October 19, 2018

Brian Jankauskas, P.E.
New York State Department of Environmental Conservation
Division of Environmental Remediation, Remedial Bureau A
625 Broadway
12th Floor
Albany, NY 12233-7015

Subject: **Groundwater Sampling Work Plan for Emerging Contaminants - Revised**
Former Ciba-Geigy Facility - Main Plant Site and Pretreatment Plant Site
Glens Falls, NY
NYSDEC Site No.: 557011

Dear Mr. Jankauskas:

This Groundwater Sampling Work Plan (Work Plan) has been prepared in response to the New York State Department of Environmental Conservation (NYSDEC) letter dated March 20, 2018, requesting the collection of groundwater samples from the former Ciba-Geigy facility Main Plant Site (MPS) and Pretreatment Plant Site (PTP) in Glens Falls, NY (**Figure 1**), for the analysis of per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane, also referred to as "emerging contaminants." EHS Support LLC ("EHS Support") is submitting this Work Plan to the NYSDEC on behalf of Ashland LLC ("Ashland") and BASF Corporation ("BASF") (herein referred to as the Parties). As a matter of background, corrective measure operations are conducted for the MPS and PTP Sites under a Hazardous Waste Management (HWM) Post Closure Permit (NYSDEC Site No. 557011). Ashland and BASF are respectively responding on behalf of the Permittees for the Site, Hercules Incorporated (previously acquired by Ashland) and Ciba Corporation (previously acquired by BASF).

PFAS and 1,4-dioxane are not suspected constituents of concern (COCs) for the former Ciba-Geigy MPS or PTP Sites; therefore, there are no suspected source areas. However, based on the March 20, 2018, NYSDEC letter, our understanding is that the NYSDEC is requesting groundwater sampling for these constituents at all open remediation sites in New York in 2018.

This Work Plan is based on information provided in the March 20, 2018, NYSDEC letter, and our subsequent conversation (Brian Jankauskas, NYSDEC, and Cassie Reuter, EHS Support, July 13, 2018). A Work Plan was originally submitted to the NYSDEC on September 14, 2018. This version of the Work Plan supersedes the original document and incorporates comments submitted to the Parties by the NYSDEC on October 5, 2018.

Sampling Objectives

We understand that the groundwater sampling objectives are to provide data that will allow the NYSDEC to:

- Populate a statewide database for these emerging contaminants
- Compare the constituent concentrations to currently-available risk-based thresholds

Sampling Locations

To comply with the NYSDEC's request, we propose to collect groundwater samples from five well locations for the MPS and two well locations for the PTP Site. Most wells were selected for their locations near source areas for Site-specific COCs (i.e., certain metals, including hexavalent chromium and/or cyanide); their screened depth (i.e., shallow groundwater); and for spatial coverage of the Sites. The well selections also include one well on each Site that is located upgradient from source areas for Site-specific COCs.

Main Plant Site

- Upgradient: MW-24 (off-Site)
- Near Site-Specific COC source areas: MW-OB7, MW-OB14, MW-OB26, MW-OB30

Pretreatment Plant Site

- Upgradient: MW-OB20 [1]
- Near Site-Specific COC source areas: MW-OB23

Well locations are indicated on **Figure 2** for the MPS and **Figure 3** for the PTP.

Quality Control/Quality Assurance

Quality control/quality assurance (QA/QC) procedures will include the collection of one blind duplicate groundwater sample and the collection of one equipment blank water sample, with analysis for the same analytical suite as the primary groundwater samples. One matrix spike/matrix spike duplicate sample and one field blank sample will also be analyzed.

A full Category B electronic data deliverable (EDD) will be prepared, with the analytical results validated following NYSDEC protocols, including preparation of data usability summary report(s) (DUSRs).

Sampling Procedures

The samples will be collected using low-flow sampling techniques using a peristaltic pump, with sample handling procedures and precautions specific to emerging contaminants (see **Attachments 1** and **2**).

Laboratory Analysis

The groundwater samples and QA/QC samples will be shipped on ice and under Chain-of-Custody to TestAmerica Laboratories, Inc. (TestAmerica) in Sacramento, California, which has the relevant analytical method certifications and can meet the detection limits requested by the NYSDEC (see **Attachment 3**).

[1] MW-OB20 has little water, and at times, the water column has been insufficient for sampling. The water column in MW-OB20 will be checked, and if it is insufficient, the off-Site well MW-18 located on the North Lot property (**Figure 4)** will be assessed for use as an alternate location. If MW-18 is unable to be sampled, the total number of sampled wells will be reduced from seven to six (one at the PTP Site; four at the MPS; and one off-Site).

The laboratory analytical methods will be:

- **PFAS Target Analytes** – Modified (Low Level) EPA Method 537, to include the Target Analyte List developed by the NYSDEC and a minimum reporting limit of 2 ng/L (nanograms per liter; parts per trillion)
- **1,4 dioxane** – EPA Method 8270 in selective ion monitoring (SIM) mode (to achieve a minimum reporting limit of 0.28 µg/L [micrograms per liter; parts per billion])

Health and Safety

Sampling activities will be conducted in accordance with a Site-specific Health and Safety Plan (HASP) developed as a separate document. Field personnel will be required to implement the procedures presented in the HASP while conducting fieldwork.

Investigation-Derived Waste

Purge and wash water from groundwater sampling activities will be containerized for discharge to the POTW, consistent with the approach utilized during regular Site groundwater sampling rounds. Solid waste (packaging material, spent gloves) will be disposed as municipal waste.

Schedule

The groundwater samples will be collected in fall 2018, with a groundwater monitoring report and the EDDs supplied to the NYSDEC in December 2018.

Closing

We look forward to receiving approval of this Work Plan from the NYSDEC. Please contact Cassie Reuter at (608) 558-6795 regarding any questions or comments.

Sincerely,

Cassie R. Reuter
Project Manager

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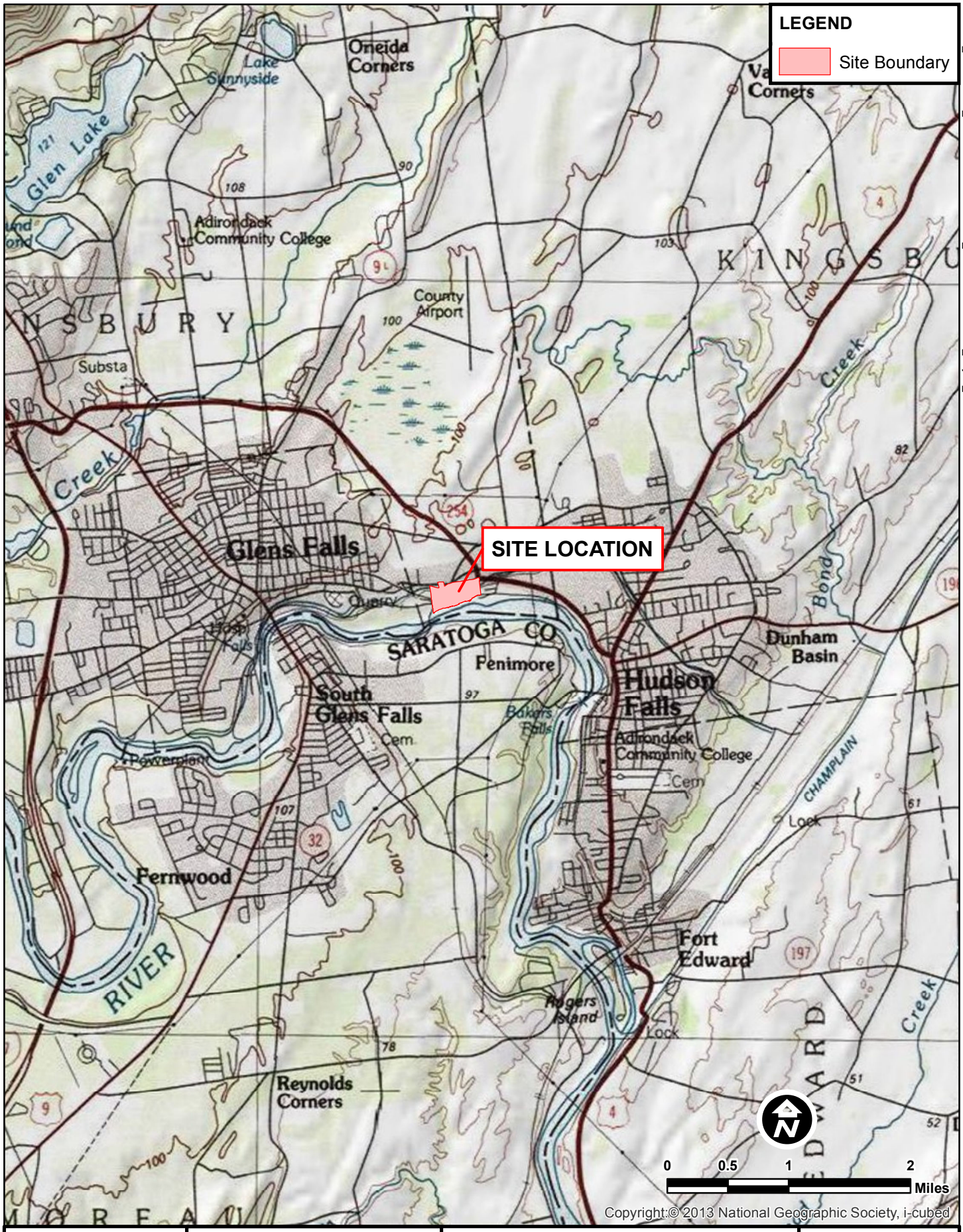
Attachment 2 Sampling Considerations When Analyzing for PFAS (document supplied by the NYSDEC)

Attachment 3 Groundwater Sampling for Emerging Contaminants (April 2018) (document supplied by the NYSDEC)

cc: James Vondracek, Ashland
Stephen Havlik, BASF
James Breza, P.G., EHS Support
Kristin VanLandingham, P.E., EHS Support
Bob O'Neill, Brown and Caldwell

Figures



D:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20160913_July16_GWF\FIGURE 1 Site Location.mxd

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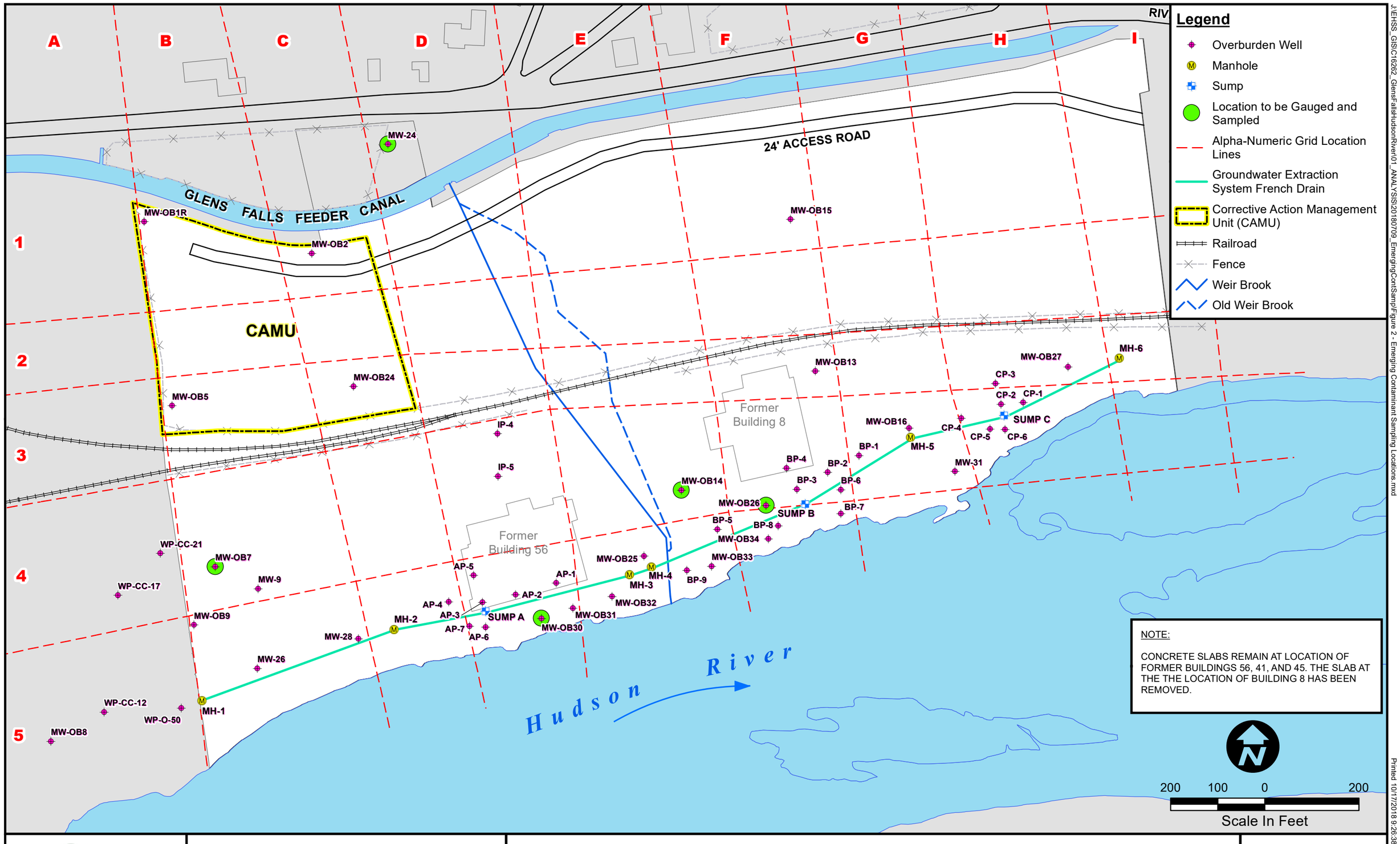
EHS Support *consider it done*	ASHLAND FORMER CIBA-GEIGY / HERCULES SITE GLENS FALLS, NY	SITE LOCATION	FIGURE 1



EHS Support *consider it done*	**ASHLAND** **FORMER CIBA-GEIGY / HERCULES SITE** **GLENS FALLS, NY**	**EMERGING CONTAMINANT SAMPLING LOCATIONS – MAIN PLANT SITE**	**FIGURE 2**

J:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20180709_EmergingContSampFigure 2 - Emerging Contaminant Sampling Locations.mxd

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693500 E

Legend

- Monitoring Well/Piezometer
- Staff Gauge
- Groundwater Sampling and Gauging Location
- Pretreatment Plan Site Boundary
- Fence

BRUSH

BRUSH

P-1

MW-OB23

MW-OB23

P-6

PRETREATMENT PLANT SWMU

P-3

IG-1

MW-OB17

P-7

P-8

MW-OB18

P-10

SG-7

TANK

MW-OB19

SG-11

MW-OB22

P-14

MW-OB21

BRUSH

IG-2

P-11

P-12

GLENS FALLS FEEDER CANAL

FLOW

IG-3R

MW-OB20

IG-4

MW-OB20

RIVER STREET

BRUSH

B R U S H

FEEDER CANAL

Edge Of Woods

BRUSH

N

50 25 0 50

Scale In Feet

EHS Support *consider it done*	**ASHLAND** **FORMER CIBA-GEIGY / HERCULES SITE** **GLENS FALLS, NY**	**EMERGING CONTAMINANT SAMPLING LOCATIONS** **PRETREATMENT PLANT SITE**	**FIGURE 3**

J:\EHSS_GIS\C16262_GlensFallsHudsonRiver\01_ANALYSIS\20180709_EmergingContSamp\Figure 3 - Emerging Contaminant Sampling Locations – Pretreatment Plant Site.mxd

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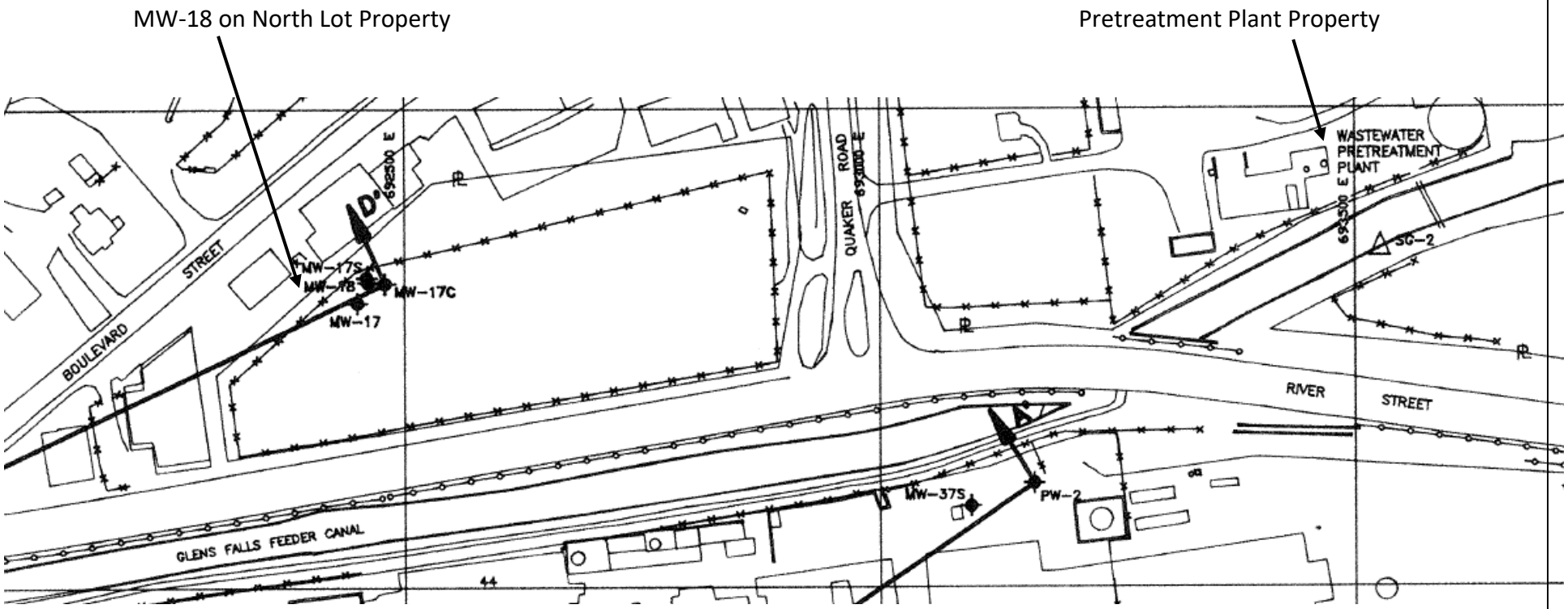

EHS Support

Figure 4
Alternate Off-Site Sampling Location

Attachment 1 Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFS) from Monitoring Wells - Sample Protocol (Revision 1.2, June 29, 2016; document supplied by the NYSDEC)

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 Sampling Considerations When Analyzing for PFAS (document supplied by the NYSDEC)

There are several potential sources of PFAS that could contribute to the cross-contamination of environmental samples during sample collection: Weatherproof clothing, pens, logbooks, cosmetics, personal hygiene products, insect repellents, even some sampling equipment could contain PFAS that could lead to false positive sampling results. Below are some special considerations when sampling for PFAS.

SAMPLING CONSIDERATIONS WHEN ANALYZING FOR PFAS	
Prohibited Materials	**Acceptable Materials**
Field Equipment	
Fluoropolymer tubing, valves and other parts in pumps (Teflon®)	High density polyethylene (HDPE) and silicon materials
Fluoropolymer bailers or pump bladders	Disposable Equipment / Dedicated Equiment (no PTFE parts)
Aluminum foil	Thin HDPE sheeting
Blue (chemical) ice*	Ice contained in plastic (polyethlene) bags (double bagged), secured to avoid meltwater from contacting sample containers, overnight shipping
Post-it notes, sharpies, waterproof fieldbook	Ball point pens, Loose paper on aluminum clipboard, non weatherproof fieldbook, pre-printed labels
Glass containers (due to potential loss of analytle through adsorption)	Polypropylene or HDPE sample bottles fitted with an unlined (no PTFE), polypropylene or HDPE screw cap
Decon 90	Alconox
Decontamination water from the site	Water used for the decontamination of sampling equipment will be laboratory certified "PFAS-free" water
Field Clothing and Personal Protective Equipment (PPE)	
New clothing or water resistant, waterproof, or stain-treated clothing, clothing containing Gore-Tex	Well-laundered clothing, defined as clothing that has been washed 6 times or more after purchase, made of synthetic or natural fibers.
Clothing laundered using fabric softener	No fabric softener
Boots containg Gore-Tex	Boots made with polyurethane and polyvinyl chloride
Cosmetics, moisturizers, hand cream or other related products as part of personal cleaning/showering routine on the morning of sampling	Sunscreens - Alba Organics Natural Sunscreen, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my face, Baby sunscreens that are "free" or "natural"
	Inspect Repellents: Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Inspect repellent, Herbal Armor, BabyGanics
Handling or prepackaged food products	Do not have at sampling location, wash hands well after handing wear powderless nitrile gloves

Attachment 3 Groundwater Sampling for Emerging Contaminants (April 2018) (document supplied by the NYSDEC)

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