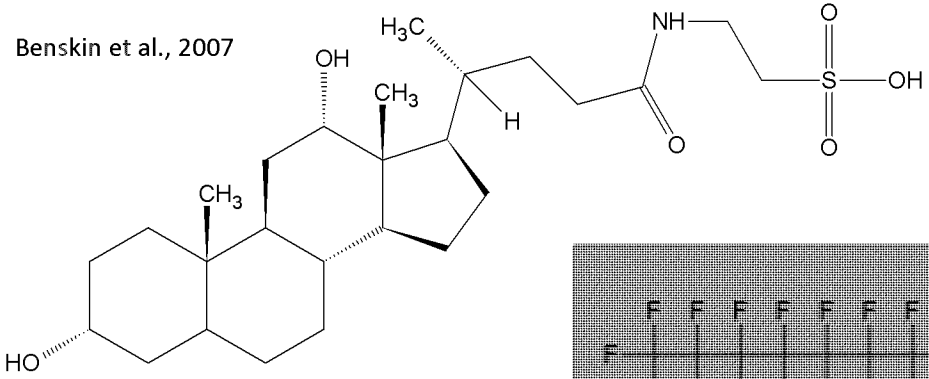
Taurodeoxycholic acid (TDCA) ENVICARB REMOVES ISSUE

Benskin et al., 2007



MW 499.35-79.8
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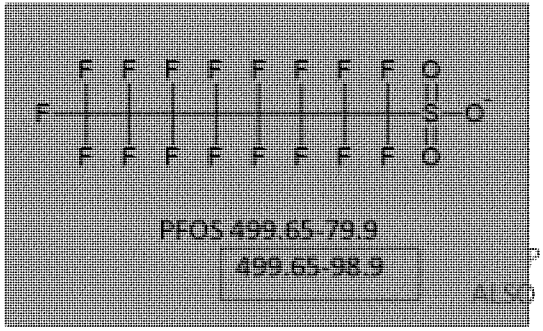
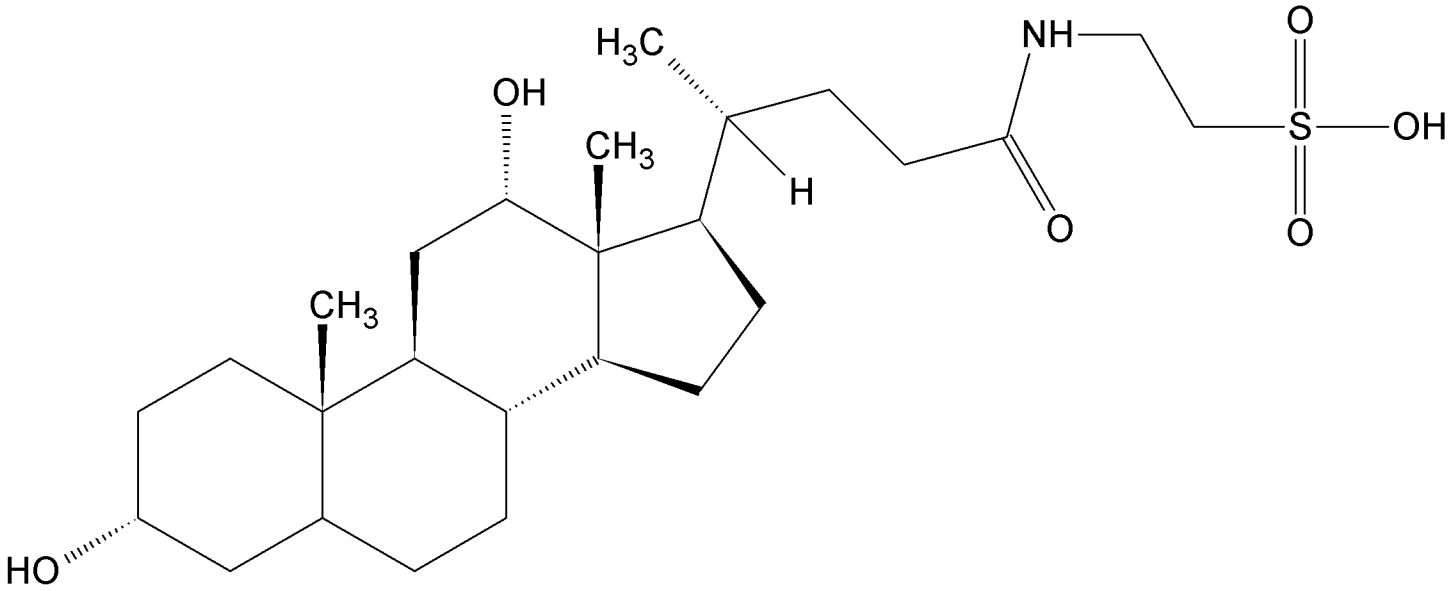


Preferred MRM
ALSO removes issue

Found in fish liver, fillets, avian eggs, human serum (SRM 1957), calf serum, cat serum, Bald Eagle blood ...Strynar et al., 2009 ASMS


H3C
NH
O
S
OH
OH
CH3
H
O
O
CH3
HO

U.S Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Exposure Methods and Measurements Division
Public Health Chemistry Branch

STANDARD OPERATING PROCEDURE

SOP Title: Improved Method for Extraction and Analysis of Perfluorinated Compounds (PFCs) from Surface Waters and Well Water by Ultra-High Performance Liquid Chromatography (UPLC)-Tandem Mass Spectrometry (MS/MS)

SOP ID: D-EMMD-PHCB-043-SOP-03	Effective Date: August 31, 2016

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SOP Discipline*: Organic Chemistry

Alternative Identification: EMAB-114.2

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* See discipline descriptions on the NERL Scientific & Technical SOP intranet site

Standard Operating Procedure for the Improved Method for Extraction and Analysis of Perfluorinated Compounds (PFCs) from Surface Waters and Well Water by Ultra-High Performance Liquid Chromatography (UPLC)-Tandem Mass Spectrometry (MS/MS)

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1. Scope and Applicability

This standard operating procedure (SOP) describes a method for the extraction, concentration, and analysis of perfluorinated compounds (PFCs) from surface waters and well water, using ultra-high performance liquid chromatography (UPLC)-tandem mass spectrometry (MS/MS). Details about how to operate the UPLC-MS/MS are not specified in this SOP.

2. Summary of Method

Oasis WAX solid phase extraction (SPE) cartridges are preconditioned for the collection and retention of PFCs. The target compounds are eluted with solvents and the resulting eluent is concentrated to 0.5 mL. The final concentrate is then diluted with buffer solution and analyzed by UPLC-MS/MS, operated in negative electro spray ionization (ESI) mode. Quantitation is completed using a multipoint calibration curve and internal standard calculation. The Limit of Quantitation (LOQ) of the method is 10.0 ng/L (10 ppt). Lower LOQs are achievable with this method, however for the developed calibration range

Note: For samples that are low volume or suspected to contain high concentrations a pre-screening may be performed prior to actual sample analysis. This step may aid in the determination of sample extraction volumes. See Section 10.2

3. Definitions

3.1 Sampling SOP

Sample collection, transportation, and storage are described in an independent SOP entitled "The Sample Collection Protocol for PFCs in Surface and Well Water" SOP # EMAB-113.0. This analytical SOP should be used as a companion to the Sample Collection SOP.

3.2 Internal Standard (IS)

A fixed amount of reference compound or solution is added to each sample and standard solution prior to extraction. The ratio of the detector signal of the native analyte to the detector signal of the internal standard (IS) is compared to the ratio obtained from the calibration curves where the IS level remains fixed and the native analyte levels vary. The internal standard is used to correct for minor sample-to-sample differences in extraction, purification, injection volume, chromatographic behavior, and mass spectrometry ionization efficiency. Internal standards used for this method are listed in Table 1b.

3.3 Quality Control (QC) Samples

Blanks, spikes, and duplicates are used as quality control measures.

Blanks are prepared with deionized laboratory water, and shipped to the field to assess potential contamination of sample containers, process reagents, and the analytical procedure.

For spikes, deionized water is spiked with known amounts of reference materials targeted by each analysis. The concentrations of analytes in these QC samples are compared to their theoretical values for the determination of the accuracy of the analysis.

Duplicate samples are sequential samples collected in the field to assess variability in the sample collection process.

4. Health and Safety

Personnel must be thoroughly acquainted with the potential hazards of the reagents, products, solvents, equipment, and procedures described in this SOP. The current Material Safety Data Sheets (MSDS) for the chemicals used in this method should be consulted. The Health and Safety Research Protocol for this laboratory activity is on file. Care should be observed with the use of all compounds specified in this protocol as some may be hazardous if used incorrectly (e.g., ammonium hydroxide, nitric acid).

5. Cautions

- **All labware and containers for samples and PFC solutions should be <u>polypropylene</u> to avoid sorption and loss of PFCs on the container walls.** Standard glassware may retain low levels of PFCs and may alter the precision and accuracy of the method.

- All labware should be washed with a non-phosphate alkaline soap solution, rinsed with warm water, followed by a final rinse with methanol or isopropanol prior to use to limit contamination and analyte carryover.

- Plastic-ware should be checked periodically for contamination, particularly when changing sources of supply or vendors. In the natural use of plastic-ware in the procedures, blank samples will show if contamination occurs.

- Strict QA/QC records for blanks and spiked samples should be maintained to assure continued quality assurance is met on a continual basis.

6. Interferences

Routine instrument maintenance is critical to achieve optimum method sensitivity. All laboratory materials must be determined to be free of contamination to ensure potential background interferences are minimized. This may be done by processing method blanks on a continuing basis in every assay. When contamination is noted the analysts should probe

further to identify the source of contamination. UPLC column efficiency and chromatographic conditions must be maintained to ensure optimum separation of the target analytes. Note that increasing the sample volume loaded during SPE extraction will also increase the potential for matrix interference (see Section 10.4.3).

7. Personal Qualifications

This SOP assumes a thorough working knowledge of basic laboratory skills, reagents, and instrumentation. This document is designed to guide a competent laboratory worker in the analysis of PFC compounds and it is not intended to instruct individuals on the basic aspects of analytical chemistry.

8. Equipment and Supplies

8.1 Equipment

8.1.1 UPLC-MS/MS system

Waters Acquity (UPLC) ultra-high performance liquid chromatography system (Waters Corporation, Milford, MA) with binary pump, auto sampler, column heater, or other equivalent automated HPLC system suitable for the instrument parameters outlined in this method.

The UPLC used in this SOP was modified as follows:

1. All solvent lines were replaced with (polyether ether ketone) PEEK tubing
2. Mobile phase OEM PTFE filters were replaced with OEM stainless-steel filters.
3. Waters ACQUITY UPLC total solution for the analysis of Perfluorinated Compounds (PFCs) P/N 176001744 kit installed. Includes PFC isolator column and stainless steel tubing installed between the mixing chamber and injection port.
4. Original sample loop (10 µL) and injection syringe (10 µL) were replaced with 50 µL and 250 µL ones, respectively for increased sample injection volume capacity.

Waters Quattro Premier XE triple quadrupole mass spectrometer or other equivalent mass spectrometer that can achieve the instrument sensitivity outlined in this method.

Waters Acquity UPLC BEH C18 reverse phase UPLC column, 2.1×50 mm, 1.7 µm (P/N 186002350) or equivalent column suitable for resolution and retention of target PFC compounds.

8.1.2 TurboVap LV nitrogen evaporator (model # 103198, Caliper Life Sciences, Hopkinton, MA) or equivalent nitrogen evaporator/heated water bath capable of heating 25–60°C, with 10–15 psi nitrogen.

8.1.3 Dual piston syringe pump (CHRATEC SepPak Concentrator, Waters Corporation, SPC10-C) or equivalent system capable of variable flow rate and positive displacement.

Note: Vacuum manifold may be used in place of a syringe pump but sample concentration times and elution rates will be more variable, with less reproducibility. In addition, turbid samples even after filtering will clog SPE cartridges and prevent water passage dependent on vacuum.

8.1.4 Balance, electronic, capable of weighing to 0.1 mg (Mettler AB204S or equivalent)

8.1.5 General house vacuum for sample filtration, SPE loading, and/or elution.

8.2 Supplies

8.2.1 Glass Microfiber Filters, GF/A glass fiber filters (70 mm diameter) (Whatman, Florham Park, NJ, P/N 1820-070)

8.2.2 Two-piece polypropylene (70 mm) Buchner funnel (ACE Glass, P/N 12557-09 or equivalent

8.2.3 Vacuum Flask, liter size, polypropylene (Nalgene, 1000 mL) or equivalent.

8.2.4 SPE cartridge, Oasis WAX Plus extraction cartridge, 225 mg, 60 µm (Waters Corporation, P/N 186003519) or equivalent

8.2.5 Sample container, high density polyethylene HDPE, 1000 mL, wide mouth, with screw top (P/N 2189-0032 24/case Nalgene Labware, Rochester, NY) or equivalent

8.2.6 Centrifuge tube and cap, polypropylene, sterile, 15 mL (BD Falcon brand, BD, Franklin Lakes, NJ, P/N 352096, or equivalent)

8.2.7 Pipettor, variable volume, positive displacement, capability of 10 to 100, and 100 to 1000 microliter ranges (Eppendorf, Westbury, NY), or equivalent

8.2.8 Pipettor, repeating, positive displacement, capability of 1 to 50 mL (Eppendorf) or equivalent

8.2.9 Disposable polypropylene pipettor tips of various sizes (10, 100, 1000, 5000 uL) (Genesee Scientific, Research Triangle Park, North Carolina USA) or equivalent

*Note: Caution should be taken to avoid low binding pipette tips. Some vendors coat tips with coatings that contain polyfluorinated compounds that can add significant

contamination. The user should assess pipette tip being used for contamination through the preparation of blank samples.

9. Reagents

9.1 Reference Materials

Reference materials including the perfluorinated analytes, the stable isotope internal standards, abbreviations, LC/MS/MS transitions, confirmation ions, and ion ratios monitored in analysis are listed in Table 1a and 1b below.

Target compounds were purchased in premixed ampoules prepared Wellington Laboratories, Guelph, Ontario, Canada (http://www.well-labs.com/). The PFAC-24PAR standard contains 24 perfluorinated analytes at 2 µg/mL (= 2 ng/µL) see Table 1a.

Internal standards were purchased as a mixture from Wellington Laboratories, Guelph, Ontario, Canada (http://www.well-labs.com/) (MPFAC-24ES) and include 19 stable isotope labeled perfluorinated analytes at 1 ug/mL (= 1 ng/uL) see Table 1b.

Additional internal standards do become available as time progresses. Ideally a matched internal standard to each analyte should be used. At the time this method was developed these were the existing commercially available internal standards.

Table 1a. Perfluorinated analytes, abbreviations, LC-MS/MS transitions, and confirmation ions.

Analyte	Abbreviation	Quant. transition	Confirm. transition
Perfluorobutanoic acid	PFBA	212.8 → 168.8	N/A
Perfluoropentanoic acid	PFPeA	262.9 → 218.8	N/A
Perfluorohexanoic acid	PFHxA	312.7 →268.7	312.7 →118.7
perfluoroheptanoic acid	PFHpA	362.7 → 318.7	362.7 → 168.7
perfluorooctanoic acid	PFOA	412.6 → 368.7	412.6 → 168.7
perfluorononanoic acid	PFNA	462.6 → 418.6	462.6 → 218.8
perfluorodecanoic acid	PFDA	512.6 → 468.6	512.6 → 468.6
perfluoroundecanoic acid	PFUdA	562.6 → 268.7	562.6 → 518.6
perfluorododecanoic acid	PFDoA	612.6 → 168.8	612.6 → 568.6
perfluorotridecanoic acid	PFTrDA	662.7 → 168.8	662.7 → 618.6
perfluorotetradecanoic acid	PFTeDA	712.7 → 318.8	712.7 → 668.7
perfluorobutane sulfonate	PFBS	298.7 → 79.9	298.7 → 98.8
perfluoropentane sulfonate	PFPeS	349.0 → 80.0	349.0 → 99.0
perfluorohexane sulfonate	PFHxS*	398.7 → 79.9	398.7 → 98.8
perfluoroheptane sulfonate	PFHpS	448.7 → 79.9	448.7 → 98.8
perfluorooctane sulfonate	PFOS*	498.7 → 79.9	498.7 → 98.8
perfluorononane sulfonate	PFNS	549.0 → 80.0	549.0 → 99.0
perfluorodecnane sulfonate	PFDS	598.6 → 79.9	598.6 → 98.8
perfluorooctane sulfonamide	PFOSA	498.0 → 77.9	498.0 → 168.9
N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	570.0 → 419.0	NA
N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	584.0 → 419.0	NA
1H,1H,2H,2H-perfluorohexane sulfonate	4:2 FTS	327.0 → 81.0	327.0 → 307.0
1H,1H,2H,2H-perfluorooctane sulfonate	6:2 FTS	426.7 → 80.9	426.7 → 406.7
1H,1H,2H,2H-perfluorodecane sulfonate	8:2 FTS	526.8 → 80.8	526.8 → 506.7

* Analyte exists in the standard as the linear and branched isomers

Table 1b. Stable isotope labeled internal standards, abbreviations, LC-MS/MS transitions, and assigned analytes.

Isotope Labeled Standards	Abbreviation	Quant. transition	Assigned Analyte(s)
Perfluoro[$^{13}C_4$]butanoic acid	MPFBA	216.8 → 171.8	PFBA
Perfluoro[$^{13}C_5$]pentanoic acid	M5PFPeA	268.0 → 223.0	PFPeA
Perfluoro[$^{13}C_5$]hexanoic acid	M5PFHxA	318.0 →273.0	PFHxA
Perfluoro[$^{13}C_4$]heptanoic acid	M4PFHpA	367.0 → 322.0	PFHpA
Perfluoro[$^{13}C_8$]octanoic acid	M8PFOA	420.7 → 375.8	PFOA
Perfluoro[$^{13}C_9$]nonanoic acid	M9PFNA	472.0 → 427.0	PFNA
Perfluoro[$^{13}C_6$]decanoic acid	M6PFDA	519.0 → 474.0	PFDA
Perfluoro[$^{13}C_7$]undecanoic acid	M7PFUdA	570.0 → 525.0	PFUdA
Perfluoro[$^{13}C_2$]dodecanoic acid	MPFDoA	615.0 → 570.0	PFDoA, PFTrDA
Perfluoro[$^{13}C_4$]tetradecanoic acid	M2PFTeDA	715.0 → 670.0	PFTeDA
Perfluoro[$^{13}C_3$]butane sulfonate	M3PFBS	301.7 → 79.8	PFBS, PFPeS
Perfluoro[$^{13}C_3$]hexane sulfonate	M3PFHxS	402.0 → 99.0	PFHxS, PFHpS
Perfluoro[$^{13}C_8$]octane sulfonate	M8PFOS	507.0 → 99.9	PFOS, PFNS, PFDS
Perfluoro[$^{13}C_8$]octane sulfonamide	M8PFOSA	506.0 → 78.0	PFOSA
N-[d_3]methylperfluorooctane sulfonamidoacetic acid	d3-N-MeFOSAA	573.0 → 419.0	N-MeFOSAA
N-[d_5]ethylperfluorooctane sulfonamidoacetic acid	d5-N-EtFOSAA	589.0 → 419.0	N-EtFOSAA
1H,1H,2H,2H-perfluoro[1,2-$^{13}C_2$]hexane sulfonate	M2-4:2 FTS	329.0 → 81.0	4:2 FTS
1H,1H,2H,2H-perfluoro[1,2-$^{13}C_2$]octane sulfonate	M2-6:2 FTS	428.7 → 408.7	6:2 FTS
1H,1H,2H,2H-perfluoro[1,2-$^{13}C_2$]decane sulfonate	M2-8:2 FTS	529.0 → 81.0	8:2 FTS

9.2 Chemicals/Solvents

9.2.1 Methanol (MEOH), HPLC grade or equivalent (Honeywell Burdick & Jackson, Muskegon, MI)

9.2.2 Water, HPLC grade or deionized (DI water), predetermined to be PFC free based on analysis using this SOP

9.2.3 Ammonium Acetate, Fluka, puriss. p.a. grade, for mass spectroscopy, ≥ 99.0% (calc. on dry basis) (P/N 17836) or equivalent

Caution: Reagent grade ammonium acetate is hydroscopic—protect from water adsorption, maintaining in desiccator when not in use.

9.2.4 Glacial acetic acid, Sigma-Aldrich (St. Louis, MO)

9.2.5 Sodium acetate, Sigma-Aldrich (St. Louis, MO)

9.2.6 Ammonium hydroxide (NH_4OH, 28% in water), Sigma-Aldrich (St. Louis, MO)

9.2.7 Five mL ampoules of 35% nitric acid, EP Scientific Products – Thermo Fisher Scientific (P/N SVCN-5-1). *Alternatively, 5 mL ampules can be made in-house as a 50:50 mix of house DI water:concentrated nitric acid. However, assessment of blanks samples due to in-house preparation should be determined prior to use in field sampling efforts.

10. Procedures for Solution Preparation and Sample Extraction

10.1 Preparation of Solutions

10.1.1 Ammonium Acetate Buffer Solution Preparation

***Stock Solution*:** Prepare a 100 mM solution of ammonium acetate by weighing 7.7 g (100% purity, anhydrous basis) per liter of deionized or HPLC grade water in a suitable storage container. Cap and shake well by hand inversion until clear and all crystals are dissolved. Label and refrigerate 4°C for long term storage.

***Working solution*:** Prepare as needed a 2 mM solution of ammonium acetate by warming the stock solution to ambient temperature and pipetting a 20 mL aliquot of the stock solution and diluting to 1 L volume with deionized or HPLC grade water. Make sure no precipitate is formed.

10.1.2 Internal Standard Preparation

***Stock Solution*:** The internal standard (IS) should be prepared so that the IS level for each compound approximates the midpoint on the standard curve. It must also be accurately and precisely delivered to each unknown, QC, and calibration sample used in the analysis.

All IS materials are supplied from the manufacturer as a mixture in methanol/isopropanol/water solutions at 1 ng/µL.

Each 1 liter of unknown, QC, or calibration sample prepared will therefore receive 50 µL IS stock solution, delivering 50 µL x 1 ng/µL = 50 ng/L of each of the IS materials.

10.1.3 Calibration Solution Preparation

The standard curve covers all of the target compounds included in the PFAC-24PAR standard purchased from Wellington Laboratories, Guelph, Ontario, Canada (http://www.well-labs.com/). Table 1a indicates the analytes included in this mixed standard.

A 6-8 point calibration curve should be prepared to bracket the range of concentrations expected in the samples being analyzed. This range can be adjusted for targeting higher or lower concentration ranges.

Refer to Table 2 below for an example calibration standards preparation.

Table 2. Example preparation of calibration standards.

Calibration Point (ng/L)	Volume DI water (mL)	Volume standard solution (uL)	Concentration in standard solution (ng/uL)	Total mass of each analyte added (ng)
10	1000	5	2.0	10
25	1000	12.5	2.0	25
50	1000	25	2.0	50
75	1000	37.5	2.0	75
100	1000	50	2.0	100
125	1000	67.5	2.0	125
150	1000	75	2.0	150
200	1000	100	2.0	200

Each of these calibration samples is prepared as indicated above, receiving the appropriate standard solution, the IS solution, and 5 mL of 35% nitric acid, used as a preservative for the unknown and QC samples.

10.1.4 QC Spike Preparation

Field spikes can be prepared at low (ex. 25 or 50 ng/L) and high (ex. 50 or 100 ng/L) levels of all of the compounds on the target list. These concentrations were chosen to bracket health advisory values for PFOS and PFOA respectively. More appropriate or additional spike levels can be prepared and assessed if needed. These QC samples will be prepared in the laboratory and

shipped with the empty sample containers to be used for the collection surface or well water samples. Preparation will be as follows:

PFAC-24PAR standard containing all of the target compounds at 2 µg/mL (= 5 ng/µL) will be purchased from Wellington Laboratories (http://www.well-labs.com/).

For example, to prepare a low level field spikes at 50 ng/L, 25 µL of this standard will be added to 1 L of deionized laboratory grade water (2 ng/µL x 25 µL = 50 ng/L) and capped and mixed well. The samples will be preserved with the addition of 5 mL of 35% nitric acid, supplied in premeasured ampoules. These low level field spikes will be prepared at a rate of 10% of all unknown water samples.

To prepare high level field spikes, 50 µL of this standard will be added to 1 L of deionized laboratory grade water (2 ng/µL x 50 µL = 100 ng/L) and capped and mixed well. The samples will be preserved with the addition of 5 mL of 35% nitric acid, supplied in premeasured ampoules. These high level field spikes will be prepared at a rate of 10% of all unknown water samples.

Additional low and high trip spikes may be prepared for a lower or higher range calibration curve range.

Note: Different vials or lots of the native standards should be used to prepare the QC spikes and the calibration samples if available.

10.1.5 Sodium Acetate Buffer Preparation (pH 4)

- Used for SPE conditioning and washing

Dilute 1.4 mL of glacial acetic acid with DI water in a glass bottle to make 1-L of 25 mM acetic acid. Weigh out 3.4 g of sodium acetate and dissolve in DI water in a glass bottle bringing up the final volume to 1 L. Mix 800 mL of acetic acid solution and 200 mL of sodium acetate solution to make the 25 mM sodium acetate buffer (pH 4).

10.1.6 Methanol/Ammonia Solution Preparation

- Used for sample elution from SPE cartridge (see Section 10.4.5)
- Refer to Table 3 for elution solvent preparation.

On every day of the analysis, a fresh mixture of this solution should be made to adequately cover the volume needed for the experiment. For example, 10 mL of solution will be required for each sample (5 mL to condition each SPE cartridge and 5 mL for analyte elution). If 100 mL of solution is to be made, mix 100 uL

of ammonium hydroxide (28% in water) with 100 mL of methanol and shake vigorously. Although this solution is good for more than one day, it is best to make this solution up fresh daily since ammonia is volatile.

Table 3. Volumes for the preparation of elution solvent.

Volume of Ammonium Hydroxide (28%) (uL)	Volume Methanol (mL)	Desired volume of elution solvent (mL)	Maximum number of WAX cartridges
100	100	100	10
200	200	200	20
300	300	300	30
400	400	400	40
500	500	500	50

10.2 Sample Pre-screening (Optional)

For samples that are limited in volume or are suspected of having high concentrations that may exceed calibration levels, analytical pre-screening may be performed to guide in sample extraction volumes. Samples may be pre-screened by taking 300 uL of each water sample and combining with 100 uL of methanol into an HPLC vial followed by vortex mixing (10 seconds) and UPLC-MS/MS analysis. Appropriate calibration curve points may be constructed by adding analytes of interest to DI water, vortex mixing (10 seconds) and sampling as above (300 uL water:100 uL methanol in HPLC vial). For example, a 7-point calibration curve may include points from 200 ng/L up to 3000 ng/L. Internal standards should be added at a concentration approximating the midpoint of the calibration curve.

10.3 Sample Pretreatment and Filtration

10.3.1 Volume Measurement

Pour whole water sample into a previously cleaned 1-L HDPE graduated cylinder and record the volume.

10.3.2 Methanol Rinse of the Sample Container

Add 10 mL of methanol into the emptied bottle, cap, and shake well. **Do not discard the rinse.** Pour the sample that is in the graduated cylinder back into the original sample bottle and mix with the methanol rinse.

Note: This step must be performed immediately prior to the filtration steps that follow (in Section10.3.4).

10.3.3 Internal Standard Addition

Add appropriate volume of working internal standard solution (containing enough mass of the IS to approximate the midpoint of the standard curve) to each sample and mix well.

10.3.4 Filtration

Filter the whole sample with GF/A glass fiber filter under gentle vacuum into a previously cleaned 1-liter vacuum flask. If the filter apparatus clogs during filtration due to a highly turbid sample, a new filter can be exchanged for the clogged one and filtration completed. This should be noted in one's notebook.

If any particulate matter remains in the original sample bottle, rinse it clean by adding 20 mL of DI water, mixing thoroughly, and discarding this rinsate to waste. After rinsing the bottle, pour the entire filtered sample back into the original bottle for the sample extraction process.

10.4 Sample Extraction

The following procedure is a general method for the capture and elution of PFCs using a dual piston pump system for the concentration of analytes on an Oasis WAX solid phase extraction (SPE) cartridge. Alternate means of collection and concentration can be used but are not addressed in this SOP.

10.4.1 Conditioning of Cartridge

Pass methanol through each SPE cartridge using the SPE pumps at a rate of 10 mL/min for 2.5 minutes. Alternatively, SPE cartridges may be conditioned by passing 5 mL of methanol through the cartridges with a vacuum manifold. Discard all solvents to waste.

10.4.2 Equilibration of Cartridge

Using a dual piston pump system, run 25 mL of DI water through the cartridge at a flow rate of 10 mL/min for 2.5 minutes to remove the methanol. Discard the water to waste. (The flow rate for all procedures using the dual piston pump is 10 mL/min).

10.4.3 Loading Samples onto Cartridge

Pass 500 mL of sample water containing the IS through the cartridge at a steady flow rate of 10 mL/min using the dual piston pump. Water that passes is discarded to waste.

Note: If more sensitivity is required, the volume of sample loaded onto the SPE cartridge can be increased. However, the sample volume must be known and recorded for later calculation of the concentration (wt/volume). It is also

important to note that increasing the sample volume will also increase the potential for matrix interference.

10.4.4 Cartridge Wash

Place the cartridge on a vacuum manifold and apply vacuum long enough to remove any obvious water drops remaining in the cartridge. Pass 4 mL of 25 mM sodium acetate buffer (pH 4.0) and discard to waste.

10.4.5 Analyte Elution and Collection

Fit the corresponding SPE cartridge on the top of the manifold to prepare for sample elution. Wash the SPE cartridge with 4 mL of 100% methanol and discard to waste except for samples needing PFOSA analysis*.

***PFOSA Collection**: For the collection of PFOSA, place a 15 mL polypropylene centrifuge tube in the collection reservoir of the vacuum manifold to capture the 4 mL of 100% methanol passed through the SPE cartridge using the WAX method that is otherwise discarded to waste. As PFOSA is not anionic, it is not retained at this step and will be lost unless captured. Remove the tube from the rack, vortex mix, and then evaporate the eluate down to approximately 500 to 1000 µL (at 40°C) with TurboVap LV or similar nitrogen/bath evaporator. Do NOT completely evaporate the eluate.

Collection of All Other Analytes: After the methanol wash, place a 15 mL polypropylene centrifuge tube in the collection reservoir of the vacuum manifold to collect the final eluate. Run 4 mL of methanol/ammonia solution through the cartridge at a flow rate of approximately 1 drip/second. Remove the tube from the rack, vortex mix, and then evaporate the eluate down to approximately 500 to 1000 µL (at 40°C) with TurboVap LV or similar nitrogen/bath evaporator.

Note: Eluate should NOT be completely evaporated, which may cause loss of analytes. A lower temperature is recommended because shorter chain species may evaporate off at higher temperatures.

10.4.6 Preparation for Instrumental Analysis

Dispense 300 µL of 2 mM ammonium acetate buffer into all HPLC auto sampler vials. Transfer 100 µL of each eluate into a respective auto sampler vial such that the final solution is 75% buffer and 25% methanol by volume.

Note: If specific UPLC conditions need to be changed to provide optimal peak shape and separation of compounds, then modify the buffer/methanol mobile phase ratio to match the initial UPLC flow conditions.

Cap and vortex each vial well for more than 10 seconds to ensure solution uniformity. Analyze the samples with UPLC-MS/MS using the conditions outlined in Section 11.

11. Determination of Analyte Concentration

11.1 UPLC

Using the instrument system and column outlined in Section 8.1.1, set up the method conditions using the following parameters:

Reservoir **A**: 2 mM ammonium acetate in DI water with 5% methanol
B: 2 mM ammonium acetate in 100% methanol
Column: BEH C18 reverse phase, 2.1×50 mm, 1.7 µm particle size
Flow rate: 500 µL/min
Column temperature: 50°C
Injection Volume: 50 µL
Gradient mobile phase program:

Time (min.)	A	B	Curve
0.00	75	25	initial
0.50	75	25	6
5.0	15	85	6
5.1	0	100	6
5.6	0	100	6
7.0	0	100	1
9.0	75	25	1
12.0	75	25	initial

Note: The gradient program should be adjusted, if necessary, for the complete separation of all analytes from any matrix interferences.

11.2 MS/MS

The Quattro Premier mass spectrometer is operated in the multiple reaction monitoring (MRM) mode using negative-ion-spray ionization under the following conditions:

Instrument Parameters	
Capillary (kV)	−0.40
Source temperature	150°C
Desolvation temperature	350°C
Cone gas flow	2 L/hr
Desolvation gas flow	1200 L/hr
Cone voltage	Optimized for
Collision energy	each compound

Note: Ionization and collision cell parameters are optimized for each individual analyte (See Section 13).

11.3 System Conditioning

From 1-3 double blanks containing unprocessed methanol and 2 mM ammonium acetate, (in a 1:3 ratio) should be injected as the first part of any sample batch in order to ensure that minimal background signal is achieved. Henceforth, an additional double blank should be inserted every 10th sample to ensure system background performance. PFCs are common contaminants in most analytical systems, but as long as any peak areas in the double blanks are at least 10 times smaller than peak areas in the lowest point on the calibration curve, adequate sensitivity has been achieved.

If an isolation column is used (see Section 8.1.1) to separate background systemic PFAS contamination from sample contamination, three double blanks should be sufficient to achieve starting chromatographic conditions. Separation of an analytical peak (a peak due to sample injection) and a background peak (systemic contamination from solvents, internal components) should achieve baseline resolution. The earlier eluting peak is the analytical peak whereas the later eluting peak is systemic. It is not uncommon for a system that has sat dormant for some time to take many injections until systemic contamination is low and consistent. However, it is not common for analytical peaks in blank samples to remain high and consistent. If this occurs it is likely that contamination from laboratory apparatus or solvents is the cause (i.e. HPLC vials and caps, solvents, pipette tips). If this occurs the source of the contamination should be identified and corrected.

11.4 Integration

Peak area counts for each analyte and internal standard are automatically determined using the mass spectrometer software (MassLynx 4.1). Each chromatogram should be reviewed by the operator to insure proper and consistent integration, and manual corrections of inappropriate integrations or missed peaks should be applied if necessary.

12. Calculation

Calculations are based on the isotope dilution method of quantitation. Calculations may also be performed by automated data system, i.e. MassLynx or other equivalent software.

A calibration curve is created separately from the analysis of each standard solution for each analyte. The peak area count ratio of the analyte to the internal standard (y-axis) versus the concentration of analyte (x-axis) is plotted and a best fit regression formula is determined using $1/x$ weighting. The resulting standard curves are used for calculation of analyte concentration in the unknown samples. Each standard curve should result in a coefficient of determination (r^2) of greater than 0.99 for a seven point curve.

Note: If samples are found to exceed the top of the calibration curve, they will need to be diluted and reanalyzed. Using and estimation of the concentration in the sample, dilute the sample(s) to approximate the mid-point of the calibration curve. Samples should be diluted using DI water with nitric acid added containing IS/liter of water at the same concentration as

in previously prepared samples. Calculation of analyte concentrations must include correction for the dilution factors used to prepare the sample.

13. Specification Parameters

The following instrumental parameters were determined to be adequate in repeated experiments involving quantitation of PFCs in surface water. Different instruments will have their own unique settings that will need to be optimized depending on each laboratory's specific operating conditions. An example of these conditions is shown in Table 4.

Table 4. Specific parameters for Quattro Premier XE (MS/MS) broken into 3 sequential time segments. Primary transitions are indicated by °1 and confirmation transitions by °2 designations.

Time segment 1 (0-3.5 minutes)

Analyte	Parent Ion	Daughter Ion	Cone Voltage	Collision Energy
PFBA	212.8	168.8	15	10
PFBA IS	216.8	171.8	15	10
PFPeA	262.9	218.8	15	9
PFPeA IS	268.0	223.0	15	9
PFBS °1	298.7	79.9	40	30
PFBS °2	298.7	98.8	40	28
13C3-PFBS	301.7	79.8	60	30
PFHxA °1	312.7	118.7	13	21
PFHxA °2	312.7	268.7	13	10
PFHxA IS	318.0	273.0	13	9
4:2 FTS °1	327.0	81.0	43	30
4:2 FTS°2	327.0	307.0	43	20
4:2 FTS IS	329.0	81.0	43	30
PFPeS °1	349.0	80.0	45	34
PFPeS °2	349.0	99.0	45	30

Time Segment 2 (3.5 – 5 minutes)

Analyte	Parent Ion	Daughter Ion	Cone Voltage	Collision Energy
PFHpA °1	362.7	168.7	14	17
PFHpA °2	362.7	318.7	14	10
PFHpA IS	367.0	322.0	14	10
PFHxS °1	398.7	79.9	50	38
PFHxS °2	398.7	98.8	50	32
PFHxS IS	402.0	99.0	50	38
PFOA °1	412.6	168.7	15	18
PFOA °2	412.6	368.7	15	11
13C8 PFOA IS	420.7	375.8	15	11
6:2 FTS °1	426.7	80.9	43	34
6:2 FTS °2	426.7	406.7	43	24
6:2 FTS-IS	428.7	408.7	43	24
PFHpS °1	448.7	79.9	60	48
PFHpS °2	448.7	98.8	60	38
PFNA °1	462.6	218.8	15	17
PFNA °2	462.6	418.6	15	11

Time Segment 2 (3.5 – 5 minutes) continued				
Analyte	**Parent Ion**	**Daughter Ion**	**Cone Voltage**	**Collision Energy**
PFNA IS	472.0	427.0	15	11
PFOS °1	498.7	79.9	60	48
PFOS °2	498.7	98.8	60	38
13C8 PFOS IS	507.0	99.0	60	48

Time Segment 3 (5-12 minutes)

Analyte	**Parent Ion**	**Daughter Ion**	**Cone Voltage**	**Collision Energy**
PFOSA °1	498.0	77.9	50	32
PFOSA °2	498.0	168.9	50	28
PFOSA IS	506.0	78.0	50	32
PFDA °1	512.6	218.8	16	18
PFDA °2	512.6	468.6	16	12
PFDA IS	519.0	474.0	16	12
8:2 FTS °1	526.8	80.8	45	45
8:2 FTS °2	526.8	506.7	45	28
8:2 FTS IS	529.0	81.0	45	45
PFNS°1	549.0	80.0	65	51
PFNS°2	549.0	99.0	65	41
PFUnA °1	562.6	268.7	18	19
PFUnA °2	562.6	518.6	18	12
MeFOSAA	570.0	419.0	35	20
PFUnA IS	570.0	525.0	17	12
MeFOSAA IS	573.0	419.0	35	20
EtFOSAA	584.0	419.0	35	20
EtFOSAA IS	589.0	419.0	35	20
PFDS °1	598.6	79.9	73	55
PFDS °2	598.6	98.8	73	44
PFDoA °1	612.6	168.8	18	28
PFDoA °2	612.6	568.6	18	13
PFDoA IS	615.0	570.0	18	13
PFTrA °1	662.7	168.8	18	28
PFTrA °2	662.7	618.6	18	13
PFTA °1	712.7	318.8	19	22
PFTA °2	712.7	668.7	19	14
PFTA IS	715.0	670.0	19	14

14. Data and Records Management

Raw data (including electronic data on individual PC hard drives and group shared drives) should be backed up, maintained and made available for review. A consistent file naming convention should be documented and used for each specific project and data type generated. data generated should be maintained by the principal investigator until completion of the project. Upon completion, data should be stored in accordance with EPA's record management policy. All instrument data should be backed up to network drives on a regular basis and should be archived along with other supporting data and relative correspondence at the completion of the study. Printed data should be referenced, signed and dated in accordance with the Office of Research & Development's Policies and Procedures Manual

Section 13.02 on Paper Laboratory Records. The research notebook will be the record for any procedure conducted in the field or laboratory and will provide the objective, procedural details, data references and discussion for project development. These entries will give a full and complete statement of the situation being examined, a specific hypothesis relating to the situation, and a brief experimental protocol designed to answer the questions posed in the hypothesis. Data will be recorded from these experiments and a discussion of the results will be presented with conclusions drawn. Any standard, solution, or sample made during these investigations should be marked with a reference number, traceable to a specific entry in the research notebook. An example could be the initials of the analyst-lab notebook number-page number-sample number (ex. MJS 1-50-1). The laboratory notebooks are the property of EPA and will be stored in accordance with EPA's record management policy.

15. Quality Control and Quality Assurance

Analysis of standard solutions should result in a best fit regression coefficient of determination (r^2) of 0.99 or greater, using a minimum of seven independent concentrations that bracket the sample concentrations. Sample concentrations resulting in peak area ratios that are lower or greater than the range of standards should be reanalyzed with appropriate re-extraction or dilution of original water sample, respectively

Trip Spike Samples: For quality control checks, samples of deionized water are acidified with nitric acid and fortified at two concentrations that bracket the expected unknown sample concentrations of PFCs. These samples are unopened in the field, shipped with unknown samples and analyzed with each batch of water extracts. Based on the demonstrated precision data, the analyses are considered acceptable if the calculated concentrations are ±20% of the expected values.

Trip Blank Sample: One laboratory method blank consisting of 1 liter of DI water acidified with nitric acid and unfortified is analyzed for each batch of samples analyzed. This sample is unopened in the field, shipped with unknown samples and analyzed with each batch of water extracts. If significant analyte levels (S/N > 5) are found in the laboratory method blank, the source of contamination should be identified, corrected, and verified as being eliminated before additional analyses of unknown samples proceed.

For each field sampling event, it is recommended that 10% fortified DI water should be sent to the field along with blank sample containers. Duplicate samples should be collected from at least 10% of the sampling sites. Refer to Sampling SOP (EMAB-113.0) for the detail.

16. Method Validation

This method has been validated for the following parameters using natural water samples and deionized water. The results of this validation procedure are presented below, and typical chromatograms can be found in Appendix I. Previous calibration ranges and QA/QC and

results are shown here for a subset suite of the total analyte list. Additional validation results are to follow with an appendix addition.

16.1 Specificity

Chromatographic examinations of method blanks, control samples (deionized water), and various natural water samples did not reveal any significant matrix interferences with each analyte or internal standard peak area.

16.2 Linearity

Each analyte solution was evaluated, in duplicate, and dilutions covered the range of 10 ng/L to 1000 ng/L. Each standard curve resulted in a coefficient of determination (r^2) of greater than 0.99 for a six point curve. Some analytes may have a better fit with a quadratic regression.

16.3 Precision

A bulk river sample was collected and split into six 500 mL subsamples. Each subsample was then prepared for analysis, representing six individual replicate analyses. The precision for all analytes based on relative standard deviation (RSD) resulted in < ± 20%.

16.4 Accuracy

Deionized water samples were spiked at either 200 ng/L (low QC) or 400 ng/L (high QC) for use as QC samples. Duplicate solutions were prepared for each daily analysis. The accuracy for all PFC analytes for QC samples both at 200 and 400 ng/L was in a range of 80 to 120% of the spiked concentration.

16.5 Recovery

Recoveries were calculated based on a matrix matched spike extraction. Pond water was spiked with known amounts of PFCs and then extracted using an SPE cartridge. After elution of the PFCs from the cartridge, the internal standards were added to the eluate. The same volume of un-spiked pond water was extracted using a second SPE cartridge. After elution, the same amount of PFCs and internal standards were added to the eluate. The area ratio of the first sample (pre-addition to cartridge) was divided by that of the second eluate (post-addition) to give a recovery determination. The equation used for the calculation is shown below. Each level had five replicates. The recoveries for each compound are illustrated in Figure 1 of Section 16.6.

$$Rc = \frac{SB - BLK}{SA - BLK}$$

Where Rc = recovery,
SB = response for SPE extract of matrix spiked before SPE
SA = response for SPE extract of matrix spiked after SPE
BLK = response for SPE extract of matrix without spike

16.6 Matrix Effect

Matrix effects were calculated comparing a blank matrix extract spiked with PFCs to a blank methanol solution spiked with the same amount of PFCs. Un-spiked pond water samples were extracted using the SPE method described above. After elution, a specific amount of PFCs and internal standards were added to the eluate. The same volume of methanol was spiked with the same amount of PFCs and internal standards. After subtracting the background level of PFCs found in the pond water, the area ratio of the first sample (post-elution spike) was divided by that of the methanol solution (solvent) to give a matrix effect determination. The equation used for the calculation is shown below. Each level had five replicates. The matrix effects for each compound are illustrated in Figure 1 below.

$$ME = \frac{SA - BLK}{Sstd}$$

Where ME = matrix effect (positive: ionization enhancement, negative: ionization suppression),

SA = response for SPE extract of matrix spiked after SPE
$Sstd$ = elution solvent spiked (no matrix)
BLK = response for SPE extract of matrix without spike

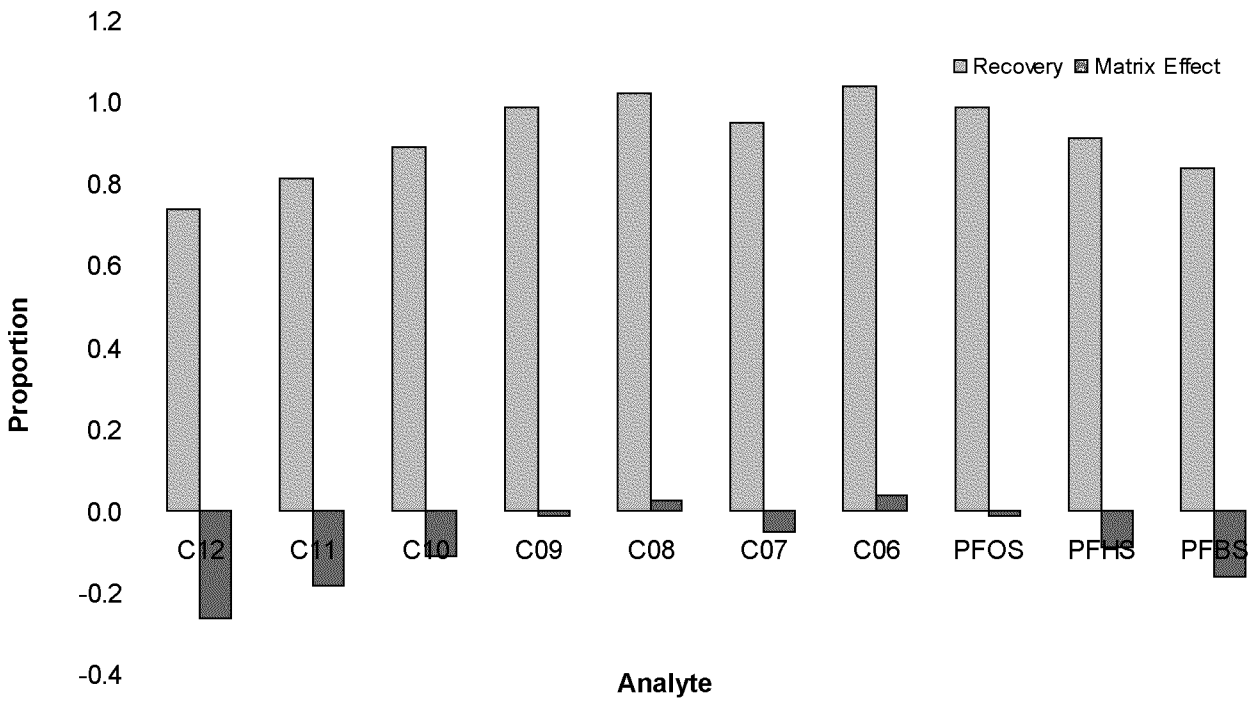


Figure 1. Recoveries and matrix effect for each compound.

16.7 Stability

16.7.1 Sample Stability

Samples are stable for a minimum of 4 weeks at ambient temperature if they are appropriately preserved (refer to the Sampling SOP (EMAB 113.0).

Note: Methanolic rinse of the sample container is essential in order to recover PFCs from sample container wall for the tested substances listed in this SOP. Additional compounds not listed in this SOP will need to be assessed for recovery and sample stability.

16.7.2 Cartridge Stability

The stability of PFCs from water samples that have been processed and captured on the WAX SPE cartridge was evaluated by storing sample loaded cartridges for one month at ambient temperature. No reduction in recovery was observed when compared to duplicate samples which were analyzed immediately after preparation.

16.7.3 Solution Stability

PFC standards and spiking solutions are stable for at least 2 months when stored at ambient temperature. Methanolic standards from the suggested vendor (Wellington Laboratories) come with NaOH added to prevent the formation of methyl esters of the analytes of interest. This leads to loss of analyte with time. This appears to only effect the perfluorinated carboxylic acids and not the sulfonic acids.

16.8 Limit of Detection

The limit of detection (LOD) and limit of quantitation (LOQ) for each PFC were determined by analyzing low concentration standards (~1/10 x the lowest calibration point) 6 times on 6 separate days. The LOD was calculated as follows;

$$\mathrm{LOD} = \frac{3 \times s}{m}$$

where s is the standard deviation of response on the MS/MS and m is the slope of the calibration curve. The LOD for this procedure has been determined to be 0.05 ng/mL for each analyte shown in Figure 1.

16.9 Limit of Quantitation

Using the procedure described above in Section 16.8 the limit of quantitation (LOQ) was determined as follows:

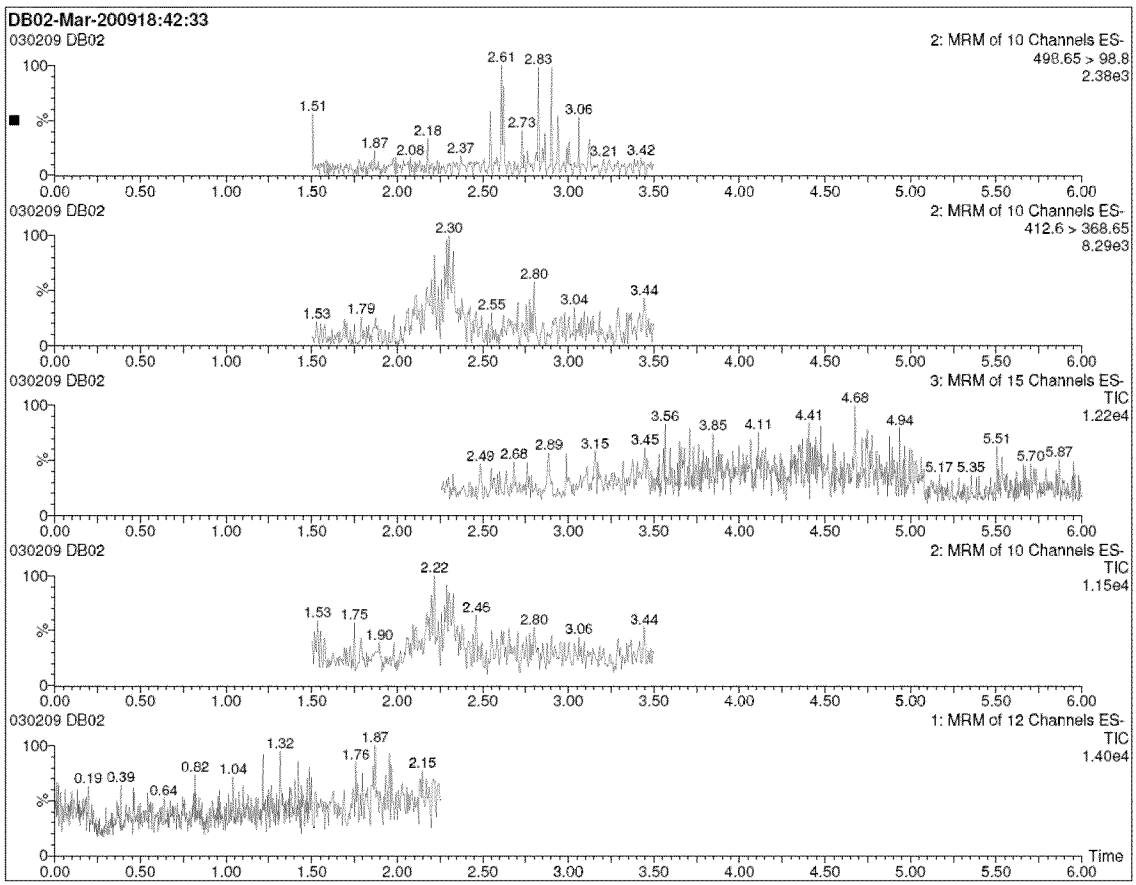
$$\text{LOQ} = \frac{10 \times s}{m}$$

The LOQ for this procedure has been determined to be 0.5 ng/mL for each analyte shown in Figure 1.

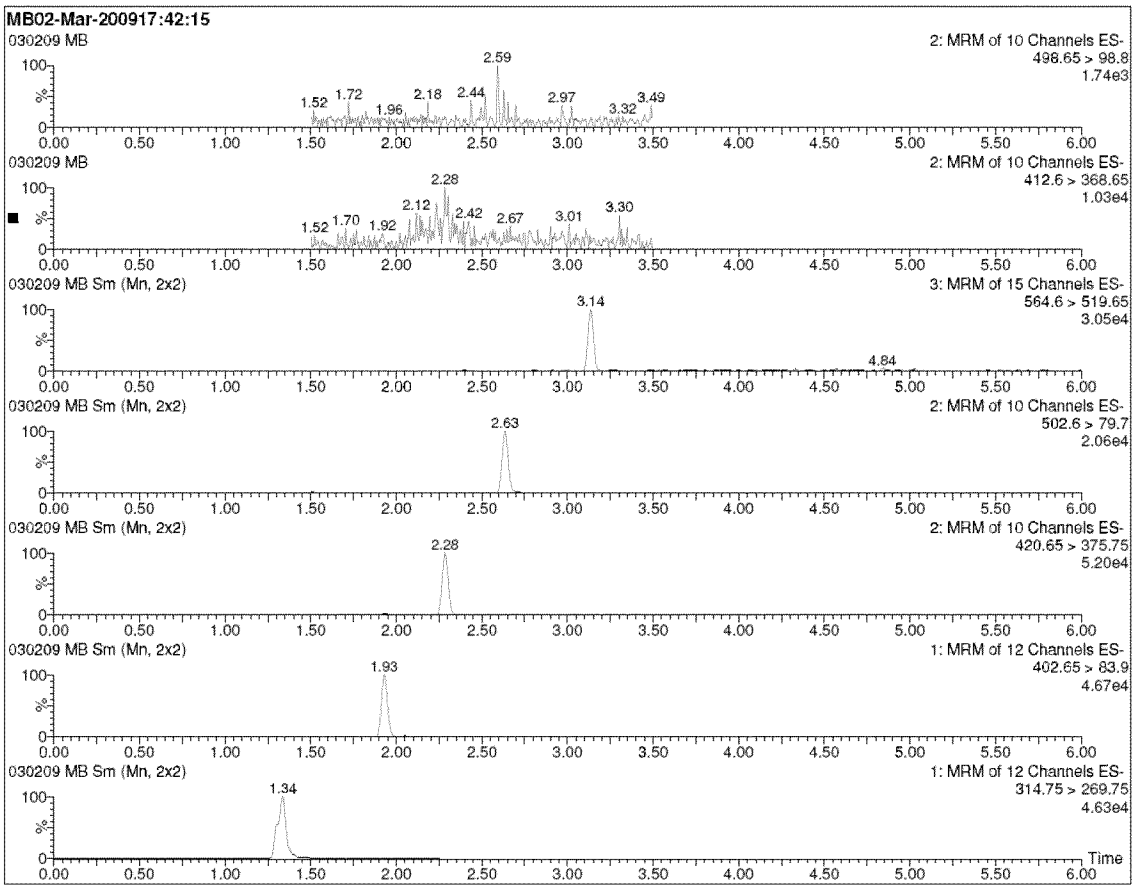
These procedures are outlined in Long G.L. and Winefordner J.D. Limit of detection. A closer look at the IUPAC definition. Analytical Chemistry, 1983, 55 (7), 712A-724A.

Appendix I. Typical Chromatograms

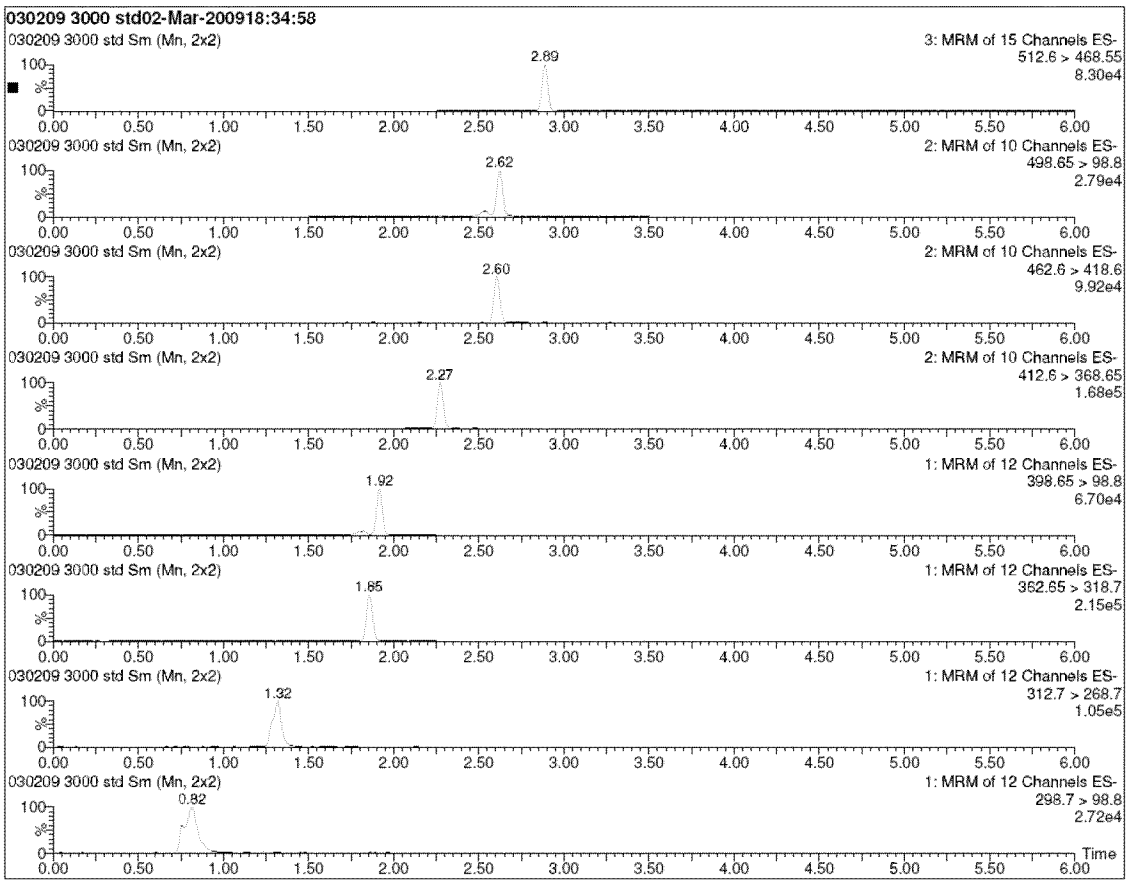
Example Solvent blank. Bottom 3 plots are total ion chromatograms (TIC) for all compounds and ISs. Top two plots are extracted ion chromatogram (EIC) for PFOA (412.65>368.65) and PFOS (498.65>98.8) primary MRMs, respectively.



Example Method Blank. Bottom 5 plots are EIC for C6-IS, PFHS-IS, PFOA-IS, PFOS-IS and C11-IS respectively. Top 2 plots are EIC for primary MRM for PFOA and PFOS, respectively.



Example Calibration Sample. Plots are of primary MRMs for each analyte starting from the bottom as PFBS, C6, C7, PFHS, C8, C9, PFOS, and C10, respectively.



U.S Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Research Triangle Park, North Carolina, Headquarters
Athens, Georgia
Cincinnati, Ohio
Las Vegas, Nevada

STANDARD OPERATING PROCEDURE

Title: Method for Extraction and Analysis of Perfluoroethercarboxylic acids (PFECAs) from Surface Water, Well Water and Waste Water by Ultra-High Performance Liquid Chromatography (UPLC)-Tandem Mass Spectrometry (MS/MS)

Number: D-EMMD-PHCB-062-SOP-01	**Effective Date**: July 5, 2017

SOP was Developed: ☒ In-house ☐ Extramural

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Note: This SOP was approved and in effect as of July 5, 2017 after some minor edits were incorporated. Dates reflect when signatures were collected.

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1. Scope and Applicability

This standard operating procedure (SOP) describes a method for the concentration, extraction, and analysis of perfluoroethercarboxylic acids (PFECAs) from surface waters and well water, using ultra-high performance liquid chromatography (UPLC)-tandem mass spectrometry (MS/MS). Details on the operation of UPLC-MS/MS instrumentation are not specified in this SOP. Note that this SOP is a revision of "Improved Method for Extraction and Analysis of Perfluorinated Compounds (PFCs) from Surface Waters and Well Water by Ultra-High Performance Liquid Chromatography (UPLC)-Tandem Mass Spectrometry (MS/MS)" (D-EMMD-PHCB-043-SOP-03 approved March 17, 2009 and updated August 31, 2016).

2. Summary of Method

Oasis WAX solid phase extraction (SPE) cartridges are preconditioned for the collection and retention of PFECAs. The target compounds are eluted with solvents and the resulting eluent is concentrated to 0.5 mL. The final concentrate is then diluted with buffer solution and analyzed by UPLC-MS/MS, operated in negative electro spray ionization (ESI) mode. Quantitation is completed using a multipoint calibration curve and internal standard calculation. The Limit of Quantitation (LOQ) of the method is 10.0 ng/L (10 ppt). Lower LOQs are achievable with this method through modification of the SPE concentration step. However, this SOP presents a verified calibration range of 10-250 ng/L.

Note: For samples that are low volume or suspected to contain high concentrations a pre-screening may be performed prior to actual sample analysis. This step may aid in the determination of sample extraction volumes. See Section 10.2

3. Definitions

3.1 Sampling SOP

Sample collection, transportation, and storage are described in an independent SOP entitled "The Sample Collection Protocol for PFCs in Surface and Well Water" SOP #D-EMMD-IEIB-003-SOP-01 (EMAB-113.0) for projects in which EPA is responsible for collecting samples. Otherwise, collaborator SOPs or protocols are used for sampling.

3.2 Internal Standard (IS)

A fixed amount of reference compound or solution is added to each sample and standard solution prior to extraction. The ratio of the detector signal of the native analyte to the detector signal of the internal standard (IS) is compared to the ratio obtained from the calibration curves where the IS level remains fixed and the native analyte levels vary. The internal standard is used to correct for minor sample-to-sample differences in extraction, purification, injection volume, chromatographic behavior, and mass spectrometry ionization efficiency. Internal standards used for this method are listed in Table 1.

3.3 Quality Control (QC) Samples (QC)

Blanks, spikes, and duplicates are used as quality control measures.

Blanks are prepared with deionized laboratory water, and shipped to the field, to assess potential contamination of sample containers, process reagents, and the analytical procedure.

For spikes: deionized water is spiked with known amounts of reference materials targeted by each analysis. The concentrations of analytes in these QC samples are compared to their theoretical values for the determination of the accuracy of the analysis.

Duplicate samples are sequential samples collected in the field to assess variability in the sample collection process.

4. Health and Safety

Personnel must be thoroughly acquainted with the potential hazards of the reagents, products, solvents, equipment, and procedures described in this SOP. The current Material Safety Data Sheets (MSDS) for the chemicals used in this method should be consulted. The Health and Safety Research Protocol for this laboratory activity is on file. Care should be observed with the use of all compounds specified in this protocol as some may be hazardous if used incorrectly (e.g., ammonium hydroxide, nitric acid).

5. Cautions

- **All labware and containers for samples and PFECA solutions should be <u>polypropylene</u> to avoid sorption and loss of PFECAs on the container walls.** Standard glassware may retain low levels of PFECAs and may alter the precision and accuracy of the method.

- All labware should be washed with non-phosphate alkaline soap solution, rinsed with warm water, followed by a final rinse with methanol or isopropanol prior to use to limit contamination and analyte carryover.

- Plastic-ware should be check periodically for contamination, particularly when changing source of supply or vendors. In the natural use of plastic-ware in the procedures, blank samples will show if contamination occurs.

- Strict QA/QC records for blanks and spiked samples should be maintained to assure continued quality assurance it met on a continual basis.

6. Interferences

Routine instrument maintenance is critical to achieve optimum method sensitivity. All laboratory materials must be determined to be free of contamination to ensure potential background interferences are minimized. This may be done by processing method blanks on a continuing basis in every assay. When contamination is noted the analysts should probe further to identify the source of contamination. UPLC column efficiency and chromatographic conditions must be maintained to ensure optimum separation of the target analytes. Note that increasing the sample volume loaded during SPE extraction will also increase the potential for matrix interference (see Section 10.4.3).

7. Personal Qualifications

This SOP assumes a thorough working knowledge of basic laboratory skills, reagents, and instrumentation. This document is designed to guide a competent laboratory worker in the analysis of PFECA compounds and it is not intended to instruct individuals on the basic aspects of analytical chemistry.

8. Equipment and Supplies

8.1 Equipment

8.1.1 UPLC-MS/MS system

Waters Acquity (UPLC) ultra-high performance liquid chromatography system (Waters Corporation, Milford, MA) with binary pump, auto sampler, column heater, or other equivalent automated HPLC system suitable for the instrument parameters outlined in this method.

The UPLC used in this SOP was modified as follows:

1. All solvent lines were replaced with (polyether ether ketone) PEEK tubing

2. Mobile phase OEM PTFE filters were replaced with OEM stainless-steel filters.

3. Waters ACQUITY UPLC total solution for the analysis of Perfluorinated Compounds (PFCs) P/N 176001744 kit installed. Includes PFC isolator column and stainless steel tubing installed between the mixing chamber and injection port.

4. Original sample loop (10 µL) and injection syringe (10 µL) were replaced with 50 µL and 250 µL ones, respectively for increased sample injection volume capacity.

Waters Quattro Premier XE triple quadrupole mass spectrometer or other equivalent mass spectrometer that can achieve the instrument sensitivity outlined in this method.

Waters Acquity UPLC BEH C18 reverse phase UPLC column, 2.1×50 mm, 1.7 µm (P/N 186002350) or equivalent column suitable for resolution and retention of target PFECA compounds.

8.1.2 **TurboVap LV nitrogen evaporator** (model # 103198, Caliper Life Sciences, Hopkinton, MA) or equivalent nitrogen evaporator/heated water bath capable of heating 25–60°C, with 10–15 psi nitrogen.

8.1.3 **Dual piston syringe pump** (CHRATEC SepPak Concentrator, Waters Corporation, SPC10-C) or equivalent system capable of variable flow rate and positive displacement.

Note: Vacuum manifold may be used in place of a syringe pump however the time for sample concentration will be more variable, with less reproducibility. In addition, turbid samples even after filtering will clog SPE cartridges and prevent water passage dependent on vacuum.

8.1.4 **Balance**, electronic, capable of weighing to 0.1 mg (Mettler AB204S or equivalent)

8.1.5 **General house vacuum** for sample filtration, SPE loading, and/or elution.

8.2 Supplies

8.2.1 **Glass Microfiber Filters, GF/A glass fiber filters** (70 mm diameter) (Whatman, Florham Park, NJ, P/N 1820-070)

8.2.2 **Two-piece polypropylene (70 mm) Buchner funnel** (ACE Glass, P/N 12557-09 or equivalent

8.2.3 **Vacuum Flask**, liter size, polypropylene (Nalgene, 1000 mL) or equivalent.

8.2.4 **SPE cartridge**, Oasis WAX Plus extraction cartridge, 225 mg, 60 µm (Waters Corporation, P/N 186003519) or equivalent

8.2.5 **Sample container, high density polyethylene HDPE**, 1000 mL, wide mouth, with screw top (P/N 2189-0032 24/case Nalgene Labware, Rochester, NY) or equivalent

8.2.6 **Centrifuge tube and cap**, polypropylene, sterile, 15 mL (BD Falcon brand, BD, Franklin Lakes, NJ, P/N 352096, or equivalent)

8.2.7 **Pipettor**, variable volume, positive displacement, capability of 10 to 100, and 100 to 1000 microliter ranges (Eppendorf, Westbury, NY), or equivalent

8.2.8 **Pipettor**, repeating, positive displacement, capability of 1 to 50 mL (Eppendorf) or equivalent

8.2.9 **Disposable polypropylene pipettor tips** of various sizes (10, 100, 1000, 5000 µL) (Genesee Scientific, Research Triangle Park, North Carolina USA) or equivalent

8.2.10 **1L HDPE graduated cylinder**

*Note: Caution should be taken to avoid low binding pipette tips. Some vendors coat tips with coatings that contain polyfluorinated compounds that can add significant

contamination. The user should assess pipette tip being used for contamination through the preparation of blank samples.

9. Reagents

9.1 Reference Materials

Reference materials including the perfluorinated analytes, the stable isotope internal standards, abbreviations, LC/MS/MS transitions, confirmation ions, and ion ratios monitored in analysis are listed in Table 1 below.

Undecafluoro-2-methyl-3-oxahexanoic acid "GenX" ($C_6HF_{11}O_3$) CAS 13252-13-6 Purchased from Synquest Labs Alachua, FL

PFECA A CAS Registry Number 863090-89-5 ($C_5HF_9O_3$) Butanoic acid, 2,2,3,3,4,4-hexafluoro-4-(trifluoromethoxy)- Purchased from Synquest Labs Alachua, FL

PFECA B CAS Registry Number 151772-58-6 ($C_5HF_9O_4$) Acetic acid, 2,2-difluoro-2-[1,1,2,2-tetrafluoro-2-(trifluoromethoxy)ethoxy]- Purchased from Synquest Labs Alachua, FL

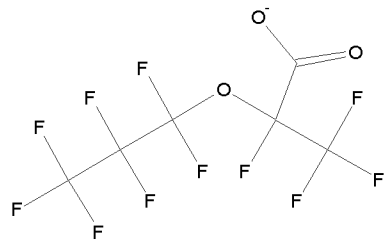
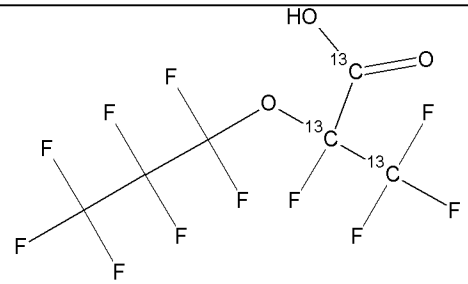
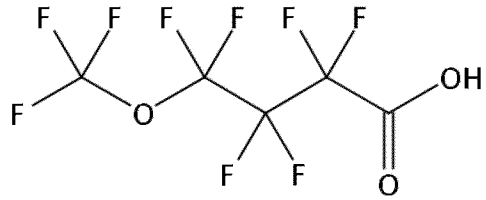
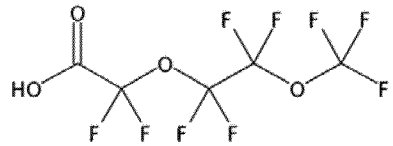
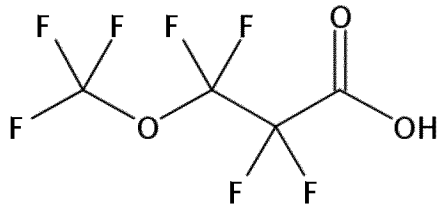
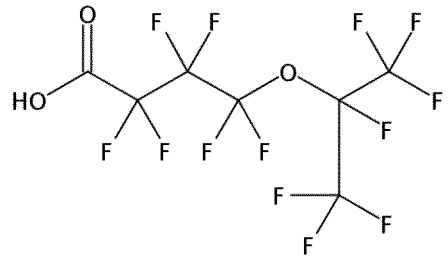
PFECA F CAS Registry Number 377-73-1 ($C_4HF_7O_3$) Propanoic acid, 2,2,3,3-tetrafluoro-3-(trifluoromethoxy)- Purchased from Synquest Labs Alachua, FL

PFECA G CAS Registry Number 801212-59-9 ($C_7HF_{13}O_3$) Butanoic acid, 2,2,3,3,4,4-hexafluoro-4-[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethoxy]- Purchased from Synquest Labs Alachua, FL

HFPO-DA "GenX" Internal Standard ($^{13}C_2$-$C_4HF_{11}O_3$) Purchased from Wellington Labs 50 ng/µL

Additional internal standards do become available as time progresses. Ideally a matched internal standard to each analyte should be used. At the time this method was developed these were the existing commercially available internal standards.

Table 1. Perfluorethercarboxylic acid (PFECA) analyte abbreviations and structures for standards.

Analyte	Structure
GenX	
GenX Internal Standard $^{13}C_3$	
PFECA A	
PFECA B	
PFECA F	
PFECA G	

9.2 Chemicals/Solvents

9.2.1 **Methanol** (MEOH), HPLC grade or equivalent (Honeywell Burdick & Jackson, Muskegon, MI)

9.2.2 **Water**, HPLC grade or deionized (DI water), predetermined to be PFECA free based on analysis using this SOP.

9.2.3 **Ammonium Acetate**, Fluka, puriss. p.a. grade, for mass spectroscopy, ≥ 99.0% (calc. on dry basis) (P/N 17836) or equivalent

Caution: Reagent grade ammonium acetate is hydroscopic—protect from water adsorption, maintaining in desiccator when not in use.

9.2.4 **Glacial acetic acid** Sigma-Aldrich (St. Louis, MO).

9.2.5 **Sodium acetate** Sigma-Aldrich (St. Louis, MO).

9.2.6 **Ammonium hydroxide** (NH_4OH, 28% in water) Sigma-Aldrich (St. Louis, MO).

9.2.7 **35% nitric acid**, five mL ampoules, EP Scientific Products – Thermo Fisher Scientific (P/N SVCN-5-1). *Alternatively 5 mL ampules can be made in house as a 50:50 mix of house DI water: concentrated nitric acid. However, assessment of blanks samples due to in-house preparation should be determined prior to use in field sampling efforts.*

10. Procedures for Solution Preparation and Sample Extraction

10.1 Preparation of Solutions

10.1.1 Ammonium Acetate Buffer Solution Preparation

Stock Solution: Prepare a 100 mM solution of ammonium acetate by weighing 7.7 g (100% purity, anhydrous basis) per liter of deionized or HPLC grade water in a suitable storage container. Shake well by hand inversion until clear and all crystals are dissolved. Label and refrigerate 4°C for long term storage.

Working solution: Prepare as needed a 2 mM solution of ammonium acetate by warming the stock solution to ambient temperature and pipetting a 20 mL aliquot of the stock solution and diluting to 1 L volume with deionized or HPLC grade water. Make sure no precipitate is formed. Note that it is acceptable for the working solution to be anywhere between 2 – 3 mM.

10.1.2 Internal Standard Preparation

Stock Solution: The internal standard should be prepared so that the IS level for each compound approximates the midpoint on the standard curve. It must also be accurately and precisely delivered to each unknown, QC, and calibration sample used in the analysis.

Individual internal standard solutions for Wellington labs come at a concentration of 50 ng/µl methanol. An initial dilution to make a stock solution of 1 ng/ µl may be required to have a working solution of 1 ng IS/µl methanol.

Each 1 liter of unknown, QC, or calibration sample prepared below will therefore receive as set amount of IS. For example for a calibration curve range of 10 to 250 ng/L 100 µL IS stock solution (1 ng IS/ µl solution), delivering 100 µL x 1 ng/µL = 100 ng/L of each of the IS materials.

10.1.3 Calibration Solution Preparation

Primary stock solutions of individual analytes may be prepared from neat by weighing out 100 mg of analyte on an appropriate balance and dissolving in 10 mL of 95% methanol 5% 2.5M NaOH in DI water. These primary stock solutions are nominally 10,000 ng/µL. However individual analyte concentrations should be recorded as exact concentration in the laboratory notebook.

NOTE: Stock solutions containing per- and polyfluorinated carboxylic acids in methanol form methyl esters and be lost from solution during storage. To avoid this from happening a small amount of NaOH is added to prevent this methyl ester formation. Standards purchased form Wellington Labs include NaOH. Serial dilutions only require methanol after primary stock preparation as the NaOH is added on a molar basis.

A stock solution of standards containing all of the target compounds at 1 ng/µL is prepared from primary stock solutions of 10,000 ng/µL. Serial dilution of each stock solution and a combination of the stock solutions to produce a mixture is advisable to avoid the need to spike individual solutions repeatedly. Commonly the 10,000 ng/µL stock solutions can be combined to form a 100 ng/µL solution. Further serial dilution to 0.1 ng/µL achieves a workable stock solution set for most applications.

The standard curve covers all of the target compounds included section 9.1. Additional analytes in Table 1 may be monitored for but not quantitated.

A 6-8 point calibration curve should be prepared to bracket the range of concentrations expected in the samples being analyzed. This range can be adjusted for targeting higher or lower concentration ranges.

Refer to Table 2 below for an example calibration standards preparation.

Table 2. Example preparation of calibration standards.

Calibration Point (ng/L)	Volume DI water (mL)	Volume standard solution (µL)	Concentration in standard solution (ng/µL)	Total mass of each analyte added (ng)
10	1000	10	1.0	10
25	1000	25	1.0	25
50	1000	50	1.0	50
100	1000	100	1.0	100
150	1000	15	10.0	150
200	1000	20	10.0	200
250	1000	25	2.0.0	250

Each of these calibration samples is prepared as indicated above, receiving the appropriate standard solution, the IS solution, and 5 mL of 35% nitric acid, used as a preservative for the unknown and QC samples.

10.1.4 QC Spike Preparation

Field spikes can be prepared at low (ex. 25 or 50 ng/L) and high (ex. 50 or 100 ng/L) levels of all of the compounds on the target list. These concentrations were chosen to bracket health advisory values for PFOS and PFOA respectively. More appropriate or additional spike levels can be prepared and assessed if needed. These QC samples will be prepared in the laboratory and shipped with the empty sample containers to be used for the collection surface or well water samples. Preparation will be as follows:

For example, to prepare low level field spikes at 50 ng/L, an amount of 50 µL of the 1 ng/µL stock standard solution will be added to 1 L of deionized laboratory grade water (1 ng/µL x 50 µL = 50 ng/L) and capped and mixed well. The samples will be preserved with the addition of 5 mL of 35% nitric acid, supplied in premeasured ampoules. These low level field spikes will be prepared at a rate of 10 % of all unknown water samples.

To prepare high level field spikes, 100 µL of this standard will be added to 1 L of deionized laboratory grade water (1 ng/µL x 100 µL = 100 ng/L) and capped and mixed well. The samples will be preserved with the addition of 5 mL of 35% nitric acid, supplied in premeasured ampoules. These high level field spikes will be prepared at a rate of 10 % of all unknown water samples.

Additional low and high trip spikes may be prepared for a lower or higher range calibration curve range.

Note: Different vials or lots of the native standards should be used to prepare the QC spikes and the calibration samples if available.

10.1.5 Sodium Acetate Buffer Preparation (pH 4)

- Used for SPE equilibration and washing.

Dilute 1.4 mL of glacial acetic acid with DI water in a glass bottle to make a 1-L of 25 mM acetic acid. Weigh out 3.4 g of sodium acetate and dissolve in DI water in a glass bottle bringing up the final volume to 1 L. Mix 800 mL of acetic acid solution and 200 mL of sodium acetate solution to make the 25 mM sodium acetate buffer (pH 4).

10.1.6 Methanol/Ammonia Solution Preparation

- Used for sample elution from SPE cartridge (see Sections 10.4.1 and 10.4.5)
- Refer to Table 3 for elution solvent preparation.

On every day of the analysis, a fresh mixture of this solution should be made to adequately cover the volume needed for the experiment. For example, 10 mL of solution will be required for each sample (5 mL to condition each SPE cartridge and 5 mL for analyte elution). If 100 mL of solution is to be made, mix 100 µL of ammonium hydroxide (28% in water) with 100 mL of methanol and shake vigorously. Although this solution is good for more than one day, it is best to make this solution up fresh daily since ammonia is volatile.

Table 3. Volumes for the preparation of elution solvent.

Volume of Ammonium Hydroxide (28%) (µL)	Volume Methanol (mL)	Desired volume of elution solvent (mL)	Maximum number of WAX cartridges
100	100	100	10
200	200	200	20
300	300	300	30
400	400	400	40
50	500	500	50

10.2 Sample Pre-screening (Optional).

For samples that are limited in volume or are suspected of having high concentrations that may exceed calibration levels, analytical pre-screening may be performed to guide in

sample extraction volumes. Samples may be pre-screened by taking 300 µL of each water sample and combining with 100 µL of methanol into an HPLC vial followed by vortex mixing (10 seconds) and UPLC-MS/MS analysis. Appropriate calibration curve points may be constructed by adding analytes of interest to DI water, vortex mixing (10 seconds) and sampling as above (300 µL water:100 µL methanol in HPLC vial). For example a 7 point calibration curve may include points from 200 ng/L up to 3000 ng/L. Internal standards should be added at a concentration approximating the midpoint of the calibration curve.

10.3 Sample Pretreatment and Filtration

10.3.1 Volume Measurement

Pour whole water sample into a previously cleaned 1-L HDPE graduated cylinder and record the volume.

10.3.2 Methanol Rinse of the Sample Container

Add 10 mL of methanol into the emptied bottle, cap, and shake well **(Do not discard the rinse).** Pour the sample that is in the graduated cylinder back into the original sample bottle and mix with the methanol rinse.

Note: This step must be performed immediately prior to the filtration steps that follow (in Section10.3.4).

10.3.3 Internal Standard Addition

Add appropriate volume of working internal standard solution containing enough mass of the IS to approximate the midpoint of the standard curve (e.g., 100 µL of a 1 ng/µL internal standard for a 10-250 ng/L calibration curve) to each sample and mix well.

10.3.4 Filtration

Filter the whole sample with GF/A glass fiber filter under gentle vacuum into a previously cleaned 1 liter vacuum flask. If the filter apparatus clogs during filtration due to a highly turbid sample, a new filter can be exchanged for the clogged one and filtration completed. This should be noted in laboratory notebook. If any particulate matter remains in the original sample bottle, rinse it clean by adding 20 mL of DI water, mixing thoroughly, and discarding this rinsate to waste. After rinsing the bottle, pour the entire filtered sample back into the original bottle for the sample extraction process.

10.4 Sample Extraction

The following procedure is a general method for the capture and elution of PFECAs using a dual piston pump system for the concentration of analytes on an Oasis WAX

solid phase extraction (SPE) cartridge. Alternate means of collection and concentration can be used but are not addressed in this SOP.

Prior to using the SPE concentrator and in between each set of samples, the system should be flushed with methanol for 2.5 minutes at a flow of 10 mL/minute. After this flushing, the following procedures should be followed.

10.4.1 Conditioning of Cartridge

Pass methanol through each SPE cartridge using the SPE pumps at a rate of 10 mL/min for 2.5 minutes. Alternatively, SPE cartridges may be conditioned by passing 5 mL of methanol through the cartridges with a vacuum manifold. Discard all solvents to waste.

10.4.2 Equilibration of Cartridge

Using a dual piston pump system, run 25 mL of DI water through the cartridge at a flow rate of 10 mL/min for 2.5 minutes to remove the methanol. (The flow rate for all procedures using the dual piston pump is 10 mL/min).

10.4.3 Loading Samples onto Cartridge

Pass 500 mL of sample water containing the IS through the cartridge at a steady flow rate of 10 mL/min using the dual piston pump. Water that passes is discarded to waste. Remove SPE cartridges from concentrator.

Note: If more sensitivity is required, the volume of sample loaded onto the SPE cartridge can be increased. However, the sample volume must be known and recorded for later calculation of the concentration (wt/volume). It is also important to note that increasing the sample volume will also increase the potential for matrix interference.

10.4.4 Cartridge Wash

Place the cartridge on a vacuum manifold and apply vacuum long enough to remove any obvious water drops remaining in the cartridge. Pass 4 mL of 25 mM sodium acetate buffer (pH 4.0). Next Wash the SPE cartridge with 4 mL of methanol and discard to waste.

10.4.5 Analyte Elution and Collection

Place a 15 mL polypropylene centrifuge tube in the collection reservoir of the vacuum manifold to collect the final eluate. Fit the corresponding SPE cartridge on the top of the manifold to elute the sample into a labeled 15 mL tube. Run 4 mL of methanol/ammonia solution through the cartridge at a flow rate of approximately 1 drip/second. Remove the tube from the rack, vortex mix. Then evaporate the eluate down to approximately 500 to 1000 µL (at 40°C) for

approximately 15 minutes with TurboVap LV or similar nitrogen/bath evaporator.

Note: Eluate should NOT be completely evaporated, which may cause loss of analytes. A lower temperature is recommended because shorter chain species may evaporate off at higher temperatures.

10.4.6 Preparation for Instrumental Analysis

Dispense 300 µL of 2 mM ammonium acetate buffer into all HPLC auto sampler vials. Transfer 100 µL of each eluate into a respective auto sampler vial such that the final solution is 75% buffer and 25% methanol by volume.

Note: If specific UPLC conditions need to be changed to provide optimal peak shape and separation of compounds, then modify the buffer/methanol mobile phase ratio to match the initial UPLC flow conditions.

Cap and vortex each vial well for more than 10 seconds to ensure solution uniformity. Analyze the samples with UPLC-MS/MS using the conditions outlined in Section 11.

11. Determination of Analyte Concentration

11.1 UPLC

Using the instrument system and column outlined in Section 8.1.1, set up the method conditions using the following parameters:

Reservoirs: A: 2 mM ammonium acetate in DI water with 5% methanol
B: 2 mM ammonium acetate in 100% methanol
Column: BEH C18 reverse phase, 2.1×50 mm, 1.7 µm particle size
Flow rate: 500 µL/min
Column temperature: 50°C
Injection Volume: 50 µL
Gradient mobile phase program:

Time (min.)	A	B	Curve
0.00	90	10	initial
0.50	90	10	6
5.0	15	85	6
5.1	0	100	6
5.6	0	100	6
7.0	0	100	1
7.1	90	10	1
9.0	90	10	initial

Note: The gradient program should be adjusted, if necessary, for the complete separation of all analytes from any matrix interferences.

11.2 MS/MS

The Quattro Premier mass spectrometer is operated in the multiple reaction monitoring (MRM) mode using negative-ion-spray ionization under the following conditions:

Instrument Parameters	
Capillary (kV)	−0.40
Source temperature	150°C
Desolvation temperature	350°C
Cone gas flow	2 L/hr
Desolvation gas flow	1200 L/hr
Cone voltage	Optimized for
Collision energy	each compound

Note: Ionization and collision cell parameters are optimized for each individual analyte (See Section 13).

11.3 System Conditioning

From 1-3 double blanks containing unprocessed methanol and 2 mM ammonium acetate, (in a 1:3 ratio) should be injected as the first part of any sample batch in order to ensure that minimal background signal is achieved. Henceforth, an additional double blank should be inserted every 10th sample to ensure system background performance. PFAS are common contaminants in most analytical systems, but as long as any peaks areas in the double blanks are at least 10 times smaller than peak areas in the lowest point on the calibration curve, it is assumed that adequate sensitivity has been achieved.

If an isolation column is used (see Section 8.1.1) to separate background systemic PFAS contamination from sample contamination, three double blanks should be sufficient to achieve starting chromatographic conditions. Separation of an analytical peak (a peak due to sample injection) and a background peak (systemic contamination from solvents, internal components) should achieve baseline resolution. The earlier eluting peak is the analytical peak whereas the later eluting peak is systemic. It is not uncommon for a system that has sat dormant for some time to take many injections until systemic contamination is low and consistent. However, it is not common for analytical peaks in blank samples to remain high and consistent. If this occurs it is likely that contamination from laboratory apparatus or solvents is the cause (i.e. HPLC vials and caps, solvents, pipette tips). If this occurs the source of the contamination should be identified and corrected.

11.4 Integration

Peak area counts for each analyte and internal standard are automatically determined using the mass spectrometer software (MassLynx 4.1). Each chromatogram should be reviewed by the operator to insure proper and consistent integration, and manual corrections of inappropriate integrations or missed peaks should be applied if necessary.

12. Calculation

Calculations are based on the isotope dilution method of quantitation. Calculations may also be performed by automated data system, i.e. MassLynx or other equivalent software.

A calibration curve is created separately from the analysis of each standard solution for each analyte. The peak area count ratio of the analyte to the internal standard (y-axis) versus the concentration of analyte (x-axis) is plotted and a best fit regression formula is determined using $1/x$ weighting. The resulting standard curves are used for calculation of analyte concentration in the unknown samples. Each standard curve should result in a coefficient of determination (r^2) of greater than 0.99 for a seven point curve.

Note: If samples are found to exceed the top of the calibration curve, they will need to be diluted and reanalyzed. Using and estimation of the concentration in the sample, dilute the sample(s) to approximate the midpoint of the calibration curve. Samples should be diluted using DI water with nitric acid added containing IS/liter of water at the same concentration as in previously prepared samples. Calculation of analyte concentrations must include correction for the dilution factors used to prepare the sample.

13. Specification Parameters

The following instrumental parameters were determined to be adequate in repeated experiments involving quantitation of PFECAs in surface water. Different instruments will have their own unique settings that will need to be optimized depending on each laboratory's specific operating conditions. An example of these conditions is shown in Table 4.

Table 4. Specific parameters for Quattro Premier XE (MS/MS) for a 9-minute monitoring period. Primary transitions are indicated by °1 and confirmation transitions by °2 designations.

	Compound Nam	Parent (m/z)	Daughter (m/z)	Dwell (s)	Cone (V)	Collision (V)
1		178.9	84.9	0.005	10	12
2	PFECA F °1	228.9	84.8	0.005	10	12
3		228.9	184.9	0.005	22	10
4		245	84.9	0.005	22	18
5		245	178.8	0.005	22	4
6	PFECA A	278.9	84.8	0.005	14	22
7		278.9	134.8	0.005	22	24
8		278.9	234.8	0.005	22	6
9	PFECA B °1	294.9	84.9	0.005	10	26
10	PFECA B °2	294.9	200.9	0.005	10	10
11		311.0821	84.9	0.005	22	20
12		311.0821	150.8	0.005	22	4
13	GenX 1°	329.16	168.9	0.005	10	12
14	GenX 2°	329.16	284.9	0.005	10	6
15	GenX IS 1°	332.16	168.9	0.005	10	12
16	GenX IS 2°	332.16	286.9	0.005	10	6
17		377	84.9543	0.005	22	26
18	PFECA G °2	379	134.8979	0.005	16	34
19	PFECA G °1	379	184.7907	0.005	16	12
20	PFECA D °2	410.9	200.7727	0.005	12	20
21	PFECA D °1	410.9	316.8597	0.005	12	10
22		443.1	84.8221	0.005	12	32
23		443.1	168.8	0.005	12	20
24	PFECA C °2	445	234.933	0.005	8	24
25	PFECA C °1	445	350.899	0.005	8	12
26	PFECA E °2	560.9	234.8612	0.005	12	32
27	PFECA E °1	560.9	466.7644	0.005	12	14

14. Data and Records Management

Raw data (including electronic data on individual PC hard drives and group shared drives) should be backed up, maintained and made available for review. A consistent file naming convention should be documented and used for each specific project and data type generated. Data generated should be maintained by the principal investigator until completion of the project. Upon completion, data should be stored in accordance with EPA's record management policy. All instrument data should be backed up to network drives on a regular basis and should be archived along with other supporting data and relative correspondence at

the completion of the study. Printed data should be referenced, signed and dated in accordance with the Office of Research & Development's Policies and Procedures Manual Section 13.02 on Paper Laboratory Records. The research notebook will be the record for any procedure conducted in the field or laboratory and will provide the objective, procedural details, data references and discussion for project development. These entries will give a full and complete statement of the situation being examined, a specific hypothesis relating to the situation, and a brief experimental protocol designed to answer the questions posed in the hypothesis. Data will be recorded from these experiments and a discussion of the results will be presented with conclusions drawn. Any standard, solution, or sample made during these investigations should be marked with a reference number, traceable to a specific entry in the research notebook. An example could be the initials of the analyst-lab notebook number-page number-sample number (ex. MJS 1-50-1). The laboratory notebooks are the property of EPA and will be stored in accordance with EPA's record management policy.

15. Quality Control and Quality Assurance

Analysis of standard solutions should result in a best fit regression coefficient of determination (r^2) of 0.99 or greater, using a minimum of seven independent concentrations that bracket the sample concentrations. Sample concentrations resulting in peak area ratios that are lower or greater than the range of standards should be reanalyzed with appropriate re-extraction or dilution of original water sample, respectively. A second source calibration standard will be used when available to verify the initial calibration standard.

Trip Spike Samples: For quality control checks, samples of deionized water are acidified with nitric acid and fortified at two concentrations that bracket the expected unknown sample concentrations of PFECAs. These samples are unopened in the field, shipped with unknown samples and analyzed with each batch of water extracts. Based on the demonstrated precision data, the analyses are considered acceptable if the calculated concentrations are ±20% of the expected values.

Trip Blank Sample: One laboratory method blank consisting of 1 liter of DI water acidified with nitric acid and unfortified is analyzed for each batch of samples analyzed. This sample is unopened in the field, shipped with unknown samples and analyzed with each batch of water extracts. If significant analyte levels (S/N > 5) are found in the laboratory method blank, the source of contamination should be identified, corrected, and verified as being eliminated before additional analyses of unknown samples proceed.

For each field sampling event, it is recommended that 10% fortified DI water should be sent to the field along with blank sample containers. Duplicate samples should be collected from at least 10% of the sampling sites. Refer to Sampling SOP #D-EMMD-IEIB-003-SOP-01 (EMAB-113.0) for the detail.

16. Method Validation

This method has been validated for the following parameters using natural water samples, wastewater and tap water sampled against an extracted DI water calibration curve. The results of this validation procedure are presented below.

16.1 Specificity

Chromatographic examinations of method blanks, control samples (deionized water), and various natural water samples did not reveal any significant matrix interferences with each analyte or internal standard peak area.

16.2 Linearity

Each analyte solution was evaluated, in duplicate, and dilutions covered the range of 10 ng/L to 1000 ng/L. Each standard curve resulted in a coefficient of determination (r^2) of greater than 0.99 for a six point curve. Some analytes may have a better fit with a quadratic regression.

16.3 Precision

Bulk surface water, wastewater and tap water samples were collected and split into 5ix 500 mL subsamples. Each subsample was then prepared for analysis, representing five individual replicate analyses. The precision for all analytes based on relative standard deviation (RSD) resulted in < ± 20%.

16.4 Accuracy

All validated water samples (surface, waste and drinking water) were spiked at either 50 ng/L (low QC spike (LS)) or 200 ng/L (high QC spike (HS)) for use as QC samples. The accuracy for all PFECAs analytes for QC samples both at 50 and 200 ng/L was in a range of 80 to 120% of the spiked concentration (see Figures 1-5).

16.5 Recovery

Recoveries were calculated based on a matrix matched spike extraction. Water samples were spiked with known amounts of PFECAs and appropriate internal standard then extracted using an SPE cartridge. After elution of the PFECAs from the cartridge, the samples were compared to an extracted DI water calibration curve for estimation of concentration and recovery calculation. Each level had five replicates. In addition 5 replicates of each un-spiked water was performed to account for PFECAs present in the sample before spiking.

Figure 1. GenX Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

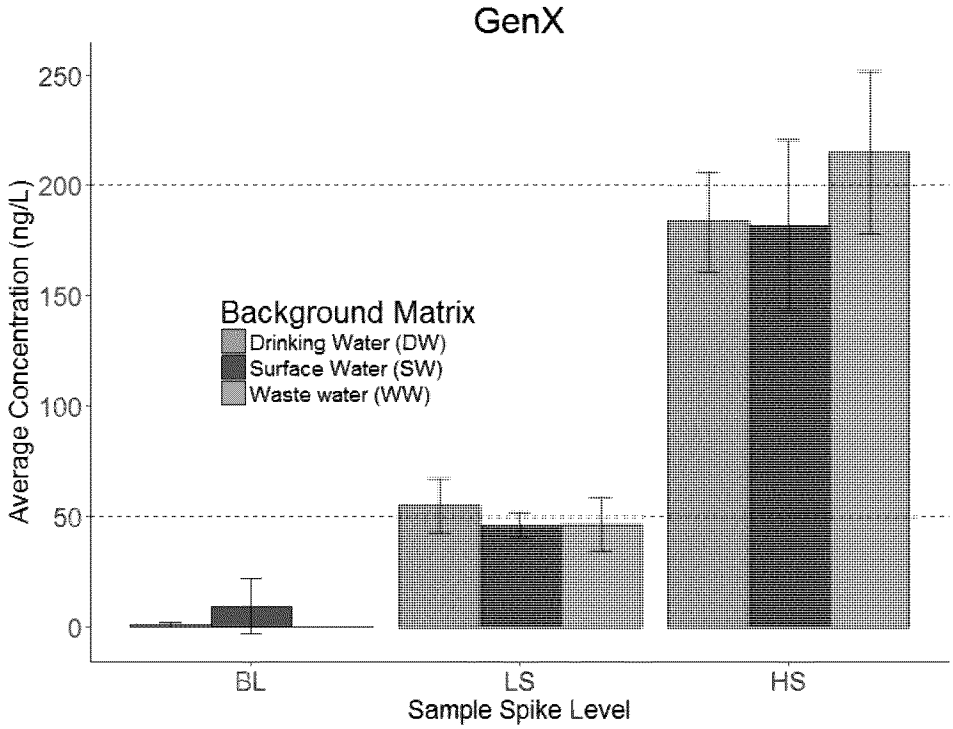


Figure 2. PFECA A Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

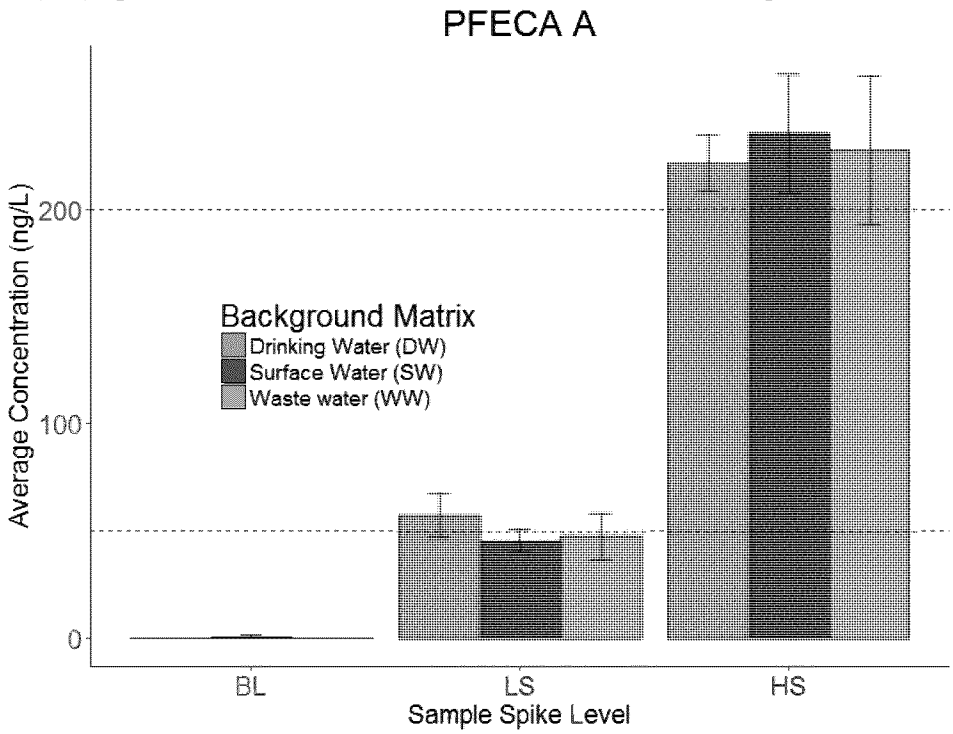


Figure 3. PFECA B Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

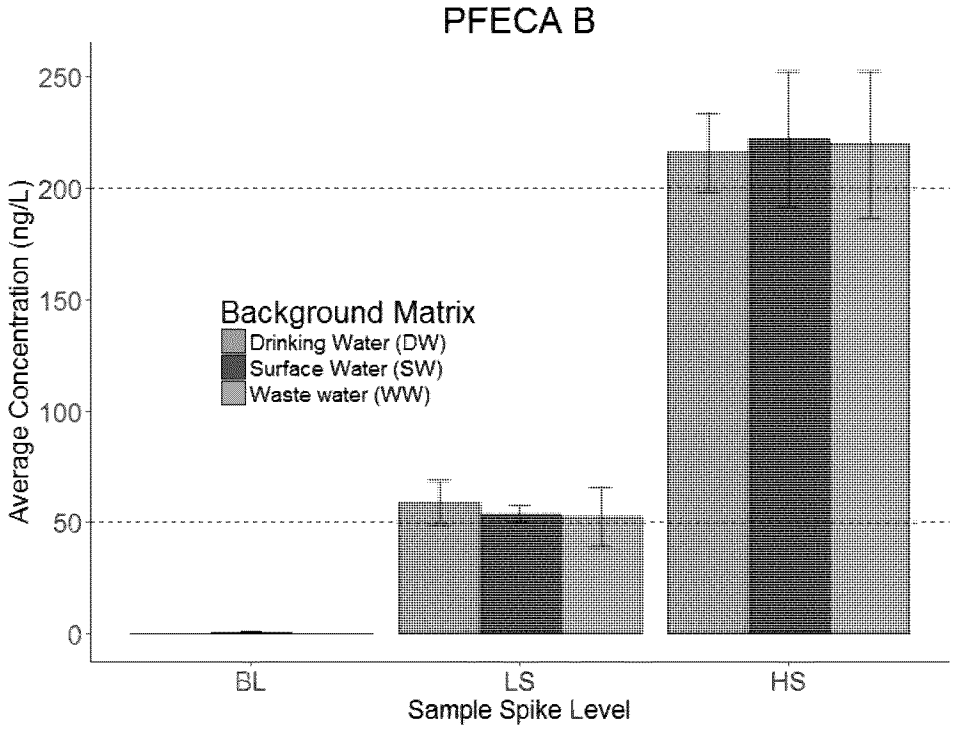


Figure 4. PFECA F Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

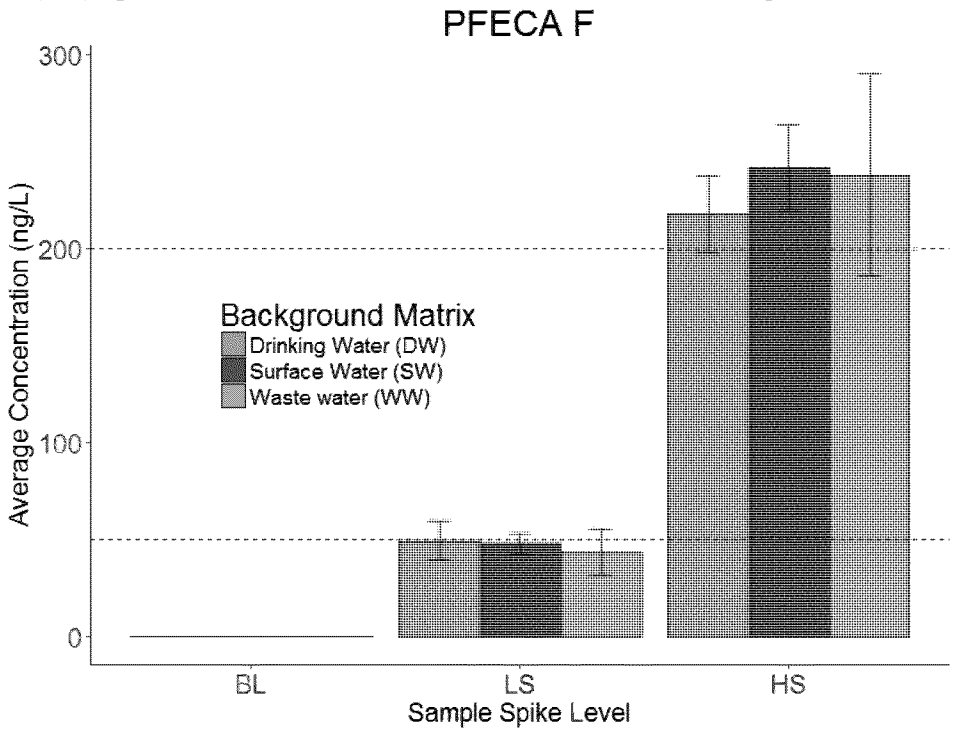
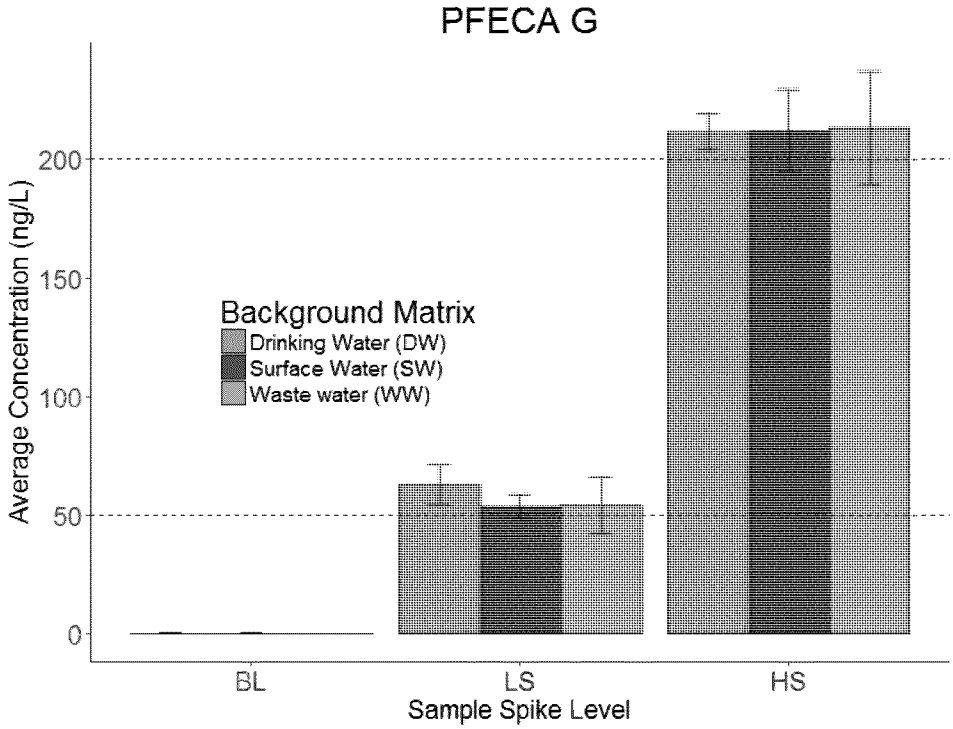


Figure 5. PFECA G Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.



16.6 Stability

16.6.1 Sample Stability

It is unknown for how long samples are stable as this has not been determined for this SOP. For other PFAS assessed in prior SOPs samples are stable for a minimum of 4 weeks at ambient temperature if they are appropriately preserved (refer to the Sampling SOP #D-EMMD-IEIB-003-SOP-01 (EMAB-113.0). It is currently assumed a comparable stability for PFECAs assessed in this SOP.

Note: Methanolic rinse of the sample container is essential in order to recover PFECAs from sample container wall for the tested substances listed in this SOP. Additional compounds not listed in this SOP will need to be assessed for recovery and sample stability.

16.6.2 Cartridge Stability

The stability of PFECAs from water samples that have been processed and captured on the WAX SPE cartridge has not been assessed post preparation.

16.6.3 Solution Stability

PFECAs standards are spiking solutions are stable for at least 1 months when stored at ambient temperature. Methanolic standards from the suggested vendor (Wellington Laboratories) come with NaOH added to prevent the formation of methyl esters of the analytes of interest. This leads to loss of analyte with time. This appears to only effect the perfluorinated carboxylic acids and not the sulfonic acids.

16.7 Limit of Detection

The limit of detection (LOD) was not assessed for this SOP.

16.8 Limit of Quantitation

LOQ was determined to be the lowest calibration curve point that has a back prediction of +/- 20% of the theoretical concentration. For all analytes in this SOP the LOQ is 10 ng/L.

To: Culpepper, Linda[linda.culpepper@ncdenr.gov]
Cc: Johnson, Chris[chris.johnson@ncdenr.gov]
From: Strynar, Mark
Sent: Thur 10/12/2017 12:12:51 PM
Subject: RE: PFAS Attachment - FW: Charts

Sorry for the slow response. We have the new site visit sample data we could be sharing soon. Perhaps that may help. I would say go out an collect the samples. How many bottles would you need?

We can fit it in at a later date. I am tied up in the ISES conference all next week.

Mark

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Wednesday, October 11, 2017 9:24 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Cc: Johnson, Chris <chris.johnson@ncdenr.gov>
Subject: FW: PFAS Attachment - FW: Charts

Dr. Strynar – I just heard that Dr. Buckley is out until tomorrow.

We are very interested in getting a Chemours outfall sample and finished drinking water samples taken this week before the plant the plant shut down, and have them analyzed for the Nafion® byproducts. Chemours confirmed that the official start date for the annual maintenance is Oct. 17th.

Could we work something out?

Linda Culpepper
Deputy Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Culpepper, Linda
Sent: Friday, October 06, 2017 6:03 PM
To: 'France.danny@Epa.gov' <France.danny@Epa.gov>; 'Sivertsen.scott@Epa.gov' <Sivertsen.scott@Epa.gov>; 'Buckley, Timothy' <Buckley.Timothy@epa.gov>; 'Allenbach, Becky' <Allenbach.Becky@epa.gov>; 'Kemker, Carol' <Kemker.Carol@epa.gov>; 'mitchell.ken@epa.gov' <mitchell.ken@epa.gov>; 'Banister.Beverly@epa.gov' <Banister.Beverly@epa.gov>
Cc: Holman, Sheila <sheila.holman@ncdenr.gov>
Subject: PFAS Attachment - FW: Charts

Sharing info. our health dept. is using with our public meetings. We had almost 200 people in attendance last night to hear info. about private well data, along with other media updates. Our sound system did not work well and added frustration, but we had very good one-on-one discussions after the opening remarks.

We appreciate Danny and Scott's time today coordinating the sample logistics and we'll begin sending our Chemours outfall and finished drinking water samples to the Athens lab the week of Oct. 16th. We are shifting to using a composite sampler at the Chemours outfall – one composite sample for Mon-Thurs and one composite sample for Fri-Sunday.

> Tim – if you have time for a discussion on the Nafion® byproduct analysis on Monday, I'll arrange my schedule to fit yours. Our staff indicated the plant is now going into their annual maintenance shut down on Oct. 18th. The plants (Chemours, Kuraray and DuPont) will not have a wastewater

discharge during the shutdown. They bring in Mt. Olive pickle wastewater to feed the wastewater system. We really need an Nafion® byproduct analysis of the current wastewater at Outfall 002 before they shut down for maintenance to compare against the results your lab provided for June-Aug. This will allow us to validate whether they have captured the Nafion® byproducts as they have told us and the public. Thank you for considering the request.

Our staff is assisting the Waste Management division next week in taking samples from lake/ponds in the neighborhoods with high GenX values in private wells. Continuing to get private well data back. The Air Quality division is continuing its work on air emission evaluations.

Again, we appreciate all the help and support for this project.
linda

Linda Culpepper
Deputy Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Shehee, Mina
Sent: Friday, September 22, 2017 12:56 PM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>
Cc: Pritchett, Jamie R <Jamie.Pritchett@dhhs.nc.gov>; Dittman, Elizabeth <Beth.Dittman@dhhs.nc.gov>
Subject: FW: Charts

Attached are the chemical structure charts we made in OEEB. These were designed with drinking water contaminants in mind.
Mina

To: Mariah Matheson (Legislative Analysis)[Mariah.Matheson@ncleg.net]; Miller, Anderson[anderson.miller@ncdenr.gov]
From: Strynar, Mark
Sent: Tue 2/20/2018 8:54:11 PM
Subject: RE: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality
Strynar 2-21-18 Mass Spectrometry and Chromatography Explained.pptx

Here are the slides. Uploading now they just got cleared at 3:30 PM here at EPA.

Mark

-----Original Message-----
From: Mariah Matheson (Legislative Analysis) [mailto:Mariah.Matheson@ncleg.net]
Sent: Tuesday, February 20, 2018 1:05 PM
To: Miller, Anderson <anderson.miller@ncdenr.gov>; Strynar, Mark <Strynar.Mark@epa.gov>
Subject: Re: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

Andy, Jeff said you would have a presentation in by noon. When do you expect to upload? Please give us a specific time so o can relay to clerk.

Thanks.

Get Outlook for iOS<https://aka.ms/o0ukef>

On Tue, Feb 20, 2018 at 12:09 PM -0500, "Mariah Matheson (Legislative Analysis)" <Mariah.Matheson@ncleg.net<mailto:Mariah.Matheson@ncleg.net>> wrote:

Andy—Will you have any handouts for your presentation with Mark? Please let me know asap. Thanks.

From: Miller, Anderson [mailto:anderson.miller@ncdenr.gov]
Sent: Tuesday, February 20, 2018 9:17 AM
To: Strynar, Mark <strynar.mark@epa.gov>; Mariah Matheson (Legislative Analysis) <Mariah.Matheson@ncleg.net>; Jeffrey Hudson (Legislative Analysis) <Jeffrey.Hudson@ncleg.net>
Cc: Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net>
Subject: Re: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

Looking forward to talking to you at 11 Mark and we can talk about it.

Best,

Andy

R. Anderson Miller
Legislative Affairs Program Director
North Carolina Department of Environmental Quality

Personal Phone / Ex. 6
anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>

217 West Jones Street
1601 Mail Service Center
Raleigh, NC 27699
Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties _____
From: Strynar, Mark <Strynar.Mark@epa.gov<mailto:Strynar.Mark@epa.gov>>
Sent: Tuesday, February 20, 2018 7:49:45 AM
To: Mariah Matheson (Legislative Analysis); Jeffrey Hudson (Legislative Analysis)
Cc: Miller, Anderson; Jennifer McGinnis (Legislative Analysis); Chris Saunders (Legislative Analysis); Kyle Evans (Legislative Analysis)
Subject: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to Report Spam.<mailto:report.spam@nc.gov>

Mariah,

The Federal government was closed yesterday due to Presidents Day. I however had not considered having any slides or handouts for dissemination. I just intended to have a discussion and answer any questions as needed. I have a discussion with Andy Miller at 11 AM today. We could discuss this.

Mark

From: Mariah Matheson (Legislative Analysis) [mailto:Mariah.Matheson@ncleg.net]
Sent: Friday, February 16, 2018 4:23 PM
To: Strynar, Mark <Strynar.Mark@epa.gov<mailto:Strynar.Mark@epa.gov>>; Jeffrey Hudson (Legislative Analysis) <Jeffrey.Hudson@ncleg.net<mailto:Jeffrey.Hudson@ncleg.net>>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>) <anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net<mailto:Jennifer.McGinnis@ncleg.net>>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net<mailto:Chris.Saunders@ncleg.net>>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net<mailto:Kyle.Evans@ncleg.net>>
Subject: RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

Mark—I will be forwarding you a FTP link on Monday morning (2/19) to upload your PowerPoint presentation if you have one. You can also upload any additional handouts. Please upload by end of business on Monday February 19, 2018. If you need more time or have any questions please let us know.

Thank you.

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Friday, February 02, 2018 1:54 PM
To: Jeffrey Hudson (Legislative Analysis) <Jeffrey.Hudson@ncleg.net<mailto:Jeffrey.Hudson@ncleg.net>>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>) <anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net<mailto:Jennifer.McGinnis@ncleg.net>>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net<mailto:Chris.Saunders@ncleg.net>>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net<mailto:Kyle.Evans@ncleg.net>>; Mariah Matheson (Legislative Analysis) <Mariah.Matheson@ncleg.net<mailto:Mariah.Matheson@ncleg.net>>
Subject: RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

I am available on the 21st to have this discussion. I am going to pass this on to my supervisors and PR

department for them to weigh in as well.

Mark

From: Jeffrey Hudson (Legislative Analysis) [mailto:Jeffrey.Hudson@ncleg.net]
Sent: Friday, February 02, 2018 11:41 AM
To: Strynar, Mark <Strynar.Mark@epa.gov<mailto:Strynar.Mark@epa.gov>>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>) <anderson.miller@ncdenr.gov<mailto:anderson.miller@ncdenr.gov>>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net<mailto:Jennifer.McGinnis@ncleg.net>>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net<mailto:Chris.Saunders@ncleg.net>>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net<mailto:Kyle.Evans@ncleg.net>>; Mariah Matheson (Legislative Analysis) <Mariah.Matheson@ncleg.net<mailto:Mariah.Matheson@ncleg.net>>
Subject: February 21 Meeting of the House Select Committee on North Carolina River Quality

Mark,

I'm one of the committee staff for the North Carolina General Assembly's House Select Committee on North Carolina River Quality.

The Committee is meeting February 21 and one of the agenda items the Chair, Representative Ted Davis, is interested in is mass spectrometers and their use in detecting and analyzing emerging contaminants.

I spoke with Andy Miller at DEQ regarding this and he mentioned that you and/or James McCord might be available on the 21st to provide some information to the Committee on mass specs.

Generally, what we are envisioning is someone from USEPA providing background on the different types of mass specs and their capabilities (or lack thereof) for detecting/analyzing emerging contaminants. We would then ask DEQ to provide information on mass specs that are owned/operated by State agencies.

Please let us know if you and/or James could be available on the 21st. If you are available, we might consider setting up a meeting or call in the next week or so to discuss any questions you might have. Also, if you have any preliminary questions, feel free to call me (919-733-2578).

Thanks for your consideration,

Jeff

EPA
United States
Environmental Protection
Agency

Mass Spectrometry and Chromatography Explained

Dr. Mark Strynar – US EPA
National Exposure Research Laboratory (NERL)

February 21st, 2018
Meeting of the House Select Committee on North Carolina River Quality

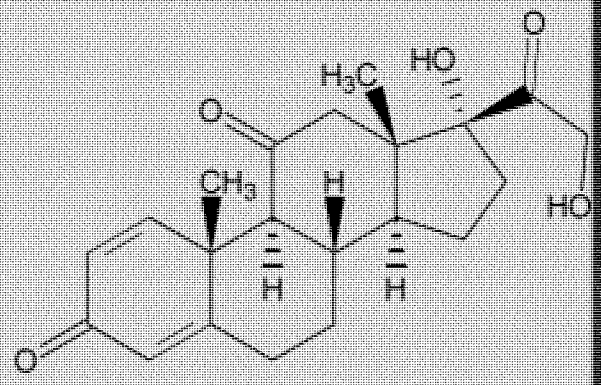
EPA
United States Environmental Protection Agency

Questions to Answer?

- What is mass spectrometry?
- What are the types of mass spectrometry
  - (MS, MS/MS, QTOF, Orbitrap)
  - What is resolution in mass spectrometry?
    (low resolution, high resolution, ultra-high resolution)
- What is mass accuracy?
- What is liquid and gas chromatography?
- What can be done with each mass spectrometer?; *i.e. targeted versus non-targeted work*
- *Questions I did not answer*

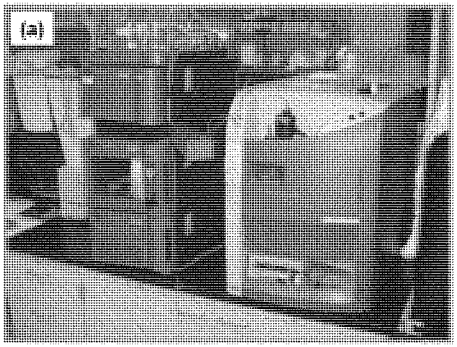
What is Mass Spectrometry

Prednisone



Molecular Formula = $C_{21}H_{26}O_5$
Formula Weight = 358.42814
Composition = C(70.37%) H(7.31%) O(22.32%)
Monoisotopic Mass = 358.178024 Da
Nominal Mass = 356 Da
Average Mass = 358.4281 Da

United States Environmental Protection Agency

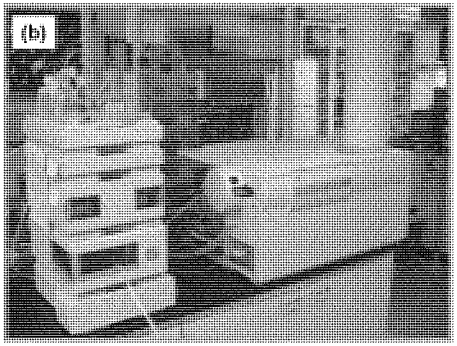


UPLC MS/MS System
UPLC - Waters Acquity

MS/MS - Micromass Quatro Premier XE

Column - Acquity UPLC BEH C18 1.7 um 2.1x50 mm

Gradient separation
A 2mM Ammonium Acetate
B Methanol



HPLC/TOFMS System
HPLC - Agilent 1100

TOFMS - Agilent LC/MSD TOF

Column - Agilent Eclipse Plus C18 3.5 um 3.0x50 mm custom packed

Gradient separation
A 2mM Ammonium Acetate
B Methanol

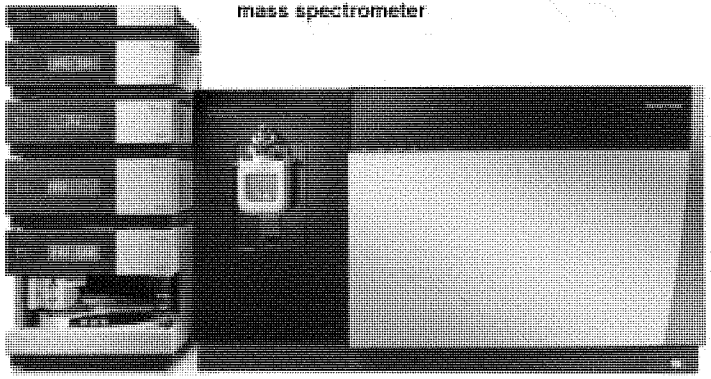
Figure 2. Picture of the (a) UPLC/MS/MS and (b) LC/TOFMS systems used

- Chevy
- Low resolution
- Nominal mass
- Inexpensive/common

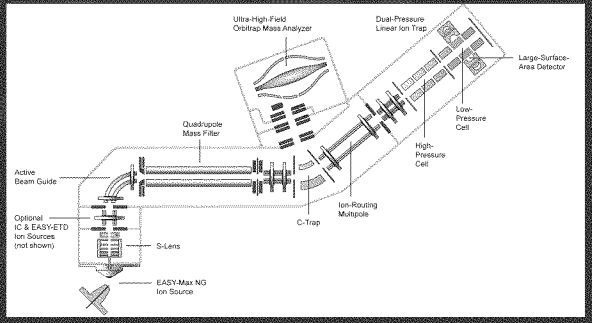
- Cadillac
- High resolution
- Exact mass
- More expensive/becoming more common

United States Environmental Protection Agency

The Thermo Scientific™ Orbitrap Fusion™ Tribrid™ mass spectrometer



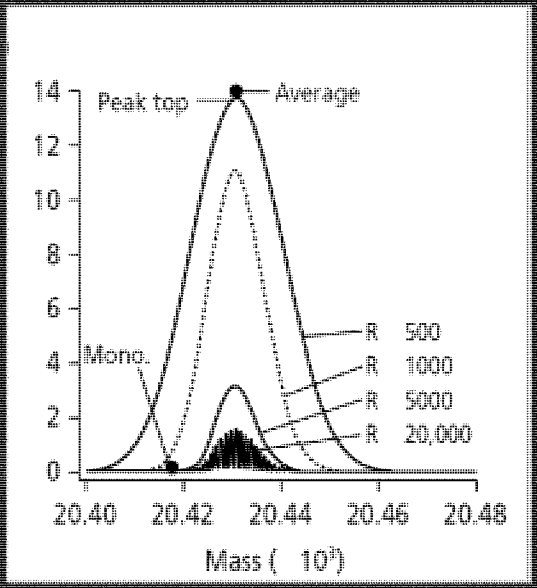
- Tesla
- Ultra-high resolution
- Exact Mass/ Fine isotope structure
- Significantly more expensive; uncommon



What is resolution?

Resolution in mass spectrometry is the ability to differentiate a detected ion from any other

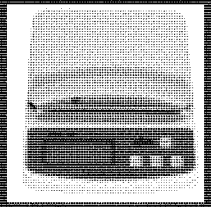
- Triple Quad or MS/MS 500-5,000 resolution
- TOF or QTOF ~25,000 resolution
- Orbitrap >250,000 resolution



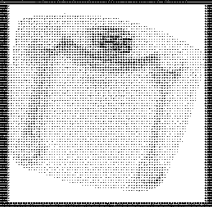
From Balough, LCGC 2004

Scales example

Lab scale



Bathroom Scale



What is Mass Accuracy?

EPA
United States
Environmental Protection
Agency

Mass Accuracy (Tune)

1633.9498 - 1633.9395 = 0.0103

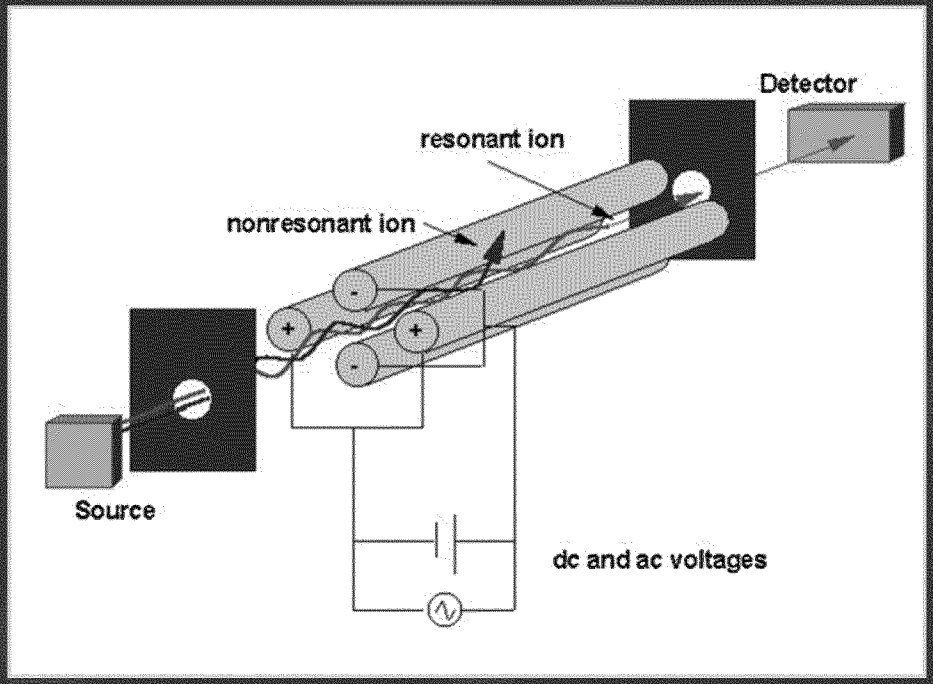
0.0103 / 1633.9498 10^6 = 6.3 ppm

True mass	400.0000
Measured mass	400.0020
Difference	0.0020 or 2 mmu
Error	$\frac{0.002}{400} \quad 10^6 \quad 5$ ppm

LCGC North America Vol 22 Number 2 February 2004 MS The Practical Art
Michael Balough "Debating Resolution and Mass Accuracy"

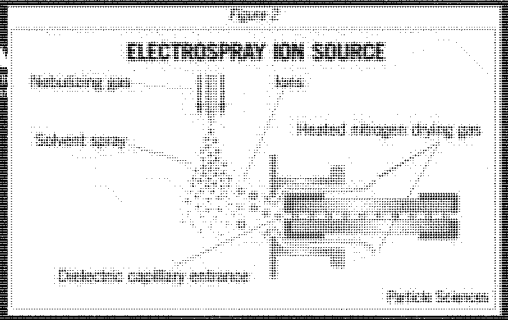
United States Environmental Protection Agency

Single Quad MS



EPA United States Environmental Protection Agency

MS/MS or Triple Quad



- MRM or transition
- Parent to daughter

Ex PFOA 413-369
413-169

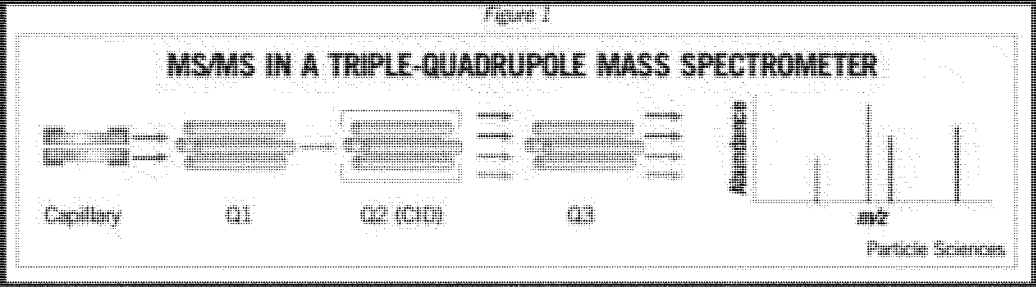
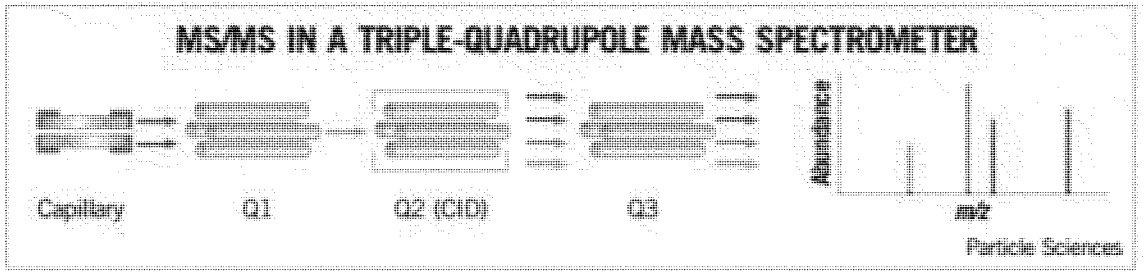
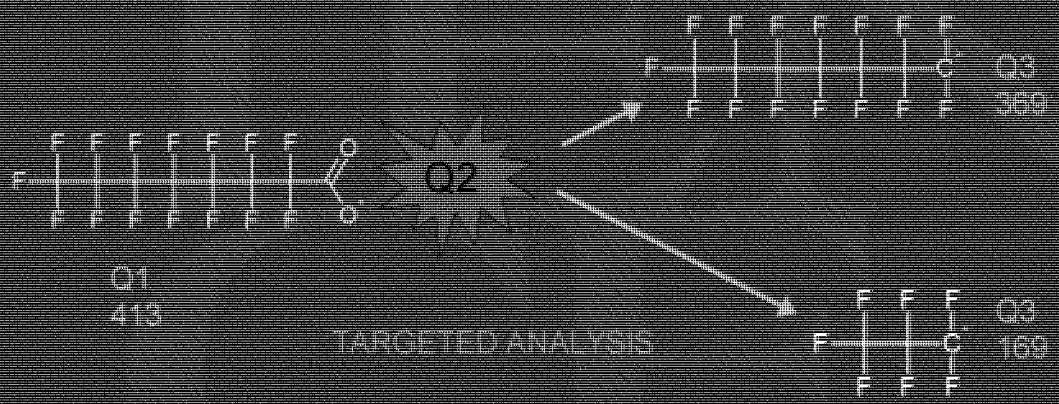


Figure 1

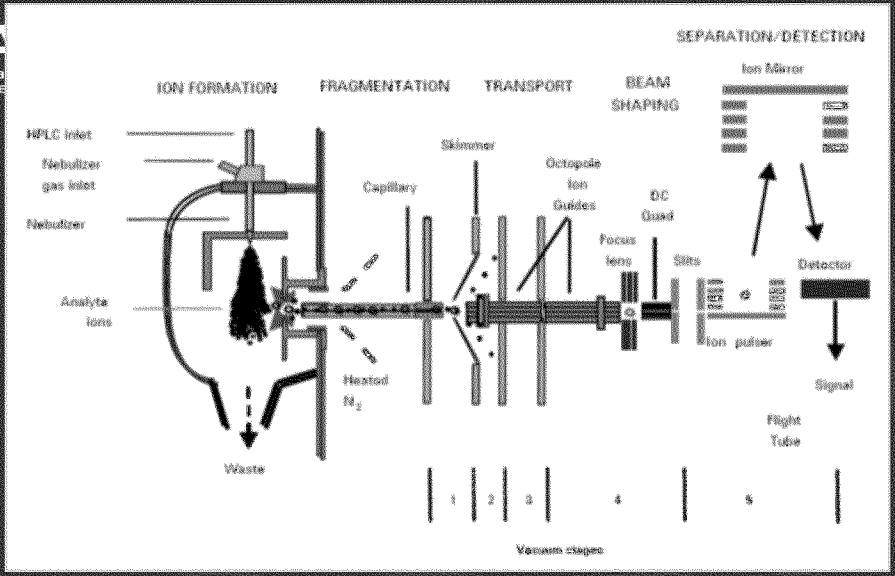


Ex PFOA



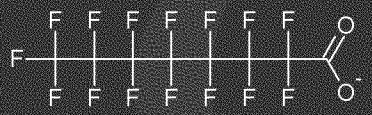
United States Environmental Protection Agency

TOFMS or QTOFMS

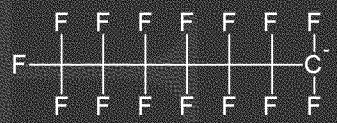


Targeted Analysis or
Non-targeted Analysis
Post-analysis data mining

Ex. PFOA exact mass 412.9664 Da



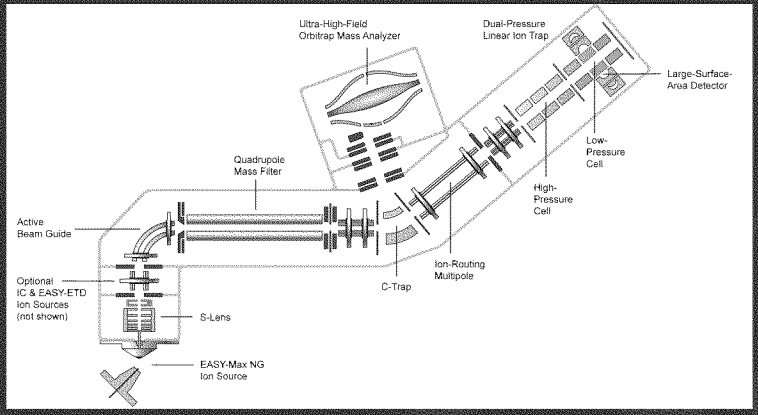
368.9766 Da



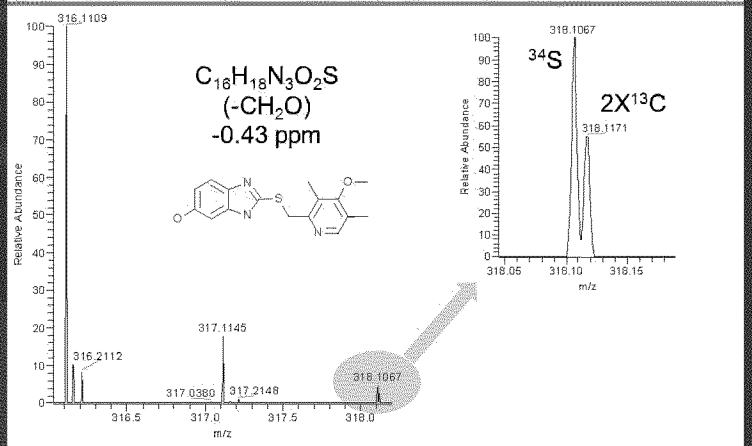
United States Environmental Protection Agency

Orbitrap

TARGETED ANALYSIS
NON TARGETED ANALYSIS
STRUCTURE ELUCIDATION
POST ANALYSIS DATA MINING



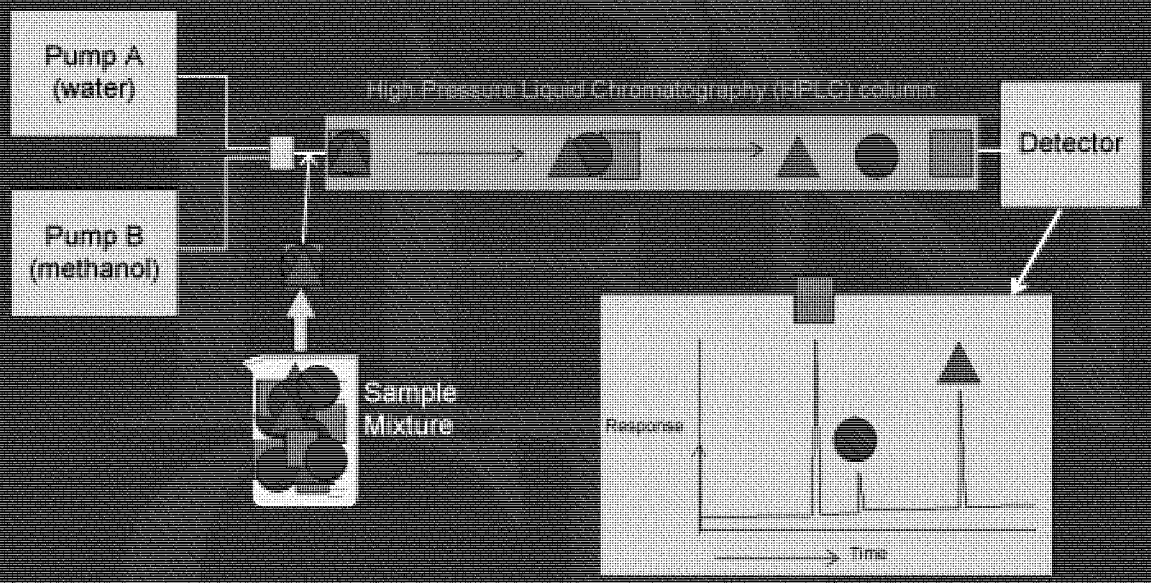
Resolution and Identification – Fine Isotope Structure



58

ThermoFisher SCIENTIFIC

What is Liquid Chromatography; Gas Chromatography



"""RT and response"""

Liquid Chromatography	vs	Gas Chromatography
Non-volatile chemicals		Volatile chemicals
Polar chemicals		Non-Polar chemicals
Water soluble chemicals		Water soluble chemicals
Example: PFOA, GenX, Nafion BP		Example: Benzene, formaldehyde, HFPO

EPA
United States Environmental Protection Agency

Work done in collaboration with NC DEQ summer/fall 2017 (GenX)

Targeted analysis of PFAS in water samples (MS/MS or Triple Quad analysis)
resolution 500-5000 GenX, legacy PFAS (PFOS/PFOA)

Non-targeted analysis of PFAS in water samples (TOFMS analysis) resolution 25,000
Nafion BP1, Nafion BP2, PFMOAA, PFO2HxA, PFO3OA, other previously undescribed analytes

Questions?

Slipman.mark@epa.gov
919-541-3706

To: Culpepper, Linda[linda.culpepper@ncdenr.gov]
Cc: Green, Jason[jason.green@ncdenr.gov]
From: Strynar, Mark
Sent: Fri 12/22/2017 12:11:54 PM
Subject: RE: Jordan Lake

Hi Linda,

I had seen this data. I saw her present it to the Town of Cary DW folks. One drinking water source that concerns me locally is Pittsboro. As you may know the Haw river is its source water. Would that be included in the Jordan Lake study as it flows into Jordan but does not influence the Cary/Apex DW plant?

Have a happy and safe Christmas/New Year's holiday.

Mark

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, December 21, 2017 3:44 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>; France, Danny <France.Danny@epa.gov>; Sivertsen, Scott <Sivertsen.Scott@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Strynar, Mark <Strynar.Mark@epa.gov>
Cc: Green, Jason <jason.green@ncdenr.gov>; Karoly, Cyndi <cyndi.karoly@ncdenr.gov>
Subject: FW: Jordan Lake

You may have already received the Duke University data set that was shared with us by Dr. Stapleton. Attaching just in case you did not.
Forwarding the article. As we've indicated to the local water utilities and health directors, we are gearing up to start taking samples
at our ambient monitoring stations. When we heard the data from Dr. Stapleton, we decided to focus on Jordan Lake first and Falls Lake
nearby in early January. Similar to our research on 1,4-dioxane and bromide, we'll evaluate the ambient stations and work from there
to isolate potential sources. Jason Green is our main point of contact for the sampling. He helped host the research workshop held in Wilmington on Dec. 11th.

Tim and Danny – would be good to set another planning meeting. I'll arrange my schedule around yours.

Any questions, please let us know.
linda

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Kritzer, Jamie
Sent: Thursday, December 21, 2017 3:15 PM
To: Regan, Michael S <Michael.Regan@ncdenr.gov>; Holman, Sheila <sheila.holman@ncdenr.gov>; Nicholson, John A. <John.Nicholson@ncdenr.gov>; Heyl, Douglas <Douglas.Heyl@ncdenr.gov>; Miller, Anderson <anderson.miller@ncdenr.gov>; Kritzer, Jamie <jamie.kritzer@ncdenr.gov>; Culpepper, Linda <linda.culpepper@ncdenr.gov>
Cc: Munger, Bridget <bridget.munger@ncdenr.gov>
Subject: Jordan Lake

Elevated levels of unregulated chemicals found in Jordan Lake, Cary drinking water

http://www.wral.com/elevated-levels-of-perfluorinated-chemicals-found-in-cary-drinking-water/17205916/

Elevated levels of unregulated chemicals found in Jordan Lake, Cary drinking water :: WRAL.com

www.wral.com

Researchers at Duke University have discovered elevated levels of several perfluorinated compounds - an unregulated family of industrial chemicals including some that can raise cancer risks - in Jordan Lake and drinking water treated by Cary.

Chemical cousins to PFAs, PFOAs, found in Jordan Lake, Town of Cary drinking water

http://pulse.ncpolicywatch.org/2017/12/21/chemical-cousins-pfas-pfoas-found-jordan-lake-town-cary-drinking-water/

Chemical cousins to PFAs, PFOAs, found in Jordan Lake, Town of Cary drinking water - The Progressive Pulse

pulse.ncpolicywatch.org

This is a developing story; it will be updated as more information becomes available. Chemical compounds in the same family as GenX have been found in Jordan Lake and the Town of Cary's drinking water, raising concerns that these substances are widespread in North Carolina. It's important to note that no GenX was found in any ...

Jamie Kritzer

Communications Director

N.C. Department of Environmental Quality

1601 Mail Service Center, Raleigh, NC 27699-1601

Office: (919) 707-8602

Personal Phone / Ex. 6

To: Culpepper, Linda[linda.culpepper@ncdenr.gov]; Detlef R. U. Knappe[knappe@ncsu.edu]
From: Strynar, Mark
Sent: Wed 11/8/2017 5:00:52 PM
Subject: RE: PFMOBA
sun et al., 2016 SI.pdf
sun et al., 2016.pdf

That compound was included in the Sun et al., 2016 paper. It was however not a major player at the time.

Mark

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Wednesday, November 08, 2017 8:40 AM
To: Detlef R. U. Knappe <knappe@ncsu.edu>; Strynar, Mark <Strynar.Mark@epa.gov>
Subject: PFMOBA

We had a question from a publication H2GO issued:
H2GO received additional perfluorinated compound results of finished water treated and supplied by Brunswick County. Samples taken on October 18 revealed GenX levels at 59.7 parts per trillion (ppt) and a total toxic mixture of perfluorinated compounds at 618.05 ppt; including an unknown compound, PFMOBA, at levels of over 270 ppt.

I know PFMOBA was included in the 2016 publication. Do you have historic data to help look at trends.
linda

Linda Culpepper
Acting Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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To: Culpepper, Linda[linda.culpepper@ncdenr.gov]
From: Strynar, Mark
Sent: Fri 9/1/2017 11:27:57 AM
Subject: RE: Brunswick Regional H2GO results from 8/14/17

Linda,

Call whenever you have some time. My cell Personal Phone / Ex. 6 is best to reach me as I am often not near my office phone. I am wide open today and will be catching up on neglected stuff.

Mark

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, August 31, 2017 6:26 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: Re: Brunswick Regional H2GO results from 8/14/17

Mark - sorry that I am just now getting messages off my personal phone. I will call you tomorrow morning. Let me know when might work for you - I'll slip out of a meeting so I'm flexible. Will call from my state cell Personal Phone / Ex. 6.
Thank you.

Sent from my iPhone
On Aug 31, 2017, at 3:47 PM, Strynar, Mark <Strynar.Mark@epa.gov> wrote:

> If that sample was taken at L&D3 boat ramp I know exactly where that is. However, the weekly sampling was of the Chemours outfall 002 and the first sample below the L&D3 was Bladen Bluffs and nothing was shown above 102 ng/L (Chemours outfall 002 7-24-17). How do you get 12,600 at L&D3 unless it is from diffuse source rather than direct discharge?
>
> Week#8 data has not been released but is very similar to week#6,7.
>
> Mark
>
> *The week 6 & 7 GenX results are much more straightforward, so I will discuss this first. These samples were received by our lab on July 28, August 1, and 4, 2017, respectively. Results show that GenX concentrations throughout the river basin continue their decline starting with the Chemours outfall (week 7 maximum of 67.9 ng/L) and extending downstream to finished drinking water (maximum at Pender Co. finished water week 7 of 43.4 ng/L). Our QA/QC samples for these results are within expected tolerances (i.e. undetected in blanks and spiked samples within 20% of expected concentrations) with one exception: a high-level spike (200 ng/L) measured at 149 ng/L in week 6 which was outside our ±20 percent range. The GenX results are provided in Attachment B.*

		Conc.	Flag
Week	**Location / Sample Identifier**	**(ng/L)**	
6	DWR #1- PO Hoffer WTP Raw Water	<10	1
6	DWR #2 - Bladen Bluffs Raw water (avg. 2 reps)	30.4	
6	DWR #3 - Bladen Bluffs Finished water	34.2	
6	DWR #4 - Smithfield Field Well	<10	1
6	NCDEQ 1 - LCFWSA Raw	35.1	
6	NCDEQ 2 - Sweeney Treated	69.5	

6	NCDEQ 3 - ASR Well	53.6	
6	NCDEQ 4 - WB Well 11	19.2	
6	NCDEQ 5 - IP-Raw	36.3	
6	NCDEQ 6 - IP-Finished	22.2	
6	NCDEQ 7 - NW Brunswick WTP - Finished	31.2	
6	NCDEQ 8 - Pender 421 WTP Finished	65.4	
6	NCDEQ 9 - WB Well 6	<10	1
6	NCDEQ 10 - CB Well 8	<10	1
6	NCDEQ 11 - CB Well 13	<10	1
6	Chemours Outfall 002 7-24-17	102	
6	Chemours Outfall 002 7-25-17 (avg. 2 reps)	74.6	
6	Chemours Outfall 002 7-26-17	71.3	
6	Chemours Outfall 002 7-27-17	77.1	
6	Chemours Outfall 002 7-28-17	63.4	
7	(2) Sweeney WTP finished	38.3	
7	(6) IP WTP Finished	12.7	
7	(7) NW Brunswick Finished	21.6	
7	(8) Pender 421 WTP Finished	39.2	
7	Pender Co. Finished water 7-31-17	43.4	
7	Chemours outfall 002 7-31-17	67.9	
7	Bladen Bluffs WTP Finished	36.2	
7	Chemours outfall 002 8-1-17	35.1	
7	Chemours outfall 002 8-2-17	41.9	
7	Chemours outfall 002 8-3-17	61.8	
7	Chemours outfall 002 8-4-17	44.0	
Flag			
1	Below Limit of Quantitation		

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, August 31, 2017 1:41 PM
To: Fransen, Tom <tom.fransen@ncdenr.gov>
Cc: Cox, Heidi <heidi.cox@ncdenr.gov>; Johnson, Chris <chris.johnson@ncdenr.gov>; Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Brunswick Regional H2GO results from 8/14/17

Tom – can you or Melanie send Dr. Strynar the GPS coordinate for the boat ramp at lock & dam #3 on the Cape Fear?

Linda Culpepper
Deputy Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Johnson, Chris
Sent: Thursday, August 31, 2017 1:14 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>; Culpepper, Linda <linda.culpepper@ncdenr.gov>
Cc: Cox, Heidi <heidi.cox@ncdenr.gov>
Subject: RE: Brunswick Regional H2GO results from 8/14/17

The only information was passed verbally by phone. I believe I heard them say that the sample was collected at the Huske Dam, no exact position provided.

Chris Johnson
NC DEQ-DWR
Water Sciences Section

Correspondence with this email address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Thursday, August 31, 2017 11:59 AM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>
Cc: Johnson, Chris <chris.johnson@ncdenr.gov>; Cox, Heidi <heidi.cox@ncdenr.gov>
Subject: RE: Brunswick Regional H2GO results from 8/14/17

Wow where did that sample come from? Do you have GPS coordinates. The August results of the outfall 002 weeks 6-7 and week8 (which have not yet been reported) do not show anything near that high.

Could it have been the old Chemours discharge creek?

Mark

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, August 31, 2017 11:00 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Cc: Johnson, Chris <chris.johnson@ncdenr.gov>; Cox, Heidi <heidi.cox@ncdenr.gov>
Subject: FW: Brunswick Regional H2GO results from 8/14/17

Mark – sharing results we heard about yesterday on a call with the local water utilities and health directors. Interesting results on page 9 of 12,600 ppt.

Linda Culpepper
Deputy Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Cox, Heidi
Sent: Thursday, August 31, 2017 10:55 AM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>
Cc: Holman, Sheila <sheila.holman@ncdenr.gov>; Gregson, Jim <jim.gregson@ncdenr.gov>; Allen, Trent <trent.allen@ncdenr.gov>; Grzyb, Julie <julie.grzyb@ncdenr.gov>
Subject: RE: Brunswick Regional H2GO results from 8/14/17

Bob Walker said he collected it from the river at the boat ramp at the O'Huske Lock and Dam, which I believe is Lock & Dam #3.
Heidi

From: Culpepper, Linda
Sent: Wednesday, August 30, 2017 10:38 PM
To: Cox, Heidi <heidi.cox@ncdenr.gov>
Cc: Holman, Sheila <sheila.holman@ncdenr.gov>; Gregson, Jim <jim.gregson@ncdenr.gov>; Allen, Trent <trent.allen@ncdenr.gov>; Grzyb, Julie <julie.grzyb@ncdenr.gov>
Subject: RE: Brunswick Regional H2GO results from 8/14/17

Heidi – please follow up with them to see where the sample on page 9 with the GenX test result of 12,600 ppt was taken.
Not sure what O'Huske L&D represents. Thank you.

Linda Culpepper
Deputy Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Cox, Heidi
Sent: Wednesday, August 30, 2017 12:11 PM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Gregson, Jim <jim.gregson@ncdenr.gov>; Allen, Trent <trent.allen@ncdenr.gov>
Subject: Brunswick Regional H2GO results from 8/14/17

Attached are the results from Brunswick Regional H2GO that were brought up by Bob Walker during the call this morning.
Heidi

Heidi Lane Cox
Regional Engineering Supervisor
Wilmington and Fayetteville Regional Offices
Public Water Supply Section
Department of Environmental Quality

(910) 796-7368 office
Personal Phone / Ex. 6
Heidi.cox@ncdenr.gov

127 Cardinal Drive Ext.
Wilmington, NC 28405

Nothing Compares

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To: Miller, Anderson[anderson.miller@ncdenr.gov]
From: Strynar, Mark
Sent: Tue 2/20/2018 5:46:10 PM
Subject: RE: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality
Strynar 2-21-18 Mass Spectrometry and Chromatography Explained.pptx

Andy,

Here are some tentative slides. I am awaiting my managers approval. Use these as a placeholder for now.

Mark

From: Miller, Anderson [mailto:anderson.miller@ncdenr.gov]
Sent: Tuesday, February 20, 2018 9:17 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>; Mariah Matheson (Legislative Analysis) <mariah.matheson@ncleg.net>; Jeffrey Hudson (Legislative Analysis) <jeffrey.hudson@ncleg.net>
Cc: Jennifer McGinnis (Legislative Analysis) <jennifer.mcginnis@ncleg.net>; Chris Saunders (Legislative Analysis) <chris.saunders@ncleg.net>; Kyle Evans (Legislative Analysis) <kyle.evans@ncleg.net>
Subject: Re: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

Looking forward to talking to you at 11 Mark and we can talk about it.

Best,

Andy

R. Anderson Miller
Legislative Affairs Program Director
North Carolina Department of Environmental Quality

Personal Phone / Ex. 6
anderson.miller@ncdenr.gov
217 West Jones Street
1601 Mail Service Center
Raleigh, NC 27699
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From: Strynar, Mark <Strynar.Mark@epa.gov>
Sent: Tuesday, February 20, 2018 7:49:45 AM
To: Mariah Matheson (Legislative Analysis); Jeffrey Hudson (Legislative Analysis)
Cc: Miller, Anderson; Jennifer McGinnis (Legislative Analysis); Chris Saunders (Legislative Analysis); Kyle Evans (Legislative Analysis)
Subject: [External] RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to Report Spam.

Mariah,

The Federal government was closed yesterday due to Presidents Day. I however had not considered having any slides or handouts for dissemination. I just intended to have a discussion and answer any questions as needed. I have a discussion with Andy Miller at 11 AM today. We could discuss this.

Mark

From: Mariah Matheson (Legislative Analysis) [mailto:Mariah.Matheson@ncleg.net]
Sent: Friday, February 16, 2018 4:23 PM

To: Strynar, Mark <Strynar.Mark@epa.gov>; Jeffrey Hudson (Legislative Analysis) <Jeffrey.Hudson@ncleg.net>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov) <anderson.miller@ncdenr.gov>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net>
Subject: RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

Mark—I will be forwarding you a FTP link on Monday morning (2/19) to upload your PowerPoint presentation if you have one. You can also upload any additional handouts. Please upload by **end of business on Monday February 19, 2018**. If you need more time or have any questions please let us know.

Thank you.

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Friday, February 02, 2018 1:54 PM
To: Jeffrey Hudson (Legislative Analysis) <Jeffrey.Hudson@ncleg.net>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov) <anderson.miller@ncdenr.gov>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net>; Mariah Matheson (Legislative Analysis) <Mariah.Matheson@ncleg.net>
Subject: RE: February 21 Meeting of the House Select Committee on North Carolina River Quality

I am available on the 21st to have this discussion. I am going to pass this on to my supervisors and PR department for them to weigh in as well.

Mark

From: Jeffrey Hudson (Legislative Analysis) [mailto:Jeffrey.Hudson@ncleg.net]
Sent: Friday, February 02, 2018 11:41 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Cc: 'Miller, Anderson' (anderson.miller@ncdenr.gov) <anderson.miller@ncdenr.gov>; Jennifer McGinnis (Legislative Analysis) <Jennifer.McGinnis@ncleg.net>; Chris Saunders (Legislative Analysis) <Chris.Saunders@ncleg.net>; Kyle Evans (Legislative Analysis) <Kyle.Evans@ncleg.net>; Mariah Matheson (Legislative Analysis) <Mariah.Matheson@ncleg.net>
Subject: February 21 Meeting of the House Select Committee on North Carolina River Quality

Mark,

I'm one of the committee staff for the North Carolina General Assembly's House Select Committee on North Carolina River Quality.

The Committee is meeting February 21 and one of the agenda items the Chair, Representative Ted Davis, is interested in is mass spectrometers and their use in detecting and analyzing emerging contaminants.

I spoke with Andy Miller at DEQ regarding this and he mentioned that you and/or James McCord might be available on the 21st to provide some information to the Committee on mass specs.

Generally, what we are envisioning is someone from USEPA providing background on the different types of mass specs and their capabilities (or lack thereof) for detecting/analyzing emerging contaminants. We would then ask DEQ to provide information on mass specs that are owned/operated by State agencies.

Please let us know if you and/or James could be available on the 21st. If you are available, we might consider setting up a meeting or call in the next week or so to discuss any questions you might have. Also, if you have any preliminary questions, feel free to call me (919-733-2578).

Thanks for your consideration,

Jeff

To: Mort, Sandra L[sandy.mort@ncdenr.gov]
From: Strynar, Mark
Sent: Thur 9/21/2017 10:45:18 AM
Subject: RE: Questions re EPA-NERL PFAS data - Chemours GW

Sandy,

I sent my responses to Tim Buckley this AM. After they have a look I expect they will be coming to you soon.

Mark

From: Mort, Sandra L [mailto:sandy.mort@ncdenr.gov]
Sent: Wednesday, September 20, 2017 3:06 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: FW: Questions re EPA-NERL PFAS data - Chemours GW

FYI –
See information request below.
Sandy

Sandy Mort, Ph.D., M.S.
Environmental Toxicologist / Risk Assessor
Division of Waste Management – Hazardous Waste & Brownfields
NC Department of Environmental Quality

(919) 707-8217 - Direct Line & Fax
sandy.mort@ncdenr.gov

1646 Mail Service Center
Raleigh, NC 27699-1646

Nothing Compares

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From: Mort, Sandra L
Sent: Wednesday, September 20, 2017 10:41 AM
To: Timothy J. Buckley PhD <buckley.timothy@epa.gov>
Subject: Questions re EPA-NERL PFAS data - Chemours GW

Dr. Buckley –
I am requesting the following clarifications / verification for the PFAS data generated by NERL on the August 2017 groundwater (GW) samples submitted by NC DEQ Division of Waste Management (see the attached report):

1. Please provide the full chemical name for the PFESA Byproduct 2 listed in Table 2. The last portion of the chemical name was cut off in the final report.
2. Please verify the CASN for the PFESA (Nafion) Byproduct 1 listed in table 2. The CASN listed is 29311-67-9. I'm asking if it should be CASN 66796-30-3 based on prior information provided by your lab.
3. The notes on Table 3 indicate the LOD = 10 ng/L. Please verify that this is for all analytes reported.
4. The Table 3 information notes include the sample dilutions. Do these dilutions apply both to the target analytes and the non-target analytes? Should the reporting limits for the target analytes reflect the 10 ng/L LOD times the noted sample dilution? Same question for the non-target analytes? (i.e., LOD x dilution = analyte reporting limit)
5. In the Sun et al, EST (2016) paper the non-target analytes PFMOPrA, PFMOBA and PFO4DA were reported in the drinking water sourced from the Cape Fear River. Neither PFMOPrA, PFMOBA or PFO4DA were reported for the groundwater. Please

clarify if this was because these 3 non-target analytes (NTAs) were not detected in the GW, or if the GW analysis did not include these 3 NTAs.

6. The text indicates that there is a conservative order-of-magnitude uncertainty in the NTA concentrations reported. Please verify that the same level of uncertainty is estimated for both the NTA PFECA and PFESA since the NTA concentrations are generated relative to the PFECA GenX instrument response.

Thank you & your staff again for your efforts.
b/r
Sandy Mort

Sandy Mort, Ph.D., M.S.
Environmental Toxicologist / Risk Assessor
Division of Waste Management – Hazardous Waste & Brownfields
NC Department of Environmental Quality

(919) 707-8217 - Direct Line & Fax
sandy.mort@ncdenr.gov

1646 Mail Service Center
Raleigh, NC 27699-1646

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To: Oneal, Gregg[gregg.oneal@ncdenr.gov]
From: Strynar, Mark
Sent: Mon 10/30/2017 8:26:31 PM
Subject: RE: [External] RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Yes front desk. 109 TW Alexander Dr.

My cell is Personal Phone / Ex. 6 if you have any issues.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Monday, October 30, 2017 2:55 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: [External] RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
We would like to visit with you and the lab form 10 to 11 am tomorrow. I feel an hour should be sufficient time unless you think otherwise. Should we just plan to meet you at the front desk?
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
gregg.oneal@ncdenr.gov

217 West Jones Street
1601 Mail Service Center
Raleigh, NC 27699

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Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Monday, October 30, 2017 2:02 PM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: [External] RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to report spam@nc.gov.

Tomorrow works fine from me between 7-11 AM. After that I am full. Wednesday is terrible for me. I am pretty much in meetings all day 9:30 am to 4:30 PM.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Monday, October 30, 2017 1:46 PM

To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
I would like arrange a visit for some of the NC DAQ Tech Services staff to meet and see your lab sometime this week if possible. Tomorrow would be optimum or early Wednesday.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
gregg.oneal@ncdenr.gov

217 West Jones Street
1601 Mail Service Center
Raleigh, NC 27699

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Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Thursday, September 28, 2017 7:29 AM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Ok Gregg. FYI I do not run Method 537. That method is an EPA standard method. We run our own internal developed methods for PFAS.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Wednesday, September 27, 2017 3:11 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
I think at this time with other issues taking priority over here at DAQ we will have to try to work out another date and time. I will try to get back with you sometime in the coming weeks to arrange this. I still very much want to see the M537 equipment.
Thanks
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Wednesday, September 27, 2017 8:12 AM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Gregg,

Thursday from 3-4 PM is booked. I have to leave at 4 PM to attend my daughters volleyball game otherwise I am usually here to 4:30.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 3:45 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
I think Thursday at 3:00pm would be nice based on your schedule. Please let me know if you are ok with this.

Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, September 26, 2017 3:23 PM

To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

I am here all week. I have very little going on Friday from lunch to 3:30 PM if that works in your time slot. I am very bust Wednesday so it will not work for me. Thursday could work but I have meetings 10-11 am and from 1-3 pm.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 2:02 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
What is your arability this week? I have 3-4 of us that would like to visit and see this equipment in operation.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
gregg.oneal@ncdenr.gov

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1601 Mail Service Center
Raleigh, NC 27699

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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, September 26, 2017 1:14 PM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Gregg,
I have UPLC-MS/MS and HPLC-MS/MS as well as TOFMS, and QTOFMS apparatus we use regularly for PFAS measurements. I am glad to show it to you anytime we are around. I have been working closely with Chris Johnson and Linda Culpepper at NCDEQ since the GenX issue broke in June 2017 for water analysis.

Let me know what you availability is.

Mark

From: Merrill, Raymond
Sent: Tuesday, September 26, 2017 1:08 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>

Cc: Merrill, Raymond <Merrill.Raymond@epa.gov>; Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: FW: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark
I'm forwarding an email from Gregg Oneal at NC DENR.
From our phone conversation, I know that you are in contact with folks at NC DENR related to PFOA and/or PFOS analysis by LC/MS/MS.
Greg is in the air program at DENR and as you can read from his email below, he has a general interest in gathering information and some familiarity with the equipment used for these analyses.

With this introduction, I'll leave it in your hands to make the connection with Gregg formally.
Let me know if you need something from me.
Thanks
Ray

Raymond Merrill Ph.D. (Ray)| USEPA/OAQPS/AQAD/Measurement Technology Group
109 TW Alexander Drive (E143-02) | Research Triangle Park, NC 27711
email: merrill.raymond@epa.gov | Phone (919)541-5225 | Fax: (919) 541-0516

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 10:27 AM
To: Merrill, Raymond <Merrill.Raymond@epa.gov>
Subject: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Ray,
Does EPA-RTP have an operational (HPLC/MS/MS) that some of us from NCDEQ-DAQ Technical Services could see? This is the equipment listed in the EPA Drinking Water Method 537 and does the PFOA lab analysis. Do you know a contact? Some of us would like to get a better understanding if possible of this analysis and the equipment operation.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

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gregg.oneal@ncdenr.gov

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Raleigh, NC 27699

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To: Johnson, Chris[chris.johnson@ncdenr.gov]; Culpepper, Linda[linda.culpepper@ncdenr.gov]
Cc: McCord, James[mccord.james@epa.gov]
From: Strynar, Mark
Sent: Wed 9/27/2017 3:29:12 PM
Subject: EPA assessment of Chemours outfall challenge samples
9-27-17 Chemours outfall challnge sample MJS.xps

All,
Some time back James and I prepared challenge samples to assess the contract lab capability for you all. A blank, and two spike levels (as I recall 150 and 1000 ng/l but don't quote me on that. In addition we supplied a water samples with 1:2:1 Cape Fear river water at Chemours outfall 002 collected 5-15-17: Cape fear river water upstream: DI water. We prepared bottles for contract labs an our self to analyze. We were hoping for a consensus value from the labs that responded. Based on the data I saw that was not given.

We disposed of the sample for us on accident. I made up a new sample last week 1:3 Cape fear River at Chemours outfall 002 5-15-17: Di water.

See the attached results. We see around 2,500 ng/L GenX in that sample with duplicate injection. Our cal curve was from 50 to 3000 ng/L so it falls in the cal curve.

Mark

Dr. Mark J. Strynar
Physical Scientist
US EPA
National Exposure Research Laboratory
919-541-3706
Strynar.mark@epa.gov

Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Method: C:\MassLynx\new MJS.PRO\MethDB\9-27-17 MJS PFECAs Chemours.mdb 27 Sep 2017 11:01:11
Calibration: 27 Sep 2017 11:01:33

Compound name: GenX new
Coefficient of Determination: R^2 = 0.991338
Calibration curve: -1.84899e-006 * x^2 + 0.390169 * x + 8.18269
Response type: Internal Std (Ref 2), Area * (IS Conc. / IS Area)
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank	4.18	1877.291			
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank	4.18	233.946	12700.963		
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard	4.18	2699.974	9347.804	53.1	6.1
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard	4.17	9138.186	17762.648	110.9	10.9
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard	4.17	11746.141	12114.349	227.8	-8.9
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard	4.17	16403.549	9168.036	438.5	-12.3
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard	4.17	31973.250	8349.050	965.0	-3.5
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard	4.16	57474.195	6562.389	2247.7	12.4
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard	4.16	59244.516	5347.078	2857.5	-4.8
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank	4.18	2194.937			
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	4.16	60673.324	6145.721	2539.9	
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	4.15	60719.930	6269.354	2490.7	
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank	4.18	2960.596			

Compound name: New GenX IS
Response Factor: 98.0734
RRF SD: 41.1864, Relative SD: 41.9955
Response type: External Std, Area
Curve type: RF

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank					
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank	4.17	12700.963		129.5	29.5
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard	4.17	9347.804		95.3	-4.7
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard	4.17	17762.648		181.1	81.1
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard	4.17	12114.349		123.5	23.5
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard	4.17	9168.036		93.5	-6.5
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard	4.17	8349.050		85.1	-14.9
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard	4.16	6562.389		66.9	-33.1
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard	4.16	5347.078		54.5	-45.5

Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Compound name: New GenX IS

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank					
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	4.16	6145.721		62.7	-37.3
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	4.16	6269.354		63.9	-36.1
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank					

Compound name: m/z 178
Coefficient of Determination: R^2 = 0.384884
Calibration curve: -0.000112201 * x^2 + 0.365363 * x + 140.793
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank					
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank	0.69	139.194			
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard	0.85	110.010			-100.0
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard	0.68	285.408		461.1	361.1
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard					
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard	0.68	262.741		377.5	-24.5
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard	0.64	313.549		574.0	-42.6
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard	0.66	492.427			-100.0
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard	0.68	210.025		202.0	-93.3
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank	1.04	107.609			
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	0.58	1665913.625			
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	0.56	1578800.750			
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank	0.57	12825.437			

Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Compound name: m/z 245
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank					
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank					
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard					
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard					
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard					
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard					
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard					
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard					
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard					
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank					
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	2.42	568140.063			
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	2.49	596318.500			
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank					

Compound name: m/z 311
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank					
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank					
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard					
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard					
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard					
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard					
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard					
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard					
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard					
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank					
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	4.02	188717.672			
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	4.02	197478.578			
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank	4.10	881.421			

Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Compound name: m/z 377
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

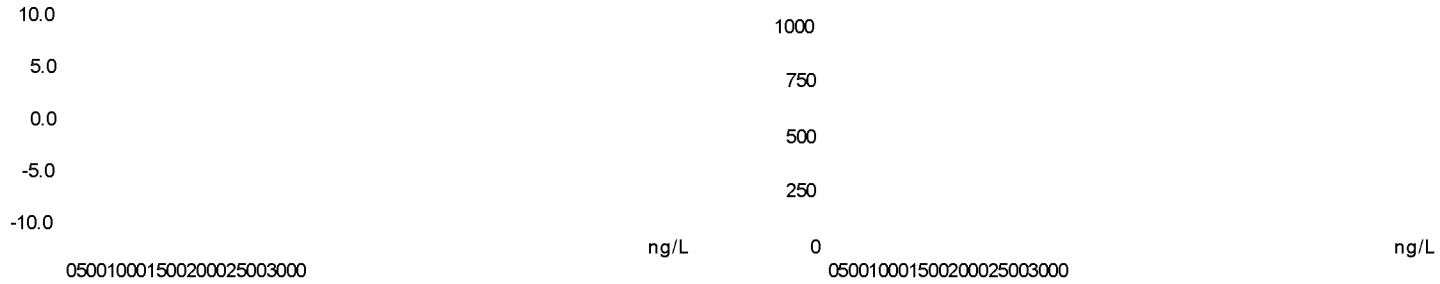
	#	Name	Sample Text	Type	RT	Area	IS Area	ng/L	Þv
1	1	9-26-17 Contract Lab outfall assesment 001	DB	Blank					
2	2	9-26-17 Contract Lab outfall assesment 002	MB	Blank					
3	3	9-26-17 Contract Lab outfall assesment 003	50 std	Standard					
4	4	9-26-17 Contract Lab outfall assesment 004	100 std	Standard					
5	5	9-26-17 Contract Lab outfall assesment 005	250 std	Standard					
6	6	9-26-17 Contract Lab outfall assesment 006	500 std	Standard					
7	7	9-26-17 Contract Lab outfall assesment 007	1000 std	Standard					
8	8	9-26-17 Contract Lab outfall assesment 008	2000 std	Standard					
9	9	9-26-17 Contract Lab outfall assesment 009	3000 std	Standard					
10	10	9-26-17 Contract Lab outfall assesment 010	DB	Blank					
11	11	9-26-17 Contract Lab outfall assesment 011	3:1 chemours outfall 002 5-...	Analyte	4.72	35742.477			
12	12	9-26-17 Contract Lab outfall assesment 012	3:1 chemours outfall 002 5-...	Analyte	4.72	36579.852			
13	13	9-26-17 Contract Lab outfall assesment 013	DB	Blank					

Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

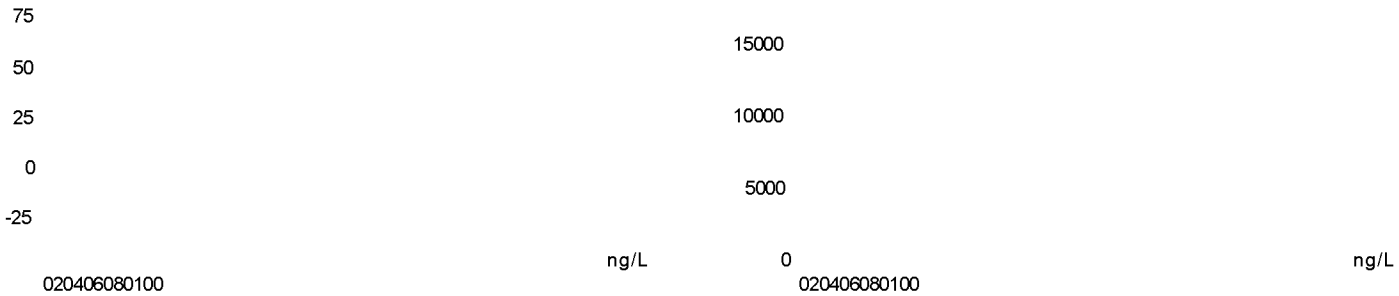
Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Method: C:\MassLynx\new MJS.PRO\MethDB\9-27-17 MJS PFECAs Chemours.mdb 27 Sep 2017 11:01:11
Calibration: 27 Sep 2017 11:01:33

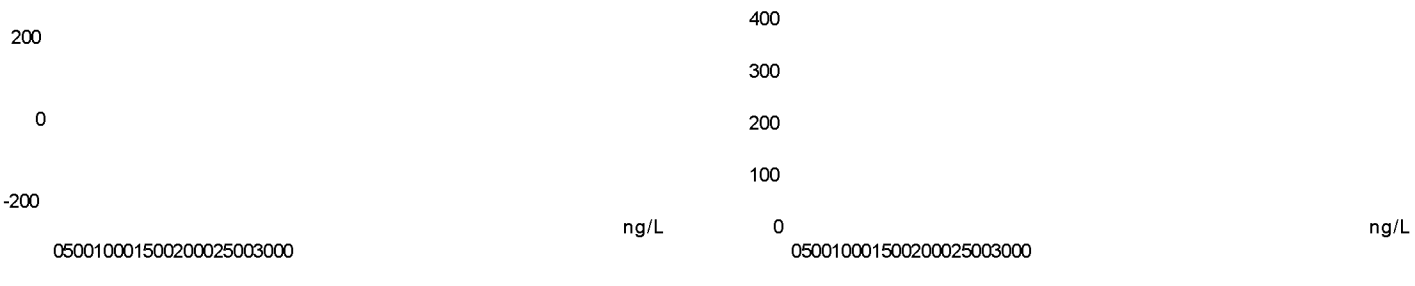
Compound name: GenX new
Coefficient of Determination: R^2 = 0.991338
Calibration curve: -1.84899e-006 * x^2 + 0.390169 * x + 8.18269
Response type: Internal Std (Ref 2), Area * (IS Conc. / IS Area)
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None



Compound name: New GenX IS
Response Factor: 98.0734
RRF SD: 41.1864, % Relative SD: 41.9955
Response type: External Std, Area
Curve type: RF



Compound name: m/z 178
Coefficient of Determination: R^2 = 0.384884
Calibration curve: -0.000112201 * x^2 + 0.365363 * x + 140.793
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None



Dataset: C:\MassLynx\new MJS.PRO\9-27-17 Chemours challenge assesment.qld

Last Altered: Wednesday, September 27, 2017 11:01:33 Eastern Daylight Time
Printed: Wednesday, September 27, 2017 11:06:57 Eastern Daylight Time

Compound name: m/z 245
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

Compound name: m/z 311
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

Compound name: m/z 377
No Calibration
Response type: External Std, Area
Curve type: 2nd Order, Origin: Exclude, Weighting: 1/x, Axis trans: None

To: Oneal, Gregg[gregg.oneal@ncdenr.gov]
From: Strynar, Mark
Sent: Mon 10/30/2017 6:01:34 PM
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Tomorrow works fine from me between 7-11 AM. After that I am full. Wednesday is terrible for me. I am pretty much in meetings all day 9:30 am to 4:30 PM.

Mark

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To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
I would like arrange a visit for some of the NC DAQ Tech Services staff to meet and see your lab sometime this week if possible. Tomorrow would be optimum or early Wednesday.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
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Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Ok Gregg. FYI I do not run Method 537. That method is an EPA standard method. We run our own internal developed methods for PFAS.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Wednesday, September 27, 2017 3:11 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,

I think at this time with other issues taking priority over here at DAQ we will have to try to work out another date and time. I will try to get back with you sometime in the coming weeks to arrange this. I still very much want to see the M537 equipment.
Thanks
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Wednesday, September 27, 2017 8:12 AM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Gregg,

Thursday from 3-4 PM is booked. I have to leave at 4 PM to attend my daughters volleyball game otherwise I am usually here to 4:30.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 3:45 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
I think Thursday at 3:00pm would be nice based on your schedule. Please let me know if you are ok with this.

Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
gregg.oneal@ncdenr.gov

217 West Jones Street
1601 Mail Service Center

Raleigh, NC 27699

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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, September 26, 2017 3:23 PM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

I am here all week. I have very little going on Friday from lunch to 3:30 PM if that works in your time slot. I am very bust Wednesday so it will not work for me. Thursday could work but I have meetings 10-11 am and from 1-3 pm.

Mark

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 2:02 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark,
What is your arability this week? I have 3-4 of us that would like to visit and see this equipment in operation.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
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gregg.oneal@ncdenr.gov

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1601 Mail Service Center
Raleigh, NC 27699

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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, September 26, 2017 1:14 PM
To: Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: RE: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Gregg,

I have UPLC-MS/MS and HPLC-MS/MS as well as TOFMS, and QTOFMS apparatus we use regularly for PFAS measurements. I am glad to show it to you anytime we are around. I have been working closely with Chris Johnson and Linda Culpepper at NCDEQ since the GenX issue broke in June 2017 for water analysis.

Let me know what you availability is.

Mark

From: Merrill, Raymond
Sent: Tuesday, September 26, 2017 1:08 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Cc: Merrill, Raymond <Merrill.Raymond@epa.gov>; Oneal, Gregg <gregg.oneal@ncdenr.gov>
Subject: FW: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Mark
I'm forwarding an email from Gregg Oneal at NC DENR.
From our phone conversation, I know that you are in contact with folks at NC DENR related to PFOA and/or PFOS analysis by LC/MS/MS.
Greg is in the air program at DENR and as you can read from his email below, he has a general interest in gathering information and some familiarity with the equipment used for these analyses.

With this introduction, I'll leave it in your hands to make the connection with Gregg formally.
Let me know if you need something from me.
Thanks
Ray

Raymond Merrill Ph.D. (Ray)| USEPA/OAQPS/AQAD/Measurement Technology Group
109 TW Alexander Drive (E143-02) | Research Triangle Park, NC 27711
email: merrill.raymond@epa.gov | Phone (919)541-5225 | Fax: (919) 541-0516

From: Oneal, Gregg [mailto:gregg.oneal@ncdenr.gov]
Sent: Tuesday, September 26, 2017 10:27 AM
To: Merrill, Raymond <Merrill.Raymond@epa.gov>
Subject: Would like to see an operational i.e. EPA's (HPLC/MS/MS)

Ray,
Does EPA-RTP have an operational (HPLC/MS/MS) that some of us from NCDEQ-DAQ Technical Services could see? This is the equipment listed in the EPA Drinking Water Method 537 and does the PFOA lab analysis. Do you know a contact? Some of us would like to get a better understanding if possible of this analysis and the equipment operation.
Thanks,
Gregg

Thomas Gregg O'Neal, III, P.E.
Engineer
Division of Air Quality, Technical Services Section
North Carolina Department of Environmental Quality

919 707-8415 office
gregg.oneal@ncdenr.gov

217 West Jones Street
1601 Mail Service Center
Raleigh, NC 27699

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To: Johnson, Chris[chris.johnson@ncdenr.gov]
From: Strynar, Mark
Sent: Tue 11/7/2017 3:10:44 PM
Subject: RE: [External] monofluoro-malonate

I am happy to look at any data you get form SGS. I am still wondering if anyone else sees an uptick in the GenX in samples around the shutdown time also (Mid October). In particular Chemours 002 or the Brunswick County water.

Mark

From: Johnson, Chris [mailto:chris.johnson@ncdenr.gov]
Sent: Tuesday, November 07, 2017 9:04 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: RE: [External] monofluoro-malonate

This is very interesting. Thanks, Mark. I'm a little envious at your equipment and the detective work you get to do.

We have updated results from SGS for August and September samples. Are you interested in seeing those.

Thank you and your staff again for helping us keep the Cape Fear a little cleaner.

Chris Johnson
NC DEQ-DWR
Water Sciences Section
919-733-3908

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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, November 07, 2017 8:29 AM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Johnson, Chris <chris.johnson@ncdenr.gov>; McCord, James <mccord.james@epa.gov>; Detlef R. U. Knappe <knappe@ncsu.edu>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Lang, Johnsie <lang.johnsie@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; Medina-Vera, Myriam <Medina-Vera.Myriam@epa.gov>
Subject: [External] monofluoro-malonate

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All,

1)I took a very small set of samples to check for the presence of mono-fluoro malonate in the waters at or near Chemours. See the structure below:

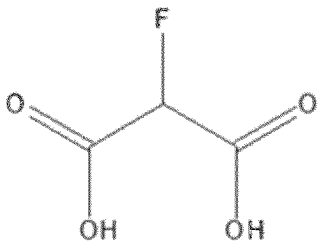
Samples used
Laboratory blank
NCDEQ Chemours outfall 002 Week#1 (around mid June)
NCDEQ Chemours outfall 002 pre shutdown (Around mid October)
Chemours onsite monitoring well LTW03

From my assessment I see NO evidence of the singly charged (m/z 120.9943) or doubly charged ion (m/z 59.9935) of the mono-fluoro malonate at all in these samples. I expect if it were a contaminant it should be in one of the three samples I have chosen. We usually do not go below 100 m/z as the mass accuracy becomes increasingly poor. Thus I reran these three extracts so I can look for the doubly charged ion and re-calibrated down to m/z 50.

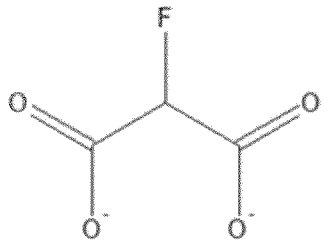
2) I then looked at every sample we have run on the TOFMS that was collected as part of the NCDEQ efforts and screened only for the singly charged ion (m/z 120.9943) as I cannot look at data below 100 m/z for the samples we have already run for the doubly charged ion. I again saw NO evidence in any sample of the mono-fluoro malonate presence.

My opinion would be this is a non-issue after this assessment.

Mark



Molecular Formula: $C_3H_3FO_4$
Monoisotopic Mass: 122.001537 Da
[M-H]-: m/z 120.99426 Da



Monoisotopic Mass: 119.986984 Da
M-2H]-2: m/z 59.9935

Dr. Mark J. Strynar
Physical Scientist
US EPA
National Exposure Research Laboratory
919-541-3706
Strynar.mark@epa.gov

To: Bowyer, Jim[jim.bowyer@ncdenr.gov]; Michael Pjetraj[michael.pjetraj@ncdenr.gov]
From: Strynar, Mark
Sent: Tue 12/12/2017 2:44:02 PM
Subject: my understanding of Fluoroether chemistry
Fluoro ether chemistry 10-24-17.pptx

Jim and Michael,

I wanted to attach a PPT slide that is a synopsis of my understanding of the fluoroether chemistry and how compounds are related at the Dupont/Chemours facility in Fayetteville, NC. It is my distillation based on my understanding along with discussions with Laurence Libelo (USEPA OCSPP) and other unnamed fluoro chemistry contacts over the years. There is likely more detail I have either left out unintentionally and intentionally in some instances to keep this as simple as possible. None of this is CBI.

Let me know if you have any questions.

Mark

Dr. Mark J. Strynar
Physical Scientist
US EPA
National Exposure Research Laboratory
919-541-3706
Strynar.mark@epa.gov

To: Abraczinskas, Michael[michael.abraczinskas@ncdenr.gov]; Mitchell, Ken[Mitchell.Ken@epa.gov]; Michael Pjetraj[michael.pjetraj@ncdenr.gov]
Cc: Kemker, Carol[Kemker.Carol@epa.gov]; McCord, James[mccord.james@epa.gov]; Lindstrom, Andrew[Lindstrom.Andrew@epa.gov]; Buckley, Timothy[Buckley.Timothy@epa.gov]
From: Strynar, Mark
Sent: Mon 11/6/2017 1:09:35 PM
Subject: RE: [External] Meeting with Mark Strynar
Chemours air emissions 2012 - 2016.xlsx
Chemours major emission chemicals.sk2

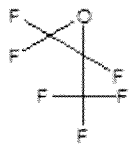
All,

My post doc James McCord took all of the emissions from the last 5 years and organized by CAS. Here is the resulting synopsis. 92.5% of the emissions can be accounted for by these 5 compounds. HFPO makes up 54.7% of the emissions.

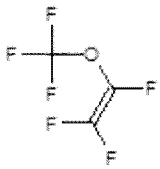
GenX and precursors is not included and accounts for about 0.57% of the total.

See the attached Excel file and Chemsketch file. If you can't open the Chemsketch here is an image of it below.

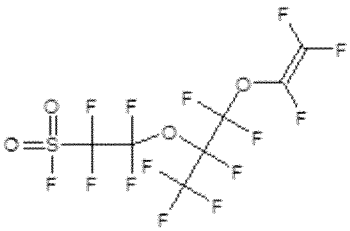
Mark



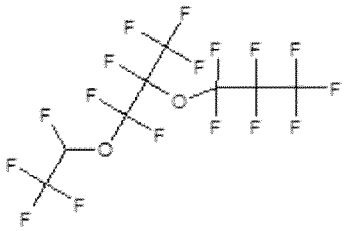
HFPO
54.66% of Emissions
CAS 428-59-1



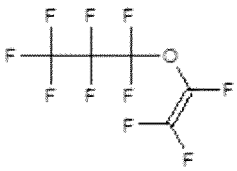
Perfluoro(methyl vinyl ether) (PMVE)
16.94% of Emissions
CAS 1187-93-5



Nafion Monomer
8.77% of Emissions
CAS 16090-14-5



POLYFLGSID_880192
7.29% of Emissions
CAS 3330-14-1



perfluoro(propyl vinyl ether) (PPVE)
4.86% of Emissions
CAS 1623-05-8

From: Abraczinskas, Michael [mailto:michael.abraczinskas@ncdenr.gov]
Sent: Thursday, November 02, 2017 5:42 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Michael Pjetraj <michael.pjetraj@ncdenr.gov>
Cc: Strynar, Mark <Strynar.Mark@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>
Subject: RE: [External] Meeting with Mark Strynar

Thanks Ken for getting this kick-started.

Mark: Would you be able to come over to our office around 3pm on Monday, Nov 6th? We can set up a call-in number for all of the R4 folks that are able to join.
Our meeting w/ Chemours is Nov 7th.

Let me know.
Thanks,
-Mike

Mike Abraczinskas, EIT, CPM
Director, Division of Air Quality
North Carolina Department of Environmental Quality

919 707 8447 office
michael.abraczinskas@ncdenr.gov

217 West Jones Street
1641 Mail Service Center
Raleigh, NC 27699

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From: Mitchell, Ken [mailto:Mitchell.Ken@epa.gov]
Sent: Thursday, November 02, 2017 4:03 PM
To: Abraczinskas, Michael <michael.abraczinskas@ncdenr.gov>; Pjetraj, Michael <michael.pjetraj@ncdenr.gov>
Cc: Strynar, Mark <Strynar.Mark@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>
Subject: [External] Meeting with Mark Strynar

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Mike and Mike....

Nice seeing you this week in Atlanta...hope you had an uneventful trip home.

I was speaking with Mark Stryner from our Office of Research and Development (the person I suggested you meet with re Chemours air emission data). I just wanted to let you know that he is out of the office tomorrow (Friday). On Monday, he is available before 11am and after 3pm. I understood that your meeting with Chemours is on November 7 (next Tuesday....or was it next Thursday?), so I thought I would let you know about the limitations of his schedule as soon as possible.

When you do meet with Mark, would it be ok if other folks here at EPA who are involved in the Chemours issue also listen in to your discussion?

Thanks!

Kenneth L. Mitchell, Ph.D. | Special Assistant to the Director |
Air, Pesticides, and Toxics Management Division
U.S. Environmental Protection Agency | 61 Forsyth Street, SW | Atlanta, GA 30303
Voice: 404-562-9065 | Fax: 404-562-9066 | Email: mitchell.ken@epa.gov

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To: Johnson, Chris[chris.johnson@ncdenr.gov]; McCord, James[mccord.james@epa.gov]
From: Strynar, Mark
Sent: Wed 9/13/2017 12:21:02 PM
Subject: RE: Contract Labs
MJS edits Contract Lab Comparison.xlsx

Chris,

Here is my assessment for Labs A and B. For QCA, QCB and QCC both labs appear acceptable for the analytes they measured and the blanks being shown as blank. Both are a bit high for GenX in the QCB sample but not terrible. I am a bit concerned Lab B does not measure PFBA and PFPeA as they are two analytes we see in CFR samples often and in particular on the Chemours site.

My major concern is that lab B did not find GenX in the QCD sample as Lab A found >2000 ng/L. I am not sure what the true value is as in our haste of cleaning up NCDEQ bottles from 8 weeks of samples we appear to have discarded the sample we kept for ourselves. However, it would have just given a consensus value. If you get a third labs results hopefully that will help.

If I were to choose I think Lab A did a better job.

Mark

From: Johnson, Chris [mailto:chris.johnson@ncdenr.gov]
Sent: Friday, September 08, 2017 11:30 AM
To: Strynar, Mark <Strynar.Mark@epa.gov>; McCord, James <mccord.james@epa.gov>
Subject: Contract Labs

Mark/James,

I've attached a summary of the first two labs' results for your QC samples. Please give me you impressions. Thanks!

Chris Johnson
Environmental Program Supervisor
Water Sciences Section / Organic Chemistry Branch

North Carolina Department of Environmental Quality
Division of Water Resources

919-733-3908 office

4405 Reedy Creek Road
Raleigh, NC 27607

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		LabA	Q	LabB	Q	LabC	Q	Target	Lab A	Lab B
QCA	PFBA	<2		NR				0		
	PFPeA	<2		NR				0		
	PFHxA	<2		<2				0		
	PFHpA	<2		<2				0		
	PFOA	0.2	J	<2				0		
	PFNA	<2		<2				0		
	PFDA	0.3	J	<2				0		
	PFBS	<2		<2				0		
	PFHxS	<2		<2				0		
	PFOS	<2		<2				0		
	GenX	ND	U	<5				0		

		LabA	Q	LabB	Q	LabC	Q	Recovery	Target	Lab A	Lab B
QCB	PFBA	134		NR					150	89.3	NR
	PFPeA	139		NR					150	92.7	NR
	PFHxA	138		150					150	92.0	100.0
	PFHpA	143		150					150	95.3	100.0
	PFOA	142		150					150	94.7	100.0
	PFNA	134		150					150	89.3	100.0
	PFDA	133		150					150	88.7	100.0
	PFBS	152		160					150	101.3	106.7
	PFHxS	155		160					150	103.3	106.7
	PFOS	144		150					150	96.0	100.0
	GenX	238		210					150	158.7	140.0

		LabA	Q	LabB	Q	LabC	Q	Recovery	Target	Lab A	Lab B
QCC	PFBA	803		NR					1000	80.3	NR
	PFPeA	832		NR					1000	83.2	NR
	PFHxA	889		1200					1000	88.9	120
	PFHpA	876		1200					1000	87.6	120
	PFOA	865		1200					1000	86.5	120
	PFNA	871		1200					1000	87.1	120
	PFDA	896		1200					1000	89.6	120
	PFBS	885		1100					1000	88.5	110
	PFHxS	890		1200					1000	89	120
	PFOS	982		1100					1000	98.2	110
	GenX	1220		1200					1000	122	120

		LabA	Q	LabB	Q	LabC	Q	
QCD	PFBA	20		NR				
	PFPeA	27.4		NR				
	PFHxA	12.8		<2				
	PFHpA	11		<2				
	PFOA	5.41		<2				
	PFNA	1.5	J	<2				
	PFDA	0.96	J	<2				
	PFBS	2.41		3.2				
	PFHxS	4.49		6.0				
	PFOS	9.03		13				
	GenX	2370		<5				only major concern

To: Boehm, Amy (Wilmington)[Amy.Boehm@sgs.com]; Johnson, Chris[chris.johnson@ncdenr.gov]
Cc: Culpepper, Linda[linda.culpepper@ncdenr.gov]; Huffman, David J[david.huffman@ncdenr.gov]; Schoenwiesner, Brian bws (Wilmington)[Brian.Schoenwiesner@sgs.com]; Milholland, Jeannie (Wilmington)[Jeannie.Milholland@sgs.com]; Martin, Allen (Wilmington)[Allen.Martin@sgs.com]; Pellechia, Geoffrey (Marlborough)[Geoffrey.Pellechia@sgs.com]; McGuire, Brian (West Creek)[Brian.McGuire@sgs.com]; Gregson, Jim[jim.gregson@ncdenr.gov]
From: Strynar, Mark
Sent: Fri 8/18/2017 10:23:36 AM
Subject: RE: QC Samples
Wellington PFAC MXA standard solution.docx

Here are the ten PFAS found in the Wellington PFAC MXA standard solution mixture.

Mark

From: Boehm, Amy (Wilmington) [mailto:Amy.Boehm@sgs.com]
Sent: Thursday, August 17, 2017 4:59 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>; Johnson, Chris <chris.johnson@ncdenr.gov>
Cc: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Huffman, David J <david.huffman@ncdenr.gov>; Schoenwiesner, Brian bws (Wilmington) <Brian.Schoenwiesner@sgs.com>; Milholland, Jeannie (Wilmington) <Jeannie.Milholland@sgs.com>; Martin, Allen (Wilmington) <Allen.Martin@sgs.com>; Pellechia, Geoffrey (Marlborough) <Geoffrey.Pellechia@sgs.com>; McGuire, Brian (West Creek) <Brian.McGuire@sgs.com>; Gregson, Jim <jim.gregson@ncdenr.gov>
Subject: RE: QC Samples

Thank you Mark and Chris – Attached, please find a copy of our COC form.

We are happy to pick-up the samples when they are available in Wilmington. Please just call or email me when they are ready and we can go get them.

We currently do not analyze for the GenX 'sister' compounds noted below. That is something that may be developed in future, but are not analytes we can currently report.

Please can you provide the exact list of analytes (or CofA) in that Wellington PFAC-MXA list? Their website does not seem to have this information and I will need that to set up the correct list and method. Depending on that list, we may need two aliquots of each test sample as we may need to extract by two different methods. Again, just depends on that list of compounds needed.

Thank you!
Amy

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Thursday, August 17, 2017 3:18 PM
To: Johnson, Chris; Boehm, Amy (Wilmington)
Cc: Culpepper, Linda; Huffman, David J; Schoenwiesner, Brian bws (Wilmington); Milholland, Jeannie (Wilmington); Martin, Allen (Wilmington); Pellechia, Geoffrey (Marlborough); McGuire, Brian (West Creek); Gregson, Jim
Subject: RE: QC Samples

Chris,

That is correct. We also spiked into the same samples a mixed PFAS standard from Wellington Labs called PFAC MXA. It is made up of the C4-C10 perfluorocarboxylic acids, PFBS, PFHxS and PFOS (http://www.well-labs.com/docs/nat_and_ml_pfac24_17nov2016_wellington_reporter.pdf)

If they are running method 537 these are very familiar analytes.

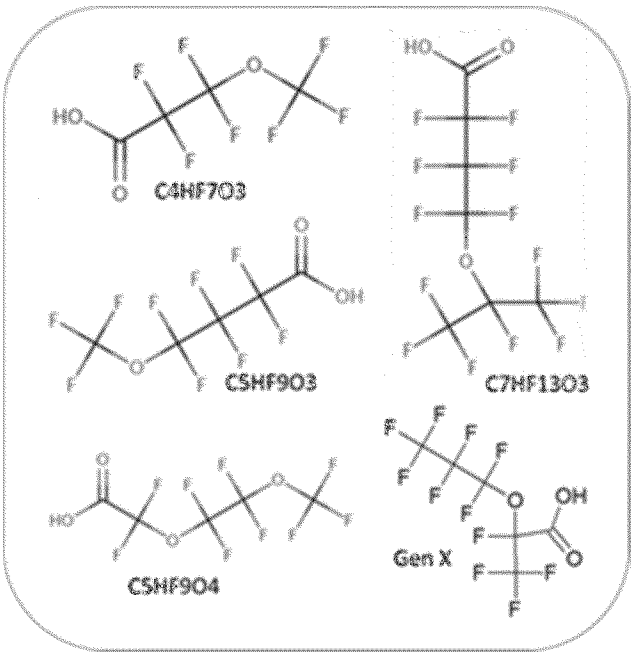
Chris I sent you additional details earlier on concentration and other sample details.

Mark

From: Johnson, Chris [mailto:chris.johnson@ncdenr.gov]
Sent: Thursday, August 17, 2017 3:01 PM
To: Boehm, Amy (Wilmington) <Amy.Boehm@sgs.com>
Cc: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Huffman, David J <david.huffman@ncdenr.gov>; Schoenwiesner, Brian bws (Wilmington) <Brian.Schoenwiesner@sgs.com>; Milholland, Jeannie (Wilmington) <Jeannie.Milholland@sgs.com>; Martin, Allen (Wilmington) <Allen.Martin@sgs.com>; Pellechia, Geoffrey (Marlborough) <Geoffrey.Pellechia@sgs.com>; McGuire, Brian (West Creek) <Brian.McGuire@sgs.com>; Gregson, Jim <jim.gregson@ncdenr.gov>
Subject: RE: QC Samples

I provided a list of associated compounds below. We are going to meet with EPA in the next few days to get more information on these compounds, so I will have a definitive list after that meeting. In the meantime, I have the QC samples available and ready to ship. We have a state courier that goes to the Wilmington Regional Office, so that may be the most economical shipping method. Your courier could pick them up there (Cardinal Drive Extension) if that's OK. The next courier run is on Monday, so they would be there on Tuesday. Please forward any paperwork you want completed to my attention later today or tomorrow and I will include in the shipment.

Here is the original list of what was being spiked into our earlier QC samples. The EPA laboratory has been extracting all these compounds by the same technique I believe. If not, Mark can correct me. These new samples should be similar:



Chris Johnson
NC DEQ-DWR
Water Sciences Section

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From: Boehm, Amy (Wilmington) [mailto:Amy.Boehm@sgs.com]
Sent: Thursday, August 17, 2017 1:11 PM
To: Johnson, Chris <chris.johnson@ncdenr.gov>
Cc: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Strynar.Mark@epa.gov; Huffman, David J <david.huffman@ncdenr.gov>; Schoenwiesner, Brian bws (Wilmington) <Brian.Schoenwiesner@sgs.com>; Milholland, Jeannie (Wilmington) <Jeannie.Milholland@sgs.com>; Martin, Allen (Wilmington) <Allen.Martin@sgs.com>; Pellechia, Geoffrey (Marlborough) <Geoffrey.Pellechia@sgs.com>; McGuire, Brian (West Creek) <Brian.McGuire@sgs.com>
Subject: RE: QC Samples

Hi Chris – Please see below. Feel free to call email if you have any further questions. Thank you!
Amy

• How do you want to receive the samples? If they are to be shipped to your laboratory, please provide shipping information.

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• The initial check samples will be provided by an EPA laboratory. Confirm that these samples can be tested and reported at no cost to evaluate capability. If not, please estimate costs for the initial capability testing. Yes, the lab will analyze up to 5 PT samples to assess capability at no cost. These samples will be expedited to the extent possible with a target TAT of 5-business-days.

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• Provide estimated pricing and turn-around times for 8-10 samples per week, and include any shipping costs that may be involved. This scope of work will be on the order of 3-6 weeks, but could potentially be longer depending on the status of testing after that time.

Analysis of samples is $250/sample/test for PFAs,10-business day TAT. 5-business day TAT is 2X above that base cost. Extract and hold for later analysis is $125/sample. If SGS provides return shipping via FedEx overnight, we will assess $100/cooler. We do not charge for local (50mi) courier.

• Provide sampling details, including preservation and shipping requirements. Indicate the types of sampling materials needed and whether your laboratory will provide the materials to be used.

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• We are interested in GenX results initially, but would like the option of having the data reprocessed at a later time to report any associated per- or poly-fluorinated compounds detected. Confirm that this is an option.

Samples analyzed for GenX are prepared using a different cartridge from our standard list of analytes. If our standard list of non-GenX analytes is requested, we would need to extract both upon receipt (or, within the 14-day holding time). After extraction, the holding time would be 28-days from extraction to analysis. Extract and hold charges are noted above.

Please can you advise the analyte list for non GenX compounds so that we can compare to our list? Depending on the list you need, we may be able to report all analytes from a single extraction.

From: Johnson, Chris [mailto:chris.johnson@ncdenr.gov]
Sent: Wednesday, August 16, 2017 11:58 AM
To: Boehm, Amy (Wilmington)
Cc: Culpepper, Linda; Strynar.Mark@epa.gov; Huffman, David J
Subject: QC Samples

Hi, Amy. I would like to schedule sending the Quality Control samples for GenX that we discussed last week, and I have a couple of questions:

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Please contact me if you need more information or have questions. Laboratory personnel at the EPA have indicated that they would be happy to discuss methodology if you want. Thank you.

Chris Johnson
Environmental Program Supervisor
Water Sciences Section / Organic Chemistry Branch

North Carolina Department of Environmental Quality
Division of Water Resources

919-733-3908 office

4405 Reedy Creek Road
Raleigh, NC 27607

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Table 1. Perfluorinated analytes, abbreviations, LC-MS/MS transitions, confirmation ions, in Wellington PFAC MXA standard solution.

Analyte	Abbreviation	Quant. transition	Confirm. transition
Perfluorobutanoic acid	PFBA	212.8 → 168.8	N/A
Perfluoropentanoic acid	PFPeA	262.9 → 218.8	N/A
Perfluorohexanoic acid	PFHxA	312.7 →268.7	312.7 →118.7
perfluoroheptanoic acid	PFHpA	362.7 → 318.7	362.7 → 168.7
perfluorooctanoic acid	PFOA	412.6 → 368.7	412.6 → 168.7
perfluorononanoic acid	PFNA	462.6 → 418.6	462.6 → 218.8
perfluorodecanoic acid	PFDA	512.6 → 468.6	512.6 → 468.6
perfluorobutane sulfonate	PFBS	298.7 → 79.9	298.7 → 98.8
perfluorohexane sulfonate	PFHxS	398.7 → 79.9	398.7 → 98.8
perfluorooctane sulfonate	PFOS	498.7 → 79.9	498.7 → 98.8

To: Johnson, Chris[chris.johnson@ncdenr.gov]; Boehm, Amy (Wilmington)[Amy.Boehm@sgs.com]
Cc: Culpepper, Linda[linda.culpepper@ncdenr.gov]; Huffman, David J[david.huffman@ncdenr.gov]; Schoenwiesner, Brian bws (Wilmington)[Brian.Schoenwiesner@sgs.com]; Milholland, Jeannie (Wilmington)[Jeannie.Milholland@sgs.com]; Martin, Allen (Wilmington)[Allen.Martin@sgs.com]; Pellechia, Geoffrey (Marlborough)[Geoffrey.Pellechia@sgs.com]; McGuire, Brian (West Creek)[Brian.McGuire@sgs.com]; Gregson, Jim[jim.gregson@ncdenr.gov]
From: Strynar, Mark
Sent: Thur 8/17/2017 7:17:31 PM
Subject: RE: QC Samples

Chris,

That is correct. We also spiked into the same samples a mixed PFAS standard from Wellington Labs called PFAC MXA. It is made up of the C4-C10 perfluorocarboxylic acids, PFBS, PFHxS and PFOS (http://www.well-labs.com/docs/nat_and_ml_pfac24_17nov2016_wellington_reporter.pdf)

If they are running method 537 these are very familiar analytes.

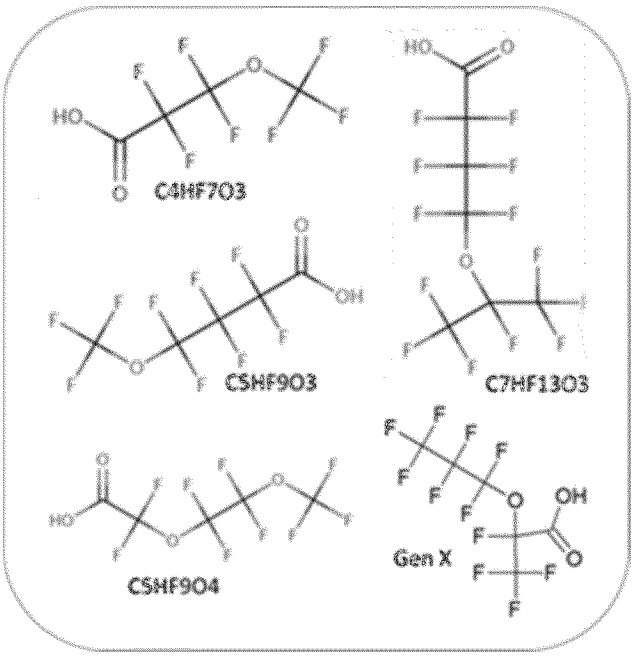
Chris I sent you additional details earlier on concentration and other sample details.

Mark

From: Johnson, Chris [mailto:chris.johnson@ncdenr.gov]
Sent: Thursday, August 17, 2017 3:01 PM
To: Boehm, Amy (Wilmington) <Amy.Boehm@sgs.com>
Cc: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Huffman, David J <david.huffman@ncdenr.gov>; Schoenwiesner, Brian bws (Wilmington) <Brian.Schoenwiesner@sgs.com>; Milholland, Jeannie (Wilmington) <Jeannie.Milholland@sgs.com>; Martin, Allen (Wilmington) <Allen.Martin@sgs.com>; Pellechia, Geoffrey (Marlborough) <Geoffrey.Pellechia@sgs.com>; McGuire, Brian (West Creek) <Brian.McGuire@sgs.com>; Gregson, Jim <jim.gregson@ncdenr.gov>
Subject: RE: QC Samples

I provided a list of associated compounds below. We are going to meet with EPA in the next few days to get more information on these compounds, so I will have a definitive list after that meeting. In the meantime, I have the QC samples available and ready to ship. We have a state courier that goes to the Wilmington Regional Office, so that may be the most economical shipping method. Your courier could pick them up there (Cardinal Drive Extension) if that's OK. The next courier run is on Monday, so they would be there on Tuesday. Please forward any paperwork you want completed to my attention later today or tomorrow and I will include in the shipment.

Here is the original list of what was being spiked into our earlier QC samples. The EPA laboratory has been extracting all these compounds by the same technique I believe. If not, Mark can correct me. These new samples should be similar:



Chris Johnson
NC DEQ-DWR
Water Sciences Section

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To: Bowyer, Jim[jim.bowyer@ncdenr.gov]
From: Strynar, Mark
Sent: Tue 12/12/2017 12:15:53 PM
Subject: RE: HFPO info sheet
Strynar UNCW 12-11-17.pptx

Sure Jim here it is. However slides 28-36 has not yet been published in a peer reviewed journal. Please keep that into inside NCDEQ for now.

Mark

From: Bowyer, Jim [mailto:jim.bowyer@ncdenr.gov]
Sent: Monday, December 11, 2017 2:43 PM
To: Strynar, Mark <Strynar.Mark@epa.gov>
Subject: Re: HFPO info sheet

Mark
Would you be amenable to sharing your presentation with me? Info was very interesting.

Jim Bowyer, Ph.D.
Environmental Program Supervisor II
Division of Air Quality,Ambient Monitoring Section
North Carolina Department of Environmental Quality
919 715 7484 office
919 715 0890 fax
jim.bowyer@ncdenr.gov
4403 Reedy Creek Road
1622 Mail Service Center
Raleigh, NC 27699-1622

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From: Bowyer, Jim
Sent: Monday, December 11, 2017 2:24:56 PM
To: Strynar.mark@Epa.gov
Subject: HFPO info sheet

Mark
Here's an info sheet that I was talking about.

http://www2.dupont.com/FluoroIntermediates/en_US/assets/downloads/k05132.pdf

Jim Bowyer, Ph.D.
Environmental Program Supervisor II
Division of Air Quality,Ambient Monitoring Section
North Carolina Department of Environmental Quality
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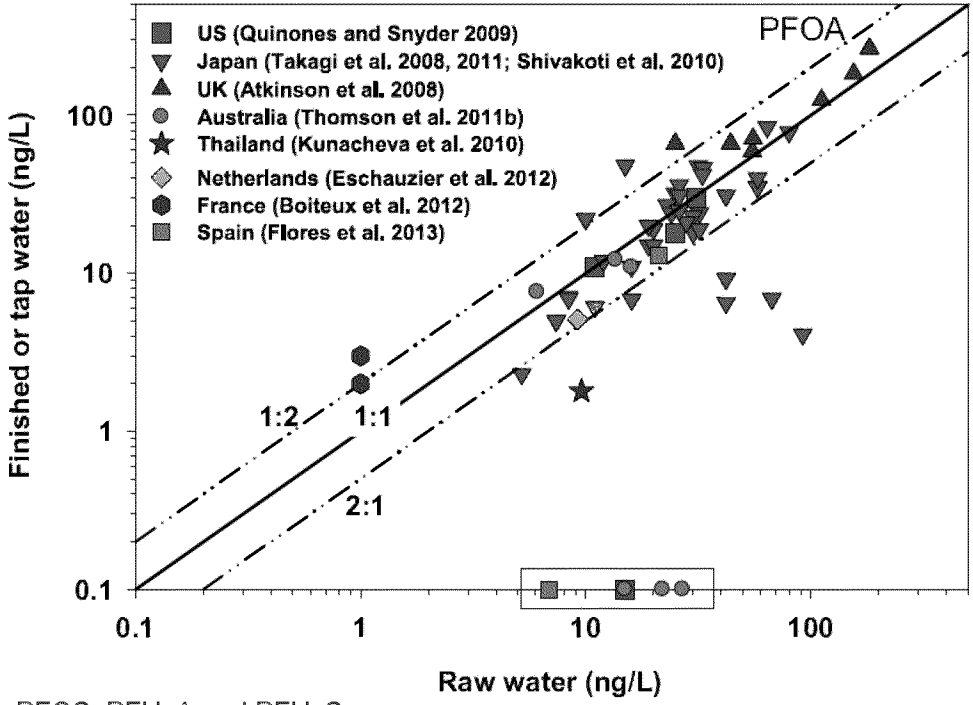
Current analytical ~~capacities~~ capabilities: per- and polyfluorinated compounds in Cape Fear river, North Carolina surface water samples

Mark Strynar[1], James McCord[2], Johnsie Lang[2], Andrew Lindstrom[1], Zack Hopkins[3], Detlef Knappe[3]

1. National Exposure Research Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC;
2. ORISE Fellow, Oak Ridge Associated Universities, Oak Ridge, TN;
3. Department of Civil, Construction, and Environmental Engineering, North Carolina State University, Raleigh, NC

ED_002003J_00096191-00001

PFAS Generally Not Removed During Conventional Drinking Water Treatment

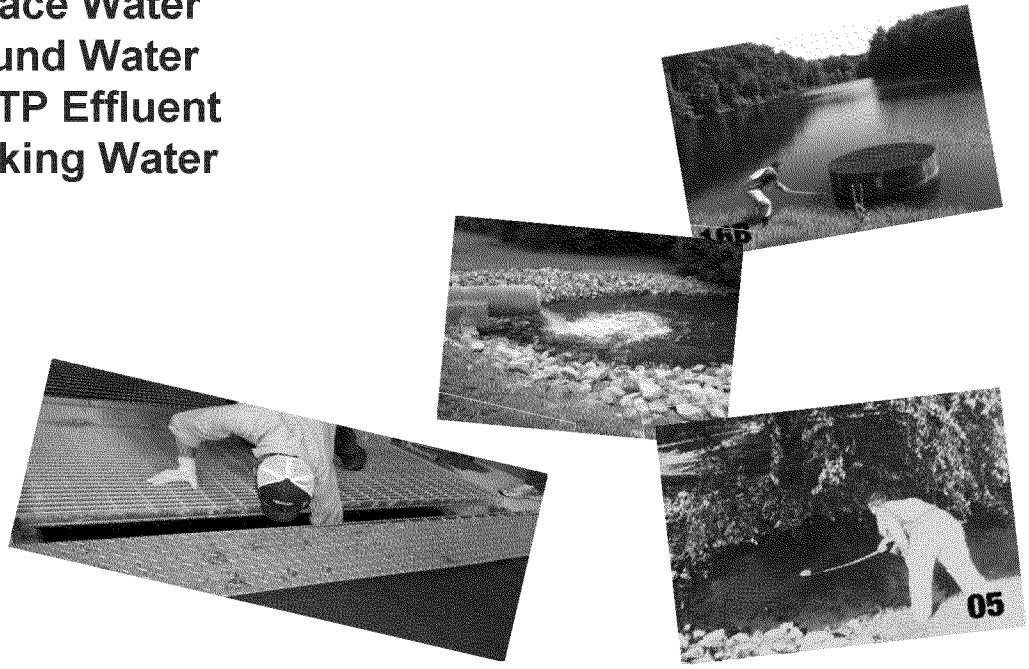


Similar for PFOS, PFHxA and PFHxS

Rahman et al., (2014) *Water Research,* 50:318-340

NERL/EMMD Water Analysis Method

Surface Water
Ground Water
WWTP Effluent
Drinking Water



Method Summary – Water Sample Collection

SS Kemmerer sampler

Lab-made dip sampler

Nalgene 1L HDPE bottles: PFAS free; Prefer wide mouth bottles

Analytes (n=24 native; n=19 isotope labeled)

Wellington PFAC-24PAR (2 ng/uL) $250/1.2 mL

	Analyte Name	Acronym	CAS Number
N-1	Perfluorotetradecanoic acid	PFTreA	376-06-7
N-2	Perfluorotridecanoic acid	PFTriA	72629-94-8
N-3	Perfluorododecanoic acid	PFDoA	307-55-1
N-4	Perfluoroundecanoic acid	PFUnA	2058-94-8
N-5	Perfluorodecanoic acid	PFDA	335-76-2
N-6	Perfluorononanoic acid	PFNA	375-95-1
N-7	Perfluorooctanoic acid	PFOA	335-67-1
N-8	Perfluoroheptanoic acid	PFHpA	375-85-9
N-9	Perfluorohexanoic acid	PFHxA	307-24-4
N-10	Perfluoropentanoic acid	PFPeA	2706-90-3
N-11	Perfluorobutanoic acid	PFBA	375-22-4
N-12	Perfluorodecanesulfonate	PFDS	335-77-3
N-13	Perfluorononanesulfonate	PFNS	68259-12-1
N-14	Perfluorooctanesulfonate	PFOS	1763-23-1
N-15	Perfluoroheptanesulfonate	PFHpS	375-92-8
N-16	Perfluorohexanesulfonate	PFHxS	355-46-4
N-17	Perfluoropentansulfonate	PFPeS	2706-91-4
N-18	Perfluorobutanesulfonate	PFBS	375-73-5
N-19	Perfluorooctanesulfonamide	PFOSA	754-91-6
N-20	Fluorotelomer sulfonate 8:2	FtS 8:2	39108-34-4
N-21	Fluorotelomer sulfonate 6:2	FtS 6:2	27619-97-2
N-22	Fluorotelomer sulfonate 4:2	FtS 4:2	NA
N-23	N-ethyl-N-((heptadecafluorooctyl)sulfonyl)glycine	NEtFOSAA	2991-50-6
N-24	N-(Heptadecafluorooctylsulfonyl)-N-methylglycine	NMeFOSAA	2355-31-9

Method 537

UCMR3

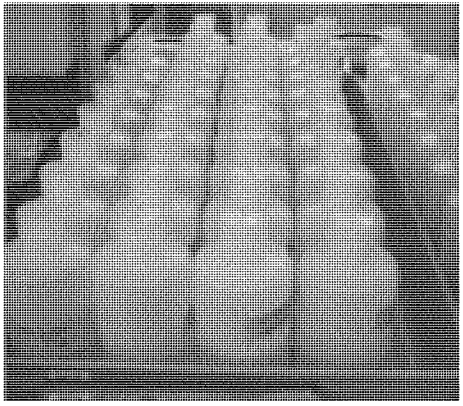
Analytes (n=24 native; n=19 isotope labeled)

Wellington MPFAC-24ES (1 ng/uL) $700/1.2 mL

	Analyte Name	Acronym
	PERFLUOROALKYLCARBOXYLATES (PFCAs)	
L-1	Perfluoro-n-[1,2-$^{13}C_2$]tetradecanoic acid	M2PFTeDA
L-2	Perfluoro-n-[1,2-$^{13}C_2$]dodecanoic acid	MPFDoA
L-3	Perfluoro-n-[1,2,3,4,5,6,7-$^{13}C_7$]undecanoic acid	M7PFUdA
L-4	Perfluoro-n-[1,2,3,4,5,6-$^{13}C_6$]decanoic acid	M6PFDA
L-5	Perfluoro-n-[$^{13}C_5$]nonanoic acid	M9PFNA
L-6	Perfluoro-n-[$^{13}C_4$]octanoic acid	M8PFOA
L-7	Perfluoro-n-[1,2,3,4-$^{13}C_4$]heptanoic acid	M4PFHpA
L-8	Perfluoro-n-[1,2,3,4,6-$^{13}C_5$]hexanoic acid	M5PFHxA
L-9	Perfluoro-n-[1,2,3,4,5-$^{13}C_5$]pentanoic acid	M5PFPeA
L-10	Perfluoro-n-[1,2,3,4-$^{13}C_4$]butanoic acid	MPFBA
	PERFLUOROALKYLSULFONATES (PFASs)	
L-11	Sodium perfluoro-[$^{13}C_8$]octanesulfonate	M8PFOS
L-12	Sodium perfluoro-1-[1,2,3-$^{13}C_3$]hexanesulfonate	M3PFHxS
L-13	Sodium perfluoro-1-[2,3,4-$^{13}C_3$]butanesulfonate	M3PFBS
	PERFLUOROOCTANESULFONAMIDES (FOSAs)	
L-14	Perfluoro-1-[$^{13}C_8$]octanesulfonamide	M8FOSA-I
	TELOMER SULFONATES	
L-15	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]decane sulfonate (8:2)	M2-8:2FTS
L-16	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]octane sulfonate (6:2)	M2-6:2FTS
L-17	Sodium 1H,1H,2H,2H-perfluoro-1-[1,2-$^{13}C_2$]hexane sulfonate (4:2)	M2-4:2FTS
	PERFLUOROOCTANESULFONAMIDOACETIC ACIDS	
L-18	N-ethyl-d5-perfluoro-1-octanesulfonamidoacetic acid	d5-N-EtFOSAA
L-19	N-methyl-d3-perfluoro-1-octanesulfonamidoacetic acid	d3-N-MeFOSAA

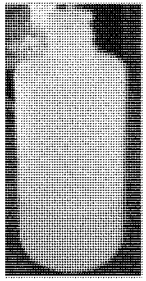
Quality Assurance – Quality Control

- Trip spike(s) (ex. 50 ng/L) MOST PEOPLE DO NOT DO THIS
- Trip blank (DI)
- Replication (>10%)
- Occasionally standard addition
- Extracted calibration curves

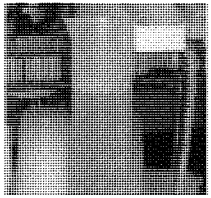


Method Summary – Sample Processing

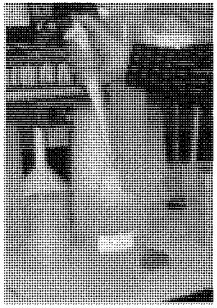
Nakayama et al., 2009, Strynar et al., 2015; Sun et al., 2016, Newton et al., 2017; McCord et al., In prep



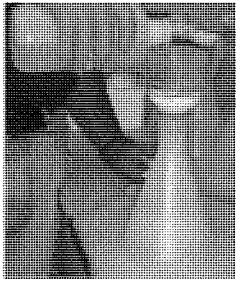
1 L HDPE bottles
5 mL 1:1 HNO_3 (35%):DI
Shipped ambient



Pour water out of sample bottle for volume measurement



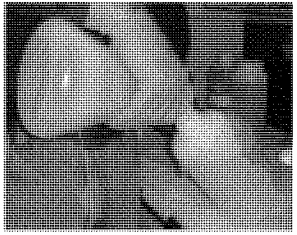
Wash bottle with 10 mL MeOH, add water back to bottle, add IS
Shake



Filter entire contents
Whatman GF/A 1.7 um

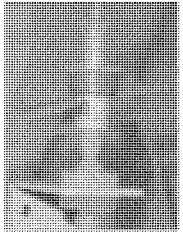
All samples Treated same way

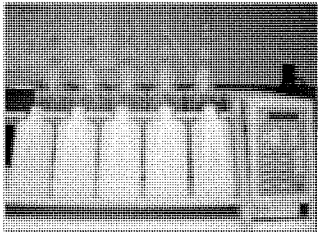
- Trip Spike
- Blanks
- Unknowns
- Calibration



Add filtered water back into original bottle

Subsample 500 mL
Store 500 mL

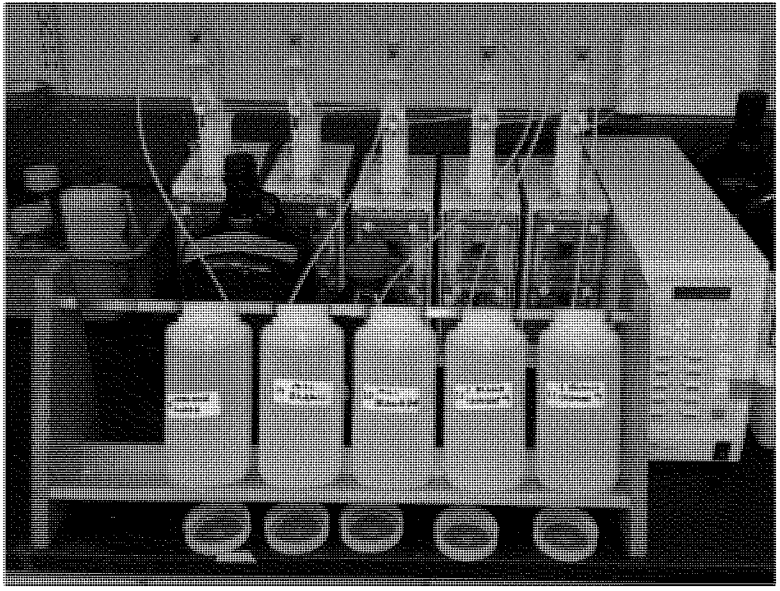




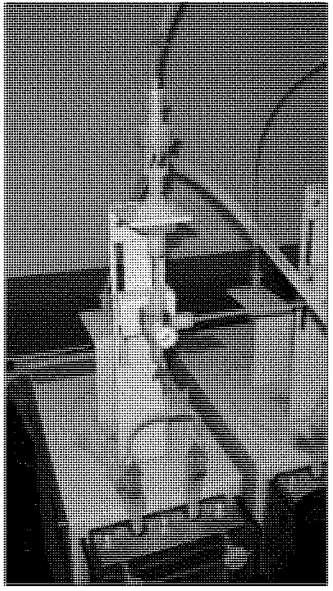
Load onto SPE tube
Waters Plus style
WAX

Elute for LC/MS-MS analysis

Positive Displacement Sample Concentration



CHRATEC Sep-Pak Concentrator
SPC 10-C (10 ml/min)



Waters Oasis WAX-plus

Sample Elution

Note: Rack modified to fit 15 mL BD Falcon tubes

Wash:
4 mL pH 4.0 buffer
(Acetate/Acetic Acid water)

4 mL methanol

Elute:
4 mL NH_4OH/MeOH

Evaporate:
~15-20 minutes 40°C N_2
TurboVap concentrator

~ 0.5 – 1.0 mL

Sample prep for analysis:
Prepare sample to match starting conditions of UPLC gradient (75:25 aqu:MeOH)

Samples That Exceed Calibration Curve

- Estimate concentration based on exceedance analysis

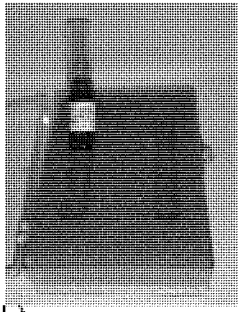
- Dilute sample (analyte and IS presence) with DI lab water (IS added) (ex 1:1, 2:1, 5:1 10:1) aiming for midpoint of calibration curve.

Example: Standard curve 10 – 1000 ng/L PFOA
Sample estimated to be 1600 ng/L

- Dilute sample into new HDPE bottle:
  1 part (250 mL prepared water sample with IS spike and analytes)
  1 part(250 mL) DI water with IS spike at same level as real sample
  Re-extract, elute and analyze.

- Calibrate against existing calibration curve.

Source of Analytical Standards



Stable Isotope Labeled (^{13}C, ^{18}O, D):

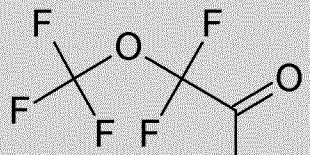
Wellington Labs
Cambridge Isotopes Labs

Native:

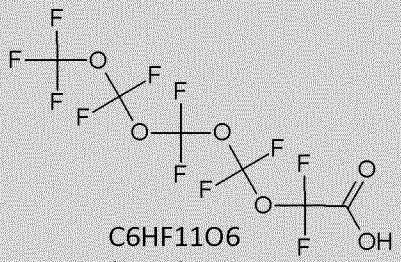
Wellington Labs (Mixtures – 1-2 ng/uL; Individual 50 ng/uL)

Sigma-Aldrich
Synquest Labs
Oakwood Products
Manufacturer (industrial mixtures 3M, DuPo
Mason Chemicals)

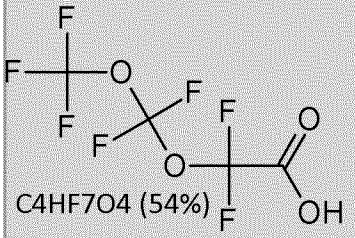
5-15-17 EPA Analysis present in CFR



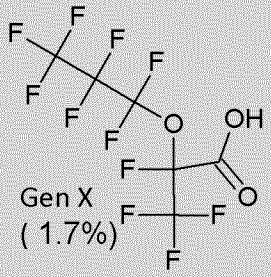
C3HF5O3 (26%)



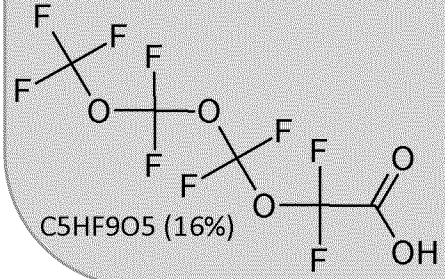
C6HF11O6 (2.3%)



C4HF7O4 (54%)

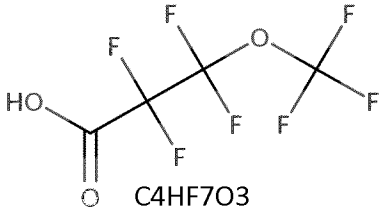


Gen X (1.7%)

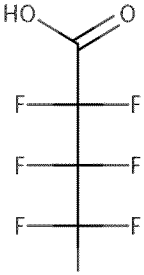


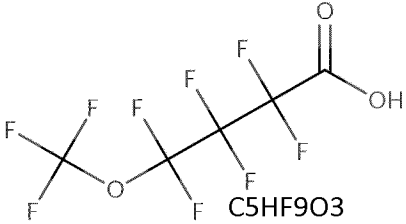
C5HF9O5 (16%)

6-23-17 EPA Quality Assurance Spiked Samples McCord et al., in prep

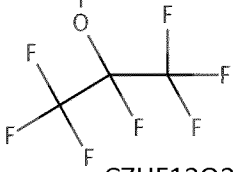


C4HF7O3

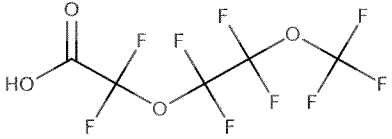




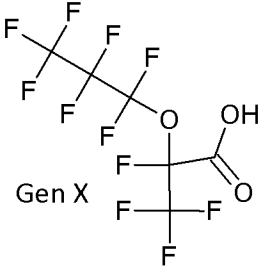
C5HF9O3



C7HF13O3



C5HF9O4

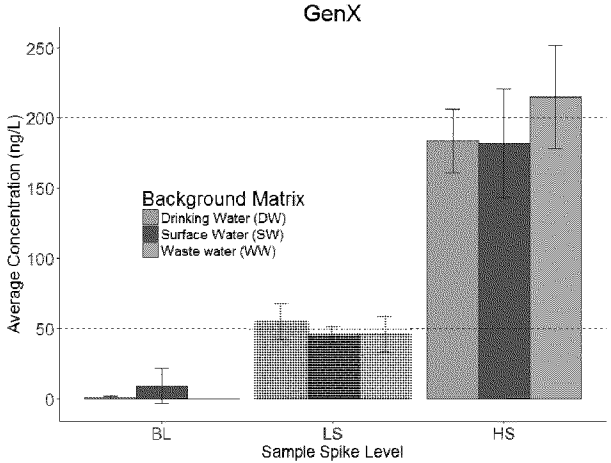


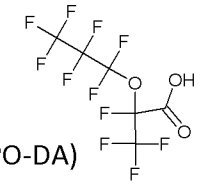
Gen X

PFECAs Method Validation

McCord et al., 2017 draft

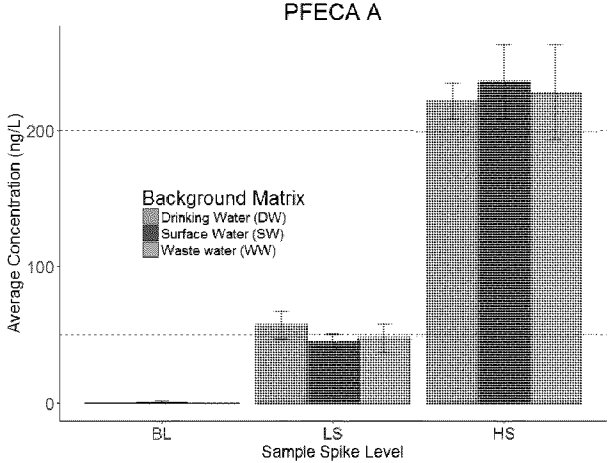
Figure 1. GenX Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

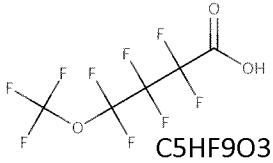




Gen X (HFPO-DA)

Figure 2. PFECA A Method Validation Results. Un-spiked (BL), 50 ng/L (LS) and 200 ng/L (HS) spiked in wastewater, surface water and drinking water.

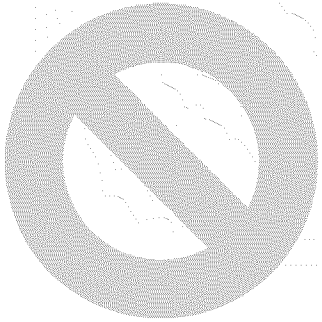




C5HF9O3

OTHER PFASs: The Era of HRMS & Non-Targeted Analysis

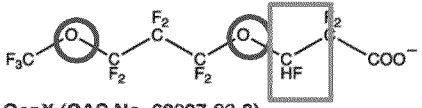
- How do we find compounds without knowing what they are?
- How do we prioritize unknowns for further analysis?
- How do we identify/quantify without analytical standards?



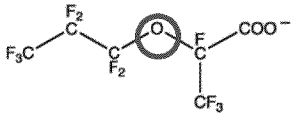
→ ???

Fluoropolymer manufacture

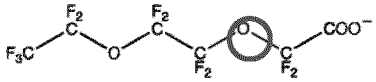
ADONA (CAS No. 958445-44-8)



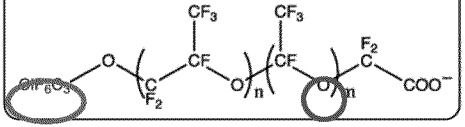
GenX (CAS No. 62037-80-3)



Asahi's product (CAS No. 908020-52-0)

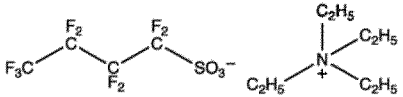


Solvay's product (CAS No. 329238-24-6)

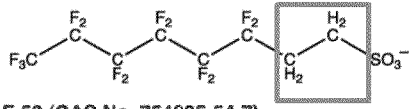


Metal plating

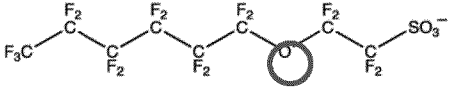
$N(Et)_4$-PFBS (CAS No. 25628-08-4)



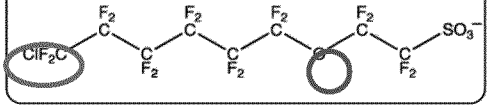
6:2 FTSA (CAS No. 27619-97-2)



F-53 (CAS No. 754925-54-7)



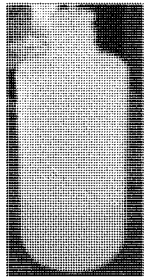
F-53B (CAS No. 73606-19-6)



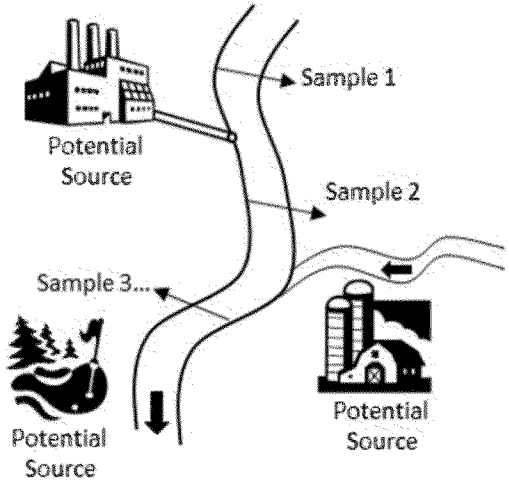
Wang et al. *Environment International*, **2013,** *60,* pp 242–248

Data Generation: Source Determination by NTA

Surface Water
Ground Water
WWTP Effluent
Drinking Water



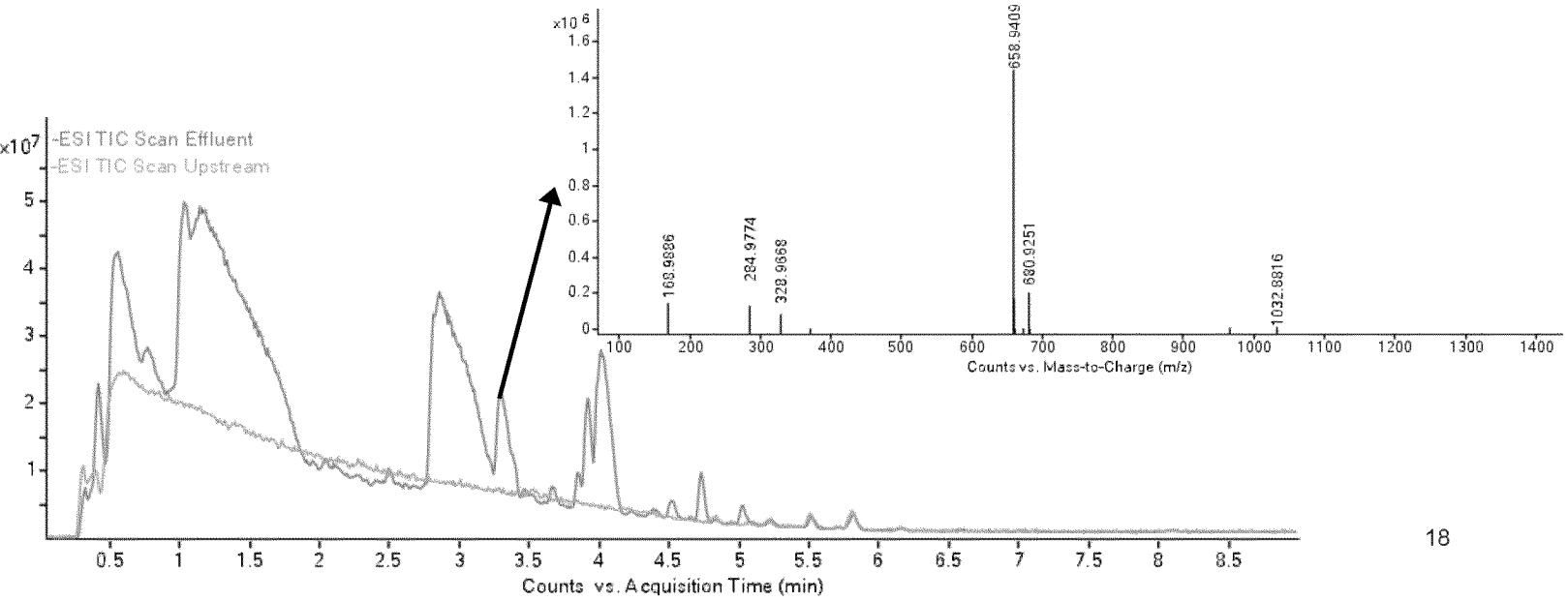
HDPE Bottles



Sampling from geographically or temporally displaced locations allows triangulation of sourcing

Strynar et al. *Environ. Sci. Technol.*, **2015**, *49* (19), pp 11622–11630

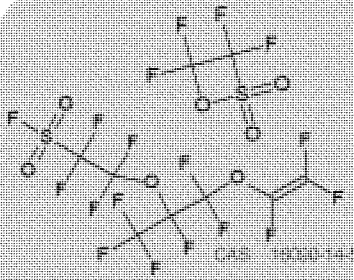
Chromatographic and MS Data



Chemours Site TSCA Inventory

Sulfonyl Fluorides

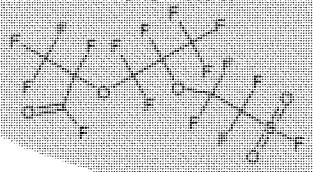
CAS 647-16-1



CAS 16030-14-4

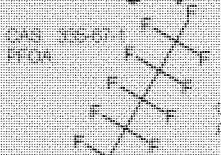
CAS 677-07-8

CAS 4089-59-1

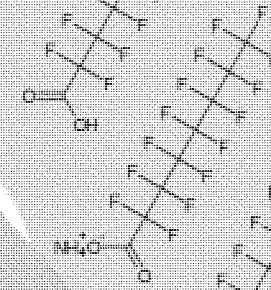


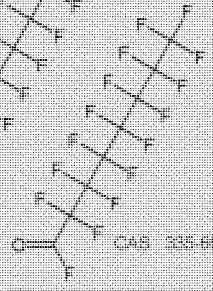
Legacy

CAS 335-67-1
PFOA



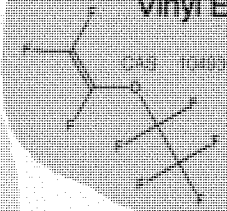
CAS 3825-26-1
APFO



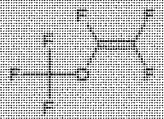


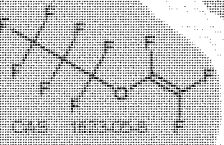
CAS 335-98-0

Vinyl Ethers



CAS 1187-93-5

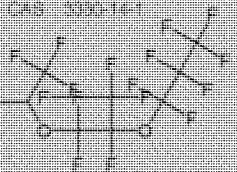




CAS 1623-05-8

Other

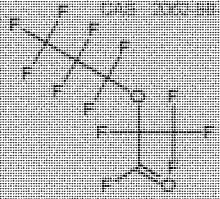
CAS 3346-11-1



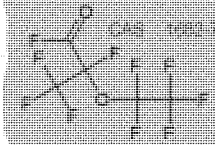
CAS 691-91-1

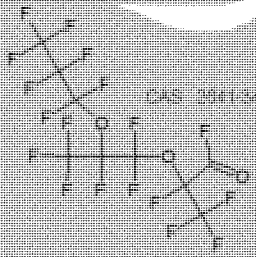
Acid Fluorides

CAS 355-98-1

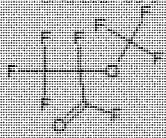


CAS 1190-71-6



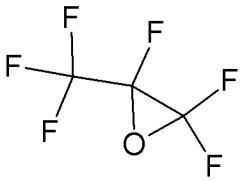


CAS 1644-41-1

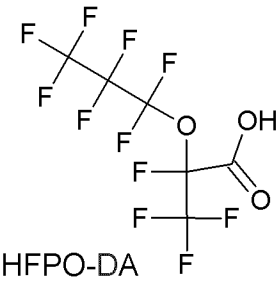


Hexafluoropropylene Oxide (HFPO)

HFPO
CAS 428-59-1



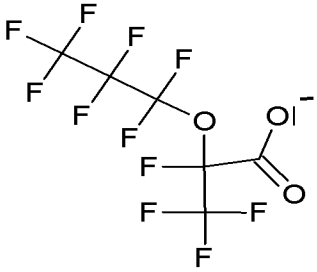
- an intermediate used in industrial organofluorine chemistry
- a monomer for fluoropolymers.
- colourless gas is the epoxide of hexafluoropropylene
- produced by DuPont and 3M and as a precursor to the lubricant Krytox and related materials
- generated by oxidation of perfluoropropylene, e.g. with oxygen as well as other oxidants



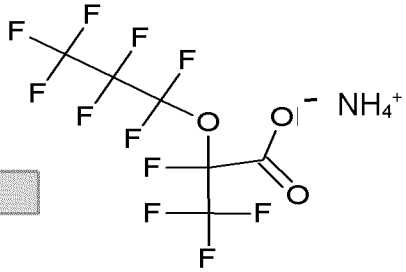
HFPO-DA
CAS 13252-13-6

In Water

Common Analyte



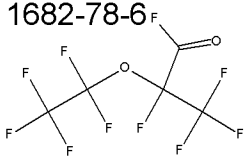
In water



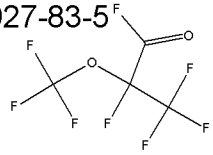
GenX
CAS 62037-80-3

Polyvinyl Ether Production

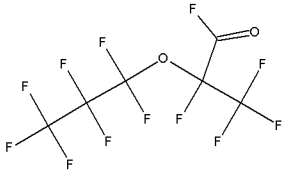
CAS 1682-78-6



CAS 2927-83-5

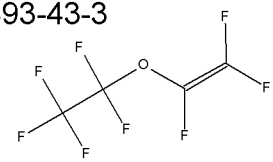


CAS 2062-98-8

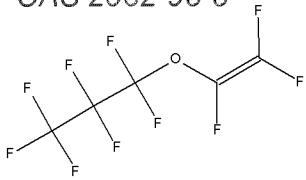


Acid Fluorides

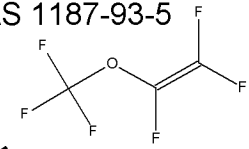
CAS 10493-43-3



CAS 2062-98-8



CAS 1187-93-5

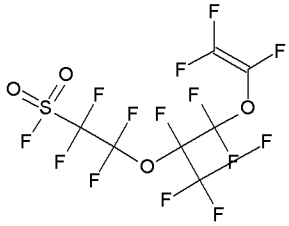


Polyvinyl Ether Intermediates

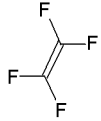
Head-$(CF_2)_n(CF_2O)_m$-Head Polyvinyl Ether

Nafion Polymer

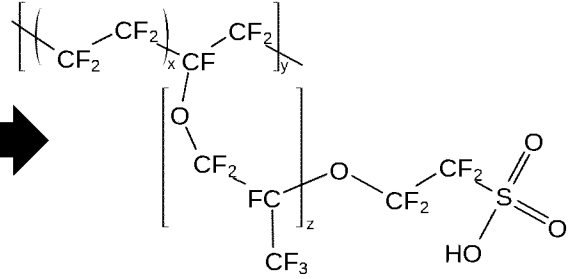
- Nafion is a sulfonated tetrafluoroethylene based fluoropolymer-copolymer.
- proton conductor for proton exchange membrane (PEM) fuel cells



CAS 16090-14-5



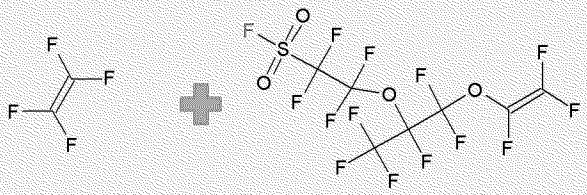
CAS 116-14-3



CAS 66796-30-3

"Nafion Like" Compounds

CAS 16090-14-5



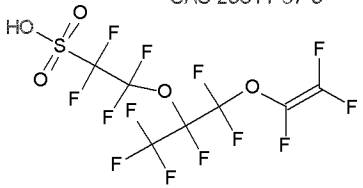
Nafion

http://www.chemspider.com/Chemical-Structure.55751.html?rid=adf15395-d088-4a3b-9df8-3298ea7c800b

- Nafion is a sulfonated tetrafluoroethylene based fluoropolymer-copolymer.
- proton conductor for proton exchange membrane (PEM) fuel cells

Molecular Formula: $C_7HF_{13}O_5S$
Monoisotopic Mass: 443.93371 Da
[M-H]-: 442.926433 Da

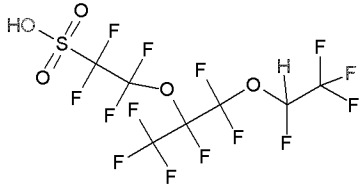
CAS 29311-67-9



Nafion BP1

Molecular Formula: $C_7H_2F_{14}O_5S$
Monoisotopic Mass: 463.939938 Da
[M-H]-: 462.932662 Da

CAS 749836-20-2



Nafion BP2

Environmental Science & Technology Letters

November 2016

Letter

pubs.acs.org/journal/estlcu

Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina

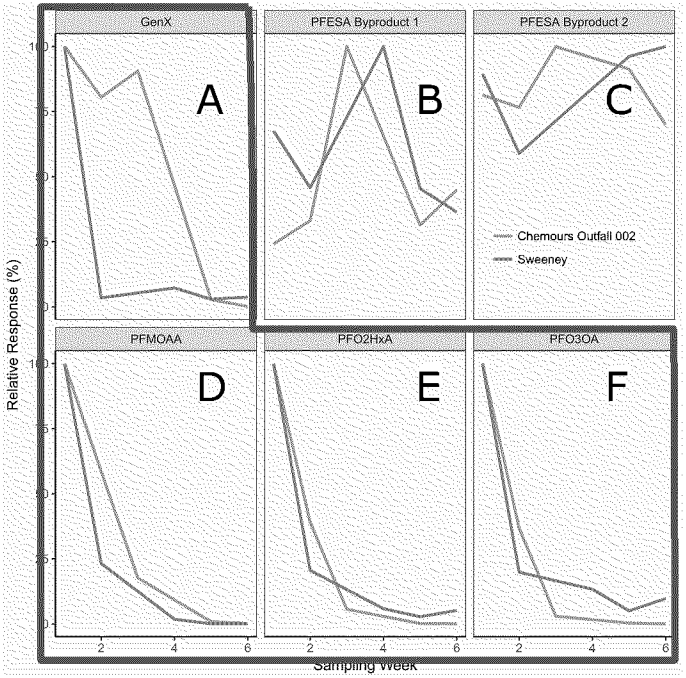
Mei Sun,*[,†,‡] Elisa Arevalo,[‡] Mark Strynar,[§] Andrew Lindstrom,[§] Michael Richardson,[∥] Ben Kearns,[∥] Adam Pickett,[⊥] Chris Smith,[#] and Detlef R. U. Knappe[‡]

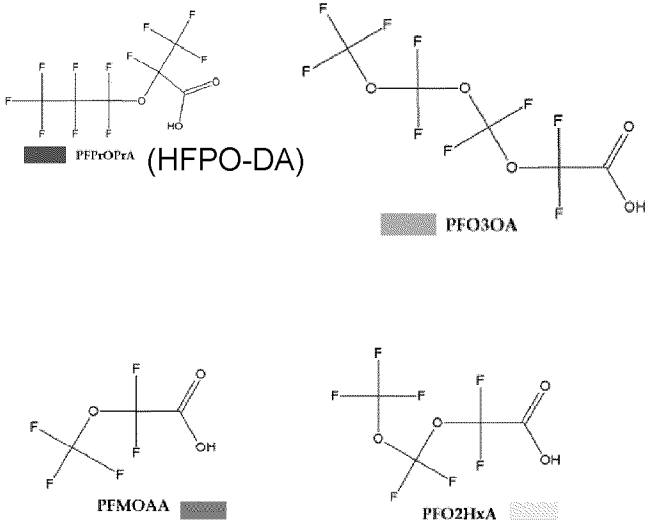
June 7, 2017 story on in Wilmington Star Online News basis.

ED_002003J_00096191-00024

Relative Quantitation Time Trends

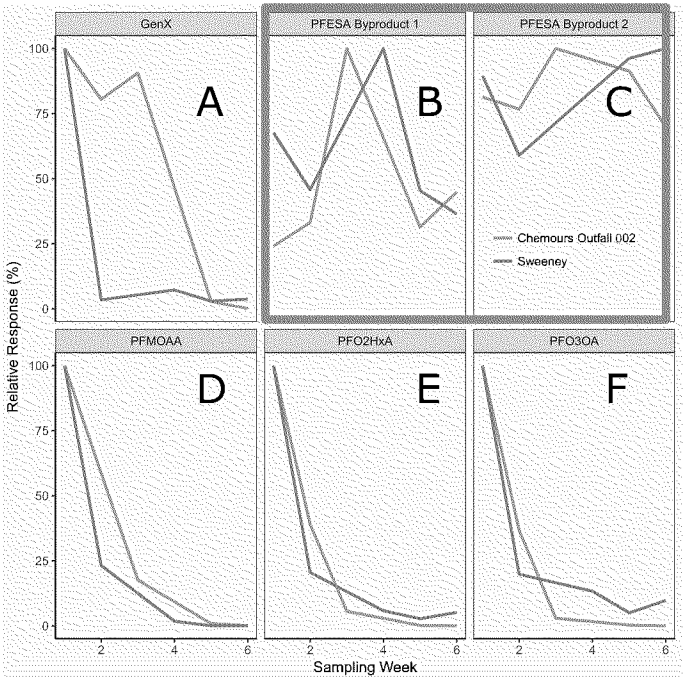
6 weeks mid June – early August

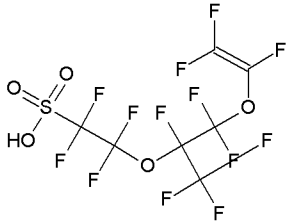




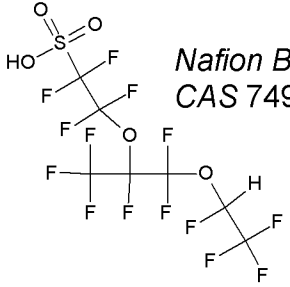
Relative Quantitation Time Trends

6 weeks mid June – early August





Nafion BP1
CAS 29311-67-9

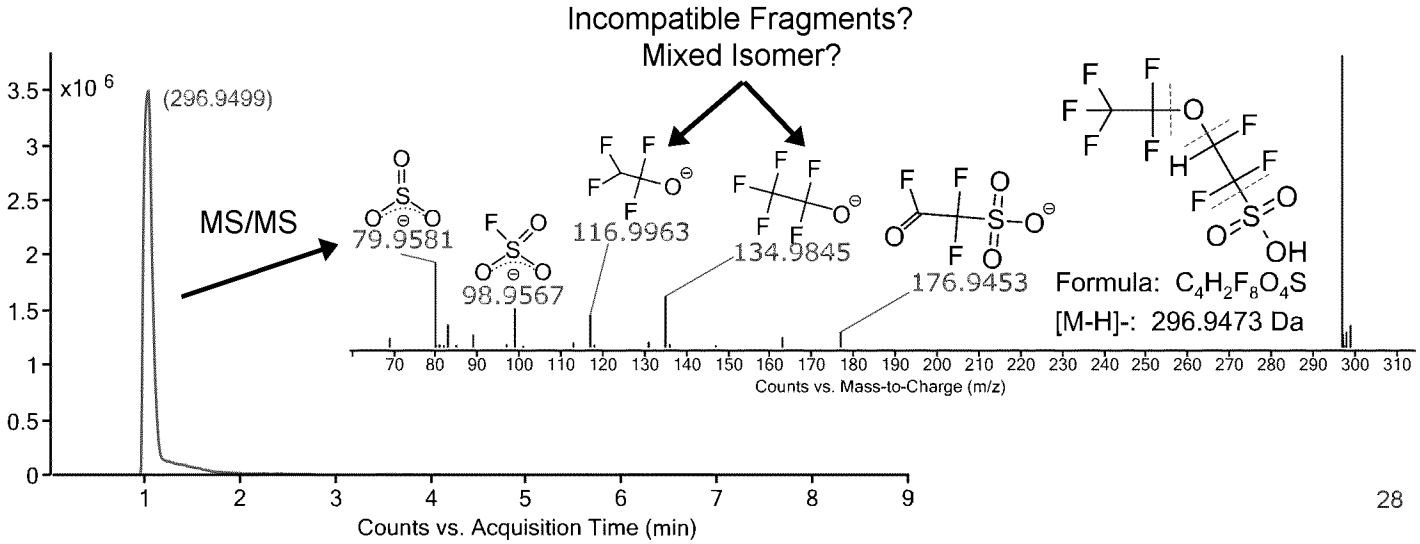


Nafion BP2
CAS 749836-20-2

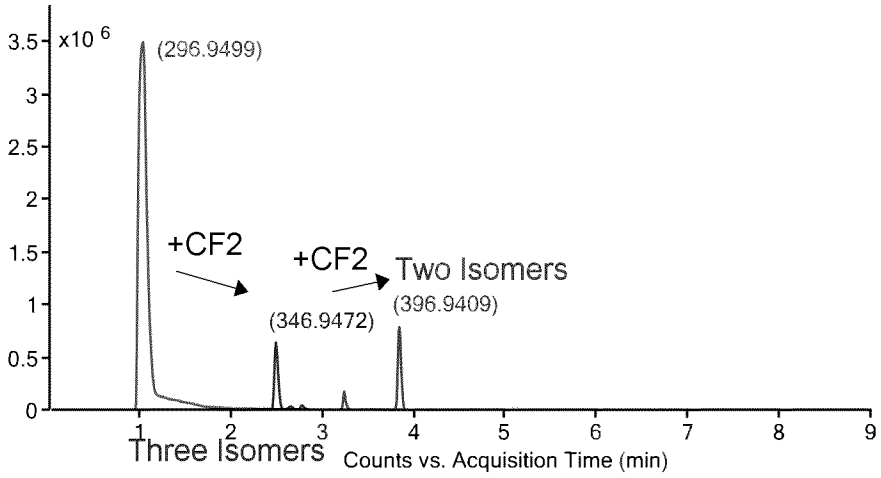
Retrospective HRMS Data Analysis

- Samples analyzed via HRMS (TOF, QTOF, Orbitrap)
- Store data files for reanalysis; like “data specimen banking”
- Data Independent Acquisition when possible (QTOF) for MS/MS
- Possible for presence absence analysis
- Eventual sharing of data files and/or spectra to public location

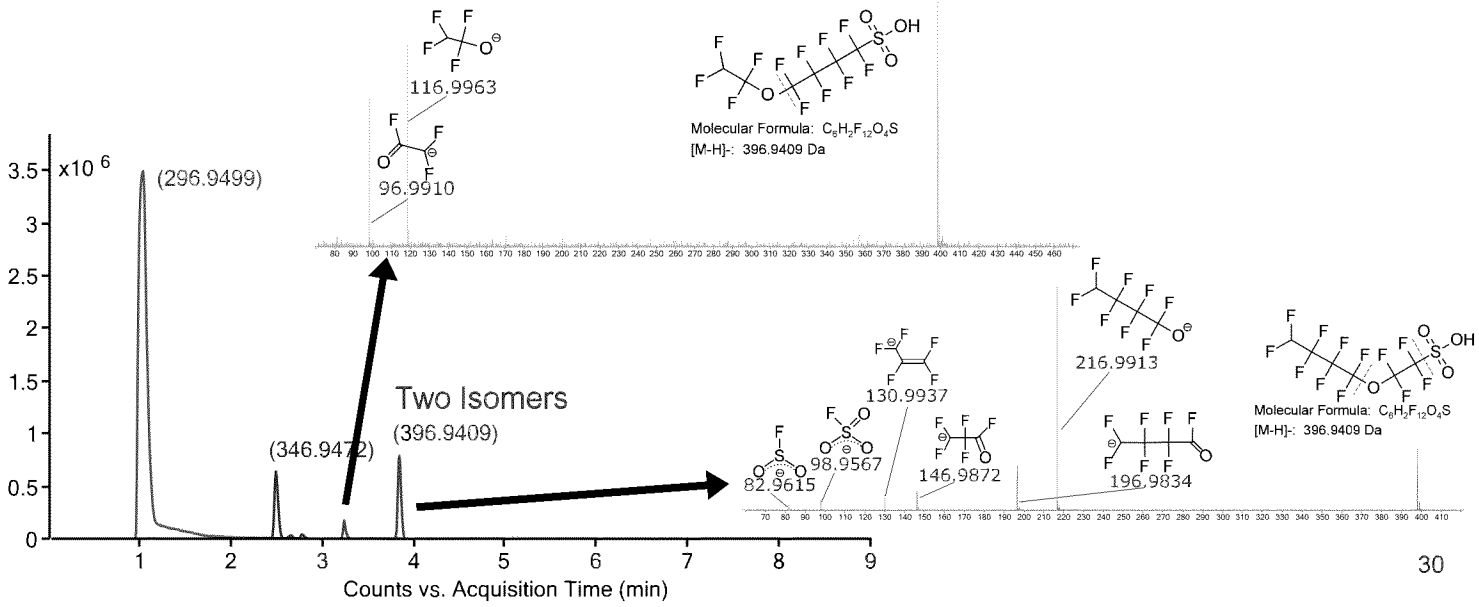
Novel Sulfonated Fluoroethers



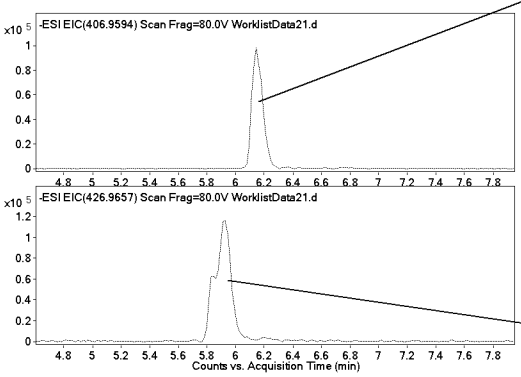
Homologous Series Improves Confirmation

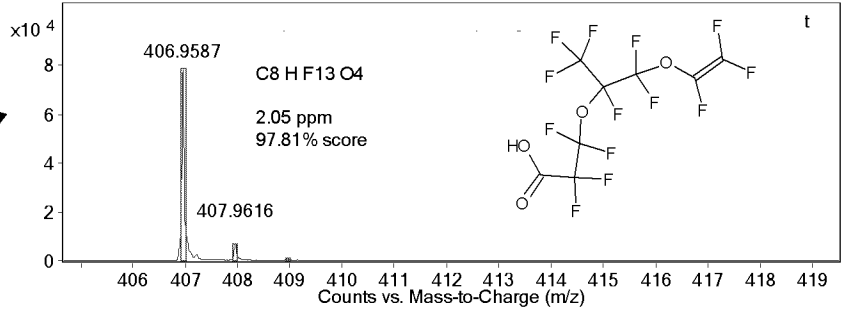


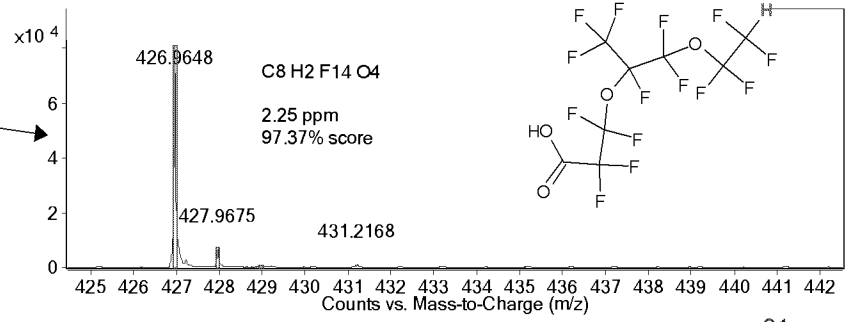
Unique MS/MS Fingerprints



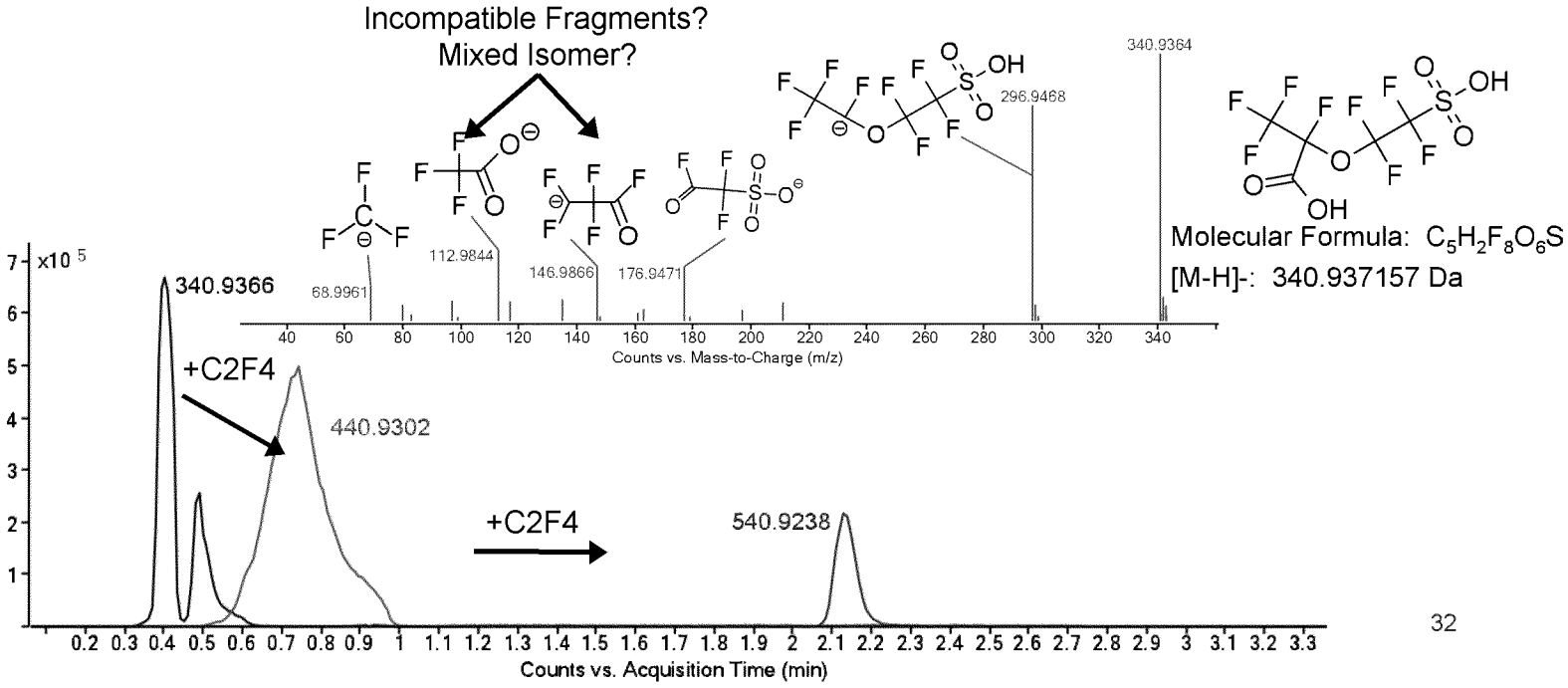
Additional Polyfluoro Ether Carboxylic Acids





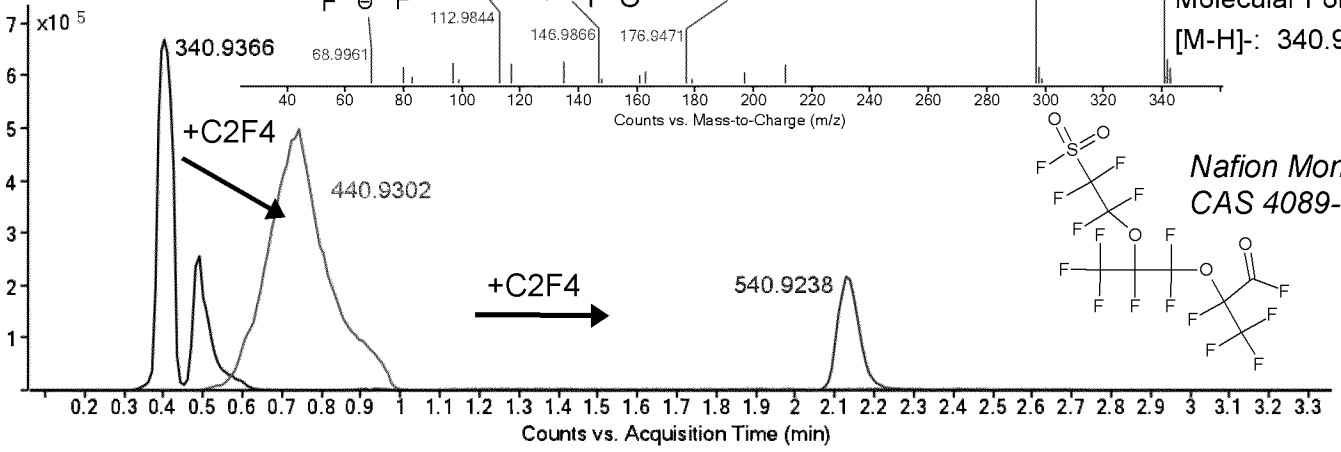


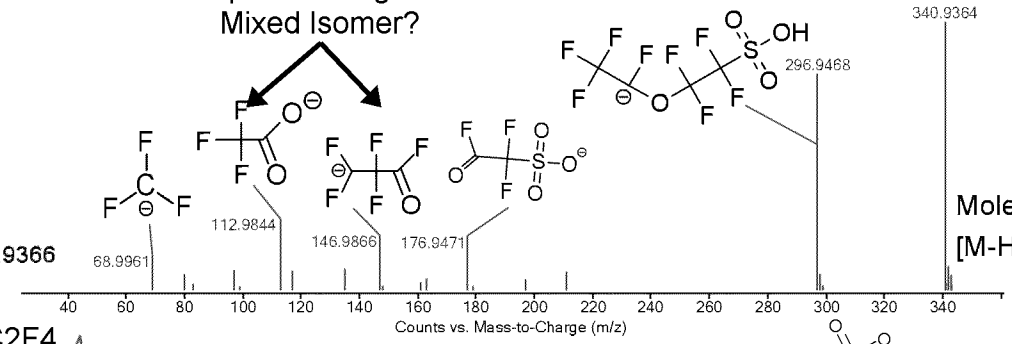
Double Headed Fluoropolymer Intermediates

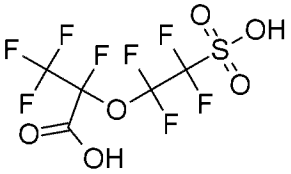


Double Headed Fluoropolymer Intermediates

Incompatible Fragments?
Mixed Isomer?







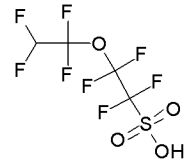
Molecular Formula: $C_5H_2F_8O_6S$

[M-H]-: 340.937157 Da

Nafion Monomer Precursor
CAS 4089-58-1

Retrospective Analysis

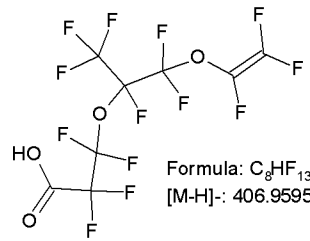
Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×	×	✓	✓	×	✓	×
	2-9-12	✓	✓	✓	✓	✓	✓	×	×
	5-4-12	✓	×	×	[illegible]	[illegible]	×	×	×
	5-4-12	✓	×	×	[illegible]	[illegible]	×	×	×
2014	11-24-14	✓	×	×	[illegible]	[illegible]	×	×	×
2015	5-12-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
	5-12-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
	8-6-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
2017	5-12-17	✓	×	✓	[illegible]	[illegible]	✓	✓	✓
	6-20-17	✓	✓	✓	[illegible]	[illegible]	×	✓	✓
	6-27-17	✓	✓	✓	[illegible]	[illegible]	×	×	×
	7-4-17	✓	✓	✓	✓	✓	×	×	×
	7-11-17	✓	✓	✓	✓	✓	×	×	×
	7-18-17	✓	✓	✓	✓	✓	×	×	×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



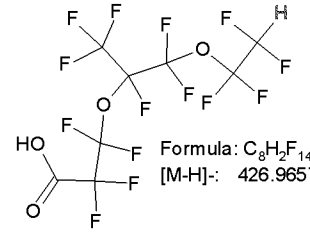
Formula: $C_4H_2F_8O_4S$
[M-H]-: 296.9473 Da

Retrospective Analysis

Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×	×	✓	✓			
	2-9-12	✓	✓	✓	✓	✓			
	5-4-12	✓	×	×	✓	×			
	5-4-12	✓	×	×	×	✓			
2014	11-24-14	✓	×	×	✓	×			
2015	5-12-15	✓	✓	✓	✓	✓			
	5-12-15	✓	✓	✓	×	✓			
	8-6-15	✓	✓	✓	×	✓			
2017	5-12-17	✓	×	✓	×	✓			
	6-20-17	✓	✓	✓	✓	✓			
	6-27-17	✓	✓	✓	✓	✓			
	7-4-17	✓	✓	✓	✓	✓			
	7-11-17	✓	✓	✓	✓	✓			
	7-18-17	✓	✓	✓	✓	✓			×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



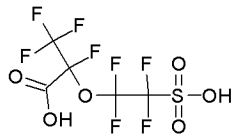
Formula: $C_8HF_{13}O_4$
[M-H]-: 406.9595 Da



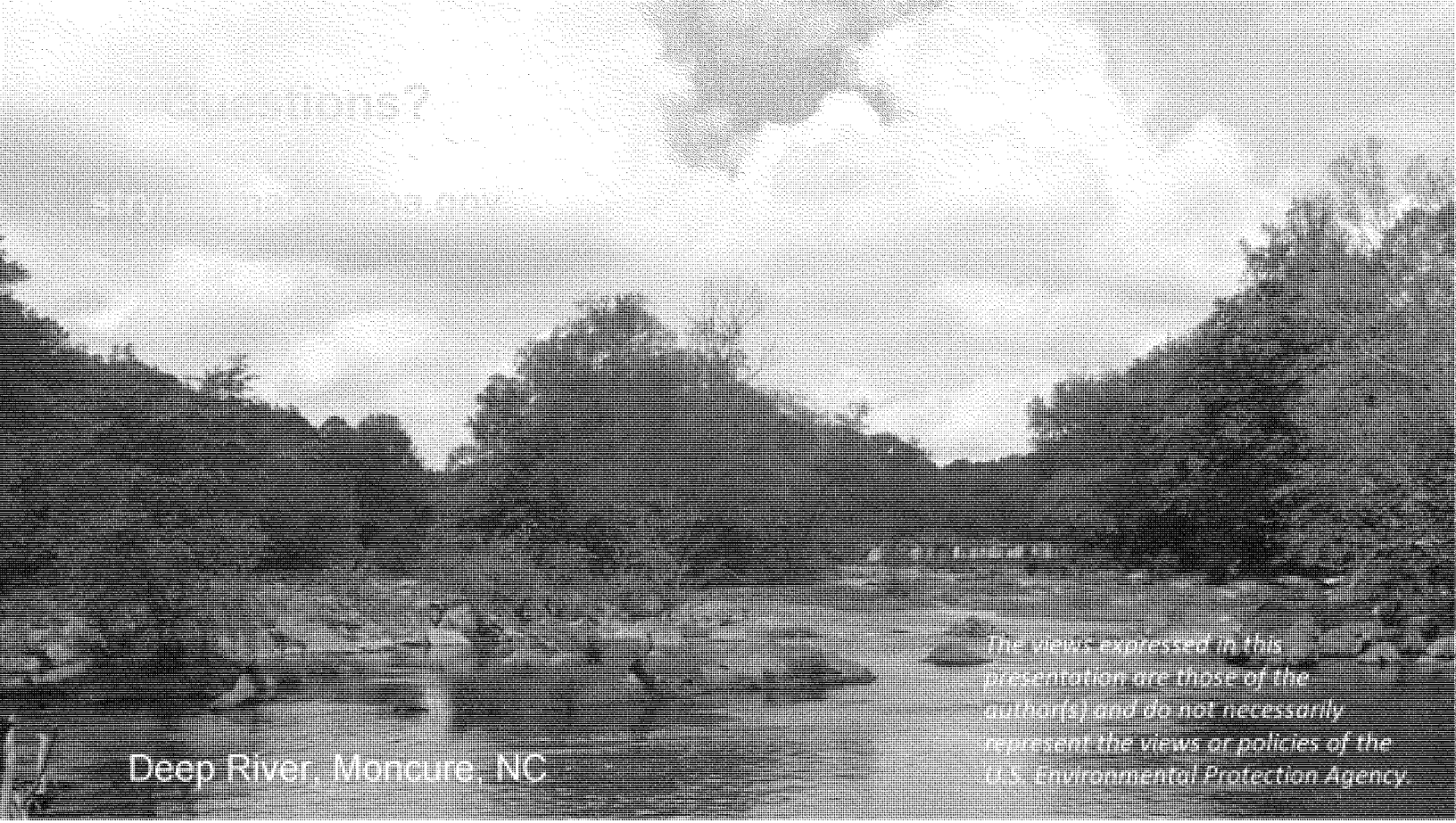
Formula: $C_8H_2F_{14}O_4$
[M-H]-: 426.9657 Da

Retrospective Analysis

Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×				×	✓	×
	2-9-12	✓	✓				✓	×	×
	5-4-12	✓	×				×	×	×
	5-4-12	✓	×				×	×	×
2014	11-24-14	✓	×				×	×	×
2015	5-12-15	✓	✓				✓	✓	✓
	5-12-15	✓	✓				✓	✓	✓
	8-6-15	✓	✓				✓	✓	✓
2017	5-12-17	✓	×				✓	✓	✓
	6-20-17	✓	✓	✓	✓	✓	×	✓	✓
	6-27-17	✓	✓	✓	✓	✓	×	×	×
	7-4-17	✓	✓	✓	✓	✓	×	×	×
	7-11-17	✓	✓	✓	✓	✓	×	×	×
	7-18-17	✓	✓	✓	✓	✓	×	×	×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



Formula: $C_5H_2F_8O_6S$
[M-H]-: 340.9372 Da


Deep River, Moncure, NC
The views expressed in this presentation are those of the author(s) and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

To: Huffman, David J[david.huffman@ncdenr.gov]; Allen, Trent[trent.allen@ncdenr.gov]; Gregson, Jim[jim.gregson@ncdenr.gov]; Perez, Helen I[helen.perez@ncdenr.gov]; West, Steve[steve.west@ncdenr.gov]; Brantley, Mark[mark.brantley@ncdenr.gov]
Cc: Satterwhite, Dana[dana.satterwhite@ncdenr.gov]; Johnson, Chris[chris.johnson@ncdenr.gov]
From: Strynar, Mark
Sent: Mon 7/10/2017 4:22:14 PM
Subject: RE: Draft of GenX sampling deviations
MJS comments GenX field sampling deviations -draft.docx

One comment. The week#3 QA/QC samples intended for EPA were sent to Test America and EPA got Test Americas QA/QC samples. They only differed by nitric acid spiking.

Mark

From: Huffman, David J [mailto:david.huffman@ncdenr.gov]
Sent: Monday, July 10, 2017 11:10 AM
To: Allen, Trent <trent.allen@ncdenr.gov>; Gregson, Jim <jim.gregson@ncdenr.gov>; Perez, Helen I <helen.perez@ncdenr.gov>; West, Steve <steve.west@ncdenr.gov>; Brantley, Mark <mark.brantley@ncdenr.gov>; Strynar, Mark <Strynar.Mark@epa.gov>
Cc: Satterwhite, Dana <dana.satterwhite@ncdenr.gov>; Johnson, Chris <chris.johnson@ncdenr.gov>
Subject: Draft of GenX sampling deviations

Hey All,

Please review my draft of GenX sampling deviations.
I'm trying to list any steps in our field sampling process that deviated from the EPA's SOP.
Let me know if I missed anything. I know the first week had the most deviations.
Also, Let me know if any of the first weeks issues carried over to the 2nd and 3rd week.
From what I can tell the 2nd and 3rd weeks of sampling followed the EPA's SOP without any issues.

Thanks

David Huffman
QA Coordinator
NC Division of Water Resources
1621 Mail Service Center
Raleigh, NC 27699-1621
Ph: 919-743-8407

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During the GenX sampling event (June 19th thru July 6th), the following bulleted items describe when the field sampling process deviated from the Sample Collection Protocol for PFC's in Surface and Well Water SOP No. EMAB-113-0.

Week 1 (June 19th and 22nd)

- The regional offices did not have EPA sampling kits. So, they used 16 ml disposable bottles to collect approx. 980 mL of sample at each site.
- A brand new standard pole sampler was used at sites that were inaccessible by hand.
- No QC sample were included in the sample set.

Week 3 (July 3- 6, 2017)

- QC samples namely Trip blanks and trip spikes were made in duplicate for EPA and Test America differing only by addition of nitric acid (EPA) or not (Test America). QC samples intended for EPA or Test America were inadvertently switched.

To: Goforth, Chris[chris.goforth@dhhs.nc.gov]
From: Strynar, Mark
Sent: Wed 5/2/2018 8:08:50 PM
Subject: RE: LTD Presentations-Drinking Water
Strynar LTD presentation 4-30-18.pptx

Chris,

Here is mine. I will also be bringing it on a flash drive.

Mark

From: Goforth, Chris [mailto:chris.goforth@dhhs.nc.gov]
Sent: Wednesday, May 02, 2018 1:41 PM
To: CGay@nycominc.com; Strynar, Mark <Strynar.Mark@epa.gov>; james.blake@durhamnc.gov; flannacm@guc.com
Subject: LTD Presentations-Drinking Water

Hi everyone,

If you are receiving this email I don't have your PowerPoint presentation for Lab Tech Day tomorrow. But don't panic! This is just a reminder to bring it on a USB drive and find me in the morning, or when you arrive. Thanks for being a presenter; see you all tomorrow!

-Chris

Chris Goforth M.S.
Laboratory Certification Supervisor
Division of Public Health, NC State Laboratory of Public Health
North Carolina Department of Health and Human Services

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919 715 8600 fax
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Raleigh, NC 27607

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Per-and Poly-fluorinated Compounds Analysis Case Study: Cape Fear Drainage Basin

Mark Strynar[1], James McCord[2], Johnsie Lang[2], Andrew Lindstrom[1], Zack Hopkins[3], Detlef Knappe[3]

1. National Exposure Research Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC;
2. ORISE Fellow, Oak Ridge Associated Universities, Oak Ridge, TN;
3. Department of Civil, Construction, and Environmental Engineering, North Carolina State University, Raleigh, NC

LAB TECHNOLOGY DAY 2018
THURSDAY – MAY 3, 2018
MCKIMMON CENTER - RALEIGH

ED_002003J_00096243-00001

Elevated levels of unregulated chemicals found in Jordan Lake, Cary drinking water

Posted December 21, 2017

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By Tyler Dukes

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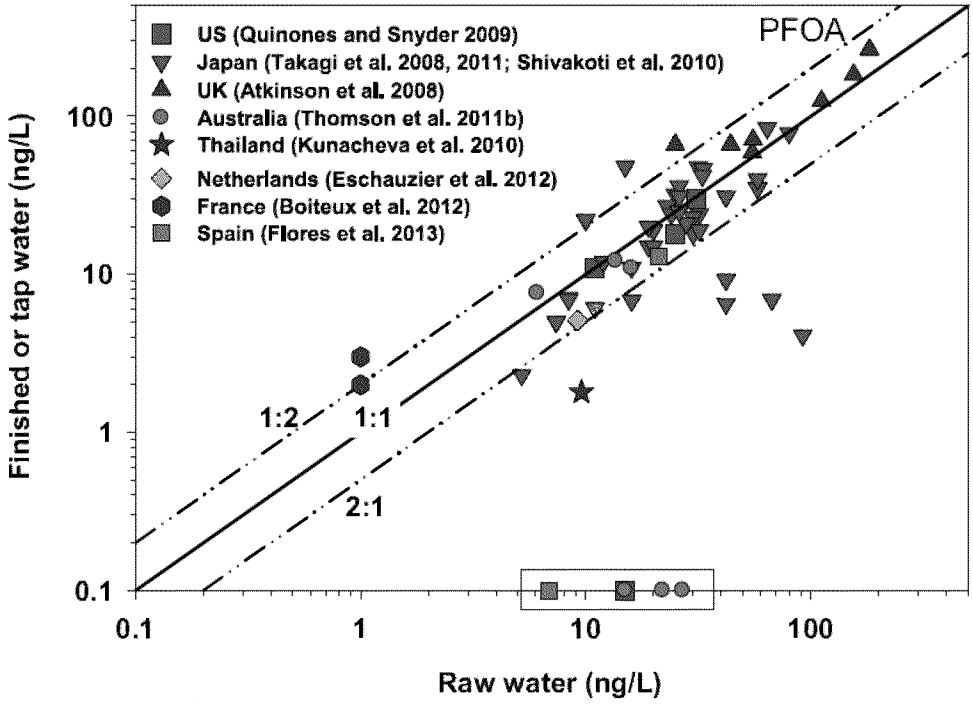
MAGNET ELEMENTARY
Nightlife Photos
Farmington Woods Ma
Green Magnet Elementary
Washington Magnet El
15 arrested in string of Moore County break-ins, drugs, weapons
APPLICATION PERIOD
WAKE COUNTY
Looking for something?

PFAS Generally Not Removed During Conventional Drinking Water Treatment



Similar for PFOS, PFHxA and PFHxS

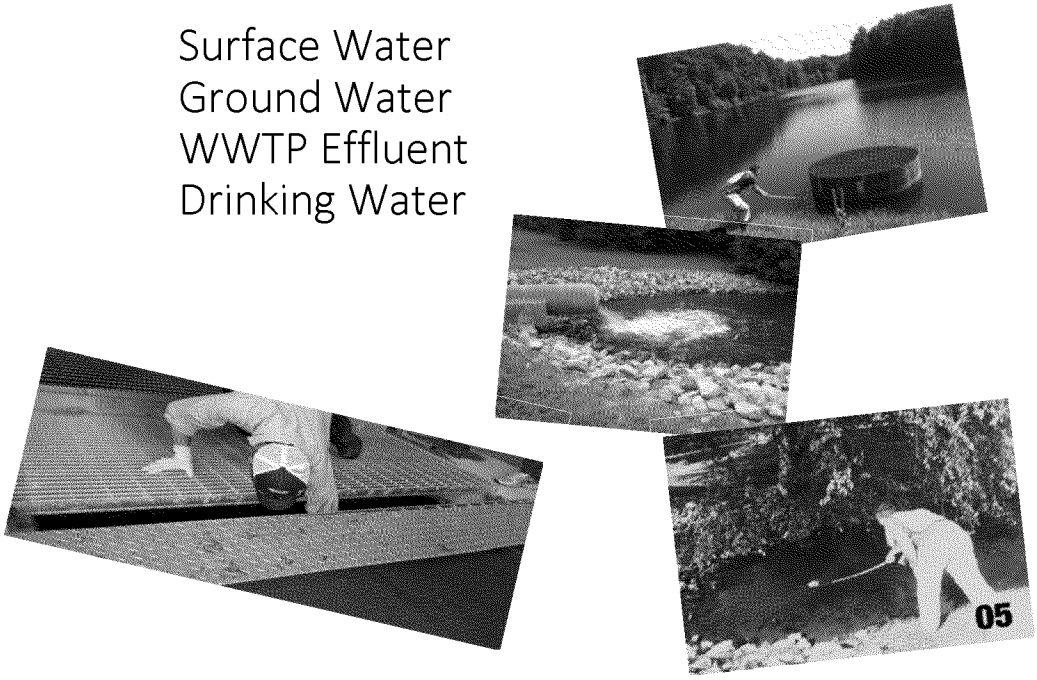
Rahman et al., (2014) *Water Research,* 50:318-340

Timeline: US EPA/NERL Water PFAS Efforts

- 2007 Nakayama et al., PFAS in Cape Fear Watershed
- 2007-2008 Decatur, AL discovery of PFAS in bio-solids, soil, surface water, groundwater
- 2009 (January) Provisional Health Advisory (PHA) for PFOA and PFOS established 400 and 200 ng/L
- 2011-2012 Sampling of Cape Fear River for determination of replacement chemistries
- 2012 (November) Presentation at SETAC Long Beach CA – Identification of novel polyfluorinated compounds in natural waters using accurate mass TOFMS (GenX)
- 2013-2014 Collaborative study with NCSU with sampling of Cape Fear River and three municipalities (Pittsboro, Fayetteville, Wilmington, NC) for legacy and PFECA determination
- 2014 (November) Presentation at SETAC Vancouver, BC - Determination of perfluoroalkyl ether carboxylic acids (PFECAs) and sulfonic acids (PFESAs) in North Carolina surface water using high resolution mass spectrometry (GenX and eleven other novel chemicals)
- 2015 (August) Publication of Strynar et al., *"Identification of Novel Perfluoroalkyl Ether Carboxylic Acids (PFECAs) and Sulfonic Acids (PFESAs) in Natural Waters Using Accurate Mass Time-of-Flight Mass Spectrometry (TOFMS)"* ES&T
- 2016 (May) OW Health Advisory for PFOS and PFOA set at 70 ng/L
- 2016 (November) Publication of Sun et al., *"Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina" ES&T Letters*
- 2017 (June) Reporting of PFECAs in CFR and Wilmington drinking water – Star News Online

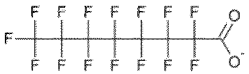
NERL/EMMD Water Analysis Method

Surface Water
Ground Water
WWTP Effluent
Drinking Water

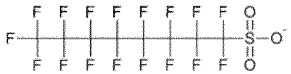


Also methods for:
Soil
Fish tissue
Dosed rodent tissue/fluids
Human Serum/Urine
House Dust

Some Typical PFAS

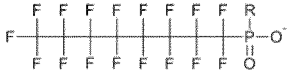


Perfluorocarboxylic acids
(ex. PFOA)

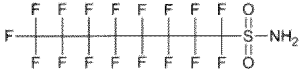


Perfluorosulfonic acids
(ex. PFOS)

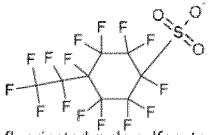
Fluorotelomer alcohol
(ex. 8:2 FTOH)



Perfluorophosphonic/phosphinic acids
(ex. If R=OH then PFOPA
If R=C8 perfluoroalkane then 8:8 PFPi)

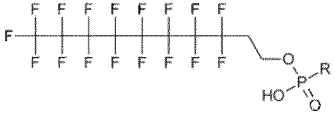


Perfluorosulfonamide
(ex. FOSA)

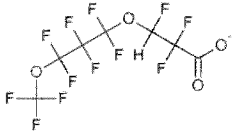


Perfluorinated cyclo sulfonates
(ex. PFECHS)

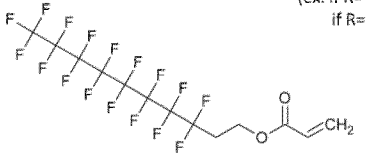
Perfluorosulfonamidoethanol
(ex. N-EtFOSE)



Fluorotelomer phosphate esters
(ex. if R= OH then 8:2 monoPAP
if R= 8:2 FTO ester then 8:2 diPAP)



Polyfluorinated ether carboxylates
(ex. 4,8-dioxa-3H-perfluorononanoate)

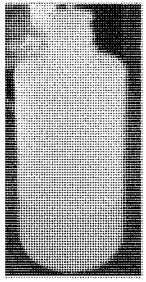


Polyfluorinated polymeric unit
(ex. 1H,1H,2H,2H-perfluorodecyl acrylate)

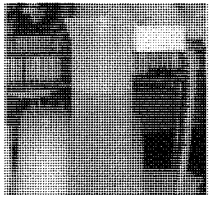
Polyfluorinated ether sulfonates
(ex. Perfluoro [hexyl ethyl ether sulfonate])

Method Summary – Sample Processing

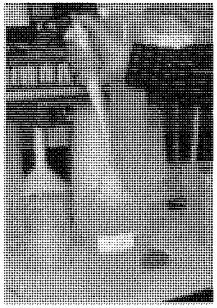
Nakayama et al., 2009, Strynar et al., 2015; Sun et al., 2016, Newton et al., 2017



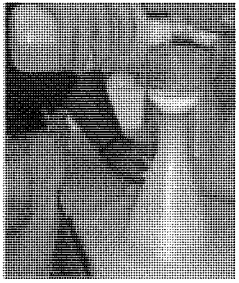
1 L HDPE bottles
5 mL 1:1 HNO_3 (35%):DI
Shipped ambient



Pour water out of sample bottle for volume measurement



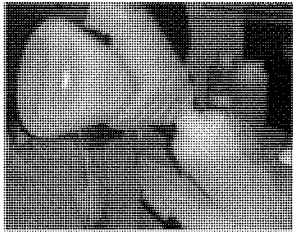
Wash bottle with 10 mL MeOH, add water back to bottle, add IS Shake



Filter entire contents
Whatman GF/A 1.7 um

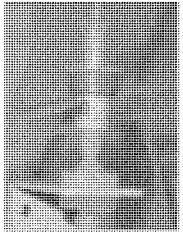
All samples
Treated same way

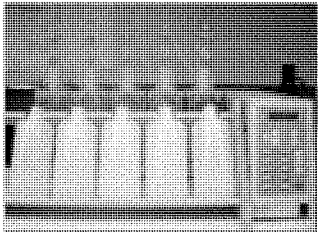
- Trip Spike
- Blanks
- Unknowns
- Calibration



Add filtered water back into original bottle

Subsample 500 mL
Store 500 mL

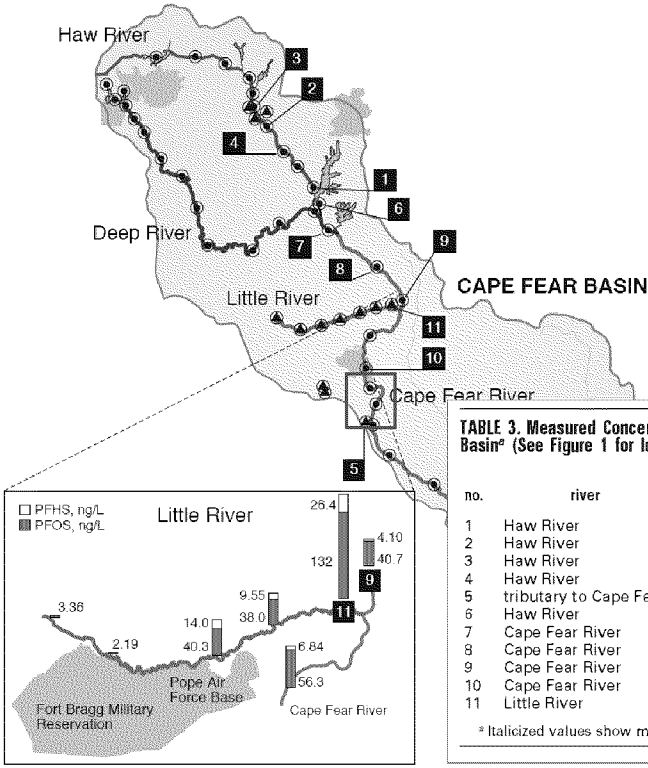




Load onto SPE tube
Waters Plus style WAX

Elute for LC/MS-MS analysis

Water Sampling Cape Fear River, NC
Nakayama et al., 2007



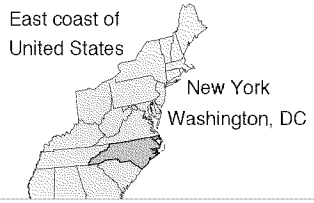


TABLE 3. Measured Concentrations at the Eleven Sites with the Highest Total Concentrations of PFCs in the Cape Fear River Basin[a] (See Figure 1 for locations)

no.	river	C12 (ng/L)	C11 (ng/L)	C10 (ng/L)	C9 (ng/L)	C8 (ng/L)	C7 (ng/L)	C6 (ng/L)	PFOS (ng/L)	PFHS (ng/L)	PFBS (ng/L)	total (ng/L)
1	Haw River	*4.46*	*52.1*	*120*	*194*	*287*	118	21.7	127	8.43	*9.41*	942
2	Haw River	3.20	28.7	112	157	200	66.8	14.5	33.4	7.87	2.61	626
3	Haw River	3.29	27.6	109	157	191	59.2	13.7	36.4	9.49	3.04	609
4	Haw River	1.98	20.0	88.2	151	201	58.2	13.2	31.5	7.49	2.88	574
5	tributary to Cape Fear	2.26	15.0	19.6	71.2	58.6	*329*	*23.0*	30.0	3.36	ND	531
6	Haw River	1.18	8.87	31.0	72.1	152	58.3	13.5	31.2	7.70	ND	376
7	Cape Fear River	< LOQ	3.34	13.2	34.8	70.3	24.0	7.84	66.7	5.59	ND	227
8	Cape Fear River	1.14	6.39	17.2	35.7	71.5	26.9	9.35	50.4	4.82	ND	223
9	Cape Fear River	1.23	6.75	17.1	38.0	72.7	23.7	7.05	40.7	4.10	ND	211
10	Cape Fear River	< LOQ	7.55	19.3	31.2	46.8	13.9	4.62	56.3	6.84	2.12	189
11	Little River	< LOQ	< LOQ	2.17	2.24	12.6	3.38	3.23	*132*	*26.4*	3.20	185

[a] Italicized values show maximal concentrations of each compound.

Fact Sheet: 2010/2015 PFOA Stewardship Program

Q1. What is the 2010/2015 PFOA Stewardship Program?

In 2006, EPA invited eight major leading companies in the per- and polyfluoroalkyl substances (PFASs) industry to join in a global stewardship program with two goals:

•To commit to achieve, no later than **2010, a 95 percent reduction,** measured from a year 2000 baseline, in both facility emissions to all media of perfluorooctanoic acid **(PFOA), precursor chemicals** that can break down to PFOA, and **related higher homologue** chemicals, and product content levels of these chemicals.

•To commit to working toward **the elimination** of these chemicals from emissions and products **by 2015**.

Q4. What companies participated in the PFOA Stewardship Program?

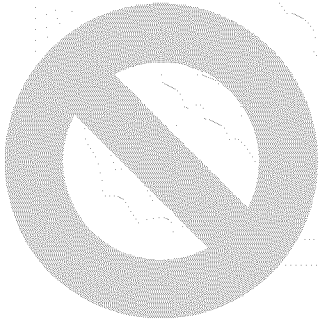
Participating companies included:

•Arkema
•Asahi
•BASF Corporation
•Clariant
•Daikin
•3M/Dyneon
•DuPont
•Solvay Solexis

https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program#what

OTHER PFASs: The Era of HRMS & Non-Targeted Analysis

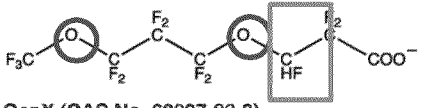
- How do we find compounds without knowing what they are?
- How do we prioritize unknowns for further analysis?
- How do we identify/quantify without analytical standards?



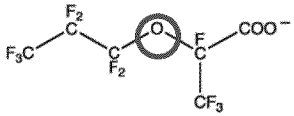
→ ???

Fluoropolymer manufacture

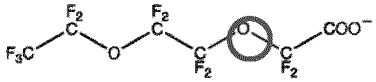
ADONA (CAS No. 958445-44-8)



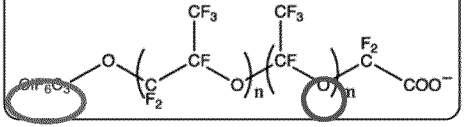
GenX (CAS No. 62037-80-3)



Asahi's product (CAS No. 908020-52-0)

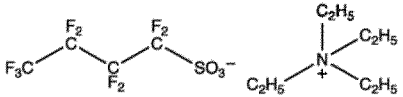


Solvay's product (CAS No. 329238-24-6)

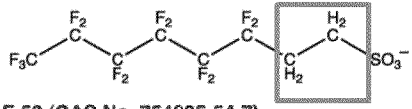


Metal plating

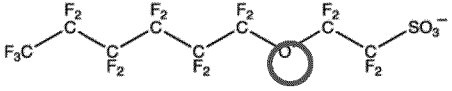
$N(Et)_4$-PFBS (CAS No. 25628-08-4)



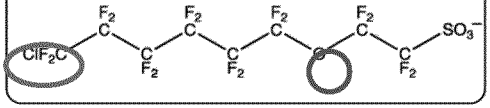
6:2 FTSA (CAS No. 27619-97-2)



F-53 (CAS No. 754925-54-7)



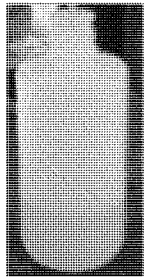
F-53B (CAS No. 73606-19-6)



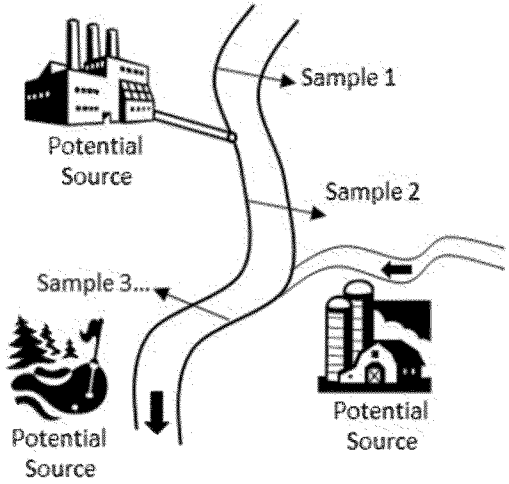
Wang et al. *Environment International*, **2013,** *60,* pp 242–248

Data Generation: Source Determination by NTA

Surface Water
Ground Water
WWTP Effluent
Drinking Water



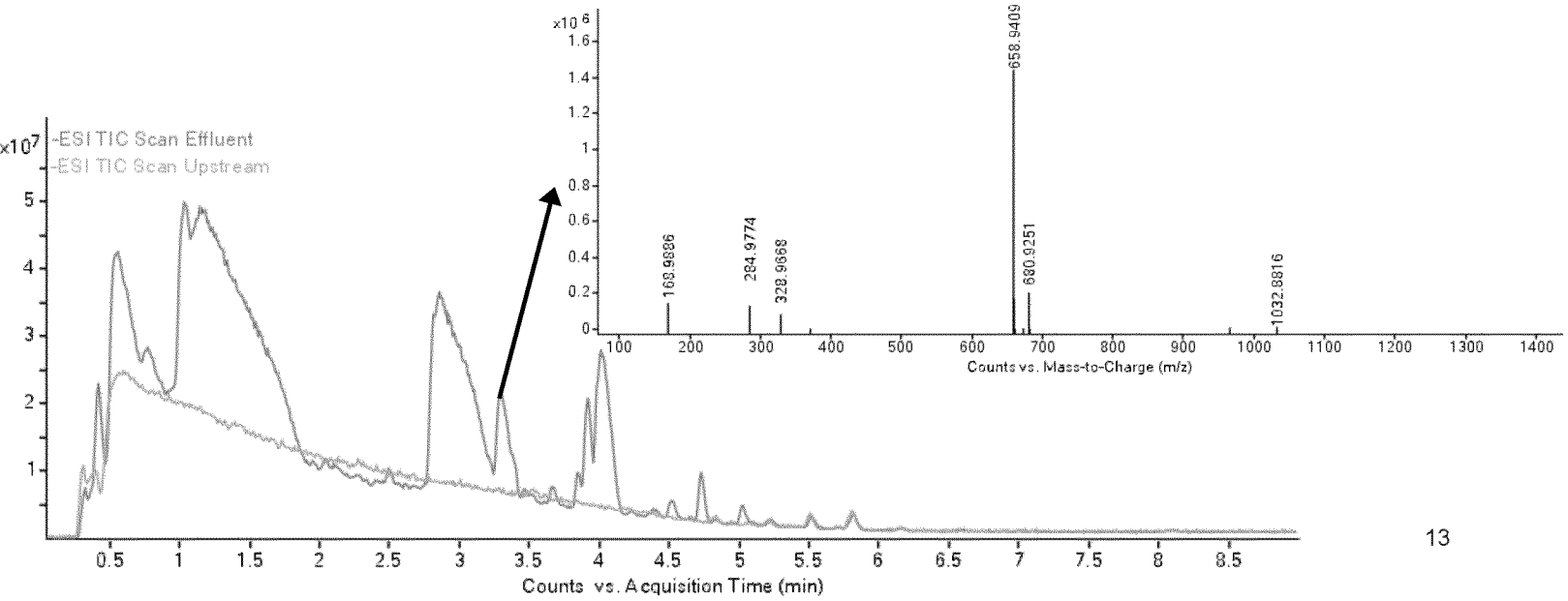
HDPE Bottles



Sampling from geographically or temporally displaced locations allows triangulation of sourcing

Strynar et al. *Environ. Sci. Technol.*, **2015**, *49* (19), pp 11622–11630

Chromatographic and MS Data



Feature Finding: Unique & Highly Different Features

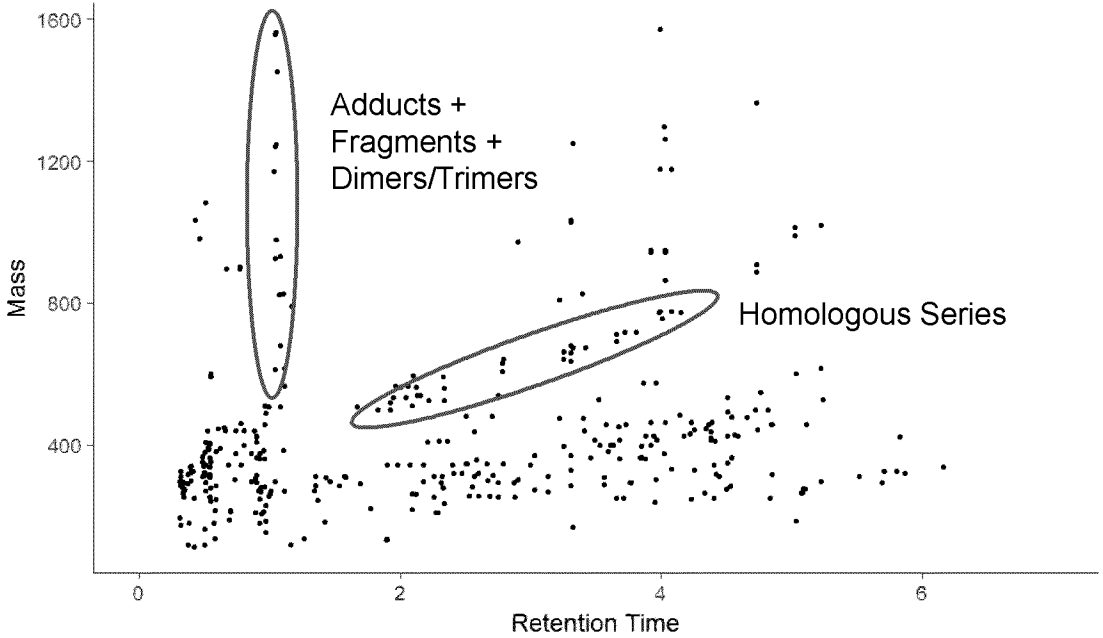
Cmpd	m/z	RT	Effluent Peak Area	Upstream Peak Area
1	194.9263	0.31	1277673	NA
2	174.9502	0.32	128095	NA
3	272.9487	0.35	893478	NA
4	290.9396	0.37	82068	NA
5	119.0345	0.37	56430	NA
6	179.0558	0.38	51910	NA
7	340.9372	0.4	1961449	NA
8	324.9428	0.41	75414	NA
9	248.961	0.42	235520	NA
10	112.9856	0.42	9963533	NA
11	1033.987	0.43	185007	NA
12	340.9376	0.49	847790	NA
13	118.9927	0.5	242003	NA
14	162.9821	0.5	1382091	NA
15	1083.984	0.51	14125	NA

Hundreds of Features of Interest

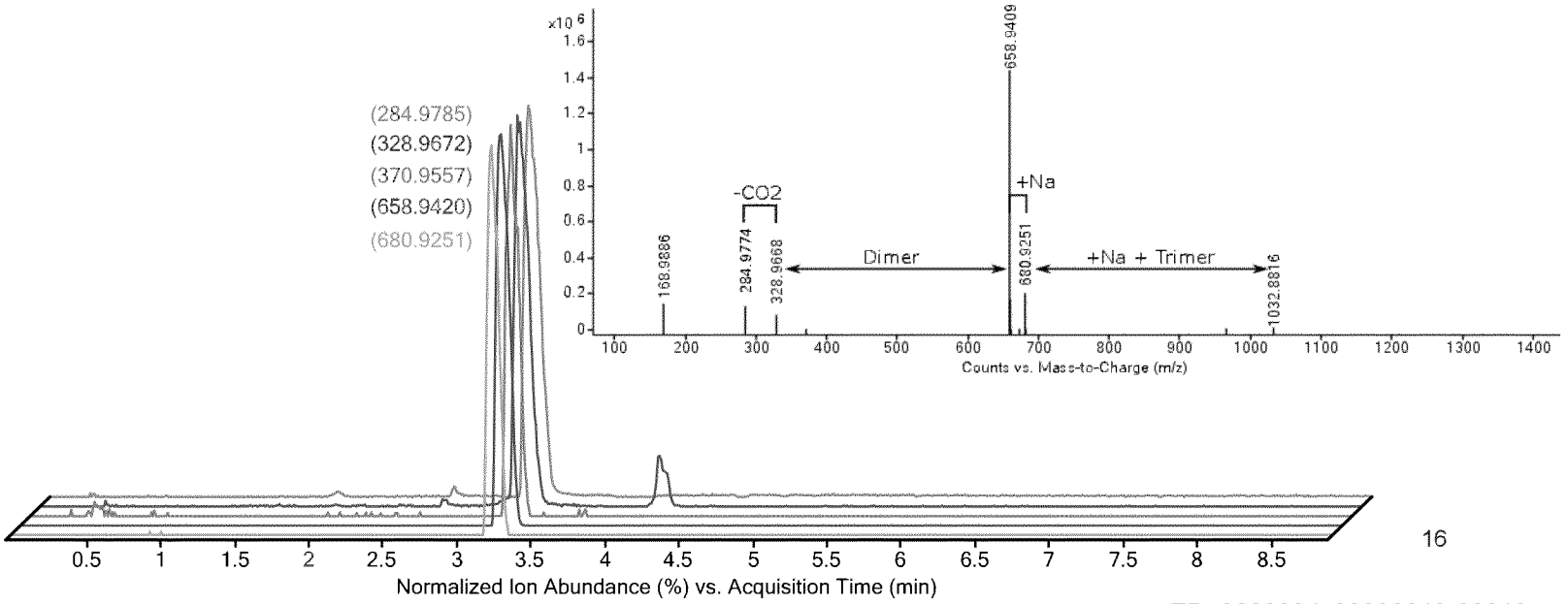
Useful For:

- Identification of increasing/decreasing chemicals
- Features unique to a specific location, time, treatment, etc.

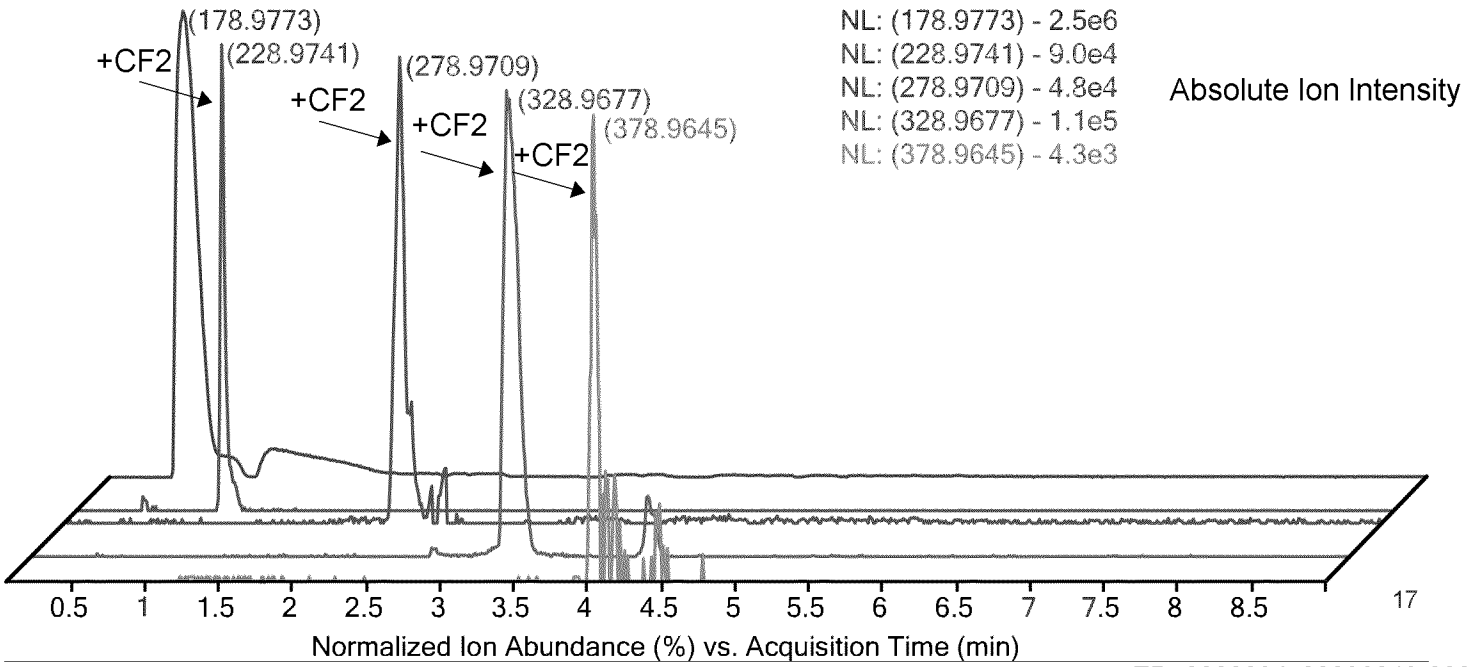
Relationships Reveal Underlying Chemistry



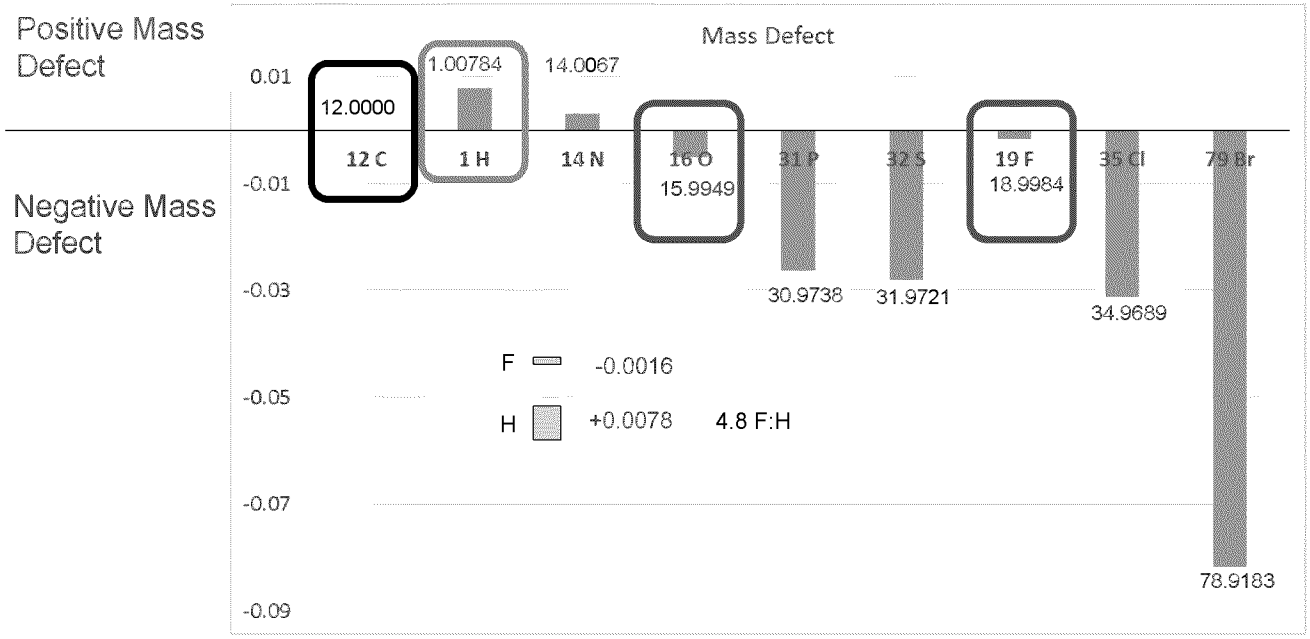
In-Source Related Species



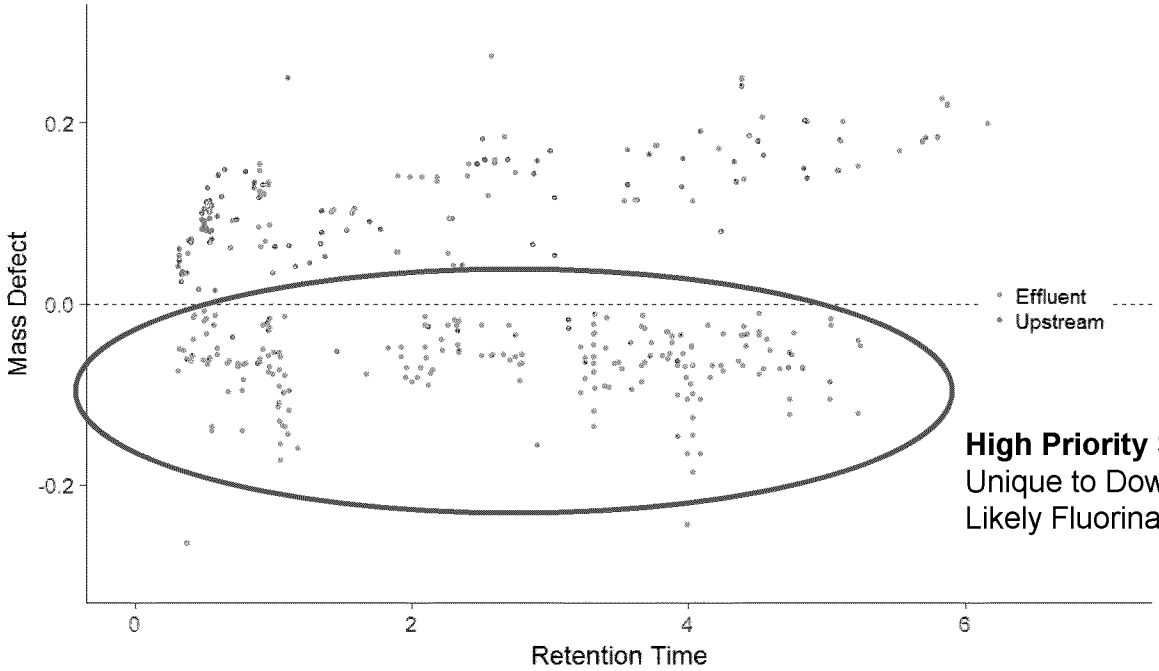
Homologous Series



Isotope Signatures: Negative Mass Defect



Mass Defect of Outfall and Upstream Features



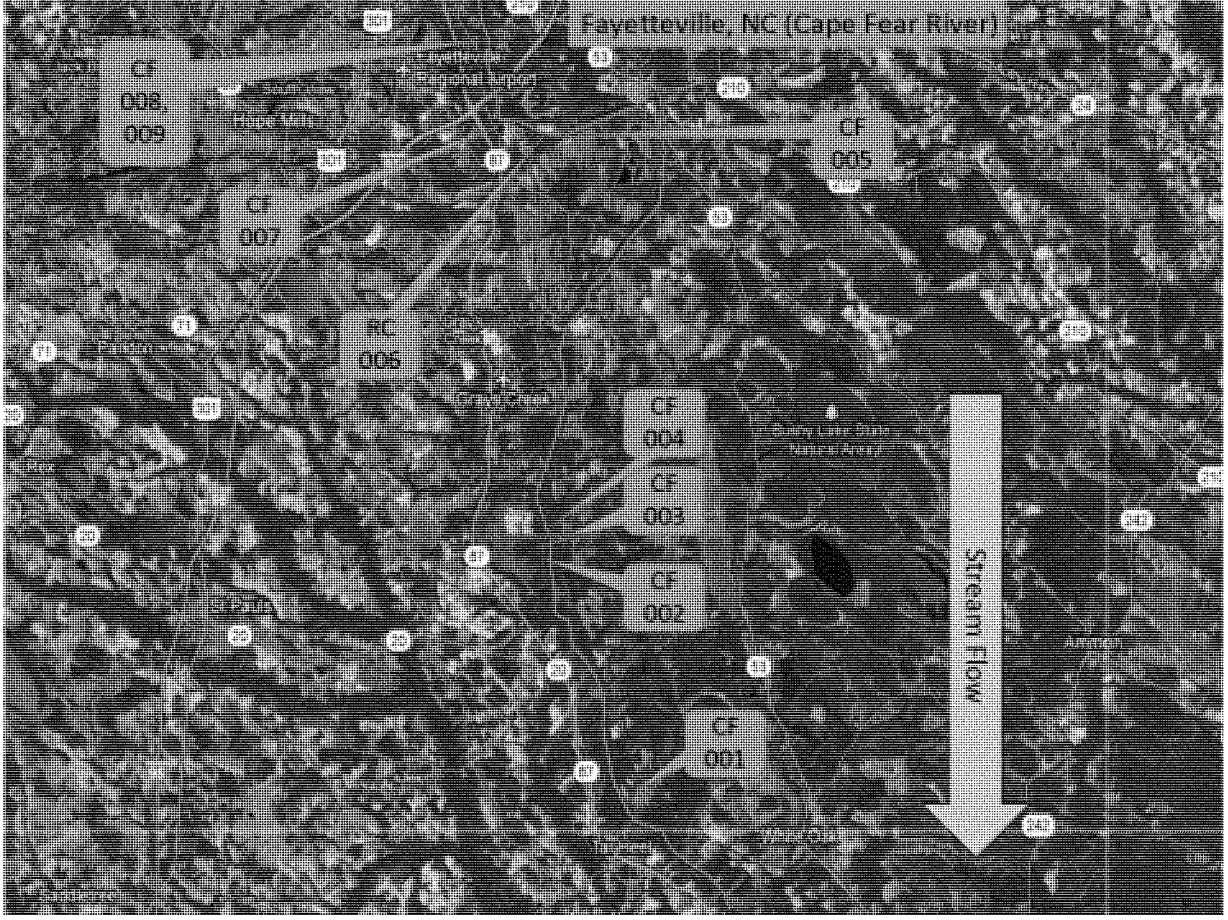
High Priority Species:
Unique to Downstream,
Likely Fluorinated

First Sampling 2011-2012

Presented at SETAC 2012

Follow-up sampling 2013-2013

Presented at SETAC 2014



Water Intake
The Chemours Company
Current Outfall
US Lock & Dam
William O Huske
Former Outfall
Google

Legacy PFAS found in Cape Fear Water

Stream Flow

Analyte	001	002	003	004	005	006	007	008	008	009
C4	23	502	3761	6	4	0	8	7	5	3
C5	441	5607	43590*	17	9	1	32	46	12	9
PFBS	4	5	3	4	5	2	9	5	6	4
C6	17	90	434	18	12	2	27	16	18	14
C7	37	599	3873	14	17	0	11	20	21	9
PFHS	7	12	10	9	7	4	9	10	9	22
C8	32	39	71	33	25	2	38	36	41	18
C9	13	34	127	7	11	1	6	8	11	5
PFOS	19	27	26	17	23	0	0	16	18	14
C10	10	17	12	11	0	3	3	8	10	5

items in red exceed the standard curve high end of 500 ng/L; 10x diluted and re-analyzed; * still exceed curve and are estimated

Environmental Science & Technology

November 2015

Article

pubs.acs.org/est

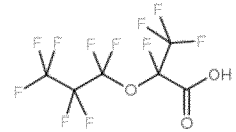
Identification of Novel Perfluoroalkyl Ether Carboxylic Acids (PFECAs) and Sulfonic Acids (PFESAs) in Natural Waters Using Accurate Mass Time-of-Flight Mass Spectrometry (TOFMS)

Mark Strynar,[*,†] Sonia Dagnino,[†,‡] Rebecca McMahen,[†,‡] Shuang Liang,[†,‡] Andrew Lindstrom,[†] Erik Andersen,[†] Larry McMillan,[§] Michael Thurman,[∥] Imma Ferrer,[∥] and Carol Ball[⊥]

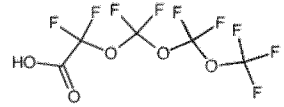
Table 1. Accurate Mass of Polyfluorinated Compounds and In-Source Artifacts Found in Extracted Water Samples

number	formula	CAS no.	name	$[M]^a$	$[M - H]^-$ m/z	$[2M - 2H + Na]^-$ m/z	$[2M - H]^-$ m/z
Monoether PFECAs							
1	$C_3HF_5O_3$			179.9846	178.9773	380.9438	358.9619
2	$C_4HF_7O_3$			229.9813	228.9740	480.9372	458.9553
3	$C_5HF_9O_3$	863090-89-5		279.9782	278.9709	580.9310	558.9491
4	$C_6HF_{11}O_3$	13252-13-6	undecafluoro-2-methyl-3-oxahexanoic acid	329.9750	328.9677	680.9247	658.9427
5	$C_7HF_{13}O_3$			379.9718	378.9645	780.9182	758.9363
6	$C_8HF_{15}O_3$			429.9686	428.9613	880.9118	858.9299
Polyether PFECAs							
7	$C_7HF_{13}O_7$	39492-91-6	perfluoro-3,5,7,9,11-pentaoxadodecanoic acid	443.9515	442.9442	908.8776	886.8957
8	$C_6HF_{11}O_6$	39492-90-5	perfluoro-3,5,7,9-butaoxadecanoic acid	377.9598	376.9525	776.8942	754.9123
9	$C_5HF_9O_5$	39492-89-2	perfluoro-3,5,7-propaoxaoctanoic acid	311.9681	310.9608	644.9108	622.9289
10	$C_4HF_7O_4$	39492-88-1	perfluoro-3,5-dioxahexanoic acid	245.9764	244.9691	512.9274	490.9455
PFESAs							
11	$C_7HF_{13}O_5S$	66796-30-3[b]		443.9337	442.9264		
12	$C_7H_2F_{14}O_5S$			463.9399	462.9326		

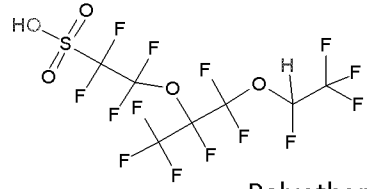
Example Structures



Monoether (6): GenX



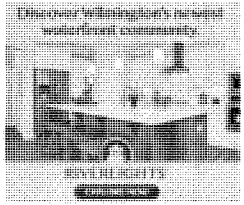
polyethers (4):



Polyethers sulfonates (2):

StarNews 150th 1867 - 2017

Toxin taints CFPUA drinking water



MOST POPULAR

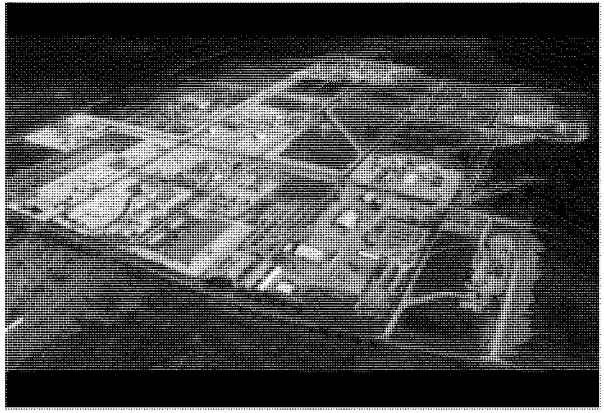
1 Carolina Surf condos - in danger of collapse - condemned, evacuated
Jul 2 at 5:50 AM

2 Man injured by hook, not bit by shark at Wrightsville Beach
Jun 30 at 1:43 PM

3 Murder suspect had other charges pending
Jul 2 at 5:44 AM

4 Residents not allowed back into Carolina Surf condos
Jul 4 at 7:33 AM

OUR PICKS

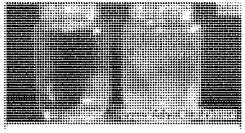


HIDE CAPTION

A 2000 aerial photo of Fayetteville Works on the Cumberland-Bladen county line. The site, home to several plants, one of which makes GenX, is about 100 miles upstream from Wilmington. [COURTESY OF THE FAYETTEVILLE OBSERVER]

By Vaughn Hagerty StarNews Correspondent
Posted Jun 7, 2017 at 10:31 AM
Updated Jun 8, 2017 at 10:38 AM

Utility can't filter out chemical produced upriver



Cape Fear River
Fayetteville to Wilmington, NC

November 2016

Environmental Science & Technology Letters

Letter

pubs.acs.org/journal/estlcu

Legacy and Emerging Perfluoroalkyl Substances Are Important Drinking Water Contaminants in the Cape Fear River Watershed of North Carolina

Mei Sun,[*,†,‡] Elisa Arevalo,[‡] Mark Strynar,[§] Andrew Lindstrom,[§] Michael Richardson,[∥] Ben Kearns,[∥] Adam Pickett,[⊥] Chris Smith,[#] and Detlef R. U. Knappe[‡]

June 7, 2017 story on in Wilmington Star Online News basis

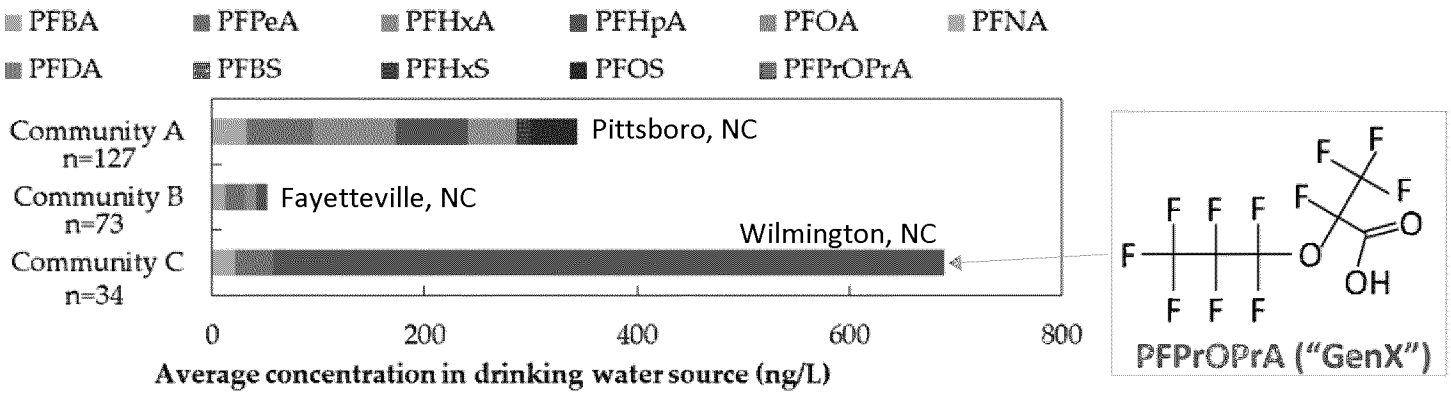
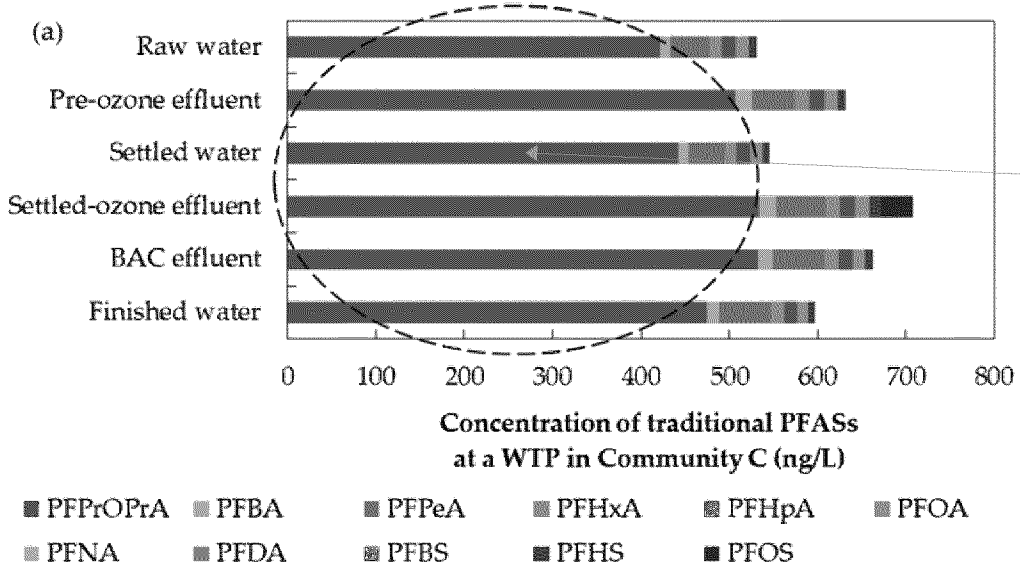
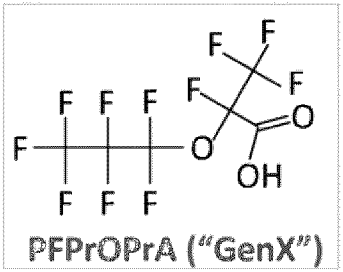


Figure 1. Occurrence of PFASs at drinking water intakes in the CFR watershed. Concentrations represent averages of samples collected between June and December 2013. Individual samples with concentrations below the quantitation limits (QLs) were considered as 0 when calculating averages, and average concentrations below the QLs were not plotted.

Sun et al., 2017

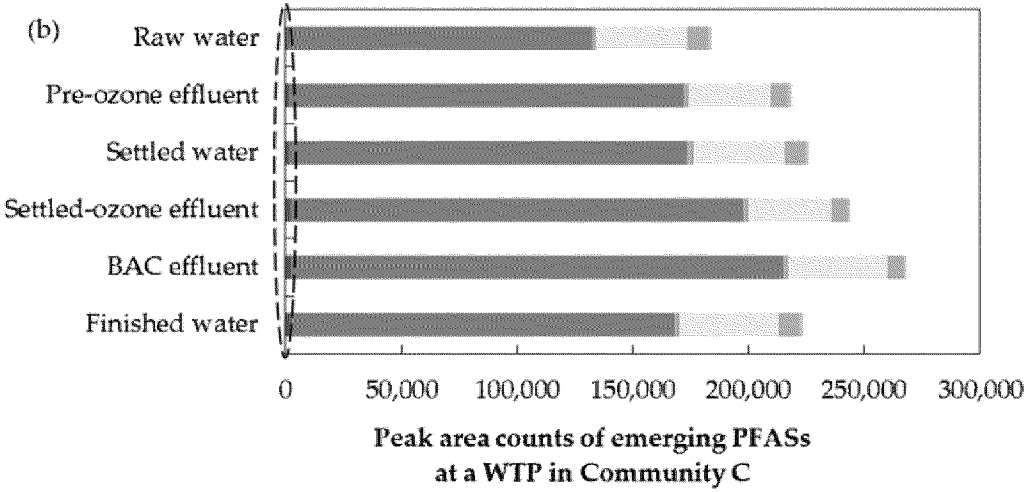
PFAS removal at Sweeney WTP

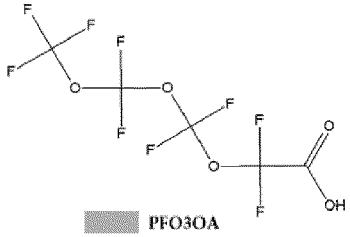


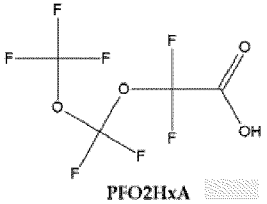


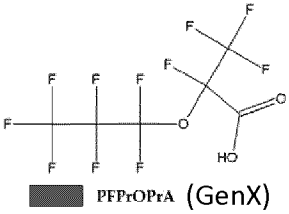
Sun et al., 2017

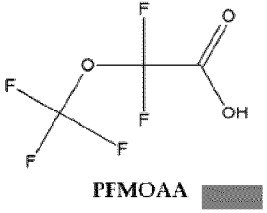
Other PFECAS Sweeney WTP







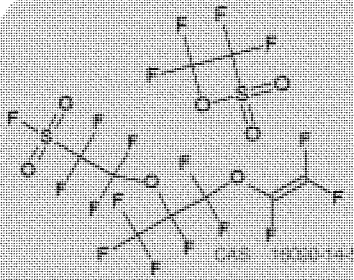




Chemours Site TSCA Inventory

Sulfonyl Fluorides

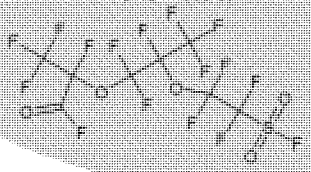
CAS 697-16-1



CAS 16030-14-4

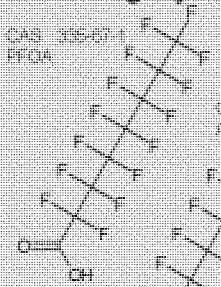
CAS 677-07-6

CAS 4089-59-1

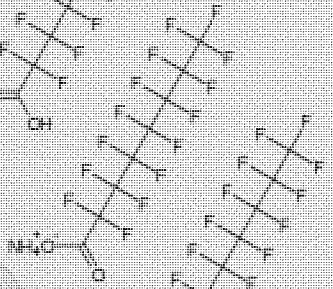


Legacy

CAS 335-67-1
PFOA

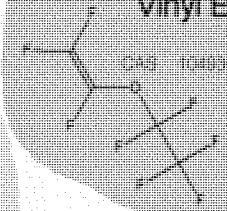


CAS 3825-26-1
APFO

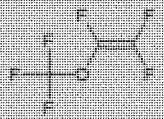


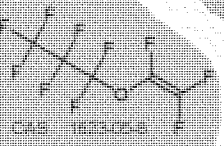
CAS 335-98-0

Vinyl Ethers



CAS 1187-93-5

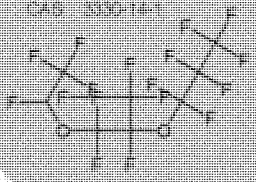




CAS 1623-05-8

Other

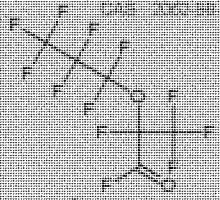
CAS 335-14-1



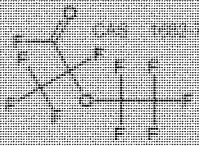
CAS 691-94-1

Acid Fluorides

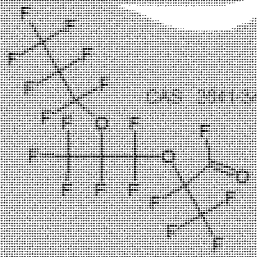
CAS 355-98-0



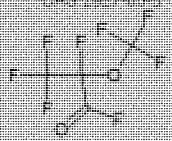
CAS 1893-71-6



CAS 1884-14-1



CAS 3027-19-3

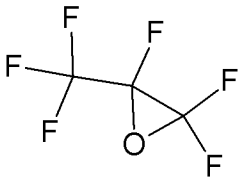


DUPONT FAYETTEVILLE PLANT
22828 NC HIGHWAY 87 WEST
FAYETTEVILLE, NC 28306-7332

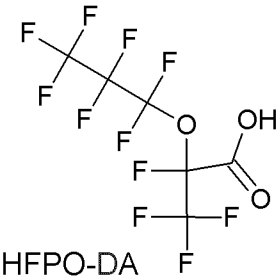
http://iaspub.epa.gov/enviro/tsca.get_chem_info?v_registry_id=110000559609

Hexafluoropropylene Oxide (HFPO)

HFPO
CAS 428-59-1



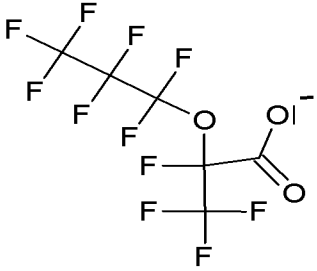
- an intermediate used in industrial organofluorine chemistry
- a monomer for fluoropolymers.
- colourless gas is the epoxide of hexafluoropropylene
- produced by DuPont and 3M and as a precursor to the lubricant Krytox and related materials
- generated by oxidation of perfluoropropylene, e.g. with oxygen as well as other oxidants



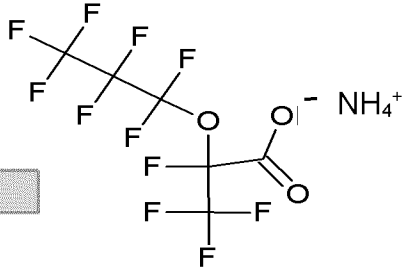
HFPO-DA
CAS 13252-13-6

In Water

Common Analyte



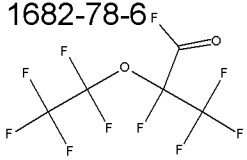
In water



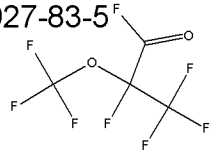
GenX
CAS 62037-80-3

Polyvinyl Ether Production

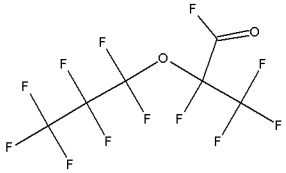
CAS 1682-78-6



CAS 2927-83-5

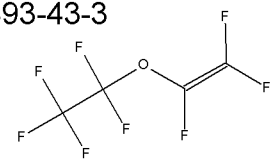


CAS 2062-98-8

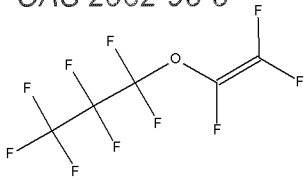


Acid Fluorides

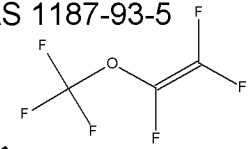
CAS 10493-43-3



CAS 2062-98-8



CAS 1187-93-5

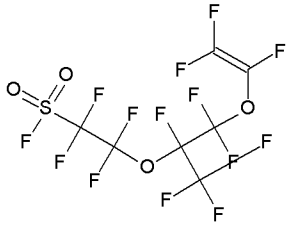


Polyvinyl Ether Intermediates

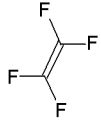
Head-$(CF_2)_n(CF_2O)_m$-Head Polyvinyl Ether

Nafion Polymer

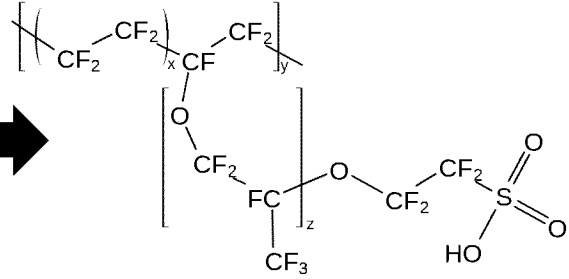
- Nafion is a sulfonated tetrafluoroethylene based fluoropolymer-copolymer.
- proton conductor for proton exchange membrane (PEM) fuel cells



CAS 16090-14-5



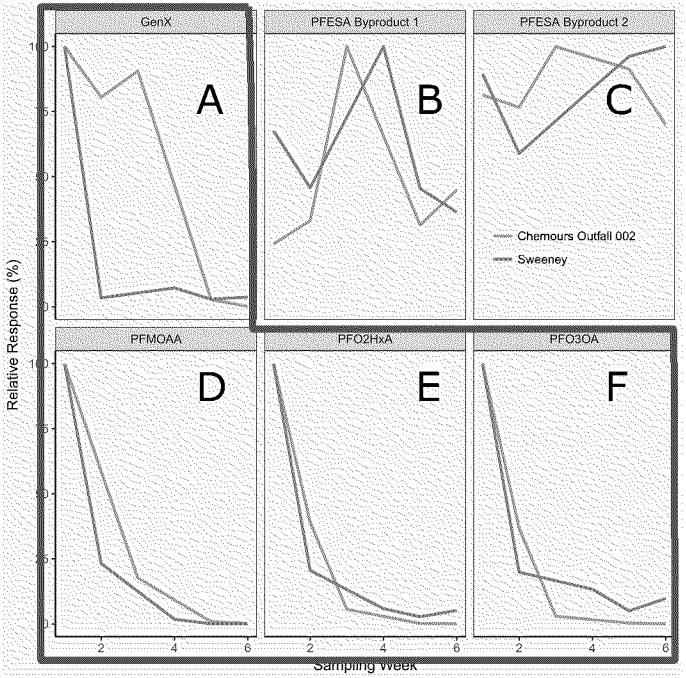
CAS 116-14-3

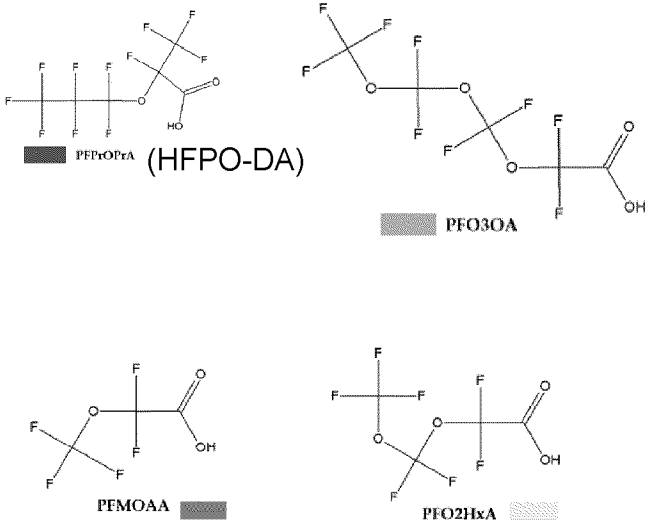


CAS 66796-30-3

Relative Quantitation Time Trends

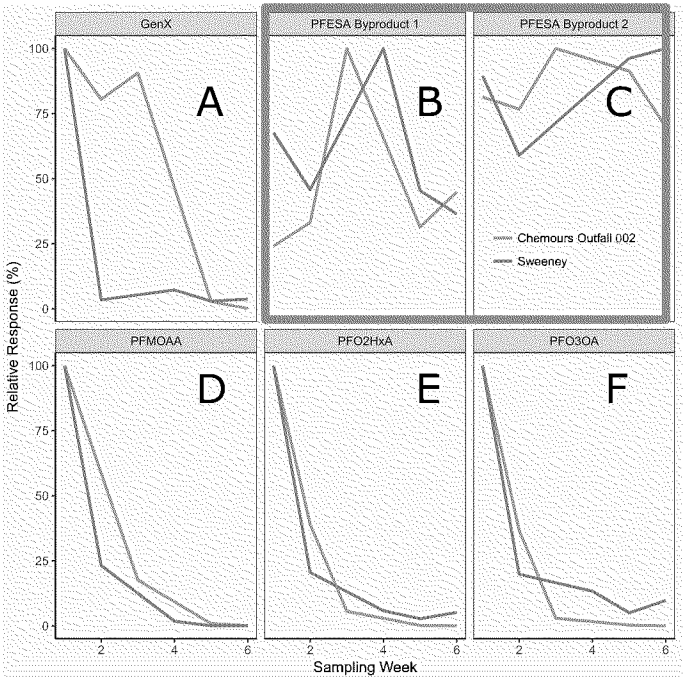
6 weeks mid June – early August

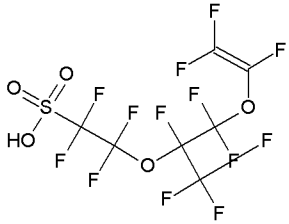




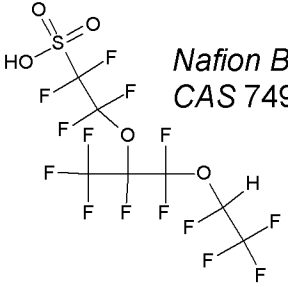
Relative Quantitation Time Trends

6 weeks mid June – early August





Nafion BP1
CAS 29311-67-9

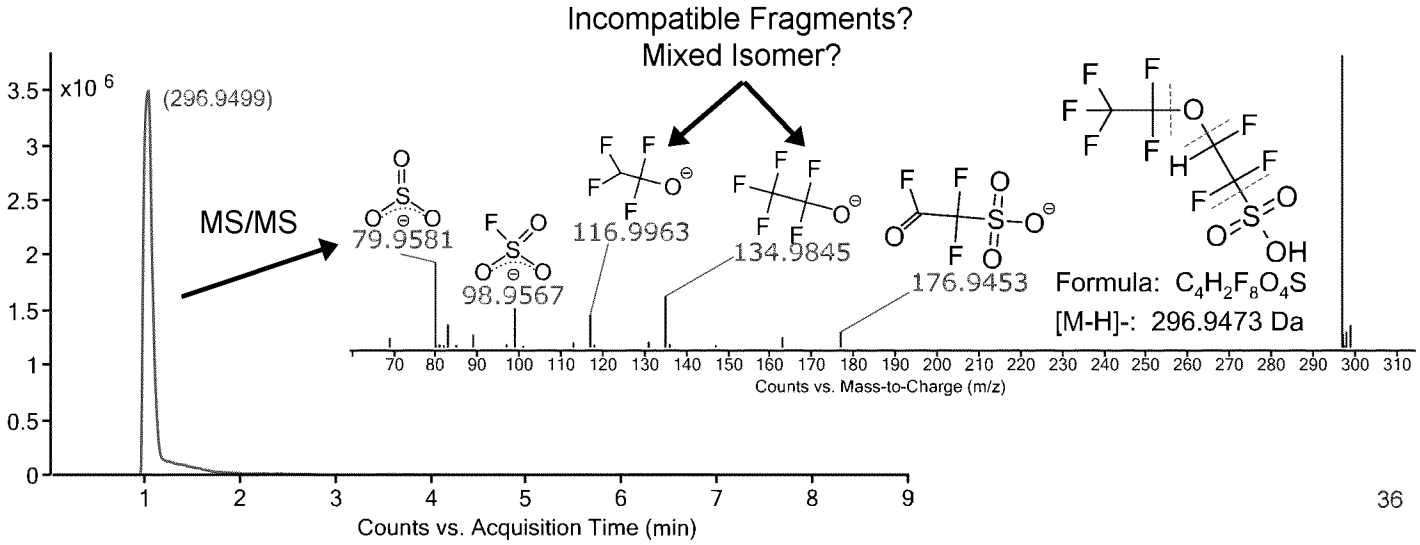


Nafion BP2
CAS 749836-20-2

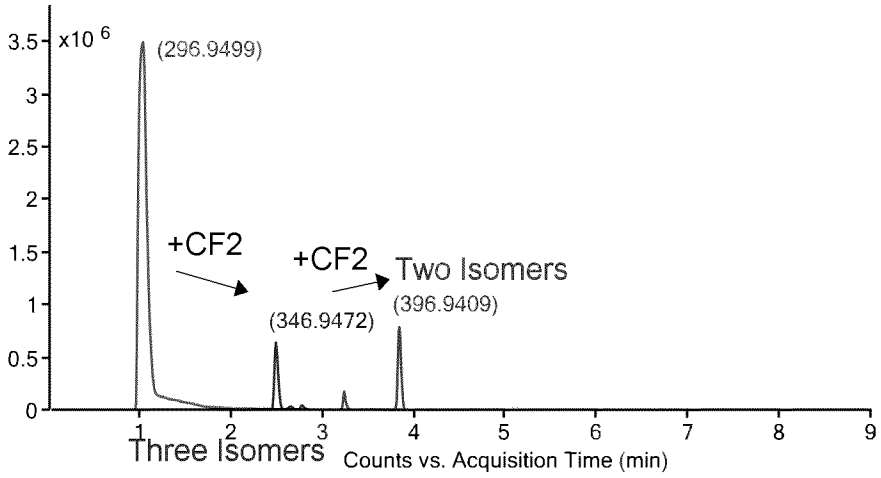
Retrospective HRMS Data Analysis

- Samples analyzed via HRMS (TOF, QTOF, Orbitrap)
- Store data files for reanalysis; like “data specimen banking”
- Data Independent Acquisition when possible (QTOF) for MS/MS
- Possible for presence absence analysis
- Eventual sharing of data files and/or spectra to public location

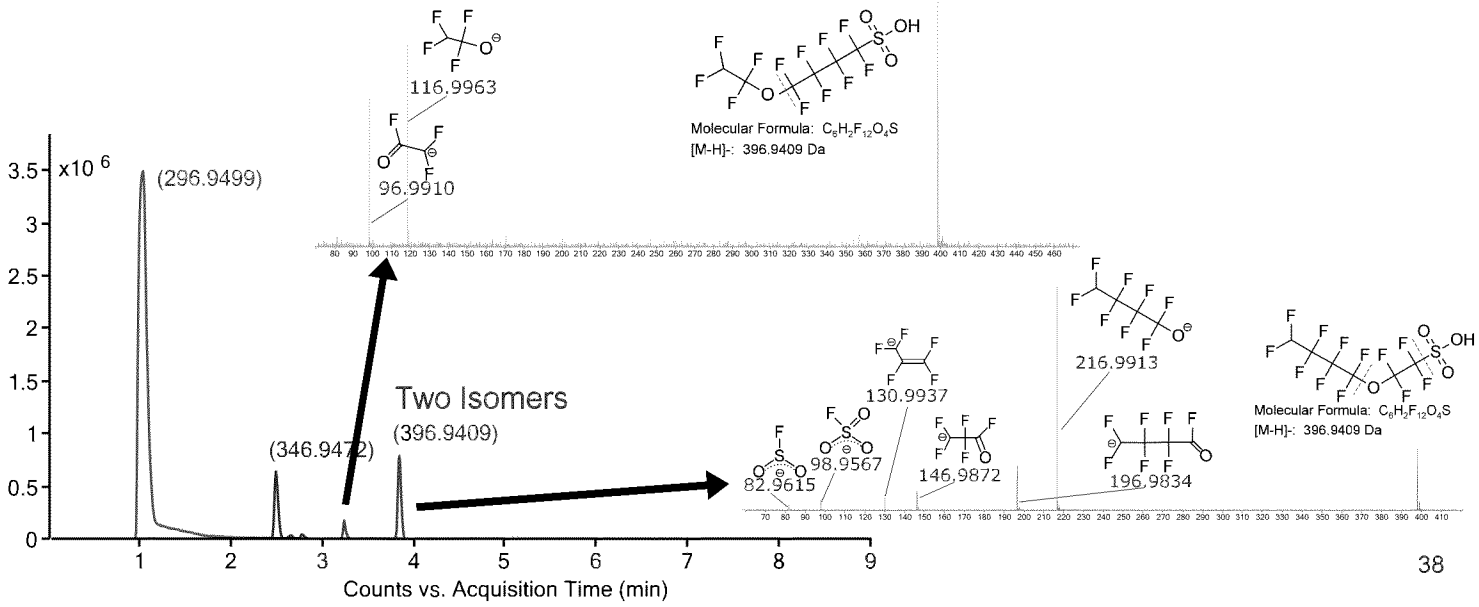
Novel Sulfonated Fluoroethers



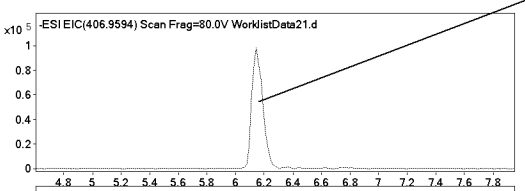
Homologous Series Improves Confirmation

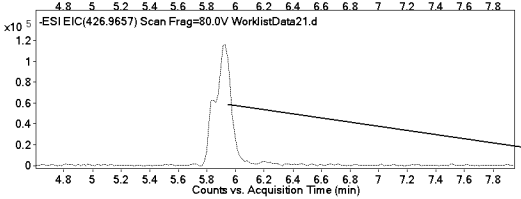


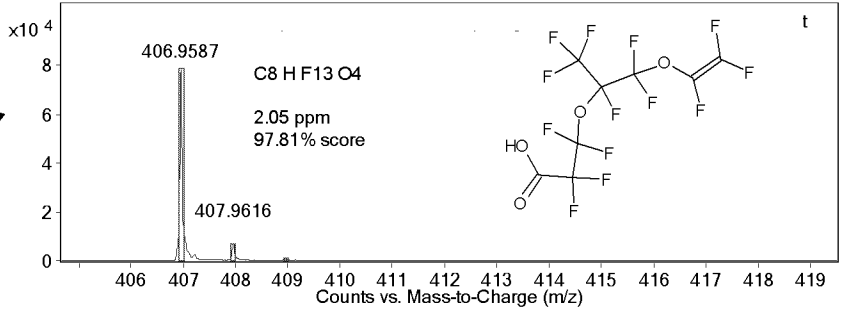
Unique MS/MS Fingerprints

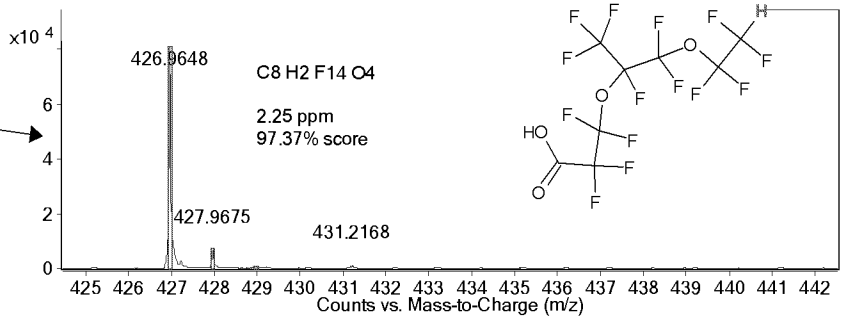


Additional Polyfluoro Ether Carboxylic Acids

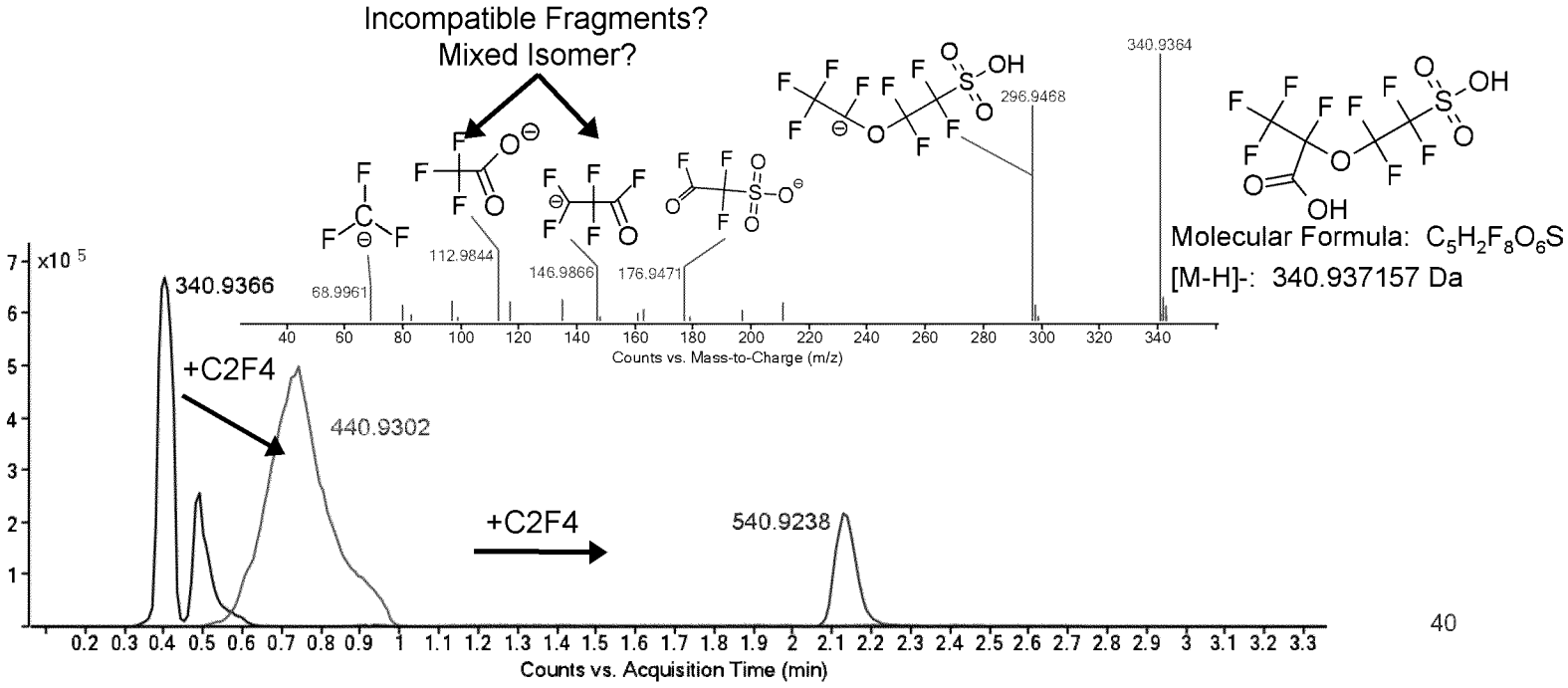






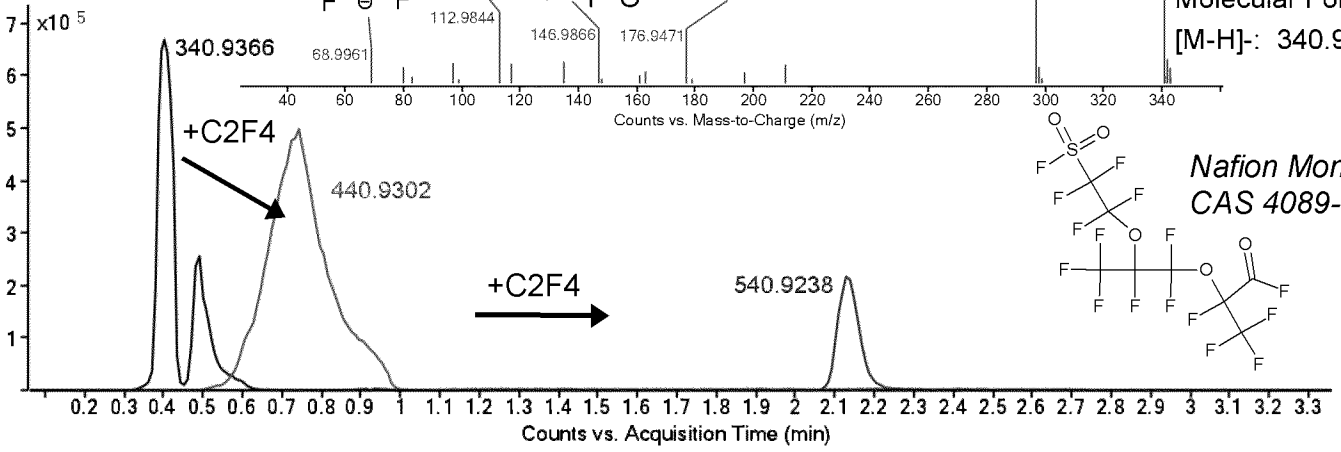


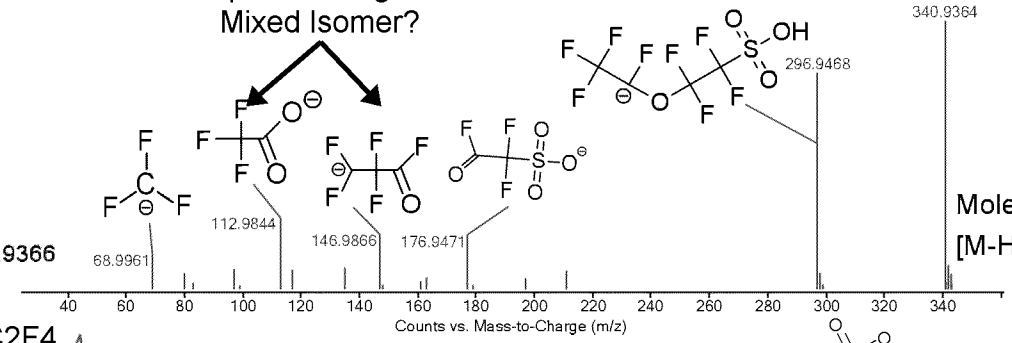
Double Headed Fluoropolymer Intermediates

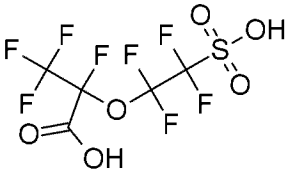


Double Headed Fluoropolymer Intermediates

Incompatible Fragments?
Mixed Isomer?







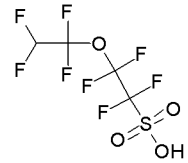
Molecular Formula: $C_5H_2F_8O_6S$

[M-H]-: 340.937157 Da

Nafion Monomer Precursor
CAS 4089-58-1

Retrospective Analysis

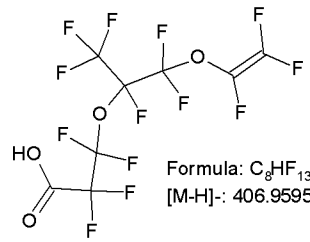
Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×	×	✓	✓	×	✓	×
	2-9-12	✓	✓	✓	✓	✓	✓	×	×
	5-4-12	✓	×	×	[illegible]	[illegible]	×	×	×
	5-4-12	✓	×	×	[illegible]	[illegible]	×	×	×
2014	11-24-14	✓	×	×	[illegible]	[illegible]	×	×	×
2015	5-12-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
	5-12-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
	8-6-15	✓	✓	✓	[illegible]	[illegible]	✓	✓	✓
2017	5-12-17	✓	×	✓	[illegible]	[illegible]	✓	✓	✓
	6-20-17	✓	✓	✓	[illegible]	[illegible]	×	✓	✓
	6-27-17	✓	✓	✓	[illegible]	[illegible]	×	×	×
	7-4-17	✓	✓	✓	✓	✓	×	×	×
	7-11-17	✓	✓	✓	✓	✓	×	×	×
	7-18-17	✓	✓	✓	✓	✓	×	×	×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



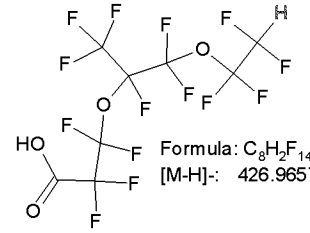
Formula: $C_4H_2F_8O_4S$
[M-H]-: 296.9473 Da

Retrospective Analysis

Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×	×	✓	✓			
	2-9-12	✓	✓	✓	✓	✓			
	5-4-12	✓	×	×	✓	×			
	5-4-12	✓	×	×	×	✓			
2014	11-24-14	✓	×	×	✓	×			
2015	5-12-15	✓	✓	✓	✓	✓			
	5-12-15	✓	✓	✓	×	✓			
	8-6-15	✓	✓	✓	×	✓			
2017	5-12-17	✓	×	✓	×	✓			
	6-20-17	✓	✓	✓	✓	✓			
	6-27-17	✓	✓	✓	✓	✓			
	7-4-17	✓	✓	✓	✓	✓			
	7-11-17	✓	✓	✓	✓	✓			
	7-18-17	✓	✓	✓	✓	✓			×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



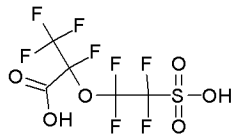
Formula: $C_8HF_{13}O_4$
[M-H]-: 406.9595 Da



Formula: $C_8H_2F_{14}O_4$
[M-H]-: 426.9657 Da

Retrospective Analysis

Year	Date	296.9473	346.9472	396.9409	406.9594	426.9657	340.9372	440.9302	540.9238
2011	11-4-11	✓	✓	✓	✓	✓	×	×	×
	1-26-12	✓	×	×	✓	✓	×	×	×
2012	2-1-12	✓	×				×	✓	×
	2-9-12	✓	✓				✓	×	×
	5-4-12	✓	×				×	×	×
	5-4-12	✓	×				×	×	×
2014	11-24-14	✓	×				×	×	×
2015	5-12-15	✓	✓				✓	✓	✓
	5-12-15	✓	✓				✓	✓	✓
	8-6-15	✓	✓				✓	✓	✓
2017	5-12-17	✓	×				✓	✓	✓
	6-20-17	✓	✓	✓	✓	✓	×	✓	✓
	6-27-17	✓	✓	✓	✓	✓	×	×	×
	7-4-17	✓	✓	✓	✓	✓	×	×	×
	7-11-17	✓	✓	✓	✓	✓	×	×	×
	7-18-17	✓	✓	✓	✓	✓	×	×	×
	7-25-17	✓	✓	✓	✓	✓	×	×	×
	8-3-17	✓	✓	✓	✓	✓	×	×	×



Formula: $C_5H_2F_8O_6S$
[M-H]-: 340.9372 Da

Questions?

Contact Information
strynar.mark@epa.gov

The views expressed in this presentation are those of the author(s) and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.

To: tom.belnick@ncdenr.gov[tom.belnick@ncdenr.gov]
From: Strynar, Mark
Sent: Thur 6/4/2015 8:15:37 PM
Subject: strynar contact
C3_acid_dimer.pdf
DuPont.pdf

Tom,

Nice to chat with you. Here is the info I said I would send you.

1. The WV DEP NDPES permit documents for a new polyfluorinated compound

2. The NSF piece on 1,4-dioxane in NC waters with Detlef Knappe.
http://www.nsf.gov/news/special_reports/science_nation/capefearwatershed.jsp

3. My presentation from the AWWA meeting in April in Wilmington, NC
http://c.ymcdn.com/sites/www.ncsafewater.org/resource/collection/F6F34F34-C0BC-479A-9F40-1E8F09B65B43/WTR_Mon_AM_1025_Strynar.pdf

Let me know if you need more.

Mark

Dr. Mark J. Strynar
US EPA
Physical Scientist
919-541-3706
strynar.mark@epa.gov

To: Strynar, Mark[Strynar.Mark@epa.gov]; Holman, Sheila[sheila.holman@ncdenr.gov]
From: Culpepper, Linda
Sent: Tue 11/7/2017 1:30:59 PM
Subject: FW: [External] monofluoro-malonate
image001.emz

Mark, thank you for running these evaluations to address the concern.

Linda Culpepper
Acting Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

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From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, November 07, 2017 8:29 AM
To: Culpepper, Linda <linda.culpepper@ncdenr.gov>; Johnson, Chris <chris.johnson@ncdenr.gov>; McCord, James <mccord.james@epa.gov>; Detlef R. U. Knappe <knappe@ncsu.edu>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Lang, Johnsie <lang.johnsie@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; Medina-Vera, Myriam <Medina-Vera.Myriam@epa.gov>
Subject: [External] monofluoro-malonate

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to report.spam@nc.gov.

All,

1)I took a very small set of samples to check for the presence of mono-fluoro malonate in the waters at or near Chemours. See the structure below:

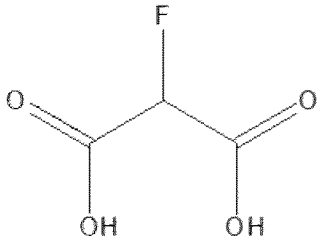
Samples used
Laboratory blank
NCDEQ Chemours outfall 002 Week#1 (around mid June)
NCDEQ Chemours outfall 002 pre shutdown (Around mid October)
Chemours onsite monitoring well LTW03

From my assessment I see NO evidence of the singly charged (m/z 120.9943) or doubly charged ion (m/z 59.9935) of the mono-fluoro malonate at all in these samples. I expect if it were a contaminant it should be in one of the three samples I have chosen. We usually do not go below 100 m/z as the mass accuracy becomes increasingly poor. Thus I reran these three extracts so I can look for the doubly charged ion and re-calibrated down to m/z 50.

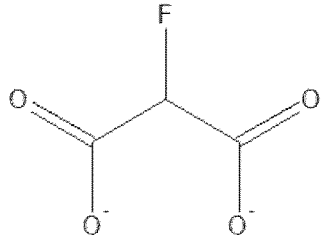
2) I then looked at every sample we have run on the TOFMS that was collected as part of the NCDEQ efforts and screened only for the singly charged ion (m/z 120.9943) as I cannot look at data below 100 m/z for the samples we have already run for the doubly charged ion. I again saw NO evidence in any sample of the mono-fluoro malonate presence.

My opinion would be this is a non-issue after this assessment.

Mark



Molecular Formula: $C_3H_3FO_4$
Monoisotopic Mass: 122.001537 Da
[M-H]-: m/z 120.99426 Da



Monoisotopic Mass: 119.986984 Da
M-2H]-2: m/z 59.9935

Dr. Mark J. Strynar
Physical Scientist
US EPA
National Exposure Research Laboratory
919-541-3706
Strynar.mark@epa.gov

To: Lindstrom, Andrew[Lindstrom.Andrew@epa.gov]
Cc: Strynar, Mark[Strynar.Mark@epa.gov]; McMillan, Larry - RTP[McMillan.Larry-RTP@epa.gov]; Lowman, Amy M[alowman@email.unc.edu]
From: Thornburg, Nathaniel
Sent: Mon 8/26/2013 7:22:58 PM
Subject: RE: Need Data on Biosolids Applications
nc_wbd_dwq_attributes20100924.shp

Andy,

Attached is a HUC12 subbasin shape file for North Carolina.

Please let me know if I can be of any further assistance.

Sincerely,
Nathaniel

****
Nathaniel D. Thornburg – Environmental Engineer III
Division of Water Resources
Aquifer Protection Section – Land Application Unit
1636 Mail Service Center
Raleigh, NC 27699-1636
919-807-6453
919-807-6496 FAX
http://portal.ncdenr.org/web/wq/aps/lau

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From: Lindstrom, Andrew [mailto:Lindstrom.Andrew@epa.gov]
Sent: Monday, August 26, 2013 7:50 AM
To: Thornburg, Nathaniel
Cc: Strynar, Mark; McMillan, Larry - RTP; Lowman, Amy M
Subject: RE: Need Data on Biosolids Applications

Nathaniel,

A subbasin layer would take a lot of the guess work out of this evaluation.

Thank you very much for your help.

Andy

From: Thornburg, Nathaniel [mailto:nathaniel.thornburg@ncdenr.gov]
Sent: Friday, August 23, 2013 11:17 AM
To: Lindstrom, Andrew
Subject: RE: Need Data on Biosolids Applications

Andy,

I should have a GIS layer available for you either by the end of today or early next week. I'm waiting on permission to access our GIS files.

Nathaniel

****
Nathaniel D. Thornburg – Environmental Engineer III
Division of Water Resources
Aquifer Protection Section – Land Application Unit
1636 Mail Service Center
Raleigh, NC 27699-1636
919-807-6453
919-807-6496 FAX
http://portal.ncdenr.org/web/wq/aps/lau

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From: Lindstrom, Andrew [mailto:Lindstrom.Andrew@epa.gov]
Sent: Thursday, August 22, 2013 12:05 PM
To: Thornburg, Nathaniel
Cc: Lowman, Amy M; McMillan, Larry - RTP
Subject: RE: Need Data on Biosolids Applications

Nathaniel,

Is there anyway to mark or indicate drainage subbasins on the map you made for us?

We would like to know which creeks will be receiving overland flow or runoff from the permitted fields that receive applications.

For example, the Dry Creek Subbasin (our sample site at Old Graham Road/NC 87 crossing Dry Creek 35.80344, -79.211211) is long and complex. It looks like there are permitted application sites in this subbasin that are receiving biosolids from Burlington, OWASA, Aqua North Carolina, and the Town of Holly Springs. On the fringes of the subbasin it is hard to guess which way flows would go.

For example, in the southern part of this subbasin it is hard to tell if applications sites will flow north into Dry Creek or south into Brooks Creek, making it difficult to estimate where potential impacts may show up.

Right now I'm looking at this USGS topographical map (http://ngmdb.usgs.gov/maps/TopoView/) and I'm guessing which way the water will flow from each permitted application site.

Do you know if there is any official map that shows the boundaries of the subbasins? Is it available as a layer for the permit map you have made for us?

Thank you,

Andy

From: Thornburg, Nathaniel [mailto:nathaniel.thornburg@ncdenr.gov]
Sent: Wednesday, July 10, 2013 11:31 AM
To: Lindstrom, Andrew
Subject: FW: Need Data on Biosolids Applications

****

Nathaniel D. Thornburg – Environmental Engineer III
Aquifer Protection Section – Land Application Unit
1636 Mail Service Center
Raleigh, NC 27699-1636
919-807-6453
919-807-6496 FAX
http://portal.ncdenr.org/web/wq/aps/lau

DISCLAIMER: All e-mails sent to and from this account are subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Thornburg, Nathaniel
Sent: Thursday, June 06, 2013 3:35 PM
To: 'McMillan, Larry'
Cc: Lindstrom, Andrew; Strynar, Mark; Risgaard, Jon
Subject: RE: Need Data on Biosolids Applications

Larry,

Attached is an Excel file with all of our non-discharge disposal fields in your area of interest. This table encompasses our disposal sites in the portion of the Cape Fear River Basin north of US 64. Please note that some of these fields lie outside of the Cape Fear

River Basin and south of US 64 because I did not have an exact way to locate the area of interest. Instead, I focused the data based on max/min latitudes and longitudes.

I also mapped the attached spreadsheet for your use. You can download this map at:
https://www.google.com/fusiontables/DataSource?docid=1qxiATYhgVHkt7T4CoYhy2q703WRO8QAdxuoCLY8#map:id=3

These documents should satisfy items 1 and 2 of your request. However, due to the intensive time commitment involved, I cannot provide data for 3, 4 and 5 at this time.

If using this map and spreadsheet allows you to focus on a smaller subset of fields based on locations/watersheds and associated high-levels of PFCs, we should be able to provide the requested data (i.e., 3, 4 and 5) for a specific area of interest.

If you have any questions, please contact me at your convenience.

Sincerely,
Nathaniel

****

Nathaniel D. Thornburg – Environmental Engineer III
Aquifer Protection Section – Land Application Unit
1636 Mail Service Center
Raleigh, NC 27699-1636
919-807-6453
919-807-6496 FAX
http://portal.ncdenr.org/web/wq/aps/lau

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From: McMillan, Larry [mailto:McMillan.Larry-RTP@epa.gov]
Sent: Wednesday, May 29, 2013 10:41 AM
To: Thornburg, Nathaniel
Cc: Lindstrom, Andrew; Strynar, Mark
Subject: Need Data on Biosolids Applications

Hi Nathaniel,

Our group have been monitoring perfluorinated compound (PFCs) on the Haw River for the past several years. Recently we sampled various tributaries on the Haw River upstream north of HWY 64 and found elevated levels of PFCs. We are researching probable sources of these high levels PFCs. One area we are looking at is biosolids applications north of Hwy 64 on the Haw River.

Can you provide me or direct me to the source for the following?

1. Application sites for sludge, reuse spray irrigation and other applications available.
2. Location of applications sites
3. Historical years of applications
4. Amount applied to the land
5. Sources of applications

Thank you

Larry McMillan
Envrionmental Scientist - SEEP
USEPA-NERL-EMAB
Voice 919-541-5647
Fax 919-541-0905
MD E-205-04

To: Lam.H.Leung-1@chemours.com[Lam.H.Leung-1@chemours.com]
From: Strynar, Mark
Sent: Wed 4/15/2015 12:38:22 PM
Subject: RE: Catching Up and Fluoros 2015
lindstrom et al., 2011 Decatur PFCs in water SI.pdf
lindstrom et al., 2011 Decatur PFCs in water.pdf
Nakayama et al., 2010 PFCs in UMRBA samples SI.pdf
Nakayama et al., 2010 PFCs in UMRBA samples.pdf
090809 Revised Whole Fish SOP.pdf

Lam,

As soon as it is accepted I will send you a copy. I am hopeful, but with ES&T it can go either way.

With respect to PFCS in surface water. We have published numerous papers on use of the methods we developed and have had very good success. I have attached a couple. The key QA/QC most people miss is a trip spike. We found if you do not spike a water sample and send it out in the field to experience all of the shipping and storage conditions, you do not properly account for losses. Lab spike prior to extraction DO NOT get at the losses we see in water samples. The 2 papers attached (Lindstrom et al., and Nakayama et al.,) talk a lot about this.

However on thing we have changed is we no longer do the step for elution containing methanol and MTBE. We now only elute with methanol with 0.03% NH4OH after a pH4 buffer wash of the SPE cartridge and a 100% methanol wash. This preconditioning, washing and elution strategy is covered in section 10.5 of the attached SOP we used for whole fish homogenate (and fish fillets). However we use it for lots of water samples and it works very well.

If you are being asked to use method 537 for surface water I would strongly contest this. It does not work well at all except in very clean water samples (likely well water).

Mark

Dr. Mark J. Strynar
US EPA
Physical Scientist
919-541-3706
strynar.mark@epa.gov

From: Lam.H.Leung-1@chemours.com [mailto:Lam.H.Leung-1@chemours.com]
Sent: Tuesday, April 14, 2015 11:13 PM
To: Strynar, Mark
Subject: RE: Catching Up and Fluoros 2015

Hi Mark,

Thank you for your message and based on the data you've shown below, I totally agree that the linear structure is the "correct" structure. So I can only guess that you had a productive visit with Chris Higgins at Colorado! I was quite impressed with one of his students' presentations at SETAC on non-targeted analysis and it seems to me that his group is doing some very interesting work out there and I'm sorry to hear that you will not be attending FLUOROS but I'm certain that you'll have a wonderful time with your family at Yellowstone (yes, I'm jealous)!!

So may I request for you to share with me the manuscript when it's accepted for publication if that's possible?

As for the Method 537, I'm in total agreement with you about the validity of this method when it comes to other water samples. However, I don't recall there's a study out there that reported the issues with the SDVB SPE column when it comes to water samples other than drinking water samples and I'd appreciate it if you can bring that to my attention. I had proposed similar study in the past and due to budgetary and other reasons, we never got this off the ground.

Anyway, I look forward to seeing your paper out there!

Best Regards,
Lam

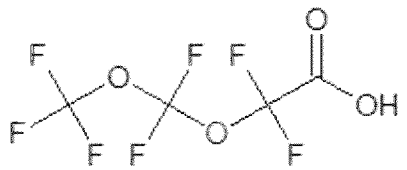
From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Tuesday, April 14, 2015 9:24 AM
To: LEUNG, LAM-WING H
Subject: RE: Catching Up and Fluoros 2015

Hi Lam,

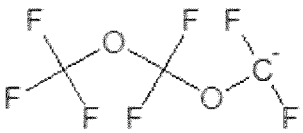
As it turns out I will now not be going to FLUOROS. It overlaps with my family vacation to Yellowstone this summer.

I got clearance to submit the paper about 2 weeks ago and I did so. I am waiting to hear back, hopefully soon.

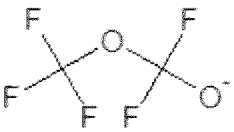
I ended up spending some time on a QQQ-TOFMS during a trip to Colorado School of Mines back in early March. I am now pretty confident in the structure being linear. I could see a series of fragments than all appear to lead back to this structure when run on a QQQ-TOFMS. For example with the m/z 244 shown below I see the following fragments that all point back to the structure. I also see a 84.9? this is a CF3O (not shown). I did similar work for the smaller and larger MW compounds but this is one compound I spent the most time on. I could not see how to get these masses with it being branched rather than linear.



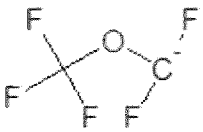
Molecular Formula: $C_6HF_7O_4$
Monoisotopic Mass: 245.976306 Da
$[M-H]^-$: 244.969029 Da



Molecular Formula: $C_3F_7O_2$
Monoisotopic Mass: 200.9792 Da



Molecular Formula: $C_2F_5O_2$
Monoisotopic Mass: 150.982394 Da



Molecular Formula: C_2F_5O
Monoisotopic Mass: 134.987479 Da

I had not heard of using method 537 for samples other than DW samples. If it were me I would not use it for any samples other than DW. As all the compounds covered under this method are anionic I would use a Waters Oasis WAX (weak anion exchange) SPE cartridge. Using the suggested polystyrenedivinylbenzene (SDVB) SPE column in surface water, wastewater and GW will accumulate lots of matrix interferences that would not work well at all. I believe this is the phase used in the Waters Oasis HLB column and we moved away from it for this reason. As I am not very familiar with method 537 I am unsure if the SPE cartridge can be substituted. I suspect not.

I was aware of the transition of DuPont to Chemours.
Take Care,
Mark

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From: Lam.H.Leung-1@chemours.com [mailto:Lam.H.Leung-1@chemours.com]
Sent: Monday, April 13, 2015 10:17 AM
To: Strynar, Mark
Subject: RE: Catching Up and Fluoros 2015

Hi Mark,

Sorry I did not get back to you sooner and I totally understand your situation on the poster proposition and for now I plan on presenting a poster on the subject on analytical with Robin Vestergren.

So have you made any progress getting clearance from your management regarding your manuscript and did the planned Orbitrap experiments get you more insight about the exact structure. As I mentioned before, the straight chain one can be a potential byproduct in one of our processes in Fayetteville and it'd be interesting to see what you find out (straight or branched).

Anyway, we've been hearing more and more about Method 537 these days from a number of our EPA contacts and are you aware that the folks at EPA are making this method the standard method (for not just drinking water but also for other water samples)?

By the way, I believe you are aware that we'll be transitioning to the new company and it'll be called Chemours such that all of our email addresses will be changed to @chemours instead of @dupont but rest assure, all emails sent to @dupont will be directed to the proper person for at least 2 years.

Hope all's well with you and thanks.

Best,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Thursday, February 12, 2015 7:48 AM
To: LEUNG, LAM-WING H
Subject: RE: Catching Up and Fluoros 2015

Hi Lam,

I had a good Holiday break. I had some comments from my management as part of the clearance I have been working through. It has not yet been submitted.

In addition I have taken a new look at the structures in question. I had scheduled some time on an Orbitrap to try to get unique fragments but my colleagues instrument was down. I am pretty confident in the formula, but perhaps the structure is not simply linear. I am adding a section to the paper to include potential branching conformations.

Concerning the co-authorship on a poster, I will respectively decline. Co-authorship of an item between a regulatory agency and a regulated company is something I try to avoid. Please understand. Mary Kaiser did this in the past and did a very good job. I am sure you will do so as well.

Mark

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Physical Scientist
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strynar.mark@epa.gov

From: Lam.H.Leung-1@chemours.com [mailto:Lam.H.Leung-1@chemours.com]
Sent: Monday, February 09, 2015 4:42 PM
To: Strynar, Mark
Subject: Catching Up and Fluoros 2015

Hi Mark,

Sorry I have not responded earlier to your note and I hope that you had a wonderful and relax holiday season. The last time I checked, the structure you indicated in your previous note, the straight chain one, probably make more sense as the ring structure is likely not stable. As far as I know and after some checking, it might be possible that the compound is a byproduct from one of our processes.

So have you submitted your manuscript as I recall you mentioning it almost getting clearance from your management?

One last item is that I understand that you are going to attend the Fluoros 2015 organized by Chris Higgins. Will you be interested in authorship with me on a poster with the emphasis on the "Dos and Don'ts in Analytical for PFAS analysis". With your vast experience in PFAS analysis and my dealings with our contract labs, I believe it'd be a good topic to present. Please let me know your thoughts on this.

Best Regards,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Monday, December 08, 2014 8:55 AM
To: LEUNG, LAM-WING H
Subject: RE: CAS #

Hi Lam. I had a good Thanksgiving and I hope you did. I am not involved with any groups in CA doing this kind of work. Sorry.

I went back and took a closer look at the suggested structures. I am still thinking this is what we have. One thing we cannot rule out is branching in the structure rather than straight chains. My chemist looked at the chemicals in the TSCA inventory reported at the Fayetteville site and thinks these compounds are possible from reactions of some of these starting materials found there.

Mark

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From: Lam.H.Leung-1@dupont.com [mailto:Lam.H.Leung-1@dupont.com]
Sent: Friday, December 05, 2014 11:13 AM
To: Strynar, Mark
Subject: RE: CAS #

Hi Mark,

Thank you for your note and I hope that you and your family had a great Thanksgiving.

As for the structure you mentioned below, I'm in the process of following up with our chemist about it and will let you know.

I came across this "report" recently and am wondering whether you are involved with this group or not? I can only speculate that they are using similar instrumentation as you do or an Orbitrap for identification. Perhaps you might have more insights.

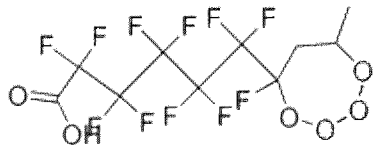
Best,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Monday, November 24, 2014 7:38 AM
To: LEUNG, LAM-WING H
Subject: RE: CAS #

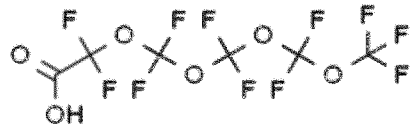
Hi Lam. I was going to be stuck in DC due to a delayed flight in Chicago, thus I was rebooked direct from Chicago to Raleigh. I got home 45 minutes before my original scheduled flights. However, I had to wait 1 hr. for my wife to arrive anyway.

Here is the CAS# of what I think we are seeing. I am taking a closer look this week but this is compound I believe it to be. It is clearly perfluorinated and there is a repeating CF2O subunit due to fragments and offsets.
CAS # 39492-90-5

However I see it drawn this way



And this way



With the same CAS#. However I get a 200.9794 fragment that is a C3 F 7 O2 it appears. I do not see how I can get that fragment from the top compound.

Mark

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Supporting Information

Title:
Cross Sectional Determination of Perfluorinated Compounds in the Upper Mississippi River Basin

Authors:
Shoji F. Nakayama, Mark J. Strynar, Jessica L. Reiner, Amy D. Delinsky, and Andrew B. Lindstrom

Number of pages: 25

Number of tables: 7

Number of figures: 5

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Method and materials

Water sampling

Total of 177 samples were collected from 88 sites in the Upper Mississippi Basin and a part of Missouri River Basin (Figure 1 and Figure S1–S4). Samples were collected by researchers from three state and one federal agencies under the collaboration with the Upper Mississippi River Basin Association.

Recovery and matrix effect

Recoveries were calculated based on a matrix matched spike extraction. Local pond water was spiked with known amounts of perfluorinated compounds (PFCs) and then extracted using a solid phase extraction (SPE) cartridge. After elution of the PFCs from the cartridge, the internal standards were added to the eluate. The same volume of unspiked pond water was extracted using a second SPE cartridge. After elution, the same amount of PFCs and internal standards were added to the eluate. The area ratio of the first sample (pre-addition to cartridge) was divided by that of the second eluate (post-addition) to give a recovery determination. The equation used for the calculation is shown below. Each level had five replicates.

$$= (\quad - \quad)/(\quad - \quad)$$, where:

Rc is the recovery

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SB is the response for the extract of matrix spiked before SPE

SA is the response for the extract of matrix spiked after SPE

Blk is the response for the extract of matrix without spike

Matrix effects were calculated comparing a blank matrix extract spiked with PFCs to a blank methanol solution spiked with the same amount of PFCs. Unspiked pond water was extracted using the SPE method described above. After elution, PFCs and internal standards were added to the eluate. The same volume of methanol was spiked with the same amount of PFCs and internal standards. The area ratio of the first sample (post-spike) was divided by that of the methanol solution (solvent) to give a matrix effect determination. The equation used for the calculation is shown below. Each level had five replicates.

$= (\quad - \quad)/ \quad$, where:

ME is the matrix effect

SA is the response for the extract of matrix spiked after SPE

Sstd is the response for elution solvent spiked (no matrix)

Blk is the response for the extract of matrix without spike

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Tables

Table S1. UPLC gradient program (A) and Quatro Premier MS parameters (B)

(A)

Time	A	B	Curve
0.00	60	40	initial
0.50	60	40	6
3.50	10	90	6
3.60	0	100	6
4.50	0	100	6
4.60	60	40	6
6.00	60	40	6

A: 2 mM ammonium acetate in deionized water with 5% methanol, B: 2 mM ammonium acetate in 100% methanol

(B)

Instrument Parameters	
Capillary (kV)	−0.40
Source temperature	150°C
Desolvation temperature	350°C
Cone gas flow	2 L/hr
Desolvation gas flow	1200 L/hr
Cone voltage	Optimized for
Collision energy	each compound

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Table S2. MS transition monitored for target compounds

Analyte	Acronym	MS/MS Transition		IS used
		Quantifier	Qualifier	
Perfluorobutanoic acid	C4	212.80 > 168.75	NA[a]	MC6
Perfluoropentanoic acid	C5	262.85 > 218.75	NA[a]	MC6
Perfluorohexanoic acid	C6	312.70 >268.70	312.70 >118.70	MC6
Perfluoroheptanoic acid	C7	362.65 > 318.70	362.65 > 168.65	MC8
Perfluorooctanoic acid	C8 or PFOA	412.60 > 368.65	412.60 > 168.70	MC8
Perfluorononanoic acid	C9	462.60 > 418.60	462.60 > 218.75	MC8
Perfluorodecanoic acid	C10	512.60 > 468.55	512.60 > 218.75	MC11
Perfluoroundecanoic acid	C11	562.60 > 518.60	562.60 > 268.65	MC11
Perfluorododecanoic acid	C12	612.60 > 568.55	612.60 > 168.75	MC11
Perfluorobutane sulfonate	PFBS	298.70 > 98.80	298.70 > 79.90	MPFHS
Perfluorohexane sulfonate	PFHS	398.65 > 98.80	398.65 > 79.90	MPFHS
Perfluorooctane sulfonate	PFOS	498.65 > 98.80	498.65 > 79.90	MPFOS
Perfluorodecane sulfonate	PFDS	598.60 > 98.80	598.60 > 79.90	MPFOS
1,2-$^{13}C_2$-Perfluorohexanoic acid	MC6	314.75 > 269.75	-	Internal Standards (IS)
1,2,3,4,5,6,7,8-$^{13}C_2$-Perfluorooctanoic acid	MC8	402.65 > 83.90	-	
1,2-$^{13}C_2$-Perfluoroundecanoic acid	MC11	429.65 > 375.75	-	
$^{18}O_2$-Perfluorohexane sulfonate	MPFHS	502.60 > 83.90	-	
$^{18}O_2$-Perfluorooctane sulfonate	MPFOS	564.60 > 519.65	-	

a: No secondary MS/MS transition was found for C4 and C5 that could be used as qualifier ions.

Table S3. Method performance characteristics: Mean, minimum, and maximum recoveries and relative standard deviation (RSD)

Compounds	L-QC[a], 5.0 ng/L					L-QC[a], 50 ng/L					F-QC[b], 50 ng/L				
	N	Mean	RSD	Min	Max	*N*	Mean	RSD	Min	Max	*N*	Mean	RSD	Min	Max
C12	16	91.6	11	79.8	116	16	93.0	5.5	85.7	110	16	93.5	12	77.0	108
C11	16	93.2	9.5	81.3	118	16	92.8	11	82.2	108	16	102	14	79.4	124
C10	16	89.3	7.5	81.1	108	16	91.9	12	77.1	115	16	100	14	76.1	123
C9	16	94.6	11	79.0	111	16	98.5	11	86.3	116	16	101	15	75.9	119
C8	16	94.4	5.4	85.8	105	16	93.2	12	82.6	111	16	103	15	79.7	125
C7	16	104	14	80.2	117	16	96.5	5.9	87.9	105	16	96.6	14	75.9	122
C6	16	100	3.8	90.5	108	16	90.2	5.2	84.4	97.7	16	95.5	15	75.8	119
C5	14	104	8.5	90.2	118	14	105	5.2	92.4	109	12	108	6.5	94.5	119
C4	14	101	7.5	87.7	112	14	99.1	9.7	83.3	116	12	99.5	10	85.8	123
PFDS	15	99.4	10	80.0	111	15	92.6	11	78.2	110	15	91.7	12	75.0	105
PFOS	16	96.2	6.9	82.7	107	16	95.1	4.5	87.2	104	16	97.9	12	75.2	123
PFHS	16	99.0	4.9	90.4	106	16	100	5.8	89.6	111	16	105	10	86.9	125
PFBS	16	95.9	7.8	84.4	111	16	89.7	6.1	76.7	100	16	95.4	10	79.8	113

a: Spike samples prepared at the same time as calibration curves in the laboratory
b: Spike sample prepared and carried to field

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Table S4. Perfluorinated compounds in samples collected by Minnesota State personnel

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFD5	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		107	105	103	110	117	97.4	101	103	98.7	85.0	92.3	93.5	85.9
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-1	–	< 1	< 1	< 1	< 1	< 1	2.41	< 1	ND	2.28	< 1	< 1	< 1	< 1
MS/MN-2	–	< 1	< 1	< 1	< 1	< 1	2.46	1.04	ND	2.77	< 1	< 1	< 1	< 1
MS/MN-3	39	< 1	< 1	< 1	< 1	< 1	2.63	1.14	< 1	3.52	< 1	< 1	< 1	< 1
MS/MN-3D	39	< 1	< 1	< 1	< 1	< 1	< 1	1.18	< 1	2.18	ND	< 1	< 1	ND
MS/MN-4	280	< 1	< 1	< 1	< 1	< 1	2.61	1.25	ND	3.01	< 1	< 1	< 1	< 1
MS/MN-5	290	< 1	< 1	< 1	< 1	1.34	4.62	1.49	ND	4.09	< 1	< 1	< 1	< 1
MS/MN-6	290	ND	< 1	< 1	< 1	1.24	4.36	1.60	< 1	3.55	< 1	< 1	< 1	< 1
MS/MN-7	290	< 1	< 1	< 1	< 1	1.17	2.31	3.25	ND	3.17	< 1	< 1	< 1	< 1
MS/MN-10	420	< 1	ND	< 1	< 1	< 1	< 1	< 1	ND	2.49	ND	< 1	< 1	< 1
MS/MN-11	420	< 1	< 1	< 1	< 1	1.21	4.58	1.74	< 1	3.54	< 1	< 1	< 1	< 1
MS/MN-12	420	< 1	< 1	< 1	< 1	1.20	2.36	< 1	< 1	3.42	< 1	< 1	< 1	< 1
MS/MN-13	470	< 1	< 1	< 1	1.14	2.14	6.62	2.39	< 1	2.74	< 1	< 1	< 1	< 1
MS/MN-13D	470	< 1	< 1	< 1	< 1	< 1	1.30	< 1	< 1	2.98	< 1	< 1	< 1	ND
TR/MN-1[b]	–	< 1	< 1	< 1	2.73	50.5	10.5	53.4	7.60	2.60	< 1	124	169	19.2
TR/MN-2	150	< 1	ND	< 1	< 1	1.10	2.66	1.39	ND	1.26	ND	1.35	< 1	< 1
TR/MN-3	21	< 1	< 1	< 1	< 1	< 1	< 1	1.09	< 1	3.49	< 1	< 1	< 1	ND

ED_002003J_00101450-00007

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		104	91.5	92.2	92.9	89.4	117	97.9	106	94.0	91.4	89.5	98.8	95.3
L-QC, 50 ng/L		90.2	83.4	85.9	89.5	82.6	90.6	87.3	109	102	85.7	91.8	95.2	90.4
F-QC, 50 ng/L		82.4	105	99.0	76.1	86.7	99.6	102	103	99.1	76.2	92.7	96.1	87.3
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-14	470	< 1	< 1	< 1	< 1	1.11	< 1	< 1	ND	2.73	< 1	< 1	< 1	ND
MS/MN-15	660	< 1	ND	< 1	< 1	< 1	1.45	< 1	ND	2.62	ND	< 1	< 1	ND
MS/MN-16	660	< 1	< 1	< 1	< 1	1.44	1.06	1.96	< 1	3.74	< 1	< 1	< 1	ND
MS/MN-17	660	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	< 1	< 1	< 1	< 1	ND
MS/MN-17D	660	< 1	< 1	< 1	< 1	1.73	< 1	< 1	ND	2.41	ND	< 1	< 1	ND
MS/MN-18	660	< 1	< 1	< 1	< 1	1.36	< 1	< 1	ND	1.74	ND	< 1	< 1	< 1
MS/MN-18D	660	< 1	< 1	< 1	< 1	1.28	< 1	< 1	ND	1.26	< 1	1.78	< 1	< 1
MS/MN-19	660	< 1	< 1	< 1	< 1	1.81	< 1	< 1	< 1	1.60	< 1	1.74	< 1	< 1
MS/MN-19D	660	< 1	< 1	< 1	< 1	2.40	< 1	< 1	< 1	2.09	ND	2.63	< 1	< 1
MN/MN-1	17	< 1	< 1	< 1	< 1	1.15	< 1	< 1	ND	1.17	ND	ND	< 1	ND
MN/MN-2	110	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.41	ND	2.41	ND	ND
MN/MN-3	690	< 1	< 1	< 1	< 1	1.33	1.80	< 1	ND	1.13	ND	< 1	< 1	ND
MN/MN-3D	690	< 1	< 1	< 1	< 1	1.10	1.00	< 1	ND	< 1	ND	1.14	< 1	< 1
MN/MN-4	690	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.81	< 1	< 1	< 1	ND
MN/MN-5	690	< 1	< 1	< 1	< 1	1.26	< 1	< 1	ND	1.82	< 1	< 1	< 1	ND
MN/MN-6	460	< 1	< 1	< 1	< 1	1.58	< 1	< 1	ND	< 1	ND	1.92	< 1	ND
MN/MN-6D	460	< 1	< 1	< 1	< 1	1.00	< 1	< 1	< 1	< 1	ND	< 1	< 1	ND
TR/MN-4	79	< 1	< 1	< 1	< 1	1.37	1.41	< 1	ND	4.87	ND	< 1	ND	ND

July

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		89.5	81.9	84.8	90.4	95.8	91.3	90.5	109	103	111	102	99.2	88.2
L-QC, 50 ng/L		95.6	84.1	77.1	86.3	83.8	87.9	86.2	106	93.8	106	95.9	104	76.7
F-QC, 50 ng/L		93.0	86.4	89.7	106	111	115	115	108	95.2	105	82.6	101	87.3
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
TR/MN-1[b]	–	< 1	< 1	< 1	6.36	95.6	28.6	128	44.9	12.5	< 1	296	365	42.3
TR/MN-1D	–	< 1	< 1	< 1	6.25	89.5	32.0	140	44.6	14.7	ND	270	371	41.1
TR/MN-1DD	–	< 1	< 1	< 1	6.59	91.3	28.4	126	45.0	12.0	ND	296	365	41.7

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August

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		82.0	99.8	98.0	103	102	114	108	102	112	80.0	107	101	111
L-QC, 50 ng/L		93.3	95.5	92.7	97.1	93.5	97.4	93.1	92.4	83.3	98.4	104	108	87.6
F-QC, 50 ng/L		106	99.4	94.7	99.3	105	104	107	101	85.8	104	107	115	96.7
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-1	–	ND	ND	ND	ND	ND	8.24	1.45	< 1	1.83	ND	ND	ND	< 1
MS/MN-2	–	1.28	< 1	< 1	< 1	3.49	13.2	3.29	1.39	< 1	ND	< 1	ND	< 1
MS/MN-3	11	ND	ND	ND	< 1	< 1	4.88	1.09	< 1	1.79	ND	ND	ND	< 1
MS/MN-3D	11	ND	ND	ND	< 1	< 1	5.36	1.31	< 1	ND	ND	1.30	ND	< 1
MS/MN-4	21	3.07	ND	ND	< 1	1.14	2.75	< 1	1.11	< 1	ND	3.48	ND	< 1
MS/MN-5	25	< 1	< 1	< 1	< 1	< 1	2.41	< 1	ND	2.38	ND	< 1	ND	< 1
MS/MN-6	25	< 1	< 1	< 1	1.98	3.63	5.65	2.29	< 1	2.44	ND	< 1	1.39	1.40
MS/MN-7	25	< 1	< 1	ND	< 1	1.48	3.95	1.41	< 1	2.00	ND	< 1	ND	< 1
MS/MN-8	25	< 1	1.97	2.46	8.52	8.18	6.07	5.81	1.96	2.27	ND	245	3.02	84.1
MS/MN-8D	25	4.36	< 1	ND	5.66	5.48	7.06	5.19	2.42	2.43	ND	206	1.09	46.8
MS/MN-9	25	ND	ND	ND	< 1	< 1	3.15	< 1	< 1	1.74	ND	< 1	< 1	< 1
MS/MN-9D	25	ND	ND	ND	< 1	1.34	4.47	1.10	< 1	2.14	ND	< 1	< 1	< 1
MS/MN-10	47	< 1	< 1	ND	ND	2.01	5.72	1.68	< 1	1.72	ND	< 1	< 1	< 1
MS/MN-11	47	< 1	ND	ND	< 1	1.35	3.35	1.00	< 1	2.95	ND	< 1	< 1	< 1
MS/MN-12	47	ND	< 1	ND	< 1	1.23	4.15	1.55	ND	2.10	ND	ND	1.86	< 1
MS/MN-13	50	ND	ND	ND	< 1	1.27	< 1	1.17	< 1	2.37	ND	ND	1.00	< 1
MS/MN-13D	50	ND	ND	ND	< 1	1.20	2.21	1.18	< 1	2.46	ND	1.62	< 1	< 1
MS/MN-14	6.6	ND	< 1	ND	ND	2.20	3.26	1.83	< 1	4.21	ND	< 1	ND	< 1
MS/MN-15	72	3.83	ND	ND	1.20	2.65	4.02	2.30	1.95	< 1	ND	20.3	4.04	3.57
MS/MN-16	72	ND	ND	< 1	< 1	5.13	4.34	3.48	1.51	4.11	ND	4.05	1.92	1.14
MS/MN-17	72	ND	< 1	1.16	2.01	8.01	4.71	5.76	2.14	6.26	ND	10.2	2.28	< 1
MS/MN-17D	72	< 1	ND	< 1	1.35	9.29	3.69	6.20	3.22	5.70	ND	4.68	3.22	< 1
MS/MN-18	72	1.76	< 1	< 1	1.38	7.96	4.16	5.67	3.92	12.7	ND	13.6	5.98	2.74
MS/MN-18D	72	2.52	< 1	< 1	2.53	9.42	4.41	6.40	3.07	11.0	ND	12.8	5.32	3.54
MS/MN-19	72	< 1	< 1	1.35	2.54	23.8	4.19	9.23	6.15	34.2	ND	29.0	13.4	15.0
MS/MN-19D	72	< 1	ND	< 1	1.90	22.5	3.50	9.35	5.54	27.5	ND	18.9	12.8	8.84

(continued)

August—continued

Samples, ng/L	Flow[a]	C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
MN/MN-1	–	< 1	ND	ND	ND	< 1	2.81	1.07	< 1	ND	ND	5.19	ND	< 1
MN/MN-2	–	< 1	< 1	ND	ND	1.13	4.10	1.10	ND	1.82	ND	< 1	ND	< 1
MN/MN-3	–	ND	< 1	ND	< 1	1.46	1.67	< 1	ND	1.69	ND	1.97	< 1	< 1
MN/MN-3D	–	1.32	ND	< 1	< 1	2.14	3.73	1.80	< 1	1.25	ND	9.20	< 1	< 1
MN/MN-4	–	1.88	ND	ND	ND	< 1	3.98	2.26	1.26	< 1	ND	6.47	2.00	ND
MN/MN-5	–	< 1	ND	ND	ND	1.46	1.80	1.40	< 1	1.52	ND	6.02	< 1	< 1
MN/MN-6	44	2.21	ND	< 1	1.14	3.95	5.14	3.60	3.00	1.47	ND	8.76	5.87	1.15
MN/MN-6D	44	ND	ND	< 1	< 1	4.06	3.74	2.92	2.07	1.57	ND	4.42	2.87	< 1
TR/MN-4	50	ND	ND	ND	ND	2.00	4.32	1.61	1.27	2.77	ND	2.10	< 1	< 1

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

b: Collected from a creek to the Wild Rice Lake Reservoir that potentially receives a run-off from a historical fire-training site at the Duluth International Airport. This stream is not a part of the Upper Mississippi River Basin but within the Cloquet River Watershed.

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Table S5. Perfluorinated compounds in samples collected by Wisconsin State personnel

March (all sites were covered by ice)

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		89.8	89.3	95.1	108	105	107	97.0	NA	NA	85.1	101	100	108
L-QC, 50 ng/L		85.7	108	111	111	109	105	97.7	NA	NA	78.2	104	105	88.5
F-QC, 50 ng/L		88.0	79.4	85.4	83.3	79.7	85.7	75.8	NA	NA	97.4	123	125	108
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	340	ND	ND	< 1	< 1	6.69	< 1	2.65	NA	NA	ND	14.2	3.76	6.27
MS/WI-3D	340	< 1	ND	< 1	2.20	9.47	1.79	2.68	NA	NA	ND	15.6	3.42	5.68
MS/WI-11	630	< 1	< 1	< 1	< 1	5.01	< 1	1.54	NA	NA	ND	9.44	2.85	4.25
TR/WI-1	–	< 1	ND	< 1	ND	< 1	< 1	2.01	NA	NA	ND	4.69	ND	1.90
TR/WI-2	–	< 1	< 1	< 1	< 1	< 1	1.44	1.94	NA	NA	ND	2.07	< 1	ND
WI/WI-1	–	< 1	ND	< 1	< 1	2.86	1.50	3.38	NA	NA	ND	7.03	< 1	1.93

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		84.5	92.3	84.7	111	93.6	81.4	101	118	109	99.3	90.5	96.8	84.4
L-QC, 50 ng/L		91.7	103	97.2	116	109	103	96.5	104	92.6	110	96.2	104	84.8
F-QC, 50 ng/L		108	87.9	87.2	88.9	85.2	87.3	79.0	107	123	95.1	120	124	102
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	2000	< 1	ND	< 1	ND	< 1	< 1	< 1	ND	ND	ND	1.71	< 1	ND
MS/WI-11	2700	< 1	ND	< 1	< 1	2.31	ND	< 1	ND	ND	ND	3.54	< 1	2.60
MS/WI-11D	2700	< 1	ND	< 1	< 1	2.54	< 1	< 1	ND	ND	ND	4.16	1.00	2.24
TR/WI-1	650	ND	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	< 1	< 1	ND
TR/WI-2	370	< 1	ND	< 1	ND	< 1	ND	< 1	ND	ND	ND	< 1	ND	ND
WI/WI-1	970	< 1	< 1	< 1	< 1	2.12	< 1	1.58	ND	ND	< 1	2.88	< 1	ND

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May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		79.8	84.5	85.6	95.9	96.2	117	103	97.4	91.9	110	95.7	95.5	96.9
L-QC, 50 ng/L		90.7	90.7	85.6	93.7	86.9	90.1	84.4	109	116	91.0	95.4	99.3	100
F-QC, 50 ng/L		83.9	119	76.1	75.9	82.4	97.7	103	119	97.4	75.0	88.0	96.7	84.5
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	2000	< 1	< 1	< 1	< 1	1.64	< 1	1.18	< 1	3.38	< 1	1.98	< 1	1.16
MS/WI-3D	2000	< 1	< 1	< 1	< 1	2.07	< 1	< 1	< 1	3.94	ND	3.07	< 1	< 1
MS/WI-11	2700	< 1	< 1	< 1	< 1	2.79	1.17	1.44	< 1	4.24	ND	4.07	< 1	< 1
TR/WI-1	650	< 1	< 1	< 1	< 1	< 1	< 1	1.40	< 1	< 1	< 1	1.56	< 1	< 1
TR/WI-2	370	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	< 1	< 1	< 1	< 1	< 1
WI/WI-1	970	< 1	< 1	< 1	< 1	2.54	1.39	1.88	< 1	1.91	ND	4.32	< 1	< 1

August

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		116	118	108	83.2	99.4	97.0	98.4	90.2	87.7	N/A	92.6	90.4	96.5
L-QC, 50 ng/L		110	107	115	91.2	96.0	93.9	93.1	93.9	89.8	N/A	87.2	89.6	88.5
F-QC, 50 ng/L		98.2	103	115	114	108	105	108	NA	NA	N/A	94.7	104	98.1
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-1	130	9.75	29.1	42.0	72.9	125	90.2	46.3	7.39	37.1	N/A	27.0	14.5	12.8
MS/WI-2	200	24.7	21.7	13.2	4.45	15.9	5.30	6.76	5.14	26.4	N/A	27.9	7.85	16.5
MS/WI-2D	200	7.29	14.9	8.42	3.13	14.4	7.61	7.15	6.17	28.8	N/A	16.1	8.39	16.8
MS/WI-3	330	5.71	9.32	5.39	3.79	10.5	4.42	3.62	2.86	11.8	N/A	13.9	2.97	2.87
MS/WI-4	360	14.0	28.3	17.0	4.06	7.28	2.28	2.69	2.63	6.85	N/A	37.1	2.36	3.51
MS/WI-5	360	1.64	1.78	< 1	1.41	7.37	2.16	2.83	2.69	12.0	N/A	6.46	1.78	3.34
MS/WI-6	380	< 1	1.62	< 1	1.49	6.75	3.11	2.16	2.28	7.51	N/A	10.5	1.59	2.36
MS/WI-7[b]	–	< 1	< 1	4.31	9.68	30.7	7.19	21.5	12.5	16.7	N/A	18.4	8.90	2.28
MS/WI-8	–	1.03	< 1	< 1	1.07	6.18	8.60	3.48	2.74	11.6	N/A	6.94	1.76	< 1
MS/WI-9	420	< 1	1.04	1.47	1.23	6.76	6.98	3.03	< 1	7.43	N/A	12.6	2.50	2.91
MS/WI-10	430	< 1	1.29	< 1	< 1	5.47	1.73	2.32	2.42	8.86	N/A	7.78	2.72	1.43
MS/WI-11	480	< 1	< 1	< 1	1.17	5.38	8.56	3.36	2.28	7.07	N/A	8.04	2.03	1.51
MS/WI-12[c]	–	< 1	< 1	3.67	4.14	31.0	5.42	19.1	12.4	3.36	N/A	61.7	101	6.16
TR/WI-3	–	< 1	< 1	< 1	< 1	4.98	8.98	3.44	5.16	< 1	N/A	3.91	< 1	< 1
TR/WI-4[d]	–	< 1	1.03	< 1	< 1	18.0	1.86	1.75	1.33	48.7	N/A	13.4	6.39	3.26

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

b: La Crosse Wastewater Treatment Plant effluent

c: Prairie du Chien Wastewater Treatment Plant outfall
d: La Crosse Well #23

Table S6. Perfluorinated compounds in samples collected by Illinois State personnel

March

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		91.2	97.1	91.4	106	97.0	80.2	100	116	109	111	82.7	96.8	106
L-QC, 50 ng/L		91.8	100	99.0	111	111	102	95.9	109	88.7	102	95.6	111	90.0
F-QC, 50 ng/L		101	106	96.4	102	96.9	93.4	90.6	NA	NA	97.1	75.2	86.9	79.8
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**CS**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-7	970	< 1	< 1	< 1	< 1	3.89	2.35	2.75	1.89	4.60	ND	10.5	5.92	4.09
IL/IL-8	860	< 1	< 1	< 1	1.42	4.63	1.92	2.69	2.08	5.46	ND	3.56	1.08	2.27
MS/IL-3	1200	< 1	< 1	< 1	< 1	7.94	2.61	4.37	31.5	325	ND	20.4	6.59	25.1
MS/IL-4	960	< 1	< 1	< 1	< 1	4.25	1.13	1.93	4.77	161	ND	5.46	1.59	4.24
MS/IL-9	4800	< 1	ND	< 1	< 1	2.75	1.65	1.74	1.96	48.0	ND	3.94	< 1	2.49
MS/IL-9D	4800	< 1	< 1	< 1	< 1	3.01	2.09	1.89	2.04	45.4	ND	4.32	< 1	2.74

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		82.3	81.3	81.1	79	85.8	91.6	105	NA	NA	86	94.9	91.4	89
L-QC, 50 ng/L		96.6	108	107.0	116	104	105	93.2	NA	NA	95	97.9	106	93.6
F-QC, 50 ng/L		101	117	107.9	114	117.4	121.9	109.1	NA	NA	102.0	100.4	111.9	97.0
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**CS**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	71	< 1	< 1	1.56	5.79	14.4	10.9	13.4	5.95	6.85	ND	17.6	4.25	2.35
IL/IL-2	71	< 1	< 1	1.16	3.34	15.6	9.82	12.6	7.34	9.17	ND	16.7	3.64	2.47
IL/IL-3	–	< 1	< 1	1.00	3.63	11.7	4.09	7.38	5.50	21.6	ND	13.7	3.60	2.35
IL/IL-3D	–	< 1	< 1	1.07	3.72	12.0	4.75	7.20	5.68	21.3	ND	14.6	3.91	2.19
TR/IL-1	140	< 1	ND	< 1	< 1	< 1	2.29	1.20	ND	ND	ND	< 1	ND	< 1

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April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		77.0	82.1	108	119	125	75.9	82.3	110	107	95.6	100	101	97.8
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	63	< 1	< 1	2.14	4.61	26.9	8.99	17.3	11.6	12.8	< 1	27.4	4.18	13.7
IL/IL-2	63	< 1	< 1	2.80	5.52	22.6	8.92	15.9	10.1	8.70	< 1	21.9	6.01	5.00
IL/IL-2D	63	< 1	< 1	2.66	5.77	23.3	8.87	15.6	9.86	8.71	< 1	23.8	5.50	5.04
IL/IL-3	–	< 1	< 1	1.48	4.29	16.5	7.02	13.9	10.0	6.85	ND	17.1	5.50	3.87
IL/IL-7	950	< 1	< 1	< 1	1.15	3.58	2.73	4.38	2.74	3.98	< 1	2.81	1.17	1.00
IL/IL-8	910	< 1	< 1	1.07	1.63	5.09	3.79	4.62	1.90	4.56	< 1	6.48	1.80	1.33
MS/IL-3	4200	< 1	< 1	< 1	< 1	4.86	3.48	4.53	12.2	420	< 1	8.33	2.18	4.65
MS/IL-4	4400	< 1	< 1	< 1	1.00	3.99	3.13	3.09	3.42	160	ND	5.53	1.13	3.13
MS/IL-9	8400	< 1	< 1	< 1	1.04	3.81	2.70	2.59	1.87	22.1	< 1	3.50	1.04	2.07
MS/IL-9D	8400	< 1	< 1	< 1	< 1	3.57	2.66	2.58	1.91	23.7	< 1	3.23	< 1	2.06
TR/IL-2	120	< 1	< 1	< 1	< 1	1.88	3.30	1.60	< 1	2.01	< 1	< 1	< 1	< 1

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		78.4	81.6	118	115	125	79.2	80.9	115	107	80.1	99.4	102	107
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-7	610	< 1	< 1	< 1	2.23	8.45	2.68	6.02	3.01	2.98	ND	4.86	2.02	1.33
IL/IL-8	730	< 1	< 1	< 1	2.27	7.28	2.62	5.41	2.65	3.45	< 1	5.28	1.88	1.44
IL/IL-9	–	< 1	< 1	< 1	1.76	6.62	2.12	4.79	2.19	3.70	ND	5.24	1.85	1.32
IL/IL-10	1000	< 1	< 1	< 1	1.91	6.77	2.54	4.81	2.52	2.68	< 1	3.33	1.56	1.27
IL/IL-11	1000	< 1	< 1	< 1	1.35	5.45	2.22	4.24	1.80	2.35	< 1	3.78	1.89	1.28
MS/IL-1	3700	< 1	< 1	< 1	< 1	2.91	1.43	2.68	< 1	3.95	< 1	3.37	1.09	1.14
MS/IL-2	4100	< 1	< 1	< 1	< 1	3.12	1.01	1.30	< 1	4.09	< 1	2.94	< 1	1.06
MS/IL-3	4100	< 1	< 1	< 1	< 1	5.43	2.42	2.56	10.5	458	< 1	8.33	2.11	2.68
MS/IL-4	4200	< 1	< 1	< 1	< 1	2.95	1.56	2.11	1.82	73.9	< 1	3.01	1.19	< 1
MS/IL-5	4700	< 1	< 1	< 1	< 1	3.66	1.34	1.59	2.78	158	< 1	4.63	< 1	1.02
MS/IL-6	–	< 1	< 1	< 1	< 1	2.01	1.67	1.08	< 1	16.5	< 1	2.03	< 1	< 1
MS/IL-7	7600	< 1	< 1	< 1	< 1	2.93	< 1	1.67	1.22	47.6	ND	2.98	< 1	1.57
MS/IL-8	8000	< 1	< 1	< 1	< 1	2.41	< 1	1.24	< 1	30.3	ND	3.06	< 1	< 1
MS/IL-9	9100	< 1	< 1	< 1	< 1	3.07	1.72	2.43	< 1	28.6	< 1	3.30	< 1	1.30
TR/IL-1	570	< 1	< 1	< 1	< 1	2.19	1.24	3.23	1.44	4.27	< 1	1.39	< 1	< 1

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		104	91.5	92.2	92.9	89.4	117	97.9	106	94.0	91.4	89.5	98.8	95.3
L-QC, 50 ng/L		90.2	83.4	85.9	89.5	82.6	90.6	87.3	109	102	85.7	91.8	95.2	90.4
F-QC, 50 ng/L		77.7	106	123	116	99.7	80.5	77.4	116	103	87.8	99.8	98.3	90.7
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	110	< 1	< 1	1.32	3.28	11.7	10.1	9.31	6.52	5.20	< 1	50.8	7.10	2.32
IL/IL-2	110	< 1	< 1	1.43	5.52	16.3	5.26	10.6	7.39	5.44	< 1	15.0	4.27	1.81
IL/IL-3	–	< 1	< 1	1.38	4.29	16.3	4.89	10.0	7.89	5.69	< 1	14.4	4.22	2.27
IL/IL-4	520	< 1	< 1	1.24	2.82	6.66	3.05	5.45	3.11	2.78	< 1	6.76	2.06	1.68
IL/IL-5	740	< 1	< 1	< 1	1.92	7.96	2.93	4.72	2.88	3.45	ND	6.43	1.57	1.74
IL/IL-6	740	< 1	< 1	1.04	2.44	9.35	3.54	5.88	3.60	3.45	< 1	6.69	1.75	1.34
TR/IL-2	80	< 1	< 1	< 1	< 1	2.88	1.23	1.70	< 1	< 1	ND	1.50	< 1	1.31

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		79.8	84.5	85.6	95.9	96.2	117	103	97.4	91.9	110	95.7	95.5	96.9
L-QC, 50 ng/L		90.7	90.7	85.6	93.7	86.9	90.1	84.4	109	116	91.0	95.4	99.3	100
F-QC, 50 ng/L		104	124	76.6	90.8	87.5	97.9	94.7	107	86.4	76.5	92.4	96.8	89.2
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/IL-10	15000	< 1	< 1	< 1	< 1	2.29	1.12	1.64	1.15	38.5	< 1	2.23	< 1	1.25
MS/IL-11	15000	< 1	< 1	< 1	< 1	1.67	< 1	1.46	1.00	17.6	< 1	2.32	< 1	1.71
MS/IL-11D	15000	< 1	< 1	< 1	< 1	1.93	< 1	1.47	< 1	19.9	< 1	3.86	< 1	1.26
MS/IL-12	16000	< 1	< 1	< 1	< 1	2.16	< 1	1.41	< 1	20.6	ND	1.76	< 1	1.35

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

Table S7. Perfluorinated compounds in samples collected by US EPA Region 7 personnel

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		84.5	92.3	84.7	111	93.6	81.4	101	118	109	99.3	90.5	96.8	84.4
L-QC, 50 ng/L		91.7	103	97.2	116	109	103	96.5	104	92.6	110	96.2	104	84.8
F-QC, 50 ng/L		100	120	111	119	119	115	119	94.5	92.2	103	96.7	108	101
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MO/MO-1[b]	1400	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	ND	< 1	2.73	< 1	ND
MO/MO-2[b]	1800	1.04	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	7.05	1.22	ND
MO/MO-3[b]	1800	< 1	ND	< 1	ND	< 1	< 1	< 1	ND	ND	ND	11.0	< 1	< 1
MO/MO-3D	1800	< 1	ND	< 1	< 1	< 1	< 1	< 1	ND	ND	ND	9.70	< 1	< 1
MO/MO-4[b]	1800	< 1	< 1	< 1	< 1	1.61	2.30	1.27	ND	ND	ND	9.11	< 1	ND
MO/MO-5[b]	6100	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	2.51	< 1	ND
MO/MO-5D[b]	6100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	ND	ND	3.04	< 1	ND
TR/IA-1	89	< 1	< 1	< 1	< 1	< 1	ND	< 1	ND	ND	ND	1.14	< 1	ND
TR/IA-2	–	< 1	< 1	< 1	ND	ND	ND	ND	ND	ND	< 1	< 1	ND	ND
TR/IA-3	37	< 1	ND	< 1	ND	ND	ND	ND	ND	ND	ND	< 1	ND	ND
TR/IA-4	240	< 1	ND	< 1	ND	ND	ND	< 1	ND	ND	ND	< 1	< 1	ND
TR/IA-5	970	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	< 1	ND	ND
TR/IA-6	350	< 1	< 1	< 1	ND	ND	ND	< 1	ND	ND	ND	< 1	ND	ND
TR/IA-7	720	< 1	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	1.83	< 1	ND
TR/IA-7D	720	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	1.65	< 1	ND
TR/MO-1[b]	190	< 1	< 1	< 1	< 1	2.01	1.05	1.34	ND	ND	< 1	15.2	1.62	ND
TR/MO-2	830	< 1	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	1.57	< 1	ND

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		90.3	106	103	87.9	97.8	91.1	82.5	112	99.3	95.2	105	112	113
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MO/IA-1[b]	590	< 1	< 1	< 1	< 1	< 1	1.13	1.06	ND	1.89	< 1	1.69	< 1	< 1
MO/IA-2[b]	620	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.76	< 1	1.67	< 1	ND
MO/IA-2D[b]	620	< 1	< 1	< 1	< 1	< 1	1.59	< 1	ND	1.70	< 1	1.62	< 1	ND
MO/IA-3[b]	850	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	2.02	< 1	1.65	< 1	ND
TR/MO-3[b]	28	< 1	< 1	< 1	< 1	1.09	< 1	< 1	ND	1.98	< 1	4.05	1.81	1.12
TR/MO-3D	28	< 1	< 1	< 1	< 1	1.16	< 1	< 1	ND	1.88	< 1	2.93	1.88	< 1

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s
b: Collected from the Missouri River Basin including Missouri (R7-1, 3–5, 13, 16–18), Kansas (R7-2), and Marmaton Rivers (R7-15).

Figures

Figure captions

Figure S1. Detailed map for samples collected by Minnesota State personnel
TR/MN-1 was from a creek to Wild Rice Lake Reservoir (not included in the Upper Mississippi River Basin); TR/MN-2 from Snake River; TR/MN-3 from Elk River; TR/MN-4 from Rum River; MN/MN-1–6 from Minnesota River and all others from Upper Mississippi River.

Figure S2. Detailed map for samples collected by Wisconsin State personnel
TR/WI-1 was from Chippewa River; TR/WI-2 from Black River; WI/WI-1 from Wisconsin River; TR/WI-3 from Halfway Creek; TR/WI-4 from Well #23 in La Cross; all others from Upper Mississippi River

Figure S3. Detailed map for samples collected by Illinois State personnel
IL/IL-4–11 were from Illinois River; IL/IL-1 from Cal Sag Channel; IL/IL-2 from Chicago Ship Canal; IL/IL-3 from Des Plaines River; TR/IL-1 from Rock River; TR/IL-2 from Kankakee River; all others from Upper Mississippi River.

Figure S4. Detailed map for samples collected by US EPA Region 7 State personnel
TR/IA-1 from Upper Iowa River; TR/IA-2 from Turkey River; TR/IA-3 from Maquoketa River; TR/IA-4 from Wapsipinicon River; TR/IA-5 from Iowa River; TR/IA-6 from Skunk River; TR/IA-7 from Des Moines River; TR/MO-1 was from Kansas River; TR/MO-2 from Meramec River; TR/MO-3 from Marmaton River; all others from Missouri River. Missouri, Kansas, and Marmaton Rivers belong to the Missouri River Basin.

Figure S5. Mass flux for C4 (or PFBA), C8 (or PFOA), PFBS, and PFOS in the Upper Mississippi River (0 kilometer point at the confluence of the Mississippi and Ohio Rivers). Three-day averaged flow is depicted as the dotted line, with flow measured in $m^3/s \times 10^3$.

Figure S1

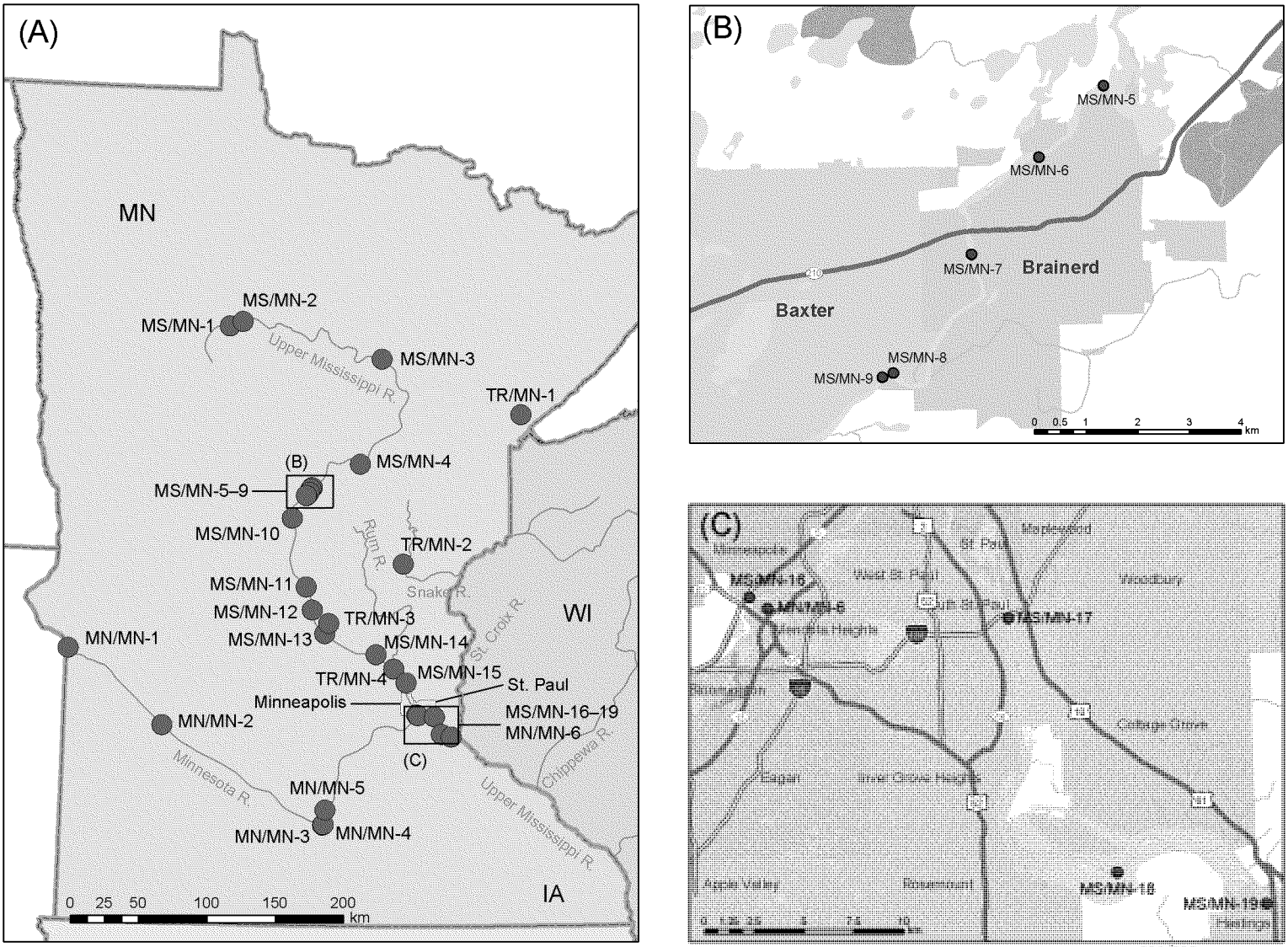
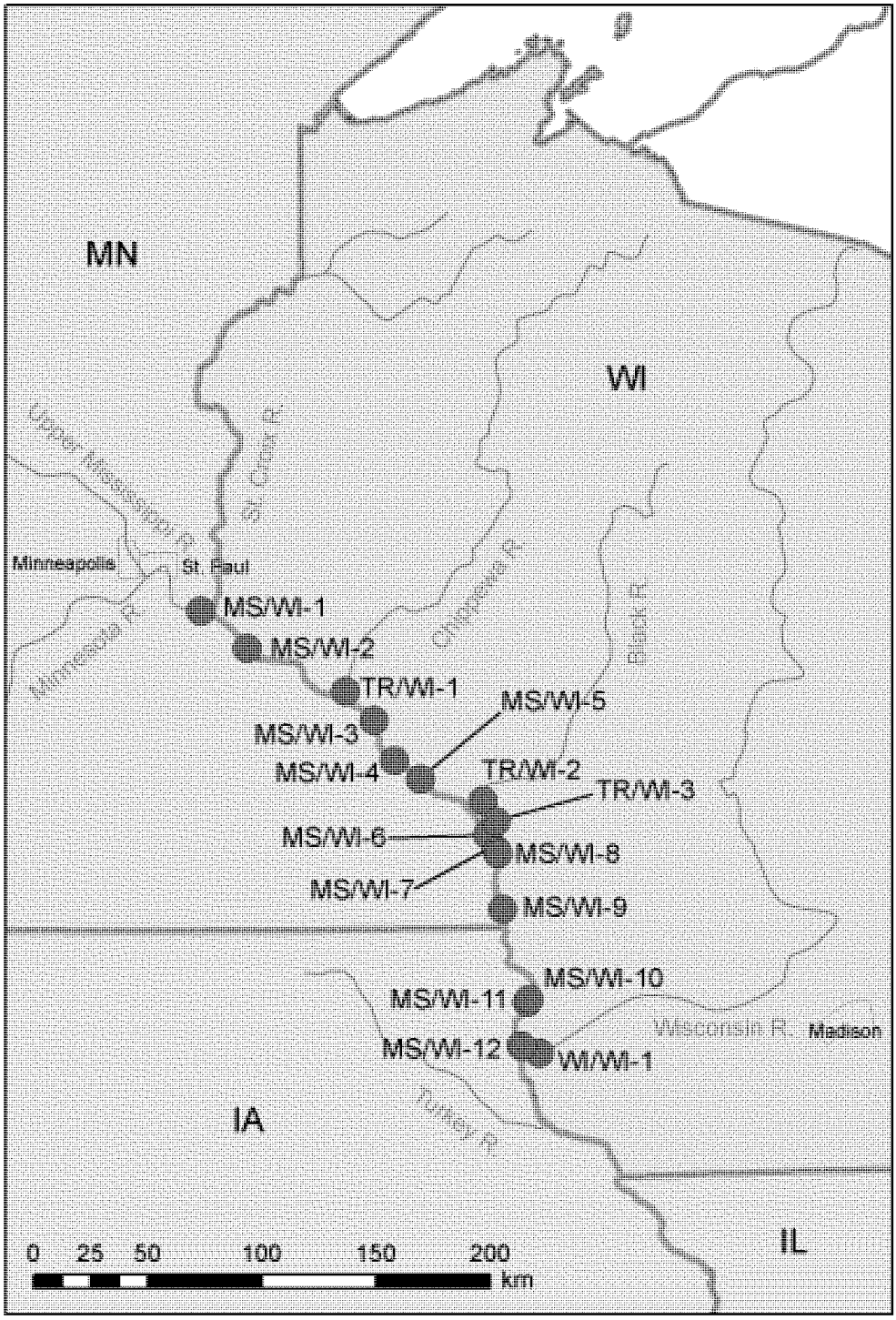

(A)
MN
WI
IA
MS/MN-1
MS/MN-2
MS/MN-3
MS/MN-4
MS/MN-5–9
MS/MN-10
MS/MN-11
MS/MN-12
MS/MN-13
MS/MN-14
MS/MN-15
MS/MN-16–19
MN/MN-1
MN/MN-2
MN/MN-3
MN/MN-4
MN/MN-5
MN/MN-6
TR/MN-1
TR/MN-2
TR/MN-3
TR/MN-4
(B)
(C)
Upper Mississippi R.
Rum R.
Snake R.
St. Croix R.
Minnesota R.
Chippewa R.
Minneapolis
St. Paul
0 25 50 100 150 200 km
(B)
MS/MN-5
MS/MN-6
MS/MN-7
MS/MN-8
MS/MN-9
Brainerd
Baxter
0 0.5 1 2 3 4 km
(C)
MS/MN-16
MS/MN-17
MS/MN-18
MS/MN-19
St. Paul
Maplewood
Woodbury
West St. Paul
Inver Grove Heights
Eagan
Apple Valley
Rosemount
Hastings
521/525

Figure S2


MN
WI
IA
IL
Minneapolis
St. Paul
St. Croix R.
Chippewa R.
Black R.
Wisconsin R.
Madison
MS/WI-1
MS/WI-2
TR/WI-1
MS/WI-3
MS/WI-4
MS/WI-5
TR/WI-2
TR/WI-3
MS/WI-6
MS/WI-7
MS/WI-8
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km

Figure S3

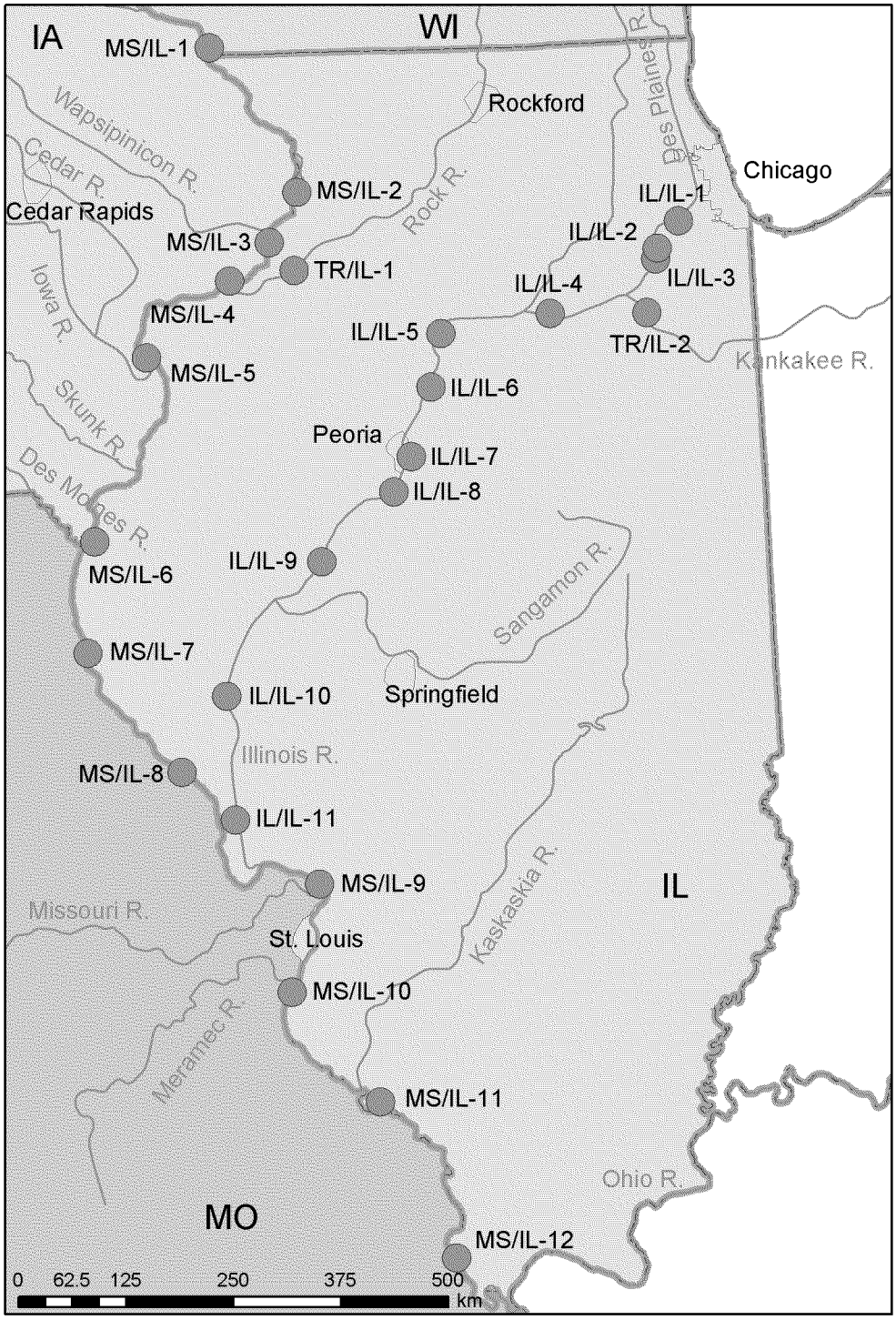

IA
WI
IL
MO
MS/IL-1
Rockford
Wapsipinicon R.
Cedar R.
Cedar Rapids
MS/IL-2
Rock R.
Des Plaines R.
Chicago
IL/IL-1
IL/IL-2
IL/IL-3
MS/IL-3
TR/IL-1
IL/IL-4
MS/IL-4
IL/IL-5
TR/IL-2
Kankakee R.
Iowa R.
MS/IL-5
IL/IL-6
Skunk R.
Peoria
IL/IL-7
IL/IL-8
Des Moines R.
MS/IL-6
IL/IL-9
Sangamon R.
MS/IL-7
IL/IL-10
Springfield
Illinois R.
MS/IL-8
IL/IL-11
MS/IL-9
Kaskaskia R.
Missouri R.
St. Louis
MS/IL-10
Meramec R.
MS/IL-11
Ohio R.
MS/IL-12
0 62.5 125 250 375 500
km

Figure S4

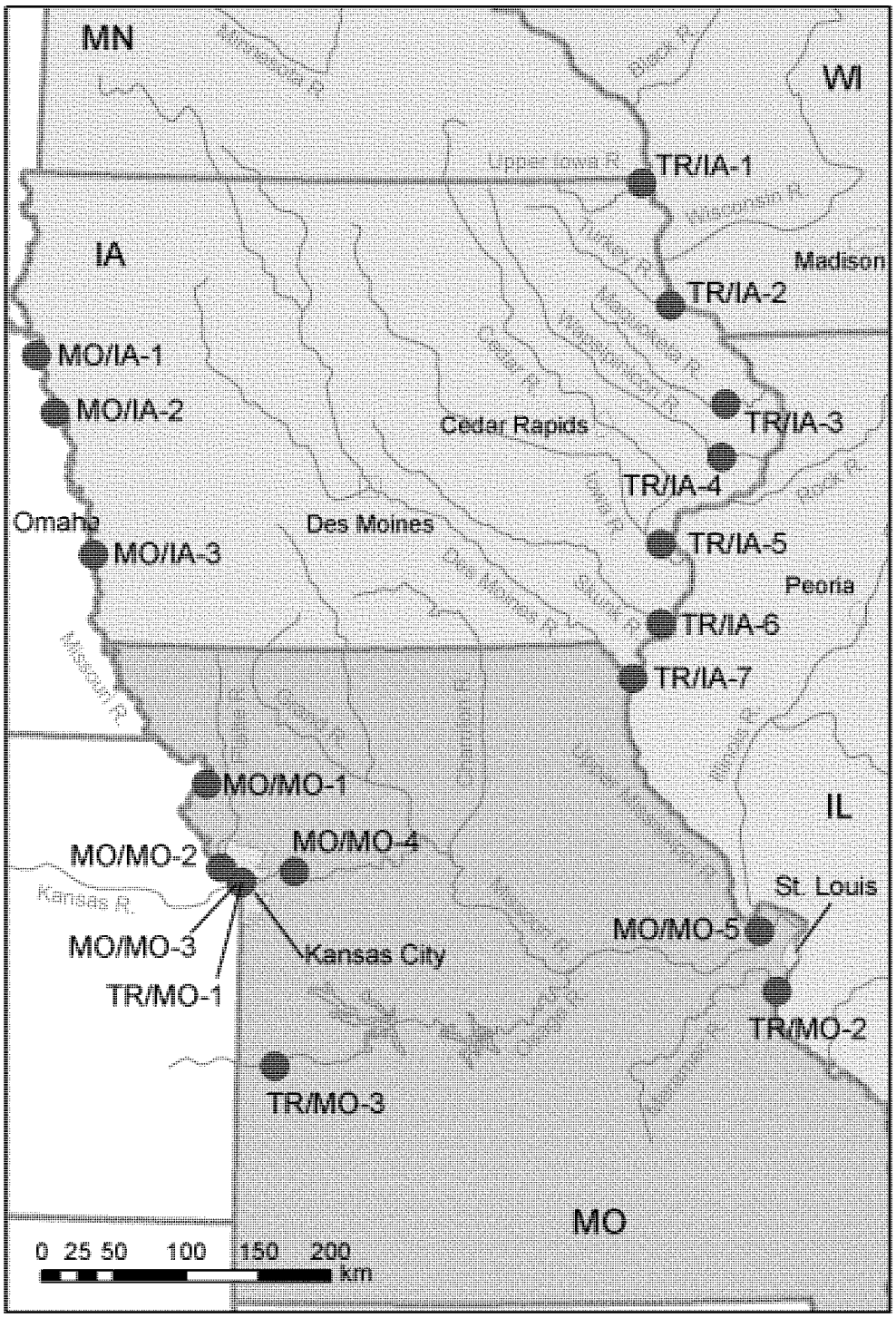
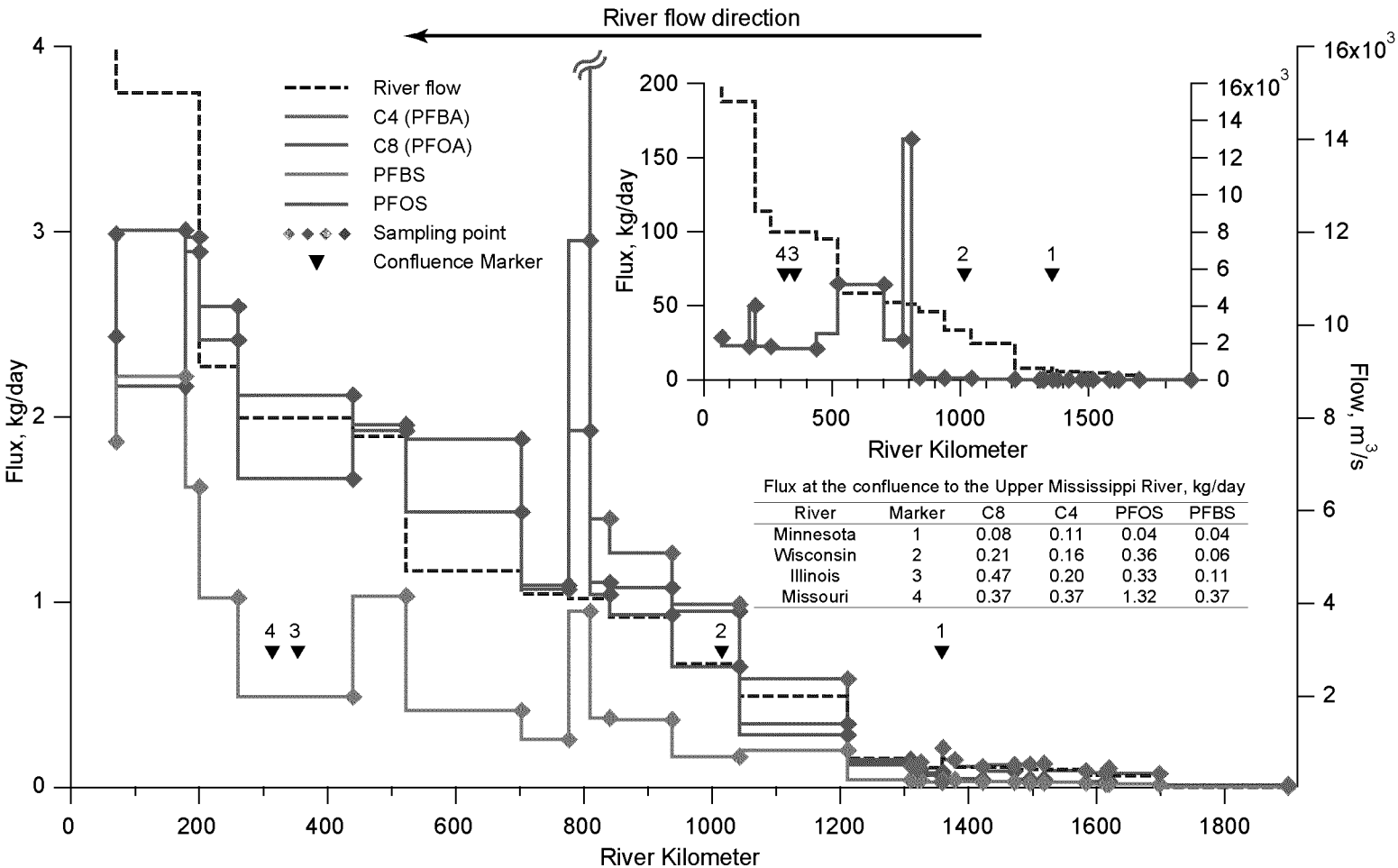

MN
WI
IA
IL
MO
Upper Iowa R.
TR/IA-1
Wisconsin R.
Madison
TR/IA-2
MO/IA-1
MO/IA-2
Cedar Rapids
TR/IA-3
TR/IA-4
Omaha
Des Moines
MO/IA-3
TR/IA-5
Peoria
TR/IA-6
TR/IA-7
Missouri R.
MO/MO-1
MO/MO-2
MO/MO-4
Kansas R.
St. Louis
MO/MO-5
MO/MO-3
Kansas City
TR/MO-1
TR/MO-2
TR/MO-3
0 25 50 100 150 200
km

Figure S5



Flux at the confluence to the Upper Mississippi River, kg/day

River	Marker	C8	C4	PFOS	PFBS
Minnesota	1	0.08	0.11	0.04	0.04
Wisconsin	2	0.21	0.16	0.36	0.06
Illinois	3	0.47	0.20	0.33	0.11
Missouri	4	0.37	0.37	1.32	0.37

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Determination of Perfluorinated Compounds in the Upper Mississippi River Basin

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Despite ongoing efforts to develop robust analytical methods for the determination of perfluorinated compounds (PFCs) such as perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA) in surface water, comparatively little has been published on method performance, and the environmental distribution of these materials remains poorly described worldwide. In this study, an existing method was improved and applied in a large-scale evaluation of the Upper Mississippi River Basin, one of the largest watersheds in the world. Samples were collected in 2008 in an effort that involved multiple sample sites and collection teams, long-range transport, and storage of up to 4 weeks before analysis. Ninety-four percent of the resulting 177 samples had quantifiable PFC concentrations, with 80% of the individual target compounds below 10 ng/L. The most abundant PFCs were perfluorobutanoic acid (C4; 77% above the limit of quantitation, LOQ), perfluorooctanoic acid (C8; 73%), perfluorooctanesulfonate (PFOS; 71%), perfluorohexanoic acid (C6; 70%), and perfluoroheptanoic acid (C7; 69%), with the remaining target compounds occurring above the LOQ in less than 50% of the samples. The highest concentrations recorded include C4 at 458 ng/L, PFOS at 245 ng/L, and C8 at 125 ng/L, suggesting various point source inputs within the Basin.

Introduction

In the past decade, a number of studies have been conducted to help characterize the distribution of perfluorinated compounds (PFCs) in surface water resources worldwide. The PFCs are fully fluorinated alkyl compounds that have been used along with their polyfluorinated precursor materials in numerous applications, including stain- and moisture-repellent surface coatings for carpets, paper, upholstery, and textiles; firefighting foams; cosmetics; lubricants; and the synthesis of various polymeric materials (*1*). Many of these compounds are extremely resistant to degradation, leading to their presence in environmental and biological media worldwide (*2*−*4*). While the routes of human exposure remain poorly characterized, many studies have measured PFCs in the serum of individuals in the general population of industrialized countries at concentrations in the nanograms per milliliter range (*5*). At the same time, an increasing number of studies with laboratory animals have documented the toxicity of some of the PFCs (*4*). Recent studies have suggested that some of the PFCs may be currently declining in human serum (*6*) as a result of voluntary reductions in production, emissions, and product content by major manufacturers in some parts of the world (*7*). However, very little is known about sources, fate, and transport of the PFCs in the environment, making it very difficult to prioritize human exposure routes and assess potential risks.

Contaminated water sources have been consistently reported as playing a central role in human exposure. In one of the first investigations of PFCs in surface and drinking water, Saito et al. (*8*) documented that elevated PFCs in the blood of the residents of a large metropolitan region in Japan was likely due to consumption of contaminated drinking water. Emmett et al. (*9*) subsequently reported on a situation in the United States where median PFOA blood levels in residents living near a major fluorochemical production facility were approximately 100 times higher than controls, with the consumption of contaminated well water being the most important exposure route determined. Most recently, a series of studies in Germany (*10, 11*) has documented that land application of PFC-contaminated sludge in the Rhine River drainage basin resulted in elevated PFC concentrations in surface water, drinking water, and the blood of residents who consumed this water.

The U.S. Environmental Protection Agency (EPA) has recently issued provisional health advisories for PFOA and PFOS in drinking water (*12*). While it has been shown that PFCs can be removed from drinking water with activated charcoal, this treatment option is not common and it requires constant monitoring because charcoal becomes saturated relatively quickly (*10, 13*). Moreover, studies of wastewater treatment plants (WWTP) report that PFCs are not efficiently removed by conventional treatment, with WWTP effluents often having higher concentrations of PFCs than process input water (*14, 15*). Because it is common for treated wastewater to make up a large proportion of the drinking water source intake for communities downstream, the measurement of surface water for potential contamination becomes essential for the evaluation of potential human exposures.

Despite numerous efforts to develop robust sampling and analytical methods for the PFCs in many matrices, the performance of these methods is often poorly characterized, and agreement between laboratories has only recently begun to improve (*16*). Given the unique chemical properties of the PFCs and the comparatively small number of studies that describe useful assay performance data, it remains important to monitor and report conventional quality control measures such as accuracy, precision, and recovery. With larger studies that may include complex study designs and multiple field teams, it also becomes important to evaluate the potential loss of analytes during long-term storage and long-range transport; possible contamination during sampling and analytical procedures; and the potential for a wide range of sample matrix contaminants to interfere with sample preparation and liquid chromatography−tandem mass spectrometry (LC/MS/MS) analysis.

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In this study, a method that was previously developed in our laboratory (*17*) was improved for use in a large-scale monitoring effort that required sample collection from a broad geographical area, a number of different sample collection teams, long-range transport, and storage of up to 4 weeks before samples were processed. This method was applied in an evaluation of PFCs in the Upper Mississippi River Basin, thus providing preliminary information about PFC concentrations in a large area of the continental United States.

Experimental Section

Standards and Reagents. Potassium salts of perfluorobutanesulfonate (PFBS, 98% purity) and perfluorohexanesulfonate (PFHS, 93%) were provided by 3M Company (St. Paul, MN). The potassium salt of perfluorooctanesulfonate (PFOS, 98%) was purchased from Fluka (Sigma–Aldrich, St. Louis, MO). Perfluorobutanoic acid (C4, 98%), perfluoropentanoic acid (C5, 98%), and perfluorodecanesulfonate (PFDS, 98%) were obtained from Wellington Laboratories (Guelph, Ontario, Canada). Perfluorohexanoic acid (C6, 97%), perfluoroheptanoic acid (C7, 99%), perfluorooctanoic acid (C8 or PFOA, 96%), perfluorononanoic acid (C9, 97%), and perfluorodecanoic acid (C10, 98%) were purchased from Sigma–Aldrich (St. Louis, MO). Perfluoroundecanoic acid (C11, 96%), and perfluorododecanoic acid (C12, 96%) were purchased from Oakwood Products (West Columbia, SC). Mass-labeled standards including sodium [1,2,3,4-$^{13}C_4$]-perfluorooctanesulfonate (MPFOS), $^{18}O_2$-labeled sodium perfluorohexanesulfonate (MPFHS), [1,2,-$^{13}C_2$]perfluorohexanoic acid (MC6), and [1,2-$^{13}C_2$]perfluoroundecanoic acid (MC11) were obtained from Wellington Laboratories (Guelph, Ontario, Canada). $^{13}C_8$-labeled PFOA (MPFOA) was purchased from Cambridge Isotope Laboratories (Andover, MA).

Original Method. This laboratory initially developed a sampling and analysis method for surface water that was applied in a study where samples were generally collected and processed within 24 h (*17*). In 2007, a series of pilot-scale studies was conducted to determine if this method could be used in situations where long-range sample transport and lengthy sample storage times would be necessary. Results (not shown) from this evaluation indicated that (1) in the time it took to ship the samples from the field site to the analytical laboratory (1 week or longer), approximately 20% of the samples developed so much bacterial and/or algal growth that they could not pass through the initial glass fiber filtration or solid-phase extraction (SPE) cleanup steps; (2) the recoveries of the target compounds in the travel spikes ranged from 16% to 48%, suggesting that analytes may have adsorbed onto the interior surface of the sample collection bottle; and (3) trace-level LC/MS/MS analysis of many of the samples was affected by varying amounts of matrix interference causing ion suppression or enhancement by as much as 200%, indicating that SPE cleanup was insufficient. A number of small-scale experiments lead to the following tentative solutions to these problems: (1) 5 mL of 35% nitric acid was added to all 1 L samples immediately after collection to suppress biological activity; (2) at the time of analysis, sample bottles were thoroughly rinsed with 10 mL of methanol to recover adsorbed material, and the rinsate was combined with the filtered sample before further processing; and (3) to help overcome matrix interferences, a weak anion-exchange (WAX) SPE cartridge was used to provide a better cleanup while also retaining the shortest acids on the target list (≤C6 acid). In addition, because the PFCs appeared to focus at the head of the cartridge, samples were eluted via a simple back-flush technique with a mixture of methanol/methyl *tert*-butyl ether (MTBE) to help minimize coeluting interferences. With these improvements in place, the modified method was used in the 2008 study as described below.

Water Collection. Samples ($n = 177$) were collected from 88 sampling sites between March and August 2008 from the Upper Mississippi River Basin and a portion of the Missouri River Basin (Figure 1) by member agencies of the Upper Mississippi River Basin Association (UMRBA). Seventy-two samples were collected by the Minnesota Pollution Control Agency, 33 by the Wisconsin Department of Natural Resources, 49 by the Illinois Environmental Protection Agency, and 23 by the U.S. EPA Region 7 Water Quality Monitoring Team in consultation with the Iowa and Missouri Departments of Natural Resources. The Upper Mississippi River Basin is one of the largest river basins in the United States, including large parts of the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin (*18*). This river basin consists of the upper half of the Mississippi River (~2000 km), 12 major tributaries including the Minnesota, Wisconsin, Iowa, Illinois, and Missouri Rivers, and many other streams, which sum up to approximately 50,000 km. Approximately 30 million residents depend on surface and groundwater resources from the Mississippi River Basin to supply their drinking water. Sampling locations were chosen by each of the participating agencies with the primary intention of providing preliminary PFC data in these individual regions. Sample sites were coded as follows: river abbreviation/state abbreviation-sample number (smaller numbers are closer to the headwaters). In some cases, sites were resampled on multiple occasions. For each sampling event, a shipping container holding approximately 6 empty precleaned (methanol-rinsed) 1-L high-density polyethylene (HDPE) bottles (Thermo Fisher Scientific, Rochester, NY) and one travel spike sample was sent from the analytical laboratory to the field crew for collection. Surface water was collected by hand approximately 15–30 cm beneath the surface of the water, and samples were preserved by adding 5 mL of 35% nitric acid (EP Scientific Products, Miami, OK). Samples were then shipped at ambient temperature via a commercial freight carrier to the analytical laboratory, where they were stored at room temperature and analyzed within 4 weeks.

Quality Assurance Samples. For each sampling event, a 1-L sample containing deionized water that was spiked with a PFC mixture (final concentration being 50 ng/L for all target analytes) and nitric acid preservative and was shipped to the field as a travel spike (F-QC) along with the empty precleaned sample collection bottles. The F-QCs were shipped back to the laboratory with the field samples and analyzed at the same time to evaluate analyte loss or contamination during sample transport and storage. Field personnel were asked to collect at least 10% of the samples in duplicate. In-house laboratory spikes (L-QCs) were also prepared at the time of analysis to assess the performance of the assay. At least two solvent blanks and matrix blanks (deionized water with internal standards that went through the whole extraction process) were analyzed with every analytical batch.

Sample Preparation and Solid-Phase Extraction. Water samples were filtered with GF/A glass fiber filter cups (Whatman Inc., Piscataway, NJ) into a polypropylene vacuum flask (Thermo Fisher Scientific, Rochester, NY). Filter cups were determined to be PFC-free and did not retain target analytes. Filtered solids were also tested and found to contain only negligible amounts of PFCs (<0.5 ng/L). The original emptied sample container was then thoroughly rinsed with 10 mL of methanol and the filtered water was poured back into the original container, thus combining the filtered sample and the methanol rinse. The samples were then spiked with 100 μL of a 0.10 ng/μL solution (10 ng) of the internal standards (MPFHS, MPFOS, MC6, MC8, and MC11) and divided into two 500-mL aliquots. Oasis WAX Plus (225 mg) cartridges (Waters Corp., Milford, MA) were conditioned with

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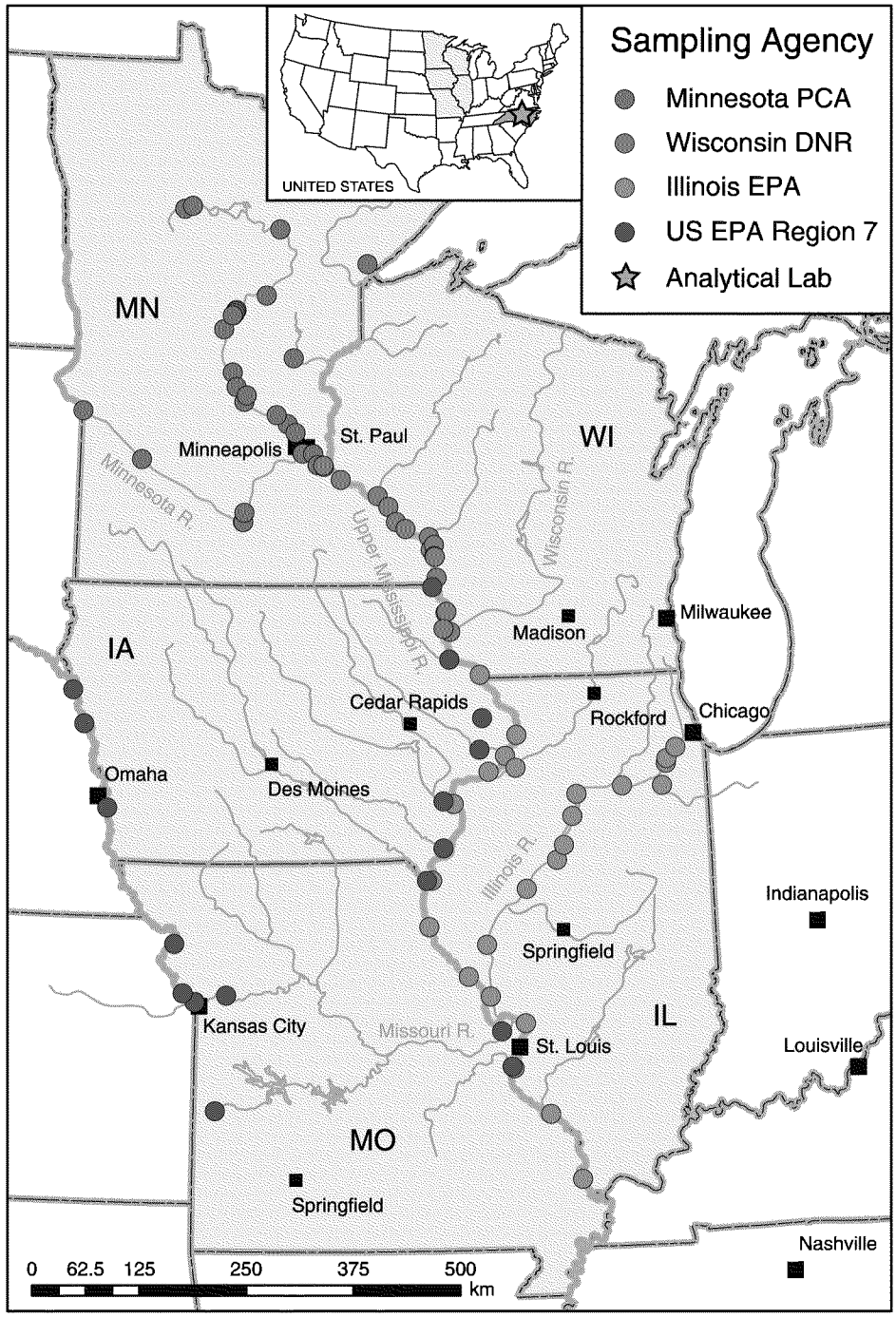

FIGURE 1. Sampling locations colored by sampling agencies.

10 mL of methanol followed by 10 mL of deionized water, each at a flow rate of 10 mL/min. A 500-mL aliquot of each water sample was loaded onto the preconditioned cartridges at a flow rate of 10 mL/min with a positive-pressure pump system (Sep-Pak concentrator, Waters Corp.). The remaining 500-mL sample aliquot was stored at room temperature in case additional analysis was required. The cartridges were washed with 10 mL of 25 mM sodium acetate buffer (pH 4) followed by 10 mL of methanol and were dried completely by purging with high-purity nitrogen gas for 10 min. For sample elution, the cartridges were set up in the vacuum manifold in an inverted direction (back-flush technique) and the target analytes were eluted from the cartridge with 2 mL of ammonium hydroxide (NH_4OH, 28% in water)/methanol/methyl *tert*-butyl ether (MTBE) solution (v/v/v 1:2:27) at a flow rate of 1 mL/min. The eluate was reduced in volume to 500 μL with TurboVap II nitrogen evaporator at 35°C (Caliper Life Sciences, Hopkinton, MA). A 100 μL aliquot of the concentrated eluate was mixed with 100 μL of 2 mM ammonium acetate buffer (pH 6.5) to approximate the initial mobile-phase conditions.

Instrumental Analysis. Samples were analyzed on a Waters Acquity ultraperformance liquid chromatography system coupled with a Waters Quatro Premier XE triple-quadrupole mass spectrometer (UPLC-MS/MS; Waters Corp.). In order to reduce PFC background in the instrument, the poly(tetrafluoroethylene) (PTFE) tubing was replaced with polyether ether ketone (PEEK) material. To further reduce instrumental contamination, a C18 hold-up column (prototype provided by Waters and now available as a PFC kit from Waters) was installed on the aqueous solvent line just before the mixing chamber. A 20 μL aliquot of each sample

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TABLE 1. Statistical Summary of Measurements

	N	% > LOQ[a]	% ND[b]	median[c]	95% CI[d] for median	P90[e]	P95[f]	P99[g]	max
C12	173	9.8	9.8	0.71	0.71−0.71	0.71	2.33	10.9	24.7
C11	173	6.4	21	0.71	0.71−0.71	0.71	1.14	23.6	29.1
C10	173	14	12	0.71	0.71−0.71	1.30	2.54	14.3	42.0
C9	173	29	13	0.71	0.71−0.71	3.33	4.51	8.84	72.9
C8	173	73	2.9	2.07	1.46−2.54	11.9	19.8	36.5	125
C7	173	69	5.8	2.16	1.56−2.46	6.91	8.89	11.5	90.2
C6	173	70	1.2	1.59	1.34−1.83	7.07	12.9	28.4	53.4
C5	167	41	34	0.71	0.71−0.71	6.03	9.27	12.4	31.5
C4	167	77	16	2.73	2.18−3.42	27.9	47.9	357	458
PFDS	158	0	61						
PFOS	173	71	2.9	3.01	2.03−3.78	17.0	27.2	147	245
PFHS	173	40	11	0.71	0.71−0.71	5.11	6.79	38.7	169
PFBS	173	43	23	0.71	0.71−1.00	4.21	10.4	31.2	84.1

[a] Percentage of samples above limit of quantitation (LOQ). LOQ = 1.0 ng/L. [b] Percentage of samples not detected (below limit of detection, LOD). LOD = 0.02 ng/L. [c] For calculation of median, values of LOQ/sqrt(2) = 0.707 and LOD/sqrt(2) = 0.014 were assigned for LOQ and ND, respectively. [d] 95% confidence interval. [e] 90th percentile. [f] 95th percentile. [g] 99th percentile.

was injected onto an Acquity UPLC BEH C18 Column (1.7 μm, 1.0 × 50 mm; Waters Corp.) that was maintained at 50 °C. Separation was achieved by use of a gradient mobile phase of 2 mM ammonium acetate buffer and methanol at a flow rate of 500 μL/min (Table S1, Supporting Information).

Electrospray negative ionization (ESI) was used with the mass spectrometer operating in the multiple-reaction-monitoring (MRM) mode (Table S1, Supporting Information). Ionization and collision cell parameters were optimized for each individual analyte. One MRM transition was used for quantitation and another transition was used for confirmation for each analyte (Table S2, Supporting Information).

Quantitation. The instrumental quantitation limit (IQL), based on methanolic standards and a 10:1 signal-to-noise ratio, was approximately 0.5 pg on column for all target compounds. By use of the same criteria and a series of fortified deionized water samples, the limit of detection (LOD) was determined to be 0.02 ng/L. Six-point calibration curves were prepared for each analytical batch in the range of 0.2−500 ng/L, but consistent measurements for all compounds giving precision of ±15% and accuracy of 100% ± 20% were obtained between 1.0 and 500 ng/L, making this the reporting range. The lower limit of quantitation (LOQ) was set to be 1.0 ng/L. Quantitation was performed with MassLynx 4.1 (Waters Corp.) using a linear $1/x$ weighted regression fit with a coefficient of correlation greater than 0.99. Data were considered reportable if the ion ratio (quantifier/confirmatory) for samples was within 70−130% of the average ion ratio for calibration standards. Additionally, data from an analytical batch were considered acceptable only if blanks were below the IQL and the QC samples were within ±25% of their theoretical concentrations.

Statistical Analyses. All statistical analyses were performed with R-2.9.0 software (*19*). When duplicate samples were collected, mean values were reported and used in all analyses. Summary statistics used LOQ/sqrt(2) for samples listed as <LOQ.

Results and Discussion

Quality Control. The performance characteristics of the improved method for remote sampling and long-range transport are presented in Table S3, Supporting Information. All 16 of the travel spike samples prepared at the 50 ng/L level had mean recoveries of 91.7%−108% for all compounds, with relative standard deviations (RSD) ≤ 15%. The laboratory spike samples prepared at the 5 and 50 ng/L levels had similar accuracy and precision, with mean recoveries ranging from 89.3% to 105%, and all RSDs being ≤14%. Recoveries of internal standards ranged from 75% to 125%. None of the blanks (n = 16) had quantifiable PFCs. Overall, the average percent relative difference for duplicate field samples (n = 31) was 12% (range 0.1%−134%), with most of this variation occurring in cases where one sample was below the LOQ. The average relative percent difference for duplicate PFOS and PFOA measurements above10 ng/L was 13.3% and 3.7%, respectively.

Distribution of PFCs in the Basin. Table 1 shows summary statistics for all measurements made in this study. At least one target compound was above the LOQ in 94% of the samples collected, with 80% of all of the individual compound measurements being below 10 ng/L. The most frequently measured compounds and the percentage above the LOQ were C4 (77%), C8 (73%), PFOS (71%), C6 (70%), and C7 (69%). The remaining target compounds occurred above the LOQ in less than 50% of the samples. Median concentrations ranged from no detection at all for PFDS to a high of 3.01 ng/L for PFOS. While compound measurements in most samples were comparable to low-level "background" concentrations reported in previous studies (<10 ng/L) (*8, 17, 20*), samples occasionally had elevated levels. The highest individual concentrations recorded include C4 at 458 ng/L, PFOS at 245 ng/L, and C8 at 125 ng/L, suggesting the influence of point source inputs at some specific sampling locations. Table 2 summarizes the 10 highest C8, C4, and PFOS concentrations recorded during this investigation.

WWTPs and PFCs. In the spring of 2007, the Minnesota Pollution Control Agency (MPCA) conducted systematic measurements of PFCs in influent, effluent, and sludge at wastewater treatment plants (WWTPs) across the state of Minnesota (*21*). The MPCA reported that multiple PFCs were measured in WWTP effluents from plants located in larger urban areas, with these compounds being attributed to local sources such as refineries, airports, and PFC production sites, which discharged waste to these WWTPs (*21*). The current study confirms these earlier findings, as, for example, the samples collected below the Metropolitan WWTP (MS/MN-19; Figure S1, Supporting Information) and adjacent to a major chemical manufacturer showed higher PFC concentrations than samples collected upstream of this area (MS/MN-18). Specifically, in August at MS/MN-19, C8 was 23.2 ± 0.9 ng/L (mean ± SD); C4, 30.9 ± 4.7 ng/L; PFOS, 24.0 ± 7.1 ng/L; PFHS, 13.1 ± 0.4 ng/L; and PFBS, 11.9 ± 4.4 ng/L. Upstream at MS/MN-18, C8 was 8.69 ± 1.03 ng/L; C4, 11.9 ± 1.2 ng/L; PFOS, 13.2 ± 0.6 ng/L; PFHS, 5.65 ± 0.47 ng/L; and PFBS, 3.14 ± 0.57 ng/L.

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TABLE 2. Sites with the 10 Highest Concentrations for C8, C4, and PFOS

site	month	C8 (ng/L)	site	month	C4 (ng/L)	site	month	PFOS (ng/L)
MS/WI-1	Aug	125	MS/IL-3	May	458	TR/MN-1[a]	Jul	287
TR/MN-1[a]	Apr	50.5	MS/IL-3	Apr	420	MS/MN-8	Aug	226
MS/WI-12[b]	Aug	31.0	MS/IL-3	Mar	325	TR/MN-1[a]	Apr	124
MS/WI-7[b]	Aug	30.7	MS/IL-4	Mar	161	MS/WI-12[b]	Aug	61.7
IL/IL-1	Apr	26.9	MS/IL-4	Apr	160	IL/IL-1	May	50.8
TR/MN-2	Aug	23.2	MS/IL-5	May	158	MS/WI-4	Aug	37.1
IL/IL-2	Apr	23.0	MS/IL-4	May	73.9	MS/WI-2	Aug	27.9
TR/WI-4	Aug	18.0	TR/WI-4[c]	Aug	48.7	IL/IL-1	Apr	27.4
IL/IL-3	Apr	16.5	MS/IL-9	Mar	46.7	MS/WI-1	Aug	27.0
IL/IL-2	May	16.3	MS/IL-7	Aug	47.6	TR/MN-2	Aug	24.0

[a] Collected from a creek to the Wild Rice Lake Reservoir that potentially receives a runoff from a historical fire-training site at the Duluth International Airport. This stream is not a part of the Upper Mississippi River Basin but within the Cloquet River Watershed. [b] Collected at wastewater outfall. [c] Well water.

Also, samples collected on the Mississippi River at the outfall of the Brainerd WWTP [MS/MN-8 (August); Figure S1, Supporting Information], had PFOS and PFBS at 226 ± 28 and 65.5 ± 26.4 ng/L, respectively (Table S4, Supporting Information). During the same sample period, several samples collected upstream of this point (MS/MN-5−7) indicated typically low concentrations of all compounds (≤10 ng/L), suggesting that the WWTP was a point source of these PFCs in this area. An earlier study by the Minnesota Department of Health (MDH) found that until September 2007, a local chrome-plating plant used a mist suppressant reagent containing 1%−7% "organic fluorosulfonate" (*21*). The results of the current study indicate that PFC material was still present in this area, perhaps as a residual from the plating plant or possibly from other industries. It should also be noted that a sample collected on the same day just 200 m downstream of the WWTP outflow site (MS/MN-9) did not have elevated concentrations of the target compounds (<LOQ for most measurements), suggesting that the volume of flow at this point in the river water diluted upstream inputs to "background" levels. Moreover, this also suggests that identification of point source inputs may require intensive sampling to pinpoint their specific origins.

Additional evidence of the potential impact of WWTPs came from Wisconsin samples collected at the outfalls of the La Cross and Prairie du Chien WWTPs (MS/WI-7 and -12; Figure S2, Supporting Information). Both sites had elevated PFCs, with the Prairie du Chien site (MS/WI-12) having PFOS at 61.7 ng/L and PFHS at 101 ng/L (Table S5, Supporting Information). Evaluation of the operations of the various sources that make discharges to these plants would be helpful for determining why these samples were elevated.

Historical Firefighting Activity. Samples were collected from a waterway near Duluth International Airport (TR/MN-1; Figure S1, Supporting Information), despite the fact that it was not part of the Mississippi River Basin, because of suspected contamination related to the historic use of firefighting foams. Initial samples from this site collected in April exhibited notably elevated levels of some of the PFCs with C8 at 50.5 ng/L; C6, 53.4 ng/L; PFOS, 124 ng/L; PFHS, 169 ng/L; and PFBS, 19.2 ng/L (Table S4, Supporting Information). To confirm the initial test results, this location was resampled in triplicate in July. Results again indicated elevated levels of the same PFCs, with concentrations of C8 at 92.1 ± 3.1 ng/L; C6, 131 ± 8 ng/L; PFOS, 287 ± 15 ng/L; PFHS, 367 ± 3 ng/L; and PFBS, 41.7 ± 0.6 ng/L (Table S4, Supporting Information). The possible link to the use of firefighting foams is anecdotal but consistent with previous reports implicating firefighting activities at airports (*17, 22*).

Differing Results from Samples Collected in Nearby Locations. Samples were collected from the same pool (MS/MN-19 and MS/WI-1; below Lock and Dam 2; Figures S1 and S2, Supporting Information) in the Mississippi River but they were separated by 1.3 km distance. MS/MN-19 and MS/WI-1 were sampled on August 20 and 13 in 2008, respectively, on which days the flow rates were 72 and 130 m^3/s, respectively. At low flow, C8 was 23.8 ng/L (MS/MN-19), but when the flow was almost 2 times higher, the concentration increased by a factor of more than 5 to 125 ng/L (MS/WI-1). In contrast, PFOS concentrations were very similar to each other despite the increased flow: 29 ng/L for MS/MN-19 and 27 ng/L for MS/WI-1. The increased amount of PFOA in the Wisconsin sample may be due to vertical mixing or turbulent resuspension of previously deposited materials in sediments since the sample was collected at the immediate outflow of the Lock and Dam 2. All of the carboxylic acids from C6 to C11 exhibited similar severalfold increases during high flow conditions, but PFOS and the other sulfonates remained at roughly the same concentrations. This may indicate an important difference in how these two classes of PFCs are transported in the environment.

C4 Elevation. The highest PFC concentrations measured in this survey are the C4 (also known as PFBA) levels in samples from the Mississippi River in the vicinity of Cordova, IL. Upstream of this area, C4 was found in the <LOQ to 10 ng/L concentration range, except for samples from below Mississippi River Lock and Dam 2 in Minnesota (MS/MN-18 and MS/MN-19) collected in August (11.0−34.2 ng/L) in an area where a historical C4 input source has been identified (*21*). In Illinois, however, C4 clearly becomes the most prominent compound measured in the Basin. For instance, at MS/IL-3 (Figure S3, Supporting Information), C4 was measured at 325 ng/L in March, 420 ng/L in April, and 458 ng/L in May 2008 (Table S6, Supporting Information). It is interesting to note that the water concentrations here remain fairly consistent, despite increasing total flow estimates more than 3 times higher. This may suggest that the samples were collected at a point within the plume of a discharge and were not well mixed, or it may imply a larger-scale area source. Some 30 km downstream near Rock Island, IL (MS/IL-4), concentrations of C4 were about 2 −4 times lower but still substantially elevated in comparison to other areas in this survey, confirming the presence of a major source in this region.

Near Chicago. Some of the samples collected in the upper reaches of the Illinois River watershed near Chicago had relatively high PFC concentrations (i.e., C6, C8, and PFOS; Table S6). Samples from where the Cal Sag Channel meets the Chicago Ship and Sanitary Canal (IL/IL-1; Figure S3, Supporting Information) had the highest PFOS levels in this region, with concentrations ranging from 17.6 to 50.8 ng/L. Both of these waterways are extensively polluted with a substantial portion of their flows derived from WWTP effluent. Further evaluation of this area would be helpful in determining specific sources in this complex urban environment.

Missouri and Iowa Samples. Samples collected in Missouri and Iowa consistently had some of the lowest PFC measure-

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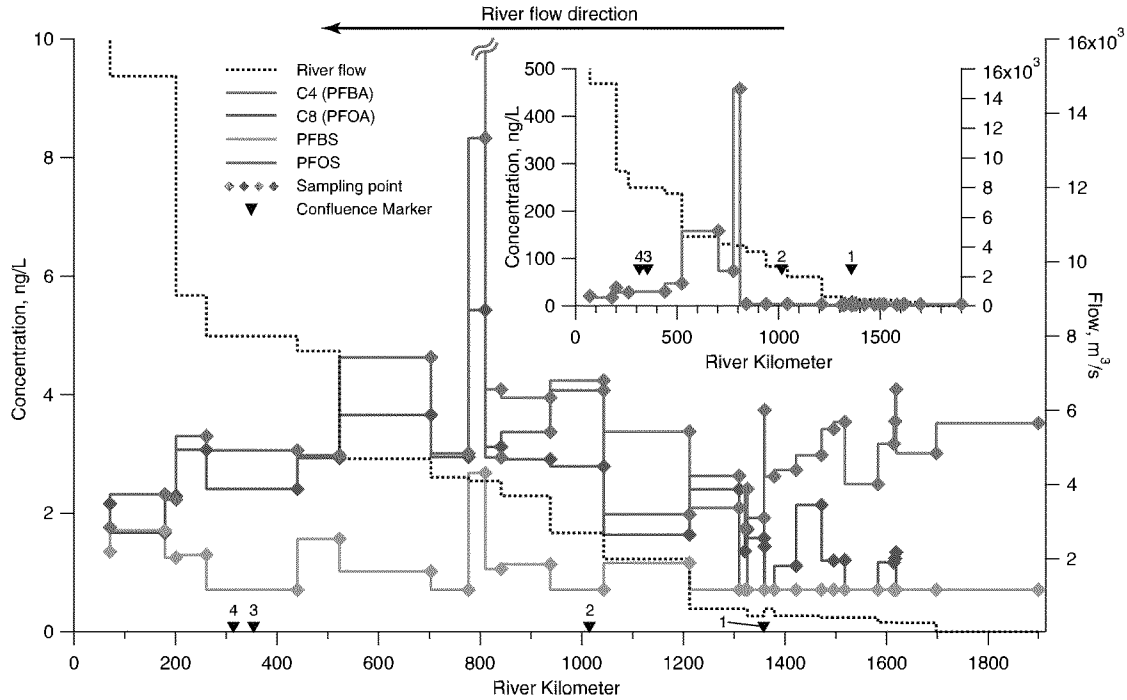

FIGURE 2. Concentrations for perfluorobutanoic acid (C4 or PFBA), perfluorooctanoic acid (C8 or PFOA), perfluorobutanesulfonate (PFBS), and perfluorooctanesulfonate (PFOS) in the Upper Mississippi River (0 km point at the confluence of the Mississippi and Ohio Rivers). Three-day averaged flow is depicted as the dotted line, with flow measured in cubic meters per second × 10^3. Confluence of other rivers at markers: (1) Minnesota River, (2) Wisconsin River, (3) Illinois River, and (4) Missouri River.

ments recorded in this survey. For most of the target analytes, more than 90% of the sites showed concentrations below LOQ. PFOS was found to be above the LOQ at 78% of the sample sites, but the only notable concentrations were 11.0 ng/L and 15.2 ng/L from sites MO/MO-3 and TR/MO-1, respectively (Figure S4, Supporting Information) in the vicinity of Kansas City.

Mass Flux Estimation. As indicated in Figure 2, there were many sampling points with localized increases in PFC concentrations in the Basin. The overall trend was for these increases to be dissipated shortly downstream, suggesting small point source inputs relative to the ever-increasing volume of the River. Figure 2 also indicates that the concentrations of C8, PFOS, and PFBS are generally flat after the midportion of the Upper Mississippi River despite the continuous increase in flow. Since two-dimensional sampling was not performed across the River, a true mass flux cannot be calculated. However, it is still useful to calculate provisional total mass flow estimates in order to help describe large-scale trends in transport. Figure S5 (Supporting Information) shows the estimated mass flux of C4, C8, PFBS, and PFOS in the main stream of the Upper Mississippi River in May 2008. At the MS/IL-3 site near Cordova, IL, the largest local increase occurred for C4, with large increases in C8, PFBS, and PFOS also being apparent. Calculations of the C4 flux stabilize as the input from the Cordova area becomes more homogeneous downstream, and it is interesting to note that a total loading of approximately 20 kg/day is maintained even after the confluence of the Ohio and Missouri Rivers. This suggests that there are no additional sources of C4 of similar magnitude in the lower reaches of the basin and that this single source dominates C4 in this section of the Mississippi River. The overall increase in all of the PFCs from the Minneapolis metropolitan area in Minnesota to the southern boundary of the Basin clearly suggests an increasing number of sources proceeding downstream. Several possible explanations of this observation can be considered: (1) multiple PFC discharges from private or public WWTP along the River and tributaries, (2) surface water runoff from cities and farm fields reflecting area source inputs, and (3) groundwater input from agricultural areas. The importance of any of these potential sources is unknown and would be a good subject of further research.

The modified method for 13 PFCs in surface water used in this study showed acceptable performance characteristics, making it useful for large-scale monitoring surveys that require long-range transport and relatively long-term storage without appreciable loss of target compounds. The results indicate multiple input sources and a continuous increase in PFC loading as the River proceeds through the Basin. Many localized areas with elevated PFC levels have been identified, indicating that PFC inputs are common and widespread. The relatively high concentration of the C4 acid in some of these samples likely reflects a shift toward lower molecular weight PFCs made by United States industries. These data also support the hypothesis that WWTPs can be sources of PFCs.

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review and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Supporting Information Available

Additional method description; tables showing UPLC-MS/MS conditions, mass transitions of each analyte, method performance, and raw data for all samples; and figures showing sampling sites and estimated mass flux. This material is available free of charge via the Internet at http://pubs.acs.org.

Literature Cited

(1) Lewandowski, G.; Meissner, E.; Milchert, E. Special applications of fluorinated organic compounds. *J. Hazard. Mater.* **2006**, *136*, 385–391.

(2) Houde, M.; Martin, J. W.; Letcher, R. J.; Solomon, K. R.; Muir, D. C. Biological monitoring of polyfluoroalkyl substances: A review. *Environ. Sci. Technol.* **2006**, *40*, 3463–3473.

(3) Fujii, S.; Polprasert, C.; Tanaka, S.; Lien, N. P. H.; Qiu, Y. New POPs in the water environment: Distribution, bioaccumulation and treatment of perfluorinated compounds - a review paper. *J. Water Supply: Res. Technol.—AQUA* **2007**, *56*, 313–326.

(4) Lau, C.; Anitole, K.; Hodes, C.; Lai, D.; Pfahles-Hutchens, A.; Seed, J. Perfluoroalkyl acids: A review of monitoring and toxicological findings. *Toxicol. Sci.* **2007**, *99*, 366–394.

(5) Fromme, H.; Tittlemier, S. A.; Volkel, W.; Wilhelm, M.; Twardella, D. Perfluorinated compounds — exposure assessment for the general population in western countries. *Int. J. Hyg. Environ. Health* **2009**, *212*, 239–270.

(6) Olsen, G. W.; Mair, D. C.; Church, T. R.; Ellefson, M. E.; Reagen, W. K.; Boyd, T. M.; Herron, R. M.; Medhdizadehkashi, Z.; Nobiletti, J. B.; Rios, J. A.; Butenhoff, J. L.; Zobel, L. R. Decline in perfluorooctanesulfonate and other polyfluoroalkyl chemicals in American Red Cross adult blood donors, 2000 −2006. *Environ. Sci. Technol.* **2008**, *42*, 4989–4995.

(7) U.S. Environmental Protection Agency. 2010/2015 PFOA stewardship program. http://www.epa.gov/oppt/pfoa/pubs/stewardship/index.html (Accessed on 16 March 2010).

(8) Saito, N.; Harada, K.; Inoue, K.; Sasaki, K.; Yoshinaga, T.; Koizumi, A. Perfluorooctanoate and perfluorooctane sulfonate concentrations in surface water in Japan. *J. Occup. Health* **2004**, *46*, 49–59.

(9) Emmett, E. A.; Shofer, F. S.; Zhang, H.; Freeman, D.; Desai, C.; Shaw, L. M. Community exposure to perfluorooctanoate: Relationships between serum concentrations and exposure sources. *J. Occup. Environ. Med.* **2006**, *48*, 759–770.

(10) Skutlarek, D.; Exner, M.; Färber, H. Perfluorinated surfactants in surface and drinking waters. *Environ Sci Pollut Res* **2006**, *13*, 299–307.

(11) Holzer, J.; Goen, T.; Rauchfuss, K.; Kraft, M.; Angerer, J.; Kleeschulte, P.; Wilhelm, M. One-year follow-up of perfluorinated compounds in plasma of German residents from Arnsberg formerly exposed to PFOA-contaminated drinking water. *Int. J. Hyg. Environ. Health* **2009**, *212*, 499–504.

(12) Provisional health advisories for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS); U.S. Environmental Protection Agency: Washington, DC, 8 January 2009.

(13) Takagi, S.; Adachi, F.; Miyano, K.; Koizumi, Y.; Tanaka, H.; Mimura, M.; Watanabe, I.; Tanabe, S.; Kannan, K. Perfluorooctanesulfonate and perfluorooctanoate in raw and treated tap water from Osaka, Japan. *Chemosphere* **2008**, *72*, 1409–1412.

(14) Loganathan, B. G.; Sajwan, K. S.; Sinclair, E.; Senthil Kumar, K.; Kannan, K. Perfluoroalkyl sulfonates and perfluorocarboxylates in two wastewater treatment facilities in Kentucky and Georgia. *Water Res.* **2007**, *41*, 4611–4620.

(15) Yu, J.; Hu, J.; Tanaka, S.; Fujii, S. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) in sewage treatment plants. *Water Res.* **2009**, *43*, 2399–2408.

(16) van Leeuwen, S. P.; Swart, C. P.; van der Veen, I.; de Boer, J. Significant improvements in the analysis of perfluorinated compounds in water and fish: Results from an interlaboratory method evaluation study. *J. Chromatogr. A* **2009**, *1216*, 401–409.

(17) Nakayama, S.; Strynar, M. J.; Helfant, L.; Egeghy, P.; Ye, X.; Lindstrom, A. B. Perfluorinated compounds in the Cape Fear Drainage Basin in North Carolina. *Environ. Sci. Technol.* **2007**, *41*, 5271–5276.

(18) Upper Mississippi River Basin Association. River and basin facts. http://www.umrba.org/index.htm (Accessed on 16 March 2010).

(19) R Development Core Team. R: A language and environment for statistical computing; R Foundation for Statistical Computing: Vienna, Austria, 2009.

(20) Murakami, M.; Shinohara, H.; Takada, H. Evaluation of wastewater and street runoff as sources of perfluorinated surfactants (PFSs). *Chemosphere* **2009**, *74*, 487–493.

(21) Minnesota Department of Health. Perfluorochemicals in Minnesota. http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/index.html (Accessed on 16 March 2010).

(22) Moody, C. A.; Hebert, G. N.; Strauss, S. H.; Field, J. A. Occurrence and persistence of perfluorooctanesulfonate and other perfluorinated surfactants in groundwater at a fire-training area at Wurtsmith Air Force Base, Michigan, USA. *J. Environ. Monitor.* **2003**, *5*, 341–345.

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Supporting Information

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Cross Sectional Determination of Perfluorinated Compounds in the Upper Mississippi River Basin

Authors:
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Method and materials

Water sampling

Total of 177 samples were collected from 88 sites in the Upper Mississippi Basin and a part of Missouri River Basin (Figure 1 and Figure S1–S4). Samples were collected by researchers from three state and one federal agencies under the collaboration with the Upper Mississippi River Basin Association.

Recovery and matrix effect

Recoveries were calculated based on a matrix matched spike extraction. Local pond water was spiked with known amounts of perfluorinated compounds (PFCs) and then extracted using a solid phase extraction (SPE) cartridge. After elution of the PFCs from the cartridge, the internal standards were added to the eluate. The same volume of unspiked pond water was extracted using a second SPE cartridge. After elution, the same amount of PFCs and internal standards were added to the eluate. The area ratio of the first sample (pre-addition to cartridge) was divided by that of the second eluate (post-addition) to give a recovery determination. The equation used for the calculation is shown below. Each level had five replicates.

$$= (\quad - \quad)/(\quad - \quad)$$, where:

Rc is the recovery

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SB is the response for the extract of matrix spiked before SPE

SA is the response for the extract of matrix spiked after SPE

Blk is the response for the extract of matrix without spike

Matrix effects were calculated comparing a blank matrix extract spiked with PFCs to a blank methanol solution spiked with the same amount of PFCs. Unspiked pond water was extracted using the SPE method described above. After elution, PFCs and internal standards were added to the eluate. The same volume of methanol was spiked with the same amount of PFCs and internal standards. The area ratio of the first sample (post-spike) was divided by that of the methanol solution (solvent) to give a matrix effect determination. The equation used for the calculation is shown below. Each level had five replicates.

$= (\quad - \quad)/ \quad$, where:

ME is the matrix effect

SA is the response for the extract of matrix spiked after SPE

Sstd is the response for elution solvent spiked (no matrix)

Blk is the response for the extract of matrix without spike

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Tables

Table S1. UPLC gradient program (A) and Quatro Premier MS parameters (B)

(A)

Time	A	B	Curve
0.00	60	40	initial
0.50	60	40	6
3.50	10	90	6
3.60	0	100	6
4.50	0	100	6
4.60	60	40	6
6.00	60	40	6

A: 2 mM ammonium acetate in deionized water with 5% methanol, B: 2 mM ammonium acetate in 100% methanol

(B)

Instrument Parameters	
Capillary (kV)	−0.40
Source temperature	150°C
Desolvation temperature	350°C
Cone gas flow	2 L/hr
Desolvation gas flow	1200 L/hr
Cone voltage	Optimized for
Collision energy	each compound

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Table S2. MS transition monitored for target compounds

Analyte	Acronym	MS/MS Transition		IS used
		Quantifier	Qualifier	
Perfluorobutanoic acid	C4	212.80 > 168.75	NA[a]	MC6
Perfluoropentanoic acid	C5	262.85 > 218.75	NA[a]	MC6
Perfluorohexanoic acid	C6	312.70 >268.70	312.70 >118.70	MC6
Perfluoroheptanoic acid	C7	362.65 > 318.70	362.65 > 168.65	MC8
Perfluorooctanoic acid	C8 or PFOA	412.60 > 368.65	412.60 > 168.70	MC8
Perfluorononanoic acid	C9	462.60 > 418.60	462.60 > 218.75	MC8
Perfluorodecanoic acid	C10	512.60 > 468.55	512.60 > 218.75	MC11
Perfluoroundecanoic acid	C11	562.60 > 518.60	562.60 > 268.65	MC11
Perfluorododecanoic acid	C12	612.60 > 568.55	612.60 > 168.75	MC11
Perfluorobutane sulfonate	PFBS	298.70 > 98.80	298.70 > 79.90	MPFHS
Perfluorohexane sulfonate	PFHS	398.65 > 98.80	398.65 > 79.90	MPFHS
Perfluorooctane sulfonate	PFOS	498.65 > 98.80	498.65 > 79.90	MPFOS
Perfluorodecane sulfonate	PFDS	598.60 > 98.80	598.60 > 79.90	MPFOS
1,2-$^{13}C_2$-Perfluorohexanoic acid	MC6	314.75 > 269.75	-	Internal Standards (IS)
1,2,3,4,5,6,7,8-$^{13}C_2$-Perfluorooctanoic acid	MC8	402.65 > 83.90	-	
1,2-$^{13}C_2$-Perfluoroundecanoic acid	MC11	429.65 > 375.75	-	
$^{18}O_2$-Perfluorohexane sulfonate	MPFHS	502.60 > 83.90	-	
$^{18}O_2$-Perfluorooctane sulfonate	MPFOS	564.60 > 519.65	-	

a: No secondary MS/MS transition was found for C4 and C5 that could be used as qualifier ions.

Table S3. Method performance characteristics: Mean, minimum, and maximum recoveries and relative standard deviation (RSD)

Compounds	L-QC[a], 5.0 ng/L					L-QC[a], 50 ng/L					F-QC[b], 50 ng/L				
	N	Mean	RSD	Min	Max	*N*	Mean	RSD	Min	Max	*N*	Mean	RSD	Min	Max
C12	16	91.6	11	79.8	116	16	93.0	5.5	85.7	110	16	93.5	12	77.0	108
C11	16	93.2	9.5	81.3	118	16	92.8	11	82.2	108	16	102	14	79.4	124
C10	16	89.3	7.5	81.1	108	16	91.9	12	77.1	115	16	100	14	76.1	123
C9	16	94.6	11	79.0	111	16	98.5	11	86.3	116	16	101	15	75.9	119
C8	16	94.4	5.4	85.8	105	16	93.2	12	82.6	111	16	103	15	79.7	125
C7	16	104	14	80.2	117	16	96.5	5.9	87.9	105	16	96.6	14	75.9	122
C6	16	100	3.8	90.5	108	16	90.2	5.2	84.4	97.7	16	95.5	15	75.8	119
C5	14	104	8.5	90.2	118	14	105	5.2	92.4	109	12	108	6.5	94.5	119
C4	14	101	7.5	87.7	112	14	99.1	9.7	83.3	116	12	99.5	10	85.8	123
PFDS	15	99.4	10	80.0	111	15	92.6	11	78.2	110	15	91.7	12	75.0	105
PFOS	16	96.2	6.9	82.7	107	16	95.1	4.5	87.2	104	16	97.9	12	75.2	123
PFHS	16	99.0	4.9	90.4	106	16	100	5.8	89.6	111	16	105	10	86.9	125
PFBS	16	95.9	7.8	84.4	111	16	89.7	6.1	76.7	100	16	95.4	10	79.8	113

a: Spike samples prepared at the same time as calibration curves in the laboratory
b: Spike sample prepared and carried to field

Table S4. Perfluorinated compounds in samples collected by Minnesota State personnel

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFD5	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		107	105	103	110	117	97.4	101	103	98.7	85.0	92.3	93.5	85.9
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-1	–	< 1	< 1	< 1	< 1	< 1	2.41	< 1	ND	2.28	< 1	< 1	< 1	< 1
MS/MN-2	–	< 1	< 1	< 1	< 1	< 1	2.46	1.04	ND	2.77	< 1	< 1	< 1	< 1
MS/MN-3	39	< 1	< 1	< 1	< 1	< 1	2.63	1.14	< 1	3.52	< 1	< 1	< 1	< 1
MS/MN-3D	39	< 1	< 1	< 1	< 1	< 1	< 1	1.18	< 1	2.18	ND	< 1	< 1	ND
MS/MN-4	280	< 1	< 1	< 1	< 1	< 1	2.61	1.25	ND	3.01	< 1	< 1	< 1	< 1
MS/MN-5	290	< 1	< 1	< 1	< 1	1.34	4.62	1.49	ND	4.09	< 1	< 1	< 1	< 1
MS/MN-6	290	ND	< 1	< 1	< 1	1.24	4.36	1.60	< 1	3.55	< 1	< 1	< 1	< 1
MS/MN-7	290	< 1	< 1	< 1	< 1	1.17	2.31	3.25	ND	3.17	< 1	< 1	< 1	< 1
MS/MN-10	420	< 1	ND	< 1	< 1	< 1	< 1	< 1	ND	2.49	ND	< 1	< 1	< 1
MS/MN-11	420	< 1	< 1	< 1	< 1	1.21	4.58	1.74	< 1	3.54	< 1	< 1	< 1	< 1
MS/MN-12	420	< 1	< 1	< 1	< 1	1.20	2.36	< 1	< 1	3.42	< 1	< 1	< 1	< 1
MS/MN-13	470	< 1	< 1	< 1	1.14	2.14	6.62	2.39	< 1	2.74	< 1	< 1	< 1	< 1
MS/MN-13D	470	< 1	< 1	< 1	< 1	< 1	1.30	< 1	< 1	2.98	< 1	< 1	< 1	ND
TR/MN-1[b]	–	< 1	< 1	< 1	2.73	50.5	10.5	53.4	7.60	2.60	< 1	124	169	19.2
TR/MN-2	150	< 1	ND	< 1	< 1	1.10	2.66	1.39	ND	1.26	ND	1.35	< 1	< 1
TR/MN-3	21	< 1	< 1	< 1	< 1	< 1	< 1	1.09	< 1	3.49	< 1	< 1	< 1	ND

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May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		104	91.5	92.2	92.9	89.4	117	97.9	106	94.0	91.4	89.5	98.8	95.3
L-QC, 50 ng/L		90.2	83.4	85.9	89.5	82.6	90.6	87.3	109	102	85.7	91.8	95.2	90.4
F-QC, 50 ng/L		82.4	105	99.0	76.1	86.7	99.6	102	103	99.1	76.2	92.7	96.1	87.3
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-14	470	< 1	< 1	< 1	< 1	1.11	< 1	< 1	ND	2.73	< 1	< 1	< 1	ND
MS/MN-15	660	< 1	ND	< 1	< 1	< 1	1.45	< 1	ND	2.62	ND	< 1	< 1	ND
MS/MN-16	660	< 1	< 1	< 1	< 1	1.44	1.06	1.96	< 1	3.74	< 1	< 1	< 1	ND
MS/MN-17	660	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	< 1	< 1	< 1	< 1	ND
MS/MN-17D	660	< 1	< 1	< 1	< 1	1.73	< 1	< 1	ND	2.41	ND	< 1	< 1	ND
MS/MN-18	660	< 1	< 1	< 1	< 1	1.36	< 1	< 1	ND	1.74	ND	< 1	< 1	< 1
MS/MN-18D	660	< 1	< 1	< 1	< 1	1.28	< 1	< 1	ND	1.26	< 1	1.78	< 1	< 1
MS/MN-19	660	< 1	< 1	< 1	< 1	1.81	< 1	< 1	< 1	1.60	< 1	1.74	< 1	< 1
MS/MN-19D	660	< 1	< 1	< 1	< 1	2.40	< 1	< 1	< 1	2.09	ND	2.63	< 1	< 1
MN/MN-1	17	< 1	< 1	< 1	< 1	1.15	< 1	< 1	ND	1.17	ND	ND	< 1	ND
MN/MN-2	110	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.41	ND	2.41	ND	ND
MN/MN-3	690	< 1	< 1	< 1	< 1	1.33	1.80	< 1	ND	1.13	ND	< 1	< 1	ND
MN/MN-3D	690	< 1	< 1	< 1	< 1	1.10	1.00	< 1	ND	< 1	ND	1.14	< 1	< 1
MN/MN-4	690	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.81	< 1	< 1	< 1	ND
MN/MN-5	690	< 1	< 1	< 1	< 1	1.26	< 1	< 1	ND	1.82	< 1	< 1	< 1	ND
MN/MN-6	460	< 1	< 1	< 1	< 1	1.58	< 1	< 1	ND	< 1	ND	1.92	< 1	ND
MN/MN-6D	460	< 1	< 1	< 1	< 1	1.00	< 1	< 1	< 1	< 1	ND	< 1	< 1	ND
TR/MN-4	79	< 1	< 1	< 1	< 1	1.37	1.41	< 1	ND	4.87	ND	< 1	ND	ND

July

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		89.5	81.9	84.8	90.4	95.8	91.3	90.5	109	103	111	102	99.2	88.2
L-QC, 50 ng/L		95.6	84.1	77.1	86.3	83.8	87.9	86.2	106	93.8	106	95.9	104	76.7
F-QC, 50 ng/L		93.0	86.4	89.7	106	111	115	115	108	95.2	105	82.6	101	87.3
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
TR/MN-1[b]	–	< 1	< 1	< 1	6.36	95.6	28.6	128	44.9	12.5	< 1	296	365	42.3
TR/MN-1D	–	< 1	< 1	< 1	6.25	89.5	32.0	140	44.6	14.7	ND	270	371	41.1
TR/MN-1DD	–	< 1	< 1	< 1	6.59	91.3	28.4	126	45.0	12.0	ND	296	365	41.7

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August

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		82.0	99.8	98.0	103	102	114	108	102	112	80.0	107	101	111
L-QC, 50 ng/L		93.3	95.5	92.7	97.1	93.5	97.4	93.1	92.4	83.3	98.4	104	108	87.6
F-QC, 50 ng/L		106	99.4	94.7	99.3	105	104	107	101	85.8	104	107	115	96.7
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/MN-1	–	ND	ND	ND	ND	ND	8.24	1.45	< 1	1.83	ND	ND	ND	< 1
MS/MN-2	–	1.28	< 1	< 1	< 1	3.49	13.2	3.29	1.39	< 1	ND	< 1	ND	< 1
MS/MN-3	11	ND	ND	ND	< 1	< 1	4.88	1.09	< 1	1.79	ND	ND	ND	< 1
MS/MN-3D	11	ND	ND	ND	< 1	< 1	5.36	1.31	< 1	ND	ND	1.30	ND	< 1
MS/MN-4	21	3.07	ND	ND	< 1	1.14	2.75	< 1	1.11	< 1	ND	3.48	ND	< 1
MS/MN-5	25	< 1	< 1	< 1	< 1	< 1	2.41	< 1	ND	2.38	ND	< 1	ND	< 1
MS/MN-6	25	< 1	< 1	< 1	1.98	3.63	5.65	2.29	< 1	2.44	ND	< 1	1.39	1.40
MS/MN-7	25	< 1	< 1	ND	< 1	1.48	3.95	1.41	< 1	2.00	ND	< 1	ND	< 1
MS/MN-8	25	< 1	1.97	2.46	8.52	8.18	6.07	5.81	1.96	2.27	ND	245	3.02	84.1
MS/MN-8D	25	4.36	< 1	ND	5.66	5.48	7.06	5.19	2.42	2.43	ND	206	1.09	46.8
MS/MN-9	25	ND	ND	ND	< 1	< 1	3.15	< 1	< 1	1.74	ND	< 1	< 1	< 1
MS/MN-9D	25	ND	ND	ND	< 1	1.34	4.47	1.10	< 1	2.14	ND	< 1	< 1	< 1
MS/MN-10	47	< 1	< 1	ND	ND	2.01	5.72	1.68	< 1	1.72	ND	< 1	< 1	< 1
MS/MN-11	47	< 1	ND	ND	< 1	1.35	3.35	1.00	< 1	2.95	ND	< 1	< 1	< 1
MS/MN-12	47	ND	< 1	ND	< 1	1.23	4.15	1.55	ND	2.10	ND	ND	1.86	< 1
MS/MN-13	50	ND	ND	ND	< 1	1.27	< 1	1.17	< 1	2.37	ND	ND	1.00	< 1
MS/MN-13D	50	ND	ND	ND	< 1	1.20	2.21	1.18	< 1	2.46	ND	1.62	< 1	< 1
MS/MN-14	6.6	ND	< 1	ND	ND	2.20	3.26	1.83	< 1	4.21	ND	< 1	ND	< 1
MS/MN-15	72	3.83	ND	ND	1.20	2.65	4.02	2.30	1.95	< 1	ND	20.3	4.04	3.57
MS/MN-16	72	ND	ND	< 1	< 1	5.13	4.34	3.48	1.51	4.11	ND	4.05	1.92	1.14
MS/MN-17	72	ND	< 1	1.16	2.01	8.01	4.71	5.76	2.14	6.26	ND	10.2	2.28	< 1
MS/MN-17D	72	< 1	ND	< 1	1.35	9.29	3.69	6.20	3.22	5.70	ND	4.68	3.22	< 1
MS/MN-18	72	1.76	< 1	< 1	1.38	7.96	4.16	5.67	3.92	12.7	ND	13.6	5.98	2.74
MS/MN-18D	72	2.52	< 1	< 1	2.53	9.42	4.41	6.40	3.07	11.0	ND	12.8	5.32	3.54
MS/MN-19	72	< 1	< 1	1.35	2.54	23.8	4.19	9.23	6.15	34.2	ND	29.0	13.4	15.0
MS/MN-19D	72	< 1	ND	< 1	1.90	22.5	3.50	9.35	5.54	27.5	ND	18.9	12.8	8.84

(continued)

August—continued

Samples, ng/L	Flow[a]	C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
MN/MN-1	–	< 1	ND	ND	ND	< 1	2.81	1.07	< 1	ND	ND	5.19	ND	< 1
MN/MN-2	–	< 1	< 1	ND	ND	1.13	4.10	1.10	ND	1.82	ND	< 1	ND	< 1
MN/MN-3	–	ND	< 1	ND	< 1	1.46	1.67	< 1	ND	1.69	ND	1.97	< 1	< 1
MN/MN-3D	–	1.32	ND	< 1	< 1	2.14	3.73	1.80	< 1	1.25	ND	9.20	< 1	< 1
MN/MN-4	–	1.88	ND	ND	ND	< 1	3.98	2.26	1.26	< 1	ND	6.47	2.00	ND
MN/MN-5	–	< 1	ND	ND	ND	1.46	1.80	1.40	< 1	1.52	ND	6.02	< 1	< 1
MN/MN-6	44	2.21	ND	< 1	1.14	3.95	5.14	3.60	3.00	1.47	ND	8.76	5.87	1.15
MN/MN-6D	44	ND	ND	< 1	< 1	4.06	3.74	2.92	2.07	1.57	ND	4.42	2.87	< 1
TR/MN-4	50	ND	ND	ND	ND	2.00	4.32	1.61	1.27	2.77	ND	2.10	< 1	< 1

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

b: Collected from a creek to the Wild Rice Lake Reservoir that potentially receives a run-off from a historical fire-training site at the Duluth International Airport. This stream is not a part of the Upper Mississippi River Basin but within the Cloquet River Watershed.

Table S5. Perfluorinated compounds in samples collected by Wisconsin State personnel

March (all sites were covered by ice)

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		89.8	89.3	95.1	108	105	107	97.0	NA	NA	85.1	101	100	108
L-QC, 50 ng/L		85.7	108	111	111	109	105	97.7	NA	NA	78.2	104	105	88.5
F-QC, 50 ng/L		88.0	79.4	85.4	83.3	79.7	85.7	75.8	NA	NA	97.4	123	125	108
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	340	ND	ND	< 1	< 1	6.69	< 1	2.65	NA	NA	ND	14.2	3.76	6.27
MS/WI-3D	340	< 1	ND	< 1	2.20	9.47	1.79	2.68	NA	NA	ND	15.6	3.42	5.68
MS/WI-11	630	< 1	< 1	< 1	< 1	5.01	< 1	1.54	NA	NA	ND	9.44	2.85	4.25
TR/WI-1	–	< 1	ND	< 1	ND	< 1	< 1	2.01	NA	NA	ND	4.69	ND	1.90
TR/WI-2	–	< 1	< 1	< 1	< 1	< 1	1.44	1.94	NA	NA	ND	2.07	< 1	ND
WI/WI-1	–	< 1	ND	< 1	< 1	2.86	1.50	3.38	NA	NA	ND	7.03	< 1	1.93

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		84.5	92.3	84.7	111	93.6	81.4	101	118	109	99.3	90.5	96.8	84.4
L-QC, 50 ng/L		91.7	103	97.2	116	109	103	96.5	104	92.6	110	96.2	104	84.8
F-QC, 50 ng/L		108	87.9	87.2	88.9	85.2	87.3	79.0	107	123	95.1	120	124	102
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	2000	< 1	ND	< 1	ND	< 1	< 1	< 1	ND	ND	ND	1.71	< 1	ND
MS/WI-11	2700	< 1	ND	< 1	< 1	2.31	ND	< 1	ND	ND	ND	3.54	< 1	2.60
MS/WI-11D	2700	< 1	ND	< 1	< 1	2.54	< 1	< 1	ND	ND	ND	4.16	1.00	2.24
TR/WI-1	650	ND	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	< 1	< 1	ND
TR/WI-2	370	< 1	ND	< 1	ND	< 1	ND	< 1	ND	ND	ND	< 1	ND	ND
WI/WI-1	970	< 1	< 1	< 1	< 1	2.12	< 1	1.58	ND	ND	< 1	2.88	< 1	ND

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May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		79.8	84.5	85.6	95.9	96.2	117	103	97.4	91.9	110	95.7	95.5	96.9
L-QC, 50 ng/L		90.7	90.7	85.6	93.7	86.9	90.1	84.4	109	116	91.0	95.4	99.3	100
F-QC, 50 ng/L		83.9	119	76.1	75.9	82.4	97.7	103	119	97.4	75.0	88.0	96.7	84.5
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-3	2000	< 1	< 1	< 1	< 1	1.64	< 1	1.18	< 1	3.38	< 1	1.98	< 1	1.16
MS/WI-3D	2000	< 1	< 1	< 1	< 1	2.07	< 1	< 1	< 1	3.94	ND	3.07	< 1	< 1
MS/WI-11	2700	< 1	< 1	< 1	< 1	2.79	1.17	1.44	< 1	4.24	ND	4.07	< 1	< 1
TR/WI-1	650	< 1	< 1	< 1	< 1	< 1	< 1	1.40	< 1	< 1	< 1	1.56	< 1	< 1
TR/WI-2	370	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	< 1	< 1	< 1	< 1	< 1
WI/WI-1	970	< 1	< 1	< 1	< 1	2.54	1.39	1.88	< 1	1.91	ND	4.32	< 1	< 1

August

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		116	118	108	83.2	99.4	97.0	98.4	90.2	87.7	N/A	92.6	90.4	96.5
L-QC, 50 ng/L		110	107	115	91.2	96.0	93.9	93.1	93.9	89.8	N/A	87.2	89.6	88.5
F-QC, 50 ng/L		98.2	103	115	114	108	105	108	NA	NA	N/A	94.7	104	98.1
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/WI-1	130	9.75	29.1	42.0	72.9	125	90.2	46.3	7.39	37.1	N/A	27.0	14.5	12.8
MS/WI-2	200	24.7	21.7	13.2	4.45	15.9	5.30	6.76	5.14	26.4	N/A	27.9	7.85	16.5
MS/WI-2D	200	7.29	14.9	8.42	3.13	14.4	7.61	7.15	6.17	28.8	N/A	16.1	8.39	16.8
MS/WI-3	330	5.71	9.32	5.39	3.79	10.5	4.42	3.62	2.86	11.8	N/A	13.9	2.97	2.87
MS/WI-4	360	14.0	28.3	17.0	4.06	7.28	2.28	2.69	2.63	6.85	N/A	37.1	2.36	3.51
MS/WI-5	360	1.64	1.78	< 1	1.41	7.37	2.16	2.83	2.69	12.0	N/A	6.46	1.78	3.34
MS/WI-6	380	< 1	1.62	< 1	1.49	6.75	3.11	2.16	2.28	7.51	N/A	10.5	1.59	2.36
MS/WI-7[b]	–	< 1	< 1	4.31	9.68	30.7	7.19	21.5	12.5	16.7	N/A	18.4	8.90	2.28
MS/WI-8	–	1.03	< 1	< 1	1.07	6.18	8.60	3.48	2.74	11.6	N/A	6.94	1.76	< 1
MS/WI-9	420	< 1	1.04	1.47	1.23	6.76	6.98	3.03	< 1	7.43	N/A	12.6	2.50	2.91
MS/WI-10	430	< 1	1.29	< 1	< 1	5.47	1.73	2.32	2.42	8.86	N/A	7.78	2.72	1.43
MS/WI-11	480	< 1	< 1	< 1	1.17	5.38	8.56	3.36	2.28	7.07	N/A	8.04	2.03	1.51
MS/WI-12[c]	–	< 1	< 1	3.67	4.14	31.0	5.42	19.1	12.4	3.36	N/A	61.7	101	6.16
TR/WI-3	–	< 1	< 1	< 1	< 1	4.98	8.98	3.44	5.16	< 1	N/A	3.91	< 1	< 1
TR/WI-4[d]	–	< 1	1.03	< 1	< 1	18.0	1.86	1.75	1.33	48.7	N/A	13.4	6.39	3.26

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

b: La Crosse Wastewater Treatment Plant effluent

c: Prairie du Chien Wastewater Treatment Plant outfall
d: La Crosse Well #23

Table S6. Perfluorinated compounds in samples collected by Illinois State personnel

March

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		91.2	97.1	91.4	106	97.0	80.2	100	116	109	111	82.7	96.8	106
L-QC, 50 ng/L		91.8	100	99.0	111	111	102	95.9	109	88.7	102	95.6	111	90.0
F-QC, 50 ng/L		101	106	96.4	102	96.9	93.4	90.6	NA	NA	97.1	75.2	86.9	79.8
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**CS**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-7	970	< 1	< 1	< 1	< 1	3.89	2.35	2.75	1.89	4.60	ND	10.5	5.92	4.09
IL/IL-8	860	< 1	< 1	< 1	1.42	4.63	1.92	2.69	2.08	5.46	ND	3.56	1.08	2.27
MS/IL-3	1200	< 1	< 1	< 1	< 1	7.94	2.61	4.37	31.5	325	ND	20.4	6.59	25.1
MS/IL-4	960	< 1	< 1	< 1	< 1	4.25	1.13	1.93	4.77	161	ND	5.46	1.59	4.24
MS/IL-9	4800	< 1	ND	< 1	< 1	2.75	1.65	1.74	1.96	48.0	ND	3.94	< 1	2.49
MS/IL-9D	4800	< 1	< 1	< 1	< 1	3.01	2.09	1.89	2.04	45.4	ND	4.32	< 1	2.74

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	CS	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		82.3	81.3	81.1	79	85.8	91.6	105	NA	NA	86	94.9	91.4	89
L-QC, 50 ng/L		96.6	108	107.0	116	104	105	93.2	NA	NA	95	97.9	106	93.6
F-QC, 50 ng/L		101	117	107.9	114	117.4	121.9	109.1	NA	NA	102.0	100.4	111.9	97.0
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**CS**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	71	< 1	< 1	1.56	5.79	14.4	10.9	13.4	5.95	6.85	ND	17.6	4.25	2.35
IL/IL-2	71	< 1	< 1	1.16	3.34	15.6	9.82	12.6	7.34	9.17	ND	16.7	3.64	2.47
IL/IL-3	–	< 1	< 1	1.00	3.63	11.7	4.09	7.38	5.50	21.6	ND	13.7	3.60	2.35
IL/IL-3D	–	< 1	< 1	1.07	3.72	12.0	4.75	7.20	5.68	21.3	ND	14.6	3.91	2.19
TR/IL-1	140	< 1	ND	< 1	< 1	< 1	2.29	1.20	ND	ND	ND	< 1	ND	< 1

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April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		77.0	82.1	108	119	125	75.9	82.3	110	107	95.6	100	101	97.8
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	63	< 1	< 1	2.14	4.61	26.9	8.99	17.3	11.6	12.8	< 1	27.4	4.18	13.7
IL/IL-2	63	< 1	< 1	2.80	5.52	22.6	8.92	15.9	10.1	8.70	< 1	21.9	6.01	5.00
IL/IL-2D	63	< 1	< 1	2.66	5.77	23.3	8.87	15.6	9.86	8.71	< 1	23.8	5.50	5.04
IL/IL-3	–	< 1	< 1	1.48	4.29	16.5	7.02	13.9	10.0	6.85	ND	17.1	5.50	3.87
IL/IL-7	950	< 1	< 1	< 1	1.15	3.58	2.73	4.38	2.74	3.98	< 1	2.81	1.17	1.00
IL/IL-8	910	< 1	< 1	1.07	1.63	5.09	3.79	4.62	1.90	4.56	< 1	6.48	1.80	1.33
MS/IL-3	4200	< 1	< 1	< 1	< 1	4.86	3.48	4.53	12.2	420	< 1	8.33	2.18	4.65
MS/IL-4	4400	< 1	< 1	< 1	1.00	3.99	3.13	3.09	3.42	160	ND	5.53	1.13	3.13
MS/IL-9	8400	< 1	< 1	< 1	1.04	3.81	2.70	2.59	1.87	22.1	< 1	3.50	1.04	2.07
MS/IL-9D	8400	< 1	< 1	< 1	< 1	3.57	2.66	2.58	1.91	23.7	< 1	3.23	< 1	2.06
TR/IL-2	120	< 1	< 1	< 1	< 1	1.88	3.30	1.60	< 1	2.01	< 1	< 1	< 1	< 1

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May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		78.4	81.6	118	115	125	79.2	80.9	115	107	80.1	99.4	102	107
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-7	610	< 1	< 1	< 1	2.23	8.45	2.68	6.02	3.01	2.98	ND	4.86	2.02	1.33
IL/IL-8	730	< 1	< 1	< 1	2.27	7.28	2.62	5.41	2.65	3.45	< 1	5.28	1.88	1.44
IL/IL-9	–	< 1	< 1	< 1	1.76	6.62	2.12	4.79	2.19	3.70	ND	5.24	1.85	1.32
IL/IL-10	1000	< 1	< 1	< 1	1.91	6.77	2.54	4.81	2.52	2.68	< 1	3.33	1.56	1.27
IL/IL-11	1000	< 1	< 1	< 1	1.35	5.45	2.22	4.24	1.80	2.35	< 1	3.78	1.89	1.28
MS/IL-1	3700	< 1	< 1	< 1	< 1	2.91	1.43	2.68	< 1	3.95	< 1	3.37	1.09	1.14
MS/IL-2	4100	< 1	< 1	< 1	< 1	3.12	1.01	1.30	< 1	4.09	< 1	2.94	< 1	1.06
MS/IL-3	4100	< 1	< 1	< 1	< 1	5.43	2.42	2.56	10.5	458	< 1	8.33	2.11	2.68
MS/IL-4	4200	< 1	< 1	< 1	< 1	2.95	1.56	2.11	1.82	73.9	< 1	3.01	1.19	< 1
MS/IL-5	4700	< 1	< 1	< 1	< 1	3.66	1.34	1.59	2.78	158	< 1	4.63	< 1	1.02
MS/IL-6	–	< 1	< 1	< 1	< 1	2.01	1.67	1.08	< 1	16.5	< 1	2.03	< 1	< 1
MS/IL-7	7600	< 1	< 1	< 1	< 1	2.93	< 1	1.67	1.22	47.6	ND	2.98	< 1	1.57
MS/IL-8	8000	< 1	< 1	< 1	< 1	2.41	< 1	1.24	< 1	30.3	ND	3.06	< 1	< 1
MS/IL-9	9100	< 1	< 1	< 1	< 1	3.07	1.72	2.43	< 1	28.6	< 1	3.30	< 1	1.30
TR/IL-1	570	< 1	< 1	< 1	< 1	2.19	1.24	3.23	1.44	4.27	< 1	1.39	< 1	< 1

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		104	91.5	92.2	92.9	89.4	117	97.9	106	94.0	91.4	89.5	98.8	95.3
L-QC, 50 ng/L		90.2	83.4	85.9	89.5	82.6	90.6	87.3	109	102	85.7	91.8	95.2	90.4
F-QC, 50 ng/L		77.7	106	123	116	99.7	80.5	77.4	116	103	87.8	99.8	98.3	90.7
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
IL/IL-1	110	< 1	< 1	1.32	3.28	11.7	10.1	9.31	6.52	5.20	< 1	50.8	7.10	2.32
IL/IL-2	110	< 1	< 1	1.43	5.52	16.3	5.26	10.6	7.39	5.44	< 1	15.0	4.27	1.81
IL/IL-3	–	< 1	< 1	1.38	4.29	16.3	4.89	10.0	7.89	5.69	< 1	14.4	4.22	2.27
IL/IL-4	520	< 1	< 1	1.24	2.82	6.66	3.05	5.45	3.11	2.78	< 1	6.76	2.06	1.68
IL/IL-5	740	< 1	< 1	< 1	1.92	7.96	2.93	4.72	2.88	3.45	ND	6.43	1.57	1.74
IL/IL-6	740	< 1	< 1	1.04	2.44	9.35	3.54	5.88	3.60	3.45	< 1	6.69	1.75	1.34
TR/IL-2	80	< 1	< 1	< 1	< 1	2.88	1.23	1.70	< 1	< 1	ND	1.50	< 1	1.31

May

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		79.8	84.5	85.6	95.9	96.2	117	103	97.4	91.9	110	95.7	95.5	96.9
L-QC, 50 ng/L		90.7	90.7	85.6	93.7	86.9	90.1	84.4	109	116	91.0	95.4	99.3	100
F-QC, 50 ng/L		104	124	76.6	90.8	87.5	97.9	94.7	107	86.4	76.5	92.4	96.8	89.2
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MS/IL-10	15000	< 1	< 1	< 1	< 1	2.29	1.12	1.64	1.15	38.5	< 1	2.23	< 1	1.25
MS/IL-11	15000	< 1	< 1	< 1	< 1	1.67	< 1	1.46	1.00	17.6	< 1	2.32	< 1	1.71
MS/IL-11D	15000	< 1	< 1	< 1	< 1	1.93	< 1	1.47	< 1	19.9	< 1	3.86	< 1	1.26
MS/IL-12	16000	< 1	< 1	< 1	< 1	2.16	< 1	1.41	< 1	20.6	ND	1.76	< 1	1.35

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s

Table S7. Perfluorinated compounds in samples collected by US EPA Region 7 personnel

April

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		84.5	92.3	84.7	111	93.6	81.4	101	118	109	99.3	90.5	96.8	84.4
L-QC, 50 ng/L		91.7	103	97.2	116	109	103	96.5	104	92.6	110	96.2	104	84.8
F-QC, 50 ng/L		100	120	111	119	119	115	119	94.5	92.2	103	96.7	108	101
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MO/MO-1[b]	1400	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	ND	< 1	2.73	< 1	ND
MO/MO-2[b]	1800	1.04	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	7.05	1.22	ND
MO/MO-3[b]	1800	< 1	ND	< 1	ND	< 1	< 1	< 1	ND	ND	ND	11.0	< 1	< 1
MO/MO-3D	1800	< 1	ND	< 1	< 1	< 1	< 1	< 1	ND	ND	ND	9.70	< 1	< 1
MO/MO-4[b]	1800	< 1	< 1	< 1	< 1	1.61	2.30	1.27	ND	ND	ND	9.11	< 1	ND
MO/MO-5[b]	6100	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	2.51	< 1	ND
MO/MO-5D[b]	6100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	ND	ND	3.04	< 1	ND
TR/IA-1	89	< 1	< 1	< 1	< 1	< 1	ND	< 1	ND	ND	ND	1.14	< 1	ND
TR/IA-2	–	< 1	< 1	< 1	ND	ND	ND	ND	ND	ND	< 1	< 1	ND	ND
TR/IA-3	37	< 1	ND	< 1	ND	ND	ND	ND	ND	ND	ND	< 1	ND	ND
TR/IA-4	240	< 1	ND	< 1	ND	ND	ND	< 1	ND	ND	ND	< 1	< 1	ND
TR/IA-5	970	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	< 1	ND	ND
TR/IA-6	350	< 1	< 1	< 1	ND	ND	ND	< 1	ND	ND	ND	< 1	ND	ND
TR/IA-7	720	< 1	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	1.83	< 1	ND
TR/IA-7D	720	< 1	< 1	< 1	ND	< 1	< 1	< 1	ND	ND	ND	1.65	< 1	ND
TR/MO-1[b]	190	< 1	< 1	< 1	< 1	2.01	1.05	1.34	ND	ND	< 1	15.2	1.62	ND
TR/MO-2	830	< 1	< 1	< 1	ND	< 1	ND	< 1	ND	ND	ND	1.57	< 1	ND

QCs, % accuracy		C12	C11	C10	C9	C8	C7	C6	C5	C4	PFDS	PFOS	PFHS	PFBS
L-QC, 5.0 ng/L		94.3	96.6	86.5	86.2	91.6	114	99.6	97.6	102	104	102	106	95.6
L-QC, 50 ng/L		92.3	82.2	82.9	91.3	83.9	96.4	86.9	107	102	84.1	92.6	96.1	90.0
F-QC, 50 ng/L		90.3	106	103	87.9	97.8	91.1	82.5	112	99.3	95.2	105	112	113
Samples, ng/L	**Flow[a]**	**C12**	**C11**	**C10**	**C9**	**C8**	**C7**	**C6**	**C5**	**C4**	**PFDS**	**PFOS**	**PFHS**	**PFBS**
MO/IA-1[b]	590	< 1	< 1	< 1	< 1	< 1	1.13	1.06	ND	1.89	< 1	1.69	< 1	< 1
MO/IA-2[b]	620	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	1.76	< 1	1.67	< 1	ND
MO/IA-2D[b]	620	< 1	< 1	< 1	< 1	< 1	1.59	< 1	ND	1.70	< 1	1.62	< 1	ND
MO/IA-3[b]	850	< 1	< 1	< 1	< 1	< 1	< 1	< 1	ND	2.02	< 1	1.65	< 1	ND
TR/MO-3[b]	28	< 1	< 1	< 1	< 1	1.09	< 1	< 1	ND	1.98	< 1	4.05	1.81	1.12
TR/MO-3D	28	< 1	< 1	< 1	< 1	1.16	< 1	< 1	ND	1.88	< 1	2.93	1.88	< 1

ED_002003J_00101451-00025

a: Three days average sandwiching each sampling day at the nearest gauging station in m^3/s
b: Collected from the Missouri River Basin including Missouri (R7-1, 3–5, 13, 16–18), Kansas (R7-2), and Marmaton Rivers (R7-15).

Figures

Figure captions

Figure S1. Detailed map for samples collected by Minnesota State personnel
TR/MN-1 was from a creek to Wild Rice Lake Reservoir (not included in the Upper Mississippi River Basin); TR/MN-2 from Snake River; TR/MN-3 from Elk River; TR/MN-4 from Rum River; MN/MN-1–6 from Minnesota River and all others from Upper Mississippi River.

Figure S2. Detailed map for samples collected by Wisconsin State personnel
TR/WI-1 was from Chippewa River; TR/WI-2 from Black River; WI/WI-1 from Wisconsin River; TR/WI-3 from Halfway Creek; TR/WI-4 from Well #23 in La Cross; all others from Upper Mississippi River

Figure S3. Detailed map for samples collected by Illinois State personnel
IL/IL-4–11 were from Illinois River; IL/IL-1 from Cal Sag Channel; IL/IL-2 from Chicago Ship Canal; IL/IL-3 from Des Plaines River; TR/IL-1 from Rock River; TR/IL-2 from Kankakee River; all others from Upper Mississippi River.

Figure S4. Detailed map for samples collected by US EPA Region 7 State personnel
TR/IA-1 from Upper Iowa River; TR/IA-2 from Turkey River; TR/IA-3 from Maquoketa River; TR/IA-4 from Wapsipinicon River; TR/IA-5 from Iowa River; TR/IA-6 from Skunk River; TR/IA-7 from Des Moines River; TR/MO-1 was from Kansas River; TR/MO-2 from Meramec River; TR/MO-3 from Marmaton River; all others from Missouri River. Missouri, Kansas, and Marmaton Rivers belong to the Missouri River Basin.

Figure S5. Mass flux for C4 (or PFBA), C8 (or PFOA), PFBS, and PFOS in the Upper Mississippi River (0 kilometer point at the confluence of the Mississippi and Ohio Rivers). Three-day averaged flow is depicted as the dotted line, with flow measured in $m^3/s \times 10^3$.

Figure S1

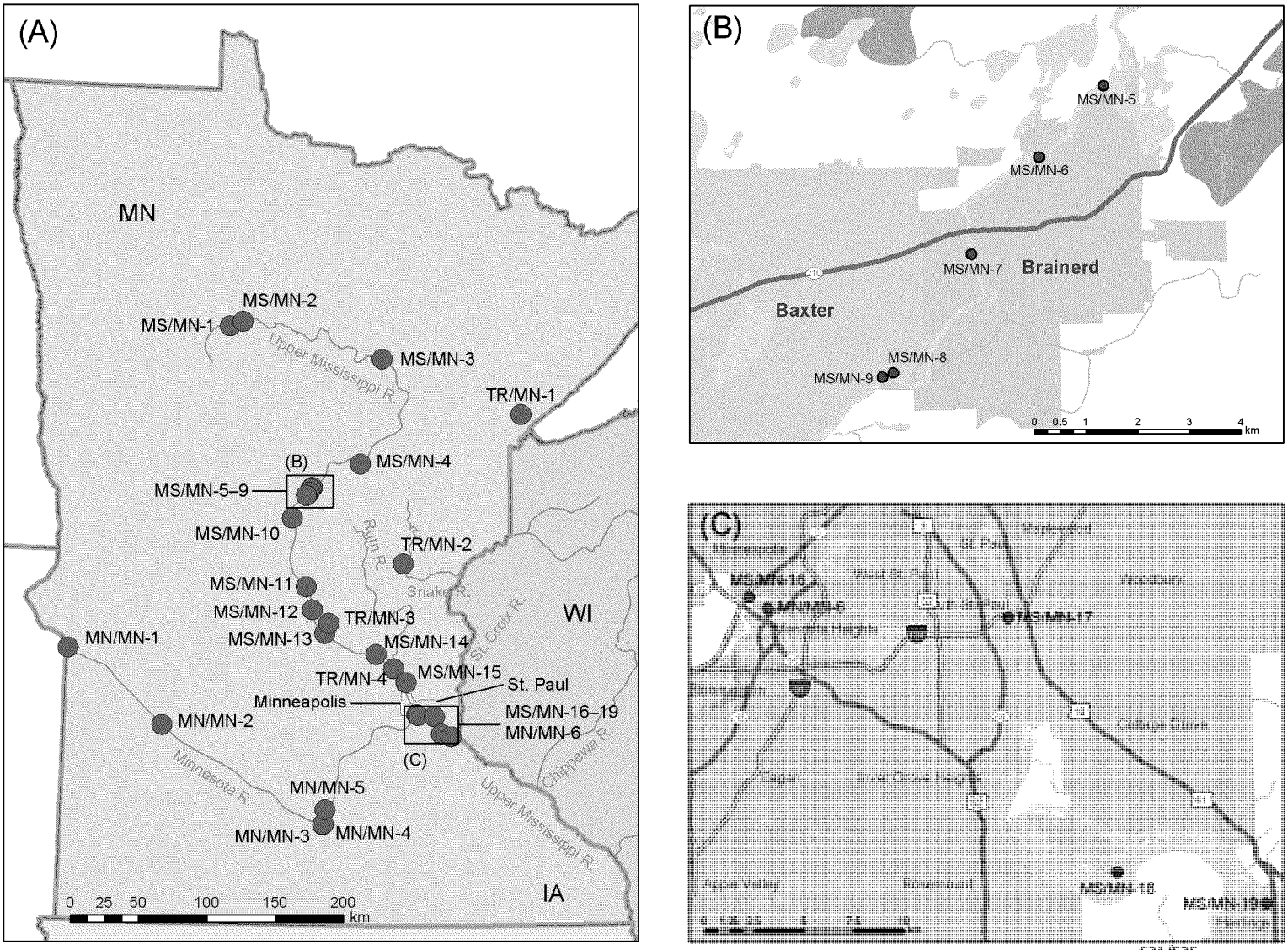

(A)
MN
WI
IA
MS/MN-1
MS/MN-2
MS/MN-3
MS/MN-4
MS/MN-5–9
MS/MN-10
MS/MN-11
MS/MN-12
MS/MN-13
MS/MN-14
MS/MN-15
MS/MN-16–19
MN/MN-1
MN/MN-2
MN/MN-3
MN/MN-4
MN/MN-5
MN/MN-6
TR/MN-1
TR/MN-2
TR/MN-3
TR/MN-4
(B)
(C)
Upper Mississippi R.
Rum R.
Snake R.
St. Croix R.
Minnesota R.
Chippewa R.
Minneapolis
St. Paul
0 25 50 100 150 200 km
(B)
MS/MN-5
MS/MN-6
MS/MN-7
MS/MN-8
MS/MN-9
Brainerd
Baxter
0 0.5 1 2 3 4 km
(C)
St. Paul
Maplewood
Woodbury
West St. Paul
Eagan
Inver Grove Heights
Apple Valley
Rosemount
Hastings
MS/MN-18
MS/MN-19

Figure S2

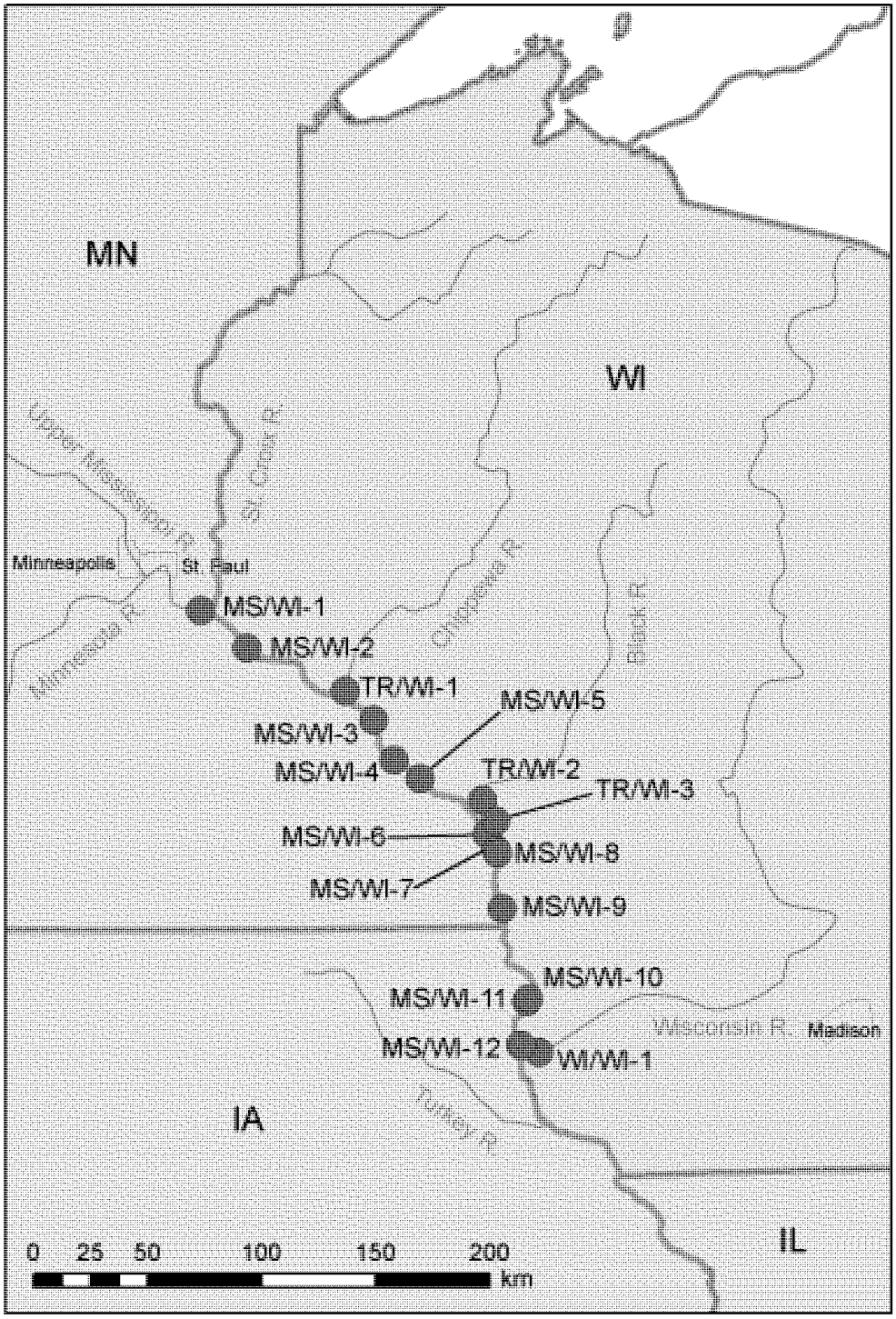

MN
WI
IA
IL
Minneapolis
St. Paul
St. Croix R.
Chippewa R.
Black R.
Wisconsin R.
Madison
MS/WI-1
MS/WI-2
TR/WI-1
MS/WI-3
MS/WI-4
MS/WI-5
TR/WI-2
TR/WI-3
MS/WI-6
MS/WI-7
MS/WI-8
MS/WI-9
MS/WI-10
MS/WI-11
MS/WI-12
WI/WI-1
0 25 50 100 150 200
km

Figure S3

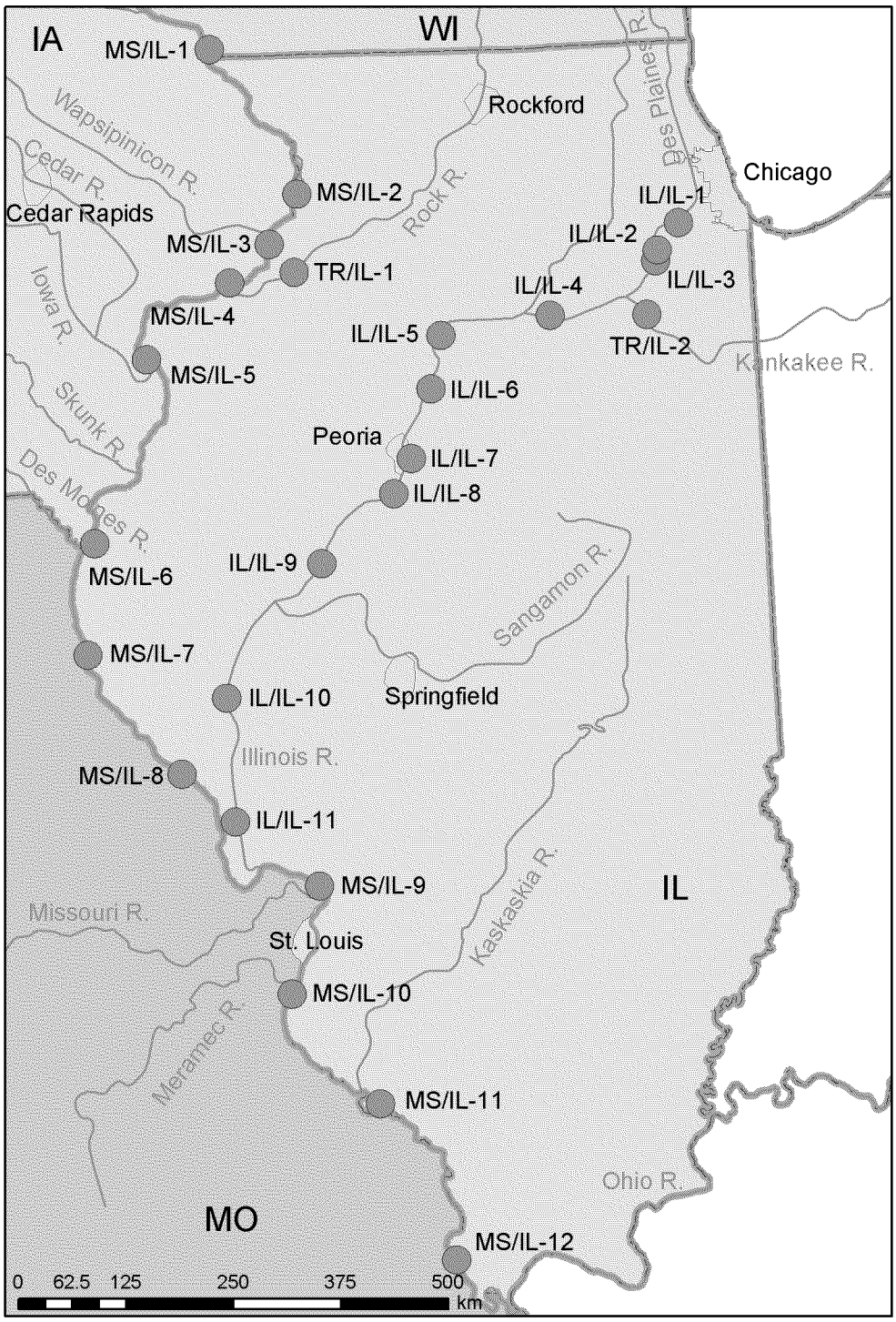

IA
WI
IL
MO
MS/IL-1
Rockford
Wapsipinicon R.
Cedar R.
Cedar Rapids
MS/IL-2
Rock R.
Des Plaines R.
Chicago
IL/IL-1
IL/IL-2
IL/IL-3
MS/IL-3
TR/IL-1
IL/IL-4
MS/IL-4
IL/IL-5
TR/IL-2
Kankakee R.
Iowa R.
MS/IL-5
IL/IL-6
Skunk R.
Peoria
IL/IL-7
IL/IL-8
Des Moines R.
MS/IL-6
IL/IL-9
Sangamon R.
MS/IL-7
IL/IL-10
Springfield
Illinois R.
MS/IL-8
IL/IL-11
MS/IL-9
Kaskaskia R.
Missouri R.
St. Louis
MS/IL-10
Meramec R.
MS/IL-11
Ohio R.
MS/IL-12
0 62.5 125 250 375 500
km

Figure S4

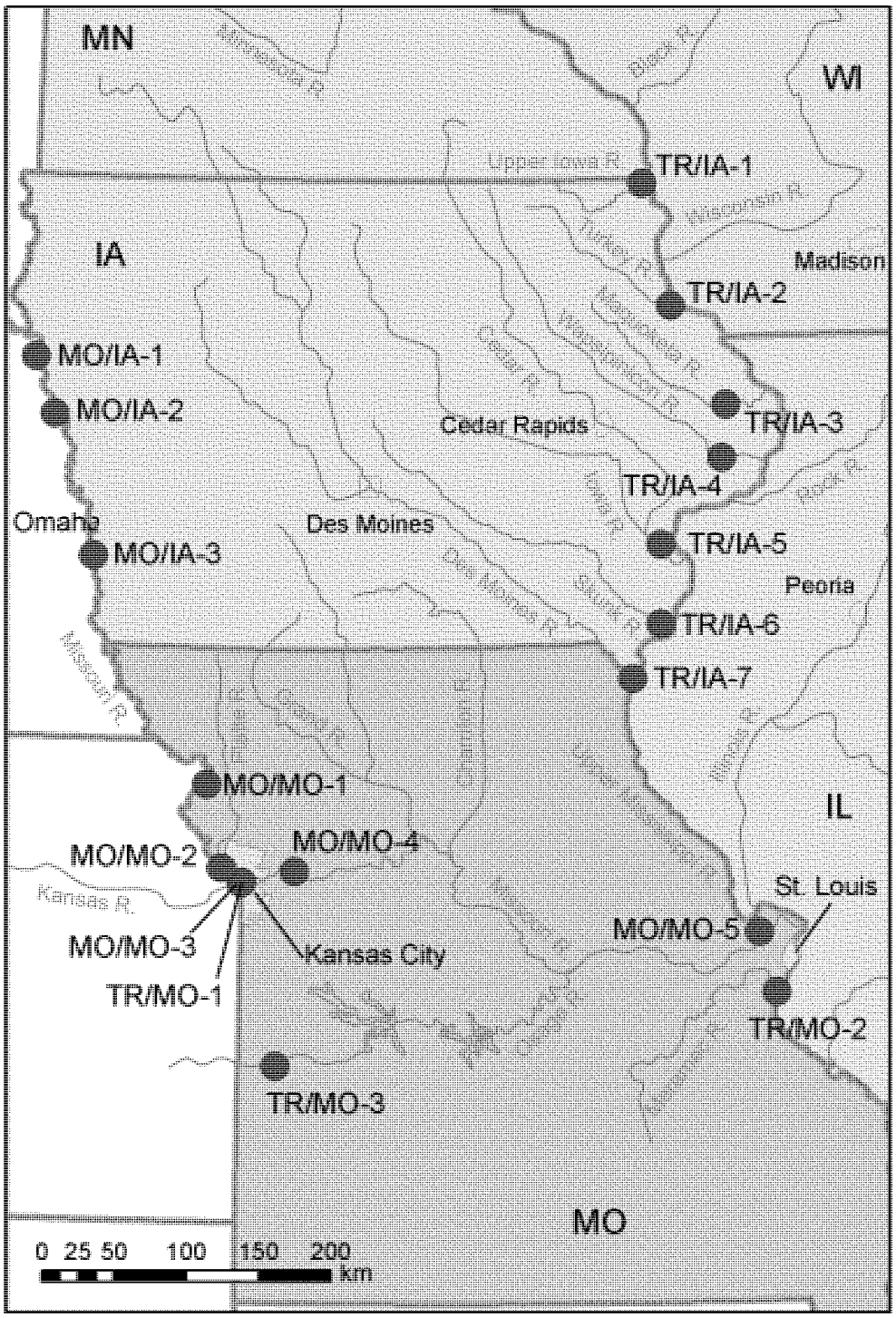
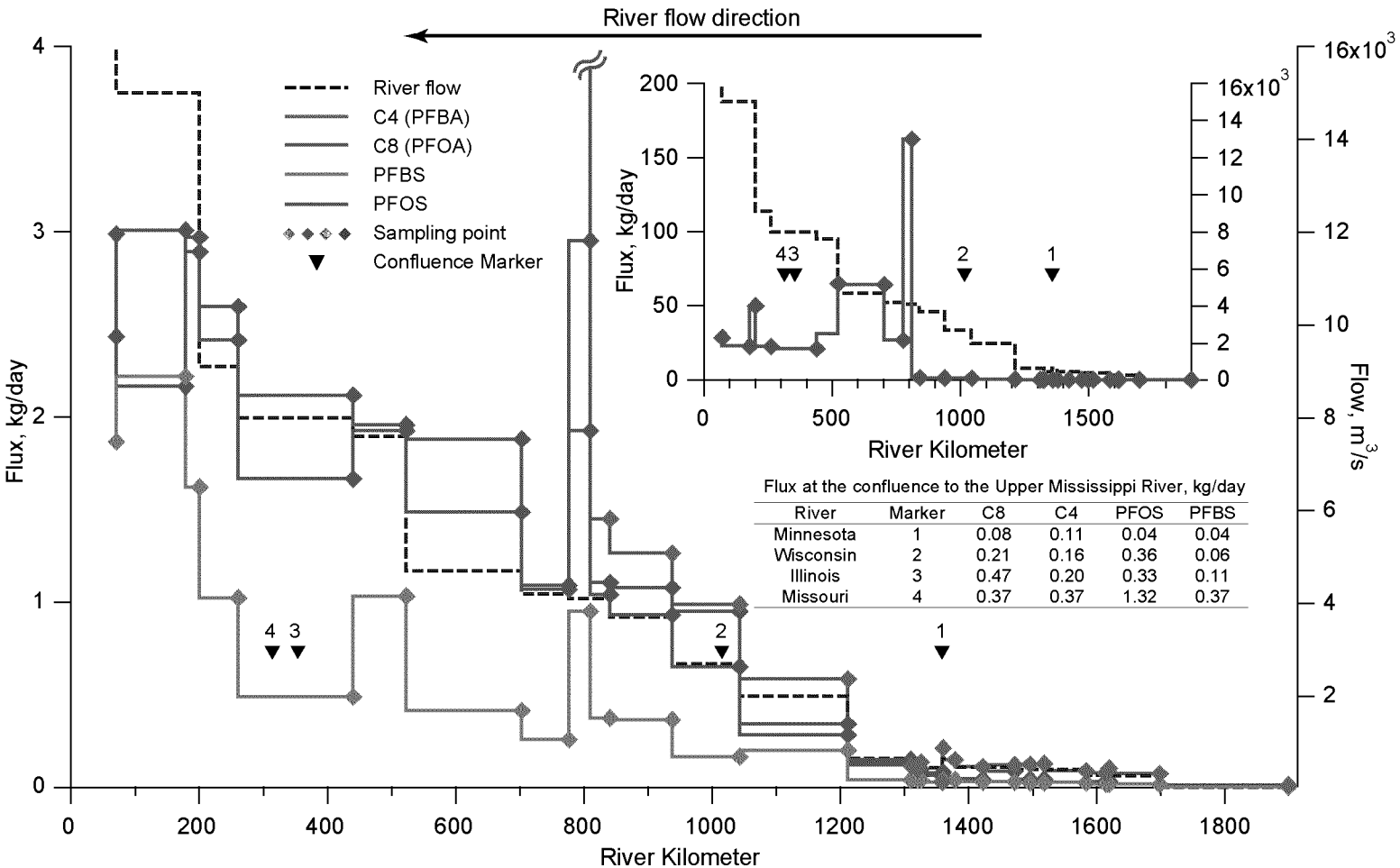

MN
WI
IA
IL
MO
Upper Iowa R.
TR/IA-1
Wisconsin R.
Madison
TR/IA-2
MO/IA-1
MO/IA-2
Cedar Rapids
TR/IA-3
TR/IA-4
Omaha
Des Moines
MO/IA-3
TR/IA-5
Peoria
TR/IA-6
TR/IA-7
Missouri R.
MO/MO-1
MO/MO-2
MO/MO-4
Kansas R.
St. Louis
MO/MO-5
MO/MO-3
Kansas City
TR/MO-1
TR/MO-2
TR/MO-3
0 25 50 100 150 200
km

Figure S5



Flux at the confluence to the Upper Mississippi River, kg/day

River	Marker	C8	C4	PFOS	PFBS
Minnesota	1	0.08	0.11	0.04	0.04
Wisconsin	2	0.21	0.16	0.36	0.06
Illinois	3	0.47	0.20	0.33	0.11
Missouri	4	0.37	0.37	1.32	0.37

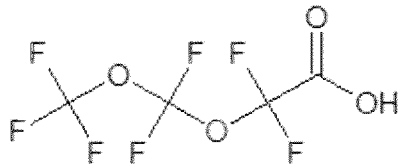
To: Lam.H.Leung-1@chemours.com[Lam.H.Leung-1@chemours.com]
From: Strynar, Mark
Sent: Tue 4/14/2015 1:24:24 PM
Subject: RE: Catching Up and Fluoros 2015

Hi Lam,

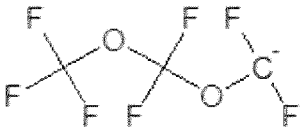
As it turns out I will now not be going to FLUOROS. It overlaps with my family vacation to Yellowstone this summer.

I got clearance to submit the paper about 2 weeks ago and I did so. I am waiting to hear back, hopefully soon.

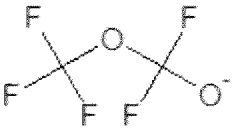
I ended up spending some time on a QQQ-TOFMS during a trip to Colorado School of Mines back in early March. I am now pretty confident in the structure being linear. I could see a series of fragments than all appear to lead back to this structure when run on a QQQ-TOFMS. For example with the m/z 244 shown below I see the following fragments that all point back to the structure. I also see a 84.9? this is a CF3O (not shown). I did similar work for the smaller and larger MW compounds but this is one compound I spent the most time on. I could not see how to get these masses with it being branched rather than linear.



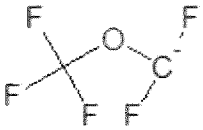
Molecular Formula: $C_6HF_7O_4$
Monoisotopic Mass: 245.976306 Da
$[M-H]^-$: 244.969029 Da



Molecular Formula: $C_5F_7O_2$
Monoisotopic Mass: 200.9792 Da



Molecular Formula: $C_2F_3O_2$
Monoisotopic Mass: 150.982394 Da



Molecular Formula: C_2F_3O
Monoisotopic Mass: 134.987479 Da

I had not heard of using method 537 for samples other than DW samples. If it were me I would not use it for any samples other than DW. As all the compounds covered under this method are anionic I would use a Waters Oasis WAX (weak anion exchange) SPE cartridge. Using the suggested polystyrenedivinylbenzene (SDVB) SPE column in surface water, wastewater and GW will accumulate lots of matrix interferences that would not work well at all. I believe this is the phase used in the Waters Oasis HLB column and we moved away from it for this reason. As I am not very familiar with method 537 I am unsure if the SPE cartridge can be substituted. I suspect not.

I was aware of the transition of DuPont to Chemours.
Take Care,
Mark

Dr. Mark J. Strynar
US EPA
Physical Scientist
919-541-3706
strynar.mark@epa.gov

From: Lam.H.Leung-1@chemours.com [mailto:Lam.H.Leung-1@chemours.com]
Sent: Monday, April 13, 2015 10:17 AM
To: Strynar, Mark
Subject: RE: Catching Up and Fluoros 2015

Hi Mark,

Sorry I did not get back to you sooner and I totally understand your situation on the poster proposition and for now I plan on presenting a poster on the subject on analytical with Robin Vestergren.

So have you made any progress getting clearance from your management regarding your manuscript and did the planned Orbitrap experiments get you more insight about the exact structure. As I mentioned before, the straight chain one can be a potential byproduct in one of our processes in Fayetteville and it'd be interesting to see what you find out (straight or branched).

Anyway, we've been hearing more and more about Method 537 these days from a number of our EPA contacts and are you aware that the folks at EPA are making this method the standard method (for not just drinking water but also for other water samples)?

By the way, I believe you are aware that we'll be transitioning to the new company and it'll be called Chemours such that all of our email addresses will be changed to @chemours instead of @dupont but rest assure, all emails sent to @dupont will be directed to the proper person for at least 2 years.

Hope all's well with you and thanks.

Best,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Thursday, February 12, 2015 7:48 AM
To: LEUNG, LAM-WING H
Subject: RE: Catching Up and Fluoros 2015

Hi Lam,

I had a good Holiday break. I had some comments from my management as part of the clearance I have been working through. It has not yet been submitted.

In addition I have taken a new look at the structures in question. I had scheduled some time on an Orbitrap to try to get unique fragments but my colleagues instrument was down. I am pretty confident in the formula, but perhaps the structure is not simply linear. I am adding a section to the paper to include potential branching conformations.

Concerning the co-authorship on a poster, I will respectively decline. Co-authorship of an item between a regulatory agency and a regulated company is something I try to avoid. Please understand. Mary Kaiser did this in the past and did a very good job. I am sure you will do so as well.

Mark

Dr. Mark J. Strynar
US EPA
Physical Scientist
919-541-3706

strynar.mark@epa.gov

From: Lam.H.Leung-1@chemours.com [mailto:Lam.H.Leung-1@chemours.com]
Sent: Monday, February 09, 2015 4:42 PM
To: Strynar, Mark
Subject: Catching Up and Fluoros 2015

Hi Mark,

Sorry I have not responded earlier to your note and I hope that you had a wonderful and relax holiday season. The last time I checked, the structure you indicated in your previous note, the straight chain one, probably make more sense as the ring structure is likely not stable. As far as I know and after some checking, it might be possible that the compound is a byproduct from one of our processes.

So have you submitted your manuscript as I recall you mentioning it almost getting clearance from your management?

One last item is that I understand that you are going to attend the Fluoros 2015 organized by Chris Higgins. Will you be interested in authorship with me on a poster with the emphasis on the "Dos and Don'ts in Analytical for PFAS analysis". With your vast experience in PFAS analysis and my dealings with our contract labs, I believe it'd be a good topic to present. Please let me know your thoughts on this.

Best Regards,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Monday, December 08, 2014 8:55 AM
To: LEUNG, LAM-WING H
Subject: RE: CAS #

Hi Lam. I had a good Thanksgiving and I hope you did. I am not involved with any groups in CA doing this kind of work. Sorry.

I went back and took a closer look at the suggested structures. I am still thinking this is what we have. One thing we cannot rule out is branching in the structure rather than straight chains. My chemist looked at the chemicals in the TSCA inventory reported at the Fayetteville site and thinks these compounds are possible from reactions of some of these starting materials found there.

Mark

Dr. Mark J. Strynar
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919-541-3706
strynar.mark@epa.gov

From: Lam.H.Leung-1@dupont.com [mailto:Lam.H.Leung-1@dupont.com]
Sent: Friday, December 05, 2014 11:13 AM
To: Strynar, Mark
Subject: RE: CAS #

Hi Mark,

Thank you for your note and I hope that you and your family had a great Thanksgiving.

As for the structure you mentioned below, I'm in the process of following up with our chemist about it and will let you know.

I came across this "report" recently and am wondering whether you are involved with this group or not? I can only speculate that they are using similar instrumentation as you do or an Orbitrap for identification. Perhaps you might have more insights.

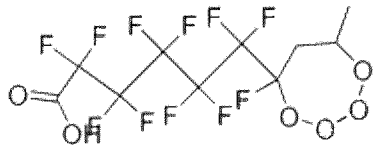
Best,
Lam

From: Strynar, Mark [mailto:Strynar.Mark@epa.gov]
Sent: Monday, November 24, 2014 7:38 AM
To: LEUNG, LAM-WING H
Subject: RE: CAS #

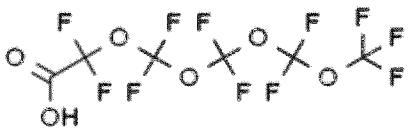
Hi Lam. I was going to be stuck in DC due to a delayed flight in Chicago, thus I was rebooked direct from Chicago to Raleigh. I got home 45 minutes before my original scheduled flights. However, I had to wait 1 hr. for my wife to arrive anyway.

Here is the CAS# of what I think we are seeing. I am taking a closer look this week but this is compound I believe it to be. It is clearly perfluorinated and there is a repeating CF2O subunit due to fragments and offsets.
CAS # 39492-90-5

However I see it drawn this way



And this way



With the same CAS#. However I get a 200.9794 fragment that is a C3 F 7 O2 it appears. I do not see how I can get that fragment from the top compound.

Mark

Dr. Mark J. Strynar
US EPA
Physical Scientist
919-541-3706
strynar.mark@epa.gov

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Francais Deutsch Italiano Espanol Portugues Japanese Chinese Korean

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To: Brower, Connie[connie.brower@ncdenr.gov]
Cc: Ventaloro, Christopher[christopher.ventaloro@ncdenr.gov]
From: Tobias, David
Sent: Fri 12/15/2017 6:03:57 PM
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

I remember you also asked who else we had spoken to from NC.

I don't have a complete list by any means but a few of the people
Amy Risen
Mina Shehee
Kennedy Holt

This is just who I emailed with and Amy Risen seemed to be our "lead" contact at nc-dhhs. There were several more people on calls – but I don't have the logs from those calls.

There are also more NC people that the risk management people talked to – but that isn't my bailiwick.

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Tuesday, December 12, 2017 1:49 PM
To: Tobias, David <Tobias.David@epa.gov>
Cc: Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

Thanks, so much!

From: Tobias, David [mailto:Tobias.David@epa.gov]
Sent: Monday, December 11, 2017 6:16 PM
To: Brower, Connie <connie.brower@ncdenr.gov>
Cc: Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

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Hello Connie and Chris

This is the ADME study that was performed on genx (HFPO-DA).

We can talk about it if you need to. I know these aren't fish, but it is a confirming piece of evidence that genx half-lives in animals are shorter than other PFCs (e.g. PFOS). I know you might not have seen this kind of data for other PFCs but some have longer half-lives than seen here for genx.

Tell me if you have questions.

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Tobias, David

Sent: Thursday, December 07, 2017 3:11 PM
To: 'Brower, Connie' <connie.brower@ncdenr.gov>
Cc: Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

Pan BAF from China
Hoke BCF from Dupont

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Thursday, December 07, 2017 12:43 PM
To: Tobias, David <Tobias.David@epa.gov>
Cc: Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

David – 3 pm is fine

My number should be appearing on the e-mails! I am so sorry!

Personal Phone / Ex. 6

We will call you at 3!

No worries

Connie and Chris

From: Tobias, David [mailto:Tobias.David@epa.gov]
Sent: Thursday, December 07, 2017 11:43 AM
To: Brower, Connie <connie.brower@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to report.spam@nc.gov.

Or better after 3pm.

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Tobias, David
Sent: Thursday, December 07, 2017 11:35 AM
To: 'Brower, Connie' <connie.brower@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

Sorry Connie

I have a conflict at 1pm. Is there any time from 2-5 pm that works for you?

I was going to call you, but I don't see your phone number in the emails.

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Thursday, December 07, 2017 8:41 AM
To: Tobias, David <Tobias.David@epa.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

Hi David –

Chris Ventaloro and I will give you a call. The others are just interested in the issues.

Connie

From: Tobias, David [mailto:Tobias.David@epa.gov]
Sent: Wednesday, December 06, 2017 5:23 PM
To: Brower, Connie <connie.brower@ncdenr.gov>; Behl, Betsy <Behl.Betsy@epa.gov>
Cc: Grzyb, Julie <julie.grzyb@ncdenr.gov>; Manning, Jeff <jeff.manning@ncdenr.gov>; Strong, Jamie <Strong.Jamie@epa.gov>; Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

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Good afternoon Connie

Sure I can talk tomorrow at 1pm.

Sorry for the late response, I was in a public meeting today on new chemical TSCA issues.

There are a lot of people on this email. Will this be a person to person call (Connie and I) or will there be a conference number needed?

Look forward to talking to you

David A. Tobias
Personal Phone / Ex. 6
Risk Assessment Division (RAD)
Office of Pollution Prevention and Toxics (OPPT)
My office hours : 8:30 am - 5:00 pm

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Wednesday, December 06, 2017 10:28 AM
To: Behl, Betsy <Behl.Betsy@epa.gov>
Cc: Grzyb, Julie <julie.grzyb@ncdenr.gov>; Manning, Jeff <jeff.manning@ncdenr.gov>; Strong, Jamie <Strong.Jamie@epa.gov>; Tobias, David <Tobias.David@epa.gov>; Ventaloro, Christopher <christopher.ventaloro@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

I am so grateful! Thanks, Betsy! And David!

David –

May I contact you tomorrow (Thursday 12/7) around 1:00 PM?

Connie

From: Behl, Betsy [mailto:Behl.Betsy@epa.gov]
Sent: Tuesday, December 05, 2017 4:51 PM
To: Brower, Connie <connie.brower@ncdenr.gov>
Cc: Grzyb, Julie <julie.grzyb@ncdenr.gov>; Manning, Jeff <jeff.manning@ncdenr.gov>; Strong, Jamie <Strong.Jamie@epa.gov>; Tobias, David <Tobias.David@epa.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

CAUTION: External email. Do not click links or open attachments unless verified. Send all suspicious email as an attachment to report.spam@nc.gov.

Connie, please follow up with David Tobias (202.564.8534). David works in the Risk Assessment Division in EPA's Office of Pollution Prevention and Toxics (OPPT). He has data and expertise on bioaccumulation of GenX in fish tissue and is ready to assist you.

Please let me know if you have additional questions

Best, Betsy

From: Brower, Connie [mailto:connie.brower@ncdenr.gov]
Sent: Tuesday, December 05, 2017 3:27 PM
To: Behl, Betsy <Behl.Betsy@epa.gov>
Cc: Grzyb, Julie <julie.grzyb@ncdenr.gov>; Manning, Jeff <jeff.manning@ncdenr.gov>
Subject: RE: [External] Re: BAFs / BCFs for perfluorinated compounds

Hi Betsy –

Our Science Advisor Board met yesterday – and yet, again, the subject of BAFs for the perfluorinated compounds (in this case Gen X) came up. Can you provide me with a contact for this question? We are definitely in need of assistance as our NPDES permitting group needs to establish a permit limit, and the citizens really are concerned with consumption of the fish , as Wilmington is a vacation/fishing destination.

Regards,
Connie

From: Behl, Betsy [mailto:Behl.Betsy@epa.gov]
Sent: Tuesday, October 17, 2017 11:41 AM
To: Brower, Connie <connie.brower@ncdenr.gov>
Subject: [External] Re: BAFs / BCFs for perfluorinated compounds

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Connie, thanks for the note and reminder. I will look into this and get back to you.

Sent from my iPhone
On Oct 17, 2017, at 10:38 AM, Brower, Connie <connie.brower@ncdenr.gov> wrote:

> Hi Betsy –
>
> We are still working on the issues related to "GenX" PFAAs in the Cape Fear River. It is a challenge, for sure. At the ACWA Vermont meeting you mentioned that you may be able to assist in finding BCFs/ BAFs for the class of compounds, or (hopefully) more specific information on "GenX" itself.
>
> We're you able to find anyone to aid us? Any assistance is useful, as we are trying to be prepared for these questions

with respect to potential development of water quality standards.

Regards,
Connie

To: Allenbach, Becky[Allenbach.Becky@epa.gov]
From: Tucker, Marlene
Sent: Wed 9/5/2018 11:08:56 AM
Subject: FW: Chemours lawsuit
Cape Fear River Watch v. Chemours.pdf

Becky,

See recent Complaint filed by the Cape Fear River Watch against Chemours alleging CWA and TSCA violations.

Regards,
Marlene Tucker

From: Tucker, Marlene
Sent: Wednesday, September 05, 2018 7:04 AM
To: George, Verne <George.Verne@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>
Subject: FW: Chemours lawsuit

See attached the Complaint dated August 29th, filed by the Cape Fear River Watch against Chemours alleging CWA and TSCA violations

Marlene Tucker

From: Tucker, Marlene
Sent: Wednesday, September 05, 2018 6:57 AM
To: Garvey, Mark <Garvey.Mark@epa.gov>
Cc: Miles, James <miles.james@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>
Subject: FW: Chemours lawsuit

Mark,

I am forwarding a copy of the Complaint dated August 29th filed by Cape Fear River Watch against Chemours alleging CWA and TSCA violations.

Regards,

Marlene Tucker

From: Nagrani, Kavita
Sent: Friday, August 31, 2018 9:22 AM
To: Palmer, Leif <Palmer.Leif@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: RE: Chemours lawsuit

Here it is – SELC linked to the complaint.

From: Palmer, Leif
Sent: Friday, August 31, 2018 9:17 AM
To: Nagrani, Kavita <Nagrani.Kavita@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: Re: Chemours lawsuit

Thanks for being alert. Please ask Josh Grimes or Saundi to see if the complaint is available on Pacer.

Marlene — please let Mark Garvey know.

I'll forward to OGC.

Sent from my iPhone
On Aug 31, 2018, at 9:08 AM, Nagrani, Kavita <Nagrani.Kavita@epa.gov> wrote:

> Good morning,
>
> I'm not sure if you all have seen this yet. It appears as though Cape Fear River Watch has filed a lawsuit against Chemours in the Eastern District of North Carolina on Wednesday alleging violations of the CWA and TSCA. I haven't read the complaint yet, but SELC's website (below) includes a link to the document.
>
> https://www.southernenvironment.org/news-and-press/news-feed/groups-sue-chemours-in-federal-court-to-stop-pfas-genx-pollution

---

Kavita K. Nagrani, Associate Regional Counsel and Special Assistant
to the Regional Counsel and Deputy Regional Counsel
U.S. Environmental Protection Agency, Region 4
Office of Regional Counsel
61 Forsyth Street, S.W.
Atlanta, Georgia 30303
Ph: (404) 562-9697
Fax: (404) 562-9486

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To: Allenbach, Becky[Allenbach.Becky@epa.gov]
Cc: Palmer, Leif[Palmer.Leif@epa.gov]
From: Nagrani, Kavita
Sent: Wed 9/19/2018 12:25:55 PM
Subject: FW: Cape Fear River Watch v. Chemours Company FC, LLC
Cape Fear River Watch v. Chemours.pdf

CONFIDENTIAL/ATTORNEY CLIENT COMMUNICATION

Hi Becky,

Please see below. Thanks!

Kavita K. Nagrani, Associate Regional Counsel and Special Assistant
to the Regional Counsel and Deputy Regional Counsel
U.S. Environmental Protection Agency, Region 4
Office of Regional Counsel
61 Forsyth Street, S.W.
Atlanta, Georgia 30303
Ph: (404) 562-9697
Fax: (404) 562-9486

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From: Nagrani, Kavita
Sent: Friday, August 31, 2018 1:57 PM
To: Palmer, Leif <Palmer.Leif@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>
Subject: Cape Fear River Watch v. Chemours Company FC, LLC

Hi Leif,

Here is some info I pulled from a very quick read of the case this afternoon. I likely will re-read this on Tuesday, but I wanted to make sure to get this to you before the end of the day.

This complaint for declaratory and injunctive relief was filed by SELC on August 29, 2018, in the Eastern District of North Carolina, Southern Division. This action is brought under the citizen suit provisions of the CWA and TSCA. Attorney Client / Deliberative Process / Ex. 5

Attorney Client / Deliberative Process / Ex. 5

Attorney Client / Deliberative Process / Ex. 5

Relief sought:

- Declaratory relief that Chemours violated TSCA CO;
- Preliminary and permanent IR to ensure Chemours immediately recovers and captures 99% of its emissions containing chemicals identified in CO;
- Declaratory relief that Chemours violated CWA with ongoing discharges to surface waters on and adjacent to the Facility;
- Declaratory relief that Chemours violated NPDES permit.
- Preliminary and permanent IR to ensure Chemours prevents discharges to WOTUS;
- Civil penalties for CWA violations;
- Civil penalties for TSCA violations;
- Award CFRW its reasonable fees, costs, and expenses, including attorneys' fees; and
- Any further and additional relief that the court may find just and proper.

Kavita K. Nagrani, Associate Regional Counsel and Special Assistant
to the Regional Counsel and Deputy Regional Counsel
U.S. Environmental Protection Agency, Region 4
Office of Regional Counsel
61 Forsyth Street, S.W.
Atlanta, Georgia 30303
Ph: (404) 562-9697
Fax: (404) 562-9486

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To: Lamberth, Larry[Lamberth.Larry@epa.gov]; Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn
Sent: Thur 8/23/2018 7:10:15 PM
Subject: FW: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5
2018-08-22 Chemours PowerPoint.pptx

FYI -

From: Allenbach, Becky
Sent: Thursday, August 23, 2018 2:34 PM
To: Gettle, Jeaneanne <Gettle.Jeaneanne@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>; Smith, Brian <Smith.Brian@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Danois, Gracy R. <Danois.Gracy@epa.gov>
Subject: FW: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5

Becky B. Allenbach, Deputy Director
Water Protection Division
EPA Region 4
Office 404-562-9687
Cell: Personal Phone / Ex. 6

From: Garvey, Mark
Sent: Thursday, August 23, 2018 2:28 PM
To: Palmer, Leif <Palmer.Leif@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>; George, Verne <George.Verne@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5

Leif,

I'm attaching the Power Point Slides used in the briefing a few minutes ago with Susan Bodine and Larry Starfield. I'm copying staff in regions 2, 3, 4, and 5 since I have gotten questions from many people about this Chemours briefing. Susan asked for a Regional follow-up to this briefing. A date has not been set for that follow-up yet. If you have questions, please contact me about TSCA issues, Jeff Speir for Water issues and Leslie Oif/Andy Crossland with RCRA issues.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Palmer, Leif
Sent: Wednesday, August 22, 2018 9:51 AM

To: Garvey, Mark <Garvey.Mark@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: Re: Chemours - Question about HFPO & HFPO DAF Releases -

Sent from my iPhone

Regards,

Message

From: Jones, Aaryn [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C2BED08A5BD54DC5A9D59C5A345C9892-JONES, AARYN]
Sent: 1/30/2018 8:48:30 PM
To: Buso, Roberto X [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=3130a0460095427da8b850e5585e36c7-Buso, Roberto X]
Subject: FW: Chemours timeline
Attachments: Cape Fear GenX Timeline_121317.docx

From: Hall, Renea
Sent: Wednesday, December 13, 2017 1:02 PM
To: Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Cc: Allenbach, Becky <Allenbach.Becky@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Subject: RE: Chemours timeline

KJ,
Here's my start.

Becky,
I'm unsure if you'd like to include TSCA on this to update their parts or add any additional details.

Aaryn,
I've added some place holders to mark the RCRA sampling private well sampling events. I'd like you to confirm the dates and details regarding this.

From: Shell, Karrie-Jo
Sent: Wednesday, December 13, 2017 8:03 AM
To: Hall, Renea <Hall.Renea@epa.gov>
Subject: Chemours timeline

Please send me any timeline you have developed re Chemours.

Karrie-Jo Robinson-Shell, P.E.
Environmental Engineer
US EPA Region 4
Water Protection Division
61 Forsyth Street
Atlanta, GA 30303
(404) 562-9308

To: Monell, Carol[Monell.Carol@epa.gov]
From: Jones, Aaryn
Sent: Mon 12/11/2017 1:22:38 PM
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm
OCE Weekly AA-DAA 12112017.pdf

FYI

From: Garvey, Mark
Sent: Friday, December 08, 2017 3:15 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm

Attached is the agenda for the **Monday ** 1pm Susan Bodine Briefing**

It is part of the weekly OCE meeting with the AA.

OCE Weekly w/AA/DAA/PDAA, call in number Personal Phone / Ex. 6

Region 4 will be joined by Regions 2, 3 and 5 on the call.

I'll send the final briefing paper when it becomes available.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.govcl

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Message

From: Toney, Anthony [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B977B6C39557465C8E1840A451687AE4-TONEY, ANTHONY]
Sent: 8/29/2018 4:21:50 PM
To: Kemker, Carol [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=765ad99166db4233bd15febf6e9917b3-Kemker, Carol]; Banister, Beverly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1d7573525c894f5dbfc19abd6a7fda91-Banister, Beverly]; Mitchell, Ken [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e49335e2f5a64cbfa97c39cbf1faff2b-Mitchell, Kenneth]
Subject: FW: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5
Attachments: 2018-08-22 Chemours PowerPoint.pptx

FYI

From: Garvey, Mark
Sent: Thursday, August 23, 2018 2:28 PM
To: Palmer, Leif <Palmer.Leif@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>; George, Verne <George.Verne@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5

Leif,

I'm attaching the Power Point Slides used in the briefing a few minutes ago with Susan Bodine and Larry Starfield. I'm copying staff in regions 2, 3, 4, and 5 since I have gotten questions from many people about this Chemours briefing. Susan asked for a Regional follow-up to this briefing. A date has not been set for that follow-up yet. If you have questions, please contact me about TSCA issues, Jeff Speir for Water issues and Leslie Oif/Andy Crossland with RCRA issues.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Palmer, Leif
Sent: Wednesday, August 22, 2018 9:51 AM
To: Garvey, Mark <Garvey.Mark@epa.gov>

Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: Re: Chemours - Question about HFPO & HFPO DAF Releases -

Sent from my iPhone

Regards,

Message

From: Hansen, Susan [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=6B2E801253D049BF908314EBF3935472-HANSEN, SUSAN]
Sent: 8/22/2017 8:08:16 PM
To: Monell, Carol [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=79068469fd5c4aeea50f2a2d6444d5e9-Monell, Carol]; Lamberth, Larry [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d76744d344414e8d884e9fa4e3633ea3-Lamberth, Larry]
Subject: FW: REVISED AGENDA
Attachments: Chemours GenX Authorities Paper 082117.docx

From: Schwartz, Paul
Sent: Tuesday, August 22, 2017 3:54 PM
To: Hansen, Susan <Hansen.Susan@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Bush, William <Bush.William@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>
Subject: FW: REVISED AGENDA

From: Speir, Jeffrey
Sent: Tuesday, August 22, 2017 3:17 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Subject: RE: REVISED AGENDA

I have attached the version of the enforcement options paper that went to Larry Starfield in advance of today's meeting.

Unfortunately, due to office absences last week, Region 4's edits sent through Scott Gordon did not get incorporated. The attached version also includes input from Water Enforcement Division management. We can discuss Region 4's input on today's call.

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

From: Speir, Jeffrey
Sent: Tuesday, August 22, 2017 10:43 AM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Subject: FW: REVISED AGENDA

Hi Paul and Karrie-Jo,

Please find attached the call-in information for an OECA meeting this afternoon at 4:30 on GenX. As I mentioned to you, Paul, Susan Shinkman (OCE Director) requested Region 4's participation on today's call. Karrie-Jo, this is the meeting that

I mentioned on our call earlier, that thought was scheduled for earlier today. Please feel free to disseminate this meeting invitation in Region 4. Mark Pollins has contacted Scott Gordon in enforcement.

The discussion will cover the enforcement options paper that (I hope) reached you both last week. I can recirculate a revised draft to you if I receive an updated version.

Please let me know if you have questions—sorry for the late notice!

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

From: Pollins, Mark
Sent: Tuesday, August 22, 2017 10:30 AM
To: Gordon, Scott <Gordon.Scott@epa.gov>
Cc: Fergusson, Bruce <Fergusson.Bruce@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
Subject: FW: REVISED AGENDA

Scott, left you a VM.

Mark Pollins, Director
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance (OECA)
U.S. Environmental Protection Agency
Phone: (202) 564-4001
Fax: (202) 564-0018

From: Washington, Debra
Sent: Monday, August 21, 2017 3:42 PM
To: Bailey, Ethel <Bailey.Ethel@epa.gov>; Benitez-Clark, Rowena <benitez-clark.rowena@epa.gov>; Brooks, Phillip <Brooks.Phillip@epa.gov>; Cherry, Andrew <Cherry.Andrew@epa.gov>; Fogarty, Johnpc <Fogarty.Johnpc@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>; Miles, Erin <Miles.Erin@epa.gov>; Miles, James <miles.james@epa.gov>; Miller, Anthony <Miller.Anthony@epa.gov>; Ng, Brian <Ng.Brian@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Schefski, Melissa <Schefski.Melissa@epa.gov>; Senn, John <Senn.John@epa.gov>; Shiffman, Cari <Shiffman.Cari@epa.gov>; Shinkman, Susan <Shinkman.Susan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Traylor, Patrick <traylor.patrick@epa.gov>; Belser, Evan <Belser.Evan@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Chapman, Apple <Chapman.Apple@epa.gov>; Crossland, Andy <Crossland.Andy@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Fried, Gregory <Fried.Gregory@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Lott, Don <Lott.Don@epa.gov>; McCray, Deborah <Mccray.Deborah@epa.gov>; Porter, Amy <Porter.Amy@epa.gov>; Stedeford, Todd <Stedeford.Todd@epa.gov>; Werner, Jacqueline <Werner.Jacqueline@epa.gov>
Subject: REVISED AGENDA

Please review and print your copy of the agenda and materials for the OCE Weekly.

STATE OF NORTH CAROLINA

COUNTY OF BLADEN

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
17 CVS 580

STATE OF NORTH CAROLINA, *ex rel.*, MICHAEL S. REGAN, SECRETARY, NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY,	)	
Plaintiff,	)	**AMENDED COMPLAINT AND MOTION FOR PRELIMINARY INJUNCTIVE RELIEF**
v.	)	
THE CHEMOURS COMPANY FC, LLC,	)	
Defendant.	)	

The State of North Carolina, complaining of the Defendant, alleges and says:

INTRODUCTION

1. This Amended Complaint represents the culmination of a months-long investigation by the North Carolina Department of Environmental Quality's ("DEQ's") Division of Water Resources ("DWR"), Division of Waste Management ("DWM"), and Division of Air Quality ("DAQ"), into Defendant The Chemours Company FC, LLC's ("Chemours'") unlawful release of chemical products, intermediaries, and byproducts from its manufacturing processes into the environment. Chemours has contaminated and continues to contaminate North Carolina's air, surface water, and groundwater through the release of "GenX" or "C3 Dimer Acid," which the U.S. Environmental Protection Agency ("EPA") and the North Carolina Department of Health and Human Services ("DHHS") have recognized may present an unreasonable risk of injury to human health and the environment.

2. For decades Chemours and/or its predecessor E. I. DuPont de Nemours & Company, Inc. ("DuPont") have been discharging GenX into the Cape Fear River. Despite knowledge of health risks associated with GenX, Chemours failed to disclose the presence of GenX in its process wastewater, and even made statements that misled DEQ as to the presence of GenX in its process wastewater. While DEQ has partially suspended Chemours' discharge permit to prevent the discharge of process wastewater from Chemours' manufacturing processes, DEQ continues to detect concentrations of GenX in the effluent being discharged from the Fayetteville Works facility's outfall into the Cape Fear River.

3. Chemours has also caused significant and widespread groundwater contamination. DEQ has detected levels of GenX in groundwater that exceed by orders of magnitude the regulatory limit set forth in North Carolina's groundwater rules as well as the provisional health goal set by the DHHS. GenX has been measured in concentrations as high as 640,000 ng/L in the groundwater beneath the Fayetteville Works facility and 4,000 ng/L in private drinking water wells. Elevated concentrations of GenX have been found in private drinking water wells over three miles from the Fayetteville Works facility.

4. DEQ has also determined that Chemours has emitted and continues to emit GenX and related compounds into the air at levels that far exceed emission rates previously reported to DEQ. GenX emissions from the Fayetteville Works facility, which are deposited on the land surface in rainwater, constitute a significant source of Chemours' ongoing violations of North Carolina's groundwater rules. In fact, GenX has been detected in rainwater in concentrations as high as 810 ng/L at a distance of five miles from the Facility. GenX has been detected in rainwater as far as seven miles from the Fayetteville Works facility.

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5. The State filed its original Complaint in this matter on September 7, 2017 based on the information available to the State at the time. As detailed in this Amended Complaint, the State now has additional evidence regarding the extent of contamination caused by Chemours' release of GenX into the environment. It is now evident that a primary source of surface water and groundwater contamination in and around the Fayetteville Works facility is Chemours' ongoing emissions of GenX and related compounds into the atmosphere and the deposition of those compounds onto the land and waters of the State.

6. The State is entitled to injunctive relief to prevent and abate Chemours' ongoing degradation of North Carolina's natural resources.

PARTIES

7. Plaintiff is the sovereign State of North Carolina. This action is being brought on the relation of Michael S. Regan, Secretary of DEQ, the State agency established pursuant to N.C. Gen. Stat. § 143B-279.1 *et seq.*, and vested with the statutory authority to enforce the State's environmental protection laws, including laws enacted to protect the water quality of the State. DWR, DWM, and DAQ are divisions within DEQ and all actions taken by DWR, DWM, or DAQ are actions of the Plaintiff.

8. Defendant Chemours is a Delaware limited liability company registered and doing business in North Carolina. Defendant owns and operates a facility known as the Fayetteville Works ("Facility") located at 22828 NC Highway 87 W, Fayetteville, Bladen County, North Carolina, which is the subject of this action.

JURISDICTION

9. The Superior Court has jurisdiction over this action for injunctive relief for existing

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or threatened violations of various laws and rules governing the protection of water quality pursuant to N.C. Gen. Stat. § 143-215.6C and air quality pursuant to N.C. Gen. Stat. § 143-114C. Furthermore, jurisdiction for injunctive relief sought to compel enforcement of a statute or regulation rests in the Superior Court pursuant to N.C. Gen. Stat. § 7A-245(a)(2) and N.C. Gen. Stat. § 1-493.

VENUE

10. Bladen County, North Carolina is a proper venue for this action because a significant portion of the violations or threatened violations that are the subject of this action for injunctive relief have occurred, are occurring, and may continue to occur at Chemours' Fayetteville Works facility in Bladen County. N.C. Gen. Stat. § 143-215.6C; N.C. Gen. Stat. § 143-114C.

LEGAL BACKGROUND

I. The Clean Water Act and North Carolina's NPDES Program

11. The Federal Clean Water Act prohibits any person from discharging pollutants into surface waters without first obtaining an appropriate permit. 33 U.S.C. § 1311. All persons are therefore required to obtain a National Pollution Discharge Elimination System ("NDPES") permit prior to the discharge of pollutants into surface waters through a point source. 33 U.S.C. § 1342.

12. Like other federal environmental programs, the Clean Water Act was designed to incorporate principles of cooperative federalism, authorizing individual states to assume responsibility for implementation of an NPDES Program upon statutory authorization and application to the United States Environmental Protection Agency ("EPA"). 33 U.S.C. § 1342(b).

13. EPA approved North Carolina's NPDES program in 1975. North Carolina's NPDES program is carried out in part pursuant to a Memorandum of Agreement between the State

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and EPA. *See National Pollution Discharge Elimination System Memorandum of Agreement Between the State of NC and the US EPA Region 4* (October 15, 2007) ("MOA"), *available at* https://www.epa.gov/sites/production/files/2013-09/documents/nc-moa-npdes.pdf.

14. As recognized in the MOA, North Carolina has authority to take action to enforce violations of 33 U.S.C. § 1311 of the Clean Water Act, which prohibits the unpermitted discharge of pollutants into surface waters. MOA § VI.A.2.a; N.C. Gen. Stat. § 143-215.1.

15. North Carolina's statutes implementing the NPDES program are set forth in Article 21 of Chapter 143 of the North Carolina General Statutes.

16. North Carolina's water quality statutes and the rules adopted under them are designed to further the public policy of the State, as stated in N.C. Gen. Stat. § 143-211, "to provide for the conservation of its water and air resources . . . [and], within the context of this Article [21] and Articles 21A and 21B of this Chapter [143], to achieve and to maintain for the citizens of the State a total environment of superior quality."

17. North Carolina's primary statute for implementing its NPDES permitting program is N.C. Gen. Stat. § 143-215.1, which requires a permit from the Environmental Management Commission ("EMC") before any person can "make any outlet into waters of the state," or

> [c]ause or permit any waste, directly or indirectly, to be discharged to or in any manner intermixed with the waters of the State in violation of the water quality standards applicable to the assigned classifications or in violation of any effluent standards or limitations established for any point source, unless allowed as a condition of any permit . . . .

18. The EMC has the power to issue permits with such conditions as the EMC believes are necessary to achieve the purposes of Article 21 of Chapter 143 of the General Statutes, including NPDES permits. N.C. Gen. Stat. § 143-215.1(b). The EMC also has the power "[t]o

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make rules implementing Article[] 21" including standards and procedures to implement North Carolina's NPDES program. N.C. Gen. Stat. § 143B-282 *et seq.*

19. The EMC has adopted rules that delegate the authority to issue NPDES permits to DWR.

20. The regulations implementing the State's NPDES permitting process are set forth in Subchapter 2H of Title 15A of the North Carolina Administrative Code. Under these rules, the permit applicant has "the burden of providing sufficient evidence to reasonably ensure that the proposed system will comply with all applicable water quality standards." 15A N.C.A.C. 2H .0112(c). These rules further provide that "no permit may be issued when the imposition of conditions cannot reasonably ensure compliance with applicable water quality standards." *Id.*

21. Part of the permit applicant's burden in this regard is to disclose all relevant information, such as the presence of known constituents in a discharge that pose a potential risk to human health. The permit applicant is required to disclose "all known toxic components that can be reasonably expected to be in the discharge, including *but not limited to* those contained in a priority pollutant analysis." 15A N.C.A.C. 2H .0105(j) (emphasis added).

22. While the North Carolina Administrative Code does not contain a definition of "toxic component," North Carolina water quality regulations define "toxic substance" to include:

> any substance or combination of substances (including disease-causing agents), which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, has the potential to cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions or suppression in reproduction or growth) or physical deformities in such organisms or their offspring.

15A N.C.A.C. 2B .0202(64).

23. These disclosure obligations do not cease upon issuance of a permit. Rather, they

are ongoing. Pursuant to NPDES Standard Permit Condition II.E.8, "Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application . . . or in any report to the Director, it shall promptly submit such facts or information." *See* NPDES Standard Permit Conditions, attached hereto and incorporated herein as Exhibit 1; *see also* 40 C.F.R. 122.41(1)(8).

24. These disclosure obligations are critical, in part, because they define the scope of the Clean Water Act's "permit shield." While compliance with the express terms of an NPDES permit generally "shields" the permittee from liability for violations of 33 U.S.C. § 1311, the permit does not shield the permittee from liability where the pollutant being discharged was not within the "reasonable contemplation" of the permitting agency when it issued the permit due to nondisclosure by the permittee. 33 U.S.C. § 1342(k); *see also Piney Run Pres. Ass'n v. Cty. Comm'rs of Carroll Cty., MD*, 268 F.3d 255, 265 (4th Cir. 2001). Indeed, EPA's guidance regarding the permit shield provides that a permit only "provides authorization and therefore a shield for . . . pollutants resulting from facility processes, waste streams and operations that have been *clearly identified* in the permit application process when discharged from specified outfalls." *EPA, Revised Policy Statement on Scope of Discharge Authorization and Shield Associated with NPDES Permits*, *available at* https://www3.epa.gov/npdes/pubs/owm0131.pdf (emphasis added).

25. The importance and accuracy of disclosures to the agency is underscored by the signatory requirements set forth in NPDES Permit Standard Conditions and 40 CFR 122.22, which require all "applications, reports or information submitted to [DEQ]" to be signed by a responsible official and accompanied by the following certification:

> I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those

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> persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, *true, accurate and complete*. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

See Exhibit A § II.B.11.d (emphasis added).

26. The NPDES Standard Permit Conditions also impose a duty on permittees to take "all reasonable steps to minimize or prevent any discharge . . . in violation of this permit with a reasonable likelihood of adversely affecting human health or the environment." Exhibit A § II.B.2.

II. Surface Water Classifications and Standards

27. North Carolina's water quality program takes a three-pronged approach to protecting North Carolina's surface waters. First, it establishes surface water classifications based on the "best uses" of surface waters. *See* 15A N.C.A.C. 2B .0101; N.C. Gen. Stat. § 143-214.1(b). Second, it establishes water quality standards for each classification in Subchapter 2B of Title 15A of the North Carolina Administrative Code ("2B Rules") to protect the assigned uses of each classification. *See, e.g.,* 15A N.C.A.C. 2B .0216(1), 15A N.C.A.C. 2B .0211. And third, it assigns these classifications to individual segments of surface waters throughout the State. *See* 15A N.C.A.C. 2B .0201.

28. The relevant segment of the Cape Fear River into which the Facility's discharge flows is classified as "Class WS-IV." The best usage of WS-IV waters is defined as "a source of water supply for drinking, culinary, or food-processing purposes . . . and any other best usage specified for Class C waters." 15A N.C.A.C. 2B .0216(1). Best usage for Class C waters includes "aquatic life propagation and maintenance of biological integrity (including fishing and fish), wildlife, secondary recreation, [and] agriculture." 15A N.C.A.C. 2B .0211(1). "Sources of water pollution that preclude any of these uses on either a short term or long term basis shall be

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considered to be violating a water quality standard." 15A N.C.A.C. 2B .0211(2), 2B .0216(2).

29. Class C and WS-IV Waters are also subject to "Water Quality Standards for Toxic Substances." 15A N.C.A.C. 2B .0208. Pursuant to 15A N.C.A.C. 2B .0208, "the concentration of toxic substances, either alone or in combination with other wastes, in surface waters shall not render waters injurious to aquatic life or wildlife, recreational activities, public health, or impair the waters for any designated uses." Specifically, "the concentration of toxic substances shall not exceed the level necessary to protect human health through exposure routes of fish tissue consumption, water consumption, or other route identified as appropriate for the water body." 15A N.C.A.C. 2B .0208(a)(2).

III. North Carolina's Groundwater Rules

30. In addition to regulating surface waters, the EMC has promulgated rules in 15A N.C.A.C. Subchapter 2L (the "2L Rules" or "groundwater rules") that "establish a series of classifications and water quality standards applicable to the groundwaters of the State." 15A N.C.A.C. 2L .0101(a). "Groundwaters" are defined in the 2L Rules as "those waters occurring in the subsurface under saturated conditions," 15A N.C.A.C. 2L .0102(11), and "groundwater" is included in the statutory definition of "waters," N.C. Gen. Stat. § 143-212.

31. The 2L Rules "are applicable to all activities or actions, intentional or accidental, which contribute to the degradation of groundwater quality, regardless of any permit issued by a governmental agency authorizing such action or activity," except in certain situations not applicable here. 15A N.C.A.C. 2L .0101(b).

32. The 2L Rules "are intended to maintain and preserve the quality of the groundwaters, prevent and abate pollution and contamination of the waters of the state, protect

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public health, and permit management of the groundwaters for their best usage by the citizens of North Carolina." 15A N.C.A.C. 2L .0103(a). The policy section of the 2L Rules provides further that

> [i]t is the policy of the Commission that the best usage of the groundwaters of the state is as a source of drinking water. These groundwaters generally are a potable source of drinking water without the necessity of significant treatment. It is the intent of these Rules to protect the overall high quality of North Carolina's groundwaters to the level established by the standards and to enhance and restore the quality of degraded groundwaters where feasible and necessary to protect human health and the environment, or to ensure their suitability as a future source of drinking water.

Id.

33. The policy section of the 2L Rules provides further that "[n]o person shall conduct or cause to be conducted, any activity which causes the concentration of any substance to exceed that specified in Rule .0202 of this Subchapter, except as authorized by the rules of this Subchapter." 15A N.C.A.C. 2L .0103(d).

34. "Contaminant" is defined in the 2L Rules as "any substance occurring in groundwater in concentrations which exceed the groundwater quality standards specified in Rule .0202 of the Subchapter." 15A N.C.A.C. 2L .0102(4).

35. "Natural conditions" are defined in the 2L Rules as "the physical, biological, chemical and radiological conditions which occur naturally." 15A N.C.A.C. 2L .0102(16).

36. The 2L Rules establish "the maximum allowable concentrations resulting from any discharge of contaminants to the land or waters of the state, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage." 15A N.C.A.C. 2L .0202(a).

37. With certain exceptions not relevant here, "substances which are not naturally

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occurring and for which no standard is specified shall not be permitted in concentrations at or above the practical quantitation limit" in groundwaters. 15A N.C.A.C. 2L .0202(c).

38. The "practical quantitation limit" or "PQL" is defined as "the lowest concentration of a given material that can be reliably achieved among laboratories within specified limits of precision and accuracy by a given analytical method during routine laboratory analysis." 15A N.C.A.C. 2L .0102(15).

39. "Any person conducting or controlling an activity that results in the discharge of a waste or hazardous substance or oil to the groundwaters of the State, or in proximity thereto, shall take action upon discovery to terminate and control the discharge, mitigate any hazards resulting from exposure to the pollutants and notify the Department." 15A N.C.A.C. 2L .0106(b).

40. Pursuant to the 2L Rules, "[i]nitial response required to be conducted prior to or concurrent with the assessment required" as set forth above "shall include" among other things,

> (2) abatement, containment, or control of the migration of contaminants; (3) removal, treatment, or control of any primary pollution source such as buried waste, waste stockpiles, or surficial accumulations of free products; (4) removal, treatment, or control of secondary pollution sources that would be potential continuing sources of pollutants to the groundwaters, such as contaminated soils and non-aqueous phase liquids.

15A N.C.A.C. 2L .0106(f).

IV. Air Quality Laws

41. Title V of the Federal Clean Air Act, 42 U.S.C. § 7661 *et seq*. requires major sources of air pollutants to obtain and operate in compliance with an operating permit. A Title V operating permit generally incorporates all applicable state and federal air quality requirements into a single permit, including emissions standards, monitoring requirements, record keeping requirements, and reporting requirements.

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42. North Carolina has received approval from EPA to operate a Title V program and the General Assembly has delegated authority to the EMC to promulgate rules for that purpose. N.C. Gen. Stat. §§ 143-215.107(a)(10), 143-215.3(c); 40 CFR Part 70, Appendix A ("Approval Status of State and Local Operating Permit Programs").

43. Each major source subject to Title V is required to submit annual emissions inventories to DEQ detailing the facility's actual emissions of various air pollutants into the environment for the previous calendar year. 15A NCAC 2Q .0207. The accuracy of these reports is required to be certified by a responsible official from the facility. *Id.*

44. The purposes of North Carolina's air quality program are set forth in N.C. Gen. Stat. § 143-215.105, which incorporates by reference the policy goals set forth in Article 21 of Chapter 143 of the North Carolina General Statutes ("Water and Air Resources"). As described in Article 21, the General Assembly intended for North Carolina's water quality and air quality programs to provide an integrated scheme for ensuring protection of public health and natural resources. The statute provides that "water and air resources of the State belong to the people, [and] the General Assembly affirms the State's ultimate responsibility for the preservation and development of these resources in the best interest of all its citizens and declares the prudent utilization of these resources to be essential to the general welfare." N.C. Gen. Stat. § 143-211(a). The statute further requires that "[s]tandards of water and air purity shall," among other things, "be designed to protect human health, to prevent injury to plant and animal life, to prevent damage to public and private property." N.C. Gen. Stat. § 143-211(c).

45. The EMC has delegated authority to the Director of the DAQ to terminate, modify or revoke any Title V permit if necessary to carry out these purposes. 15A NCAC

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2Q .0519.

V. Standard for Injunctive Relief Under N.C. Gen. Stat. § 143-215.6C and N.C. Gen. Stat. § 143-215.114C

46. Whenever DEQ has reasonable cause to believe that any person has violated or is threatening to violate any of the provisions of the State's water quality laws or administrative rules, DEQ is authorized to "request the Attorney General to institute a civil action in the name of the State upon the relation of [DEQ] for injunctive relief to restrain the violation or threatened violation." N.C. Gen. Stat. § 143-215.6C. That section further provides that "[u]pon a determination by the court that the alleged violation of the provisions of this Part or the regulations of the [EMC] has occurred or is threatened, the court shall grant the relief necessary to prevent or abate the violation or threatened violation." *Id.*

47. The same standards apply to an action brought by the State to address a violation or threatened violation of North Carolina's air quality laws. N.C. Gen. Stat. § 143-215.114C.

48. When the State brings an action to vindicate the public interest pursuant to a statute which provides for injunctive relief to abate violations of law, the usual test for issuance of injunctions need not be met. *See State ex rel. Morgan v. Dare To Be Great, Inc.*, 15 N.C. App. 275, 189 S.E.2d 802 (1972) (negating the general rule that there will be no equitable relief if there is an adequate remedy at law when the statutory scheme provided the State with injunctive relief under the circumstances presented). For example, the State is not required to show actual injury, such as irreparable harm, in order to obtain injunctive relief, including a preliminary injunction. *State ex rel. Edmisten v. Challenge, Inc.*, 54 N.C. App. 513, 521-22, 284 S.E.2d 333, 338-39 (1981) (explaining that irreparable harm need not be established by the State as long as the statutory conditions for issuance of a preliminary injunction exist). Rather, it must show only that the acts

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or practices complained of adversely affect the public interest. *See id.* An adverse effect on the public interest exists as a matter of law where the statutory conditions for issuance of injunctive relief are present, i.e., where a violation of the applicable statute or regulations exists or is threatened. *Id.* at 522, 284 S.E.2d at 339.

FACTUAL ALLEGATIONS

I. The Fayetteville Works Facility

49. The Facility is a chemical manufacturing facility with manufacturing areas operated by three separate companies, including Chemours.

50. Upon information and belief, DuPont began its Nafion® manufacturing process at the Facility in the 1970s. Since that time, the Facility's business has expanded to include other chemical manufacturing processes.

51. The Facility has discharged wastewater pursuant to National Pollutant Discharge Elimination System Permit No. NC003573 ("NPDES Permit"), the most recent version of which was issued by DWR on October 28, 2015. The NPDES Permit is attached hereto and incorporated herein as Exhibit 2.

52. Chemours took ownership of the Facility and the NPDES Permit in 2015.

53. The Chemours' Fluoromonomers/Nafion® Membrane Manufacturing Area produces, among other products, Chemours Nafion® Membrane and Polymer Dispersions, HFPO monomers and vinyl ether monomers. *See* NPDES Permit Application dated April 27, 2016, Supplemental Information at 3, attached hereto and incorporated herein as Exhibit 3; *see also* Facility Map, attached hereto and incorporated herein as Exhibit 4.

54. The Chemours Polymer Processing Aid ("PPA") Manufacturing Area produces a

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polymer processing aid known as GenX.

55. GenX is the trade name for a chemical known as C3 Dimer Acid (also known as HFPO Dimer Acid), which has a "Chemical Abstracts Registry" or "CAS" number of 13252-13-6. CAS numbers are universally used to provide a unique identifier for chemical substances.

56. C3 Dimer Acid Fluoride (also known as HFPO Dimer Acid Fluoride), CAS No. 2062-98-8, and C3 Dimer Acid Ammonium Salt (also known as HFPO Dimer Acid Ammonium Salt), CAS No. 62037-80-3, convert to GenX in the presence of water. GenX, C3 Dimer Acid Fluoride, and C3 Dimer Acid Ammonium Salt are collectively referred to herein as "GenX Compounds."

57. GenX Compounds fall within a family of chemicals known as per- and polyfluoroalkyl substances or "PFAS," which are commonly used in the manufacture of nonstick coatings and for other purposes.

58. The Facility also houses areas leased by Kuraray America Inc. for the manufacture of Butacite® and SentryGlas®. Another area is leased by DuPont for the manufacture of Polyvinyl Fluoride.

59. The NPDES Permit authorizes discharge of wastewater and stormwater from the Facility through Outfalls 001 and 002. Outfall 001 is an internal outfall from the Facility's wastewater treatment plant. Outfall 002 discharges the Facility's treated wastewater as well as non-contact cooling water and stormwater into the Cape Fear River.

60. The Permit does not authorize any process wastewater to be discharged through Outfall 002 that has not been discharged through Outfall 001 and been treated by the wastewater treatment plant.

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61. The segment of the Cape Fear River into which the Facility's wastewater is discharged is upstream of various drinking water intakes and is classified as a WS-IV water.

62. The surface water into which the Facility's wastewater is discharged is used as a public water source that serves residents and businesses in several counties.

63. Upon information and belief, the Facility began producing GenX commercially in 2009 or 2010.

64. Chemours has represented to DEQ that wastewater from the GenX production process occurring in the PPA Manufacturing Area has been collected and shipped offsite for disposal since that time.

65. GenX Compounds are also generated during other manufacturing processes occurring at the Facility in other manufacturing areas.

66. Upon information and belief, GenX Compounds and other PFAS have been discharged by the Facility into the Cape Fear River since the early 1980s.

67. The onsite wastewater treatment plant at the Facility has been ineffective at removing GenX Compounds and other PFAS from the process wastewater discharged into the Cape Fear River through Outfall 002. Non-contact cooling water used by the various manufacturing areas also contains GenX Compounds and other PFAS from contaminated groundwater and surface water, residual contamination of soils and from air deposition at the Facility. This non-contact cooling water also discharges through Outfall 002.

68. GenX Compounds and other PFAS discharged by the Facility have been and continue to be present in public drinking water supplied to residents and businesses in several counties.

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69. Chemours and DuPont have known for years that GenX and other PFAS were being discharged into surface waters of the State.

II. DEQ's Investigation of GenX Contamination in the Cape Fear River

70. DEQ, in consultation with the DHHS and EPA, has been leading a State investigation into the presence of GenX Compounds and other PFAS in the Cape Fear River since June 2017.

71. DHHS set a provisional health goal for exposure to GenX in drinking water of 140 ng/L (also referred to as parts per trillion or "ppt"). The DHHS Risk Assessment for GenX is attached hereto and incorporated herein as Exhibit 5.

72. On June 19, 2017, DEQ began collecting water samples from twelve sites along the Cape Fear River.

73. Samples collected at various locations along the Cape Fear River in June of 2017 showed that concentrations of GenX were present in the Cape Fear River at levels that were well above the DHHS provisional health goal of 140 ng/L.

74. On August 31, 2017 EPA reported to DEQ that additional PFAS were detected in samples collected at Outfall 002. EPA's report is attached hereto and incorporated herein as Exhibit 6.

III. Chemours' Nondisclosure and Misrepresentations Relating to Its Discharge of GenX Compounds and Other PFAS Into the Cape Fear River

75. DuPont and Chemours failed to timely disclose to DWR the discharge of GenX Compounds and other PFAS into the Cape Fear River.

76. In particular, none of the DuPont or Chemours NPDES permit applications referenced "GenX," "GenX Compounds," "C3 Dimer Acid," "C3 Dimer Acid Fluoride," "C3

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Dimer Acid Ammonium Salt" or any chemical name, formula, or CAS number that would identify any GenX or related compounds in the Facility's discharge, instead disclosing without explanation only that "[t]he HFPO monomer and the Vinyl Ether monomers are used to manufacture various fluorochemical products such as ChemoursTM Teflon."

77. In fact, information provided by DuPont and Chemours led DWR staff to reasonably believe that GenX was not being discharged into the Cape Fear.

78. On August 26, 2010, representatives of DuPont, including environmental manager Michael Johnson, met with DEQ staff regarding DuPont's anticipated use of GenX technology at the Fayetteville Works as a replacement for the compound perfluorooctanoic acid ("PFOA"), also known as "C8."

79. The information DuPont provided indicated that the GenX would be produced in a closed-loop system that would not result in the discharge of GenX into the Cape Fear River.

80. DuPont and Chemours did not notify DWR of an actual ongoing discharge of GenX at this meeting or in any information subsequently provided to DWR prior to 2017.

81. Prior to 2017, DuPont and Chemours did not notify DWR that C3 Dimer Acid Fluoride reacts with water to generate GenX or that any discharge of C3 Dimer Acid Fluoride is likely to result in the release of GenX into the environment.

82. While DuPont and Chemours no longer produces C8 or PFOA, its manufacturing history is telling.

83. On May 3, 2001, DuPont submitted an NPDES renewal application to DWR stating that it intended to begin manufacturing PFOA. The 2001 Application and the 2004 Fact Sheet for NPDES Permit Development are attached hereto and incorporated herein as Exhibits 7 and 8.

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84. During the application process, DuPont represented to DWR that:

a. PFOA does not pose a health concern to humans or animals at levels present in the workplace or environment;

b. DuPont had used PFOA for forty years with no observed health effects on workers;

c. PFOA is neither a known developmental toxin nor a known carcinogen.

85. Upon information and belief, EPA launched a "PFOA Stewardship Program" in January 2006 because of concerns about the impact of PFOA and long-chain PFAS on human health and the environment, including concerns about their persistence, presence in the environment and in the blood of the general U.S. population, long half-life in people, and developmental and other adverse effects in laboratory animals.

86. In 2006, DuPont began to phase out its use of PFOA as part of the PFOA Stewardship Program, aiming to completely eliminate the use and production of PFOA.

87. Upon information and belief, in 2008 DuPont submitted to EPA notices of its intent to manufacture GenX pursuant to the Toxic Substances Control Act ("TSCA").

88. On January 28, 2009, EPA and DuPont entered into a Consent Order governing the manufacture of GenX. A publicly-available redacted version of the Consent Order is attached hereto and incorporated herein as Exhibit 9.

89. The Consent Order provides that "EPA has concerns that [GenX] will persist in the environment, could bioaccumulate, and be toxic . . . to people, wild animals, and birds." Exhibit 9, at vii.

90. The Consent Order also stated that EPA had "human health concerns" regarding

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GenX. Exhibit I, at vii. The Consent Order recognized that "uncontrolled . . . disposal of [GenX] may present an unreasonable risk of injury to human health and the environment." Exhibit 9, at xv.

91. The Consent Order required DuPont to "recover and capture (destroy) or recycle [GenX] at an overall efficiency of 99% from all the effluent process streams and the air emissions (point source and fugitive)." Exhibit 9, at 36.

92. At DuPont's 2010 meeting with DEQ regarding its transition from PFOA to GenX, DuPont explained that GenX would be produced in a closed-loop system that would not result in the discharge of GenX into the Cape Fear River.

93. DuPont represented that the wastewater generated from the manufacture of GenX would be collected and shipped offsite for disposal and therefore this wastewater would not be discharged into the Facility's wastewater treatment plant or into the Cape Fear River.

94. At no time during this meeting did DuPont notify DWR of an actual discharge of GenX Compounds into the Cape Fear River.

95. On April 29, 2011, DuPont submitted an NDPES permit renewal application, which is attached hereto and incorporated herein as Exhibit 10, confirming that "all process wastewater generated from [the PPA Manufacturing Area] is collected and shipped offsite for disposal" and "no process wastewater from this manufacturing facility is discharged to the site's biological [waste water treatment plant] or to the Cape Fear River." The application made no mention of GenX Compounds being discharged into the Cape Fear River.

96. On February 6, 2012, DWR issued a renewal permit with an effective date of March 1, 2012 ("2012 Permit"). The 2012 Permit is attached hereto and incorporated herein as Exhibit

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11. The 2012 Permit makes no mention of GenX Compounds as part of the authorized discharge from the Facility.

97. On or around November 10, 2016, the EPA and Dr. Detlef Knappe, professor of Civil, Construction and Environmental Engineering at N.C. State University, published a study that identified the presence of GenX and other PFAS in the Cape Fear River. This publication is attached hereto and incorporated herein as Exhibit 12. The study indicated that levels of GenX in one sample area in the Cape Fear River were as high as approximately 4500 ng/L, which is more than thirty times higher than the provisional health goal set by DHHS.

98. On June 12, 2017, after substantial media coverage regarding the presence of GenX in the Cape Fear River, Chemours informed DEQ in a meeting that for several decades, GenX and other PFAS had been produced as byproducts at the Facility and routinely discharged into the Cape Fear River.

99. In late August 2017, Chemours provided to DEQ—and only after DEQ's request—internal health studies on GenX Compounds that had been conducted previously by DuPont or Chemours.

100. DuPont and Chemours' misrepresentations and inadequate disclosures shielded important information from DEQ and the public, and they deterred DEQ staff from inquiring further into the nature of GenX discharges and other related activities at the Facility.

101. Had the appropriate disclosures been made, they would have justified the application of one or more different permit conditions at the time the Permit was issued, such as monitoring and reporting requirements, appropriate health-based water quality standards, effluent limits, or evaluation of alternatives to discharging GenX Compounds and other PFAS in the

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process wastewater at the Facility.

IV. DEQ's Suspension of Chemours' NPDES Permit

102. On September 5, 2017, DEQ sent Chemours a letter providing 60 days notice of DEQ's intent to partially suspend the NPDES Permit. DEQ's September 5, 2017 letter is attached hereto and incorporated herein as Exhibit 13.

103. Despite Chemours diversion of additional process wastewater for offsite disposal, DEQ continues to detect elevated levels of GenX at Outfall 002 and in the Cape Fear River.

104. On November 3, 2017, DWR staff conducted an inspection of the Facility. Based on this inspection, DWR determined that on October 6, 2017, the Facility released GenX Compounds from the Vinyl Ethers South stack. Subsequent rain events carried the GenX Compounds to Outfall 002 and ultimately into the Cape Fear River. The spill resulted in elevated concentrations of GenX at Outfall 002 and in the Cape Fear River. Chemours failed to report this spill to DEQ in violation of the Permit.

105. On November 13, 2017, DEQ issued a Notice of Violation and Intent to Assess Civil Penalties to Chemours for this violation. DEQ's November 13, 2017 NOV is attached hereto and incorporated herein as Exhibit 14.

106. On November 16, 2017, DEQ sent Chemours a letter partially suspending the Permit provisions that authorized Chemours to discharge any process wastewater from Chemours' manufacturing processes. DEQ's November 16, 2017 letter is attached hereto and incorporated herein as Exhibit 15.

107. Since the end of November 2017, upon information and belief, Chemours has ceased its discharge of wastewater from its manufacturing processes and shipped this wastewater

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offsite for disposal.

108. Concentrations of GenX in effluent being released from Outfall 002 continue, with higher levels occurring during or after rain events.

109. Chemours subsequently reported that prior to the end of November, 2017, for an unknown period of time, Chemours had been discharging process wastewater containing PFAS at unknown concentrations and in unknown quantities into an open ditch, known as the "Nafion Ditch." Such discharges bypassed the wastewater treatment plant and discharged directly into Outfall 002 and ultimately into the Cape Fear River. On March 23, 2018, DEQ sent a letter to Chemours requesting detailed information regarding these discharges. DEQ's March 23, 2018 letter is attached hereto and incorporated herein at Exhibit 16.

V. Chemours' Contamination of Groundwater

110. In 2003, DuPont began a groundwater monitoring program at the Facility, testing for various constituents including PFOA.

111. The requirement to conduct this groundwater monitoring was incorporated into the Resource Conservation and Recovery Act Facility Investigation Workplan Outline, which is a part of the facility's Hazardous Waste Management Permit, No. NCD047368642-R2-M3 ("DWM Permit").

112. The DWM Permit was first issued in February of 1984 by DEQ's Division of Waste Management ("DWM") with the most recent version issued on June 23, 2015. The most recent version of the DWM Permit is attached hereto and incorporated herein as Exhibit 17. The DWM Permit allows the Facility to store and treat hazardous waste, including waste from the Fluoromonomers/Nafion® Membrane Manufacturing Area.

113. In 2015, following the detection of certain PFAS (in addition to PFOA) in the Cape Fear River, DEQ instructed Chemours to conduct supplemental groundwater sampling to determine whether groundwater flowing from the site was causing these concentrations in the river. The groundwater sampling results showed an elevated concentration of one of these PFAS in the groundwater sample from an onsite monitoring well. Chemours provided DEQ only with the PFOA groundwater sampling results, and, until July 2017, failed to share the results showing the elevated concentration of the additional PFAS.

114. In August 2017, DWM directed Chemours to conduct additional groundwater sampling at the Facility, including sampling for GenX.

115. Because GenX is not naturally occurring in groundwater and no numerical groundwater standard has been established for GenX, GenX is not permitted in groundwater at concentrations at or above the PQL. The PQL for GenX is currently at or below 10 ng/L. *See* 15A N.C.A.C. 2L .0202(c). A memorandum dated July 13, 2017 from the EPA to Linda Culpepper, Deputy Director of DWR, documenting the PQL for GenX at EPA's Laboratory is attached hereto and incorporated herein as Exhibit 18.

116. Samples were gathered in August 2017 from fourteen groundwater monitoring wells and shared with three laboratories, including the National Exposure Research Laboratory of the EPA ("EPA Lab"), GEL Laboratories in Charleston, SC ("GEL"), and Test America, a private lab contracted by Chemours. The data received from GEL show GenX in samples taken from thirteen of the fourteen onsite monitoring wells at levels greater than the PQL, and therefore in violation of the groundwater standard set forth in the 2L Rules.

117. GenX was detected in these thirteen wells at levels ranging from 519 to 61,300 ng/L

– far greater than the PQL. A map generated by DEQ illustrating these well locations and measured concentrations of GenX in groundwater is attached hereto and incorporated herein as Exhibit 19. All five wells located adjacent to the Cape Fear River have GenX levels greater than 11,800 ng/L.

118. On September 6, 2017, DWR and DWM jointly issued Chemours a Notice of Violation and Notice of Intent to enforce for Chemours' violation of groundwater rules at the Facility ("September 6, 2017 NOV"). The September 6, 2017 NOV is attached hereto and incorporated herein as Exhibit 20.

119. On January 31, 2018, Chemours submitted an Additional Site Investigation Report, which was prepared in response to the September 6, 2017 NOV. This Additional Site Investigation Report is attached hereto and incorporated herein as Exhibit 21. In this Additional Site Investigation Report, Chemours reported the results of additional onsite groundwater sampling. These results showed concentrations of GenX in one well at 640,000 ng/L, more than 64,000 times greater than the PQL.

120. Other onsite wells had concentrations of GenX at 170,000 ng/L; 160,000 ng/L; 140,000 ng/L; 130,000 ng/L; 110,000 ng/L; 63,000 ng/L; 59,000 ng/L; 51,000 ng/L; 45,000 ng/L; and 42,000 ng/L.

121. Numerous additional PFAS were found at elevated concentrations at onsite wells. For example,

a. the highest concentrations for PFMOAA, CAS No. 674-13-5, were 8,174,250 ng/L; 6,662,860 ng/L; 1,726,095 ng/L; and 1,715,830 ng/L;

b. the highest concentrations for PFO2HxA, CAS No. 39492-88-1, were 1,935,440 ng/L; 1,610,185 ng/L; 912,105 ng/L; and 898,740 ng/L;

c. the highest concentrations for "PFESA Byproduct 1," CAS No. 29311-67-9 were 260,295 ng/L; 144,625 ng/L; 129,815 ng/L; and 71,915 ng/L; and

d. the highest concentrations for "PFESA Byproduct 2," CAS No. 749836-20-2 were 76,230 ng/L; 76,125 ng/L; 22,743 ng/L; and 22,374 ng/L.

122. DEQ continues to investigate the extent of, and environmental risks associated with these contaminants.

123. On February 28, 2018, Chemours submitted a Focused Feasibility Study Report – PFAS Remediation ("Feasibility Study") to DEQ, which provides additional information regarding PFAS contamination in surface waters and groundwaters. That report is attached hereto and incorporated herein as Exhibit 22.

124. The Feasibility Study indicates that concentrations of PFAS beneath the Facility are contributing to contamination of offsite groundwater and of adjacent surface water bodies.

125. Contaminated groundwater is discharging north of the Facility into Willis Creek, where GenX was detected at 230 ng/L to 450 ng/L. It is also discharging south of the Facility into the Georgia Branch, where GenX was detected at 540 ng/L and 690 ng/L. Both Willis Creek and the Georgia Branch discharge into the Cape Fear River, adding to the contaminant loading in the River.

126. Chemours has identified the flow of onsite groundwater directly to the Cape Fear River as the most significant current source of contaminant loading in the River.

127. Chemours has represented to DEQ that a primary source of the site-wide groundwater contamination appears to be past releases of process wastewater from unlined ditches. Chemours has identified air deposition as another source.

128. In addition to evaluating onsite groundwater contamination, from September 2017 through the present, DEQ has overseen extensive sampling of offsite groundwater. To date, 866 offsite wells have been tested in four phases.

129. Of these 866 wells, 190 wells have concentrations of GenX above the DHHS provisional health goal of 140 ng/L. Additionally, 486 wells have detectable concentrations of GenX at a level lower than 140 ng/L. In total, 639 wells have detectable concentrations of GenX. The highest detected concentration of GenX in private drinking water wells is 4,000 ng/L. Concentrations above the DHHS provisional health goal of 140 ng/L were detected in private drinking water wells over 3 miles from the Facility.

130. A map illustrating the offsite sampling results is attached hereto and incorporated as Exhibit 23. In accord with prevailing winds, and as will be discussed more fully below, this map illustrates that the impacts of GenX contamination extend furthest to the areas northeast and southwest of the Facility.

VI. DEQ's Investigation of Chemours' Air Emissions of GenX and Other PFAS

131. DEQ has conducted an extensive investigation into air emissions from the Chemours Fayetteville Works and the impacts of those air emissions on the surrounding environment.

132. DEQ has discovered that a major source of groundwater contamination, both onsite and offsite, is Chemours' air emissions of GenX Compounds.

133. On December 14, 2016, DAQ issued Chemours Air Quality Permit NO. 03735T43. The Permit requires Chemours to submit an annual inventory of its emissions to DAQ.

134. Chemours submitted an air emissions inventory to DAQ on June 24, 2017. The air emissions inventory reported that the Facility emitted approximately 66.6 pounds of GenX

Compounds in 2016.

135. On September 20, 2017, DAQ sent a letter to Chemours requesting additional information regarding Chemours' emission of GenX Compounds and other PFAS. A copy of this September 20, 2017 letter is attached hereto and incorporated herein as Exhibit 24.

136. On October 20, 2017, Chemours submitted a revised assessment of emissions of GenX Compounds. Specifically, Chemours stated that in 2016 the Facility emitted 594 pounds of GenX Compounds. This revised assessment is attached hereto as Exhibit 25. This figure is nearly nine times higher than the quantity of emissions of GenX Compounds reported in June 2017.

137. Since October 18, 2017, DAQ directed Chemours to conduct testing of its process operations to quantify the level of GenX Compounds and other PFAS in its emissions. DAQ also directed Chemours to evaluate its Leak Detection and Repair ("LDAR") program to determine current outdoor fugitive emissions from connectors, valves and pumps at the Facility. Chemours LDAR Report is attached hereto and incorporated herein as Exhibit 26.

138. Based on the results of the stack testing that Chemours performed and Chemours LDAR report submitted on January 31, 2018, Chemours has reported to DAQ that it currently emits GenX Compounds at a rate of 2,241 pounds per year. This figure is approximately 33.6 times higher than the quantity of emissions of GenX Compounds reported in June 2017 and approximately 3.7 times higher than in the quantity of emissions of GenX Compounds reported in October 2017. DEQ's own calculations indicate that Chemours' emissions of GenX compounds could exceed 2,700 pounds per year. The cover letters for Chemours stack tests reports representing Chemours' calculations of annual emissions rates are attached hereto as Exhibits 27 and 28.

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139. In conjunction with its efforts to quantify emission rates, DEQ has undertaken measures to determine the fate of GenX Compounds emitted from the Chemours facility in the environment. Rainwater sampling was conducted on January 28-29, February 4-5, and February 28-March 2, 2018. Each of these sampling events showed that GenX was present in rainwater at levels exceeding the PQL. The sampling included measurements of 810 ng/L five miles to the northeast of the facility and three samples measuring between 40 and 60 ng/L seven miles to the northeast of the Facility. A combined rainwater sampling map and offsite groundwater contamination map is attached hereto and incorporated herein as Exhibit 29 and reproduced below:

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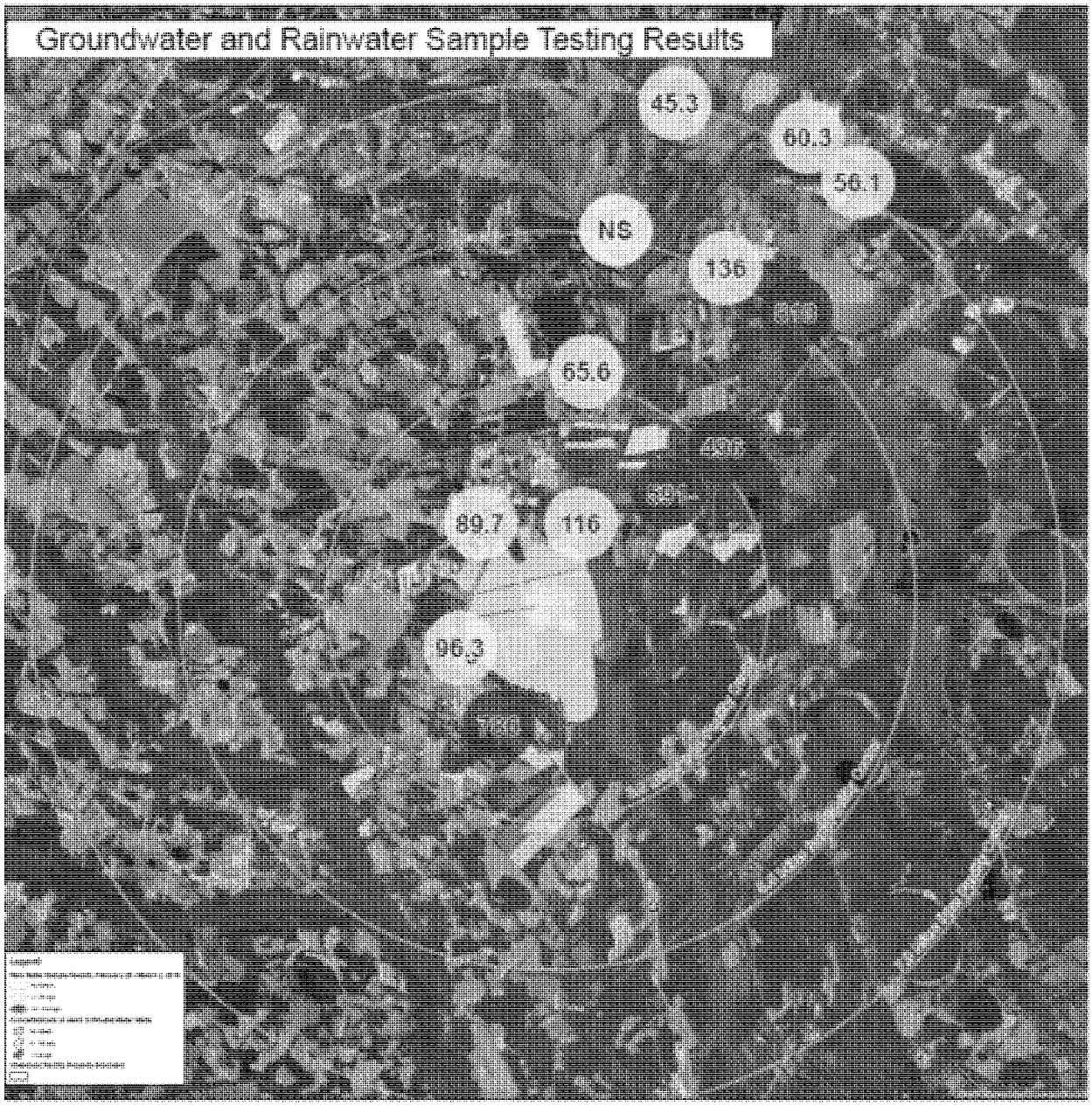

Groundwater and Rainwater Sample Testing Results: Rainwater results are shown using white, yellow and red circles. A white circle means "no sample"; a yellow circle means "1-140 ng/L"; and a red circle means "141-810 ng/L." Property parcels with concentrations of GenX in private wells are shaded in green, yellow, and red. Green means "no detect"; yellow means "0-140 ng/L" and red means "greater than 140 ng/L."

140. A Wind Rose is a diagram showing the relative frequency of wind directions at a particular location. A Wind Rose plotting meteorological data from the nearby Fayetteville Airport is attached hereto and incorporated herein as Exhibit 30.

141. A comparison between (a) the combined rainwater and offsite groundwater contamination map and (b) the Wind Rose shows the correlation between the pattern of offsite groundwater contamination and the pattern of air deposition.

142. Upon information and belief, there are no other facilities in North Carolina which produce or use GenX Compounds.

143. These data indicate that Chemours emissions of GenX Compounds are a primary source of groundwater contamination in private drinking water wells and these emissions cause or contribute to violations of groundwater rules occurring beyond the Facility's property line. These emissions are also a source of onsite groundwater contamination, especially areas not in close proximity to ditches and surface water conveyances.

144. On April 6, 2018, DAQ sent Chemours a letter providing Chemours sixty days notice of its intent to modify Chemours' air quality permit in order to ensure that Chemours' air emissions will no longer cause or contribute to violations of North Carolina's groundwater rules. The April 6, 2018 letter is attached hereto and incorporated herein as Exhibit 31.

VIOLATIONS OF NORTH CAROLINA'S WATER QUALITY LAWS

Claim I: Violation of Groundwater rules

145. The allegations contained in Paragraphs 1 through 144 are incorporated into this claim as if fully set forth herein.

146. Under North Carolina groundwater rules, detection of GenX at or above the PQL constitutes a violation of North Carolina's groundwater rules.

147. Concentrations of GenX in groundwater samples taken from monitoring wells at the Facility drastically exceed allowable concentrations under North Carolina's groundwater rules.

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148. Concentrations of GenX in groundwater samples taken from private drinking water wells in the vicinity of the Facility also exceed allowable concentrations under North Carolina's groundwater rules.

149. Air deposition of GenX Compounds from the Facility is an ongoing source of both onsite and offsite groundwater contamination, which Chemours has failed to adequately remove, treat, or control in violation of North Carolina's groundwater rules.

150. Chemours' failure to correct these violations constitutes a continuing violation of the State's groundwater rules that, as a matter of law, adversely affects the public interest. *See Challenge*, 54 N.C. App. at 522, 284 S.E.2d at 339. Pursuant to N.C. Gen. Stat. § 143-215.6C and N.C. Gen. Stat. § 143-114C, the State is therefore entitled to preliminary and permanent injunctive relief against Chemours to prevent and abate Chemours' violation of groundwater rules, including control of the GenX Compounds emitted by Chemours into the atmosphere.

Claim II: Misrepresentation and Violation of NPDES Disclosure Requirements

151. The allegations contained in Paragraphs 1 through 150 are incorporated into this claim for relief as if fully set forth herein.

152. Upon information and belief, the process wastewater from the Fluoromonomers/Nafion® Membrane Manufacturing Area contains and has contained substances or combinations of substances which meet the definition of "toxic substance" set forth in 15A N.C.A.C. 2B .0202.

153. Upon information and belief, DuPont was aware that these substances had potential toxic effects prior to submitting its 2012 Permit Application to DWR.

154. Upon information and belief, Chemours was aware that these substances had

potential toxic effects when it was spun off as an independent business from DuPont.

155. Upon information and belief, by representing to DWR that its GenX manufacturing process would be a closed loop system and, therefore, that GenX Compounds would not be discharged into surface waters, and withholding information regarding its discharge of GenX Compounds, DuPont and Chemours knowingly misled DWR into believing that GenX Compounds were not being discharged from the Facility into surface waters.

156. Upon information and belief, Chemours violated 15A N.C.A.C. 2H .0105(j) by failing to fully disclose all known toxic components reasonably expected to be in the discharge.

157. Upon information and belief, Chemours violated NPDES Permit Standard Condition II.E.8, by failing to disclose all known toxic components reasonably expected to be in the discharge after it became aware that such facts were not disclosed in the 2012 Permit Application.

158. Chemours' failure to correct these violations constitutes a continuing violation of the NPDES Permit and the State's water quality laws that, as a matter of law, adversely affects the public interest. *See Challenge*, 54 N.C. App. at 522, 284 S.E.2d at 339. The State is entitled to preliminary and permanent injunctive relief against Chemours to address Chemours' misrepresentations and violations of NPDES disclosure requirements pursuant to N.C. Gen. Stat. § 143-215.6C.

Claim III: Unpermitted Discharge

159. The allegations contained in Paragraphs 1 through 158 are incorporated into this claim for relief as if fully set forth herein.

160. The presence of various toxic substances, including GenX and related compounds,

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were not in the reasonable contemplation of DWR when it issued the 2012 Permit.

161. Chemours has discharged these substances into the Cape Fear River in violation of N.C. Gen. Stat. § 143-215.1.

162. Upon information and belief, for an unknown period of time Chemours also discharged process wastewater containing PFAS of currently unknown concentrations and in currently unknown quantities into an open ditch, commonly called the Nafion Ditch, thereby bypassing the wastewater treatment plant and discharging directly into Outfall 002 and the Cape Fear River in violation of N.C. Gen. Stat. § 143-215.1 and the NPDES Permit.

163. Upon information and belief, following partial suspension of its NPDES Permit, Chemours has ceased its discharge of process wastewater from the Facility and shipped this wastewater offsite for disposal.

164. Pursuant to N.C. Gen. Stat. § 143-215.6C, the State is entitled to preliminary and permanent injunctive relief against Chemours, ordering it to continue to ship its process wastewater offsite for disposal and to provide a full accounting of its discharge of process wastewater to the Nafion Ditch.

PRAYER FOR RELIEF

WHEREFORE, the Plaintiff, State of North Carolina, prays that the Court grant the following relief:

1. That this verified Complaint be used as an affidavit upon which to base all orders of the Court.

2. That the Court preliminarily, and upon final judgment permanently, enter a prohibitory and/or mandatory injunction requiring Chemours to:

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a. Remove, treat or control air emissions of GenX Compounds such that they no longer cause or contribute to any violation of North Carolina's groundwater rules;

b. Remove, treat, or control all other sources of GenX Compounds such that they no longer cause or contribute to any violation of North Carolina's groundwater rules;

c. Prohibit the discharge of Chemours' process wastewater until such time as DEQ issues a NPDES permit with appropriate limits authorizing such discharge or otherwise authorizes such activities;

d. Provide a full accounting of the discharge of process wastewater to the Nafion Ditch and any other unpermitted discharges; and

e. Cease and abate all ongoing violations of North Carolina's water and air quality laws.

3. That the cost of this action, including attorneys' fees, if allowable, be taxed against Chemours.

4. That this Court grant such other and further relief as the Court shall deem to be just and proper.

ED_002003M_00008623-00035

Respectfully submitted this the 9th day of April, 2018.

JOSH STEIN
Attorney General

By: _____
Francisco J. Benzoni
Special Deputy Attorney General
N.C. State Bar No. 38660
fbenzoni@ncdoj.gov

Asher P. Spiller
Assistant Attorney General
N.C. State Bar No. 46425
aspiller@ncdoj.gov

N.C. Department of Justice
Environmental Division
PO Box 629
Raleigh, NC 27602
(919)716-6600 (phone)
(919)716-6767 (fax)
Attorneys for Plaintiff

ED_002003M_00008623-00036

STATE OF NORTH CAROLINA

COUNTY OF WAKE

VERIFICATION

Linda Culpepper, being duly sworn, deposes and says that she is the Interim Director of the Division of Water Resources of the North Carolina Department of Environmental Quality, that she has read the foregoing AMENDED COMPLAINT AND MOTION FOR PRELIMINARY INJUNCTIVE RELIEF and that she is acquainted with all of the facts and circumstances stated in paragraphs 49-109, that the same is true of her own knowledge, except as to those matters and things stated and alleged upon information and belief, and as to those matters and things she believes them to be true.

Linda Culpepper

Subscribed and sworn to before me

This the 9th day of April, 2018.

ANNA V. SMITH NOTARY PUBLIC WAKE COUNTY, NC

Anna V. Smith
Notary Public

My Commission Expires: 10/22/2021

ED_002003M_00008623-00037

STATE OF NORTH CAROLINA

COUNTY OF WAKE

VERIFICATION

Michael Scott, being duly sworn, deposes and says that he is the Director of the Division of Waste Management of the North Carolina Department of Environmental Quality, that he has read the foregoing AMENDED COMPLAINT AND MOTION FOR PRELIMINARY INJUNCTIVE RELIEF and that he is acquainted with all of the facts and circumstances stated in paragraphs 110-130; that the same is true of his own knowledge, except as to those matters and things stated and alleged upon information and belief, and as to those matters and things he believes them to be true.

Michael Scott

Subscribed and sworn to before me

This the 9th day of April, 2018.

Anna V. Smith
Notary Public

ANNA V. SMITH NOTARY PUBLIC WAKE COUNTY, NC

My Commission Expires: 10/22/2021

ED_002003M_00008623-00038

STATE OF NORTH CAROLINA

COUNTY OF WAKE

VERIFICATION

Michael Abraczinskas, being duly sworn, deposes and says that he is the Director of the Division of Air Quality of the North Carolina Department of Environmental Quality, that he has read the foregoing AMENDED COMPLAINT AND MOTION FOR PRELIMINARY INJUNCTIVE RELIEF and that he is acquainted with all of the facts and circumstances stated in paragraphs 131-144; that the same is true of his own knowledge, except as to those matters and things stated and alleged upon information and belief, and as to those matters and things he believes them to be true.

Michael Abraczinskas

Subscribed and sworn to before me

This the 9th day of April, 2018.

Anna V. Smith
Notary Public

ANNA V. SMITH NOTARY PUBLIC WAKE COUNTY, NC

My Commission Expires: 10/22/2021

ED_002003M_00008623-00039

To: Sweeney, Matthew L[Matthew.L.Sweeney@wv.gov]
From: Moncavage, Carissa
Sent: Thur 7/26/2018 6:56:06 PM
Subject: RE: The Chemours Company LLC (WV0001279)

Hi Matt,

EPA has no further comments.

Thanks,
Carissa

From: Sweeney, Matthew L [mailto:Matthew.L.Sweeney@wv.gov]
Sent: Tuesday, July 24, 2018 5:31 PM
To: Moncavage, Carissa <Moncavage.Carissa@epa.gov>
Cc: Patel, Yogesh P <Yogesh.P.Patel@wv.gov>; Trulear, Brian <Trulear.Brian@epa.gov>; Hales, Dana <Hales.Dana@epa.gov>; Cruz, Francisco <Cruz.Francisco@epa.gov>
Subject: RE: The Chemours Company LLC (WV0001279)

Carissa,

The agency concurs that the facility is subject to 316(b) of the Clean Water Act. The language in the fact sheet was more subjective in that it was simply indicating that the facility was potentially subject to it and that the necessary information relative to 316(b) needed to be submitted. As the permit properly contains requirements for the submittal of pertinent information regarding 316(b) as well as properly prescribes that the permittee is subject to 316(b), the agency believes the permit contains the necessary information.

Please let us know if this addresses EPA's comments.

Thanks,
Matt Sweeney, P.E.
NPDES Individual Permitting Supervisor
WV Department of Environmental Protection
Division of Water and Waste Management
601 57th Street, SE
Charleston, WV 25304

From: Moncavage, Carissa <Moncavage.Carissa@epa.gov>
Sent: Thursday, May 31, 2018 4:01 PM
To: Sweeney, Matthew L <Matthew.L.Sweeney@wv.gov>
Cc: Patel, Yogesh P <Yogesh.P.Patel@wv.gov>; Trulear, Brian <Trulear.Brian@epa.gov>; Hales, Dana <Hales.Dana@epa.gov>; Cruz, Francisco <Cruz.Francisco@epa.gov>
Subject: The Chemours Company LLC (WV0001279)

Matt,

According to our Memorandum of Agreement, the Environmental Protection Agency (EPA) Region III has received the draft National Pollutant Discharge Elimination System (NPDES) permit for:

The Chemours Company (a.k.a. Washington Works, a.k.a. Dupont)
NPDES Number: WV001279
EPA Received: April 16, 2018

This is a major permit discharging to Ohio River and is affected by the OCPSF ELG found at 40CFR Part 414 subparts C, D, E, I and J. EPA has chosen to perform a limited review based on the application of the ELG's, WQBEL/TBEL evaluations,

316(b) requirements, and compliance schedule requirements. I have completed my review and offer one comment:

1. The fact sheet states that the facility's cooling water structure is *potentially* subject to 316(b) requirements. We recommend removing the word "potentially" since both the permit and fact sheet have established that this facility is subject to 316(b) of the Clean Water Act.

Please provide me with any changes to the draft permit and/or fact sheet.

Regards,

Carissa Moncavage
U.S. EPA Region 3 | Water Protection Division
NPDES Permits Branch
1650 Arch Street (3WP41), Philadelphia, PA 19103
Ph: (215) 814-5798 | Fax: (215) 814-2318
(pronouns: she/her)

To: Allenbach, Becky[Allenbach.Becky@epa.gov]
From: Garvey, Mark
Sent: Tue 11/21/2017 2:58:40 PM
Subject: FW: Chemours' NPDES Permit Notice
Letter November 11-16-17 (003).pdf

Becky,

I should have sent you a note last week thanking you for forwarding this to me. I noticed today I had not.
So much is going on at Chemours. Thanks for keeping me informed.

Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information,
attorney-work product, enforcement sensitive material or privileged information.

-----Original Message-----
From: Allenbach, Becky
Sent: Thursday, November 16, 2017 6:11 PM
To: Speir, Jeffrey <speir.jeffrey@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; King, Carol <King.Carol@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: FW: Chemours' NPDES Permit Notice

FYI

Becky B. Allenbach, Chief
Grants and Drinking Water Protection Branch Water Protection Division EPA Region 4 – Atlanta
Office: 404-562-9687
Cell: 678-641-0032

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-----Original Message-----
From: Walker, Mary
Sent: Thursday, November 16, 2017 6:02 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Heard, Anne <Heard.Anne@epa.gov>; Forsgren, Lee <Forsgren.Lee@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Jenkins, Brandi <Jenkins.Brandi@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Grevatt, Peter <Grevatt.Peter@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Wise, Allison <Wise.Allison@epa.gov>

Subject: Chemours' NPDES Permit Notice

This afternoon North Carolina DEQ notified Chemours of the suspension of portions of the facility's NPDES permit and of DEQ's intention to revoke those portions in 60 days. (See attached.) The portions of the permit in question are those associated with the Fluoromonomers/NafionMembrane manufacturing area – which would include multiple manufacturing processes.

Mary

To: Allenbach, Becky[Allenbach.Becky@epa.gov]
Cc: Pollins, Mark[Pollins.Mark@epa.gov]; Speir, Jeffrey[speir.jeffrey@epa.gov]; Collins, Charlie[collins.charlie@epa.gov]; Denton, Loren[Denton.Loren@epa.gov]; Bahk, Benjamin[Bahk.Benjamin@epa.gov]
From: Theis, Joseph
Sent: Wed 11/21/2018 10:22:45 PM
Subject: Fwd: Updated Draft 308s
2018-11-20 DRAFT Chemours 308 Letter Washington Works.docx
ATT00001.htm
2018-11-20 DRAFT Chemours 308 Letter Fayetteville Works.docx
ATT00002.htm
2018-11-20 DRAFT Chemours 308 Letter Chambers Works.docx
ATT00003.htm

Becky,
Hi attached is the last draft of the Fayetteville 308 that I have. Our point person left on travel for Thanksgiving yesterday, so I wasn't able to confirm if there were any additional changes . I anticipate that Mark will sign and we will send that one by the end of next week, but I will ask Jeff to send you and Mita the final version when he is back in the office on Monday.
- Joe

Begin forwarded message:

From: "Speir, Jeffrey" <speir.jeffrey@epa.gov>
Date: November 20, 2018 at 11:44:34 AM EST
To: "Theis, Joseph" <Theis.Joseph@epa.gov>
Cc: "Collins, Charlie" <collins.charlie@epa.gov>
Subject: Updated Draft 308s

Enforcement Confidential / Deliberative / Do Not Release

Hi Joe,

I have attached draft 308s for all three facilities:

Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5

-Jeff

Jeffrey Speir, Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
(202) 564-0872

To: Allenbach, Becky[Allenbach.Becky@epa.gov]
From: Ghosh, Mita
Sent: Tue 10/23/2018 10:32:24 AM
Subject: FW: Chemours 308
2018-10-17 Chemours 308 Letter DRAFT pxs comments.docx

Becky:

Here are Paul's comments to the Chemours HQ 308. Please include these with any comments that the program has. Thanks.

Mita

Mita Ghosh
Chief, Office of Water Legal Support
Office of Regional Counel
United States Environmental Protection
Region 4
404-562-9568

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From: Schwartz, Paul
Sent: Monday, October 22, 2018 10:08 AM
To: Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: RE: Chemours 308

Here are my comments

From: Ghosh, Mita
Sent: Monday, October 22, 2018 8:49 AM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>
Subject: Chemours 308

Paul:

Have you had a chance to review the HQ information request?

Mita Ghosh
Chief, Office of Water Legal Support
U.S. Environmental Protection Agency, Region 4
(404) 562-9568

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To: Theis, Joseph[Theis.Joseph@epa.gov]; Allenbach, Becky[Allenbach.Becky@epa.gov]
Cc: Pollins, Mark[Pollins.Mark@epa.gov]; Collins, Charlie[collins.charlie@epa.gov]; Denton, Loren[Denton.Loren@epa.gov]; Bahk, Benjamin[Bahk.Benjamin@epa.gov]
From: Speir, Jeffrey
Sent: Mon 11/26/2018 3:02:02 PM
Subject: RE: Updated Draft 308s
2018-11-20 DRAFT Chemours 308 Letter Fayetteville Works.docx

Hi Becky,

Yes—the version that Joe attached (also attached here) is the latest draft 308 for Fayetteville Works.

-Jeff

Jeffrey Speir, Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
(202) 564-0872

From: Theis, Joseph
Sent: Wednesday, November 21, 2018 5:23 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>
Subject: Fwd: Updated Draft 308s

Becky,

Enforcement/Investigatory / Ex. 7(a) // Deliberative Process / Ex. 5

- Joe

Begin forwarded message:

> **From:** "Speir, Jeffrey" <speir.jeffrey@epa.gov>
> **Date:** November 20, 2018 at 11:44:34 AM EST
> **To:** "Theis, Joseph" <Theis.Joseph@epa.gov>
> **Cc:** "Collins, Charlie" <collins.charlie@epa.gov>
> **Subject: Updated Draft 308s**
>
> *Enforcement Confidential / Deliberative / Do Not Release*
>
> Hi Joe,
>
> **Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5**
>
> -Jeff
>
> Jeffrey Speir, Attorney-Adviser
> U.S. Environmental Protection Agency
> OECA – OCE – Water Enforcement Division

(202) 564-0872

To: Ghosh, Mita[Ghosh.Mita@epa.gov]
Cc: Rubini, Suzanne[Rubini.Suzanne@epa.gov]; Walker, Mary[walker.mary@epa.gov]
From: Allenbach, Becky
Sent: Tue 10/23/2018 9:12:27 PM
Subject: RE: Chemours 308
2018-10-17 Chemours 308 Letter DRAFT pxs + bba comments.docx

Did not receive any additional comments. I answered one of Paul's issues in this version

Becky B. Allenbach, Deputy Director
Water Protection Division
EPA Region 4
Office 404-562-9687
Cell: 678-641-0032

From: Ghosh, Mita
Sent: Tuesday, October 23, 2018 9:19 AM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>
Subject: Chemours 308

Becky:

If you all have additional comments to Paul's comments can you please send to me. Suzanne would like to send them to OECA.

Mita

Mita Ghosh
Chief, Office of Water Legal Support
Office of Regional Counel
United States Environmental Protection
Region 4
404-562-9568

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2018-11-27 Chemours Fayetteville Works CWA 308 Information Request.pdf

Mary:

Following is information for your to consider sending to Mississippi as a heads up:

As part of an on-going investigation, EPA's Office of Enforcement and Compliance Assurance (OECA) sent an information request letter to the Chemours Company to gather information about facilities that may "manufacture, receive, and/or process PFAS and/or other fluorinated compounds."

First Chemical Pascagoula (1001 Industrial Rd., Pascagoula, MS 39581): Chemours identified this facility as one that has "discharged, released, spilled, or leaked" PFAS to "navigable waters" as defined by the CWA; Chemours utilizes carbon treatment with filtration to treat PFAS discharges at this facility; wastewater is then collected on-site in above-ground tanks and discharged to a POTW; production units that had PFOA in wastewater were shut down in late 2015, so the last PFOA discharge report, as we understand, was submitted to Mississippi in February 2016.

This is the only information that we have to relay at this time. OECA expects additional information

Becky B. Allenbach, Deputy Director
Water Protection Division
EPA Region 4
Office 404-562-9687
Cell: 678-641-0032

To: Gettle, Jeaneanne[Gettle.Jeaneanne@epa.gov]
From: Allenbach, Becky
Sent: Wed 2/20/2019 10:45:15 PM
Subject: Information from Chemours 308 Letter
2018-11-27 Chemours Fayetteville Works CWA 308 Information Request.pdf

Jeaneanne, did you want to send to Mary or shall I? I do not recall with so many items needing communication....

Mary:

Following is information for your to consider sending to Mississippi as a heads up. I confirmed that none of the information is CBI:

As part of an on-going investigation, EPA's Office of Enforcement and Compliance Assurance (OECA) sent an information request letter to the Chemours Company to gather information about facilities that may "manufacture, receive, and/or process PFAS and/or other fluorinated compounds."

First Chemical Pascagoula (1001 Industrial Rd., Pascagoula, MS 39581): Chemours identified this facility as one that has "discharged, released, spilled, or leaked" PFAS to "navigable waters" as defined by the CWA; Chemours utilizes carbon treatment with filtration to treat PFAS discharges at this facility; wastewater is then collected on-site in above-ground tanks and discharged to a POTW; production units that had PFOA in wastewater were shut down in late 2015, so the last PFOA discharge report, as we understand, was submitted to Mississippi in February 2016.

This is the only information that we have to relay at this time. OECA expects additional information from Chemours by February 26th.

Becky B. Allenbach, Deputy Director
Water Protection Division
EPA Region 4
Office 404-562-9687
Cell: 678-641-0032

To: Annicella, Alan[Annicella.Alan@epa.gov]
From: Crossland, Andy
Sent: Wed 7/18/2018 2:21:58 PM
Subject: Emailing: NEI Facility Lists with Ranking with 2018 inspections
NEI Facility Lists with Ranking with 2018 inspections.xlsx

Alan - here is what I am pretty sure is the most recent version of the file... I'll also get it back up on the one Drive.

-Andy
Your message is ready to be sent with the following file or link attachments:

NEI Facility Lists with Ranking with 2018 inspections

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

To: Crossland, Andy[Crossland.Andy@epa.gov]; amend, carol[amend.carol@epa.gov]; Baptista, Chrisna[Baptista.Chrisna@epa.gov]; Chavez, Kimberly[Chavez.Kimberly@epa.gov]; Chow, Emily[Chow.Emily@epa.gov]; Lamberth, Larry[Lamberth.Larry@epa.gov]; Moore, Letitia[Moore.Letitia@epa.gov]; O'Donnell, Mary Jane[Odonnell.Maryjane@epa.gov]; Rapp, Steve[Rapp.Steve@epa.gov]; Russell, Bethany[Russell.Bethany@epa.gov]; Saenz, Diana[Saenz.Diana@epa.gov]; Simpson, Andrea[simpson.andrea@epa.gov]; Vizard, Elizabeth[Vizard.Elizabeth@epa.gov]; Welles, Laura[Welles.Laura@epa.gov]; Wilk, John[Wilk.John@epa.gov]; Tidmore, Guy[tidmore.guy@epa.gov]; Mostaghim, Negin[Mostaghim.Negin@epa.gov]; Danois, Héctor[Danois.Hector@epa.gov]; Schofield, John[Schofield.John@epa.gov]; Lin, Sharon[Lin.Sharon@epa.gov]; Mallick, Parvez[Mallick.Parvez@epa.gov]; Jabar, Abdool[Jabar.Abdool@epa.gov]; Thomas, Derval[Thomas.Derval@epa.gov]; Annicella, Alan[Annicella.Alan@epa.gov]
From: Bellot, Michael
Sent: Wed 12/13/2017 4:51:20 PM
Subject: SIT Call - **Personal Phone / Ex. 6**
Crosstables 12-5-17.xlsx

Hi All!

For those of you that can attend our SIT call in a few minutes, one of the key things we want to do is finalize our numbers for the NEI for FY17. Dan Klaus has been working with some of the regions to get the final results entered. It appears there are a few things we need to iron out yet. We will be talking from the attached spreadsheet.

To: Shell, Karrie-Jo[Shell.Karrie-Jo@epa.gov]
From: Davis, Molly
Sent: Fri 11/17/2017 12:31:11 PM
Subject: FW: Chemours' NPDES Permit Notice
Letter November 11-16-17 (003).pdf

Deliberative Process / Ex. 5

-----Original Message-----
From: Walker, Mary
Sent: Thursday, November 16, 2017 6:02 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Heard, Anne <Heard.Anne@epa.gov>; Forsgren, Lee <Forsgren.Lee@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Jenkins, Brandi <Jenkins.Brandi@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Grevatt, Peter <Grevatt.Peter@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Wise, Allison <Wise.Allison@epa.gov>
Subject: Chemours' NPDES Permit Notice

This afternoon North Carolina DEQ notified Chemours of the suspension of portions of the facility's NPDES permit and of DEQ's intention to revoke those portions in 60 days. (See attached.) The portions of the permit in question are those associated with the Fluoromonomers/NafionMembrane manufacturing area – which would include multiple manufacturing processes.

Mary

To: Davis, Molly[Davis.Molly@epa.gov]; Shell, Karrie-Jo[Shell.Karrie-Jo@epa.gov]
From: Walker, Mary
Sent: Wed 12/13/2017 9:55:20 PM
Subject: FW: Recent Chemours release
NCD047368642_Ltr. from C. Compton Chemours to T. Allen DEQ on Dec 2017 release_20171211.pdf

In case you did not receive...

From: Jones, Aaryn
Sent: Wednesday, December 13, 2017 4:46 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Wise, Allison <Wise.Allison@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Monell, Carol <Monell.Carol@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Mundrick, Doug <Mundrick.Doug@epa.gov>; France, Danny <France.Danny@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Howard, Chris <Howard.Chris@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; George, Verne <George.Verne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Rinck, Todd <Rinck.Todd@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>; Gettle, Jeaneanne <Gettle.Jeaneanne@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>
Subject: Recent Chemours release

Hi all,

I just found this while searching the NCDEQ Waste Division's online records for something else. Carol Kempker advised me to send an email to the group of folks listed in the Chemours SOP. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Davis, Molly[Davis.Molly@epa.gov]; Hall, Renea[Hall.Renea@epa.gov]; Jones, Aaryn[Jones.Aaryn@epa.gov]; Janovitz, Sara[Janovitz.Sara@epa.gov]; Campbell-Dunbar, Shawneille[Campbell-Dunbar.Shawneille@epa.gov]; Mitchell, Ken[Mitchell.Ken@epa.gov]; Shell, Karrie-Jo[Shell.Karrie-Jo@epa.gov]; Schwartz, Paul[Schwartz.Paul@epa.gov]; Bush, William[Bush.William@epa.gov]; Mancusi-Ungaro, Philip[Mancusi-Ungaro.Philip@epa.gov]; Ghosh, Mita[Ghosh.Mita@epa.gov]; Lewis, Jennifer[Lewis.Jennifer@epa.gov]
From: Allenbach, Becky
Sent: Thur 11/16/2017 9:38:49 PM
Subject: Chemours NPDES Permit Notice
Letter November 11-16-17.pdf

Becky B. Allenbach, Chief
Grants and Drinking Water Protection Branch
Water Protection Division
EPA Region 4 – Atlanta
Office: 404-562-9687
Cell: 678-641-0032

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From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, November 16, 2017 4:02 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>
Subject: FW: NPDES Permit Notice

For our conf. call

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Culpepper, Linda
Sent: Thursday, November 16, 2017 4:00 PM
To: 'ellis.h.mcgaughy@chemours.com' <ellis.h.mcgaughy@chemours.com>
Cc: Johnson, Michael E <MICHAEL.E.JOHNSON@chemours.com>; Holman, Sheila <sheila.holman@ncdenr.gov>
Subject: NPDES Permit Notice

Forwarding the attached file.

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

To: Walker, Mary[walker.mary@epa.gov]
Cc: Davis, Molly[Davis.Molly@epa.gov]
From: Allenbach, Becky
Sent: Thur 11/16/2017 9:31:45 PM
Subject: FW: NPDES Permit Notice
Letter November 11-16-17.pdf

Mary:

Do you plan to share with OECA or would you like me to share it with them at my level???

Becky

Becky B. Allenbach, Chief
Grants and Drinking Water Protection Branch
Water Protection Division
EPA Region 4 – Atlanta
Office: 404-562-9687
Cell: 678-641-0032

CONFIDENTIALITY NOTICE: This message is intended exclusively for the individual(s) or entity(s) to whom or to which it is addressed. This communication may contain information that is proprietary, privileged, pre-decisional, confidential or otherwise legally exempt from disclosure. If you are not the named addressee, you are not authorized to read, print, retain, copy, or disseminate this message or any part of it. If you have received this message in error, please notify the sender immediately by e-mail and delete all copies of the message.

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, November 16, 2017 4:02 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>
Subject: FW: NPDES Permit Notice

For our conf. call

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Culpepper, Linda
Sent: Thursday, November 16, 2017 4:00 PM
To: 'ellis.h.mcgaughy@chemours.com' <ellis.h.mcgaughy@chemours.com>
Cc: Johnson, Michael E <MICHAEL.E.JOHNSON@chemours.com>; Holman, Sheila <sheila.holman@ncdenr.gov>
Subject: NPDES Permit Notice

Forwarding the attached file.

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

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Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

To: Theis, Joseph[Theis.Joseph@epa.gov]; Walker, Mary[walker.mary@epa.gov]; Allenbach, Becky[Allenbach.Becky@epa.gov]; Ghosh, Mita[Ghosh.Mita@epa.gov]; Davis, Molly[Davis.Molly@epa.gov]; Shell, Karrie-Jo[Shell.Karrie-Jo@epa.gov]; Hall, Renea[Hall.Renea@epa.gov]; Jones, Aaryn[Jones.Aaryn@epa.gov]; Gordon, Scott[Gordon.Scott@epa.gov]; Bush, William[Bush.William@epa.gov]
Cc: Pollins, Mark[Pollins.Mark@epa.gov]; Denton, Loren[Denton.Loren@epa.gov]; Bahk, Benjamin[Bahk.Benjamin@epa.gov]; Collins, Charlie[collins.charlie@epa.gov]; Speir, Jeffrey[speir.jeffrey@epa.gov]
From: Rubini, Suzanne
Sent: Wed 10/24/2018 4:47:08 PM
Subject: RE: Draft Chemours CWA Information Request
2018-10-17 Chemours 308 Letter DRAFT R4 comments.docx

Joe – attached are R4's comments on the 308. If you have any questions or concerns, please contact Paul Schwartz at 404-562-9576.

Thanks,
Suzanne

From: Theis, Joseph
Sent: Thursday, October 18, 2018 10:09 AM
To: Walker, Mary <walker.mary@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
Subject: Draft Chemours CWA Information Request

Region 4 Colleagues,

Enforcement/Investigatory / Ex. 7(a) // Deliberative Process / Ex. 5

- Joe

Joseph G. Theis
Associate Director
Water Enforcement Division
Office of Enforcement and Compliance Assurance
U.S. EPA (2243A)
1200 Pennsylvania Ave, NW
Washington, D.C. 20460
(202)564-4053

This email may contain deliberative, attorney-client, attorney work product or otherwise privileged material. Do not release under FOIA without appropriate review. If this email has been received by you in error, you are instructed to delete it from your machine and all storage media whether electronic or hard copy.

To: Drinkard, Andrea[Drinkard.Andrea@epa.gov]
From: Schollhamer, Mary
Sent: Tue 10/24/2017 4:20:29 PM
Subject: RE: ACTION: StarNews re: NPDES and Chemours

They say it's the region (Specifically, Molly Davis, who is on detail as Chief of the NPDES Permitting and Enforcement Branch of the Region 4 Water Protection Division).

Mary G Schollhamer
Communications Director
Office of Wastewater Management
U.S. Environmental Protection Agency
Office: 202-564-5759
Mobile: Personal Phone / Ex. 6
schollhamer.mary@epa.gov

Office of Wastewater Management: Solutions for Clean Water

From: Drinkard, Andrea
Sent: Tuesday, October 24, 2017 12:19 PM
To: Schollhamer, Mary <Schollhamer.Mary@epa.gov>
Subject: RE: ACTION: StarNews re: NPDES and Chemours

Cool. Enesta reflagged for me. Anything new?

From: Schollhamer, Mary
Sent: Tuesday, October 24, 2017 8:40 AM
To: Drinkard, Andrea <Drinkard.Andrea@epa.gov>
Subject: RE: ACTION: StarNews re: NPDES and Chemours

UPDATE: No update. I'm still waiting on a response.

Mary G Schollhamer
Communications Director
Office of Wastewater Management
U.S. Environmental Protection Agency
Office: 202-564-5759
Mobile: Personal Phone / Ex. 6
schollhamer.mary@epa.gov

Office of Wastewater Management: Solutions for Clean Water

From: Drinkard, Andrea
Sent: Tuesday, October 24, 2017 7:43 AM
To: Schollhamer, Mary <Schollhamer.Mary@epa.gov>
Subject: Fwd: ACTION: StarNews re: NPDES and Chemours

Would they notify OECA? Or would they notify us? Or both?
Sent from my iPhone

Begin forwarded message:

> **From:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> **Date:** October 24, 2017 at 7:41:42 AM EDT
> **To:** "Drinkard, Andrea" <Drinkard.Andrea@epa.gov>, "Strauss, Linda" <Strauss.Linda@epa.gov>, "Maguire, Megan" <Maguire.Megan@epa.gov>, "Hubbard, Carolyn" <Hubbard.Carolyn@epa.gov>, "Grantham, Nancy" <Grantham.Nancy@epa.gov>, "Senn, John" <Senn.John@epa.gov>, "Lincoln, Larry"

<Lincoln.Larry@epa.gov>
Cc: "Jones, Enesta" <Jones.Enesta@epa.gov>
Subject: ACTION: StarNews re: NPDES and Chemours

Good day!

Reporter: Vaughn Hagerty
Outlet: StarNews
DDL: 5 p.m. today

Request:
According to the Memorandum of Understanding that allows N.C. to run its NPDES program:

"When the State makes a detennination to suspend or revoke a permit, in whole or in part, EPA will be notified."

https://www.epa.gov/sites/production/files/2013-09/documents/nc-moa-npdes.pdf

Has EPA been notified by North Carolina regulators that they intend to suspend or revoke the NPDES permit (NC0003573) held by Chemours for the Fayetteville Works site in North Carolina? If so, when was the notice received? What, if anything, was EPA's response? What were the details of the notification?

To: Senn, John[Senn.John@epa.gov]; Jones, Enesta[Jones.Enesta@epa.gov]; Drinkard, Andrea[Drinkard.Andrea@epa.gov]; Dennis, Allison[Dennis.Allison@epa.gov]; Strauss, Linda[Strauss.Linda@epa.gov]; Marraccini, Davina[Marraccini.Davina@epa.gov]; Harris-Young, Dawn[Harris-Young.Dawn@epa.gov]; Maguire, Megan[Maguire.Megan@epa.gov]; Sauerhage, Maggie[Sauerhage.Maggie@epa.gov]; Hubbard, Carolyn[Hubbard.Carolyn@epa.gov]
From: Grantham, Nancy
Sent: Thur 6/22/2017 10:04:49 PM
Subject: RE: Port City Daily re: Chemours

Deliberative Process / Ex. 5

Nancy Grantham
Office of Public Affairs
US Environmental Protection Agency
202-564-6879 (desk)
Personal Phone / Ex. 6 **(mobile)**

From: Senn, John
Sent: Thursday, June 22, 2017 4:38 PM
To: Jones, Enesta <Jones.Enesta@epa.gov>; Grantham, Nancy <Grantham.Nancy@epa.gov>; Drinkard, Andrea <Drinkard.Andrea@epa.gov>; Dennis, Allison <Dennis.Allison@epa.gov>; Strauss, Linda <Strauss.Linda@epa.gov>; Marraccini, Davina <Marraccini.Davina@epa.gov>; Harris-Young, Dawn <Harris-Young.Dawn@epa.gov>; Maguire, Megan <Maguire.Megan@epa.gov>; Sauerhage, Maggie <Sauerhage.Maggie@epa.gov>; Hubbard, Carolyn <Hubbard.Carolyn@epa.gov>
Subject: RE: Port City Daily re: Chemours

Here's my suggest response:

Deliberative Process / Ex. 5

Thanks,
John

From: Jones, Enesta
Sent: Thursday, June 22, 2017 12:23 PM
To: Grantham, Nancy <Grantham.Nancy@epa.gov>; Senn, John <Senn.John@epa.gov>; Drinkard, Andrea <Drinkard.Andrea@epa.gov>; Dennis, Allison <Dennis.Allison@epa.gov>; Strauss, Linda <Strauss.Linda@epa.gov>; Marraccini, Davina <Marraccini.Davina@epa.gov>; Harris-Young, Dawn <Harris-Young.Dawn@epa.gov>; Maguire, Megan <Maguire.Megan@epa.gov>; Sauerhage, Maggie <Sauerhage.Maggie@epa.gov>; Hubbard, Carolyn <Hubbard.Carolyn@epa.gov>; Jones, Enesta <Jones.Enesta@epa.gov>
Subject: Fwd: Port City Daily re: Chemours

http://portcitydaily.com/2017/06/22/kuraray-shares-chemours-permit-dumps-a-chemical-more-dangerous-than-genx-news/
we know anything about an error on the site?

Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."
Begin forwarded message:

> **From:** Ben Schachtman <ben@localvoicemedia.com>
> **Date:** June 22, 2017 at 11:57:53 AM EDT
> **To:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> **Subject: Re: Port City Daily re: Chemours**

Enesta,

An important follow up. Kuraray claims it is not produce or dump PFOA. A rep for the company said the EPA's DMR website has an error on it. I'd really like to get to the bottom of this. If that's the case, who is dumping PFOA?

Ben

On Tue, Jun 20, 2017 at 4:12 PM, Ben Schachtman <ben@localvoicemedia.com> wrote:
Enesta,

Thank you, I appreciate it. An important question, I think: is Chemours the sole source of toxicity data on PFPrOPrA (GenX)?

A few related questions, which i've also posed to NCDEQ - is there any EPA activity relating to Kuraray, which shares the Fayetteville site? According to the EPA's DMR site, Kuraray is still dumping PFOA into the Cape Fear, though Dupont and Chemours stopped using it.

Also, is there any move to put GenX on the Contaminant Candidate List?

Thanks for all your help,

Ben

On Tue, Jun 20, 2017 at 4:03 PM, Jones, Enesta <Jones.Enesta@epa.gov> wrote:
Hi Ben,

Please attribute our statement below to an agency spokesperson:

EPA is committed to protecting public health and supporting states and public water systems as the appropriate steps to address the presence of GenX in drinking water are determined.
EPA has initiated an investigation into Chemours's compliance with a 2009 order issued under the Toxic Substances Control Act (TSCA) for the production of GenX. This investigation will allow EPA to determine whether Chemours is in compliance with requirements of the order to control releases to the environment at the Fayetteville, N.C., facility. EPA is also reviewing the additional toxicity data submitted by the company, as required under the consent order, and updating the risk assessment using the additional toxicity data specific to GenX. At the request of the North Carolina Department of Environmental Quality (NCDEQ), EPA has agreed to perform independent laboratory analysis for GenX in some of the water samples being collected by NCDEQ at 13 locations in the Cape Fear River over the next three weeks.
Background

- Typically, EPA investigates potential TSCA noncompliance through a review of production and environmental controls records required by any rule or order and, as needed, an on-site inspection. EPA may also use information requests to inform our investigation.
- When EPA issued the consent order, the risk assessment for GenX was informed by available toxicity data for GenX and analogous substances such as PFOA (also known as C8). The consent order required the company to conduct additional toxicity testing on GenX.
- EPA has received the data from Chemours and is using it to update its risk assessment.
- Chemours agreed to bear all costs for the water collection and testing. The samples are being sent to a private laboratory in Colorado, and the EPA Office of Research and Development laboratory in Research

Triangle Park, NC for independent verification.

NCDEQ believes the completed results will be back from the laboratory in Colorado within four weeks from when the samples are received. EPA is working to determine a timeline for its analysis.

Under the Safe Drinking Water Act, EPA undertakes extensive evaluations of contaminants and uses the best available peer reviewed science to identify and regulate contaminants that present meaningful opportunities for health risk reduction.

The agency is working closely with the states and public water systems to determine the appropriate next steps to ensure public health protection.

Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."

From: Ben Schachtman [mailto:ben@localvoicemedia.com]
Sent: Tuesday, June 20, 2017 11:41 AM
To: Jones, Enesta <Jones.Enesta@epa.gov>
Subject: Re: Port City Daily re: Chemours

The NPDES permit, yes.

Sent from my iPhone
On Jun 20, 2017, at 11:35 AM, Jones, Enesta <Jones.Enesta@epa.gov> wrote:

Hi Ben,

Are you asking for the NPDES permit, or a different permit?

Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."

From: Ben Schachtman [mailto:ben@localvoicemedia.com]
Sent: Tuesday, June 20, 2017 10:09 AM
To: Jones, Enesta <Jones.Enesta@epa.gov>
Subject: Port City Daily re: Chemours

Enesta,

Hope this finds you well!

My name is Ben, we spoke on Monday. I was trying to find some information on GenX and other pollutants in the Cape Fear.

A second question, which arose yesterday, I also hope you can help with. I can't seem to find Chemours (The Chemours Company, Fayetteville Works) in the EPA database of facilities. Our local/regional water company recently filed a FOIA for the company's permit - NC0003573 - but when I looked that permit up, it's a Japanese company, Kuraray. I'm hoping you can help me get to the bottom of this!

Ben

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Ben Schachtman
Assistant Editor - Port City Daily
ben@localvoicemedia.com
Office: 910-772-6300
Cell: Personal Phone / Ex. 6

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Cell: Personal Phone / Ex. 6

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Ben Schachtman
Assistant Editor - Port City Daily
ben@localvoicemedia.com
Office: 910-772-6300
Cell: Personal Phone / Ex. 6

Facility Multi-Year Loading Report

KURARAY AMERICA, FAYETTEVILLE, NC, 28306
FRS ID: **110000559609**
NPDES ID(s): NC0003573
Click a NPDES ID to view that facility's detail page.
TRI ID(s): 28302DPNTFHIGHW
Click a TRI ID to view that facility's detail page.

Loads for the current year are not based on a full reporting year because data are not con

Discharges to DMR Pollutants by Pounds (lbs) and Toxic-Weighted Pounds (TWPE)

Pollutant	2013 lbs/yr	2013 lbs-eq/yr	2014 lbs/yr	2014 lbs-eq/yr	201 lbs/
PFOA	2.64	0	0.91	0	

Most recent TRI data available are from 2015.

To: Senn, John[Senn.John@epa.gov]; Grantham, Nancy[Grantham.Nancy@epa.gov]; Drinkard, Andrea[Drinkard.Andrea@epa.gov]; Dennis, Allison[Dennis.Allison@epa.gov]; Strauss, Linda[Strauss.Linda@epa.gov]; Marraccini, Davina[Marraccini.Davina@epa.gov]; Harris-Young, Dawn[Harris-Young.Dawn@epa.gov]; Maguire, Megan[Maguire.Megan@epa.gov]; Sauerhage, Maggie[Sauerhage.Maggie@epa.gov]; Hubbard, Carolyn[Hubbard.Carolyn@epa.gov]
From: Jones, Enesta
Sent: Thur 6/22/2017 8:39:49 PM
Subject: RE: Port City Daily re: Chemours

Thanks.

Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."

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Deliberative Process / Ex. 5

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> **Date:** June 22, 2017 at 11:57:53 AM EDT

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Facility Multi-Year Loading Report

KURARAY AMERICA, FAYETTEVILLE, NC, 28306
FRS ID: **110000559609**
NPDES ID(s): NC0003573
Click a NPDES ID to view that facility's detail page.
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From: Senn, John
Sent: Thur 6/22/2017 4:46:09 PM
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I will ask our folks.

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Enesta Jones
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> Enesta,
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>
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>
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Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."

From: Ben Schachtman [mailto:ben@localvoicemedia.com]
Sent: Tuesday, June 20, 2017 11:41 AM
To: Jones, Enesta <Jones.Enesta@epa.gov>
Subject: Re: Port City Daily re: Chemours

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Sent from my iPhone
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> **U.S. EPA**
> **Office of Media Relations**
> **Office:** 202.564.7873
> **Cell:** Personal Phone / Ex. 6
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--

Ben Schachtman
Assistant Editor - Port City Daily
ben@localvoicemedia.com
Office: 910-772-6300
Cell: 910-538-2001

Facility Multi-Year Loading Report

KURARAY AMERICA, FAYETTEVILLE, NC, 28306
FRS ID: 110000559609
NPDES ID(s): NC0003573
Click a NPDES ID to view that facility's detail page.
TRI ID(s): 28302DPNTFHIGHW
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From: Jones, Enesta
Sent: Thur 6/22/2017 4:22:35 PM
Subject: Fwd: Port City Daily re: Chemours

http://portcitydaily.com/2017/06/22/kuraray-shares-chemours-permit-dumps-a-chemical-more-dangerous-than-genx-news/
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> **From:** Ben Schachtman <ben@localvoicemedia.com>
> **Date:** June 22, 2017 at 11:57:53 AM EDT
> **To:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> **Subject: Re: Port City Daily re: Chemours**
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From: Canavan, Sheila
Sent: Tue 6/20/2017 3:43:37 PM
Subject: RE: ACTION: Port Daily re: Chemours

That is a water permit number.

From: Jones, Enesta
Sent: Tuesday, June 20, 2017 11:00 AM
To: Grantham, Nancy <Grantham.Nancy@epa.gov>; Drinkard, Andrea <Drinkard.Andrea@epa.gov>; Dennis, Allison <Dennis.Allison@epa.gov>; Senn, John <Senn.John@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Harris-Young, Dawn <Harris-Young.Dawn@epa.gov>; Marraccini, Davina <Marraccini.Davina@epa.gov>; Strauss, Linda <Strauss.Linda@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Maguire, Megan <Maguire.Megan@epa.gov>; Sauerhage, Maggie <Sauerhage.Maggie@epa.gov>; Hubbard, Carolyn <Hubbard.Carolyn@epa.gov>; Canavan, Sheila <Canavan.Sheila@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>
Cc: Jones, Enesta <Jones.Enesta@epa.gov>
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Reporter: Ben Schachtman
Outlet: Port Daily
DDL: 2 p.m. today

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U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

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To: Schollhamer, Mary[Schollhamer.Mary@epa.gov]
From: Drinkard, Andrea
Sent: Tue 6/20/2017 6:02:02 PM
Subject: RE: ACTION: Port Daily re: Chemours

The NPDES angle is new, so maybe comments from the former EPA employee where picked up in a story and now others are chasing the angle. Thanks for doing due diligence and checking with your folks. The one true benefit of this is that I now know that your my girl for permit stuff!! One.day.at.a.time....

-AD-

From: Schollhamer, Mary
Sent: Tuesday, June 20, 2017 1:55 PM
To: Drinkard, Andrea <Drinkard.Andrea@epa.gov>
Subject: RE: ACTION: Port Daily re: Chemours

I wonder why everyone is asking about this today. Interesting. Thanks!

Mary G Schollhamer
Communications Coordinator
Office of Wastewater Management
U.S. Environmental Protection Agency
Office: 202-564-5759
Mobile: Personal Phone / Ex. 6
schollhamer.mary@epa.gov

Office of Wastewater Management: Solutions for Clean Water

From: Drinkard, Andrea
Sent: Tuesday, June 20, 2017 11:46 AM
To: Schollhamer, Mary <Schollhamer.Mary@epa.gov>
Subject: FW: ACTION: Port Daily re: Chemours

FYI...

From: Jones, Enesta
Sent: Tuesday, June 20, 2017 11:44 AM
To: Harris-Young, Dawn <Harris-Young.Dawn@epa.gov>
Cc: Grantham, Nancy <Grantham.Nancy@epa.gov>; Drinkard, Andrea <Drinkard.Andrea@epa.gov>; Dennis, Allison <Dennis.Allison@epa.gov>; Senn, John <Senn.John@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Marraccini, Davina <Marraccini.Davina@epa.gov>; Strauss, Linda <Strauss.Linda@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Maguire, Megan <Maguire.Megan@epa.gov>; Sauerhage, Maggie <Sauerhage.Maggie@epa.gov>; Hubbard, Carolyn <Hubbard.Carolyn@epa.gov>; Canavan, Sheila <Canavan.Sheila@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>
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The NPDES permit is what he is asking about (just confirmed), so I will send him to the state. Thanks.

Enesta Jones
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Office: 202.564.7873
Cell: Personal Phone / Ex. 6

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Dawn

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From: "Jones, Enesta" <Jones.Enesta@epa.gov>
Date: June 20, 2017 at 11:00:26 AM EDT
To: "Grantham, Nancy" <Grantham.Nancy@epa.gov>, "Drinkard, Andrea" <Drinkard.Andrea@epa.gov>, "Dennis, Allison" <Dennis.Allison@epa.gov>, "Senn, John" <Senn.John@epa.gov>, "Lincoln, Larry" <Lincoln.Larry@epa.gov>, "Harris-Young, Dawn" <Harris-Young.Dawn@epa.gov>, "Marraccini, Davina" <Marraccini.Davina@epa.gov>, "Strauss, Linda" <Strauss.Linda@epa.gov>, "Doa, Maria" <Doa.Maria@epa.gov>, "Maguire, Megan" <Maguire.Megan@epa.gov>, "Sauerhage, Maggie" <Sauerhage.Maggie@epa.gov>, "Hubbard, Carolyn" <Hubbard.Carolyn@epa.gov>, "Canavan, Sheila" <Canavan.Sheila@epa.gov>, "Henry, Tala" <Henry.Tala@epa.gov>
Cc: "Jones, Enesta" <Jones.Enesta@epa.gov>
Subject: ACTION: Port Daily re: Chemours

Hi All,

Who can help with this one?

Reporter: Ben Schachtman
Outlet: Port Daily
DDL: 2 p.m. today

A second question, which arose yesterday, I also hope you can help with. I can't seem to find Chemours (The Chemours Company, Fayetteville Works) in the EPA database of facilities. Our local/regional water company recently filed a FOIA for the company's permit - NC0003573 - but when I looked that permit up, it's a Japanese company, Kuraray. I'm hoping you can help me get to the bottom of this!

Enesta Jones
U.S. EPA
Office of Media Relations
Office: 202.564.7873
Cell: Personal Phone / Ex. 6

"The root of all joy is gratefulness."

To: Ross, David P[ross.davidp@epa.gov]; Forsgren, Lee[Forsgren.Lee@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Fotouhi, David[Fotouhi.David@epa.gov]; Molina, Michael[molina.michael@epa.gov]
From: Leopold, Matt (OGC)
Sent: Fri 8/31/2018 10:14:59 PM
Subject: FW: FYI Chemours PFAS/Gen X lawsuit
Cape Fear River Watch v. Chemours.pdf

FYI, regarding a new citizen suit filed for PFAS discharges in North Carolina.

From: Wehling, Carrie
Sent: Friday, August 31, 2018 10:30 AM
To: Fotouhi, David <Fotouhi.David@epa.gov>; Leopold, Matt (OGC) <Leopold.Matt@epa.gov>
Cc: Maher, Lauren <Maher.Lauren@epa.gov>; Wendelowski, Karyn <wendelowski.karyn@epa.gov>; Hughes, Krista <hughes.krista@epa.gov>; Neugeboren, Steven <Neugeboren.Steven@epa.gov>; Messier, Dawn <Messier.Dawn@epa.gov>
Subject: FW: FYI Chemours PFAS/Gen X lawsuit

New citizen suit against Chemours brought by SELC on behalf of Cape Fear River Watch for PFAS discharges, including Gen X. The CWA counts include both allegations of NPDES permit violations and allegations of unpermitted discharges as a result of groundwater contamination that reaches surface waters.

Carrie

Caroline (Carrie) Wehling
Assistant General Counsel
Water Law Office
U.S. Environmental Protection Agency
Washington DC 20004
202-564-5492
wehling.carrie@epa.gov

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
From: Buso, Roberto X
Sent: Thur 10/26/2017 6:54:44 PM
Subject: FW: Chemours - GenX Enforcement Coordination Call -NON - TSCA CBI
2017-10-24 GenX NCDEQ Letter Not to Suspend NPDES.pdf
2017-09-08 GenX 17 CVS 580 NC Partial Consent Order.pdf
2017-10-16 GenX CFPUA Complaint (E.D.N.C.).pdf

FYI.

From: Speir, Jeffrey
Sent: Thursday, October 26, 2017 2:17 PM
To: Garvey, Mark <Garvey.Mark@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

As I mentioned on the call this afternoon, I am sending the following documents:

1. NC DEQ's October 24 letter to Chemours stating its decision not to suspend Chemours' NPDES permit;
2. NC and Chemours' September 8 Partial Consent Order, to which the document above refers; and
3. Cape Fear Public Utility Authority's October 16 complaint filed in federal district court.

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

From: Garvey, Mark
Sent: Thursday, October 26, 2017 8:57 AM
To: Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita

<bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

Below is today's Agenda. For Your convenience, I'm also attaching the same items sent around last week since there will be discussion involving them.

Agenda for today's call
Roll call (5 minutes)
TSCA CBI Cleared Employees

I. Region 3 Inspection- Preliminary Impressions of Chemours at Parkersburg WV Last Week
By Lauren Davis (7 minutes)
a. CDR Updated
b. Air Monitoring
c. River Monitoring
d. PPE Issues

II. Water Enforcement
By Jeff Speir (6 minutes)
a. Decision Not to Suspend NPDES Permit
b. Ongoing Litigation (NC, CFPUA, class actions)

III. Air Emissions
By Maria Doa (4 minutes)

IV. TSCA Inspection by Region 4 Update
By Verne George (5 minutes)

V. Questions/Comments from Participants
By Everyone (4 minutes)

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information,

attorney-work product, enforcement sensitive material or privileged information.

-----Original Appointment-----
From: Miles, James
Sent: Friday, September 22, 2017 11:45 AM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Schwartz, Paul; Davis, Molly; Ireland, Laurie; Moyer, Adam; DeDora, Caroline; Bean, Mark; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; Schulz, Susan; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Pollins, Mark; Theis, Joseph; Bahk, Benjamin; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer; Baptista, Chrisna; Niess, Claudia; Spann, Tony; Timsina, Gopal; Allenbach, Becky; Mancusi-Ungaro, Philip; Bush, William; Janovitz, Sara; Hall, Renea; Shell, Karrie-Jo; Devkota, Om
Cc: Reinhart, Roger; Buso, Roberto X
Subject: Chemours - Enforcement Coordination Call - TSCA CBI
When: Thursday, October 26, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: 1-866-299-3188; 202-564-5161

Continuing bi-weekly call through Nov.

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
From: Bias, Wendy
Sent: Fri 10/20/2017 3:14:46 PM
Subject: Final_CFPUA v ChemoursandDuPont_NC 10.20.2017.doc
Final_CFPUA v ChemoursandDuPont_NC 10.20.2017.doc

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
From: Bias, Wendy
Sent: Fri 10/20/2017 1:48:08 PM
Subject: Final_CFPUA v ChemoursandDuPont_NC 10.20.2017.doc
Final_CFPUA v ChemoursandDuPont_NC 10.20.2017.doc

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
Cc: Hansen, Susan[Hansen.Susan@epa.gov]; Gordon, Scott[Gordon.Scott@epa.gov]
From: Lamberth, Larry
Sent: Fri 10/20/2017 12:35:57 PM
Subject: CFPUA v ChemoursandDuPont_NC 10.16.2017.doc
CFPUA v ChemoursandDuPont_NC 10.16.2017.doc

Wendy can help with the format issues. Please confirm the appropriate contact and Branch name for water. Scott, does this need to be routed through you or is a CC fine? I can't remember what we decided before.

To: Lewis, Jennifer[Lewis.Jennifer@epa.gov]; Jones, Aaryn[Jones.Aaryn@epa.gov]; Wellborn, Floyd[Wellborn.Floyd@epa.gov]
From: Sivertsen, Scott
Sent: Fri 10/12/2018 3:49:03 PM
Subject: RE: Chemical question
DEQp00020339.pdf

EPA Chemistry Dashboard:
https://comptox.epa.gov/dashboard/dsstoxdb/results?search=DTXSID00274608

I assume this search is related to Fayetteville Works. Two potassium species are given on page 36 in the attachment.

As if one rabbit hole wasn't enough!

-----Original Message-----
From: Lewis, Jennifer
Sent: Friday, October 12, 2018 11:18 AM
To: Sivertsen, Scott <Sivertsen.Scott@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Wellborn, Floyd <Wellborn.Floyd@epa.gov>
Subject: RE: Chemical question

Thank you Scott. **Deliberative Process / Ex. 5**
Deliberative Process / Ex. 5

-----Original Message-----
From: Sivertsen, Scott
Sent: Friday, October 12, 2018 11:01 AM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Wellborn, Floyd <Wellborn.Floyd@epa.gov>
Subject: RE: Chemical question

There seem to be lots of fluoromalonate derivatives. Chemspider shows 13 results.

Hopefully this link works: http://www.chemspider.com/Search.aspx?rid=2b34f03c-d6b3-49c6-850e-b9ba04997c7a [If it doesn't, search for " fluoromalonate", then "Search for partial matches".]

This may be referred to as fluoromalonate, but it isn't listed in the synonyms:
http://www.chemspider.com/Chemical-Structure.17344.html

Fluoromalonate at PubChem (dianion of malonic acid):
https://pubchem.ncbi.nlm.nih.gov/compound/17889146

Scott

-----Original Message-----
From: Lewis, Jennifer
Sent: Friday, October 12, 2018 10:38 AM
To: Sivertsen, Scott <Sivertsen.Scott@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Wellborn, Floyd <Wellborn.Floyd@epa.gov>
Subject: RE: Chemical question

Could it be the same as methyl difluoromalonic acid ? Or difluromalonic acid (1514-85-8)?

-----Original Message-----
From: Sivertsen, Scott

Sent: Friday, October 12, 2018 9:52 AM
To: Jones, Aaryn <Jones.Aaryn@epa.gov>; Wellborn, Floyd <Wellborn.Floyd@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Subject: RE: Chemical question

Same here. Is the spelling fluoromalonate?

-----Original Message-----
From: Jones, Aaryn
Sent: Friday, October 12, 2018 9:50 AM
To: Wellborn, Floyd <Wellborn.Floyd@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Cc: Sivertsen, Scott <Sivertsen.Scott@epa.gov>
Subject: RE: Chemical question

Do you have a CAS number? I'm getting several different compounds on a quick search.

-----Original Message-----
From: Wellborn, Floyd
Sent: Friday, October 12, 2018 9:38 AM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Cc: Jones, Aaryn <Jones.Aaryn@epa.gov>; Sivertsen, Scott <Sivertsen.Scott@epa.gov>
Subject: Re: Chemical question

I'm not sure. I'm not familiar with

Aaryn or Scott - do you have an opinion?

Floyd

Sent from my iPhone

> On Oct 12, 2018, at 8:53 AM, Lewis, Jennifer <Lewis.Jennifer@epa.gov> wrote:
>
> Hi Floyd.
> Is fluormalanate a toxic substance?
> I can't find it on our database but I'm not very familiar with it and would like a chemist's opinion.
> Thank you.
>
> Sent from my iPhone

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
From: Buso, Roberto X
Sent: Mon 10/16/2017 3:27:07 PM
Subject: RE: CFPUA v ChemoursandDuPont_NC rxb1.doc
CFPUA v ChemoursandDuPont_NC routing 10.16.2017.doc

Ok. Let's go with this version. Let me know if you receive any comments or feedback as it routes?

From: Jones, Aaryn
Sent: Thursday, October 12, 2017 1:02 PM
To: Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: CFPUA v ChemoursandDuPont_NC rxb1.doc

Opps, and in my comments I meant they must have decided the response should come from NPDES branch, not "clean water enf" branch. Had it backwards. But ultimately I think we should change ours to match what went out regardless of what originally routed to Larry?

From: Jones, Aaryn
Sent: Thursday, October 12, 2017 1:00 PM
To: Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: CFPUA v ChemoursandDuPont_NC rxb1.doc

Replied to your comments...everything else looks good to me.

Thanks!

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

From: Buso, Roberto X
Sent: Thursday, October 12, 2017 12:14 PM
To: Jones, Aaryn <Jones.Aaryn@epa.gov>
Subject: FW: CFPUA v ChemoursandDuPont_NC rxb1.doc

Hi – I am still waiting for feedback from Susan, but thought I would go ahead and get this back to you.

From: Buso, Roberto X
Sent: Wednesday, October 11, 2017 2:43 PM
To: Hansen, Susan <Hansen.Susan@epa.gov>
Subject: CFPUA v ChemoursandDuPont_NC rxb1.doc

Hi –

I could not find a delegation for this – so I am not sure how it routes. Any ideas? Aaryn was just going to follow the Water routing....

Let me know if you have any additional comments? I will send this back to Aaryn after I hear from you.

Thanks!!

To: Jones, Aaryn[Jones.Aaryn@epa.gov]
From: Janovitz, Sara
Sent: Wed 10/4/2017 4:44:16 PM
Subject: RE: Chemours NOI
CFPUA v ChemoursandDuPont_NC.DOC

Aaryn-

I do. It has my response in it, but you can just delete it and put in RCRAs.

Good luck!

Sara Schiff Janovitz

(404) 562-9870

From: Jones, Aaryn
Sent: Wednesday, October 4, 2017 12:43 PM
To: Janovitz, Sara <Janovitz.Sara@epa.gov>
Subject: Chemours NOI

Hi Sara!

I am working on our RCRA response to the NOI – quick question, do you have a word version of the NOI response memorandum? I only have the hard copy from routed from Patricia Bullock and a pdf electronic version. Just curious how you added the Water response in. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Hansen, Susan[Hansen.Susan@epa.gov]
From: Jones, Aaryn
Sent: Thur 10/18/2018 6:35:36 PM
Subject: FW: Draft Chemours CWA Information Request
2018-10-17 Chemours 308 Letter DRAFT.docx

From: Theis, Joseph
Sent: Thursday, October 18, 2018 10:09 AM
To: Walker, Mary <walker.mary@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
Subject: Draft Chemours CWA Information Request

Region 4 Colleagues,
Attached as promised, is a draft of the CWA Section 308 information request that we will be sending to Chemours Corporate Headquarters relating to Chemours' facilities in Regions 2, 3, and 4. As promised, we are sending it to each Region for review prior to issuing it. Also, as Mark had discussed with Mary, we will work with Region 4 to confirm what information the State of North Carolina may already have on hand, prior to sending the information request. I reached out to Becky this morning, and have a call into Molly Davis to help coordinate with the State. If folks could please review this draft and provide any comments by COB Tuesday of next week (October 23rd), it would be greatly appreciated. Please send comments to Jeff Speir and myself. If you have any questions, please contact Jeff at 564-0872, or feel free to give me a call at the number below. Thanks much,
- Joe

Joseph G. Theis
Associate Director
Water Enforcement Division
Office of Enforcement and Compliance Assurance
U.S. EPA (2243A)
1200 Pennsylvania Ave, NW
Washington, D.C. 20460
(202)564-4053

This email may contain deliberative, attorney-client, attorney work product or otherwise privileged material. Do not release under FOIA without appropriate review. If this email has been received by you in error, you are instructed to delete it from your machine and all storage media whether electronic or hard copy.

To: Bias, Wendy[Bias.Wendy@epa.gov]
From: Jones, Aaryn
Sent: Fri 10/20/2017 1:21:59 PM
Subject: Memo review
Final_CFPUA v ChemoursandDuPont_NC 10.20.2017.doc

Hi Wendy,

Attached is the NOI memo I just spoke to you about. Thanks a bunch!

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn
Sent: Thur 10/18/2018 6:07:43 PM
Subject: FW: Draft Chemours CWA Information Request
2018-10-17 Chemours 308 Letter DRAFT.docx

Wonder if one is coming out of RCRA (?) have you heard anything from Leslie recently?

From: Theis, Joseph
Sent: Thursday, October 18, 2018 10:09 AM
To: Walker, Mary <walker.mary@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
Subject: Draft Chemours CWA Information Request

Region 4 Colleagues,
Attached as promised, is a draft of the CWA Section 308 information request that we will be sending to Chemours Corporate Headquarters relating to Chemours' facilities in Regions 2, 3, and 4. As promised, we are sending it to each Region for review prior to issuing it. Also, as Mark had discussed with Mary, we will work with Region 4 to confirm what information the State of North Carolina may already have on hand, prior to sending the information request. I reached out to Becky this morning, and have a call into Molly Davis to help coordinate with the State. If folks could please review this draft and provide any comments by COB Tuesday of next week (October 23rd), it would be greatly appreciated. Please send comments to Jeff Speir and myself. If you have any questions, please contact Jeff at 564-0872, or feel free to give me a call at the number below. Thanks much,
- Joe

Joseph G. Theis
Associate Director
Water Enforcement Division
Office of Enforcement and Compliance Assurance
U.S. EPA (2243A)
1200 Pennsylvania Ave, NW
Washington, D.C. 20460
(202)564-4053

This email may contain deliberative, attorney-client, attorney work product or otherwise privileged material. Do not release under FOIA without appropriate review. If this email has been received by you in error, you are instructed to delete it from your machine and all storage media whether electronic or hard copy.

To: Lamberth, Larry[Lamberth.Larry@epa.gov]
From: Jones, Aaryn
Sent: Thur 10/19/2017 8:45:02 PM
Subject: FW: Draft Chemours NOI response
CFPUA v ChemoursandDuPont_NC 10.16.2017.doc

So Rob clarified that Susan has yet to give him any feedback, so hopefully that means she looked and didn't see anything – or it means she has yet to look at it.

Just let me know how you want it to route and I'll get it prepared. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

From: Jones, Aaryn
Sent: Monday, October 16, 2017 4:01 PM
To: Lamberth, Larry <Lamberth.Larry@epa.gov>
Subject: Draft Chemours NOI response

Hi Larry,

According to Rob, this has been approved by Susan. We are still trying to figure out how the routing should go – but here's an electronic copy for now. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Hansen, Susan[Hansen.Susan@epa.gov]
Cc: Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn
Sent: Fri 11/16/2018 3:40:24 PM
Subject: FW: Draft Chemours CWA Information Request
2018-10-17 Chemours 308 Letter DRAFT R4 comments.docx

And this is the last version of it I saw...

From: Rubini, Suzanne
Sent: Wednesday, October 24, 2018 12:47 PM
To: Theis, Joseph <Theis.Joseph@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
Subject: RE: Draft Chemours CWA Information Request

Joe – attached are R4's comments on the 308. If you have any questions or concerns, please contact Paul Schwartz at 404-562-9576.

Thanks,
Suzanne

From: Theis, Joseph
Sent: Thursday, October 18, 2018 10:09 AM
To: Walker, Mary <walker.mary@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
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Joseph G. Theis
Associate Director
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1200 Pennsylvania Ave, NW
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To: Moyer, Adam[moyer.adam@epa.gov]
Cc: Mitchell, Ken[Mitchell.Ken@epa.gov]; Allenbach, Becky[Allenbach.Becky@epa.gov]
From: Jones, Aaryn
Sent: Mon 1/29/2018 7:49:43 PM
Subject: Chemours releases
NCD047368642_Ltr. from C. Compton Chemours to T. Allen DEQ on Dec 2017 release_20171211.pdf
NCD047368642_Chemours DAF Leak from Hose 12.31.17_20180103.pdf
NCD047368642_Chemours NC-HWS Notification of 10-06-2017 Release_20171130.pdf
NCD047368642_Ltr. from C.Compton Chemours to T. Allen DEQ on 01.14.18 spill_20180116.pdf

Hi Adam,

Ken and I were just talking and we weren't sure if you had copies of these letters from Chemours notifying NCDEQ of releases (I have knowledge of four separate incidents based on the NCDEQ Waste Division's online documents).

Passing along in case you don't already have them. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn
Sent: Thur 10/12/2017 5:00:00 PM
Subject: RE: CFPUA v ChemoursandDuPont_NC rxb1.doc
CFPUA v ChemoursandDuPont_NC rxb1 adj comments.doc

Replied to your comments...everything else looks good to me.

Thanks!

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

From: Buso, Roberto X
Sent: Thursday, October 12, 2017 12:14 PM
To: Jones, Aaryn <Jones.Aaryn@epa.gov>
Subject: FW: CFPUA v ChemoursandDuPont_NC rxb1.doc

Hi – I am still waiting for feedback from Susan, but thought I would go ahead and get this back to you.

From: Buso, Roberto X
Sent: Wednesday, October 11, 2017 2:43 PM
To: Hansen, Susan <Hansen.Susan@epa.gov>
Subject: CFPUA v ChemoursandDuPont_NC rxb1.doc

Hi –

I could not find a delegation for this – so I am not sure how it routes. Any ideas? Aaryn was just going to follow the Water routing....

Let me know if you have any additional comments? I will send this back to Aaryn after I hear from you.

Thanks!!

To: Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn
Sent: Wed 10/11/2017 2:16:22 PM
Subject: NOI response draft
CFPUA v ChemoursandDuPont_NC.doc

Hi Rob,

Here's the first draft. It's a combination of Water's response and our enforcement options language.

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Kemker, Carol[Kemker.Carol@epa.gov]; Mitchell, Ken[Mitchell.Ken@epa.gov]; Gettle, Jeaneanne[Gettle.Jeaneanne@epa.gov]; Walker, Mary[walker.mary@epa.gov]; Ghosh, Mita[Ghosh.Mita@epa.gov]; Zapata, Cesar[Zapata.Cesar@epa.gov]; Danois, Gracy R.[Danois.Gracy@epa.gov]
From: Allenbach, Becky
Sent: Thur 10/18/2018 2:51:40 PM
Subject: FW: Draft Chemours CWA Information Request
2018-10-17 Chemours 308 Letter DRAFT.docx

Becky B. Allenbach, Deputy Director
Water Protection Division
EPA Region 4
Office 404-562-9687
Cell: 678-641-0032

From: Theis, Joseph
Sent: Thursday, October 18, 2018 10:09 AM
To: Walker, Mary <walker.mary@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Bush, William <Bush.William@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>
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- Joe

Joseph G. Theis
Associate Director
Water Enforcement Division
Office of Enforcement and Compliance Assurance
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To: Doa, Maria[Doa.Maria@epa.gov]; Aubee, Catherine[Aubee.Catherine@epa.gov]; Moyer, Adam[moyer.adam@epa.gov]; EL-Zoobi, Majd[El-Zoobi.Majd@epa.gov]
Cc: Mitchell, Ken[Mitchell.Ken@epa.gov]
From: Kemker, Carol
Sent: Wed 12/13/2017 10:52:16 PM
Subject: FW: Recent Chemours release
NCD047368642_Ltr. from C. Compton Chemours to T. Allen DEQ on Dec 2017 release_20171211.pdf

OPPT Colleagues,

Please see the attached correspondence from Chemours on a recent release.

Carol

From: Jones, Aaryn
Sent: Wednesday, December 13, 2017 4:46 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Wise, Allison <Wise.Allison@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Monell, Carol <Monell.Carol@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Mundrick, Doug <Mundrick.Doug@epa.gov>; France, Danny <France.Danny@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Howard, Chris <Howard.Chris@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; George, Verne <George.Verne@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Rinck, Todd <Rinck.Todd@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>; Gettle, Jeaneanne <Gettle.Jeaneanne@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Lincoln, Larry <Lincoln.Larry@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>
Subject: Recent Chemours release

Hi all,

I just found this while searching the NCDEQ Waste Division's online records for something else. Carol Kempker advised me to send an email to the group of folks listed in the Chemours SOP. Thanks,

Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Hansen, Susan[hansen.susan@epa.gov]
From: Lamberth, Larry
Sent: Fri 10/20/2017 10:37:51 AM
Subject: FW: Draft Chemours NOI response
CFPUA v ChemoursandDuPont_NC 10.16.2017.doc

I have not looked at it either.

From: Jones, Aaryn
Sent: Thursday, October 19, 2017 4:45 PM
To: Lamberth, Larry <Lamberth.Larry@epa.gov>
Subject: FW: Draft Chemours NOI response

So Rob clarified that Susan has yet to give him any feedback, so hopefully that means she looked and didn't see anything – or it means she has yet to look at it.

Just let me know how you want it to route and I'll get it prepared. Thanks,

Aaryn Jones
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Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

From: Jones, Aaryn
Sent: Monday, October 16, 2017 4:01 PM
To: Lamberth, Larry <Lamberth.Larry@epa.gov>
Subject: Draft Chemours NOI response

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Aaryn Jones
Environmental Scientist
U.S. Environmental Protection Agency
61 Forsyth St, S.W.
Atlanta, GA 30303
(404) 562-8969
jones.aaryn@epa.gov

To: Shell, Karrie-Jo[Shell.Karrie-Jo@epa.gov]
From: Myers, Pamala
Sent: Fri 6/16/2017 4:46:19 PM
Subject: RE: Cape Fear monitoring data
Cape Fear RB_NPDES permit list from PCS.xls

Just found this. Has NPDES permit numbers.

Pamala Myers | Environmental Engineer
NPDES Permitting Section Industrial Lead | PQR Lead
NPDES Permitting & Enforcement Branch | Water Protection Division
U.S. EPA, Region 4 | 61 Forsyth St. SW | Atlanta, GA 30303
404.562.9421
myers.pamala@epa.gov

From: Shell, Karrie-Jo
Sent: Friday, June 16, 2017 12:41 PM
To: Myers, Pamala <Myers.Pamala@epa.gov>; Guzman, Humberto <Guzman.Humberto@epa.gov>
Subject: RE: Cape Fear monitoring data

ok

Karrie-Jo Robinson-Shell, P.E.
Environmental Engineer
US EPA Region 4
Water Protection Division
61 Forsyth Street
Atlanta, GA 30303
(404) 562-9308

From: Myers, Pamala
Sent: Friday, June 16, 2017 12:40 PM
To: Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Guzman, Humberto <Guzman.Humberto@epa.gov>
Subject: Cape Fear monitoring data

KJ,

If you are looking for monitoring data you may not find it unless you go through the WQ coalitions. Years back I found this...

The in-stream monitoring was conditionally waived for several facilities in that area because of the permittee's membership in the **Cape Fear Monitoring Coalition**.

Look for this and others. http://lcfrp.uncw.edu/riverproject/

Pam

Pamala Myers | Environmental Engineer
NPDES Permitting Section Industrial Lead | PQR Lead
NPDES Permitting & Enforcement Branch | Water Protection Division
U.S. EPA, Region 4 | 61 Forsyth St. SW | Atlanta, GA 30303
404.562.9421
myers.pamala@epa.gov

To: Schollhamer, Mary[Schollhamer.Mary@epa.gov]
Sent: Tue 10/24/2017 2:13:55 PM
Subject: FW: ACTION: StarNews re: NPDES and Chemours

Mary:

Let me know if you want me to translate some of the

From: Weiss, Kevin
Sent: Tuesday, October 24, 2017 10:08 AM
To: Schollhamer, Mary <Schollhamer.Mary@epa.gov>; Zobrist, Marcus <Zobrist.Marcus@epa.gov>; Wilson, Scott <Wilson.Js@epa.gov>
Subject: FW: ACTION: StarNews re: NPDES and Chemours

From: Diaz, Denisse
Sent: Tuesday, October 24, 2017 9:33 AM
To: Weiss, Kevin <Weiss.Kevin@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Hesterlee, Craig <Hesterlee.Craig@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Subject: Fwd: ACTION: StarNews re: NPDES and Chemours

Kevin:
See Karrie Jo's comments below. Molly is out of the office and I am on a detail and moving to a new job permanently on Monday. Should you have additional questions please contact Craig who is acting for Molly.
Denisse

Sent from my iPhone
Begin forwarded message:

> **From:** "Shell, Karrie-Jo" <Shell.Karrie-Jo@epa.gov>
> **Date:** October 24, 2017 at 9:15:41 AM EDT
> **To:** "Diaz, Denisse" <Diaz.Denisse@epa.gov>
> **Cc:** "Hesterlee, Craig" <Hesterlee.Craig@epa.gov>
> **Subject: RE: ACTION: StarNews re: NPDES and Chemours**
>
> I'm not sure what "suspending" the permit means. They are administratively continuing the current permit until a new one is reissued. The current permit expired Oct. 31, 2016, and the facility submitted a timely renewal permit application. EPA has not received a draft renewal permit.
>
> Also, NC can't modify or revoke and reissue an expired permit. They can terminate the permit or reissue a new one.
>
> I hope this helps.
>
> Karrie-Jo Robinson-Shell, P.E.
> Environmental Engineer
> US EPA Region 4
> Water Protection Division
> 61 Forsyth Street
> Atlanta, GA 30303
> (404) 562-9308
>
> ---
>
> **From:** Diaz, Denisse
> **Sent:** Tuesday, October 24, 2017 9:01 AM
> **To:** Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
> **Subject:** FW: ACTION: StarNews re: NPDES and Chemours

KJ:

Do you know the answer to this question? Thanks!
Denisse

From: Weiss, Kevin
Sent: Tuesday, October 24, 2017 8:51 AM
To: Davis, Molly <Davis.Molly@epa.gov>; Diaz, Denisse <Diaz.Denisse@epa.gov>
Cc: Hoyt, Sarita <Hoyt.Sarita@epa.gov>; Zobrist, Marcus <Zobrist.Marcus@epa.gov>
Subject: Fwd: ACTION: StarNews re: NPDES and Chemours

Molly/Denisse:

Has NC provided you with notice that they are suspending the Chemours permit?

Thanks

Kevin

Sent from my iPhone
Begin forwarded message:

> **From:** "Schollhamer, Mary" <Schollhamer.Mary@epa.gov>
> **Date:** October 24, 2017 at 8:08:14 AM EDT
> **To:** "Weiss, Kevin" <Weiss.Kevin@epa.gov>, "Zobrist, Marcus" <Zobrist.Marcus@epa.gov>
> **Cc:** "Hoyt, Sarita" <Hoyt.Sarita@epa.gov>
> **Subject: FW: ACTION: StarNews re: NPDES and Chemours**
>
> Good morning – I'm not sure which of you to ask. Has North Carolina told us they're suspending the Chemours permit?
>
> Mary G Schollhamer
> Communications Director
> Office of Wastewater Management
> U.S. Environmental Protection Agency
> Office: 202-564-5759
> Mobile: Personal Phone / Ex. 6
> schollhamer.mary@epa.gov
>
> ***Office of Wastewater Management: Solutions for Clean Water***
>
> ---
>
> **From:** Drinkard, Andrea
> **Sent:** Tuesday, October 24, 2017 7:43 AM
> **To:** Schollhamer, Mary <Schollhamer.Mary@epa.gov>
> **Subject:** Fwd: ACTION: StarNews re: NPDES and Chemours
>
> Would they notify OECA? Or would they notify us? Or both?
> Sent from my iPhone
>
> Begin forwarded message:
>
> > **From:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> > **Date:** October 24, 2017 at 7:41:42 AM EDT
> > **To:** "Drinkard, Andrea" <Drinkard.Andrea@epa.gov>, "Strauss, Linda" <Strauss.Linda@epa.gov>, "Maguire, Megan" <Maguire.Megan@epa.gov>, "Hubbard, Carolyn" <Hubbard.Carolyn@epa.gov>, "Grantham, Nancy" <Grantham.Nancy@epa.gov>, "Senn, John" <Senn.John@epa.gov>, "Lincoln,

Larry" <Lincoln.Larry@epa.gov>
Cc: "Jones, Enesta" <Jones.Enesta@epa.gov>
Subject: ACTION: StarNews re: NPDES and Chemours

Good day!

Reporter: Vaughn Hagerty
Outlet: StarNews
DDL: 5 p.m. today

Request:
According to the Memorandum of Understanding that allows N.C. to run its NPDES program:

"When the State makes a detennination to suspend or revoke a permit, in whole or in part,
EPA will be notified."

https://www.epa.gov/sites/production/files/2013-09/documents/nc-moa-npdes.pdf

Has EPA been notified by North Carolina regulators that they intend to suspend or revoke the NPDES permit (NC0003573) held by Chemours for the Fayetteville Works site in North Carolina? If so, when was the notice received? What, if anything, was EPA's response? What were the details of the notification?

To: Zobrist, Marcus[Zobrist.Marcus@epa.gov]; Weiss, Kevin[Weiss.Kevin@epa.gov]
Cc: Hoyt, Sarita[Hoyt.Sarita@epa.gov]; Wilson, Scott[Wilson.Js@epa.gov]
From: Schollhamer, Mary
Sent: Tue 10/24/2017 12:59:03 PM
Subject: RE: ACTION: StarNews re: NPDES and Chemours

Great – and will do. Thanks!

Mary G Schollhamer
Communications Director
Office of Wastewater Management
U.S. Environmental Protection Agency
Office: 202-564-5759
Mobile: Personal Phone / Ex. 6
schollhamer.mary@epa.gov

Office of Wastewater Management: Solutions for Clean Water

From: Zobrist, Marcus
Sent: Tuesday, October 24, 2017 8:58 AM
To: Schollhamer, Mary <Schollhamer.Mary@epa.gov>; Weiss, Kevin <Weiss.Kevin@epa.gov>
Cc: Hoyt, Sarita <Hoyt.Sarita@epa.gov>; Wilson, Scott <Wilson.Js@epa.gov>
Subject: RE: ACTION: StarNews re: NPDES and Chemours

I've not heard this, but will check with R4. Also, please contact Scott on future questions regarding this facility as this is an Industrial issue.

From: Schollhamer, Mary
Sent: Tuesday, October 24, 2017 8:08 AM
To: Weiss, Kevin <Weiss.Kevin@epa.gov>; Zobrist, Marcus <Zobrist.Marcus@epa.gov>
Cc: Hoyt, Sarita <Hoyt.Sarita@epa.gov>
Subject: FW: ACTION: StarNews re: NPDES and Chemours

Good morning – I'm not sure which of you to ask. Has North Carolina told us they're suspending the Chemours permit?

Mary G Schollhamer
Communications Director
Office of Wastewater Management
U.S. Environmental Protection Agency
Office: 202-564-5759
Mobile: Personal Phone / Ex. 6
schollhamer.mary@epa.gov

Office of Wastewater Management: Solutions for Clean Water

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Sent from my iPhone

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"Maguire, Megan" <Maguire.Megan@epa.gov>, "Hubbard, Carolyn" <Hubbard.Carolyn@epa.gov>, "Grantham, Nancy" <Grantham.Nancy@epa.gov>, "Senn, John" <Senn.John@epa.gov>, "Lincoln, Larry" <Lincoln.Larry@epa.gov>
Cc: "Jones, Enesta" <Jones.Enesta@epa.gov>
Subject: ACTION: StarNews re: NPDES and Chemours

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Reporter: Vaughn Hagerty
Outlet: StarNews
DDL: 5 p.m. today

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To: Schollhamer, Mary[Schollhamer.Mary@epa.gov]; Zobrist, Marcus[Zobrist.Marcus@epa.gov]; Wilson, Scott[Wilson.Js@epa.gov]
From: Weiss, Kevin
Sent: Tue 10/24/2017 2:07:53 PM
Subject: FW: ACTION: StarNews re: NPDES and Chemours

From: Diaz, Denisse
Sent: Tuesday, October 24, 2017 9:33 AM
To: Weiss, Kevin <Weiss.Kevin@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Hesterlee, Craig <Hesterlee.Craig@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Subject: Fwd: ACTION: StarNews re: NPDES and Chemours

Kevin:
See Karrie Jo's comments below. Molly is out of the office and I am on a detail and moving to a new job permanently on Monday. Should you have additional questions please contact Craig who is acting for Molly.
Denisse

Sent from my iPhone
Begin forwarded message:

> **From:** "Shell, Karrie-Jo" <Shell.Karrie-Jo@epa.gov>
> **Date:** October 24, 2017 at 9:15:41 AM EDT
> **To:** "Diaz, Denisse" <Diaz.Denisse@epa.gov>
> **Cc:** "Hesterlee, Craig" <Hesterlee.Craig@epa.gov>
> **Subject: RE: ACTION: StarNews re: NPDES and Chemours**
>
> I'm not sure what "suspending" the permit means. They are administratively continuing the current permit until a new one is reissued. The current permit expired Oct. 31, 2016, and the facility submitted a timely renewal permit application. EPA has not received a draft renewal permit.
>
> Also, NC can't modify or revoke and reissue an expired permit. They can terminate the permit or reissue a new one.
>
> I hope this helps.
>
> Karrie-Jo Robinson-Shell, P.E.
> Environmental Engineer
> US EPA Region 4
> Water Protection Division
> 61 Forsyth Street
> Atlanta, GA 30303
> (404) 562-9308
>
> ---
>
> **From:** Diaz, Denisse
> **Sent:** Tuesday, October 24, 2017 9:01 AM
> **To:** Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
> **Subject:** FW: ACTION: StarNews re: NPDES and Chemours
>
> KJ:
>
> Do you know the answer to this question? Thanks!
> Denisse
>
> ---
>
> **From:** Weiss, Kevin
> **Sent:** Tuesday, October 24, 2017 8:51 AM
> **To:** Davis, Molly <Davis.Molly@epa.gov>; Diaz, Denisse <Diaz.Denisse@epa.gov>

Cc: Hoyt, Sarita <Hoyt.Sarita@epa.gov>; Zobrist, Marcus <Zobrist.Marcus@epa.gov>
Subject: Fwd: ACTION: StarNews re: NPDES and Chemours

Molly/Denisse:

Has NC provided you with notice that they are suspending the Chemours permit?

Thanks

Kevin

Sent from my iPhone
Begin forwarded message:

> **From:** "Schollhamer, Mary" <Schollhamer.Mary@epa.gov>
> **Date:** October 24, 2017 at 8:08:14 AM EDT
> **To:** "Weiss, Kevin" <Weiss.Kevin@epa.gov>, "Zobrist, Marcus" <Zobrist.Marcus@epa.gov>
> **Cc:** "Hoyt, Sarita" <Hoyt.Sarita@epa.gov>
> **Subject: FW: ACTION: StarNews re: NPDES and Chemours**
>
> Good morning – I'm not sure which of you to ask. Has North Carolina told us they're suspending the Chemours permit?
>
> Mary G Schollhamer
> Communications Director
> Office of Wastewater Management
> U.S. Environmental Protection Agency
> Office: 202-564-5759
> Mobile: Personal Phone / Ex. 6
> schollhamer.mary@epa.gov
>
> *Office of Wastewater Management: Solutions for Clean Water*
>
> ---
>
> **From:** Drinkard, Andrea
> **Sent:** Tuesday, October 24, 2017 7:43 AM
> **To:** Schollhamer, Mary <Schollhamer.Mary@epa.gov>
> **Subject:** Fwd: ACTION: StarNews re: NPDES and Chemours
>
> Would they notify OECA? Or would they notify us? Or both?
> Sent from my iPhone
>
> Begin forwarded message:
>
> > **From:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> > **Date:** October 24, 2017 at 7:41:42 AM EDT
> > **To:** "Drinkard, Andrea" <Drinkard.Andrea@epa.gov>, "Strauss, Linda" <Strauss.Linda@epa.gov>, "Maguire, Megan" <Maguire.Megan@epa.gov>, "Hubbard, Carolyn" <Hubbard.Carolyn@epa.gov>, "Grantham, Nancy" <Grantham.Nancy@epa.gov>, "Senn, John" <Senn.John@epa.gov>, "Lincoln, Larry" <Lincoln.Larry@epa.gov>
> > **Cc:** "Jones, Enesta" <Jones.Enesta@epa.gov>
> > **Subject: ACTION: StarNews re: NPDES and Chemours**
> >
> > Good day!
> >
> > **Reporter: Vaughn Hagerty**
> > **Outlet: StarNews**

DDL: 5 p.m. today

Request:
According to the Memorandum of Understanding that allows N.C. to run its NPDES program:

"When the State makes a detennination to suspend or revoke a permit, in whole or in part,
EPA will be notified."

https://www.epa.gov/sites/production/files/2013-09/documents/nc-moa-npdes.pdf

Has EPA been notified by North Carolina regulators that they intend to suspend or revoke the NPDES permit (NC0003573) held by Chemours for the Fayetteville Works site in North Carolina? If so, when was the notice received? What, if anything, was EPA's response? What were the details of the notification?

To: Bookman, Robert[Bookman.Robert@epa.gov]
Cc: Toney, Anthony[Toney.Anthony@epa.gov]
From: Fite, Mark[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=2AEC26020C954F7AAC1D0EA918827C7D-FITE, MARK]
Sent: Thur 11/30/2017 1:55:14 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)
Chemours GenX Briefing Paper 112817 for Dec 4.docx

Robert-

Here's the latest version of the briefing sheet I saw coming out of HQ. Hope this helps!

Mark J. Fite
Technical Authority for CAA, TSCA, FIFRA, & EPCRA
Office of Enforcement Coordination
U.S. EPA Region 4
61 Forsyth St., SW
Atlanta, GA 30303
fite.mark@epa.gov
404.562.9740

From: Garvey, Mark
Sent: Tuesday, November 28, 2017 5:25 PM
To: Speir, Jeffrey <speir.jeffrey@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; George, Verne <George.Verne@epa.gov>; Miles, James <miles.james@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)

To Region 4 TSCA & Water teams,

I'm attaching a revised version of the briefing paper Jeff Speir sent earlier today. It now includes Enforcement/Investigatory / Ex. 7(a) sections along with a few sentences mentioning the Regions 3 and 2 involvement. After speaking with my Division Director this afternoon, this effort appears to be an extremely heavy lift to get ready by Thursday for my Office Director. While I'm still requesting comments by Thursday at noon, we will be talking with our Office Director tomorrow morning to see if there is any flexibility in the scheduling of the briefing paper. There are a lot of fast moving details here and we want to be accurate with Susan Bodine.
We will also be asking about the level of participation at the Susan Bodine meeting. We anticipate that each Region will be asked to participate. We can discuss this on Thursday afternoon's GenX bi-weekly general discussion that James Miles set up.

Please note that this is not a meeting requesting senior management direction, but rather an informational briefing for Susan Bodine.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Speir, Jeffrey
Sent: Tuesday, November 28, 2017 12:08 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>
Subject: Draft GenX Paper for OECA Briefing

Hello, Region 4 Water Team:

The Director of the Office of Civil Enforcement at Headquarters has requested that we brief OECA leadership on GenX. The briefing will be for Larry Starfield, Patrick Traylor, and Susan Bodine, the Administrator's counsel for enforcement who has expressed interest in this matter. The briefing is scheduled for Monday, December 4 at 2:00 pm. Note: This briefing is not a request for an OECA decision; rather, it is a presentation of the issues and our federal authorities.

We have prepared the attached draft briefing paper. It somewhat resembles a briefing paper you likely saw in August, with more emphasis on background facts and the State's actions, and less emphasis on enforcement "options." My counterpart in our Enforcement/Investigatory / Ex. 7(a) division will send his updates to the relevant Region 4 Enforcement/Investigatory / Ex. 7(a) folks.

Unfortunately, the deadline to send up the briefing paper is tight. Please provide any feedback you may have to me and Mark Garvey (cc'd) by Thursday, November 30 at noon. I apologize about the timing.

Please let me know if you have any questions or if you would like to discuss this further.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

To: Bookman, Robert[Bookman.Robert@epa.gov]; George, Verne[George.Verne@epa.gov]
From: Timsina, Gopal
Sent: Wed 12/13/2017 9:14:11 PM
Subject: RE: ACTION: Chemours timeline
Cape Fear GenX Timeline_121317.docx

Hi Robert,

Please see the attachment for updated timeline

Thank you
Gopal

From: Bookman, Robert
Sent: Wednesday, December 13, 2017 2:28 PM
To: George, Verne <George.Verne@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>
Subject: FW: ACTION: Chemours timeline

Verne and Gopal,

Please update the attached timeline using track changes with TSCA's activities and email back to me. I am out tomorrow, so if you can get this back to me today that would be great.

Robert

From: Mitchell, Ken
Sent: Wednesday, December 13, 2017 1:41 PM
To: Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Toney, Anthony <Toney.Anthony@epa.gov>; George, Verne <George.Verne@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>
Subject: ACTION: Chemours timeline

Robert....

Mary Walker has asked that we put together a timeline for Chemours. Would you please add your TSCA activities (non-CBI) to this timeline using Track Changes and send back to me and Carol. We need to provide our edits to the Water Division by COB tomorrow. Thanks....should only take a couple of minutes.

Kenneth L. Mitchell, Ph.D. | Special Assistant to the Director |
Air, Pesticides, and Toxics Management Division
U.S. Environmental Protection Agency | 61 Forsyth Street, SW | Atlanta, GA 30303
Voice: 404-562-9065 | Fax: 404-562-9066 | Email: mitchell.ken@epa.gov

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From: Allenbach, Becky
Sent: Wednesday, December 13, 2017 1:04 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>
Cc: Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Subject: FW: Chemours timeline

Yes, we should include TSCA. Copying Ken

Becky B. Allenbach, Chief
Grants and Drinking Water Protection Branch
Water Protection Division
EPA Region 4 - Atlanta
Office: 404-562-9687

Cell: Personal Phone / Ex. 6

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From: Hall, Renea
Sent: Wednesday, December 13, 2017 1:02 PM
To: Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>
Cc: Allenbach, Becky <Allenbach.Becky@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Subject: RE: Chemours timeline

KJ,
Here's my start.

Becky,
I'm unsure if you'd like to include TSCA on this to update their parts or add any additional details.

Aaryn,
I've added some place holders to mark the RCRA sampling private well sampling events. I'd like you to confirm the dates and details regarding this.

From: Shell, Karrie-Jo
Sent: Wednesday, December 13, 2017 8:03 AM
To: Hall, Renea <Hall.Renea@epa.gov>
Subject: Chemours timeline

Please send me any timeline you have developed re Chemours.

Karrie-Jo Robinson-Shell, P.E.
Environmental Engineer
US EPA Region 4
Water Protection Division
61 Forsyth Street
Atlanta, GA 30303
(404) 562-9308

Message

From: Bookman, Robert [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=1E8DB468531A44949EEC31F94DB4F002-BOOKMAN, ROBERT]
Sent: 5/18/2018 5:18:11 PM
To: Bates, Keith [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=19222721f29b4d969d4f94c22a24a2a7-Bates, Keith]
CC: Timsina, Gopal [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9f7677a9d23c44c9b6172dfd8331d5be-Timsina, Go]
Subject: Fwd: Citizen Suit Notice (CWA/TSCA)
Attachments: CapeFearRiverWatch v Chemours_NC.doc; ATT00001.htm; CapeFearRiverWatch v Chemours_NC.pdf; ATT00002.htm

FYI.

Begin forwarded message:

From: "Toney, Anthony" <Toney.Anthony@epa.gov>
To: "Bookman, Robert" <Bookman.Robert@epa.gov>, "Kemker, Carol" <Kemker.Carol@epa.gov>, "Mitchell, Ken" <Mitchell.Ken@epa.gov>, "Banister, Beverly" <Banister.Beverly@epa.gov>
Cc: "George, Verne" <George.Verne@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)

FYI.

From: Bullock, Patricia
Sent: Friday, May 18, 2018 9:45 AM
To: Moore, Yvonne <Moore.Yvonne@epa.gov>; Jones, Laurie <JONES.LAURIE@EPA.GOV>
Cc: O'Lone, Dan <Olone.Dan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>
Subject: Citizen Suit Notice (CWA/TSCA)
Importance: High

Attached are NOIs for both CWA and TSCA statues (hard copies were forwarded via interoffice mail). Please review and forward back via word document and interoffice mail by due date.

Thank you,

Pat

Message

From: Jenkins, Brandi [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=9B3EA7AACD1A44C0AB3EE9A8F0A2EA3F-JENKINS, BRANDI]
Sent: 8/13/2018 2:42:32 PM
To: Myers, Bryan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=6eb60ccf2ce4435b9471ea12208860ed-Myers, Bryan]; Hill, Franklin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b9465c42aff64cfe97e6a80199b04d3c-Hill, Franklin]; Banister, Beverly [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1d7573525c894f5dbfc19abd6a7fda91-Banister, Beverly]; Monell, Carol [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=79068469fd5c4aeea50f2a2d6444d5e9-Monell, Carol]; Tellis, Vickie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=8d7366a76f624879bd0a611cf3e6017f-Tellis, Vickie]; Gettle, Jeaneanne [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d8e72aa7e1894faea44006fd9f22b637-Gettle, Jeaneanne]; Jones-Johnson, Shea [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e62082476b004c0cbd696cc4badd29ca-Jones-Johnson, Shea]; Marraccini, Davina [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=66fecfe52dc84d8db7ab0859adee8426-Marraccini, Davina]; Ashbee, Blake [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b8dd6ba2cead4b9db18cff8e4820bec4-Ashbee, Bla]; Allenbach, Becky [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=fd8d7185973c44268441863f02a769d1-Allenbach, Becky]; Kemker, Carol [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=765ad99166db4233bd15febf6e9917b3-Kemker, Carol]; Jones, Aaryn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c2bed08a5bd54dc5a9d59c5a345c9892-Jones, Aaryn]; Walker, Mary [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Walker, Mary S.]; Wise, Allison [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=763a1079917346d1a4f504dc8bf5c108-Wise, Allison]
CC: France, Danny [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2ea6b0627f864f7aa4b237db0d581671-France, Danny]; Adams, Glenn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c79e328cd4484265b012dfa81663f5e7-Adams, Glenn]; Jones, Aaryn [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=c2bed08a5bd54dc5a9d59c5a345c9892-Jones, Aaryn]
Subject: RE: PFAS Meeting Prep Materials
Attachments: TG PFAS Talking Points Outline_20180808.pdf

I've tweaked the Q&As slightly.

Brandi

From: Myers, Bryan
Sent: Monday, August 13, 2018 9:52 AM
To: Hill, Franklin <Hill.Franklin@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>; Monell, Carol <Monell.Carol@epa.gov>; Tellis, Vickie <Tellis.Vickie@epa.gov>; Gettle, Jeaneanne <Gettle.Jeaneanne@epa.gov>; Myers, Bryan <Myers.Bryan@epa.gov>; Jones-Johnson, Shea <Jones-Johnson.Shea@epa.gov>; Jenkins, Brandi <Jenkins.Brandi@epa.gov>; Marraccini, Davina <Marraccini.Davina@epa.gov>; Ashbee, Blake <ashbee.blake@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Wise, Allison <Wise.Allison@epa.gov>
Cc: France, Danny <France.Danny@epa.gov>; Adams, Glenn <Adams.Glenn@epa.gov>; Jones, Aaryn

<Jones.Aaryn@epa.gov>
Subject: FW: PFAS Meeting Prep Materials

Here are the materials we are working from for todays Prep.

Thanks
Bryan

PFAS Q&As
August 2018

1. Agency-Level Messaging – What is EPA Doing?

1.1. Feedback from the May National Summit

1.1.1. Protecting America's drinking water is a top priority for EPA. **EPA is providing national leadership to fulfill its core responsibilities: Protect public health and provide clean and safe drinking water for all Americans**

1.1.2. EPA is taking the lead on this important public health issue and is committed to take actions to meet the needs of impacted communities.

1.1.3. Recently, EPA held a PFAS Leadership Summit to get information from states, associations, industry and nongovernmental organizations to gain a national perspective. **At the summit, EPA announced four concrete actions the agency will take to address PFAS.**

1.1.4. We're here today to listen to communities to understand their concerns and hear about issues at a local level.

1.1.5. Community input, along with the national summit and the submissions from the public docket will be critical to the development of our PFAS Management Plan.

1.1.6. The Management Plan will provide information and solutions to states and communities for addressing PFAS.

1.2. Commitments

1.2.1. Four Actions Then EPA Administrator Pruitt Committed to take at the National Leadership Summit

1.2.1.1. EPA will initiate steps to evaluate the need for a maximum contaminant level (MCL) for PFOA and PFOS. We will convene our federal partners and examine everything we know about PFOA and PFOS in drinking water.

1.2.1.2. EPA is beginning the necessary steps to propose designating PFOA and PFOS as "hazardous substances" through one of the available statutory mechanisms, including potentially CERCLA Section 102.

1.2.1.3. EPA is currently developing groundwater cleanup recommendations for PFOA and PFOS at contaminated sites and will complete this task by fall of this year.

1.2.1.4. EPA is taking action in close collaboration with our federal and state partners to develop toxicity values for GenX and PFBS.

1.3. What is the status of the Chemours Enforcement?

1.3.1. EPA has completed our initial TSCA investigation and EPA's Office of Enforcement and Compliance Assurance is evaluating this situation comprehensively for compliance and then will determine next steps.

ED_002003U_00008342-00001

1.4. Is my water safe to drink?

1.4.1. As far as we know, the latest data shows water from public water supplies is below the 140 ppt NC's water health goal for GenX.

1.4.2. For private wells, residents are receiving bottled water if they exceed the 140 ppt water health goal. Chemours is conducting the testing and providing the bottled water. The state is validating.

1.5. Does EPA think North Carolina is doing a good and appropriate job in addressing these issues?

ED_002003U_00008342-00002

2. Region 4 Specifics

2.1. Overall Region 4 PFAS status

2.1.1. EPA has worked with the State of North Carolina since the summer of 2017 to provide technical assistance and laboratory support as they address GenX in the Cape Fear Watershed. [According to our information, current levels of Gen X in drinking water provided by the local utilities sampled along the Cape Fear River are below North Carolina's Health Goal of 140 ppt.]

2.1.1.1.

2.1.2. EPA Region 4 has also provided technical assistance and worked with other states as they address PFAS issues. 14 utilities in 4 states in the Region were identified in 2016 under the Unregulated Contaminant Monitoring Rule as having levels in finished drinking water exceeding EPA's Health Advisory of 70 ppt combined for PFOA/PFOS. These systems took steps to blend water, take wells off line, find other sources, and in some cases, install control equipment, to remedy the issue.

2.1.3. EPA stands ready to aid other states as new PFAS areas of concern are identified. Additional steps the EPA plans to take are below.

2.2. Region 4 Actions

2.2.1. When did EPA know about this? Was it before June of last year?

2.2.1.1. In late 2016, the WPD Division Director was provided a courtesy copy of the UNC/ORD study report.

2.2.1.2. Study of 10 legacy PFAS and 7 recently discovered PFECAs to report

2.2.1.2.1. their occurrence in the Cape Fear River (CFR) watershed

2.2.1.2.2. their fate in water treatment processes

2.2.1.2.3. their absorbability on powdered activated carbon (PAC).

2.2.2. Why delay? Why did we not know before?

2.2.2.1. The PFOA/PFOS Health Advisories (HA) were released in May 2016 and the WPD's focus at that time was on gathering results from UCMR3 and working with 14 utilities responding to the HA's recommendations for PFOA and PFOS. GenX is an unregulated contaminant. At that time, little information was known about GenX and other emerging compounds. The Region confirmed that the water systems were aware of the results; they were part of the study and co-authors on the report.

2.2.2.2. In May 2017, a reporter from StarNews reached out to the WPD about GenX and PFAS compounds in the Cape Fear River; shortly thereafter, the City of Wilmington reached out to the WPD in June 2017.

ED_002003U_00008342-00003

2.2.2.3. After this was brought to the Region's attention, we began to work with ORD and the rest of the Agency to expand the scope of EPA's evaluation of PFAS compounds.

2.2.2.4. We also provided assistance to the State of North Carolina with testing and analysis of samples and treatment technique expertise regarding the removal of PFAS in drinking water.

2.2.3. Where is this waste going? Is it safe for facility it is going to? (Mention compliance with UIC permit) How can this be a safe option?

2.2.3.1. NC DEQ indicated that Chemour's process water effluent is stored onsite and is transported to Canada for incineration and TX for incineration

2.2.3.2. The waste is being transported off-site via truck or rail for disposal. The disposal methods thus far have been either incineration or deep well injection in other states. EPA has confirmed that the receiving facilities have proper permits (Air, TSCA, or UIC).

2.2.4. What is EPA doing to sample drinking water? How do we know it is safe?

2.2.4.1. Since June 2017, the Region (SESD and ORD) has been working with NC DEQ and public water systems with intakes near the Cape Fear River to conduct weekly/biweekly testing to ensure that the levels are below NC's Health goal of 140 ppt for GenX. The Region assisted the state in establishing their health goal by arranging OW and OPPT expertise to assist them and continues to support the state with their efforts.

2.2.4.2. RCRA - EPA is not currently assisting the State to conduct sampling on soils or groundwater.

2.2.5. How can it be higher in groundwater?

2.2.5.1. Groundwater contamination appears to be a result of releases from the facility both via liquid spills to the subsurface and air deposition.

2.2.6. What coordination is happening between state and EPA? What happens when there is an exceedance? How is the state or EPA protection human health?

2.2.6.1. For the past year, the Region has engaged with the state biweekly to discuss sampling and analysis and any other recent developments at the state and local level related to PFAS contamination in the Cape Fear River and to provide any assistance the state may need.

2.2.6.2. During exceedances, the Region has discussed possible causes with the state, such as recent spills, onsite operational practices and procedures, and the onsite perched aquifer (which is beneath the facility and has high amounts of PFAS).

2.2.6.3. Moreover, when there is an exceedance of the State's 140 ppt health goal for GenX in a private well, the State DHHS issues a letter to the homeowner notifying them of the exceedance and the home is eligible to receive bottled water from Chemours.

2.2.7. How is state or EPA protecting human health?

2.2.7.1. Chemours has provided citizens with private wells exceeding the health goal with bottled water. A pilot study of Point of Entry Granular Activated Carbon filters has been installed for 6 private wells. Although the POE filters are still being piloted for effectiveness, Chemours has indicated that they would like to install POE filters for additional well owners in exceedance of the health goal.

2.2.8. What are the impacts to fish in the cape fear river and how that impacts human health?

2.2.8.1. In the spring, NCDEQ collected fish tissue from Marshwood Lake, a recreational pond just north of the plant. NCDEQ plans to conduct a follow-up fish tissue study in the fall to assess bioaccumulation factors.

2.2.8.2. From the NCDEQ FAQs:

There are no fish advisories in place related to GenX. A list of statewide and lo cation-
specific fish advisories related to other contaminants is available at: http://e pi.publichealth.nc.gov/oee/fish/advisories.html

2.3. North Carolina PFAS timeline?

2.3.1. North Carolina has taken action to reduce facility-wide air emissions of GenX compounds by at least 97% by August 31, 2018 with a 99% reduction by December 31, 2019. EPA has supported the state with technology advise and analyses necessary to take these actions. We appreciate the actions North Carolina has taken with Chemours to address releases to the environment of GenX.

2.3.2. Since June 2017, NC has proactively addressed PFAS compounds by collecting water samples from public utilities; working with utilities on risk communications; evaluating the effectiveness of POE GAC filters for residences; working with Chemours on NPDES permit, inspection and enforcement concerns. On several occasions, NC has indicated to the Agency that they intend to devote their resources to proactively addressing PFAS compounds statewide. Currently all public water systems along the Cape Fear River are serving water below the NC Health Goal and residents with private wells above the Health Goal are receiving

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bottled water. NC is beginning Phase 5 of their private well sampling to ensure that all affected homes are identified.

2.3.3. Recently, the NC General Assembly awarded funds to NC DEQ and NC DHHS to expand their PFAS monitoring efforts outside of the Cape Fear River to reflect their concerns by monitoring PFAS at the statewide level.

2.3.4. In addition, we understand that the State's current proposed court order seeking injunctive relief is multi-media in nature, and requires numerous compliance measures with associated timelines for meeting contaminant reductions, additional sampling, etc. We understand that the public comment period recently closed for this order and that the State is currently considering public input.

2.4. Specific facilities with exceedances or PFAS concerns?

2.4.1. What is the status of Camp LeJeune?

2.4.1.1. Camp LeJeune has an existing history of significant groundwater contamination. Last year Camp Lejeune investigated four sites that were suspected of having PFAS contamination. Groundwater was contaminated at three of the four sites. Concentrations were as high as 35,000 ppt at one of the fire-fighting training pits. The Base is planning a site-wide PFAS investigation that will include investigating 12 AOCs suspected of PFAS release and a percentage of 70 plane crash sites. The Navy is currently conducting interviews and will submit an PA/SI Work Plan later this year. Camp Lejeune does not have PFAS in the base drinking water. There are no known exposures to PFAS-contaminated groundwater at the Base. The EPA RPM for Camp LeJeune has been involved in the PFAS investigations to date.

2.4.2. What is the status of Cherry Point?

2.4.2.1. In 2017, the U.S. Navy announced that it would take precautionary measures and offered to test private drinking water wells identified near Marine Corps Outlying Landing Field (MCOLF) Atlantic as part of its commitment to ensuring drinking water supplies have not been affected by past Navy firefighting operations. This outlying field was expedited, because of the concern of residents near the runway. 258 samples were collected, and two exceeded the Lifetime Health Advisory (LHA). Bottled water is being provided to these well owners until a treatment solution is implemented. While MCAS Cherry Point is on the NPL, the MCOLF is not part of the footprint of the NPL site and is not covered under a Federal Facility Agreement. Accordingly, the EPA RPM for MCAS Cherry Point has had limited involvement at this site.

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2.5. Coordination on addressing exceedances

2.5.1. What was EPA's role in NC establishing a health based standard?

2.5.1.1. At the Regional and HQ levels, the Agency has remained engaged with NC DEQ and DHHS as they developed their HB standards, conducted their risk assessment and analyzed results. While the EPA currently does not have an Agency health-based standard for GenX, toxicity values for it and PFBS will be available later this year.

2.5.2. What is EPA doing to look at other emerging contaminants? What is the timeline?

2.5.2.1. GenX and PFBS toxicity values should be published later this year.

2.5.2.2. The Agency has organized various internal and cross-agency workgroups, with other federal agencies such as CDC, ATSDR and DoD, to evaluate and address the health effects, occurrence data, analytical methods, risk communication and effective treatment of PFAS compounds.

2.6. EPA's sampling

2.6.1. Superfund is not currently involved in sampling for PFAS at the Chemours site. There are PFAs investigations underway at two Superfund sites at Federal Facilities in North Carolina – (1) Camp LeJeune and (2) Marine Corps Air Station Cheery Point and Marine Corps Outlying Landing Field (MCOLF).

2.6.2. What is EPA doing to look at nafion by-products of the GenX process and if they are in the water?

2.6.2.1. We are expeditiously working on a method to be able to analyze for these byproducts in our labs.

2.6.3. What sampling method did EPA use and how does it apply to the broad category of PFAS or is it just specific to GenX?

2.6.3.1. The Science and Ecosystem Support Division of U.S. EPA Region 4 has used a modified ASTM method 7979 to analyze a suite of compounds in the PFAS category, including GenX, PFOA, PFOS and PFBS.

2.7. Enforcement

2.7.1. **Chemours.** EPA has completed our initial TSCA investigation and EPA's Office of Enforcement and Compliance Assurance is evaluating this situation comprehensively for compliance and then will determine next steps.

2.7.1.1. We appreciate the actions North Carolina has taken with Chemours to address releases to the environment of GenX.

2.7.1.2. North Carolina has taken action to reduce facility-wide air emissions of GenX compounds by at least 97% by August 31, 2018 with a 99% reduction by December 31, 2019. EPA has supported the state with technology advise and analyses necessary to take these actions.

ED_002003U_00008342-00008

To: Lamberth, Larry[Lamberth.Larry@epa.gov]
Cc: Monell, Carol[Monell.Carol@epa.gov]; Farmer, Alan[Farmer.Alan@epa.gov]
From: Jones, Aaryn[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C2BED08A5BD54DC5A9D59C5A345C9892-JONES, AARYN]
Sent: Wed 11/29/2017 2:02:01 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)
Chemours GenX Briefing Paper 112817 for Dec 4.docx

FYI...Rob and I are looking at this, there are some updates on groundwater information. The Enforcement/Investigatory / Ex. 7(a) is now included.

From: Garvey, Mark
Sent: Tuesday, November 28, 2017 5:25 PM
To: Speir, Jeffrey <speir.jeffrey@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; George, Verne <George.Verne@epa.gov>; Miles, James <miles.james@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)

To Region 4 TSCA & Water teams,

I'm attaching a revised version of the briefing paper Jeff Speir sent earlier today. It now includes Enforcement/Investigatory / Ex. 7(a) along with a few sentences mentioning the Regions 3 and 2 involvement. After speaking with my Division Director this afternoon, this effort appears to be an extremely heavy lift to get ready by Thursday for my Office Director. While I'm still requesting comments by Thursday at noon, we will be talking with our Office Director tomorrow morning to see if there is any flexibility in the scheduling of the briefing paper. There are a lot of fast moving details here and we want to be accurate with Susan Bodine.
We will also be asking about the level of participation at the Susan Bodine meeting. We anticipate that each Region will be asked to participate. We can discuss this on Thursday afternoon's GenX bi-weekly general discussion that James Miles set up.

Please note that this is not a meeting requesting senior management direction, but rather an informational briefing for Susan Bodine.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Speir, Jeffrey
Sent: Tuesday, November 28, 2017 12:08 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>
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We have prepared the attached draft briefing paper. It somewhat resembles a briefing paper you likely saw in August, with more emphasis on background facts and the State's actions, and less emphasis on enforcement "options." My counterpart in our Enforcement/Investigatory / Ex. 7(a) division will send his updates to the relevant Region 4 Enforcement/Investigatory / Ex. 7(a) folks.

Unfortunately, the deadline to send up the briefing paper is tight. Please provide any feedback you may have to me and Mark Garvey (cc'd) by Thursday, November 30 at noon. I apologize about the timing.

Please let me know if you have any questions or if you would like to discuss this further.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

To: Buso, Roberto X[Buso.Roberto@epa.gov]
From: Jones, Aaryn[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=C2BED08A5BD54DC5A9D59C5A345C9892-JONES, AARYN]
Sent: Wed 11/29/2017 1:48:58 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)
Chemours GenX Briefing Paper 112817 for Dec 4.docx

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Jeffrey Speir
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Washington, DC 20460
(202) 564-0872

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Sent: Tue 11/28/2017 5:31:31 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing
Chemours GenX Briefing Paper 112817.docx

I think I forwarded you a later email without the attachment.

From: Speir, Jeffrey
Sent: Tuesday, November 28, 2017 12:08 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>
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Jeffrey Speir
Attorney-Adviser
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OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

To: Mike Fisher (Fisher.Mike@epa.gov)[Fisher.Mike@epa.gov]
From: Lewis, Jennifer
Sent: Mon 12/11/2017 5:23:11 PM
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 2pm & Briefing Paper attached
OCE Weekly AA-DAA 12112017.pdf

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
US EPA Region 4
Atlanta Federal Center
61 Forsyth St. SW
Atlanta, GA 30303
404-562-9518

From: Speir, Jeffrey
Sent: Monday, December 11, 2017 11:09 AM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Cc: Garvey, Mark <Garvey.Mark@epa.gov>
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 2pm & Briefing Paper attached

Hi Jennifer,

I wanted to be sure you were aware of the Chemours/GenX OECA briefing set to take place at 2:00 pm today. I saw Leif Palmer's name below, but wanted to be sure you received the call-in information directly.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

From: Garvey, Mark
Sent: Saturday, December 09, 2017 12:15 AM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 2pm & Briefing Paper attached

There are conflicting times for the Monday meeting. The agenda from the front office says 1pm and the invite from the front office says 2.

My management believes it is **scheduled for 2pm on Monday** and the agenda has the wrong time. The attachment also has the final GenX briefing paper below the item below the agenda.

Sorry for the confusion. We'll try to clarify things on Monday.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Garvey, Mark
Sent: Friday, December 08, 2017 3:15 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <strynar.mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm

Attached is the agenda for the **Monday ** 1pm Susan Bodine Briefing**

It is part of the weekly OCE meeting with the AA.

OCE Weekly w/AA/DAA/PDAA, call in number Personal Phone / Ex. 6

Region 4 will be joined by Regions 2, 3 and 5 on the call.

I'll send the final briefing paper when it becomes available.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney

202-564-4168
garvey.mark@epa.govcl

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

Organizer: Miles, James[miles.james@epa.gov]

Location: Personal Phone / Ex. 6

Importance: Normal

Subject: Chemours - Enforcement Coordination Call

Start Time: Wed 9/20/2017 5:30:00 PM (UTC)

End Time: Wed 9/20/2017 6:00:00 PM (UTC)

Required Attendees: Daryl Hudson; Dan-Tam Nguyen; Paul BuellesbachAubee, Catherine; Dan-Tam Nguyen; Gorman, John; Paul Buellesbach; Daryl Hudson; Toney, Anthony; Ellis, Tony; Fite, Mark; daw, harry; Mitchell, Ken; Pratt, Stacie; Schulz, Susan; Martinez, Jeffrey; Anderson, Kate; DeDora, Caroline; King, Carol; Allison, Rose; Bookman, Robert; Doa, Maria; Bean, Mark; Sullivan, Greg; Swan, Russell; Bates, Keith; Henry, Tala; Star, David; Kemker, Carol; Saenz, Diana; Bahk, Benjamin; Davis, Lauren O.; Tucker, Marlene; Freed, Elisabeth; George, Verne; Klevs, Mardi; Denton, Loren; Gordon, Scott; Pollins, Mark; Garvey, Mark; Theis, Joseph

Optional Attendees: Allenbach, Becky; Ramalho, Louis; Day, Christopher; Clark, Jacqueline; Wilson, Jennifer; Niess, Claudia; Lewis, Jennifer; rogers, rick; Mancusi-Ungaro, Philip; Bair, Rita; Janovitz, Sara; Hall, Renea; Bush, William; Coe, Mary; Timsina, Gopal; Speir, Jeffrey; Schwartz, Paul; Shell, Karrie-Jo; Unger, LouAnn; Shoven, Heather; Harris, Kimberly; Field, Stephen; Ireland, Laurie (Ireland.Laurie@epa.gov); Spann, Tony; Duchovnay, Andrew; Baptista, Chrisna; Moyer, Adam; Collins, Charlie; Davis, Molly; Poy, Thomas

Today's Agenda for Gen-X Update Call

Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5

James Miles, Chief
Chemical Risk and Reporting Enforcement Branch
Waste and Chemical Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
William Jefferson Clinton Bldg., South, Rm. 4111A
1201 Constitution Ave., NW
Washington, DC 20004
202.564.5161
miles.james@epa.gov<mailto:sander.matthew@epa.gov>

Message

From: George, Verne [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8D8C394177AF44B28B4CE452BCCBC851-GEORGE, VERNE]
Sent: 8/23/2018 7:05:00 PM
To: Timsina, Gopal [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9f7677a9d23c44c9b6172dfd8331d5be-Timsina, Go]
Subject: FW: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5
Attachments: 2018-08-22 Chemours PowerPoint.pptx

From: Garvey, Mark
Sent: Thursday, August 23, 2018 2:28 PM
To: Palmer, Leif <Palmer.Leif@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>; George, Verne <George.Verne@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Chemours - Power Point Slides presented to AA, Sending To Regions 2,3,4,5

Leif,

I'm attaching the Power Point Slides used in the briefing a few minutes ago with Susan Bodine and Larry Starfield. I'm copying staff in regions 2, 3, 4, and 5 since I have gotten questions from many people about this Chemours briefing. Susan asked for a Regional follow-up to this briefing. A date has not been set for that follow-up yet. If you have questions, please contact me about TSCA issues, Jeff Speir for Water issues and Leslie Oif/Andy Crossland with RCRA issues.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Palmer, Leif
Sent: Wednesday, August 22, 2018 9:51 AM
To: Garvey, Mark <Garvey.Mark@epa.gov>
Cc: Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: Re: Chemours - Question about HFPO & HFPO DAF Releases -

Sent from my iPhone

Regards,

Message

From: George, Verne [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8D8C394177AF44B28B4CE452BCCBC851-GEORGE, VERNE]
Sent: 9/6/2018 12:54:38 PM
To: Timsina, Gopal [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9f7677a9d23c44c9b6172dfd8331d5be-Timsina, Go]
Subject: FW: Chemours lawsuit
Attachments: Cape Fear River Watch v. Chemours.pdf

From: Tucker, Marlene
Sent: Wednesday, September 5, 2018 7:04 AM
To: George, Verne <George.Verne@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>
Subject: FW: Chemours lawsuit

See attached the Complaint dated August 29th, filed by the Cape Fear River Watch against Chemours alleging CWA and TSCA violations

Marlene Tucker

From: Tucker, Marlene
Sent: Wednesday, September 05, 2018 6:57 AM
To: Garvey, Mark <Garvey.Mark@epa.gov>
Cc: Miles, James <miles.james@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>
Subject: FW: Chemours lawsuit

Mark,

I am forwarding a copy of the Complaint dated August 29th filed by Cape Fear River Watch against Chemours alleging CWA and TSCA violations.

Regards,

Marlene Tucker

From: Nagrani, Kavita
Sent: Friday, August 31, 2018 9:22 AM
To: Palmer, Leif <Palmer.Leif@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: RE: Chemours lawsuit

Here it is – SELC linked to the complaint.

From: Palmer, Leif
Sent: Friday, August 31, 2018 9:17 AM
To: Nagrani, Kavita <Nagrani.Kavita@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie

<Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: Re: Chemours lawsuit

Thanks for being alert. Please ask Josh Grimes or Saundi to see if the complaint is available on Pacer.

Marlene — please let Mark Garvey know.

I'll forward to OGC.

Sent from my iPhone

On Aug 31, 2018, at 9:08 AM, Nagrani, Kavita <Nagrani.Kavita@epa.gov> wrote:

> Good morning,
>
> I'm not sure if you all have seen this yet. It appears as though Cape Fear River Watch has filed a lawsuit against Chemours in the Eastern District of North Carolina on Wednesday alleging violations of the CWA and TSCA. I haven't read the complaint yet, but SELC's website (below) includes a link to the document.
>
> https://www.southernenvironment.org/news-and-press/news-feed/groups-sue-chemours-in-federal-court-to-stop-pfas-genx-pollution
>
> ---
>
> Kavita K. Nagrani, Associate Regional Counsel and Special Assistant
> to the Regional Counsel and Deputy Regional Counsel
> U.S. Environmental Protection Agency, Region 4
> Office of Regional Counsel
> 61 Forsyth Street, S.W.
> Atlanta, Georgia 30303
> Ph: (404) 562-9697
> Fax: (404) 562-9486
>
> CONFIDENTIALITY NOTICE: This message is being sent by or on behalf of an attorney. It is intended exclusively for the individual(s) or entity(ies) to whom or to which it is addressed. This communication may contain information that is proprietary, privileged, or confidential or otherwise legally exempt from disclosure. If you are not the named addressee, you are not authorized to read, print, retain, copy, or disseminate this message or any part of it. If you have received this message in error, please notify the sender immediately by email and delete all copies of the message.

To: Timsina, Gopal[Timsina.Gopal@epa.gov]
From: George, Verne[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8D8C394177AF44B28B4CE452BCCBC851-GEORGE, VERNE]
Sent: Tue 11/28/2017 8:55:25 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing
Chemours GenX Briefing Paper 112817.docx

From: Fite, Mark
Sent: Tuesday, November 28, 2017 12:26 PM
To: Gordon, Scott <Gordon.Scott@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>
Cc: Ireland, Laurie <Ireland.Laurie@epa.gov>
Subject: FW: Draft GenX Paper for OECA Briefing
Importance: High

FYI, OECA is asking for feedback on the attached in preparation for a Monday briefing with Susan Bodine, Patrick Traylor and Larry Starfield. See note below.

Mark J. Fite
Technical Authority for CAA, TSCA, FIFRA, & EPCRA
Office of Enforcement Coordination
U.S. EPA Region 4
61 Forsyth St., SW
Atlanta, GA 30303
fite.mark@epa.gov
404.562.9740

From: Speir, Jeffrey
Sent: Tuesday, November 28, 2017 12:08 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>
Subject: Draft GenX Paper for OECA Briefing

Hello, Region 4 Water Team:

The Director of the Office of Civil Enforcement at Headquarters has requested that we brief OECA leadership on GenX. The briefing will be for Larry Starfield, Patrick Traylor, and Susan Bodine, the Administrator's counsel for enforcement who has expressed interest in this matter. The briefing is scheduled for Monday, December 4 at 2:00 pm. Note: This briefing is not a request for an OECA decision; rather, it is a presentation of the issues and our federal authorities.

We have prepared the attached draft briefing paper. It somewhat resembles a briefing paper you likely saw in August, with more emphasis on background facts and the State's actions, and less emphasis on enforcement "options." My counterpart in our Enforcement/Investigatory / Ex. 7(a) division will send his updates to the relevant Region 4 Enforcement/Investigatory / Ex. 7(a) folks.

Unfortunately, the deadline to send up the briefing paper is tight. Please provide any feedback you may have to me and Mark Garvey (cc'd) by Thursday, November 30 at noon. I apologize about the timing.

Please let me know if you have any questions or if you would like to discuss this further.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division

1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

To: Timsina, Gopal[Timsina.Gopal@epa.gov]
From: George, Verne[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=8D8C394177AF44B28B4CE452BCCBC851-GEORGE, VERNE]
Sent: Fri 10/27/2017 1:12:08 PM (UTC)
Subject: FW: Chemours - GenX Enforcement Coordination Call - TSCA CBI
2017-10-24 GenX NCDEQ Letter Not to Suspend NPDES.pdf
2017-09-08 GenX 17 CVS 580 NC Partial Consent Order.pdf
2017-10-16 GenX CFPUA Complaint (E.D.N.C.).pdf

From: Speir, Jeffrey
Sent: Thursday, October 26, 2017 2:17 PM
To: Garvey, Mark <Garvey.Mark@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

As I mentioned on the call this afternoon, I am sending the following documents:

1. NC DEQ's October 24 letter to Chemours stating its decision not to suspend Chemours' NPDES permit;
2. NC and Chemours' September 8 Partial Consent Order, to which the document above refers; and
3. Cape Fear Public Utility Authority's October 16 complaint filed in federal district court.

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

From: Garvey, Mark
Sent: Thursday, October 26, 2017 8:57 AM
To: Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose

<Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

Below is today's Agenda. For Your convenience, I'm also attaching the same items sent around last week since there will be discussion involving them.

Agenda for today's call
Roll call (5 minutes)
TSCA CBI Cleared Employees

I. Region 3 Inspection- Preliminary Impressions of Chemours at Parkersburg WV Last Week
By Lauren Davis (7 minutes)
a. CDR Updated
b. Air Monitoring
c. River Monitoring
d. PPE Issues

II. Water Enforcement
By Jeff Speir (6 minutes)
a. Decision Not to Suspend NPDES Permit
b. Ongoing Litigation (NC, CFPUA, class actions)

III. Air Emissions
By Maria Doa (4 minutes)

IV. TSCA Inspection by Region 4 Update
By Verne George (5 minutes)

V. Questions/Comments from Participants
By Everyone (4 minutes)

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

-----Original Appointment-----
From: Miles, James
Sent: Friday, September 22, 2017 11:45 AM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Schwartz, Paul; Davis, Molly; Ireland, Laurie; Moyer, Adam; DeDora, Caroline; Bean, Mark; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; Schulz, Susan; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Pollins, Mark; Theis, Joseph; Bahk, Benjamin; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer; Baptista, Chrisna; Niess, Claudia; Spann, Tony; Timsina, Gopal; Allenbach, Becky; Mancusi-Ungaro, Philip; Bush, William; Janovitz, Sara; Hall, Renea; Shell, Karrie-Jo; Devkota, Om
Cc: Reinhart, Roger; Buso, Roberto X
Subject: Chemours - Enforcement Coordination Call - TSCA CBI
When: Thursday, October 26, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Personal Phone / Ex. 6

Continuing bi-weekly call through Nov.

To: Bates, Keith[Bates.Keith@epa.gov]; Timsina, Gopal[Timsina.Gopal@epa.gov]; Bates, Keith[Bates.Keith@epa.gov]; Devkota, Om[devkota.om@epa.gov]
From: George, Verne
Sent: Mon 12/11/2017 2:48:10 PM
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 2pm & Briefing Paper attached
OCE Weekly AA-DAA 12112017.pdf

FYI

From: Garvey, Mark
Sent: Saturday, December 09, 2017 12:15 AM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 2pm & Briefing Paper attached

There are conflicting times for the Monday meeting. The agenda from the front office says 1pm and the invite from the front office says 2.
My management believes it is **scheduled for 2pm on Monday** and the agenda has the wrong time. The attachment also has the final GenX briefing paper below the item below the agenda.

Sorry for the confusion. We'll try to clarify things on Monday.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Garvey, Mark
Sent: Friday, December 08, 2017 3:15 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn

<Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <strynar.mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm

Attached is the agenda for the **Monday ** 1pm Susan Bodine Briefing**

It is part of the weekly OCE meeting with the AA.

OCE Weekly w/AA/DAA/PDAA, call in number **Personal Phone / Ex. 6**

Region 4 will be joined by Regions 2, 3 and 5 on the call.

I'll send the final briefing paper when it becomes available.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.govcl

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

To: Spann, Tony[Spann.Tony@epa.gov]
From: Timsina, Gopal
Sent: Thur 8/17/2017 11:53:56 AM
Subject: FW: Chemours - Enforcement Coordination Call
2017-08-03 GenX CFPUA Citizen Suit Notice Letter.pdf
2017-07-28 GenX Civitas Citizen Suit Notice Letter.pdf

fyi

From: George, Verne
Sent: Tuesday, August 15, 2017 2:45 PM
To: Timsina, Gopal <Timsina.Gopal@epa.gov>
Subject: FW: Chemours - Enforcement Coordination Call

From: Speir, Jeffrey
Sent: Tuesday, August 15, 2017 2:17 PM
To: Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>
Cc: Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Subject: RE: Chemours - Enforcement Coordination Call

Hello, all:

Please find attached the notice letters discussed on today's call, submitted on behalf of: (1) Civitas Institute, dated July 28, alleging CWA violations and (2) the Cape Fear Public Utility Authority, dated August 3, alleging CWA and RCRA violations.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

-----Original Appointment-----
From: Miles, James
Sent: Thursday, August 03, 2017 5:09 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt,

Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: Chemours - Enforcement Coordination Call
When: Tuesday, August 15, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Conference number / Ex. 6

Agenda for Gen-X Update Call

--12:30 Conference Call (30 minutes)

I. HQ Discussion (15 minutes)
   a. 8/3/17 Notice of Intent to Sue Chemours and Dupont – from Cape Fear Public Utility Authority under CWA and RCRA
   b. 8/9/17 EPA Call with State and Local Officials from North Carolina
   c. Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5

II. Regional Update (15 minutes)
   a. Region 4 inspection follow-up on requested information
   b. Any new items to raise by Regions

From: Timsina, Gopal
Location: Personal Phone / Ex. 6
Importance: Normal
Subject: FW: Chemours - Enforcement Coordination Call
Start Time: Wed 9/20/2017 5:30:00 PM
End Time: Wed 9/20/2017 6:00:00 PM
Required Attendees: Devkota, Om
Updates 9.20.2017.00.docx

-----Original Appointment-----
From: Miles, James
Sent: Monday, August 28, 2017 4:26 PM
To: Miles, James; Aubee, Catherine; Dan-Tam Nguyen; Gorman, John; Paul Buellesbach; Daryl Hudson; Toney, Anthony; Ellis, Tony; Fite, Mark; daw, harry; Mitchell, Ken; Pratt, Stacie; Schulz, Susan; Martinez, Jeffrey; Anderson, Kate; DeDora, Caroline; King, Carol; Allison, Rose; Bookman, Robert; Doa, Maria; Bean, Mark; Sullivan, Greg; Swan, Russell; Bates, Keith; Henry, Tala; Star, David; Kemker, Carol; Saenz, Diana; Bahk, Benjamin; Davis, Lauren O.; Tucker, Marlene; Freed, Elisabeth; George, Verne; Klevs, Mardi; Denton, Loren; Gordon, Scott; Pollins, Mark; Garvey, Mark; Theis, Joseph
Cc: Allenbach, Becky; Ramalho, Louis; Day, Christopher; Clark, Jacqueline; Wilson, Jennifer; Niess, Claudia; Lewis, Jennifer; rogers, rick; Mancusi-Ungaro, Philip; Bair, Rita; Janovitz, Sara; Hall, Renea; Bush, William; Coe, Mary; Timsina, Gopal; Speir, Jeffrey; Schwartz, Paul; Shell, Karrie-Jo; Unger, LouAnn; Shoven, Heather; Harris, Kimberly; Field, Stephen; Ireland, Laurie (Ireland.Laurie@epa.gov); Spann, Tony; Duchovnay, Andrew; Baptista, Chrisna; Moyer, Adam; Collins, Charlie; Davis, Molly; Poy, Thomas
Subject: Chemours - Enforcement Coordination Call
When: Wednesday, September 20, 2017 1:30 PM-2:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Personal Phone / Ex. 6

Today's Agenda for Gen-X Update Call

Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5

James Miles, Chief
Chemical Risk and Reporting Enforcement Branch
Waste and Chemical Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency
William Jefferson Clinton Bldg., South, Rm. 4111A
1201 Constitution Ave., NW
Washington, DC 20004
202.564.5161
miles.james@epa.gov<mailto:sander.matthew@epa.gov>

To: George, Verne[George.Verne@epa.gov]
From: Timsina, Gopal
Sent: Wed 9/6/2017 1:00:44 PM
Subject: FW: Chemours - Enforcement Coordination Call
2017-08-03 GenX CFPUA Citizen Suit Notice Letter.pdf

FYI

From: George, Verne
Sent: Tuesday, August 15, 2017 2:45 PM
To: Timsina, Gopal <Timsina.Gopal@epa.gov>
Subject: FW: Chemours - Enforcement Coordination Call

From: Speir, Jeffrey
Sent: Tuesday, August 15, 2017 2:17 PM
To: Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>
Cc: Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Subject: RE: Chemours - Enforcement Coordination Call

Hello, all:

Please find attached the notice letters discussed on today's call, submitted on behalf of: (1) Civitas Institute, dated July 28, alleging CWA violations and (2) the Cape Fear Public Utility Authority, dated August 3, alleging CWA and RCRA violations.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

-----Original Appointment-----
From: Miles, James
Sent: Thursday, August 03, 2017 5:09 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson;

DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: Chemours - Enforcement Coordination Call
When: Tuesday, August 15, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Conference Number / Ex. 6

Agenda for Gen-X Update Call

--12:30 Conference Call (30 minutes)

I. HQ Discussion (15 minutes)
   a. 8/3/17 Notice of Intent to Sue Chemours and Dupont – from Cape Fear Public Utility Authority under CWA and RCRA
   b. 8/9/17 EPA Call with State and Local Officials from North Carolina
   c. Enforcement/Investigatory / Ex. 7(a) / Deliberative Process/ Ex. 5

II. Regional Update (15 minutes)
   a. Region 4 inspection follow-up on requested information
   b. Any new items to raise by Regions

To: Nagrani, Kavita[Nagrani.Kavita@epa.gov]
Cc: Palmer, Leif[Palmer.Leif@epa.gov]; Nowell, Valerie[Nowell.Valerie@epa.gov]
From: Tucker, Marlene
Sent: Tue 7/3/2018 5:37:16 PM
Subject: FW: Chemours NOI Alleging TSCA violations

Kavita,
I am out of the office this afternoon and will not return until next Tuesday (7/10). I am forwarding the last email (dated 6/28) that I sent to the OGC attorney (Don Sadowsky) assigned to the Chemours TSCA matter. I have did not get a response to my email so I called him to discuss this. Unfortunately, he did not have anything substantive to report. **Deliberative Process / Ex. 5**

Deliberative Process / Ex. 5

Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5

Regards and Happy July 4th.
Marlene Tucker

From: Tucker, Marlene
Sent: Thursday, June 28, 2018 7:27 AM
To: Sadowsky, Don
Cc: Garvey, Mark
Subject: Chemours NOI Alleging TSCA violations
Don,
In your last email communication with me on 6/14, you indicated that you were scheduled to meet with your management. You also mentioned that OSCPP was assigned the task to respond to the congressional inquiry from the Honorable Richard Hudson (the United States Representative for North Carolina's 8th congressional district), who posed the question concerning "***whether GenX was used in a manner that was incompatible with the consent agreement under the Toxic Substances Control Act.***"

I would appreciate knowing the status on this. Also, please forward a copy of EPA's response to Congressman Hudson.

Thanks.
Regards,

Marlene Tucker | Office of Regional Counsel
US EPA- Region 4
Atlanta Federal Center
61 Forsyth Street, SW
13th Floor
Atlanta, Georgia 30303-8960
Office: 404.562.9536
Tucker.Marlene@epa.gov

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To: Personal Email / Ex. 6
From: Tucker, Marlene
Sent: Sun 12/10/2017 11:29:01 PM
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm
OCE Weekly AA-DAA 12112017.pdf

Marlene Tucker

From: Nowell, Valerie
Sent: Friday, December 08, 2017 3:29 PM
To: Caplan, Robert W. <Caplan.Robert@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: FW: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm

ATTORNEY CLIENT COMMUNICATION – ATTORNEY WORK PRODUCT – IN ANTICIPATION OF LITIGATION – DO NOT RELEASE

Bob and Marlene – are you going to be physically present in the office Monday for this briefing? Or, are you planning on attending by phone? Or, if you're not planning on attending, please let me know that also. Thanks.

Valerie Nowell
Chief, Office of Air, Pesticides and Toxics Legal Support
U.S. Environmental Protection Agency, Region 4
(404) 562-9555

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From: Garvey, Mark
Sent: Friday, December 08, 2017 3:15 PM
To: Mitchell, Ken <Mitchell.Ken@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>
Cc: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; King, Carol <King.Carol@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Rog, Morgan <Rog.Morgan@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Miles, James <miles.james@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Hansen, Susan <Hansen.Susan@epa.gov>; Lamberth, Larry <Lamberth.Larry@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Strynar, Mark <Strynar.Mark@epa.gov>; Lindstrom, Andrew <Lindstrom.Andrew@epa.gov>; George, Verne <George.Verne@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; Vendinello, Lynn <Vendinello.Lynn@epa.gov>; Buckley, Timothy <Buckley.Timothy@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>
Subject: RE: - Briefing OECA AA Susan Bodine Chemours / GenX Call-in info Monday 1pm

Attached is the agenda for the **Monday ** 1pm Susan Bodine Briefing**

It is part of the weekly OCE meeting with the AA.

OCE Weekly w/AA/DAA/PDAA, call in number Personal Phone / Ex. 6

Region 4 will be joined by Regions 2, 3 and 5 on the call.

I'll send the final briefing paper when it becomes available.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.govcl

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

To: Nowell, Valerie[Nowell.Valerie@epa.gov]
Cc: Caplan, Robert W.[Caplan.Robert@epa.gov]; Rubini, Suzanne[Rubini.Suzanne@epa.gov]
From: Tucker, Marlene[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=E3E98FDFF54241C1B2BADC0D1F1B893D-TUCKER, MARLENE]
Sent: Wed 11/29/2017 9:26:42 PM (UTC)
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)
Chemours GenX Briefing Paper 112817 for Dec 4.docx

Valerie,

I just want to give you a heads up. The attached draft Gen X Briefing sheet was sent out by OECA (Jeffrey Speir) for review. According to the email below, the briefing sheet is being prepared because ***"The Director of the Office of Civil Enforcement at Headquarters has requested that we brief OECA leadership on GenX. The briefing will be for Larry Starfield, Patrick Traylor, and Susan Bodine, the Administrator's counsel for enforcement who has expressed interest in this matter. The briefing is scheduled for Monday, December 4 at 2:00 pm. Note: This briefing is not a request for an OECA decision; rather, it is a presentation of the issues and our federal authorities."***

FYI: The original email was forwarded to me by Paul Schwartz on Monday and Rob Buso forwarded the updated draft after I called him this afternoon to find out the status. I am not sure why Mark Garvey (OECA) did not include me on the earlier emails. Since Rob indicted that Scott Gordon was not aware of the briefing sheet and the scheduled OECA briefing, I left a voicemail message for Suzanne in the event she was not informed about this.

Regards,

Marlene Tucker

From: Buso, Roberto X
Sent: Wednesday, November 29, 2017 4:07 PM
To: Tucker, Marlene <Tucker.Marlene@epa.gov>
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)

From: Jones, Aaryn
Sent: Wednesday, November 29, 2017 8:49 AM
To: Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: FW: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)

From: Garvey, Mark
Sent: Tuesday, November 28, 2017 5:25 PM
To: Speir, Jeffrey <speir.jeffrey@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>; George, Verne <George.Verne@epa.gov>; Miles, James <miles.james@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Schulz, Susan <Schulz.Susan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Oif, Leslie <Oif.Leslie@epa.gov>
Subject: RE: Draft GenX Paper for OECA Briefing With Enforcement/Investigatory / Ex. 7(a)

To Region 4 TSCA & Water teams,

I'm attaching a revised version of the briefing paper Jeff Speir sent earlier today. It now includes Enforcement/Investigatory / Ex. 7(a) along with a few sentences mentioning the Regions 3 and 2 involvement. After speaking with my Division Director this afternoon, this effort appears to be an extremely heavy lift to get ready by Thursday for my Office Director. While I'm still requesting comments by Thursday at noon, we will be talking with our Office Director tomorrow morning to see if there is any flexibility in the scheduling of

the briefing paper. There are a lot of fast moving details here and we want to be accurate with Susan Bodine.
We will also be asking about the level of participation at the Susan Bodine meeting. We anticipate that each Region will be asked to participate. We can discuss this on Thursday afternoon's GenX bi-weekly general discussion that James Miles set up.

Please note that this is not a meeting requesting senior management direction, but rather an informational briefing for Susan Bodine.

Thanks,
Mark

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

From: Speir, Jeffrey
Sent: Tuesday, November 28, 2017 12:08 PM
To: Schwartz, Paul <Schwartz.Paul@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Jones, Aaryn <Jones.Aaryn@epa.gov>
Cc: Davis, Molly <Davis.Molly@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Garvey, Mark <Garvey.Mark@epa.gov>
Subject: Draft GenX Paper for OECA Briefing

Hello, Region 4 Water Team:

The Director of the Office of Civil Enforcement at Headquarters has requested that we brief OECA leadership on GenX. The briefing will be for Larry Starfield, Patrick Traylor, and Susan Bodine, the Administrator's counsel for enforcement who has expressed interest in this matter. The briefing is scheduled for Monday, December 4 at 2:00 pm. Note: This briefing is not a request for an OECA decision; rather, it is a presentation of the issues and our federal authorities.

We have prepared the attached draft briefing paper. It somewhat resembles a briefing paper you likely saw in August, with more emphasis on background facts and the State's actions, and less emphasis on enforcement "options." My counterpart in our Enforcement/Investigatory / Ex. 7(a) division will send his updates to the relevant Region 4 Enforcement/Investigatory / Ex. 7(a) folks.

Unfortunately, the deadline to send up the briefing paper is tight. Please provide any feedback you may have to me and Mark Garvey (cc'd) by Thursday, November 30 at noon. I apologize about the timing.

Please let me know if you have any questions or if you would like to discuss this further.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

Message

From: Lewis.Jennifer@epa.gov [Lewis.Jennifer@epa.gov]
Sent: 5/24/2018 7:14:39 PM
To: Banu.Rangarajan@usdoj.gov; Cassie Barnum [Cassandra.Barnum@usdoj.gov]; LaPointe, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b126520197da4fa0bd8928a00a784b23-LaPointe, Kevin]
Subject: Fwd: Citizen Suit Notice (CWA/TSCA)
Attachments: CapeFearRiverWatch v Chemours_NC.doc; ATT00001.htm; CapeFearRiverWatch v Chemours_NC.pdf; ATT00002.htm

Sent from my iPhone

Begin forwarded message:

From: "Miles, James" <miles.james@epa.gov>
To: "Lewis, Jennifer" <Lewis.Jennifer@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)

From: Sullivan, Greg
Sent: Friday, May 18, 2018 7:10 PM
To: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>
Cc: Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Miles, James <miles.james@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

FYI

From: Kemker, Carol
Sent: Friday, May 18, 2018 6:10 PM
To: Sullivan, Greg <Sullivan.Greg@epa.gov>; Miles, James <miles.james@epa.gov>
Cc: Banister, Beverly <Banister.Beverly@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

Greg and James,

Wanted to make sure you all have a copy of the NOIs. Let's discuss the timing for the case development.

Carol

From: Toney, Anthony
Sent: Friday, May 18, 2018 12:32 PM
To: Bookman, Robert <Bookman.Robert@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>
Cc: George, Verne <George.Verne@epa.gov>

Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

FYI.

From: Bullock, Patricia
Sent: Friday, May 18, 2018 9:45 AM
To: Moore, Yvonne <Moore.Yvonne@epa.gov>; Jones, Laurie <JONES.LAURIE@EPA.GOV>
Cc: O'Lone, Dan <Olone.Dan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>
Subject: Citizen Suit Notice (CWA/TSCA)
Importance: High

Attached are NOIs for both CWA and TSCA statues (hard copies were forwarded via interoffice mail). Please review and forward back via word document and interoffice mail by due date.

Thank you,

Pat

To: Lewis, Jennifer[Lewis.Jennifer@epa.gov]; Palmer, Leif[Palmer.Leif@epa.gov]
From: Rubini, Suzanne
Sent: Thur 2/21/2019 8:14:34 PM
Subject: RE: Chemours legal memo
Chemours Legal Memo srubinicomments.docx

FWIW, my comments are attached. I'd be happy to discuss with you both.

Thanks,
Suzanne

From: Lewis, Jennifer
Sent: Tuesday, February 12, 2019 11:36 AM
To: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>
Subject: Chemours legal memo

FWIW, here's a draft. Please comment as soon as you can. I need to get this up to Mike sooner rather than later and I suspect it needs a lot of work.

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
U.S. EPA, Region 4
Atlanta, GA
Phone: 404-562-9518
Cell: 770-548-7418

Message

From: Palmer, Leif [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D43408D25CF047A8B43AEC713A5EE837-PALMER, LEIF]
Sent: 8/15/2017 7:00:49 PM
To: Lewis, Jennifer [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d10b9dc822484c529c3bc671113b89a1-Lewis, Jennifer]; Rubini, Suzanne [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1bd777d6ab434a339122bfdd62491d0c-Rubini, Suzanne]
CC: Tucker, Marlene [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=e3e98fdff54241c1b2badc0d1f1b893d-Tucker, Marlene]; Mancusi-Ungaro, Philip [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=79878f817874461bbcdbe5e9a3dccc75-Mancusi-Ungaro, Philip]; Schwartz, Paul [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d2cdc821c2414bc7ac512bde5b73d997-Schwartz, Paul]; Bush, William [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=4e5f0fe888bb4366b1edbf97c804b882-Bush, William]; Nowell, Valerie [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=70acc3335ff44cf7afcaaf77c16c67c7-Nowell, Valerie]
Subject: FW: Citizen Suit Notice (CWA) - – Cititas v The Chemours Company Regarding provision violations of NPDES Permit located in Raleigh, NC - NON EJ POTENTIAL
Attachments: CivitasInstitute v Chemours_NC.pdf; Fw: Chemours - NOIs

FYI – these relate to the same facility that we are having a Parallel Proceedings meeting about on Thursday.

Leif Palmer
Supervisory-Attorney
EPA Region 4
61 Forsyth Street SW
Atlanta, GA 30303
(404) 562-9542

From: Bullock, Patricia
Sent: Tuesday, August 15, 2017 2:47 PM
To: Bush, William <Bush.William@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>
Cc: Bullock, Patricia <Bullock.Patricia@epa.gov>
Subject: Citizen Suit Notice (CWA) - – Cititas v The Chemours Company Regarding provision violations of NPDES Permit located in Raleigh, NC - NON EJ POTENTIAL

Omitted pdf document – attached.

From: Bullock, Patricia
Sent: Tuesday, August 15, 2017 2:40 PM
To: Bush, William <Bush.William@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Palmer, Leif <Palmer.Leif@epa.gov>; Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>
Cc: Bullock, Patricia <Bullock.Patricia@epa.gov>
Subject: Citizen Suit Notice (CWA) - – Cititas v The Chemours Company Regarding provision violations of NPDES Permit located in Raleigh, NC - NON EJ POTENTIAL

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 8/15/2017 6:54:52 PM
To: Palmer, Leif [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d43408d25cf047a8b43aec713a5ee837-Palmer, Leif]
Subject: Fw: Chemours - NOIs
Attachments: 2017-08-03 GenX CFPUA Citizen Suit Notice Letter.pdf; 2017-07-28 GenX Civitas Citizen Suit Notice Letter.pdf

---

From: Speir, Jeffrey
Sent: Tuesday, August 15, 2017 2:16 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: RE: Chemours - Enforcement Coordination Call

Hello, all:

Please find attached the notice letters discussed on today's call, submitted on behalf of: (1) Civitas Institute, dated July 28, alleging CWA violations and (2) the Cape Fear Public Utility Authority, dated August 3, alleging CWA and RCRA violations.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

-----Original Appointment-----
From: Miles, James
Sent: Thursday, August 03, 2017 5:09 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day,

Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: Chemours - Enforcement Coordination Call
When: Tuesday, August 15, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: 1-866-299-3188; 202-564-5161

Agenda for Gen-X Update Call

--12:30 Conference Call (30 minutes)

I. HQ Discussion (15 minutes)
   a. 8/3/17 Notice of Intent to Sue Chemours and Dupont – from Cape Fear Public Utility Authority under CWA and RCRA
   b. 8/9/17 EPA Call with State and Local Officials from North Carolina
   c. Compliance order authority options under TSCA, SDWA, CWA & RCRA requested by OCE Office Director

II. Regional Update (15 minutes)
   a. Region 4 inspection follow-up on requested information
   b. Any new items to raise by Regions

Message

From: LaPointe, Kevin [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B126520197DA4FA0BD8928A00A784B23-LAPOINTE, KEVIN]
Sent: 6/29/2017 6:44:44 PM
To: Lewis, Jennifer [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d10b9dc822484c529c3bc671113b89a1-Lewis, Jennifer]
Subject: my newest version attachment
Attachments: Chemours Company attachment 17June29 version.docx

I was able to be more specific based on yesterday.

Kevin S. LaPointe
Resident Agent-in-Charge
U.S. EPA Criminal Investigation Division
Charlotte Resident Office

Message

From: LaPointe, Kevin [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=B126520197DA4FA0BD8928A00A784B23-LAPOINTE, KEVIN]
Sent: 11/20/2018 8:27:43 PM
To: Lewis, Jennifer [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d10b9dc822484c529c3bc671113b89a1-Lewis, Jennifer]
Subject: White papers 6(e) materials
Attachments: Chemours White Paper - 10.04.2018.pdf

Kevin S. LaPointe
EPA Region 4
Charlotte

To: Fisher, Mike[Fisher.Mike@epa.gov]
From: Lewis, Jennifer
Sent: Wed 12/12/2018 8:26:53 PM
Subject: Chemours Permit Shield analysis
December 12 2018 Briefing Memorandum.docx
December 12 2018 Briefing Memorandum.pdf

Hi Mike,

Enforcement/Investigatory / Ex. 7(a) / Attorney Client / Attorney Work Product / Deliberative Process / Ex. 5

Thanks,
Jennifer

To: Palmer, Leif[Palmer.Leif@epa.gov]
From: Lewis, Jennifer
Sent: Tue 8/15/2017 6:54:52 PM
Subject: Fw: Chemours - NOIs
2017-08-03 GenX CFPUA Citizen Suit Notice Letter.pdf
2017-07-28 GenX Civitas Citizen Suit Notice Letter.pdf

From: Speir, Jeffrey
Sent: Tuesday, August 15, 2017 2:16 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: RE: Chemours - Enforcement Coordination Call

Hello, all:

Please find attached the notice letters discussed on today's call, submitted on behalf of: (1) Civitas Institute, dated July 28, alleging CWA violations and (2) the Cape Fear Public Utility Authority, dated August 3, alleging CWA and RCRA violations.

-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

-----Original Appointment-----
From: Miles, James
Sent: Thursday, August 03, 2017 5:09 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: Chemours - Enforcement Coordination Call
When: Tuesday, August 15, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Personal Phone / Ex. 6

Agenda for Gen-X Update Call

--12:30 Conference Call (30 minutes)

I. HQ Discussion (15 minutes)
   a. 8/3/17 Notice of Intent to Sue Chemours and Dupont – from Cape Fear Public Utility Authority under CWA and RCRA

b. 8/9/17 EPA Call with State and Local Officials from North Carolina

c. **Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5**

II. Regional Update (15 minutes)

a. Region 4 inspection follow-up on requested information

b. Any new items to raise by Regions

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 6/29/2017 7:19:33 PM
To: LaPointe, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b126520197da4fa0bd8928a00a784b23-LaPointe, Kevin]
Subject: RE: my newest version attachment
Attachments: Chemours Company attachment 17June29 version jml rev.docx

Added Title V renewal request.

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
US EPA Region 4
Atlanta Federal Center
61 Forsyth St. SW
Atlanta, GA 30303
404-562-9518

From: LaPointe, Kevin
Sent: Thursday, June 29, 2017 2:45 PM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Subject: my newest version attachment

I was able to be more specific based on yesterday.

Kevin S. LaPointe
Resident Agent-in-Charge
U.S. EPA Criminal Investigation Division
Charlotte Resident Office

To: LaPointe, Kevin[LaPointe.Kevin@epa.gov]; Barnum, Cassandra (ENRD)[Cassandra.Barnum@usdoj.gov]; Rangarajan, Banu (USANCE)[Banu.Rangarajan@usdoj.gov]
From: Lewis, Jennifer
Sent: Tue 8/15/2017 6:19:25 PM
Subject: Notices of intent to sue
2017-08-03 GenX CFPUA Citizen Suit Notice Letter.pdf
2017-07-28 GenX Civitas Citizen Suit Notice Letter.pdf

FYI.

From: Speir, Jeffrey
Sent: Tuesday, August 15, 2017 2:16 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
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-Jeff

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460
(202) 564-0872

-----Original Appointment-----
From: Miles, James
Sent: Thursday, August 03, 2017 5:09 PM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Schulz, Susan; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; DeDora, Caroline; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Bean, Mark
Cc: Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Baptista, Chrisna; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer
Subject: Chemours - Enforcement Coordination Call
When: Tuesday, August 15, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Personal Phone / Ex. 6

Agenda for Gen-X Update Call

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c. Compliance order authority options under Enforcement/Investigatory / Ex. 7(a) / Deliberative Process / Ex. 5 requested by OCE Office Director

II. Regional Update (15 minutes)

a. Region 4 inspection follow-up on requested information

b. Any new items to raise by Regions

To: Banu Rangarajan[Banu.Rangarajan@usdoj.gov]; Cassandra Barnum[Cassandra.Barnum@usdoj.gov]; LaPointe, Kevin[LaPointe.Kevin@epa.gov]
From: Lewis, Jennifer[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: Thur 11/16/2017 11:13:19 PM (UTC)
Subject: Fwd: Chemours NPDES Permit Notice
Letter November 11-16-17.pdf
ATT00001.htm

Sent from my iPhone

Begin forwarded message:

From: "Allenbach, Becky" <Allenbach.Becky@epa.gov>
To: "Davis, Molly" <Davis.Molly@epa.gov>, "Hall, Renea" <Hall.Renea@epa.gov>, "Jones, Aaryn" <Jones.Aaryn@epa.gov>, "Janovitz, Sara" <Janovitz.Sara@epa.gov>, "Campbell-Dunbar, Shawneille" <Campbell-Dunbar.Shawneille@epa.gov>, "Mitchell, Ken" <Mitchell.Ken@epa.gov>, "Shell, Karrie-Jo" <Shell.Karrie-Jo@epa.gov>, "Schwartz, Paul" <Schwartz.Paul@epa.gov>, "Bush, William" <Bush.William@epa.gov>, "Mancusi-Ungaro, Philip" <Mancusi-Ungaro.Philip@epa.gov>, "Ghosh, Mita" <Ghosh.Mita@epa.gov>, "Lewis, Jennifer" <Lewis.Jennifer@epa.gov>
Subject: Chemours NPDES Permit Notice

Becky B. Allenbach, Chief
Grants and Drinking Water Protection Branch
Water Protection Division
EPA Region 4 – Atlanta
Office: 404-562-9687
Cell: Personal Phone / Ex. 6

CONFIDENTIALITY NOTICE: This message is intended exclusively for the individual(s) or entity(s) to whom or to which it is addressed. This communication may contain information that is proprietary, privileged, pre-decisional, confidential or otherwise legally exempt from disclosure. If you are not the named addressee, you are not authorized to read, print, retain, copy, or disseminate this message or any part of it. If you have received this message in error, please notify the sender immediately by e-mail and delete all copies of the message.

From: Culpepper, Linda [mailto:linda.culpepper@ncdenr.gov]
Sent: Thursday, November 16, 2017 4:02 PM
To: Allenbach, Becky <Allenbach.Becky@epa.gov>; Walker, Mary <walker.mary@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>
Subject: FW: NPDES Permit Notice

For our conf. call

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Culpepper, Linda

Sent: Thursday, November 16, 2017 4:00 PM
To: 'ellis.h.mcgaughy@chemours.com' <ellis.h.mcgaughy@chemours.com>
Cc: Johnson, Michael E <MICHAEL.E.JOHNSON@chemours.com>; Holman, Sheila <sheila.holman@ncdenr.gov>
Subject: NPDES Permit Notice

Forwarding the attached file.

Linda Culpepper
Interim Director
Division of Water Resources
North Carolina Department of Environmental Quality

1611 Mail Service Center
Phone: 919-707-9014

Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

To: Rangarajan, Banu (USANCE)[Banu.Rangarajan@usdoj.gov]; Barnum, Cassandra (ENRD)[Cassandra.Barnum@usdoj.gov]; Kevin LaPointe (LaPointe.Kevin@epa.gov)[LaPointe.Kevin@epa.gov]; Wood, Seth (USANCE)[Seth.Wood@usdoj.gov]
From: Lewis, Jennifer[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: Thur 10/26/2017 6:33:52 PM (UTC)
Subject: FW: Chemours - GenX Enforcement Coordination Call - TSCA CBI
2017-10-24 GenX NCDEQ Letter Not to Suspend NPDES.pdf
2017-09-08 GenX 17 CVS 580 NC Partial Consent Order.pdf
2017-10-16 GenX CFPUA Complaint (E.D.N.C.).pdf

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
US EPA Region 4
Atlanta Federal Center
61 Forsyth St. SW
Atlanta, GA 30303
404-562-9518

From: Speir, Jeffrey
Sent: Thursday, October 26, 2017 2:17 PM
To: Garvey, Mark <Garvey.Mark@epa.gov>; Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

As I mentioned on the call this afternoon, I am sending the following documents:

1. NC DEQ's October 24 letter to Chemours stating its decision not to suspend Chemours' NPDES permit;
2. NC and Chemours' September 8 Partial Consent Order, to which the document above refers; and
3. Cape Fear Public Utility Authority's October 16 complaint filed in federal district court.

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
OECA – OCE – Water Enforcement Division
1200 Pennsylvania Avenue, NW (2243-A)
Washington, DC 20460

(202) 564-0872

From: Garvey, Mark
Sent: Thursday, October 26, 2017 8:57 AM
To: Miles, James <miles.james@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Doa, Maria <Doa.Maria@epa.gov>; Star, David <star.david@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Ellis, Tony <Ellis.Tony@epa.gov>; Sullivan, Greg <Sullivan.Greg@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>; Martinez, Jeffrey <Martinez.Jeffrey@epa.gov>; King, Carol <King.Carol@epa.gov>; Anderson, Kate <Anderson.Kate@epa.gov>; Henry, Tala <Henry.Tala@epa.gov>; Allison, Rose <Allison.Rose@epa.gov>; Swan, Russell <Swan.Russell@epa.gov>; Unger, LouAnn <unger.louann@epa.gov>; Bair, Rita <bair.rita@epa.gov>; Shoven, Heather <shoven.heather@epa.gov>; Field, Stephen <Field.Stephen@epa.gov>; Schwartz, Paul <Schwartz.Paul@epa.gov>; Davis, Molly <Davis.Molly@epa.gov>; Ireland, Laurie <Ireland.Laurie@epa.gov>; Moyer, Adam <moyer.adam@epa.gov>; DeDora, Caroline <DeDora.Caroline@epa.gov>; Bean, Mark <Bean.Mark@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; Pratt, Stacie <Pratt.Stacie@epa.gov>; daw, harry <daw.harry@epa.gov>; Gorman, John <Gorman.John@epa.gov>; Klevs, Mardi <klevs.mardi@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>; Paul Buellesbach <paul.buellesbach@erg.com>; Dan-Tam Nguyen <Dan-Tam.Nguyen@erg.com>; Daryl Hudson <Daryl.Hudson@erg.com>; Schulz, Susan <Schulz.Susan@epa.gov>; Davis, Lauren O. <Davis.LaurenO@epa.gov>; Gordon, Scott <Gordon.Scott@epa.gov>; Fite, Mark <Fite.Mark@epa.gov>; George, Verne <George.Verne@epa.gov>; Bates, Keith <Bates.Keith@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Pollins, Mark <Pollins.Mark@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Bahk, Benjamin <Bahk.Benjamin@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>; Speir, Jeffrey <speir.jeffrey@epa.gov>; Collins, Charlie <collins.charlie@epa.gov>; Aubee, Catherine <Aubee.Catherine@epa.gov>; rogers, rick <rogers.rick@epa.gov>; Wilson, Jennifer <wilson.jenniferA@epa.gov>; Harris, Kimberly <harris.kimberly@epa.gov>; Clark, Jacqueline <clark.jacqueline@epa.gov>; Duchovnay, Andrew <Duchovnay.Andrew@epa.gov>; Day, Christopher <Day.Christopher@epa.gov>; Coe, Mary <Coe.Mary@epa.gov>; Ramalho, Louis <Ramalho.Louis@epa.gov>; Lewis, Jennifer <Lewis.Jennifer@epa.gov>; Baptista, Chrisna <Baptista.Chrisna@epa.gov>; Niess, Claudia <niess.claudia@epa.gov>; Spann, Tony <Spann.Tony@epa.gov>; Timsina, Gopal <Timsina.Gopal@epa.gov>; Allenbach, Becky <Allenbach.Becky@epa.gov>; Mancusi-Ungaro, Philip <Mancusi-Ungaro.Philip@epa.gov>; Bush, William <Bush.William@epa.gov>; Janovitz, Sara <Janovitz.Sara@epa.gov>; Hall, Renea <Hall.Renea@epa.gov>; Shell, Karrie-Jo <Shell.Karrie-Jo@epa.gov>; Devkota, Om <devkota.om@epa.gov>
Cc: Reinhart, Roger <Reinhart.Roger@epa.gov>; Buso, Roberto X <Buso.Roberto@epa.gov>
Subject: RE: Chemours - GenX Enforcement Coordination Call - TSCA CBI

Below is today's Agenda. For Your convenience, I'm also attaching the same items sent around last week since there will be discussion involving them.

Agenda for today's call
Roll call (5 minutes)
TSCA CBI Cleared Employees

I. Region 3 Inspection- Preliminary Impressions of Chemours at Parkersburg WV Last Week
By Lauren Davis (7 minutes)
a. CDR Updated
b. Air Monitoring
c. River Monitoring
d. PPE Issues

II. Water Enforcement
By Jeff Speir (6 minutes)
a. Decision Not to Suspend NPDES Permit
b. Ongoing Litigation (NC, CFPUA, class actions)

III. Air Emissions
By Maria Doa (4 minutes)

IV. TSCA Inspection by Region 4 Update
By Verne George (5 minutes)

V. Questions/Comments from Participants
By Everyone (4 minutes)

Mark Garvey
EPA Headquarters
Office of Civil Enforcement
Attorney
202-564-4168
garvey.mark@epa.gov

NOTE: This email and its attachments may contain confidential information, attorney-work product, enforcement sensitive material or privileged information.

-----Original Appointment-----
From: Miles, James
Sent: Friday, September 22, 2017 11:45 AM
To: Miles, James; Toney, Anthony; Doa, Maria; Star, David; Garvey, Mark; Tucker, Marlene; Ellis, Tony; Sullivan, Greg; Saenz, Diana; Martinez, Jeffrey; King, Carol; Anderson, Kate; Henry, Tala; Allison, Rose; Swan, Russell; Unger, LouAnn; Bair, Rita; Shoven, Heather; Field, Stephen; Schwartz, Paul; Davis, Molly; Ireland, Laurie; Moyer, Adam; DeDora, Caroline; Bean, Mark; Bookman, Robert; Pratt, Stacie; daw, harry; Gorman, John; Klevs, Mardi; Kemker, Carol; Denton, Loren; Paul Buellesbach; Dan-Tam Nguyen; Daryl Hudson; Schulz, Susan; Davis, Lauren O.; Gordon, Scott; Fite, Mark; George, Verne; Bates, Keith; Mitchell, Ken; Pollins, Mark; Theis, Joseph; Bahk, Benjamin; Poy, Thomas; Speir, Jeffrey; Collins, Charlie; Aubee, Catherine; rogers, rick; Wilson, Jennifer; Harris, Kimberly; Clark, Jacqueline; Duchovnay, Andrew; Day, Christopher; Coe, Mary; Ramalho, Louis; Lewis, Jennifer; Baptista, Chrisna; Niess, Claudia; Spann, Tony; Timsina, Gopal; Allenbach, Becky; Mancusi-Ungaro, Philip; Bush, William; Janovitz, Sara; Hall, Renea; Shell, Karrie-Jo; Devkota, Om
Cc: Reinhart, Roger; Buso, Roberto X
Subject: Chemours - Enforcement Coordination Call - TSCA CBI
When: Thursday, October 26, 2017 12:30 PM-1:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Conference Number/ Ex. 6

Continuing bi-weekly call through Nov.

To: James Morgan (Morgan.James@epa.gov)[Morgan.James@epa.gov]
From: Lewis, Jennifer[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: Fri 10/12/2018 5:01:14 PM (UTC)
Subject: Chemours permit
DEQp00020339.pdf

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
U.S. EPA, Region 4
Atlanta, GA
Phone: 404-562-9518
Cell: 770-548-7418

To: Fisher, Mike[Fisher.Mike@epa.gov]
From: Lewis, Jennifer
Sent: Wed 11/28/2018 5:31:48 PM
Subject: Chemours Issue
Permit Shield Analysis for Chemours .docx

Hi Mike,
Since I don't want to wait too long to get input, I'm sending you a draft of the permit shield analysis for Chemours which will be included in a more substantive legal memo.
Please weigh in if you can based on what's here. If you need more info, let me know that too. I'm adding more references to evidence but it is voluminous and I didn't want to wait.

Enforcement/Investigatory / Ex. 7(a)/ Attorney Client / Attorney Work Product / Deliberative Process / Ex. 5

Thanks
Jennifer

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 2/13/2019 3:30:02 PM
To: Mazer, Jodi [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5d8887f139204ed0ad7b7a93a9e3f02e-Jmazer02]
Subject: White paper
Attachments: Chemours White Paper - 10.04.2018.pdf

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 9/4/2018 7:34:03 PM
To: Rangarajan, Banu (USANCE) [Banu.Rangarajan@usdoj.gov]; Barnum, Cassandra (ENRD) [Cassandra.Barnum@usdoj.gov]; Kevin LaPointe (LaPointe.Kevin@epa.gov) [LaPointe.Kevin@epa.gov]
Subject: FW: Chemours lawsuit
Attachments: Cape Fear River Watch v. Chemours.pdf

From: Nagrani, Kavita
Sent: Friday, August 31, 2018 10:17 AM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Cc: Palmer, Leif <Palmer.Leif@epa.gov>
Subject: FW: Chemours lawsuit

Hi Jennifer,

Leif asked me to forward this to you. Thanks!

From: Nagrani, Kavita
Sent: Friday, August 31, 2018 9:22 AM
To: Palmer, Leif <Palmer.Leif@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: RE: Chemours lawsuit

Here it is – SELC linked to the complaint.

From: Palmer, Leif
Sent: Friday, August 31, 2018 9:17 AM
To: Nagrani, Kavita <Nagrani.Kavita@epa.gov>
Cc: Rubini, Suzanne <Rubini.Suzanne@epa.gov>; Tucker, Marlene <Tucker.Marlene@epa.gov>; Nowell, Valerie <Nowell.Valerie@epa.gov>; Ghosh, Mita <Ghosh.Mita@epa.gov>
Subject: Re: Chemours lawsuit

Thanks for being alert. Please ask Josh Grimes or Saundi to see if the complaint is available on Pacer.

Marlene — please let Mark Garvey know.

I'll forward to OGC.

Sent from my iPhone

On Aug 31, 2018, at 9:08 AM, Nagrani, Kavita <Nagrani.Kavita@epa.gov> wrote:

> Good morning,

I'm not sure if you all have seen this yet. It appears as though Cape Fear River Watch has filed a lawsuit against Chemours in the Eastern District of North Carolina on Wednesday alleging violations of the CWA and TSCA. I haven't read the complaint yet, but SELC's website (below) includes a link to the document.

https://www.southernenvironment.org/news-and-press/news-feed/groups-sue-chemours-in-federal-court-to-stop-pfas-genx-pollution

---

Kavita K. Nagrani, Associate Regional Counsel and Special Assistant
to the Regional Counsel and Deputy Regional Counsel
U.S. Environmental Protection Agency, Region 4
Office of Regional Counsel
61 Forsyth Street, S.W.
Atlanta, Georgia 30303
Ph: (404) 562-9697
Fax: (404) 562-9486

CONFIDENTIALITY NOTICE: This message is being sent by or on behalf of an attorney. It is intended exclusively for the individual(s) or entity(ies) to whom or to which it is addressed. This communication may contain information that is proprietary, privileged, or confidential or otherwise legally exempt from disclosure. If you are not the named addressee, you are not authorized to read, print, retain, copy, or disseminate this message or any part of it. If you have received this message in error, please notify the sender immediately by email and delete all copies of the message.

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 5/24/2018 7:16:04 PM
To: Banu.Rangarajan@usdoj.gov; Cassie Barnum [Cassandra.Barnum@usdoj.gov]; LaPointe, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b126520197da4fa0bd8928a00a784b23-LaPointe, Kevin]; Seth.Wood@usdoj.gov
Subject: Fwd: Citizen Suit Notice (CWA/TSCA)
Attachments: CapeFearRiverWatch v Chemours_NC.doc; ATT00001.htm; CapeFearRiverWatch v Chemours_NC.pdf; ATT00002.htm

You probably already have this but just in case...

Sent from my iPhone

Begin forwarded message:

From: "Miles, James" <miles.james@epa.gov>
To: "Lewis, Jennifer" <Lewis.Jennifer@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)

From: Sullivan, Greg
Sent: Friday, May 18, 2018 7:10 PM
To: Pollins, Mark <Pollins.Mark@epa.gov>; Denton, Loren <Denton.Loren@epa.gov>
Cc: Kelley, Rosemarie <Kelley.Rosemarie@epa.gov>; Theis, Joseph <Theis.Joseph@epa.gov>; Miles, James <miles.james@epa.gov>; Saenz, Diana <Saenz.Diana@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

FYI

From: Kemker, Carol
Sent: Friday, May 18, 2018 6:10 PM
To: Sullivan, Greg <Sullivan.Greg@epa.gov>; Miles, James <miles.james@epa.gov>
Cc: Banister, Beverly <Banister.Beverly@epa.gov>; Mitchell, Ken <Mitchell.Ken@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>; Bookman, Robert <Bookman.Robert@epa.gov>; George, Verne <George.Verne@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

Greg and James,

Wanted to make sure you all have a copy of the NOIs. Let's discuss the timing for the case development.

Carol

From: Toney, Anthony
Sent: Friday, May 18, 2018 12:32 PM
To: Bookman, Robert <Bookman.Robert@epa.gov>; Kemker, Carol <Kemker.Carol@epa.gov>; Mitchell,

Ken <Mitchell.Ken@epa.gov>; Banister, Beverly <Banister.Beverly@epa.gov>
Cc: George, Verne <George.Verne@epa.gov>
Subject: FW: Citizen Suit Notice (CWA/TSCA)
Importance: High

FYI.

From: Bullock, Patricia
Sent: Friday, May 18, 2018 9:45 AM
To: Moore, Yvonne <Moore.Yvonne@epa.gov>; Jones, Laurie <JONES.LAURIE@EPA.GOV>
Cc: O'Lone, Dan <Olone.Dan@epa.gov>; Toney, Anthony <Toney.Anthony@epa.gov>
Subject: Citizen Suit Notice (CWA/TSCA)
Importance: High

Attached are NOIs for both CWA and TSCA statues (hard copies were forwarded via interoffice mail). Please review and forward back via word document and interoffice mail by due date.

Thank you,

Pat

To: James Morgan (Morgan.James@epa.gov)[Morgan.James@epa.gov]
From: Lewis, Jennifer[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: Tue 11/27/2018 5:56:34 PM (UTC)
Subject: Enforcement/Investigatory / Ex. 7(a) / Attorney-Client / Attorney Work Product / Ex. 5

Enforcement/Investigatory / Ex. 7(a) / Attorney-Client / Attorney Work Product / Ex. 5

Needs more fleshing out but any input is appreciated. Unfortunately, need it ASAP if you have the time.

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
U.S. EPA, Region 4
Atlanta, GA
Phone: 404-562-9518
Cell: 770-548-7418

To: Rubini, Suzanne[Rubini.Suzanne@epa.gov]; Palmer, Leif[Palmer.Leif@epa.gov]
From: Lewis, Jennifer
Sent: Tue 2/12/2019 4:35:52 PM
Subject: Chemours legal memo
Chemours Legal Memo 2-10-18.docx

FWIW, here's a draft. Please comment as soon as you can. I need to get this up to Mike sooner rather than later and I suspect it needs a lot of work.

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
U.S. EPA, Region 4
Atlanta, GA
Phone: 404-562-9518
Cell: 770-548-7418

Message

From: Lewis, Jennifer [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: 8/15/2018 5:44:27 PM
To: Rangarajan, Banu (USANCE) [Banu.Rangarajan@usdoj.gov]; Cassie Barnum [cassandra.barnum@usdoj.gov]
Subject: Draft Report
Attachments: Toxicology report.pdf

Here you go.

To: Mike Fisher (Fisher.Mike@epa.gov)[Fisher.Mike@epa.gov]
From: Lewis, Jennifer[/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D10B9DC822484C529C3BC671113B89A1-LEWIS, JENNIFER]
Sent: Tue 12/18/2018 4:19:40 PM (UTC)
Subject: FW: White papers 6(e) materials
Chemours White Paper - 10.04.2018.pdf

FYI. Also, Banu asked that we mark our memo's as drafts. She forgot to do so before she transmitted it.
Thanks
Jennifer

Jennifer M. Lewis
Senior Regional Criminal Enforcement Counsel
U.S. EPA, Region 4
Atlanta, GA
Phone: 404-562-9518
Cell: 770-548-7418

From: LaPointe, Kevin
Sent: Tuesday, November 20, 2018 3:28 PM
To: Lewis, Jennifer <Lewis.Jennifer@epa.gov>
Subject: White papers 6(e) materials

Kevin S. LaPointe
EPA Region 4
Charlotte

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

NOV 26 2018

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Andrew S. Hartten
Principal Project Manager-Corporate Remediation
The Chemours Company
1007 Market Street, #3094
Wilmington, DE 19899

VIA FEDEX

Re: Information Request pursuant to Section 308 of the Clean Water Act

Dear Mr. Hartten:

Pursuant to Section 308 of the Clean Water Act (CWA), 33 U.S.C. § 1318, the U.S. Environmental Protection Agency hereby requests that the Chemours Company provide the information set forth in Enclosure D ("Information Request Questions"). Chemours is required to respond to this information request within 30 days of physical receipt of this letter. Please direct Chemours' response to:

Charlie A. Collins, II
Environmental Scientist
U.S. Environmental Protection Agency
Office of Civil Enforcement
Mail Code 2243-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Chemours' response should specifically reference the particular section and item number of the request and should be organized for the purpose of clarity. In addition, all information submitted must be accompanied by the following certification signed by a responsible Chemours official in accordance with 40 C.F.R. § 122.22:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on any personal knowledge I may have and my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Failure to comply with this information request may result in enforcement proceedings under Section 309 of the CWA, 33 U.S.C. § 1319, which could result in the judicial imposition of civil or criminal penalties or the administrative imposition of civil penalties. In addition, there is potential criminal liability for the falsification of any response to the requested information.

Chemours shall preserve, until further notice, all records (either written or electronic), which exist at the time of receipt of this letter that relate to any of the matters set forth in this letter. The term "records" shall be interpreted in the broadest sense to include information of every sort. The response to this information request shall include assurance that these record protection provisions were put into place, as required. No such records shall be disposed of until written authorization is received from EPA.

Chemours cannot withhold from EPA what it may consider to be confidential business information. However, Chemours has the discretion to assert, at the time of submission, a claim of business confidentiality for part or all of the requested information by following the requirements at 40 C.F.R. § 2.203(b). EPA will not disclose any information covered by such a claim except as authorized by 40 C.F.R. Part 2, Subpart B. If no claim of business confidentiality is received with Chemours' submission, EPA may make the information available to the public without further notice. All confidentiality claims are subject to EPA verification.

If you have questions regarding this notice and information request, please contact Jeffrey Speir (202-564-0872; speir.jeffrey@epa.gov) or me (202-564-4001; pollins.mark@epa.gov).

Sincerely,

Mark Pollins, Director
Water Enforcement Division
Office of Civil Enforcement

Enclosures

Enclosure A:
Instructions

1. Identify the person(s) responding to each question or subpart of a question in this Information Request.

2. Provide a separate narrative response to each and every question and subpart of a question set forth in this Information Request.

3. Precede each answer with the text and the number of the question and its subpart to which the answer corresponds.

4. Each document submitted must contain a notation indicating the question and subpart of the question to which it is responsive.

5. In answering each Information Request question and subpart thereto, identify all documents and persons consulted, examined, or referred to in the preparation of each response and provide true and accurate copies of all such documents.

6. If information not known or not available to you as of the date of submission of a response to this Information Request should later become known or available to you, you must supplement your response to the EPA. Moreover, should you find at any time after the submission of your response that any portion of the submitted information is false or misrepresents the truth, you must notify the EPA thereof as soon as possible.

7. Where specific information has not been memorialized in a document, but is nonetheless responsive to a question, respond to the question with a written response.

8. Please provide all information in your possession that is responsive to this Information Request, regardless of whether the response relates to your activities or the activities of another entity.

9. If information responsive to this Information Request is not in your possession, custody, or control, then identify the person(s) from whom such information may be obtained.

10. If you have reason to believe that there may be persons able to provide a more detailed or complete response to any question or who may be able to provide additional responsive documents, identify such persons and the additional information or documents that they may have.

11. Please provide all documents in an electronic format compatible with PDF.

ED_002003W_00000806-00003

12. Please provide any spreadsheet information in electronic format compatible with MS Excel.

13. If any question relates to activities undertaken by entities other than the recipient of this Information Request, and to the extent that you have information pertaining to such activities, provide such information for each entity.

ED_002003W_00000806-00004

Enclosure B:
Definitions

1. All terms not defined herein shall have their ordinary meanings, unless such terms are defined in the Clean Water Act, or its implementing regulations, in which case the statutory or regulatory definitions shall control.

2. The term "Chemours" shall mean the Chemours Company.

3. The term "PFAS" shall mean per- and polyfluoroalkyl substance(s), including, but not limited to: "GenX" compounds (CAS # 13252-13-6, CAS # 62037-80-3, C3 Dimer Acid, C3 Dimer Acid Fluoride, C3 Dimer Acid Ammonium Salt, HFPO-Dimer Acid, HFPO-Dimer Acid Ammonium Salt); Perfluorobutanoate (PFBA); Perfluoro-n-pentanoic acid (PFPeA); Perfluorohexanoic acid (PFHxA); Perfluoroheptanoic acid (PFHpA); Perfluorooctanoic acid (PFOA); Perfluorononanoic acid (PFNA); Perfluorodecanoic acid (PFDA); Perfluoroundecanoic acid (PFUnA); Perfluorododecanoic acid (PFDoA); Perfluorotridecanoic acid (PFTriA); Perfluorotetradecanoic acid (PFTeA); Perfluorobutanesulfonic acid (PFBS); Perfluorohexanesulfonic acid (PFHxS); Perfluorooctanesulfonic acid (PFOS); Perfluorooctanesulfonamide (PFOSA); PFESA Byproduct 1 (CAS # 29311-67-9); PFESA Byproduct 2 (CAS # 749836-20-2); PFMOAA (CAS # 674-13-5); PFO2HxA (CAS # 39492-88-1); PFO3OA (CAS # 39492-89-2).

4. The term "GenX" shall mean the GenX Technology Processing Aid (both the ammonium salt and its free acid version) and the chemicals identified by CAS # 13252-13-6 or CAS # 62037-80-3 or by any one of the following names C3, C3 Dimer Acid, C3 Dimer Acid Fluoride, C3 Dimer Acid Ammonium Salt, HFPO, HFPO-Dimer Acid, HPFO-Dimer Acid Fluoride, HFPO-Dimer Acid Ammonium Salt.

5. The terms "and" and "or" shall be construed either disjunctively or conjunctively as necessary to bring within the scope of this Information Request any information which might otherwise be construed outside its scope.

6. The term "discharge" or "discharge of pollutants" shall mean any action within the meaning of these terms, as defined at Section 502 of the CWA, 33 U.S.C. § 1362, and all regulations promulgated thereunder.

7. The term "identify" means, with respect to a natural person, to set forth the person's name, job title, position or business, business address and business telephone number.

8. The term "identify" means, with respect to a document, to provide its customary business description, its date, its number if any (invoice or purchase order number), the identity of the author, addressee and/or recipient, and substance of the subject matter.

9. The term "identify" means, with respect to a corporation, partnership, business trust or other association or business entity (including a sole proprietorship), to set forth its full name, address, legal form (e.g., corporation, partnership, etc.), organization, if any, and a brief description of its business.

10. The term "You" and "Your" shall mean Chemours and/or any of its agents, employees or contractors.

11. The term "NPDES" or "NPDES Permit" shall mean the National Pollutant Discharge Elimination System permit issued pursuant to the Clean Water Act.

12. The term "stormwater" shall mean stormwater runoff, snow melt runoff, and surface runoff and drainage.

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Enclosure C:
Confidential Business Information

You may assert a business confidentiality claim covering all or part of the information you provide in response to this Information Request for any business information entitled to confidential treatment under Section 308(b) of the CWA, 33 U.S.C. § 1318, and 40 C.F.R. Part 2, subpart B. Under Section 308(b) of the CWA, you are entitled to confidential treatment of information that would divulge methods or processes entitled to protection as trade secrets. Under 40 C.F.R. Part 2, subpart B, business confidentiality means "the concept of trade secrecy and other related legal concepts which give (or may give) a business the right to preserve the confidentiality of business information and to limit its use or disclosure by others in order that the business may obtain or retain business advantages it derives from its rights in the information." 40 C.F.R. § 2.201(e).

Information covered by a claim of business confidentiality will be disclosed by the EPA only to the extent, and by means of the procedures, set forth in Section 308(b) of the CWA and 40 C.F.R. Part 2, subpart B. EPA will construe your failure to furnish a business confidentiality claim with your response to this Information Request as a waiver of that claim, and the information may be made available to the public without further notice to you.

To assert a business confidentiality claim, you must place on (or attach to) all information you desire to assert as business confidential either a cover sheet, stamped or typed legend, or other suitable form of notice employing language such as "trade secret," "proprietary," or "company confidential" at the time you submit your response to this Information Request. Allegedly confidential portions of otherwise non-confidential documents should be clearly identified and may be submitted separately to facilitate identification and handling by the EPA. You should indicate if you desire confidential treatment only until a certain date or until the occurrence of a certain event.

The criteria the EPA will use in determining whether material you claim as business confidential is entitled to confidential treatment are set forth at 40 C.F.R. §§ 2.208 and 2.301. These regulations provide, among other things, that you must satisfactorily show that: (1) the information is within the scope of business confidentiality as defined at 40 C.F.R. § 2.201(e), (2) that you have taken reasonable measures to protect the confidentiality of the information and that you intend to continue to do so, (3) the information is not and has not been reasonably obtainable by legitimate means without your consent, and (4) the disclosure of the information is likely to cause substantial harm to your business competitive edge. *See* 40 C.F.R. §§ 2.208 (a)-(e). Effluent data, as defined at 40 C.F.R. § 2.302(a)(2), is expressly not entitled to confidential treatment under 40 C.F.R. Part 2, subpart B. *See* 33 U.S.C. § 1318(b); 40 C.F.R. § 2.302(e). If you assert a claim of business confidentiality in connection with information and documents forwarded in response to this Information Request, in accordance with 40 C.F.R. § 2.204(e)(4), the EPA is requesting that you answer the following requests with respect to any information or document for which you assert a claim of business confidentiality:

1. What specific portions of the information are allegedly to be entitled to confidential treatment? Specify by page, paragraph, and sentence when identifying the information

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subject to your claim.

2. For what period of time do you request that the information be maintained as confidential (*e.g.*, until a certain date, until the occurrence of a specified event, or permanently)? If the occurrence of a specific event will eliminate the need for confidentiality, specify that event. Additionally, explain why the information should be protected for the time period you have specified.

3. What measures have you taken to protect the information claimed as confidential from undesired disclosure? Have you disclosed the information to anyone other than a governmental body or someone who is bound by an agreement not to disclose the information further? If so, why should the information still be considered confidential?

4. Is the information contained in any publicly available material such as the Internet, publicly available databases, promotional publications, annual reports or articles? Is there any means by which a member of the public could obtain access to the information? Is the information of a kind that you would customarily not release to the public?

5. Has any governmental body made a determination as to the confidentiality of the information? If so, please attach a copy of the determination.

6. For each category of information claimed as confidential, explain with specificity whether disclosure of the information is likely to result in substantial harm to your competitive position. Explain the specific nature of that harm, why they should be viewed as substantial, and the causal relationship between disclosure and such harmful effect. How could your competitors make use of this information to your detriment?

7. Is there any other explanation you deem relevant to the EPA's determination of your business confidentiality claim that is not covered in the preceding requests? If so, you may provide such additional explanation.

You must furnish comments to the above requests concurrent with your response to this Information Request if you have claimed any information as business confidential. *See* 40 C.F.R. § 2.204(e)(2). Pursuant to 40 C.F.R. § 2.205(b)(2), you may request an extension of this deadline.

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The EPA will construe your failure to furnish timely comments as a waiver of your confidentiality claim, consistent with 40 C.F.R. § 2.204(e)(1). Please submit your comments to:

Jeffrey Speir
Attorney-Adviser
U.S. Environmental Protection Agency
Office of Civil Enforcement
Mail Code 2243-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Pursuant to 40 C.F.R. § 2.205(c), you are hereby advised that information you submit as part of your comments may be entitled to confidential treatment if, when it is received by the EPA, it is marked in accordance with 40 C.F.R. § 2.203(b). As required by 40 C.F.R. § 2.204(e)(6), you may assert a business confidentiality claim covering all or part of your response to these requests, as provided in 40 C.F.R. § 2.203(b). Information covered by such a business confidentiality claim will be disclosed by the EPA only to the extent, and by means of the procedures, set forth in Section 308(b) of the CWA and 40 C.F.R. Part 2. The EPA will construe the failure to furnish a confidentiality claim with your comments as a waiver of that claim, and the information may be made available to the public without further notice to you.

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Enclosure D:
Information Request Questions

In answering each question below and subpart thereto, identify all documents consulted, examined, or referred to in the preparation of each response and provide true and accurate copies of all such documents. In answering each question below and subpart thereto, identify each PFAS specifically (e.g., PFOA), and not PFAS generally.

1. Identify the person to contact regarding your response, including title, address and phone number.

2. Identify all facilities owned and/or operated by Chemours that manufacture, receive, and/or process PFAS.
    a. For each such facility, identify the specific PFAS that are manufactured, received, and/or processed.
    b. For each such facility, identify any pollution controls currently installed to treat PFAS.
    c. For each such facility that receives PFAS, identify the amounts of PFAS that are received.
    d. For each such facility that receives PFAS, identify the method of transport for such receipt.

3. Identify all facilities, not owned or operated by Chemours, to which Chemours has distributed PFAS for further processing, use, treatment, or disposal.
    a. For each such facility, identify the specific PFAS that are distributed.
    b. For each such facility, identify the amounts of PFAS that are distributed.
    c. For each such facility, identify the method of transport for such distribution.

4. Identify each facility owned and/or operated by Chemours that currently discharges or has discharged, released, spilled, or leaked at any time in the past PFAS to "navigable waters," as that term is defined in Section 502 of the CWA and applicable regulations.

5. Identify all facilities owned and/or operated by Chemours that have NPDES permit conditions for PFAS discharges, NPDES permit limitations for PFAS discharges, or any authorization to discharge PFAS. For each such facility, identify specifically which PFAS are covered by such NPDES permit conditions, NPDES permit limitations, or authorizations to discharge. Further, identify the substantive coverage provided in the NPDES permit conditions, NPDES permit limitations, or authorizations to discharge.

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6. For the Washington Works facility in West Virginia and its environs, since January 1, 2013, please provide:
    a. With respect to "Outlet 002" as designated in NPDES Permit WV0001279, information on GenX in effluent discharged through "Outlet 002" to the Ohio River, including:
        i. A description of the discharge of any level of GenX through "Outlet 002;"
        ii. Sampling results showing any level of GenX in the discharge through "Outlet 002;"
        iii. Monitoring results showing any level of GenX in the discharge through "Outlet 002;" and
        iv. A description of the starting (and ending, if applicable) dates of discharge of any level of GenX through "Outlet 002."

    b. With respect to "Outlet 005" as designated in NPDES Permit WV0001279, information on GenX in effluent discharged through "Outlet 005" to the Ohio River, including:
        i. A description of the discharge of any level of GenX through "Outlet 005;"
        ii. Sampling results showing any level of GenX in the discharge through "Outlet 005;"
        iii. Monitoring results showing any level of GenX in the discharge through "Outlet 005;" and
        iv. A description of the starting (and ending, if applicable) dates of discharge of any level of GenX through "Outlet 005."

    c. With respect to "Outlet 002" as designated in NPDES Permit WV0001279, information on PFAS other than GenX in effluent discharged through "Outlet 002" to the Ohio River, including:
        i. A description of the discharge of any level of any PFAS through "Outlet 002;"
        ii. Sampling results showing any level of any PFAS in the discharge through "Outlet 002;"
        iii. Monitoring results showing any level of any PFAS in the discharge through "Outlet 002;" and
        iv. A description of the starting (and ending, if applicable) dates of discharge of any level of any PFAS through "Outlet 002."

    For each answer to subquestion i. through subquestion iv., above, specify the particular PFAS analyte identified and, for subquestion ii. and subquestion iii., the resulting level measured or detected.

    d. With respect to "Outlet 005" as designated in NPDES Permit WV0001279, information on PFAS other than GenX in effluent discharged through "Outlet 005" to the Ohio River, including:

i. A description of the discharge of any level of any PFAS through "Outlet 005;"
ii. Sampling results showing any level of any PFAS in the discharge through "Outlet 005;"
iii. Monitoring results showing any level of any PFAS in the discharge through "Outlet 005;" and
iv. A description of the starting (and ending, if applicable) dates of discharge of any level of any PFAS through "Outlet 005."

For each answer to subquestion i. through subquestion iv., above, specify the particular PFAS analyte identified and, for subquestion ii. and subquestion iii., the resulting level measured or detected.

e. Information on PFAS in effluent discharged through outlets that discharge non-contact cooling water, stormwater, groundwater, wastewater, or pump seal water (i.e., "Outlet 001," "Outlet 003," "Outlet 006," "Outlet 007," "Outlet 011," "Outlet 013," "Outlet 016," "Outlet 019," "Outlet 022," "Outlet 023," "Outlet 025," "Outlet 026," "Outlet 028," "Outlet 030," "Outlet 031," "Outlet 032," "Outlet 033," "Outlet 034" and "Outlet 036," as designated in NPDES Permit WV0001279) to the Ohio River, Page Run, or Coal Hollow, including:
   i. A description of the discharge of any level of any PFAS through such outlets;
   ii. Sampling results showing any level of any PFAS in the discharge through such outlets;
   iii. Monitoring results showing any level of any PFAS in the discharge through such outlets; and
   iv. A description of the starting (and ending, if applicable) dates of discharge of any level of any PFAS through such outlets.

   For each answer to subquestion i. through subquestion iv., above, specify the particular PFAS analyte identified and, for subquestion ii. and subquestion iii., the resulting level measured or detected.

f. Discharge Monitoring Reports showing any level of any PFAS in effluent discharged from any outlet at the facility.

g. Information on whether and how PFAS are discharged, released, spilled, or leaked through pathways not specifically identified in NPDES Permit WV0001279 (e.g., via channelized stormwater flows, terra cotta pipes, abandoned ditches, unlined former outfalls, erosion channels, or other runoff points) to the Ohio River, Page Run, or Coal Hollow, including:
   i. A description of the nature of such discharge, release, spill, or leak, containing any level of any PFAS;
   ii. Sampling results showing any level of any PFAS in such discharges, releases, spills, or leaks;

iii. Monitoring results showing any level of any PFAS in such discharges, releases, spills, or leaks; and
iv. The starting (and ending, if applicable) dates of discharges, releases, spills, or leaks containing any level of any PFAS.

For each answer to subquestion i. through subquestion iv., above, specify the particular PFAS analyte identified and, for subquestion ii. and subquestion iii., the resulting level measured or detected.

h. Information on whether and how air emissions from the facility contribute to any level of any PFAS in groundwater or surface water, including reports of sampling provided to the West Virginia Department of Environmental Protection.

i. All analytical results of groundwater samples collected on- and off-site by Chemours for the purpose of determining PFAS contamination, including results from all wells (specifying each individual well), whether or not such well is currently in service.

For each on-site sampling result:

i. State whether the well was in service at the time of sampling;
ii. State whether the sample was taken before or after treatment; and
iii. State whether the sample has been blended with water from a different location or source.

For each off-site sampling result:

i. State the latitude and longitude or address for each result.

j. Information on treatment utilized to reduce or eliminate PFAS in groundwater or surface water.

k. Information on disposal of PFAS to groundwater or surface water.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 2 7 2018

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

Mr. Andrew S. Hartten
Principal Project Manager-Corporate Remediation
The Chemours Company
1007 Market Street, #3094
Wilmington, DE 19899

Re: Information Request pursuant to Section 308 of the Clean Water Act

Dear Mr. Hartten:

Pursuant to Section 308 of the Clean Water Act (CWA), 33 U.S.C. § 1318, the U.S. Environmental Protection Agency hereby requests that the Chemours Company provide the information set forth in Enclosure D ("Information Request Questions"). Chemours is required to respond to this information request within 30 days of receipt of this letter. Please direct Chemours' response to:

Charlie A. Collins, II
Environmental Scientist
U.S. Environmental Protection Agency
Office of Civil Enforcement
Mail Code 2243-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Chemours' response should specifically reference the particular section and item number of the request and should be organized for the purpose of clarity. In addition, all information submitted must be accompanied by the following certification signed by a responsible Chemours official in accordance with 40 C.F.R. § 122.22:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on any personal knowledge I may have and my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Failure to comply with this information request may result in enforcement proceedings under Section 309 of the CWA, 33 U.S.C. § 1319, which could result in the judicial imposition of civil or criminal penalties or the administrative imposition of civil penalties. In addition, there is potential criminal liability for the falsification of any response to the requested information.

Chemours shall preserve, until further notice, all records (either written or electronic), which exist at the time of receipt of this letter that relate to any of the matters set forth in this letter. The term "records" shall be interpreted in the broadest sense to include information of every sort. The response to this information request shall include assurance that these record protection provisions were put into place, as required. No such records shall be disposed of until written authorization is received from EPA.

Chemours cannot withhold from EPA what it may consider to be confidential business information. However, Chemours has the discretion to assert, at the time of submission, a claim of business confidentiality for part or all of the requested information by following the requirements at 40 C.F.R. § 2.203(b). EPA will not disclose any information covered by such a claim except as authorized by 40 C.F.R. Part 2, Subpart B. If no claim of business confidentiality is received with Chemours' submission, EPA may make the information available to the public without further notice. All confidentiality claims are subject to EPA verification.

If you have questions regarding this notice and information request, please contact Jeffrey Speir (202-564-0872; speir.jeffrey@epa.gov) or me (202-564-4001; pollins.mark@epa.gov).

Sincerely,

Mark Pollins, Director
Water Enforcement Division
Office of Civil Enforcement

Enclosures