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August 7, 2018

Ms. Ruth Curley
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Emerging Contaminants Groundwater Sampling Work Plan
Former Ward Products Site, 61 Edson Street, Amsterdam, NY
NYSDEC Site ID #429004

Dear Ms. Curley,

On behalf of New Water Realty (NWR), AECOM Technical Services, Inc. (AECOM) has prepared this Emerging Contaminants Groundwater Sampling Work Plan (Work Plan) in response to your letter request of April 5, 2018, directing emerging contaminants groundwater sampling at the Former Ward Products Site (the Site) in Amsterdam, New York. The April 5, 2018 letter stated, "The New York State Department of Environmental Conservation (NYSDEC) is undertaking a Statewide evaluation of remediation sites to better understand the risk posed to New Yorkers by 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS). PFAS have historically not been evaluated at remediation sites, and 1,4-dioxane has not been evaluated at levels that are now thought to represent a health concern. This initiative is being undertaken as a result of these "emerging contaminants" having been found in a number of drinking water supplies in New York."

In the April 5, 2018 letter, NYSDEC directed NWR to conduct groundwater sampling analyses utilizing existing monitoring wells that are representative of the potential for the Site to be a source of 1,4-dioxane and PFAS. In order to meet this requirement, this Work Plan identifies wells proposed for sampling, sampling methods, and a sampling schedule. This Work Plan will be used in conjunction with the Site Management Plan (SMP) (AECOM, February 2011, as modified by NYSDEC on January 23, 2017) which is the current document guiding groundwater sampling at the Site. Refer to the SMP for routine field work activities, field forms, and quality assurance procedures.

1. Scope of Work

To meet NYSDEC's requirement to evaluate for the presence of 1,4-dioxane and PFAS at the Site, groundwater samples will be collected from three existing bedrock monitoring wells. Figure 1 depicts the location of the proposed monitoring wells to be sampled and the rationale for sampling is provided below:

- MW-11 - Upgradient location;
- MW-04R – Location representative of site conditions; and
- MW-10 - Downgradient, on-site location.

Samples will be collected and analyzed in accordance with the guidance information included with the April 5, 2018 NYSDEC correspondence, which included:

- *Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol Revision 1.2* (June 29, 2016); and
- *Groundwater Sampling for Emerging Contaminants* (April 2018).

This guidance information is provided as Attachment 1 to this Work Plan. The above summarized scope of work is presented in more detail in the Field Methodology section below.

2. Field Methodology

As described above, groundwater samples will be collected from three existing bedrock monitoring wells (MW-11, MW-04R, and MW-10). Sampling procedures will concur with the sample protocol included with the April 5, 2018 NYSDEC letter (see Attachment 1). The groundwater sample from each well will be analyzed for the following parameters:

- 1,4-dioxane by EPA Method 8270 Selective Ion Monitoring (SIM); and
- 21 PFAS compounds by United States Environmental Protection Agency (EPA) Method 537 Modified (low level).

The samples will be collected by personnel trained to perform PFAS sampling. Recommended sample bottle requirements, preservation, and holding times are provided in Table 1. The estimated number of samples is shown in Table 2.

Since PFAS are to be analyzed, the following techniques will be used in conjunction with, or instead of, the procedures cited in the February 2011 SMP:

- Use only laboratory certified "PFAS-free" water for equipment decontamination.
- Use only Alconox® or Liquinox® soap for decontamination.
- No Sharpies will be used, only ball point pens.
- No waterproof field books/ laboratory notebooks, only loose paper on aluminum clipboards.
- Do not wear the following:
  - Personal hygiene items (cosmetics, lotions, moisturizers).
  - Sunscreens and insect repellants. Instead, wear long sleeve / light colored 100% cotton shirts and wide brimmed hats.
  - New or unwashed clothing.
  - Clothing washed with fabric softeners.
  - Treated clothing (i.e., waterproof, water resistant, stain-resistant, etc.).
  - Treated boots (i.e., waterproof, water resistant, stain-resistant, etc.).
  - Coated Tyvek® suits.
- Do not handle prepackaged food products immediately prior to sampling.
- Wear a new pair of disposable powderless nitrile gloves prior to sample collection.
- Do not use fluoropolymer bailers, pump bladders, tubing, valves and other pump parts.
- Do not use anything with Teflon®.
- Use high-density polyethylene (HDPE) and silicon materials only.
- Do not use glass containers for sampling. Use only bottleware provided by the laboratory (i.e., polypropylene or HDPE sample bottles with unlined [no Teflon®] polypropylene or HDPE screw caps).
- Do not use aluminum foil.
- Do not filter samples in the field.

The PFAS Sampling Checklist, provided in Attachment 2, will be filled out prior to the beginning of the field sampling event and if there are staffing or associated sampling equipment changes.

Samples will be delivered to Eurofins Lancaster Laboratories Environmental (Eurofins) a New York State Department of Health Environmental Laboratory Approval Program-(ELAP) approved analytical laboratory. Eurofin's ELAP certifications for PFOA and Perfluorodecanesulfonic acid (PFOS) in drinking water by EPA Method 537 and for 1,4-dioxane in non-potable water by EPA Method 8270 SIM are provided in Attachment 3 for your reference. Standard laboratory turn-around time [10 business days] will be requested.

Purged groundwater will be transferred to the on-site groundwater extraction and treatment system, per the approved SMP (AECOM, 2011).

3. Quality Assurance

The contracted laboratory has stated that they can achieve the method detection limit of 2 nanograms/liter (ng/L) for each PFAS target analyte provided in the table below:

Chemical Name	Abbreviation	CAS Number
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorodecanesulfonic acid	PFDS	335-77-3
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
6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctanesulfonamide	FOSA	75409106
N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
N-ethyl perlfuorooctanesulfonamidoaceetic acid	N-EtFOSAA	2991-50-6

Additionally, the contracted laboratory has stated that they can achieve the method detection limit of 0.28 micrograms/liter (µg/L) for 1,4-dioxane.

Quality control samples (i.e., equipment blank, ambient blank (PFAS), and trip blank (1,4-dioxane)) will be collected as summarized in Table 2. Equipment and ambient blanks will be collected with PFAS free water supplied by the laboratory. The laboratory will provide the results in an Analytical Services Protocol (ASP) Category B equivalent data deliverable. A Data Usability Summary Report (DUSR) will be performed for all data acquired and included with the groundwater sampling summary report. All data from this sampling event will be uploaded to the NYSDEC EQuIS database.

4. Schedule

The collection of 1,4-dioxane and PFAS groundwater samples at the Site will occur after NYSDEC approval of this Work Plan. In accordance with the February 2011 SMP for the Site (as modified by NYSDEC on January 23, 2017), groundwater sampling occurs on an annual basis in August. It is proposed that the 1,4 dioxane and PFAS sampling described in this Work Plan be performed with the next scheduled sampling event (the week of August 27, 2018).

5. Reporting

Groundwater sample data will be provided as a stand-alone summary letter report upon the completion of groundwater sampling and data assessment activities. The letter report will be submitted to NYSDEC within 45 days of completion of the field work.

If you have any questions or comments, please contact Jennifer Atkins or Laura Warren of AECOM at (978) 905-2100.

Yours sincerely,

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AECOM
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Project Manager
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enclosures: Attachments:
Tables 1 and 2
Figure 1
Attachment 1 – NYSDEC provided Sampling Guidance Documents
Attachment 2 – PFAS Sampling Checklist
Attachment 3 - Eurofins NYSDOH ELAP Certifications

cc: B. D'Avella, Jr. – New Water Realty
R. Conway, Jr., Esq. - Schenck, Price, Smith & King

TABLES

Table 1

Analytical Methods, Sample Container and Preservation Requirements, and Analytical Holding Times

61 Edson Street, Amsterdam, NY
NYSDEC Site #4-029-004

Matrix/Parameter	Laboratory to Perform Analyses	Method Number	Container	Minimum Sample Volume	Preservation	Holding Time*
I. Water						
1,4-Dioxane	Eurofins Lancaster Laboratories Environmental	EPA Method SW846 8270D SIM	2 - 1 L Amber Glass	1000 mL	Cool, 4^0C	7 days for extraction, 40 days for analysis
Requested List of 21 PFAS Compounds	Eurofins Lancaster Laboratories Environmental	EPA Method 537 Modified	2 - 250 mL HDPE	250 mL	Cool, 4^0C	14 days for extraction, 28 days for analysis

NOTES:

* All holding times are from time of collection.

PFAS - per- and polyfluoroalkyl substances

Table 2

Summary of Samples and Analytical Parameters

61 Edson Street, Amsterdam, NY
NYSDEC Site #4-029-004

Parameter	Method Number	Estimated Number of Samples	Field QA/QC Samples			Total No. of Samples
			Equipment Blanks*	Ambient Blanks	Trip Blanks	
1,4-Dioxane	EPA Method SW846 8270D SIM	3	1	--	1	5
Requested List of 21 PFAS Compounds	EPA Method 537 Modified	3	1	1	--	5

NOTES:

* One equipment blank will be collected for each type of sampling equipment used using certified PFAS-free water

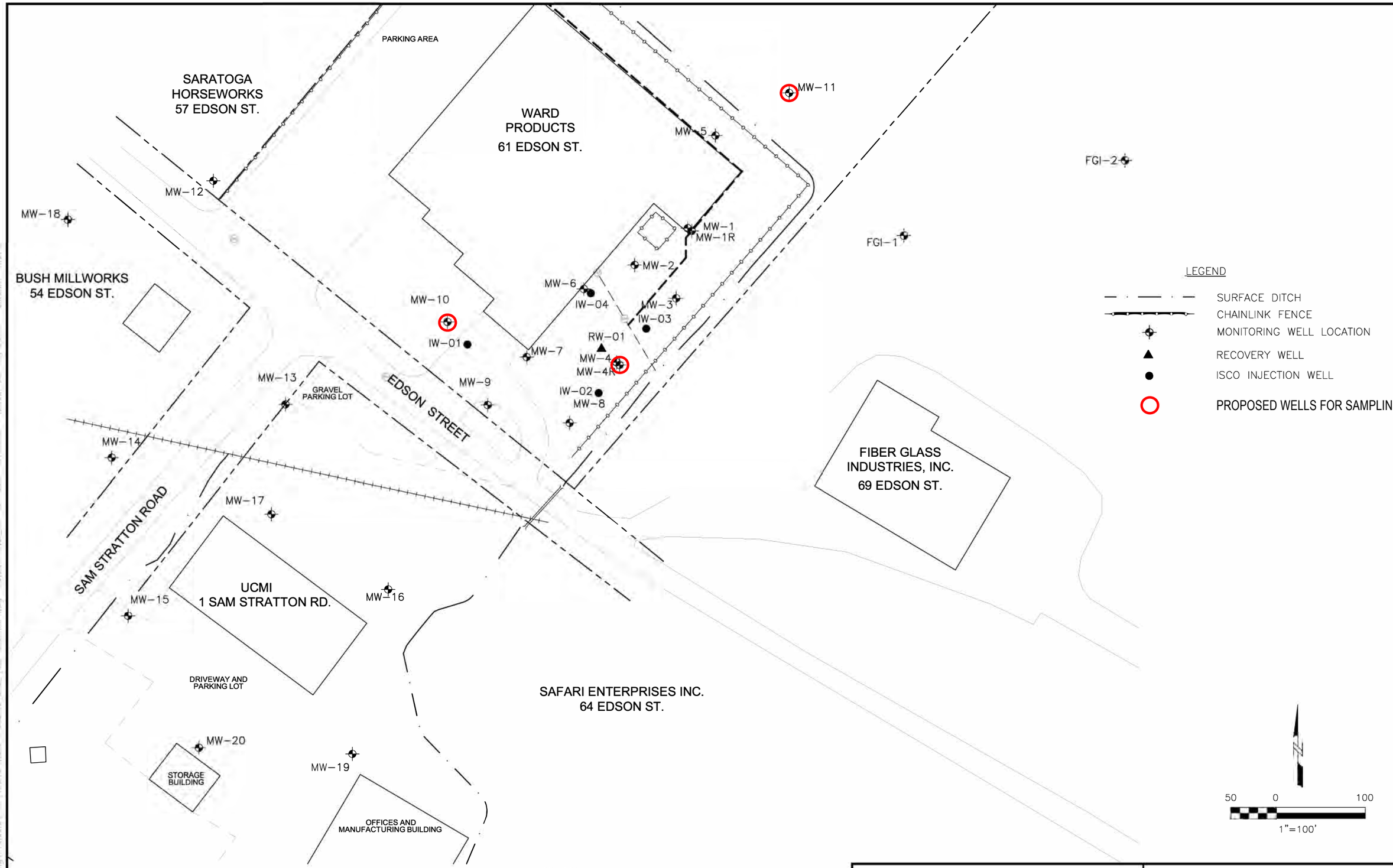
-- - Not applicable

PFAS - per- and polyfluoroalkyl substances

QA/QC - Quality Assurance/Quality Control

FIGURES

Figure 1: Monitoring Well Location Map



NOTES:
1. MW-1, MW-2, MW-3 AND MW-4 ARE OVERBURDEN WELLS AND ARE NOT USED TO CONTOUR.
2. FGI-1 AND FGI-2 ARE DEEP BEDROCK WELLS AND ARE NOT USED TO CONTOUR.

AECOM

WARD PRODUCTS SITE
AMSTERDAM, NEW YORK
60139490.100

DATE: __/__/__ | DRWN: CADD

MONITORING WELLS FOR EMERGING CONTAMINANT SAMPLING

FIGURE 1

ATTACHMENT 1

Groundwater Sampling for Emerging Contaminants

Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

Groundwater Sampling for Emerging Contaminants

April 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: Currently, ELAP does not offer certification for PFAS compounds in matrices other than finished drinking water. However, laboratories analyzing environmental samples (ex. soil, sediments, and groundwater) are required, by DER, to hold ELAP certification for PFOA and PFOS in drinking water by EPA Method 537 or ISO 25101.

Modified EPA Method 537 is the preferred method to use for groundwater samples due to the ability to achieve 2 ng/L (ppt) detection limits. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve similar reporting limits, the project manager should discuss this with a DER chemist. Note: Reporting limits for PFOA and PFOS should not exceed 2 ng/L.

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 the use of method 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 Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) 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 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), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC 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 PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFCs.

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 500 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.

ATTACHMENT 2

PFAS Sampling Checklist

Figure 1 PFAS Sampling Checklist

Project No.:
Project Location:
Signature:
Date:

Team Members

Yes	No	Description
		Has AECOM PFAS Sampling guidance been reviewed by all team members?
		Comments:
Yes	No	Has AECOM field sampling staff received needed training certification?
		Comments:
Yes	No	Was a briefing held for field sampling staff?
		Comments:
Yes	No	Were additional PFAS sampling instructions given to field sampling staff?
		Comments:
Yes	No	Have personal clothing and PPE requirements been followed by all field sampling staff?
		Comments:
Yes	No	Were lotions and sunscreen used for field sampling staff?
		Comment:

Sample Collection

Yes	No	Has a PFAS-free water source been identified?
		Comment
		Source of PFAS-free water:
Yes	No	Have all sampling items, parts and equipment been inspected to be free of PFAS?
		Comment:
Yes	No	Has sampling location sequence been communicated to avoid cross-contaminations?
		Comment:
Yes	No	Have drilling fluids been evaluated and shown to be free of PFAS?
		Comment:
Yes	No	Use of PFAS-free decontamination solution?
		Brand name of decontamination solution:
Yes	No	Have all field logs, notebooks, pens, labels been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all sample shipping materials (ice, Ziploc® bags or similar style bags) been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all blanks arrived at the site and will they be collected to verify cross-contamination?
		Comment:

Document Control

Yes	No	Have all variances from sampling guidance been documented?
		Comment:

Other Comments:

ATTACHMENT 3

Eurofins NYSDOH ELAP Certifications

TO BE PROVIDED SEPARATELY