Initial Site Investigation Work Plan for BRRTS Activity # 02-13-584472

Plan prepared by

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February 17, 2020 (revised)

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1.0 Introduction and Facility Information

Pursuant to the Wisconsin Department of Natural Resources (WDNR) October 11, 2019, letter regarding BRRTS Activity #02-13-584472 and a meeting on 21 January 2020, this document has been revised to provide a description of activities being initiated at the Dane County Regional Airport (Airport) to initiate the investigation of reported and suspected per- and polyfluorinated alkyl substances (PFAS). In the case of the storm water discharges, sampling data has established the presence of PFAS compounds in discharges from certain Airport storm water outfalls. Therefore, the need is to identify and isolate source(s) of illicit groundwater discharges containing PFAS into the storm sewer system so that interim corrective actions, such as lining, grouting, or other methods of removing infiltrating groundwater can be taken. The need to assess the likelihood of there being PFAS contamination will lead to soil and groundwater field investigations under a next phase if there is a risk of PFAS being present.

The purpose of this initial investigation is to evaluate the presence of PFAS in the Airport's storm water system and inform the next steps of investigation and interim remedial action planning. This work plan has been developed to address elements specified in Wisconsin Administrative Code NR 716.07 and 716.09. A description of the site and details of the proposed sampling and analysis strategy for this initial investigation are presented in this plan.

A work plan to address soil and groundwater field investigations of the burn pits in response to the October 7, 2019, letter (BRRTS #02-13-584369) is being prepared and will be submitted to WDNR separately.

The Airport is a joint use facility and a Part 139 certificated airport for which the FAA requires the use Aqueous Film Forming Foam (AFFF) for firefighting activities. The Wisconsin Air National Guard (Guard), a tenant at the Airport, provides firefighting services. As the military specification for AFFF currently requires PFAS, the Guard is participating in the cost sharing for the implementation of the investigation described in this Work Plan.

1.1. Site Name and Information

Site Name:	Dane County Regional Airport
Site Address:	4000 International Lane, Madison, WI 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 Parties:	Wisconsin Air National Guard (WANG), 3110 Mitchell Street, Building 1210, Madison, WI 53704-2529 Dane County Regional Airport, 4000 International Lane, Madison, WI 53704 City of Madison, 210 Martin Luther King Blvd., #403, Madison, WI 53703
Consultants Involved:	Mead & Hunt, 2440 Deming Way, Middleton, WI 53562-1562 LimnoTech, 501 Avis Drive, Ann Arbor, MI 4108

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

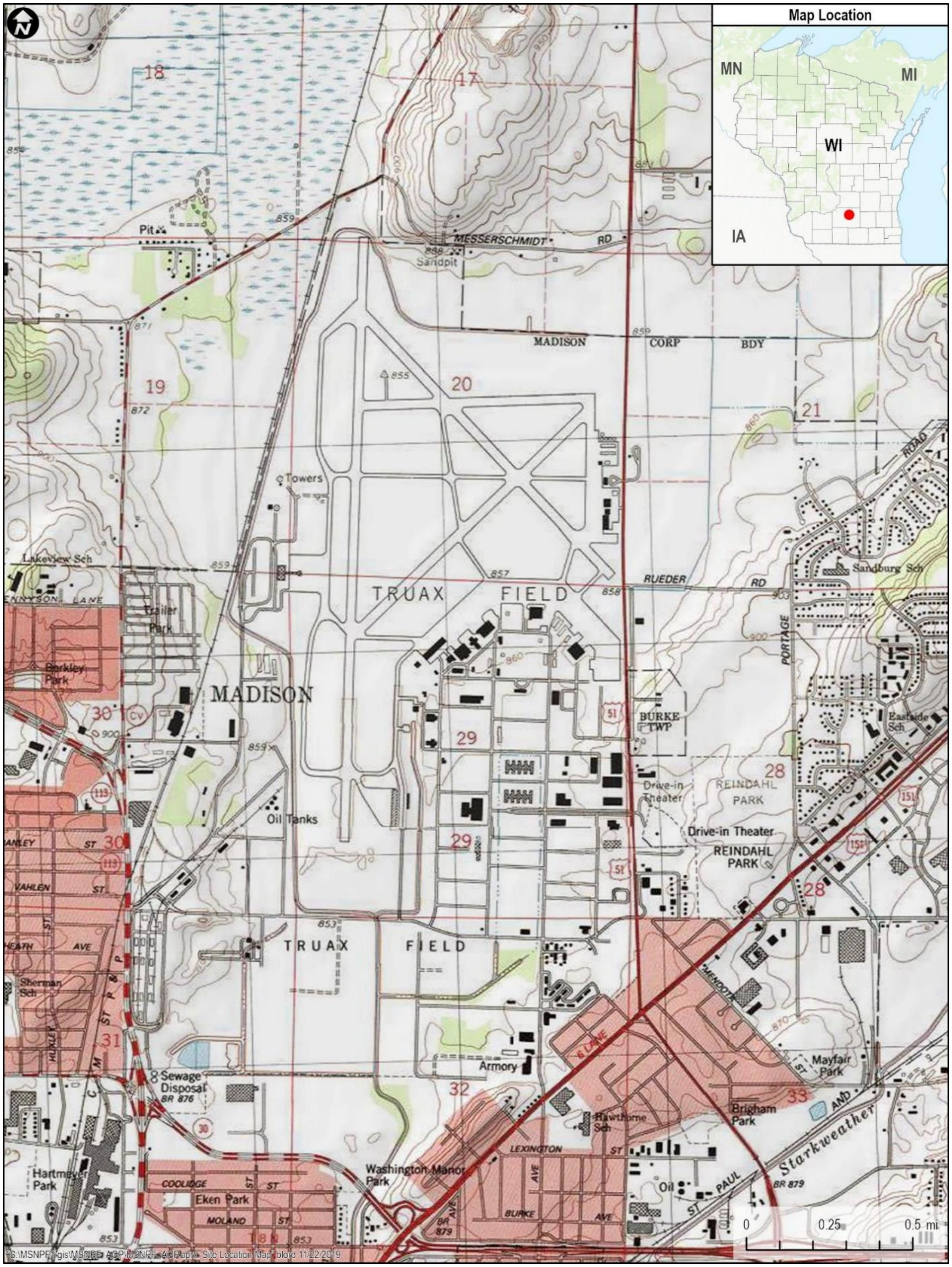

Figure 1. Topographic Quadrangle (DeForest Quad) Showing Location of the Airport.

1.2. Summary of Information Gathered During Scoping

Three sources of information were reviewed as part of the preparation of this work plan: the Phase 1 Regional Site Inspection of Truax Field conducted by Amec Foster Wheeler[1], surface water sampling in Starkweather Creek conducted in 2019 by WDNR[2], and storm water sampling conducted by Mead & Hunt at the Airport between April and June 2019[3].

A Phase 1 site inspection for perfluorinated compounds (PFCs, a.k.a. PFAS) was conducted for the National Guard Bureau at the Truax Field Air National Guard Base (Base) that is located on the southeast side of Airport property. Findings of the inspection were reported in March 2019[4]. The inspection included evaluation of nine (9) potential release areas characterized by sampling of soil and groundwater. Sampling indicated exceedance of the United States Environmental Protection Agency (USEPA) lifetime drinking water Health Advisory for PFOA and PFOS in drinking water in groundwater at nine (9) locations and exceedance of the calculated United States Air Force soil screening level[5] for PFOA and PFOS at two (2) locations. The report recommends further investigations to determine the nature and extent of PFC contamination at each of the nine (9) potential release areas.

In June 2019, WDNR collected surface water samples at four locations on Starkweather Creek, three (3) of which are downstream of the Airport. Varying numbers of PFAS compounds were detected in all samples at varying concentrations with a maximum result of 270 ng/L reported for PFOS at the Fair Oaks Avenue location on the West Branch. This location is approximately 1.5 miles downstream of the Airport, and the PFOS result was over three times higher than the result reported at the Anderson Street location, which is immediately downstream of the Airport.

In October 2019, WDNR collected surface water samples from an additional eleven (11) locations on Starkweather Creek, five (5) locations in Lake Monona, and fish samples from Starkweather Creek and Lake Monona. Varying PFAS compounds were detected in all samples at concentrations ranging from less than 5 ng/l to a maximum result of 3,700 ng/L reported for PFOS. The highest PFOS concentration was reported for a sample collected on an unnamed tributary to the West Branch of Starkweather Creek just east of where the West Branch of Starkweather Creek crosses Anderson Street. This location is south of the Airport and WANG property. The fish samples were collected from the lake, four (4) near the mouth of Starkweather Creek and one (1) further to the southwest away from any immediate effects of water from Starkweather entering the lake. The PFOS concentrations ranged 9.8-12 ppt and the PFOA concentrations ranged from 2.4-2.9 ppt.

[1] Amec Foster Wheeler Environment & Infrastructure, Inc. 2019. *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.
[2] WDNR public notice.
[3] Dane County Regional Airport. October 7, 2019, letter to WDNR regarding supplemental PFAS sampling for WPDES Permit # WI 0048747-04-0 renewal application. October 2019.
[4] Amec Foster Wheeler Environment & Infrastructure, Inc. 2019. *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.
[5] U.S. Air Force screening level (1,260 ug/kg) calculated using the USEPA Regional Screening Level calculator.

In April, May, and June 2019, Mead & Hunt collected samples at the request of WDNR at outfalls that are sampled as part of the Airport's Wisconsin Pollutant Discharge Elimination System (WPDES) permit. Monitoring was conducted during wet and dry weather conditions, and the results were reported to WDNR on October 7, 2019. Sample results indicated the presence of several PFAS compounds at outfalls 003, 032, 001, 034, and 102. Concentrations were generally similar during wet and dry conditions and overall average highest concentrations were observed at outfall 032. Only one compound (PFBA) was detected in one of the two samples collected at outfall 101.

Information from these sources has 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

The Airport is 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 (MSL), 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[6]. 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.

[6] PEER Consultants, P.C. 1988. Final Preliminary Assessment, 128th Tactical Fighter Wing, Wisconsin Air National Guard, Truax Field, Madison, Wisconsin in *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.

- Structurally, regional dips are controlled by numerous domes and uplifts. Except the southern border, the entire province is bordered by topography that is higher in elevation[7].
- 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[8].

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 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 feet 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 obtain during the investigations, four (4) 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 (4) private wells are believed to be abandoned or not in use[9.] As part of the proposed investigation, additional records search will be conducted to verify this, if possible.

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[7] PEER Consultants, P.C., 1988. Final Preliminary Assessment, 128th Tactical Fighter Wing, Wisconsin Air National Guard, Truax Field, Madison, Wisconsin in *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.
[8] Amec Foster Wheeler Environment & Infrastructure, Inc. 2019. *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.
[9] Amec Foster Wheeler Environment & Infrastructure, Inc. 2019. *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.

1.5. Potential migration pathways

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

Elements of this work plan include the following tasks:

- Task 1 – Information Collection and Data Validation;
- Task 2 – Storm Water Discharge Monitoring; and;
- Task 3 – Identification of Next Steps.

Each task is described in the following sections.

2.0 Task 1 – Information Collection and Data Validation

Mead & Hunt will work closely with the Airport in the collection of the following reports/information that will support the storm water investigations:

- Historical use of and locations for PFAS compounds at the Airport
- Geotechnical reports for historical and current Airport projects
- Potential areas where PFAS compounds were used and/or stored at the Airport
- WANG reports under BRRTS 02-13-581254
- Stream and storm water sampling data from the WDNR and Airport, respectively
- Obtaining analytical results and data packages from the Airport, ANG, and WDNR

A Quality Assurance/Quality Control (QA/QC) review of the compiled analytical data will be conducted to evaluate its utility and validity in supplementing the current and future investigations.

3.0 Task 2 - Storm water Discharge Monitoring

The Monitoring Program discussed in this section describes the strategy, locations, methods, and frequencies for monitoring activities under this study. This section also includes a description of QA/QC measures that will be employed and the estimated schedule of activities.

3.1 Sampling Strategy

The strategy for storm water discharge sampling is to identify sources of PFAS entering the storm sewer system for two purposes: (1) To plan interim remedial actions such as lining, grouting, or other isolation methods to reduce the PFAS discharge from the storm sewer system; and (2) as a step to locate the origins of PFAS discharges.. Per the meeting on January 21, 2020, WNDR has requested implementing the draft work plan submitted on December 6, 2019 while the revisions are being prepared and submitted to them for approval. LimnoTech is scheduling this initial storm water system sampling as soon as possible. This sampling will be considered a “dry” conditions event which will allow observations of infiltrating groundwater locations into the storm water systems. A subsequent “wet” weather sampling event will be planned following evaluation of data collected from the proposed sampling event as weather permits.

The initial sampling event will focus on Outfalls 001, 032, and 021 storm water drainage areas. These areas were selected based upon a review of previous Mead & Hunt and WDNR sample data and locations. The sampling teams will collect water samples starting at the lower ends of each sub basin and subsequently work their way upstream through the collection of samples from where pipes entering a junction. Initial samples will be collected from major storm sewer junctions to further aid in identifying specific groundwater infiltration locations with elevated PFAS concentrations. GPS coordinates and flow data will also be collected at each junction sampled to support mass balance estimates. Additional samples may be collected as necessary in sub basins where elevated PFAS concentrations are detected to further define the source of PFAS.

Sections of the storm sewer system that are identified as being a source of elevated PFAS concentrations will be televised to identify areas with excessive infiltration of high PFAS groundwater to identify pipe defects and appropriateness of lining, grouting, or replacing. The proposed televised results will be compared to the previous effort to evaluate pipe integrity. The results of the televising effort and storm water data will be used to assess where the pipes are compromised and inform strategies for interim measures, such as slip lining or grouting to reduce infiltration of groundwater with elevated PFAS concentrations.

Samples for PFAS compounds at the Airport’s existing storm water outfalls (003 to 020, 022, A, 024 to 030, 033 to038) will also be collected during dry weather conditions to characterize storm water runoff from the other drainage areas at the Airport during different runoff conditions. If these additional outfall samples do not indicate PFAS levels, then the outfall drainage basin will be assumed to be unaffected by PFAS source areas and further analysis will not be conducted. However, if an outfall has PFAS levels that warrant further investigation upstream in the basin, then the detailed sampling methodology utilized at Outfalls 001, 021, and 032 will be completed as soon as possible. Sampling data will be used along with data previously generated to systematically extend subsequent monitoring, as necessary, into other branches of the storm drainage network where impacted groundwater might be infiltrating the system.

Sampling locations, frequency, and analyses are described on the next page.

3.2 Monitoring Locations

Storm water runoff will be sampled at the outfall locations shown in **Figure 2**. Samples will be collected as grab samples (see Section 3.2.2). Additional samples will be collected upstream of outfalls within the existing storm water conveyance system based on engineering professional judgement. Earlier sampling of outfalls 001 and 032 had elevated PFAS concentrations so additional samples will be collected within those drainage areas during the dry weather sampling. The elevated PFAS concentration measured downstream of outfall 021 indicates discharges from outfall 021 are a possible source of PFAS so additional sampling is proposed in the outfall 021 collection system. The proposed locations of the sampling points in outfalls 001, 032, and 021 sub basins are shown in **Figure 3, Figure 4,** and **Figure 5**, respectively.

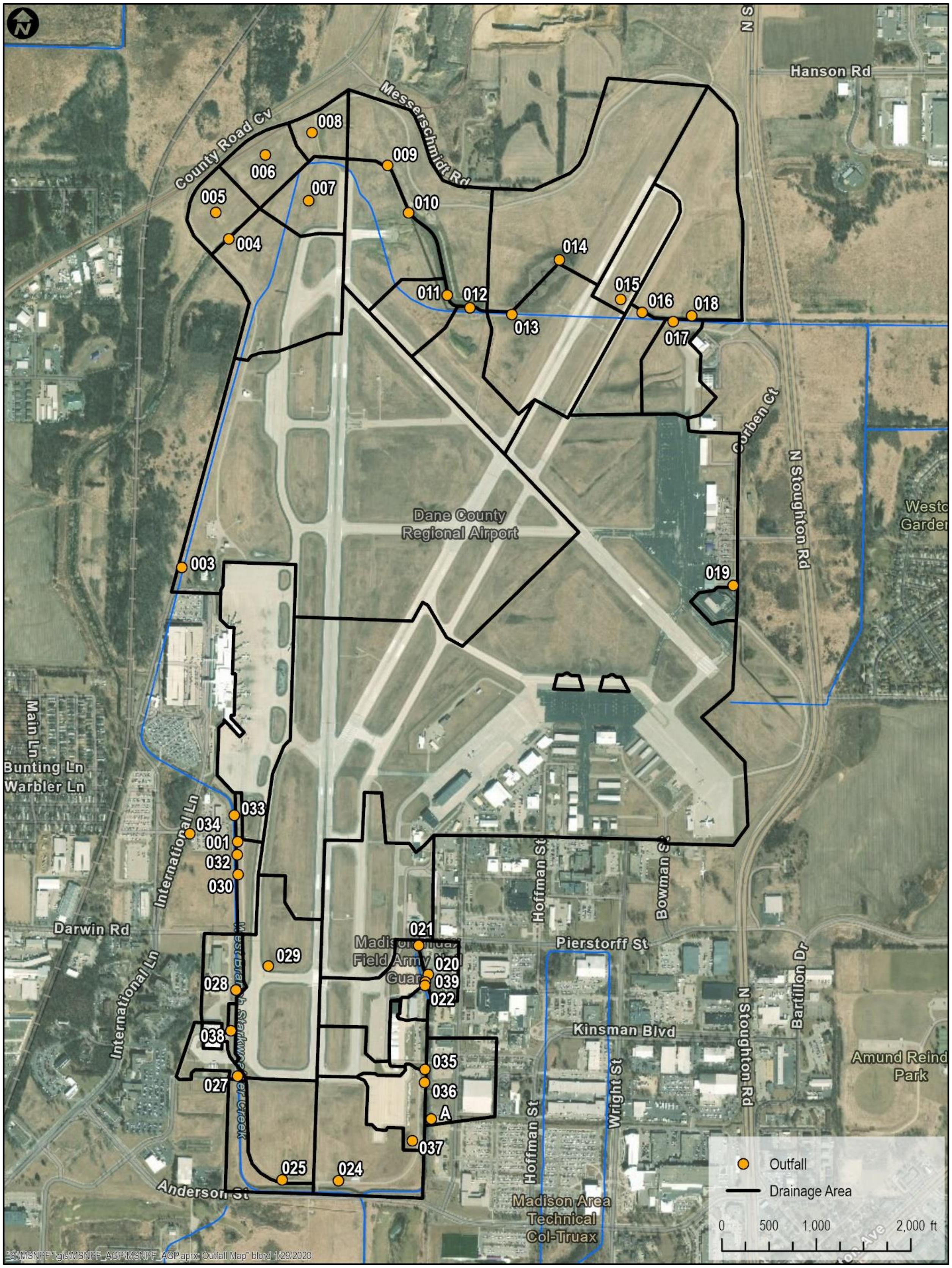


Figure 2. Storm water Outfalls.

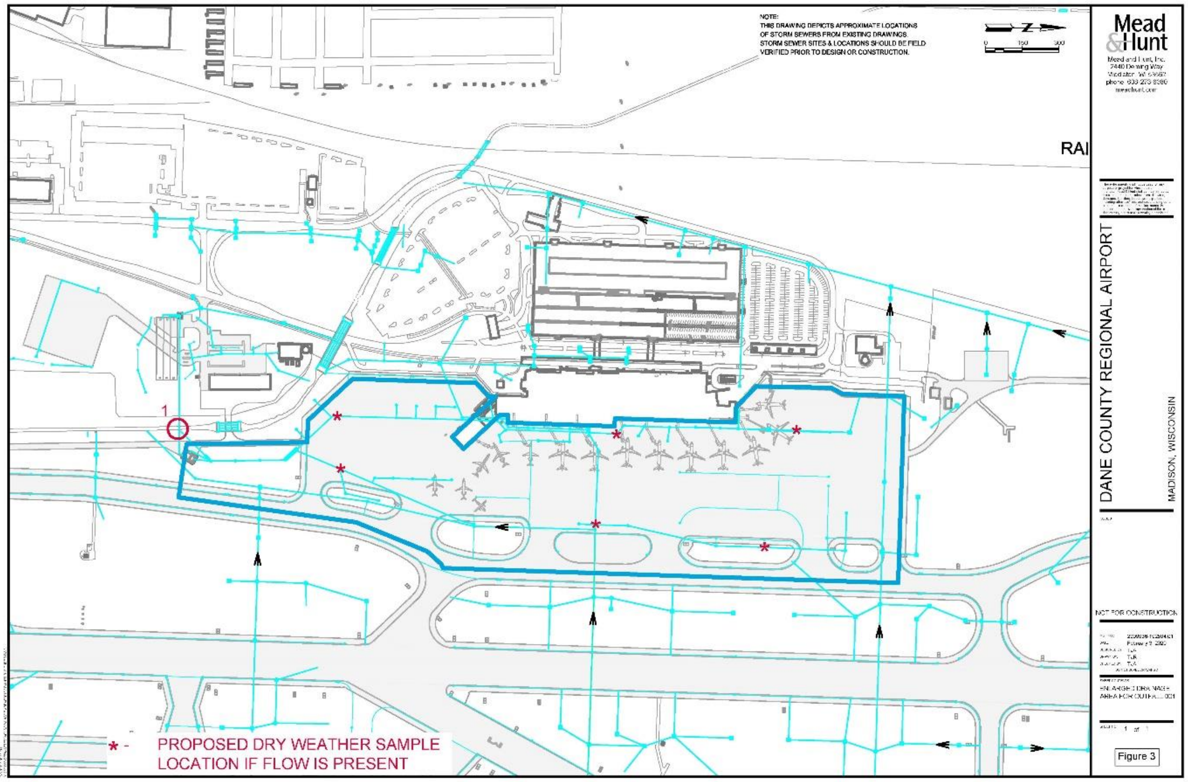


Figure 3. Additional Sampling Locations in the Outfalls 001 Drainage Networks

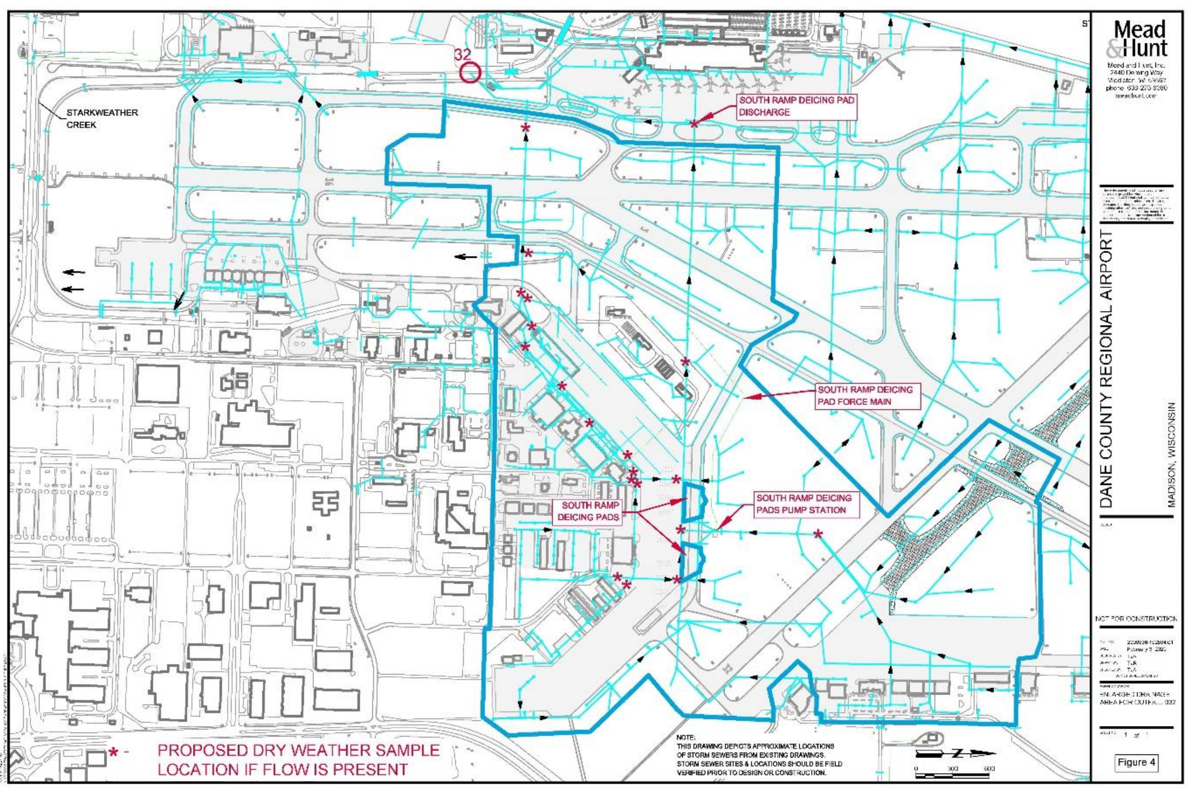


Figure 4. Additional Sampling Locations in the Outfalls 032 Drainage Networks

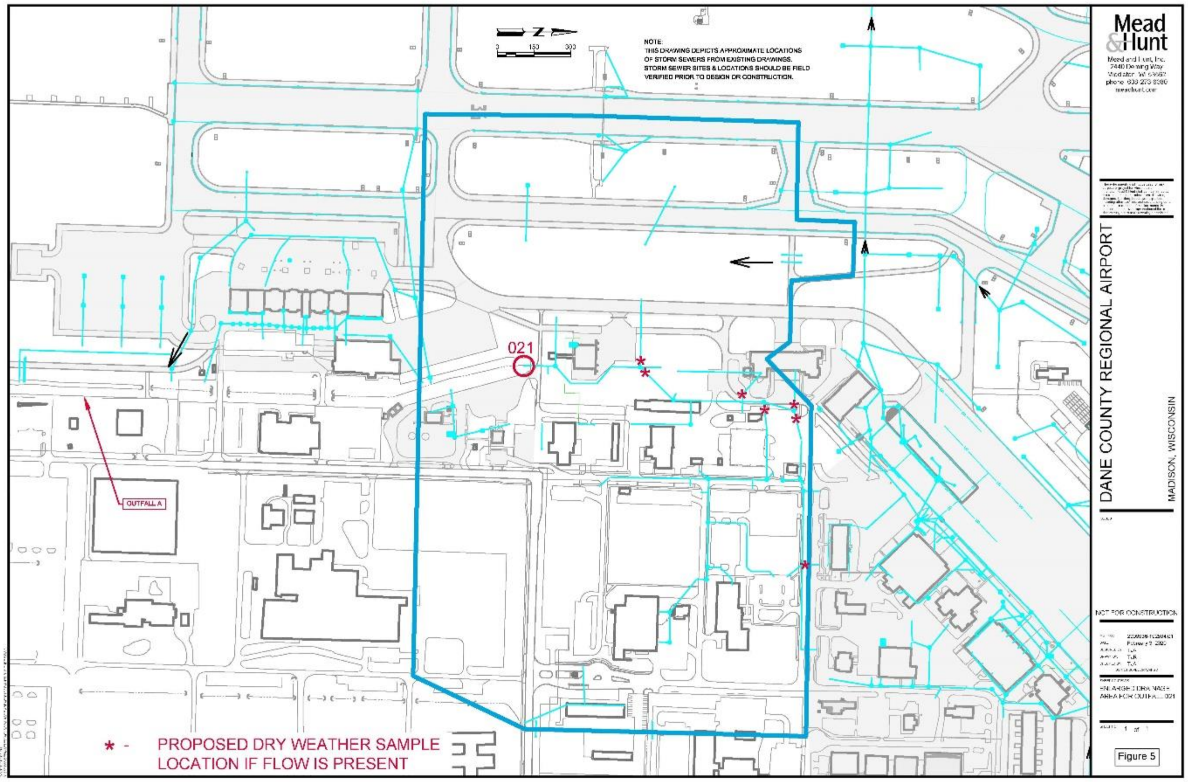


Figure 5. Additional Sampling Locations in the Outfalls 021 Drainage Networks

Table 1 contains a summary listing of the outfalls to be sampled as part of this effort.

Table 1. Outfall Summary.

Outfall	Description
1[1,2]	30" RCCP
3[1,2]	66" RCCP
4	36" RCCP
5	Inlet (21" RCCP)
6	Inlet (27" RCCP)
7	Inlet (30" RCCP)
8	Inlet (15" RCCP)
9	18" RCCP
10	12" RCCP
11	21" RCCP
12	29" x 45" HECP
13	Grass Swale
14	Grass Swale
15	Inlet
16	30" RCCP
17	48" RCCP
18	Grass Swale
19	12" DI
20	18" RCCP

Outfall	Description
21	Grass Swale
22	21" RCCP
24	Grass Swale
25	18" RCCP
26	Grass Swale
27	18" RCCP
28	18" RCCP
29	18" RCCP
30	18" RCCP
32[1,2]	60" RCCP
33	Grass Swale
34[1,2,3]	4" HDPE
35	24" RCCP
36	42" RCCP
37	2-12"" RCCP and 4" HDPE
38	18" RCCP
39	12" RCCP
A	18" RCCP

[1] **NPDES sampling outfall.**
[2] **Sampled earlier in 2019 for PFAS.**
[3] **Same drainage area of 001. Will not be sampled.**

During each sampling event, samples will be collected if flow is present. If no flow is present, the condition will be noted as part of the documentation of field activities. If the outfall cannot be safely accessed, a sample will be collected at the closest available upstream location within the storm water system. This condition will also be noted as part of the documentation of field activities.

3.2.1 Monitoring Events and Sampling Frequency

One wet and one dry weather event will be monitored at selected outfalls based upon the results of the dry weather samples to characterize storm water quality. A qualifying rainfall event will be defined as a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that created 0.1 inch of rainfall. The dry weather event will be conducted following a period of at least 72 hours after the previous measurable storm event that created 0.1 inch of rainfall.

Meteorological data will be monitored and obtained from the National Weather Service (NWS) monitoring station at the Airport. Meteorological data recorded during qualifying rainfall events will include the following parameters:

- Minimum, maximum, and average temperature
- Total precipitation
- Duration of precipitation

Forecasted rainfall from this station will be used to identify qualifying rainfall events based on forecasted rainfall depth and time since the last event.

3.2.2 Analytical Parameters and Methods

Storm water samples will be collected manually, as grab samples and flow rates will be measured at each location. Each sample will be analyzed for appropriate PFAS compounds using Method 537 (Modified). 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 quantitation limits as provided by the laboratory. Flow measurements will be used to estimate PFAS mass balances.

We are recommending reducing the number of PFAS compounds for this analytical sampling. Our justification is that several of the WDNR proposed compounds have not been detected in any of the samples collected to date (either WDNR or M&H events) and the same Method 537 analysis for the standard 24 compounds can be performed by a certified laboratory.

All laboratory reports will be submitted electronically following analysis of each sample batch.

Table 2. Summary of Storm water Sampling PFAS Analytical Parameters.

Analyte Name	CAS#	Analyte	RL (ng/l)
Perfluorobutanoic acid	375-22-4	PFBA	6.9
Perfluoropentanoic acid	2706-90-3	PFPeA	3.4
Perfluorobutanesulfonic acid	375-73-5	PFBS	3.4
Perfluorohexanoic acid	307-24-4	PFHxA	3.4
Perfluoroheptanoic acid	375-85-9	PFHpA	3.4
Perfluorohexanesulfonoic acid	355-46-4	PFHxS	3.4
6:2 Fluorotelomer sulfonic acid	27619-97-2	6:2-FTS	6.9
Perfluorooctanoic acid	335-67-1	PFOA	3.4
Perfluoroheptanesulfonoic acid	375-92-8	PFHpS	3.4
Perfluorooctanesulfonic acid	1763-23-1	PFOS	3.4
Perfluorononanoic acid	375-95-1	PFNA	3.4
Perfluorodecanoic acid	335-76-2	PFDA	3.4
8:2 Fluorotelomer sulfonic acid	39108-34-4	8:2-FTS	6.9
Perfluorooctane sulfonamide	754-91-6	PFOSA	3.4
Perfluorodecanesulfonic acid	335-77-3	PFDS	3.4
Perfluoroundecanoic acid	2058-94-8	PFUnA/PFUdA	3.4
Perfluorododecanoic acid	307-55-1	PFDoA	3.4
Perfluorotridecanoic acid	72629-94-8	PFTrDA	3.4
Perfluorotetradecanoic acid	376-06-7	PFTeDA	3.4
N-ethyl perfluorooctanesulfonamidoacetic acid	2991-50-6	EtFOSAA	17.0
N-methyl perfluorooctanesulfonamidoacetic acid	2355-31-9	MeFOSAA	17.0
4:2 Fluorotelomer sulfonic acid	757124-72-4	4:2-FTS	6.9
Perfluoropentane sulfonic acid	2706-91-4	PFPeS	3.4
Perfluorononane sulfonic acid	68259-12-1	PFNS	3.4

3.2.3 Quality Assurance / Quality Control

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

3.2.4 Sample Handling and Custody

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.

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 (flow rates, temperature, pH, etc.)
- Field observations (weather conditions, flow appearance, etc.)
- GPS coordinates for each junction.

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 and will be signed by a representative of the laboratory upon receipt of the samples.

Quality Control Requirements

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.

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 as with all other samples.

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.

3.3 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**.

3.4 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.

3.4.1 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.

3.4.2 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.

3.5 Anticipated Schedule and Reporting

It is expected that sampling of the two events will be completed within three months of plan approval, subject to the occurrence of qualifying rainfall events as described above.

After the initial dry weather sampling of the outfalls and detailed Outfalls 001, 021, and 032 sub-basin sampling has been completed, the Mead team will prepare a report summarizing the sample results for submittal to WDNR two to three weeks following data arrival. The report will contain the following information:

- Dates and duration of storm events;

- Meteorological conditions (rainfall, air temperature, etc. as reported by the National Weather Service, Madison station);
- Field measurements;
- Description of any deviation(s) from standard operating procedures;
- Laboratory reports and notations for the parameters to be reported;
- Duration between sampled event and end of previous storm event; and
- Parameter concentrations.

Additional reporting for wet condition events sampling is dependent on weather conditions and evaluation of initial "dry" weather sampling.

4.0 Task 3 – Next Steps

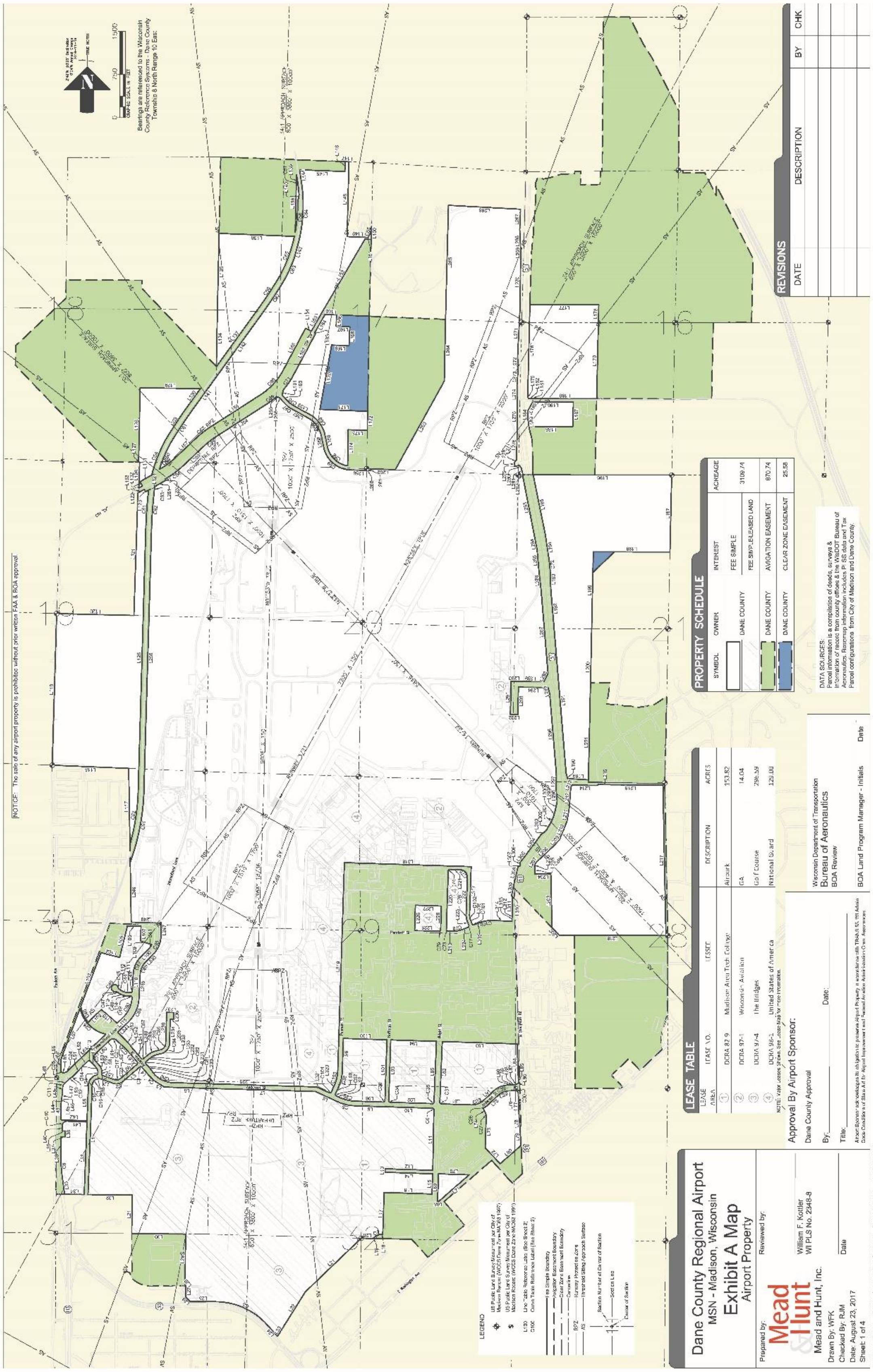
The next steps will be determined by the results of Tasks 1 and 2. The storm water sampling effort will identify specific locations and mechanisms by which PFAS is entering the storm sewer network and provide the basis for interim remedial actions to stop illicit discharges to the network. Such actions will be designed and implemented to minimize PFAS in the water discharged at the storm water outfalls. Follow-up sampling at the outfalls would evaluate the effectiveness of the actions taken to reduce or remove the source(s) of PFAS to the storm sewer network.

Video surveillance of the storm water conveyance system will be utilized to identify compromised pipe sections. The Airport team will review the results of the sampling and pipe surveillance efforts to identify portions of the storm sewer that should be repaired to reduce groundwater infiltration. The Airport will seek the appropriate funding sources to implement recommended interim remedial actions and may need to get FAA approval depending upon work area locations. A schedule for implementing recommended actions is dependent upon approvals by FAA, County, and Airport agencies.

Concurrent with data analysis and report writing of the dry weather event, provisions will begin for the televising of pipes. The extent of pipe televising will be decided with Airport, WDNR and Mead & Hunt team representatives following submittal of the Dry Weather Report to the WDNR. The team will evaluate the pipe lining and grouting methods to reduce PFAS discharges. Selected methods will then be used for interim remediation actions. Other potential interim mitigation may also be investigated during completion of the work plan. The general proposed timeline is as follows:

1. Dry Weather Sampling report submitted to WDNR – two to three weeks after data received from laboratory
2. Begin arrangements for televising of lines – concurrent with dry weather sampling report preparation
3. Develop interim action plan based on sampling and videotaping results – anticipated to be a combination of pipe lining and grouting – initiate with submittal of sampling report
4. Procurement of contractor for interim remediation actions – The Airport is committed to proceeding with prudent interim actions. The timing is dependent on scope of repairs, regulatory agency approval, and funding sources and the Airport will work to minimize delays within its control.

APPENDIX A Airport Property Map


Dane County Regional Airport
MSN - Madison, Wisconsin
Exhibit A Map
Airport Property
Mead & Hunt
Mead and Hunt, Inc.
Drawn By: WFK
Checked By: RJM
Date: August 23, 2017
Sheet: 1 of 4
William F. Kottler
WI PLS No. 2349-8
LEGEND
LEASE TABLE
LEASE AREA
LEASE NO.
LESSEE
DESCRIPTION
ACRES
DCRA 82-9
Madison Area Tech College
Airpark
153.82
DCRA 97-1
Wisconsin Aviation
GA
14.04
DCRA 97-4
The Bridges
Golf Course
296.59
DCRA 98-1
United States of America
National Guard
120.00
Approval By Airport Sponsor:
Dane County Approval
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
3108.74
DANE COUNTY
FEE SIMPLE/LEASED LAND
DANE COUNTY
AVIGATION EASEMENT
870.74
DANE COUNTY
CLEAR ZONE EASEMENT
25.58
DATA SOURCES:
REVISIONS
DATE
DESCRIPTION
BY
CHK

APPENDIX B Standard Operating Procedures

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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: ***Sunscreens*** - Alba Organics Natural Sunscreen, Yes To Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, Baby sunscreens that are "free" or "natural" ***Insect Repellents*** - Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect repellant, Herbal Armor, California Baby Natural Bug Spray, BabyGanics ***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.)

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.