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Unicorn Management Consultants, LLC

July 3, 2019
Refer to: OP-4048

Mr. Christopher Magee
Remedial Bureau E
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, 12th floor
Albany, NY 12233-7017

Re: Work Plan for the Sampling of Emerging Contaminates (PFAS and 1,4-dioxane)
Lehigh Valley Railroad Derailment Superfund Site
Leroy, New York

Dear Mr. Magee:

On January 9, 2019, the New York State Department of Environmental Conservation (NYSDEC) sent a letter to Unicorn Management Consultants, LLC (UMC) regarding NYSDEC's statewide evaluation of emerging contaminates on and around remediation sites in the state of New York, and requesting that UMC test the groundwater at the Lehigh Valley Railroad Derailment Superfund Site in LeRoy, NY (the "Site") for per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane.

On behalf of the Lehigh Valley Rail Road Company (LVRR), UMC hereby submits the following work plan for the collection of groundwater samples from the Site to be analyzed for PFAS and 1,4-dioxane as requested in the above referenced letter. As noted in UMC's previous letter, dated January 11, 2019, the spilled materials on Site are trichloroethylene (TCE) and crystalline cyanide.

In order to assist with NYSDEC's initiative to better understand the risks posed to the public by PFAS and 1,4-dioxane, UMC proposes the collection of a single round of groundwater samples from monitoring wells on Site to be analyzed for these particular compounds.

Groundwater samples are proposed to be collected from the following areas and monitoring wells on Site (see enclosed figure):

- Spill Area:
  - DC-01 A
- Upgradient:
  - DC-04 A
- Plume Axis:
  - LVRR-33 B
  - GCM-1
- Southern Boundary:
  - DC-12 B
- Downgradient
  - DC-13 A

July 3, 2019
Refer to: OP-4048

Each of the wells listed in the previous section will be sampled as described in the following paragraphs. Sample collection and analysis for PFAS and 1,4-dioxane will meet or exceed the requirements presented in the NYSDEC guidance documents provided in the January 9, 2019 letter: *Groundwater Sampling for Emerging Contaminates,* dated March 2018; and *Collection of Groundwater Samples for Per- and Polyfluoroalkyl Substances (PFAS) from Monitoring Wells Sample Protocol*, dated August 9, 2018. Both guidance documents have been enclosed with this work plan.

UMC will collect the groundwater samples following the procedures outlined in UMC's standard operating procedure (SOP) DNC 1-44 (enclosed with this work plan). Samples will be collected in the appropriate laboratory supplied sample bottles. UMC will containerize the purge water on site. The containerized purge water will be disposed of properly based on the resulting analytical data.

Additionally, UMC will collect the following QA/QC:

- duplicate,
- matrix spike/matrix spike duplicate (MS/MSD),
- field blank, and
- equipment (rinsate) blank

UMC will ensure that all equipment used during sample collection is free of PFAS compounds and will not contribute to detections of PFAS in the groundwater samples. UMC will immediately pack the groundwater samples on ice. Groundwater samples will be packed for shipping and shipped under chain of custody to Eurofins Lancaster Laboratories Environmental, LLC (ELLE) in Lancaster, PA for analysis for PFAS according to Modified EPA Method 537 and 1,4-dioxane by EPA Method 8270 SIM. ELLE reporting limits for PFOS (2 ng/L) and PFOA (1 ng/L) both meet NYSDEC's requirements as stated in the March 2018 guidance.

ELLE will provide UMC with full category B analytical reports with NYSDEC formatted electronic data deliverables. The analytical reports will be sent to Trillium, Inc. of Downingtown, PA for third party validation.

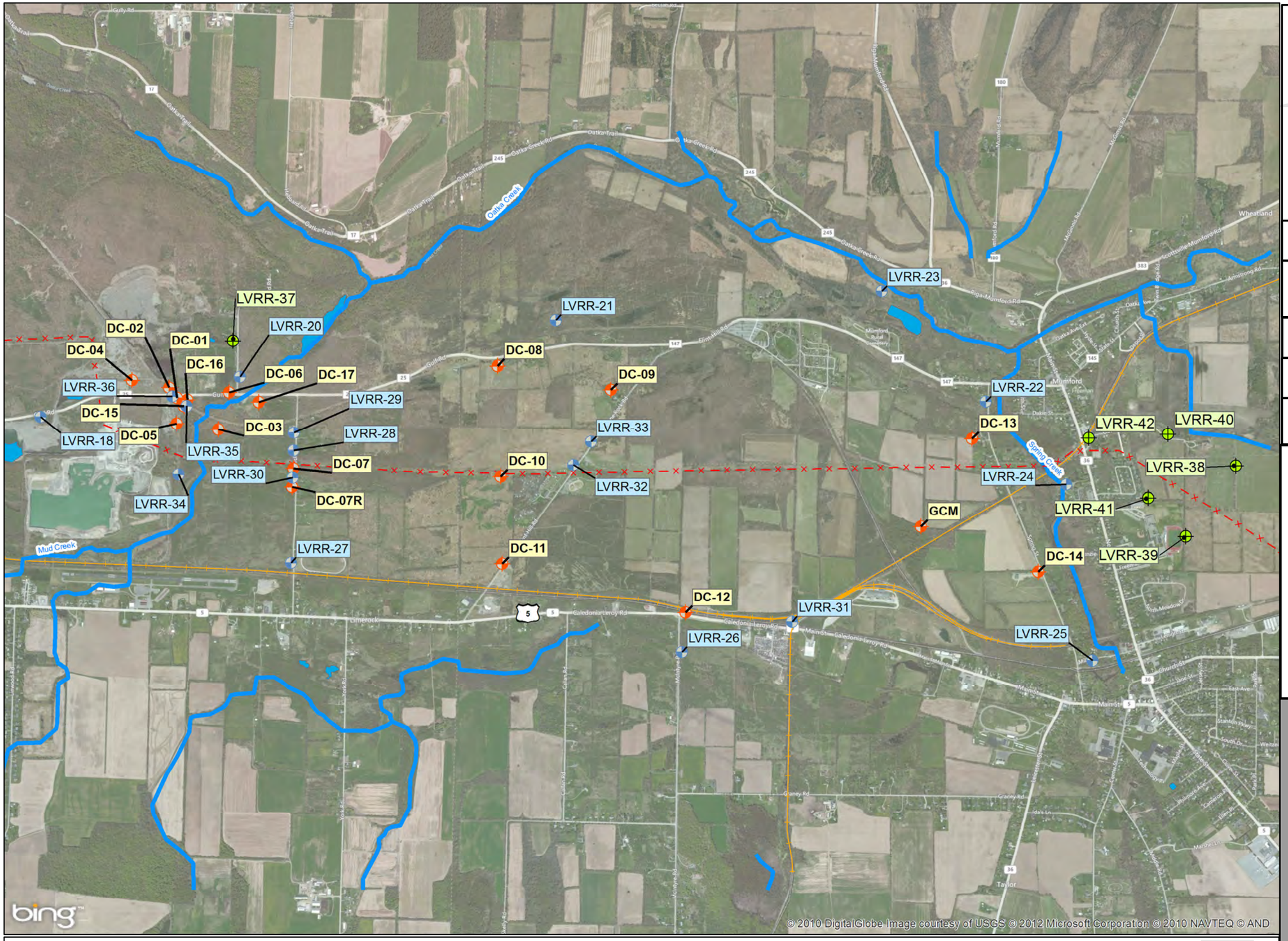
If you should have any questions or comments, please don't hesitate to contact me at your earliest convenience.

Sincerely,
UNICORN MANAGEMENT CONSULTANTS, LLC

Francisco Trejo
President

Enclosures

Cc: M. Hill, Blank Rome
M. Jon, USEPA



0 2,850 5,700 11,400 Feet

LVRR Basemap- 2012

M/N

Unicorn Management Consultants, LLC

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Suite 2C
Danbury, CT
06810

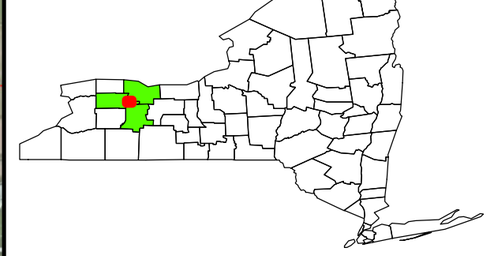
(203) 205-9000

Project Name:	Lehigh Valley Railroad Derailment Superfund Site

FIGURE 1

Author:	RTM	**Checked By:**	
Project #:	2032	**Created:**	10/27/09
		Revised:	10/31/12
Scale:	1 in:2,123 ft	**File:**	New_basemap

New York State



● = Appoximate Site Location

Legend

- New Well Cluster
- LVRR Monitoring Well
- DEC Well Clusters
- Major Transmission Line
- Streams
- Railroad

Groundwater Sampling for Emerging Contaminants

March 2018

Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where "full TAL/TCL sampling" would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard "full TAL/TCL" sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator, and the electronic data submission should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html ,

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Samples should be analyzed by an environmental laboratory certified by ELAP to use EPA method 537 or ISO 25101. ELAP does not currently offer certification for PFAS analysis of non-drinking water samples (including groundwater, soil and sediment), so there is no requirement to use an ELAP certified method. The preferred method is the modified EPA Method 537. Labs have been able to achieve reporting limits for PFOA and PFOS of 2 ng/l (part per trillion). If labs are not able to achieve similar reporting limits, the NYSDEC project manager will make case-by-case decisions as to whether the analysis can meet the needs for the specific site.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other sources of these chemicals. Like routine refinements to parameter lists based on investigative findings,

the full PFAS target analyte list may not be needed for all sampling intended to define the extent of contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in "selective ion monitoring" (SIM) mode. DER is advising PMS to use 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

Full PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	**Perfluorobutanesulfonic acid**	**PFBS**	**375-73-5**
	Perfluorohexanesulfonic acid	**PFHxS**	**355-46-4**
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	**PFOS**	**1763-23-1**
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	**PFHpA**	**375-85-9**
	Perfluorooctanoic acid	**PFOA**	**335-67-1**
	Perfluorononanoic acid	**PFNA**	**375-95-1**
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUA/PFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriA/PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTA/PFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctane-sulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidoacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

Bold entries depict the 6 original UCMR3 chemicals

Collection of Groundwater Samples for Per- and Polyfluoroalkyl Substances (PFAS) from Monitoring Wells Sample Protocol

Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.

The sampling procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE) and polypropylene. Additional materials may be acceptable if proven not to contain PFAS. **NOTE: Grunfos pumps and some bladder pumps are known to contain PFAS materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFAS materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials must be avoided. Many food and drink packaging materials and "plumbers thread seal tape" contain PFAS.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 250 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at 4 ± 2º Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

UMC

ENVIRONMENTAL SERVICES
STANDARD OPERATING PROCEDURE

SAMPLING POLYFLUORINATED AND PERFLUORINATED ALKYL SUBSTANCES (PFAS) GROUNDWATER, SURFACE WATER, PUBLIC AND PRIVATE SUPPLY WELLS SURFACE SOIL, SUBSURFACE SOIL, STOCKPILE, SEDIMENT

PROJECT NUMBER: 2010		DOCUMENT CONTROL NUMBER: DCN1-44	
APPROVALS			
Title-Signature-Date			
REV NO.	PREPARED BY	DIRECTOR REVIEW	PRESIDENT
0	Amy Leonard 3/25/16	3/25/16	3/25/16
1	6/19/18	6/19/18	6/19/18
2	7/2/18	7/2/18	7/2/18
3			
4			
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10			
11			
12			

1.0 **PURPOSE**

The purpose of this standard operating procedure (SOP) is to provide the general methodology for the sample collection of PFAS, a class of more than 24 synthetic compounds, from groundwater, surface water, public service wells, private service wells, surface soil, subsurface soil, stockpile, and sediment sample locations. These procedures may be superseded by project, client, regulatory, or site specific procedures established in a sampling and analysis plan (SAP), Quality Assurance Project Plan (QAPP) or other project document. Project or site specific procedures take precedence over the generic procedures set forth here.

This SOP was developed based in part upon the following references:

- Sampling and Analysis Plan for the Pownal Tannery Site, Pownal Vermont prepared by Weston Solutions, Inc. for the USEPA, Region I, Superfund Technical Assessment and Response Team IV (START), March 2016 (as provided to Unicorn Management Consultants, LLC [UMC] by the Vermont Department of Environmental Conservation [VTDEC] on March 25, 2016).
- Work Scope (Revised 3/15/16), Surface Soil Sampling, Village of North Bennington, VT, prepared by C.T. Male Associates, D.P.C., (as provided to UMC by the VTDEC on March 25, 2016).
- Perfluorinated Compound Sampling Plan, Former ChemFab, North Bennington, VT prepared by Weston & Sampson Engineers, Inc., on behalf of the VTDEC, February 2016.
- Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, U.S. Environmental Protection Agency (USEPA), Region I, EPASOP-GW-01, Revision 3, dated July 30, 1996, revised January 19, 2010.

2.0 **PROHIBITED AND ACCEPTABLE MATERIALS FOR COLLECTING PFAS SAMPLES**

The sampler will assure that no potential PFAS-containing materials are utilized during sampling. No materials containing Teflon, Gortex, or other waterproofing can be utilized while sampling. Please take extra care to assure that clothing, storage containers, and sampling equipment do not contain potential PFAS. Appendix A of this SOP contains a summary of prohibited and acceptable materials for PFAS sampling.

3.0 **CALIBRATION OF FIELD ANALYSIS EQUIPMENT**

Calibrate field analysis equipment (e.g., PID/FID, multi-parameter and turbidity meters, etc.) before use or as required in the manufacturer's manual for the instrument. Summarize the calibration procedures in the field notebook or on applicable field sheets.

4.0 **PREPARING THE FIELD TRIP BLANK**

A field trip blank is needed to represent ambient air conditions (e.g., indoor, outdoor, change of property, etc.) during sampling regardless of matrix being sampled. A separate field trip blank is required to be collected for each different ambient air location on the same date and proximate time as the PFAS samples being collected.

Prior to handling the field trip blank bottles, each sampling team member will don at least three pairs (layers) of Nitrile gloves. The cooler containing the PFAS sampling containers will be opened and the full bottle labeled "field trip blank" and the empty bottle marked "field trip blank" will be located. Label

the sample container(s) with appropriate information such as: client name, site location, sample identification (location, etc.) date, time of collection, and sampler's initials.

Once sample bottles have been labeled, remove each bottle cap. This is done best with one person holding the bottles firmly and another person uncapping both bottles and maintaining the caps upright. Then the contents of the full "field trip blank" bottle will be dispensed into the empty "field trip blank" bottle. Both bottles will be recapped and the field trip blank bottle will be placed into a resealable (Ziploc-type) bag before proceeding. The bottle will be placed in the sample cooler in a location away from the sampling point. The outer pair of Nitrile gloves will then be doffed.

5.0 **AQUEOUS SAMPLE COLLECTION FOR PFAS**

This SOP establishes generic procedures for collecting groundwater, surface water, and supply well aqueous sample. These procedures may be superseded by project, client, regulatory, or site specific procedures established in a SAP or other project document. Project or site specific procedures take precedence over the generic procedures set forth here.

5.1 AQUEOUS SAMPLE COLLECTION

When possible, aqueous samples should be collected from locations/wells that are the least impacted followed by locations/wells with potentially greater impacts. Prior to sample collection, record location, time, date, and appropriate information in the field notebook and on the field data sheet.

5.2 GROUNDWATER SAMPLE COLLECTION FOR PFAS

5.2.1 GROUNDWATER SAMPLING EQUIPMENT AND MATERIALS

The equipment and materials required for groundwater sample collection may include, but is not limited to, the following:

- Electronic water-level indicator (WLI) or steel tape and chalk, with 0.01 foot increments. Electronic oil/water interface probe (EIP) for measuring non-aqueous phase liquid (NAPL), if needed.
- Water-quality indicator parameter meter(s):
    - Multi-Parameter meter with flow-through-cell to monitor pH, oxygen reduction potential (ORP), dissolved oxygen (DO), specific conductivity, turbidity, and temperature. The flow-through-cell should be a clear, closed cell with the inlet located near the bottom and the outlet near the top.
    - Turbidity meter if not included in multi-parameter meter above.
- Sampling pump - adjustable rate submersible or stainless steel pumps. Adjustable rate, peristaltic pump can be used when the depth to water is 25 feet or less.
- Power Source: Batteries or if a combustion engine generator is used, it must be placed downwind of the sampling area.
- Tubing – when possible high density polyethylene tubing (HDPE) is used when sampling for PFAS. Silicone flexible tubing may be used within a peristaltic pump.
- Flow measurement supplies: graduated cylinder, or other volumetric measuring device, and a stop watch.
- Decontamination Supplies – Laboratory prepared PFAS free rinse water, distilled or deionized water, non-phosphate soap (such as Alconox), isopropyl alcohol, brushes, pressure sprayers, spray bottles, buckets or decontamination tubes for pumps.

- Sample bottles (and preservation supplies if bottles are not pre-preserved).
- Sample labels
- Chain-of-custody forms.
- Field Sampling Plan and/or Quality Assurance Project Plan.
- Well construction data
- Water quality data from previous sampling events.
- Well keys
- Map of well locations.
- Field notebook, groundwater sampling logs and calculator. A field data sheet (low flow groundwater sampling data collection sheet) is provided in the attachment. Do not use waterproof paper for PFAS sampling.
- 0.45 micron in-line disposable filters (if filtered samples are needed).
- Personal protective equipment as specified in the Site Health and Safety Plan (if necessary).
- Air monitoring equipment as specified in the Site Health and Safety Plan (if necessary).
- Tool box - All needed tools for all site equipment used.
- A 55-gallon drum or container to collect the purged water (if necessary).
- Portable rain-shelter (e.g. tarp and guy-lines or ice-fishing tent).

5.2.2 GENERAL GROUNWATER SAMPLE COLLECTION CONSIDERATIONS

If sampling from monitoring wells is required, check the condition of the well for damage or evidence of tampering and record observations in the field notebook. As required, monitor the headspace of the unopened monitoring well at the rim of the outer casing for volatile organic compounds (VOCs) with a PID or FID, and record in the field notebook and on the field data sheet. Remove inner casing cap and monitor the headspace of the monitoring well at the rim of the casing for VOCs and record in the field notebook.

Prior to sampling monitoring wells, measure the water level depth to nearest 0.01 foot with a WLI or EIP (refer to the UMC SOP for measuring water levels, UMC DCN 0001-016) and record in the field notebook and on the field data sheet. If the presence of non-aqueous phase liquid (NAPL) is suspected or unknown, the depth to water measurement should be made with an EIP. Do not sample groundwater in the well if EIP indicates that NAPL is present in the well unless specified on the SAP. Check the available well information or field information for the total depth of the monitoring well. Use the depth to water measurement and the total depth of the monitoring well to calculate the mid-point of the saturated screen length and the volume of the water in the monitoring well. Avoid sounding well to determine depth to bottom less than 48-hours prior to sampling.

5.2.3 SAMPLING GROUNDWATER WITH PERISTALTIC PUMPS FOR PFAS

Adjustable rate peristaltic pumps may be used when the top of the water table is less than 25 feet below the ground surface to collect groundwater samples for PFAS analysis.

Once the mid-point of the saturated screen length has been calculated, HDPE tubing will be measured and lowered slowly (to minimize disturbance) into the well to the midpoint of the saturated zone to be sampled. If possible, the tubing will be placed at least two feet above the bottom of the well to minimize disturbing

any particulates at the bottom of the well. The HDPE tubing will be connected to the silicon tubing located within the peristaltic pump.

Prior to activating the pump, a water level meter will be lowered into the well to the top of the water column and will remain in the well to record drawdown of the water column during purging and well stabilization.

Once the water level meter is secured down-well, verify that the pump is set to its lowest pumping rate, then activate the pump and slowly increase the pumping rate until groundwater discharge occurs. Monitor the drawdown of the water column in the well and adjust the flow rate of the pump as necessary until the drawdown is less than 0.3 feet.

Allow the well to purge until the water clarity improves then connect the discharge tubing to the flow through cell and water quality multi-parameter meter using silicon tubing. During well purging, record water quality parameters in 5-minute intervals over a 45-minute minimum purge time on dedicated field sheets (see Appendix B). Well stabilization is considered to be achieved once the minimum purge time has been met and three consecutive water quality parameter readings are within the following limits:

- Turbidity (10% for values greater than 1NTU)
- Temperature (3%)
- pH (0.1 Unit)
- ORP (10 millivolts)
- Specific Conductance (3%)
- DO (10%)

Once the well is stabilized, groundwater sampling may begin. First, prior to collecting a groundwater sample the pump is turned off and disconnected from the flow through cell. The pump is then restarted and groundwater is allowed to flow for approximately one minute before sample collection.

For groundwater sampling, adjust the flow rate to approximately 200-300 milliliters per minute. Label the laboratory supplied, certified pre-cleaned, containers using an indelible ink (Sharpie). Wearing a minimum of two layers of Nitrile gloves, fill the sample bottles nearly to the top, secure caps on bottles, and gently agitate the bottles in an up and down manner to allow the preservative to dissolve. The filled sample bottles will be returned to a resealable bag.

All relevant information and observations pertaining to the sample location including an inventory of potential PFAS containing items in the area nearby the sampling point, if any, will be recorded in the field book and/or on the field sheets, and the sampling location will be photo-documented.

After sampling location observations and information are recorded, the tubing can be removed from the well and peristaltic pump and discarded. Note that the silicon tubing associated with the peristaltic pump

must be changed between sampling locations. A final water level will be recorded prior to removal of the water level meter from the well.

The samples will be recorded on a chain-of-custody, prepared for shipment, and transported to an offsite laboratory for analysis in accordance with UMC's Sample Handling SOP.

5.2.4 SAMPLING GROUNDWATER WITH SUBMERSIBLE PUMPS FOR PFAS

For deep overburden or bedrock wells (>25 feet), UMC will utilize a stainless steel submersible pump to minimize the introduction of PFAS during sample collection. Once the mid-point of the saturated screen length has been calculated, secure tubing to the pump, and lower the pump slowly (to minimize disturbance) into the well to the midpoint of the saturated zone to be sampled. If possible, place the pump at least two feet above the bottom of the well to minimize disturbing any particulates at the bottom of the well. The water level meter will remain in the well at the top of the water column to monitor drawdown after the pump is started.

Once the water level meter and pump are secured down-well, verify that the pump is set to its lowest pumping rate, then activate the pump and slowly increase the pumping rate until groundwater discharge occurs. Monitor the drawdown of the water column in the well and adjust the flow rate of the pump as necessary until the drawdown is less than 0.3 feet.

Allow the well to purge until the water clarity improves then connect the pump's discharge tubing to the water quality multi-parameter meter flow through cell using silicon tubing. During well purging, record water quality parameters in 5-minute intervals over a 45-minute minimum purge time on dedicated field sheets (Appendix B). Well stabilization is considered to be achieved once the minimum purge time has been met and three consecutive water quality parameter readings are within the following limits:

- Turbidity (10% for values greater than 1NTU)
- Temperature (3%)
- pH (0.1 Unit)
- ORP (10 millivolts)
- Specific Conductance (3%)
- DO (10%)

Once the well is stabilized, groundwater sampling may begin. For groundwater sampling, adjust the flow rate to approximately 200-300 milliliters per minute. Label the laboratory supplied, certified pre-cleaned, containers using indelible ink (Sharpie). Wearing a minimum of two layers of Nitrile gloves, fill the sample bottles nearly to the top, secure caps on bottles, and gently agitate the bottles in an up and down

manner to allow the preservative to dissolve. The filled sample bottles will be returned to a resealable bag.

All relevant information and observations pertaining to the sample location including an inventory of potential PFAS containing items in the area nearby the sampling point, if any, will be recorded in the field book and/or on the field sheets, and the sampling location will be photo-documented.

After sampling location observations and information are recorded, a final water level will be recorded prior to removal of the water level meter and pump from the well.

The samples will be recorded on a chain-of-custody, prepared for shipment, and transported to an offsite laboratory for analysis in accordance with UMC's Sample Handling SOP.

5.3 SURFACE WATER SAMPLING FOR PFAS

Each sampling team member will don at least three pairs (layers) of Nitrile gloves. Label the laboratory supplied, certified pre-cleaned, containers using indelible ink (Sharpie). Surface water samples will be collected directly from the surface water source using a non-preserved, laboratory supplied, container (suitable for analysis of PFAS). Care will be taken to minimize the collection of sediment.

Once the surface water sample is within the non-preserved laboratory supplied container, it will be transferred into a preserved laboratory supplied container, as necessary. Wearing a minimum of two layers of Nitrile gloves, fill the sample bottles nearly to the top, secure caps on bottles, and gently agitate the bottles in an up and down manner to allow the preservative to dissolve. The filled sample bottles will be placed into a resealable bag. Discard the empty sampling container (non-preserved) used to acquire the surface water sample.

All relevant information and observations pertaining to the sample location including an inventory of potential PFAS containing items in the area nearby the sampling point, if any, will be recorded in the field book and/or on the field sheets, and the sampling location will be photo-documented.

The samples will be recorded on a chain-of-custody, prepared for shipment, and transported to an offsite laboratory for analysis in accordance with UMC's Sample Handling SOP.

5.4 SAMPLING PRIVATE AND PUBLIC SUPPLY WELLS FOR PFAS

Supply well samples should be collected before any treatment systems or softeners. If present any screens, aerators or deviators will be removed from the selected sampling tap. The cold water tap will be turned on and allowed to flow at approximately 2 to 3 gallons per minute for at least 10 minutes. The flow on the tap will be adjusted to ensure a slow, constant flow of less than ½ gallon per minute.

Label the laboratory supplied, certified pre-cleaned, containers using indelible ink (Sharpie). Wearing a minimum of two layers of Nitrile gloves, fill the sample bottles nearly to the top, secure caps on bottles, and gently agitate the bottles in an up and down manner to allow the preservative to dissolve. The filled sample bottles will be placed into a resealable bag.

All relevant information and observations pertaining to the sample location including an inventory of potential PFAS containing items in the area nearby the sampling point, if any, will be recorded in the field book and/or on the field sheets, and the sampling location will be photo-documented.

The samples will be recorded on a chain-of-custody, prepared for shipment, and transported to an offsite laboratory for analysis in accordance with UMC's Sample Handling SOP.

6.0 **SOIL SAMPLE COLLECTION FOR PFAS**

This SOP establishes generic procedures for collecting soil and sediment samples for PFAS analysis. These procedures are generally consistent with previously established UMC SOPs (e.g., UMC DCN 0001-027 titled Collecting Surface and Soil Samples and Installing Monitoring Wells); modified for the collection of surface, subsurface, stockpiled soil, and sediment PFAS samples. These procedures may be superseded by project, client, regulatory, or site specific procedures established in a SAP or other project document. Project or site specific procedures take precedence over the generic procedures set forth here.

6.1 SOIL SAMPLING CONSIDERATIONS

Soil and sediment samples can be collected from the surface, or at depth. Commonly, surface sampling refers to the collection of samples at a 0-6 inch depth; the minimum and maximum depth of surface samples must be defined in the SAP. Surface samples can be collected directly by sampling personnel with, for example, stainless steel trowels or scoops. Subsurface samples may be collected directly, *e.g.*, on an excavation face, or indirectly by bringing the soil to the sampling personnel with a hand auger, split-spoon sampler, a thin-walled tube sampler, with a back hoe, or other excavation equipment.

The SAP should specify sampling locations. The locations can be selected on a bias or randomly (simple, stratified, or systematic). The SAP should indicate the type of sampling (random or biased) and the rationale behind the selection of the sampling points. This will allow sampling personnel to make field modifications to the SAP which are consistent with the purpose of the sampling.

Either grab or composite samples can be taken dependent upon the SAP and specific analytical method requirements. A grab sample is collected from one specific sample site. A composite sample is comprised of sample fractions collected at more than one sampling point. A commonly used application of composite samples is characterizing stockpiled soils and sediment for treatment or waste disposal. To avoid off-gassing of contaminants, care must be exercised when composite samples are to be analyzed for VOCs.

6.2 SOIL SAMPLE COLLECTION EQUIPMENT AND MATERIALS

Sample collection methods, materials, and Quality Assurance/Quality Control (QA/QC) requirements should be specified in the SAP. The SOP for Collecting Quality Control Samples (DCN 0001-018) should be referenced regarding the collection of quality control samples. Equipment and materials required for proper collection of soil samples includes, but is not limited to, the following:

- A detailed SAP;
- Field notebook, maps, boring log, and field data sheets maps;
- Decontamination supplies including: non-phosphate laboratory grade detergent, buckets, brushes, potable water, distilled water, PFAS-Free rinse water, regulatory-required reagents, aluminum foil, and plastic sheeting, garbage bags - Refer to the SOP for Decontamination of Field Equipment (DCN 0001-019) for detailed procedures.
- SAP specified sampling device(s), *e.g.*, split-spoon sampler, thin-walled tube sampler, stainless steel hand auger, or stainless steel trowel;
- Stainless steel spoons, spatulas, scrapers, probes and other small tools;

- Stainless steel mixing bowl;
- Disposable sampling gloves (Nitrile gloves);
- Laboratory-supplied and cleaned sample containers;
- Sample labels, Chain-of-Custody/Analytical Request Forms, custody seals;
- Sample Shuttle/cooler and ice;
- Zip-lock bags (or similar) and packing material;
- Indelible marker (sharpie like);
- Tape measure;
- Paper Towels;
- Masking and packing tape;
- Overnight (express) mail forms.

6.3 SOIL SAMPLE COLLECTION PROCEDURES

Prior to initiating soil sample collection, determine the size and number of sample containers needed and prepare preservatives if required. Label the sample container(s) with appropriate information such as: client name, site location, sample identification (location, depth, etc.) date and time of collection, and sampler's initials. Determine the type and quantity of sampling equipment required. Ensure that all sampling equipment has been thoroughly cleaned according to the SOP for Decontamination of Field Equipment (DCN 0001-019) and prepare decontamination equipment and materials if reusable sample equipment is to be used. In cases where it is not known which type of sampling equipment will work best, several types of systems and devices should be on hand and available.

Once the soil sample location is identified in accordance with the SAP, secure a piece of six foot by six foot plastic sheeting over the sampling location and remove a one foot by one foot opening in the center of the plastic sheeting. Remove vegetation, humus, or other ground surface cover to expose the top of ground surface.

For indirectly collected subsurface samples, the boring must be advanced with thoroughly cleaned equipment to the top of the desired sampling interval. A pre-cleaned sampling device should then be advanced through the sampling horizon (after removal of the boring tool if required). When the sampling tool is also the boring device, e.g., bucket auger, the device should be withdrawn and cleaned prior to advancement through the sampling horizon; or, preferably, another pre-cleaned device should be used to collect the sample.

Using disposable gloves (triple layered for PFAS sample collection) and a pre-cleaned, stainless steel spatula, spoon, scoop or other approved device, collect the sample directly or extract the sample from the sampler, and place the sample in a laboratory-supplied pre-cleaned sample container or stainless steel bowl (if homogenizing is required). Samples to be analyzed for VOCs must be collected prior to other constituents, utilizing no headspace sampling techniques, and handling should be kept to a minimum. For directly collected samples, if possible, remove an inch of soil before collecting the sample so that the collected soil has not been directly exposed to the atmosphere. For indirectly collected samples, collect the soil or sediment towards the middle or bottom of the sampler because soil at the ends of the sampler may not be representative of the depth interval being sampled. Immediately after collection the sample should be cooled to 4°C and placed in a cooler/sample shuttle. See the SOP for Sample Handling (DCN 0001-011) for proper sample handling and documentation.

Using the remaining portion of the soil from the sampler, record at minimum the following soil observations: color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc. Samples may be screened with portable instrumentation such as a PID. These results should also be recorded in the field notebook or on the appropriate field data forms.

Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions. Sampling equipment will be decontaminated between each sampling interval. All reusable sampling equipment must be thoroughly cleaned in accordance with the UMC SOP for Decontamination of Field Equipment (DCN 0001-019). Equipment decontamination fluids that have potentially been impacted by PFAS must be changed between sampling intervals and locations.

All relevant information and observations pertaining to the sample location including an inventory of potential PFAS containing items in the area nearby the sampling point, if any, will be recorded in the field book and/or on the field sheets, and the sampling location will be photo-documented.

The samples will be recorded on a chain-of-custody, prepared for shipment, and transported to an offsite laboratory for analysis in accordance with UMC's Sample Handling SOP.

7.0 **DECONTAMINATION PROCEDURES FOR PFAS IMPACTED EQUIPMENT**

General decontamination procedures are described in UMC SOP for Decontamination of Field Equipment (DCN 0001-019). Specific consideration is needed when sampling for PFAS using submersible pumps or any other pieces of equipment used during the sample collection of PFAS which may come in contact with potentially PFAS impacted water or soil. Specifically, the decontamination of potentially PFAS-impacted equipment will be conducted as follows:

Flush the equipment with potable water
Flush with Alconox and potable water wash solution
Flush with potable water to remove all the Alconox solution
Flush with isopropyl alcohol
Flush with potable water
Allow the equipment to air dry or wipe dry with paper toweling

Equipment decontamination fluids that have potentially been impacted by PFAS must be changed between sampling intervals and locations.