DANE COUNTY REGIONAL AIRPORT MADISON

# Initial Site Investigation Work Plan for BRRTS Activity #02-13-583366

Plan prepared by

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# 1.0 Introduction and Facility Information

Pursuant to the Wisconsin Department of Natural Resources (WDNR) October 7, 2019 letter referencing BRRTS Activity #02-13-584369, this work plan has been prepared to provide a description of activities being initiated at the Dane County Regional Airport (DCRA or the Airport) to initiate the investigation of reported and suspected per- and polyfluorinated alkyl substances (PFAS) contamination at the Airport. The purpose of this investigation is to evaluate the presence of PFAS in soils and groundwater at two closed firefighting training areas (referred to as Pearson Street/East and Darwin Street/West in this work plan), and inform additional investigation steps or remedial action, if warranted. This work plan has been developed to address elements required by and specified in Wisconsin Administrative Code NR 716.07 and 716.09. A description of the site is provided in **Section 1** and details of the proposed sampling and analysis strategy for this initial investigation are presented in **Section 3** of this plan.

This plan reflects the WDNR's February 19, 2020 comments on the Draft Work Plan, in which they noted that the BRRT Activity # 02-13-583366 should be used for the firefighting training areas investigations. Therefore, this work plan and all future work related to the two firefighting training areas will reference BRRT #02-13-58366. We respectfully request that WDNR close BRRTS #02-13-584369 issued on October 7, 2019 in deference to the older BRRTS number.

## 1.1. Site Name and Information

| | |
|---|---|
| Site Name: | Dane County Regional Airport |
| Site Address: | 4000 International Lane, Madison, Wisconsin 53704 |
| Site Location: | All or parts of Sections 16, 17, 18, 19, 20, 21, 28, 29, 30, 31, and 32 of Dane County Township 8N., Range 10E. See Appendix A for Airport Property Map. |
| Responsible Party or Parties: | Wisconsin Air National Guard (WANG), 3110 Mitchell Street, Building 1210, Madison, Wisconsin 53704-2529 |
| | Dane County Regional Airport, 4000 International Lane, Madison, Wisconsin 53704 |
| | City of Madison, 210 Martin Luther King Blvd., #403, Madison, Wisconsin 53703 |
| Consultants Involved: | Mead & Hunt, 2440 Deming Way, Middleton, Wisconsin 53562-1562 |
| | LimnoTech, 501 Avis Drive, Ann Arbor, MI 4108 |

A map showing the location and site layout of DCRA is shown in **Figure 1** and **Appendix A**.

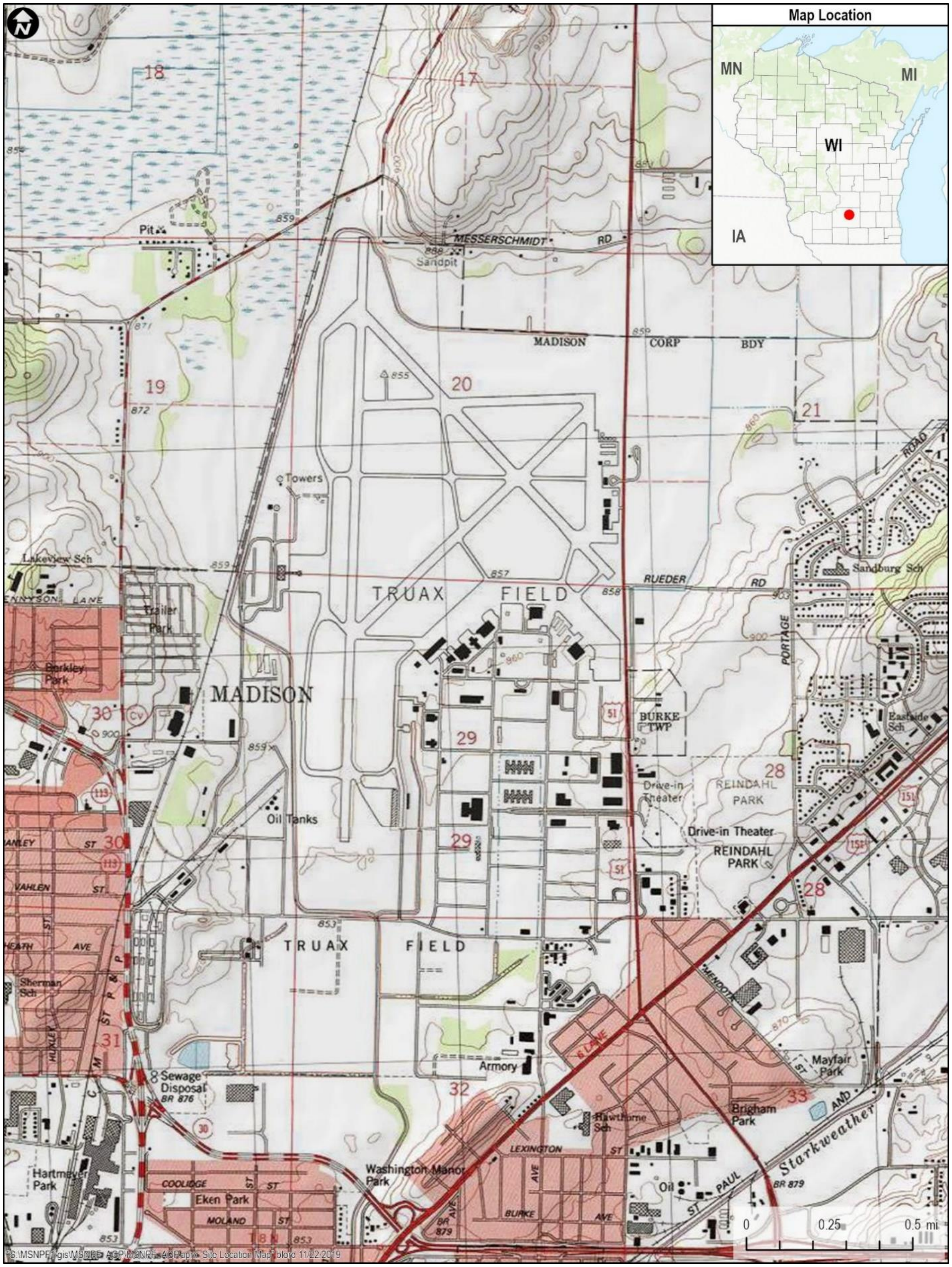



**Figure 1. Topographic Quadrangle (DeForest Quad) Showing Location of DCRA.**

## 1.2. Summary of Information Gathered During Scoping

Both firefighting training areas were evaluated in the past for petroleum-based contamination. Neither firefighting training area was evaluated for PFAS compounds during previous evaluations. Petroleum-based contamination was found and remediated at the Pearson Street/East Firefighting Training Area. No remediation was conducted at the Darwin Street/West Fire Training Area. Information on these firefighting training areas was limited in the Airport's records to the Final Engineering Report – Contamination Evaluation Truax Field[1] for the Darwin Street/West Firefighting Training Area and the Closure Report for Former Fire Training Pit Area[2] for the East Firefighting Training Area. The location of the Darwin Street/West and Pearson Street/East Firefighting Training Area where taken from these reports and are shown in Figure 2.

The Final Engineering Report – Contamination Evaluation Truax Field[1] for the Darwin Street/West Firefighting Training Area contained the following statements:

> "The fireman training area practice burn pit was probably created in the early 1950s by the DOD and was in use by DOD and numerous other organizations until December 1987."

PFAS compounds were not included in the sampling and analytical data collected for the evaluation of the Darwin Street/West Firefighting Training Area. Six soil and one groundwater locations were advanced and samples for BTEX, TPH, and inorganics analysis were collected.

A Closure Report for Former Fire Training Pit Area[2] , the Pearson Street/East Firefighting Training Area, was submitted to WDNR under Activity #02-13-231618 on 30 December 2003 by BT[2], Inc. A summary of this report indicates that 640 cubic yards of soils were removed and landfilled from the former Pearson Street/East Firefighting Training Area. Excavation was advanced to around 8 feet below ground surface (BGS), which was the depth of groundwater encounter. Analytical parameters were limited to diesel range organics (DRO), gasoline range organics (GRO), and petroleum volatile organic compounds (PVOCs) due to the presence of a UST north of the Pearson Street/East Firefighting Training Area.

PFAS compounds were also not included in the sampling and analytical data collected for the closure of the Pearson Street/East Firefighting Training Area. Soil and groundwater (both from permanent wells and piezometers) were sampled and analyzed for the aforementioned parameters. This report also included information on and sampling at the former UST area to the north.

Information from these sources have been used to prepare this work plan and will continue to be reviewed, along with the findings of the efforts described in this work plan, to inform appropriate future investigation activities.

## 1.3. Physiographic and Geological Setting Information

This section provides general physiographic and geological setting information as summarized in the Phase 1 Regional Site Inspection of Truax Field and other sources.

### 1.3.1. Topography

DCRA is located in south central Wisconsin, northeast of the city of Madison. The Airport is located at an elevation of approximately 890 feet above mean sea level and topography at the Airport is generally level. The Airport is within the Great Lakes Section of the Central Lowlands Physiographic Province, which is characterized by numerous lakes with associated lacustrine plains, prominent end moraines, and a still partially exposed cuestaform topography[1]. Lakes Mendota, Monona, and Waubesa are located to the southwest and south of the Airport.

#### 1.3.2. Surface water drainage

Surface water drainage at the Airport is to Starkweather Creek, which flows around the Airport on the north, west, and south sides. Surface water flow at the Airport is conveyed by ditches, culverts, and storm sewers that outfall to Starkweather Creek. Starkweather Creek empties into Lake Monona approximately 2 miles to the south.

#### 1.3.3. Geology

Information provided in the Phase 1 Regional Site Inspection of Truax Field include the following summary observations that we believe to be representative of the Airport. The geology and hydrogeology information will be field verified during the next steps investigation:

- Bedrock in the Central Lowlands Physiographic Province is primarily of Paleozoic age. There is also some bedrock of Cretaceous age underlying the western boundary of the province.
- Rock strata are generally flat to gently inclined, and the topographic effects of glaciation are common throughout the province.
- Structurally, regional dips are controlled by numerous domes and uplifts. With the exception of the southern border, the entire province is bordered by topography that is higher in elevation[2].
- Glacial deposits in southern Wisconsin range in thickness from a few feet to several hundred feet. Because the Airport is situated on a locally thick (approximately 300 feet) section of glacial drift, several geologic layers encountered elsewhere in the region do not occur beneath the Airport. There is an approximately 350-foot layer of Mt. Simon Sandstone bedrock beneath the glacial till underneath the Airport[3].

### 1.4. General hydrogeologic information

Information provided in the Phase 1 Regional Site Inspection of Truax Field includes the following summary observations that we believe to be representative of the Airport:

- Regionally, groundwater is found in the unconsolidated glacial deposits and underlying bedrock formations including sandstone of the Trempealeau Group, the deeper Tunnel City Group, and the underlying Elk Mound Group. These bedrock aquifers comprise the principal water supply aquifers in Dane County. The Mt. Simon Sandstone underlying the glacial deposits in the vicinity of the Airport is the lowermost formation of the Elk Mound Group.
- Based on information collected during 2017 investigation activities, monitoring wells within the water table zone indicate shallow groundwater flow is generally toward the south

[1] Envirodyne Engineers, Inc. 1989. Final Engineering Report – Contamination Evaluation Truax Field, Madison, Wisconsin under Contract DCRA 49-87-D-0003, Delivery No. 9, prepared for US Army Corps of Engineers.

[2] BT[2], Inc. 12003. Final Engineering Report – Contamination Evaluation Truax Field, Madison, Wisconsin under Contract DCRA 49-87-D-0003, Delivery No. 9, prepared for US Army Corps of Engineers.

[3] *FY 16 Phase 1 Regional Site Inspections for Perfluorinated Compounds, Wisconsin Air National Guard Truax Air National Guard Base Madison, WI*. Amec Foster Wheeler Environment & Infrastructure, Inc. March 2019.

and southeast. The water table at the Airport is generally encountered at depths of 5 to 10 feet below ground surface, and groundwater flow gradients calculated from the investigations indicate groundwater flow velocities of 0.5 to 0.9 ft. per day.

- There are currently no known drinking water supply wells at the Airport, and the shallow groundwater system in the vicinity of the Airport is not used as a source of drinking water. Based on information obtained during the investigations, four private wells may have been located in the immediate vicinity of the Airport prior to initial construction activities in 1942; however, in light of the extensive development in the area, the four private wells are believed to be abandoned or not in use[4]. As part of the proposed investigation, additional records search will be conducted to verify this, if possible.

## 1.5. Potential migration pathways

Based on the initial review of information identified to date, potential migration pathways from DCRA may include stormwater discharge and groundwater flow. These potential migration pathways will be evaluated as part of this work plan.

Elements of this work plan are discussed in the following sections:

- 2 – Field Investigation and Sampling Plan
- 3 – Data Quality Objectives
- 4 – Quality Assurance/Quality Control
- 5 – Next Steps

[4] *FY 16 Phase 1 Regional Site Inspections for Perfluorinated Compounds, Wisconsin Air National Guard Truax Air National Guard Base Madison, WI*. Amec Foster Wheeler Environment & Infrastructure, Inc. March 2019.


**Figure 2. Location of Former Firefighting Training Areas at DCRA.**

# 2. Field Investigation and Sampling Plan

As stated in Section 1 of this work plan, the objective of this investigation is to evaluate the presence of PFAS in soils and groundwater at the Pearson Street/East and Darwin Street/West Firefighting Training Area, and inform additional investigation steps or remedial action, if warranted. As such, the investigation described here is not intended to fully define the nature, extent, and distribution of PFAS, if present, in soil and/or groundwater.

## 2.1. Health and Safety

A project health and safety plan (HASP) will be prepared for subsurface investigation activities at the Airport. A copy of the HASP will be provided to each organization participating in field work, including subcontractors. All field personnel will have reviewed the site-specific HASP prepared for this investigation and will be aware of the chemical and physical hazards specific to this project. The HASP will be reviewed by all field personnel prior to initiating any field activities. In addition, all persons performing field investigative tasks for this project will have experience working on similar site investigation projects and will have completed OSHA 40-hour HAZWOPER safety training, with 8-hour refresher courses as needed. A copy of the HASP will remain onsite for the duration of field activities.

## 2.2. Investigation Overview

This preliminary investigation of the East and West firefighting training areas consists of the following components:

- Advancement of up to six (6) soil borings in the vicinity of each firefighting training area, for a total of ten (12) borings.
- Collection of up to two (2) soil samples from each boring for PFAS analysis, for a total of up to twenty (24) soil samples.
- Collection of one (1) groundwater sample from each boring, for a total of up to twelve (12) groundwater samples.

Installation of permanent monitoring wells is not planned as part of this preliminary investigation. Based on previous investigations at the WANG base, it is expected that groundwater will be encountered within five to ten feet below ground surface. Borings will be advanced until groundwater is encountered. Sampling locations are described in Section 2.3 and sampling methods are described in Section 2.4. Appendix A includes standard operating procedures (SOPs) for PFAS sampling, equipment cleaning, field documentation, soil sampling, and low flow groundwater sampling.

## 2.3. Sampling Locations

Six (6) direct-push soil borings are planned in the vicinity of each firefighting training area, as shown in Figures 3 and 4. Final boring locations may be adjusted in the field based on site conditions and/or utility clearance. Final boring locations will be determined in the field using GPS. The rationale for soil boring placement is that groundwater flow is generally in a southeasterly direction, based on previous investigation reports (AMEC Foster Wheeler, 2019), so the planned borings for the East Area and West Area are generally located on Figures 3 and 4, respectively, and area as follows:

- One boring will be located within each of the former firefighting training areas. The East Firefighting Training Area boring will include a soil sample at 1-2 feet bgs and at the water table due to past soil handling activities here.

- One or two borings will be located generally upgradient, approximately 20 to 30 feet north and northwest of each firefighting training area.
- One or two borings will be located immediately downgradient (southeast), within ten feet of each firefighting training area, if possible.
- Two borings will be located generally downgradient, approximately 20 to 30 feet south and southwest of each firefighting training area.

Table 1 contains a summary of the sampling quantities by area for this preliminary investigation. In total, this investigation likely will result in collecting 12 groundwater samples and up to 24 soil samples for laboratory analysis, plus quality assurance samples (duplicates, field blanks, equipment blanks) as described in Section 4.

**Table 1. Sampling Summary for Preliminary Investigation**

| Location | Number of Soil Borings | Number of Soil Samples | Number of Groundwater Samples |
|---|---|---|---|
| Darwin Street/West Firefighting Training Area | 6 | Up to 12 | 6 |
| Pearson Street/East Firefighting Training Area | 6 | Up to 12 | 6 |


**Figure 3. Pearson Street/East Firefighting Training Area Sample Locations.**


**Figure 4. Darwin Street/West Firefighting Training Area Sample Locations.**

## 2.4. Sampling Methods

All soil borings will be advanced using direct-push (e.g. Geoprobe) methods. Soil types encountered in each boring will be logged in the field by an experienced scientist or engineer. These borings will be advanced until the water table is encountered. All soil and groundwater samples will be collected by the LimnoTech geologist or engineer observing the boring.

Up to two (2) soil samples will be collected above the water table from each soil boring. The first soil sample will be collected from the uppermost foot of the soil boring, between ground surface and a depth of one foot below ground surface. The second soil sample will be collected from unsaturated soil within one foot of the water table. If extremely shallow groundwater or other conditions are encountered that indicate a second soil sample will yield redundant or otherwise unnecessary data, the second soil sample in each boring may be omitted based on the judgment of the geologist or engineer overseeing the boring. Soil sampling will be conducted in accordance with LimnoTech's SOP for soil sampling (attached), modified as necessary and appropriate by LimnoTech's SOP for PFAS sampling (attached).

Given the shallow depth to groundwater, groundwater samples will be collected using a peristaltic pump. Groundwater will be purged using the pump and conventional water quality parameters will be monitored by field personnel during purging to ensure that the groundwater sample is representative of the aquifer. Groundwater sampling will be conducted in accordance with LimnoTech's SOP for groundwater sampling (attached), modified as necessary and appropriate by LimnoTech's SOP for PFAS sampling (attached).

## 2.5. Analytical Parameters and Methods for Soil and Groundwater Samples

All soil and groundwater samples will be analyzed for PFAS by modified Method 537, unless an approved analytical method for PFAS is approved by the USEPA at the time of the investigation. The laboratory will be certified by the Department of Defense (DoD) to be compliant with Table B-15 of Quality Systems Manual (QSM), dated 2017, version 5.1 or later. Samples collected will be submitted to a certified, qualified laboratory for analysis. **Table 2** provides a summary of PFAS compounds to be analyzed and expected reporting limits

**Table 2. Summary of DCRA Stormwater Sampling PFAS Analytical Parameters**

| Analyte Name | CAS# | Analyte | Aqueous QL (ng/l) | Soil QL (ng/g) |
|---|---|---|---|---|
| Perfluorobutanoic acid | 375-22-4 | PFBA | 4.0 | 2.0 |
| Perfluoropentanoic acid | 2706-90-3 | PFPeA | 4.0 | 2.0 |
| Perfluorobutanesulfonic acid | 375-73-5 | PFBS | 4.0 | 2.0 |
| Perfluorohexanoic acid | 307-24-4 | PFHxA | 4.0 | 2.0 |
| Perfluoroheptanoic acid | 375-85-9 | PFHpA | 4.0 | 2.0 |
| Perfluorohexanesulfonic acid | 355-46-4 | PFHxS | 4.0 | 2.0 |
| 6:2 Fluorotelomer sulfonic acid | 27619-97-2 | 6:2-FTS | 4.0 | 2.0 |
| Perfluorooctanoic acid | 335-67-1 | PFOA | 4.0 | 2.0 |
| Perfluoroheptanesulfonic acid | 375-92-8 | PFHpS | 4.0 | 2.0 |
| Perfluorooctanesulfonic acid | 1763-23-1 | PFOS | 4.0 | 2.0 |
| Perfluorononanoic acid | 375-95-1 | PFNA | 4.0 | 2.0 |
| Perfluorodecanoic acid | 335-76-2 | PFDA | 4.0 | 2.0 |

| Analyte Name | CAS# | Analyte | Aqueous QL (ng/l) | Soil QL (ng/g) |
|---|---|---|---|---|
| 8:2 Fluorotelomer sulfonic acid | 39108-34-4 | 8:2-FTS | 4.0 | 2.0 |
| Perfluorooctane sulfonamide | 754-91-6 | PFOSA | 4.0 | 2.0 |
| Perfluorodecanesulfonic acid | 335-77-3 | PFDS | 4.0 | 2.0 |
| Perfluoroundecanoic acid | 2058-94-8 | PFUnA/PFUdA | 4.0 | 2.0 |
| Perfluorododecanoic acid | 307-55-1 | PFDoA | 4.0 | 2.0 |
| N-methylperfluoro-1-octanesulfonamide | 31506-32-8 | MeFOSA | 20 | 10 |
| N-methylperfluoro-1-octanesulfonamido ethanol | 24448-09-7 | MeFOSE | 20 | 10 |
| Perfluorotridecanoic acid | 72629-94-8 | PFTrDA | 4.0 | 2.0 |
| N-ethylperfluoro-1-octanesulfonamide | 4151-50-2 | EtFOSA | 20 | 10 |
| N-ethylperfluoro-1-octanesulfonamido ethanol | 1691-99-2 | EtFOSE | 20 | 10 |
| Perfluorotetradecanoic acid | 376-06-7 | PFTeDA | 4.0 | 2.0 |
| Perfluorohexadecanoic acid | 67905-19-5 | PFHxDA | 4.0 | 2.0 |
| N-ethyl perfluorooctanesulfonamidoacetic acid | 2991-50-6 | EtFOSAA | 8.0 | 2.0 |
| N-methyl perfluorooctanesulfonamidoacetic acid | 2355-31-9 | MeFOSAA | 8.0 | 2.0 |
| Perfluorooctadecanoic acid | 16517-11-6 | PFODA | 7.0 | 2.0 |
| 4:2 Fluorotelomer sulfonic acid | 757124-72-4 | 4:2-FTS | 4.0 | 2.0 |
| Perfluoropentane sulfonic acid | 2706-91-4 | PFPeS | 4.0 | 2.0 |
| Perfluorononane sulfonic acid | 68259-12-1 | PFNS | 4.0 | 2.0 |
| Hexafluoropropylene oxide dimer acid | 13252-13-6 | HFPO-DA (GEN-X) | 5.0 | 2.0 |
| 4,8-dioxa-3H-perfluorononanoic acid | 919005-14-4 | ADONA | 4.0 | 2.0 |
| 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid | 756426-58-1 | 9Cl-PF3ONS | 4.0 | 2.0 |
| 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid | 763051-92-9 | 11Cl-PF3OUdS | 4.0 | 2.0 |
| Perfluorododecane sulfonic acid | 79780-39-5 | PFDoS | 5.0 | 4.0 |
| 10:2 Fluorotelomer sulfonic acid | 120226-60-0 | 10:2 FTS | 5.0 | 4.0 |

## 2.6. Field Documentation

All field activities will be documented by field personnel using the procedures described in LimnoTech's SOP for field documentation (**Appendix B**), modified as necessary for PFAS sampling by LimnoTech's SOP for PFAS sampling (**Appendix B**). Upon completion of investigation activities, field documentation will be stored with other project files at LimnoTech's office or at another location designated by the project manager. Further detail on field documentation is contained in Section 4.1.2.

## 2.7. Sample Documentation

Sample documentation includes assignment of a unique sample identification number at the time of sampling, which is subsequently used through the chain of custody to the final laboratory report.

### 2.7.1. Sample Identification

Samples will be designated with a unique identification that includes the boring or monitoring well identification number and, in the case of soil samples, the depth interval (in feet below ground surface) from which the sample is collected. The letters “SB” will be used to designate soil borings and “GW” will be used to designate groundwater samples. The letter “W” will be used in sample identification numbers for the Darwin Street/West Firefighting Training Area will include with and the letter “E” will be used in sample identification numbers for the Pearson Street/East Firefighting Training Area. The sample identification numbers will also include the digits “20” to represent the year. Example sample identification codes are given below:

**Table 3. Sample Identification Examples**

| Sample Description | Sample Identification Number |
|---|---|
| Soil boring #1 from Darwin Street/West Firefighting Training Area | SBW20-01 |
| Soil sample collected between 4 to 5 feet below ground surface from soil boring #1 at Darwin Street/West Firefighting Training Area | SBW20-01 (4-5) |
| Groundwater sample surface from soil boring #1 at Darwin Street/West Firefighting Training Area | SBW20-01-GW |

This identification system will reduce the potential for confusion between sample results.

### 2.7.2. Chain of Custody

At the time of sampling, field sampling personnel will initiate a chain of custody (COC) using the COC form provided by the analytical laboratory. The COC is discussed in more detail in Section 4.1.3.

## 2.8. Investigation-Derived Waste

The investigation activities in this Work Plan are expected to generate the following types of investigation-derived waste (IDW):

- Used expendable materials related to sampling (e.g., nitrile gloves)
- Excess groundwater pumped during groundwater sampling
- Equipment decontamination water (municipal supply)
- Excess soil material generated during soil borings

Used expendable materials will be placed in sealed trash bags for disposal at a licensed solid waste facility. Environmental media (groundwater and soil) and decontamination water will be stored in drums at a secure location until they can be properly characterized for disposal.

# 3. Data Quality Objectives

Data quality objectives (DQOs) are quantitative and qualitative criteria intended to ensure that the data collected during the investigation are of an adequate level of quality for their intended uses.

## 3.1. Investigation Data Quality Objectives

The following specific DQOs have been identified for this investigation:

1. Analytical results for groundwater and soil samples must accurately represent actual groundwater and soil chemical quality.
2. Analytical results for groundwater and soil samples should be of sufficient quality to inform the conceptual site model and for comparison to regulatory criteria.
3. Analytical results must meet quality control requirements for accuracy, precision, completeness and comparability.

## 3.2. Data Quality Indicators

Data quality indicators (DQIs) are measures that are used to assess data quality and to verify that DQOs are met. The four DQIs (accuracy, precision, completeness and comparability) are discussed below.

### 3.2.1. Accuracy

Accuracy reflects the degree of bias in a measurement. To determine accuracy, a laboratory or field value is compared to a known or true concentration. Accuracy is determined by such QC indicators as: matrix spikes, surrogate spikes, laboratory control samples (blank spikes) and performance samples. Accuracy will be assessed using percent recovery, calculated as follows:

%R = 100 x (A-B)/C

Where:

%R = percent recovery

A = analyte concentration from spiked sample

B = analyte concentration from unspiked sample

C = analyte concentration of spike added

For this investigation, acceptable %R will be 80% - 120%.

### 3.2.2. Precision

Precision is a measure of the reproducibility of data measurements under similar conditions and is typically assessed by measuring the degree of mutual agreement between or among independent measurements of the same sample. The common measure of precision is the relative percent difference (RPD), calculated as follows:

RPD = 100 x (X1 – X2)/[(X1 + X2)/2]

Where: X1 = original sample value

X2 = duplicate sample value.

RPD relates to the analysis of duplicate laboratory or field samples. Typically, field precision is assessed by co-located samples, field duplicates, or field splits and laboratory precision is assessed using laboratory duplicates, matrix spike duplicates, or laboratory control sample duplicates.

For this investigation target RPD limits will be 40%. RPDs will not be calculated if the observed concentration is less than five times the reporting limit in either the sample or field duplicate.

### 3.2.3. Completeness

Completeness measures the quantity of valid data obtained during the investigation, compared to the quantity of valid data expected. For this investigation, it is expected that all data will be valid. Completeness is calculated as follows:

Completeness = 100 x (number of valid samples obtained)/(number of samples collected)

The completeness goal for this investigation is 95%.

### 3.2.4. Comparability

Comparability expresses the confidence with which one data set can be compared to another. For this investigation, comparability will be assessed by documenting conformance to the work plan and noting any significant deviations. The data quality assurance review will also be considered in assessing data comparability. It should be noted that the current lack of a standardized methodology for the analysis of PFAS in soil and groundwater matrices must be considered when comparing data generated from different analytical laboratories.

# 4. Quality Assurance / Quality Control (QA/QC)

This section outlines the QA/QC measures that will be used during field monitoring activities.

## 4.1. Sample Handling and Custody

### 4.1.1. Field Sampling Custody

The objective of field sample custody is to assure that samples are traceable and are not tampered with between sample collection and receipt by the analytical laboratory. A person will have custody of a sample when the samples are:

- In their physical possession;
- In their view after being in their possession;
- In their personal possession and secured to prevent tampering; and
- In a restricted area accessible only to authorized personnel, and the person is one of the authorized personnel.

Field custody documentation will consist of both field log books and chain of custody forms.

### 4.1.2. Field Logbooks

Field logbooks serve as a daily record of events, observations, and measurements during field activities. All information pertinent to monitoring activities is recorded in the logbooks, and will include:

- Name and title of author
- Name(s) of field crew personnel
- Name of site and project code
- Description of sample location
- Number and volume of samples taken
- Date and time of collection
- Sample identification numbers
- Sampling method
- Preservatives used
- Field measurements (temperature, pH, etc.)
- Field observations (weather conditions, flow appearance, etc.)

### 4.1.3. Chain-of-Custody Forms

Completed chain-of-custody forms will be required for all samples to be analyzed. Chain-of-custody forms will be prepared by the field sampling crew during the daily sample collection events. The chain-of-custody form will contain the following information:

- Unique sample identification number
- Sample location
- Sample date and time

- Sample description
- Sample type
- Sample preservation
- Analyses required
- Sampling staff

The original chain-of-custody form will accompany the samples to the laboratory. The chain-of-custody forms will remain with the samples at all times and will be signed by a representative of the laboratory upon receipt of the samples.

## 4.2. Quality Control Requirements

### 4.2.1. Field Measurements

The accuracy of field measurements will be maintained through calibration of the field instruments according to manufacturer's specifications. Accuracy will be checked prior to the sampling event and following the sampling event and recorded in the field logbook.

### 4.2.2. Field Duplicates

Field duplicates (splits) will be collected and analyzed to check the precision or reproducibility of sampling and analytical procedures. Field duplicates are defined as two separate samples collected at a single location and time, labeled with separate identification codes so the laboratory cannot identify the samples as duplicates. Duplicate samples will be collected at the rate of approximately 10 percent. The duplicate samples will be handled and analyzed by the laboratory exactly the same as all other samples.

### 4.2.3. Field Blanks

Field blanks will be analyzed to check for chemical constituent infiltration and sample bottle contamination originating from sample transport and storage. A field blank will consist of analyte-free water poured into a sample bottle at the sample site and preserved according to the parameters to be analyzed. Field blanks will be collected at the rate of one per event.

### 4.2.4. Matrix Spike/Matrix Spike Duplicates

Laboratory quality control (QC) samples will analyzed as part of standard laboratory practice to monitor the precision and accuracy of its analytical procedures. These laboratory QC samples are referred to as matrix spike/matrix spike duplicate (MS/MSD) samples. The term "matrix" refers to use of the actual media collected in the field (e.g., routine soil and water samples). MS/MSD samples will be collected in the field and submitted to the laboratory with other samples. The DOD QSM specifies that MS/MSD samples be provided at a frequency of "one per preparatory batch" (QSM Table B-2), so the laboratory will specify the number of required MS/MSD samples based on their standard analytical batch size.

## 4.3. Special Precautions: PFC-Free Equipment, Supplies, Materials and Clothing

Special precautions shall be employed to minimize the possibility of sample cross-contamination related to the low PFAS detection limits and the widespread use of PFAS in consumer products and industrial processes, including:

- Conduct sampling beginning in areas of known or suspected lowest concentrations and progressing to areas of highest concentrations;

- Water used for equipment cleaning/rinsing will be sampled periodically to evaluate potential PFAS content;
- Sampling equipment and materials should be free of polytetrafluorethylene (PTFE), ethylene tetrafluoroethylene (ETFE), and fluorocarbon-based products (e.g., field filters, sample tubing, etc.); and
- Personal protective equipment, clothing, and hygiene products should be free of PFAS (e.g., fluoropolymer linings used on Tyvek, Nomex, and Viton materials, GoreTex linings, water resistant/waterproof/stain resistant treatments, sunblock, insect repellents, cosmetics/hand creams, food packaging protective of water and grease). All equipment, materials, supplies and clothing used during field activities must be PFC-free in accordance with the guidelines presented below.

LimnoTech's standard operating procedure for PFAS sampling is contained in **Appendix B**.

## 4.4. Data Assessment

QA review of all data will be conducted and documented before the data are reported in any way other than the original laboratory reports. Level IV QA/QC documentation reports will be requested for the soil and groundwater samples submitted as part of this investigation.

### 4.4.1. Laboratory Data Review and Validation

Laboratory QA review will be conducted in accordance with the laboratory Quality Assurance Plan (QAP). Upon receipt of the laboratory report for each sample batch, the project QA reviewer will verify that internal laboratory QA was conducted.

### 4.4.2. LimnoTech Data Review and Validation

When data are received from the analytical laboratory, they will be evaluated by the project QA reviewer to determine if they meet project requirements. Specific items to be reviewed during data validation are:

- Chain of custody completeness
- Holding times
- Duplicate analyses data
- Field and equipment blank data
- Precision and accuracy data
- Matrix spike and matrix spike duplicate data
- Surrogate standards (where applicable)
- Overall data assessment

The project QA reviewer will document the QA review of each data set in writing.

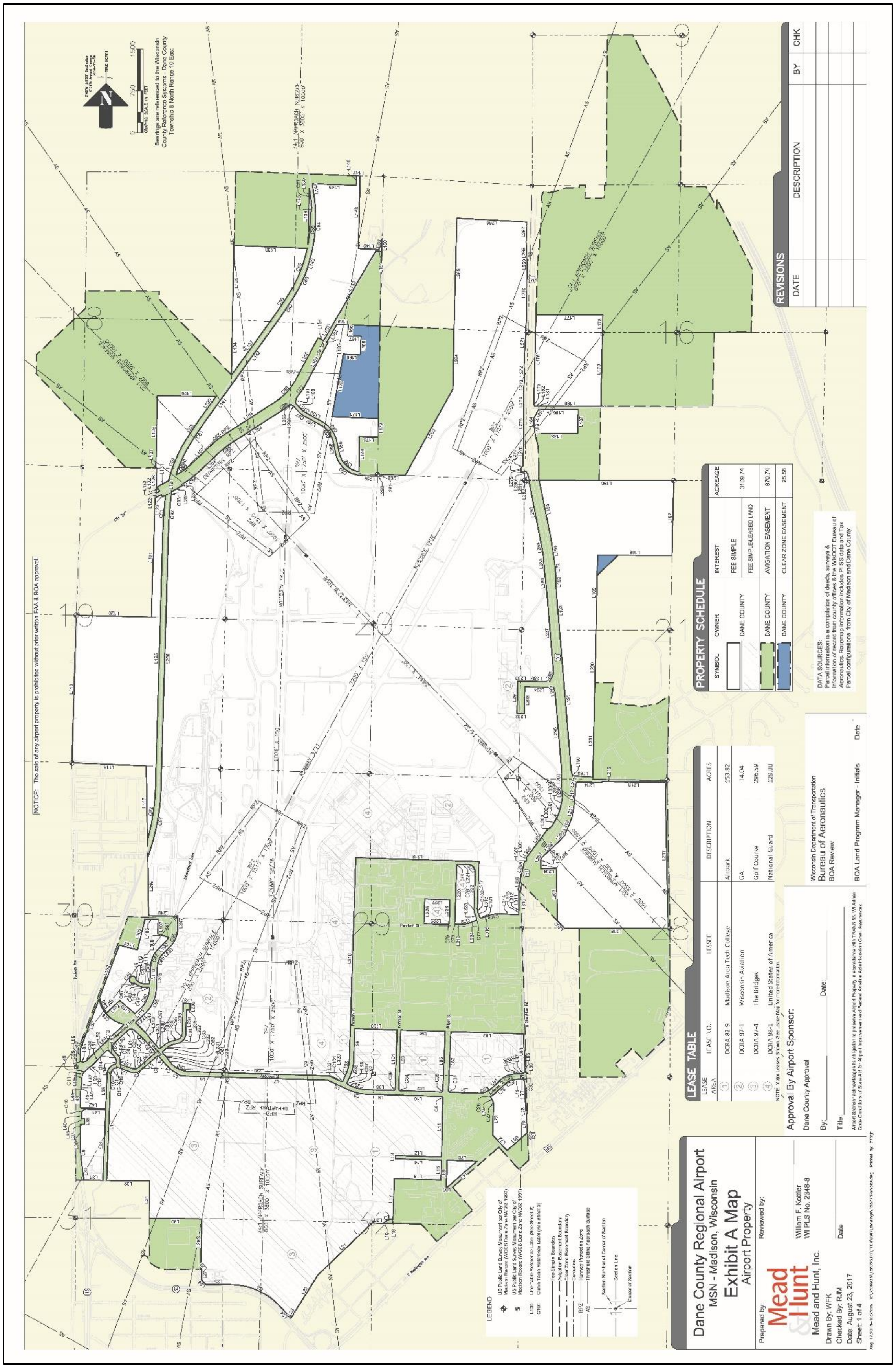
## 4.5. Anticipated Schedule and Reporting

It is expected that sampling at the firefighting training areas will be completed within one month of WDNR's plan approval, subject to the schedule availability of a qualified drilling contractor. A report summarizing the work completed and the sample results will be available within three weeks of final QA/QC data packages.

# 5. Next Steps

Any next steps will be determined by the results of the sampling efforts.  This work plan included soil and groundwater sampling and analysis efforts at former firefighting training areas at the Airport.

# APPENDIX A Airport Property Map


NOTICE: The sale of any airport property is prohibited without prior written FAA & BOA approval
Bearings are referenced to the Wisconsin County Reference Systems - Dane County Township 8 North Range 10 East
LEGEND
Dane County Regional Airport
MSN - Madison, Wisconsin
Exhibit A Map
Airport Property
Prepared by:
Reviewed by:
Mead & Hunt
Mead and Hunt, Inc.
William F. Kottler
WI PLS No. 2348-8
Drawn By: WFK
Checked By: RJM
Date: August 23, 2017
Sheet: 1 of 4
Date
LEASE TABLE
LEASE AREA | LEASE NO. | LESSEE | DESCRIPTION | ACRES
1 | DCRA 82-9 | Madison Area Tech College | Airpark | 153.82
2 | DCRA 97-1 | Wisconsin Aviation | GA | 14.04
3 | DCRA 97-4 | The Bridges | Golf Course | 296.59
4 | DCRA 98-1 | United States of America | National Guard | 129.00
Approval By Airport Sponsor:
Dane County Approval
By: Date:
Title:
Wisconsin Department of Transportation
Bureau of Aeronautics
BOA Review
BOA Land Program Manager - Initials Date
PROPERTY SCHEDULE
SYMBOL | OWNER | INTEREST | ACREAGE
DANE COUNTY | FEE SIMPLE / FEE SIMPLE/LEASED LAND | 3109.74
DANE COUNTY | AVIGATION EASEMENT | 870.74
DANE COUNTY | CLEAR ZONE EASEMENT | 25.58
DATA SOURCES:
Parcel information is a compilation of deeds, surveys & information of record from county offices & the WisDOT Bureau of Aeronautics. Basemap information includes PLSS data and Tax Parcel configurations from City of Madison and Dane County.
REVISIONS
DATE | DESCRIPTION | BY | CHK

# APPENDIX B Standard Operating Procedures

# I. INTRODUCTION

This standard operating procedure (SOP) is applicable to the collection of representative samples for analysis of per- and polyfluoroalkyl substances (PFAS; also referred to as and subsets of perfluorinated chemicals (PFCs)). The procedures described are intended to be applicable to most environmental media and sampling methods, although they were developed with an emphasis on water samples (e.g., drinking water, ground water, surface water). These typically applicable procedures have been adapted from a number of sources and may be varied or changed as required, dependent upon site conditions or equipment and procedural limitations, as long as the goal of collecting representative samples is maintained. The actual procedures used should be documented in the field notes, especially if changes are made. This SOP is designed to be used in conjunction with another SOP that describes the specific sampling methods for a specific environmental medium.

PFAS are a large group of chemicals used in many consumer, commercial, and industrial products and processes, and include water-, stain-, and oil-repelling coatings and fire-fighting foams. Some chemicals in this group (e.g., perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA)) have been identified as persistent, bioaccumulative, and toxic chemicals. PFOS, PFOA, and their known precursors were largely phased out in the United States in the mid-2000s and early 2010s. Sample analytical reporting for PFAS analytes is usually at very low concentrations (parts per trillion, ppt), which can exacerbate problems with cross-contamination of samples.

There are two primary interferences or potential problems with representative sampling. These include cross contamination of samples and improper sample collection. Following proper decontamination procedures and minimizing disturbance of the sample site will minimize these problems as follows:

- Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment for each location. If this is not possible or practical, then decontamination of sampling equipment is necessary. Refer to the Equipment Cleaning SOP.
- Conduct sampling beginning in areas of known or suspected lowest concentrations and progressing to areas of highest concentrations.
- Improper sample collection can involve using contaminated equipment, disturbance of stream or impoundment substrate, and sampling in an obviously disturbed area.

To collect a representative sample, the hydrology and morphometrics of a stream or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons or impoundments, flow patterns in streams, and appropriate sampling locations and depths. In addition, water quality indicator data may be collected, if necessary, in water bodies to determine if stratification is present. Measurements such as dissolved oxygen, pH, temperature, and redox potential can indicate if strata exist which would affect analytical results.

# II. MATERIALS

A wide range of products commonly used in site investigations are known or suspected to contain PFAS. It is critical that the sampling program design consider as many sources of PFAS contamination as practicable to minimize cross contamination during a sampling event. All field equipment, supplies, materials and personnel clothing used during sampling operations shall be PFAS free as noted below and in Tables 1 and 2.

- All sampling, monitoring and drilling equipment (e.g., field filters, tubing, pumps, lubricants, packers, transducers, liners, O-rings, pipe-thread pastes, tapes, sealants, valves, and wiring) must be constructed of materials that are free from the following:
  a) Polytetrafluorethylene (PTFE), trademark Teflon®;
  b) Ethylene tetrafluoroethylene (ETFE), trademark Tefzel®;
  c) Polyvinylidene fluoride (PVDF), trademark Kynar®;
  d) Fluorinated ethylene propylene (FEP), trademark Neoflon®.
- Personal protective equipment, clothing, and hygiene products should be free of PFAS (e.g., fluoropolymer linings used on Tyvek, Nomex, and Viton materials, GoreTex linings, water resistant/waterproof/stain resistant treatments, sunblock, insect repellants, cosmetics/hand creams, food packaging protective of water and grease).
- Sample containers should be polypropylene or HDPE and/or as specified/provided by the laboratory; do not use glass to avoid analyte adsorption.
- Sample transfer to the laboratory should be conducted at 4°C ± 2°C or as specified by the laboratory using ice in double-bagged polyethylene plastic; do not use chemical- or gel-based cooling products.
- Use only laboratory-supplied PFAS-free water for preparation of field reagent blanks and equipment blanks.
- Water from any other sources, including public water supplies, used for any other purposes must be pre-determined to be PFAS-free.
- Deionized (DI) water will not be used to clean equipment due to the possible contamination from polytetrafluoroethylene material used in the DI water purification system.

## III. PREPARATIONS

- Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies needed.
- Obtain the necessary sampling and monitoring equipment to suit the task. Consider sample volume, depth, deployment circumstances (shore, wading, boat, currents), type of sample, sampler composition materials, and analyses to be conducted.
- Decontaminate or pre-clean equipment and ensure that it is in working order.
- Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
- Perform a general site survey prior to site entry, in accordance with the site-specific Health and Safety Plan.
- Use stakes, flagging, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.
- If collecting sediment or near-shore soil samples, develop procedures that will eliminate interferences with collection of representative water samples.
- The field team leader will work with field personnel to assure compliance with PFAS-free guidelines (see Table 1)

prior to commencement of field activities. Table 2 provides a list of prohibited and acceptable items for a PFAS field investigation. Daily compliance inspections will be conducted prior to beginning field activities. Corrective action will include removal of noncompliance items or workers from the site until in compliance.

## IV. GENERAL SAMPLE COLLECTION PROCEDURES

1. Record pertinent data on the field log (see attached Surface Water Sampling Field Log, or equivalent).
2. Label all sample containers with the date, time, well number, site location, sampling personnel, and other requested information.
3. Don appropriate personal protective equipment (as required by the Health and Safety Plan).
   - Do not sample without powderless nitrile gloves.
4. Clean all sampling equipment prior to sample collection according to the procedures described in Section V.
5. Sample collection (see Tables 1 and 2 for complete lists of acceptable and unacceptable attire, materials, etc.):
   - The sample cap should never be placed directly on the ground during sampling.
   - Markers (Sharpie® or otherwise) are to be avoided.
   - Bottles should only be opened immediately prior to sampling.
   - Dust and fibers must be kept out of sample bottles.
   - Ballpoint pens may be used to label sample containers.
   - Samples should be double bagged using resealable low-density polyethylene (LDPE) bags (e.g. Ziploc®.
   - If possible, collect PFAS samples prior to collecting samples for other, non-PFAS analytes (e.g., VOCs) or field parameters (temperature, pH, etc.).
6. For samples requiring field filtering, use the appropriate PFAS-free equipment and, if possible, collect the sample directly into the sample container.
7. If field preservation is required (see SAP and/or QAPP), place appropriate preservative into the sample container prior to sample collection. Note the preservative used on the sample container and sampling log.
8. Quality control samples are normally specified and described (i.e., collection procedures, frequencies) in the work plans (SAP and/or QAPP), and for PFAS sampling they may include trip blanks, field reagent blanks, field equipment blanks, field duplicate samples, and matrix spike/matrix spike duplicate samples. These samples should be collected in the following manner:
   - Trip blanks should be prepared by the laboratory using PFAS-free water at the time sample bottle ware is prepared for delivery to the field. Trip blank containers shall be of the same type of sample container as those used for investigative samples collected for PFAS analysis. A

laboratory-supplied trip blank (comprised of the same sample containers, containing the same reagents, preservatives and other consumables used for investigative PFAS analysis) shall be placed in the environmental sample cooler immediately after the first sample collected for PFAS analysis is placed in the cooler. Trip blank samples shall be given a sample date and time of when the trip blank is placed in the environmental sample cooler. Trip blank samples shall accompany investigatory sample containers collected for PFAS analysis from collection, during the duration of the sample event, and during shipment to the laboratory. At no time after preparation and prior to arriving at the laboratory shall trip blanks be opened.

- Field reagent blanks should be collected using two appropriate laboratory-supplied containers (one containing PFAS-free water and the other empty). During the sampling event, field personnel transfer the preserved PFAS-free water from one container into the other container, screw on the laboratory-supplied caps, and place the sample containers into the cooler for submittal with the samples collected that day.
- Field equipment or rinse blanks should be collected by pouring PFAS-free water through/over the decontaminated sampling device into the sample container in the field, preserved and shipped to the laboratory with the field samples. Generally, equipment blanks are only collected if reusable sampling equipment is employed.
- Field duplicate samples should be collected into two distinct sample containers at the same time or immediately following one another in accordance with procedures described in the SAP or QAPP. Each sample of a field duplicate pair employs the same type of sample container, preservatives and other additives used. If blind duplicate samples are specified, one of the duplicate samples should be labelled so that it does not identify the other sample of the duplicate pair to the laboratory. For example, one sample of the duplicate pair would be labelled following the normal protocol, while the second would be labelled with a sample ID of "DUPLICATE" and a blank line placed in the location, date and time boxes of the sample label. It is important that the duplicate pair samples are identified separately in the field notes with information including location, sample ID (as entered on the sample container label and COC), sample date and time so that analytical results can be paired after received from the laboratory.
- Matrix spike (MS) and matrix spike duplicate (MSD) samples include two additional volumes of sample material collected in the field at the same time as an investigative sample (similar to field duplicate sampling), or may be collected by the laboratory from an existing investigative sample submitted from the field.

9. Record sample collection information on the field log and store the samples in an iced cooler according to the PFAS-free guidelines described herein and in the

Standard Operating Procedure for the Shipping and Handling of Samples.

10. Handle, pack, and ship samples according to the PFAS-free guidelines described herein and in Standard Operating Procedure for the Shipping and Handling of Samples.
    - Do not use chemical or blue ice.
    - Refresh with regular ice double bagged in Ziploc® bags
    - Chain of Custody should be bagged in Ziploc® storage bags and taped to the inside of the cooler lid.
    - The cooler should be taped closed with a custody seal and shipped by overnight courier.

## V. EQUIPMENT DECONTAMINATION

Field sampling equipment used multiple times can become contaminated with PFAS. Decontamination procedures should be implemented to prevent cross-contamination.

The following procedures must be followed:

- Do not use Decon 90®
- Laboratory supplied PFAS-free water is preferred for decontamination.
- Water from any other sources, including public water supplies, used for any other purposes must be pre-determined to be PFAS-free.
- Deionized (DI) water will not be used to clean equipment due to the possible contamination from polytetrafluoroethylene material used in the DI water purification system.
- Alconox®, Liquinox® and Citranox® can be used for equipment decontamination.
- Sampling equipment can be scrubbed using a polyethylene or PVC brush to remove particulates.
- Decontaminated sampling equipment should be triple rinsed using PFAS-free water.

## VI. EQUIPMENT-SPECIFIC SAMPLE COLLECTION PROCEDURES

See appropriate equipment- and medium-specific sample collection SOP and/or sampling equipment operation manual, as specified in the SAP or QAPP.

## Table 1. PFAS-Free Guidelines.

| PFAS-Free Guidelines (source: USEPA, DoD and ITRC) |
|---|
| **Field Clothing and PPE: (see reference at bottom for acceptable products)** |
| No clothing or boots containing Gore-Tex™ |
| All safety boots made from polyurethane and PVC |
| No materials containing Tyvek® |
| Field crew has not used fabric softener on clothing |
| Field crew has not used cosmetics, moisturizers, hand cream, or other related products this morning |
| Field crew has not applied unauthorized sunscreen or insect repellant |
| **Field Equipment:** |
| No Teflon® or LDPE containing materials on-site |
| All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene |
| No waterproof field books on-site |
| No plastic clipboards, binders, or spiral hard cover notebooks on-site |
| No adhesives (Post-It Notes) on-site |
| No Sharpies and permanent markers allowed; regular ball point pens are acceptable |
| No aluminum foil allowed |
| Keep PFAS samples in separate cooler, away from sampling containers that may contain PFAS |
| Coolers filled with regular ice only. No chemical (blue) ice packs in possession |
| **Sample Containers:** |
| All sample containers made of HDPE or polypropylene |
| Caps are unlined and made of HDPE or polypropylene |
| **Wet Weather Gear:** |
| Wet weather gear made of polyurethane and PVC only |
| **Equipment Decontamination:** |
| "PFC-free" water on-site for decontamination of sample equipment. No other water sources to be used. |
| Only Alconox and Liquinox to be used as decontamination materials |
| **Food Considerations:** |
| No food or drink on-site with exception of bottled water and/or hydration drinks (e.g., Gatorade, Powerade) that is available for consumption only in the staging area |
| Reference-NHDES https://www.des.nh.gov/organization/divisions/waste/hwrb/documents/pfc-stakeholder-notification-20161122.pdf |

## Table 2. Prohibited and Acceptable Items for Perfluorinated Compound (PFC) Field Investigations.

| PPE, Clothing, Hygiene Products | PFC Concerns | Approved Alternative |
|---|---|---|
| **Steel-toed boots** | Boots may not contain Gore-Tex. Many waterproof boots are lined with Gore-Tex and are prohibited. | Steel-toed boots made with polyurethane and polyvinyl chloride (PVC) |
| **Clothing** | Water resistant, waterproof, or stain-treated clothing should be avoided. (EDQW 2016) | Clothing made of synthetic or natural fibers should be worn. Non-new cotton is preferred. Field gear should be laundered a minimum of six times prior to use, avoiding use of fabric softeners. Cotton overalls may be provided for use. |
| **Rain Gear** | Most rain gear is coated with a Gore-Tex lining and contains fluoropolymers. | Rain gear made from polyurethane and wax-coated materials may be worn (U.S. Navy 2015; EDWQ 2016). |
| **Gloves** | Nitrile gloves are specified for use in EPA Method 537. | Only nitrile gloves should be used. These should be changed often as outlined in EDQW 2016. Recommended powderless nitrile gloves. |
| **Protective clothing** | Fluoropolymer linings are used on Tyvek, Nomex, and Viton materials (U.S. Navy 2015; EDWQ 2016) | Avoid these materials. Select alternative protective clothing that does not contain fluoropolymers. |
| **Sunblock and insect repellant** | Many manufactured sun blocks and repellants contain PFCs. | Avoid use. If necessary, use of a 100% natural ingredient product may be used upon approval. |
| **Cosmetics, moisturizers, hand creams, etc.** | Many of these products contain surfactants and represent a potential source for PFCs. | Use of these products should be avoided prior to a sampling event. Acceptable products may include:<br>***Sunscreens*** - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, Baby sunscreens that are "free" or "natural"<br>***Insect Repellents*** - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics<br>***Sunscreen and insect repellant*** - Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion |
| **Food and drink** | Food packaging often contains PFCs as a protectant from water and grease. | No food or drink shall be brought on-site, except for bottled water and hydration drinks. No blue ice packs should be used. Additionally, hands should be thoroughly washed following consumption of any wrapped fast food or pizza. |

| General Sampling Equipment and Field Supplies | Approved Alternative |
|---|---|
| Standard decontamination water or municipal water | Water from a known source that has been analyzed for PFCs and has been determined to be acceptable for the specific sampling program. |
| Decon 90 detergent | Alconox and Liquinox are the only detergents approved for decontamination (EDQW 2016) |
| Glass or Teflon-lined sampling bottles and lids | Polypropylene or high-density polyethylene (HDPE) sample bottles with an unlined polypropylene HDPE screw cap |
| Fluoropolymer tubing, valves, and other parts in pumps | HDPE and silicon materials (EDQW 2016) |
| Teflon tubing, bailers, tape, and plumbing paste | HDPE and silicon materials or disposable equipment |
| Pumps, packers, transducers, tubing, liners, valves, and wiring with polytetrafluorethylene or ethylene tetrafluoroethylene | Alternative materials |
| LDPE HydraSleeves | HDPE HydraSleeves (EDQW 2016) |
| Aluminum foil | Thin HDPE sheeting |
| Markers and waterproof pens | Non-waterproof pens (EDQW 2016) |
| Rite-in-the-rain paper, binders, and plastic clipboards | All field paperwork should be printed on standard paper and placed in a non-water-resistant folder or aluminum clipboard (EDQW 2016) |
| Post-It Notes | No Post-It Notes should be brought to the site |
| Chemical (blue) ice packs | Only regular ice should be used for refrigeration on site (EDQW 2016) |

Table 2 References

Source Document - Groundwater and PFAS: State of Knowledge and Practice, Section 5: Field Sampling and Analysis, National Groundwater Association Press, 2017 – Draft Copy Not NGWA Board-approved, Not for circulation.

EDQW 2016. Bottle Selection and Other Sampling Considerations When Sampling for Per- and Poly-Fluoroalkyl Substances (PFAS). Revision 1.1.

U.S. Navy 2015a. Perfluorinated Compounds (PFCs) Interim Guidance/Frequently Asked Questions (FAQs). Memorandum from Commander, Naval Facilities Engineering Command, January 29, 2015.

U.S. Navy 2015b. Bureau of Medicine and Surgery, 2015. Testing for Perfluorochemicals (PFCs) in Drinking Water. Memorandum for Commander, Navy Medicine East.

## SAMPLE COLLECTION FIELD LOG

Project Name:________________Project Code:___________Page __ of __

| Date | Time | Sample ID | Sample Location | Equipment Used | Samplers | Comments (sample volumes, preservatives, descriptions, weather conditions, other observations, etc.) |
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Notes:

## I. INTRODUCTION

Equipment cleaning areas will be located within or adjacent to a specific work area or as specified in the Health and Safety Plan. The equipment cleaning procedures described in this document include pre-field, in-field, and post-field cleaning of sampling equipment. The sampling equipment consists of soil sampling devices, well construction materials, ground-water sampling devices, water testing instruments, and other activity-specific sampling equipment. All non-disposable sampling equipment will be cleaned after completion of each sampling event. If appropriate, cleaning procedures will be monitored through the analysis of rinse blank samples as described in the project work plan or QAPP. **NOTE: If field activities involve per- and polyfluoroalkyl substances (PFASs) such as PFOS or PFOA, refer to the PFAS sampling SOP for additional measures which supersede this SOP.**

## II. MATERIALS

The following materials will be available during equipment cleaning, as needed:

- Personal protection equipment (as required in the Health and Safety Plan);
- Distilled/de-ionized water;
- Non-phosphate detergent (Alconox, Liquinox, or equivalent);
- Tap water;
- Appropriate cleaning solvent (e.g., methanol, hexane, nitric acid);
- High-pressure hot water/steam cleaning unit;
- Wash basins;
- Brushes;
- Polyethylene sheeting;
- Aluminum foil;
- Plastic overpack drum, storage tub, or other suitable storage unit (for bladder or other pumps);
- Large heavy-duty garbage bags;
- Spray bottles (to hold tap water, distilled/de-ionized water, methanol, hexane, or nitric acid); and
- Disposable and/or heavy-duty reusable (PVC, latex or nitrile) gloves.

## III. STORAGE OF EQUIPMENT

All cleaned sampling equipment will be stored in a clean environment and, where appropriate, the equipment will be covered/sealed with aluminum foil.

## IV. SAFETY PROCEDURES DURING EQUIPMENT CLEANING

1. Personnel will wear the following personal protection equipment at a minimum, when cleaning sampling equipment (e.g., split-spoon sampler, trowels) and larger equipment (e.g., drill rig, augers):

- Safety glasses, goggles, or a splash shield; and
- PVC, latex, or nitrile outer gloves,
- Coated Tyvek® or Saranex® disposable coveralls or rain suit, optional for small equipment cleaning; and
- Chemical resistant over boots, optional for small equipment cleaning.

2. All solvent rinsing if required, will be conducted in an adequately ventilated area.
3. All solvents transported into the field will be stored and packaged in appropriate containers with care taken to avoid exposure to extreme heat.
4. Handling of solvents will be consistent with the manufacturer's Material Safety Data Sheets (MSDS).

# V. FIELD CLEANING PROCEDURES

## A. Cleaning Station

A designated field equipment cleaning station location will be established to conduct all cleaning at each work area of the Site. The field equipment cleaning station will be located away from the immediate work area to minimize adverse impacts from work activities on the cleaning procedures, but close enough so the sampling teams can minimize equipment handling and transport. All heavy equipment such as drill rigs and backhoes will receive an initial cleaning prior to use at the Site and will be cleaned again before leaving the site. The frequency of any additional cleaning will depend on the amount of use the heavy equipment receives and the extent of exposure to dirt and contaminants during the sampling event.

## B. Cleaning of Smaller Sampling Equipment

Cleaning of smaller sampling equipment (e.g., split-spoon samplers, bailers, trowels) will be conducted according to the following sequential procedure:

- ♦ Non-phosphate detergent (Alconox, Liquinox, or equivalent) and tap water wash;
- ♦ Tap water rinse;
- ♦ Solvent rinse, if required (e.g., methanol or hexane for organic constituent analysis, nitric acid for inorganic constituent analysis); and
- ♦ Triple distilled/de-ionized water rinse.

The first step in decontamination is physical removal, where gross contaminants such as dust, soils and sediments can be removed through physical means such as wiping, scraping, shaking, and in some cases steam cleaning. Non-phosphate detergent and tap water scrub is intended to remove all visible particulate matter, residual oil and grease, and most but not all contaminants. Surfactants or detergents accumulate at the water to gas, solid, and oils interface, break the adhesive forces between the contaminant and the surface being cleaned, making the contaminants more soluble, allowing the contaminants to be washed away. The tap water rinse is necessary to remove all soapy residues and wash away loosened contaminants. The need for a specific solvent used for the solvent rinse, if required in the work plan or QAPP, will depend upon what the sample will be analyzed for and what contaminants are expected to be present. Some contaminants such as PCBs adhere to surfaces so tightly that a methanol or hexane rinse is required to break the adhesive bonds and adequately decontaminate the sampling equipment. Caution should be used when using solvent rinses to make sure that the chosen solvent is compatible with the sampling equipment and any PPE it will be used upon. It should be noted that most PPE constructed of organic materials could be damaged or dissolved by organic solvents such as alcohols, ethers, ketones, aromatics, straight chain alkanes and common petroleum products. The final rinse of distilled/de-ionized water will be repeated three times. Rinsing removes any remaining contaminants through dilution, physical attraction, and solubilization. The equipment will then be allowed to air dry.

## C. Cleaning of Submersible Pumps

Submersible pumps may be used to evacuate stagnant groundwater from the well casing (e.g., air lift or turbine pumps) or to collect samples (e.g., bladder pump). The pumps will be cleaned and flushed between wells using an external detergent wash and tap water rinse. Steam cleaning may be substituted for pump casing, hose, and cables followed by a flushing with potable water through the pump and tubing or discharge hose. The cleaning process for development and purge pumps can be performed by pumping potable water from a clean plastic over-pack, drum or storage tub until a sufficient amount of water has been flushed through the system. The decontamination process for sampling pumps will consist of filling each of three clean suitable decontamination units sequentially with detergent water, tap water, and distilled/de-ionized water. Placing the sampling pump into each respective decontamination unit and pumping sufficient liquid from each unit through the sampling pump chamber and tubing if appropriate, to flush out any contaminants. It is recommended that disposable tubing be used whenever possible, thus reducing the amount of equipment and time needed for decontamination. In some cases, the chosen sampling pump (e.g. QED Micro Purge bladder pump) can easily be disassembled, decontaminated as individual small parts, disposable parts such as bladders and grab plates replaced and them reassembled for use. Such a pump, if appropriate for your sampling situation, would save time when cleaning and provide a more thorough decontamination, since all surfaces of the pump in which sample water has contact can be inspected, cleaned or replaced. If electric power pumps are used, care should be taken to avoid contact with the pump, well casing, pump reel and sample or purge water in direct contact with the pump, while the pump is running to avoid electric shock.

## D. Cleaning of Heavy Equipment

Other equipment and materials, such as drill rigs, well casings, tools, and auger flights, associated with sampling events, will be cleaned prior to use. This equipment may retain chemical constituents from sources unrelated to the sampling site such as roadways, storage areas, or material from previous job sites that were not adequately removed. Heavy equipment will be thoroughly steam cleaned and/or manually scrubbed and rinsed upon arrival on site and when moved between sampling locations, as necessary. Drill rig items such as auger flights, wrenches, drill rods, and drill bits will also be cleaned before changing sample locations.

## E. Collection and Disposal of used Solvents, Residuals and Rinse Solutions

All solvents, residuals, and rinse waters generated during the cleaning of equipment on-site will be collected, containerized, and stored on-site until arrangements can be made for proper disposal.

# I. INTRODUCTION

Documentation of observations, conditions and generated data during field activities is an accepted scientific procedure and a critical component of any investigation. The rigorous documentation methods described in this SOP may be changed, as necessary, depending upon the needs of any particular investigation. Review the project work plans for any specific field documentation guidance. If changes are made to this SOP, document those changes in the field notes.

# II. Methodology

- Use a new bound logbook for each project.
- Label logbook cover and binding with project name and code. Label inside cover with site information (name, address, contact(s), phone numbers, etc.). This will serve as a reference when performing fieldwork.
- Number each page of the logbook sequentially.
- All entries must be made in indelible ink (black is preferred because it copies well).
- All corrections or changes should be initialized, dated and marked with a circled error code. Any mistakes should be drawn through with a single line. Commonly error codes that may be used include: RE Recording Error, CE Calculation Error, SE Spelling Error, CL Changed for Clarity, WO Write Over.
- All entries should be accurate, factual, and unbiased. Never record an opinion.
- Notes should be detailed but concise.
- Notes should be written such that the day's activities can be reconstructed at a later date.
- Date the beginning of each day's notes.
- Use the 24-hour time format throughout the notes.
- Complete each day's notes with your signature.
- Maximize use of each line, crossing out gaps and blank pages so notes cannot be altered.
- Reference in the logbook when using other forms (e.g., boring logs, sampling forms, etc.).
- Return logbook to project manager upon completion of fieldwork.

# III. Materials

The materials required for this SOP include the following:

- Bound field logbook(s).
- Field forms.
- Black waterproof/indelible ink pen(s).

# IV. Items to include in a logbook

Field activities can vary widely. Entries in field logbooks will describe activities conducted and may include, but are not limited to, the following:

- Times of arrival and departure for ALL site personnel.
- Personnel on-site and affiliation (LTI and subcontractor, regulatory personnel, visitors/guests, and uninvited intruders).
- List of equipment used on-site (LTI and subcontractor).
- Detailed descriptions of daily activities.
- Locations of structures, features, utilities, etc.
- Conversations with client, contractor, regulatory agencies, office (changes to scope of work, health and safety

issues, and cost/payment issues are especially important).

- Weather conditions.
- Documentation of field instrument calibration.
- Documentation that photos were taken (include date/time of photo, photographer, site name/location, description of photo subject, compass direction taken, photo number).
- Sample collection and field measurement information including sample location, description, date/time, methodology, container types, preservatives, instrument type/serial number (reference applicable field form, if applicable).
- Wastes generated (containers, volumes, matrix, storage locations).
- Materials used (e.g., water sources, well materials, field reagents, construction materials).
- Deviations from intended scope of work.
- Deviations from SOPs if not already indicated in the work plan.
- Keep notes legible so others can read the logbook.

**A bound logbook is the legal documentation of fieldwork performed at a site. Always remember that your notes may be used in litigation.**