PFAS BACKGROUND IN VERMONT SHALLOW SOILS

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1.0 INTRODUCTION

This study was conducted by University of Vermont and Sanborn, Head & Associates (Sanborn Head) with partial funding and support provided by Vermont Department of Environmental Conservation (VTDEC). Soil samples were collected from June through August 2018 to determine the background concentrations of a number of per- and polyfluoroalkyl substances (PFAS) in Vermont shallow soils. Shallow soils were collected at a subset of properties sampled in a recent VTDEC Background Study of the levels of polyaromatic hydrocarbons (PAHs), arsenic, and lead in VT soils. The properties sampled in the previous background study were selected by overlaying a 100-square mile grid across the state, identifying the largest municipality in each grid, and then sampling within the town or municipality at state or municipal parks, forests, greens, or building or school lawns.

Proposed properties for sampling were selected using the screening process described in the Quality Assurance Project Plan (QAPP) and Data Quality Objectives Plan (DQO Plan). Based on access issues at some of the proposed properties, some alternative properties were selected. A total of 66 properties were sampled of the 69 properties proposed in the QAPP and DQO Plan. A list of properties, including annotations indicating properties with access issues and those selected as alternatives, is provided in the Appendices. A total of 17 PFAS, summarized in Table 1, were investigated as target analytes in this study. These target analytes belong to either of two groups of PFAS based on their functional groups: perfluoroalkyl carboxylic acids (PFCAs) and perfluoroalkyl sulfonates (PFSAs). Additionally, six field duplicate samples were collected and submitted to Alpha Analytical, Inc. (Alpha Analytical) for analysis of 24 PFAS, including the target analyte list for this study.

2.0 FIELD SAMPLING METHODOLOGY

Soil samples were collected from 66 sites across State of Vermont by Sanborn Head. Several municipalities (E1, K6 and L2) provided more than one property for sample collection, which were designated by subsequent lowercase letters, such as E1a. Samples were collected using the methods described in the QAPP and DQO Plan. Soil samples were classified and logged on-site by the field representative using a modified Burmister Soil Classification System. Summarized field sampling forms and Chain-of-Custody forms are provided in the Appendices.

3.0 LABORATORY METHODOLOGY

3.1 Determination of Percent Solid and Total Organic Carbon (TOC)

The percent solids of collected soil samples was determined using ATSM D2216-10 Method, and TOC was measured according to the ASTM 2000 method which is referred as Loss on Ignition (LOI) method.

3.2 Extraction Method

The extraction method used in this project was adapted from the method developed by Rankin *et al.* (2016)[1] where they achieved roughly 100% recovery of PFOA, PFDA and PFDoDA in spike-and-recovery experiments.

3.3 Instrumental Analysis and Quantification

A liquid chromatography-tandem mass spectrometry (LC-MS/MS) system was used to evaluate the existence of PFAS in the soil samples. Typically, a Shimadzu Prominence LC using a Waters Atlantis dC18 column was coupled to an ABI Qtrap 4000 mass spectrometer which was operated in negative electrospray ionization mode. The detailed instrumental parameters and methods were summarized in Appendices. The average recovery of M8PFOA was 80.33% (RSD: 7.62), which was consistent with the laboratory's acceptance limits (70-130%). Accuracy and precision of the method were determined through analysis of LCS/LCSD at four different spiking level as shown in the Appendices. Based on the method used herein, method detection limit (MDL) and reporting limit (RL) of each analyte were summarized in Table 2 and the detailed calculation methods were described in the Appendices. Instead of using PFAS concentrations in dry weight, originally detected values from LC-MS/MS were used to compare with MDL and/or RL. RL was used as the quantified detection threshold of each analyte. Laboratory detections above RL were considered to be quantitative detections, and detections above MDL but below RL were considered qualitative detections and estimated values.

3.4 Quality Assurance Sampling

A total of 22 blank samples (12 trip blanks, three field blanks, three equipment blanks, four method blanks) and two field duplicates samples, were prepared for quality assurance purposes. In addition, six field duplicate samples were collected and submitted for analysis to Alpha Analytical Inc as an overall check on the analytical results.

4.0 SUMMARY OF RESULTS

4.1 Detection Frequency and Concentration of PFAS in Soils

A total of 68 soil samples, including two duplicates, were collected from 66 locations across Vermont. The qualitative and quantitative detection frequency of each PFAS, minimum and maximum concentration of quantitative detections at the 66 locations were provided in Table 2. As estimated values, qualitative detections were not included in further discussions and statistical analyses unless mentioned.

Several PFAS were quantitively detected at relatively high frequencies in the soil samples from Vermont (Table 2). Six PFCAs (PFHxA, PFHpA, PFOA, PFNA, PFDA, and PFUnDA) and two PFSAs (PFBS and PFOS) were quantitively detected at frequencies higher than 50%. PFOS was quantitively detected at the highest frequency and was observed in all soil

[1] Rankin, K., Mabury, S.A., Jenkins, T.M., and Washington, J.W., A North American and Global Survey of Perfluoroalkyl Substances in Surface Soils: Distribution Patterns and Mode of Occurrence. *Chemosphere*, (2016), 161, 333-341.

samples. In contrast, several other PFAS (i.e., PFBA, PFPeA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, and PFODA) were quantitively detected in less than 10% of the samples.

Total concentration of total PFAS (ΣPFAS) quantitively detected in samples ranged from 540 to 35,000 ng/kg. The highest ΣPFAS concentration, 35,000 ng/kg, was observed at location J6, with the concentrations of total PFCAs (ΣPFCAs) and total PFSAs (ΣPFASs) measured at 23,000 ng/kg and 12,000 ng/kg, respectively. These values are much higher than those obtained from other locations, with the next highest ΣPFAS concentration of 9,400 ng/kg measured at location K6e.

The PFAS concentrations, solids contents, and TOC contents for each soil sample were summarized in Table 3. PFAS detected below the MDL were marked as "<MDL", and PFAS qualitatively detected (less than RL but greater than MDL) were labeled with a "J" qualifier. PFAS not detected by the laboratory method were marked as non-detects ("ND").

Target PFAS were less than the MDLs in all trip blanks, field blanks, and equipment blanks. A trace amount of PFOA (<MDL) was observed in the method blank of the first sample batch. A washing process was added after each injection for the following batches and the trace PFOA was no-longer observed in the method blanks. Of the six duplicate samples analyzed by Alpha Analytical Inc, there were two quantitative detections of PFOS at concentrations similar to those measured using the study methodology; the other 23 PFAS were less than the laboratory RLs, which was 1,030 to 1,300 ng/kg. Because the Alpha Analytical laboratory RLs were higher than the study methodology RLs, the frequency of non-detects is consistent with the study results. The results of PFOS and PFOA, the two most abundant PFAS of the six samples, were summarized in side-by-side comparisons in Table 4.

The two duplicate samples (C1 and I7) were analyzed using relative percent difference (RPD), provided in the Appendices. Of the 16 quantitative detections across the two sets of duplicate samples, two PFAS had RPD values greater than the 50 percent (%) threshold selected for this study (53% for PFBS at C1 and 72% for PFHxA at I7). The corresponding data at locations C1 and I7 were labeled with a "P" qualifier. In the following discussions and statistical analyses, the arithmetic average PFAS concentrations C1 and I7 were applied.

4.2 Composition and Spatial Distribution

A PFAS concentration profile of quantitatively detected PFCAs and PFSAs was provided in Figure 1. Additionally, relative composition profiles were prepared to show the contribution of each target analyte to ΣPFAS, ΣPFCAs, and ΣPFSAs at each location (Figures 2, 3, and 4, respectively). Across the 66 locations, PFCAs were more than 50% of the ΣPFAS at 41 locations, with the highest percentage (85%) at location E5. PFSAs made up the highest percentage of the ΣPFAS (80%) at location D8.

At a majority of locations, PFOA and PFOS were the greatest contributors to ΣPFCAs and ΣPFSAs, respectively. Concentrations of PFOA ranged from 52 to 4,900 ng/kg and concentrations of PFOS ranged from 110 to 9,700 ng/kg, respectively. Overall, PFOS was the predominant compound detected in Vermont soils and accounted for approximately 13% to 80% of ΣPFAS detected in samples.

The spatial distribution of ΣPFAS, ΣPFCAs, and ΣPFSAs was shown in Figures 5.1, 5.2, and 5.3, respectively. The samples with ΣPFAS concentrations higher than 5,000 ng/kg (Figure 5.1) were observed in the northern-third of Vermont and in the Hartford area. The ΣPFCA concentrations were less than 2,000 ng/kg (Figure 5.2), except at several locations in the northern-third of Vermont, in the Hartford area (K5/K6/J6), and at Woodford State Park in Woodford (P2). Similarly, relatively higher ΣPFSAs concentrations of greater than 2,000 ng/kg were observed at several locations in central to north-Vermont, in the Hartford area (J6 and K6), and at the South Stream Boat Launch in Pownal (Q1) (Figure 5.3).

The spatial distribution of select PFAS (i.e., PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFBS, PFHxS, PFOS, and PFDS) were shown in Figures 6-1 through 6-11. The spatial distributions of individual PFAS were largely similar to the spatial trends described above for ΣPFAS, ΣPFCAs, and ΣPFSAs. Particularly, the most evident trend was the relatively higher concentrations in the Hartford area for several PFAS (e.g., PFHxA, PFOA, PFNA, PFDA, PFUnDA, and PFBS).

4.3 Statistical Analyses

4.3.1 Correlations

Potential correlations among TOC, moisture content, and PFAS concentrations were tested and the complete results of the tests were provided in the Appendices. It has been widely reported that concentrations of hydrophobic organic pollutants can be affected by soil characteristics, including TOC.[2] However, in this study, no significant correlation was observed between TOC and individual or ΣPFAS. Moisture content also did not have a significant correlation with any PFAS compounds.

There were strong positive correlations (>0.95) observed among PFNA, PFDA, and PFUnDA, and a less-strong positive correlation (>0.80) with PFHxA and PFNA, PFDA, and PFUnDA. Similar to the study conducted by Bossi *et al.*,[3] notable positive correlations were observed between PFOS and three long chain PFCAs (PFNA, PFDA and PFUnDA). In this study, PFHxA was also positively correlated with PFOS. The underlying cause(s) of these correlations is unknown because PFAS occurrence in soils is potentially affected by multiple factors, including physicochemical characteristics of individual PFAS, soil properties, and local/nearby environmental parameters and sources.

4.3.2 Background Statistics

Preliminary background threshold values (BTVs) were estimated for select PFAS using the ProUCL 5.1 statistical software developed by the United States Environmental Protection Agency (US EPA). BTVs were not calculated for PFAS with quantitative detection frequencies less than 10% (i.e., PFBA, PFPeA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, and PFODA). To

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[2] Yan, H., Cousins, I. T., Zhang, C., & Zhou, Q., Perfluoroalkyl acids in municipal landfill leachates from China: Occurrence, fate during leachate treatment and potential impact on groundwater. *Science of the Total Environment*, (2015),524, 23-31.

[3] Bossi, R., Dam, M., & Rigét, F. F. Perfluorinated alkyl substances (PFAS) in terrestrial environments in Greenland and Faroe Islands. *Chemosphere*, (2015), 129, 164-169.

estimate the BTVs using ProUCL 5.1, Upper Tolerance Limits (UTLs) were calculated with full dataset, where NDs, concentrations below MDLs, and qualitative detections represented by their RLs.

Because of the relatively high concentrations of numerous PFAS at J6, a summary of statistical analysis before and after removing J6 data as an outlier was provided in Table 5.1 and Table 5.2, respectively. Similarly, the percentiles for each PFAS were also calculated with and without J6 data and summarized in Table 6.1 and 6.2, respectively. Based on the outsized influence the J6 sample had on many of the summary statistics, the J6 data were not included in the data used for UTLs by ProUCL 5.1.

The results of the ProUCL 5.1 analysis were summarized in Table 7. All but three PFAS (PFDA, PFUnDA and PFHxS) fit either a Gamma distribution, Lognormal distribution, or both. UTLs for the PFAS that did not fit a distribution were estimated using their 95% percentile values. Detailed ProUCL outputs for the UTL estimates were provided in the Appendices.

4.4 Data Limitations

Sample collection and laboratory analytical methods were based on the QAPP and DQO Plan prepared specifically for this study. Limitations on the usability of this data should be considered in the context of the procedures described in the QAPP and DQO Plan. We do not recommend application of this data beyond the purpose of this study. Additionally, we provide the following limitations.

- Variations in the types and concentrations of PFAS in soil may occur due to continued or discontinued releases to the environment, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed, and the findings of this study should be updated accordingly;
- Samples were collected at a limited number of publicly owned properties. These data reflect the specific locations and depths at which the samples were collected from and do not necessarily indicate concentrations in soil elsewhere at the property or at other properties;
- Analyses were performed for only 17 PFAS. Beyond those PFAS detected as part of this study, PFAS not searched for during the current study might be present in soil Vermont soils;
- The study was conducted specifically in Vermont and may not reflect conditions in other geographic areas.

5.0 ACKNOWLEDGEMENTS

This study was supported through partial funding from VTDEC, with significant in-kind contributions from University of Vermont, Sanborn Head, and Alpha Analytical. The authors would like to thank the numerous State and municipal officials for their gracious help in coordinating access to the sampling locations.

Table 1. PFAS Analyte List
Basic naming structure and shorthand for target perfluoroalkyl substances (PFAS).

Acronym	**Name (n- linear structure)**	**Molecular Weight (g/mole)**	**Formula**	**CAS No.**
PFBA	Perfluoro-n-butanoic acid	214.03	C_3F_7COOH	375-22-4
PFPeA	Perfluoro-n-pentanoic acid	264.05	C_4F_9COOH	2706-90-3
PFHxA	Perfluoro-n-hexanoic acid	314.05	$C_5F_{11}COOH$	307-24-4
PFHpA	Perfluoro-n-heptanoic acid	364.06	$C_6F_{13}COOH$	375-85-9
PFOA	Perfluoro-n-octanoic acid	414.07	$C_7F_{15}COOH$	335-67-1
PFNA	Perfluoro-n-nonanoic acid	464.08	$C_8F_{17}COOH$	375-95-1
PFDA	Perfluoro-n-decanoic acid	514.09	$C_9F_{19}COOH$	335-76-2
PFUnDA	Perfluoro-n-undecanoic acid	564.09	$C_{10}F_{21}COOH$	2058-94-8
PFDoDA	Perfluoro-n-dodecanoic acid	614.10	$C_{11}F_{23}COOH$	307-203-2
PFTrDA	Perfluoro-n-tridecanoic acid	664.11	$C_{12}F_{25}COOH$	72629-94-8
PFTeDA	Perfluoro-n-tetradecanoic acid	714.12	$C_{13}F_{27}COOH$	376-06-7
PFHxDA	Perfluoro-n-hexadecanoic acid	814.13	$C_{15}F_{31}COOH$	67905-19-5
PFODA	Perfluoro-n-octadecanoic acid	914.15	$C_{17}F_{35}COOH$	240-582-5
PFBS*	Perfluoro-1-butanesulfonic acid	299.95	$C_4F_9SO_3H$	375-73-5
PFHxS*	Perfluoro-1-hexanesulfonic acid	399.94	$C_6F_{13}SO_3H$	355-46-4
PFOS*	Perfluoro-1-octanesulfonic acid	499.94	$C_8F_{17}SO_3H$	1763-23-1
PFDS*	Perfluoro-1-decanesulfonic acid	599.93	$C_{10}F_{21}SO_3H$	335-77-3
M8PFOA*	Perfluoro-n-[$^{13}C_8$]octanoic acid	422.01	$^{13}C_7F_{15}{}^{13}COOH$	335-67-1

* M8PFOA was obtained Wellington Laboratories (Canada) named M8PFOA0717 (isotopic purity>99%); non-isotopic standards were obtained from Wellington Laboratories (Canada) in a mixture named PFCA-MXB (purity > 99%).
* PFBS, PFHxS, PFOS, and PFDS were received in their form of salts, which were Potassium perfluoro-1-butanesulfonate, Sodium perfluoro-1-hexanesulfonate, Sodium perfluoro-1-octanesulfonate, and Sodium perfluoro-1-decanesulfonate, respectively.

Table 2. Laboratory Detection Limits and Detection Frequency Summary
MDL (ng/kg), RL (ng/kg) of each analyte. General Statistics, including: number of observations (Obs), number of qualitative detections (Qual D), number of quantitative detections (Quant D), qualitative frequency of detections (Qual F, %), quantitative frequency of detections (Quant F, %), minimum concentration of quantitative detections (Min, ng/kg), and maximum concentration of quantitative detections (Max, ng/kg) of each analyte**.**

Analyte	MDL	RL	Obs	Qual D	Quant D	Qual F	Quant F	Min	Max
PFBA	100	520	66	0	0	0	0	N/A	N/A
PFPeA	70	350	66	5	5	7.6	7.6	140	1,300
PFHxA	7.6	39	66	33	33	50	50	50	4,400
PFHpA	4.4	22	66	59	59	89	89	44	900
PFOA	7.0	35	66	60	60	91	91	52	4,900
PFNA	9.7	48	66	66	61	100	92	51	5,000
PFDA	8.0	40	66	64	57	97	86	43	7,600
PFUnDA	7.0	35	66	63	48	95	73	38	2,600
PFDoDA	11	54	66	25	3	38	4.6	100	690
PFTrDA	13	65	66	2	1	3.0	1.5	N/A	130
PFTeDA	21	110	66	1	0	1.5	0	N/A	N/A
PFHxDA	23	110	66	3	0	4.5	0	N/A	N/A
PFODA	24	120	66	13	0	20	0	N/A	N/A
PFBS	6.0	30	66	49	42	74	63	33	1,600
PFHxS	14	72	66	46	29	70	44	76	880
PFOS	5.0	25	66	66	66	100	100	106	9,700
PFDS	5.3	26	66	27	23	40	35	32	920

* N/A: not applicable due to limited quantitative detections.
* Statistical analyses were performed on raw data with additional precision, and results have been rounded to two significant digits.

Table 3. Laboratory Analytical Data Summary
Solid percent, total organic carbon (TOC), and analyte concentration (ng/kg, dry weight) for each site.

Analyte	**Soil Sample ID**				
	A1	**A3**	**A5**	**A7**	**A9**
Solid (%)	93	76	86	82	80
TOC (%)	6.8	9.9	8.8	7.8	8.8
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	1,300	ND
PFHxA	ND	ND	1,500	520	ND
PFHpA	ND	150	660	110	510
PFOA	520	240	290	150	140
PFNA	140	82	310	170	220
PFDA	96	38 J	170	95	72
PFUnDA	64	33 J	160	97	44 J
PFDoDA	22 J	ND	27 J	26 J	ND
PFTrDA	<MDL	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	<MDL	<MDL	ND	ND	ND
PFODA	51 J	63 J	ND	ND	ND
PFBS	ND	ND	190	350	81
PFHxS	300	63 J	87	ND	120
PFOS	1,800	330	720	1,600	650
PFDS	110	ND	51	100	ND
ΣPFCA*	820	470	3,100	2,400	940
ΣPFSA*	2,200	330	1,100	2,100	850
ΣPFAS	3,100	800	4,100	4,500	1,800

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	B2	**B4**	**B6**	**B8**	**C1#1**[†]
Solid (%)	86	94	86	93	75
TOC (%)	11	8.2	9.3	11	10
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	ND	79	680	100	ND
PFHpA	410	260	540	170	150
PFOA	1,600	330	<MDL	390	430
PFNA	1,200	150	150	78	160
PFDA	100	67	160	22 J	89
PFUnDA	75	73	76	14 J	63
PFDoDA	22 J	<MDL	ND	ND	<MDL
PFTrDA	<MDL	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	<MDL	<MDL	ND	ND	ND
PFODA	57 J	51 J	ND	ND	ND
PFBS	ND	ND	1,600	39	240 P
PFHxS	180	83	ND	48 J	230
PFOS	4,400	670	930	380	660
PFDS	150	ND	ND	ND	31
ΣPFCA*	2,400	960	1,600	740	890
ΣPFSA*	4,800	750	2,600	420	1,200
ΣPFAS	7,100	1,700	4,200	1,200	2,100

[†] C1#1 and C1#2 were duplicate samples collected from C1.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* P: The RPD between the results exceeds the method-specified criteria.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	C1#2[†]	**C3**	**C5**	**C7**	**C9**
Solid (%)	94	94	98	84	86
TOC (%)	10	6.3	8.6	10	7.5
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	360
PFHxA	ND	ND	680	770	ND
PFHpA	130	110	340	390	120
PFOA	430	140	160	690	190
PFNA	140	78	54	230	110
PFDA	71	45	76	77	51
PFUnDA	50	34 J	73	52	40 J
PFDoDA	ND	ND	17 J	ND	ND
PFTrDA	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	<MDL	ND	ND	ND
PFODA	ND	51 J	ND	ND	ND
PFBS	140 P	ND	150	260	ND
PFHxS	160	89	140	40 J	25 J
PFOS	690	340	590	860	380
PFDS	33	11 J	ND	ND	ND
ΣPFCA*	800	370	1,400	2,200	830
ΣPFSA*	1,000	430	880	1,100	380
ΣPFAS	1,900	800	2,300	3,300	1,200

[†] C1#1 and C1#2 were duplicate samples collected from C1.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* P: The RPD between the results exceeds the method-specified criteria.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	D1	**D3**	**D4**	**D6**†	**D8**
Solid (%)	92	89	92	35	94
TOC (%)	9.7	5.5	12	2.8	4.2
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	ND	ND	340	ND	17 J
PFHpA	410	120	650	210	46
PFOA	500	140	1,400	270	160
PFNA	260	100	230	33 J	51
PFDA	210	65	330	ND	110
PFUnDA	75	52	84	ND	84
PFDoDA	23 J	ND	33 J	ND	12 J
PFTrDA	ND	ND	ND	ND	<MDL
PFTeDA	ND	ND	<MDL	ND	ND
PFHxDA	ND	<MDL	ND	ND	ND
PFODA	ND	54 J	<MDL	ND	ND
PFBS	100	ND	86	380	ND
PFHxS	440	89	62 J	ND	42 J
PFOS	940	360	1,200	310	1,800
PFDS	230	14 J	170	ND	ND
ΣPFCA*	1,500	480	3,100	480	440
ΣPFSA*	1,700	450	1,400	690	1,800
ΣPFAS	3,200	930	4,500	1,200	2,200

† D6 was collected after a rain.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	E1	**E1a**	**E1c**	**E1d**	**E1e**
Solid (%)	88	95	90	84	91
TOC (%)	8.5	9.6	7.5	9.5	6.7
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	590	610	1,400	150	390
PFHpA	52	160	210	290	ND
PFOA	<MDL	260	430	470	ND
PFNA	120	290	400	190	370
PFDA	87	210	250	430	360
PFUnDA	74	110	100	120	130
PFDoDA	37 J	ND	ND	100	ND
PFTrDA	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	ND	ND
PFODA	ND	ND	ND	ND	ND
PFBS	120	510	440	160	340
PFHxS	ND	ND	ND	120	ND
PFOS	290	1,400	3,700	3,200	3,800
PFDS	ND	ND	ND	380	190
ΣPFCA*	920	1,600	2,800	1,700	1,200
ΣPFSA*	410	1,900	4,100	3,800	4,300
ΣPFAS	1,300	3,500	6,900	5,600	5,600

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	E1f	**E3**	**E5**	**E7**	**E9**
Solid (%)	93	78	54	87	97
TOC (%)	7.0	11	13	7.7	8.2
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	360	ND	370	63	ND
PFHpA	ND	230	900	87	80
PFOA	82	410	4,900	330	370
PFNA	340	160	330	96	100
PFDA	400	95	66 J	49	53
PFUnDA	83	140	65 J	68	50
PFDoDA	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	<MDL
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	ND	ND
PFODA	ND	ND	ND	ND	ND
PFBS	180	130	80	37	20 J
PFHxS	ND	ND	94	430	96
PFOS	2,000	650	1,000	690	310
PFDS	ND	ND	ND	61	ND
ΣPFCA*	1,300	1,000	6,500	690	650
ΣPFSA*	2,200	780	1,200	1,200	410
ΣPFAS	3,500	1,800	7,700	1,900	1,100

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	F2	**F4**	**F6**	**G1**	**G3**
Solid (%)	95	77	99.6	69	86
TOC (%)	9.2	9.5	7.8	10	7.8
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	100	370	ND	ND	ND
PFHpA	110	280	78	90	130
PFOA	470	690	200	300	200
PFNA	290	300	110	90	44 J
PFDA	81	280	69	56 J	30 J
PFUnDA	60	65	70	38 J	26 J
PFDoDA	ND	43 J	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	ND	ND
PFODA	ND	ND	ND	ND	ND
PFBS	45	300	38	100	43
PFHxS	ND	130	40 J	ND	95
PFOS	540	2,200	310	380	110
PFDS	ND	120	ND	ND	ND
ΣPFCA*	1,100	1,300	530	480	330
ΣPFSA*	590	2,700	350	480	240
ΣPFAS	1,700	4,700	870	960	570

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	G5	**G7**	**H2**	**H4**	**I1**
Solid (%)	80	93	96	80	81
TOC (%)	9.0	8.7	8.1	9.7	10
PFBA	ND	ND	ND	ND	ND
PFPeA	370	140	ND	ND	ND
PFHxA	92	50	210	ND	120
PFHpA	180	89	200	320	190
PFOA	590	450	370	1,000	610
PFNA	180	180	190	150	160
PFDA	75	28 J	43	81	55
PFUnDA	62	21 J	38	33 J	52
PFDoDA	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	30 J	ND
PFODA	ND	ND	ND	65 J	ND
PFBS	55	21 J	44	ND	33
PFHxS	55 J	29 J	22 J	<MDL	35 J
PFOS	1,000	320	330	630	500
PFDS	79	ND	ND	ND	ND
ΣPFCA*	1,600	910	1,100	1,600	1,200
ΣPFSA*	1,200	320	370	630	530
ΣPFAS	2,700	1,200	1,400	2,200	1,700

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	I3	**I5**	**I7#1**	**I7#2**	**J4**
Solid (%)	90	84	84	83	84
TOC (%)	11	7.3	10	13	9.8
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	150	ND	140 J	67 J	28 J
PFHpA	210	410	79	93	200
PFOA	540	550	410	360	490
PFNA	180	210	210	170	150
PFDA	64	110	100	79	44
PFUnDA	36 J	67	52	40	26 J
PFDoDA	ND	27 J	ND	ND	ND
PFTrDA	ND	<MDL	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	28 J	ND	ND	ND
PFODA	ND	72 J	ND	ND	ND
PFBS	130	ND	ND	9.4 J	48
PFHxS	ND	32 J	36 J	68 J	110
PFOS	800	990	540	470	330
PFDS	ND	26 J	14 J	ND	ND
ΣPFCA*	1,100	1,300	1,000	810	890
ΣPFSA*	930	990	540	470	490
ΣPFAS	2,100	2,300	1,500	1,300	1,400

† I7#1 and I7#2 were duplicate samples collected from I7.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* P: The RPD between the results exceeds the method-specified criteria.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	J6	**K1**†	**K3**	**K5**	**K6**
Solid (%)	87	83	71	95	89
TOC (%)	9.0	14	12	6.0	6.7
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	4,400	ND	58	110	200
PFHpA	830	180	150	100	ND
PFOA	2,000	770	590	<MDL	<MDL
PFNA	5,000	170	220	38 J	220
PFDA	7,600	63	97	44	110
PFUnDA	2,600	91	71	34 J	47
PFDoDA	690	26 J	ND	<MDL	ND
PFTrDA	130	ND	ND	ND	ND
PFTeDA	65 J	ND	ND	ND	ND
PFHxDA	94 J	ND	ND	ND	ND
PFODA	ND	ND	ND	<MDL	ND
PFBS	980	200	36 J	79	ND
PFHxS	39 J	100	100	ND	ND
PFOS	9,700	690	470	210	620
PFDS	920	110	ND	ND	ND
ΣPFCA*	23,000	1,300	1,200	250	570
ΣPFSA*	12,000	1,100	570	290	620
ΣPFAS	35,000	2,400	1,800	540	1,200

† K1 was collected after a rain.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	K6b	**K6c**	**K6d**	**K6e**	**L2a**
Solid (%)	94	79	89	91	81
TOC (%)	5.0	9.4	5.0	8.3	8.4
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	250	960	210	1,200	ND
PFHpA	ND	470	ND	500	190
PFOA	ND	420	52	730	500
PFNA	140	390	430	700	170
PFDA	100	310	410	2,800	83
PFUnDA	ND	190	80	520	80
PFDoDA	ND	27 J	ND	510	26 J
PFTrDA	ND	ND	ND	71 J	ND
PFTeDA	ND	ND	ND	<MDL	ND
PFHxDA	ND	ND	ND	<MDL	ND
PFODA	ND	ND	ND	ND	ND
PFBS	130	650	140	890	46
PFHxS	ND	ND	ND	ND	100
PFOS	680	1800	1,900	1,500	780
PFDS	ND	ND	87	ND	29 J
ΣPFCA*	500	2,700	1,200	7,000	1,000
ΣPFSA*	810	2,500	2,100	2,400	900
ΣPFAS	1,300	5,200	3,300	9,400	1,900

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	L2b	**L4**	**M1**†	**M3**	**M5**
Solid (%)	79	73	86	78	88
TOC (%)	8.3	8.0	5.6	7.0	8.1
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND
PFHxA	ND	ND	ND	ND	ND
PFHpA	250	200	700	230	190
PFOA	470	560	70	440	210
PFNA	130	150	120	73	120
PFDA	47	97	110	38 J	120
PFUnDA	88	49	140	37 J	52
PFDoDA	ND	16 J	30 J	<MDL	25 J
PFTrDA	ND	<MDL	ND	ND	<MDL
PFTeDA	ND	ND	ND	ND	<MDL
PFHxDA	<MDL	<MDL	ND	<MDL	<MDL
PFODA	62 J	69 J	ND	62 J	57 J
PFBS	ND	ND	87	ND	ND
PFHxS	880	76	390	83	48 J
PFOS	570	790	640	300	1,200
PFDS	35	ND	ND	40	56
ΣPFCA*	990	1,100	1,100	740	690
ΣPFSA*	1,500	860	1,000	420	1,200
ΣPFAS	2,500	1,900	2,200	1,200	1,900

† M1 was collected after a rain.

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**				
	N2	**O1**	**O3**	**O5**	**P2**
Solid (%)	91	76	71	86	78
TOC (%)	8.9	8.8	9.2	7.2	9.3
PFBA	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	620
PFHxA	30 J	ND	ND	ND	ND
PFHpA	44	150	110	ND	870
PFOA	120	660	150	120	350
PFNA	160	160	140	80	120
PFDA	65	97	70	150	54
PFUnDA	40	71	32 J	70.0	75
PFDoDA	ND	24 J	ND	38 J	42 J
PFTrDA	ND	ND	ND	<MDL	ND
PFTeDA	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	<MDL	ND
PFODA	ND	ND	ND	56 J	ND
PFBS	27 J	50	31 J	ND	160
PFHxS	140	ND	15 J	290	89 J
PFOS	230	800	350	720	1,200
PFDS	ND	50	ND	97	48
ΣPFCA*	430	1,100	460	420	2,100
ΣPFSA*	370	900	350	1,100	1,400
ΣPFAS	800	2,000	810	1,500	3,500

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Analyte	**Soil Sample ID**		
	Q1	**Q3**	**Q5**
Solid (%)	65	74	71
TOC (%)	9.0	9.7	9.5
PFBA	ND	ND	ND
PFPeA	ND	ND	ND
PFHxA	76	ND	ND
PFHpA	160	76	130
PFOA	990	88	110
PFNA	220	56 J	66 J
PFDA	140	ND	110
PFUnDA	190	ND	180
PFDoDA	45 J	ND	55 J
PFTrDA	ND	ND	ND
PFTeDA	ND	ND	ND
PFHxDA	ND	ND	ND
PFODA	ND	ND	ND
PFBS	41 J	29 J	45
PFHxS	320	280	360
PFOS	2,100	160	330
PFDS	100	ND	50
ΣPFCA*	1,800	160	540
ΣPFSA*	2,500	440	790
ΣPFAS	4,300	600	1,300

* PFCA: perfluoroalkyl carboxylic acids; PFSA: perfluoroalkyl sulfonates.
* J: Estimated value (qualitative detection), this value is less than RL but greater than MDL.
* Analytes below RLs were not included in calculating the total amount of PFCA (ΣPFCA), PFSA (ΣPFSA), and PFAS (ΣPFAS).
* Data were rounded to two significant digits.

Table 4. Comparison of Laboratory Analytical Data from Alpha Analytical Inc and UVM
PFOS and PFOA concentrations detected by Alpha Analytical Inc and UVM, RPD for PFOS.

Analyte / Sample ID	PFOS (ng/kg)		Precision	PFOA (ng/kg)	
	Alpha	**UVM**	**RPD (%)**	**Alpha**	**UVM**
A1	1,650	1,800	10	<1,090	520
A3	<1,200	330	N/A	<1,200	240
B2	3,740	4,400	17	<1,300	1,600
B4	<1,100	670	N/A	<1,100	330
C3	<1,200	340	N/A	<1,200	140
D3	<1,030	360	N/A	<1,030	140

* Statistical analyses were performed on raw data with additional precision, and all results have been rounded to two significant digits.
* Reporting limit (RL) was listed when the detected concentration was lower than RL.
* For each sample, Alpha Analytical Inc applied the same RL value for all 24 PFAS analyzed, and except PFOS detected in A1 and B2 samples, all the other PFAS were reported below RL.

Table 5.1. Statistical Summary for Select PFAS (all samples)
General Statistics on quantitative detections, including: number of observations (Obs), number of quantitative detections (Quant D), quantitative frequency of detections (Quant F, %), minimum concentration (Min, ng/kg), and maximum concentration (Max, ng/kg) of each analyte**,** mean concentration (Mean, ng/kg), median concentration (Median, ng/kg) and KM mean (ng/kg) of each analyte.

Analyte	**Obs**	**Quant D**	**Quant F**	**Min**	**Max**	**Mean**	**Median**	**KM Mean**
PFHxA	66	33	50	50	4,400	520	260	280
PFHpA	66	59	89	44	900	260	190	240
PFOA	66	60	91	52	4,900	520	400	480
PFNA	66	61	92	51	5,000	270	160	250
PFDA	66	57	86	43	7,600	310	95	270
PFUnDA	66	48	73	38	2,600	150	75	120
PFBS	66	42	64	33	1,600	230	130	160
PFHxS	66	29	44	76	880	200	120	130
PFOS	66	66	100	106	9,700	1,100	680	1,100
PFDS	66	23	35	32	920	140	97	67

* Minimum, maximum, mean, and median were calculated based on quantitative detections.
* Kaplan Meier method was used to calculate KM mean based on the full data; NDs, concentration below MDLs, and qualitative detections were represented by RLs.
* Statistical analyses were performed on raw data with additional precision, results have been rounded to two significant digits.

Table 5.2. Statistical Summary for Select PFAS (outlier removed)
General Statistics on quantitative detections, including: number of observations (Obs), number of quantitative detections (Quant D), quantitative frequency of detections (Quant F, %), minimum concentration (Min, ng/kg), and maximum concentration (Max, ng/kg) of each analyte**,** mean concentration (Mean, ng/kg), median concentration (Median, ng/kg) and KM mean (ng/kg) of each analyte.

Analyte	**Obs**	**Quant D**	**Quant F**	**Min**	**Max**	**Mean**	**Median**	**KM Mean**
PFHxA	65	32	49	50	1,500	400	230	220
PFHpA	65	58	89	44	900	250	190	230
PFOA	65	59	91	52	4,900	500	390	450
PFNA	65	60	92	51	700	190	160	180
PFDA	65	56	86	43	2,800	180	95	160
PFUnDA	65	47	72	38	520	93	74	77
PFBS	65	41	63	33	1,600	210	130	150
PFHxS	65	28	43	76	880	200	120	130
PFOS	65	65	100	110	4,400	970	680	970
PFDS	65	22	34	32	380	110	92	53

* Minimum, maximum, mean, and median were calculated based on quantitative detections.
* Kaplan Meier method was used to calculate KM mean based on the full data; NDs, concentration below MDLs, and qualitative detections were represented by RLs.
* Statistical analyses were performed on raw data with additional precision, all results have been rounded to two significant digits.

Table 6.1. Percentiles for Select PFAS (all samples)

Variable	10%ile	20%ile	25%ile	50%ile	75%ile	80%ile	90%ile	95%ile	99%ile
PFHxA	39	39	39	44	240	370	680	1,200	2,500
PFHpA	33	86	92	170	290	390	520	690	880
PFOA	60	140	145	370	530	590	750	1,300	3,000
PFNA	64	96	110	160	220	230	340	400	2,200
PFDA	40	47	53	82	120	160	320	410	4,500
PFUdA	35	35	35	66	83	91	140	190	1,300
PFBS	30	30	30	47	160	190	370	620	1,200
PFHxS	72	72	72	72	110	130	300	380	600
PFOS	310	330	360	680	1,200	1,500	2,100	3,500	6,300
PFDS	26	26	26	26	51	79	120	180	570

* Percentiles were calculated with full dataset; NDs, concentrations below MDLs, and qualitative detections were represented by their RLs.
* Statistical analyses were performed on raw data with additional precision, and all results have been rounded to two significant digits.

Table 6.2. Percentiles for Select PFAS (outlier removed)

Variable	10%ile	20%ile	25%ile	50%ile	75%ile	80%ile	90%ile	95%ile	99%ile
PFHxA	39	39	39	39	210	360	650	920	1,400
PFHpA	31	85	89	170	280	350	500	650	880
PFOA	59	140	150	370	520	560	720	1,000	2,800
PFNA	62	95	110	160	220	230	320	390	530
PFDA	40	46	53	81	110	160	300	390	1,300
PFUdA	35	35	35	65	82	89	130	180	310
PFBS	30	30	30	46	150	180	340	500	1,200
PFHxS	72	72	72	72	110	130	300	380	600
PFOS	310	330	360	680	1,200	1,400	2,000	3,000	4,000
PFDS	26	26	26	26	50	64	110	170	280

***** Percentiles were calculated with full dataset; NDs, concentrations below MDLs, and qualitative detections were represented by their RLs; J6 was removed as outlier.
* Statistical analyses were performed on raw data with additional precision, and all results have been rounded to two significant digits.

Table 7. Proposed UTLs for Select PFAS
Proposed Upper Tolerance Limits (UTLs) for each PFAS compound.

Analyst	**Method**	**Proposed UTL (ng/kg)**
PFHxA	95% Approx. Gamma UTL with 95% Coverage (WH)-KM*	870
PFHpA	95% BCA UTL95% Coverage (Lognormal)	840
PFOA	95% BCA UTL95% Coverage (Lognormal)	1,600
PFNA	95% Approx. Gamma UTL with 95% Coverage (WH)-KM*	440
PFDA	95% percentile	390
PFUnDA	95% percentile	180
PFBS	95% KM UTL (Lognormal) 95% Coverage	590
PFHxS	95% percentile	380
PFOS	95% UTL95% Coverage (Lognormal)	3,400
PFDS	95% Approx. Gamma UTL with 95% Coverage (WH)-KM*	150

* Statistical analyses were performed on raw data with additional precision, and all results have been rounded to two significant digits.

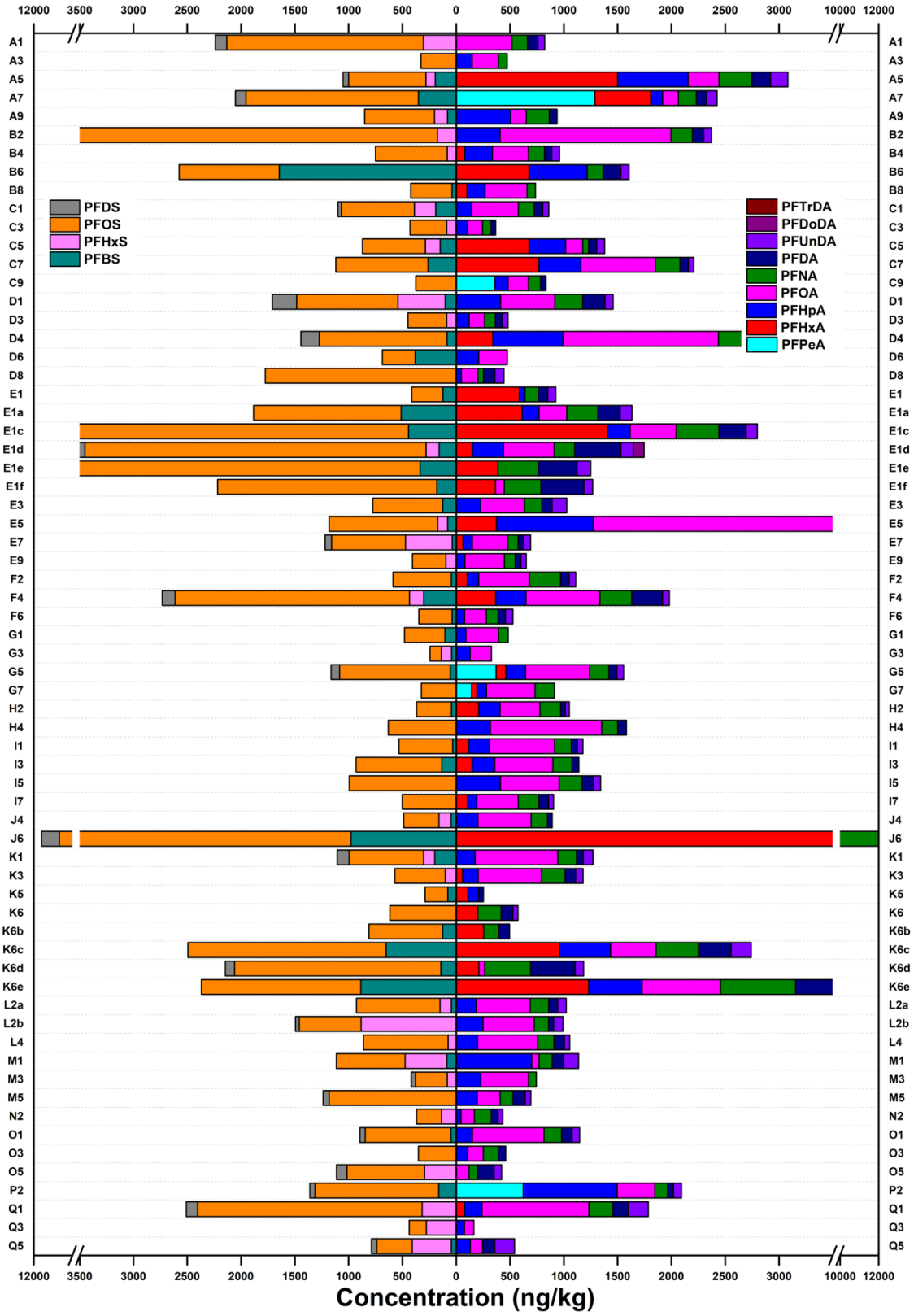

Figure 1. PFAS concentration profile. An Overview of PFCAs and PFSAs (quantitative detections) concentrations in each soil sample of Vermont.

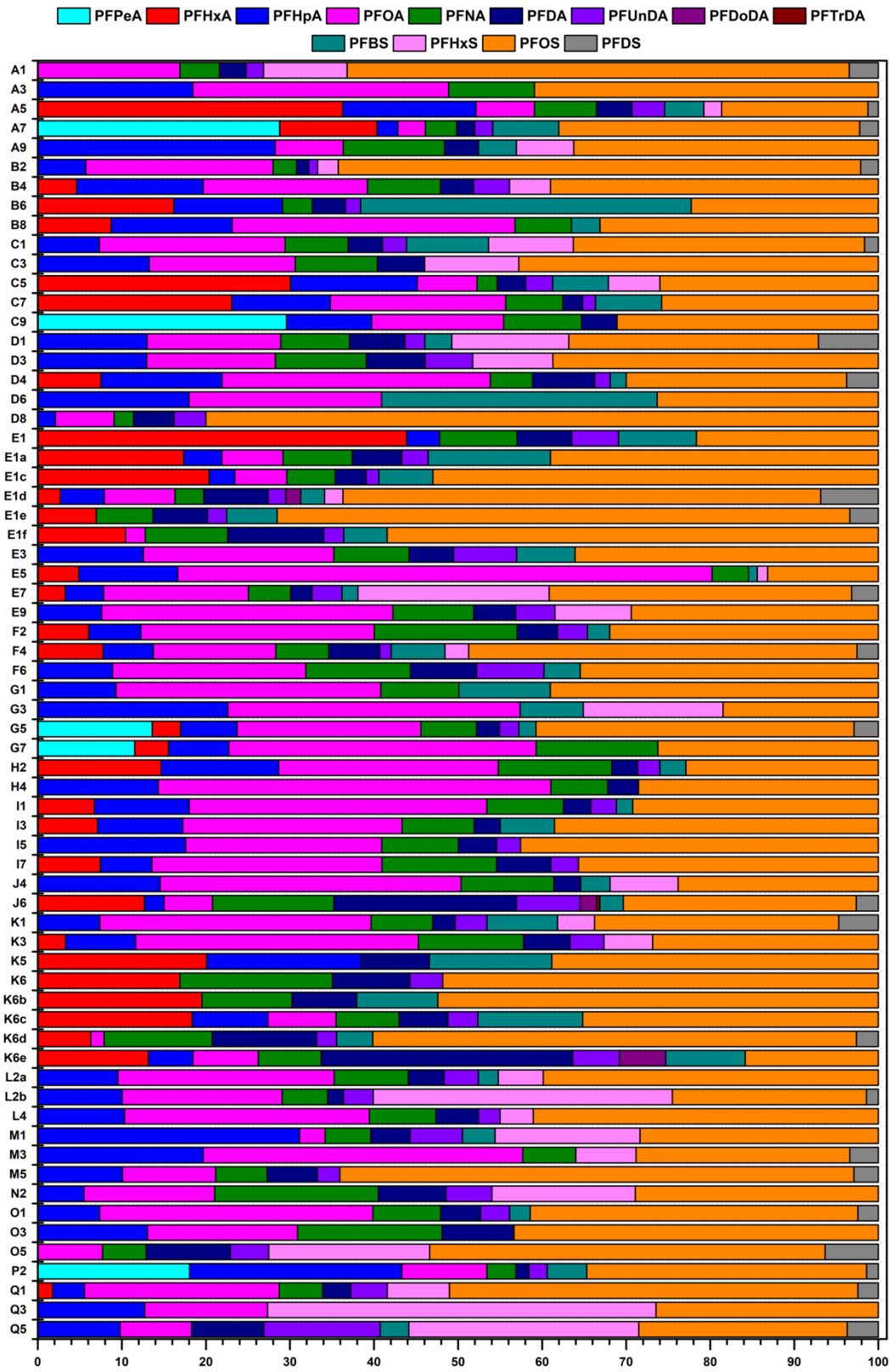

Figure 2. PFAS relative concentration profiles. Relative composition profile (%) of individual PFAS (quantitative detections) in each soil sample of Vermont.

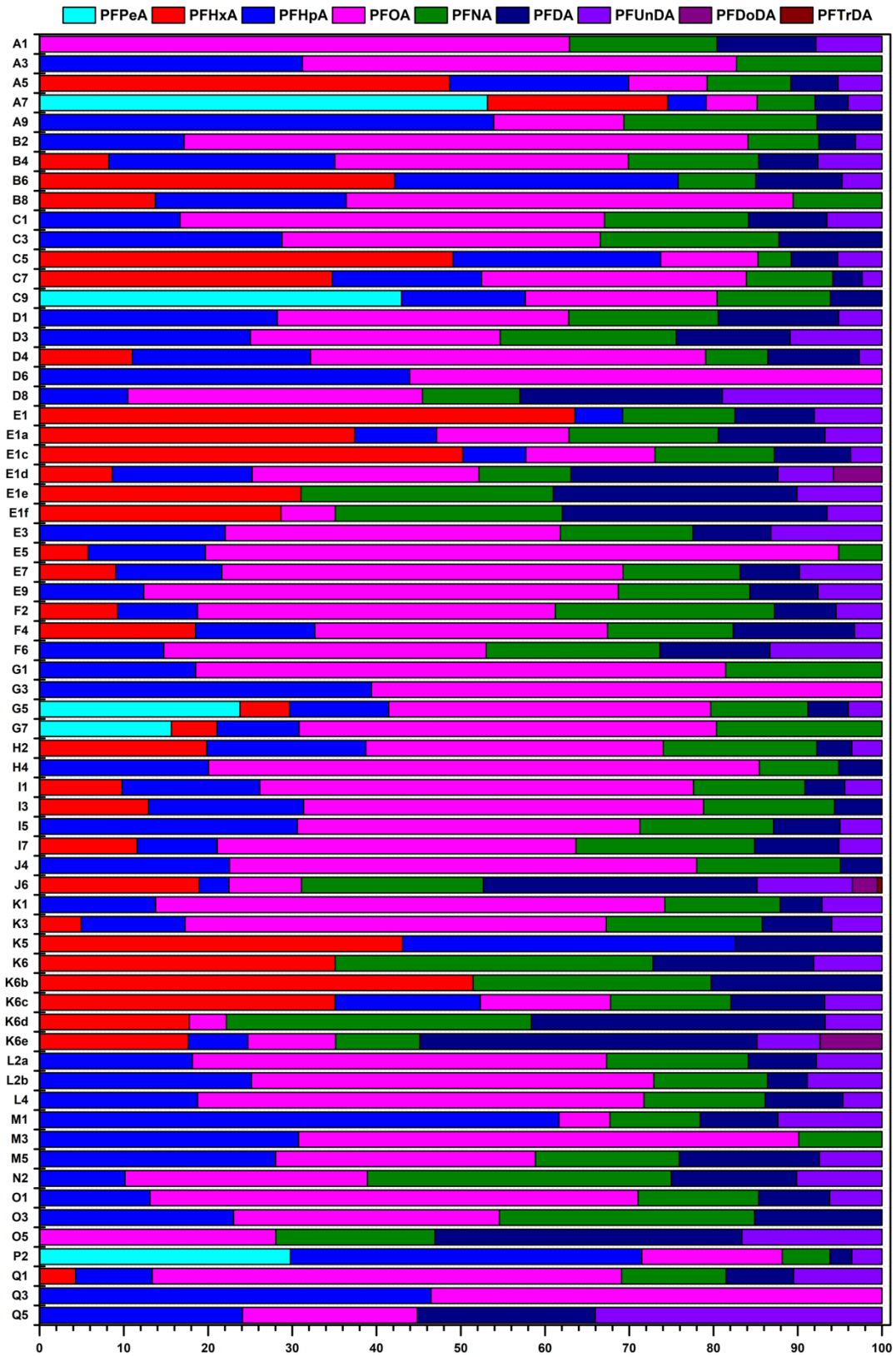

Figure 3. PFCAs relative concentration profiles. Relative composition profile (%) of individual PFCA (quantitative detections) in each soil sample of Vermont.

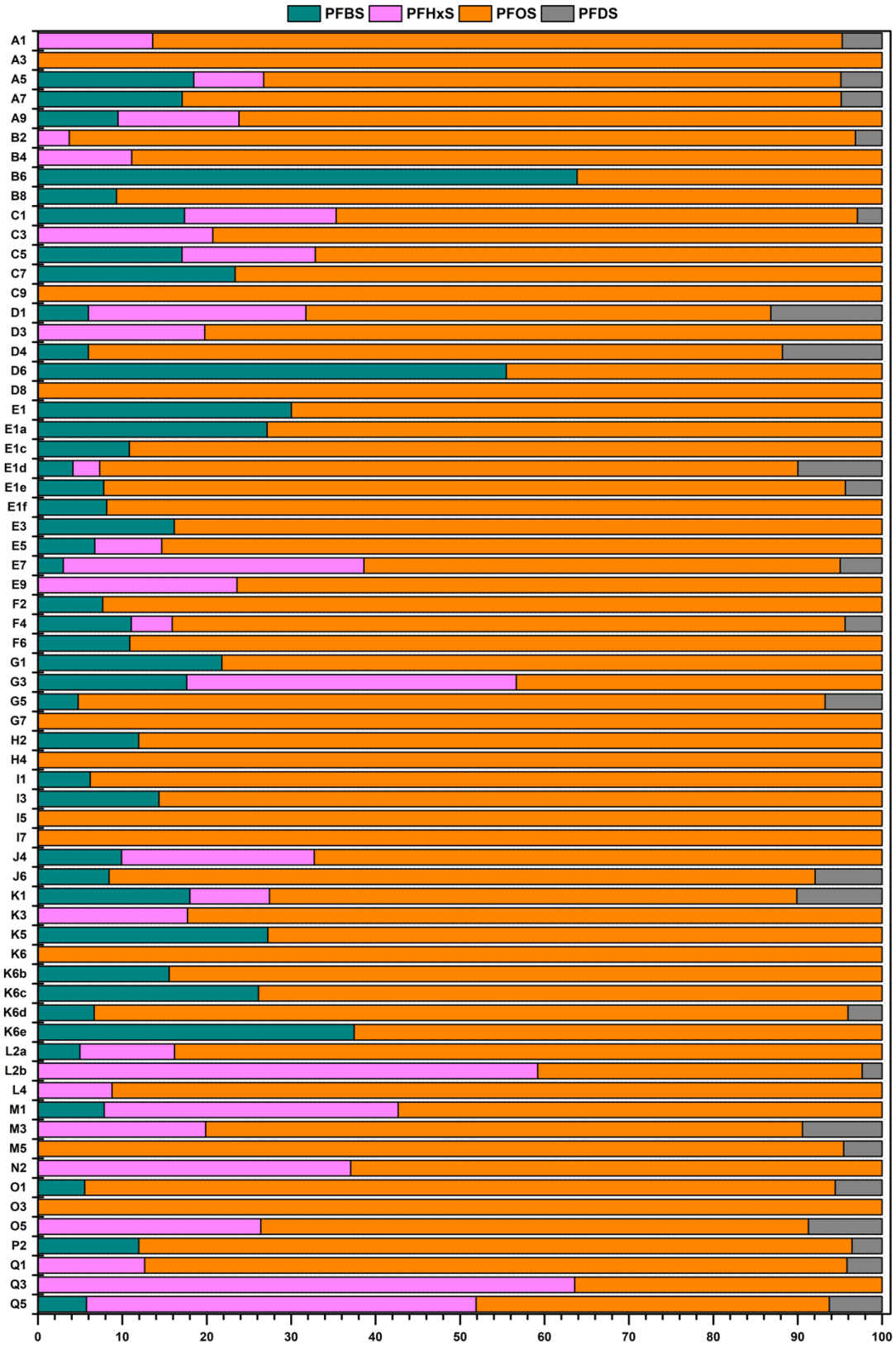

Figure 4. PFSAs relative concentration profiles. Relative composition profile (%) of individual PFSAs (quantitative detections) in each soil sample of Vermont.

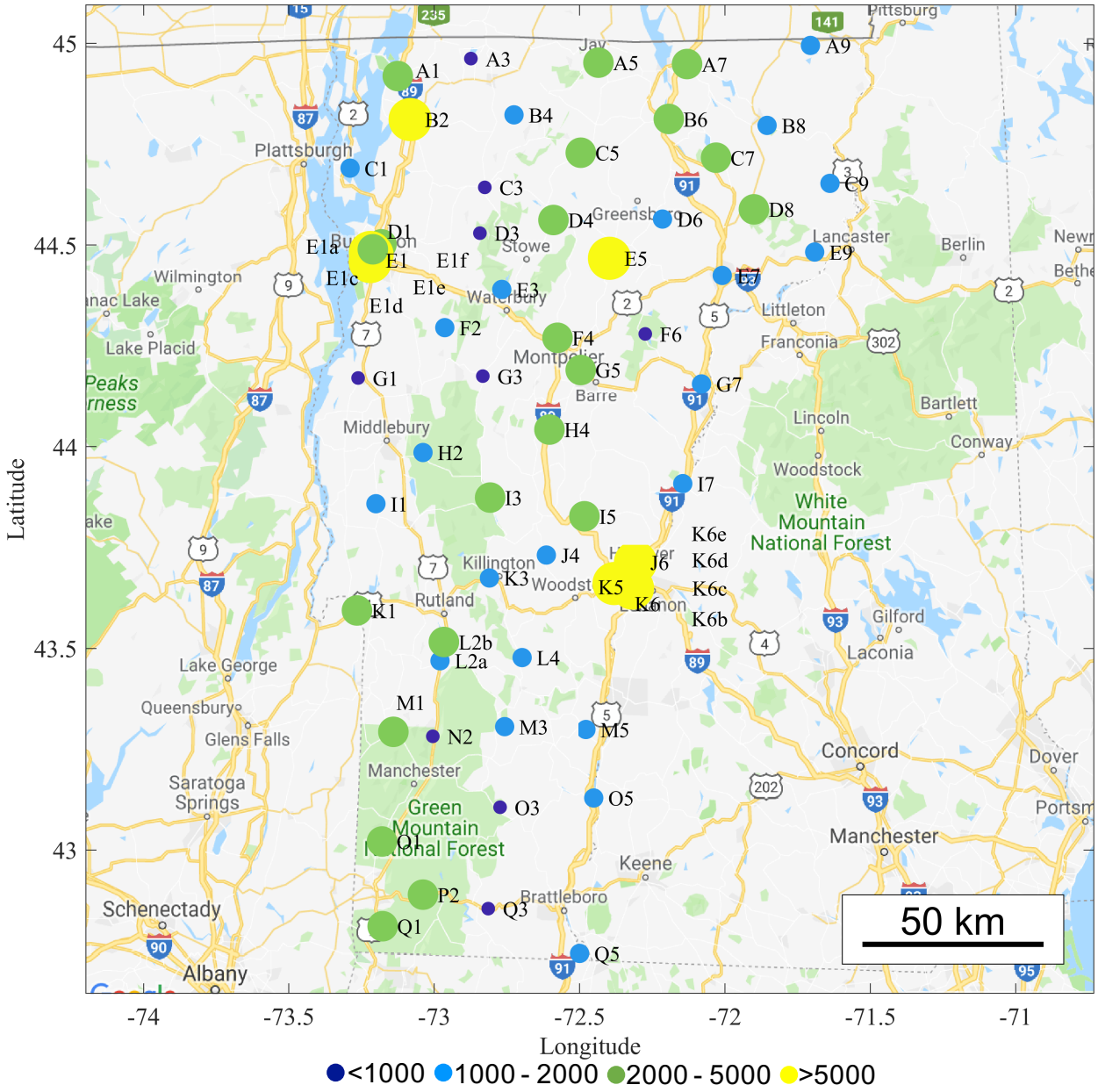

Figure 5.1. Spatial distribution of ΣPFAS.

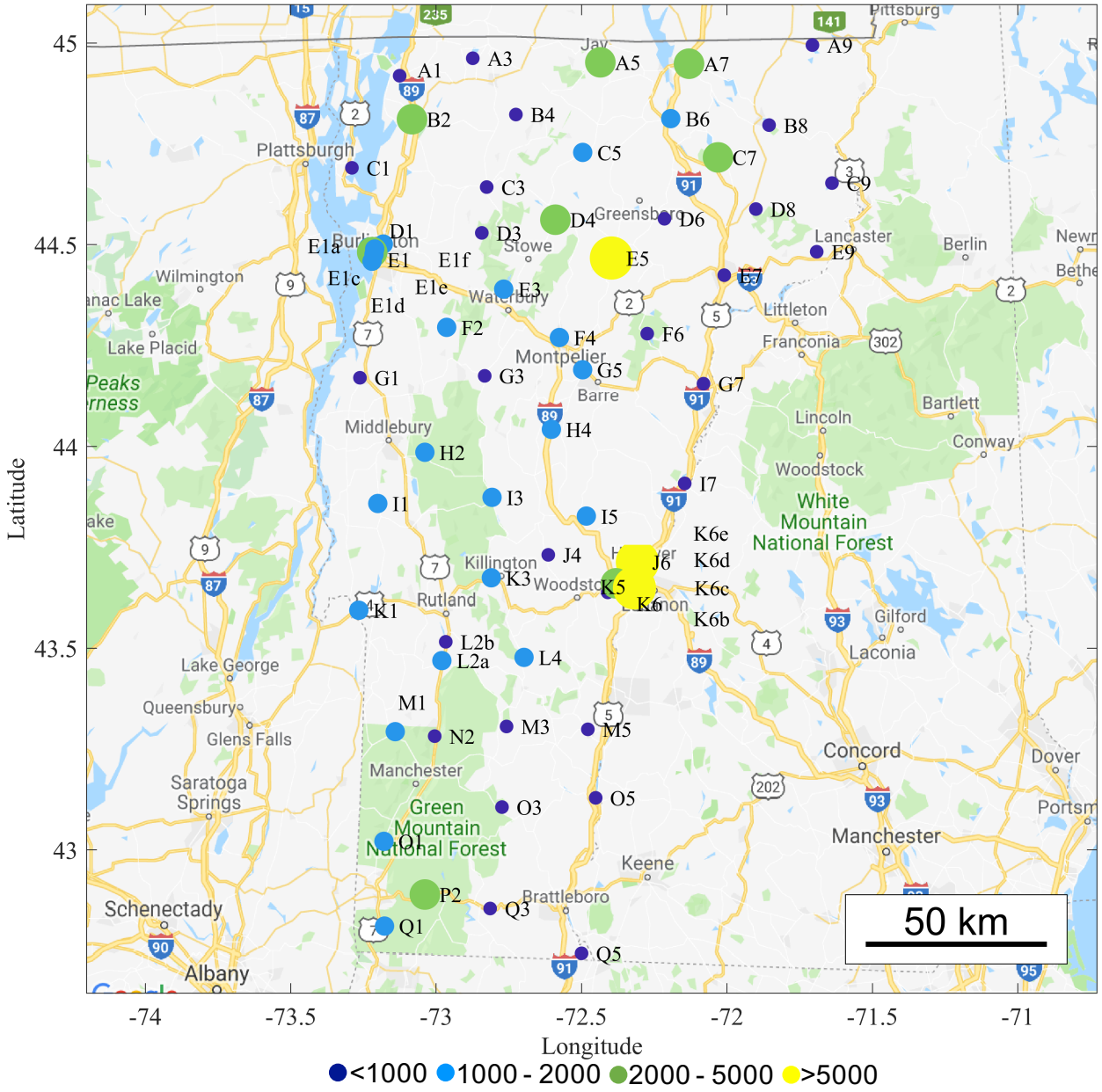

Figure 5.2. Spatial distribution of ΣPFCAs.

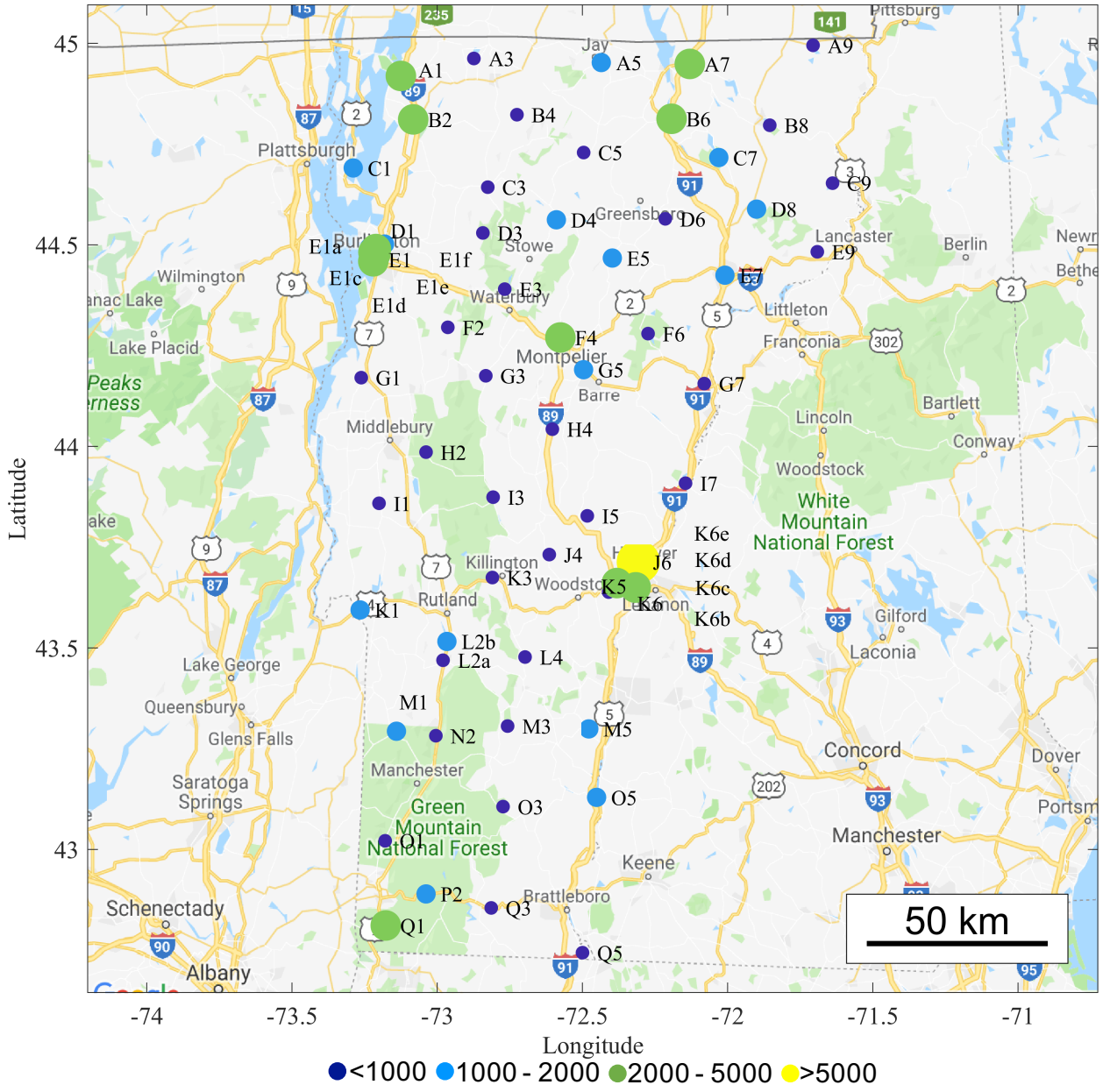

Figure 5.3. Spatial distribution of ΣPFSAs.

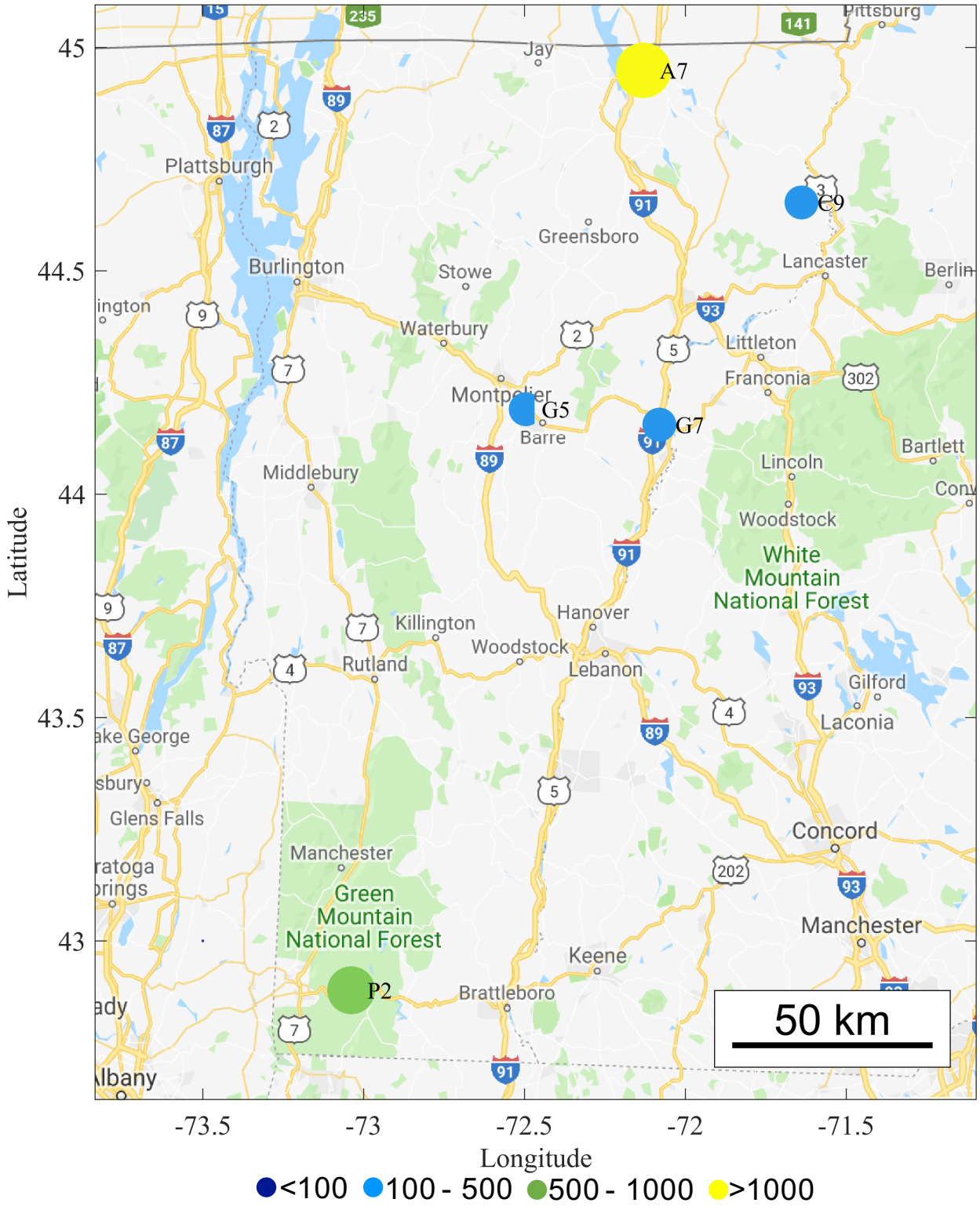

Figure 6.1. Spatial distribution of PFPeA.

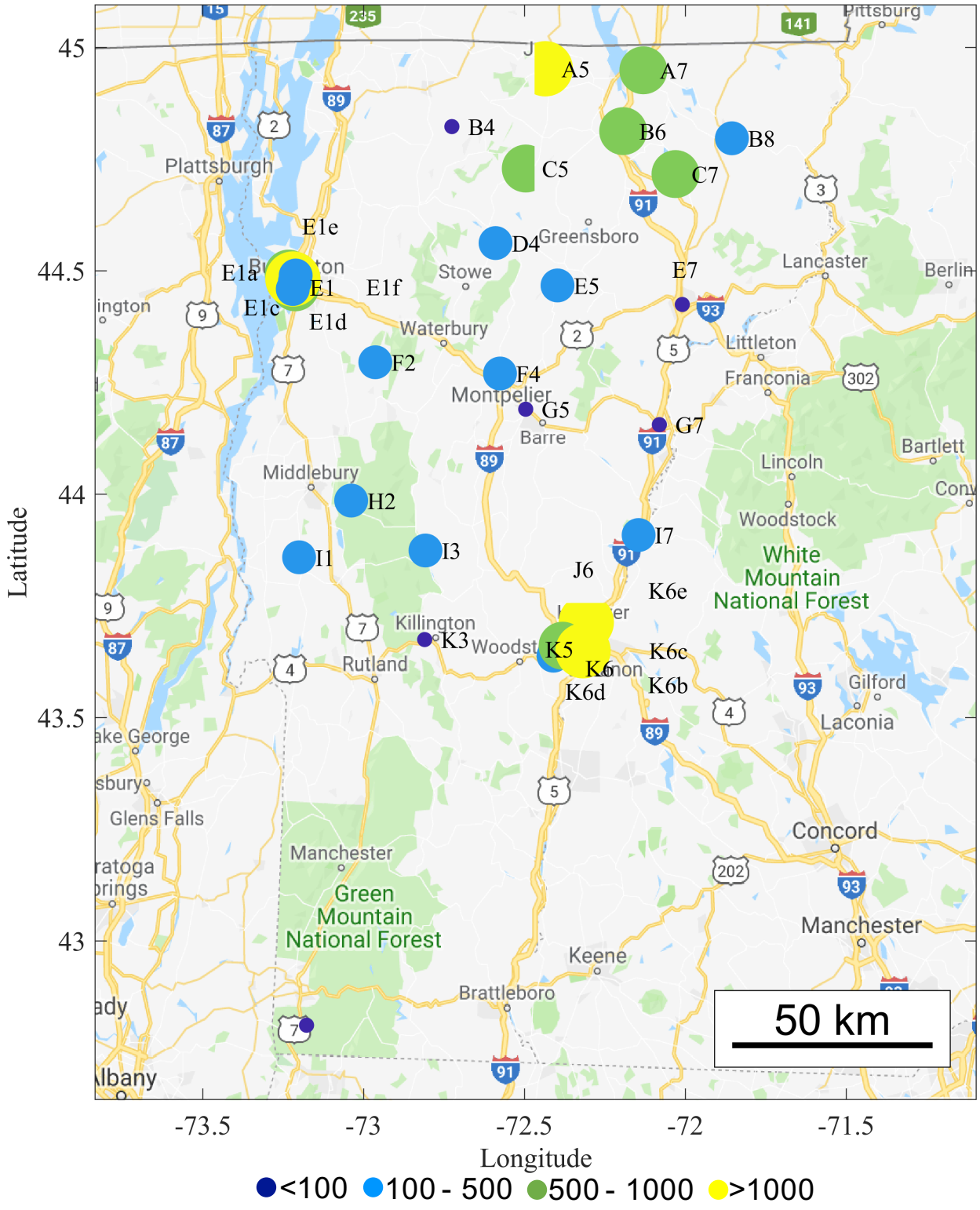

Figure 6.2. Spatial distribution of PFHxA.

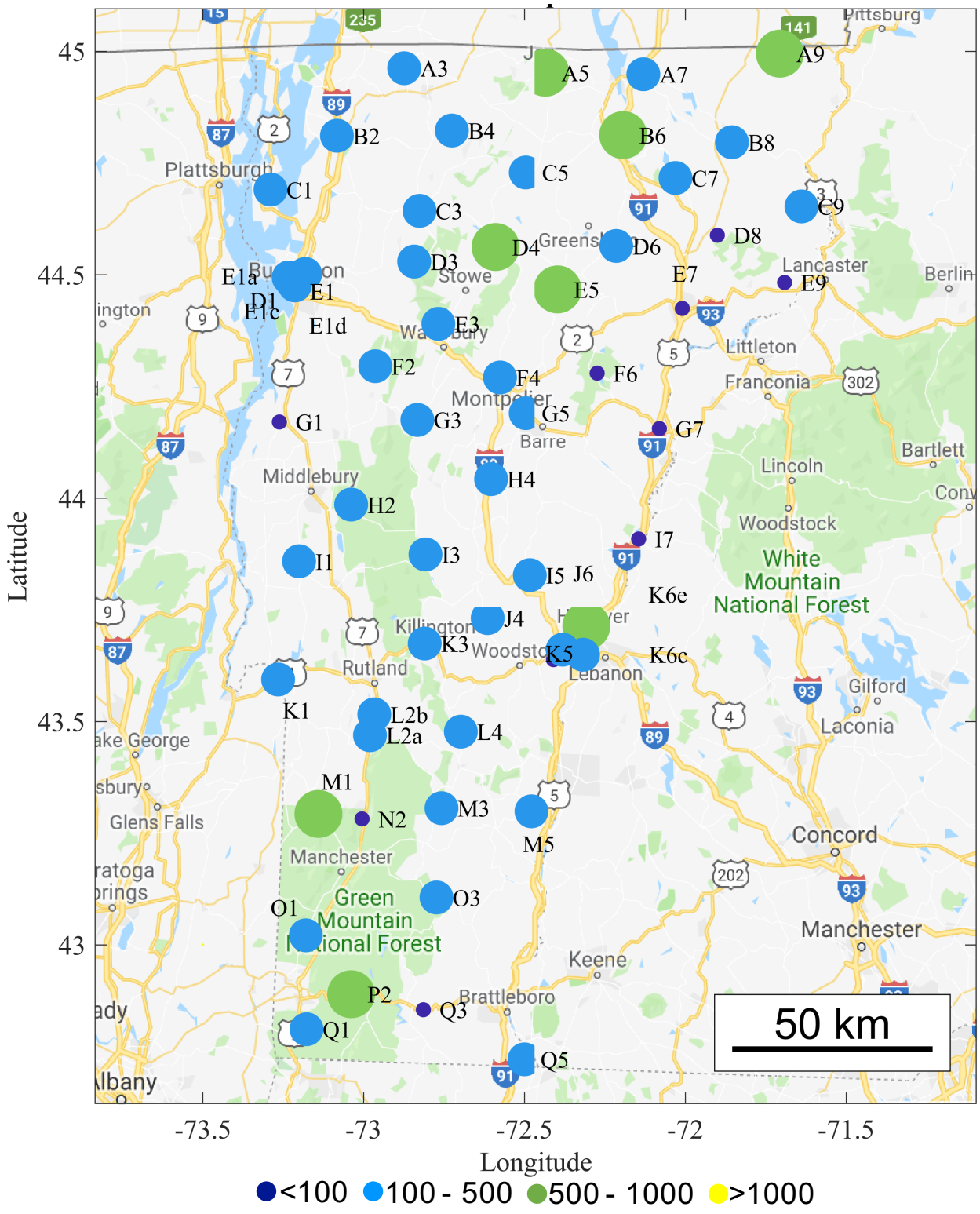

Figure 6.3. Spatial distribution of PFHpA.

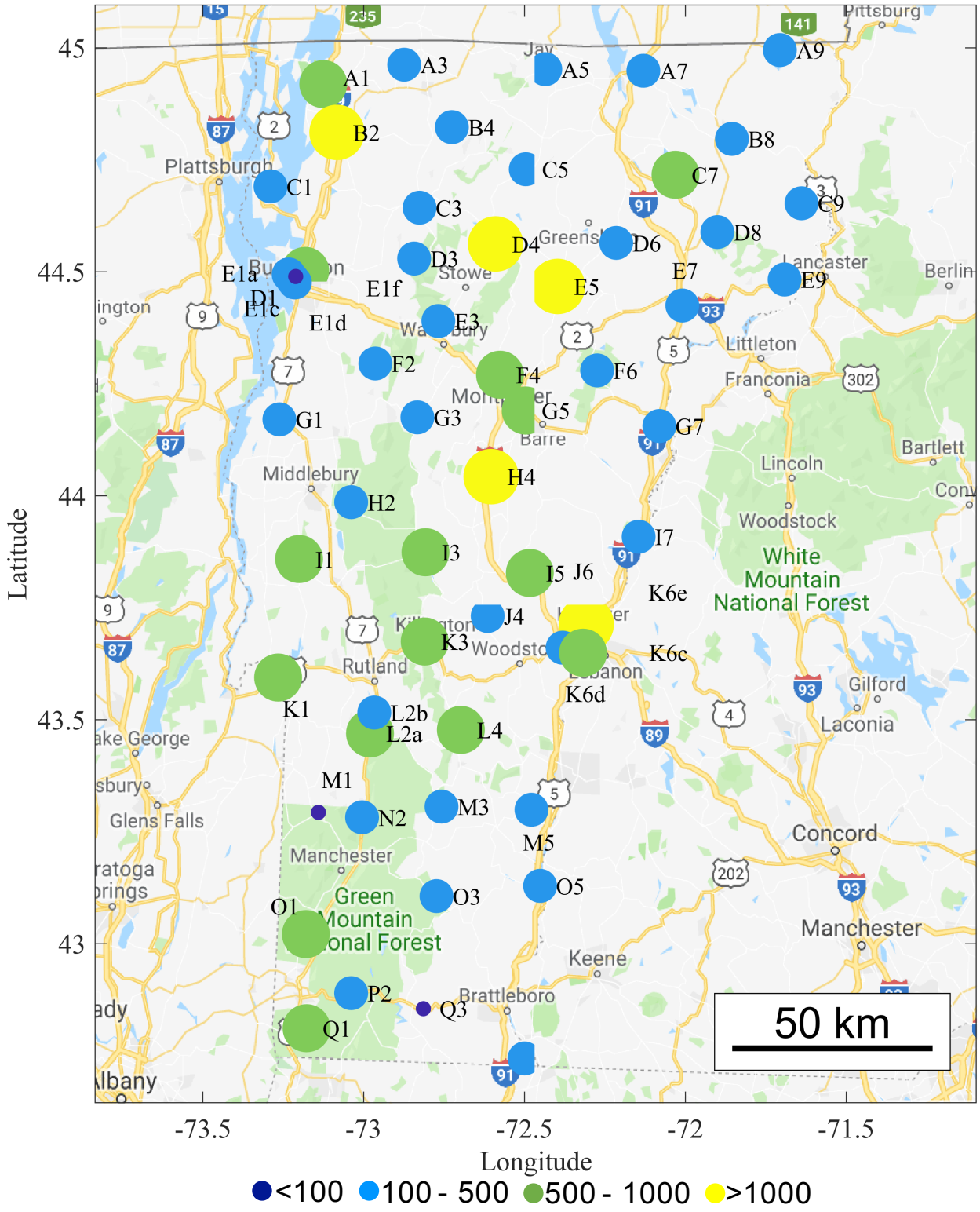

Figure 6.4. Spatial distribution of PFOA.

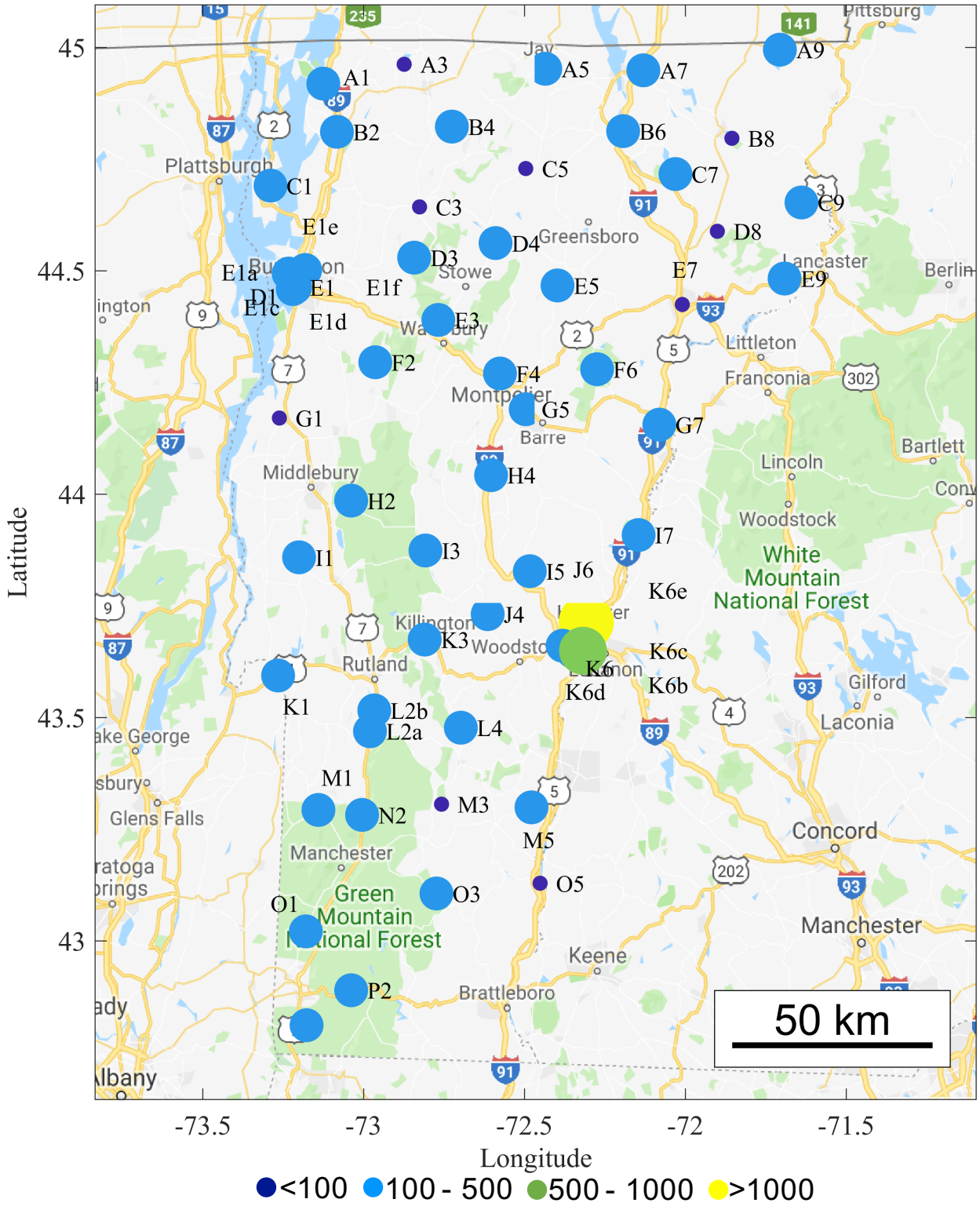

Figure 6.5. Spatial distribution of PFNA.

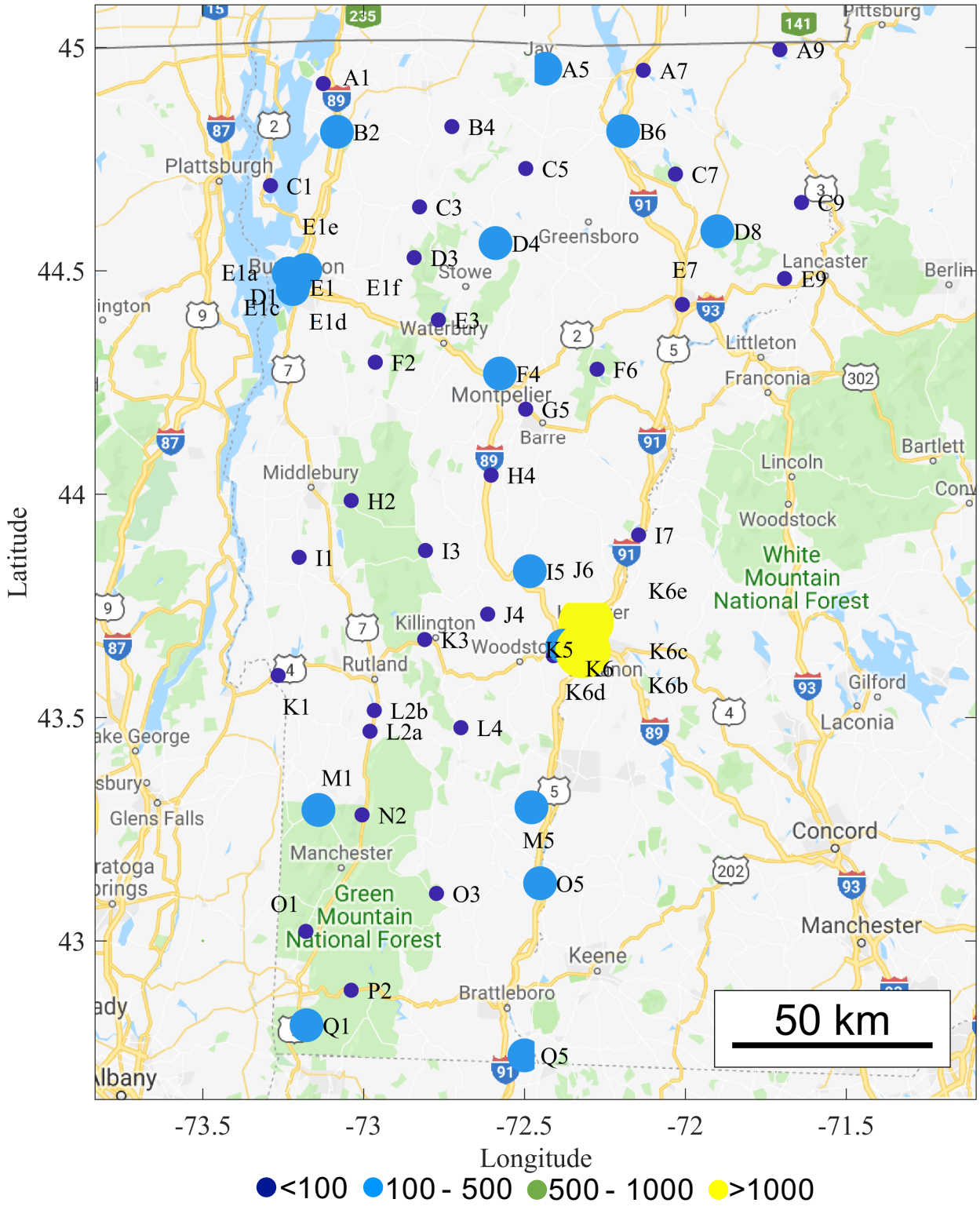

Figure 6.6. Spatial distribution of PFDA.

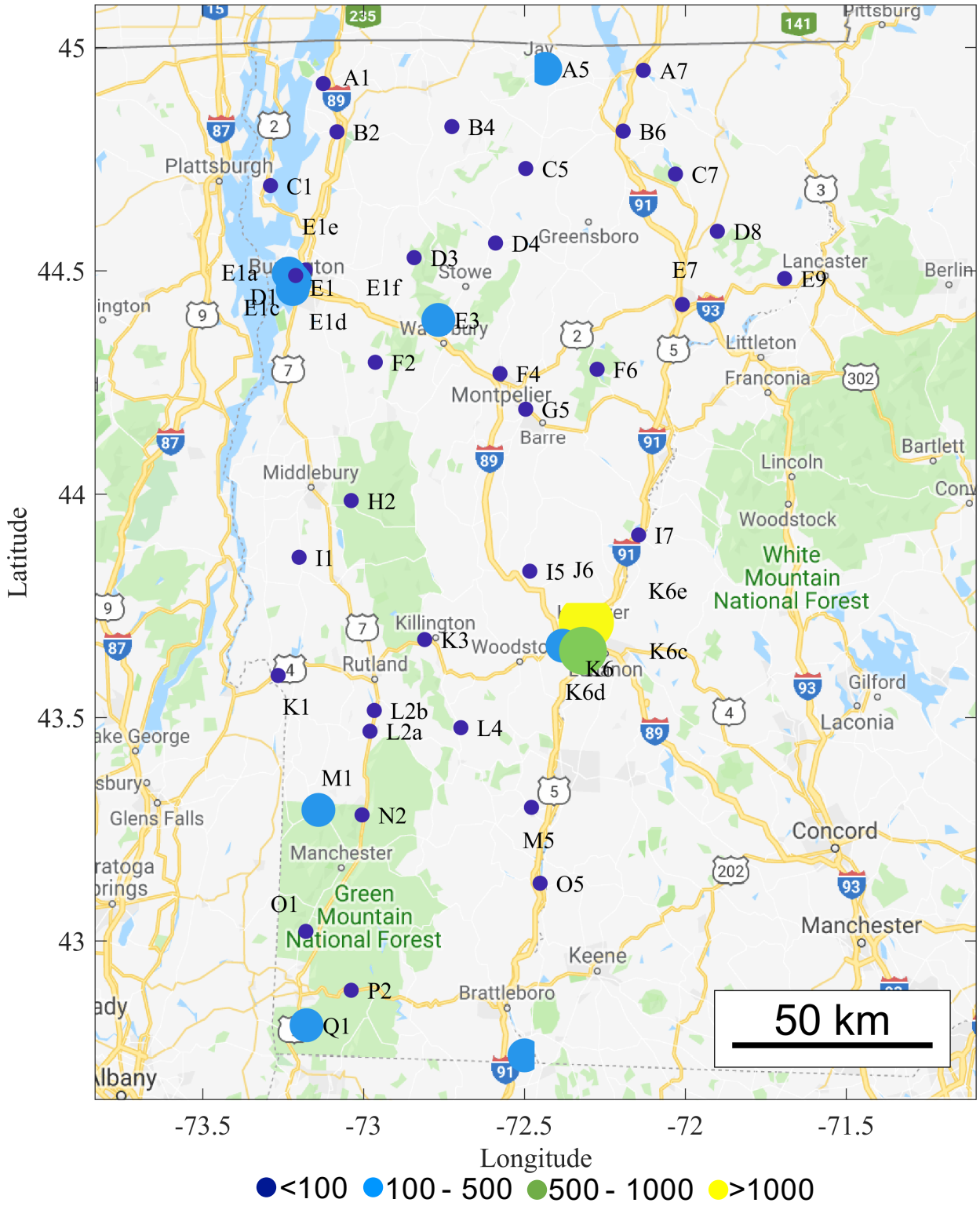

Figure 6.7. Spatial distribution of PFUnDA.

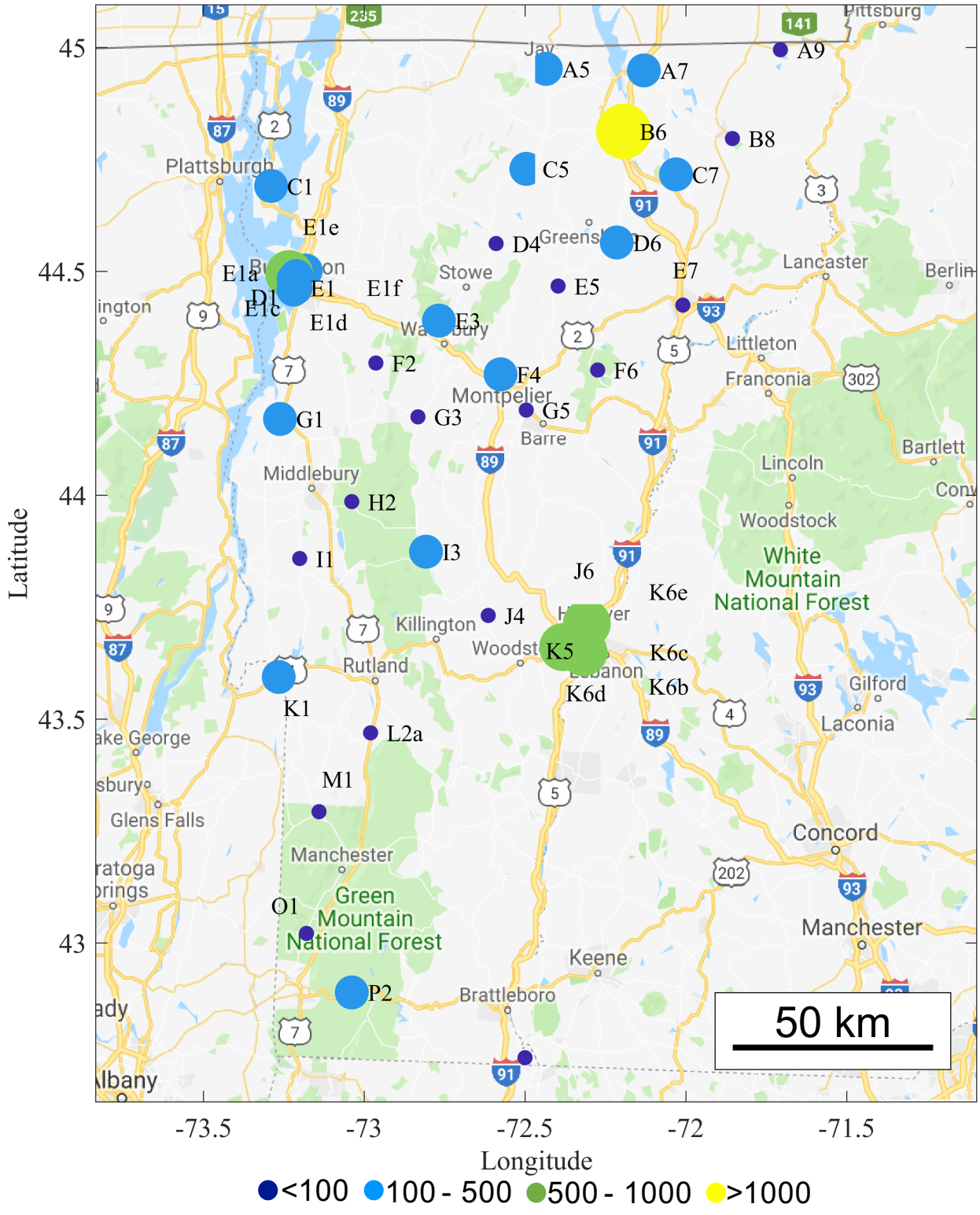

Figure 6.8. Spatial distribution of PFBS.

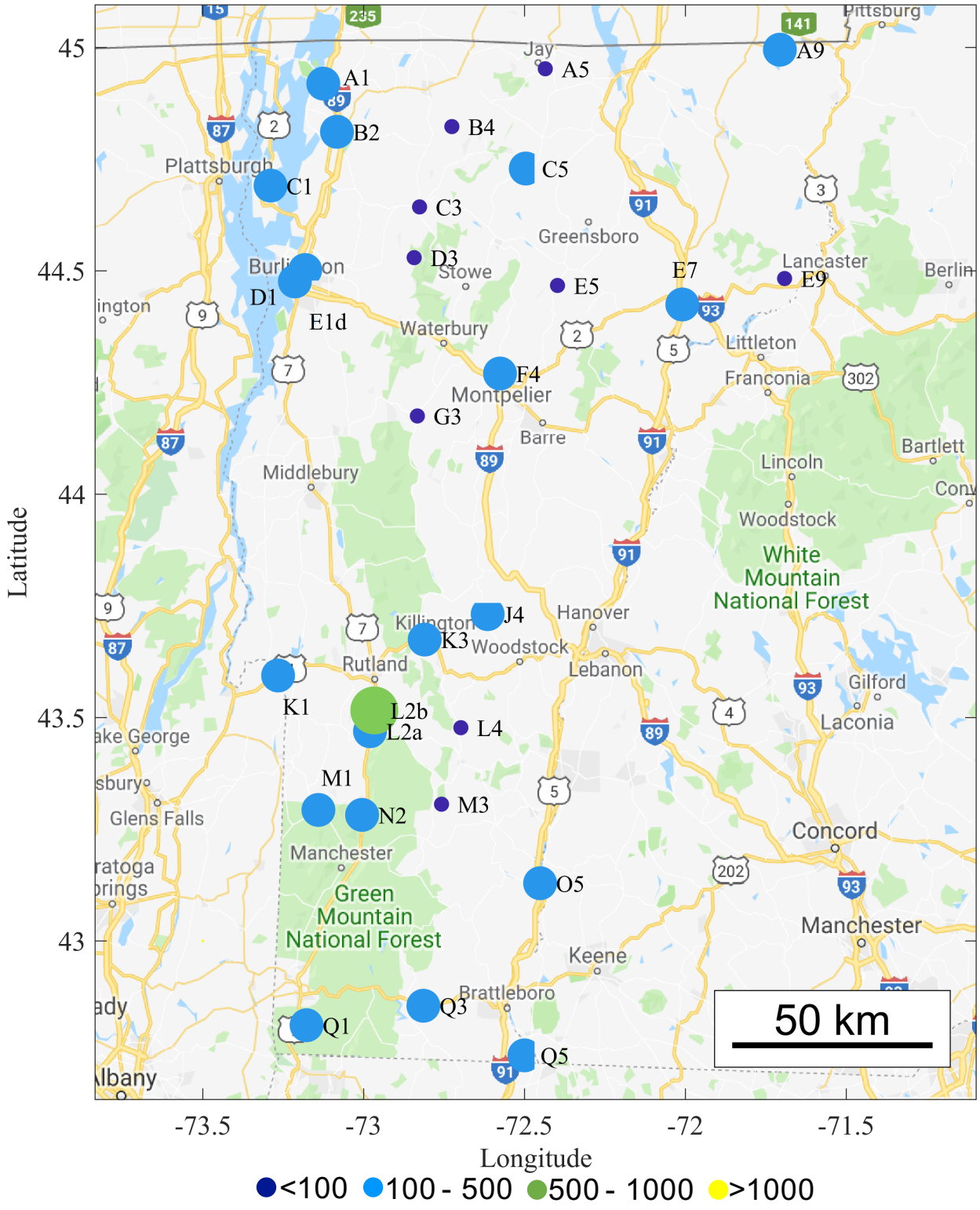

Figure 6.9. Spatial distribution of PFHxS.

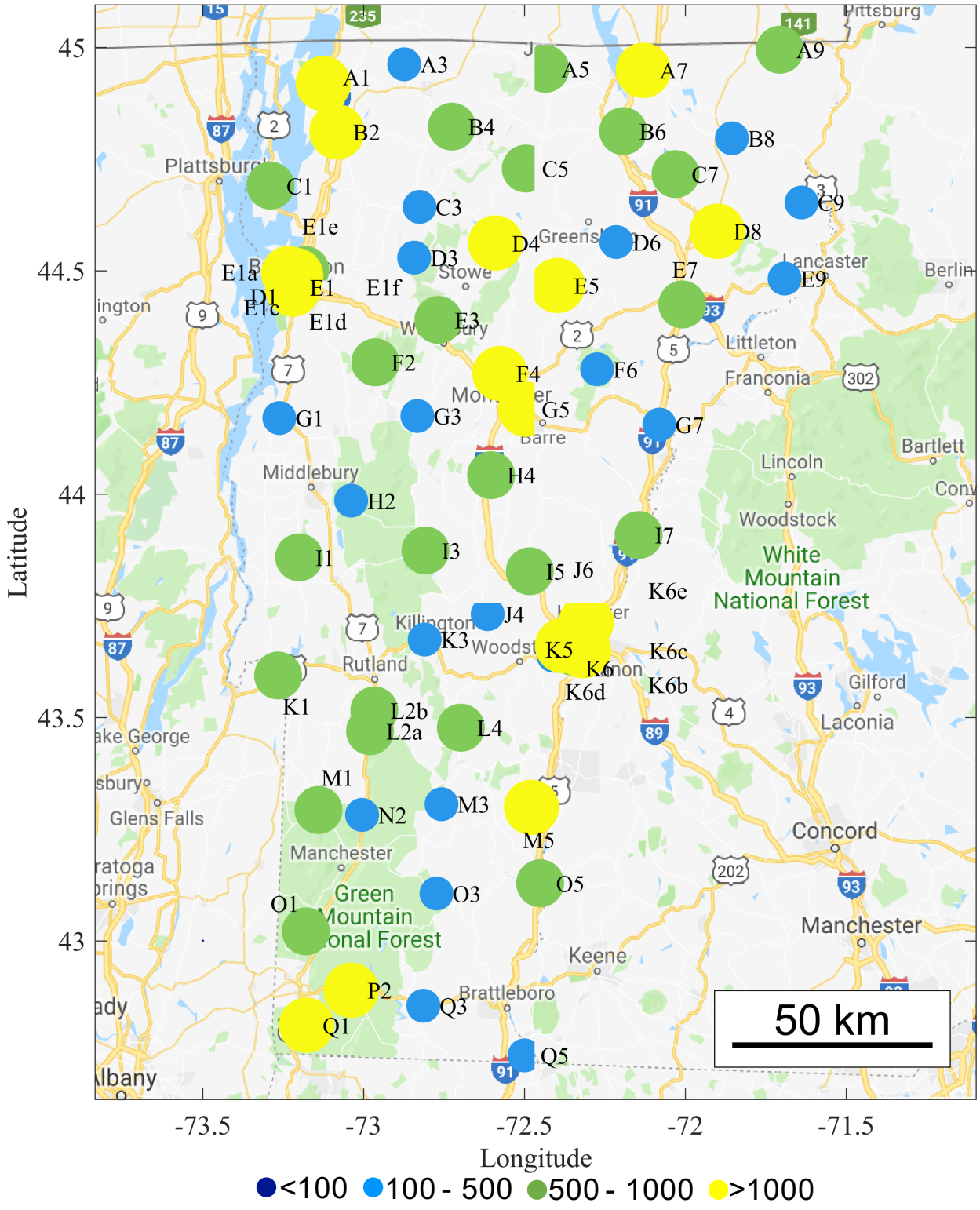

Figure 6.10. Spatial distribution of PFOS.

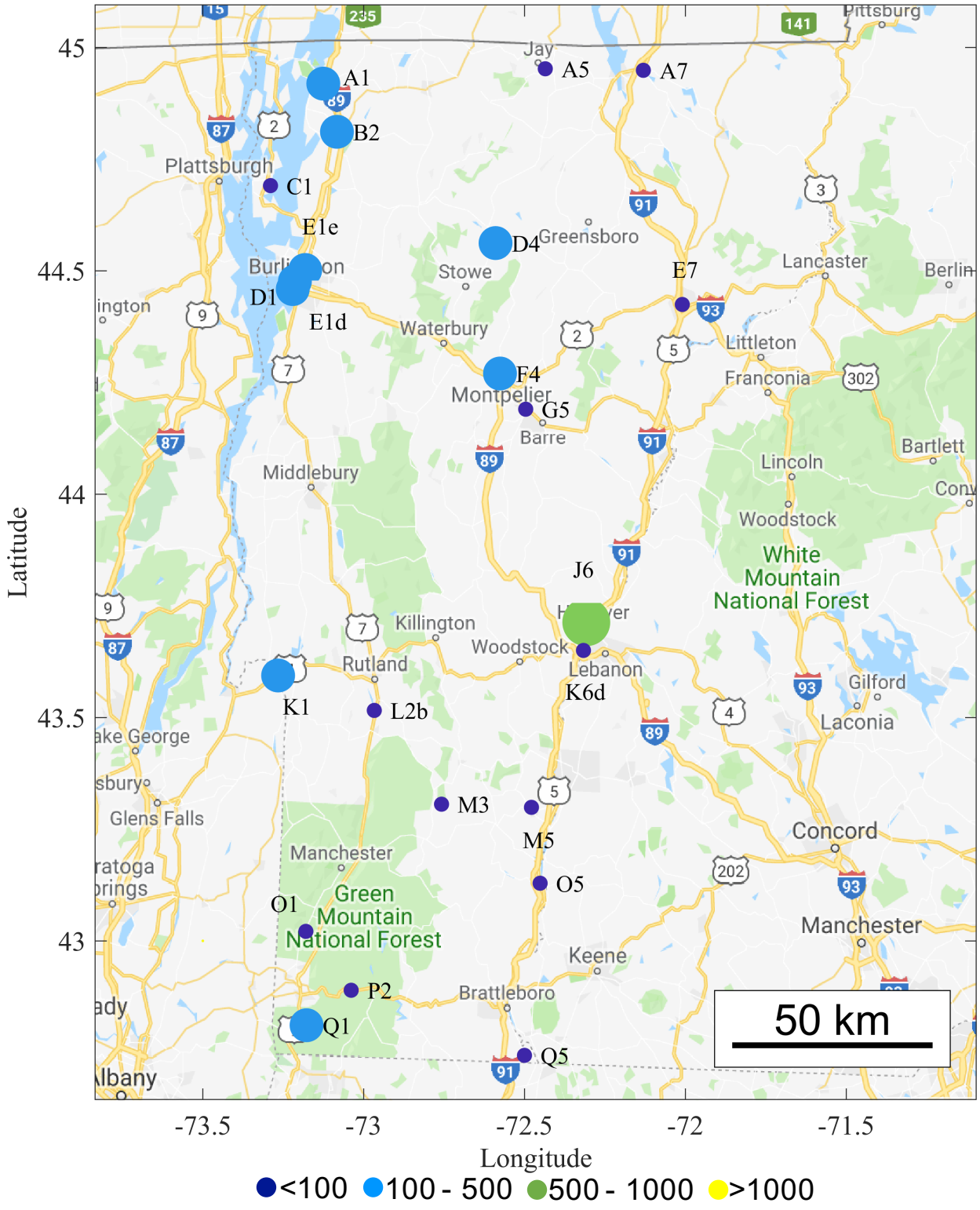

Figure 6.11. Spatial distribution of PFDS.

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LABORATORY ANALYTICAL METHODS

Percent Solids Determination using ATSM D2216-10 Method

The soil sample was sieved through a methanol-washed, stainless-steel, 2 mm sieve to remove rocks, solid particles and other solid contaminants. The sample was grinded if necessary. A representative quantity of soil in a clean aluminum weighing dish (42 mm) was placed in the oven and dried at constant temperature of between 102 °C and 105 °C. Following drying the dish was placed in a desiccator to cool before recoding the dry weight. The percent moisture content is calculated on a dry basis to ensure consistency. The moisture content of the soil is described as the ratio of the mass of water held in the soil to the dry soil.

Moisture content (%) = $\left(\frac{W_2 - W_3}{W_3 - W_1} \times 100\right)$ where,

W_1 = weight of empty dish, g
W_2 = weight of dish containing a representative quantity of soil, g
W_3 = weight of dish containing a representative quantity of soil after drying, g
Solid content (%) = 100 – Moisture content (%)

Total Organic Carbon (TOC) Determination

TOC was measured according to the ASTM 2000 method which is referred as Loss on Ignition (LOI) method. Briefly, the soil sample was sieved and grinded, if necessary, to create a homogeneous sample. A certain amount (5-20 g, depending on the soil condition) of soil was dried in the oven for 12 h at 65 °C to remove moisture from the sample. Following drying, the sample was cooled in a desiccator to room temperature and grinded for further homogenization if necessary. Using a 4-decimal point balance, 1.0000 (±0.0099) gram of soil was carefully taken from the dried and homogenized sample and transferred into ceramic crucible for ashing process, which was carried out in a muffle furnace for 12 h at 440 °C. Temperature control is critical in this process since heating above 440 °C is associated with the risk of losing inorganic carbon that might generate biased result. After ashing, the samples were cooled to room temperature in the desiccator and were weighed to measure the loss of organic compounds due to ashing process following Equation 1 (E1). Finally, the calculated weight loss of organic compounds was converted to percent loss of organic matter (E2) and multiplied by "Van Bemmelen" factor of 0.58 to calculate the TOC (E3).

Loss of Organic Matter, $M = M_{initial} - (M_{final} - M_{crucible})$ E1
Percent of Organic Matter loss, $M_1 = (M/M_{initial}) \times 100$ E2
$TOC = M_1 \times 0.58$ E3

Extraction Method

The extraction method used in this project was adapted from the method developed by Rankin et al (2016) where they reported that roughly 100% recovery of PFOA, PFDA and PFDoDA in spike-and-recovery experiments was achieved.

To avoid possible contamination from the solvents during sample preparation and exaction, high-purity 18.2 MΩ-cm water (HW) and high-purity tetrabutyl ammonium hydrogen sulfate (TBAHS) ion-pairing agent were prepared as follows: High-purity waters was made by passing 18.2 MΩ-cm water through an Oasis 35 cc HLB cartridge, after that HW was collected by a specific 2 L Erlenmeyer flask washed by high-purity methanol before usage. To make sure that HW was of good quality, the HLB cartridge was changed when the total

volume of 6 L was filtered. Similarly, TBAHS ion pairing agent was first prepared by slowly mixing 0.25 M Na_2CO_3 solution with 0.50 M TBAHS solution (2:1, v/v) to avoid spillage due to the generation of CO_2. The mixture was purified by passing through the Oasis 35 cc HLB cartridge.

Soil samples were 2mm-sieved the same way as described earlier. Briefly, for each soil sample, 5 g (wet weight) was prepared and transferred into methanol-washed PPCO centrifuge tubes and sealed with PPCO caps. Here, $^{13}C8$ mass-labeled PFOA (M8PFOA) was used as a recovery standard, and 2000 pg was spiked into each 5 g-soil sample. Subsequently, 400 μL of 2M sodium hydroxide and 8.5 mL of 90:10 acetonitrile (ACN):HW solution were mixed into the soil sample by vortexing for 15 to 30 s, and then was sonicated in an ice bath for 1 h. After that, the samples were loaded onto a LabQuake rotisserie mixer and rotated for around 15 h at 8 rpm before they were centrifuged at 17,500 rpm and 20 ℃ for 15 min. After carefully decanted the supernatants into glass vials, a second round of extraction using 90:10 ACN:HW solution were conducted on the soil samples and the supernatant was combined together with the one from the first round. A solid-phase extraction (SPE) manifold was employed to blow the obtained supernatants to near dryness under filtered air. The extract matrices were reconstituted into 4 mL TBAHS ion-paring solution and extracted by 5 mL of methyl-tert-butyl ether (MTBE) through vortexing. After stored the mixture overnight in a freezer, MTBE fractions were decanted into glass vials while the TBAHS solutions were extracted by MTBE for a second round. The collected MTBE fractions from the two rounds of extraction were then blown to dryness in the SPE. Finally, 1 mL of ACN was used to reconstitute the dried extracts and filtered by 0.2 μm Nylon filters.

MDL and RL

MDL of each analyst was calculated using Equation 4 (E4) below, where SD is the standard deviation of the lab fortified blank replicates, t is the student's t value at 99% confidence interval and n is the number of replicates. Reporting limit (RL) of each analyte was defined as MDL times a safety factor (five in this report) as illustrated in Equation 2 (E5). MDL and RL of each compound are summarized in Table 2.

$$MDL=SD(t_{(n-1)}) \quad \text{E4}$$

$$RL=MDL \times 5 \quad \text{E5}$$

Table A1. Instrumental method parameters for analysis of PFAS by LC-MS/MS.

Instrument	Shimadzu Prominence LC system interfaced with an ABI 4000Qtrap mass spectrometer. Operated in the negative ion multiple reaction monitoring mode.
Analytical Column	Waters Atlantis dC18 (100Å, 5μm, 1.0x150mm)
Mobile Phases	A: 0.15% acetic acid in water B: 0.15% acetic acid in acetonitrile
Gradient Profile	

Time (min)	Percentage B	Flow rate (mL/min)
0.00	25	0.10
1.00	25	0.10
10.99	98	0.10
11.00	98	0.15
12.00	98	0.15
12.01	25	0.15
16.00	25	0.15
16.01	25	0.10
20.00	25	0.10

Injection Volume	10 μL
Monitored Ion Transitions	

Analytes	Ion Transitions	DP	CE	CXP	EP	RT
PFBA	213.1 > 169.0	-42	-13	-6	-10	2.4
PFPeA	263.1 > 219.0	-33	-13	-6	-10	4.4
PFHxA	313.1 > 269.0	-40	-14	-6	-10	6.6
PFHpA	363.1 > 319.0	-40	-15	-6	-10	7.2
PFOA	413.2 > 369.0	-40	-16	-11	-10	7.5
PFNA	463.0 > 419.0	-45	-16	-12	-10	7.9
PFDA	513.2 > 469.0	-45	-17	-12	-10	8.2
PFUnDA	563.2 > 519.0	-45	-18	-15	-10	8.5
PFDoDA	613.2 > 569.0	-55	-19	-17	-10	8.8
PFTrDA	663.3 > 619.0	-55	-19	-19	-3	9.1
PFTeDA	713.3 > 669.0	-60	-20	-23	-3	9.5
PFHxDA	813.2 > 769.0	-60	-22	-27	-10	10.3
PFODA	913.2 > 869.0	-70	-25	-28	-10	11.5
PFBS	299.1 > 80.0	-80	-58	-6	-10	6.6
PFHxS	399.1 > 80.0	-90	-80	-6	-10	7.6
PFOS	499.2 > 80.0	-100	-90	-6	-10	8.1
PFDS	599.2 > 80.0	-100	-100	-6	-10	8.5
M8PFOA	421.2 > 376.0	-45	-16	-11	-10	7.5

Calibration	Quantitation was achieved with an 9-point linear regressed calibration curve spanning 0.05 to 20 ng/mL.

* RT : Retention time (min).

SAMPLING INFORMATION

Table A2. List of Sampled Properties, locations, sampling date.

Sample ID	Property			Sampling Date	Sampling Time
	Name	Latitude	Longitude		
A1	Swanton Village Green	44.91884	-73.12551	8/15/18	13:50
A3	Lake Carmi State Park	44.96210	-72.87404	8/15/18	12:43
A5	Jay Elementary	44.95206	-72.43537	7/13/18	11:58
A7	N. Country Union Jr. High School	44.94861	-72.13055	7/13/18	13:21
A9	Great Averill Pond Boat Launch	44.99474	-71.70613	7/20/18	13:23
B2	St. Albans Taylor Park	44.81101	-73.08299	8/15/18	11:39
B4	Avery's Gore Wildlife Management Area	44.82265	-72.72577	8/15/18	16:35
B6	Willoughby Falls Fishing Access Area	44.81250	-72.19334	7/13/18	14:17
B8	Brighton State Park	44.79647	-71.85522	7/20/18	12:51
C1	Grand Isle State Park	44.69054	-73.28962	8/23/18	10:55
C3	Cambridge Elementary School	44.64285	-72.82619	8/15/18	17:27
C5	Eden Boat Launch - field repositioned	44.72878	-72.49607	7/13/18	10:34
C7	Willoughby State Forest	44.71641	-72.03065	7/13/18	15:58
C9	Maidstone State Forest	44.65277	-71.63894	7/20/18	14:40
D1	Winooski High School	44.50167	-73.18167	8/23/18	12:07
D3	Underhill State Park	44.52931	-72.84304	8/15/18	18:08
D4	Peoples Academy-Morrisville	44.56194	-72.59000	7/18/18	10:21
D6	Flagg Pond	44.56431	-72.21493	7/13/18	17:00
D8	Darling State Forest	44.58833	-71.90055	7/20/18	11:36
E1	Callahan Park-Burlington	44.46285	-73.21300	6/13/18	11:40
E1a	Lakeview Cementery	44.49370	-73.23308	6/13/18	14:20

E1c	Battery Park	44.48148	-73.21988	6/13/18	12:45
E1d	City Hall Park	44.47603	-73.21377	8/23/18	11:28
E1e	Lakeside Park	44.45895	-73.22038	6/13/18	10:50
E1f	Roosevelt Park	44.48931	-73.21127	6/13/18	13:25
E3	Little River State Park	44.38988	-72.76780	7/18/18	16:42
E5	Buck Lake WMA	44.46704	-72.39734	7/18/18	11:36
E7	St. J. Municipal Forest	44.42448	-72.00947	7/20/18	17:03
E9	Neal Pond Launch	44.48254	-71.69150	7/20/18	15:51
F2	Huntington Schools (Brewster-Pierce Memorial School)	44.29513	-72.96381	7/16/18	17:08
F4	Hubbard Park - Montpelier*	44.26994	-72.57617	8/23/18	12:56
F6	Groton State Forest @ Stillwater	44.27953	-72.27425	7/18/18	13:06
G1	Former Week's School	44.17027	-73.26197	7/16/18	10:22
G3	Waitsfield Lareau Park	44.17493	-72.83302	7/16/18	16:18
G5	Barre Spaulding High	44.19005	-72.49625	7/18/18	15:42
G7	Blue Mtn. Union School-Wells River	44.15551	-72.08078	7/18/18	14:15
H2	Ripton Elementary	43.98555	-73.03879	7/16/18	12:02
H4	Brookfield Floating Bridge	44.04244	-72.60382	7/31/18	18:25
I1	Whiting Elementary	43.85859	-73.20070	7/16/18	13:22
I3	Rochester Town Green	43.87382	-72.80785	7/16/18	15:52
I5	McIntosh Pond	43.82744	-72.48354	7/31/18	17:31
I7	Samuel Morey Elementary-Fairlee	43.90844	-72.14525	7/31/18	13:22
J4	Silver Lake State Park	43.73137	-72.61446	7/31/18	16:43
J6	Norwich Green	43.71329	-72.30790	6/27/18	14:29
K1	Fair Haven Village Green	43.59402	-73.26590	8/17/18	10:13
K3	Gifford Woods State Park	43.67444	-72.81028	7/31/18	15:39

K5	Quechee State Park	43.63834	-72.41001	6/27/18	12:28
K6	Ratcliffe Park-WRJ	43.64378	-72.31537	6/27/18	11:08
K6b	Hurricane Wildlife Refuge	43.64706	-72.34908	6/27/18	11:48
K6c	Meeting House Common	43.66070	-72.38163	6/27/18	13:50
K6d	Lyman's Point Park	43.65006	-72.31670	6/27/18	10:39
K6e	Veterans Memorial Park - Hartford*	43.64944	-72.31809	6/27/18	13:16
L2a	Wallingford Recreation Fields	43.46922	-72.98030	8/17/18	14:49
L2b	Lower Clarendon Gorge State Forest*	43.51583	-72.96694	8/6/18	11:52
L4	Camp Plymouth State Park	43.47719	-72.69784	8/6/18	13:05
M1	Mettawee River Boat Launch	43.29309	-73.14064	8/17/18	11:28
M3	Okemo State Forest	43.30595	-72.75792	8/6/18	13:51
M5	The Commons Park-Springfield	43.29889	-72.47835	8/6/18	16:288
N2	Emerald Lake State Park	43.28198	-73.00499	8/17/18	12:08
O1	Shaftsbury State Park	43.02127	-73.17963	8/22/18	12:21
O3	Jamaica State Park	43.10612	-72.77359	8/17/18	13:08
O5	Rockingham Recreation Fields-Bellows Falls	43.12904	-72.45146	8/6/18	15:40
P2	Woodford State Park	42.88945	-73.03882	8/22/18	14:24
Q1	South Stream Boat Launch	42.81119	-73.17750	8/22/18	13:32
Q3	Molly Stark State Park	42.85478	-72.81434	8/22/18	15:06
Q5	Vernon Hatchery Pond	42.74374	-72.50004	-8/22/18	16:21

Notes:
(1) Sample and property names generally correspond with those designated in the DEC Background study. Sample names correspond with the grid pattern indicated in the figure also include in the Appendix A. Sample locations at the properties were selected and documented in the field by sampling personnel. Access to the proposed properties has not been confirmed and alternative sampling locations or properties may be selected if access issues are encountered.
(2) Proposed properties for sampling were selected using the screening process described in the QAPP and DQO plan. Based on access issues at some of the proposed properties, some alternative properties were selected (indicated by *). A total of 66 properties were sampled compared to 69 properties proposed in the QAPP and DQO plan.

Table A3. Summarized field sampling forms.

Sample Location	**A1**	**A3**	**A5**	**A7**	**A9**
Sample ID	A1_20180815	A3_20180815	A5_20180713	A7_20180713	A9_20180720
Property Name	Swanton Village Green	Lake Carmi State Park	Jay Elementary	N. Country Union Jr. High School	Great Averill Pond Boat Launch
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/15/18	8/15/18	7/13/18	7/13/18	7/20/18
Sampling Time	13:50	12:43	11:58	13:21	13:23
Latitude	44.91884	44.96210	44.95206	44.94861	44.99474
Longitude	-73.12551	-72.87404	-72.43537	-72.13055	-71.70613
Weather	Mostly cloudy	Cloudy	Sunny	Sunny with some clouds	Clear skies
Location Description	Grass area behind metal bench at northwest corner of park, approximately 10 ft from the sidewalk and 15-20 ft from the street.	Grass area behind nature trail sign, visible from end of one-way loop closest to the woods.	Grass area under trees, approximately 10 ft from a power box and stone/metal in-ground boxes.	Grass area near the southeast corner of paved bus drop-off zone.	Grass area on edge of lake within fishing access lot.
Surroundings Description	Residential/Commercial. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Residential/Agricultural Fields. No potential PFAS source was observed.	Residential. No potential PFAS source was observed.	Residential/Wooded. No potential PFAS source was observed.
Burmister Soil Description	Light-medium brown, SILT, little Sand, few root fragments, topsoil and subsoil. Moist.	Brown, SILT, and Sand, few root fragments, topsoil and subsoil. Moist.	Brown, SILT & CLAY, some Sand, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark brown, CLAY & SILT, some Sand, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark brown, fine to coarse SAND, little Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**B2**	**B4**	**B6**	**B8**	**C1**
Sample ID	B2_20180815	B4_20180815	B6_20180713	B8_20180720	C1 _20180823
Property Name	St. Albans Taylor Park	Avery's Gore Wildlife Management Area	Willoughby Falls Fishing Access Area	Brighton State Park	Grand Isle State Park
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/15/18	8/15/18	7/13/18	7/20/18	8/23/18
Sampling Time	11:39	16:35	14:17	12:51	10:55
Latitude	44.81101	44.82265	44.81250	44.79647	44.69054
Longitude	-73.08299	-72.72577	-72.19334	-71.85522	-73.28962
Weather	Cloudy with sun	Partly cloudy	Sunny with some clouds	Clear skies	Mostly cloudy
Location Description	Grass area approximately 50-75 feet from side walk, between two trees in the southwest quadrant of the park.	Grass area accessed from roadway.	Gravel trail area along the river falls, near the information hut at the beginning of path.	Grass backyard of check-in cabin/park managers home.	Grass area behind large center tree at beach front.
Surroundings Description	Residential/Commercial. No potential PFAS source was observed.	Wooded/Fields. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Light-medium brown, fine to coarse SAND, some Clayey Silt, few root fragments, topsoil and subsoil. Moist.	Light brown, fine to coarse SAND, some Silt, little Gravel, few root fragments, topsoil and subsoil	Dark brown, fine to coarse SAND, and Silt, subsoil, some root fragments. Moist.	Brown, fine to coarse SAND, trace Silt, little root fragments, topsoil and subsoil. Moist.	Brown, fine to coarse SAND, little Gravel, little Silt, few root fragments, topsoil and subsoil. Moist.

Sample Location	**C3**	**C5**	**C7**	**C9**
Sample ID	C3_20180815	C5_20180713	C7_20180713	C9_20180720
Property Name	Cambridge Elementary School	Eden Boat Launch - field repositioned	Willoughby State Forest	Maidstone State Forest
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/15/18	7/13/18	7/13/18	7/20/18
Sampling Time	17:27	10:34	15:58	14:40
Latitude	44.64285	44.72878	44.71641	44.65277
Longitude	-72.82619	-72.49607	-72.03065	-71.63894
Weather	Partly cloudy	Sun	Sunny, partly cloudy	Clear skies
Location Description	Grass area east of the home plate for the baseball field farthest from school bus parking lot.	Grass area to the far west of launch road, close to bordering greenery.	Wooded area approximately 15-20 feet south from parking area.	Brass area between "Maidstone State Park" sign and the nearest tree.
Surroundings Description	Residential/Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Wooded/Camping Area. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Light Brown, SILT & CLAY, and Sand, few root fragments, topsoil and subsoil. Moist.	Light Brown, GRAVEL, and Sand, trace Silt, topsoil and subsoil, few/no root fragments. Moist.	Very dark brown, fine to coarse SAND, some Silt, little Gravel, very few root fragments, subsoil. Moist.	Dark brown, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**D1**	**D3**	**D4**	**D6**	**D8**
Sample ID	D1_20180823	D3_20180815	D4_20180718	D6_20180713	D8_20180720
Property Name	Winooski High School	Underhill State Park	Peoples Academy-Morrisville	Flagg Pond	Darling State Forest
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/23/18	8/15/18	7/18/18	7/13/18	7/20/18
Sampling Time	12:07	18:08	10:21	17:00	11:36
Latitude	44.50167	44.52931	44.56194	44.56431	44.58833
Longitude	-73.18167	-72.84304	-72.59000	-72.21493	-71.90055
Weather	Mostly clear skies, few clouds	Cloudy	Mostly sunny	After a shower. Sunny with few clouds	Clear skies
Location Description	Grass area near the soccer field bleachers and circular playground feature, northwest of the school.	Grass area next to picnic table located near of parking lot.	Grass area near custodial parking lot, south of the main school building.	Wooded area bordering pond, approximately 10-15 ft from gravel road pull-off parking.	Grass area at camping ground "Lot 1", near parking lot of Burke Mountain campground check-in cabin.
Surroundings Description	Residential/Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Residential/Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Dark brown and gray, fine to coarse SAND, little Silt, trace Gravel, topsoil and subsoil. Moist.	Very dark brown, GRAVEL, and Sand, some Clay & Silt, few root fragments, topsoil and subsoil. Moist.	Olive-brown, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Very dark brown, Silty CLAY, little Sand, subsoil, some root fragments. Moist, wet at approximately 4-inches deep.	Brown, fine to coarse SAND, and Gravel, trace Silt, few root fragments, topsoil and subsoil. Moist.

Sample Location	**E1**	**E1a**	**E1c**	**E1d**	**E1e**
Sample ID	E1_20180613	E1a_20180613	E1c_20180613	E1d_20180823	E1e_20180613
Property Name	Callahan Park-Burlington	Lakeview Cementery	Battery Park	City Hall Park	Lakeside Park
Collector(s)	Harrison Roakes & Ryan Weinstein	Harrison Roakes & Ryan Weinstein	Harrison Roakes & Ryan Weinstein	Ryan Weinstein	Harrison Roakes & Ryan Weinstein
Sampling Date	6/13/18	6/13/18	6/13/18	8/23/18	6/13/18
Sampling Time	11:40	14:00	12:45	11:28	10:50
Latitude	44.46285	44.49370	44.48148	44.47603	44.45895
Longitude	-73.21300	-73.23308	-73.21988	-73.21377	-73.22038
Weather	Mostly cloudy	Mostly cloudy	Mostly cloudy	Mostly clear skies, few clouds	Mostly cloudy
Location Description	North edge of park, approximately 20 ft from the park athletic fields.	Grass area in cemetery, approximately 10 feet from gravel access road.	Grass area north of the center of the park.	Grass area at the southwest corner of city hall park beside a flower bed.	Grass area under trees at the southwest corner of park, approximately 25 ft from roadway.
Surroundings Description	Residential/ Athletic Fields. No potential PFAS source was observed.	Cemetery/Athletic fields/Wooded. No potential PFAS source was observed.	Residential/Commercial. No potential PFAS source was observed.	Residential/Commercial. No potential PFAS source was observed.	Residential. No potential PFAS source was observed.
Burmister Soil Description	Light brown, Clayey SILT, some Sand, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Light brown, fine to coarse SAND, some Silt, few root fragments, topsoil and subsoil. Moist.	Dark brown, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, Clayey SILT, little Sand, few root fragments, topsoil and subsoil. Moist.	Brown, fine to coarse SAND, some Silt, some Gravel, topsoil and subsoil, few root fragments. Moist.

Sample Location	**E1f**	**E3**	**E5**	**E7**	**E9**
Sample ID	E1f_20180613	E3_20180718	E5_20180718	E7_20180720	E9_20180720
Property Name	Roosevelt Park	Little River State Park	Buck Lake WMA	St. J. Municipal Forest	Neal Pond Launch
Collector(s)	Harrison Roakes & Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	6/13/18	7/18/18	7/18/18	7/20/18	7/20/18
Sampling Time	13:25	16:42	11:36	17:03	15:51
Latitude	44.48931	44.38988	44.46704	44.42448	44.48254
Longitude	-73.21127	-72.76780	-72.39734	-72.00947	-71.69150
Weather	Cloudy	Clear skies	Clear skies	Clear skies	Clear skies
Location Description	Mulched area between the basketball and tennis courts.	Picnic area near campsite check-in parking lot.	Wooded area approximately 200 ft up a trail, opposite an informational sign.	Behind the backstop fence of the western baseball field.	grass area between the parking area and the lake.
Surroundings Description	Residential/ Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Commercial/Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Olive-brown, fine to coarse SAND, little Silt, few root fragments, subsoil. Moist.	Dark brown, fine to coarse SAND, little Silt, some root fragments, subsoil. Moist. Synthetic material (suspected fiberglass) found in the soil and removed prior to sample collection.	Dark brown, Clayey SILT, and Sand, some root fragments, topsoil and subsoil. Moist.	Dark brown, fine to coarse SAND, and Silt, few root fragments, topsoil and subsoil. Moist.	Dark-light brown, fine to coarse SAND, little Silt, little Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**F2**	**F4**	**F6**	**G1**	**G3**
Sample ID	F2_20180716	F4_20180823	F6_20180718	G1_20180716	G3_20180716
Property Name	Huntington Schools (Brewster-Pierce Memorial School)	Hubbard Park - Montpelier	Groton State Forest at Stillwater	Former Week's School	Waitsfield Lareau Park
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	7/16/18	8/23/18	7/18/18	7/16/18	7/16/18
Sampling Time	17:08	12:56	13:06	10:22	16:18
Latitude	44.29513	44.26994	44.27953	44.17027	44.17493
Longitude	-72.96381	-72.57617	-72.27425	-73.26197	-72.83302
Weather	Sunny	Mostly cloudy	Clear skies	Mostly sunny	Sunny with slight clouds
Location Description	Beneath tree near the basketball court.	Grass area near gravel parking lot.	Grass area behind basketball hoop at the parking lot.	South of the tree in the horse-shoe driveway island of Vermont Job Corps parking lot.	Grass area near the southern end of the parking lot.
Surroundings Description	Residential/Commercial. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Agricultural Fields/Commercial/Residential. No potential PFAS source was observed.	Agricultural Fields. No potential PFAS source was observed.
Burmister Soil Description	Dark-light brown, SILT, and Sand, few root fragments, topsoil and subsoil. Moist.	Light brown, CLAY & SILT, little Sand, trace Gravel, few root fragments, topsoil and subsoil. Moist. .	Light brown and gray, fine to coarse SAND, and Gravel, little root fragments, topsoil and subsoil. Moist.	Very light brown, fine SAND, little Silt, topsoil and subsoil, some root fragments. Moist.	Brown, fine to coarse SAND, little Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**G5**	**G7**	**H2**	**H4**	**I1**
Sample ID	G5-20180718	G7_20180718	H2_20180716	H4_20180731	I1_20180716
Property Name	Barre Spaulding High	Blue Mtn. Union School-Wells River	Ripton Elementary	Brookfield Floating Bridge	Whiting Elementary
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	7/18/18	7/18/18	7/16/18	7/31/18	7/16/18
Sampling Time	15:42	14:15	12:02	18:25	13:22
Latitude	44.19005	44.15551	43.98555	44.04244	43.85859
Longitude	-72.49625	-72.08078	-73.03879	-72.60382	-73.20070
Weather	Clear skies	Clear skies	Sunny	Partly cloudy	Sunny, light clouds
Location Description	Grass area approximately 15 ft behind the Homeplate of eastern baseball field.	Behind the backstop of northern baseball field, approximately 10 ft from the batting cage.	Grass area near the woods, north of the basketball court.	Grass area at the center of the park.	Grass area near the second base in the baseball field.
Surroundings Description	Residential/Athletic Fields. No potential PFAS source was observed.	Wooded/Athletic Fields. No potential PFAS source was observed.	Wooded/Fields. No potential PFAS source was observed.	Residential. No potential PFAS source was observed.	Agricultural Fields/Commercial/Residential. No potential PFAS source was observed.
Burmister Soil Description	Brown, fine to coarse SAND, and Silt, few root fragments, topsoil and subsoil. Moist.	Light brown, SILT, and Sand, few root fragments, topsoil and subsoil. Moist.	Very light brown, fine to coarse SAND, little Gravel, trace Silt, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, fine to coarse SAND, and Silt & Clay, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, CLAY & SILT, trace Sand, topsoil and subsoil, few root fragments. Moist.

Sample Location	**I3**	**I5**	**I7**	**J4**
Sample ID	I3_20180716	I5_20180731	I7_20180731	J4_20180731
Property Name	Rochester Town Green	McIntosh Pond	Samuel Morey Elementary-Fairlee	Silver Lake State Park
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	7/16/18	7/31/18	7/31/18	7/31/18
Sampling Time	14:52	17:31	13:22	16:42
Latitude	43.87382	43.82744	43.90844	43.73137
Longitude	-72.80785	-72.48354	-72.14525	-72.61446
Weather	Sunny with some clouds	Mostly cloudy	Mostly sunny, some clouds	Cloudy
Location Description	Southwest of the monument and west of the gazebo steps, approximately 50 to 100 ft from sidewalk.	Grass area between the parking area and the pond.	Grass outfield approximately 100 ft from gravel path at the northeast end of the school.	Grass area northwest of the basketball court.
Surroundings Description	Residential/Commercial. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Residential/Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Light-medium brown, fine to coarse SAND, some Gravel, trace Silt, few root fragments, topsoil and subsoil. Moist.	Light brown and gray, fine to coarse SAND, and Gravel, some Clay & Silt, few root fragments, topsoil and subsoil. Moist.	Dark brown, Clayey SILT, some Sand, few root fragments, topsoil and subsoil. Moist.	Light-medium brown, fine to coarse SAND, some Silt, little root fragments, topsoil and subsoil. Moist.

Sample Location	**J6**	**K1**	**K3**	**K5**	**K6**
Sample ID	J6_20180627	K1_20180817	K3_20180731	K5_20180627	K6_20180627
Property Name	Norwich Green	Fair Haven Village Green	Gifford Woods State Park	Quechee State Park	Ratcliffe Park-WRJ
Collector(s)	Abigail Ames & Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Abigail Ames & Ryan Weinstein	Abigail Ames & Ryan Weinstein
Sampling Date	6/27/18	8/17/18	7/31/18	6/27/18	6/27/18
Sampling Time	14:29	10:13	15:39	12:28	11:08
Latitude	43.71329	43.59402	43.67444	43.63834	43.64378
Longitude	-72.30790	-73.26590	-72.81028	-72.41001	-72.31537
Weather	Cloudy	Cloudy, light rain	Cloudy	Cloudy	Cloudy
Location Description	North of the gazebo, approximately 20 ft from garden area and path off Main Street.	Near large tree in the northeast quadrant of the park.	Behind the "Gifford Woods State Park off season access" sign.	Grass area accessed from gravel parking, northeast of the signs and trees.	At the end of left outfield fence.
Surroundings Description	Athletic Fields/Residential/Commercial. No potential PFAS source was observed.	Residential/Commercial. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.	Residential/ Athletic Fields. No potential PFAS source was observed.
Burmister Soil Description	Brown, fine to coarse SAND, some Silt, few root fragments, topsoil and subsoil. Moist.	Dark brown and gray, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark brown, fine to coarse SAND, some Gravel, little Silt, some root fragments, topsoil and subsoil. Moist.	Brown, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Brown, Clayey SILT, and Sand, few root fragments, topsoil and subsoil. Moist.

Sample Location	**K6b**	**K6c**	**K6d**	**K6e**	**L2A**
Sample ID	K6B_20180627	K6C_20180627	K6D_20180627	K6E_20180627	L2A_20180817
Property Name	Hurricane Wildlife Refuge	Meeting House Common	Lyman's Point Park	Veterans Memorial Park - Hartford	Wallingford Recreation Fields
Collector(s)	Abigail Ames & Ryan Weinstein	Abigail Ames & Ryan Weinstein	Abigail Ames & Ryan Weinstein	Abigail Ames & Ryan Weinstein	Ryan Weinstein
Sampling Date	6/27/18	6/27/18	6/27/18	6/27/18	8/17/18
Sampling Time	11:48	13:50	10:39	13:16	14:49
Latitude	43.64706	43.66070	43.65006	43.64944	43.46922
Longitude	-72.34908	-72.38163	-72.31670	-72.31809	-72.98030
Weather	Cloudy	Cloudy	Cloudy	Cloudy	Partly cloudy with sun
Location Description	On grass walkway near the picnic table.	Grass area on the north end of the park.	Southwest corner of park, approximately 100 ft southwest from stage and near the top of the stairs that go under the railroad.	Grass area near a park bench, approximately 30 feet west of the memorial and bird statues.	Grass area in front of the third-base line dugout of the most southern baseball field.
Surroundings Description	Wooded/Fields. No potential PFAS source was observed.	Residential/Fields/Wooded. No potential PFAS source was observed.	Commercial. No potential PFAS source was observed.	Commercial. No potential PFAS source was observed.	Residential /Athletic Fields. No potential PFAS source was observed.
Burmister Soil Description	Light brown, fine to coarse SAND, and Gravel, few root fragments, topsoil and subsoil. Moist.	Dark brown, CLAY & SILT, trace Sand, few root fragments, topsoil and subsoil. Moist.	Dark brown, fine to coarse SAND, little Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Light brown, fine to coarse SAND, trace Silt, some Gravel, few root fragments, topsoil and subsoil. Moist.	Light-medium brown, CLAY & SILT, little Sand, few root fragments, topsoil and subsoil. Moist.

Sample Location	**L2B**	**L4**	**M1**	**M3**	**M5**
Sample ID	L2B_20180806	L4_20180806	M1_20180817	M3_20180806	M5_20180806
Property Name	Lower Clarendon Gorge State Forest	Camp Plymouth State Park	Mettawee River Boat Launch	Okemo State Forest	The Commons Park-Springfield
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/6/18	8/6/18	8/17/18	8/6/18	8/6/18
Sampling Time	11:52	13:05	11:28	13:51	16:28
Latitude	43.51583	43.47719	43.29309	43.30595	43.29889
Longitude	-72.96694	-72.69784	-73.14064	-72.75792	-72.47835
Weather	Sunny	Sunny	Very cloudy, light rain	Sunny	Sunny
Location Description	Grass area to the west side of the state forest path, approximately 5 ft south of the rocks lining the entrance.	Grass area between two horseshoe pits, approximately 20 ft from picnic table area.	Grass area approximately 5 ft southeast of the "Stone Byway" sign.	Grass area on the western side of the access road.	Grass area in the outfield along the first-base line.
Surroundings Description	Wooded/Residential. No potential PFAS source was observed.	Wooded/Residential/Fields. No potential PFAS source was observed.	Wooded/Agricultural Fields. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.	Residential/Athletic Fields/Cemetery. No potential PFAS source was observed.
Burmister Soil Description	Dark brown, CLAY & SILT, little Sand, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, Silty CLAY, trace Sand, few root fragments, topsoil and subsoil. Moist.	Light-medium brown, fine to coarse SAND, and Gravel, little Silt, few root fragments, topsoil and subsoil. Moist.	Dark-light brown, fine to coarse SAND, trace Silt, few root fragments, topsoil and subsoil. Moist.	Dark-light brown, fine to coarse SAND, some Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**N2**	**O1**	**O3**	**O5**	**P2**
Sample ID	N2_20180817	O1_20180822	O3_20180817	O5_20180806	P2_20180822
Property Name	Emerald Lake State Park	Shaftsbury State Park	Jamaica State Park	Rockingham Recreation Fields-Bellows Falls	Woodford State Park
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/17/18	8/22/18	8/17/18	8/6/18	8/22/18
Sampling Time	12:08	12:21	13:08	15:40	14:24
Latitude	43.28198	43.02127	43.10612	43.12904	42.88945
Longitude	-73.00499	-73.17963	-72.77359	-72.45146	-73.03882
Weather	Cloudy, little sun	Cloudy with sun	Partly cloudy, some sun	Sunny	Few clouds, mostly clear skies
Location Description	Grass area north of the gravel entrance road.	Grass area approximately 15 ft south of the mulch area around the playground structure.	Grass area west of the park entrance road.	Grass area approximately 15 ft north of the parking lot.	Along grass path accessed from the loop road.
Surroundings Description	Wooded/Fields. No potential PFAS source was observed.	Wooded/Fields. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.	Residential/Athletic Fields. No potential PFAS source was observed.	Wooded. No potential PFAS source was observed.
Burmister Soil Description	Light gray, fine to coarse SAND, little Gravel, trace Silt, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, fine to coarse SAND, Silt & Clay, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Light brown, Clayey SILT, little fine Sand, few root fragments, topsoil and subsoil. Moist.	Dark-medium brown, fine to coarse SAND, some Silt, little root fragments, topsoil and subsoil. Moist.	Brown and gray, fine to coarse SAND, little Silt, trace Gravel, few root fragments, topsoil and subsoil. Moist.

Sample Location	**Q1**	**Q3**	**Q5**
Sample ID	Q1_20180822	Q3_20180822	Q5_20180822
Property Name	South Stream Boat Launch	Molly Stark State Park	Vernon Hatchery Pond
Collector(s)	Ryan Weinstein	Ryan Weinstein	Ryan Weinstein
Sampling Date	8/22/18	8/22/18	8/22/18
Sampling Time	13:32	15:06	16:21
Latitude	42.81119	42.85478	42.74374
Longitude	-73.17750	-72.81434	-72.50004
Weather	Dark clouds	Partly cloudy	Partly cloudy
Location Description	Grass area near the boat launch.	Grass shoulder of the entrance road, approximately 15 ft southeast of the entrance at Vermont Route 9.	Leaf-litter covered area approximately 5 ft east of the pond billboard sign.
Surroundings Description	Wooded/Residential. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.	Wooded/Residential. No potential PFAS source was observed.
Burmister Soil Description	Dark brown, Clayey SILT, some Sand, few root fragments, topsoil and subsoil. Moist.	Dark brown, CLAY & SILT, little Sand, trace Gravel, few root fragments, topsoil and subsoil. Moist.	Dark brown and gray, fine to coarse SAND, little Silt, little Gravel, few root fragments, topsoil and subsoil. Moist.

QA/QC

Table A4. PFAS Analyst list analyzed by Alpha Analytical Inc.

Acronym	**Name (n- linear structure)**	**Acronym**	**Name (n- linear structure)**
PFBA	Perfluoro-n-butanoic acid	PFHxS	Perfluoro-1-hexanesulfonic acid
PFPeA	Perfluoro-n-pentanoic acid	PFOS	Perfluoro-1-octanesulfonic acid
PFHxA	Perfluoro-n-hexanoic acid	PFDS	Perfluoro-1-decanesulfonic acid
PFHpA	Perfluoro-n-heptanoic acid	PFNS*	Perfluoro-1-nonanesulfonic acid
PFOA	Perfluoro-n-octanoic acid	PFPeS*	Perfluoro-1-pentanesulfonic acid
PFNA	Perfluoro-n-nonanoic acid	PFHpS*	Perfluoro-1-heptanesulfonic acid
PFDA	Perfluoro-n-decanoic acid	4:2FTSA*	1H,1H,2H,2H-Perfluorahexanesulonic acid
PFUnDA	Perfluoro-n-undecanoic acid	6:2FTSA*	1H, 1H, 2H, 2H-Perfluorooactanesulfonic acid
PFDoDA	Perfluoro-n-dodecanoic acid	8:2FTSA*	1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid
PFTrDA	Perfluoro-n-tridecanoic acid	N-MeFOSAA*	N-Methyl Perfluoro-1-octanesulfonamidoacetic acid
PFTeDA	Perfluoro-n-tetradecanoic acid	N-EtFOSAA*	N-Ethyl Perfluoro-1-octanesulfonamidoacetic acid
PFBS	Perfluoro-1-butanesulfonic acid	FOSA*	Perfluoro-1-octanesulfonamide

* PFNS, PFPeS, PFHpS, 4:2FTSA, 6:2FTSA, 8:2FTSA, N-MeFOSAA, N-EtFOSAA and FOSA were not analyzed in UVM method.
* PFHxDA and PFODA were not analyzed in AlphaLab method.

Table A5. RLs of 24 PFAS analyzed by Alpha Analytical Inc.

Sample ID	RL (ng/kg)
A1	<1,090
A3	<1,200
B2	<1,300
B4	<1,100
C3	<1,200
D3	<1,030

Table A6. Trip Blank Data Summary

Analyte	TB 1	TB 2	TB 3	TB 4	TB 5	TB 6	TB 7	TB 8	TB 9	TB 10	TB 11	TB 12
PFBA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHpA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFUnDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDoDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFODA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFBS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table A7. Field Blanks, Equipment Blanks and Method Blanks Data Summary.

Analyte	**FB 1**	**FB 2**	**FB 3**	**EB 1**	**EB 2**	**EB 3**	**MB 1**	**MB 2**	**MB 3**	**MB 1**
PFBA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFPeA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHpA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOA	ND	ND	ND	ND	ND	ND	<MDL	ND	ND	ND
PFNA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFUnDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDoDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFTrDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFTeDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxDA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFODA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFBS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFHxS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFOS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PFDS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table A8. Precision and accuracy of LCS/LCSDs.

Spiking level (ng/mL)	**0.3**		**1.2**		**2.4**		**9.6**	
Analyst	**Recovery (%)**	**RPD (%)**	**Recovery (%)**	**RPD (%)**	**Recovery (%)**	**RPD (%)**	**Recovery (%)**	**RPD (%)**
PFBA	104	2.5	47	5.3	36	28	43	14
PFPeA	99	6.4	97	16	74	1.0	76	5.8
PFHxA	142	24	132	2.6	111	16	91	27
PFHpA	142	11	122	7.9	107	10	104	0.72
PFOA	98	12	107	3.9	115	15	129	23
PFNA	126	11	112	4.5	106	10	120	5.9
PFDA	127	6.6	122	8.6	104	10	92	6.7
PFUnDA	66	18	73	3.4	95	12	87	2.9
PFDoDA	N/A	N/A	68	20	55	23	65	9.4
PFTrDA	N/A	N/A	62	24	47	4.2	50	36
PFTeDA	N/A	N/A	65	32	57	1.5	48	24
PFHxDA	N/A	N/A	106	27	99	24	109	17
PFODA	N/A	N/A	71	29	73	13	125	21
PFBS	152	6.7	121	12	106	21	86	25
PFHxS	109	16	114	19	105	11	102	8.3
PFOS	133	8.9	103	2.9	110	12	93	0.19
PFDS	128	6.0	119	0.55	111	15	92	6.9

* LCS: laboratory control samples; LCDs: laboratory control sample duplicates.
* LCS/LCDs of four spiking levels, including low (0.3 ng/mL), moderate (1.2 ng/mL and 2.4 ng/mL), and high (9.6 ng/mL), were applied to evaluate the accuracy and precision of the analytical method.
* PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, PFODA showed recoveries lower than 50% at spiking level of 0.3 ng/mL, and were labeled as N/A.
*RPD results have been rounded to two significant digits.

Table A9. RPD analysis for duplicate samples.

	C1#1	**C1#2**	**RPD (%)**
TOC (%)	10	10	0.10
PFHpA	150	130	15
PFOA	430	430	0.076
PFNA	160	140	11
PFDA	89	71	23
PFUnDA	63	50	24
PFBS	240	140	53
PFHxS	230	160	33
PFOS	660	690	4.3
PFDS	31	33	6.4
	I7#1	**I7#2**	**RPD (%)**
TOC (%)	10	13	22
PFHxA	140	67	72
PFHpA	79	93	17
PFOA	410	360	14
PFNA	210	170	19
PFDA	100	79	25
PFUnDA	52	40	26
PFOS	540	470	13

* Qualitative detections were not included.
* Statistical analyses were performed on raw data with additional precision, and all results have been rounded to two significant digits.
* If RPD≤50, results were accepted as reported; if RPD>50, the resulted were taken as estimated values and marked by P.

STATISTICAL ANALYSES

Table A10.1. Pearson Correlations (α<0.05) between TOC, percent solid and individual PFAS and ΣPFCA, ΣPFSA and ΣPFAS.

		PFHxA	PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFBS	PFOS	ΣPFCA	ΣPFSA	ΣPFAS
TOC	r	0.0227	0.277	0.4541	0.042	-0.0016	0.0167	0.0145	-0.0157	0.1342	-0.0054	0.0883
Solid%	r	0.1098	-0.195	-0.3433	0.0527	0.0769	0.0495	0.0062	0.077	-0.0264	0.0611	0.0049

* r: Pearson's correlation coefficient; calculated based on quantitative detections.

Table A10.2. Correlations between individual PFAS and ΣPFCA, ΣPFSA and ΣPFAS by Pearson Correlation ($\alpha<0.05$).

		PFHpA	PFOA	PFNA	PFDA	PFUnDA	PFBS	PFOS	ΣPFCA	ΣPFSA	ΣPFAS
PFHxA	r	0.4502	0.2678	0.8862	0.8739	0.8801	0.6254	0.7631	0.9043	0.7923	0.9022
	p	0.00012	0.2773	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
PFHpA	r		0.5649	0.3831	0.3765	0.3846	0.3918	0.3229	0.5588	0.3686	0.5127
	p		<0.00001	0.0013	0.0016	0.0012	0.0095	0.0072	<0.00001	0.0020	<0.00001
PFOA	r			0.3339	0.2811	0.2805	0.0464	0.3259	0.5205	0.3098	0.4651
	p			0.0054	0.0202	0.0205	0.7071	0.0067	<0.00001	0.0102	0.00007
PFNA	r				0.9656	0.9832	0.4469	0.8205	0.9560	0.8310	0.9514
	p				<0.00001	<0.00001	0.0001	<0.00001	<0.00001	<0.00001	<0.00001
PFDA	r					0.9780	0.5024	0.7821	0.9479	0.8055	0.9364
	p					<0.00001	0.000013	<0.00001	<0.00001	<0.00001	<0.00001
PFUnDA	r						0.4646	0.8020	0.9474	0.8239	0.9429
	p						0.0001	<0.00001	<0.00001	<0.00001	<0.00001
PFBS	r							0.4387	0.5034	0.5455	0.5410
	p							0.0002	0.000012	<0.00001	<0.00001
PFOS	r								0.8022	0.9860	0.9054
	p								<0.00001	<0.00001	<0.00001
ΣPFCA	r									0.8213	0.9774
	p									<0.00001	<0.00001
ΣPFSA	r										0.9234
	p										<0.00001

* r: Pearson's correlation coefficient; calculated based on quantitative detections.
* p: p-value for Pearson r score.

Table A11. Estimated UTLs of each PFAS compound by ProUCL 5.1.

Analyst	**PFHxA**		**PFHpA**		**PFOA**		**PFNA**		**PFDA**		**PFUnDA**	
Kaplan Meier (KM) Background Statistics Assuming Normal Distribution												
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Normal (5%)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
95% UTL95% Coverage	1501	879.7	659.9	628.6	1,786	1,717	1,462	404.1	2,210	844.6	757.2	212.4
Gamma ROS Statistics using Imputed Non-Detects												
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Gamma (5%)	N & Y	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
k star	<1	<1	<1	<1	<1	<1	<1	>1	<1	<1	<1	<1
95% Approx. Gamma UTL with 95% Coverage (WH)	1,497	1,200	1,003	964.9	2,011	1,905	959.6	518.7	1,114	678.5	536.3	349.9
95% Approx. Gamma UTL with 95% Coverage (HW)	1,880	1,549	1,940	1,261	2,519	2,399	1,118	583.7	1,232	841.6	690.3	478
Gamma and KM, Upper Limits using WH and HW Methods												
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Gamma (5%)	N & Y	YES	NO	NO	NO	NO	NO	YES	NO	NO	NO	NO
95% Approx. Gamma UTL with 95% Coverage (WH)	1146	868.2	767.9	731	1,642	1,539	772.2	435.5	940.9	502.3	361.1	189.6
95% Approx. Gamma UTL with 95% Coverage (HW)	1143	884.8	811.4	772.3	1,710	1,602	731.9	446.1	844	481.6	332.9	189.2
Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects												
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Lognormal (5%)	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO	NO
95% UTL95% Coverage	2,592	1,895	970.1	913.9	2,122	1,958	717	500.3	834.6	546.4	352.4	222.8
95% Bootstrap (%) UTL95% Coverage	1,476	1,371	860.8	860	2,015	1,589	698.6	422.3	2,797	428.8	522.1	187.3
95% BCA UTL95% Coverage	1,476	1,371	860.8	838.4	1,909	1,589	698.6	428.7	2,205	425.7	522.1	187.1
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution												

	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Lognormal (5%)	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO	NO
95% KM UTL (Lognormal)95% Coverage	1,224	1,001	1,092	1,037	2,290	2,139	684.7	497.2	664.4	451.7	279.7	192.2
Nonparametric Distribution Free Background Statistics												
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6
Discernible (5%)	YES	YES	YES	YES	YES	YES	NO	YES	NO	NO	NO	NO
95% UTL with95% Coverage	1,500	1,406	872.8	872.8	2,015	1,589	698.6	428.7	2,797	428.8	522.1	187.3

Analyst	**PFBS**		**PFHxS**		**PFDS**			**PFOS**	
Kaplan Meier (KM) Background Statistics Assuming Normal Distribution							**Background Statistics Assuming Normal Distribution**		
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6			
Normal (5%)	NO	NO	NO	NO	NO	NO		RL-O	RL-J6
95% UTL95% Coverage	686.7	638.1	393.3	396.3	309	172.7	Normal (5%)	NO	NO
Gamma ROS Statistics using Imputed Non-Detects							95% UTL with 95% Coverage	3,886	2,761
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	**Background Statistics Assuming Gamma Distribution**		
Gamma (5%)	NO	NO	NO	NO	NO	YES			
k star	<1	<1	<1	<1	<1	<1		RL-O	RL-J6
95% Approx. Gamma UTL with 95% Coverage (WH)	853.6	784.7	550.7	562.5	269.9	211.2	Gamma	NO	NO
95% Approx. Gamma UTL with 95% Coverage (HW)	1126	1040	705.2	724.3	310.2	250.5	95% WH Approx. Gamma UTL with 95% Coverage	3,527	2,904
Gamma and KM, Upper Limits using WH and HW Methods							95% HW Approx. Gamma UTL with 95% Coverage	3,571	2,979
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6			
Gamma (5%)	NO	NO	NO	NO	NO	YES	**Background Statistics assuming Lognormal Distribution**		
95% Approx. Gamma UTL with 95% Coverage (WH)	599.8	541.3	345.9	349.6	214.3	154.1			
95% Approx. Gamma UTL with 95% Coverage (HW)	603.2	543.2	341.5	345.3	207	152.8		RL-O	RL-J6

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects							Lognormal	YES	YES
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6	95% UTL with 95% Coverage	3,971	3,407
Lognormal (5%)	N & Y	YES	NO	NO	YES	YES	**Nonparametric Upper Limits for Background Threshold Values**		
95% UTL95% Coverage	1,131	994.2	582.7	588.3	408.6	276			
95% Bootstrap (%) UTL95% Coverage	977.5	887	439	440.5	382.8	225.4			
95% BCA UTL95% Coverage	954.9	840	439	439.3	382.8	218		RL-O	RL-J6
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution							Discernible	YES	YES
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6		Lognormal	
Lognormal (5%)	N & Y	YES	NO	NO	YES	YES	95% Percentile Bootstrap UTL with 95% Coverage	4,431	3,790
95% KM UTL (Lognormal)95% Coverage	657.3	586.4	330.5	334.8	191.5	150.3			
Nonparametric Distribution Free Background Statistics							95% UTL with 95% Coverage	4,431	3,790
	RL-O	RL-J6	RL-O	RL-J6	RL-O	RL-J6			
Discernible (5%)	YES	YES	NO	NO	YES	YES	95% BCA Bootstrap UTL with 95% Coverage	4,271	3,763
95% UTL with95% Coverage	977.5	887	440.5	440.5	382.8	225.4			

* RL-O represents that the results were achieved based on full data set without removing J6 data, and these ULTs were listed here for purpose of comparison.
* RL-J6 represents that the results were obtained after removing J6 data from the data set.
* YES means that the data set passed the both GOF tests given in ProUCL5.1.
* NO means that the data set failed the GOF tests given in ProUCL5.1.
* N&Y means that the data set only passed one of the two GOF tests given in ProUCL 5.1.

PFAS ANALYTICAL RESULTS FROM ALAPHA ANALYTICAL INC

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS
Lab Number: L1832167
Project Number: 4357.00
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-01
Client ID: TRIP BLANK_20180815
Sample Location: STATEWIDE
Date Collected: 08/15/18 10:28
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 122,537(M)
Analytical Date: 09/01/18 10:35
Analyst: AJ
Extraction Method: EPA 537
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	1.86	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	1.86	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.86	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	1.86	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.86	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.86	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.86	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.86	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.86	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	1.86	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.86	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.86	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.86	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.86	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	1.86	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.86	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.86	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.86	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.86	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/l	1.86	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.86	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.86	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.86	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	1.86	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS **Lab Number:** L1832167

Project Number: 4357.00 **Report Date:** 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-04
Client ID: A1_20180815
Sample Location: STATEWIDE

Date Collected: 08/15/18 13:50
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 16:04
Analyst: PB
Percent Solids: 90%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.09	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.09	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.09	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.09	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.09	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.09	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.09	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.09	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.09	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.09	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.09	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.09	--	1
Perfluorooctanesulfonic Acid (PFOS)	1.65		ng/g	1.09	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.09	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.09	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.09	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.09	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.09	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.09	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.09	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.09	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.09	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.09	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.09	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS **Lab Number:** L1832167

Project Number: 4357.00 **Report Date:** 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-03
Client ID: A3_20180815
Sample Location: STATEWIDE

Date Collected: 08/15/18 12:43
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 15:47
Analyst: PB
Percent Solids: 78%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.20	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.20	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.20	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.20	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.20	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.20	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.20	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.20	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.20	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.20	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.20	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.20	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.20	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.20	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.20	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.20	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.20	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.20	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.20	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.20	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.20	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS **Lab Number:** L1832167

Project Number: 4357.00 **Report Date:** 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-02
Client ID: B2_20180815
Sample Location: STATEWIDE

Date Collected: 08/15/18 11:39
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 15:31
Analyst: PB
Percent Solids: 72%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.30	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.30	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.30	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.30	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.30	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.30	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.30	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.30	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.30	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.30	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.30	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.30	--	1
Perfluorooctanesulfonic Acid (PFOS)	3.74		ng/g	1.30	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.30	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.30	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.30	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.30	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.30	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.30	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.30	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.30	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.30	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.30	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.30	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS
Lab Number: L1832167
Project Number: 4357.00
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-05
Client ID: B4_20180815
Sample Location: STATEWIDE

Date Collected: 08/15/18 16:35
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 16:21
Analyst: PB
Percent Solids: 89%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.10	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.10	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.10	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.10	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.10	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.10	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.10	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.10	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.10	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.10	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.10	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.10	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.10	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.10	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.10	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.10	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.10	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.10	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.10	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.10	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.10	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.10	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.10	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.10	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS **Lab Number:** L1832167

Project Number: 4357.00 **Report Date:** 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-06
Client ID: C3_20180815
Sample Location: STATEWIDE

Date Collected: 08/15/18 17:27
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 16:37
Analyst: PB
Percent Solids: 82%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.20	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.20	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.20	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.20	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.20	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.20	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.20	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.20	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.20	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.20	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.20	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.20	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.20	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.20	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.20	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.20	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.20	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.20	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.20	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.20	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.20	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.20	--	1

Serial_No:09051810:07

Project Name: UNIVERSITY OF VT, PFAS BSS
Lab Number: L1832167
Project Number: 4357.00
Report Date: 09/05/18

SAMPLE RESULTS

Lab ID: L1832167-07
Client ID: D3_20180815
Sample Location: STATEWIDE

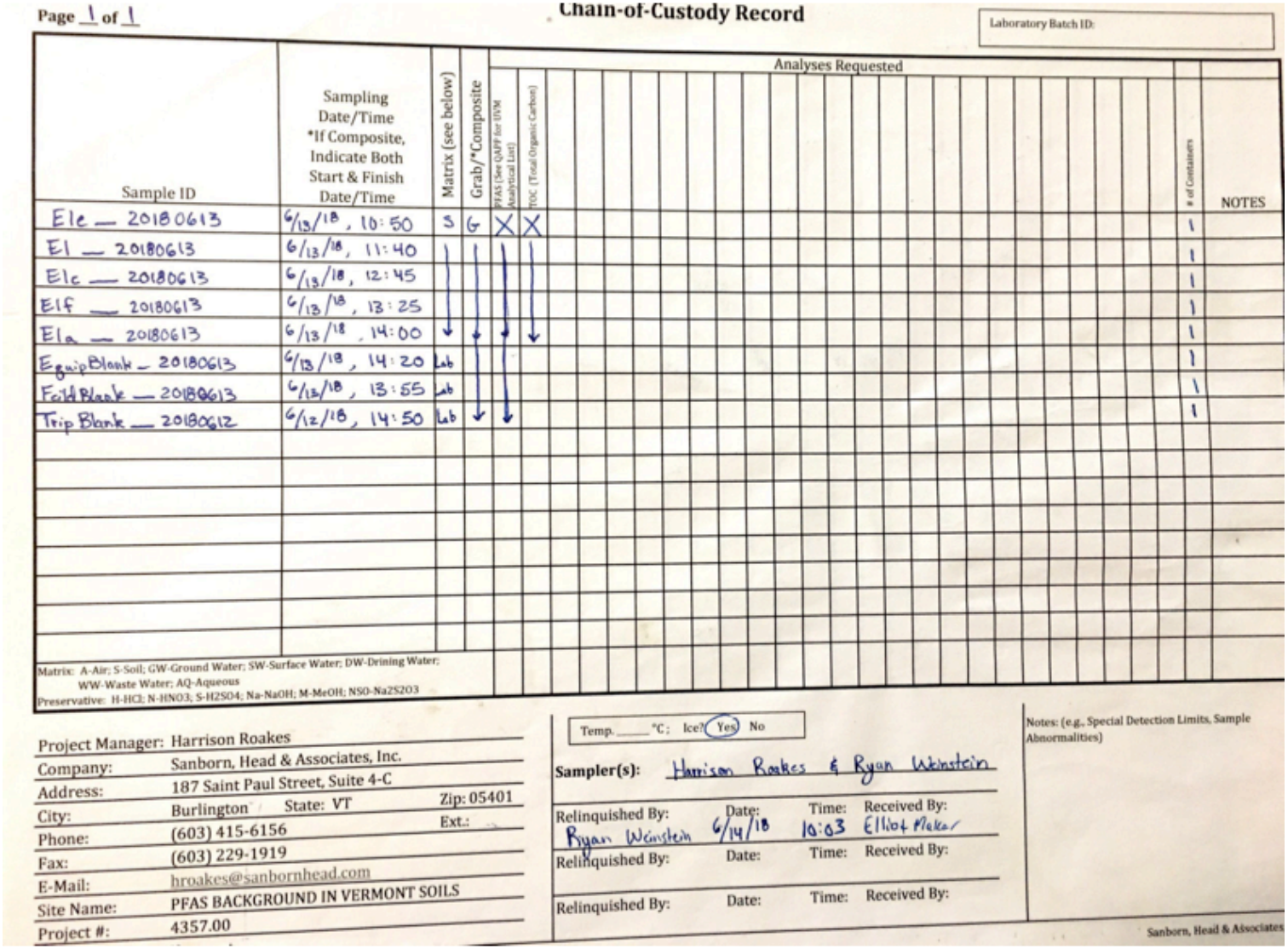
Date Collected: 08/15/18 18:08
Date Received: 08/16/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 122,537(M)
Analytical Date: 08/26/18 16:54
Analyst: PB
Percent Solids: 85%

Extraction Method: EPA 537(M)
Extraction Date: 08/22/18 18:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/g	1.03	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	1.03	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	1.03	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.03	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	1.03	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.03	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	1.03	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	1.03	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	1.03	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	1.03	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	1.03	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	1.03	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	1.03	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	1.03	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	1.03	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.03	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	1.03	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	1.03	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	1.03	--	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	1.03	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	1.03	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	1.03	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	1.03	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	1.03	--	1

CHAIN-OF-CUSTODY RECORD



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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	PFAS (See QAPP for 1937 Analytical List)	TOC (Total Organic Carbon)	# of Containers	NOTES
Ele — 20180613	6/13/18, 10:50	S	G	X	X	1	
El — 20180613	6/13/18, 11:40	↓	↓	↓	↓	1	
Elc — 20180613	6/13/18, 12:45					1	
Elf — 20180613	6/13/18, 13:25					1	
Ela — 20180613	6/13/18, 14:00					1	
EquipBlank — 20180613	6/13/18, 14:20	Lab				1	
FieldBlank — 20180613	6/13/18, 13:55	Lab				1	
TripBlank — 20180612	6/12/18, 14:50	Lab	↓	↓		1	

Analyses Requested

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00

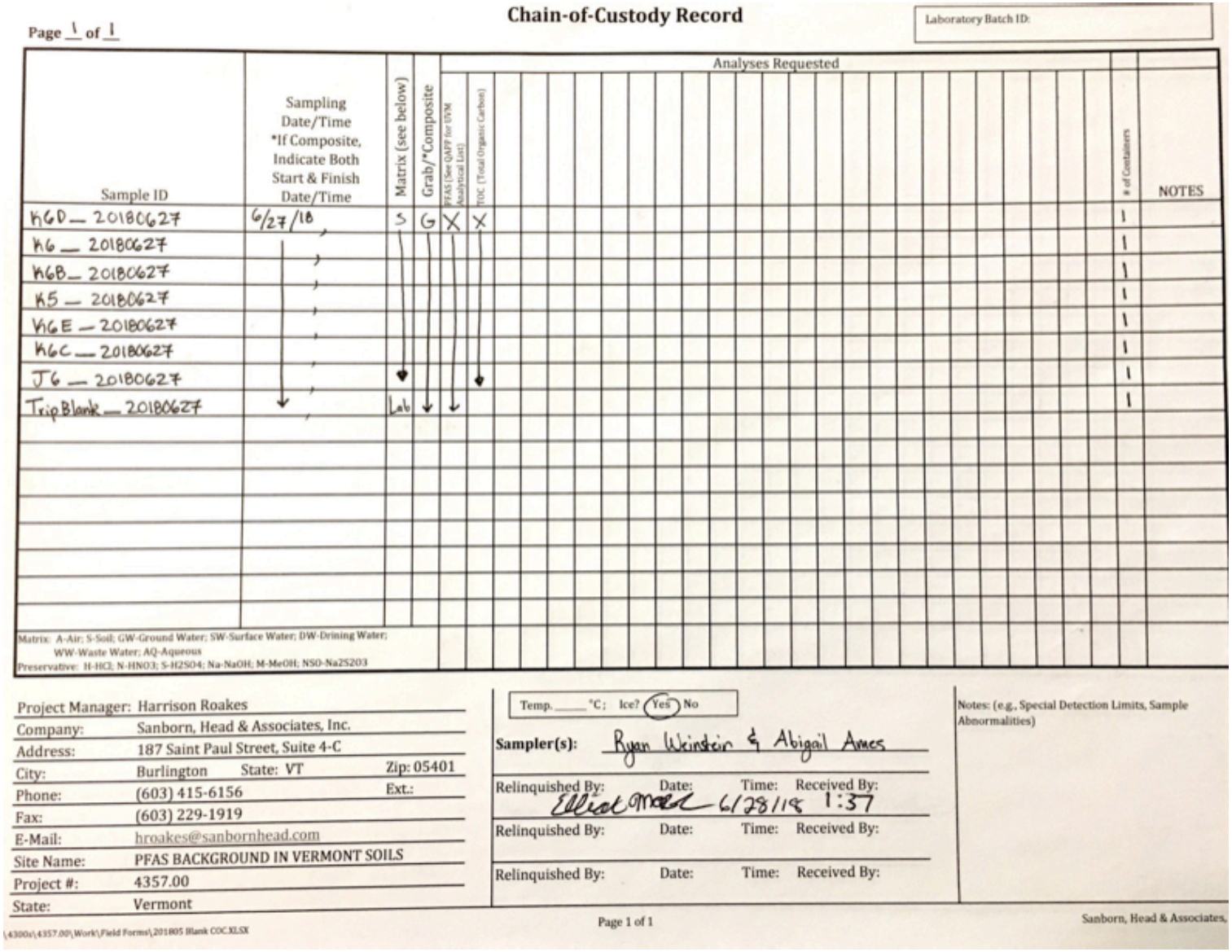
Temp. ____ °C; Ice? (Yes) No

Sampler(s): Harrison Roakes & Ryan Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan Weinstein	6/14/18	10:03	Elliot Maker
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

Sanborn, Head & Associates



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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested: PFAS (See QAPP for EVM Analytical List)	Analyses Requested: TOC (Total Organic Carbon)	# of Containers	NOTES
H6D_20180627	6/27/18	S	G	X	X	1	
H6_20180627						1	
H6B_20180627						1	
H5_20180627						1	
H6E_20180627						1	
H6C_20180627						1	
J6_20180627						1	
TripBlank_20180627		Lab				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Weinstein & Abigail Ames

Relinquished By:	Date:	Time:	Received By:
Elliot Mack	6/28/18	1:37	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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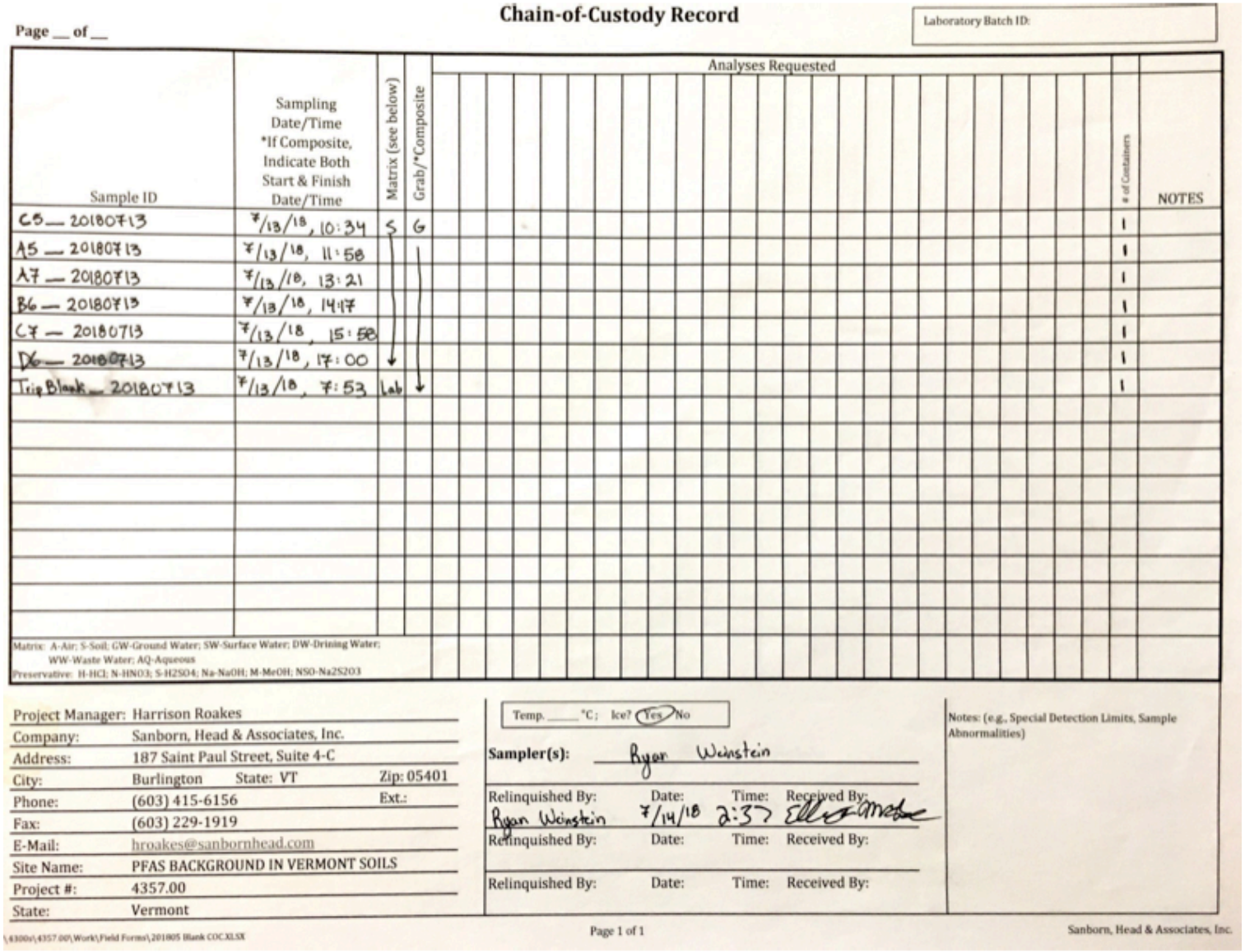

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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
C5 — 20180713	7/13/18, 10:34	S	G		1	
A5 — 20180713	7/13/18, 11:58				1	
A7 — 20180713	7/13/18, 13:21				1	
B6 — 20180713	7/13/18, 14:17				1	
C7 — 20180713	7/13/18, 15:58				1	
D6 — 20180713	7/13/18, 17:00				1	
Trip Blank — 20180713	7/13/18, 7:53	Lab			1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes		
Company:	Sanborn, Head & Associates, Inc.		
Address:	187 Saint Paul Street, Suite 4-C		
City:	Burlington	State: VT	Zip: 05401
Phone:	(603) 415-6156		Ext.:
Fax:	(603) 229-1919		
E-Mail:	hroakes@sanbornhead.com		
Site Name:	PFAS BACKGROUND IN VERMONT SOILS		
Project #:	4357.00		
State:	Vermont		

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan Weinstein	7/14/18	2:37	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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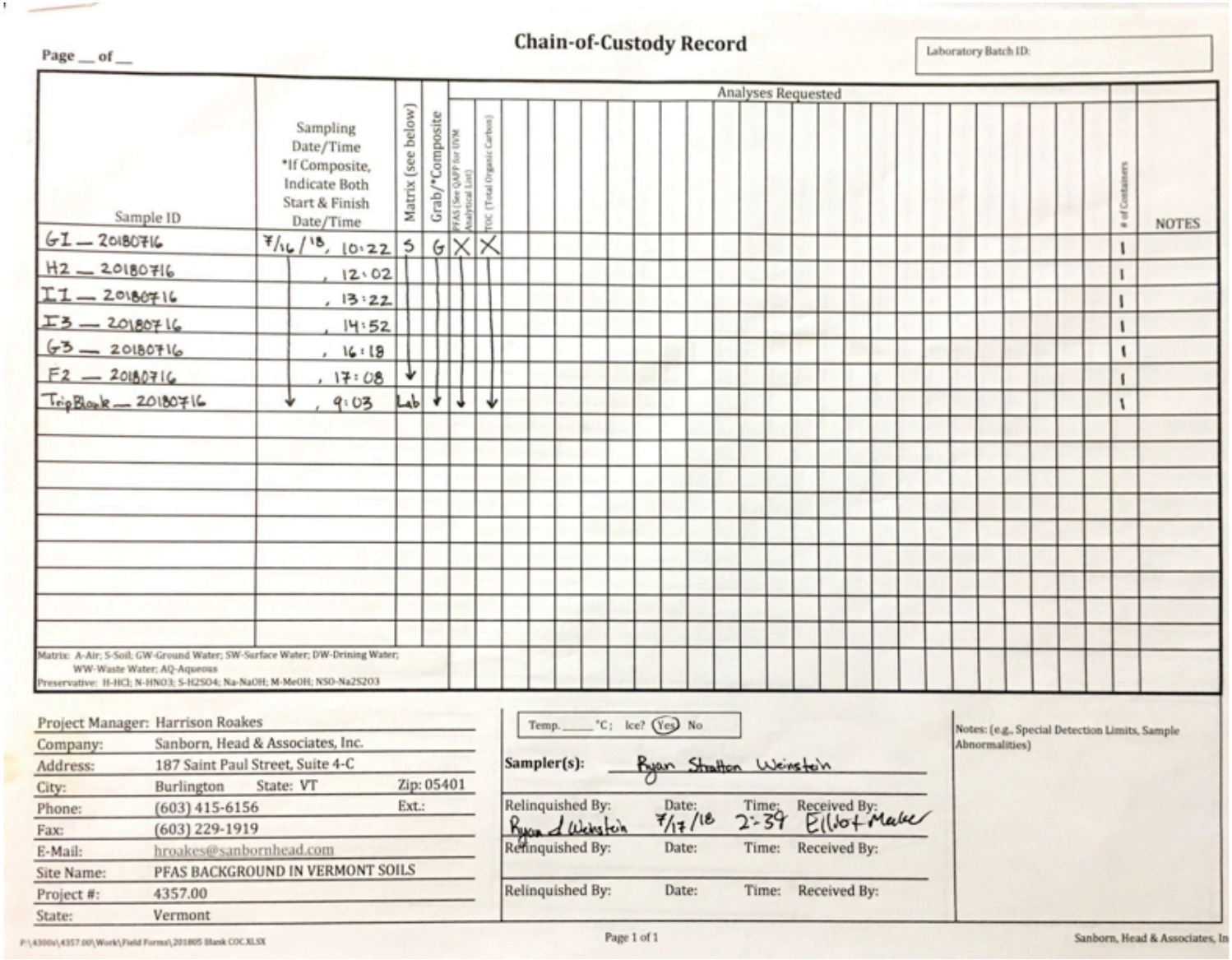
Sanborn, Head & Associates, Inc.



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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested: PFAS (See QAPP for UVM Analytical List)	Analyses Requested: TOC (Total Organic Carbon)	# of Containers	NOTES
G1 — 20180716	7/16/18, 10:22	S	G	X	X	1	
H2 — 20180716	, 12:02					1	
I1 — 20180716	, 13:22					1	
I3 — 20180716	, 14:52					1	
G3 — 20180716	, 16:18					1	
F2 — 20180716	, 17:08					1	
TripBlank — 20180716	, 9:03	Lab				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan S Weinstein	7/17/18	2:39	Elliot Mackey
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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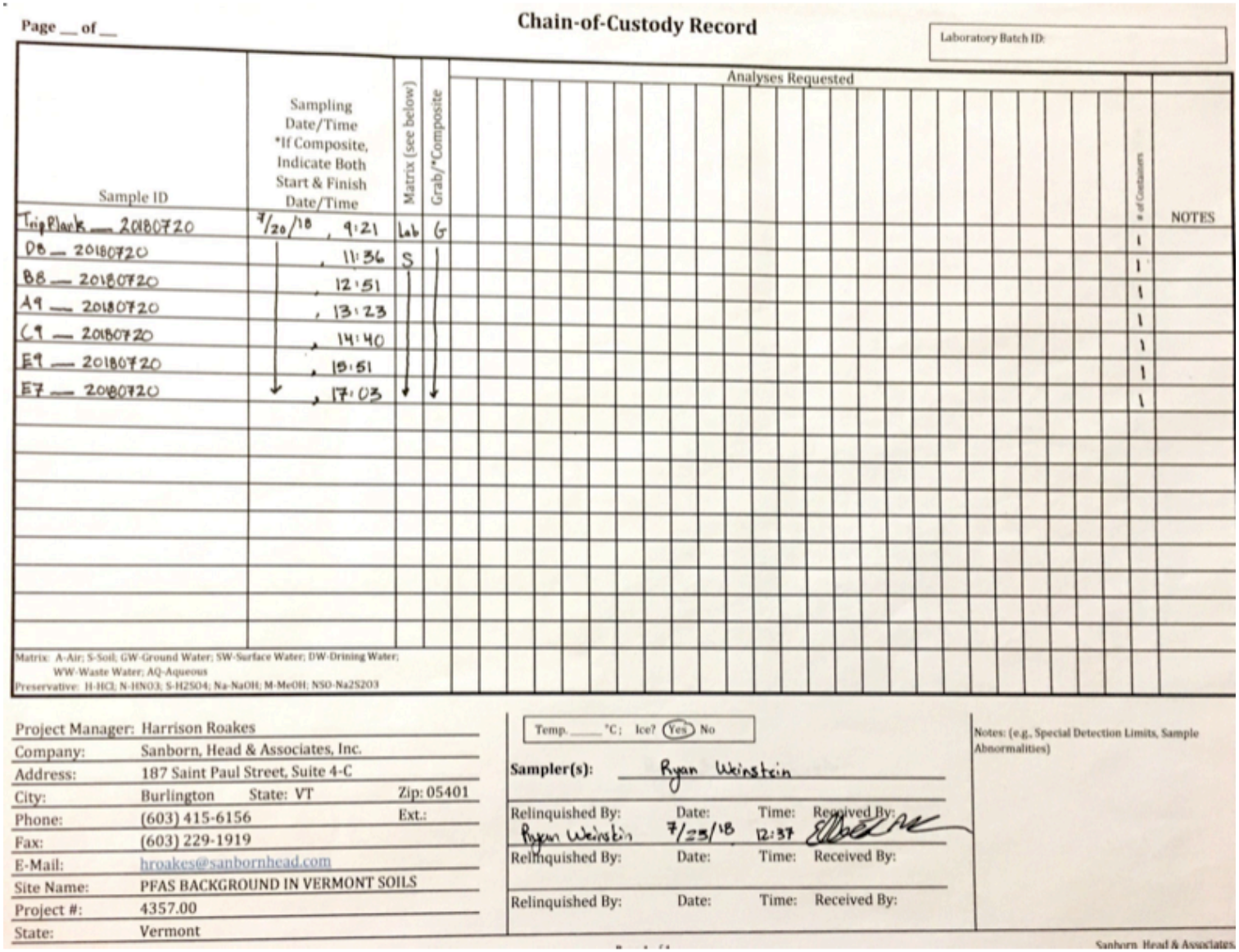
Sanborn, Head & Associates, In



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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
TripBlank_20180720	7/20/18, 9:21	Lab	G		1	
D8_20180720	, 11:36	S			1	
B8_20180720	, 12:51				1	
A9_20180720	, 13:23				1	
C9_20180720	, 14:40				1	
E9_20180720	, 15:51				1	
E7_20180720	, 17:03				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

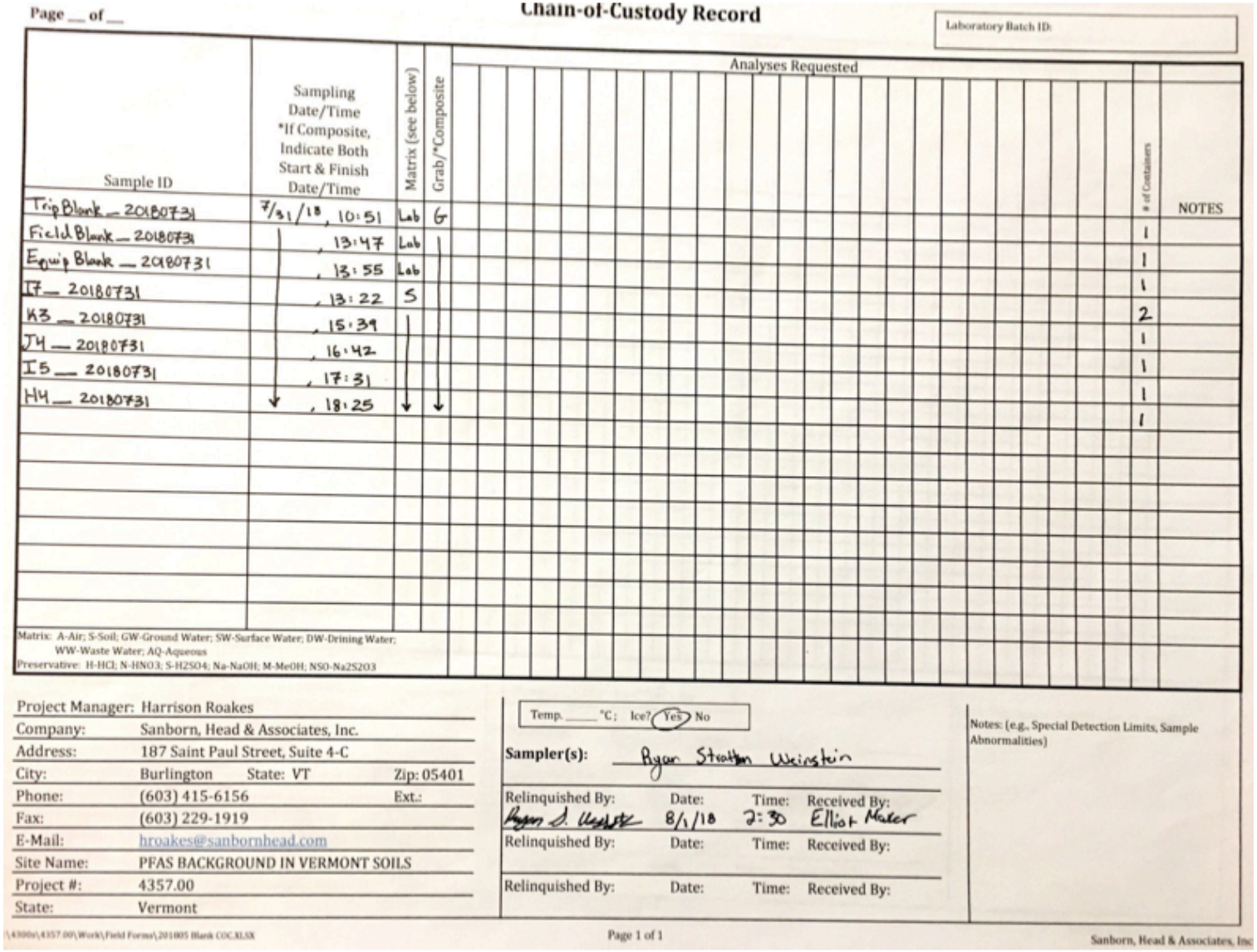
Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan Weinstein	7/23/18	12:37	
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

Sanborn Head & Associates



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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
Trip Blank – 20180731	7/31/18, 10:51	Lab	G		1	
Field Blank – 20180731	, 13:47	Lab			1	
Equip Blank – 20180731	, 13:55	Lab			1	
IF – 20180731	, 13:22	S			1	
K3 – 20180731	, 15:39				2	
J4 – 20180731	, 16:42				1	
I5 – 20180731	, 17:31				1	
H4 – 20180731	, 18:25				1	
					1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan S. Weinstein	8/1/18	7:30	Elliot Maier
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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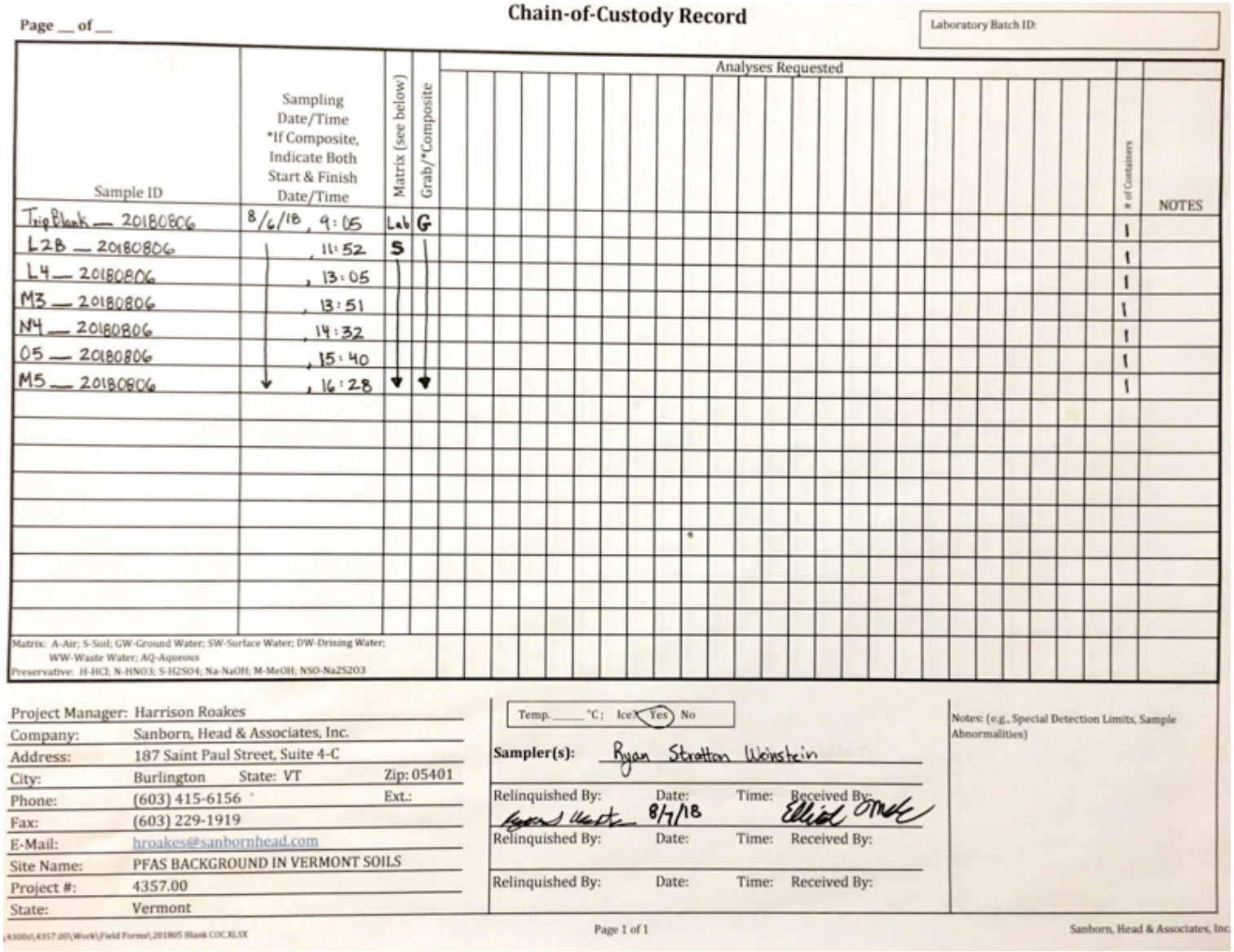

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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
Trip Blank — 20180806	8/6/18, 9:05	Lab	G		1	
L2B — 20180806	, 11:52	S			1	
L4 — 20180806	, 13:05				1	
M3 — 20180806	, 13:51				1	
N4 — 20180806	, 14:32				1	
O5 — 20180806	, 15:40				1	
M5 — 20180806	, 16:28				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan Weinstein	8/7/18		Elliot Omde
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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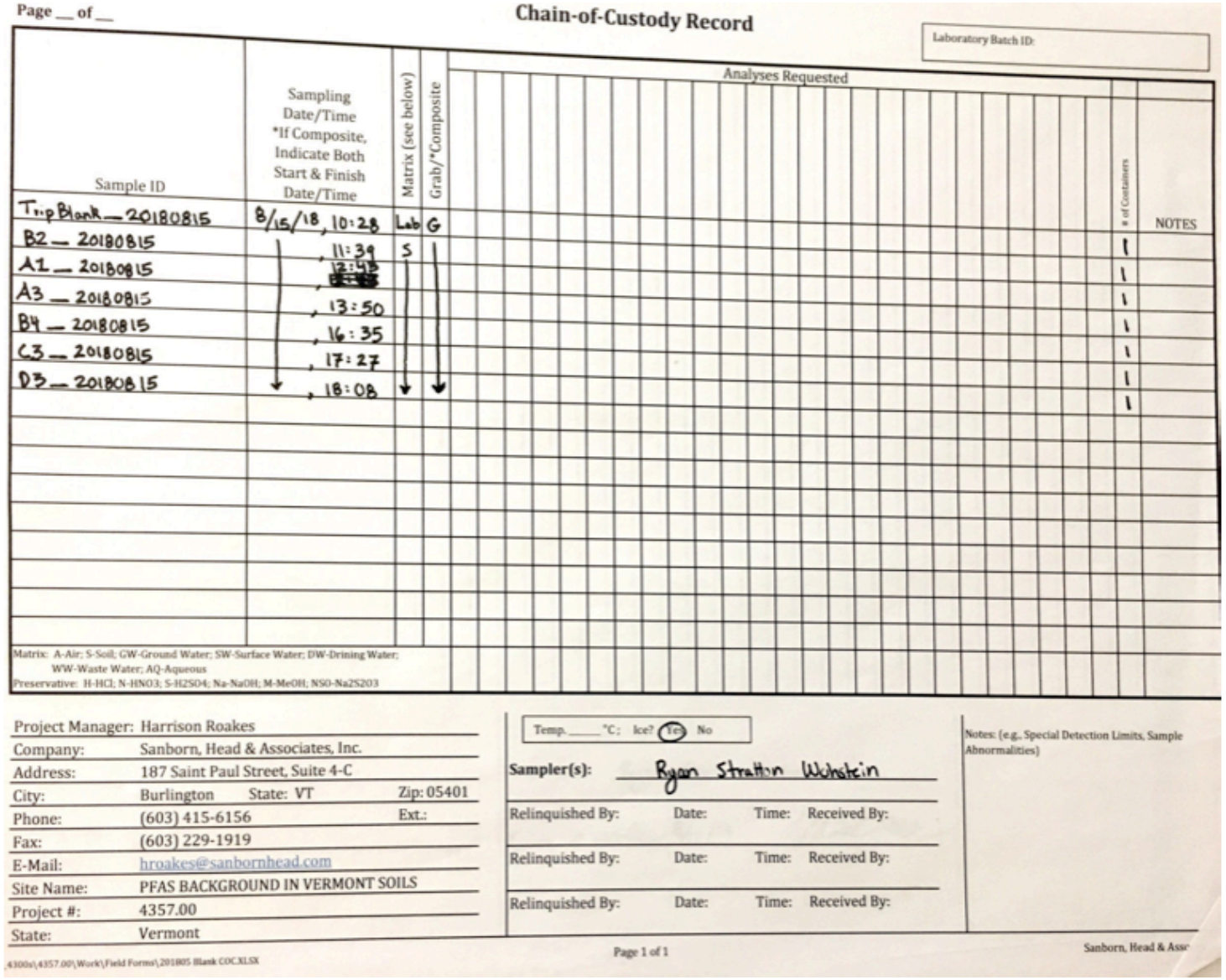

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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
Trip Blank — 20180815	8/15/18, 10:28	Lab	G		1	
B2 — 20180815	, 11:39	S			1	
A1 — 20180815	, 12:43				1	
A3 — 20180815	, 13:50				1	
B4 — 20180815	, 16:35				1	
C3 — 20180815	, 17:27				1	
D3 — 20180815	, 18:08				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NS0-Na2S203

Project Manager:	Harrison Roakes
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E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. _____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Wunstein

Relinquished By: Date: Time: Received By:

Relinquished By: Date: Time: Received By:

Relinquished By: Date: Time: Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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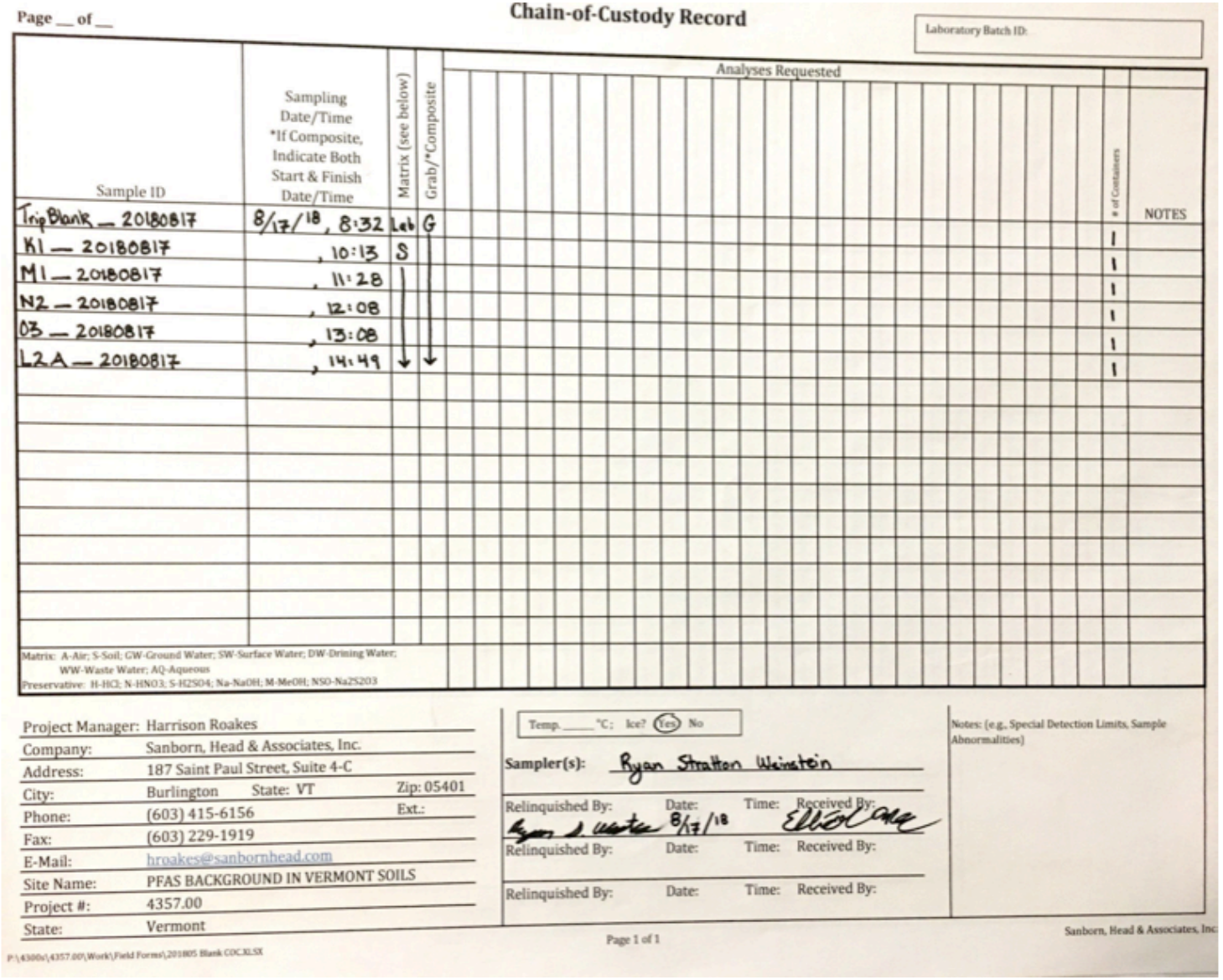

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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
Trip Blank — 20180817	8/17/18, 8:32	Lab	G		1	
K1 — 20180817	, 10:13	S			1	
M1 — 20180817	, 11:28				1	
N2 — 20180817	, 12:08				1	
O3 — 20180817	, 13:08				1	
L2A — 20180817	, 14:49				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-H2SO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
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Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan Weinstein	8/17/18		Elliot Cole
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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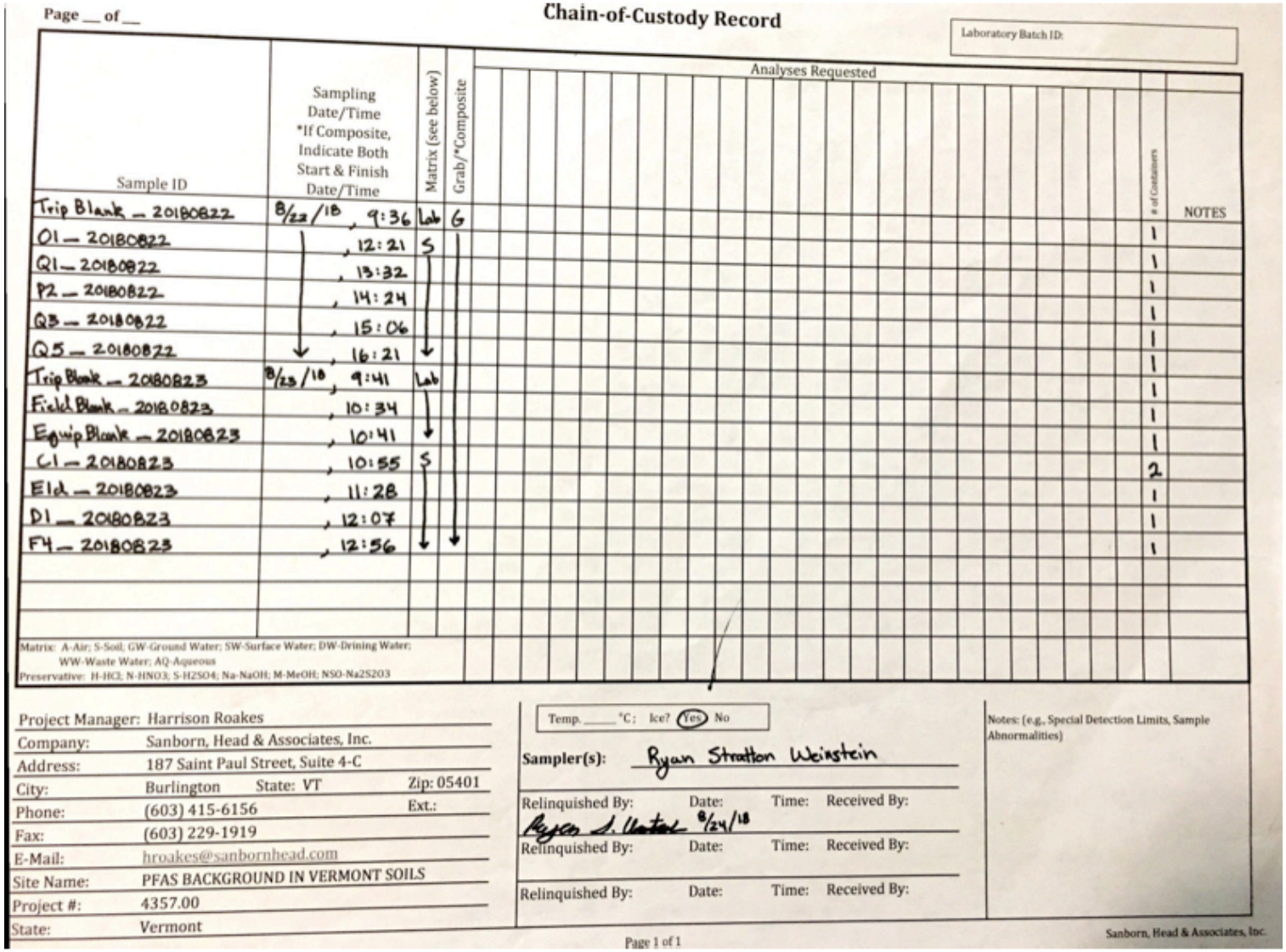

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Chain-of-Custody Record

Laboratory Batch ID:

Sample ID	Sampling Date/Time *If Composite, Indicate Both Start & Finish Date/Time	Matrix (see below)	Grab/*Composite	Analyses Requested	# of Containers	NOTES
Trip Blank – 20180822	8/22/18, 9:36	Lab	G		1	
O1 – 20180822	, 12:21	S			1	
Q1 – 20180822	, 13:32				1	
P2 – 20180822	, 14:24				1	
Q3 – 20180822	, 15:06				1	
Q5 – 20180822	, 16:21				1	
Trip Blank – 20180823	8/23/18, 9:41	Lab			1	
Field Blank – 20180823	, 10:34				1	
Equip Blank – 20180823	, 10:41				1	
C1 – 20180823	, 10:55	S			2	
E1d – 20180823	, 11:28				1	
D1 – 20180823	, 12:07				1	
F4 – 20180823	, 12:56				1	

Matrix: A-Air; S-Soil; GW-Ground Water; SW-Surface Water; DW-Drining Water; WW-Waste Water; AQ-Aqueous
Preservative: H-HCl; N-HNO3; S-HZSO4; Na-NaOH; M-MeOH; NSO-Na2S2O3

Project Manager:	Harrison Roakes
Company:	Sanborn, Head & Associates, Inc.
Address:	187 Saint Paul Street, Suite 4-C
City:	Burlington State: VT Zip: 05401
Phone:	(603) 415-6156 Ext.:
Fax:	(603) 229-1919
E-Mail:	hroakes@sanbornhead.com
Site Name:	PFAS BACKGROUND IN VERMONT SOILS
Project #:	4357.00
State:	Vermont

Temp. ____ °C; Ice? (Yes) No

Sampler(s): Ryan Stratton Weinstein

Relinquished By:	Date:	Time:	Received By:
Ryan S. Weinstein	8/24/18		
Relinquished By:	Date:	Time:	Received By:
Relinquished By:	Date:	Time:	Received By:

Notes: (e.g., Special Detection Limits, Sample Abnormalities)

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