4.0 Sample Documentation and Shipment

Field notes, photographs, river and lake field forms (Appendix D), fish sampling logs (Appendix E and F), and chain-of-custody (COC) forms (Appendix G) will be the primary documentation used to record and track information about each sample. Field staff should note any additional information, such as weather, water conditions, whether recreational activities are occurring during the sampling collection, any interactions with officials or the public, and any troubleshooting necessary. Those notes should be documented on field sheets kept in an aluminum clipboard. The field sampling crew will ensure that all entries are legible, written in blue or black ink (using ball point pens), and contain accurate and inclusive documentation of the field activities.

The field sampling crew will note any departures from SAP procedures on field sheets or COC forms. Any errors in the notes or COC forms will be corrected using a single line to cross out the erroneous entry, and the field sampling crew member will date and initial the change that was made. Field personnel will bring loose plain paper in an aluminum clipboard with them in case additional space for documentation is needed. Due to the potential for PFAS cross-contamination, the field sampling crews will not use waterproof/treatment paper or field books for additional notes.

Hard copies of field notes, river and lake field forms, fish sampling logs, and COCs will be retained in Normandeau's project files. Field sampling crews will upload scanned copies of these documents to ERG's SharePoint site after samples are shipped to the laboratory.

4.1 Photographs

The field sampling crew will take digital photographs at all the sampling locations. These photos will document field activities, waterbody characteristics, and unusual site conditions. Photographs will serve to verify information entered in the field notes form. Field sampling crews will upload photos to ERG's SharePoint site for each waterbody after sampling activities are complete.

4.2 River and Lake Field Sheets

The field sampling crew will complete river and lake field sheets provided by MassDEP's Watershed Planning Program. On these sheets, they will document general site conditions at each waterbody and information on the surface water samples that were collected. Depending on the type of waterbody being sampled, the field team will use either MassDEP's river form or lake form. Project-specific OWMID sample ID labels, which are one-time use stickers, will be placed on the forms for each of the surface water samples collected. A blank copy of river and lake field sheets can be found in Appendix E and F, respectively, with all required fields highlighted in yellow.

Details on the specific fields that need to be populated on the river and lake forms are provided below. This is followed by the surface water sample logs, which are the same for lakes and rivers and attached to each of the forms. These forms will be completed in the field, prior to leaving the site. Certain fields will be pre-populated in advance of sampling, to the extent possible.

River Field Sheets

- Project: Enter “MassDEP-PFAS”
- Site name (STAID): Enter the designated numeric ID for the waterbody
- Waterbody name
- Town
- Alternate station description: Use this to describe deviations from planned sampling locations
- Field lat/long
- Lat/long method: Select “handheld GPS”
- Survey crew lead
- Other crew
- Date
- Time
- Weather: Select “clear”, “mostly sun”, “mostly cloudy”, “overcast”, “fog”, “drizzle”, “rain”, “sleet”, or “snow”
- General notes: Use this space for general site visit notes
- Flow condition: Select “flowing”, “no water”, “stagnant”, “ice covered”, or “no access”
- Est. flow velocity: Select “0 fps”, “<1 fps”, “1-3fps”, “3-5 fps”, and “>5 fps” based on professional judgement
- Samples taken from: Select as many locations as needed from the options provided
- Samples taken from description: Use this field to provide more detail on where and how the samples were collected. For example, this field can specify the type of boat used in the sampling.

Lake Field Sheets

- Project: Enter “MassDEP-PFAS”
- Site name (STAID): Enter the designated numeric ID for the waterbody
- Waterbody name
- Town
- Alternate station description: Use this to describe deviations from planned sampling locations
- Field lat/long
- Lat/long method: Select “handheld GPS”
- Survey crew lead
- Other crew
- Date
- Time
- Weather: Select “clear”, “mostly sun”, “mostly cloudy”, “overcast”, “fog”, “drizzle”, “rain”, “sleet”, or “snow”
- General notes: Use this space for general site visit notes
- Max depth site, station max depth, and depth method: These fields will be populated with available information from bathymetry maps after data collection; the field sampling crew does not need to complete this in the field.
- Samples taken from description: Use this field to provide more detail on where and how the samples were collected. For example, this field can specify the type of boat used in the sampling.

Surface Water Sample Log
As noted above, the river and lake field sheets have the same surface water sample log attached. This log must be completed for each surface water sample that is collected (primary samples [collected in the same area as the fish samples], "beach area" samples [where applicable], field blanks, and field duplicates). Three surface water samples can be documented on a single page.

The log should be filled out as follows:

- Sample-Lab: Place the same pre-printed OWMID label (one-time use sticker) here that was placed on the surface water sample bottle
- Sample type: Select "routine sample" for all parent samples. Select "blank" for field blanks and "field duplicate" for duplicate samples. Note that this program does not require collection of "equipment blanks" or "integrated vertical profile" surface water samples.
- OWMID parent ID: If you selected "field duplicate" for the "sample type", populate this field with the OWMID for the parent sample. Otherwise, leave this field blank.
- Medium: Select "water"
- Medium (subdivision): Select "surface water"
- Relative depth: Select "surface"
- Start time: Note the date and time that the samples were collected; use military time
- Gear type: Select "water bottle"
- Composite (Type): Select "no"
- Sample notes: Use this field to distinguish between samples that are collected in the area of fish sample collection versus those collected in "beach areas", when necessary.
- Bottle group: Check "PFAS (PF)" under "planned" and "collected". Leave the field for "preserved in the field" blank and check "Y" for "filtered in the field".

Multi-Probe Information Field Form
This form is included with both the river and lake field sheets. Field sampling crew will select "no" for the "sample collected" field. The rest of the form does not need to be completed.

4.3 Fish Sampling Log

The field sampling crew will complete the fish sampling log provided by MassDEP's Watershed Planning Program to document all fish samples collected at a given waterbody (Appendix D). These forms will document information on each individual fish that goes into a composite, as well as the composite sample ID that represents those fish.

The top portion of the form will be completed in the field, and some information will be pre-populated before sampling, to the extent possible. Note on specific data elements follow:

- Project: Enter "MassDEP-PFAS"
- Waterbody Name/Town
- Date-Time
- Lat/Long: Enter GIS coordinates from where the samples were collected
- Lat/Long method: Enter "handheld GPS"
- FS Login ID: Enter the ID as "N" (for Normandeau), the year, and the site location ID (Table 6). For example N2022001, N2022002, N2022003, etc.

The rest of the form will be completed in Normandeau's Bedford facility while the fish samples are being processed. Normandeau will populate this form with details for each individual fish and for the composite samples. For each individual fish, the following will be documented: sample code, species code, length (mm), weight (g), sex (male or female), sample type (typically "C" for composite), collection method-gear, and comments. Additional information can be found in Appendix D.

4.4 Sample Labeling

The field sampling crew will label all samples in a clear and precise way for proper identification in the field and tracking in the laboratory. Details are provided below for assigning surface water (Section 4.5.1) and fish (Section 4.5.2) sample IDs.

4.4.1 Surface Water Sample IDs

MassDEP requires unique OWMID sample IDs for surface water samples. These IDs will be provided to the field sampling crew on pre-printed labels. The IDs begin with "20" and then have 4 additional values which are assigned sequentially (e.g., 20-0001, 20-0002, 20-0003). Sample IDs are assigned sequentially regardless of whether they are parent samples, field blanks, or field duplicates. The field sampling crew will apply the pre-printed labels to the sample collection bottles. The same label will also be applied to the surface water sampling log that is attached to the river/lake field sheets.

All sample labels will be covered with clear packing tape that completely encircles the sample bottle to prevent smearing or physical damage to the label.

4.4.2 Fish Sample IDs

Each composite fish sample that is sent to the laboratory will receive a unique alphanumeric ID to identify the sample location and sample number. These IDs will be assigned by Normandeau when processing the fish samples in their Bedford facility. Composite fish sample IDs are strings that include characters that denote the contractor that collected the samples, year, location, species, and composite details. The IDs be assigned as follows:

- "N" to indicate Normandeau as the contractor that collected the sample
- "2022" or "2023" to indicate the sample collection year
- A three-digit code to indicate the sampling location (see Table 6)
- A one to three character code to indicate the species (see Table 7)
- A two-digit code to indicate the composite sample number for that waterbody, beginning with 01 and then increasing sequentially with each additional composite sample that is prepared. Note that the sample numbers are assigned sequentially at each survey location, and numbering will start at 01 at each location.

Table 6. Sample Location Codes for Fish Sample IDs

Waterbody Name	Sample Location Code
Flint Pond	001
Lake Boon	002
Connecticut River	003
Upper Spectacle Pond	004
Ashumet Pond	005
Asnacomet Pond	006

Waterbody Name	Sample Location Code
Buck Pond	007
Congomond Lakes	008
Crocker Pond	009
~~Delaney Pond~~ Hardwick Pond	010
Falls Pond	011
Forge Pond	012
Hathaway Ponds	013
Hopedale Pond	014
Jamaica Pond	015
Lake Attitash	016
Lake Cochituate	017
Lake Mirimichi	018
Lake Quannapowitt	019
Lake Ripple	020
Lake Sabbatia	021
Lake Winthrop	022
Long Pond (Lakeville)	023
Long Pond (Yarmouth)	024
Mascuppic Lake	025
Moores Pond	026
Mossy Pond	027
Norton Reservoir	028
Nutting Lake	029
Oxbow Pond-Easthampton	047
Pelham Lake	031
Pontoosuc Lake	032
Robbins Pond	033
Sandy Pond	034
Snake Pond	035
Studley Pond	036
Wachusett Reservoir	037
Webster Lake	038
West Lake	039
Blackstone River	040
Bungay River	041
Charles River	042
Chicopee River	043

Waterbody Name	Sample Location Code
Concord River	044
Deerfield River	045
Hoosic River	046
Merrimack River	**030**
Millers River	048
Nashua River	049
~~**Sudbury River**~~ **Ware River**	050
South Watuppa Pond	**051**
Whitman's Pond	**052**
Lake Cochichewick	**053**

Table 7, Fish Species Codes for Fish Sample IDs

Fish Species	Fish Species Code
Largemouth bass	LMB
Smallmouth bass	SMB
Black crappie	BC
Bluegill	B
Pumpkinseed	P
White perch	WP
Yellow perch	YP
Brook trout	BT
Rainbow trout	RT
Brown bullhead	BB
Yellow bullhead	YB
Black bullhead	BH
Chain pickerel	CP
Common carp	C
White sucker	**WS**
American eel	**AE**
Redbreast	**RB**
Brown trout	**BRT**

Example fish IDs for four composite samples (two comprised of largemouth bass, one comprised of chain pickerel, and one comprised of bluegill) for sampling location 001 are as follows:

- N2022001-LMB-01
- N2022001-LMB-02
- N2022001-CP-03
- N2022001-B-04

When a field duplicate is collected, the sample ID should match the parent sample but have "DUP" added to the end (e.g., N2002001-LMB-01 and N2022001-LMB-01-DUP). Equipment blanks will match the waterbody sample ID but will have a "B" added to the end (e.g., N2002001-B).

Sample labels will be affixed to the outside of the sample bags that are shipped to the laboratory and covered completely with clear packing tape.

4.4.3 Chain-of-Custody Forms

COC forms will be maintained throughout the course of the sampling effort. Eurofins will provide COC forms for each waterbody (Appendix G), and the field sampling crew will complete these forms at each waterbody. Any corrections to COC forms will be made by a single-line strike make through the incorrect item; the correct entry will be entered adjacent to the strikeout item, with the date and staff initials to document the change.

The Eurofins COC form is pre-populated with contact information for the laboratory project manager (Kerri Sachtleben), the COC number, the state (MA), client contact information (Richard Chase, MassDEP), and Eurofins' project number. Field teams will need to populate the sampler's name and phone number, along with details on the samples included in the shipment. The latter includes sample ID, collection date and time, type of sample, matrix, and analyses requested (PFAS Method 1633). The bottom of the COC records possession of the samples, which is to be filled out every time the samples are transferred to a new handler.

The field sampling crew will complete one COC form for every sample collection event. They will send the original form with the sample shipment and upload scanned copies to ERG's SharePoint site.

4.5 Preservation

When initially caught, fish will be placed in an ambient temperature live well in the field. When sample collection is complete, fish of the same species will be placed in a PFAS-free LDPE plastic bag provided by the laboratory and on ice for transport back to Normandeau's facility. If the fish need to be stored over night before processing, they will be stored in a refrigerator at 0-6°C. Whole fish will be filleted by Normandeau staff prior to shipment. After the fish are filleted and before they are shipped, the fillets will be frozen at Normandeau's facility. The frozen fillets will then be packaged by species as composites in double-bagged PFAS-free LDPE bags provided by Eurofins with wet ice for shipment to the laboratory.

Surface water samples will be immediately placed on ice following collection. Samples will be frozen at Normandeau's Bedford facility prior to shipment to the laboratory. Frozen water samples will be packaged with wet ice for shipment to the laboratory.

4.6 Packaging and Shipping

Surface water samples must be chilled during shipment and not exceed 6°C during the first 48 hours after collection. When preparing samples for shipment, frozen surface water samples will be double-bagged using PFAS-free LDPE bags provided by the laboratory. As much double-bagged wet ice as will fit in the cooler should be used for transporting and shipping liquid and frozen samples. Chemical or blue ice will not be used. Sample temperature must be confirmed to be at 0° to 6°C when the samples are received at the laboratory.

For fish tissue, frozen fillets will be shipped in PFAS-free LDPE bags provided by the laboratory. Each sample bag will contain fillets for a single composite sample. Samples will not be shipped until they have been frozen for approximately 18 to 24 hours. In some cases, this may mean holding samples at Normandeau's facility for an extra day before they are shipped to the laboratory.

Before shipping samples, the field sampling crew will prepare all shipping documents. The field sampling crew will complete and then tape shipping documents to the exterior of the cooler, including forms required by the shipping service (e.g., a Federal Express waybill). A copy of the COC form will be placed inside of the cooler. The COC is included in Appendix G**.** If the field sampling crew has any questions or concerns regarding the completion of the shipping documentation of packaging of samples, they will contact the laboratory Project Manager.

Samples will be shipped to Eurofins in Lancaster, MA by FedEx overnight in coolers provided by the lab, typically with samples from one waterbody per cooler. If samples from multiple waterbodies fit in the same cooler, they will be shipped that way. The field crew will use pre-paid FedEx shipping labels provided by Eurofins. Normandeau will share FedEx tracking numbers with ERG upon dropping the samples off at FedEx. Eurofins will send confirmation of receipt within 48 hours of receiving the samples. ERG will alert MassDEP of any shipping delays.

The COC forms sent to the lab must be completed with all designated information; the pages must be originals (not photocopies); and the COCs must be unique to the samples contained in the cooler. Upon receipt, the analytical laboratory will confirm that all samples listed are present and then sign the COC form.

5.0 Analytical Methods

Water and tissue matrices will be analyzed in accordance with EPA draft Method 1633. Further information is included in the method documentation and in Section 3.3 of the QAPP.

As noted previously, Normandeau will process the fish at its Bedford facility. The samples that arrive at the laboratory will be skin-off fillets. The analytical laboratory will then homogenize the fillets before analyzing them according to method specifications.

Analytical SOPs have been requested from the Eurofins laboratory by MassDEP and are included in the project QAPP by addendum.

The laboratory will document any deviations from the proposed analytical method in the laboratory reports. The laboratory will provide sufficient documentation to allow for an independent validation and verification of the analytical results.

6.0 Quality Assurance / Quality Control (QA/QC)

6.1 Field and Equipment Blanks

The field sampling crew will collect blank samples at a random 10-20% of sites. The blanks will be collected with greater frequency during Phase 1 and early Phase 2 compared with mid-to-late Phase 2, provided that the blanks show no PFAS contamination. The type of blank samples will differ for surface water and fish tissue samples.

Field blanks for surface water will be collected by transferring PFAS-free water into sampling containers in the field. These containers will then be treated in an identical fashion to all other surface water grab samples. The laboratory will analyze the field blanks for the same PFAS contaminants that will be measured in surface water. Field blanks will be collected at two waterbodies under Phase 1. The frequency of field blanks for Phase 2 surface water sampling will be evaluated at a later date. Note that MassDEP will provide PFAS-free water for field blanks from its MassDEP-WPP-Worcester facility.

Equipment blanks for fish tissue will consist of rinsate samples from equipment used to collect and process fish samples in Normandeau's Bedford facility. To collect an equipment blank, the field sampling crew will pour PFAS-free water over each piece of cleaned equipment used to process the fish (including the measuring board, cutting board, scale, and knives) and collect that water in one of the fish tissue sample collection containers (i.e., a PFAS-free LDPE bag provided by the laboratory). The water will then be transferred from the bag into an HDPE sample bottle. Rinsate blanks will be sent to the laboratory for analysis of the same PFAS contaminants that will be measured in fish tissue. When rinsate blanks are collected, they will be collected either (1) prior to any fish processing at the start of the day or (2) after processing all of the fish for a composite and completing the decontamination process outlined above. Equipment blanks will be collected to evaluate sample processing for two waterbodies under Phase 1. The frequency of equipment blanks for Phase 2 will be evaluated on an ongoing basis.

Quality assurance (QA) procedures are documented in further detail in Section 3.4 the project QAPP.

6.2 Duplicate Samples

Field duplicate samples will be collected to characterize precision of the sampling and analytical methods. Two types of duplicate samples will be collected, according to these specifications:

- At 10-20% of the waterbodies sampled, the surface water collected near the fishing location will be collected in duplicate. Meaning, field sampling crews will collect two grab surface water samples at side-by-side locations. One surface water duplicate will be collected during Phase 1 sampling. The rest will be collected in Phase 2.

- At 10-20% of waterbodies sampled, the field sampling crew will also collect field duplicate fish samples. For a given composite, the duplicate sample will be prepared at the Normandeau facility in Bedford, NH. When preparing the fish duplicate samples, the field sampling crew will prepare two composites (or duplicates) for the same group of fish. One composite will be composed of all right-side fillets while the other composite will be composed of all left-side fillets. One composite sample duplicate will be collected during Phase 1 sampling. The rest will be collected in Phase 2.

7.0 References

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US EPA 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. https://www.epa.gov/sites/production/files/2015-06/documents/g4-final.pdf

US EPA 2019. National Rivers and Streams Assessment 2018/19 Field Operations Manual Wadeable. EPA-841-B-17-003a. https://www.epa.gov/sites/production/files/2019-05/documents/nrsa_1819_fom_wadeable_version_1.2_0.pdf

Appendix A– Scientific Collection Permit

Scientific Collection Permit

FISH

VALID

2022

NORMANDEAU ASSOCIATES
COREY FRANCIS
25 NASHUA ROAD
BEDFORD, NH 03110

DATE: 5/20/2022

PERMIT#: 143.22SCF

Subpermittee(s): Christian Gagne, Tyler Parrent, Ethan Sobo

is (are) hereby authorized, in accordance with the provisions of Section 4, Chapter 131 and 131A of the Massachusetts General Laws, to remove from the wild within the Commonwealth, subject to conditions set forth below, the following species and numbers:

UP TO 3 FISH SPECIES AND NO MORE THAN 45 FISH PER LAKE . UP TO 2 SPECIES, TOTAL OF 30 FISH FROM EACH RIVER MAY BE TAKEN EXCEPT THAT NO FISH SPECIES LISTED AS ENDANGERED, THREATENED, OR OF SPECIAL CONCERN MAY BE TAKEN. IN ADDITION STOCKED BROOK, BROWN AND RAINBOW TROUT MAY ALSO BE TAKEN. GAME SPECIES MAY ONLY BE COLLECTED IN NUMBERS THAT DO NOT EXCEED CREEL LIMITS. SEE ABSTRACTS FOR RECREATIONAL

SPECIAL CONDITIONS:
- Restrict analysis of PFAS concentration to edible portions of the fish (fillets)
- all fish included in the study should greater than minimum harvest lengths
- for fish with no legal harvest length the applicant need to consult with Masswildlife to determine a appropriate length for inclusion into the study
- Collection activities for each species and within each pond should be spatially dispersed to the extent possible. Little is known about spatial variability in PFAS concentration and spreading the sample out will hedge against any variability affecting the results.

RARE STATE-LISTED SPECIES ENCOUNTERED IN THE FIELD MUST BE REPORTED TO NHESP USING THE "HERITAGE HUB" ONLINE REPORTING SYSTEM

The following method(s) of taking is (are) hereby authorized:

ELECTROFISHING, ROD & REEL, TROT LINE

Collection activites under this permit shall be restricted to the following locations, subject to the approval of private landowners

- Connecticut River/ Chicopee
- Lake Boon/Hudson, Stow
- Ashumet Pond/Mashpee
- Flint Pond/Tyngsborough
- Upper Spectacle pond/Otis

All specimens secured under this permit shall be donated to the following institutions:

RETAINED FOR FLESH ANALYSIS

No specimen taken under the authority of this permit may be sold. No specimen may be transferred to another not duly licensed.

This permit or a copy thereof shall be carried at all times by the permittee and subpermittee(s) while engaged in the activities authorized herein.

This permit does not absolve the permittee from compliance in full with any and all other applicable federal, state and local requirements, including the acquisition of a federal endangered species permit if required.

Upon expiration of this permit, a complete report detailing all collection activities shall be filed with this office and must include a listing of all species taken, numbers of specimens, and the disposition of same.

This permit, unless sooner revoked for cause, shall expire on December 31 of the year of issue.

Mark S. Tisa

Mark Tisa, Ph.D., M.B.A., Director

Appendix B– US EPA Standard Protocols for Maintaining Biological Security During Biological and Water Quality Surveys

Standardized Protocols for Maintaining Biological Security During Biological and Water Quality Surveys

By Hilary Snook, USEPA
(snook.hilary@epa.gov)

Purpose: These protocols are to establish formal operating, reporting, and decontamination procedures to prevent the spread of invasive/alien plant or animal species, biological viruses, pathogens, fungi, contaminants, or other detrimental factors from one surveyed water body/sampling location to another during the course of performing biological and water quality surveys.

No protocol can comprehensively cover all of variations of the entities listed above, but these field procedures should minimize the probability of alien/invasive transfers or viral/bacterial infections most prevalent in the New England Region. Strict adherence to these protocols is required while conducting surveys.

Pre-survey Planning

In the process of pre-survey planning, considerations need to be made as to the present disposition of the water bodies to be surveyed. Preliminary inquiries should be made to determine if the water bodies presently contain invasive plant/animal species, or if viral/bacterial agents have been reported or are present. Surveys spanning separate water bodies, or encompassing large contiguous stream/river reaches, especially over consecutive days, should be conducted in a manner whereby the most "pristine" sites are completed first if possible, thereby minimizing possibilities of cross contamination/transfer among sites. This in most cases will mean working from an upstream to downstream direction whenever possible in order to avoid spreading invasives further up into a watershed. Decontamination procedures should take place in all waters where the habitat is suitable for invasives, with the presumption being that they may already exist in the waterbody but as yet have not been detected.

Equipment recommendations

The equipment choices made for surveys may have a large influence on the susceptibility of transfer of environmental contaminants. Avoid absorbent porous material whenever possible. Use of felt soled waders, wading boots, should be replaced with cleated or studded wading boots. Carpeted boat decking and trailer bunks should be replaced with impervious decking material or their use avoided. If use of these types of materials is unavoidable, then extra diligence and care will be necessary during the decontamination process. The use of vessels with hull designs containing thru hull fixtures or hardware that take on and retain water should be minimized.

Decontamination Personal Protection Equipment (PPE)

The PPE for decontaminating equipment should consist of rubber gloves and laboratory safety glasses at a minimum. Long sleeved shirts and pants should be worn when using corrosives (bleach) and a plastic/rubber apron to keep overspray off of the clothing. Avoid contact with skin and clothing.

Decontamination procedures

The decontamination/disinfection products listed have been selected based on their relevancy to known pathogens/contaminants of concern to fisheries in the region and the existence of invasive aquatic plant species presently found in New England. The proper use of these products, along with sound sampling plan designs and equipment choices, should provide a high degree of protection against the transfer and propagation of these environmental stressors/contaminants.

The level of decontamination employed is a hierarchical approach based on the level of perceived risk of transferring invasive or pathogenic entities. Visual inspections of all equipment are to be made at every site before and after the survey, regardless of the condition of the resource. Any survey sites known or suspected to have invasive plant/animal species or pathogens need to follow the procedures listed below. It is the responsibility of the project manager to know the sites and their current disposition, as well as to employ the appropriate decontamination procedure and ensure that field crews have been appropriately trained in these protocols. The procedures used at a site will be recorded in the field log book.

1. All organic matter, plant fragments, and miscellaneous debris should be removed from nets, traps, temporary holding pens, boots & waders, gloves, anchor lines & chains, boat trailers and vehicles, and all other surfaces that have come into contact with ambient water, potentially contaminated sediments, fish, or other aquatic biota. Any material found after leaving the site should be disposed of in the trash and not flushed down any drains.
2. One of two disinfectants may be used as described below. All appropriate small field gear (gloves, waders, nets, anode rings, rat tails, etc.) should be immersed in a large plastic waste barrel utilizing a 2% solution of chlorhexadine diacetate (i.e. Novalsan) for a period of 15 minutes, or one ounce of 65% available Chlorine powder to twenty three gallons of water to obtain a 200 ppm solution. The latter is an inexpensive alternative using a "wetted time" of 20-30 minutes. Equipment that cannot be immersed (i.e. boats and trailers) should be disinfected utilizing a portable hand sprayer.
3. Chlorine solution is corrosive and will deteriorate neoprene, cloth, rubber seals, and other materials. The materials should be thoroughly rinsed in fresh water after soaking. Rubber intake and discharge lines, pumps with rubberized components on vessels, should all be checked frequently for deterioration.
4. Vehicles, boats, and trailers should be power washed at a commercial car laundry in between sites if operating in consecutive days and disinfection procedures

applied. Live wells, holding tanks, thru hulls, intake lines and discharge lines should be thoroughly flushed with the prescribed chlorine disinfection solution and then subsequently rinsed with fresh water.

5. Outboard motor cooling systems should be flushed out with decontamination solution for the specified minimum of one minute's time then let stand for 15 minutes. It should be flushed again with clean fresh water that has come from a town water supply.

6. Flush the interior of your boat with the disinfecting solution and then use the bilge pump to expel residual water before opening the bungs if possible. Some residual decontamination solution may be left in the bilges to "slosh" and continue deconning during travel provided no below deck equipment will be damaged in the process and the bilge water is disposed of properly. Care must be taken to ensure that this material is not carried over to another water body.

7. Mats, deck carpeting, anchor lines and other absorbent and porous materials should be thoroughly soaked with decontamination solution, allowing extra time for the solution to fully saturate the item. If possible, avoid using equipment that has these materials on board as part of your surveys. Chlorinated disinfectants will bleach out carpeting and other fabrics.

<u>Invasive/Alien Species reporting</u>

- A comprehensive post survey report will be written describing the species and external disposition of individual fish, or the presence of other aquatic invasives. In most cases for fish this will include species, age class, length, weight, and any signs of physical or behavioral anomalies.
- Fish will be examined for deformities, fin erosions, fungi, lesions, and tumors, external parasites, and visible signs of viral/bacterial hemorrhagic infections. Fish will be retained for further pathological examination at the discretion of the survey fisheries biologist, or with consultation with the state agency biologist whose jurisdiction the survey has taken place. Photos may be taken to accompany voucher collections or pathology.
- All fish collected during a survey will be reported on and submitted to the appropriate state fish & wildlife agency and notations made as to their disposition.

To prevent the spread of viral/bacterial fish infections, the following guidelines should be adhered to:

- Do not transport fish from one body of water to another
- Only put fish back into the water body it was taken from
- Do not dispose of fish carcasses or by-products in any body of water.
- Remove all mud, aquatic plants and animals from all gear, boats, motors and trailers before leaving a body of water;

- Drain your live well, bilge and bait tanks before leaving the water you are fishing or boating on. Any water body known or suspected of being infected or having invasive plant/animal species need to follow the disinfection guidelines.

Resources:

New England Invasive Species:
http://www.epa.gov/ne/topics/ecosystems/invspecies.html

Didymosphenia geminata
http://www.issg.org/database/species/ecology.asp?si=775&fr=1&sts

USFWS Decontamination protocols
http://www.fws.gov/sacramento/es/documents/crf_survey_guidance_aug2005.pdf

Maine Department of Inland Fisheries and Wildlife. 2005. *Fisheries Staff Biosecurity and Disinfection Guidelines for Field Work (Draft).*

Maine Atlantic Salmon Commission. 2005. *Disinfection Procedures (Draft).*

Appendix C– Normandeau Associates, Inc. Biosecurity Plan Disinfection Procedures (09/2017)

Introduction

Invasive species are found throughout the United States. Typical encountered invasives include Eurasian watermilfoil, Hydrilla, Water Chestnut, Asian Clams and Zebra Mussels. To prevent the spread of invasive species by field sampling activities undertaken by Normandeau Associates, Inc. (NAI), the following decontamination policy will apply to all boats and equipment that are used when transporting from one water body to another or across watersheds. At a minimum visual inspection will occur prior to transporting from one water body to another. Remove any obvious materials and discard in appropriate trash receptacles; do not return these materials to the water.

Purpose of Procedure:

Normandeau personnel working with aquatic organisms in the United States will maintain a high standard of biosecurity. All Normandeau field sampling crews will follow NAI's disinfection procedures, in order to prevent the spread of aquatic invasive species and diseases.

Equipment Needed:

- Steam pressure washer
- 2 large (40+gal.) trash cans
- Sprayer bottle
- Bleach or
- A solution of copper sulfate, benzethonium chloride and Formula 409
- Rubbing alcohol
- Garden hose
- 1 Large stiff bristle brush

Alternative Method:

- Box freezer
- Salt water 5% to 10%

Crew Vehicles:

Inspect and wash equipment regularly during field season

Boats and Trailers:
The boats and trailers will be visually inspected for aquatic plants and when found will be removed by hand. All boat hulls, bilges, and trailers will be steam cleaned or washed with 10% bleach to disinfect before use. All outboard motors will be flushed with tap water for 10 minutes before being used.

Field Equipment:

All field equipment will be inspected and disinfected before use between different lakes and river systems or watersheds. Disinfection for most equipment will be accomplished with 10% bleach and water solution in large trash cans (1gal. bleach/10 gal. water). Large equipment will be disinfected with steam when practical (i.e. barge shocker, holding tanks, trap nets, seines). Equipment that comes in constant contact with lake or river water, such as waders, dip nets, gloves, buckets, measuring boards will be placed in a 10% bleach solution and left to soak for at least 10 minutes and then rinsed thoroughly. Solutions of copper sulfate (252 mg/L Cu), or benzethonium chloride (1,940 mg/L), and Formula 409 (50% dilution) may be used to prevent structural damage to waders. When disinfection occurs off site of the NAI offices all solutions shall be collected, stored, and properly disposed of at the NAI offices.

An alternative is to freeze nets and other gear in a box type freezer. Place gear in a freezer below 32 degrees Fahrenheit for a minimum of eight hours, thaw gear and immerse in a solution of 5% to 10% salt water.

Delicate equipment, such as D.O. meters, electronic scales, etc., will be sprayed with ethanol alcohol and air dried.

Safety

Personnel will be made aware of the hot stream generated and the potential to burn skin by steam pressure wash equipment. Appropriate field gear like rubber gloves, rain pants and coats will be worn when using the steam pressure washer.

Personnel will review a Safety Data Sheet for alcohol used to spray equipment prior to use. Alcohol is flammable; no smoking or ignition sources will be nearby when spraying equipment.

Bleach solutions typically Clorox or similar brands may cause skin irritation, nausea or vomiting if ingested. Personnel will review a Safety Data Sheet prior to use.

Copper sulfate can cause eye, skin irritation and respiratory problems and is extremely harmful to aquatic life. Personnel will review Safety Data Sheet prior to use.

Training and Documentation

Employees who are required to perform disinfection procedures will be provided with a copy of this procedure. After reading and acknowledging understanding of the procedure, a sign off sheet will be signed to document this training.

When equipment is disinfected according to the procedure, a log sheet will be kept documenting this activity whether it was performed prior to field, during or after field activities. Documentation will be stored in the NAI Field Operations office at each location

Appendix D – Biological Survey of Water: Fish Sampling Log

[Required fields are highlighted in yellow]

[A complete example of this log is provided immediately after the blank forms]

Project:	Waterbody Name/Town:	Unique ID:
Date-Time:	Lat/Long: /	Lat/Long Method:
FS Login ID:	Crew Lead:	Crew:

Sample Code	Species	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging structure	Collection Method-Gear	Comments

Sample Code	Species Code	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging Structure	Collection Method-Gear	Comments

Fish Species	Fish Species Code
Largemouth bass	LMB
Smallmouth bass	SMB
Black crappie	BC
Bluegill	B
Pumpkinseed	P
White perch	WP
Yellow perch	YP
Brook trout	BT
Rainbow trout	RT
Brown bullhead	BB
Yellow bullhead	YB
Black bullhead	BH
Chain pickerel	CP
Common carp	C
White sucker	**WS**
American eel	**AE**
Brown trout	**BRT**
Redbreast	**RB**

Collection Method-Gear
SHOCK: Backpack
SHOCK: Boat
SHOCK: Pram
SHOCK: Stream-side
Netting: Gill Net
Netting: Other (Specify)
Rod and Reel
Hook and Line
Trot line
Trap
Other: (Specify)

Example of Populated Forms

Project: MassDEP-PFAS	Waterbody Name/Town: Upper Spectacle Pond/Otis	Unique ID:
Date-Time: 6/2/22 1400	Lat/Long: 42.17905 / -73.11789	Lat/Long Method: Handheld
FS Login ID:	Crew Lead: Christian Gagne	Crew: Chris Kelsey

Sample Code	Species	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging structure	Collection Method-Gear	Comments
N2022004-B-01A	B	227	239	M	C		Shock-Boat	
01B	↓	195	180	M	↓		↓	
01C		204	212	M				
01D		186	159	M				
01E	↓	200	189	M	↓		↓	
N2022004-B-01								
N2022004-B-02A	B	206	210	M	C		Shock-Boat	
02B	↓	216	225	F	↓		↓	
02C		210	219	M				
02D		216	207	F				
02E	↓	190	153	M	↓		↓	
N2022004-B-02								

Project: MassDEP-PFAS	Waterbody Name/Town: Upper Spectacle Pond/Otis	Unique ID:
Date-Time: 6/2/22 1400	Lat/Long: 42.17905 / -73.11789	Lat/Long Method: Handheld
FS Login ID:	Crew Lead: Christian Gagne	Crew: Chris Kulsex

Sample Code	Species	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging structure	Collection Method-Gear	Comments
N2022004-B-03A	B	170	105	M	C		Shock-Boat	
03B	↓	164	100	F	↓		↓	
03C		179	114	F				
03D		183	138	F				
03E		165	97	M				
N2022004-B-03								
N2022004-P-04A	P	197	190	M	C		Shock-Boat	
04B	↓	208	218	F	↓		↓	
04C		211	232	F				
04D		226	301	F				
04E		185	157	F				
N2022004-P-04								

Project: MassDEP-PFAS	Waterbody Name/Town: Upper Spectacle Pond/Otis	Unique ID:
Date-Time: 6/2/22 1400	Lat/Long: 42.17905 / -73.11789	Lat/Long Method: Handheld
FS Login ID:	Crew Lead: Christian Gayne	Crew: Chris Kelsey

Sample Code	Species	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging structure	Collection Method-Gear	Comments
N2022004-P-05A	P	223	345	M	C		Shock-Boat	
05B	↓	215	251	M	↓		↓	
05C		172	131	M				
05D		191	168	M				
05E	↓	185	175	M	↓		↓	
N2022004-P-05								
N2022004-P-06A	P	193	183	M	C		Shock-Boat	
06B	↓	147	72	M	↓		↓	
06C		158	108	M				
06D		160	94	F				
06E	↓	194	198	F	↓		↓	
N2022004-P-06								

Project: MassDEP-PFAS	Waterbody Name/Town: Upper Spectacle Pond/Otis	Unique ID:
Date-Time: 6/2/22 1400	Lat/Long: 42.17905 / -73.11789	Lat/Long Method: Hand Held
FS Login ID:	Crew Lead: Christian Gagne	Crew: Chris Kelsey

Sample Code	Species	Length (mm)	Weight (g)	Sex (M or F)	Sample Type	Aging structure	Collection Method-Gear	Comments
N2022004-LMB07A	LMB	363	678	M	C		Shock Boat	
07B	↓	312	419	F	↓		↓	
07C	↓	325	505	F	↓		↓	
N2022004-LMB-07								
N2022004-LMB-08A	LMB	470	1229	F	C		Shock Boat	
08B	↓	434	994	M	↓		↓	
08C	↓	380	707	F	↓		↓	
N2022004-LMB-08								

Appendix E – River Field Sheet

[Required fields are highlighted in yellow]

STATION INFORMATION (*fill out prior to departure*)	
Field Sheet Login #:	**Unique ID:**
Project:	**Site Name (STAID):**
Waterbody Name:	**Town:**

GENERAL SITE INFORMATION

Alternate Station Description (Does site match description?) ☐ **YES** ☐ **NO** *If not, describe below:*

Field Lat/Long /	**Lat/Long Method** ☐ GETAC F110 Tablet ☐ Handheld GPS ☐ Other
Survey Crew Lead:	**Other Crew:**
Date:	**Time:** ☐ **EST** ☐ **EDT**

Weather Conditions ☐ Clear ☐ Mostly sun ☐ Mostly cloud ☐ Overcast ☐ Fog ☐ Drizzle ☐ Rain ☐ Sleet ☐ Snow

Air Temperature ☐ < 20 °F ☐ 21-30 °F ☐ 31-40 °F ☐ 41-50 °F ☐ 51-60 °F ☐ 61-70 °F ☐ 71-80 °F ☐ 81-90 °F ☐ 91-100 °F

Water Odor ☐ None ☐ Musty ☐ Petrol ☐ Sewage ☐ Effluent ☐ Sulfide ☐ Fishy ☐ Chlorine ☐ Rotten Veg. ☐ Other ☐ Unobservable

Turbidity ☐ None ☐ Slightly Turbid ☐ Moderately Turbid ☐ Highly Turbid ☐ Unobservable

Water Color ☐ None ☐ Brownish ☐ Blackish ☐ Greenish ☐ Greyish ☐ Reddish ☐ Yellowish ☐ Other ☐ Unobservable

Floating Scum ☐ None ☐ Algal mat ☐ Foam ☐ Oily sheens ☐ Pollen blankets ☐ Sewage ☐ Other ☐ Unobservable
Description:

General Notes:

OBSERVATIONS (RIVER ONLY)

Flow Condition ☐ Flowing ☐ No Water ☐ Stagnant ☐ Ice Covered ☐ No Access

Est. Flow Velocity ☐ ~0 fps ☐ < 1 fps ☐ 1-3 fps ☐ 3-5 fps ☐ > 5 fps

Tidal Condition ☐ Not Applicable ☐ Ebb (outgoing tide) ☐ Flood (incoming tide) ☐ Slack ☐ Indeterminate

% Open Sky: _____% (e.g., total shade=0%, total sun = 100%)

Dominant Substrates ☐ Bedrock ☐ Boulder ☐ Cobble ☐ Coarse gravel ☐ Sand ☐ Silt/Mud/Clay ☐ Unobservable

Staff Gage Reading (in feet to the 1/100th): _____ ft

Discharge (Reference) ☐ Upstream of a discharge ☐ Adjacent to a discharge ☐ Downstream of a discharge ☐ Unknown

OBSERVATIONS (RIVER AND LAKE)

Objectionable Deposits ☐ None ☐ Trash ☐ Flocculent mass ☐ Other ☐ Unobservable Description:

Shoreline Erosion ☐ None ☐ Slight ☐ Moderate ☐ Severe ☐ Unobservable Description:

Wildlife ☐ None ☐ Fish ☐ Mammals ☐ Birds ☐ Amphibians ☐ Other Description:

Beneficial Uses ☐ None ☐ Swimming ☐ Boating ☐ Water intake ☐ Fishing ☐ Other Description:

Pollution Sources ☐ None ☐ Outfalls ☐ Garbage ☐ Road runoff ☐ Waterfowl ☐ Land clearing ☐ Lawns

Aesthetics Impaired? ☐ YES ☐ NO *Based on water odor, clarity, unnatural color, growths, scum and/or deposits, is the site impaired?*

Water Level (relative to annual high-water level) ☐ Low ☐ Normal ☐ High Water level, ft above/below _____ ft

STATION SPECIFIC PLANT DENSITY None 0% Sparse 1-25% Moderate 25-50% Dense 50-75% Very Dense 75-100% Unobservable	
Overall Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Floating Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Emergent Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Submerged Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Duckweed	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Free-floating algae	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U

ALGAL BLOOM
Algal Bloom Present ☐ YES ☐ NO
Bloom Type ☐ Cyanobacteria ☐ Green Algae ☐ Other ☐ Unknown
Evidence of Bloom (check all that apply) ☐ Scum ☐ Color ☐ Turbidity ☐ Odor ☐ Other
Lakeward Width (in meters) ☐ <1 m ☐ 1-5 m ☐ 5-10 m ☐ 10-15 m ☐ >15 m
Shoreline Length (in meters) ☐ <1 m ☐ 1-5 m ☐ 5-10 m ☐ 10-15 m ☐ >15 m
Bloom specific notes:

SITE SPECIFIC PERIPHYTON **N**one: 0% **S**parse: 1-25% **M**oderate: 25-50% **D**ense: 50-75% **V**ery **D**ense: 75-100% **U**nobservable		
Filamentous	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool
Film	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool
Loose Floc	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Orange ☐ White ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool
Moss *(enter in Rivers section)*	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool

SAMPLE - GENERAL
Samples taken from ☐ From shore/left bank ☐ From shore/center stream ☐ From shore/right bank ☐ Wade in/left bank ☐ Wade in/center stream ☐ Wade in/right bank ☐ Bridge upstream ☐ Bridge downstream ☐ Boat ☐ Shore (Lake) ☐ Wading (Lake) ☐ Dock ☐ Pipe ☐ Other (describe): _____
Samples taken from description:

Sample-Lab	<Place OWMID Label here>	<Place OWMID Label here>	<Place OWMID Label here>
Sample Type	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:
OWMID Parent			
Medium	☐ Water ☐ Sediment ☐ Other	☐ Water ☐ Sediment ☐ Other	☐ Water ☐ Sediment ☐ Other
Medium (Subdivision)	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown
Relative Depth	☐ Surface ☐ Mid-Water ☐ Near Bottom	☐ Surface ☐ Mid-Water ☐ Near Bottom	☐ Surface ☐ Mid-Water ☐ Near Bottom
Start/End Depth (m)	/	/	/
Start Time (Date/Time)	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST
End Time (Date/Time)	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST
Gear Type	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A
Gear Serial #			
Composite (Type)	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth
Field Lat/Long	/	/	/
Field Lat/Long Method	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS
Sample Notes			

Bottle Group	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field
Bacteria (B)	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N
Nutrient (N)	☐	☐	☐ H_2SO_4	☐ Y ☐ N	☐	☐	☐ H_2SO_4	☐ Y ☐ N	☐	☐	☐ H_2SO_4	☐ Y ☐ N
Metals (M)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
OrgCarb (OC)	☐	☐	☐ H_3PO_4	☐ Y ☐ N	☐	☐	☐ H_3PO_4	☐ Y ☐ N	☐	☐	☐ H_3PO_4	☐ Y ☐ N
Nutrient (N3)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Solids (S)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Chl a (I)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Color/Turb (R)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
PFAS (PF)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N

Multi-Probe Information

<Place OWMID Label here>	**Sample Collected**	☐ Yes ☐ No	**Depth Calibrated on Site**	☐ Yes ☐ No
	Date/Time	**Start Date**	**End Date**	
	☐ EDT ☐ EST	**Start Time**	**End Time**	

Sample Type	☐ P_ATT (Attended Probe) ☐ P_ATTDEPTH (Attended Probe, Depth Profile) ☐ P_ATTREP (Attended Probe Replicate)

Gear Type (Sonde)	☐ Sonde-Fluorometry ☐ Sonde-Multi ☐ Sonde-Single	**Sonde Serial #**	
Gear Type (Logger)	☐ Logger ☐ Not Applicable	**Logger Serial #**	

Medium	☐ Water ☐ Air ☐ Other	**Medium Subdivision**	☐ SW (Surface Water) ☐ StmW (Stormwater) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ AmbAir (Ambient Air) ☐ Unknown

Field Lat/Long	/	**Method:**	☐ Handheld GPS ☐ GETAC F110 Tablet ☐ Other
Probe Notes			

Multi-Probe DATA

Time	Depth (m)	Temp (°C)	DO (mg/L)	Sat (%)	Scond (uS/cm)	pH	TDS/Salinity (g/l)/(ppt)	Phycocyanin (cells/ml)

Appendix F – Lake Field Sheet

[Required fields are highlighted in yellow]

STATION INFORMATION (*fill out prior to departure*)

Field Sheet Login #:	**Unique ID:**
Project:	**Site Name (STAID):**
Waterbody Name:	**8.0 Town:**

GENERAL SITE INFORMATION

Alternate Station Description (Does site match description?) ☐ **YES** ☐ **NO** *If not, describe below:*

Field Lat/Long /	**Lat/Long Method** ☐ GETAC F110 Tablet ☐ Handheld GPS ☐ Other
Survey Crew Lead:	**Other Crew:**
Date:	**Time:** ☐ **EST** ☐ **EDT**

Weather Conditions ☐ Clear ☐ Mostly sun ☐ Mostly cloud ☐ Overcast ☐ Fog ☐ Drizzle ☐ Rain ☐ Sleet ☐ Snow

Air Temperature ☐ < 20 °F ☐ 21-30 °F ☐ 31-40 °F ☐ 41-50 °F ☐ 51-60 °F ☐ 61-70 °F ☐ 71-80 °F ☐ 81-90 °F ☐ 91-100 °F

Water Odor ☐ None ☐ Musty ☐ Petrol ☐ Sewage ☐ Effluent ☐ Sulfide ☐ Fishy ☐ Chlorine ☐ Rotten Veg. ☐ Other ☐ Unobservable

Turbidity ☐ None ☐ Slightly Turbid ☐ Moderately Turbid ☐ Highly Turbid ☐ Unobservable

Water Color ☐ None ☐ Brownish ☐ Blackish ☐ Greenish ☐ Greyish ☐ Reddish ☐ Yellowish ☐ Other ☐ Unobservable

Floating Scum ☐ None ☐ Algal mat ☐ Foam ☐ Oily sheens ☐ Pollen blankets ☐ Sewage ☐ Other ☐ Unobservable
Description:

General Notes:

OBSERVATIONS (RIVER AND LAKE)

Objectionable Deposits ☐ None ☐ Trash ☐ Flocculent mass ☐ Other ☐ Unobservable Description:

Shoreline Erosion ☐ None ☐ Slight ☐ Moderate ☐ Severe ☐ Unobservable Description:

Wildlife ☐ None ☐ Fish ☐ Mammals ☐ Birds ☐ Amphibians ☐ Other Description:

Beneficial Uses ☐ None ☐ Swimming ☐ Boating ☐ Water intake ☐ Fishing ☐ Other Description:

Pollution Sources ☐ None ☐ Outfalls ☐ Garbage ☐ Road runoff ☐ Waterfowl ☐ Land clearing ☐ Lawns

Aesthetics Impaired? ☐ YES ☐ NO *Based on water odor, clarity, unnatural color, growths, scum and/or deposits, is the site impaired?*

Water Level (relative to annual high-water level) ☐ Low ☐ Normal ☐ High Water level, ft above/below _____ ft

STATION SPECIFIC PLANT DENSITY None 0% Sparse 1-25% Moderate 25-50% Dense 50-75% Very Dense 75-100% Unobservable

Overall Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Floating Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Emergent Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Submerged Aquatic Plants	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U Species:
Duckweed	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Free-floating algae	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U

ALGAL BLOOM

Algal Bloom Present ☐ YES ☐ NO

Bloom Type ☐ Cyanobacteria ☐ Green Algae ☐ Other ☐ Unknown

Evidence of Bloom (check all that apply) ☐ Scum ☐ Color ☐ Turbidity ☐ Odor ☐ Other

Lakeward Width (in meters) ☐ <1 m ☐ 1-5 m ☐ 5-10 m ☐ 10-15 m ☐ >15 m

Shoreline Length (in meters) ☐ <1 mm ☐ 1-5 m ☐ 5-10 m ☐ 10-15 m ☐ >15 m

Bloom specific notes:

SITE SPECIFIC PERIPHYTON None: 0% Sparse: 1-25% Moderate: 25-50% Dense: 50-75% Very Dense: 75-100% Unobservable		
Filamentous	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool
Film	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool
Loose Floc	☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U	Color: ☐ Black ☐ Brown ☐ Green ☐ Grey ☐ Orange ☐ White ☐ Other Location: ☐ On plants ☐ On rocks ☐ On bottom Location Type: ☐ Riffle ☐ Run ☐ Pool

OBSERVATIONS (LAKE)		
Wind Conditions ☐ Calm ☐ Slight ☐ Moderate ☐ Gusty ☐ Strong		
Wind Direction ☐ Calm ☐ North ☐ Northeast ☐ East ☐ Southeast ☐ South ☐ Southwest ☐ West ☐ Northwest		
Water Surface ☐ Calm ☐ Ripples ☐ Choppy ☐ White caps		
Dom. Habitat ☐ Bedrock ☐ Boulder ☐ Cobble ☐ Gravel ☐ Sand ☐ Silt ☐ Woody debris ☐ Organic ☐ Vegetation ☐ Other ☐ Unobservable		
Max Depth Site ☐ Yes ☐ No	**Station Max. Depth** _____ meters	**Depth Method** ☐ Secchi ☐ Lead line ☐ Sonar ☐ Survey Rod ☐ Other

WHOLE LAKE PLANTS None 0% Sparse 1-25% Moderate 25-50% Dense 50-75% Very Dense 75-100% Unobservable
Overall Aquatic Plants ☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Dominant Aquatic Plants (in order of dominance, include any NON-NATIVE)
(E / S / F)
(E / S / F)
(E / S / F)
Duckweed specific ☐ N ☐ S ☐ M ☐ D ☐ VD ☐ U
Duckweed Band Width (m) ☐ <1 m ☐ 1-5 m ☐ 5-10 m ☐ 10-15 m ☐ >15 m
Duckweed % Cover __

SECCHI MEASUREMENT		
Secchi Measured ☐ Yes ☐ No	**Time:**_____ ☐ EST ☐ EDT	**Secchi Method** ☐ Secchi disk ☐ Secchi tube ☐ Other
Secchi depth _____ meters	**Dup. Secchi depth** _____m	**On bottom** ☐ Yes ☐ No
Secchi reading condition ☐ Viewfinder used ☐ In weeds ☐ In sunlight		**Secchi Comments:**

SAMPLE - GENERAL

Samples taken from ☐ From shore/left bank ☐ From shore/center stream ☐ From shore/right bank

☐ Wade in/left bank ☐ Wade in/center stream ☐ Wade in/right bank

☐ Bridge upstream ☐ Bridge downstream

☐ Boat ☐ Shore (Lake) ☐ Wading (Lake) ☐ Dock

☐ Pipe

☐ Other (describe): _____

Samples taken from description:

Sample-Lab	<Place OWMID Label here>	<Place OWMID Label here>	<Place OWMID Label here>
Sample Type	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:	☐ FQC_BLANK (Blank) ☐ FQC_BLANKRINS (Equipment Blank) ☐ FQC_REP (Field Duplicate) ☐ FS_IVP (Integrated Vertical Profile) ☐ FS_ROUTINE (Routine Sample) ☐ Other:
OWMID Parent			
Medium	☐ Water ☐ Sediment ☐ Other	☐ Water ☐ Sediment ☐ Other	☐ Water ☐ Sediment ☐ Other
Medium (Subdivision)	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown	☐ SW (Surface Water) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ StmW (Stormwater) ☐ Unknown
Relative Depth	☐ Surface ☐ Mid-Water ☐ Near Bottom	☐ Surface ☐ Mid-Water ☐ Near Bottom	☐ Surface ☐ Mid-Water ☐ Near Bottom
Start/End Depth (m)	/	/	/
Start Time (Date/Time)	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST
End Time (Date/Time)	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST	/ ☐ EDT ☐ EST
Gear Type	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A	☐ Water Bottle ☐ Tygon Tube ☐ Sampling Pole ☐ Auto Sampler ☐ Van Dorn ☐ Other ☐ Basket ☐ N/A
Gear Serial #			
Composite (Type)	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth	☐ No ☐ Yes ☐ Flow ☐ Time ☐ Depth
Field Lat/Long	/	/	/
Field Lat/Long Method	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS	☐ GETAC F110 Tablet ☐ Other: ☐ Handheld GPS
Sample Notes			

Bottle Group	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field	Planned	Collected	Preserved In Field	Filtered In Field
Bacteria (B)	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N	☐	☐	☐ $Na_2S_2O_3$	☐ Y ☐ N
Nutrient (N)	☐	☐	☐ H_2SO_4	☐ Y ☐ N	☐	☐	☐ H_2SO_4	☐ Y ☐ N	☐	☐	☐ H_2SO_4	☐ Y ☐ N
Metals (M)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
OrgCarb (OC)	☐	☐	☐ H_3PO_4	☐ Y ☐ N	☐	☐	☐ H_3PO_4	☐ Y ☐ N	☐	☐	☐ H_3PO_4	☐ Y ☐ N
Nutrient (N3)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Solids (S)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Chl a (I)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
Color/Turb (R)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
PFAS (PF)	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N
	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N	☐	☐		☐ Y ☐ N

Multi-Probe Information

<Place OWMID Label here>	**Sample Collected**	☐ Yes ☐ No	**Depth Calibrated on Site**	☐ Yes ☐ No
	Date/Time ☐ EDT ☐ EST	**Start Date** **Start Time**	**End Date** **End Time**	

Sample Type	☐ P_ATT (Attended Probe) ☐ P_ATTDEPTH (Attended Probe, Depth Profile) ☐ P_ATTREP (Attended Probe Replicate)

Gear Type (Sonde)	☐ Sonde-Fluorometry ☐ Sonde-Multi ☐ Sonde-Single	**Sonde Serial #**	
Gear Type (Logger)	☐ Logger ☐ Not Applicable	**Logger Serial #**	

Medium	☐ Water ☐ Air ☐ Other	**Medium Subdivision**	☐ SW (Surface Water) ☐ StmW (Stormwater) ☐ IndEff (Industrial Effluent) ☐ MunSewEff (Muni. Sewage Effluent) ☐ AmbAir (Ambient Air) ☐ Unknown

Field Lat/Long	/	**Method:**	☐ Handheld GPS ☐ GETAC F110 Tablet ☐ Other
Probe Notes			

Multi-Probe DATA

Time	Depth (m)	Temp (°C)	DO (mg/L)	Sat (%)	Scond (uS/cm)	pH	TDS/Salinity (g/l)/(ppt)	Phycocyanin (cells/ml)

Appendix G – Chain-of-Custody Form

Eurofins Lancaster Laboratories Environme

2425 New Holland Pike
Lancaster, PA 17601
Phone (717) 656-2300

Chain of Custody Record

eurofins | Environment Testing America

Client Information	Sampler:	Lab PM: Sachtleben, Kerri S	Carrier Tracking No(s):	COC No: 410-56539-16029.1
Client Contact: Richard Chase	Phone:	E-Mail: Kerri.Sachtleben@et.eurofinsus.com	State of Origin: MA	Page: Page 1 of 1
Company: Massachusetts Dept of Envir. Protection	PWSID:	Analysis Requested		Job #:
Address: 8 New Bond St.	Due Date Requested:			Preservation Codes: A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
City: Worcester	TAT Requested (days):			
State, Zip: MA, 01606	Compliance Project: Δ Yes Δ No			
Phone: 508-792-7470(Tel) 508-791-4134(Fax)	PO#:			
Email: richard.f.chase@state.ma.us	WO#:			
Project Name:	Project #: 41010708			
Site:	SSOW#:			Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (Water, Solid, Oil, Tissue, Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)														Total Number of containers	Special Instructions/Note:
			Preservation Code:																		

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Appendix H – Normandeau's Health and Safety Plan