SIMON V. KINSELLA
E-MAIL: [redacted]
[redacted]
WAINSCOTT, N. Y. 11975
M [redacted]

March 26, 2018

Supervisor Peter Van Scoyoc
Town of East Hampton
159 Pantigo Road
East Hampton, NY 11937

Re: Town Drinking Water Contamination

Dear Supervisor Van Scoyoc

During your inaugural address on January 2, 2018, you spoke reassuringly about many issues, one of which was the quality of drinking water within the Town of East Hampton –

I believe that foremost among them is protecting and improving our water quality. We must continue to be vigilant in protecting our drinking water resources. The water that we depend on is under foot. We must tread lightly and be mindful of the fact that what we do on the land can have a direct and significant impact on the quality of our water.

I hope you meant what you said and take substantive action to protect the health and well-being of Town residents, especially those living in Wainscott, by restoring our drinking water so that we may drink it.

As you are aware, I have been pushing since December 2016 for the Town Board to ensure actively residents' access to clean drinking water. I started by giving testimony at a New York State Senate and Assembly Health and Environmental Conservation Committees' hearing. These hearings resulted in the publication of the Hannon Report in January 2017 which, *inter alia*, identified perfluorinated compound (PFC) contaminants in drinking water supplies near airports on Long Island as a cause for great concern.

Suffolk County Department of Health Services (SCDHS) knew of the potential dangers posed by PFC contaminants enough to test the public supply wells near East Hampton Airport in January 2017, but at the time it failed to test private drinking water wells despite knowing that ninety percent of residents living in Wainscott use private wells for their drinking water.

<u>Water Quality Reports for PFC Contamination</u>

Earlier this month I received from SCDHS two hundred and eighty four (284) laboratory test results for drinking-water samples taken from wells within Wainscott. To verify their authenticity, a small selection of the laboratory test results were compared to those test results that were mailed directly to Wainscott residents (by SCDHS). The sample laboratory test results were identical.

PFC Contamination and Property Valuations

Some people argue that PFC contamination of our drinking-water supply should not be made public for fear of negatively impacting property valuations. This may be true, but for the survey area within Wainscott already having been widely published by SCDHS and the Town of East Hampton. By writing this letter, I do not believe property valuations will plummet any more as a result. I further argue that to permit the current problem of PFC contamination to linger without it being aggressively resolved will do far greater damage to property valuations. But the worst of all possible outcomes is for a resident of Wainscott to end up in hospital suffering from cancer or liver damage caused by long-term exposure to PFC contamination. I, therefore, believe that for issue of contamination of our drinking water supply to be adequately addressed, it has to be identified in all its ugliness and resolved swiftly. Had SCDHS and the Town of East Hampton acted decisively when it first came to their attention in January 2017, there would be no need for me to write this letter now.

Analysis of Water Quality Test Results Received from SCDHS

On August 14, 2017, SCDHS commenced sampling private drinking-water wells in Wainscott. Since that time, SCDHS has been testing private drinking-water wells for chemical compounds with profile characteristics of synthetic firefighting foams known as Aqueous Film-Forming Foams (AFFFs). It is well established that past uses of AFFFs have contaminated aquifers used for drinking-water with many long-chain perfluorinated compound (PFC) contaminates, including the following –

- PFOA Perfluorooctanoic Acid 8-Carbon (C8)
- PFOS Perfluorooctanesulfonic Acid 8-Carbon (C8)
- PFNA Perfluorononanoic Acid 9-Carbon (C9)
- PFHxS Perfluorohexansulfonic Acid 6-Carbon (C6)
- PFHpA Perfluoroheptanoic Acid 7-Carbon (C7)
- PFBS Perfluorobutanesulfonic Acid 4-Carbon (C4)

Of the laboratory results received for samples taken from private drinking-water wells in Wainscott, PFC contamination was detected in four hundred and forty-nine (449) instances, representing twenty six percent (26%) of the total. Table 1 (below) details the breakdown per PFC contaminant of the four hundred and forty-nine (449) instances.

Table 1

PFC Contaminant	No. of Instances where PFC Detected	P'centage of Total
Perfluorooctanoic Acid (PFOA)	110	24%
Perfluorohexansulfonic Acid (PFHxS)	96	21%
Perfluorooctanesulfonic Acid (PFOS)	86	19%
Perfluoroheptanoic Acid (PFHpA)	72	16%
Perfluorobutanesulfonic Acid (PFBS)	57	13%
Perfluorononanoic Acid (PFNA)	28	6%
Total	449	100%

Each instance of PFC contamination was then classified by the severity of its contamination (expressed in parts per trillion) as follows –

Extreme contamination		> 100 ppt
High contamination (above EPA PFOS/PFOA limit)	70 ppt	to 99 ppt
Significant contamination (above NJ PFNA limit)	10 ppt	to 69 ppt
Low level contamination	< 10 ppt	

Table 2 breaks down the levels of severity of PFC contamination for each contaminant (i.e. PFNA, PFOS, etc.). For example, seven percent (7%) of drinking-water samples had detectable levels of Perfluorononanoic Acid (PFNA) in extreme concentrations (i.e. greater than one hundred parts per trillion or 100 ppt).

Table 2

Contamination Levels per Contaminant					
Contaminant	Extreme	High	Significant	Low	Total
PFNA	7%		21%	71%	100%
PFOS	6%	5%	27%	63%	100%
PFHxS	5%	9%	32%	53%	100%
PFOA		4%	23%	74%	100%
PFBS		2%	5%	93%	100%
PFHpA			31%	69%	100%

Table 3 breaks down the levels of severity of PFC contamination into each contaminant (i.e. PFNA, PFOS, etc.). For example, forty two percent (42%) of drinking-water samples with extreme concentrations (i.e. greater than one hundred parts per trillion or 100 ppt) were contaminated with Perfluorohexansulfonic Acid (PFHxS).

Table 3

Contamination Levels per Classification				
Contaminant	Extreme	High	Significant	Low
PFHxS	42%	50%	28%	17%
PFOS	42%	22%	21%	17%
PFOA		22%	23%	26%
PFNA	17%		5%	6%
PFBS		6%	3%	17%
PFHpA			20%	16%
Total	100%	100%	100%	100%

Maps illustrating the streets within the survey area in Wainscott where extreme and high levels of PFC contamination were detected for each contaminant (i.e. PFOS, PFOA, etc.) can be found at the end of this letter (see Appendices A to F). Please note that the laboratory test results I received for PFC contamination only identify the street name, not the house number. The contamination, therefore, may not necessarily have occurred exactly at the location where it is marked on the map.

It should also be noted that of the two hundred and eighty four (284) test results, there were no test results for properties owned by the Town of East Hampton. Although these properties are arguably the most susceptible to PFC contamination (due to their location), the laboratory results for Town-owned property remains conspicuously absent.

Individual Water Quality Test Results with Extreme Contamination

On August 29, 2017, SCDHS tested three drinking-water samples taken from wells immediately south of and adjacent to a former sand mine in the heart of Wainscott which is now a multi-use industrial site ("Industrial Pit"). All three samples showed extremely high contamination levels of Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA). The laboratory test results (see Appendix G) for combined PFOS/PFOA contamination are 168 ppt, 168 ppt and 162 ppt. Each of these test results is more than double the EPA Drinking Water Health Advisory for combined PFOA/PFOS contamination of 70 ppt (see Appendix H), and more than eight-times the Health Advisory Level of 20 ppt (for combined PFOS/PFOA) issued in Vermont in 2017. The Vermont Health Advisory further warns that where combined concentrations of PFOA and PFOS exceed 20 ppt, residents should not use their "water for drinking, food preparation, cooking, brushing teeth, preparing baby formula, or any other manner of ingestion. Do not use water containing PFOA and PFOS over 20 ppt to water your garden. The PFOA and PFOS could be taken up by the vegetables" (see Appendix I).

In each of these three drinking-water test results taken on August 29, 2017, the PFOS contamination was higher than the PFOA contamination. The three contamination levels for PFOS are 124 ppt, 124 ppt and 117 ppt (see Appendix G). For comparison, these levels are more than nine-times the recommended New Jersey Health-based Maximum Contamination Level (MCL) of 13 ppt (please see Appendix J) and more than four-times the Minnesota guidance value of 27 ppt (see Appendix K). The less significant contaminant of the two contaminants, PFOA, had detectible levels of 44 ppt, 44 ppt and 45 ppt respectively. These contamination levels are all more than three-times the New Jersey Health-based MCL of 14 ppt (see Appendix L) and all exceed the Minnesota guidance value of 35 ppt (see Appendix M).

On August 14, 2017, SCDHS tested six drinking-water samples taken from wells immediately to the east and adjacent to the Industrial Pit. Of the six samples, two had extremely high concentrations of Perfluorononanoic Acid (PFNA). The recorded PFNA contamination levels are 672 ppt and 637 ppt (see Appendix N). For comparison (neither the EPA nor New York State regulates PFNA), these levels are more than sixty-times the New Jersey interim specific ground water quality criterion for PFNA of 10 ppt established in October 2015 (see Appendix O), and more than nine-times the Connecticut (CT) Drinking Water Action Level of 70 ppt. The CT Drinking Water Action Level advises its residents not to bath or shower where levels are greater than 3-times 70 ppt (see Appendix P). Regardless as to the regulatory standard chosen for comparison, PFNA contamination levels of 672 ppt and 637 ppt in the centre of Wainscott are sufficient grounds for serious concern.

On August 29, 2017, the three drinking-water samples taken from wells immediately south of and adjacent to the Industrial Pitt also contained extremely high concentration levels of Perfluorohexansulfonic Acid (PFHxS) contamination (see Appendix G). The recorded concentration levels of PFHxS contamination are – 224 ppt, 218 ppt and 218 ppt. These extremely high contamination levels are more than three-times the CT Drinking Water Action Level for PFHxS of 70 ppt (PFHxS is neither regulated by the EPA nor New York State). PFHxS is a long-chain perfluorinated compound (C6) similar to the long-chain perfluorinated compounds of PFOA (C8) and PFOS (C8). It is my belief that SCDHS is testing drinking-water samples for PFHxS contamination in Wainscott for the same reason it is testing drinking-water samples for PFOA and PFOS contamination which all "have very long half-lives in humans and primarily affect the liver, blood lipids, are endocrine disruptive and have adverse effects on in utero development" (please see Appendix P).

After analysing the results, I believe that residents who live within the revised survey area who do not have access to public water have to have appropriate residential filtration installed, immediately. The filtration systems should reduce contamination levels of the aforementioned perfluorinated compounds (listed on page 2) to less than 10 parts per trillion.

If I can be of any further assistance, please contact me.

[redacted]

Si Kinsella

c/c: Deputy Supervisor Sylvia Overby
Councilman David Lyns
Councilman Jeffrey L. Bragman
Councilwoman Kathee Burke-Gonzalez
East Hampton Town Board
159 Pantigo Road
East Hampton, NY 11937

Residents of Wainscott (via email distribution list)

Wainscott Citizens' Advisory Committee (WCAC)
Co-Chair Barry Frankel, Co-Chair Susan Macy, Dennis D'Andrea, Rick Del Mastro, José Arandia, Bruce Solomon, Kathleen Begala, Sally Sunshine, Cindy Tuma, Phil Young, Michael Hansen and Frank Dalene

Robert A. Bilott / Partner
Taft Stettinius & Hollister LLP
425 Walnut Street, Suite 1800
Cincinnati, Ohio 45202-3957

East Hampton Town Trustees

Deputy Clerk Bill Taylor
Trustee Dell Cullum
Trustee Jim Grimes
Trustee Susan Vorpahl
Deputy Clerk Rick Drew
Trustee Brian Byrnes
Trustee Susan McGraw Keber
Trustee John Aldred

P.O. Box 7073, 267 Bluff Road
Amagansett, New York 11930

Sara Davison
Executive Director
Friend of Georgica Pond Foundation, Inc.
P.O. Box 1393
Wainscott, NY 11975

Professor Christopher J. Gobler, Ph.D
Stony Brook Southampton
239 Montauk Highway
Southampton, NY 11968

Executive Director Nancy Kelley
The Nature Conservancy, Long Island
P.O. Box 5125
East Hampton, NY 11937

NYS Senator Brad Hoylman
Environmental Conservation Committee
322 Eighth Avenue, Suite 1700
New York , NY 10001

Senator Thomas F. O'Mara, Chair
Environmental Conservation Committee
Legislative Office Building, Room 307
Albany, NY 12247

Commissioner Basil Seggos
Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-1010

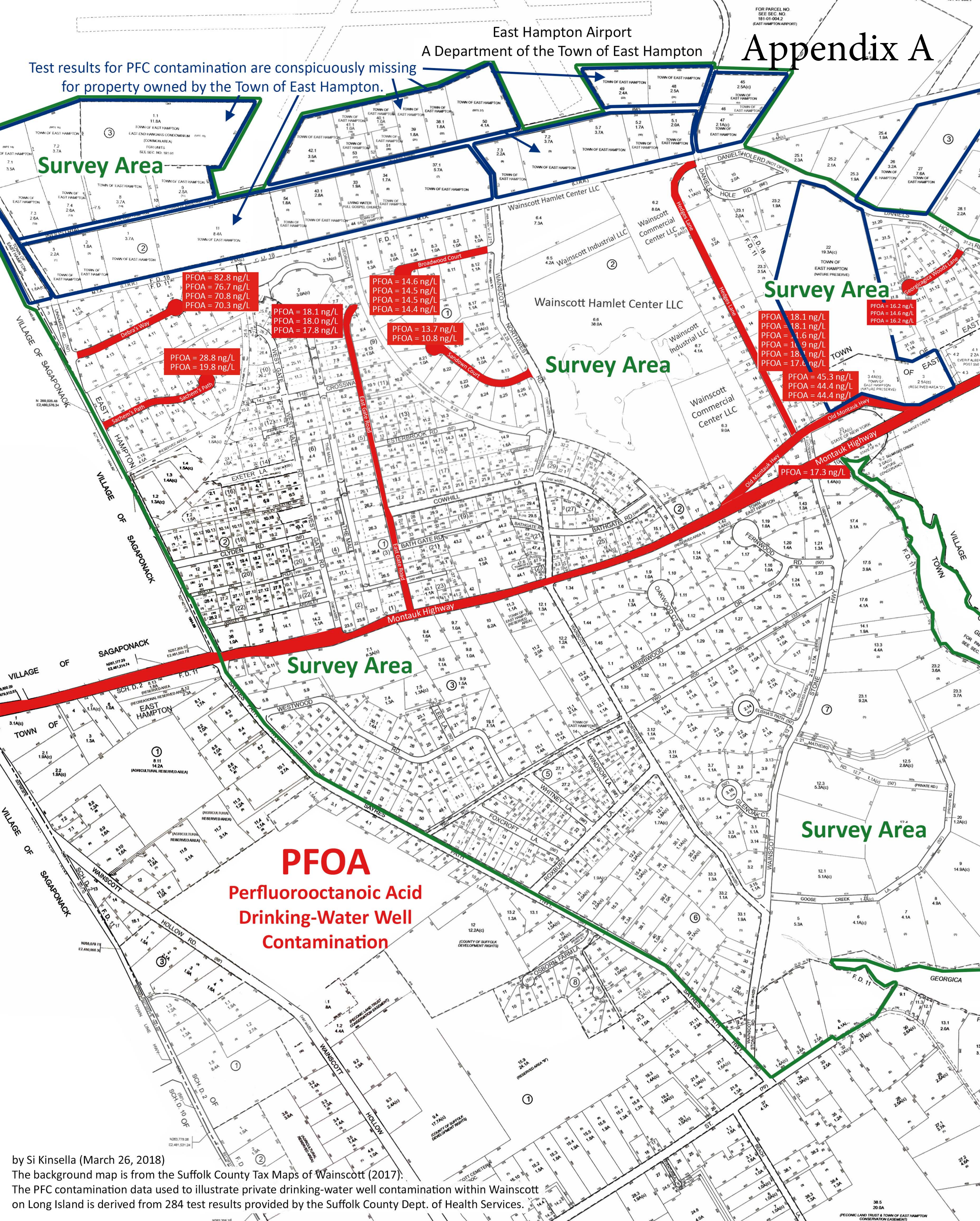
NYS Senator Kenneth P. LaValle
Legislative Office Building, Room 806
Albany, NY 12247

Assemblyman Fred W. Thiele, Jr.
PO Box 3062
Bridgehampton, NY 11932

US Congressman Lee Zeldin
31 Oak Street, Suite 20
Patchogue, NY 11772

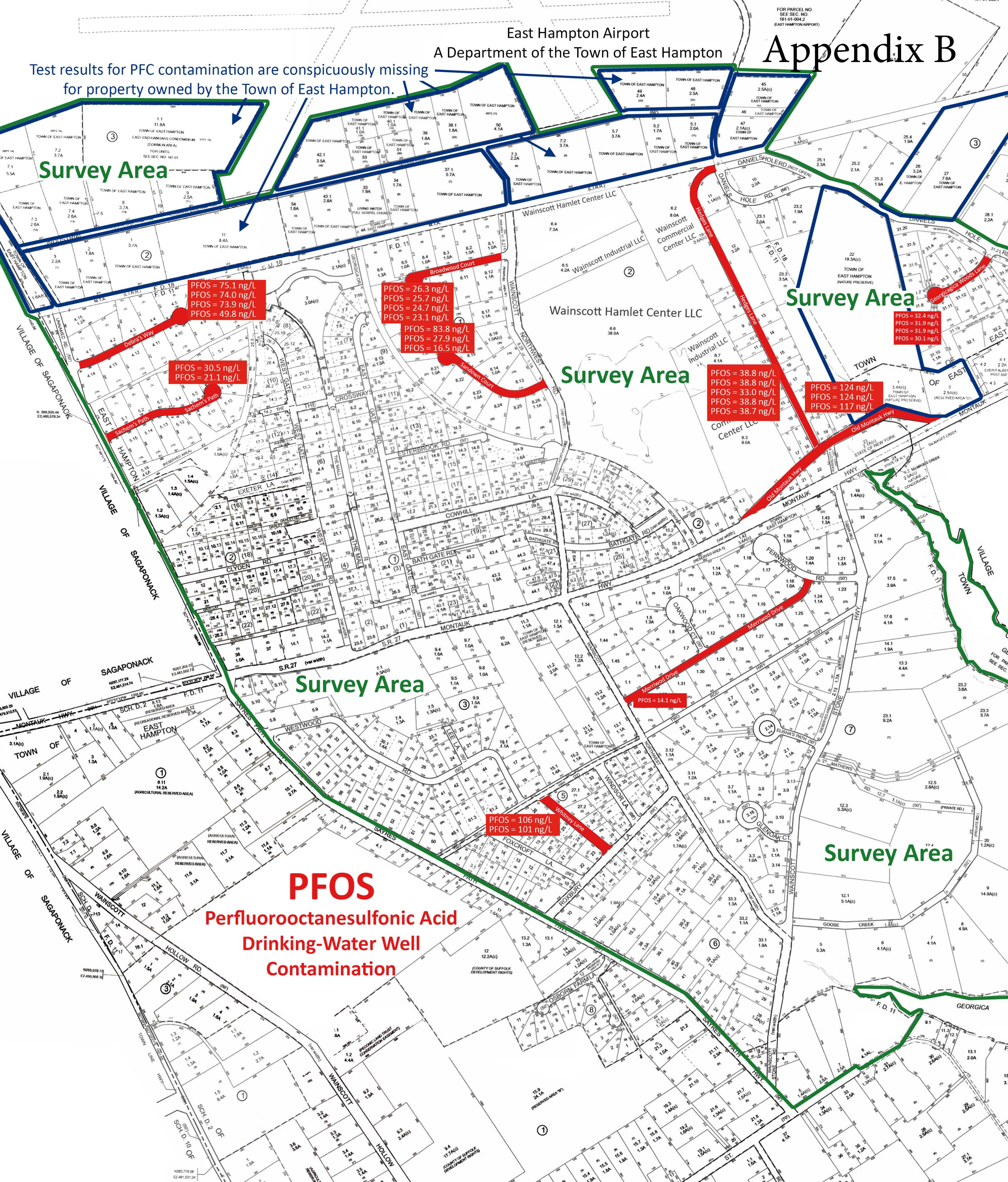
List of Appendices

Appendix A



by Si Kinsella (March 26, 2018)
The background map is from the Suffolk County Tax Maps of Wainscott (2017).
The PFC contamination data used to illustrate private drinking-water well contamination within Wainscott on Long Island is derived from 284 test results provided by the Suffolk County Dept. of Health Services.

Appendix B



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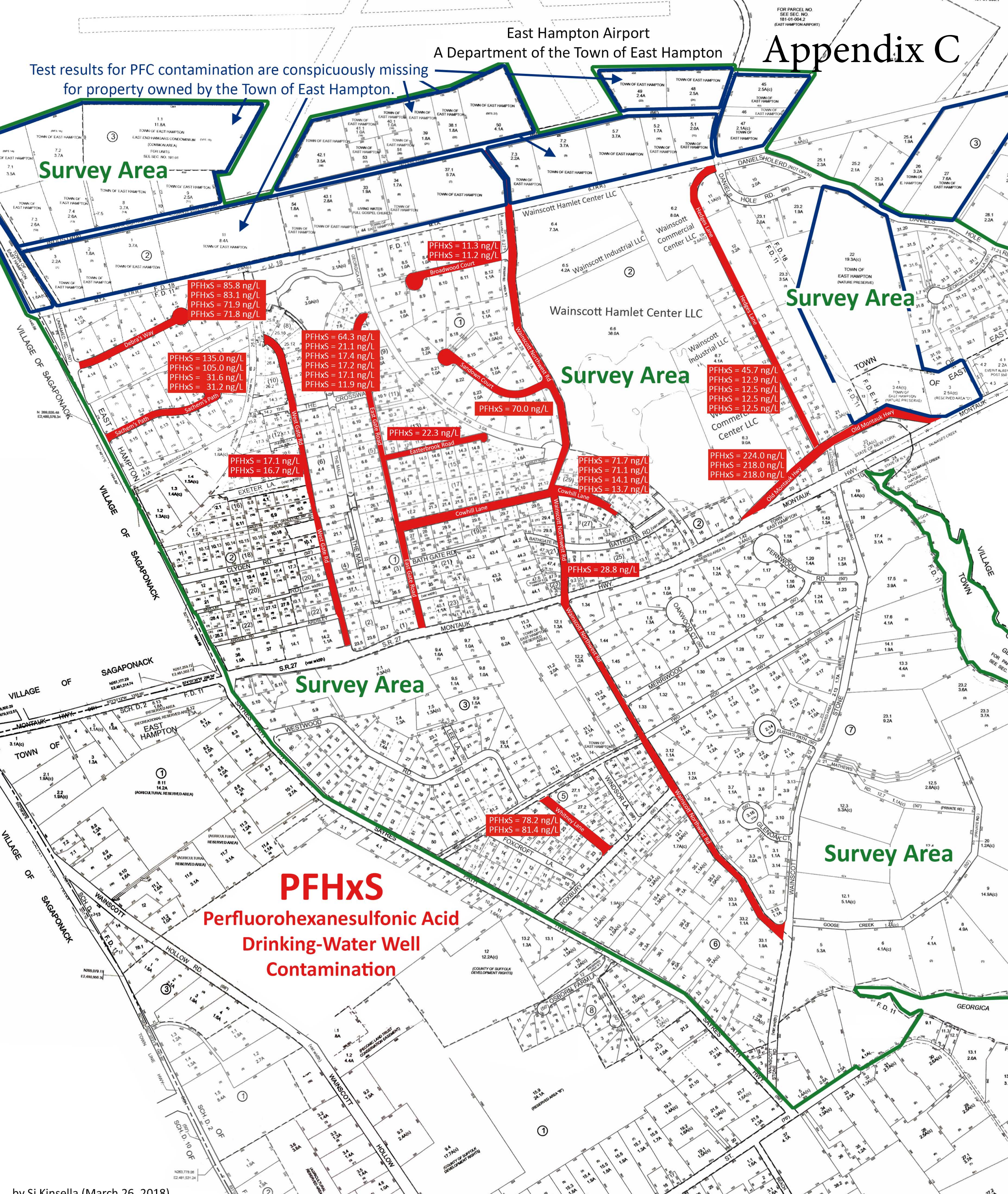
Appendix C



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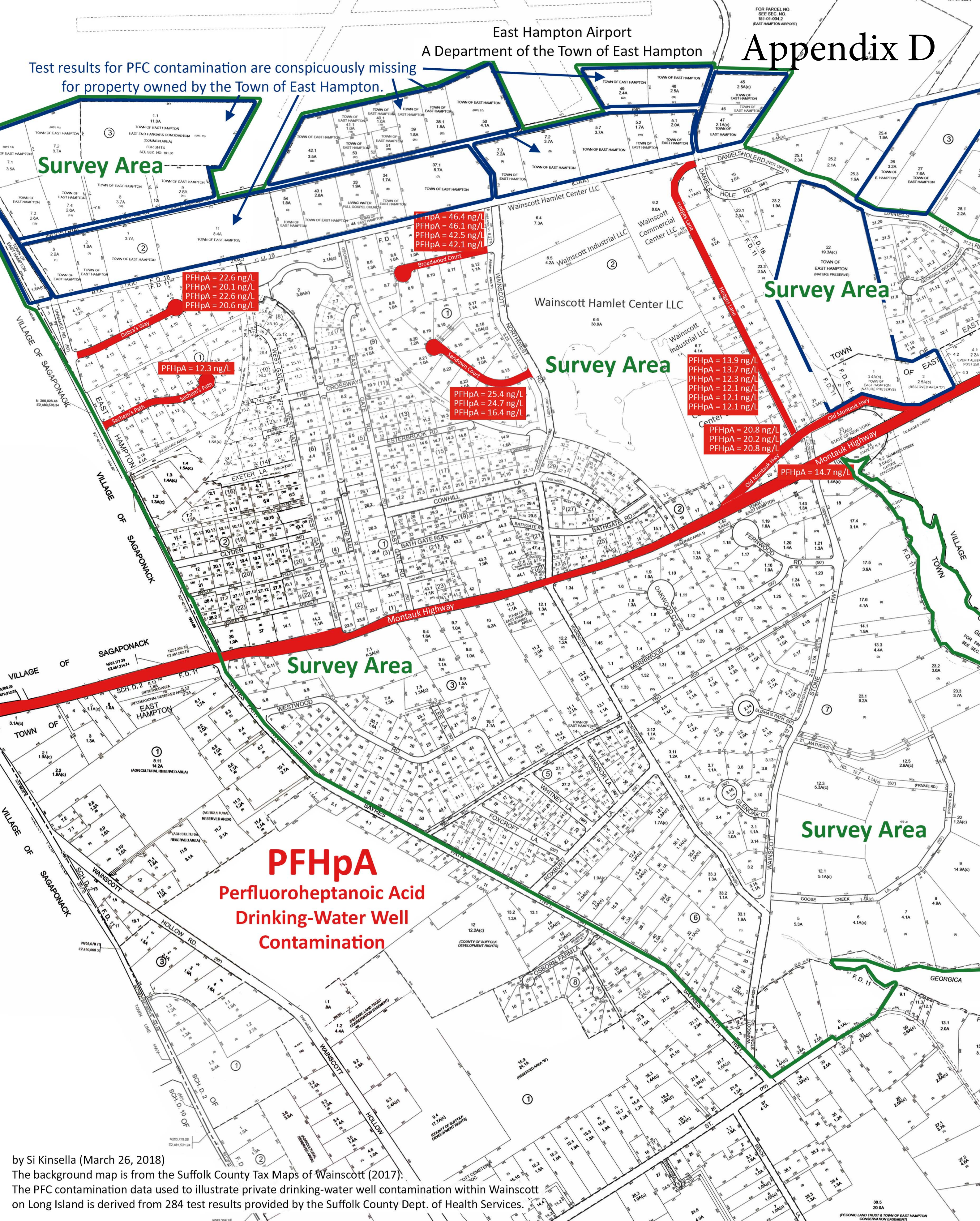
Appendix D



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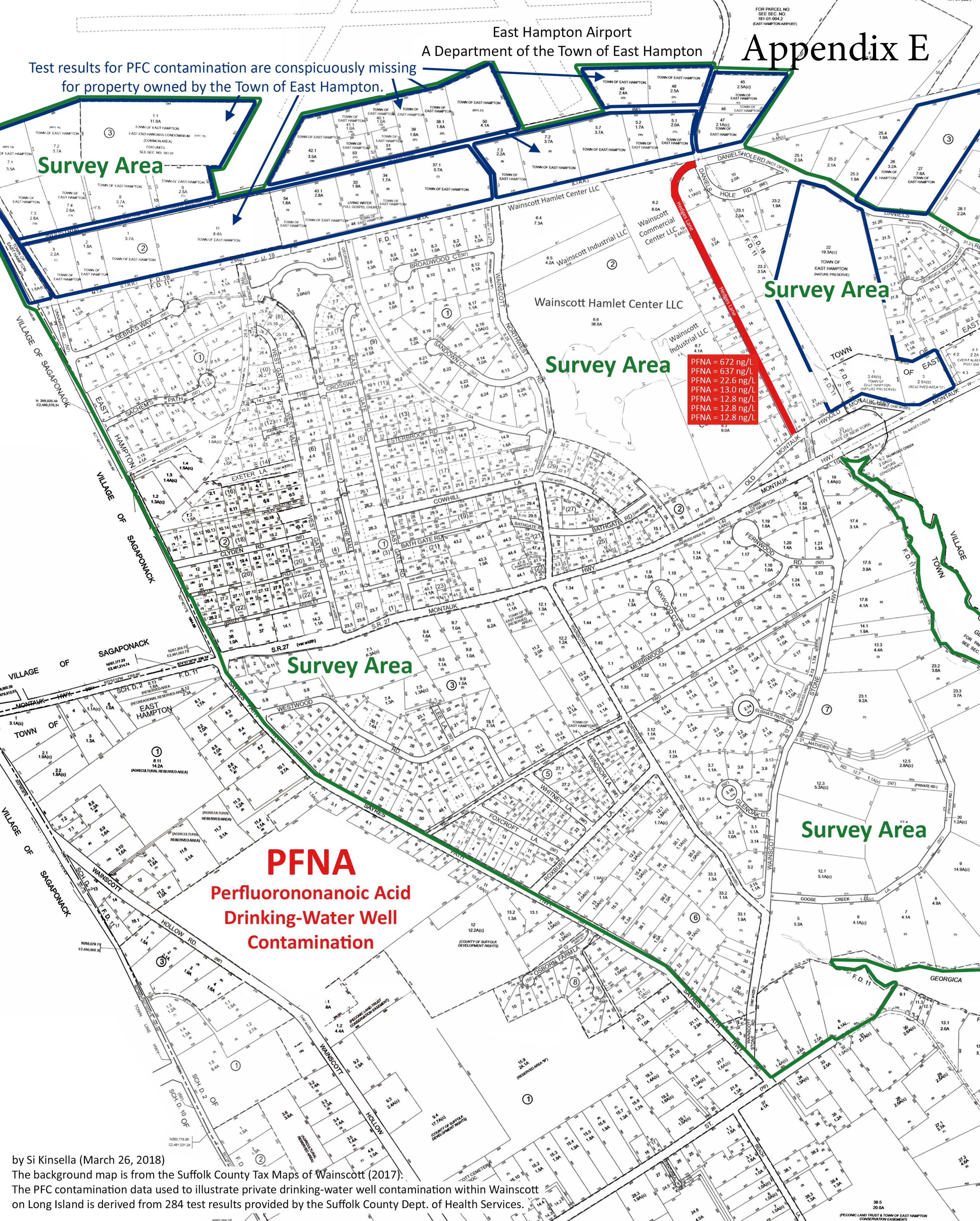
Appendix E



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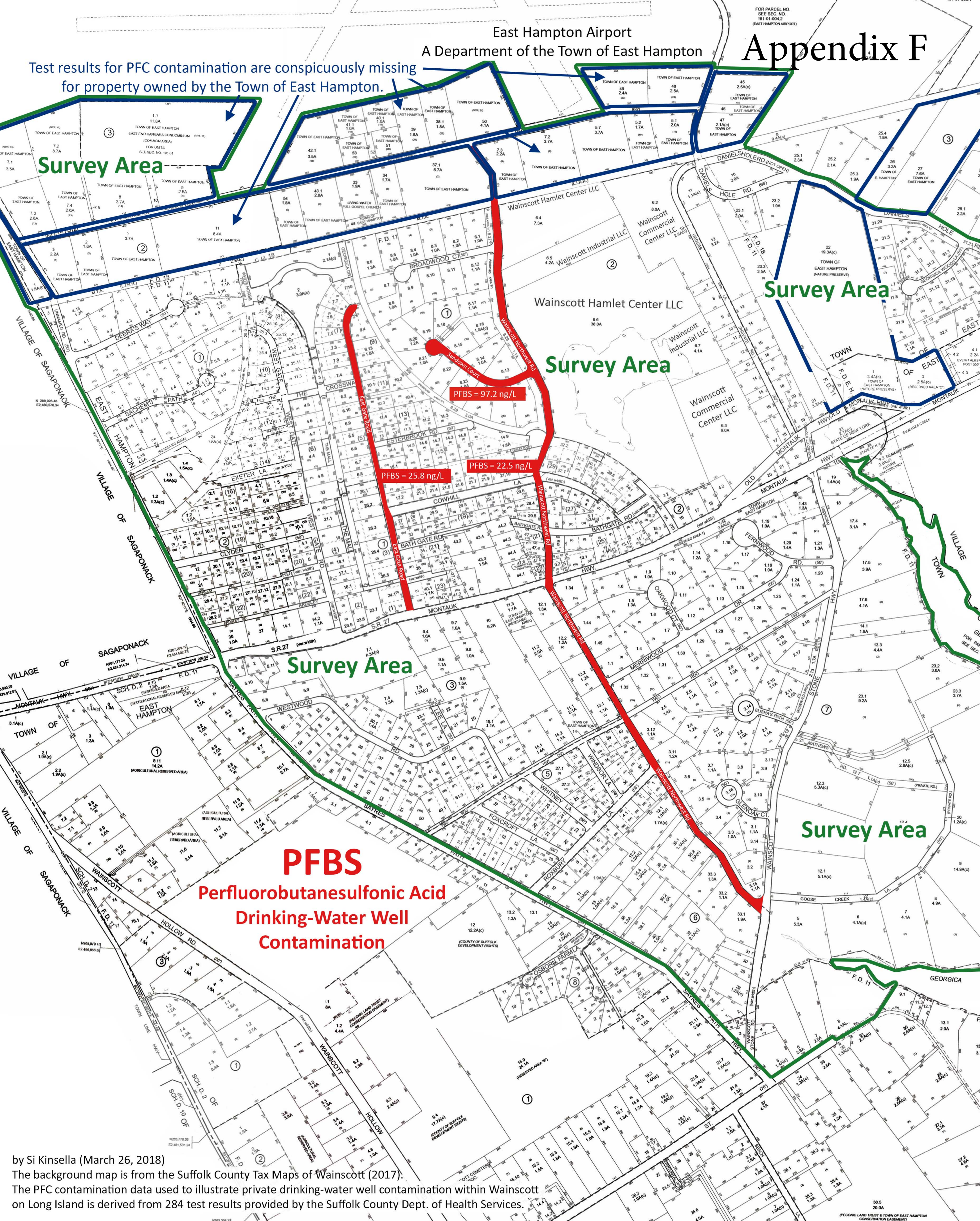
Appendix F



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New York State Department of Health
Wadsworth Center

Biggs Laboratory
PO Box 509
Albany, NY 12201
CLIA# 33D0654341

David Axelrod Institute
120 New Scotland Avenue
Albany, NY 12208
CLIA# 33D2005937

Griffin Laboratory
5668 State Farm Road
Slingerlands, NY 12159
CLIA# 33D2005935

Report No: EHS1700045273-SR-1

Report Date: 09/28/2017

Report retrieved via NYSDOH Health Commerce System by hinajc01 on 09/28/2017

REQUESTED BY: DIRECTOR-CEHBWSP

ATTN: LLOYD WILSON
DIRECTOR'S OFFICE
BUREAU OF WATER SUPPLY PROTECTION
ROOM 1110
CORNING TOWER - EMPIRE STATE PLAZA
ALBANY NY 12237

Submitter's Reference Number: 184-929-170829

Public Water Systems (BWSP)

County: SUFFOLK
City (or) Town: EAST HAMPTON
Submitted by: KATE ABAZIS
Collected by:

Grab/Collection Date: 08/29/2017 11:45
Date received: 09/07/2017 11:00

Additional Info: [redacted]

Location/Project/Facility Name: 184929170829
Sampling Location Details: [redacted] KITCHEN TAP
[redacted] OLD MONTAUK HIGHWAY
WAINSCOTT NY 11975
Chlorinated: No

FINAL LABORATORY REPORT

Biggs Laboratory
NYS ELAP ID: 10763

Laboratory of Organic Analytical Chemistry
Lab Director: Dr. K. Kannan
Contact: Dr. David Spink 518-486-2530

Sample Id: EHS1700045273-01

Sample Type: Raw Water

Received Temperature (°C): 3.1

Lab Tracking Id: 184929170829

Perfluoroalkyl Substances (PFASs) in Drinking Water by Ultra Performance Liquid Chromatography (UPLC) Tandem Mass Spectrometry (MS/MS): ISO 25101

Start Date: 9/8/2017 Analysis Date: 9/8/2017

Perfluorobutanesulfonic acid (PFBS):	9.45 ng/L	
Perfluorohexanesulfonic acid (PFHxS):	218 ng/L	
Perfluoroheptanoic acid (PFHpA):	20.8 ng/L	
Perfluorooctanoic acid (PFOA):	44.4 ng/L	NYSELAP
Perfluorooctanesulfonic acid (PFOS):	124 ng/L	NYSELAP
Perfluorononanoic acid (PFNA):	3.00 ng/L	

$\sum 168.4$

The purpose of our sampling is to analyze for PFOA and/or PFOS, as per ISO 25101:2009 (E) method. This test includes four additional Perfluorinated Chemicals (PFCs): perfluorobutanesulfonic acid (PFBS), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), perfluoronoanoic acid (PFNA) that have been validated by the laboratory. These other PFCs may have been detected at very low concentrations-EPA has not established health advisories for these chemicals. All six PFCs are effectively removed from drinking water by granular activated carbon filtration systems.

NYSELAP: Accredited by the New York State Environmental Laboratory Approval Program

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES - WATER ANALYSIS

Requestor Name: [redacted]
Location: [redacted] OLD MONTAUK HIGHWAY, WAINSCOTT
Sample Location: KITCHEN TAP
Treatment: ION EXCHANGE

Request No.: [redacted]
Sample Date: 08/29/2017
Sanitarian: ABAZIS
Field No.: 184-929-17-08-29

Survey #: SV0317

Notes: '<' symbol means "less than" indicating no detection. mg/L = milligrams per liter; ug/L = micrograms per liter. Alkalinity is reported as mg/L as CaCO3. '*' symbol means level found exceeds the maximum contaminant level (MCL), or action level for lead and copper. Moderately restricted sodium diet should not exceed 270 mg/L. Severely restricted should not exceed 20 mg/L. The MCL for nickel is a proposed limit. Any MCL's not shown below have not been established.

Analyte		Result	MCL	Unit	Analyte		Result	MCL	Unit
===== Results for Sample Group: ALDICARB PESTICIDES analyzed by Suffolk County Department of Health Services =====									
Total Aldicarb (calc)	<	0.0		ug/L	Carbaryl	<	0.5	50.00	ug/L
Aldicarb	<	0.5	3.00	ug/L	1-Naphthol	<	0.5	50.00	ug/L
Aldicarb-Sulfoxide	<	0.5	4.00	ug/L	Methomyl	<	0.5	50.00	ug/L
Aldicarb-Sulfone	<	0.5	2.00	ug/L	Propoxur (Baygon)	<	0.5	50.00	ug/L
Carbofuran	<	0.5	40.00	ug/L	Methiocarb	<	0.5	50.00	ug/L
3-Hydroxycarbofuran	<	0.5	50.00	ug/L	Methiocarb sulfone	<	0.5	50.00	ug/L
Oxamyl	<	0.5	50.00	ug/L					
===== Results for Sample Group: BACTERIOLOGICAL analyzed by Suffolk County Department of Health Services =====									
TColi	<	ABSENT	ABSENT		EColi	<	ABSENT	ABSENT	
===== Results for Sample Group: CHLORINATED PESTICIDES analyzed by Suffolk County Department of Health Services =====									
alpha-BHC	<	0.2	5.00	ug/L	4,4-DDD	<	0.2	5.00	ug/L
beta-BHC	<	0.2	5.00	ug/L	4,4-DDT	<	0.2	5.00	ug/L
gamma-BHC (Lindane)	<	0.02	0.20	ug/L	Endrin	<	0.01	2.00	ug/L
delta-BHC	<	0.2	5.00	ug/L	Chlordane	<	0.2	2.00	ug/L
Heptachlor	<	0.04	0.40	ug/L	Alachlor	<	0.2	2.00	ug/L
Heptachlor epoxide	<	0.02	0.20	ug/L	Methoxychlor	<	0.1	40.00	ug/L
Aldrin	<	0.2	5.00	ug/L	Endosulfan II	<	0.2	5.00	ug/L
Dieldrin	<	0.2	50.00	ug/L	Endosulfan Sulfate	<	0.2	50.00	ug/L
Endosulfan I	<	0.2	5.00	ug/L	1,2-dibromoethane	<	0.01	0.05	ug/L
Dacthal	<	0.2	50.00	ug/L	1,2-dibromo-3-chloropropane	<	0.02	0.20	ug/L
4,4-DDE	<	0.2	50.00	ug/L					
===== Results for Sample Group: DACTHAL PESTICIDES analyzed by Suffolk County Department of Health Services =====									
Monomethyltetrachloroterephthalate	<	5.	50.00	ug/L	Tetrachloroterephthalic acid	<	5.	50.00	ug/L
===== Results for Sample Group: HERBICIDE METABOLITES analyzed by Suffolk County Department of Health Services =====									
Didealkylatrazine (G-28273)	<	0.8	50.00	ug/L	Metolachlor	<	0.2	50.00	ug/L
Deisopropylatrazine (G-28279)	<	0.2	50.00	ug/L	Tebuthiuron	<	0.3	50.00	ug/L
Desethylatrazine (G-30033)	<	0.4	50.00	ug/L	Caffeine	<	0.2	50.00	ug/L
Imidacloprid	<	0.2	50.00	ug/L	Dinoseb	<	0.3	7.00	ug/L
Imidacloprid Urea	<	0.2	50.00	ug/L	Bisphenol A	<	0.2	50.00	ug/L
Alachlor OA (Oxanilic Acid)	<	0.4	50.00	ug/L	Diuron	<	0.2	50.00	ug/L
Alachlor ESA (Sulfonic Acid)	<	0.2	50.00	ug/L	Phenytoin (Dilantin)	<	0.2	50.00	ug/L
Metolachlor metabolite (CGA-37735)	<	0.2	50.00	ug/L	4-Hydroxyphenytoin	<	0.5	50.00	ug/L
Metolachlor OA (CGA-51202)	<	0.3	50.00	ug/L	Diethyltoluamide (DEET)	<	0.2	50.00	ug/L
Metolachlor ESA (CGA-354743)	<	0.3	50.00	ug/L	Acetaminophen	<	0.2	50.00	ug/L
Metolachlor metabolite (CGA-41638)	<	0.3	50.00	ug/L	Bisphenol B	<	0.2	50.00	ug/L
Metolachlor metabolite (CGA-40172)	<	0.3	50.00	ug/L	Estrone	<	0.2	50.00	ug/L
Metolachlor metabolite (CGA-67125)	<	0.3	50.00	ug/L	17 alpha Ethynylestradiol	=	0.8	50.00	ug/L
2-HydroxyAtrazine (G-34048)	<	0.3	50.00	ug/L	Diethylstilbestrol	<	0.5	50.00	ug/L
Malaoxon	<	0.2	50.00	ug/L	17 beta Estradiol	=	1.0	50.00	ug/L
Trichlorfon	<	0.3	50.00	ug/L	4-Androstene-3,17-dione	<	0.2	50.00	ug/L
Siduron	<	0.3	50.00	ug/L	Picaridin	<	0.2	50.00	ug/L
Dichlorvos	<	0.6	50.00	ug/L	Propachlor ESA	<	0.2	50.00	ug/L
Propamocarb hydrochloride	<	0.3	50.00	ug/L	Propachlor OA	<	0.3	5.00	ug/L
2,6-Dichlorobenzamide	<	0.5	50.00	ug/L	Testosterone	<	0.3	50.00	ug/L
Ibuprofen	<	0.2	50.00	ug/L	Equilin	<	0.7	50.00	ug/L
Gemfibrozil	<	0.4	50.00	ug/L	Estriol	<	0.7	50.00	ug/L
Metalaxyl	<	0.2	50.00	ug/L					
===== Results for Sample Group: METALS analyzed by Suffolk County Department of Health Services =====									
Lithium	<	1.		ug/L	Cadmium (Cd)	<	1.	5.00	ug/L
Beryllium (Be)	<	0.2	4.00	ug/L	Tin	<	0.5		ug/L
Aluminum (Al)	<	5.		ug/L	Antimony (Sb)	<	0.2	6.00	ug/L
Titanium (Ti)	<	1.		ug/L	Tellurium	<	0.5		ug/L
Vanadium (V)	<	1.		ug/L	Barium (Ba)	<	1.	2000.00	ug/L
Chromium (Cr)	<	1.	100.00	ug/L	Mercury (Hg)	<	0.3	2.00	ug/L
Manganese (Mn)	=	0.001	0.30	mg/L	Thallium (Tl)	<	0.2	2.00	ug/L
Cobalt (Co)	<	1.		ug/L	Lead (Pb)	<	1.	15.00	ug/L
Nickel (Ni)	<	0.2	100.00	ug/L	Thorium (Th)	<	2.		ug/L
Copper (Cu)	=	36.	1300.00	ug/L	Uranium	<	0.5	30.00	ug/L
Zinc (Zn)	<	5.	5000.00	ug/L	Calcium	<	0.1		mg/L
Germanium	<	2.5		ug/L	Iron (Fe)	<	0.1	0.30	mg/L
Arsenic (As)	<	1.	10.00	ug/L	Iron + Manganese (Combined, Calc)	=	0.001	0.50	mg/L
Selenium (Se)	<	1.	50.00	ug/L	Potassium	<	0.5		mg/L
Strontium	<	1.		ug/L	Magnesium	<	0.1		mg/L
Molybdenum (Mo)	<	1.		ug/L	Sodium (Na)	=	106.0		mg/L
Silver (Ag)	<	2.5	100.00	ug/L					
===== Results for Sample Group: PERFLUORINATED COMPOUNDS analyzed by New York State Department of Health =====									
PFBS (Perfluorobutanesulfonic Acid)	=	9.45	50000	ng/L	PFOA (Perfluorooctanoic Acid)	=	44.4	50000	ng/L
PFHxs (Perfluorohexanesulfonic Acid)	=	218.	50000	ng/L	PFOS (Perfluorooctanesulfonic Acid)	=	124.	50000	ng/L
PFHpA (Perfluoroheptanoic Acid)	=	20.8	50000	ng/L	PFNA (Perfluorononanoic Acid)	=	3.	50000	ng/L

Σ 168.4

RESULTS CONTINUED ON NEXT PAGE....

New York State Department of Health
Wadsworth Center

Biggs Laboratory
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Albany, NY 12201
CLIA# 33D0654341

David Axelrod Institute
120 New Scotland Avenue
Albany, NY 12208
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CLIA# 33D2005935

Report No: **EHS1700045273-SR-1**

Report Date: **09/28/2017**

Report retrieved via NYSDOH Health Commerce System by hinajc01 on 09/28/2017

REQUESTED BY: DIRECTOR-CEHBWSP

ATTN: LLOYD WILSON
DIRECTOR'S OFFICE
BUREAU OF WATER SUPPLY PROTECTION
ROOM 1110
CORNING TOWER - EMPIRE STATE PLAZA
ALBANY NY 12237

Submitter's Reference Number: 184-929-170829

Public Water Systems (BWSP)

County: SUFFOLK
City (or) Town: EAST HAMPTON
Submitted by: KATE ABAZIS
Collected by:

Grab/Collection Date: 08/29/2017 11:45
Date received: 09/07/2017 11:00

Additional Info: [redacted]

Location/Project/Facility Name: 184929170829
Sampling Location Details: [redacted] KITCHEN TAP
[redacted] OLD MONTAUK HIGHWAY
WAINSCOTT NY 11975
Chlorinated: No

FINAL LABORATORY REPORT

Biggs Laboratory
NYS ELAP ID: 10763

Laboratory of Organic Analytical Chemistry
Lab Director: Dr. K. Kannan
Contact: Dr. David Spink 518-486-2530

Sample Id: EHS1700045273-01

Sample Type: Raw Water

Received Temperature (°C): 3.1

Lab Tracking Id: 184929170829

Perfluoroalkyl Substances (PFASs) in Drinking Water by Ultra Performance Liquid Chromatography (UPLC) Tandem Mass Spectrometry (MS/MS): ISO 25101

Start Date: 9/8/2017 Analysis Date: 9/8/2017

Perfluorobutanesulfonic acid (PFBS):	9.45 ng/L	
Perfluorohexanesulfonic acid (PFHxS):	218 ng/L	
Perfluoroheptanoic acid (PFHpA):	20.8 ng/L	
Perfluorooctanoic acid (PFOA):	44.4 ng/L	NYSELAP
Perfluorooctanesulfonic acid (PFOS):	124 ng/L	NYSELAP
Perfluorononanoic acid (PFNA):	3.00 ng/L	

$\sum 168.4$

The purpose of our sampling is to analyze for PFOA and/or PFOS, as per ISO 25101:2009 (E) method. This test includes four additional Perfluorinated Chemicals (PFCs): perfluorobutanesulfonic acid (PFBS), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), perfluoronoanoic acid (PFNA) that have been validated by the laboratory. These other PFCs may have been detected at very low concentrations-EPA has not established health advisories for these chemicals. All six PFCs are effectively removed from drinking water by granular activated carbon filtration systems.

NYSELAP: Accredited by the New York State Environmental Laboratory Approval Program

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory.

United States Environmental Protection Agency

FACT SHEET
PFOA & PFOS Drinking Water Health Advisories

Overview

EPA has established health advisories for PFOA and PFOS based on the agency's assessment of the latest peer-reviewed science to provide drinking water system operators, and state, tribal and local officials who have the primary responsibility for overseeing these systems, with information on the health risks of these chemicals, so they can take the appropriate actions to protect their residents. EPA is committed to supporting states and public water systems as they determine the appropriate steps to reduce exposure to PFOA and PFOS in drinking water. As science on health effects of these chemicals evolves, EPA will continue to evaluate new evidence.

Background on PFOA and PFOS

PFOA and PFOS are fluorinated organic chemicals that are part of a larger group of chemicals referred to as perfluoroalkyl substances (PFASs). PFOA and PFOS have been the most extensively produced and studied of these chemicals. They have been used to make carpets, clothing, fabrics for furniture, paper packaging for food and other materials (e.g., cookware) that are resistant to water, grease or stains. They are also used for firefighting at airfields and in a number of industrial processes.

Because these chemicals have been used in an array of consumer products, most people have been exposed to them. Between 2000 and 2002, PFOS was voluntarily phased out of production in the U.S. by its primary manufacturer. In 2006, eight major companies voluntarily agreed to phase out their global production of PFOA and PFOA-related chemicals, although there are a limited number of ongoing uses. Scientists have found PFOA and PFOS in the blood of nearly all the people they tested, but these studies show that the levels of PFOA and PFOS in blood have been decreasing. While consumer products and food are a large source of exposure to these chemicals for most people, drinking water can be an additional source in the small percentage of communities where these chemicals have contaminated water supplies. Such contamination is typically localized and associated with a specific facility, for example, an industrial facility where these chemicals were produced or used to manufacture other products or an airfield at which they were used for firefighting.

EPA's 2016 Lifetime Health Advisories

EPA develops health advisories to provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. EPA's health advisories are non-enforceable and non-regulatory and provide technical information to states agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination. In 2009, EPA published provisional health advisories for PFOA and PFOS based on the evidence available at that time. The science has evolved since then and EPA is now replacing the 2009 provisional advisories with new, lifetime health advisories.

FACT SHEET

PFOA & PFOS Drinking Water Health Advisories

EPA's 2016 Lifetime Health Advisories, continued

To provide Americans, including the most sensitive populations, with a margin of protection from a lifetime of exposure to PFOA and PFOS from drinking water, EPA established the health advisory levels at 70 parts per trillion. When both PFOA and PFOS are found in drinking water, the combined concentrations of PFOA and PFOS should be compared with the 70 parts per trillion health advisory level. This health advisory level offers a margin of protection for all Americans throughout their life from adverse health effects resulting from exposure to PFOA and PFOS in drinking water.

How the Health Advisories were developed

EPA's health advisories are based on the best available peer-reviewed studies of the effects of PFOA and PFOS on laboratory animals (rats and mice) and were also informed by epidemiological studies of human populations that have been exposed to PFASs. These studies indicate that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes).

EPA's health advisory levels were calculated to offer a margin of protection against adverse health effects to the most sensitive populations: fetuses during pregnancy and breastfed infants. The health advisory levels are calculated based on the drinking water intake of lactating women, who drink more water than other people and can pass these chemicals along to nursing infants through breastmilk.

Recommended Actions for Drinking Water Systems

Steps to Assess Contamination

If water sampling results confirm that drinking water contains PFOA and PFOS at individual or combined concentrations greater than 70 parts per trillion, water systems should quickly undertake additional sampling to assess the level, scope and localized source of contamination to inform next steps

Steps to Inform

If water sampling results confirm that drinking water contains PFOA and PFOS at individual or combined concentrations greater than 70 parts per trillion, water systems should promptly notify their State drinking water safety agency (or with EPA in jurisdictions for which EPA is the primary drinking water safety agency) and consult with the relevant agency on the best approach to conduct additional sampling.

Drinking water systems and public health officials should also promptly provide consumers with information about the levels of PFOA and PFOS in their drinking water. This notice should include specific information on the risks to fetuses during pregnancy and breastfed and formula-fed infants from exposure to drinking water with an individual or combined concentration of PFOA and PFOS above EPA's health advisory level of 70 parts per trillion. In addition, the notification should include actions they are taking and identify options that consumers may consider to reduce risk such as seeking an alternative drinking water source, or in the case of parents of formula-fed infants, using formula that does not require adding water.

Recommended Actions for Drinking Water Systems, continued

Steps to Limit Exposure

A number of options are available to drinking water systems to lower concentrations of PFOA and PFOS in their drinking water supply. In some cases, drinking water systems can reduce concentrations of perfluoroalkyl substances, including PFOA and PFOS, by closing contaminated wells or changing rates of blending of water sources. Alternatively, public water systems can treat source water with activated carbon or high pressure membrane systems (e.g., reverse osmosis) to remove PFOA and PFOS from drinking water. These treatment systems are used by some public water systems today, but should be carefully designed and maintained to ensure that they are effective for treating PFOA and PFOS. In some communities, entities have provided bottled water to consumers while steps to reduce or remove PFOA or PFOS from drinking water or to establish a new water supply are completed.

Many home drinking water treatment units are certified by independent accredited third party organizations against American National Standards Institute (ANSI) standards to verify their contaminant removal claims. NSF International (NSF®) has developed a protocol for NSF/ANSI Standards 53 and 58 that establishes minimum requirements for materials, design and construction, and performance of point-of-use (POU) activated carbon drinking water treatment systems and reverse osmosis systems that are designed to reduce PFOA and PFOS in public water supplies. The protocol has been established to certify systems (e.g., home treatment systems) that meet the minimum requirements. The systems are evaluated for contaminant reduction by challenging them with an influent of 1.5±30% µg/L (total of both PFOA and PFOS) and must reduce this concentration by more than 95% to 0.07 µg/L or less (total of both PFOA and PFOS) throughout the manufacturer's stated life of the treatment system. Product certification to this protocol for testing home treatment systems verifies that devices effectively reduces PFOA and PFOS to acceptable levels.

Other Actions Relating to PFOA and PFOS

Between 2000 and 2002, PFOS was voluntarily phased out of production in the U.S. by its primary manufacturer, 3M. EPA also issued regulations to limit future manufacturing, including importation, of PFOS and its precursors, without first having EPA review the new use. A limited set of existing uses for PFOS (fire resistant aviation hydraulic fluids, photography and film products, photomicrolithography process to produce semiconductors, metal finishing and plating baths, component of an etchant) was excluded from these regulations because these uses were ongoing and alternatives were not available.

In 2006, EPA asked eight major companies to commit to working toward the elimination of their production and use of PFOA, and chemicals that degrade to PFOA, from emissions and products by the end of 2015. All eight companies have indicated that they have phased out PFOA, and chemicals that degrade to PFOA, from emissions and products by the end of 2015. Additionally, PFOA is included in EPA's proposed Toxic Substance Control Act's Significant New Use Rule (SNUR) issued in January 2015 which will ensure that EPA has an opportunity to review any efforts to reintroduce the chemical into the marketplace and take action, as necessary, to address potential concerns.

Other Actions Relating to PFOA and PFOS, continued

EPA has not established national primary drinking water regulations for PFOA and PFOS. EPA is evaluating PFOA and PFOS as drinking water contaminants in accordance with the process required by the Safe Drinking Water Act (SDWA). To regulate a contaminant under SDWA, EPA must find that it: (1) may have adverse health effects; (2) occurs frequently (or there is a substantial likelihood that it occurs frequently) at levels of public health concern; and (3) there is a meaningful opportunity for health risk reduction for people served by public water systems.

EPA included PFOA and PFOS among the list of contaminants that water systems are required to monitor under the third Unregulated Contaminant Monitoring Rule (UCMR 3) in 2012. Results of this monitoring effort are updated regularly and can be found on the publicly-available National Contaminant Occurrence Database (NCOD) (https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule#3). In accordance with SDWA, EPA will consider the occurrence data from UCMR 3, along with the peer reviewed health effects assessments supporting the PFOA and PFOS Health Advisories, to make a regulatory determination on whether to initiate the process to develop a national primary drinking water regulation.

In addition, EPA plans to begin a separate effort to determine the range of PFAS for which an Integrated Risk Information System (IRIS) assessment is needed. The IRIS Program identifies and characterizes the health hazards of chemicals found in the environment. IRIS assessments inform the first two steps of the risk assessment process: hazard identification, and dose-response. As indicated in the 2015 IRIS Multi-Year Agenda, the IRIS Program will be working with other EPA offices to determine the range of PFAS compounds and the scope of assessment required to best meet Agency needs. More about this effort can be found at https://www.epa.gov/iris/iris-agenda.

Non-Drinking Water Exposure to PFOA and PFOS

These health advisories only apply to exposure scenarios involving drinking water. They are not appropriate for use, in identifying risk levels for ingestion of food sources, including: fish, meat produced from livestock that consumes contaminated water, or crops irrigated with contaminated water.

The health advisories are based on exposure from drinking water ingestion, not from skin contact or breathing. The advisory values are calculated based on drinking water consumption and household use of drinking water during food preparation (e.g., cooking or to prepare coffee, tea or soup). To develop the advisories, EPA considered non-drinking water sources of exposure to PFOA and PFOS, including: air, food, dust, and consumer products. In January 2016 the Food and Drug Administration amended its regulations to no longer allow PFOA and PFOS to be added in food packaging, which will likely decrease one source of non-drinking water exposure.

Where Can I Learn More?

- EPA's Drinking Water Health Advisories for PFOA and PFOS can be found at: https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos
- PFOA and PFOS data collected under EPA's Unregulated Contaminant Monitoring Rule are available: https://www.epa.gov/dwucmr/occurrence-data-unregulated-con taminant-monitoring-rule
- EPA's stewardship program for PFAS related to TSCA: https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/and -polyfluoroalkyl-substances-pfass-under-tsca
- EPA's research activities on PFASs can be found at: http://www.epa.gov/chemical-research/perfluorinated-chemical-pfc-research
- The Agency for Toxic Substances and Disease Registry's Perflourinated Chemicals and Your Health webpage at: http://www.atsdr.cdc.gov/PFC/

EPA
United States
Environmental Protection
Agency

VERMONT
DEPARTMENT OF HEALTH

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a large group of human-made chemicals that have been used in industry and consumer products worldwide since the 1950s. PFAS chemicals include PFOA (perfluorooctanoic acid) and PFOS (perfluorooctane sulfonic acid).

- PFAS do not occur naturally, but are widespread in the environment.
- PFAS are found in people, wildlife and fish all over the world.
- Some PFAS can stay in people's bodies for a long time.
- Some PFAS do not break down easily in the environment.

How can I be exposed to PFAS?

PFAS contamination may be in drinking water, food, indoor dust, some consumer products, and workplaces. Most non-worker exposures occur through drinking contaminated water or eating food that contains PFAS. Although some types of PFAS are no longer used, some products may still contain PFAS:

- Food packaging materials
- Nonstick cookware
- Stain resistant carpet treatments
- Water resistant clothing
- Cleaning products
- Paints, varnishes and sealants
- Firefighting foam
- Cosmetics

What is the health advisory level for PFOA and PFOS in drinking water?

Vermont's health advisory level for the combination of PFOA and PFOS is 20 ppt (parts per trillion). That means that the sum of PFOA and PFOS levels should not exceed 20 ppt in your drinking water.

What should I do if PFOA and PFOS exceed the health advisory level?

You should not use your water for drinking, food preparation, cooking, brushing teeth, preparing baby formula, or any other manner of ingestion. Use bottled water instead or water from a known safe source. Do not use water containing PFOA and PFOS over 20 ppt to water your garden. The PFOA and PFOS could be taken up by the vegetables.

How can PFAS affect people's health?

Some scientific studies suggest that certain PFAS may affect different systems in the body. Although more research is needed, some studies in people have shown that certain PFAS may:

- Affect growth, learning and behavior of babies and older children
- Lower a woman's chance of getting pregnant
- Interfere with the body's natural hormones

- Increase cholesterol levels
- Affect the immune system
- Increase the risk of cancer

These health effects may be the same for pets. If you are concerned, you can give your pet bottled water or water from a known safe source.

Should I have my blood tested for PFAS?

We know that almost every American has PFAS in their blood, including PFOA and PFOS. We know from scientific studies that if you drink water containing PFAS, you are likely to have PFAS in your blood at levels that are higher than most Americans.

Studies have shown that once the exposure has stopped, the level of PFAS in the body will decrease over time.

The blood test cannot tell if your exposure to PFAS will cause you health problems, or if a condition you have was caused by PFAS. The information can become part of your medical history, and may help inform discussions about your health with your doctor.

What can be done to take PFAS out of the body?

There are no medical interventions that will remove PFAS from the body. The best intervention is to stop the source of exposure. This means people who have PFOA and PFOS in their water above 20 ppt should not drink the water.

When should I see a health care provider?

If PFAS are detected in your water, or if you or family members have signs or symptoms that you think are related to PFAS exposure, discuss your concerns with your family's health care provider. The Health Department has information available for health care providers on our website.

How can I learn more?

For questions about testing your drinking water for PFAS, call the Vermont Department of Environmental Conservation at 802-828-1138.

For questions about the health effects of PFAS, call the Health Department at 1-800-439-8550 or visit www.healthvermont.gov/water/pfas

Centers for Disease Control and Prevention PFAS Information:
www.atsdr.cdc.gov/pfc/index.html

March 14, 2018

Updated December 2017

Drinking Water Facts:
Per- *and Polyfluoroalkyl Substances (PFAS) in Drinking Water*

*formerly titled PFCs in Drinking Water

- **Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals with many commercial and industrial uses.**
- **PFAS have been associated with a variety of adverse health effects in humans, but it has not been definitively established that PFAS cause these effects.**
- **PFOA, PFNA, and PFOS have proposed or recommended drinking water regulations in New Jersey.**

What are PFAS and perfluorinated chemicals (PFCs)?

PFAS are a group of manmade chemicals which include a smaller group of chemicals called PFCs. PFAS repel water and oil, and are resistant to heat and chemical reactions. They therefore have important industrial and commercial uses. PFAS are used in production of some non-stick cookware, in waterproof and stain proof coatings, in "leak-proof" coatings on food packaging materials, in fire-fighting foams, and in other uses. PFAS can enter drinking water through industrial release to water, air, or soil; discharges from sewage treatment plants; land application of contaminated sludge; and use of fire-fighting foam.

PFCs are not broken down in the body. Four types of PFCs have been found in the blood (serum) of greater that 98% of the United States population. **These PFCs build up and stay in the human body for many years, and the amount goes down very slowly over time.**

- **PFOS** – perfluorooctane sulfonate
- **PFOA** – perfluorooctanoic acid
- **PFNA** – perfluorononanoic acid
- **PFHxS** – perfluorohexane sulfonate

How can I be exposed to PFAS?

Some PFAS can dissolve in water. Therefore, drinking water may be a major source of exposure to PFAS for people living in communities with contaminated drinking water. Other sources of PFAS exposure include food, food packaging, consumer products, house dust, indoor and outdoor air, and at workplaces where PFAS are made or used.

Exposure to PFAS in drinking water is primarily from ingestion. Exposure to PFAS through other household uses of water such as showering, bathing, laundry and dishwashing is not significant.

Are PFAS harmful to my health?

There is considerable information on the health effects of PFAS in humans and animals, and more information is continually becoming available. In experimental animals, some PFAS have been found to cause developmental, immune, neurobehavioral, liver, endocrine, and metabolic toxicity, generally at levels well above human exposures. Some studies of the general population, communities with drinking water exposures, and exposed workers suggest that PFAS increase the risk of a number of health effects. The most consistent human health effect findings for PFOA – the most well-studied of the PFAS – are increases in serum cholesterol, some liver enzymes, and uric acid levels. For PFOS, the most consistently found human health effects include increased serum cholesterol and uric acid levels. PFOA and PFOS have been associated with decreased antibody response following vaccination.

PFOA and PFOS caused tumors in rodents. In a community with substantial exposure to PFOA through drinking water, PFOA exposure was associated with higher incidence of kidney and testicular cancers.

How can PFAS affect children?

In experimental animals, some PFAS cause developmental effects. In humans, exposure to PFAS before birth or in early childhood may result in decreased birth weight, decreased immune responses, and hormonal effects later in life. More research is needed to understand the role of PFAS in developmental effects.

Infants and children consume more water per body weight than older individuals, so their exposures may be higher than adults in communities with PFAS in drinking water. They may also be more sensitive to the effects of PFAS.

Continue to Page 2

Continued...

When PFAS are elevated in a drinking water supply, it is advisable to use bottled water to prepare infant formula for bottle-fed babies. Beverages for infants, such as juice made from concentrate, should also be prepared with bottled water. PFAS are present in breast milk. Based on the scientific understanding at this time, since the benefits of breast-feeding are well-established, infants should continue to be breast-fed. Pregnant, nursing, and women considering having children may choose to use home water filters or bottled water for drinking and cooking to reduce exposure to PFAS in your water. However, exposure to fetuses and nursing infants is influenced by past exposures and slow excretion of these substances from the body, so risk reduction will not be immediate.

What levels of PFAS in drinking water are safe?

The New Jersey Department of Environmental Protection (NJDEP) is moving forward with setting enforceable Maximum Contaminant Levels (MCLs) for **PFOA (14 parts per trillion (ppt) [ng/L]) and PFNA (13 ppt)**. NJDEP will also be considering a recommended MCL for **PFOS (13 ppt)**. These levels are based on current scientific information and are intended to protect for lifetime exposure.

USEPA has issued a lifetime drinking water Health Advisory for **PFOA** and **PFOS** of **70 ppt** individually or when concentrations of PFOA and PFOS are combined. A Health Advisory is non-enforceable guidance that identifies the concentration of a contaminant in drinking water at which USEPA has concluded adverse health effects are not anticipated to occur. The proposed and recommended NJ MCLs are more stringent.

How do I know if I have PFAS in my drinking water?

Large public water systems in the U.S. and a subset of smaller water systems were required to test for some PFAS as part of the USEPA Unregulated Contaminant Monitoring program. All of the water systems which tested for PFAS have reported their results in your annual Consumer Confidence Report (CCR). The CCR may be available online or can be provided by your water provider. The only way to know whether your private well has PFAS is to have it tested. To find a laboratory certified to test for PFAS, you can contact NJDEP Office of Quality Assurance at 609-292-3950 or access the information at: https://www13.state.nj.us/DataMiner

What should I do if I am concerned about PFAS in my drinking water?

PFAS are **not** removed from water by boiling. **If tap or well water is found to contain PFAS, people may choose to use home water filters or bottled water for drinking and cooking to reduce exposure to PFAS in their water.**

Granular activated carbon filters or reverse osmosis water treatment devices are technologies that can reduce the level of PFAS in drinking water. If a treatment is used, it is important to follow the manufacturer's guidelines for maintenance and operation. NSF International, an independent and accredited organization, certifies products proven effective for reducing PFOA and PFOS below the USEPA Health advisory level (70 ppt) (http://info.nsf.org/Certified/DWTU/). The Minnesota Department of Health tested several household water treatment devices and found many to be effective. See link: http://www.health.state.mn.us/divs/eh/wells/waterquality/poudevicefinalsummary.pdf

What can blood testing for PFAS tell me?

PFAS can be measured in your blood serum but this is not a routine test. While a blood test may indicate whether you have been exposed to PFAS, results cannot be used to predict your health effects nor can they be linked to specific health problems. Also test results alone cannot be used to specifically identify sources of exposure, and there is no treatment to reduce levels of PFAS in blood. A national program has been measuring PFAS in blood among the U.S. population. This information can be used to determine if the levels of PFAS in your blood are higher than national background levels. For example, if your concentration is higher than the 95th percentile, this means your blood serum concentration is higher than the concentration found in 95% of the U.S. population.

Estimates of four most common PFAS measured in the U.S. general population, 2013-2014 (ng/ml [ppb])

PFAS	Geometric Mean	50th Percentile	95th Percentile
PFOS	4.99	5.20	18.42
PFOA	1.94	2.00	5.51
PFNA	0.67	0.64	1.99
PFHxS	1.35	1.33	5.54

Additional Resources:

http://www.nj.gov/health/ceohs/environmental-occupational/drinking-water-public-health/

DEPARTMENT OF HEALTH

PFOS and Drinking Water

PFOS

Perfluorooctane sulfonate (PFOS) is one of a group of related chemicals known as perfluorochemicals (PFCs). These are also called perfluorinated alkylated substances (PFAS). This group of chemicals is commonly used in non-stick and stain-resistant consumer products, food packaging, fire-fighting foam, and industrial processes.

PFOS has been used in stain-resistant fabrics, fire-fighting foams, food packaging, and as a surfactant in industrial processes. The 3M Company was once a major manufacturer of PFOS and products containing PFOS, but production was phased out in 2002.[1] PFOS production has been phased out nationwide, but continues in other countries. Products containing PFOS may be imported into the United States.

PFOS in Minnesota Waters

The Minnesota Pollution Control Agency (MPCA) detected PFOS in the Mississippi River in the Twin Cities metro area at levels up to 0.15 parts per billion (ppb).[2] Detections were more common at sites immediately downriver from an industrial facility with historical PFOS use or disposal.

PFOS has been detected in private drinking water wells and public drinking water systems in several parts of Minnesota where known industrial use or disposal of PFOS occurred in the past. PFOS has been detected in sources of public drinking water at levels up to 1.4 ppb.[3] MDH and MPCA routinely sample affected areas for PFOS and related chemicals.

MDH Guidance Value

Based on available information, MDH developed a guidance value of 0.027 ppb for PFOS in drinking water. MDH guidance values are developed to protect people who are most vulnerable to the potentially harmful effects of a contaminant. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects.

Potential Health Effects

Scientists are still studying whether PFOS causes health problems in workers, people living in communities with PFOS in their drinking water, and the general public. In some studies, higher levels of PFOS in a person's body were associated with higher cholesterol, changes to liver function, changes in thyroid hormone levels, and reduced immune response.

In laboratory animal studies, effects of PFOS exposure included developmental changes such as decreased body weight, changes in liver function and liver weight, reduced immune response, and decreased thyroid hormone levels.

Potential Exposure to PFOS

Almost everyone is exposed to small amounts of PFOS, but this does not necessarily indicate a risk to your health. Large-scale biomonitoring programs show that PFOS levels in people's blood are declining.[4] For most people, the main route of exposure to PFOS is through the foods they eat. PFOS can be present on food crops due to environmental exposures and some food packaging may transfer PFOS to packaged food items. PFOS may also be present in the fish people catch and eat. MDH provides guidelines for eating fish, including fish caught in areas affected by PFOS. Ingestion of household dust can also be a significant route of exposure, especially for infants and young children.

For people living in areas affected by PFC releases or disposal, drinking water may be a major source of exposure. MDH and MPCA have studied a number of sites in Minnesota with known PFC releases. For more information on those locations, please visit Perfluorochemicals (PFCs) in Minnesota (http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/sites.html). Reverse osmosis and activated carbon filter treatment systems can reduce the levels of PFOS in drinking water in your home. You may choose to use bottled water for drinking and cooking for a short time, but long-term bottled water use will be more expensive than installing a treatment system.

PFOS transfers from a mother to infant during pregnancy, to an infant through breastmilk, and to an infant when contaminated water is used to mix formula. Breastfeeding is important for the short and long term health of both a mother and infant. MDH recommends that women currently breastfeeding, and pregnant women who plan to breastfeed, continue to do so. Exclusive breastfeeding is recommended by doctors and other health professionals. If formula is used, by those living in affected areas, it should be prepared only with treated or bottled water.

PFOS in the Environment

PFOS use has declined in recent years, so new releases of PFOS into the environment are rare. PFOS is persistent in the environment, meaning it does not break down easily in soil or water. How PFOS moves through soil is dependent on the makeup of the soil and its chemistry. In several areas of Minnesota, PFOS has moved into groundwater over the course of many years.

Health Risk Assessment Unit

The MDH Health Risk Assessment Unit evaluates the health risks from contaminants in drinking water sources and develops health-based guidance values for drinking water. MDH works in collaboration with the Minnesota Pollution Control Agency and the Minnesota Department of Agriculture to understand the occurrence and environmental effects of contaminants in water.

References

1. US Environmental Protection Agency (EPA). 2017. “Fact Sheet: 2010/2015 PFOA Stewardship Program.” Retrieved from https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program#mfg. Accessed April 2017.
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3. Minnesota Drinking Water Information System (MNDWIS). 2017. Accessed April 2017.
4. Centers for Disease Control and Prevention (CDC). 2017. “Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables, January 2017, Volume One.” Retrieved from https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Jan2017.pdf. Accessed April 2017.

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State of New Jersey

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BOB MARTIN
Commissioner

TO: Mark Pedersen, Assistant Commissioner, Site Remediation & Waste Management

THROUGH: Gary Buchanan, Ph.D., Director
Alan Stern, Dr.P.H., DABT, Chief, Risk Analysis Section

FROM: Gloria Post, Ph.D., DABT, Research Scientist

SUBJECT: Updated Drinking Water Guidance for Perfluorooctanoic Acid (PFOA)

DATE: October 3, 2017

Drinking water guidance values developed by NJDEP for PFOA and other contaminants are intended to be protective for chronic (lifetime) exposure. This memorandum provides an update of the drinking water guidance for perfluorooctanoic acid (PFOA) of 40 ng/L (0.04 µg/L) developed by the Division of Science, Research and Technology in 2007. An update of the 2007 guidance is appropriate because a large body of relevant health effects information from both human and animal studies has become available since it was developed.

The New Jersey Drinking Water Quality Institute (DWQI) has conducted a detailed evaluation of the relevant scientific information that is currently available and developed a Health-based Maximum Contaminant Level (MCL) of 14 ng/L (0.014 µg/L) (DWQI, 2017a). The DWQI also evaluated the Practical Quantitation Level for PFOA and the ability of available treatment technology to remove PFOA from drinking water. The DWQI concluded that achievement of the Health-based MCL is not limited by the analytical or treatment removal considerations. Therefore, the DWQI recommended a Maximum Contaminant Level (MCL) of 14 ng/L to NJDEP Commissioner Martin (DWQI, 2017a).

The DWQI recommendations have been reviewed by the Division of Science, Research and Environmental Health (DSREH). DSREH scientists are in agreement with the DWQI recommendation of a heath based drinking water value of 14 ng/L, and they also agree that PFOA can be quantitated and removed from drinking water to levels below the health based value of 14 ng/L.

It is our understanding that Commissioner Martin has accepted the DWQI recommendation of a PFOA MCL of 14 ng/L, and that NJDEP plans to propose this as a regulatory MCL. An updated drinking water guidance for PFOA is needed at this time in order to provide current and health-protective advice to New Jersey public water systems with detections of PFOA until the New Jersey PFOA MCL is finalized. Therefore, it is recommended that the drinking water guidance for PFOA be updated to 14 ng/L at this time.

The basis for the 2007 guidance of 40 ng/L and the current guidance of 14 ng/L are briefly summarized below.

Basis of 2007 guidance (40 ng/L)

Although the key primary scientific literature was reviewed as appropriate, NJDEP did not conduct a comprehensive literature search on health effects of PFOA when developing the 2007 guidance due to the need for a rapid response. Instead, the 2007 guidance was based on No Observed Adverse Effect Levels (NOAELs) or Lowest Observed Adverse Effect Levels (LOAELs) for administered doses and serum PFOA levels (internal doses) in experimental animals at various life stages that were identified in the USEPA (2005) draft risk assessment for PFOA. While NOAELs and LOAELs were identified, USEPA (2005) did not develop Reference Doses (RfDs), slope factors, or a health-based drinking water level for PFOA.

Because the half-life of PFOA is much longer in humans (several years) than in the animal species used in the toxicological studies (several hours to 30 days), the 2007 guidance was based on comparisons between effect levels in animal studies and human exposures on the basis of serum levels rather than external dose.

For non-carcinogenic effects, Target Human Serum Levels (analogous to RfDs, but on a serum level basis) were derived by applying uncertainty factors to the measured or modeled serum levels at the NOAELs or LOAELs identified by USEPA (2005). The default Relative Source Contribution factor (RSC) of 20% was applied to the Target Human Serum Levels to account for contributions to serum PFOA from non-drinking water exposures.

For carcinogenic effects, NJDEP noted that PFOA was classified as having "suggestive evidence of carcinogenic potential" by USEPA (2005) and as "likely to be carcinogenic to humans" by the USEPA Science Advisory Board (2006). The serum level resulting in a one in one million (10^{-6}) risk level was estimated by linear extrapolation from the modeled serum level in animals at a dose resulting in an approximate 10% tumor incidence.

The mean ratio of approximately 100:1 between serum PFOA levels and drinking PFOA water concentrations in exposed communities was used to convert the serum PFOA levels for non-carcinogenic and carcinogenic effects identified above to the corresponding drinking water concentrations (Post et al., 2009). The range of drinking water concentrations for the seven toxicological endpoints assessed (six non-carcinogenic endpoints and carcinogenicity) was 40 – 260 ng/L, and drinking water concentrations for five of these endpoints fell within a similar range (40, 50, 60, 70, and 80 ng/L). The most sensitive endpoints, resulting in a drinking water concentration of 40 ng/L, were decreased body weight and hematological effects in the adult female rat in a chronic dietary study (Sibinski, 1987). This value was determined to be protective for carcinogenic effects, as the drinking water concentration at the 10^{-6} cancer risk level was estimated as 60 ng/L. Therefore, the guidance of 40 ng/L was considered to be protective for both non-carcinogenic and carcinogenic effects.

Basis of updated guidance (14 ng/L)

The updated guidance of 14 ng/L is based on the Health-based MCL and MCL recommended by the DWQI (2017a). In developing the Health-based MCL for PFOA, DWQI (2017b) conducted a literature search in 2015 that identified over 2000 publications related to PFOA, with subsequent updated searches to identify additional relevant publications. Of these studies, only 244 were published in 2005 or earlier, while more than 1700 were published in 2006 or later and were therefore not considered by USEPA (2005) or by NJDEP in developing its 2007 PFOA guidance of 40 ng/L.

It was noted that a large body of relevant health effects information not considered in development of the 2007 guidance has become available. Of particular importance are toxicology studies reporting developmental effects in mice, and epidemiology studies reporting associations of PFOA with numerous health effects in the general population and in communities with contaminated drinking water. Developmental effects of PFOA in mice were first reported in 2006, while earlier developmental studies were from rats. The rat is not a suitable model for developmental effects of PFOA because of very rapid excretion of PFOA (half-life 2-4 hours) in females. In contrast, the mouse is an appropriate model for developmental effects of PFOA because female mice, like humans, excrete PFOA slowly. In humans, PFOA exposure levels prevalent in the general population have been associated with health effects including increased serum cholesterol and liver enzymes, decreased response to vaccines, and decreased birth weight. Drinking water exposure to PFOA was also associated with testicular and kidney cancer. In addition, the DWQI noted that PFOA persists in the body for many years after exposure ends (half-life of several years) and that relatively low exposures in drinking water substantially increase serum PFOA levels. The DWQI concluded that the information presented above supports a public health protective approach in developing a Health-based MCL and a need for caution regarding exposure through drinking water.

Both non-carcinogenic and carcinogenic effects were evaluated for Health-based MCL development. Delayed mammary gland development and increased liver weight were the most sensitive non-carcinogenic endpoints with serum PFOA data needed for dose-response analysis, and Target Human Serum Level were developed for these endpoints. The Target Serum Levels were developed by applying appropriate uncertainty factors to serum BMDLs (lower confidence limit on Benchmark Dose) developed through Benchmark Dose modeling. A clearance factor (1.4×10^{-4} L/kg/day) which relates serum PFOA concentrations to human PFOA doses was applied to the Target Human Serum Levels to develop Reference Doses. This clearance factor predicts a ratio of drinking water:serum levels of 114:1 from average water consumption, consistent with observations in communities using drinking water contaminated with PFOA.

For delayed mammary gland development, the Target Human Serum Level is 0.8 ng/ml, which is below the median serum PFOA level in the U.S. general population, and the Reference Dose for this endpoint is 0.11 ng/kg/day. Because the use of delayed mammary gland development as the basis for quantitative risk assessment is a currently developing topic, a Health-based MCL using this endpoint as its primary basis was not recommended. However, it was concluded that an uncertainty factor for sensitive endpoints is needed to protect for this and other effects that occur at similarly low doses.

A Health-based MCL protective for increased relative liver weight was derived based on a study in which male mice were exposed to PFOA for 14 days (Loveless et al., 2006). For increased relative liver weight, the Target Human Serum Level is 14.5 ng/ml and the Reference Dose is 2 ng/kg/day. This Target Human Serum Level and Reference Dose incorporate uncertainty factors to protect sensitive human subpopulations, to account for toxicodynamic differences between human and experimental animals, and to protect for more sensitive endpoints that occur from developmental exposures (delayed mammary gland development, persistent hepatic toxicity, and others). Default values for drinking water exposure assumptions (2 L/day water consumption; 70 kg body weight) and Relative Source Contribution factor (20%) were used to develop a Health-based MCL of 14 ng/L based on the Reference Dose for increased relative liver weight.

A cancer slope factor of 0.021 $(mg/kg/day)^{-1}$ was developed based on increased incidence of testicular tumors in a chronic rat study. This slope factor was used to develop a Health-based MCL protective for cancer effects at the 1×10^{-6} (one in one million) lifetime cancer risk level of 14 ng/L, identical to the Health-based MCL based on non-cancer endpoints.

Therefore, the Health-based MCL recommended by the DWQI and accepted by NJDEP was 14 ng/L.

In conclusion, it is recommended that the drinking water guidance for PFOA be updated to 14 ng/L.

Please let me know if you have any questions or need additional information.

c: Dan Kennedy, Assistant Commissioner, Water Resource Management

<u>Citations</u>

DWQI (2017a). New Jersey Drinking Water Quality Institute. Maximum Contaminant Level Recommendations for Perfluorooctanoic Acid in Drinking Water. March 15, 2017. http://www.nj.gov/dep/watersupply/pdf/pfoa-recommend.pdf

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Loveless, S.E., Finlay, C., Everds, N.E., Frame, S.R., Gillies, P.J., O'Connor, J.C., Powley, C.R., Kennedy, G.L. (2006). Comparative responses of rats and mice exposed to linear/branched, linear, or branched ammonium perfluorooctanoate (APFO). Toxicology 220: 203–217.

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Sibinski, L.J. (1987). Final report of a two year oral (diet) toxicity and carcinogenicity study of fluorochemical FC-143 (perfluorooctanoate ammonium carboxylate) in rats. Vol. 1-4, 3M Company/RIKER. No.0281CR0012; 8EHQ-1087-0394, October 16, 1987.

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DEPARTMENT OF HEALTH

PFOA and Drinking Water

PFOA

Perfluorooctanoic acid (PFOA) is one of a group of related chemicals known as perfluorochemicals (PFCs). These are also called perfluorinated alkylated substances (PFAS). This group of chemicals is commonly used in non-stick and stain-resistant consumer products, food packaging, fire-fighting foam, and industrial processes.

PFOA has been used to manufacture chemicals used in non-stick and stain-resistant coatings, fire-fighting foams, and as a surfactant in industrial processes. The 3M Company was once a major manufacturer of PFOA and products containing PFOA, but production was phased out in 2002.[1] PFOA production has been phased out nationwide but continues in other countries. Products containing PFOA may be imported into the United States.

PFOA in Minnesota Waters

The Minnesota Pollution Control Agency (MPCA) has detected PFOA in the Mississippi River in the Twin Cities metro area at levels up to 0.22 parts per billion (ppb).[2] Detections were more common at sites immediately downriver from an industrial facility with historical PFOA use or disposal.

PFOA has been detected in private drinking water wells and public drinking water systems in several parts of Minnesota where known industrial use or disposal of PFOA occurred in the past. PFOA has been detected in sources of public drinking water at levels up to 1 ppb.[3] MDH and MPCA routinely sample affected areas for PFOA and related chemicals.

MDH Guidance Value

Based on available information, MDH developed a guidance value of 0.035 ppb for PFOA in drinking water. MDH guidance values are developed to protect people who are most vulnerable to the potentially harmful effects of a contaminant. A person drinking water at or below the guidance value would be at little or no risk for harmful health effects.

Potential Health Effects

Scientists are still studying whether PFOA causes health problems in workers, people living in communities with PFOA in their drinking water, and the general public. In some studies, higher levels of PFOA in a person's body were associated with higher cholesterol, changes to liver function, reduced immune response, thyroid disease, and increased kidney and testicular cancer.

In laboratory animal studies, effects of PFOA exposure included developmental changes such as delayed bone growth, delayed mammary gland development, and accelerated male sexual development. Other effects of PFOA exposure included changes to the liver, reduced immune response, and increased kidney weight. Increased incidence of Leydig cell tumors in the testes of male rats has been reported, but it is unclear whether this type of tumor is relevant to humans. At this time, MDH considers the existing data to be inadequate to assess the carcinogenic potential of PFOA.

Potential Exposure to PFOA

Almost everyone is exposed to small amounts of PFOA, but this does not necessarily indicate a risk to your health. Large-scale biomonitoring programs show that PFOA levels in people's blood are declining.[4] For most people, the main route of exposure to PFOA is through the foods they eat. PFOA can be present on food crops due to environmental exposures and some food packaging may transfer PFOA to packaged food items. Ingestion of household dust can also be a significant route of exposure, especially for infants and young children.

For people living in areas affected by PFC releases or disposal, drinking water may be a major source of exposure to PFOA. MDH and MPCA have studied a number of sites in Minnesota with known PFC releases. For more information on those locations, please visit Perfluorochemicals (PFCs) in Minnesota (http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcs/sites.html). Reverse osmosis and activated carbon filter treatment systems can reduce the levels of PFOA in drinking water in your home. You may choose to use bottled water for drinking and cooking for a short time, but long-term bottled water use will be more expensive than installing a treatment system.

PFOA transfers from a mother to infant during pregnancy, to an infant through breastmilk, and to an infant when contaminated water is used to mix formula. Breastfeeding is important for the short and long term health of both a mother and infant. MDH recommends that women currently breastfeeding, and pregnant women who plan to breastfeed, continue to do so. Exclusive breastfeeding is recommended by doctors and other health professionals. If formula is used by those living in affected areas, it should be prepared only with treated or bottled water.

PFOA in the Environment

PFOA use has declined in recent years, so new releases of PFOA into the environment are rare. PFOA is persistent in the environment, meaning it does not break down easily in soil or water. How PFOA moves through soil is dependent on the makeup of the soil and its chemistry. In several large areas of Minnesota, PFOA has moved into groundwater over the course of many years.

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References

1. US Environmental Protection Agency (EPA). 2017. "Fact Sheet: 2010/2015 PFOA Stewardship Program." Retrieved from https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program#mfg. Accessed April 2017.
2. Minnesota Pollution Control Agency (MPCA). 2013. "Perfluorochemicals in Mississippi River Pool 2: 2012 Update." Retrieved from https://www.pca.state.mn.us/sites/default/files/c-pfc1-21.pdf. Accessed April 2017.
3. Minnesota Drinking Water Information System (MNDWIS). 2017. Accessed by MDH staff April 2017.
4. Centers for Disease Control and Prevention (CDC). 2017. "Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables, January 2017, Volume One." Retrieved from https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Jan2017.pdf. Accessed April 2017.

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MAY 2017

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SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES - WATER ANALYSIS

Requestor Name: [redacted]
Location: [redacted] HEDGES LANE, WAINSCOTT
Sample Location: OUTDOOR SPIGOT
Treatment: NONE

Request No.: [redacted]
Sample Date: 08/14/2017
Sanitarian: ABAZIS
Field No.: 158-929-17-08-14

Survey #: SV0317

Notes: '<' symbol means "less than" indicating no detection. mg/L = milligrams per liter; ug/L = micrograms per liter. Alkalinity is reported as mg/L as CaCO3. '*' symbol means level found exceeds the maximum contaminant level (MCL), or action level for lead and copper. Moderately restricted sodium diet should not exceed 270 mg/L. Severely restricted should not exceed 20 mg/L. The MCL for nickel is a proposed limit. Any MCL's not shown below have not been established.

RESULTS CONTINUED FROM PRECEDING PAGE

===== Results for Sample Group: PERFLUORINATED COMPOUNDS analyzed by New York State Department of Health =====

Parameter		Result	MCL	Units
PFBS (Perfluorobutanesulfonic Acid)	=	1.89	50000	ng/L
PFHxs (Perfluorohexanesulfonic Acid)	=	4.92	50000	ng/L
PFHpA (Perfluoroheptanoic Acid)	=	13.9	50000	ng/L
PFOA (Perfluorooctanoic Acid)	=	11.8	50000	ng/L
PFOS (Perfluorooctanesulfonic Acid)	=	6.3	50000	ng/L
PFNA (Perfluorononanoic Acid)	=	672.	50000	ng/L

===== Results for Sample Group: STANDARD INORGANICS analyzed by Suffolk County Department of Health Services =====

Parameter		Result	MCL	Units
pH-Lab	=	7.0		N/A
Specific Conductivity-Lab	=	146.		umho/ù cm
Chloride (Cl)	=	7.	250.00	mg/L
Sulfate (SO4)	=	7.	250.00	mg/L
Nitrite (NO2-N)	<	0.05	1.00	mg/L
Nitrate	=	0.24	10.00	mg/L
Bromide	=	0.055		mg/L
Orthophosphate	<	0.1		mg/L
Fluoride	<	0.1	2.20	mg/L
T. Alkalinity	=	54.		mg/L
Hexavalent Chromium	<	0.03		ug/L
Chlorate	<	0.05		mg/L

===== Results for Sample Group: SEMI-VOLATILE ORGANICS METHOD 525 analyzed by Suffolk County Department of Health Services =====

Parameter		Result	MCL	Units
1-Methylnaphthalene	<	0.2	50.00	ug/L
2-Methylnapthalene	<	0.2	50.00	ug/L
Acenaphthene	<	0.2	50.00	ug/L
Acenaphthylene	<	0.2	50.00	ug/L
Acetochlor	<	0.2	50.00	ug/L
Alachlor	<	0.2	2.00	ug/L
Allethrin	<	0.2	50.00	ug/L
Anthracene	<	0.5	50.00	ug/L
Atrazine	<	0.1	3.00	ug/L
Azoxystrobin	<	0.2	50.00	ug/L
Benfluralin	<	0.5	50.00	ug/L
Benzo(A)Anthracene	<	0.5	50.00	ug/L
Benzo(B)Fluoranthene	<	0.2	50.00	ug/L
Benzo(GHI)Perylene	<	0.2	50.00	ug/L
Benzo(K)Fluoranthene	<	0.2	50.00	ug/L
Benzo(A)Pyrene	<	0.02	0.20	ug/L
Benzophenone	<	0.2	50.00	ug/L
Benzyl butyl phthalate	<	0.2	50.00	ug/L
Bis(2-ethylhexyl)adipate	<	0.5	50.00	ug/L
Bis(2-ethylhexyl)phthalate	<	3.0	6.00	ug/L
Bisphenol A	<	0.5	50.00	ug/L
Bloc	<	0.2	50.00	ug/L
Bromacil	<	0.5	50.00	ug/L
Butachlor	<	0.2	50.00	ug/L
Carbamazepine	<	0.5	50.00	ug/L
Carbazole	<	0.2	50.00	ug/L
Carisoprodol	<	0.5	50.00	ug/L
Chlordane	<	0.2	2.00	ug/L
Chlorofenvinphos	<	0.2	50.00	ug/L
Chloroxylenol	<	0.2	50.00	ug/L
Chlorpyriphos	<	0.2	50.00	ug/L
Chrysene	<	0.2	50.00	ug/L
Cyfluthrin	<	0.2	50.00	ug/L
Cypermethrin	<	0.5	50.00	ug/L
Dacthal	<	0.2	50.00	ug/L
Deltamethrin	<	0.5	50.00	ug/L
Dibenzo(A,H)Anthracene	<	0.2	50.00	ug/L
Dibutyl Phthalate	<	1.0	50.00	ug/L
Dichlobenil	<	0.2	50.00	ug/L
Dichlorvos	<	0.5	50.00	ug/L
Dieldrin	<	0.2	50.00	ug/L
Diethyl phthalate	<	1.0	50.00	ug/L
Diethyltoluamide (DEET)	<	0.2	50.00	ug/L
Dimethyl phthalate	<	0.2	50.00	ug/L
Dioctyl Phthalate	<	0.2	50.00	ug/L
Disulfoton sulfone	<	0.2	50.00	ug/L
Endosulfan Sulfate	<	0.2	50.00	ug/L
EPTC	<	0.2	50.00	ug/L
Ethofumesate	<	0.2	50.00	ug/L
Ethyl Parathion	<	0.2	50.00	ug/L
Fluoranthene	<	0.2	50.00	ug/L
Fluorene	<	0.2	50.00	ug/L
Hexachlorobenzene	<	0.1	1.00	ug/L
Hexachlorocyclopentadiene	<	0.1	5.00	ug/L
Hexachloroethane	<	1.0	5.00	ug/L
Hexazinone	<	1.0	50.00	ug/L
Indeno(1,2,3-cd)Pyrene	<	0.2	50.00	ug/L
Iodofenphos	<	0.2	50.00	ug/L
Iprodione	<	0.5	50.00	ug/L
Isofenphos	<	0.5	50.00	ug/L
Kelthane	<	0.5	50.00	ug/L
Malathion	<	0.5	50.00	ug/L
Metalaxyl	<	0.2	50.00	ug/L
Methoprene	<	0.2	50.00	ug/L
Methoxychlor	<	0.1	50.00	ug/L
Methyl Parathion	<	0.2	50.00	ug/L
Metolachlor	<	0.2	50.00	ug/L
Naled (Dibrom)	<	0.2	50.00	ug/L
Napropamide	<	0.2	50.00	ug/L
Pendimethalin	<	0.2	5.00	ug/L
Pentachlorobenzene	<	0.2	50.00	ug/L
Pentachloronitrobenzene	<	0.2	50.00	ug/L
Permethrin	<	0.2	50.00	ug/L
Phenanthrene	<	0.2	50.00	ug/L
Piperonyl butoxide	<	0.5	50.00	ug/L
Prometon	<	0.5	50.00	ug/L
Prometryne	<	0.2	50.00	ug/L
Propachlor	<	0.2	50.00	ug/L
Propiconazole (Tilt)	<	0.2	50.00	ug/L
Pyrene	<	0.5	50.00	ug/L
Resmethrin	<	0.2	50.00	ug/L
Ronstar	<	0.2	50.00	ug/L
Simazine	<	0.07	4.00	ug/L
Sumithrin	<	0.2	50.00	ug/L
Tebuthiuron	<	0.5	50.00	ug/L
Terbacil	<	0.5	50.00	ug/L
Triadimefon	<	0.5	50.00	ug/L
Triclosan	<	0.5	50.00	ug/L
Trifluralin	<	0.5	50.00	ug/L
Vinclozolin	<	0.5	50.00	ug/L
Total Triazines + Metabolites (Calc)	<	0.	4.00	ug/L
Etofenprox	<	0.2	50.00	ug/L
Etofenprox alpha-CO	<	0.2	50.00	ug/L
Prallethrin	<	0.2	50.00	ug/L

RESULTS CONTINUED ON NEXT PAGE....

New York State Department of Health
Wadsworth Center

Biggs Laboratory PO Box 509 Albany, NY 12201 CLIA# 33D0654341	David Axelrod Institute 120 New Scotland Avenue Albany, NY 12208 CLIA# 33D2005937	Griffin Laboratory 5668 State Farm Road Slingerlands, NY 12159 CLIA# 33D2005935

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Report Date: **09/22/2017**

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ROOM 1110
CORNING TOWER - EMPIRE STATE PLAZA
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Public Water Systems (BWSP)

County: SUFFOLK
City (or) Town: EAST HAMPTON
Submitted by: KATE ABAZIS
Collected by:

Grab/Collection Date: 08/14/2017 11:40
Date received: 08/22/2017 14:40

Additional Info: [redacted]

Location/Project/Facility Name: 158-929-170814 DUP
Sampling Location Details: [redacted] OUTDOOR SPIGOT
[redacted] HEDGES LANE
WAINSCOTT NY 11975
Chlorinated: No

FINAL LABORATORY REPORT

Biggs Laboratory
NYS ELAP ID: 10763

Laboratory of Organic Analytical Chemistry
Lab Director: Dr. K. Kannan
Contact: Dr. David Spink 518-486-2530

Sample Id: EHS1700042955-01

Sample Type: Raw Water

Received Temperature (°C): **4.9**

Lab Tracking Id: 158929170814DUP

Perfluoroalkyl Substances (PFASs) in Drinking Water by Ultra Performance Liquid Chromatography (UPLC) Tandem Mass Spectrometry (MS/MS): ISO 25101

Start Date: 8/23/2017 Analysis Date: 8/24/2017

Perfluorobutanesulfonic acid (PFBS):	**1.93 ng/L**	
Perfluorohexanesulfonic acid (PFHxS):	**4.87 ng/L**	
Perfluoroheptanoic acid (PFHpA):	**13.7 ng/L**	
Perfluorooctanoic acid (PFOA):	**10.9 ng/L**	NYSELAP
Perfluorooctanesulfonic acid (PFOS):	**6.18 ng/L**	NYSELAP
Perfluorononanoic acid (PFNA):	**637 ng/L**	

The purpose of our sampling is to analyze for PFOA and/or PFOS, as per ISO 25101:2009 (E) method. This test includes four additional Perfluorinated Chemicals (PFCs): perfluorobutanesulfonic acid (PFBS), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), perfluoronoanoic acid (PFNA) that have been validated by the laboratory. These other PFCs may have been detected at very low concentrations-EPA has not established health advisories for these chemicals. All six PFCs are effectively removed from drinking water by granular activated carbon filtration systems.

NYSELAP: Accredited by the New York State Environmental Laboratory Approval Program

END OF REPORT

The Laboratory Director authorizes the release of this report. The results in this report relate only to the sample submitted to the laboratory.

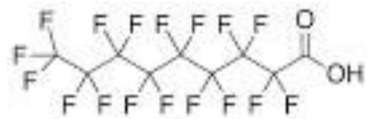
Ground Water Quality Standard for Perfluorononanoic acid

CASRN# 375-95-1

October 2015 NJDEP

Summary of Decision: In accordance with the New Jersey Ground Water Quality Standards rules at N.J.A.C. 7:9C-1.7, the Department of Environmental Protection (Department) has developed an interim specific ground water quality criterion of 0.01 µg/L (ppb) and a practical quantitation level (PQL) of 0.003 µg/L (ppb) for perfluorononanoic acid (PFNA). The basis for this criterion and PQL are discussed below. Pursuant to N.J.A.C. 7:9C-1.9(c), **the applicable constituent standard is 0.01 µg/L**.

Perfluorononanoic acid (PFNA)
Molecular Formula:
$C_9HF_{17}O_2$
Molecular Structure:



Background: PFNA is a fully fluorinated carboxylic acid**.** PFNA was historically used primarily as a processing aid in the emulsion process used to make fluoropolymers, mainly polyvinylidene fluoride (Prevedouros et al., 2006). Like other perfluorinated chemicals (PFCs), PFNA is extremely persistent in the environment and is soluble in water (Post et al., 2013). The manufacture and use of PFNA and other long-chain perfluorinated carboxylates is currently being phased out by eight major manufacturers through a voluntary stewardship agreement with the U.S. Environmental Protection Agency (USEPA), with the ultimate goal of eliminating emissions and product content by 2015 (USEPA, 2010, 2012). Most of the participating companies are currently operating at or near this goal (see USEPA's Web site at http://www.epa.gov/oppt/pfoa/pubs/stewardship/). Notwithstanding this progress, environmental contamination caused by PFNA is anticipated to continue for the foreseeable future due to its persistence in the environment, formation from precursor compounds (discussed below), and the potential for continued production by other manufacturers in the U.S. and/or overseas (USEPA, 2009; Lindstrom, et al., 2011).

Reference Dose: The Reference Dose is based on increased liver weight in pregnant mice observed in a developmental study conducted by USEPA (Das et al., 2014). Of the numerous effects observed in this study, increased maternal liver weight was selected as the critical endpoint for quantitative risk assessment because serum levels and liver weights were both measured at the same time point (gestational day (GD) 17), one day after the last dose. Liver weight increased in a dose-related manner, with a Lowest Observed Adverse Effect Level (LOAEL) of 1 mg/kg/day and a serum level BMDL (lower confidence limit on the benchmark dose) of 4,900 ng/ml (4.9 µg/ml) for increased liver weight (Das et al., 2015; numerical data and statistical parameters obtained from C. Lau, USEPA). A No Observed Effect Level (NOAEL) was not identified. An uncertainty factor of 1000 was applied to the BMDL to derive a target human serum level (i.e., Reference Dose in terms of serum level) of

4.9 ng/ml (4.9 μg/L). This includes uncertainty factors of 10 for intraspecies variability, 3 for interspecies variability, 10 to account for less-than-chronic study duration in Das et al. (2015), and 3 for gaps in the toxicological database.

A chemical specific Relative Source Contribution factor (RSC) of 0.5, based on the 95th percentile of serum PFNA in the U.S. general population from the most recent (2011-12) NHANES (CDC, 2015), is applied to the target human serum level of 4.9 ng/ml to derive the target human serum level from drinking water exposure only:

4.9 ng/ml x 0.5 = 2.45 ng/ml which rounds to 2.5 ng/ml (2.5 μg/L)

Pharmacokinetic data support a factor of 0.08 (ng/kg/day)/(ng/ml) relating PFNA intake and increase in PFNA serum level. This factor is used to derive the daily PFNA intake from drinking water (ng/kg/day) which will result in an increase in the serum level of 2.5 ng/ml (4.9 μg/L) as follows.

$$\frac{0.08\ \text{ng/kg/day}}{\text{Ng/ml}} \times 2.5\ \text{ng/ml} = 0.2\ \text{ng/kg/day}$$

Based on the average daily water consumption value recommended by USEPA (2011) of 16 ml/kg/day (0.016 L/kg/day), the drinking water concentration that will result in exposure to 0.2 ng/kg/day is:

$$\frac{0.2\ \text{ng/kg/day}}{0.016\ \text{L/kg/day}} = 13\ \text{ng/L}$$

Using the chemical specific RSC of 0.5 and default assumptions for drinking water consumption and body weight, the Reference Dose that supports the derivation of a criterion of 13 ng/L is 0.74 ng/kg/day, as follows:

$$\frac{13\ \text{ng/L} \times 2\ \text{L/day}}{70\ \text{kg} \times 0.5} = 0.74\ \text{ng/kg/day}$$

<u>Derivation of Interim Specific Ground Water Quality Criterion</u>: The interim specific ground water quality criterion for PFNA was derived pursuant to the formula established at N.J.A.C. 7:9C-1.7(c)4, using 0.74 ng/kg/day as the Reference Dose (as explained above), and standard default assumptions:

$$\frac{0.74\ \text{ng/kg/day} \times 70\ \text{kg} \times 0.5}{2\ \text{L/day}} = 13\ \text{ng/L} = 0.013\ \text{ug/L}$$

(which rounds to 0.01 ug/L)

Where: 13 ng/L = Interim specific ground water criterion
70 kg = Average adult body weight
2 L/day = Assumed daily water consumption
0.5 = Relative Source Contribution factor

<u>Derivation of PQL</u>: The method detection limit (MDL) and the practical quantitation level (PQL) are performance measures used to estimate the limits of performance of analytical chemistry methods for measuring contaminants. The MDL is defined as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero" (40 CFR Part 136 Appendix B). The Department uses a value of five times the median as an upper boundary of the interlaboratory MDL distribution and PQL. Establishing the PQL at a level that is five times the interlaboratory MDL provides a reliable quantitation level that most laboratories can be expected to meet during day-to-day operations. The Department's Office of Quality Assurance currently certifies three commercial laboratories for PFNA analysis. The three certified laboratories had similar performance values for PFNA analysis using USEPA Method 537 and/or proprietary methods. The statistical technique that was used is called the "Bootstrap Estimate of a confidence interval of the mean" and was calculated using the statistical package "R". This process was used because sufficient interlaboratory data (from a minimum of five laboratories) were not available to follow the Department's usual PQL calculation procedures. USEPA also uses this method when a limited set of performance data is available (Winslow, 2004). Using this approach, the upper 95% confidence interval (UCL) of the concentration level that would encompass the certified laboratory community quantification capability value was 2.5 ng/L (rounded to 3 ng/l). **Therefore, the Department has established a PQL of 0.003 ppb or 0.003 ug/L for PFNA.**

Conclusion: Based on the information provided above (and cited below), the Department has established an interim specific ground water quality criterion of 0.01 µg/L and a PQL of 0.003 µg/L (ppb) for PFNA. Since the ground water quality criterion is higher than the PQL for this constituent, pursuant to N.J.A.C. 7:9C-1.9(c), **the applicable constituent standard for PFNA is 0.01 µg/L**.

Technical Support Documents:

Interim Specific Ground Water Criterion For Perfluorononanoic Acid (PFNA, C9) NJDEP Office of Science Web site at http://nj.gov/dep/dsr/pfna/index-April2015.htm;

Practical Quantitation Level (PQL) determination to support Interim Specific Ground Water Quality Criterion development for Perfluorononanoic Acid(PFNA), R. Lee Lippincott, Ph.D., NJDEP, March 6, 2014

References:

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Drinking Water Action Level for Perfluorinated Alkyl Substances (PFAS)

Gary Ginsberg, Brian Toal 12/12/16
Connecticut DPH, Environmental and Occupational Health Assessment

Abstract

The PFAS compounds perfluorooctanoic acid (PFOA) and perfluorooctanesulfonate (PFOS) have been the most extensively studied PFAS found in the environment. Spurred by recent detections in drinking water supplies in several states, PFOS and PFOA limits for drinking water have been derived by USEPA (2016), VT (2016), NH (2016), ME (2014), NJ (2007, 2016) and MN (2008). The Connecticut Department of Public Health (DPH) considers USEPA's Health Advisory of 70 ppt for PFOA and PFOS (cap of 70 ppt for PFOA + PFOS) to be health protective and adopts this as our Action Level. As part of the 70 ppt target concentration, DPH includes additional PFAS compounds as follows: perfluorohexanesulfonate (PFHxS), perfluorononanoic acid (PFNA), and perfluoroheptanoic acid (PFHpA). The detected concentration for these PFAS will be added into the PFAS total and this should not exceed 70 ppt in a water sample. The Action Level involves the adoption of an RfD for PFOS and PFOA of 0.02 ug/kg/d as per the USEPA determination, while no RfD is derived at this time for other PFAS. The PFAS compounds have the potential to penetrate the skin. Therefore, the default CT DPH bathing and showering (B/S) advice that pertains to this class of contaminant (no B/S if greater than 3 times the drinking water standard) is applicable to the targeted PFAS compounds.

Introduction

PFOA and PFOS toxicology has been extensively reviewed by USEPA and various states in order to set risk-based drinking water concentrations. There are no federal or state Maximum Contaminant Levels (MCLs) and so these determinations have been set as guidance. The one exception is the draft 2016 New Jersey determination which when finalized would be a state MCL. PFOA and PFOS have very long half-lives in humans and primarily affect the liver, blood lipids, are endocrine disruptive and have adverse effects on in utero development (e.g., growth restriction). As summarized in Table 1, reference doses (RfDs) and drinking water limits have been derived by a number of states and USEPA using standard toxicology approaches. The one exception is that these determinations have involved a rather large pharmacokinetic (PK) adjustment in extrapolating results across species because of the much shorter half-life in rodents compared to humans. The drinking water limits range from 14 parts per trillion (ppt) to 300 ppt although the most recent determinations are in the 14 to 70 ppt range. The differences between these determinations are shown in the table and further described below.

Table 1. Summary of Federal and State PFAS Drinking Water Determinations[1]

Jurisdiction	Chemical	Limit	RfD/Basis	Application to DW
USEPA Health Advisory, 2016	PFOS, PFOA, combination	70 ppt	PFOA: liver wt effects in rodents across multiple studies → PK adj for HED NOAEL /30 = 0.02 ug/kg/d PFOS: developmental effects in rats; NOAEL→PK adj for HED/30	Water ingestion to pregnant woman: approx 3L/60kg, RSC=20%
VT, 2016	PFOS, PFOA combination	20 ppt	Same as EPA	Water ingestion to 0-1 yr old child, approx. 1.75 liter per 10 kg child; RSC= 20%
NH, 2016	PFOS, PFOA combination	70 ppt	Same as EPA	Same as EPA
NJ, 2016	PFOA	14 ppt	0.002 ug/kg/d based upon BMDL for liver wt effects in adult mice; BMDL extrapolated to HED by PK adj, divided by 300x cumulative UF	Water ingestion to adult (2L/70kg), RSC = 20%
ME, 2014	PFOA	100 ppt	0.006 ug/kg/d; liver wt effects in rodents across 6 studies; BMDL → PK adj for HED /300	Water ingestion to adult, (2 L/70kg), RSC = 0.6 based upon NHANES upper 95th human serum level
MN 2008 HRL[2]	PFOA	300 ppt	0.077 ug/kg/d; liver wt effects in monkeys; BMDL → PK adj for HED / 30	Water ingestion to adult, 3.7 L/day for 70 kg, RSC = 20%
NJ, 2015 Interim GW Criterion	PFNA	13 ppt	$BMDL_{10}$ for liver wt ↑ in mice converted to human serum concentration and divided by cumulative UF of 1000x	Water ingestion to serum concentration ratio in human adults of 200:1

[1]Abbreviations: the following have not been identified elsewhere in text and are not self-evident: adj – adjustment; HED – human equivalent dose; PK – pharmacokinetic; RSC – relative source contribution; BMDL – benchmark dose lower limit; UF – uncertainty factor; GW - groundwater

[1]Health Risk Limit: Minnesota is reviewing their 2008 determination in light of USEPA's 2016 Health Advisory of 70 ppt.

Further Details

Additional perspective on the derivation of drinking water targets for PFOS and PFOA across the jurisdictions listed above is divided into 4 main decision points as follows:

1) Choice of toxicity endpoint: PFOS and PFOA have a wide variety of effects even at relatively low dose with enlargement of liver, endocrine disruption (especially thyroid), and effects on in utero development including developmental neurotoxicity and immunotoxicity all observed at LOAELs

or BMDLs in the range of 1 mg/kg/d or below. The endpoints with the greatest data in rodents and monkeys are developmental toxicity and liver enlargement. As seen in the table, RfDs ranging from 0.002 to 0.077 ug/kg/d have been derived with this difference based upon a number of factors including choice of endpoint, species and study. For example, the highest RfD derived, 0.077 ug/kg/d used the same endpoint (liver weight effects) as in the USEPA determination but the species selected (monkey) required smaller adjustments across species for PK differences than necessitated in the extrapolation from the rat liver weight effects. The in utero developmental endpoints for PFOA were primarily from mouse studies and yielded the same RfD as other endpoints in the USEPA (2016) health advisory derivation. Thus, no one endpoint appears to be the most sensitive or risk driver.

2) Extrapolation of pharmacokinetics from animals to humans: this is based upon fairly straightforward one compartment modeling to go from animal point of departure dose to human equivalent dose (HED) based upon the much longer half life in humans compared to the test animals. This PK adjustment is in the range of 50 to 150 fold depending upon which species is being extrapolated to humans and which PFAS chemicals are involved.

3) Choice of other uncertainty factors to establish RfD: the uncertainty factors have generally followed defaults for cross species (10x) and intra-individual (10x) except that cross species PK was not the typical default but the 3x normally applied for this factor was based upon cross species half life differences. Aside from the PK adjustment a net 30 fold UF was used from a NOAEL or BMDL while in some cases an extra 10 fold was used to account for use of a LOAEL. Also, ME and NJ used larger UFs to account for uncertainties in the PFOA database. These approaches yielded an array of RfDs from 0.002 ug/kg/d to 0.077 ug/kg/d for PFOA and 0.02 to 0.05 ug/kg/d for PFOS. The final choice of RfDs for PFOS and PFOA by USEPA was 0.02 ug/kg/d for both.

4) Application of RfD to drinking water advisory: all derivations shown in the above table except for VT apply the RfD to an adult exposure scenario ranging from the traditional default of 2 L/day for 70 kg body wt to more updated and conservative values, such as USEPA's assumption of 3 L/day for a 60 kg body weight during pregnancy. VT applied the RfD to a 10 kg child ingesting 1.75 L/day given that PFOA and PFOS have developmental toxicity and 1.75 L/day is an upper bound ingestion rate for young children. Aside from the exposure scenario, the Relative Source Contribution (RSC) is a point of difference between ME (RSC = 0.6) vs all others (RSC= 0.2). The higher RSC from ME was based upon comparison to NHANES biomonitoring data for PFOA in which ME used the 95th percentile of the distribution of serum PFOA values to develop the background exposure from diet and other exposures. This serum level from NHANES is 7.5 ug/L while ME showed that the RfD equivalent in drinking water equates to a serum level of 21 ug/L. Thus the background level of exposure uses up only 40% of the RfD leaving 60% that can come from drinking water. This consideration can lead one to a higher drinking water advisory because of the higher RSC, but conversely, it can lead to a greater level of concern given that consumption of water at the drinking water advisory value of 70 ppt leads to a serum level of 7 ug/L which is double the 95th percentile of the background PFOA exposure distribution. Thus, from an exposure perspective, a person ingesting water at USEPA's health advisory for PFOA would theoretically be placed into the upper tail of the exposure distribution. This may not be

of public health concern if adverse effects do not start occurring until well above this range. However, as described in a brief synopsis of the epidemiology below, this may not be the case.

NJ's Draft MCL for PFOA, June 2016 (Released August 2016)

The New Jersey Drinking Water Quality Institute (NJDWQI) derived a draft MCL for PFOA of 14 ppt based upon liver weight effects in mice using the BMDL approach to estimate the point of departure. Although this endpoint is different than that used by USEPA, the dose response and point of departure are similar. The reason for the lower target in the draft NJ derivation is an additional 10 fold uncertainty factor for possibly more sensitive endpoints in the PFOA toxicology database, specifically with respect to delayed mammary development in mice, an endocrine disruption endpoint whose PFOA-induced mechanism is not known. In spite of this endpoint being found in mice across 5 publications and in spite of the fact that it has the lowest effect level of any endpoint (0.01 mg/kg/d in Macon et al. 2011), it was not used by USEPA or in the NJ determination for setting the RfD. The lack of precedent for use of this endpoint in regulatory decision-making, the lack of known mechanism and unclear clinical/health implications led to this reluctance. However, the NJ determination added a 10 fold UF for this effect that USEPA did not, which to a large extent explains why the NJ drinking water target is lower than USEPA's. The other consideration by the NJDWQI was that the range of drinking water targets already developed (e.g., 70 ppt, USEPA) or being considered by NJ will theoretically increase the human body burden above what is common at the background level of exposure (e.g., from diet, see above RSC discussion). Given that epidemiology studies suggest that the existing background body burden may be associated with health effects (particularly effects on birth weight), this raises the concern that any increase above background body burden is a public health concern.

CTDPH's review of these considerations is that delayed mammary development is a clearly demonstrated response to PFOA but its dose response is variable across mouse strains with the C57Bl6 and BalbC strains apparently much less sensitive than CD-1 mice (Yang et al. 2009; Macon et al. 2011). Given this and other uncertainties neither USEPA or NJDWQI used this endpoint for standard-setting. The conservatism in applying a 10 fold uncertainty factor for this endpoint combined with also applying a full 20% RSC in spite of the small background contribution to body burden relative to drinking water at the considered concentrations, provides additional conservatism. For example, Maine's derivation as shown in the above table utilizes an additional 10 fold uncertainty factor for possibly more sensitive endpoints (cumulative 300 fold UF) but through a careful analysis sets the RSC at 60%. Had NJ used this larger RSC, the drinking water target would have calculated out to 42 ug/L. However, it is not clear whether an RSC of 60% applies to all of the PFAS contaminants that we are including in the Action Level (see below). The concern raised in the NJDWQI analysis relative to human body burden and effect levels seen in epidemiology studies is addressed to some extent in the synthesis section below.

Synthesis for a Drinking Water Target in CT

The USEPA Health Advisories for PFOS and PFOA of 70 ppt (separately or combined) are risk-based targets that aim to keep exposures from drinking water to a level that is below known effect levels in animals. The RfD of 0.02 ug/kg/d is in full consideration of a range of endpoints and set based upon a toxicokinetic approach and uncertainty factors that are reasonable and consistent with previous EPA assessments. An argument can be made that a database uncertainty factor could have been applied, as done in ME and NJ, given that in a number of studies a threshold for PFOA effects has not been determined (LOAELS instead of NOAELs), that additional types of vulnerabilities and vulnerable populations could have been assessed, that these compounds are slowly cleared and highly bioaccumulative, that additional endpoints may be affected that need to further assessed (e.g., mammary development, immunotoxicity), and that associations have been reported in epidemiology studes at low levels of exposure within range of US background (Johnson et al. 2014). However, other conservatisms exist in the USEPA derivation such as the water intake rate of 3 L/day for 60 kg body weight and using an RSC of 20% by convention while a greater RSC may be more reflective of the underlying exposure and biomonitoring information at least for where this has been closely examined (PFOA). The 70 ppt health advisories are within the range of determinations made in other jurisdictions (see above table) and have been thoroughly vetted by USEPA's Office of Water review process as well as external review.

One gap in USEPA's Health Advisory determination is a quantitative analysis of PFOA/PFOS toxicity in humans. This could be a valuable check of the health protectiveness of the advisory drinking water target given that a body of epidemiological evidence has accumulated. Given that 70 ppt can lead to body burdens that are double the 95th percentile of population exposure and that some epidemiology studies have found associations within the range of background exposure (e.g., Johnson et al. 2014, USEPA 2016), it is possible that the health advisory level of exposure is already at a human effect level. The relationship between PFOA and birth weight across 9 epidemiological studies as reported by Johnson et al. 2014 is a decrease of 18.9 grams per ng/ml PFOA in maternal serum. Their meta-analysis of 9 studies was culled from a group of 32 studies in which 10 of the 32 showed a statistically significant association between PFOA and birth weight in humans. If one assumes a normal birth weight of 2500 g (the bottom of the range of normal birth weight), this percent change in birth weight is 0.76% for a 1 ng/ml increase in serum PFOA. The drinking water concentration equivalent to 1 ng/ml (1000 ppt) in serum is 100 fold lower or 10 ppt. Thus, ingestion of PFOA in drinking water concentration at 10 ppt by pregnant women is theoretically associated with a 0.76% decrease in birth weight. Points of departure in RfD derivation based upon the benchmark dose (BMD) approach are typically based off of the 10% effect level, although for reproductive endpoints a BMD can be based upon a 1% or 5% effect level. The drinking water concentrations associated with these possible PODs are: 1%: 13 ppt, 5%: 66 ppt, 10%: 132 ppt. Given that the Johnson et al. (2014) analysis comes from human data for sensitive individuals, additional uncertainty factors may not be needed from these PODs, although a statistical lower bound on the BMD may be feasible and preferable (the BMDL).

The fact that USEPA's animal-based health advisory for PFOA is roughly equivalent to the 5% effect level for decreased birth weight in humans from the subset of studies which are positive for this effect indicates that this drinking water target is in a reasonable risk range. However, we cannot exclude the possibility of a very small effect on birth weight at the 70 ppt Action Level. In other epidemiological findings, effects on blood lipids, impaired immune function, neurodevelopment and endocrine disruption were generally at serum concentrations at or above those described above for birth weight effects (USEPA 2016). Such studies and endpoints may not drive any greater level of risk although they do add to the level of public health concern. Detections below the Action Level may still trigger followup as described in a subsequent section.

Other considerations for PFAS in drinking water are: 1) Additional constituents besides PFOA and PFOS that have been found in drinking water samples; 2) Bathing and showering advice for PFAS in tap water above 70 ppt.

Additional Constituents

A variety of additional perfluorinated alkyl substances (PFAS) are assessed in the standard PFOS/PFOA analytical screen with the following specifically monitored nationwide in the recent Unregulated Contaminant Monitoring Rule (UCMR-3): PFNA (perfluorononanoic acid), PFBS (perfluorobutane sulfonate), PFHxS (perfluorohexane sulfonate) and PFHpA (perfluoroheptanoic acid). The frequency of detection of PFHxS and PFHpA in UCMR-3 testing was similar to that for PFOS and PFOA while the detection of the other two PFASs was much less common. PFHxS and PFHpA are relatively long chain carboxylic acid (PFHpA – 7 fluorines) and sulfonate (PFHxS – 6 fluorines) PFAS compounds with half lives in humans of 8.5 years reported for PFHxS and for PFHpA there are no data in humans but the half-life in rats is relatively short (ATSDR 2015). The half-life for another UCMR PFAS, PFNA is long in rats and so may be on the order of years in humans but data are not available (ATSDR 2015).

In vivo studies in lab animals are less available for these additional PFAS contaminants but there is evidence in rats for effects for PFHxS and PFNA below 1 mg/kg/d in repeat dose studies making the range of potency potentially similar to PFOA and PFOS. The most sensitive endpoint for PFHxS was disorders of the blood (e.g., increased prothrombin time, decreased hemoglobin) while for PFNA it was liver weight changes (ATSDR 2015). Shorter chain PFAS such as PFBS have shorter half-life and may be less toxic. The state of Minnesota has set a drinking water limit for PFBS and PFBA of 7000 ppt at the same time they set a limit of 300 ppt for PFOA and PFOS (MN 2008).

As shown in Table 1, the state of NJ has derived a health-based MCL of 13 ppt for PFNA, which was rounded down to 10 ppt for their interim groundwater guidance. The 2015 support document shows that the rodent and human half life of PFNA is likely to be as long if not longer than PFOA, with several of the toxicology endpoints similar including effects on blood lipids, endocrine effects on thyroid, immune effects, reproductive effects and a consistent increase in liver weight across studies. NJ's BMDL was based upon increased liver weight in mice adjusted for PK differences across species and divided by a cumulative UF of 1000 fold.

A variety of in vitro studies have evaluated the ability of PFOS, PFOA and other PFAS compounds to perturb cell cultures or modulate gene expression through the peroxisome proliferator activation system (PPAR-alpha, gamma). These systems generally show greater activity with longer fluorine chain length, with additive and in some cases synergistic activity between several PFAS compounds and PFOS or PFOA (Wolf et al. 2008, 2014; Hu et al. 2014).

Given the datagaps and uncertainties for PFAS compounds such as PFHxS, PFNA, and PFHpA, the emerging toxicology information, both in vitro and in vivo, suggests that a precautionary approach be taken for these PFAS. Additionally, several have long biological half lives similar to PFOS and PFOA. The derivation of a recent criterion for PFNA in NJ that is below the USEPA Health Advisory for PFOA/ PFOS highlights the potential activity of these additional long chain PFAS chemicals. Thus, it is a reasonable precaution to add these 3 PFASs to the PFOS and PFOA levels found in a drinking water sample to derive a total that must meet the drinking water health advisory of 70 ppt. Given the shorter half life and derivation of higher drinking water targets for PFBS and PFBA (MN 2008), it is not necessary to add these to the overall total of PFAS compounds in a drinking water sample.

Bathing and Showering Considerations

The CT DPH default guidance for semi-volatile organics as it pertains to PFOA and PFOS is the following:

>30x the drinking water criterion (PFOS/PFOA of 2100 ng/L) – no B/S immediately

3-30x the drinking water criterion (210-2100 ng/L) – no B/S within 3 months

The concern for dermal penetration of PFOS and PFOA is based upon both in vivo and in vitro studies. Blood levels of PFOA were readily detected in dose response fashion following dermal exposure of rats (Kennedy 1985) and mice (Franko et al. 2012). The in vitro penetration of PFOA across mouse and human skin found 40-70% penetration over a 24 hour test (Franko et al. 2012). While this penetration was dependent upon the ionization state of PFOA, it appears that a sufficient percentage is unionized under physiological conditions in the skin to allow the penetration seen in the limited studies available. In other in vitro studies rat skin appeared to be more permeable to PFOA than human skin with the estimated dermal penetration coefficient being 9.49×10^{-7} cm/hour in the isolated human epidermis and 3.25×10^{-5} cm/hour in the isolated rat epidermis (ATSDR 2015). A relatively low dermal dose applied to mouse skin for 4 days (6.25 mg/kg/d) produced a systemic effect, increased liver weight (Fairly et al. 2007). Studies characterizing the dermal penetration or systemic toxicity of dermally applied compound were not found for PFOS or other PFAS.

This evidence of dermal penetration suggests that the CT DPH generic advice regarding bathing and showering limits for semi-volatile organics as described above is reasonable for PFOA and without further information to the contrary, should also be applied to PFOS and other PFAS.

Detection and Feasibility

The proposed DPH Action Level for PFAS is not a detection or feasibility issue as USEPA and other states have already reviewed this for PFOS and PFOA in setting their guidance levels. The other three PFAS included in this determination and summed with PFOS and PFOA (PFHxS, PFNA, PFHpA) are similar to PFOS and PFOA in detection (limits below 70 ppt in recent UCMR-3; all detectable via USEPA Method 537) and treatment (carbon filtration).

Follow-up for Detections Above and Below the Action Level

Detections above the Action Level of 70 ppt (sum of the 5 PFAS) result in a "do not drink" recommendation which also includes not using the water for food preparation. As discussed above, higher concentrations would trigger a bathing and showering concern. The source of the contamination should be investigated and the individual well can be treated with a carbon (or other) filter demonstrated to effectively address PFAS contamination.

Detection of PFAS in a drinking water sample is unlikely to be caused by background conditions, and instead may indicate a plume of contamination related to an industrial or firefighting release. Thus, detections of PFAS at any level should be reported to local and state environmental and health authorities (e.g., CT DPH EOHA program, CT DPH Private Well Program, CT DEEP, Local Health Dept.) for possible follow up investigation. Further, well owners with confirmed PFAS contamination, even if below the Action Level, should be made aware of treatment options (carbon filtration) to remove this form of contamination from their drinking water.

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