Sampling and Analysis Plan

PFAS Surface Water and Foam Sampling Program in Nantucket

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Prepared for

Town of Nantucket

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ABBREVIATIONS

CASRN	Chemical Abstracts Service Registry Numbers
COC	chain-of-custody
DI	deionized
DQO	data quality objective
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
ERG	Eastern Research Group, Inc.
FEP	fluorinated ethylene propylene
GPS	global positioning system
HASP	health and safety plan
HDPE	high density polyethylene
ITRC	Interstate Technology Regulatory Council
LBOH	local board of health
LCS	laboratory control sample
LDPE	low density polyethylene
L	liter
MassDEP	Massachusetts Department of Environmental Protection
MA DPH	Massachusetts Department of Public Health
MDL	method detection limit
MI EGLE	Michigan Department of Environment, Great Lakes, and Energy

mL	milliliter
MRL	method reporting limit
ng	nanogram
NRD	Nantucket Natural Resources Department
Pace	Pace Analytical Services, Inc.
PCP	personal care products
PFAS	per- and polyfluoroalkyl substances
PPE	personal protective equipment
PVC	polyvinyl chloride
RPD	relative percent difference
SAP	sampling and analysis plan
SOP	standard operating procedures
QA	quality assurance
QC	quality control

Abbreviations for all PFAS analytes are shown in Table 3.

1.0 Introduction

The Town of Nantucket has initiated a project to investigate levels of per- and polyfluoroalkyl substances (PFAS) in surface water and, if present, sea foam at selected coastal beaches and inland ponds across Nantucket, Massachusetts. The primary goal of this sampling effort is to characterize PFAS contamination in nearshore coastal waters and selected inland ponds to better understand potential public health risks associated with recreational water use.

This Sampling and Analysis Plan (SAP) outlines the procedures that field crews will follow for sample collection, processing, and transport, and the analytical methods the laboratory will use to ensure reliable, high-quality data. It also includes broader information about the sampling effort, such as team roles and responsibilities, health and safety protocols, a list of sampling locations, the sampling design approach, and quality assurance/quality control (QA/QC) measures. This plan is designed to promote consistency, efficiency, and data integrity to support informed public health decisions. The methods described are consistent with U.S. Environmental Protection Agency (EPA) recommendations (EPA 2002, 2006) and those published by the Interstate Technology Regulatory Council (ITRC, 2023) and state agencies (e.g., MassDEP, 2023; MA DPH, 2024; MI EGLE, 2019; MI EGLE 2022).

The SAP covers the project's data quality objectives (DQOs) (Section 2.0), sampling plan (Section 3.0), field methods and procedures (Section 4.0), sample documentation and shipment (Section 5.0), analytical methods (Section 6.0), QA/QC procedures (Section 7.0), comparison concentrations (Section 8.0), and communication plan (Section 9.0). References are listed in Section 10.0 and additional information is provided in the following appendices:

- Appendix A: Surface water sample collection field sheet
- Appendix B: Surface water foam sample collection field sheets
- Appendix C: Chain-of-custody (COC) form from the commercial laboratory
- Appendix D: Additional Details on Screening Values
- Appendix E: Project health and safety plan (HASP)

1.1 Background

In August 2020, the Town of Nantucket began investigating the presence of PFAS across the island, focusing on Town-owned facilities, including the area surrounding Nantucket Memorial Airport, the Nantucket Landfill, and the Nantucket Sewer Department. In February 2021, CDM Smith completed its Preliminary Assessment of PFAS – Town-wide Planning Approach (CDM Smith, 2021). Since that time, multiple projects have been implemented to assess, manage, and mitigate the impacts of PFAS contamination. Environmental sampling efforts have included testing PFAS in public drinking water, private wells, wastewater, groundwater, soil, and surface water.

In May 2024, the Massachusetts Department of Public Health released Operational Guidance for Bathing Beaches at PFAS-Impacted Waterbodies (MA DPH, 2024). This guidance assists municipalities and beach operators in evaluating and managing bathing beaches affected by PFAS. Although testing for PFAS at bathing beaches is not mandatory, MA DPH notes that it may be conducted for various reasons, such as proximity to a known PFAS source or as part of surveillance programs.

The current project seeks to address a data gap by evaluating PFAS levels in coastal surface waters at public beaches, other high-use shoreline areas, and selected inland freshwater bodies known for recreational use. Other similar studies and sampling efforts, such as those conducted by MA DPH in Cape Cod and statewide, have detected PFAS in surface water from coastal beaches and freshwater inland lakes and ponds (MA DPH, 2021; 2023). In addition, recent (though limited) studies suggest that PFAS can accumulate in foam in both marine and freshwater environments, potentially increasing exposure and health risk. For example, a recent study reported elevated levels in sea foam along beaches in the Cape Fear area of North Carolina (Enders et al., 2025) and another found elevated levels in the Great Lakes of Michigan (MI EGLE, 2021). Therefore, this project will also analyze PFAS concentrations in sea foam, if sufficient quantities of foam are present near surface water sampling locations to allow for collection and analysis.

1.2 Project Objectives

The primary objective of this project is to characterize the nature and extent of PFAS contamination in surface water and, where present, foam at selected coastal beaches and inland ponds across the Town of Nantucket. The sampling results will support efforts in understanding and mitigating PFAS-related exposure and potential health risks on the island. The resulting data will be used to guide public health communications, including the development of a summary report, fact sheet, and virtual presentation of key findings to the Nantucket community. Key findings will also be published on the Town's PFAS website.

1.3 Project Team

The Town of Nantucket has contracted with Eastern Research Group, Inc. (ERG) to collect, analyze, and report on surface water and foam samples. ERG has subcontracted with Pace Analytical Services, Inc. (Pace) to perform PFAS analysis with EPA Method 1633A (EPA, 2024). Table 1 lists the primary contacts from each organization, along with their title or role in the project and their contact information.

Table 1. Project Team Contact List

Name	Organization	Project Role or Title	Email	Phone Number
Andrew Shapero	Nantucket Health & Human Services	Nantucket Project Manager	ashapero@nantucket-ma.gov	508-221-9526
Chuck Larson	Town of Nantucket	Manager of Strategic Projects	clarson@nantucket-ma.gov	508-922-5089
Gregg Tivnan	Town of Nantucket	Assistant Town Manager for Strategic Projects	gtivnan@nantucket-ma.gov	508-228-7200 ext. 7307
John Hedden	Nantucket Health & Human Services	Chief Environmental Health Officer	jdhedden@nantucket-ma.gov	508-228-7200 ext. 7732
Roque Miramontes	Nantucket Health & Human Services	Public Health Director	rmiramontes@nantucket-ma.gov	508-228-7200 ext. 7322
Rebecca DeVries	ERG	ERG Project Manager	Rebecca.DeVries@erg.com	201-669-9974
Clifton Dassuncao	ERG	Senior Health Scientist	Clifton.Dassuncao@erg.com	703-373-8105

Name	Organization	Project Role or Title	Email	Phone Number
Anna Stanley-Lee	ERG	Data Manager and Analyst	Anna.Stanley@erg.com	978-514-0424
Kort Kirkeby	ERG	Senior Biologist and Technical Advisor	Kort.Kirkeby@erg.com	720-789-8047
Rebecca Faust	Pace	Pace Project Manager	Rebecca.Faust@pacelabs.com	413-486-5061

2.0 Project Data Quality Objectives

When evaluating public health risks associated with environmental contamination, it is essential to use sampling data that are of known and high quality. This section outlines the quality specifications established for this project. Measurements that meet these criteria will be considered appropriate for supporting the project's primary objectives.

2.1 Data Quality Indicators

Table 2 presents the data quality indicators established for PFAS measurements in this project. Depending on the specific indicator, data quality will be assessed either qualitatively or quantitatively.

Table 2. Data Quality Indicators

Data Quality Indicator and Purpose	Project-specific Requirements
Representativeness To ensure that PFAS measurements adequately characterize waterbody conditions and reflect the range of PFAS levels present at public bathing beaches and other frequently used coastal and inland recreational areas.	▪ Sampling locations will be distributed along the coast of Nantucket and will include beaches and inland ponds. ▪ Locations will be selected to align with those used in the Town's routine beach bacteria monitoring program, covering the most frequently used beaches. ▪ Additional nearshore background sites will be included to provide context.
Comparability To ensure that PFAS measurements can be compared to those made by other parties using similar methods and to MA DPH's screening levels.	▪ The field team will follow standard, reproducible sampling methodologies to ensure consistency and data reliability. ▪ Samples will be collected in a manner that allows for direct comparison with the Massachusetts Department of Public Health (MA DPH) screening value for PFAS, as outlined in the agency's operational beach guidance (MA DPH, 2024). ▪ A commercial laboratory will analyze samples according to the specifications of EPA Method 1633A, a published and peer-reviewed analytical method widely used for PFAS (EPA, 2024). ▪ PFAS measurements will be reviewed to ensure analyses have been conducted according to the method and any supplemental data quality requirements in this SAP. ▪ Samples will be collected from the same locations during two separate sampling events to enable comparison between the two time points.
Completeness To ensure that sufficient data are collected to meet this program's objectives (consistent with the total project sample numbers described in the scope of work) and to minimize the likelihood of missing, invalid, or incomplete data.	▪ The field team will review this SAP and receive additional training on the proper procedures for sample collection, storage, processing, and tracking. ▪ The field team will implement contingency plans should unforeseen conditions prevent sample collection at a selected location. ▪ The field team will strive to collect 60 total samples—the requested sample count in the project scope of work. ▪ Measurement data reported by the analytical laboratory will be immediately and thoroughly reviewed. The laboratory will be asked to clarify invalid or missing data.
Sensitivity To generate PFAS measurements of a known and high quality at	▪ Pace will report results down to the laboratory's method detection limits (MDLs) as specified in their SOP. These MDLs are one to two orders of magnitude lower than the MA DPH surface water screening values that will be used for comparison.

Data Quality Indicator and Purpose	Project-specific Requirements
concentrations recommended in EPA's analytical method.	▪ The project team will review field and laboratory QC samples against data usability criteria. ▪ Potential for matrix interferences will be evaluated.
Precision To confirm that this project's PFAS measurements are highly repeatable.	▪ Surface water field duplicates will be collected at 10% of the sampling locations. Duplicate samples will be collected in both coastal and freshwater environments. A foam duplicate will be prepared if there is sufficient foam present to collect a second sample. ▪ The relative percent difference (RPD) between PFAS measured in parent and field samples will be used to assess precision. For individual surface water duplicate pairs: o If concentration is ≥5× MDL, the RPD should be ≤40%. o If concentration is <5× MDL, the RPD should be ≤100%. A higher degree of variability is expected for sea foam field duplicates, which will be explored as part of this project. ▪ The laboratory will report the results of one laboratory duplicate sample per batch of 20 samples.
Accuracy To confirm that this project's PFAS measurements are free from bias.	▪ Field blanks will be collected at 5% of the sampling locations to verify the absence of cross-contamination. ▪ A commercial laboratory will use analytical methods documented to be reliable and will employ rigorous QC procedures, according to specifications of EPA Method 1633A (EPA, 2024) and as outlined in the laboratory's SOP for this method. ▪ The laboratory will report the results of one procedural blank per batch of approximately 20 samples. ▪ To reduce the potential for cross contamination, the field team will use PFAS-free best practices for sampling and new sample collection materials and supplies at each sampling location. ▪ The field team will use deionized (DI) water provided by the laboratory—verified to be PFAS-free—for preparing field blanks during sample collection. This same DI water will also be used to decontaminate any sampling equipment in the field, though the need for decontamination is expected to be minimal.

2.2 Criteria for Measurement Data

All surface water and foam samples will be analyzed by Pace Laboratories using EPA Method 1633A (EPA, 2024). Table 3 lists the 40 PFAS to be measured, along with their acronyms, Chemical Abstracts Service Registry Numbers (CAS RNs), MDLs, and method reporting limits (MRLs). Pace will report results down to the lowest calibration point for each compound, which corresponds to the MDLs in this table. Any detections between the MDL and MRL will be flagged with a "J" qualifier, indicating estimated low-level concentrations. Note that the MDLs and MRLs presented in Table 3 are based on a liquid sample volume of 500 milliliters (mL). Lower sample volumes (as might occur if sufficient volume of aqueous material from sea foam is not available) will result in higher values.

The MDLs presented in Table 3 are roughly two orders of magnitude lower than MA DPH's surface water screening level of 20 ng/L for selected PFAS compounds (see Section 8.0). This level of sensitivity supports the project's primary objective: evaluating potential health risks associated with exposure to PFAS in surface water and sea foam.

Table 3. MDLs and MRLs Surface Water and Foam Samples

PFAS Analyte	Acronym	CASRN	MDL (ng/L)	MRL (ng/L)
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid	PFBA	375-22-4	0.8	6.4
Perfluoropentanoic acid	PFPeA	2706-90-3	0.45	3.2
Perfluorohexanoic acid	PFHxA	307-24-4	0.28	1.6
Perfluoroheptanoic acid	PFHpA	375-85-9	0.28	1.6
Perfluorooctanoic acid	PFOA	335-67-1	0.42	1.6
Perfluorononanoic acid	PFNA	375-95-1	0.65	1.6
Perfluorodecanoic acid	PFDA	335-76-2	0.39	1.6
Perfluoroundecanoic acid	PFUnA	2058-94-8	0.51	1.6
Perfluorododecanoic acid	PFDoA	307-55-1	0.35	1.6
Perfluorotridecanoic acid	PFTrDA	72629-94-8	0.48	1.6
Perfluorotetradecanoic acid	PFTeDA	376-06-7	0.15	1.6
Perfluoroalkane sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid	PFBS	375-73-5	0.34	1.6
Perfluoropentanesulfonic acid	PFPeS	2706-91-4	0.47	1.6
Perfluorohexanesulfonic acid	PFHxS	355-46-4	0.62	1.6
Perfluoroheptanesulfonic acid	PFHpS	375-92-8	0.85	1.6
Perfluorooctanesulfonic acid	PFOS	1763-23-1	0.4	1.6
Perfluorononanesulfonic acid	PFNS	68259-12-1	0.47	1.6
Perfluorodecanesulfonic acid	PFDS	335-77-3	0.51	1.6
Perfluorododecanesulfonic acid	PFDoS	79780-39-5	0.72	1.6
Perfluoroalkane sulfonamides (FASA) and				
Perfluorooctanesulfonamide	PFOSA	754-91-6	0.56	1.6
N-ethyl perfluorooctane sulfonamidoethanol	NEtFOSE	1691-99-2	1.6	16
N-methyl perfluorooctane sulfonamidoethanol	NMeFOSE	24448-09-7	1.3	16
N-ethyl perfluorooctane sulfonamide	NEtFOSA	4151-50-2	0.33	1.6
N-methyl perfluorooctane sulfonamide	NMeFOSA	31506-32-8	0.27	1.6
N-ethyl perfluorooctanesulfonamidoacetic acid	NEtFOSAA	2991-50-6	0.65	1.6
N-methyl perfluorooctanesulfonamidoacetic acid	NMeFOSAA	2355-31-9	1.5	1.6
Fluorotelomer sulfonic acid (FTSA)				
4:2 Fluorotelomer sulfonic acid	4:2 FTS	757124-72-	1.3	6.4
6:2 Fluorotelomer sulfonic acid	6:2 FTS	27619-97-2	3	6.4
8:2 Fluorotelomer sulfonic acid	8:2 FTS	39108-34-4	3.3	6.4
Perfluoroalkyl ether carboxylic acids (PFECAs)				
Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1	0.46	3.2
Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-	0.43	3.2
Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	1.5	6.4
Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-	2.1	3.2
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-	0.85	6.4
Polyfluoroalkyl ether sulfonic acids (PFESAs)				
Perfluoro(2-ethoxyethane)sulfonic acid	PFEESA	113507-82-	0.57	3.2
9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic	9Cl-PF3ONS	756426-58-	0.93	6.4
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic	11Cl-	763051-92-	1.7	6.4
Fluorotelomer carboxylic acids (FTCAs)				
3-Perfluoropropyl propanoic acid	3:3FTCA	356-02-5	2.2	8
2H,2H,3H,3H-Perfluorooctanoic acid	5:3FTCA	914637-49-	7	40
3-Perfluoroheptyl propanoic acid	7:3FTCA	812-70-4	9	40

3.0 Sampling Plan

This sections describes the overall sampling plan, including the sampling locations (Section 3.1), sampling schedule (Section 3.2), and types of samples to be collected (Section 3.3). Details on sample collection procedures are provided in Section 4.0.

3.1 Sampling Locations

The ERG field team will collect surface water grab samples at 21 locations on or near Nantucket Island. These locations include coastal beaches, harbors, inland ponds, and nearshore sites. Figure 1 shows the sampling locations and Table 4 provides additional information on them, such as the sample location identification numbers (IDs), sampling location names, and coordinates. Note that per MA DPH's *Operational Guidance for Bathing Beaches at PFAS Impacted Waterbodies*, samples will be collected at the same locations where routine surface water bacterial testing occurs (MA DPH, 2024; 2025). At sites not included in the Town's existing beach sampling program (excluding background locations), the field team will target areas with the highest apparent recreational use.

When collecting samples, ERG field staff will accompany Town of Nantucket beach inspectors during routine bacterial beach sampling events. These inspectors typically follow two established routes—one along the island's northern shore and one along the southern coastline. Of the 21 sampling locations identified for this project, nine are located along the southern route (IDs beginning with "S") and ten along the northern route (IDs beginning with "N"). Inland ponds included in the sampling plan were assigned to one of these routes based on recommendations from the Town of Nantucket. Samples will also be collected at two nearshore "background" locations (IDs beginning with "B") north of the island. ERG staff will access these sites using a 25-foot Privateer boat operated by the Town's Natural Resources Department (NRD). Overall, ERG will collect samples from 18 saltwater locations and three freshwater locations.

Figure 1. Sampling Locations

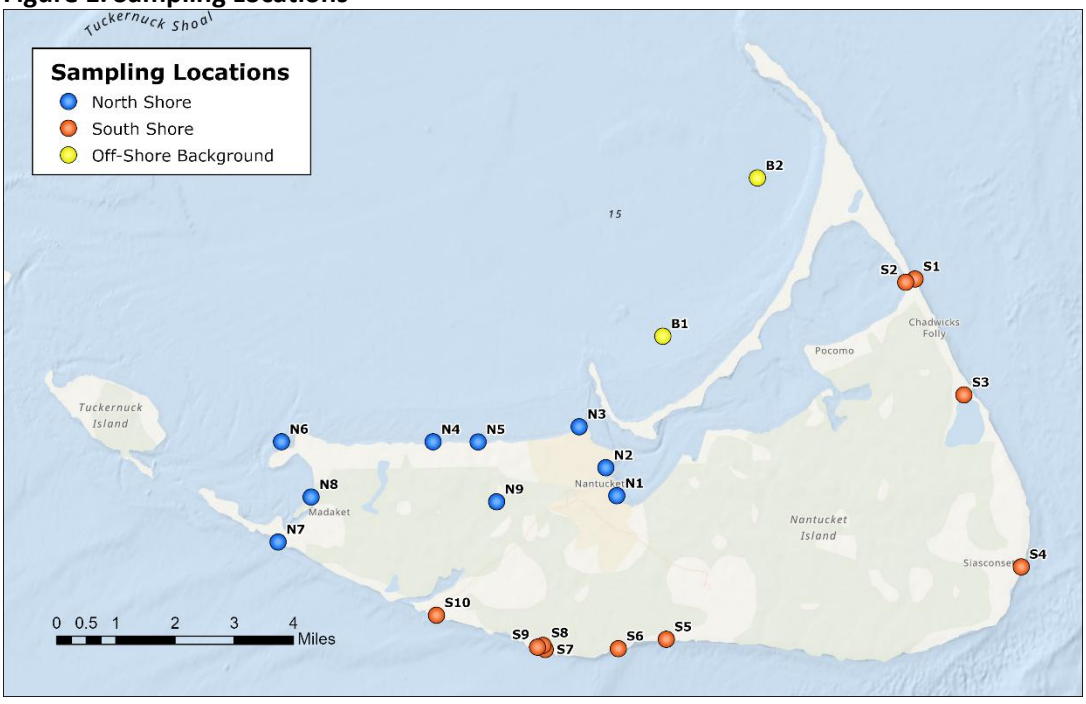

Table 4. Sampling Locations

Sampling Location ID	Sampling Location Name	Latitude	Longitude	Freshwater or Saltwater	Sampling Route	Included in Existing Bacterial Sampling Program?
S1	Wauwinet Ocean	41.3318	-69.9957	Saltwater	South Shore	Yes
S2	Wauwinet Harbor	41.3311	-69.9988	Saltwater	South Shore	Yes
S3	Sesachacha Pond	41.3033	-69.9805	Freshwater	South Shore	Yes
S4	Sconset Beach	41.2610	-69.9629	Saltwater	South Shore	Yes
S5	Nobadeer Beach	41.2448	-70.0784	Saltwater	South Shore	Yes
S6	Surfside Beach	41.2427	-70.0940	Saltwater	South Shore	Yes
S7	Sewerbeds	41.2428	-70.1177	Saltwater	South Shore	Yes
S8	Miacomet Pond	41.2438	-70.1184	Freshwater	South Shore	Yes
S9	Miacomet Beach	41.2434	-70.1202	Saltwater	South Shore	Yes
S10	Cisco Beach	41.2516	-70.1528	Saltwater	South Shore	Yes
N1	Washington Street	41.2801	-70.0937	Saltwater	North Shore	Yes
N2	Children's Beach	41.2870	-70.0971	Saltwater	North Shore	Yes
N3	Jetties Beach	41.2965	-70.1069	Saltwater	North Shore	Yes
N4	Dionis Beach	41.2940	-70.1530	Saltwater	North Shore	Yes
N5	Washing Pond Beach	41.2938	-70.1384	Saltwater	North Shore	Yes
N6	40th Pole Beach	41.2946	-70.2022	Saltwater	North Shore	Yes
N7	Madaket Beach	41.2701	-70.2038	Saltwater	North Shore	Yes
N8	Madaket Harbor	41.2870	-70.1916	Saltwater	North Shore	No
N9	Hummock Pond	41.2791	-70.1327	Freshwater	South Shore	No
B1	Northern Nearshore Area (Trap/Pot Waters Area)	41.3189	-70.0779	Saltwater	Background	No
B2	Northeastern Nearshore Area (near Coskata Beach)	41.3572	-70.0463	Saltwater	Background	No

3.2 Sampling Schedule

The ERG field team will sample the 21 locations twice, once in July and once in August. July sampling will assess potential PFAS exposure at the start of summer when beach recreational use is high. The August sampling will help identify differences over time, while also capturing conditions during continued high beach usage in late summer. The two background locations will only be sampled in August if PFAS are detected at these locations during the July sampling event.

As noted in Section 3.1, ERG field staff will collect samples alongside Town beach inspectors during their regularly scheduled bacterial sampling events. These events typically take place in the early morning, between approximately 6:00 AM and 9:30 AM. ERG will record detailed notes on sampling times and tidal conditions at each site. If it is not low tide conditions during the scheduled sampling window, ERG will collect samples at the Washington Street (N1) and Children's Beach (N2) locations separately during or close to low tide.

3.3 Types of Samples Collected

The ERG field team will collect surface water samples at the locations shown in Figure 1. During both the July and August sampling events, one surface water sample will be collected from each location. Co-located sea foam samples will be collected at up to four locations, depending on whether or not there is sufficient foam present for sampling. Note that the laboratory requires a minimum of 500 mL of water for PFAS analysis with EPA Method 1633A. To allow for potential re-analysis, the laboratory recommends that field teams submit 1,000 mL per sample. For sea foam, the laboratory will analyze the aqueous phase material. Because sea foam condenses significantly, a much larger volume must be collected in the field to ensure that at least 500 mL of aqueous material is available for analysis.

Field QC samples will also be collected. At a subset of the sampling locations, ERG field staff will collect two field blanks, two surface water duplicates, and, where feasible, one foam duplicate per event. Assuming all sites are accessible, and foam is collected at four locations, 30 samples will be collected in July, and 30 samples will be collected in August. Table 5 lists the expected numbers of different types of samples to be collected in both months.

Table 5. Sample Counts

Sampling Event	Number of Field Samples		Number of Field QC Samples		Total Number of Samples
	Surface Water	Foam[a]	Duplicates[b]	Field Blanks[c]	
July 2025	21	4	3	2	30
August 2025	21	4	3	2	30

[a] *Assumes locations will have sufficient foam for sample collection.*

[b] *One duplicate will be a foam sample, if a foam sample is collected.*

[c] *One field blank will be collected at a background location.*

4.0 Field Methods and Procedures

This section outlines the steps ERG field staff will follow to collect samples in the field and prepare them for shipment to Pace for PFAS analysis.

4.1 PFAS-Specific Sample Collection Considerations

Due to the ubiquitous nature of PFAS in consumer products and the low PFAS concentrations that this project aims to measure, preventing cross contamination is critical at every step of sample collection and processing. This section discusses precautions the field team will take to minimize the potential for cross contamination. The precautions described here are based on those used in similar projects conducted by the Massachusetts Department of Environmental Protection (MassDEP) (MassDEP, 2023) and on established guidance for collecting environmental samples for PFAS analysis (e.g., MI EGLE, 2019; MI EGLE, 2022; ITRC, 2022). ERG field staff will screen all field sampling materials and equipment to ensure they are "PFAS-free" before using them, with ample time ahead of sampling to procure replacements, if needed. The staff will also be trained in and will follow the precautions outlined in Table 6.

Table 6. PFAS-Specific Sampling Precautions

Clothing Precautions
▪ Use life jackets made of PFAS-free materials such as polyethylene foam and nylon shell fabric. ▪ Ensure footwear are made from PFAS-free materials. ▪ Avoid clothing that has 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 (PVC), polyurethane, or rubber (e.g., PVC rain jackets). ▪ Keep clothing and personal protective equipment (PPE) dust-free. ▪ Wear old, well laundered clothing (i.e., 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. Field staff 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 remove PPE if PCPs must be applied. Wash your hands thoroughly after handling or applying PCPs and when finished, don new gloves.
Food Precautions
▪ Do not handle or consume pre-wrapped food, carry-out food, or other food items in the sampling area. ▪ When taking a break, remove gloves and any other PPE, if worn, and then move to a designated area for food and beverage consumption away from the sampling area. ▪ After eating or drinking, wash hands and put on a fresh pair of powderless nitrile gloves before returning to the sampling area.
Glove Changes
▪ Use PFAS-free powderless nitrile gloves at all times during sample collection and handling. ▪ Change powderless nitrile gloves frequently to prevent cross contamination, especially: o When handling new sampling equipment or materials (e.g., sample bottles). o Before collecting a new sample. o After touching potentially contaminated surfaces or when field personnel deem it necessary.
Sample Collection Precautions
▪ Prevent dust or fiber from falling into the sample container. ▪ Avoid any contact with the inside surfaces of sample bags and containers.

▪ After collecting and sealing a surface water sample, place the sample bottle into a sealed Ziploc® bag, then store it on ice in a cooler. ▪ For sea foam samples, place the foam-containing bag inside a second bag and keep the double-bagged sample on ice until the foam settles. When transferring condensed foam into sample bottles, change gloves between handling each sample.
Compounds and Equipment to Avoid
▪ Polytetrafluoroethylene, including trademarks Teflon® and Hostaflon®, found in many items, such as hose lining, tubing, wiring, certain kinds of gears, and some objects that require sliding parts. Use alternatives such as high-density polyethylene (HDPE), silicone, polypropylene, or other PFAS-free materials. ▪ Polyvinylidene fluoride, including trademark Kynar®, found in many items, such as tubing, films and coatings on aluminum, galvanized or aluminized steel, wire insulators, and lithium-ion batteries. ▪ Polychlorotrifluoroethylene, including trademark Neoflon®, found in valves, seals, gaskets, and food packaging. ▪ Ethylene-tetrafluoro-ethylene, including trademark Tefzel®, used in wire and cable insulation, roofing and siding films, pipe liners, and some cable ties. ▪ Fluorinated ethylene propylene (FEP), including trademarks Teflon® FEP and Hostaflon® FEP, and may also include Neoflon®, found in wire and cable insulation, pipe linings, and certain 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. Although LDPE raw materials do not contain PFAS, cross contamination may occur during manufacturing. ▪ Pipe thread compounds and tape. ▪ Most soaps (except Alconox® or Liquinox®) and tap water. When decontaminating equipment, use DI water supplied by the laboratory. ▪ Gel packs, blue ice, or other chemical ice. Use only non-chemical ice or frozen water bottles.
Equipment / Supplies Precautions
▪ Do not use Post-it® notes. ▪ Do not use waterproof field books. ▪ Avoid plastic clipboards, notebooks, or binders; use aluminum clipboards instead.

Miscellaneous allowable materials relevant to this project include:

- Materials that are either made of HDPE, polypropylene, silicone, or acetate.
- PFAS-free HDPE jars for water and sea foam samples provided by the analytical laboratory.
- PFAS-free Ziploc® bags.
- Powderless nitrile gloves.

4.2 Field Equipment

The field team will bring all materials and equipment needed for sample collection to each site. At a minimum, they will acquire and use the following:

- Printed copies of the following (on PFAS-free paper):
  - A copy of this SAP
  - Surface water field sheets (Appendix A)
  - Foam field sheets (Appendix B)
  - COC form (Appendix C)
  - HASP (Appendix E)
- Plain paper for additional notes
- Ball point pens
- Cell phones for taking photographs and logging global positioning system (GPS) coordinates
- Polarized sunglasses

- Ice (contained in plastic [polyethylene] bags [double bagged] in the coolers)
- Aluminum clip boards
- Paper towels
- PFAS-free life jackets
- Powderless nitrile gloves
- PFAS-free sandals to wade into the water
- Polyethylene plastic bags (gallon-sized Ziploc® bag)
- 500 mL HDPE wide-mouth bottles (provided by Pace)
- PFAS-free water for decontamination (provided by Pace)
- Sample labels (provided by Pace)
- Coolers (provided by Pace)

Note: ERG will bring most of the materials listed above to Nantucket. Pace will ship the sample bottles, labels, COCs, and coolers directly to the Nantucket Health & Human Services office. ERG will coordinate with Town staff to confirm that all sampling materials have arrived. Ice will be purchased on the island.

4.3 Sample Collection Methods

The ERG field team will collect surface water and sea foam samples following the procedures outlined in Sections 4.3.1 and 4.3.2, respectively. Details on sample containers, storage conditions, sample volume, and hold times are provided in Table 7. Note that while sea foam will be collected, the laboratory will analyze the condensed aqueous material from the foam for PFAS.

Table 7. Sampling and Analysis Details for EPA Method 1633A

Matrix	Method	Sampling Container	Storage Condition	Sample Volume/ Mass	Maximum Hold Time before Extraction (Days)	Extract Hold Time
Surace water	EPA 1633A	2 x 500 mL HDPE bottles	Option 1: 0-6°C Option 2: Frozen	1,000 mL[a]	Option 1: 28 Days Option 2: 90 Days	28 Days
Foam (analyzed as water)		3 1-gallon Ziploc® bags, 2 x 500 mL HDPE bottles		1,000 mL liquid[a]		

[a] A minimum of 500 mL is required for PFAS analysis; however, the laboratory recommends submitting 1,000 mL per sample to allow for potential re-analysis.

4.3.1 Surface Water Sample Collection

At each of the 21 sampling locations, the field team will fill two 500-mL HDPE bottles with surface water. While a minimum of 500 mL is required for PFAS analysis, the laboratory recommends submitting 1,000 mL per sample to accommodate potential re-analysis needs. Following MA DPH 's Operational Guidance for Bathing Beaches at PFAS Impacted Waterbodies (MA DPH, 2024), samples will be taken where the water depth is approximately 1 to 1.5 feet. In accordance with Method 1633A protocols and relevant sampling guidance (e.g., MI EGLE, 2022), the team will not filter samples in the field to minimize the risk of cross-contamination. To reduce the need for filtering, samples will be collected with minimal

disturbance to sediments. When arriving at each sampling location, the field team will follow the procedures outlined below, along with the PFAS-specific considerations listed in Table 6.

1. Label the two 500-mL HDPE sample bottles and any applicable QA/QC sample bottles. Refer to Section 5.2 for labeling guidance.
2. Don a fresh pair of powderless nitrile gloves.
3. Fill both pre-labeled 500-mL HDPE bottles. Follow these steps:
    - Remove the bottle cap immediately before collecting the sample, making sure not to touch the inside of the cap or the inside of the bottle. Do not place the cap on the ground. Note: For coastal beach locations, observe the wave pattern for several minutes before sampling. Collect samples when the water appears well-mixed but not overly turbulent—ideally after the initial splash and foam from breaking waves have settled, but before the next wave crest. Avoid sampling at the peak of a wave crest or immediately after a large wave breaks, as the surface microlayer may be disrupted and sediment resuspension can occur, both of which can bias PFAS levels high.
    - Invert the bottle (mouth down) and submerge it to a depth of approximately 0.5 to 1 foot. Do not submerge the bottle to the ground surface. If the sample bottle contacts the ground surface, obtain a new bottle and restart the sampling process.
    - Turn the bottle upright underwater to let it fill from depth.
    - Slowly bring the bottle straight up through the water and cap it immediately once above water, without letting it skim the surface. If needed, uncap the bottle and pour off water until the level is just below the neck, leaving airspace at the top.
    - Immediately place the bottles into a Ziploc® bag and then into a cooler with ice.
4. Store bagged bottles at 0 to 6°C and protect them from light. This is achieved by packing the bottles in wet ice inside a cooler.
5. Complete the surface water field sheet (Appendix A) before leaving the site. Be sure to record the GPS coordinates of the exact sampling location. See Section 5.1 for guidance on field sheets.
6. Repeat this procedure at each sampling location.
7. If sampling spans multiple days, transfer surface water samples from the cooler to a freezer until shipment to the laboratory. If a freezer is unavailable, keep samples on ice and replenish the ice as needed to maintain temperatures between 0 and 6°C.
8. At the end of each sampling event, follow all packaging and shipping procedures as outlined in Section 5.6.

For the two nearshore background samples, field staff will collect samples from a 25-foot Privateer boat operated by NRD. They will follow the general procedures outlined above but will lean over the side of the boat to collect each sample. Because boats may have components that contain PFAS—such as protective water-repellent coatings—the field team will collect samples on the upgradient side of the boat, positioning themselves as far away from the motor as possible. Note that if ERG staff are not able to collect samples by leaning over the side of the boat, they will use a sampling pole provided by NRD.

4.3.2 Sea Foam Sample Collection

The field team will collect sea foam samples from the water surface or from solid surfaces (e.g., sand) at a subset of locations where sufficient foam has accumulated. Sampling will be opportunistic—based on the presence of foam—and limited to a maximum of four locations. Field teams assigned to the northern and southern routes will coordinate in real time to determine optimal sampling sites.

To meet laboratory requirements for PFAS analysis, enough foam must be collected to yield a sufficient volume of aqueous phase once the foam condenses. However, foam density can vary significantly, with lighter foam producing less liquid volume upon condensation. As evidence of this, a study by the Michigan Department of Environment, Great Lakes, and Energy (MI EGLE) (MI EGLE, 2019) found that the same volume of foam can yield widely different amounts of liquid. In that study, field teams collected foam into two one-gallon Ziploc® bags to obtain the volume of aqueous material required for PFAS analysis (Method 537).

For this project, the contract laboratory requires 500 mL of condensed aqueous sample for PFAS analysis with EPA Method 1633A. Lower volumes are acceptable but could result in higher MDLs than what is shown in Table 3. To ensure that foam samples yield sufficient quantities of aqueous material for analysis, field teams will aim to fill three one-gallon Ziploc® bags per sea foam sample. The volume of sea foam collected in this project may be adjusted during the second sampling event based on lessons learned during the first.

Consistent with surface water sampling procedures, the aqueous material formed in the sea foam samples will not be filtered. Samples will be initially collected in plastic polyethylene bags (e.g., Ziploc®). After the foam has condensed into a liquid, the sample will be transferred to an HPDE sample bottle provided by the laboratory. The field teams will fill one HDPE sample bottle per sea foam sampling location.

For reference, the following figure is an image of sea foam similar to what the field team may encounter.

Image 1. Sea form at Ocean Beach in San Franscisco, from NOAA (https://oceanservice.noaa.gov/facts/sea foam.html)

The field team will adhere to the following procedures when collecting sea foam samples. They will also follow the considerations listed in Table 6 to avoid PFAS cross contamination.

1. Photograph the presence of foam and the location of the foam in the water or on the beach that will be sampled (if possible).
2. Label the PFAS-free bags used for initial sea foam collection (three one-gallon Ziploc® bags per sample). See Section 5.3 for labeling guidance.

3. Don a fresh pair of powderless nitrile gloves.
4. Collect a foam grab sample by filling the three, one-gallon-size Ziploc® bags. Follow these steps:
    - Open each bag immediately before collecting the sample, avoiding contact with the inside surfaces of the bag.
    - Scoop accumulated foam from the water surface and/or solid surfaces, taking care to avoid including sediment, sand, or debris.
    - Seal each bag tightly to prevent liquid from escaping.
    - Double-bag each foam-filled bag for extra containment.
    - Place the foam samples in a cooler with ice to allow time to condense.

    Note: When collecting surface water foam that has blown inland onto the shoreline, avoid including any underlying sediment. If collecting foam directly from the water surface, take care to avoid the surface microlayer (top 2 mm) and the underlying water. Whenever possible, collect foam samples that represent the full thickness of the foam present at the sampling location.
5. Record the approximate total volume of foam on the foam field sheet (Appendix B).
6. Store samples at 0 to 6°C and protect them from light by packing the samples bags in wet ice inside a cooler.
7. Complete the remaining foam field sheet entries (Appendix B) before leaving the site, including the GPS coordinates of the exact sampling location. See Section 5.1 for detailed instructions.
8. Check bags of sea foam roughly every hour. Once the foam has dissipated or condensed, label a 500-mL HDPE bottle for the sample. If there is enough liquid to fill more than one bottle, label a second 500-mL bottle.
9. Don a fresh pair of powderless nitrile gloves.
10. Gently decant the liquid from the bags into the 500-mL HDPE bottle(s).
11. Record the approximate volume of liquid in the bottle(s) on the foam field sheet.

Sea foam samples in bags should be kept in coolers on ice or refrigerated until transferred to an HDPE bottle; once transferred, the samples can be stored in a freezer. If a freezer is not available, the field team will continue to keep samples on ice in a cooler, replacing the ice as needed to maintain temperatures between 0 and 6°C. At the end of the July sampling and the August sampling, samples will be packaged and shipped per the procedures detailed in Section 5.6.

Note: The approach described above aligns with guidance published by MI EGLE in 2019. Due to limited research on PFAS in environmental foam, this work should be considered exploratory. The methods may need to be reviewed and refined following the initial sampling event.

4.4 Town Responsibilities

Town of Nantucket staff will transport the ERG field team to all sampling locations. They will also coordinate with NRD to provide boat transport to the two nearshore background sites off the northern coast. Additionally, Town staff will assist by storing sampling materials shipped by the laboratory before the ERG team's arrival and confirming that no materials are missing or damaged. Samples that must be stored overnight will be placed in the Town of Nantucket's on-site refrigerator or freezer at 3 East Chestnut Street. If there is not enough room in the refrigerator/freezer, samples will be stored on ice in coolers.

4.5 Health and Safety

ERG field staff and Town field staff will review and sign the project Health and Safety Plan included in Appendix E. This plan details health and safety procedures for field sampling activities, including PPE requirements, safety protocols for collecting samples on beaches and from boats, weather considerations, and precautions against insects, ticks, and other environmental hazards.

5.0 Sample Documentation and Shipment

Photographs, field sheets (Appendix A and B), and COC forms (Appendix C) will be the primary documentation used to record and track information about each sample. Field staff will note any additional information, such as weather conditions, whether recreational activities are occurring during the sampling collection, any interactions with officials or the public, and other relevant observations. Those notes will be recorded on field sheets kept on an aluminum clipboard. The field sampling crew will ensure that all entries are legible, written in blue or black ink (using ballpoint pens), and contain accurate and inclusive documentation of the field activities.

The field team will note any departures from SAP procedures on field sheets and/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 staff will bring loose plain paper on an aluminum clipboard in case additional documentation is needed.

ERG will retain hard copies of field notes and COCs within its project files. After shipping samples to the laboratory, ERG will upload scanned copies of these documents to its SharePoint site, where the Nantucket project team can access them in real time. Additionally, ERG will include these documents in the final materials submitted to the Town when the project is complete.

5.1 Photographs

The field team will take digital photographs at every sampling location. These photos will document field activities, waterbody characteristics, and unusual site conditions. For any sea foam samples that are collected, the team will take photographs of the foam initially collected at the site, as well as the condensed foam (liquid) to be sent to the laboratory for analysis. Field sampling crews will upload photos to ERG's SharePoint site after sampling activities are complete.

5.2 Field Data Sheets

The field team will complete surface water and sea foam sampling field sheets in the field. They will complete these sheets prior to leaving sampling locations. The only exception will be for the volume of condensed liquid from foam samples, which will be filled in several hours later after the foam has fully condensed. On these sheets, field staff will document general site conditions at each waterbody and information on the water and sea foam samples that were collected, as described below in Section 5.2.1 (surface water) and Section 5.2.2 (sea foam). Blank copies of these forms can be found in Appendix A and Appendix B, respectively.

5.2.1 Surface Water Field Sheets

Details on the specific fields that need to be populated on the surface water field sheets are provided below. These forms will be completed in the field, prior to leaving the site.

- Sample ID: Enter the unique sample identifier (see Section 5.3)
- Location name: Record the site name and designated site ID as listed in Table 4.
- Latitude: Record the latitude coordinate of the sampling location.
- Longitude: Record the longitude coordinate of the sampling location.

- Field staff initials: Enter the initials of the ERG staff who collected the sample.
- QA/QC Sample ID: Enter the sample ID assigned to any field duplicates or field blanks collected at the site; enter "NA" if no QA/QC samples were collected.
- Weather: Briefly describe the weather conditions, including temperature, precipitation, etc.
- Wave Environment: Describe wave conditions briefly (e.g., low energy, protected).
- Tide: Note the tidal conditions. This field can be completed after sample collection, with publicly available data, if needed.
- Potential Contaminant Sources: Document any visible potential sources of PFAS near the sampling location.
- Notes: Use this field for general site visit observations, including where and how samples were collected, recreational and other activities occurring at the time samples were collected, and any unique sample characteristics (e.g., high turbidity, presence of sand).

5.2.2 Sea Foam Field Sheets

Details on the specific fields that need to be populated on the sea foam field sheets are provided below. These forms will be completed in the field, prior to leaving the site, except the volume of condensed liquid field will be entered after the foam has fully condensed.

- Sample ID: Enter the unique sample identifier (see Section 5.3).
- Location Name: Record the site name and designated site ID as listed in Table 4.
- Latitude: Record the latitude coordinate of the sampling location.
- Longitude: Record the longitude coordinate of the sampling location.
- Field Staff Initials: Enter the initials of the ERG staff who collected the sample.
- QA/QC Sample ID: Enter the sample ID assigned to any field duplicates collected at the site; enter "NA" if no QA/QC samples were collected.
- Volume of Fresh Foam: Enter the estimated volume of sea foam collected in the Ziploc® bags and the number of bags used to collect that volume.
- Volume of Condensed Liquid: Enter the volume of condensed sea foam (liquid) included in the sample sent to the laboratory for analysis.
- Notes: Use this field for general site visit notes, including details on where and how the samples were collected and any recreational and other activities occurring at the time samples were collected. Document as much detail as possible about the sea foam collected.

5.3 Sample Labeling

This section specifies how field sampling crew will label all samples. Each sample label will include the sample ID, collection date and time, sampler's initials, and requested analysis.

The field team will apply the labels to the sample collection bottles before sampling. All sample labels will be covered with clear, PFAS-free packing tape that completely encircles the sample bottle to prevent smearing or physical damage to the label.

5.3.1 Sample IDs

Sample IDs will be assigned based on the "Sampling Location ID" from Table 4, the sampled media (i.e., "SW" for surface water or "FM" for foam), and the sampling event number ("01" for July or "02" for August). These text strings will be separated by underscores to create the sample ID. For example:

- A surface water sample collected at site S2 in July will be labeled “S2_SW_01.”
- A surface water sample collected at site S2 in August will be labeled “S2_SW_02.”
- A sea foam sample collected at site N7 in July will be labeled “N7_FM_01”
- A sea foam sample collected at site N7 in August will be labeled “N7_FM_02”

5.3.2 QA/QC Sample IDs

For duplicate samples, **“_DUP”** will be added to the end of the parent sample’s ID. For field blanks, the sampled media abbreviation will be removed from the sample ID, and **“_FB”** will be appended to the end of the parent location’s sample ID. For example:

- A duplicate of a sea foam sample from site N2 in July will be labeled “N2_FM_01_DUP.”
- A duplicate of a surface water sample from site N2 in August will be labeled “N2_SW_02_DUP”
- A field blank collected at site B1 in August will be labeled “B1_02_FB”

5.4 Chain-of-Custody Forms

Pace will provide the COC forms, and the ERG field team will populate them before shipment. One field crew member will fill out the form, and another will review it for accuracy. To correct any errors, the field team will strike through the incorrect item with a single line, enter the correct information next to it, and include the date and their initials to document the change.

Each COC form (see Appendix C) will be pre-populated with information in the company name, street address, contact/report to, invoice to, customer project number, and purchase order number fields. The field team will add the sampler’s name and signature and details about the samples included in the shipment. These details include sample ID, matrix (water), composite or grab sample type (grab), sampling date and time, number and type of containers, and analyses requested (PFAS Method 1633A) for each sample. The bottom of the COC form tracks sample possession and must be completed each time the samples transfer to a new handler.

The field team will complete one COC form per cooler shipped to Pace. They will send the original form with the shipment and upload scanned copies to ERG’s SharePoint site.

5.5 Preservation

The ERG field team will immediately place surface water samples on ice after collection to maintain a temperature between 0°C and 6°C. Samples will then be transferred to a Town of Nantucket freezer for temporary overnight storage prior to shipment. If the freezer is unavailable or lacks sufficient space, samples will remain on ice in coolers. Sea foam samples will be kept on ice in coolers until the foam dissipates or condenses, at which point the liquid will be transferred into HDPE sample bottles provided by the laboratory. Once transferred, the samples will be stored in a freezer with the Town of Nantucket, if available, or kept on ice in coolers.

5.6 Packaging and Shipping

All samples collected during this project must be chilled during shipment and not exceed 6°C during the first 48 hours after collection. When preparing samples for shipment, the team will fill the cooler with as

much double-bagged wet ice as possible for transport and shipping. Chemical or blue ice will not be used. The laboratory will confirm sample temperatures are between 0° and 6°C upon receipt.

Before shipping, the field team will prepare all shipping documents and securely tape completed paperwork to the cooler's exterior, including any forms required by the shipping service (e.g., Federal Express waybill). A copy of the COC form will be placed inside the cooler.

Samples will be shipped overnight to Pace in coolers provided by the lab. To avoid shipping delays and minimize the risk of samples arriving above 6°C, shipments will not be sent on Fridays (since Pace cannot receive samples on Sundays). Pace will confirm receipt within 48 hours. ERG will notify the Town of Nantucket promptly of any shipping delays.

Samples will be shipped to the following address:

C/O Sample Receiving
Pace Analytical
39 Spruce Street
East Longmeadow, MA 01028
PH: 413-525-2332

The COC forms sent to the laboratory must include all required information, be original documents (not photocopies), and be unique to the samples contained in a given corresponding cooler. Upon receiving the samples, Pace will verify that all samples listed on the COC are present and then sign the form. ERG will upload a completed copy of each COC to its SharePoint site, which the Town of Nantucket project team can access in real time.

6.0 Analytical Methods

This section briefly describes the analytical methods to be used by Pace (Section 6.1), how ERG will manage data (Section 6.2), and how ERG will analyze data (Section 6.3).

6.1 Laboratory Analysis

Pace will analyze the surface water and sea foam samples for 40 PFAS using EPA Method 1633A (EPA, 2024). This method involves preparing and extracting environmental samples and then analyzing the sample extracts using liquid chromatography-tandem mass spectrometry in multiple reaction monitoring mode. Sample concentrations are determined by isotope dilution or extracted internal standard quantification, using isotopically labeled compounds added prior to extraction. Additional details on this method are provided in Pace's SOP. Pace will document any deviations from the method in its reports and include sufficient detail to support independent validation and verification of the results. PFAS concentrations will be reported in nanograms per liter (ng/L).

Pace will send analytical reports (PDF format) and electronic data deliverables (EDDs, in Excel or CSV format) to ERG. These files will include environmental sample results and laboratory QC data. The EDDs will contain, at a minimum, the data elements listed in Table 8. ERG's project manager and data manager will receive these files via email, save them to the project SharePoint site, and ensure they are

accessible to the Town of Nantucket. ERG will also forward the files to the Town's project lead by email upon request.

Table 8. Key Electronic Data Deliverable Elements

Data Elements	Description
SAMPLENAME	Project sample ID
LABSAMPID	Sample ID assigned by the lab
MATRIX	Sample matrix (e.g., water)
SAMPDATE	Sample collection date and time (from the COC)
PREPDATE	Sample preparation date and time (at the lab)
ANADATE	Analysis date and time (at the lab)
METHODNAME	EPA 1633A
ANALYTE	Full name of the PFAS analyte
CASNUMBER	CAS RN for the PFAS analyte
Result	Measured concentration (two significant digits) or ND
DL	MDL
RL	MRL
UNITS	ng/L
DILUTION	Dilution factor (e.g., 1 for no dilution)

6.2 Data Management

This project will generate various records during field sampling and laboratory analysis. ERG will store all project data—including field data sheets, photographs, and COC forms—on a project-specific SharePoint site accessible to the Town of Nantucket. The ERG data manager will enter field data into an Excel-based project database and organize photos in site-specific folders. ERG will maintain and update these records throughout the project and submit final copies to the Town at project completion.
Pace will record laboratory data following their internal protocols and send analytical reports (PDFs) and electronic data deliverables (EDDs in Excel) to ERG. These will include sample results and QA/QC data.

The ERG data manager will save these files onto the SharePoint site and will forward them to the Town's project lead upon request. After reviewing the reports, ERG will upload PFAS data and associated sample metadata (e.g., location and date) to the project database, which will also be shared with the Town at the end of the project.

6.3 Data Analysis

Upon receiving the complete dataset for the July samples, ERG will prepare a brief interim summary of results. This will present descriptive statistics for the measured PFAS concentrations in surface water and sea foam. These statistics will include frequency of detection, range of detected values, arithmetic mean, standard deviation, and selected percentiles (e.g., 25^{th}, 50^{th} [median], 75^{th}). ERG will also compare the results to the screening values developed by MA DPH and described in Section 8.0. A similar summary will be prepared after results from the second sampling event are received.

Following the second sampling event, ERG will conduct a comprehensive data analysis for the project summary report. This will include descriptive statistics, an evaluation of potential health risks, and an assessment of spatial and temporal variability. ERG will also develop plots to illustrate PFAS profiles and highlight patterns in the data, such as differences in PFAS profiles observed in coastal surface water

samples from the northern versus southern areas of the island, and between coastal and freshwater surface water locations. To contextualize the results, ERG will compare measured PFAS concentrations in both media to those reported from other similar sampling efforts. Collectively, these findings will inform recommendations for a path forward.

7.0 Quality Assurance / Quality Control (QA/QC)

7.1 Field QC Samples

The ERG field team will collect field blanks and field duplicates as described below. Because all sampling materials and equipment are dedicated to individual samples, they will not collect equipment blanks.

7.1.1 Field Blanks

To characterize whether sample contamination occurs during normal field sampling processes, two field blanks will be collected during both the July sampling event and during the August sampling event. One blank will be collected before sampling along either the northern or southern route (see Figure 1), and the other prior to sampling at the background locations from the boat. Field blanks will be prepared by transferring PFAS-free DI water into sampling containers on-site, before any environmental samples are collected. These containers will then be handled and processed in the same manner as all other grab samples. The laboratory will analyze the field blanks for the same suite of PFAS compounds measured in surface water and sea foam samples. Pace will supply PFAS-free DI water for the field blanks.

7.1.2 Field Duplicates

Field duplicate samples will be collected to assess the precision of both the sampling and analytical methods. Approximately 10% of surface water samples will be collected in duplicate, meaning that field crews will obtain two grab samples (one immediately after the other) from the same location at those sites. As detailed in Table 5, each of the two sampling events will include duplicates from two surface water locations and, where feasible, one sea foam sampling location.

7.2 Laboratory QC Samples

Pace will prepare and analyze various QC samples, as specified in their SOP. Key laboratory QC samples that will be considered when reviewing the samples are listed below.

- Method blank: A QC sample used to check for contamination introduced during laboratory processing. It contains all reagents and undergoes the full sample preparation and analysis process, just like an environmental sample, but without any actual environmental material. Pace will run a method blank for every batch of 20 or fewer samples.
- Laboratory control sample (LCS): A QC sample with known concentrations of target analytes, used to verify the accuracy and reliability of the analytical method. Pace will analyze an LCS with each batch of samples (one per batch of 20 or fewer) to identify any systematic errors or biases.
- Laboratory duplicate: A duplicate preparation and analysis of a sample aliquot taken from the same container as the parent sample in the lab, used to assess analytical precision. Although EPA Method 1633A does not require laboratory duplicates, ERG has requested that Pace analyze a laboratory duplicate for every batch of 20 samples.

8.0 Reference Concentrations for Comparison

For surface water, ERG will use the Massachusetts Department of Public Health's *Operational Guidance for Bathing Beaches at PFAS Impacted Waterbodies* (MA DPH, 2024) to interpret PFAS levels. Specifically, ERG will apply DPH's initial screening value of 20 ng/L for eight PFAS compounds with established toxicity criteria by the Agency for Toxic Substances and Disease Registry and the U.S. Environmental Protection Agency: PFBA, PFBS, PFHxA, PFHxS, PFOA, PFOS, PFNA, and GenX (HFPO-DA). Additional information on the derivation of these values is provided in Appendix D. If any surface water sample results exceed 20 ng/L for any individual PFAS, ERG will recommend collecting a confirmatory sample. In this scenario, Town of Nantucket beach inspectors will collect a sample for PFAS analysis during their next routine bacterial beach sampling event. ERG will provide the sampling materials needed for confirmatory sampling and will coordinate shipping and analysis with Pace. The higher of the two values will then be used to determine the next steps based on the decision logic outlined below, as recommended by MA DPH.

- **≤20 ng/L: No action required.**
    - PFAS levels are below MA DPH's health-based screening value for all eight individual PFAS.
- **>20–90 ng/L: No restriction.**
    - Post a public notice to inform beachgoers that PFAS were detected, but levels are considered safe for recreational use.
    - Coordinate with the Local Board of Health (LBOH) or MA DPH on follow-up sampling for a period of two years.
- **>90–500 ng/L: Site-specific evaluation.**
    - Conduct a beach-specific evaluation to determine whether swimming restrictions (none, partial, or full) are appropriate. Additional information (e.g., frequency of use, access points) will be considered as part of this evaluation.
    - Coordinate with the LBOH and MA DPH on follow-up sampling for a period of two years.
- **>500 ng/L: Swimming is prohibited.**
    - Notify residents and affected homeowners that water is unsafe for swimming.
    - Post a "No Swimming" sign at beach.
    - Coordinate with the LBOH, MA DPH, and MassDEP on need for site investigation.

Sea foam is known to concentrate PFAS significantly above the levels found in surrounding surface water, due to PFAS compounds' surfactant-like properties. However, screening values are not typically developed for sea foam, as it is not considered a standard exposure medium in most risk assessments. The primary purpose of collecting foam samples in this project is to support qualitative evaluation, understand localized accumulation patterns, and inform potential public communication strategies. As such, measured sea foam PFAS concentrations will not be compared to a screening value. Results will, however, be discussed in context of findings from other similar studies. A general recommendation to minimize surface water foam exposure will likely be included.

9.0 Communication Plan

Throughout this project, ERG will collaborate with the Town of Nantucket and Nantucket Health & Human Services to ensure that all stakeholders, including community members, are kept informed of progress and key findings. Specifically, ERG plans for the following communications activities:

- Updates to LBOH: ERG will prepare two 15-minute presentations, one following each sampling event, to be delivered at monthly Nantucket Board of Health meetings. These presentations will provide a brief overview of the methods and key findings from each sampling event, consistent with the interim data summaries described in Section 6.3.
- Project Report: ERG will develop a final report summarizing results from both sampling events. The report will characterize PFAS in coastal surface water and sea foam around Nantucket, discuss potential health-related concerns, compare results to similar studies, and summarize any identified spatial and temporal patterns (limited to two time points).
- Project Fact Sheet: To accompany the technical project report, ERG will produce a two-page informational factsheet summarizing key findings in plain language for the general public.
- Update to the community: ERG will prepare and deliver a 60-minute virtual presentation for the Nantucket community. This session will highlight key findings from the project report and offer residents and other interested parties an opportunity to ask questions. ERG assumes that the Town of Nantucket will provide a platform for this virtual presentation.

10.0 References

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Appendix A
Surface Water Field Sheet

Nantucket PFAS Field Sheet: Surface Water

Sample ID			
Location Name			
Date			
Time			
Latitude			
Longitude			
Field Staff Initials			
QA/QC Sample ID			
Weather			
Wave Environment (Low Energy, Protected Harbor, etc.)			
Tide			
Potential Contaminant Sources			
Notes			

Appendix B
Foam Field Sheet

Nantucket PFAS Field Sheet: Foam

Sample ID			
Location Name			
Date			
Time			
Latitude			
Longitude			
Field Staff Initials			
QA/QC Sample ID			
Water Surface or Shore Sample?			
Volume of Fresh Foam (Note Units)			
Volume of Condensed Liquid (Note Units) * 12 hours after initial sampling, or until foam has condensed to a liquid			
Notes * Clarify observations different from SW field sheet			

Appendix C
Chain-of-Custody Form

Pace® Location Requested (City/State):

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here

Scan QR Code for instructions

Company Name:	Contact/Report To:
Street Address:	Phone #:
	E-Mail:
	Cc E-Mail:
Customer Project #:	Invoice to:
Project Name:	Invoice E-mail:
Site Collection Info/Facility ID (as applicable):	Purchase Order # (if applicable):
	Quote #:
Time Zone Collected: [ ] AK [ ] PT [ ] MT [ ] CT [ ] ET	County / State origin of sample(s):
Data Deliverables: [ ] Level II [ ] Level III [ ] Level IV [ ] EQUIS [ ] Other_____	Regulatory Program (DW, RCRA, etc.) as applicable:
	Rush (Pre-approval required): [ ] 2 Day [ ] 3 day [ ] 5 day [ ] Other_____
	Date Results Requested:
	DW PWSID # or WW Permit # as applicable:
	Field Filtered (if applicable): [ ] Yes [ ] No
	Analysis:

Specify Container Size **

Identify Container Preservative Type***

Analysis Requested

**Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL vial, (7) EnCore, (8) TerraCore, (9) Other

*** Preservative Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) Zn Acetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other

Lab Use Only: Proj. Mgr: | AcctNum / Client ID: | Table #: | Profile / Template: | Prelog / Bottle Ord. ID:

Preservation non-conformance identified for sample.

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Other (OT), Surface Water (SW),Sediment (SED), Sludge (SL), Caulk

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start) Date	Collected (or Composite Start) Time	Composite End Date	Composite End Time	Res. CL2	Number & Type of Containers Plastic	Number & Type of Containers Glass	Sample Comment

Customer Remarks / Special Conditions / Possible Hazards:

Collected By:
Printed Name
Signature

Additional Instructions from Pace®:

# Coolers:	Thermometer ID:	Correction Factor (°C):	Obs. Temp. (°C):	Corrected Temp. (°C):

Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:
Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)	Date/Time:

Tracking Number:

Delivered by: [ ] In- Person [ ] Courier [ ] FedEX [ ] UPS [ ] Other

Appendix D
Additional Details on Screening Values

Background

To support the interpretation of sampling results, this appendix outlines the approach that will be used to screen for PFAS in surface water, including health-based thresholds and recommended response actions when those thresholds are exceeded. This appendix also provides context for interpreting PFAS concentrations in seafoam, which currently lack formal screening values but may still inform public health messaging and follow-up actions.

PFAS Screening Levels for Surface Water

For this project, ERG will follow the Massachusetts Department of Public Health's (DPH's) *Operational Guidance for Bathing Beaches at PFAS Impacted Waterbodies* as the basis for interpreting PFAS levels in surface water (DPH, 2024). Specifically, we will apply an **initial screening value of 20 nanograms per liter (ng/L)** for the eight individual PFAS that DPH determined have established toxicity criteria. Specifically, DPH relied on Minimum Risk Levels (MRLs) by the Agency for Toxic Substances and Disease Registry and chronic oral Reference Doses (RfDs) by the U.S. Environmental Protection Agency (See **Table 9**). This conservative threshold is designed to protect public health by identifying concentrations that may warrant further evaluation. According to this operational guidance, if any of the following individual PFAS exceed 20 ng/L, further action is required:

- Perfluorobutanoic acid (PFBA)
- Perfluorobutane sulfonic acid (PFBS)
- Perfluorohexanoic acid (PFHxA)
- Perfluorohexane sulfonic acid (PFHxS)
- Perfluorooctanoic acid (PFOA)
- Perfluorooctane sulfonic acid (PFOS)
- Perfluorononanoic acid (PFNA)
- Hexafluoropropylene oxide dimer acid (HFPO; also known as GenX)

Table 9. Toxicity criteria for surface water screening values developed by DPH.

Parameter	Value (*ng/kg-day)*	Basis
PFOS	2	Intermediate MRL (ATSDR, 2021)
PFOA	3	Intermediate MRL (ATSDR, 2021)
PFNA	3	Intermediate MRL (ATSDR, 2021)
GenX (HFPO-DA)	3	Chronic RfD (US EPA, 2021a)
PFHxS	20	Intermediate MRL (ATSDR, 2021)
PFBS	300	Chronic RfD (US EPA, 2021b)
PFBA	1000	Chronic RfD (US EPA, 2022)

Source: DPH, 2023a

Response Actions When PFAS Levels Exceed Initial Screening Value

If any of the above PFAS exceed the initial screening level of 20 ng/L in a single sample, a second "confirmatory" sample should be collected. In general, the higher result of the two samples is then used to determine further actions.

DPH's tiered framework for evaluating PFAS in bathing waters will be used to guide interpretation and decision-making:

- **≤20 ng/L: No action required.**
  - PFAS levels are below the health-based screening value.
  - Town may consider periodic longer-term sampling (e.g., every 5 to 10 years) to track broader temporal trends in PFAS concentrations, particularly if additional PFAS sources are identified on the island.

- **>20–90 ng/L: No restriction.**
  - Public notice is posted to inform beachgoers that PFAS were detected, but levels are considered safe for recreational use.
  - Coordinate with Local Board of Health (LBOH) and DPH on conducting annual follow-up sampling for 2 years.

- **>90–500 ng/L: Site-specific evaluation.**
  - Conduct a beach-specific evaluation to determine whether swimming restrictions (none, partial, or full) are appropriate. Additional information (e.g., frequency of use, access points) may be considered.
  - Coordinate with LBOH and DPH on conducting annual follow-up sampling for 2 years.

- **>500 ng/L: Swimming is prohibited.**
  - Notify residents and affected homeowners that water is unsafe for swimming.
  - Post "No Swimming" sign at beach.
  - Coordinate with LBOH, DPH, and MassDEP on site investigation.

This tiered framework provides a high-level structure for interpreting surface water PFAS concentrations. The Massachusetts DPH Operational Guidance should be followed for more detailed instructions, including specific requirements and recommendations related to public signage, annual follow-up monitoring, and procedures for lifting or reducing swimming restrictions once in place.

Beach-specific Evaluation

When PFAS concentrations in surface water exceed 90 ng/L but are below 500 ng/L, DPH recommends conducting a beach-specific evaluation to determine whether swimming restrictions are necessary. This process is described in detail in DPH's *Evaluation of PFAS in Recreational Waterbodies in Massachusetts* (DPH, 2023a).

The evaluation involves calculating exposure point concentrations (EPCs) for detected PFAS, which are then compared to compound-specific action levels derived from toxicity reference doses (RfDs). The PFAS are evaluated individually and in some cases jointly because they have shared critical health effects. Specifically, the PFAS evaluated jointly are:

- PFOS and PFNA;
- GenX and PFBA; and
- PFHxS, PFBA, and PFBS.

In cases where PFAS are evaluated jointly, DPH provides equations that weight each compound's concentration according to its relative toxicity. These weighted sums are used to calculated a combined EPC, which is then compared to a group-based action level. **Table 10** (recreated from Table 3.2 of DPH, 2023a) presents these equations and the current action levels used in beach-specific evaluations.

Table 10. DPH Action Levels used when conducting a beach-specific evaluation.

PFAS	Action Level (ng/L)	Basis for Comparison
PFOS	168	If PFNA not detected
PFOA	252	Always applicable
PFNA	252	If PFOS not detected
GenX (HFPO-DA)	252	If PFBA not detected
PFHxS	1,680	If PFBA, PFBS not detected
PFBS	25,200	If PFBA, PFHxS not detected
PFBA	83,900	If PFBS, PFHxS, GenX not detected
GenX + (3/1000) x PFBA	252	If GenX and PFBA detected
PFHxS + [(2/100) x PFBA] + [(2/30) x PFBS]	1,680	If PFHxS, PFBA and/or PFBS detected
PFOS + (2/3) x PFNA	168	If PFOS and PFNA detected

Source: Recreated from Table 3.2 of DPH, 2023a

If any individual or combined EPC exceeds its corresponding action level, a target recreational exposure frequency (in days per year) is calculated to determine the level of restriction. This calculation reflects how often someone could safely swim in the waterbody without exceeding the protective dose threshold. Based on this evaluation, DPH may recommend a partial restriction (e.g., swimming permitted only a limited number of days per year), or a full restriction (e.g., swimming prohibited).

For reference, **Table 11** below summarizes exposure assumptions used by DPH to derive the action levels. These parameters reflect conservative assumptions protective of frequent users (e.g., daily exposures in the summer months). For full details, including the derivation methodology and additional examples of beach-specific evaluations, refer to the DPH technical guidance document (DPH, 2023a).

Table 11. Toxicity and Exposure Assumptions Used to Calculate PFAS Surface Water Action Levels

Parameter	Value	Basis
Body Weight, BW (kg)	17.4	Mean body weight for 2 to <6 year-old (ATSDR, 2016, US EPA, 2011)
Exposure Frequency, EF (days/month)	30	98th percentile for exposure frequency (US EPA, 1996)
Exposure Time, ET (hours/day)	2	75th percentile for time spent swimming (US EPA, 1996)
Ingestion Rate, IR (L/hour)	0.053	75th percentile for incidental ingestion of surface water while swimming (US EPA, 2019)
Exposure Duration, ED (months)	3.3	Professional judgement that swimming would occur between Memorial Day and Labor Day
Averaging Time, AT (days)	102	Dictated by exposure duration
Relative Source Contribution, RSC (%)	50	Professional judgement, considering exposure to PFOS from sources other than surface water

Source: Recreated from Table 2.2 of DPH, 2023a

Comparison Values for PFAS in Ocean Water

While the screening values described above will serve as the basis for any public health response or management action, it is also helpful to consider general background concentrations of PFAS in marine environments. These background levels provide useful context for interpreting surface water data from Nantucket and can help differentiate between localized impacts and broader, regional patterns.

Numerous studies have measured PFAS in ocean and coastal waters, including locations in the North Atlantic Ocean. **Table 12** summarizes examples of PFAS levels reported in the literature for ocean or nearby coastal surface waters. Concentrations in open ocean water are often well below one ng/L across PFAS, which is generally much lower than what is observed in coastal areas with known point sources, such as wastewater discharges, manufacturing facilities, population centers, historical contamination, or river discharges (De Silva et al., 2020). Even so, samples collected by DPH from the Massachusetts coast were generally below limits of quantification (LOQs). In comparison, surface water samples collected from inland lakes and ponds across Massachusetts were substantially higher (MassDEP 2023).

Analytical methods used in the studies summarized below varied by publication. Most studies relied on validated liquid chromatography-tandem mass spectrometry (LC-MS/MS) methods that predate the adoption of EPA Method 1633a. As a result, detection limits and target analyte lists may differ among studies. EPA Method 1633a is the agency's most recent standardized method for PFAS analysis in non-potable waters and is specifically recommended by EPA for use in regulatory monitoring programs. While Method 1633a establishes consistent procedures and supports comparability of results across projects, this method has relatively higher reporting limits compared to some methods developed in academic research laboratories that measure PFAS in marine environments. These differences should be considered when comparing results across studies, especially when interpreting "non-detect" results.

Table 12. PFAS concentrations observed in the North Atlantica and off the coast of MA

Citation	Location	Sample Year	PFAS*	Concentration (ng/L)	Notes
DPH, 2023b	Massachusetts Coast	2022	PFOS PFOA PFHxS PFNA PFBS PFBA	ND-2.3 ND-0.2J ND-0.13J ND ND-0.2 ND	Range of seven Locations in Boston Harbor, Broad Sound, Nahant Bay, and Quincy Bay. "J" qualified values were detected but below limit of quantification.
Savvidou et al., 2023	North Atlantic	2019	PFOS PFOA PFHxS PFHxA PFNA	0.010-0.023 0.017-0.055 0.004-0.011 0.001-0.033 0.012-0.028	Range of 8 sampling locations from a depth of 5 meters taken from the open ocean between 20 and 45 N Latitude.
Zhang et al., 2019	Northwest Atlantic	2014	 PFOS PFOA PFHxS PFHxA PFNA PFBS	**Shelf; Slope** 0.355; 0.194 0.370; 0.115 0.129; 0.065 0.338; 0.203 0.139; 0.045 0.045; 0.011	Geometric means of surface samples from "coastal/shelf" sites and from continental "slope sites" taken from NE US coast between 36 and 42 N.

Citation	Location	Sample Year	PFAS*	Concentration (ng/L)	Notes
Muir & Miaz, 2021	North Atlantic	2000-2009 and 2010-2014		**'00-'09; '10-'14**	Review article. Median of "North Atlantic" samples during two time periods. Other global oceans and seas measured as well.
			PFOS	0.043; 0.075	
			PFOA	0.080; 0.103	
			PFHxS	0.008; 0.043	
			PFHxA	0.024; 0.079	
			PFNA	0.025; 0.044	
			PFBA	0.001; NA	
			PFBS	0.004; 0.031	

ND = Non-detect, NA = Not available
**Only PFAS with an established DPH surface water action level are shown. Studies may have measured other PFAS.*

Comparison Values for PFAS in Foam

Surface water foam (SWF) is known to concentrate PFAS significantly above the levels found in surrounding surface water, due to PFAS' surfactant-like properties. However, screening values are not typically developed for SWF, as it is not considered a standard exposure medium in risk assessments. The primary purpose of collecting SWF samples in this project is to support qualitative evaluation, understand localized accumulation patterns, and inform potential public communication strategies.

Due to limited studies, published PFAS concentrations in SWF are scarce but suggest enrichment factors can range from tens to thousands of times higher than co-located surface water. A summary of available PFAS measurements in SWF samples are presented in **Table 13**. Note that these examples include seafoam as well as foam collected from contaminated freshwater sites.

Because there is no standardized analytical method specifically validated for surface water foam, most studies instead apply established surface water PFAS methods (e.g., LC-MS/MS protocols) to condensed foam samples. Typically, foam is collected in sufficient volume, so that it settles to a liquid volume that is adequate for extraction and analysis.

Table 13. PFAS measured in surface water foam (SWF)

Citation	Location	Sample Year	PFAS*	Concentration (ng/L)	Notes
Madsen et al. 2025	Denmark (three locations on western coast)	2023	PFOS	2,900-8,100	Article also cites three reports of PFAS in seafoam with higher concentrations than presented here, but reports are all in Danish.
			PFOA	1,300-6,000	
			PFHxS	210-1,000	
			PFBA	<3- 3.9	
			PFNA	910-3,200	

Citation	Location	Sample Year	PFAS*	Concentration (ng/L)	Notes
Enders et al., 2025	North Carolina (Cape Fear River Estuary)	2022-2023	PFOS PFOA PFHxS PFBS PFBA PFHxA PFNA GenX	113,169 7,689 506.4 5.2 <LOQ 46.1 11,399 47.4	Pre-print that has not been peer-reviewed. Median analyte concentration out of 13 samples taken near the Cape Fear Estuary, which is heavily contaminated with PFAS due to a Dupont chemical manufacturing facility.
MI EGLE, 2021	Michigan (six lakes and rivers)	2019-2020	PFOS PFOA PFHxS PFBS PFBA PFHxA PFNA	3,420-222,000 54.7-2,920 7.55-2,550 ND-3.73 ND-4.66 ND-381 400-6,010	Range for six SWF samples from Rogue River, four from Thornapple River; three from Van Etten Lake, one each from Cedar Lake, Huron River, and Lake Magrethe.
Schwichtenberg et al., 2020	Michigan (lake)	2020	PFOS PFOA PFHxS PFHxA PFNA PFBA PFBS	1,500-97,000 ND-1,300 ND-2,000 ND -140 ND-1,500 ND ND	Range for 8 bulk SWF samples from a lake contaminated by known PFAS releases.
WI DNR, 2019a; 2019b	Wisconsin (two rivers)	2019	PFOS PFOA PFHxS PFBA PFHxA PFNA	17,000-92,000 230-990 6.5-1,200 30-230 11-120 420-5,400	One sample event at two locations. Range for three SWF samples and a duplicate. Results for multiple analytes were qualified including 'E'- too concentrated to quantitate- and 'B'-detections in the blank.

ND = Non-detect, <LOQ = Detected but below limit of quantification
*Only PFAS with an established DPH surface water action level are shown. Studies may have measured other PFAS.

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Appendix E
Health and Safety Plan

Health and Safety Plan

Town of Nantucket

Surface Water and Foam Sampling Project

Prepared by:

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June 2025

APPROVED BY

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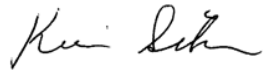

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Table of Contents

1. Introduction

The Town of Nantucket has initiated a project to investigate levels of per- and polyfluoroalkyl substances (PFAS) in surface water and, if present, sea foam at selected coastal beaches and inland ponds across Nantucket, Massachusetts. The primary goal of this sampling effort is to characterize PFAS contamination in nearshore coastal waters and selected inland ponds to better understand potential public health risks associated with recreational water use.

The full scope of the project is described in the separate Sampling and Analysis (SAP) for the project. This document presents the Health and Safety Plan (HASP) for this work. It covers field activities to be performed by Eastern Research Group, Inc. (ERG), a contractor to the Town of Nantucket.

2. Purpose

The purpose of this HASP is to inform ERG field staff of known or potential health and safety hazards that may be encountered during the surface water and foam sampling activities, which will occur in Nantucket, MA. This HASP describes the possible hazards and the procedures required to minimize the potential for exposure to hazardous conditions, accidents, and injuries during the work activities.

3. Scope

ERG will support the Town of Nantucket by conducting two surface water and foam sampling events in Nantucket, MA. These events will involve wading into coastal beaches and inland ponds to a depth of 1.5 to 2.0 feet, as well as collecting surface water samples from a boat at locations up to one mile off the northern coast of the island. For both events, ERG will work alongside Town of Nantucket staff who will be simultaneously collecting surface water samples as part of their routine weekly sampling efforts.

4. General Information

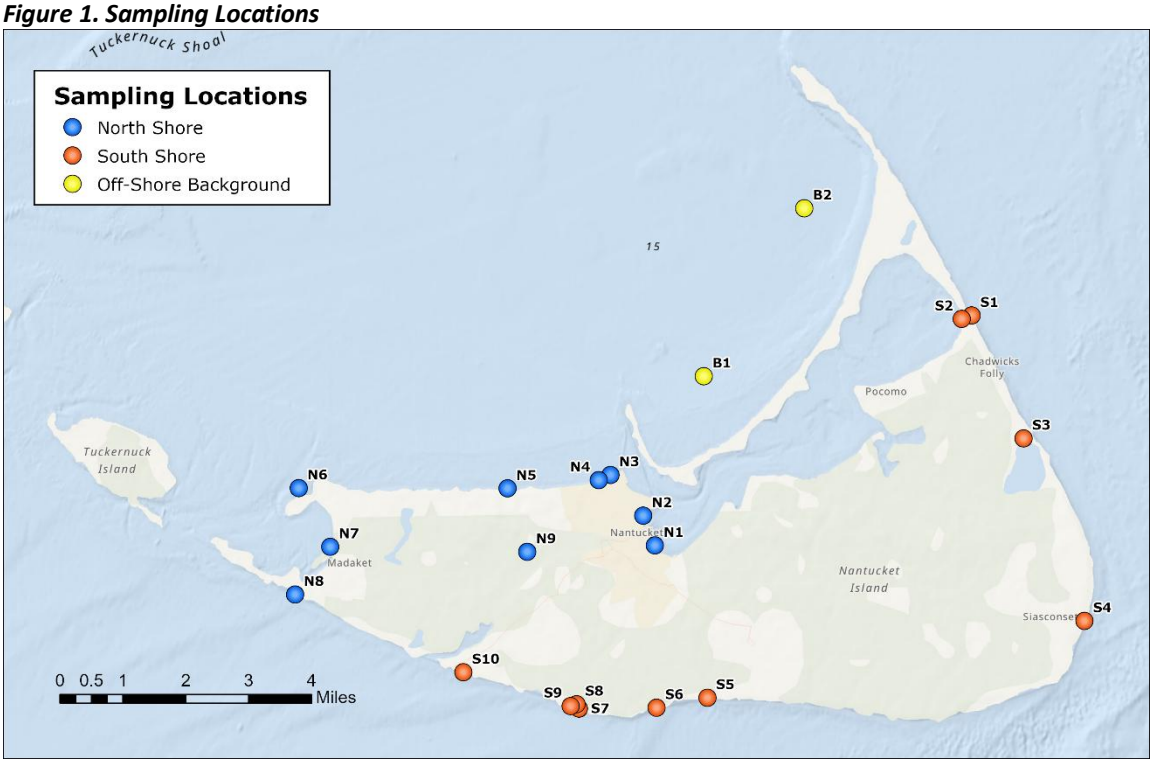
1.	Project Title:	PFAS Surface Water and Foam Sampling Program in Nantucket	Contract Number	2751
2.	Location	Nantucket, Massachusetts		
3.	Description of Field Activities:	Environmental data collection: Collect surface water and foam samples at beaches around the Nantucket coastline and from inland ponds, as well as at two nearshore locations off the northern coast of the island.		
4.	Date of Field Activities:	First sampling event: July 8-9, 2025 Second sampling event: August 26-27, 2025 (tentative)		
5.	ERG Personnel	Rebecca DeVries	Project Manager and Field Sampling	
		Clifton Dassuncao	Senior Environmental Health Scientist	
		Anna Stanley Lee	Data Manager and Field Sampling	
		Kort Kirkeby	Technical Advisor	
		Meghan Harris	Field Team Member	
		Alessandria Schumacher	Field Team Member	

During both sampling events, the field team will sample 19 coastal and inland pond locations. For each event, an ERG staff member will accompany Town of Nantucket beach inspectors as they collect their routine bacterial samples along the island's northern and southern shores. One ERG field team member will join the inspector traveling to sites along the north shore and another ERG field team member will simultaneously join the other inspector traveling to sites along the south shore. The Town's beach inspectors will transport ERG staff in their vehicles to each site, ensuring proper access and accurate location. ERG field staff will collect one surface water sample at each location. If sufficient sea foam is present at any of these locations, ERG field staff will also collect a sea foam sample (up to a maximum of four sea foam samples per sampling event).

ERG field staff will also collect surface water samples at two locations located approximately one-mile off the northern coast of the island. Staff from the Town of Nantucket's Natural Resources Department (NRD) will transport ERG personnel to these sites using a 25-foot Privateer boat. ERG staff will collect the samples by leaning over the side of the vessel. At least one member of the Town's project team will also be present during this sampling.

Sampling locations are shown in Figure 1.

Figure 1. Sampling Locations



5. General Health and Safety Guidelines

To prevent injuries and adverse health effects, the following general safe workflow practices are to be followed by all ERG field team members when conducting work involving known and unknown site hazards. These practices establish a pattern of general precautions and measures for reducing risks associated with field operations.

- Be familiar with and adhere to all instructions in this HASP and the SAP.
- Hold a safety meeting or "tailgate talk" at the start of each day to discuss the hazards of the sampling locations and all planned sampling activities. Anticipated hazards include rip currents, heat exhaustion, sun protection, dehydration, and shark and other wildlife or insect presence.
- Review emergency contact information for the field crew members.
- Review and discuss weather conditions for each day of scheduled sampling.
- Review and check any personal protective equipment (PPE) to be used prior to sampling activities, including sunscreen, sunglasses, hats, water, personal flotation devices (PFDs), etc.
- Use a "buddy system" during field sampling activities. In order to assist each other in the event of an emergency, maintain visual contact with a buddy at all times. For this project, "buddy teams" will consist of an ERG field team member and a Town of Nantucket staff person.
- Use caution when walking along the shoreline or in the water. Broken glass or other sharp objects may be embedded in the substrate.
- Use extreme caution when wading in coastal waters. Do not enter water with strong wave activity or if there is an increased likelihood of rip currents. Check tide charts and surf forecasts before heading into the field. Be aware of biological hazards (e.g., jellyfish, sharks).
- Be familiar with the symptoms of heat exhaustion and heat stroke and be prepared to move a suffering individual into cooler surroundings and hydrate immediately.
- Minimize exposure to foam and sediments as much as possible as infectious agents and toxic substances may be present.
- Take proper precautions and have any needed medications handy if allergic to bee stings, other insect bites, or plants.
- Maintain awareness of other watercrafts, swimmers, snorkelers, divers, and sensitive or hazardous wildlife in the sampling area.
- Be aware of the effects of prolonged exposure to rain, wind, and wet clothing, which can lead to discomfort, and, in some extreme cases, hypothermia.
- Do not use perfumes or colognes.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the project manager and the Corporate Health and Safety Manager (CHSM).
- Maintain a project-specific safety log in the office to record incidents and other information related to safety matters.

Personal Safety Equipment

Personnel participating in field activities should be in sound physical condition. Proper field clothing should be worn to prevent heat exhaustion, sunstroke, drowning, or other dangers. To this end, ERG field team members will have the following items with them during sampling activities:

- PFAS-free field clothing and other protective gear (e.g., sunscreen, hat, sunglasses)
- Medical and personal information (e.g., allergies, personal health conditions)
- Emergency contact information (e.g., police, fire departments, hospitals)
- Cell phone
- First-aid kit (with Benadyl and Sting No More)
- U.S. Coast Guard-approved PFD (whenever in a boat)

General Vehicle Safety

ERG field staff will be transported to field sampling locations by Town of Nantucket personnel. Before departing for field activities, ERG field team members will verify that the designated driver holds a valid U.S. state driver's license. If the ERG field staff member has any concerns regarding the safety of the driver or the vehicle—especially given the potential for off-road travel at some locations—they will immediately contact the Project Manager. Note that ERG will be traveling with Town staff who routinely collect these samples and who are well aware of the driving conditions at each site.

General Boat Safety

ERG field staff will be transported by NRD personnel to two sampling locations off the coast of the island. Transportation will be provided via a 25-foot Privateer boat operated by NRD staff, with each trip expected to last approximately 90 minutes. Prior to and during the trip, ERG field staff will monitor the weather forecast and communicate any concerns directly to the Town of Nantucket Project Manager. Two ERG field staff will participate in these sampling activities.

Before departure from the shoreline, ERG field staff will request to review the boat's registration and verify that the operator possesses a valid boating safety certificate. They will also confirm that the following required safety equipment is on board the vessel:

- Wearable U.S. Coast Guard-approved PFDs for every person on board (Type I, II, or III)
- Throwable PFD (Type IV)
- U.S. Coast Guard-approved fire extinguisher
- Sound-producing device (e.g., horn or whistle)
- Visual distress signals (e.g., flares)
- Anchor, chain, and line
- Manual water discharge equipment (e.g., bailer or pump)
- Appropriate footwear such as structured, closed-toe sandals (e.g., KEEN or Teva-style)

6. Physical Hazards Assessment

Field sampling teams will collect samples from beaches and ponds across the island. Possible physical hazards associated with working in these environments are those related to slips, trips, and falls; heavy lifting; and drowning. Brief descriptions of these hazards follow, along with measures for preventing or mitigating their consequences.

Slips, Trips, and Falls

Slips, trips, and falls are often overlooked but are among the most common causes of injury during fieldwork. Throughout sampling activities, ERG staff must remain alert and use sound judgment to assess walking and working surfaces. Common hazards include:

- Steep slopes
- Uneven or unstable terrain
- Downed limbs, dense vegetation, and debris
- Muddy surfaces or slick aquatic substrates

- Complacency or lack of situational awareness

These risks are especially pronounced when wading in aquatic environments, where turbid water can obscure the bottom and create slippery or sticky conditions.

To minimize the risk of slips, trips, and falls, ERG staff will follow best practices:

- Wear appropriate footwear when wading into the water. In most aquatic conditions expected for this project—such as shallow, sandy-bottomed areas—structured, closed-toe sandals (e.g., KEEN or Teva-style) with secure straps and sturdy soles are acceptable. Always move slowly and deliberately, especially when the water is turbid and obscures the substrate.
- Assess and monitor conditions. Remain alert to changing terrain and weather conditions throughout the day. Check the forecast in advance, particularly for rain, which can significantly increase the risk of slippery surfaces. This is especially true when working on a boat.
- Manage load and balance. Be mindful when carrying backpacks, equipment, and coolers, as they can shift your center of gravity and affect balance. Use caution when traversing uneven or sloped terrain, especially with a heavy load.

Lifting Hazards

ERG Field Sampling Leads will assess potential physical hazards prior to sampling to help prevent lifting-related injuries. They are responsible for demonstrating proper lifting techniques and instructing Field Team Members to ask for assistance when handling heavy or awkward loads.

ERG staff are not expected to lift or move any individual item weighing more than 25 pounds on their own. If a heavier item needs to be moved, it must be carried by two employees working together. Heavy lifting for this project will be limited to moving coolers filled with ice and sample bottles.

Drowning

ERG field staff will wade into coastal and inland waters to a maximum depth of two feet when collecting shoreline samples, posing minimal drowning risk. As noted above, ERG staff will work in a “buddy system” with staff from the Town of Nantucket while collecting samples from the shoreline. During offshore sampling—up to one mile from shore—the risk increases. To mitigate this, staff will wear U.S. Coast Guard-approved personal flotation devices (PFDs) at all times while aboard the vessel. They will also confirm that the boat is equipped with all required safety equipment, including a throwable PFD.

7. Environmental Hazard Assessment

During fieldwork, staff may encounter environmental hazards such as lightning, dangerous beach and surf conditions, sun exposure, and heat. The sections below describe each hazard and outline steps to prevent or reduce associated risks.

Lightning

Lightning strikes kill approximately 80 people in the U.S. each year and injure hundreds more. Most strikes occur in the late afternoon during spring and summer, but lightning can occur anytime, anywhere, and may strike the same place multiple times. A lightning strike can be fatal, stopping the

heart instantly. Survivors may experience burns, nerve damage, or other serious medical issues, some of which may not appear for months. To minimize risk, ERG staff will follow the safety guidelines below.

Prevention

If you see lightning or hear thunder, take action immediately—especially if the time between the two is 30 seconds or less. This means the storm is nearby. Note that lightning can strike even 10 miles away from a visible storm, including under sunny skies. Lightening tends to strike tall objects (e.g., trees, poles, towards), metal (e.g., fences, tools, vehicles), water (e.g., ponds), and people in open areas or on elevated terrain. Field teams must act quickly if a storm approaches.

DO NOT:

- Be the tallest object in the area
- Shelter under a tree or near metal items or structures (pipes, fences, poles, towers)
- Stay near water

DO:

- Seek shelter in a fully enclosed building
- If no building is available, get into a fully enclosed vehicle with windows closed

If you are caught outside and cannot reach an enclosed structure, crouch down with your feet together, keeping only your feet in contact with the ground. Place your hands over your ears to protect against loud thunder. This low position reduces your chances of being struck directly, and by minimizing contact with the ground, you lower the risk of being injured by ground current. Do not lie flat, as that increases your exposure to electrical flow across the surface. After the last lightning flash and clap of thunder, wait at least 30 minutes before resuming outdoor activities. Use good judgment and remain alert to changing weather conditions.

Treatment

If someone is struck by lightning, call emergency services (911) immediately. The victim does not remain electrified, so it is safe to touch them right away. If the person has no pulse, begin CPR. However, be cautious about remaining in an open area during an active storm, as you could also be at risk. If it is safe to do so, move the victim to a sheltered location before providing further assistance.

Beach and Surf Hazards

Coastal environments present serious—and often underestimated—hazards for field staff. Strong surf, shifting tides, and rapidly changing ocean conditions can pose significant risks to anyone working near the waterline. Hazards such as rip currents and shorebreaks are responsible for thousands of injuries and rescues each year. Awareness and understanding of these coastal dangers are essential for ensuring safety during fieldwork along the shore. Brief descriptions of these follow, along with preventative measures to minimize risk.

Rip Currents

Rip currents are narrow but powerful flows of water moving away from the shore through the surf zone. They are the leading cause of beach lifeguard rescues each year and can pull even strong swimmers beyond the breaking waves. Rip currents typically form at low spots or breaks in sandbars and near

structures such as jetties or piers. In some cases, rip currents are visible before entering the water, often appearing as darker, calmer channels or lines of foam and debris moving seaward. To help prevent being caught in a rip current, ERG staff must not wade into coastal waters deeper that two feet when collecting shoreline samples. If caught in a rip current, however, do not attempt to swim directly against it. Instead, swim parallel to the shore to escape the current's pull, then angle back toward land. If you cannot escape, tread water and signal for help.

Shorebreaks

Shorebreak conditions occur when waves crash directly onto the shoreline instead of gradually breaking in shallow water, often where the ocean floor drops off sharply near the beach. Even small waves can exert enough force to knock a person down or cause injury. Common risks include head, neck, and spinal injuries, as well as forceful tumbling in shallow water. To minimize these hazards, carefully observe wave behavior before entering the surf and avoid any areas where shorebreaks are observed.

Sun Exposure

ERG field staff will be exposed to the sun's ultraviolet (UV) rays, even on cloudy days. UV rays are a part of sunlight that is an invisible form of radiation. There are three types of UV rays. UVA is believed to damage connective tissue and increase the risk for developing skin cancer. UVB penetrates less deeply into the skin but can still cause some types of skin cancer. Natural UVC is absorbed by the atmosphere and does not pose a risk.

Sunburn typically begins to show about four hours after exposure, worsens over the next 24 to 36 hours, and heals gradually within three to five days. Common symptoms include red, tender, and swollen skin. In more severe cases, blistering can occur. Additional symptoms may include headache, fever, nausea, and fatigue. Eyes exposed to sunlight can become red, dry, painful, and gritty, and chronic UV exposure may cause permanent damage, including blindness.

Prevention:

- Wear sunscreen with a minimum SPF of 30 (PFAS-free)
- Apply sunscreen liberally (at least 1 oz.) 20 minutes before sun exposure
- Cover exposed skin including ears, scalp, lips, neck, tops of feet, and backs of hands
- Reapply sunscreen at least every 2 hours and after swimming or sweating
- Be aware that insect repellents may reduce sunscreen effectiveness
- Replace sunscreen every 1–2 years (it loses potency over time)
- Wear protective clothing with a tight weave or UV protection rating
- Use wide-brimmed hats and sunglasses with UV protection and side panels

Treatment

- Take aspirin, acetaminophen, or ibuprofen to relieve pain, headache, and fever
- Drink plenty of water to stay hydrated
- Use cool baths or gently apply cool, wet cloths to burned areas
- Avoid further sun exposure until the burn has healed
- Apply a moisturizing lotion, aloe, or 1% hydrocortisone cream to reduce discomfort
- Lightly bandage blistered areas with gauze to prevent infection
- Do not break blisters, as this slows healing and increases the risk of infection

- When blisters break and skin peels, gently remove dried skin and apply antiseptic ointment or hydrocortisone cream
- Seek medical attention if the sunburn covers more than 15% of the body, signs of dehydration appear, fever exceeds 101 °F, or pain lasts longer than 48 hours

Heat Exposure

ERG field staff will be collecting samples during warm summer months, with potential for high heat exposures. Working in hot environments can lead to heat-related illnesses such as heat exhaustion and heat stroke, which require prompt attention. ERG field staff should be able to recognize the symptoms, respond quickly, and take steps to prevent these conditions during sampling work in high temperatures.

Heat stroke is a serious, potentially life-threatening condition that occurs when the body's temperature regulation fails. It is marked by an extremely high body temperature (over 103 °F), red, hot, and dry skin with no sweating, a rapid and strong pulse, and neurological symptoms such as confusion, dizziness, headache, nausea, or unconsciousness.

Heat exhaustion is less severe but still dangerous. It occurs when the body becomes overheated and begins to lose fluids and salts through heavy sweating. Symptoms may include paleness, muscle cramps, tiredness, weakness, dizziness, nausea or vomiting, headache, and fainting.

Prevention:

- Be familiar with the signs and symptoms of heat-related illnesses.
- Carry a portable shade device if working in areas with little natural cover.
- Establish a daily maximum temperature limit above which fieldwork is suspended.
- Ensure you bring sufficient water when sampling and drink plenty of water throughout the day.
- Take regular breaks in shaded or air-conditioned areas or vehicles.
- Wear loose-fitting, lightweight clothing that allows for evaporation and cooling.
- Light-weight and light-colored long sleeves, long pants, and a wide-brimmed hat are recommended for sun and heat protection.
- Field sampling personnel should keep an eye on each other throughout the sampling event to monitor for signs or symptoms of heat exposure.

Treatment:

- If someone shows signs of either condition, move them immediately into a cooler, shaded area. Encourage them to drink water and rest, and seek medical attention—especially if symptoms are severe or do not improve quickly.

8. Biological Hazard Assessment

ERG field staff may encounter various biological hazards, including biting or stinging insects (i.e., ticks, mosquitos, and bees/wasps/hornets), certain aquatic organisms (i.e., jellyfish, stingrays, sharks), poisonous plants, waterborne pathogens, and possibly wild animals. The sections below describe each hazard and outline steps to prevent or reduce associated risks.

Ticks

Ticks are common in Nantucket and can transmit several potentially serious illnesses to humans, most notably Lyme disease, as well as anaplasmosis, babesiosis, and Powassan virus. These diseases are spread primarily by the deer tick (*Ixodes scapularis*), also known as the blacklegged tick. Tick activity is highest in late spring through early fall, especially in grassy, brushy, and wooded areas.

After a tick bite, symptoms may appear within days to weeks, depending on the disease. Early signs often include redness or a rash near the bite site—in Lyme disease, this may develop into a distinctive bull's-eye pattern. People commonly experience fever, chills, headache, fatigue, muscle aches, and swollen lymph nodes. If left untreated, infections like Lyme disease can cause more severe issues such as joint pain and neurological problems. In rare cases, Powassan virus infection can lead to serious complications like encephalitis or meningitis.

Prevention

- Wear long sleeves, long pants (where possible), and light-colored clothing to spot ticks easily.
- Use EPA-registered tick repellents containing DEET, picaridin, or IR3535 on skin and permethrin on clothing and gear (not on skin) provided by the project team.
- Avoid walking through tall grass, dense brush, or leaf litter.
- Conduct full-body tick checks after fieldwork, especially under arms, behind knees, around the waistband, and along the scalp and neck.
- Shower as soon as possible after being outdoors.
- Wash and dry field clothes on high heat to kill any ticks.

Treatment

- Remove attached ticks promptly using fine-tipped tweezers—grasp the tick as close to the skin's surface as possible and pull upward steadily.
- Clean the bite area with soap and water or rubbing alcohol.
- Watch for signs of illness over the next 30 days.
- Seek medical attention if symptoms develop or if a tick was attached for more than 24 hours.
- Early treatment with antibiotics (typically doxycycline) is effective for most tick-borne diseases.

Mosquitos

In Nantucket, mosquitoes pose a seasonal health concern, as they can transmit West Nile Virus (WNV), a potentially serious illness affecting birds, other animals, and humans. WNV typically peaks in summer and continues into fall, coinciding with Nantucket's warm months.

Symptoms typically appear 3 to 14 days after infection. Milder West Nile Fever symptoms last from a few days to several weeks and include headache, fever, tiredness, body aches, nausea, vomiting, swollen lymph nodes, and sometimes a skin rash. Severe infections (West Nile encephalitis or meningitis) can cause headaches, high fever, neck stiffness, nausea, vomiting, disorientation or coma, tremors, muscle weakness or paralysis, and vision loss. These symptoms can last weeks and sometimes cause permanent neurological problems.

Prevention:

- Minimize mosquito exposure by wearing long sleeves and long pants (when appropriate).

- Use EPA-registered insect repellents provided by the project team.
- Wash treated skin after returning indoors.
- Do not use perfumes or colognes.

Treatment:

- Irritation from bites can be eased with topical hydrocortisone cream after sample collection; severe itching may require antihistamines like Benadryl.

Bees, Wasps, and Hornets

In Nantucket's natural and residential areas, bees, wasps, and hornets are common and will sting if disturbed. Their nests are often found in hollow trees, attics, walls, under eaves, in shrubs, or hidden places like tires and rodent holes. Bee stings cause allergic reactions ranging from mild hives to anaphylaxis. Bees sting once, but wasps and hornets can sting multiple times.

Prevention

- Avoid disturbing nests and remain calm if insects are nearby.
- Avoid fragrances, which attract these insects.
- Observe caution around food and drinks outdoors.

Treatment:

- If stung, remove the stinger, clean the wound, and apply a cold pack.
- Watch for allergic reactions—extreme swelling, redness, or breathing difficulty require immediate medical attention.
- Those with known allergies should carry prescribed EpiPens and follow first aid protocols if stung. Field teams will also carry Benadryl in first aid kids.

Jellyfish

ERG field staff may encounter jellyfish while working in Nantucket's coastal waters, particularly in late summer and early September when ocean temperatures are highest. The lion's mane jellyfish is the most common species, typically found in shallow waters over sandy shorelines near bays and estuaries. Stings occur when the jellyfish's nematocysts are triggered by contact, injecting toxins that cause a burning sensation. In some individuals, reactions may be more severe and include muscle cramps and cardiovascular symptoms.

Prevention

- Scan shallow water before entering, especially during windy weather or a week after the full moon.
- Heed posted warning signs at swimming beaches
- Avoid wading into waters where jellyfish are visible.

Treatment

- Rinse the affected area with vinegar to neutralize the venom
- Apply heat, not ice, as cold can intensify the venom's effects
- Use a venom-inhibiting product such as Sting No More, available in first aid kits.

- Seek immediate medical attention if symptoms include breathing difficulty, heart palpitations, cramps, or vision issues

Portuguese Man O' War

Portuguese man o' war, sometimes called bluebottles, are occasionally found in Nantucket waters, especially during windy conditions. Though they resemble jellyfish, they are actually *siphonophores*—colonial organisms made up of specialized polyps that function together as a single unit. They float at the ocean surface using a gas-filled sac that acts like a sail and trail long, venomous tentacles—sometimes extending up to 165 feet underwater. Contact with these tentacles can result in a powerful, painful sting that causes a burning sensation and, in some cases, severe reactions such as difficulty breathing or cardiovascular collapse.

Prevention:

- Scan shallow water and the shoreline before wading to collect samples, especially during or after strong winds.
- Observe and follow any posted warning signs at beaches.
- Be aware that their translucent bodies can be difficult to detect in open water or on wet sand.

Treatment:

- Rinse the affected area (with vinegar, if available) to neutralize the venom.
- Apply ice to help reduce pain (unlike jellyfish stings, cold can be helpful for man o' war stings).
- Use a venom-inhibiting product like Sting No More, available in first aid kits.
- Seek immediate medical attention if you experience severe symptoms such as shortness of breath, chest pain, or dizziness.

Stingrays

In Nantucket, stingrays pose minimal danger if given space and not accidentally disturbed. These bottom-dwelling animals have venomous spines on their tails, which they use only when threatened. While not aggressive, a stingray may sting if stepped on or startled, causing immediate sharp pain, swelling, and redness at the wound site. The venom can also lead to systemic symptoms such as muscle cramps, dizziness, nausea, or, in rare cases, breathing difficulty or allergic reactions.

Prevention:

- Avoid touching or attempting to interact with stingrays.
- When wading in shallow water, shuffle your feet to alert stingrays and avoid stepping on them.

Treatment:

- Exit the water immediately and immobilize the affected area.
- Immerse the wound in hot water (as hot as safely tolerable) for 30 to 90 minutes to help neutralize the venom and reduce pain.
- Seek prompt medical attention for further evaluation and care.

Sharks

At least 15 shark species, including great whites, inhabit Nantucket waters. However, attacks are very rare in nearshore areas, and there have been no confirmed human attacks in Nantucket waters.

Prevention:

- Avoid the water if sharks have been sighted or are known to be present. If one is spotted, leave the water calmly and without splashing.
- Never provoke or harass a shark, regardless of its size.
- Do not enter the water with open wounds or if bleeding; sharks can detect trace amounts of blood.

Treatment

- If bitten, exit the water immediately and seek emergency medical assistance.
- Apply first aid (such as controlling bleeding) while waiting for help.

Poisonous Plants

Field team members may come into contact with plants that cause skin irritation or allergic reactions, such as invasive poison ivy and native poison sumac. Risks arise from direct contact with plant sap, hairs, or thorns, as well as inhalation of airborne plant compounds. Examples of hazardous plants in Nantucket include poison ivy (*Toxicodendron radicans*), Oriental bittersweet (*Celastrus orbiculatus*), and Virginia Creeper (*Parthenocissus quinquefolia).* Symptoms includes a red rash within a few days of contact, swelling, itching, and bumps, patches, or streaking blisters.

Prevention:

- Wear long sleeves, pants, boots, and gloves
- Wash exposed clothing separately in hot water with detergent
- Clean tools after use with rubbing alcohol or soap and water while wearing disposable gloves

Treatment:

- Immediately rinse skin with rubbing alcohol, poison plant wash, or degreasing soap and plenty of water, rinsing frequently to avoid spreading urushiol
- Scrub under nails with a brush
- Apply wet compresses, calamine lotion, Technu, or hydrocortisone cream to reduce itching and blistering
- Oatmeal baths may relieve itching
- Antihistamines can help but may cause drowsiness
- Seek medical attention if rash is severe or on sensitive areas like the face or genitals
- Call 911 or go to the emergency room if you experience severe allergic reactions such as swelling or difficulty breathing, or have a history of severe reactions

Waterborne Pathogens

While collecting surface water samples from inland ponds on Nantucket, ERG field staff may be exposed to microorganisms naturally present in freshwater systems. These pathogens can enter the body

through cuts or abrasions in the skin or through accidental contact with the mouth, nose, or eyes. Risk may increase after heavy rainfall, in warm stagnant waters, or in areas with known wildlife activity.

Inland ponds may contain bacteria (e.g., *E. coli*), protozoa (e.g., *Giardia*, *Cryptosporidium*), or, in rare cases, *Leptospira* bacteria—particularly if the water is contaminated with animal waste. Although the risk is low, these organisms can cause gastrointestinal illness, skin irritation, or more serious infections if proper precautions are not taken.

Prevention:

- Avoid entering the water if you have open wounds, cuts, or abrasions, to the extent possible. If needed, cover cuts with waterproof dressings.
- Wear protective gloves and water shoes or closed-toe sandals (e.g., KEEN or Teva-style) when sampling.
- Avoid contact with your face (mouth, nose, eyes) during sampling activities.
- Wash exposed skin thoroughly with soap and clean water after sampling.
- Delay work in flooded/high-risk areas if possible.

Treatment:

- Seek prompt medical care if symptoms like fever, chills, or muscle aches develop.
- Inform healthcare providers about possible exposure, which may aid in diagnosis.
- Early treatment with antibiotics may be necessary for infections like leptospirosis.

Wild Animals

ERG field staff working in Nantucket may encounter wild animals. This is particular a concern if those animals exhibit unusual behavior, such as nocturnal animals active during the day, excessive drooling, partial paralysis, irritability, aggression, or an unusually quiet demeanor. If bitten, staff should move away calmly to prevent further injury. Minor wounds should be cleaned and dressed promptly, with monitoring for signs of infection. Serious bleeding requires immediate medical attention without attempting to clean the wound. Suspected rabid animals must be reported to the appropriate authorities, and medical care should be sought immediately. Traveling in groups is recommended to reduce the risk of animal encounters or attacks. Additionally, field staff should never touch dead animals due to the risk of disease transmission from fleas. Avoid contact with animal droppings, as they can carry airborne pathogens.

Deer

Deer are common on Nantucket and, while generally not aggressive, can pose a threat if startled or during rutting season when males may behave unpredictably. Field staff should never approach or feed deer and should back away calmly if one acts agitated (e.g., stomping or snorting). Always stay alert when working near wooded or open areas, especially at dawn or dusk.

Deer also pose a hazard when driving. They are most active around dawn and dusk and often travel in groups. Drivers should slow down in wooded or signed deer-crossing areas, use high beams when safe, and never swerve to avoid a deer—brake firmly and stay in your lane. Report any deer encounters or collisions to the Site Lead and CHSM.

9. Chemical Hazards

Chemical exposures are limited to gasoline during sample collection from the boat, described below.

Gasoline

Gasoline is a chemical compound that crews are required to use when working with vehicle motors or generators. Like ethanol, the primary safety concern when working with gasoline is its flammable nature. It has the potential to be explosive and should, therefore, never be kept near extreme heat, open flames, or sparks. Because gasoline is so volatile, it should never be kept in a container that was not specifically designed to store gasoline. Inhalation of gasoline vapors can irritate the mucous membranes, induce the onset of pneumonia and cause narcosis. Prolonged inhalation of gasoline vapors can affect the peripheral nervous system and blood alterations. Exposure of the skin or eyes can cause irritation and dermatitis. Ingestion of gasoline can cause a number of gastrointestinal disturbances and can be fatal. Long term exposure to gasoline is suspected to be carcinogenic. Crew members can avoid the adverse health effects of working with gasoline by keeping it in a proper storage container. If gasoline must be handled outside of the proper storage container, the crew member should work in a well-ventilated area; wear impermeable gloves, safety goggles, and protective clothing; and thoroughly wash any exposed areas prior to eating, drinking, or the use of toilet facilities. If gasoline contacts the eye, it should be flushed with water for 15 minutes.

If the skin is contacted with gasoline, it should be thoroughly washed with soap and water. If the fumes are inhaled to the point of overexposure, the crew member should be removed to a well-ventilated area, artificial respiration should be given, if necessary, and medical attention should be sought. If gasoline is ingested, the crew member should be given a dose of vegetable oil to prevent absorption and medical attention should be sought immediately. Vomiting should not be induced. If gasoline ignites, it should be extinguished with a Class B medium such as foam, carbon dioxide or a dry chemical.

10. Contacts for Local Emergency Services

Prior to ERG's field activity, ERG will provide each of its field staff with the pertinent emergency contact information for Nantucket. That information follows:

Emergency Information

Ambulance:	All emergencies, call 911	Phone:	911
Hospital:	Nantucket Cottage Hospital 57 Prospect St	Phone:	(508) 825-8100
Fire Department:	Nantucket Fire Department	Phone:	(508) 228-2323
Police Department:	Nantucket Police Department	Phone:	(508) 228-1212
Poison Control Center:	Poison Center	Phone:	(800) 222-1222

Personal Injury

If an injury occurs, a qualified first aid provider (all staff will be adult first aid/CPR certified) will assess and initiate appropriate first aid and contact emergency services (911) immediately as needed. All incidents should be immediately reported to the Site Lead who will be responsible for communicating and reporting any injuries.

Natural Hazards

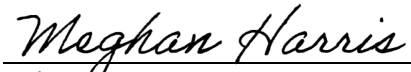
Field sampling leads will alert staff of current and impending weather emergencies (e.g., thunderstorms, heat waves, etc.) and determine whether site activities should be paused.

11. Staff Concurrences

ERG will require all Field Team Members, before they report to Nantucket, to read and understand this HASP. They will also be required to sign the ERG staff concurrence sheet at the end of this plan.

ERG Nantucket Sampling Supplement Health and Safety Signature Page

I have read and fully understand all aspects of the ERG field sampling health and safety guidelines. This information will also be available on the ERG SharePoint website for future reference. All ERG employees involved with the field sampling must return signed and dated signature page to the CHSM.

Signature	Printed Name	Date
	Anna Stanley Lee	7/2/2025
	Rebecca DeVries	7/2/2025
	Meghan Harris	8/15/2025