Australian Government
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National Measurement Institute

Proficiency Test Final Report
AQA 24-12
PFAS in Water

February 2025

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ACKNOWLEDGMENTS

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I would like to thank the management and staff of the participating laboratories for supporting the study. It is only through widespread participation that we can provide an effective service to laboratories.

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Accredited for compliance with ISO/IEC 17043:2023

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SUMMARY

This report presents the results of the proficiency test AQA 24-12 PFAS in Water. This study was designed based on USEPA Method 1633 requirements and participant demands, and is focused on the measurement of 34 per- and polyfluorinated alkyl substances (PFAS): PFBS, PFPeS, total PFHxS, linear PFHxS, PFHpS, total PFOS, linear PFOS, PFNS, PFDS, PFUdS, PFDoS, PFTrDS, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUdA, PFDoA, PFTrDA, PFTeDA, PFODA, PFOSA, 4:2FTS, 6:2FTS, 8:2diPAP, 5:3FTCA, GenX, ADONA, PFEESA, 9Cl-PF3ONS and 11Cl-PF3OUdS in water. The study also included a pilot sample, a reagent grade water spiked with PFAS analytes at trace level.

Thirty-eight laboratories participated and thirty-four submitted results.

Three test samples were prepared at the NMI North Ryde laboratory and consisted of:

- Sample S1: Potable water spiked with 27 PFAS contaminants at low and standard level,
- Sample S2: River water spiked with 28 PFAS contaminants at low and standard level,
- Sample S3: Reagent grade water spiked with 6 PFAS contaminants at low and trace level,

The assigned values were the robust averages of participants' results. The associated uncertainties were estimated from the robust standard deviations of the participants' results.

The outcomes of the study were assessed against the aims as follows, to:

i. compare the performances of participant laboratories and to assess their accuracy in the measurement of PFAS in water;

Laboratory performance was assessed using both z-scores and E_n-scores.

Of 1122 z-scores, 1060 (94%) returned $|z| \leq 2.0$, indicating an acceptable performance.

Of 1116 E_n-scores, 858 (77%) returned $|E_n| < 1.0$, indicating agreement of the participant's result with the assigned value within their respective expanded uncertainties.

Laboratories **12** and **38** reported numeric results for all 46 scored analytes and all returned acceptable z-scores.
All results reported by Laboratories **25** (44), **37** (42), **32** (41), **14** (36), **27** (36), **29** (36), **21** (35), **3** (34), **19** (32), **24** (26), **4** (18) and **18** (3) returned acceptable (z-scores).
Laboratory **25** returned the highest number of acceptable E_n-scores (44 out of 44 reported).

ii. evaluate the laboratories' methods for PFAS in water analysis;

Overall participants' performance in the potable and river water samples was similar.

Eleven participants reported at least one PFAS analyte that was not spiked into the test samples.

Twelve laboratories did not add isotopically labelled standards directly into the bottle to adjust for errors that may be introduced during sample preparation before extraction. The results reported by most of these laboratories were biased either low or high.

Most of the low z-scores for the long chain carboxylic acids were from laboratories who did not use the entire sample.

PFODA and PFEESA were introduced for the first time in water in the present study based on participants' feedback. Most reported results were in good agreement with each other and with the spike value.

Sample S3 was pilot sample designed to assess laboratories' capabilities in measuring PFAS at low and trace levels in water. The majority of the reported results for this sample were in good agreement with each other and with the spike value. The robust average of participants' results for PFOS in the reagent grade water sample S3, was higher than the spike value, possibly indicating background PFOS contamination in the laboratories.

The most popular method used for measurement of PFAS in water samples S1 and S2 was a SPE extraction which involved taking for analysis the entire sample, methanol or methanol base as elution solvent, and no carbon cleanup step.

iii. compare the performance of participant laboratories with their past performance;

Over the last 10 years, laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the reported results have been compatible with each other.

AQA 15-03 was conducted in 2015 and included 6 tests. AQA 24-12 is the tenth NMI proficiency test of PFAS analytes in water, and participants had the choice of reporting up to 67 tests across three water samples. Although the analytes' levels in the present study were lower than in previous studies most laboratories performed similarly or better.

Laboratories significantly improved their capabilities in measuring 11Cl-PF3OUdS in water.

iv. develop the practical application of traceability and measurement uncertainty and provide participants with information that will be useful in assessing their uncertainty estimates.

Of 1317 numerical results for spiked analytes in this study, 1161 (88%) were reported with an expanded measurement uncertainty.

A large number of laboratories still report unrealistically small or large relative uncertainties for routine PFAS. The magnitude of the reported expanded uncertainties was within the range 0% to 300% of the reported value. Additionally, some laboratories are still reporting numeric estimates of uncertainties for non-numeric results.

v. produce materials that can be used in method validation and as control samples.

Surplus test samples from the present study are available for sale. The samples are homogeneous and well characterised, both by in-house testing and from the results of the proficiency round.

1 INTRODUCTION

1.1 NMI Proficiency Testing Program

The National Measurement Institute (NMI) is responsible for Australia's national measurement infrastructure, providing a range of services including a chemical proficiency testing program.

Proficiency testing (PT) is the: 'evaluation of participant performance against pre-established criteria by means of interlaboratory comparisons.'[1] NMI PT studies target chemical testing in areas of high public significance such as trade, environment, law enforcement and food safety. NMI offers studies in:

- pesticide residues in fruit and vegetables, soil and water;
- petroleum hydrocarbons in soil and water;
- PFAS in soil, water, biota and food;
- inorganic analytes in soil, water, food and pharmaceuticals;
- chlorophyll a in water; and
- controlled drug assay, drugs in wipes and clandestine laboratory.

1.2 Study Aims

The aims of the study were to:

- compare the performances of participant laboratories and assess their accuracy in the measurement of PFAS in water matrices;
- evaluate the laboratories' test methods for PFAS in water;
- compare the performance of participant laboratories with their past performance;
- develop the practical application of traceability and measurement uncertainty and provide participants with information that will be useful in assessing their uncertainty estimates; and
- produce materials that can be used in method validation and as control samples.

1.3 Study Conduct

The conduct of NMI proficiency tests is described in the NMI Study Protocol for Proficiency Testing.[2] The statistical methods used are described in the NMI Chemical Proficiency Testing Statistical Manual.[3] These documents have been prepared with reference to ISO/IEC 17043[1] and The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories.[4]

NMI is accredited by the National Association of Testing Authorities, Australia (NATA) to ISO/IEC 17043:2023 as a provider of proficiency testing schemes.[1] This study falls within the scope of NMI's accreditation.

2 STUDY INFORMATION

2.1 Study Timetable

The timetable of the study was:

Invitation issued	1 July 2024
Samples dispatched	26 August 2024
Results due	8 October 2024
Interim report issued	11 October 2024

Preliminary report issued 14 October 2024

The results due date was extended to 8 October 2024 due to sample delivery delays.

2.2 Test Material

Three test samples were provided for analysis.

- Sample S1 consisted of 2x50 mL of potable water spiked with 27 PFAS compounds.
- Sample S2 consisted of 2x50 mL of river water spiked with 28 PFAS compounds.
- Sample S3 consisted of 2x500 mL of laboratory reagent water spiked with 6 PFAS compounds.

Details of the spiked analytes and levels are presented in Table 1 and of the sample preparation procedure in Appendix 1.

Table 1 Formulated concentrations of test samples

PFAS	S1 Potable Water (Spiked) µg/L	S2 River Water (Spiked) µg/L	S3 Reagent Water (Spiked) µg/L
PFBS*	Not Spiked	0.0104	Not Spiked
PFPeS*	0.00554	Not Spiked	Not Spiked
PFHxS*	0.0120	0.0296	0.00377
PFHxS_L*	0.0120	0.0288	0.00377
PFHpS*	Not Spiked	0.00388	Not Spiked
PFOS*	0.00468	0.0139	0.00139
PFOS_L*	0.00349	0.00909	0.00110
PFNS*	0.0362	Not Spiked	Not Spiked
PFDS*	0.0363	0.0725	Not Spiked
PFUdS	0.0364	Not Spiked	Not Spiked
PFDoS*	Not Spiked	0.0729	Not Spiked
PFTrDS*	0.0366	0.0731	Not Spiked
PFBA	0.0730	0.133	Not Spiked
PFPeA	0.0161	0.0227	Not Spiked
PFHxA	0.00746	0.0223	Not Spiked
PFHpA	Not Spiked	0.0120	Not Spiked
PFOA	0.0105	0.0241	0.00201
PFNA	0.00502	Not Spiked	0.00100
PFDA	0.0251	0.0501	Not Spiked
PFUdA	Not Spiked	0.0501	Not Spiked
PFDoA	Not Spiked	0.0499	Not Spiked
PFTrDA	0.0250	Not Spiked	Not Spiked
PFTeDA	0.0250	0.0500	Not Spiked
PFODA	0.0700	0.0699	Not Spiked
PFOSA	0.0377	0.0753	Not Spiked
4:2FTS	0.0654	0.0653	Not Spiked
6:2FTS*	0.0284	0.0284	Not Spiked
8:2diPAP*	0.0489	0.0489	Not Spiked
5:3FTCA	0.101	0.151	Not Spiked
GenX	0.0150	Not Spiked	Not Spiked
ADONA*	Not Spiked	0.0282	Not Spiked
PFEESA	0.0445	0.0499	Not Spiked
9Cl-PF3ONS*	0.0939	0.140	Not Spiked
11Cl-PF3OUdS*	0.0950	0.142	Not Spiked

* Values for these analytes are the anion concentration.

2.3 Participation

Thirty-eight laboratories participated in this study and thirty-four submitted results. A confidential laboratory code number was assigned to each of these 38 participants.

2.4 Test Material Homogeneity and Stability Testing

The preparation of the study samples is described in Appendix 1. No homogeneity or stability testing was conducted on the water samples. These samples were prepared, stored and packaged using a process that has been demonstrated to produce homogeneous and stable samples in previous NMI PFAS PTs. Participants' results gave no reason to question the homogeneity and stability of previously used analytes.

Only 45% of the spiked value was recovered for PFDoS, 52% for PFODA, and 56% for PFTeDA in S2 (see Table 66 in Section 6.1). However the results were variable and the robust average might not be a clear indication of the analyte level in the sample. No relationship was evident between the reported results and the date when the sample was received or sample condition on arrival.

2.5 Sample Storage, Dispatch and Receipt

Before dispatch the water samples were refrigerated at 4ºC.

The samples were packed in a foam box with cooler bricks and sent by courier on 26 August 2024.

The following items were packaged with the samples: a covering letter which included a description of the test samples and instructions for participants, and a form for participants to confirm the receipt and condition of the samples.

2.6 Instructions to Participants

Participants were instructed as follows:

- Quantitatively analyse the samples using your routine test method.
- Report results in units of µg/L.
- Use the entire content of the bottle for analysis. The second bottle is provided for repeat analysis.
- If analyses cannot be commenced on the day of receipt, please store the samples chilled.
- For PFAS analytes that contain linear and branched isomers, report TOTAL – the sum of linear and branched.
- For PFOS and PFHxS you are asked to report TOTAL (the sum of linear and branched isomers) and LINEAR (the linear isomers only).
- The analytes range for PFAS in S1 is 0-5 µg/L, in S2 is 0-10 µg/L, and S3 is 0-0.005 µg/L.
- Report results using the electronic results sheet emailed to you.
- For each analyte, report a single result expressed as if reporting to a client (i.e. corrected for recovery or not, according to your standard procedure, but state if results are corrected on the result sheet). This figure will be used in all statistical analysis in the study report.

- For each analyte report the associated expanded measurement uncertainty (e.g. 0.50 ± 0.02 µg/kg), if determined.
- No limit of reporting has been set for this study. Report results as you would to a client, applying the limit of reporting of the method used for analysis.
- Report any listed analyte not tested as NT.
- Please complete the method details and report the basis of your uncertainty estimates as required by the results sheet.
- If determined, report your internal standard percentage recovery. This will be presented in the report for information only.

2.7 Interim Report and Preliminary Report

An Interim Report was emailed to all participants on 11 October 2024.

A Preliminary Report was emailed to all participants on 14 October 2024. This report included: a summary of results reported by all laboratories, assigned values, performance coefficients of variation, z-scores and E_n-scores for each analyte tested by participants. No data from the Preliminary Report has been changed in the present Final Report.

3 PARTICIPANT LABORATORY INFORMATION

3.1 Test Methods Reported by Participants

Participants were requested to provide methodology information. Responses are presented in Appendix 7. The study coordinator thanks participants for completing the questionnaire.

3.2 Basis of Participants' Measurement Uncertainty Estimates

Participants were requested to provide information about their basis of measurement uncertainty (MU). Responses are presented in Tables 2 and 3.

Table 2 Basis of Participants' Uncertainty Estimate

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
1	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Duplicate analysis	Recoveries of SS	Nordtest Report TR537
2	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS Instrument calibration	Instrument calibration Recoveries of SS Standard purity	Eurachem/CITAC Guide
3	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS Duplicate analysis Instrument calibration	CRM	NMI Uncertainty Course
4	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
5	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Duplicate analysis	Instrument calibration Laboratory bias from PT studies Recoveries of SS Standard purity	
6	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - RM Duplicate analysis		Eurachem/CITAC Guide
7	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Standard deviation from PT studies only		ISO/GUM
8	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
9	Professional judgment Coverage factor not reported			Professional Judgement
10	Top Down - precision and estimates of the method and laboratory bias k = 2	Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS Standard purity	ISO/GUM
11	Coverage factor not reported			

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
12	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Control samples - SS Duplicate analysis Instrument calibration	Instrument calibration Laboratory bias from PT studies Standard purity	ASTM E2254-13
13	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - CRM Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS Standard purity	NMI Uncertainty Course
14	Top Down - reproducibility (standard deviation) from PT studies used directly Coverage factor not reported			ISO/GUM
15	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Duplicate analysis	Instrument calibration Laboratory bias from PT studies Recoveries of SS Standard purity	
16	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported		Recoveries of SS	ISO/GUM
17	Professional judgment Coverage factor not reported	Control samples - SS Duplicate analysis	CRM Recoveries of SS	Other
18	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - CRM Duplicate analysis	Standard purity	Eurachem/CITAC Guide
19	Coverage factor not reported	Control samples - SS	CRM Recoveries of SS	
21	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
23	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - CRM Duplicate analysis Instrument calibration	CRM Instrument calibration	Eurachem/CITAC Guide
24	Bottom Up (ISO/GUM, fish bone/cause and effect diagram) k = 2	Standard deviation from PT studies only		Nordtest Report TR537
25	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
27	Coverage factor not reported	Control samples - CRM		ASTM E2254-13

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
28	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS	Recoveries of SS	NEN 7779
29*	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Control samples - SS	Recoveries of SS	Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition
30	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Standard deviation from PT studies only		Eurachem/CITAC Guide
		Control samples - SS Duplicate analysis Instrument calibration	Recoveries of SS	
31	Bottom Up (ISO/GUM, fish bone/cause and effect diagram) Coverage factor not reported	Control samples Duplicate analysis Instrument calibration	CRM Instrument calibration Laboratory bias from PT studies Recoveries of SS	Eurachem/CITAC Guide
32	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples Duplicate analysis Instrument calibration	CRM Instrument calibration Laboratory bias from PT studies Recoveries of SS	Eurachem/CITAC Guide
33	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
35	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - CRM	CRM Recoveries of SS	Eurachem/CITAC Guide
36	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - RM	CRM Standard purity	ISO/GUM
37*	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Control samples - SS	Recoveries of SS	SW846
38	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Duplicate analysis	Instrument calibration Standard purity	Eurachem/CITAC Guide

*SS = Spiked Samples, RM = Reference Material, CRM = Certified Reference Material. *Additional Information in Table 4

Table 3 Uncertainty Estimate Additional Information

Lab Code	Approach to Estimating MU
29	Measurement Uncertainty (U) estimated from the standard deviation (u) of replicate recovery samples using the expression U = 2 x u. Procedure as set out in Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition
37	Standard practice for laboratories utilizing US EPA's SW-846 document.

3.3 Participants' Comments

Participants were invited to make comments for this PT study. Such feedback allows for the improvement of future studies. Participants' comments are presented in Table 4, along with the study coordinator's response where appropriate.

Table 4 Participants' Comments

Lab. Code	Sample	Participant's Comments	Study Coordinator's Response
8	All	S3 was spiked at low level (trace level) but send 2x500 mL bottles. Usually for trace level (about 0.001 ug/L), whole bottle (125 mL) extraction (with rinsing sample bottle) method is used. So, this time we took 125 mL sample from one of the 500 mL bottle and analysed. Can you please provide 2x125 mL or 4x125 mL sample for trace level test in future.	Thank you for your feedback. We will consider changing the design of our study. Can the other participants please send us their preferred sample size for PFAS in water at trace level?
32	S3	As whole-bottle extraction was required, a smaller volume would be preferable for our Trace method workflow.	
35	All	More sample volume for samples S1 and S2 especially the reported results were in a similar range to sample S3.	
17	All	Adding more PFAS components	The study's design was based on USEPA Method 1633 requirements and on the special requirements of our participants. Please send us an email with the matrix, analyte and analyte level you would like to see included in our future studies.

4 PRESENTATION OF RESULTS AND STATISTICAL ANALYSIS

4.1 Results Summary

Participant results are listed in Tables 5 to 65 with resultant summary statistics: robust average, median, mean, maximum (Max), minimum (Min), robust standard deviation (Robust SD) and robust coefficient of variation (Robust CV). Bar charts of results and performance scores are presented in Figures 2 to 62. An example chart with interpretation guide is shown in Figure 1.

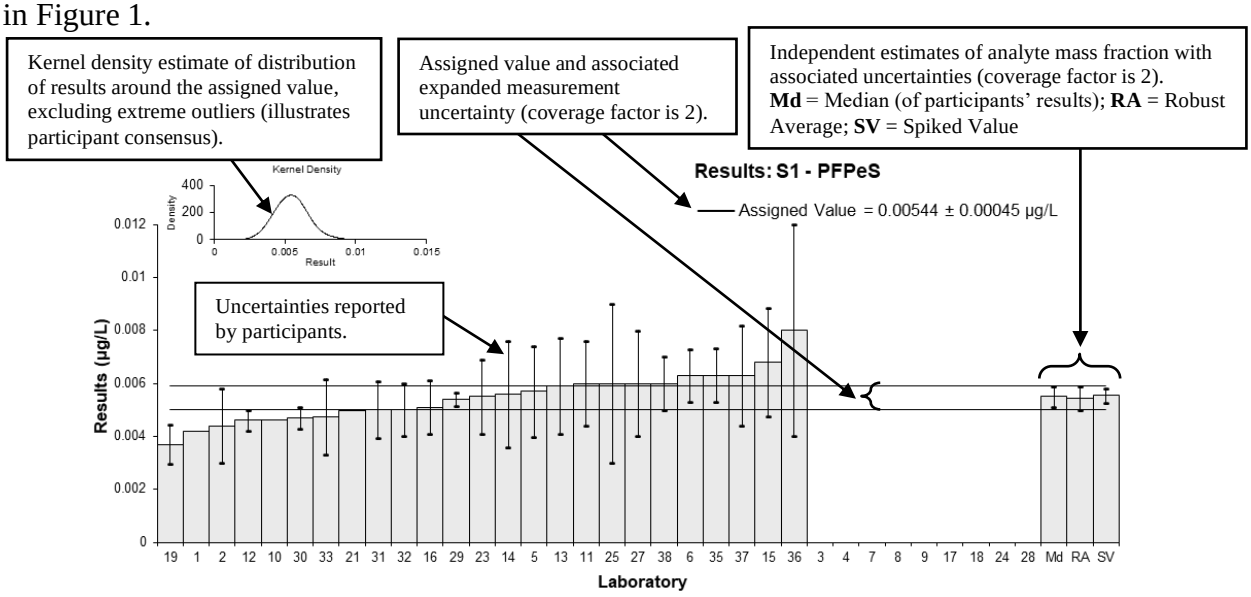


Figure 1 Guide to Presentation of Results

4.2 Outliers and Extreme Outliers

Outliers were results less than 50% and greater than 150% of the robust average and were removed before assigned value calculation. Extreme outliers were obvious blunders, such as those with incorrect units, decimal errors, or results from a different proficiency test item (gross errors) and were removed for calculation of summary statistics.[3,4]

4.3 Assigned Value

An example of the assigned value calculation using data from the present study is given in Appendix 3. The assigned value is defined as 'the value attributed to a particular property or characteristic of a proficiency testing item'.[1] In this study the property is the mass concentration of analyte. Assigned values were the robust average of participants' results; the expanded uncertainties were estimated from the associated robust standard deviations.[3,5]

4.4 Robust Average and Robust Between-Laboratory Coefficient of Variation

The robust averages and associated expanded measurement uncertainties were calculated using the procedure described in 'Statistical methods for use in proficiency testing by interlaboratory comparison, ISO 13528.[5]

The robust between-laboratory coefficient of variation (robust CV) is a measure of the variability of participants' results and was calculated using the procedure described in ISO 13528.[5]

4.5 Target Standard Deviation for Proficiency Assessment

The target standard deviation for proficiency assessment (σ) is the product of the assigned value *(X)* and the performance coefficient of variation (PCV). This value is used for calculation of participant z-score and provides scaling for laboratory deviation from the assigned value.

$$\sigma = (X) \times \text{PCV} \qquad \text{Equation 1}$$

It is important to note that the PCV is a fixed value and is not the standard deviation of participants' results. The fixed value set for PCV is based on the existing regulation, the acceptance criteria indicated by the methods, the matrix, the concentration level of analyte and/or on experience from previous studies. It is backed up by mathematical models such as Thompson Horwitz equation.[6]

4.6 z-Score

An example of z-score calculation using data from the present study is given in Appendix 2. For each participants' result a z-score is calculated according to Equation 2 below:

$$z = \frac{(\chi - X)}{\sigma} \qquad \text{Equation 2}$$

where:

z is z-score;

χ is participants' result;

X is the study assigned value;

σ is the target standard deviation for proficiency assessment.

A z-score with absolute value (|z|):

- $|z| \leq 2.0$ is acceptable;
- $2.0 < |z| < 3.0$ is questionable;
- $|z| \geq 3.0$ is unacceptable.

To account for potential low bias in consensus value due to inefficient methodologies, scores may be adjusted for a 'maximum acceptable result' (see Section 6.3 for more information).

4.7 E_n-Score

An example of E_n-score calculation using data from the present study is given in Appendix 2. The E_n-score is complementary to the z-score in assessment of laboratory performance. E_n-score includes measurement uncertainty and is calculated according to Equation 3 below:

$$E_n = \frac{(\chi - X)}{\sqrt{U_\chi^2 + U_X^2}} \qquad \text{Equation 3}$$

where:

E_n is E_n-score;

χ is a participants' result;

X is the assigned value;

U_χ is the expanded uncertainty of the participants' result;

U_X is the expanded uncertainty of the assigned value.

An E_n-score with absolute value ($|E_n|$):

- $|E_n| < 1.0$ is acceptable;
- $|E_n| \geq 1.0$ is unacceptable.

4.8 Traceability and Measurement Uncertainty

Laboratories accredited to ISO/IEC Standard 17025 must establish and demonstrate the traceability and measurement uncertainty associated with their test results.[7] Guidelines for quantifying uncertainty in analytical measurement are described in the Eurachem/CITAC Guide.[8]

5 TABLES AND FIGURES

Table 5

Sample Details

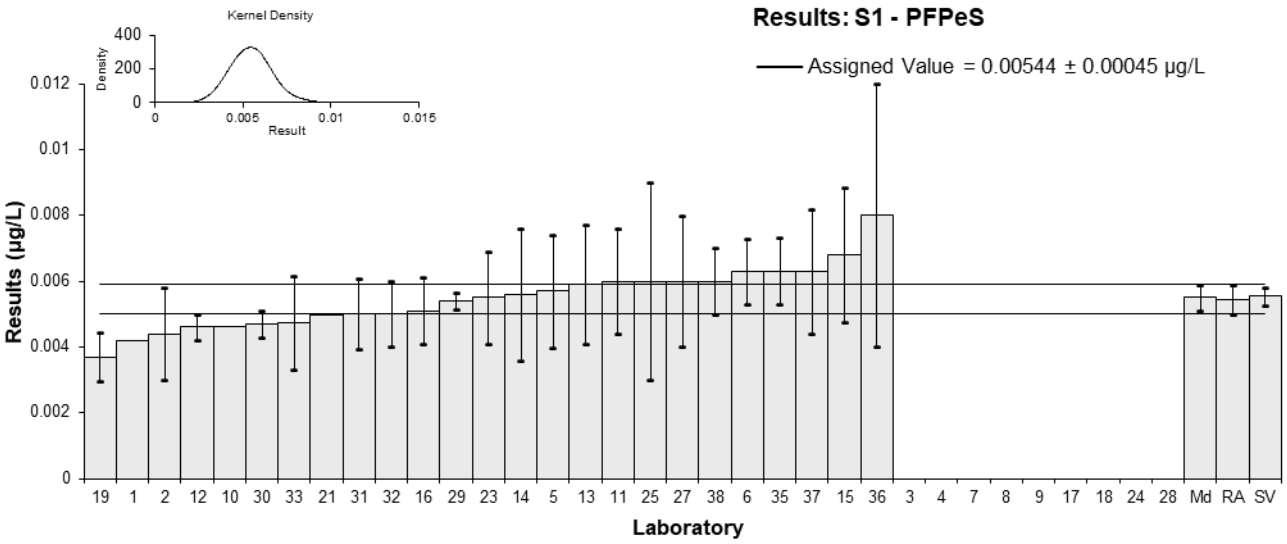
Sample No.	S1
Matrix	Potable Water
Analyte	PFPeS
Unit	µg/L

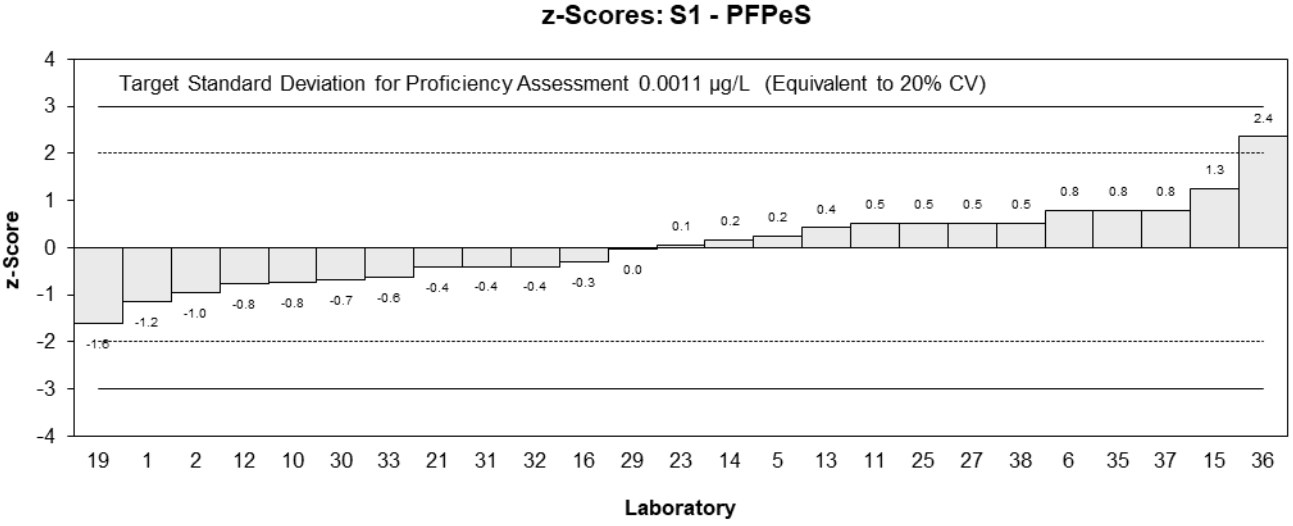
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00418	NR	NR	-1.16	-2.80
2	0.0044	0.0014	NR	-0.96	-0.71
3	NR	NR	NR		
4	<0.01	NR	84		
5	0.0057	0.00171	76	0.24	0.15
6	0.0063	0.001	88.32	0.79	0.78
7	NT	NT	NT		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	0.004629	NR	NR	-0.75	-1.80
11	0.006	0.0016	75	0.51	0.34
12	0.0046	0.0004	NR	-0.77	-1.40
13	0.0059	0.0018	NR	0.42	0.25
14	0.0056	0.002	96	0.15	0.08
15	0.0068	0.00204	95	1.25	0.65
16	0.0051	0.001	NR	-0.31	-0.31
17	NS	NS	NS		
18	NR	NR	NR		
19	0.0037	0.00074	NR	-1.60	-2.01
21	0.00498	NR	NR	-0.42	-1.02
23	0.0055	0.0014	101.55	0.06	0.04
24	<0.01	NR	98.48		
25	0.006	0.003	83	0.51	0.18
27	0.0060	0.002	130	0.51	0.27
28	<0.1	NR	NR		
29	0.0054	0.00027	87	-0.04	-0.08
30	0.0046897280	0.0004028852	105	-0.69	-1.24
31	0.005	0.00108	74	-0.40	-0.38
32	0.005	0.001	103	-0.40	-0.40
33	0.00475	0.001425	NR	-0.63	-0.46
35	0.0063	0.001008	85.84	0.79	0.78
36	0.008	0.004	NR	2.35	0.64
37	0.00630	0.00189	88	0.79	0.44
38	0.006	0.001	101	0.51	0.51

Statistics

Assigned Value	0.00544	0.00045
Spike Value	0.00554	0.00028
Robust Average	0.00544	0.00045
Median	0.00550	0.00039
Mean	0.00547	
N	25	
Max	0.008	
Min	0.0037	
Robust SD	0.00089	
Robust CV	16%	


Kernel Density
Density
Result
Results: S1 - PFPeS
Assigned Value = 0.00544 ± 0.00045 µg/L
Results (µg/L)
Laboratory
19 1 2 12 10 30 33 21 31 32 16 29 23 14 5 13 11 25 27 38 6 35 37 15 36 3 4 7 8 9 17 18 24 28 Md RA SV


z-Scores: S1 - PFPeS
Target Standard Deviation for Proficiency Assessment 0.0011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
19 1 2 12 10 30 33 21 31 32 16 29 23 14 5 13 11 25 27 38 6 35 37 15 36

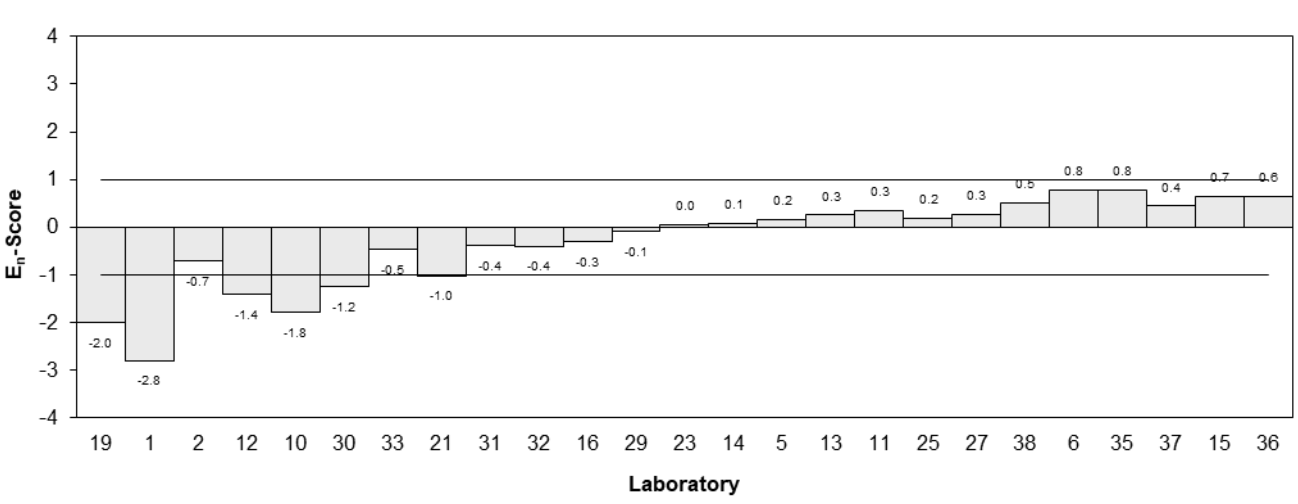

En-Scores: S1 - PFPeS
En-Score
Laboratory
19 1 2 12 10 30 33 21 31 32 16 29 23 14 5 13 11 25 27 38 6 35 37 15 36

Figure 2

Table 6

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFHxS
Unit	µg/L

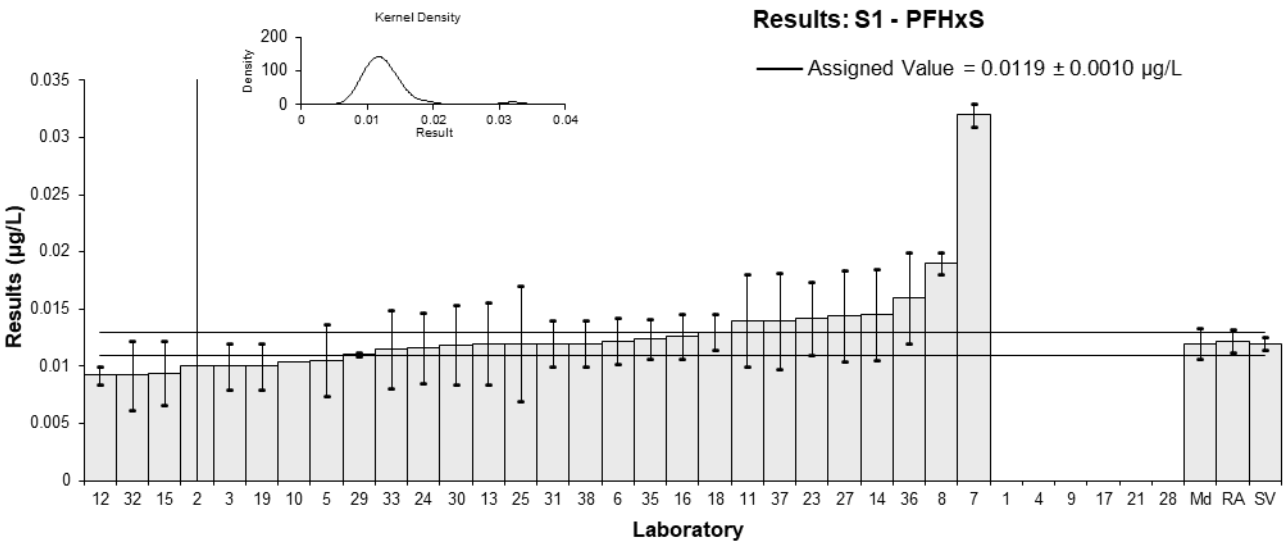
Participant Results

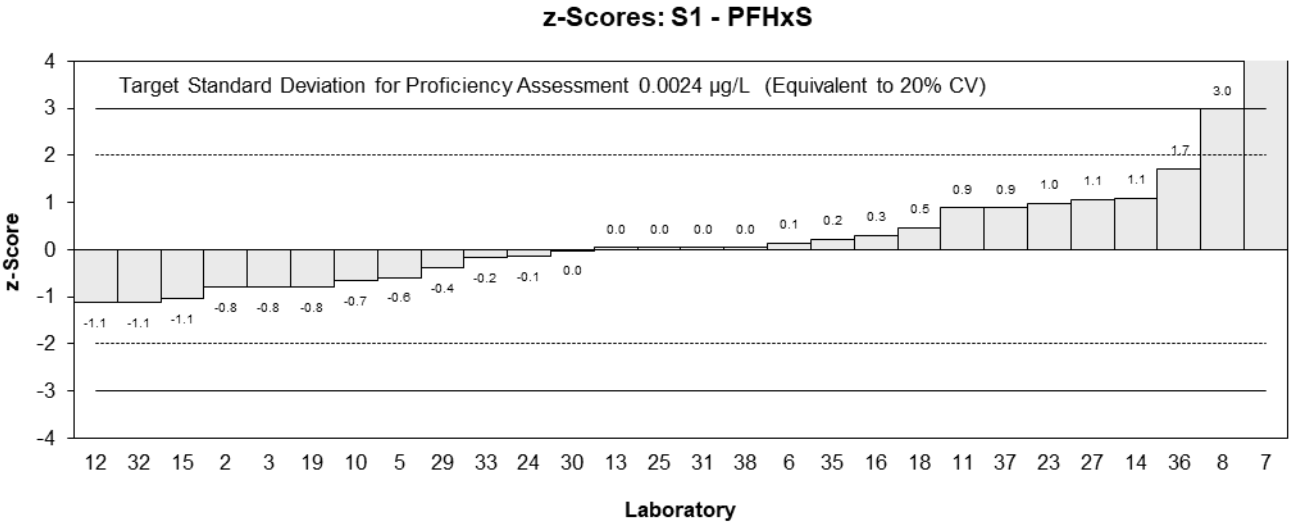
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	0.01	0.03	105	-0.80	-0.06
3	0.010	0.002	143	-0.80	-0.85
4	<0.01	NR	84		
5	0.0105	0.00315	83	-0.59	-0.42
6	0.0122	0.002	88.32	0.13	0.13
7*	0.032	0.001	83.05	8.45	14.21
8*	0.019	0.001	81	2.98	5.02
9	<0.01	NR	94		
10	0.010361	NR	108	-0.65	-1.54
11	0.014	0.004	85	0.88	0.51
12	0.0092	0.0008	NR	-1.13	-2.11
13	0.0120	0.0036	86	0.04	0.03
14	0.0145	0.004	96	1.09	0.63
15	0.0094	0.00282	105	-1.05	-0.84
16	0.0126	0.002	95	0.29	0.31
17	NS	NS	NS		
18	0.0130	0.0016	NR	0.46	0.58
19	0.01	0.002	NR	-0.80	-0.85
21	NT	NT	NT		
23	0.0142	0.0032	101.55	0.97	0.69
24	0.0116	0.0031	98.48	-0.13	-0.09
25	0.012	0.005	83	0.04	0.02
27	0.0144	0.004	130	1.05	0.61
28	<0.1	NR	NR		
29	0.011	0.00017	100	-0.38	-0.89
30	0.0118798816	0.0034464144	105	-0.01	-0.01
31	0.012	0.002	93	0.04	0.04
32	0.0092	0.003	103	-1.13	-0.85
33	0.0115	0.00345	NR	-0.17	-0.11
35	0.0124	0.0017	78.94	0.21	0.25
36	0.016	0.004	72	1.72	0.99
37	0.0140	0.0042	88	0.88	0.49
38	0.012	0.002	NR	0.04	0.04

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0119	0.0010
Spike Value	0.0120	0.0006
Robust Average	0.0122	0.0010
Median	0.0120	0.0013
Mean	0.0129	
N	28	
Max	0.032	
Min	0.0092	
Robust SD	0.0022	
Robust CV	18%	


Results: S1 - PFHxS
Assigned Value = 0.0119 ± 0.0010 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
12 32 15 2 3 19 10 5 29 33 24 30 13 25 31 38 6 35 16 18 11 37 23 27 14 36 8 7 1 4 9 17 21 28 Md RA SV


z-Scores: S1 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.0024 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
12 32 15 2 3 19 10 5 29 33 24 30 13 25 31 38 6 35 16 18 11 37 23 27 14 36 8 7

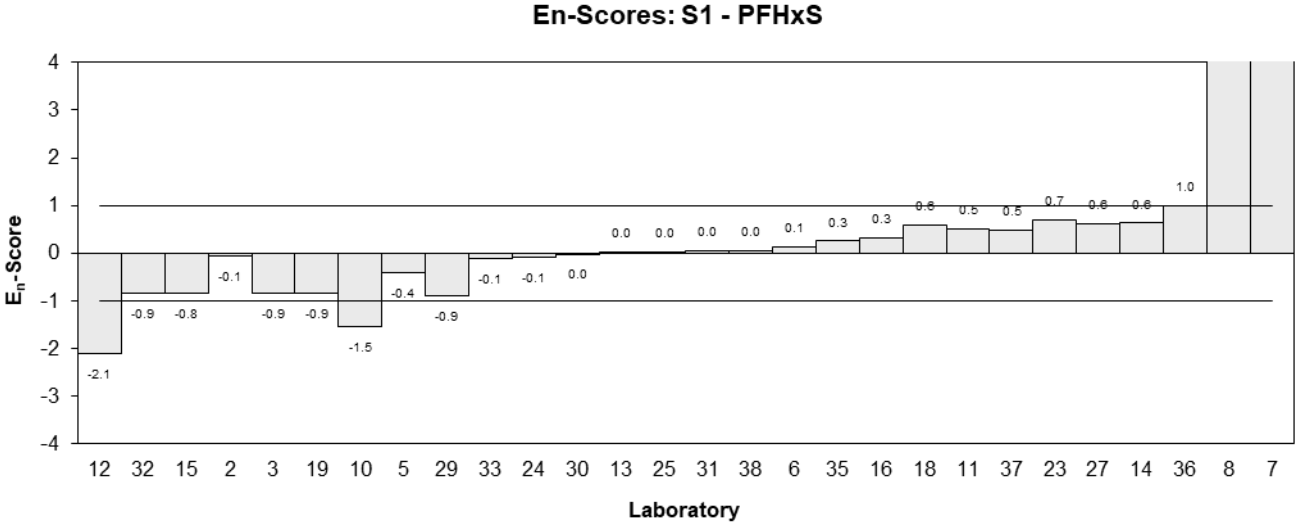

En-Scores: S1 - PFHxS
En-Score
Laboratory
12 32 15 2 3 19 10 5 29 33 24 30 13 25 31 38 6 35 16 18 11 37 23 27 14 36 8 7

Figure 3

Table 7

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFHxS_L
Unit	µg/L

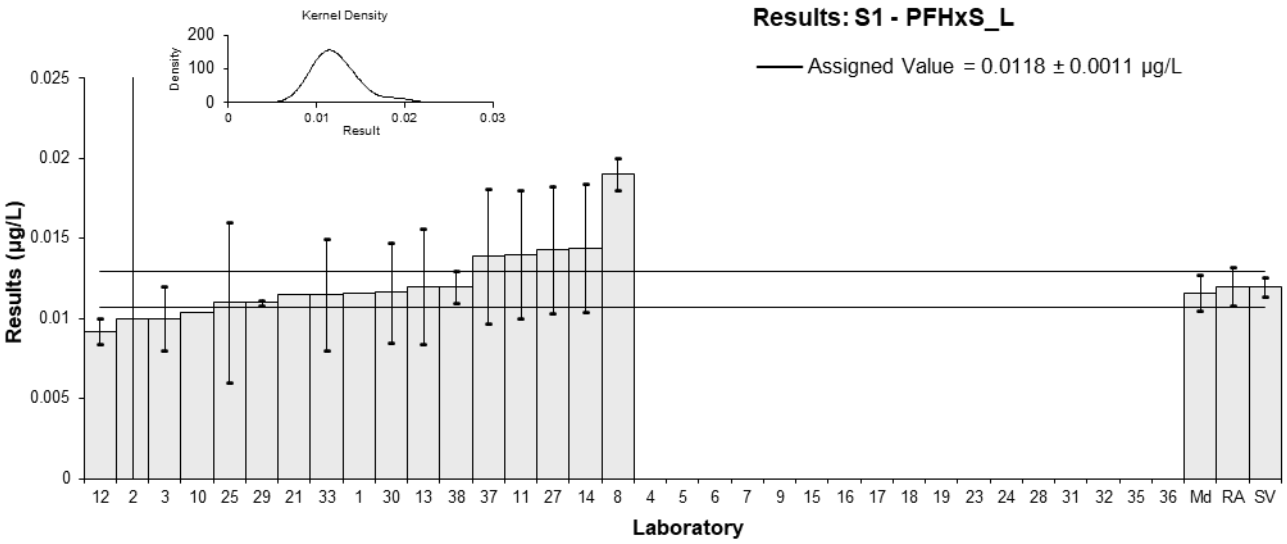
Participant Results

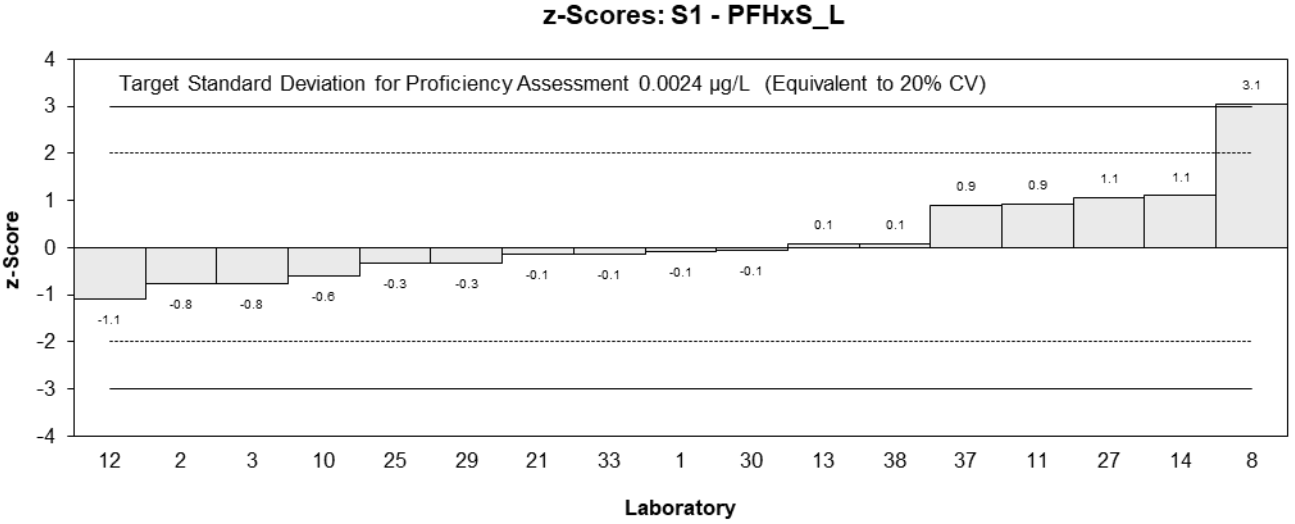
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0116	NR	NR	-0.08	-0.18
2	0.01	0.03	NR	-0.76	-0.06
3	0.010	0.002	NR	-0.76	-0.79
4	<0.01	NR	84		
5	NT	NT	NT		
6	NT	NT	NT		
7	NR	NR	NR		
8*	0.019	0.001	81	3.05	4.84
9	NT	NT	NT		
10	0.010361	NR	108	-0.61	-1.31
11	0.014	0.004	85	0.93	0.53
12	0.0092	0.0008	NR	-1.10	-1.91
13	0.0120	0.0036	86	0.08	0.05
14	0.0144	0.004	96	1.10	0.63
15	NT	NT	NT		
16	NR	NR	NR		
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	0.0115	NR	NR	-0.13	-0.27
23	NT	NT	NT		
24	NT	NT	NT		
25	0.011	0.005	83	-0.34	-0.16
27	0.0143	0.004	130	1.06	0.60
28	<0.1	NR	NR		
29	0.011	0.00017	100	-0.34	-0.72
30	0.0116243561	0.0031358805	105	-0.07	-0.05
31	NT	NT	NT		
32	NT	NT	NT		
33	0.0115	0.00345	NR	-0.13	-0.08
35	NT	NT	NT		
36	NT	NT	NT		
37	0.0139	0.00417	88	0.89	0.49
38	0.012	0.001	101	0.08	0.13

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0118	0.0011
Spike Value	0.0120	0.0006
Robust Average	0.0120	0.0012
Median	0.0116	0.0011
Mean	0.0122	
N	17	
Max	0.019	
Min	0.0092	
Robust SD	0.0020	
Robust CV	16%	


Kernel Density
Density
Result
Results: S1 - PFHxS_L
Assigned Value = 0.0118 ± 0.0011 µg/L
Results (µg/L)
Laboratory
12 2 3 10 25 29 21 33 1 30 13 38 37 11 27 14 8 4 5 6 7 9 15 16 17 18 19 23 24 28 31 32 35 36 Md RA SV


z-Scores: S1 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.0024 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
12 2 3 10 25 29 21 33 1 30 13 38 37 11 27 14 8

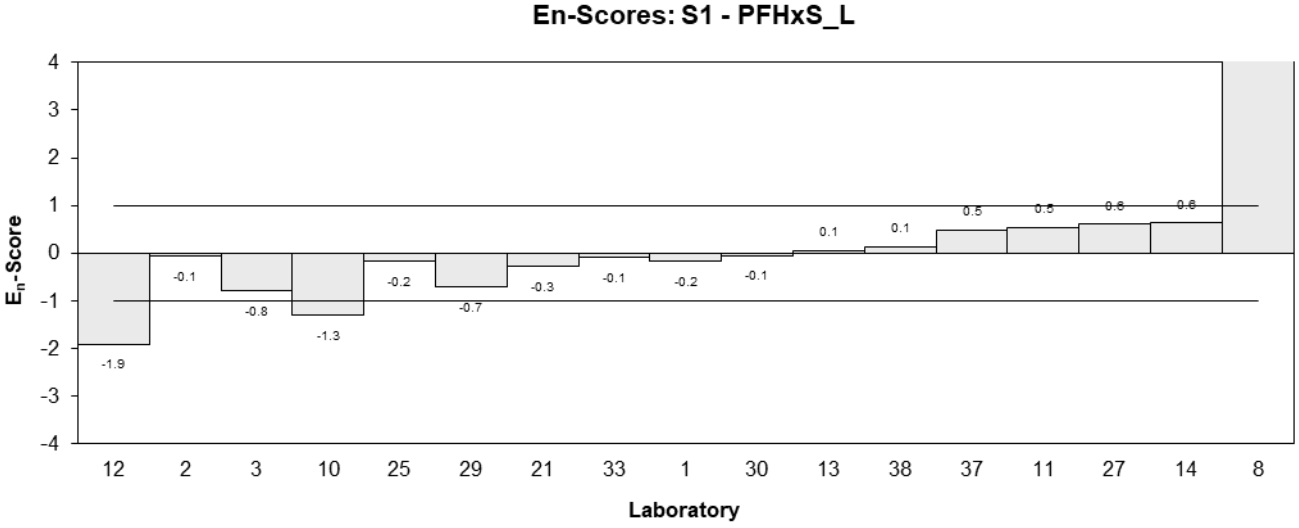

En-Scores: S1 - PFHxS_L
En-Score
Laboratory
12 2 3 10 25 29 21 33 1 30 13 38 37 11 27 14 8

Figure 4

Table 8

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFOS
Unit	µg/L

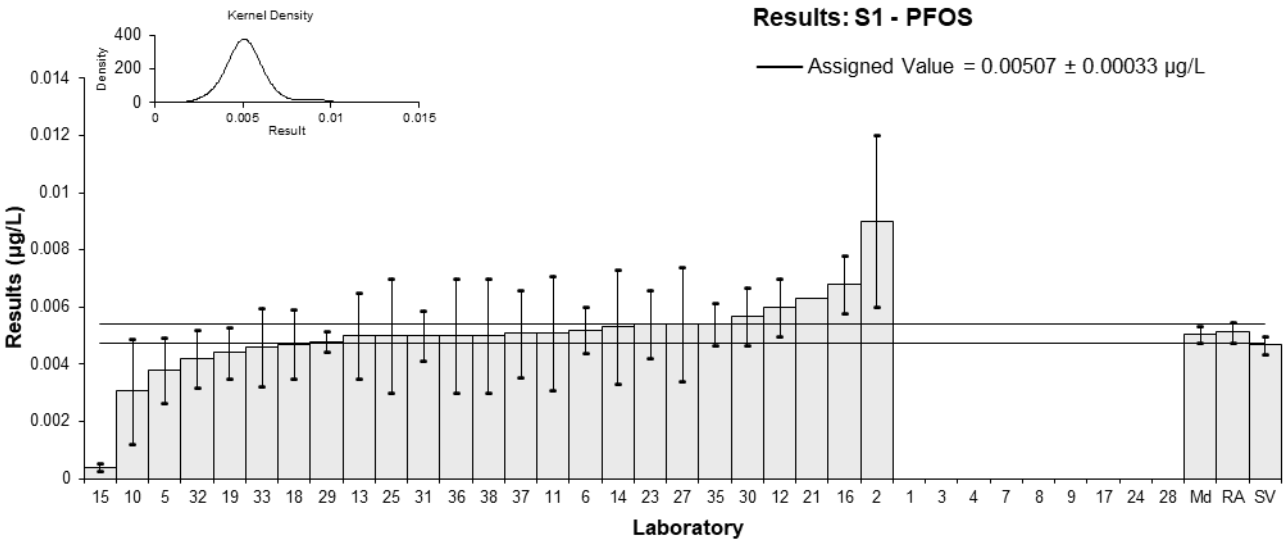
Participant Results

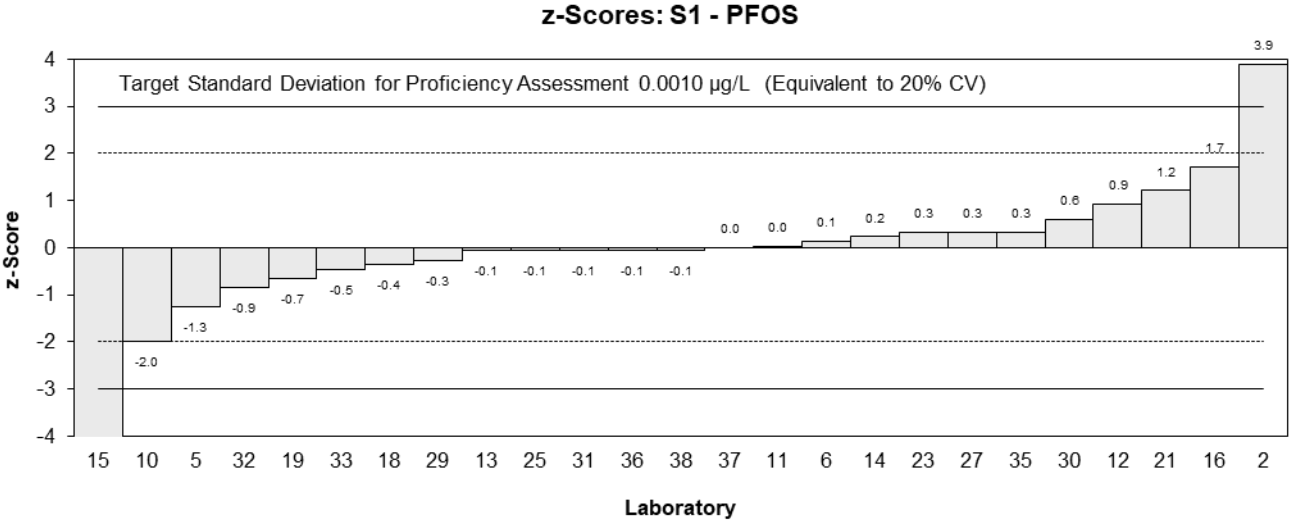
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	<0.00535	NR	NR		
2*	0.009	0.003	106	3.88	1.30
3	NR	NR	NR		
4	<0.01	NR	91		
5	0.0038	0.00114	82	-1.25	-1.07
6	0.0052	0.0008	93.36	0.13	0.15
7	NR	NR	NR		
8	<0.01	NR	NR		
9	<0.01	NR	80		
10	0.003055	0.001833	111	-1.99	-1.08
11	0.0051	0.002	109	0.03	0.01
12	0.0060	0.0010	NR	0.92	0.88
13	0.0050	0.0015	85	-0.07	-0.05
14	0.0053	0.002	92	0.23	0.11
15**	0.0004	0.00012	90	-4.61	-13.30
16	0.0068	0.001	86	1.71	1.64
17	NS	NS	NS		
18	0.0047	0.0012	NR	-0.36	-0.30
19	0.0044	0.00088	NR	-0.66	-0.71
21	0.00630	NR	NR	1.21	3.73
23	0.0054	0.0012	103.05	0.33	0.27
24	<0.01	NR	98.48		
25	0.005	0.002	85	-0.07	-0.03
27	0.0054	0.002	146	0.33	0.16
28	<0.1	NR	NR		
29	0.0048	0.00034	110	-0.27	-0.57
30	0.0056752190	0.0010255507	91	0.60	0.56
31	0.005	0.00089	91	-0.07	-0.07
32	0.0042	0.001	127	-0.86	-0.83
33	0.0046	0.00138	NR	-0.46	-0.33
35	0.0054	0.00073	97.48	0.33	0.41
36	0.005	0.002	94	-0.07	-0.03
37	0.00507	0.001521	94	0.00	0.00
38	0.005	0.002	NR	-0.07	-0.03

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.00507	0.00033
Spike Value	0.00468	0.00031
Robust Average	0.00512	0.00036
Median	0.00504	0.00028
Mean	0.00522	
N	24	
Max	0.009	
Min	0.003055	
Robust SD	0.00070	
Robust CV	14%	


Kernel Density
Density
Result
Results: S1 - PFOS
Assigned Value = 0.00507 ± 0.00033 µg/L
Results (µg/L)
Laboratory
15 10 5 32 19 33 18 29 13 25 31 36 38 37 11 6 14 23 27 35 30 12 21 16 2 1 3 4 7 8 9 17 24 28 Md RA SV


z-Scores: S1 - PFOS
Target Standard Deviation for Proficiency Assessment 0.0010 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
15 10 5 32 19 33 18 29 13 25 31 36 38 37 11 6 14 23 27 35 30 12 21 16 2

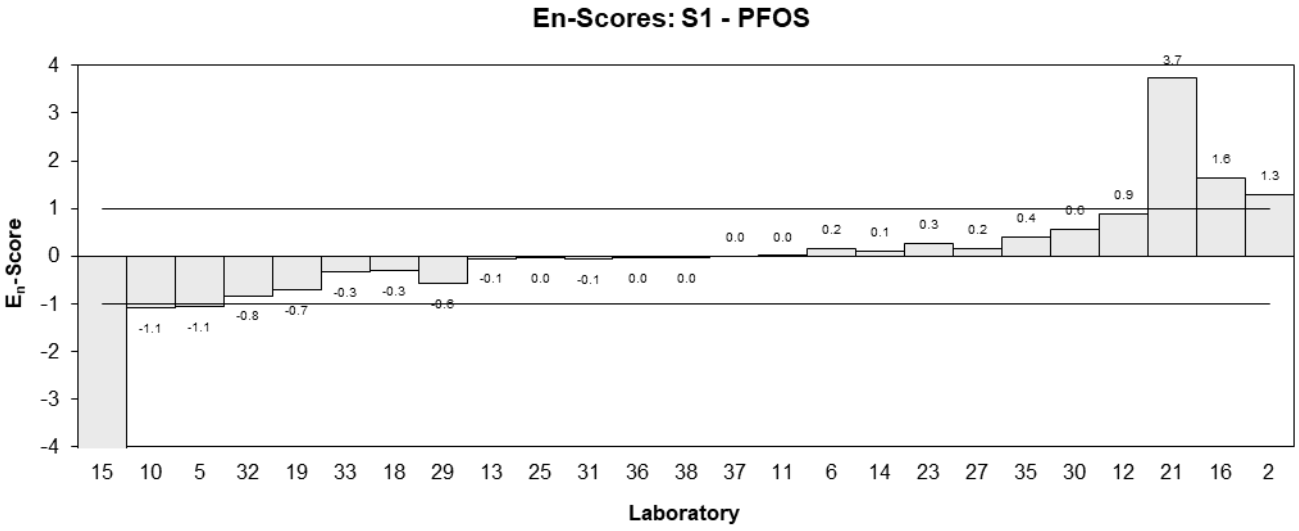

En-Scores: S1 - PFOS
En-Score
Laboratory
15 10 5 32 19 33 18 29 13 25 31 36 38 37 11 6 14 23 27 35 30 12 21 16 2

Figure 5

Table 9

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFOS_L
Unit	µg/L

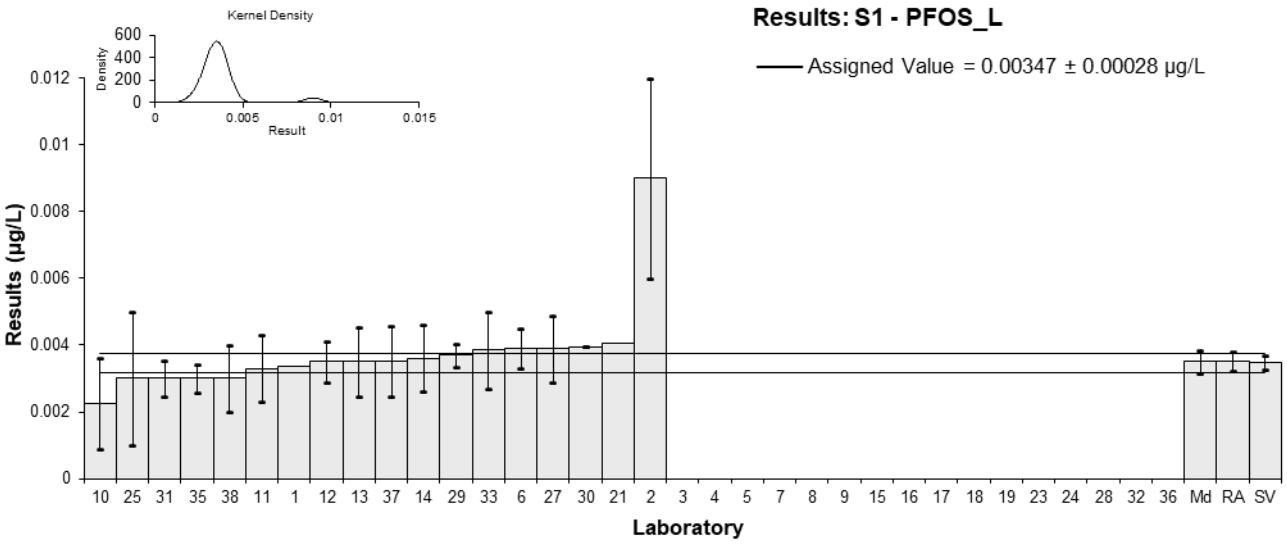
Participant Results

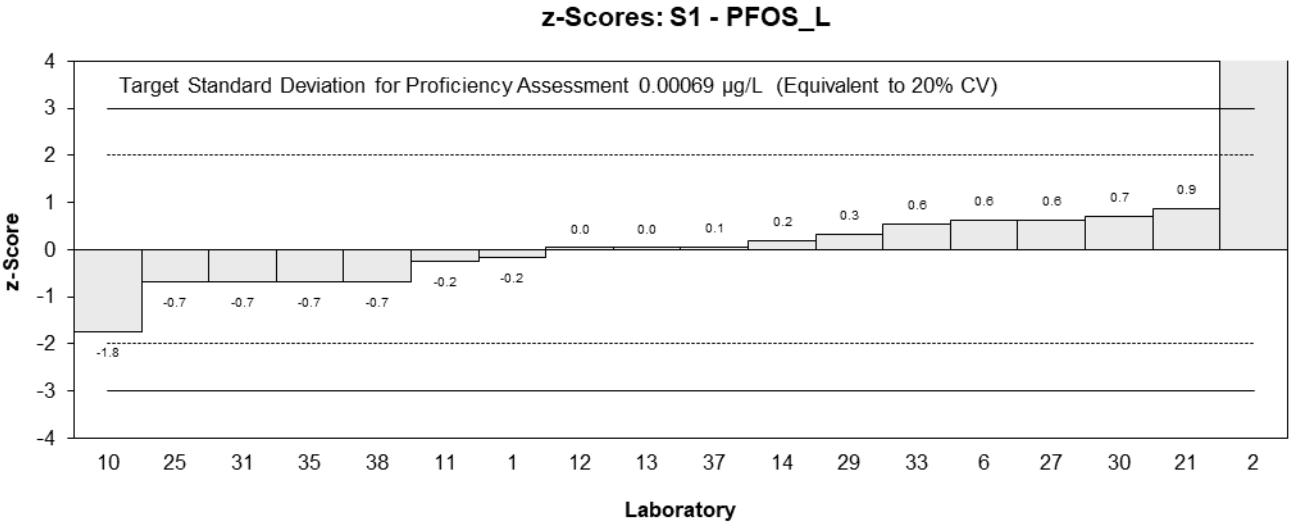
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00335	NR	NR	-0.17	-0.43
2*	0.009	0.003	NR	7.97	1.84
3	NR	NR	NR		
4	<0.01	NR	91		
5	NR	NR	NR		
6	0.0039	0.0006	93.36	0.62	0.65
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	0.002258	0.0013548	111	-1.75	-0.88
11	0.0033	0.001	109	-0.24	-0.16
12	0.0035	0.0006	NR	0.04	0.05
13	0.0035	0.00105	85	0.04	0.03
14	0.0036	0.001	92	0.19	0.13
15	NR	NR	NR		
16	NR	NR	NR		
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	0.00407	NR	NR	0.86	2.14
23	NT	NT	NT		
24	NT	NT	NT		
25	0.003	0.002	85	-0.68	-0.23
27	0.0039	0.001	146	0.62	0.41
28	<0.1	NR	NR		
29	0.0037	0.00034	110	0.33	0.52
30	0.0039597481	0.0000133352	91	0.71	1.75
31	0.003	0.00054	91	-0.68	-0.77
32	NT	NT	NT		
33	0.00385	0.001155	NR	0.55	0.32
35	0.003	0.00041	97.48	-0.68	-0.95
36	NT	NT	NT		
37	0.00351	0.001053	94	0.06	0.04
38	0.003	0.001	102	-0.68	-0.45

* Outlier, see Section 4.2

Statistics

Assigned Value	0.00347	0.00028
Spike Value	0.00349	0.00021
Robust Average	0.00351	0.00029
Median	0.00351	0.00035
Mean	0.00374	
N	18	
Max	0.009	
Min	0.002258	
Robust SD	0.00049	
Robust CV	14%	


Kernel Density
Density
Result
Results: S1 - PFOS_L
Assigned Value = 0.00347 ± 0.00028 µg/L
Results (µg/L)
Laboratory
10 25 31 35 38 11 1 12 13 37 14 29 33 6 27 30 21 2 3 4 5 7 8 9 15 16 17 18 19 23 24 28 32 36 Md RA SV


z-Scores: S1 - PFOS_L
Target Standard Deviation for Proficiency Assessment 0.00069 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 25 31 35 38 11 1 12 13 37 14 29 33 6 27 30 21 2

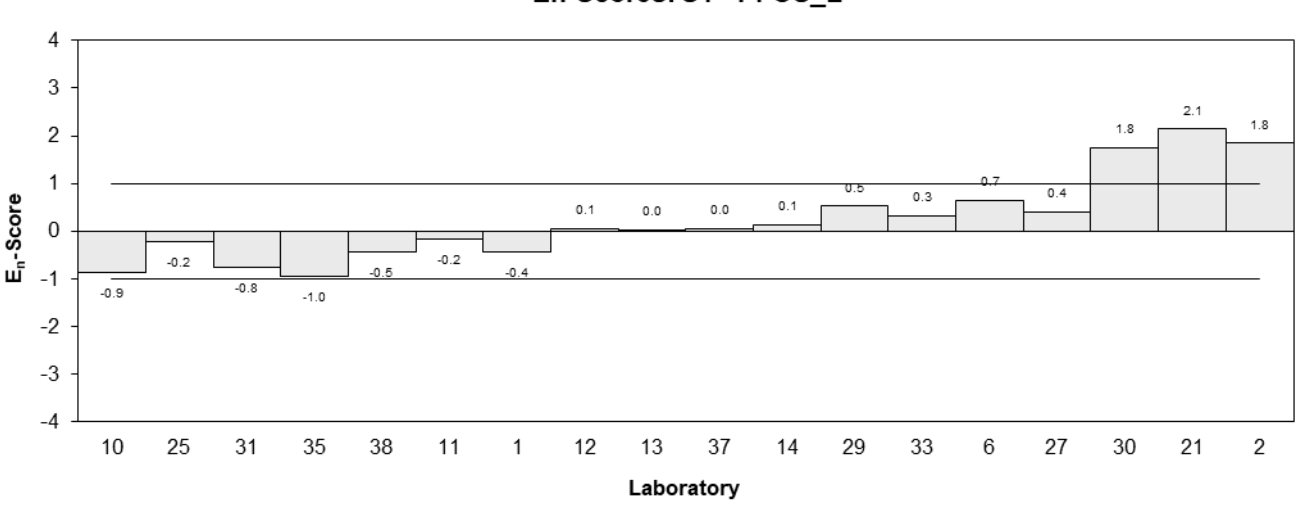

En-Scores: S1 - PFOS_L
En-Score
Laboratory
10 25 31 35 38 11 1 12 13 37 14 29 33 6 27 30 21 2

Figure 6

Table 10

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFNS
Unit	µg/L

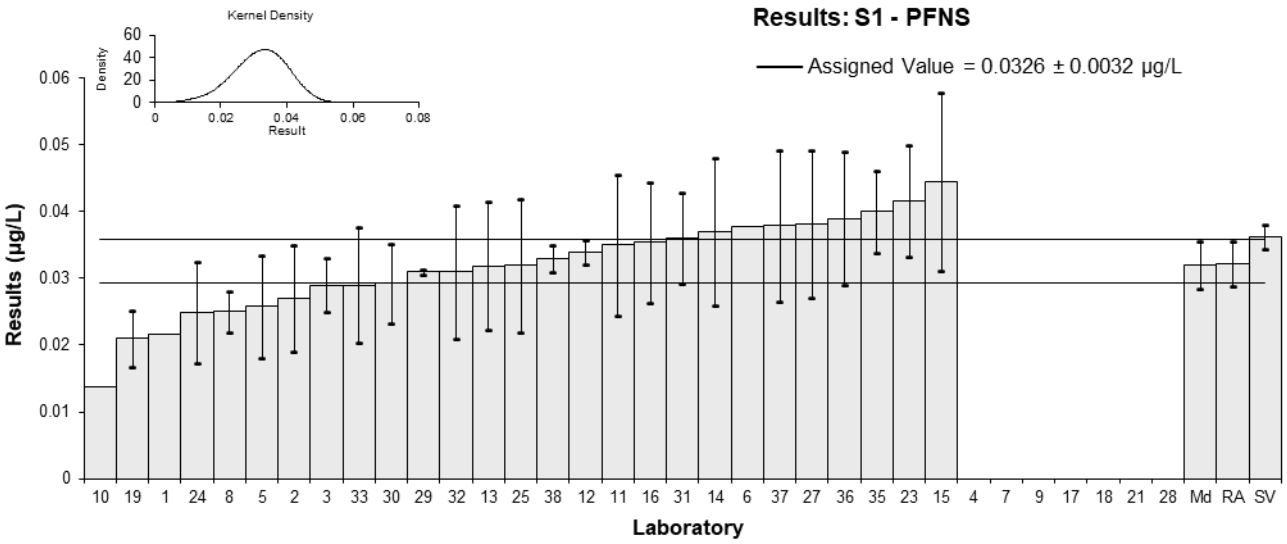
Participant Results

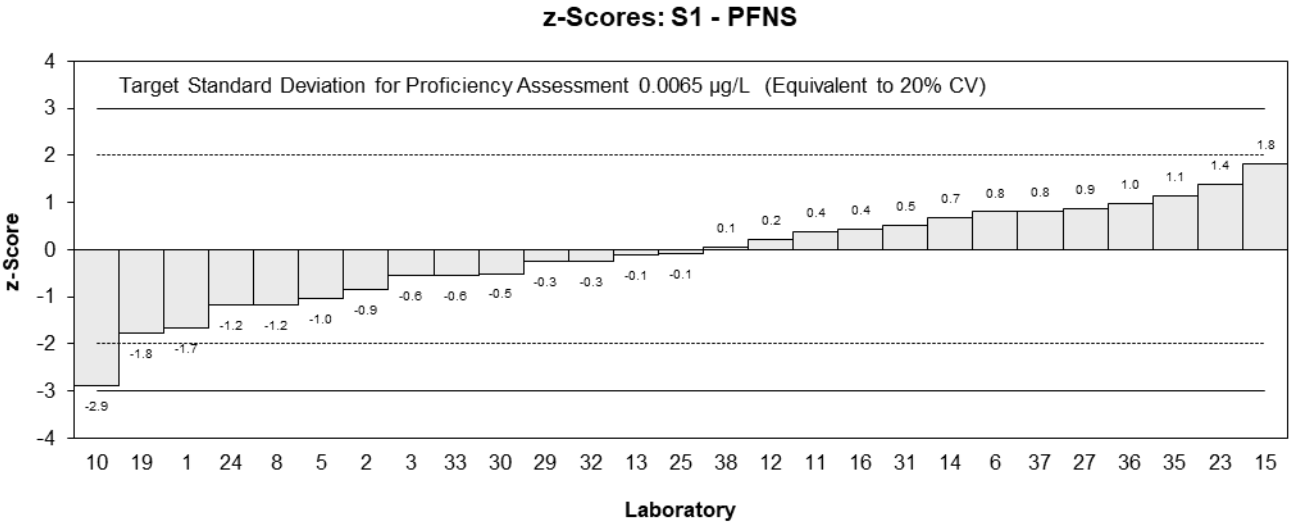
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0217	NR	NR	-1.67	-3.41
2	0.027	0.008	NR	-0.86	-0.65
3	0.029	0.004	NR	-0.55	-0.70
4	NT	NT	NT		
5	0.0258	0.00774	73	-1.04	-0.81
6	0.0378	NR	93.36	0.80	1.63
7	NR	NR	NR		
8	0.025	0.003	102	-1.17	-1.73
9	NT	NT	NT		
10*	0.013712	NR	NR	-2.90	-5.90
11	0.035	0.0105	109	0.37	0.22
12	0.034	0.0018	NR	0.21	0.38
13	0.0319	0.0096	NR	-0.11	-0.07
14	0.0370	0.011	86	0.67	0.38
15	0.0445	0.01335	95	1.83	0.87
16	0.0354	0.009	NR	0.43	0.29
17	NS	NS	NS		
18	NR	NR	NR		
19	0.021	0.0042	NR	-1.78	-2.20
21	NT	NT	NT		
23	0.0416	0.0083	103.05	1.38	1.01
24	0.0249	0.0075	98.48	-1.18	-0.94
25	0.032	0.01	85	-0.09	-0.06
27	0.0382	0.011	146	0.86	0.49
28	<0.1	NR	NR		
29	0.031	0.00039	110	-0.25	-0.50
30	0.0292864081	0.0059400020	91	-0.51	-0.49
31	0.036	0.0068	91	0.52	0.45
32	0.031	0.01	127	-0.25	-0.15
33	0.029	0.0087	NR	-0.55	-0.39
35	0.04	0.0062	97.48	1.13	1.06
36	0.039	0.01	NR	0.98	0.61
37	0.0379	0.01137	94	0.81	0.45
38	0.033	0.002	102	0.06	0.11

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0326	0.0032
Spike Value	0.0362	0.0018
Robust Average	0.0322	0.0034
Median	0.0320	0.0036
Mean	0.0319	
N	27	
Max	0.0445	
Min	0.013712	
Robust SD	0.0071	
Robust CV	22%	


Kernel Density
Density
Result
Results: S1 - PFNS
Assigned Value = 0.0326 ± 0.0032 µg/L
Results (µg/L)
Laboratory
10 19 1 24 8 5 2 3 33 30 29 32 13 25 38 12 11 16 31 14 6 37 27 36 35 23 15 4 7 9 17 18 21 28 Md RA SV


z-Scores: S1 - PFNS
Target Standard Deviation for Proficiency Assessment 0.0065 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 19 1 24 8 5 2 3 33 30 29 32 13 25 38 12 11 16 31 14 6 37 27 36 35 23 15

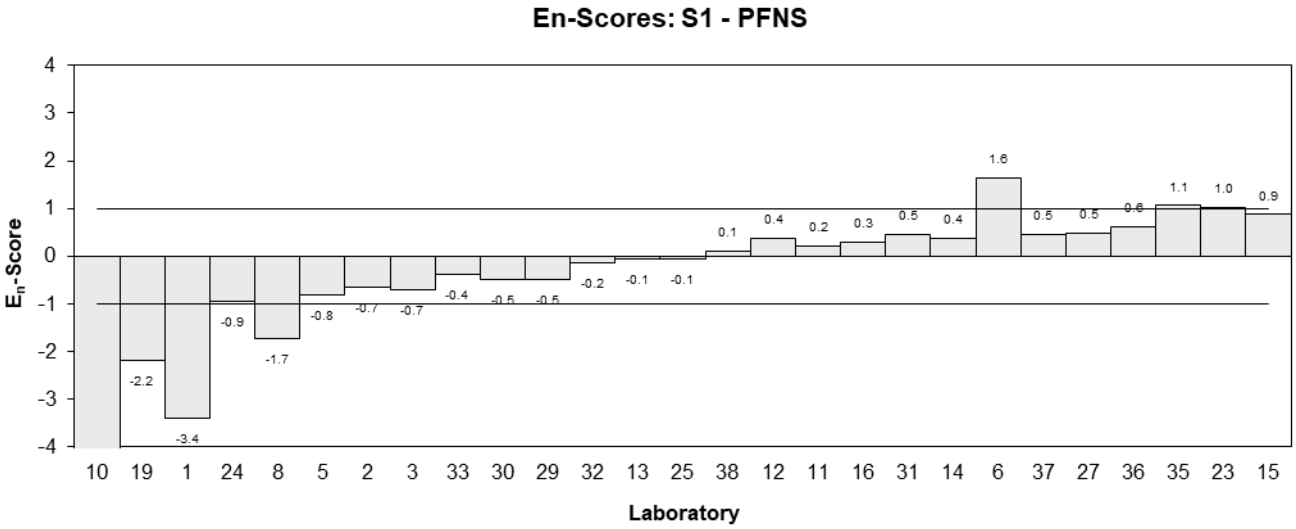

En-Scores: S1 - PFNS
En-Score
Laboratory
10 19 1 24 8 5 2 3 33 30 29 32 13 25 38 12 11 16 31 14 6 37 27 36 35 23 15

Figure 7

Table 11

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFDS
Unit	µg/L

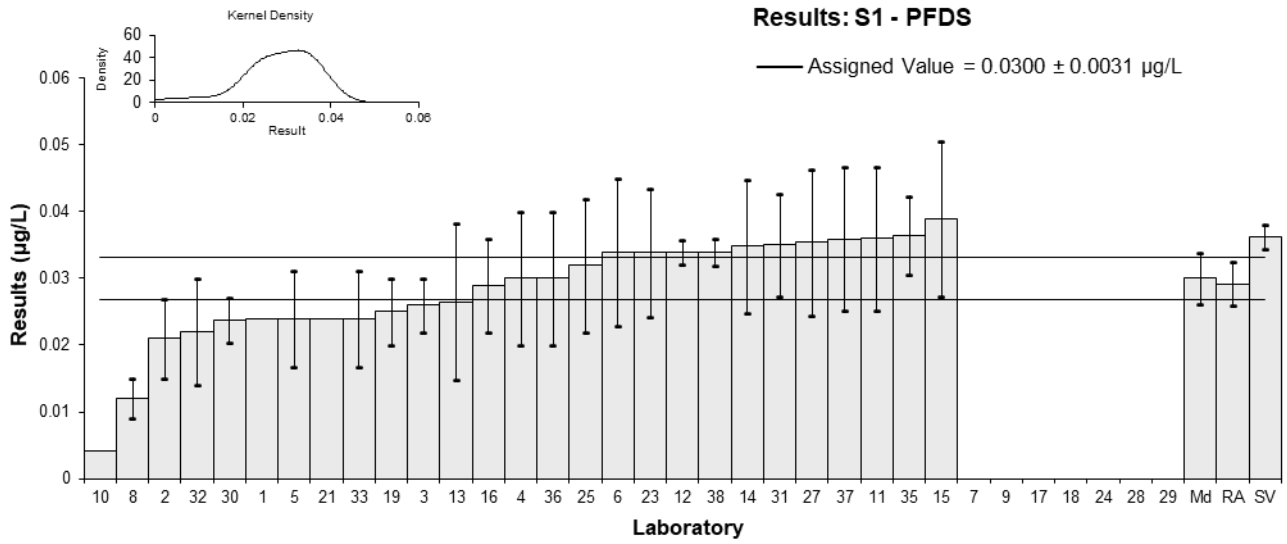
Participant Results

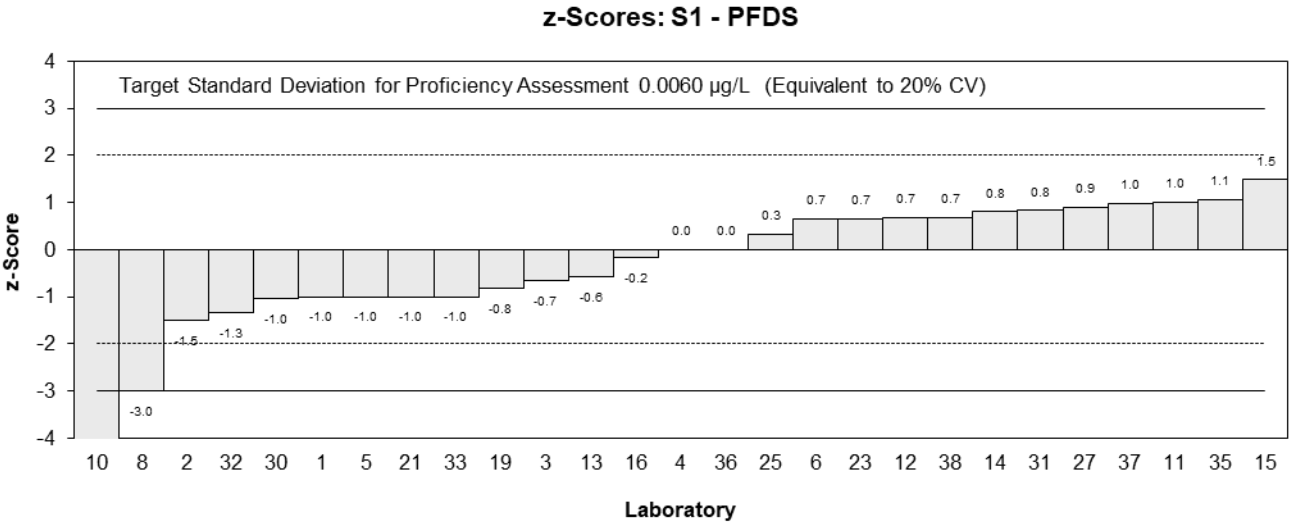
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.024	NR	NR	-1.00	-1.94
2	0.021	0.006	NR	-1.50	-1.33
3	0.026	0.004	NR	-0.67	-0.79
4	0.03	0.01	83	0.00	0.00
5	0.024	0.0072	57	-1.00	-0.77
6	0.0339	0.011	93.36	0.65	0.34
7	NR	NR	NR		
8*	0.012	0.003	102	-3.00	-4.17
9	NT	NT	NT		
10*	0.004042	NR	NR	-4.33	-8.37
11	0.036	0.0108	109	1.00	0.53
12	0.034	0.0018	NR	0.67	1.12
13	0.0265	0.0117	NR	-0.58	-0.29
14	0.0348	0.010	86	0.80	0.46
15	0.0389	0.01167	75	1.48	0.74
16	0.0289	0.007	NR	-0.18	-0.14
17	NS	NS	NS		
18	NR	NR	NR		
19	0.025	0.005	NR	-0.83	-0.85
21	0.0240	NR	NR	-1.00	-1.94
23	0.0339	0.0096	103.05	0.65	0.39
24	<0.06	NR	71.50		
25	0.032	0.01	85	0.33	0.19
27	0.0354	0.011	146	0.90	0.47
28	<0.1	NR	NR		
29	NR	NR	110		
30	0.0237773447	0.0033316448	91	-1.04	-1.37
31	0.035	0.0077	91	0.83	0.60
32	0.022	0.008	127	-1.33	-0.93
33	0.024	0.0072	NR	-1.00	-0.77
35	0.0364	0.0059	97.48	1.07	0.96
36	0.03	0.01	NR	0.00	0.00
37	0.0359	0.01077	94	0.98	0.53
38	0.034	0.002	102	0.67	1.08

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0300	0.0031
Spike Value	0.0363	0.0018
Robust Average	0.0292	0.0033
Median	0.0300	0.0039
Mean	0.0283	
N	27	
Max	0.0389	
Min	0.004042	
Robust SD	0.0068	
Robust CV	23%	


Kernel Density
Density
Result
Results: S1 - PFDS
Assigned Value = 0.0300 ± 0.0031 µg/L
Results (µg/L)
Laboratory
10 8 2 32 30 1 5 21 33 19 3 13 16 4 36 25 6 23 12 38 14 31 27 37 11 35 15 7 9 17 18 24 28 29 Md RA SV


z-Scores: S1 - PFDS
Target Standard Deviation for Proficiency Assessment 0.0060 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 8 2 32 30 1 5 21 33 19 3 13 16 4 36 25 6 23 12 38 14 31 27 37 11 35 15

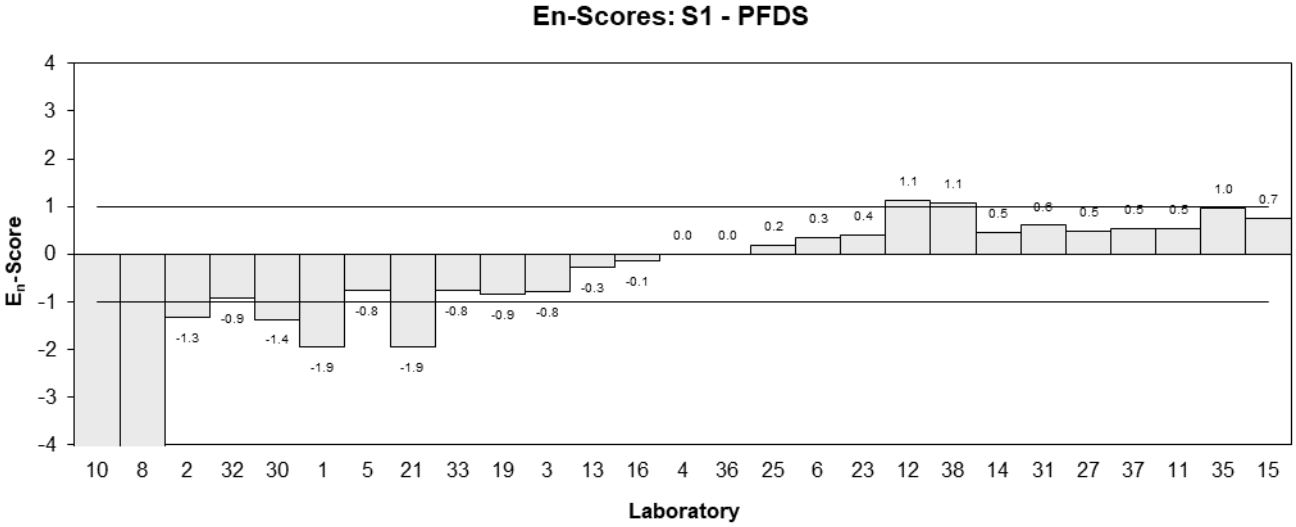

En-Scores: S1 - PFDS
En-Score
Laboratory
10 8 2 32 30 1 5 21 33 19 3 13 16 4 36 25 6 23 12 38 14 31 27 37 11 35 15

Figure 8

Table 12

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFUdS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.0132	NR	NR
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	NT	NT	NT
6	NT	NR	NT
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NR	NR	NR
16	NR	NR	NR
17	NS	NS	NS
18	NR	NR	NR
19	NT	NT	NT
21	NT	NT	NT
23	NT	NT	NT
24	0.0193	0.0057	62.08
25	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0364	0.0018
Robust Average	NA (N<6)	
Median	NA (N<3)	
Mean	0.0163	
N	2	
Max	NA (N<3)	
Min	NA (N<3)	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

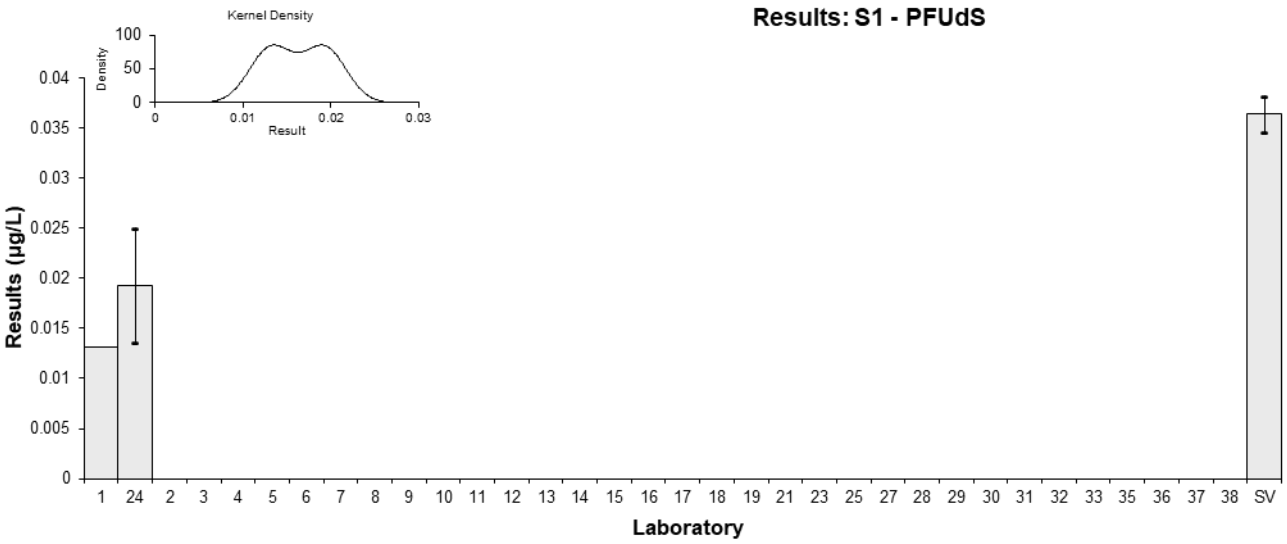

Results: S1 - PFUdS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 24 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 23 25 27 28 29 30 31 32 33 35 36 37 38 SV

Figure 9

Table 13

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFTrDS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.01	NR	NR
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	NT	NT	NT
6	NT	NR	NT
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NR	NR	NR
16	NR	NR	NR
17	NS	NS	NS
18	NR	NR	NR
19	NT	NT	NT
21	NT	NT	NT
23	NT	NT	NT
24	0.0135	0.004	62.08
25	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0366	0.0018
Robust Average	NA (N<6)	
Median	NA (N<3)	
Mean	0.0118	
N	2	
Max	NA (N<3)	
Min	NA (N<3)	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

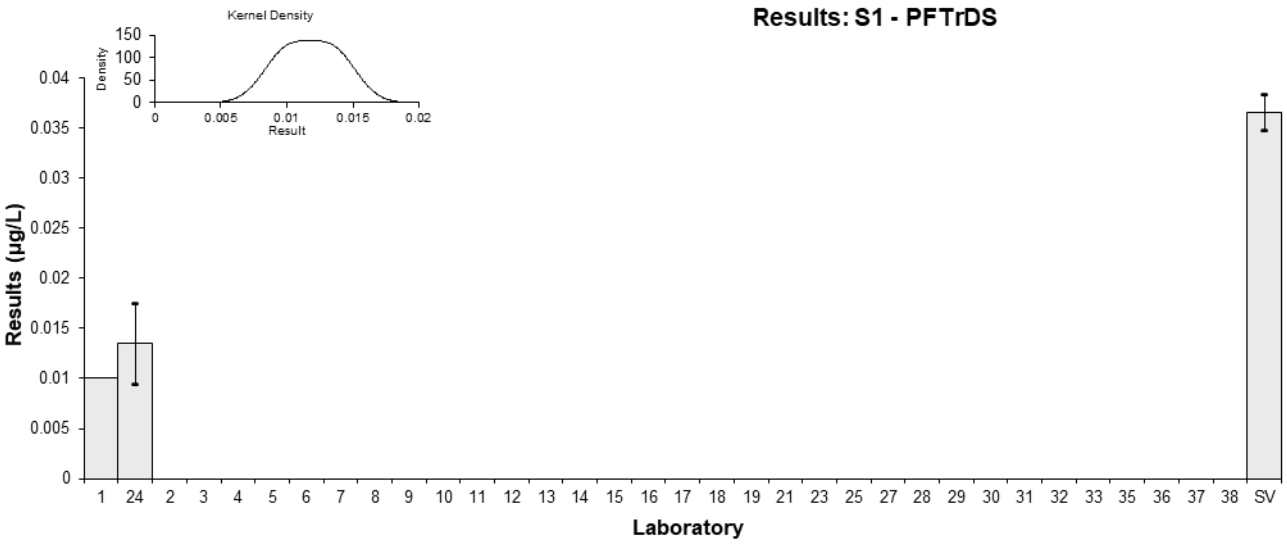

Results: S1 - PFTrDS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 24 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 23 25 27 28 29 30 31 32 33 35 36 37 38 SV

Figure 10

Table 14

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFBA
Unit	µg/L

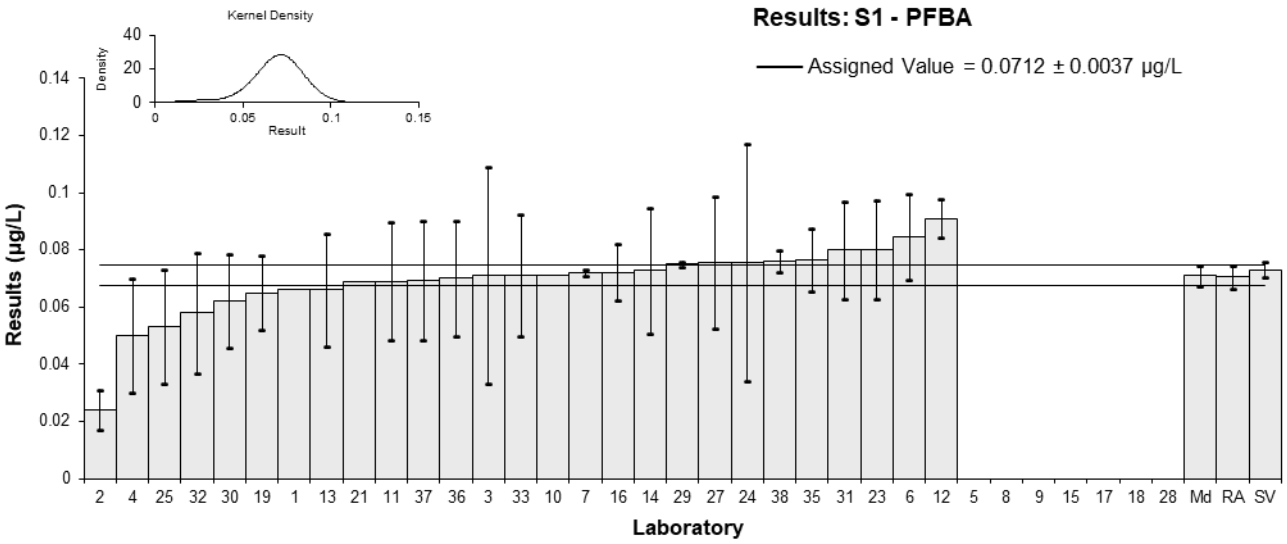
Participant Results

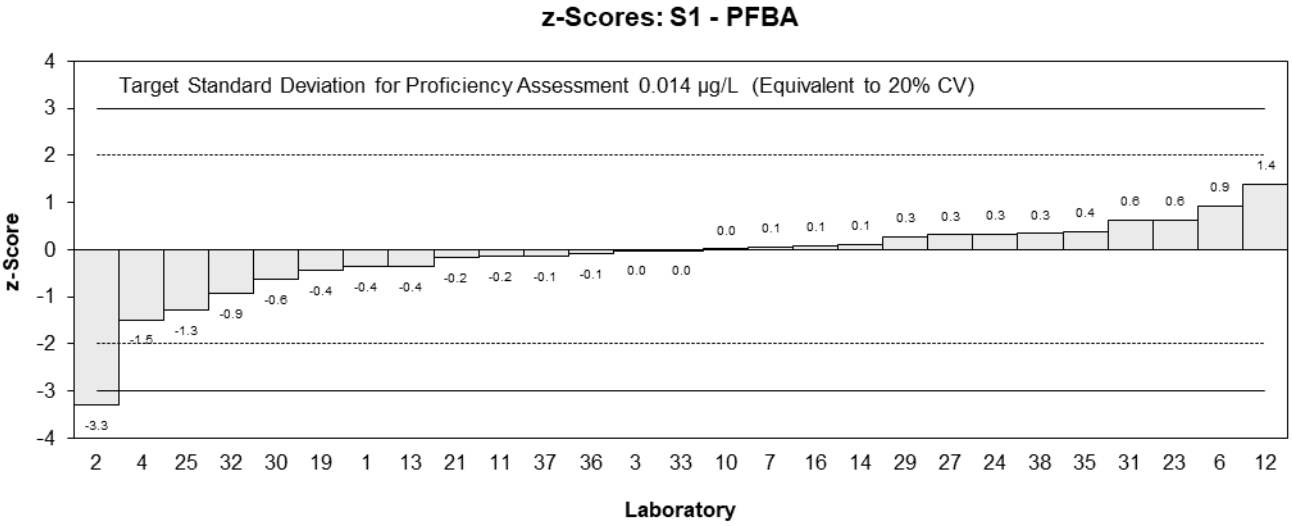
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.066	NR	NR	-0.37	-1.41
2*	0.024	0.007	104	-3.31	-5.96
3	0.071	0.038	115	-0.01	-0.01
4	0.05	0.02	82	-1.49	-1.04
5	NR	NR	NR		
6	0.0845	0.015	64.57	0.93	0.86
7	0.072	0.001	78.1200	0.06	0.21
8	<0.06	NR	NR		
9	NT	NT	NT		
10	0.071295	NR	92	0.01	0.03
11	0.069	0.0207	11	-0.15	-0.10
12	0.091	0.0066	NR	1.39	2.62
13	0.0660	0.0198	87	-0.37	-0.26
14	0.0728	0.022	29	0.11	0.07
15	NR	NR	NR		
16	0.0722	0.010	67	0.07	0.09
17	NS	NS	NS		
18	NR	NR	NR		
19	0.065	0.013	NR	-0.44	-0.46
21	0.0689	NR	NR	-0.16	-0.62
23	0.0801	0.0173	68	0.63	0.50
24	0.0757	0.0416	81.10	0.32	0.11
25	0.053	0.02	60	-1.28	-0.89
27	0.0756	0.023	123	0.31	0.19
28	<0.5	NR	NR		
29	0.075	0.00085	78	0.27	1.00
30	0.0621211441	0.0163970268	12	-0.64	-0.54
31	0.08	0.017	54	0.62	0.51
32	0.058	0.021	85	-0.93	-0.62
33	0.071	0.0213	NR	-0.01	-0.01
35	0.0764	0.0111	63.34	0.37	0.44
36	0.07	0.02	92	-0.08	-0.06
37	0.0693	0.02079	94	-0.13	-0.09
38	0.076	0.004	104	0.34	0.88

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0712	0.0037
Spike Value	0.0730	0.0027
Robust Average	0.0705	0.0040
Median	0.0710	0.0036
Mean	0.0691	
N	27	
Max	0.091	
Min	0.024	
Robust SD	0.0084	
Robust CV	12%	


Results: S1 - PFBA
Assigned Value = 0.0712 ± 0.0037 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
2 4 25 32 30 19 1 13 21 11 37 36 3 33 10 7 16 14 29 27 24 38 35 31 23 6 12 5 8 9 15 17 18 28 Md RA SV


z-Scores: S1 - PFBA
Target Standard Deviation for Proficiency Assessment 0.014 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 4 25 32 30 19 1 13 21 11 37 36 3 33 10 7 16 14 29 27 24 38 35 31 23 6 12

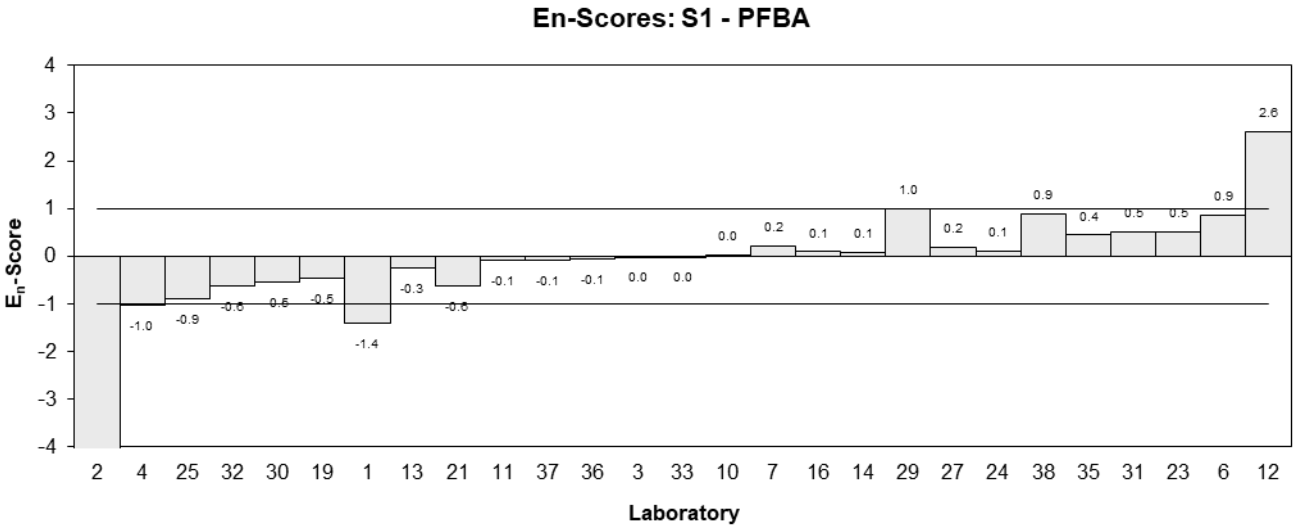

En-Scores: S1 - PFBA
En-Score
Laboratory
2 4 25 32 30 19 1 13 21 11 37 36 3 33 10 7 16 14 29 27 24 38 35 31 23 6 12

Figure 11

Table 15

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFPeA
Unit	µg/L

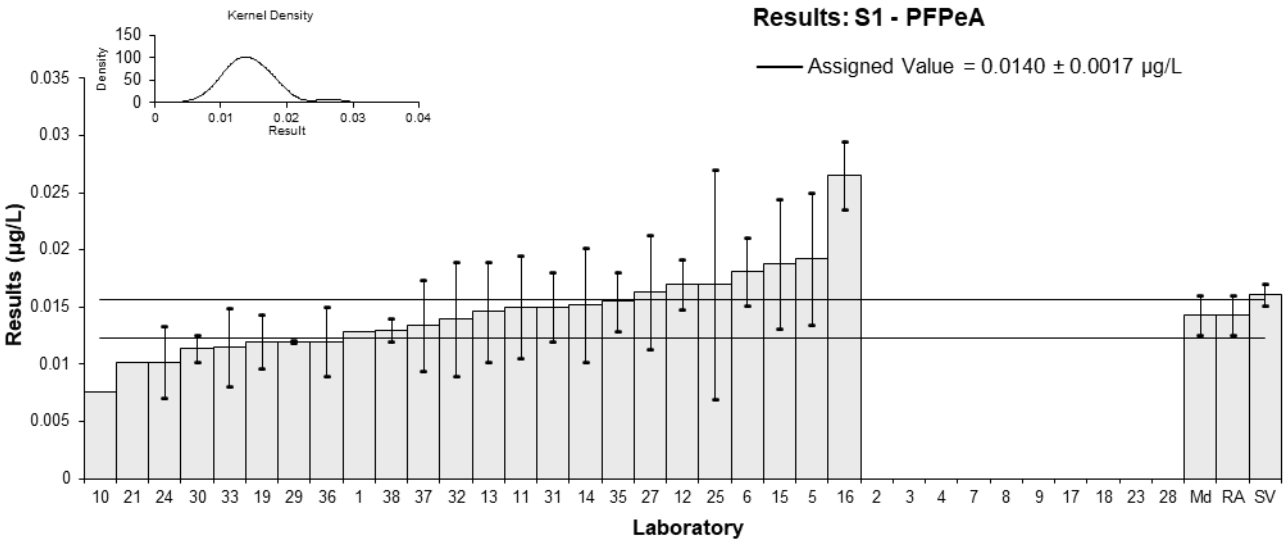
Participant Results

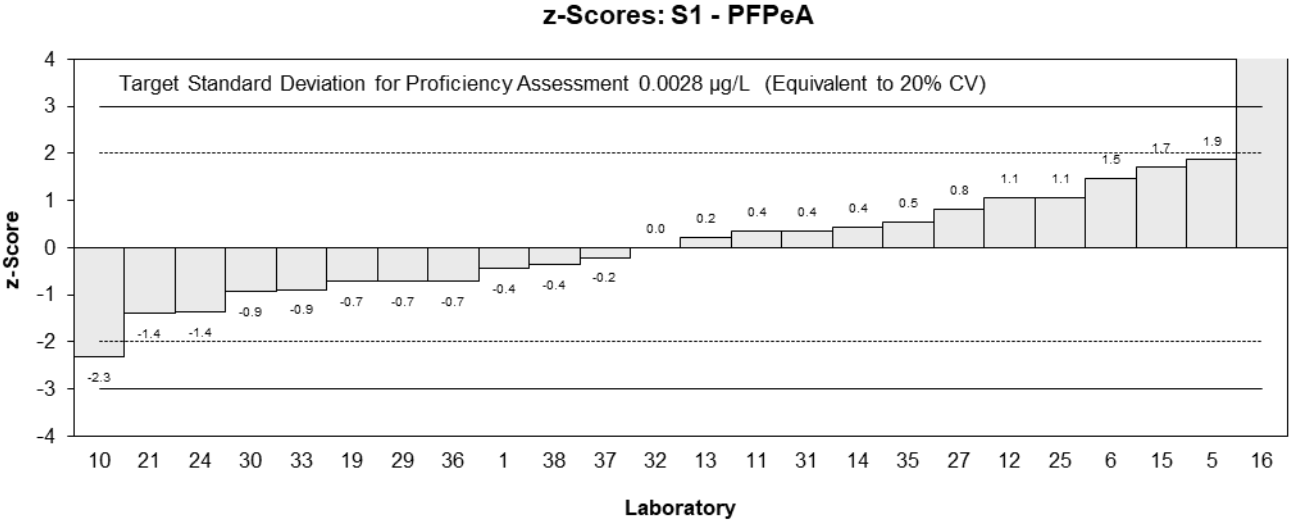
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0128	NR	NR	-0.43	-0.71
2	<0.01	NR	104		
3	NR	NR	NR		
4	<0.02	NR	89		
5	0.0192	0.00576	73	1.86	0.87
6	0.0181	0.003	81.2	1.46	1.19
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	0.007543	NR	85	-2.31	-3.80
11	0.015	0.0045	84	0.36	0.21
12	0.0170	0.0022	NR	1.07	1.08
13	0.0146	0.0044	84	0.21	0.13
14	0.0152	0.005	62	0.43	0.23
15	0.0188	0.00564	105	1.71	0.81
16*	0.0265	0.003	88	4.46	3.63
17	NS	NS	NS		
18	NR	NR	NR		
19	0.012	0.0024	NR	-0.71	-0.68
21	0.0101	NR	NR	-1.39	-2.29
23	<0.0040	NR	70.64		
24	0.0102	0.0031	103.59	-1.36	-1.07
25	0.017	0.01	66	1.07	0.30
27	0.0163	0.005	121	0.82	0.44
28	<0.1	NR	NR		
29	0.012	0.00011	95	-0.71	-1.17
30	0.0113776429	0.0011608822	106	-0.94	-1.27
31	0.015	0.003	72	0.36	0.29
32	0.014	0.005	99	0.00	0.00
33	0.0115	0.00345	NR	-0.89	-0.65
35	0.0155	0.0026	78.88	0.54	0.48
36	0.012	0.003	114	-0.71	-0.58
37	0.0134	0.00402	95	-0.21	-0.14
38	0.013	0.001	104	-0.36	-0.51

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0140	0.0017
Spike Value	0.0161	0.0010
Robust Average	0.0143	0.0017
Median	0.0143	0.0017
Mean	0.0145	
N	24	
Max	0.0265	
Min	0.007543	
Robust SD	0.0034	
Robust CV	24%	


Kernel Density
Density
Result
Results: S1 - PFPeA
Assigned Value = 0.0140 ± 0.0017 µg/L
Results (µg/L)
Laboratory
10 21 24 30 33 19 29 36 1 38 37 32 13 11 31 14 35 27 12 25 6 15 5 16 2 3 4 7 8 9 17 18 23 28 Md RA SV


z-Scores: S1 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.0028 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 21 24 30 33 19 29 36 1 38 37 32 13 11 31 14 35 27 12 25 6 15 5 16

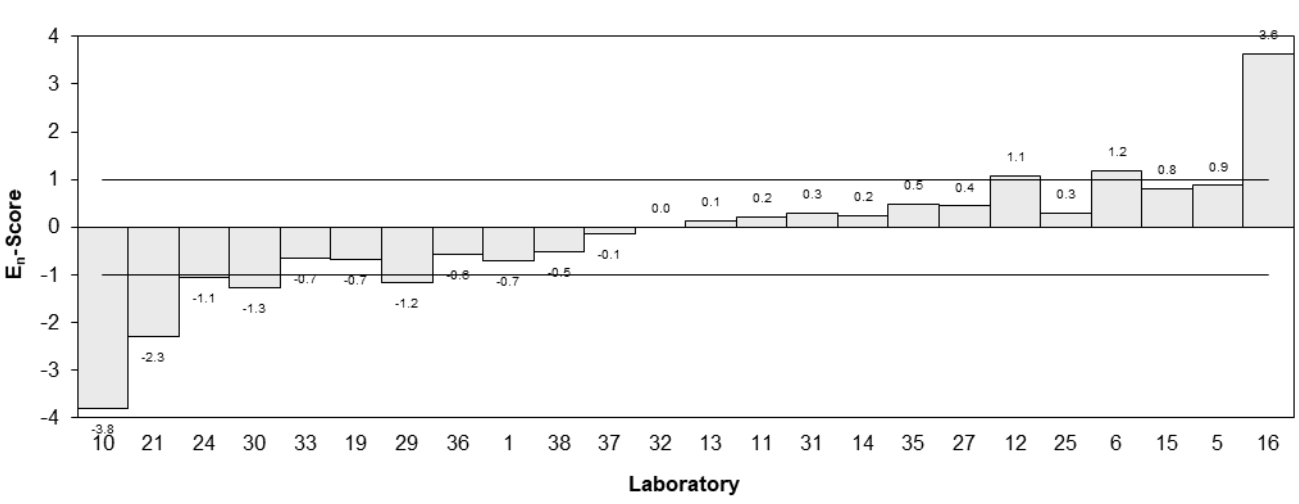

En-Scores: S1 - PFPeA
En-Score
Laboratory
10 21 24 30 33 19 29 36 1 38 37 32 13 11 31 14 35 27 12 25 6 15 5 16

Figure 12

Table 16

Sample Details

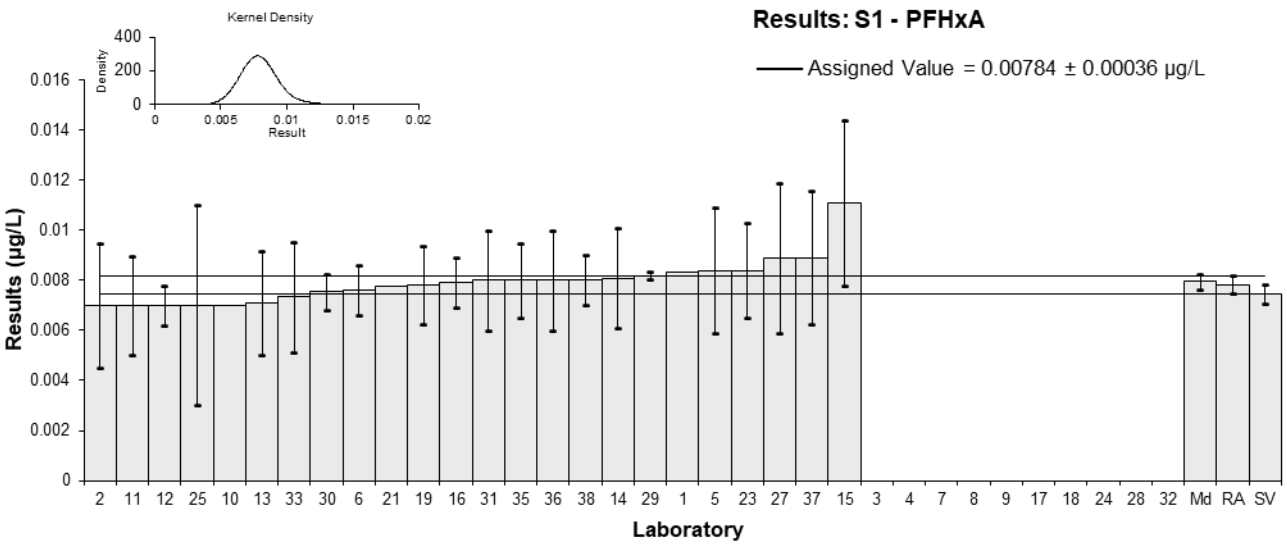
Sample No.	S1
Matrix	Potable Water
Analyte	PFHxA
Unit	µg/L

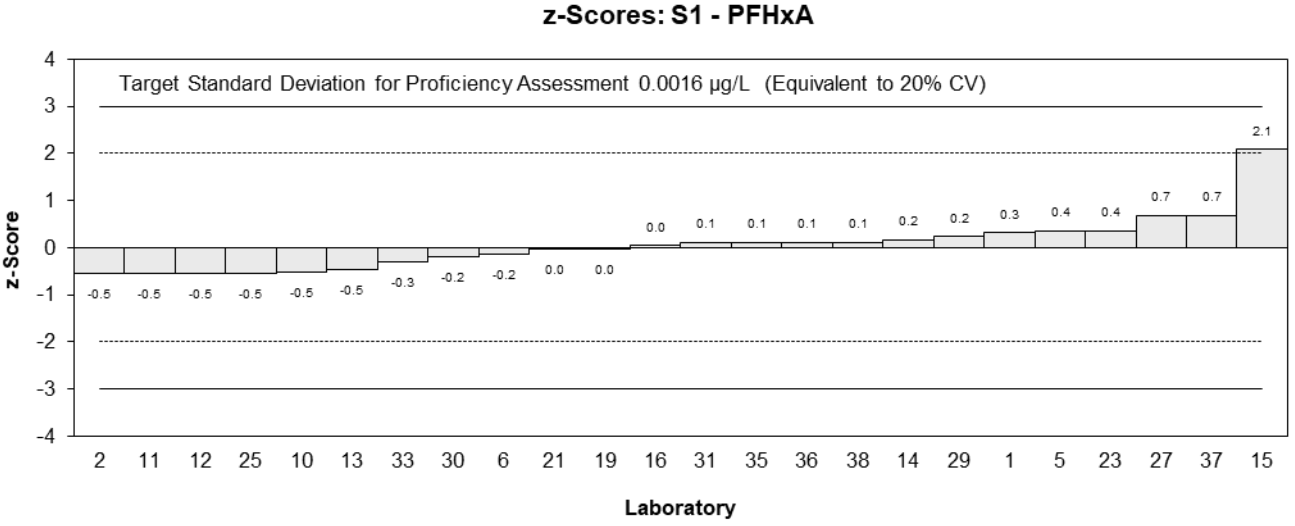
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00833	NR	NR	0.31	1.36
2	0.007	0.0025	103	-0.54	-0.33
3	NR	NR	NR		
4	<0.01	NR	90		
5	0.0084	0.00252	70	0.36	0.22
6	0.0076	0.001	88.47	-0.15	-0.23
7	NR	NR	NR		
8	<0.01	NR	NR		
9	<0.01	NR	62		
10	0.007017	NR	96	-0.52	-2.29
11	0.007	0.00198	90	-0.54	-0.42
12	0.0070	0.0008	NR	-0.54	-0.96
13	0.0071	0.0021	86	-0.47	-0.35
14	0.0081	0.002	77	0.17	0.13
15	0.0111	0.00333	115	2.08	0.97
16	0.0079	0.001	88	0.04	0.06
17	NS	NS	NS		
18	NR	NR	NR		
19	0.0078	0.00156	NR	-0.03	-0.02
21	0.00778	NR	NR	-0.04	-0.17
23	0.0084	0.0019	69.69	0.36	0.29
24	<0.01	NR	103.59		
25	0.007	0.004	103	-0.54	-0.21
27	0.0089	0.003	99	0.68	0.35
28	<0.1	NR	NR		
29	0.0082	0.00015	87	0.23	0.92
30	0.0075452810	0.0007100639	102	-0.19	-0.37
31	0.008	0.002	76	0.10	0.08
32	<0.01	NR	104		
33	0.00735	0.002205	NR	-0.31	-0.22
35	0.008	0.0015	96.28	0.10	0.10
36	0.008	0.002	103	0.10	0.08
37	0.00890	0.00267	97	0.68	0.39
38	0.008	0.001	111	0.10	0.15

Statistics

Assigned Value	0.00784	0.00036
Spike Value	0.00746	0.00036
Robust Average	0.00784	0.00036
Median	0.00795	0.00032
Mean	0.00793	
N	24	
Max	0.0111	
Min	0.007	
Robust SD	0.00071	
Robust CV	9%	


Kernel Density
Density
Result
Results: S1 - PFHxA
Assigned Value = 0.00784 ± 0.00036 µg/L
Results (µg/L)
Laboratory
2 11 12 25 10 13 33 30 6 21 19 16 31 35 36 38 14 29 1 5 23 27 37 15 3 4 7 8 9 17 18 24 28 32 Md RA SV


z-Scores: S1 - PFHxA
Target Standard Deviation for Proficiency Assessment 0.0016 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 11 12 25 10 13 33 30 6 21 19 16 31 35 36 38 14 29 1 5 23 27 37 15

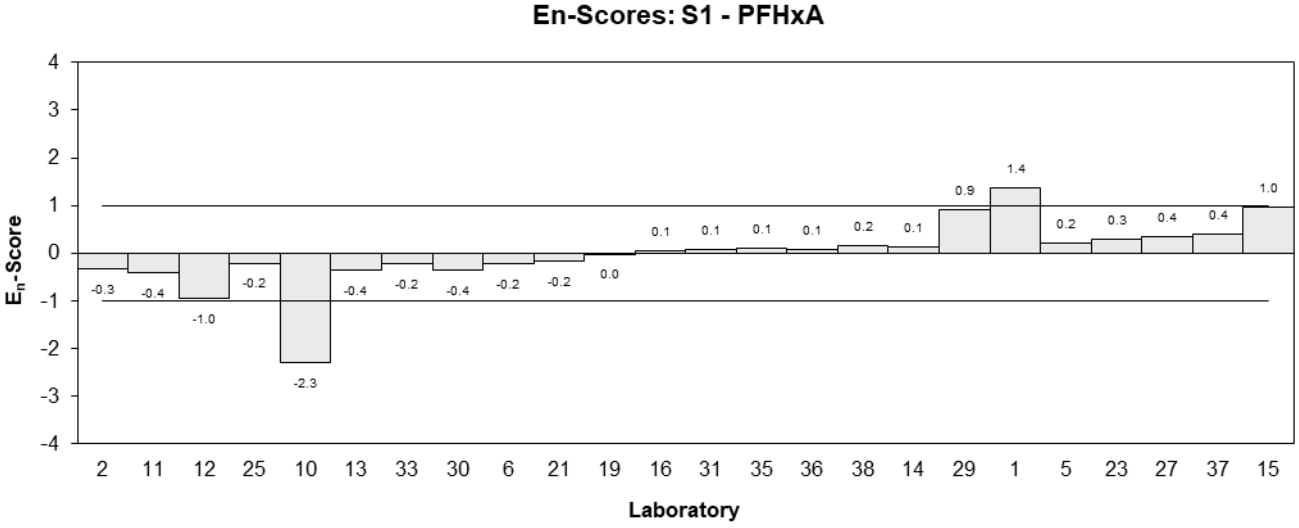

En-Scores: S1 - PFHxA
En-Score
Laboratory
2 11 12 25 10 13 33 30 6 21 19 16 31 35 36 38 14 29 1 5 23 27 37 15

Figure 13

Table 17

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFOA
Unit	µg/L

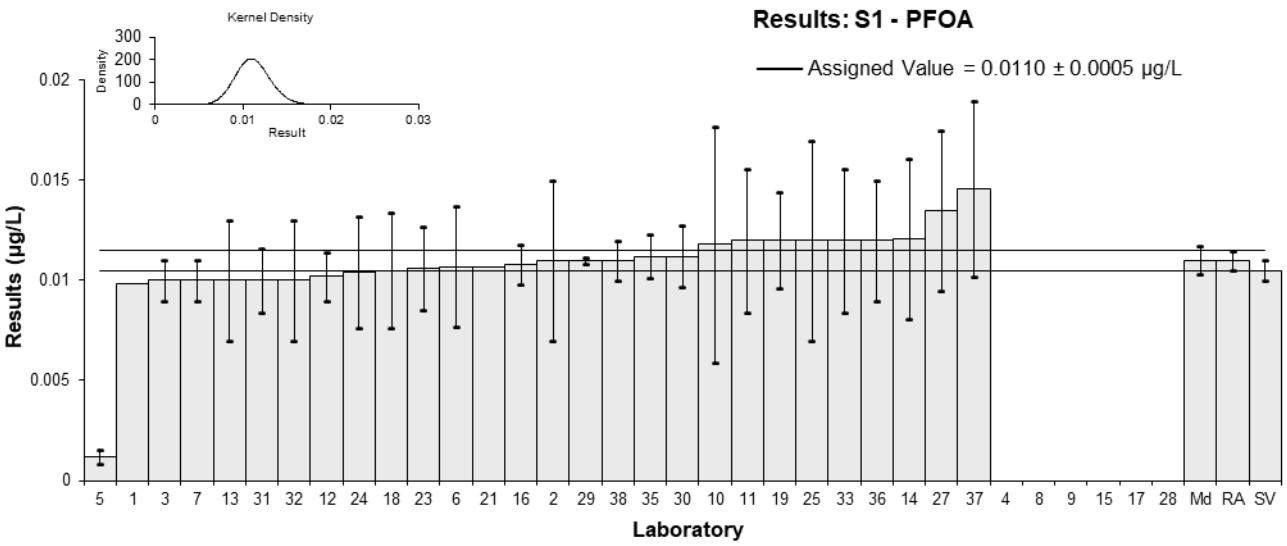
Participant Results

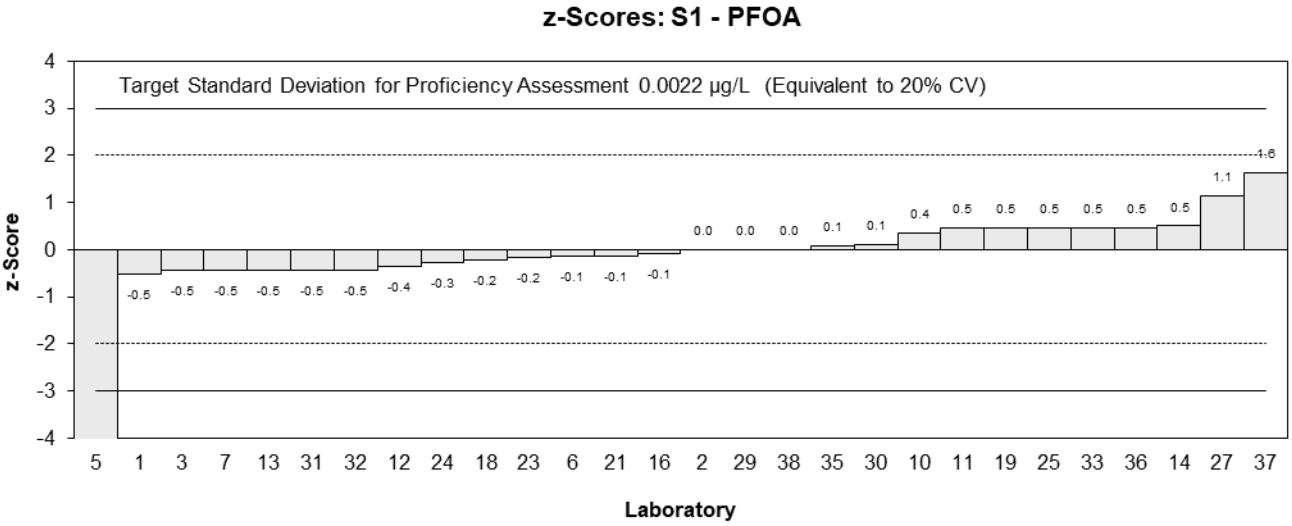
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00986	NR	NR	-0.52	-2.28
2	0.011	0.004	104	0.00	0.00
3	0.010	0.001	121	-0.45	-0.89
4	<0.01	NR	95		
5**	0.0012	0.00036	102	-4.45	-15.91
6	0.0107	0.003	99.91	-0.14	-0.10
7	0.010	0.001	91.1700	-0.45	-0.89
8	<0.01	NR	NR		
9	<0.01	NR	110		
10	0.011795	0.0058975	98	0.36	0.13
11	0.012	0.0036	81	0.45	0.28
12	0.0102	0.0012	NR	-0.36	-0.62
13	0.0100	0.0030	83	-0.45	-0.33
14	0.0121	0.004	100	0.50	0.27
15	NR	NR	NR		
16	0.0108	0.001	101	-0.09	-0.18
17	NS	NS	NS		
18	0.0105	0.0029	NR	-0.23	-0.17
19	0.012	0.0024	NR	0.45	0.41
21	0.0107	NR	NR	-0.14	-0.60
23	0.0106	0.0021	74.14	-0.18	-0.19
24	0.0104	0.0028	102.86	-0.27	-0.21
25	0.012	0.005	98	0.45	0.20
27	0.0135	0.004	138	1.14	0.62
28	<0.1	NR	NR		
29	0.011	0.00016	96	0.00	0.00
30	0.0112129068	0.0015493141	97	0.10	0.13
31	0.01	0.0016	92	-0.45	-0.60
32	0.010	0.003	123	-0.45	-0.33
33	0.012	0.0036	NR	0.45	0.28
35	0.0112	0.0011	111.98	0.09	0.17
36	0.012	0.003	102	0.45	0.33
37	0.0146	0.00438	100	1.64	0.82
38	0.011	0.001	107	0.00	0.00

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0110	0.0005
Spike Value	0.0105	0.0005
Robust Average	0.0110	0.0005
Median	0.0110	0.0007
Mean	0.0112	
N	27	
Max	0.0146	
Min	0.00986	
Robust SD	0.00098	
Robust CV	8.9%	


Results: S1 - PFOA
Kernel Density
Density
Result
Assigned Value = 0.0110 ± 0.0005 µg/L
Results (µg/L)
Laboratory
5 1 3 7 13 31 32 12 24 18 23 6 21 16 2 29 38 35 30 10 11 19 25 33 36 14 27 37 4 8 9 15 17 28 Md RA SV


z-Scores: S1 - PFOA
Target Standard Deviation for Proficiency Assessment 0.0022 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
5 1 3 7 13 31 32 12 24 18 23 6 21 16 2 29 38 35 30 10 11 19 25 33 36 14 27 37

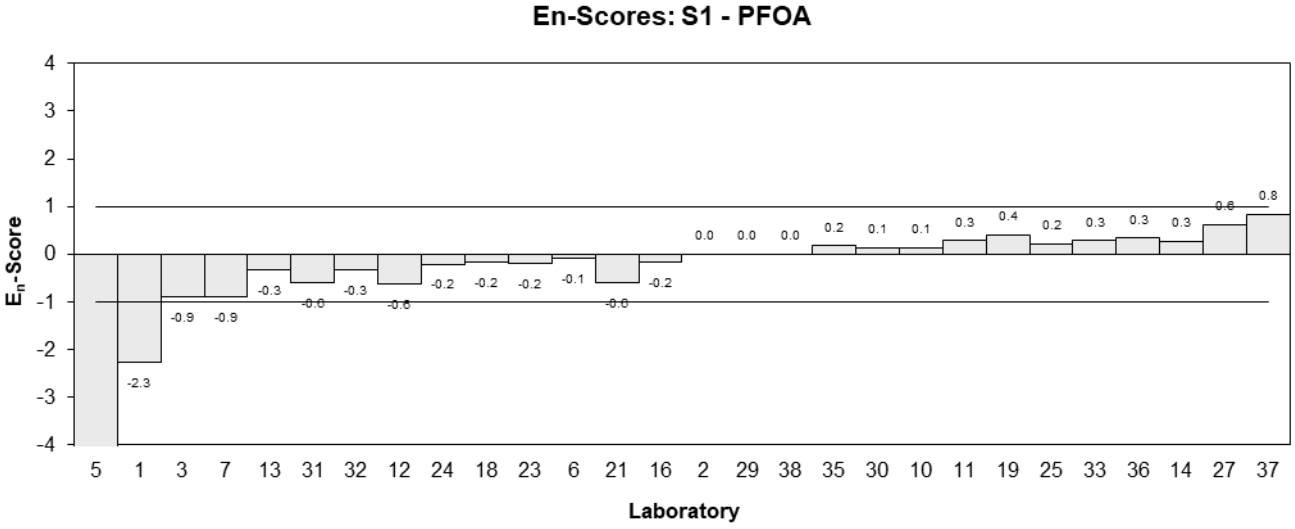

En-Scores: S1 - PFOA
En-Score
Laboratory
5 1 3 7 13 31 32 12 24 18 23 6 21 16 2 29 38 35 30 10 11 19 25 33 36 14 27 37

Figure 14

Table 18

Sample Details

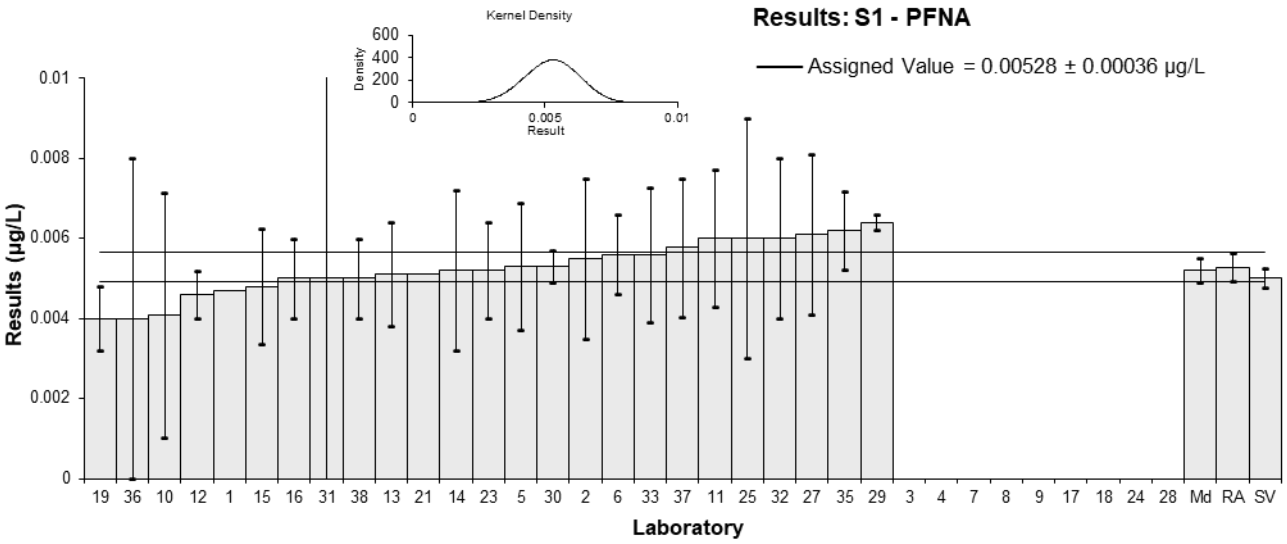
Sample No.	S1
Matrix	Potable Water
Analyte	PFNA
Unit	µg/L

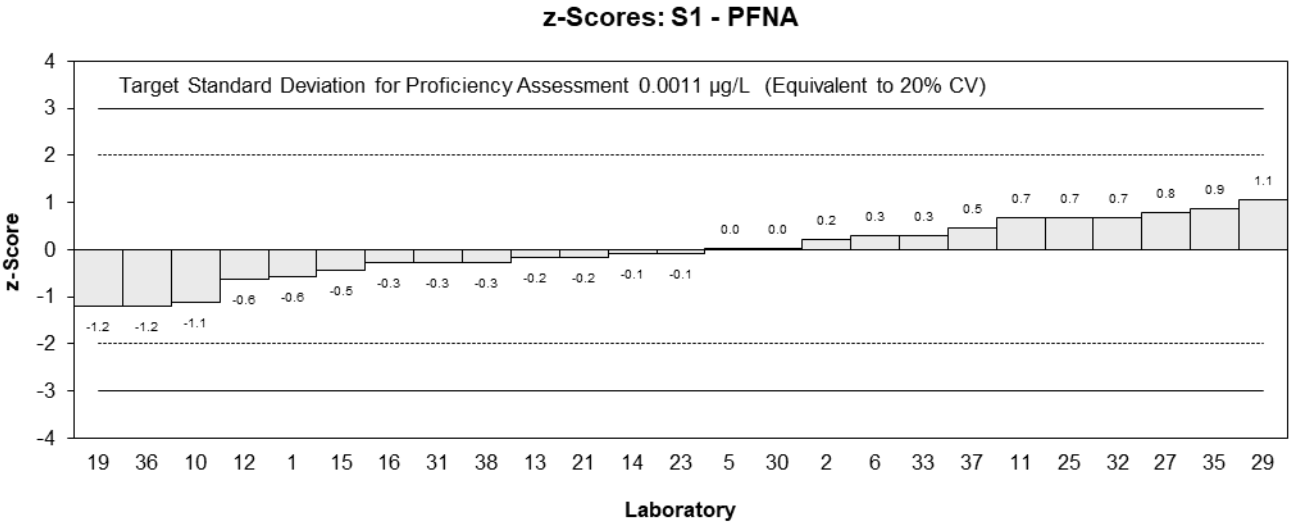
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00468	NR	NR	-0.57	-1.67
2	0.0055	0.002	108	0.21	0.11
3	NR	NR	NR		
4	<0.01	NR	95		
5	0.0053	0.00159	89	0.02	0.01
6	0.0056	0.001	98.81	0.30	0.30
7	NR	NR	NR		
8	<0.01	NR	NR		
9	<0.02	NR	105		
10	0.004084	0.003063	113	-1.13	-0.39
11	0.006	0.00171	88	0.68	0.41
12	0.0046	0.0006	NR	-0.64	-0.97
13	0.0051	0.0013	87	-0.17	-0.13
14	0.0052	0.002	102	-0.08	-0.04
15	0.0048	0.00144	85	-0.45	-0.32
16	0.005	0.001	91	-0.27	-0.26
17	NS	NS	NS		
18	NR	NR	NR		
19	0.004	0.0008	NR	-1.21	-1.46
21	0.00510	NR	NR	-0.17	-0.50
23	0.0052	0.0012	76.45	-0.08	-0.06
24	<0.01	NR	102.86		
25	0.006	0.003	111	0.68	0.24
27	0.0061	0.002	145	0.78	0.40
28	<0.1	NR	NR		
29	0.0064	0.00019	90	1.06	2.75
30	0.0053008734	0.0004079490	98	0.02	0.04
31	0.005	0.0084	107	-0.27	-0.03
32	0.006	0.002	115	0.68	0.35
33	0.0056	0.00168	NR	0.30	0.19
35	0.0062	0.00099	99.32	0.87	0.87
36	0.004	0.004	100	-1.21	-0.32
37	0.00577	0.001731	103	0.46	0.28
38	0.005	0.001	107	-0.27	-0.26

Statistics

Assigned Value	0.00528	0.00036
Spike Value	0.00502	0.00025
Robust Average	0.00528	0.00036
Median	0.00520	0.00030
Mean	0.00526	
N	25	
Max	0.0064	
Min	0.004	
Robust SD	0.00071	
Robust CV	13%	


Results: S1 - PFNA
Kernel Density
Density
Result
Assigned Value = 0.00528 ± 0.00036 µg/L
Results (µg/L)
Laboratory
19 36 10 12 1 15 16 31 38 13 21 14 23 5 30 2 6 33 37 11 25 32 27 35 29 3 4 7 8 9 17 18 24 28 Md RA SV


z-Scores: S1 - PFNA
Target Standard Deviation for Proficiency Assessment 0.0011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
19 36 10 12 1 15 16 31 38 13 21 14 23 5 30 2 6 33 37 11 25 32 27 35 29

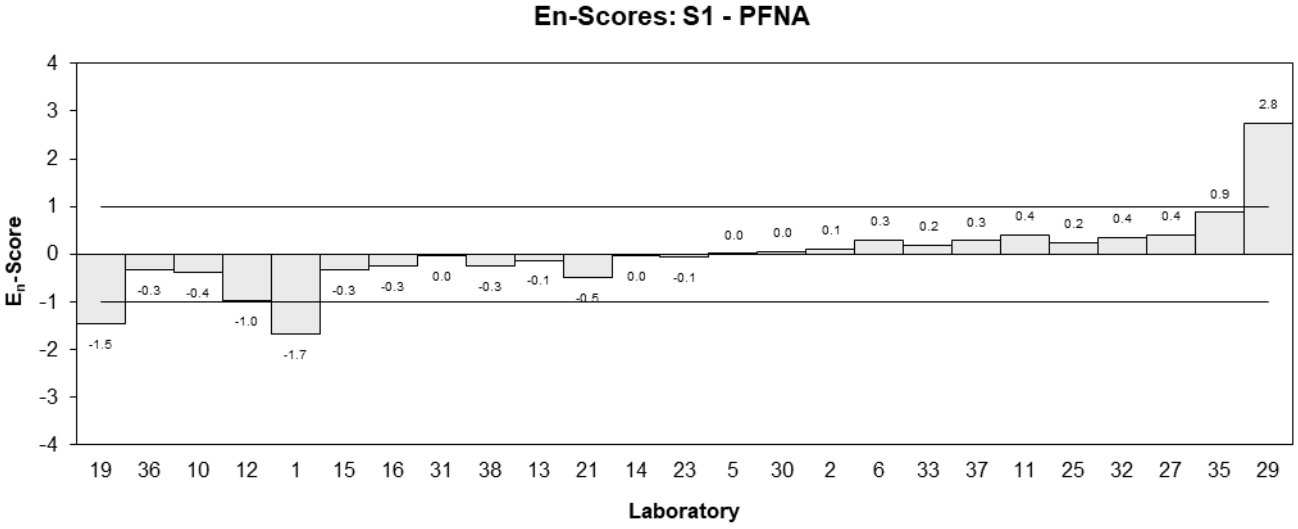

En-Scores: S1 - PFNA
En-Score
Laboratory
19 36 10 12 1 15 16 31 38 13 21 14 23 5 30 2 6 33 37 11 25 32 27 35 29

Figure 15

Table 19

Sample Details

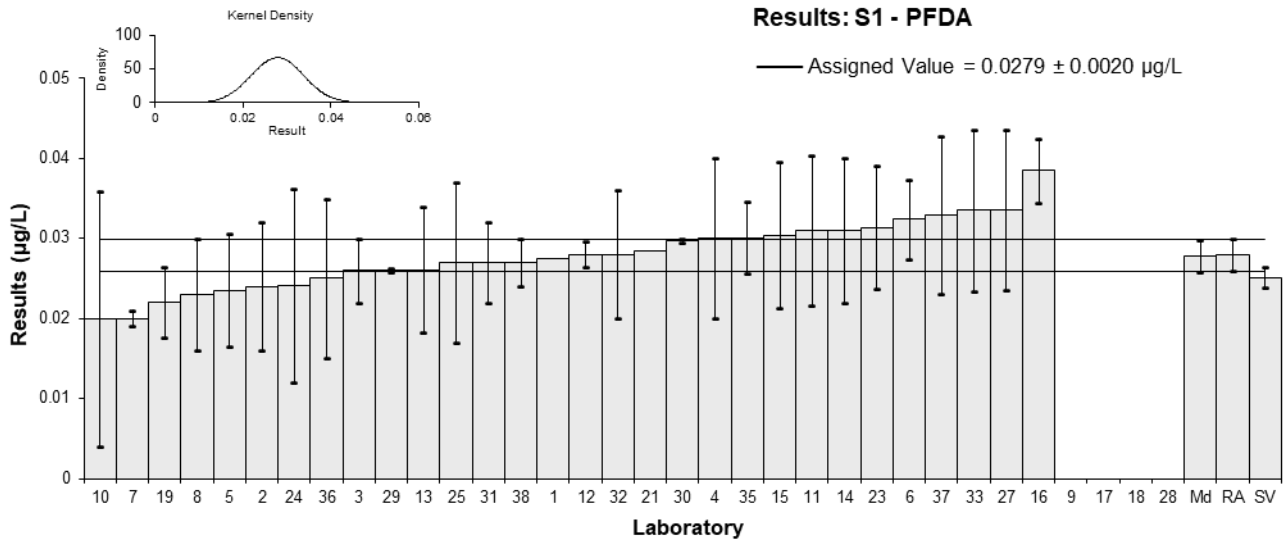
Sample No.	S1
Matrix	Potable Water
Analyte	PFDA
Unit	µg/L

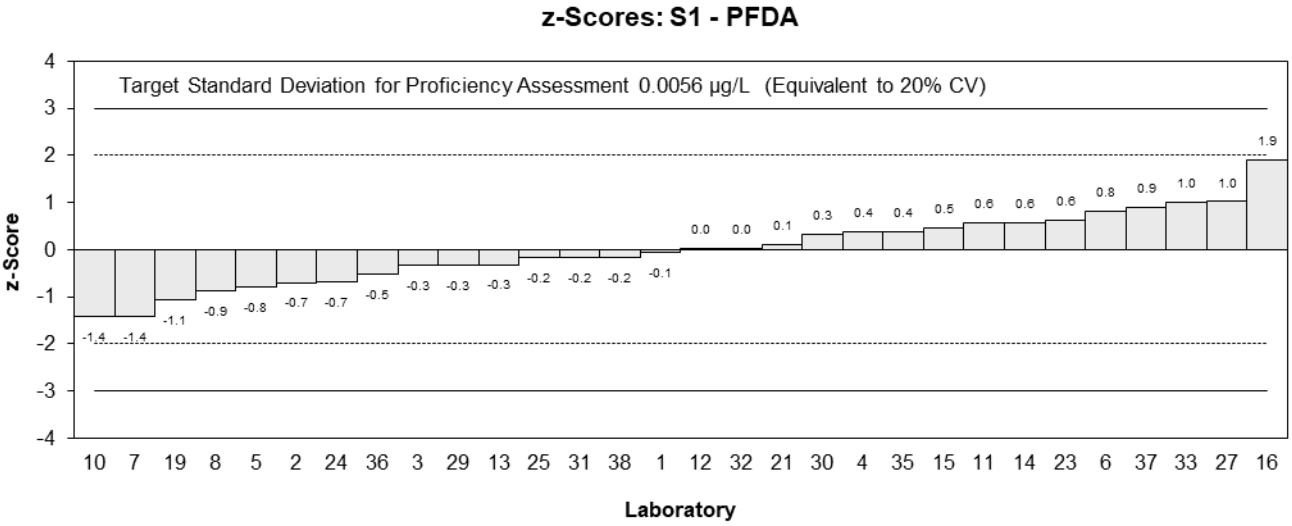
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0275	NR	NR	-0.07	-0.20
2	0.024	0.008	108	-0.70	-0.47
3	0.026	0.004	108	-0.34	-0.42
4	0.03	0.01	91	0.38	0.21
5	0.0235	0.00705	83	-0.79	-0.60
6	0.0324	0.005	95.83	0.81	0.84
7	0.020	0.001	91.0700	-1.42	-3.53
8	0.023	0.007	87	-0.88	-0.67
9	NT	NT	NT		
10	0.019964	0.0159712	113	-1.42	-0.49
11	0.031	0.0093	107	0.56	0.33
12	0.028	0.0016	NR	0.02	0.04
13	0.0261	0.0078	85	-0.32	-0.22
14	0.0310	0.009	94	0.56	0.34
15	0.0304	0.00912	90	0.45	0.27
16	0.0385	0.004	81	1.90	2.37
17	NS	NS	NS		
18	NR	NR	NR		
19	0.022	0.0044	NR	-1.06	-1.22
21	0.0285	NR	NR	0.11	0.30
23	0.0314	0.0077	82.42	0.63	0.44
24	0.0241	0.0121	102.86	-0.68	-0.31
25	0.027	0.01	122	-0.16	-0.09
27	0.0336	0.010	146	1.02	0.56
28	<0.1	NR	NR		
29	0.026	0.00026	122	-0.34	-0.94
30	0.0296981326	0.0002161418	80	0.32	0.89
31	0.027	0.005	92	-0.16	-0.17
32	0.028	0.008	118	0.02	0.01
33	0.0335	0.01005	NR	1.00	0.55
35	0.0301	0.0045	117.39	0.39	0.45
36	0.025	0.01	102	-0.52	-0.28
37	0.0329	0.00987	103	0.90	0.50
38	0.027	0.003	106	-0.16	-0.25

Statistics

Assigned Value	0.0279	0.0020
Spike Value	0.0251	0.0013
Robust Average	0.0279	0.0020
Median	0.0278	0.0020
Mean	0.0279	
N	30	
Max	0.0385	
Min	0.019964	
Robust SD	0.0043	
Robust CV	15%	


Results: S1 - PFDA
Kernel Density
Density
Result
Assigned Value = 0.0279 ± 0.0020 µg/L
Results (µg/L)
Laboratory
10 7 19 8 5 2 24 36 3 29 13 25 31 38 1 12 32 21 30 4 35 15 11 14 23 6 37 33 27 16 9 17 18 28 Md RA SV


z-Scores: S1 - PFDA
Target Standard Deviation for Proficiency Assessment 0.0056 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 7 19 8 5 2 24 36 3 29 13 25 31 38 1 12 32 21 30 4 35 15 11 14 23 6 37 33 27 16

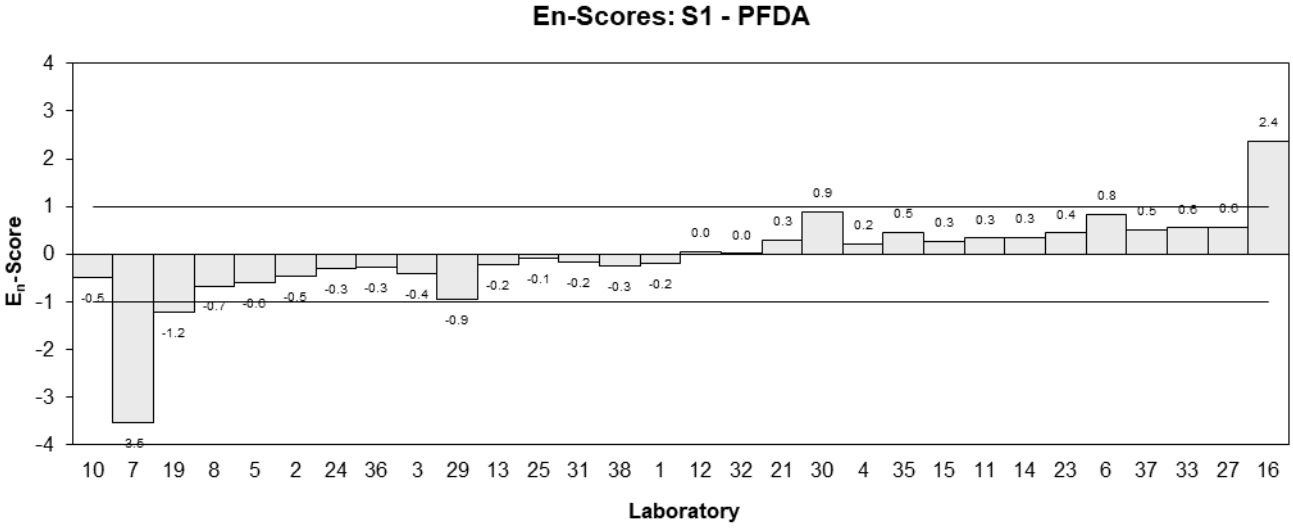

En-Scores: S1 - PFDA
En-Score
Laboratory
10 7 19 8 5 2 24 36 3 29 13 25 31 38 1 12 32 21 30 4 35 15 11 14 23 6 37 33 27 16

Figure 16

Table 20

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFTrDA
Unit	µg/L

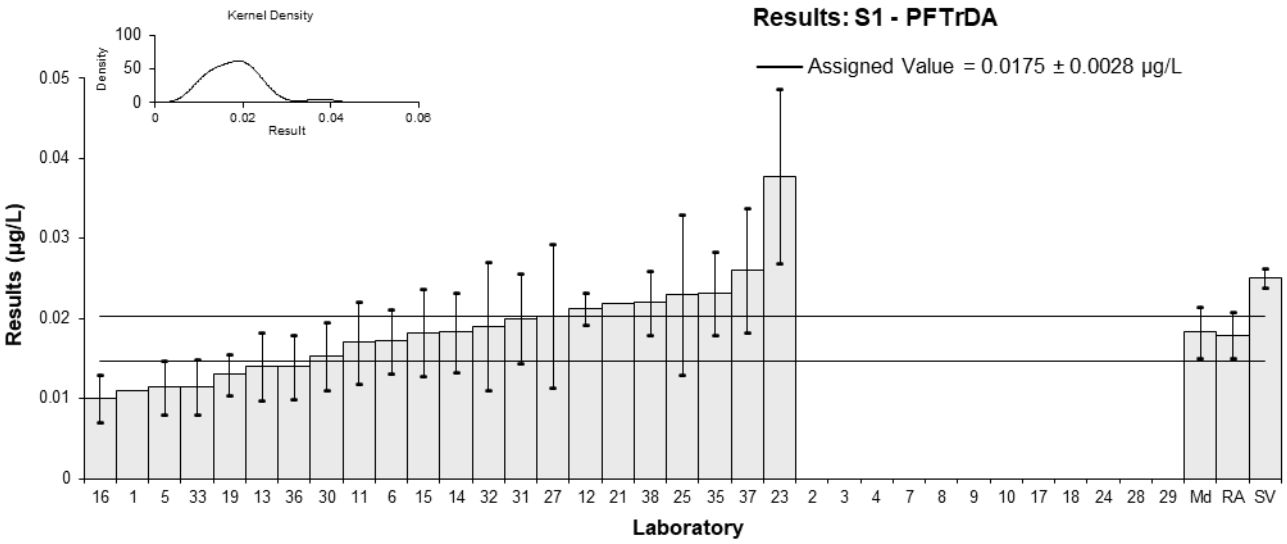
Participant Results

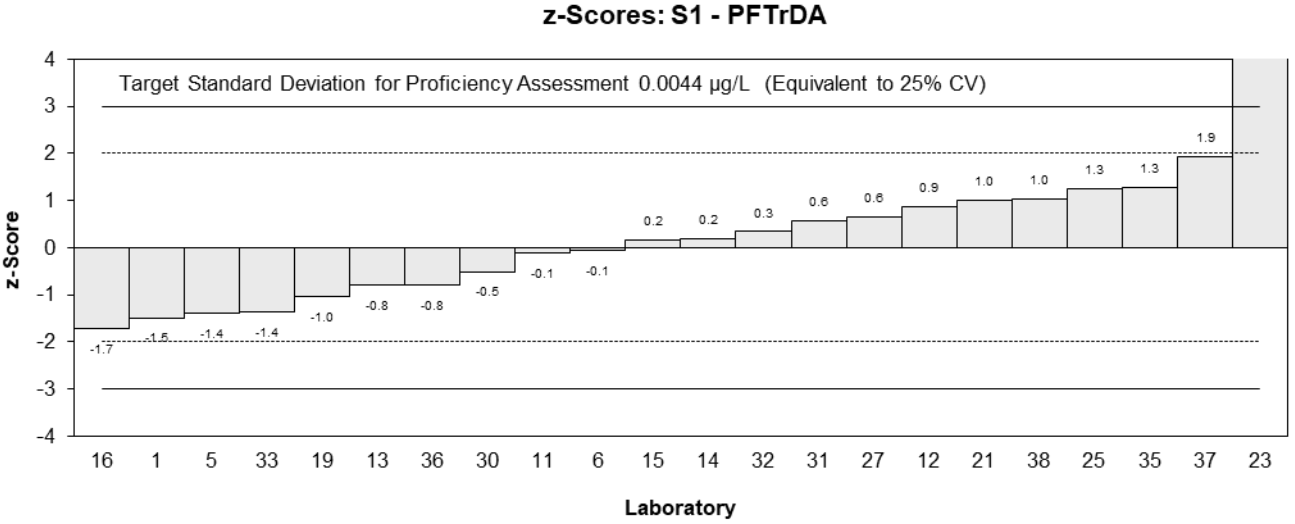
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.011	NR	NR	-1.49	-2.32
2	<0.002	NR	106		
3	NR	NR	NR		
4	<0.1	NR	98		
5	0.0114	0.00342	44	-1.39	-1.38
6	0.0172	0.004	89.92	-0.07	-0.06
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	<0.001	NR	NR		
11	0.017	0.0051	100	-0.11	-0.09
12	0.0213	0.0020	NR	0.87	1.10
13	0.0140	0.0042	NR	-0.80	-0.69
14	0.0183	0.005	66	0.18	0.14
15	0.0182	0.00546	50	0.16	0.11
16	0.01	0.003	NR	-1.71	-1.83
17	NS	NS	NS		
18	NR	NR	NR		
19	0.013	0.0026	NR	-1.03	-1.18
21	0.0219	NR	NR	1.01	1.57
23*	0.0378	0.0109	54.93	4.64	1.80
24	<0.03	NR	71.50		
25	0.023	0.01	129	1.26	0.53
27	0.02030	0.009	143	0.64	0.30
28	<0.1	NR	NR		
29	NR	NR	287		
30	0.0152725175	0.0042065750	48	-0.51	-0.44
31	0.02	0.0056	93	0.57	0.40
32	0.019	0.008	121	0.34	0.18
33	0.0115	0.00345	NR	-1.37	-1.35
35	0.0231	0.0052	114.72	1.28	0.95
36	0.014	0.004	NR	-0.80	-0.72
37	0.0260	0.0078	92	1.94	1.03
38	0.022	0.004	114	1.03	0.92

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0175	0.0028
Spike Value	0.0250	0.0012
Robust Average	0.0179	0.0029
Median	0.0183	0.0032
Mean	0.0184	
N	22	
Max	0.0378	
Min	0.01	
Robust SD	0.0055	
Robust CV	31%	


Kernel Density
Density
Result
Results: S1 - PFTrDA
Assigned Value = 0.0175 ± 0.0028 µg/L
Results (µg/L)
Laboratory
16 1 5 33 19 13 36 30 11 6 15 14 32 31 27 12 21 38 25 35 37 23 2 3 4 7 8 9 10 17 18 24 28 29 Md RA SV


z-Scores: S1 - PFTrDA
Target Standard Deviation for Proficiency Assessment 0.0044 µg/L (Equivalent to 25% CV)
z-Score
Laboratory
16 1 5 33 19 13 36 30 11 6 15 14 32 31 27 12 21 38 25 35 37 23

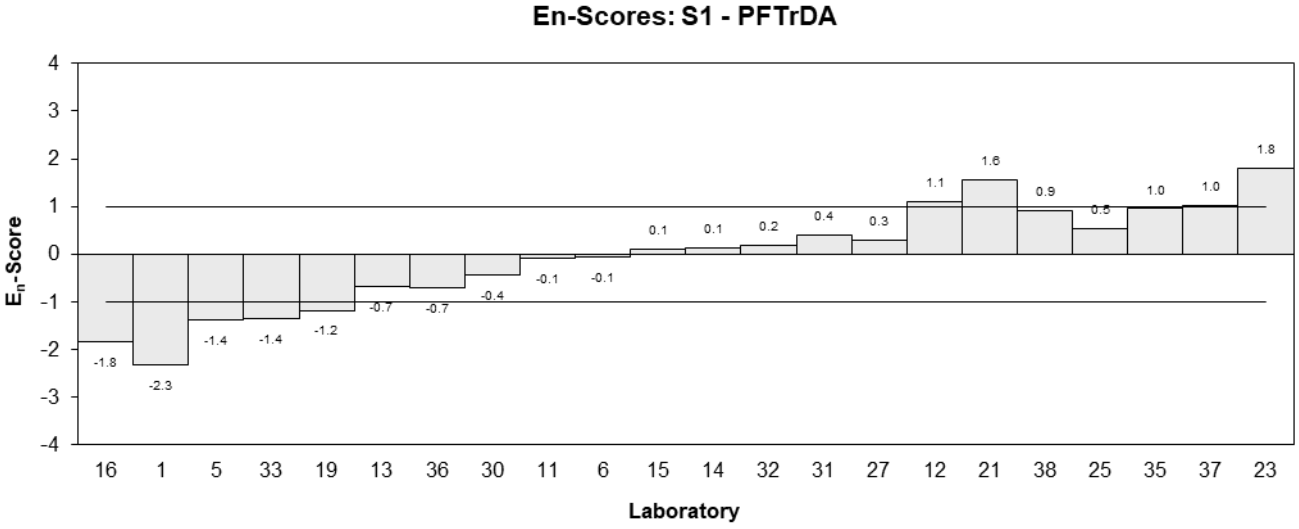

En-Scores: S1 - PFTrDA
En-Score
Laboratory
16 1 5 33 19 13 36 30 11 6 15 14 32 31 27 12 21 38 25 35 37 23

Figure 17

Table 21

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFTeDA
Unit	µg/L

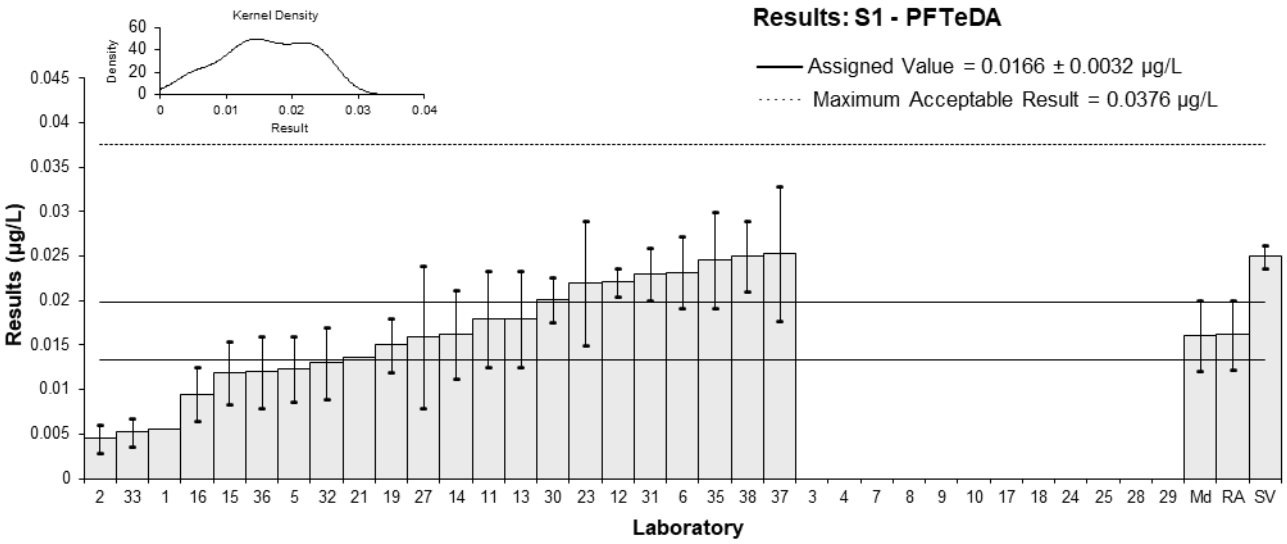
Participant Results

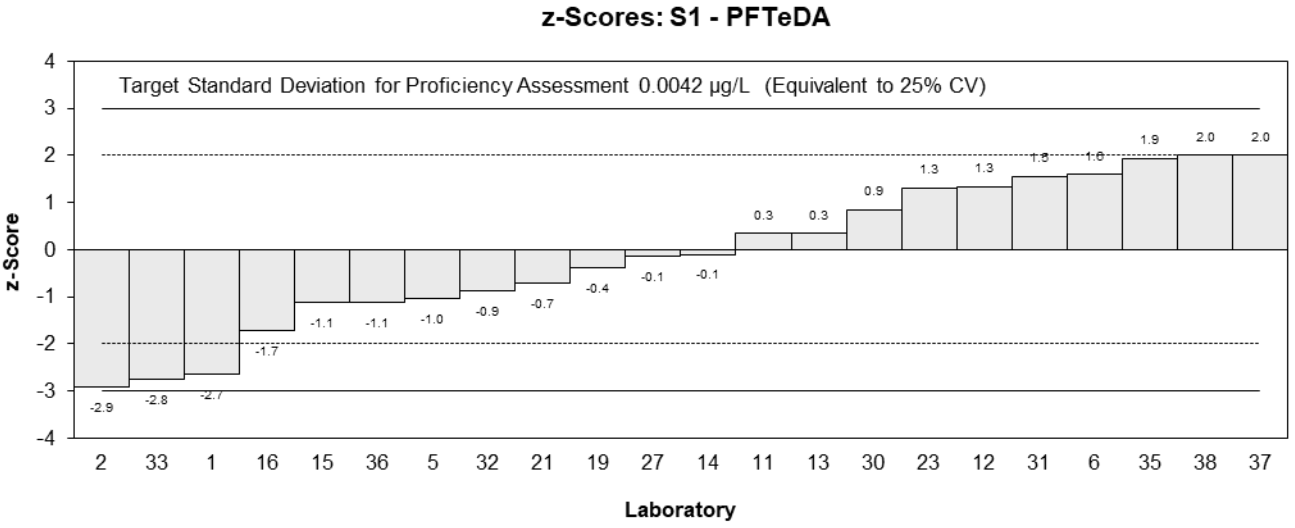
Lab. Code	Result	Uncertainty	Rec	z	E_n
1*	0.00561	NR	NR	-2.65	-3.43
2*	0.0045	0.0016	NR	-2.92	-3.38
3	NR	NR	NR		
4	<0.5	NR	100		
5	0.0123	0.00369	26	-1.04	-0.88
6	0.0232	0.004	46.82	1.59	1.29
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	<0.001	NR	101		
11	0.018	0.0054	100	0.34	0.22
12	0.0221	0.0016	NR	1.33	1.54
13	0.0180	0.0054	130	0.34	0.22
14	0.0162	0.005	66	-0.10	-0.07
15	0.0119	0.00357	25	-1.13	-0.98
16	0.0095	0.003	76	-1.71	-1.62
17	NS	NS	NS		
18	NR	NR	NR		
19	0.015	0.003	NR	-0.39	-0.36
21	0.0136	NR	NR	-0.72	-0.94
23	0.022	0.007	94.37	1.30	0.70
24	<0.02	NR	71.50		
25	< 0.05	NR	129		
27	0.01600	0.008	143	-0.14	-0.07
28	<0.1	NR	NR		
29	NR	NR	169		
30	0.0201358375	0.0025257026	19	0.85	0.87
31	0.023	0.003	78	1.54	1.46
32	0.013	0.004	105	-0.87	-0.70
33*	0.0052	0.00156	NR	-2.75	-3.20
35*	0.0246	0.0054	115.66	1.93	1.27
36	0.012	0.004	76	-1.11	-0.90
37*	0.0253	0.00759	88	2.00▼	
38*	0.025	0.004	121	2.00▼	

* Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.0166	0.0032
Spike Value	0.0250	0.0013
Robust Average	0.0162	0.0039
Max Acceptable Result	0.0376	
Median	0.0161	0.0040
Mean	0.0162	
N	22	
Max	0.0253	
Min	0.0045	
Robust SD	0.0074	
Robust CV	45%	


Kernel Density
Density
Result
Results: S1 - PFTeDA
Assigned Value = 0.0166 ± 0.0032 µg/L
Maximum Acceptable Result = 0.0376 µg/L
Results (µg/L)
Laboratory
2 33 1 16 15 36 5 32 21 19 27 14 11 13 30 23 12 31 6 35 38 37 3 4 7 8 9 10 17 18 24 25 28 29 Md RA SV


z-Scores: S1 - PFTeDA
Target Standard Deviation for Proficiency Assessment 0.0042 µg/L (Equivalent to 25% CV)
z-Score
Laboratory
2 33 1 16 15 36 5 32 21 19 27 14 11 13 30 23 12 31 6 35 38 37

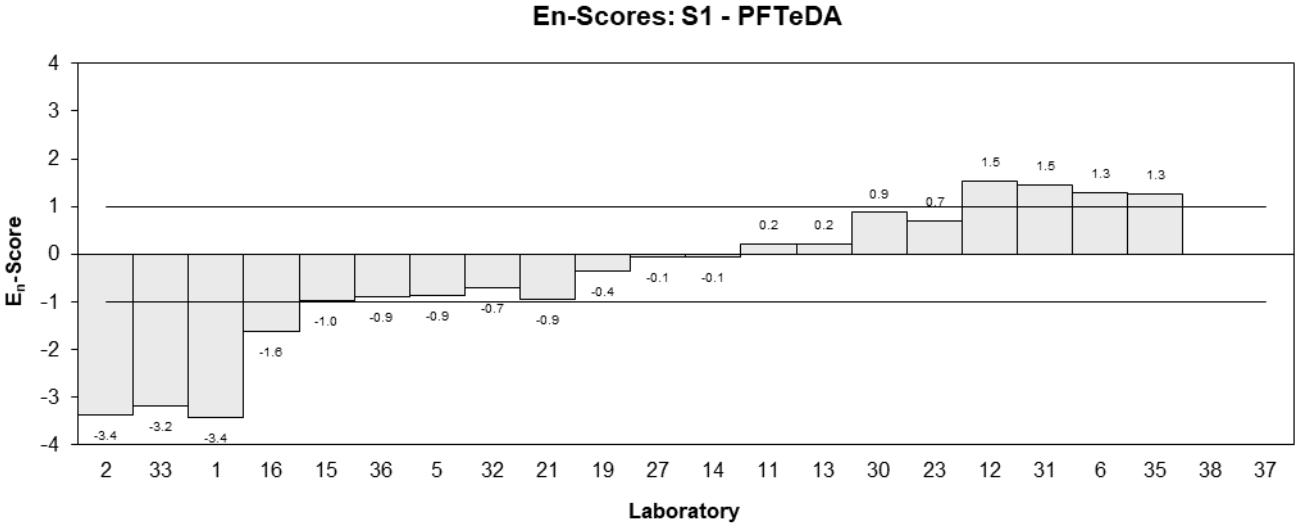

En-Scores: S1 - PFTeDA
En-Score
Laboratory
2 33 1 16 15 36 5 32 21 19 27 14 11 13 30 23 12 31 6 35 38 37

Figure 18

Table 22

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFODA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.0423	NR	NR
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	0.0682	0.02046	72
6	NT	NT	NT
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	0.072	0.0216	72
16	NR	NR	NR
17	NS	NS	NS
18	NR	NR	NR
19	NT	NT	NT
21	0.0468	NR	NR
23	NT	NT	NT
24	<0.19	NR	71.50
25	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	0.0742	0.02226	99
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0700	0.0035
Robust Average	NA (N<6)	
Median	0.0682	0.0099
Mean	0.061	
N	5	
Max	0.0742	
Min	0.0423	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

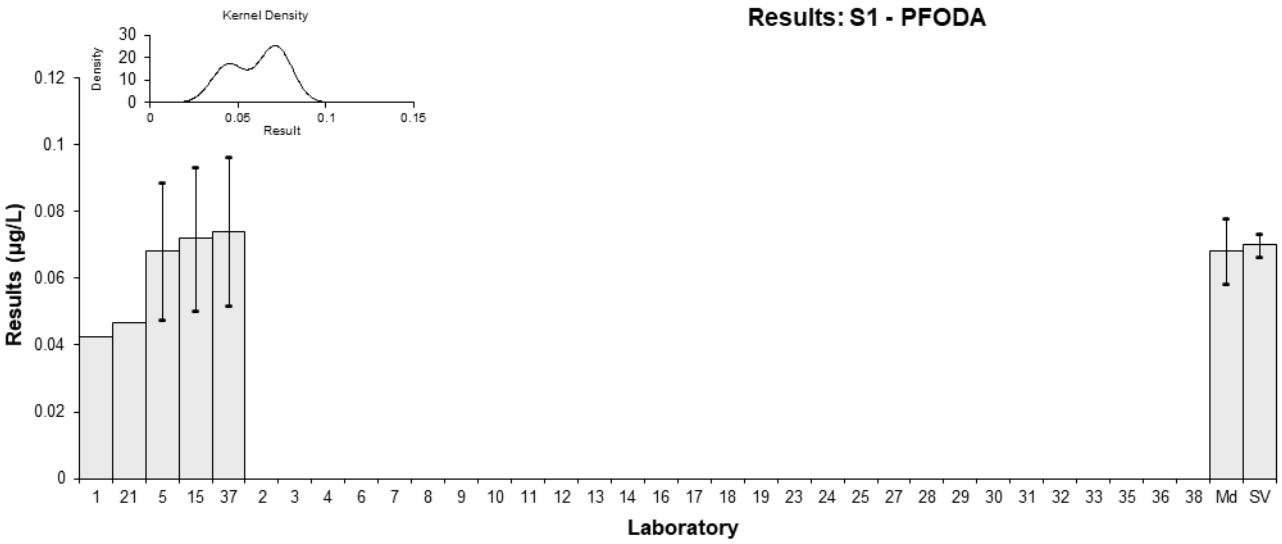

Results: S1 - PFODA
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 21 5 15 37 2 3 4 6 7 8 9 10 11 12 13 14 16 17 18 19 23 24 25 27 28 29 30 31 32 33 35 36 38 Md SV

Figure 19

Table 23

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	PFOSA
Unit	µg/L

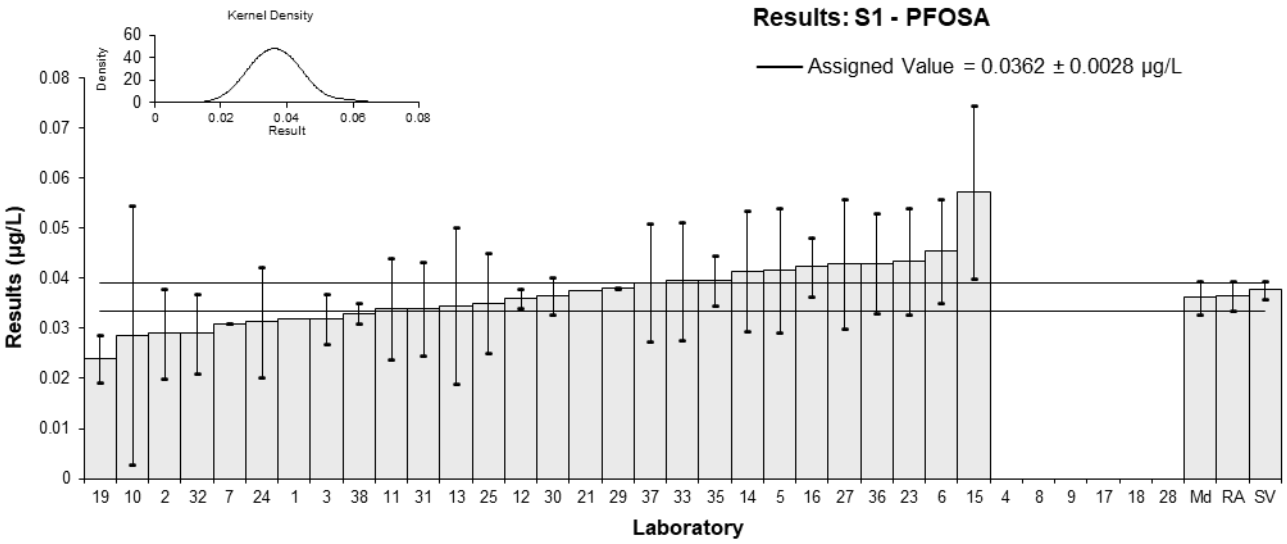
Participant Results

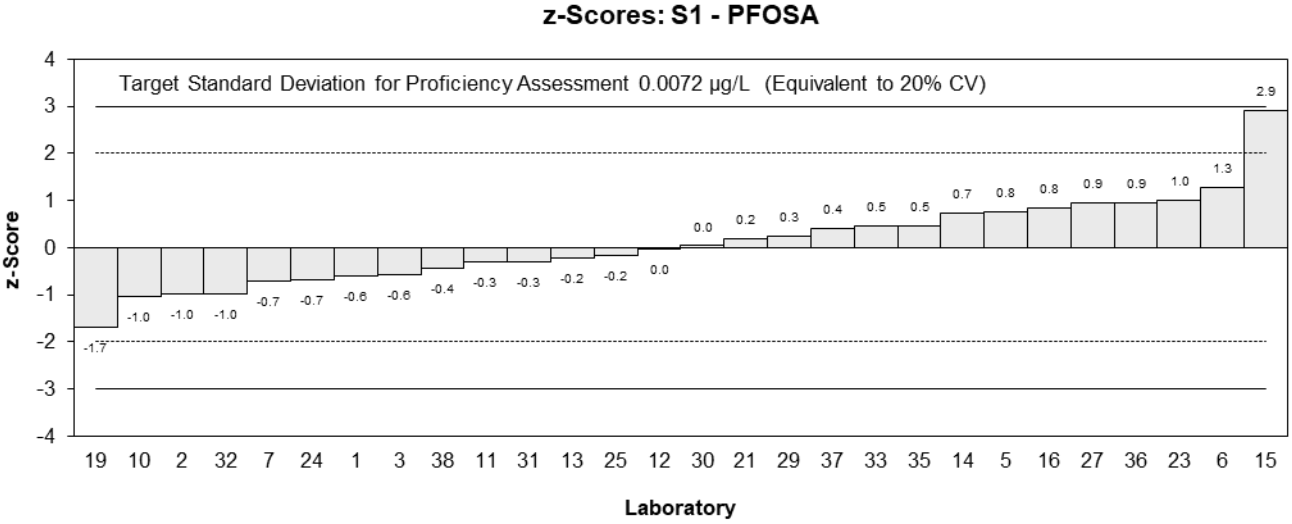
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0318	NR	NR	-0.61	-1.57
2	0.029	0.009	NR	-0.99	-0.76
3	0.032	0.005	92	-0.58	-0.73
4	<0.1	NR	97		
5	0.0417	0.01251	65	0.76	0.43
6	0.0455	0.0103	73.22	1.28	0.87
7	0.031	0.0001	104.65	-0.72	-1.86
8	<0.05	NR	NR		
9	NT	NT	NT		
10	0.028675	0.0258075	100	-1.04	-0.29
11	0.034	0.0102	75	-0.30	-0.21
12	0.0360	0.0020	NR	-0.03	-0.06
13	0.0346	0.0156	81	-0.22	-0.10
14	0.0415	0.012	89	0.73	0.43
15*	0.0573	0.01719	30	2.91	1.21
16	0.0423	0.006	73	0.84	0.92
17	NS	NS	NS		
18	NR	NR	NR		
19	0.024	0.0048	NR	-1.69	-2.20
21	0.0375	NR	NR	0.18	0.46
23	0.0435	0.0106	72.79	1.01	0.67
24	0.0313	0.011	62.08	-0.68	-0.43
25	0.035	0.01	104	-0.17	-0.12
27	0.0430	0.013	127	0.94	0.51
28	NT	NT	NT		
29	0.038	0.00016	58	0.25	0.64
30	0.0364672858	0.0037093966	90	0.04	0.06
31	0.034	0.0093	90	-0.30	-0.23
32	0.029	0.008	96	-0.99	-0.85
33	0.0395	0.01185	NR	0.46	0.27
35	0.0396	0.0049	94.3	0.47	0.60
36	0.043	0.01	108	0.94	0.65
37	0.0392	0.01176	86	0.41	0.25
38	0.033	0.002	106	-0.44	-0.93

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0362	0.0028
Spike Value	0.0377	0.0019
Robust Average	0.0365	0.0029
Median	0.0362	0.0033
Mean	0.0368	
N	28	
Max	0.0573	
Min	0.024	
Robust SD	0.0062	
Robust CV	17%	


Results: S1 - PFOSA
Kernel Density
Density
Result
Assigned Value = 0.0362 ± 0.0028 µg/L
Results (µg/L)
Laboratory
19 10 2 32 7 24 1 3 38 11 31 13 25 12 30 21 29 37 33 35 14 5 16 27 36 23 6 15 4 8 9 17 18 28 Md RA SV


z-Scores: S1 - PFOSA
Target Standard Deviation for Proficiency Assessment 0.0072 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
19 10 2 32 7 24 1 3 38 11 31 13 25 12 30 21 29 37 33 35 14 5 16 27 36 23 6 15

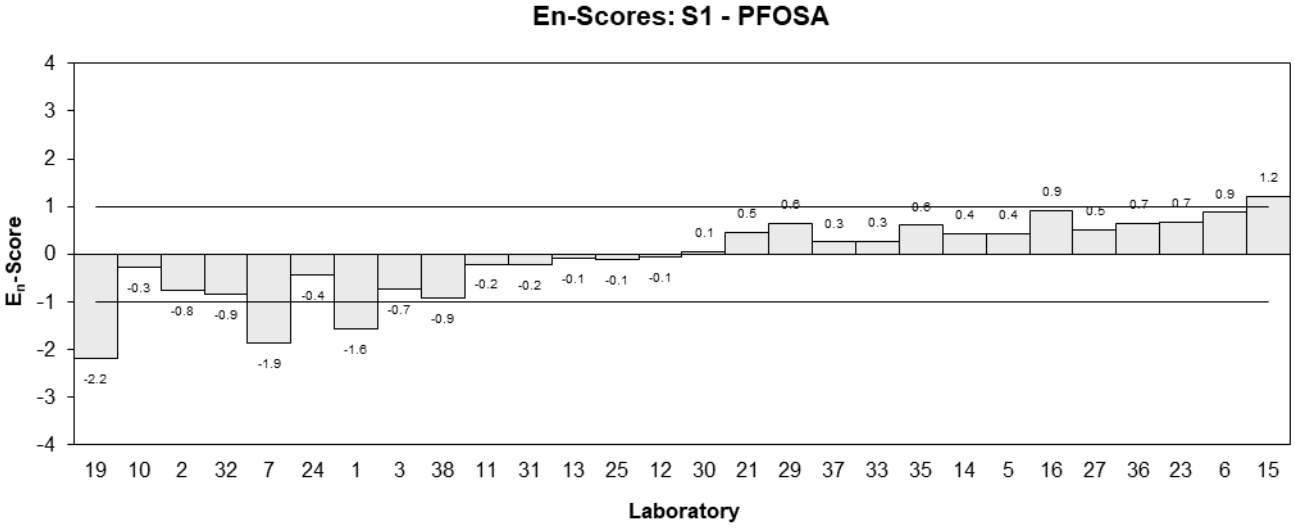

En-Scores: S1 - PFOSA
En-Score
Laboratory
19 10 2 32 7 24 1 3 38 11 31 13 25 12 30 21 29 37 33 35 14 5 16 27 36 23 6 15

Figure 20

Table 24

Sample Details

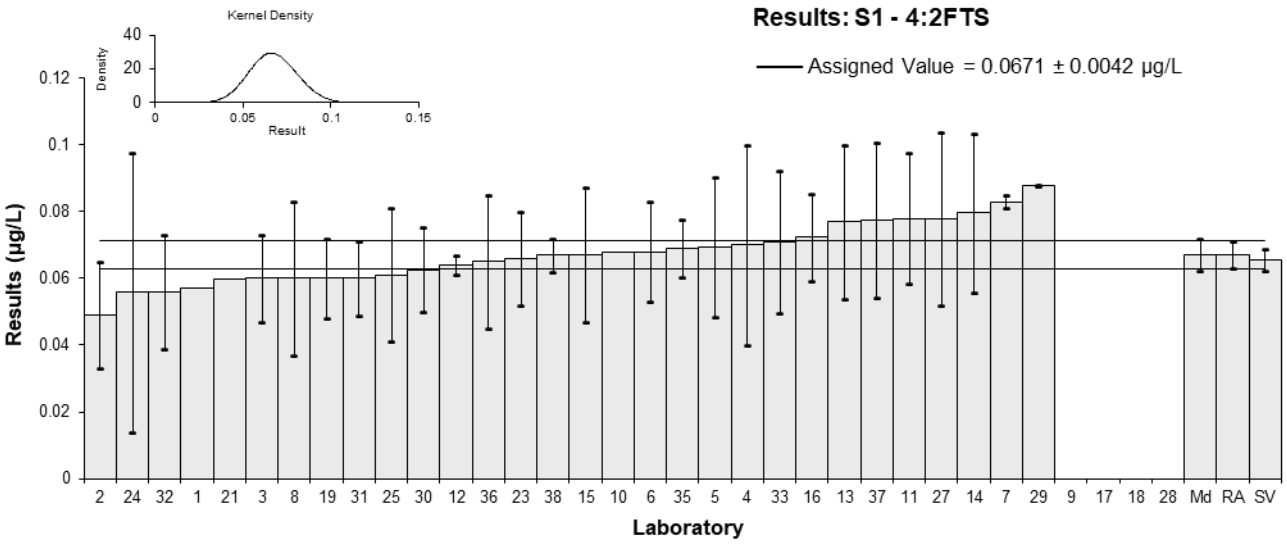
Sample No.	S1
Matrix	Potable Water
Analyte	4:2FTS
Unit	µg/L

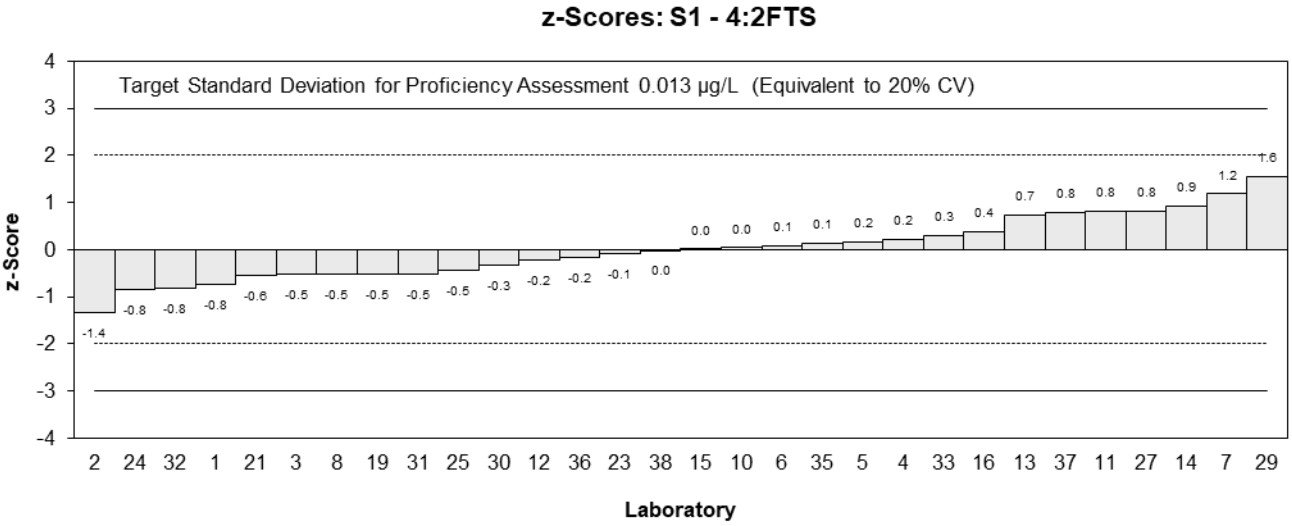
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0571	NR	NR	-0.75	-2.38
2	0.049	0.016	NR	-1.35	-1.09
3	0.060	0.013	145	-0.53	-0.52
4	0.07	0.03	78	0.22	0.10
5	0.0694	0.02082	83	0.17	0.11
6	0.068	0.015	178.52	0.07	0.06
7	0.083	0.002	115.98	1.18	3.42
8	0.06	0.023	215	-0.53	-0.30
9	NT	NT	NT		
10	0.067695	NR	116	0.04	0.14
11	0.078	0.0195	138	0.81	0.55
12	0.064	0.0030	NR	-0.23	-0.60
13	0.0770	0.0231	87	0.74	0.42
14	0.0796	0.024	94	0.93	0.51
15	0.0672	0.02016	95	0.01	0.00
16	0.0723	0.013	98	0.39	0.38
17	NS	NS	NS		
18	NR	NR	NR		
19	0.06	0.012	NR	-0.53	-0.56
21	0.0597	NR	NR	-0.55	-1.76
23	0.066	0.014	75.38	-0.08	-0.08
24	0.0558	0.0419	128.33	-0.84	-0.27
25	0.061	0.02	124	-0.45	-0.30
27	0.0780	0.026	199	0.81	0.41
28	<0.1	NR	NR		
29	0.088	0.0002	120	1.56	4.97
30	0.0626283944	0.0126752648	171	-0.33	-0.33
31	0.06	0.011	90	-0.53	-0.60
32	0.056	0.017	144	-0.83	-0.63
33	0.071	0.0213	NR	0.29	0.18
35	0.069	0.0086	73.24	0.14	0.20
36	0.065	0.02	103	-0.16	-0.10
37	0.0776	0.02328	96	0.78	0.44
38	0.067	0.005	91	-0.01	-0.02

Statistics

Assigned Value	0.0671	0.0042
Spike Value	0.0654	0.0033
Robust Average	0.0671	0.0042
Median	0.0671	0.0048
Mean	0.0673	
N	30	
Max	0.088	
Min	0.049	
Robust SD	0.0092	
Robust CV	14%	


Kernel Density
Density
Result
Results: S1 - 4:2FTS
Assigned Value = 0.0671 ± 0.0042 µg/L
Results (µg/L)
Laboratory
2 24 32 1 21 3 8 19 31 25 30 12 36 23 38 15 10 6 35 5 4 33 16 13 37 11 27 14 7 29 9 17 18 28 Md RA SV


z-Scores: S1 - 4:2FTS
Target Standard Deviation for Proficiency Assessment 0.013 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 24 32 1 21 3 8 19 31 25 30 12 36 23 38 15 10 6 35 5 4 33 16 13 37 11 27 14 7 29

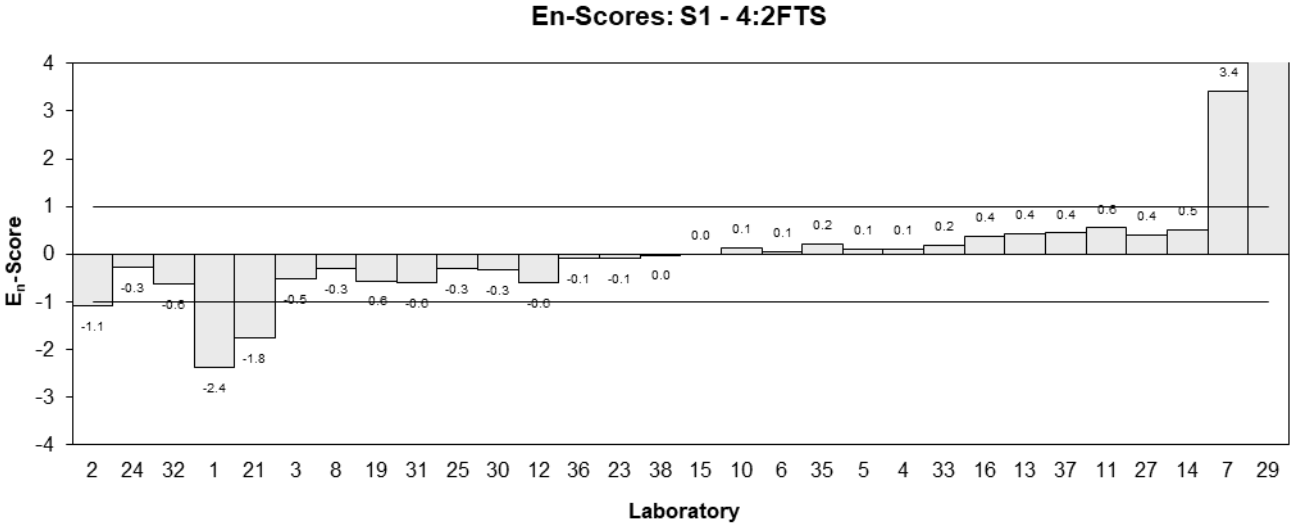

En-Scores: S1 - 4:2FTS
En-Score
Laboratory
2 24 32 1 21 3 8 19 31 25 30 12 36 23 38 15 10 6 35 5 4 33 16 13 37 11 27 14 7 29

Figure 21

Table 25

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	6:2FTS
Unit	µg/L

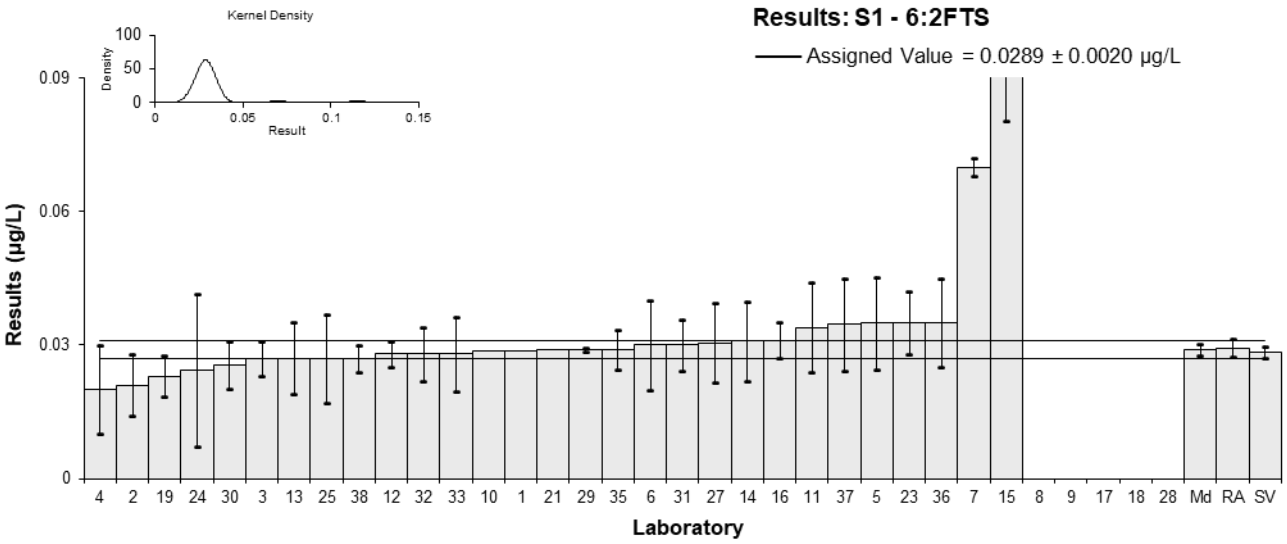
Participant Results

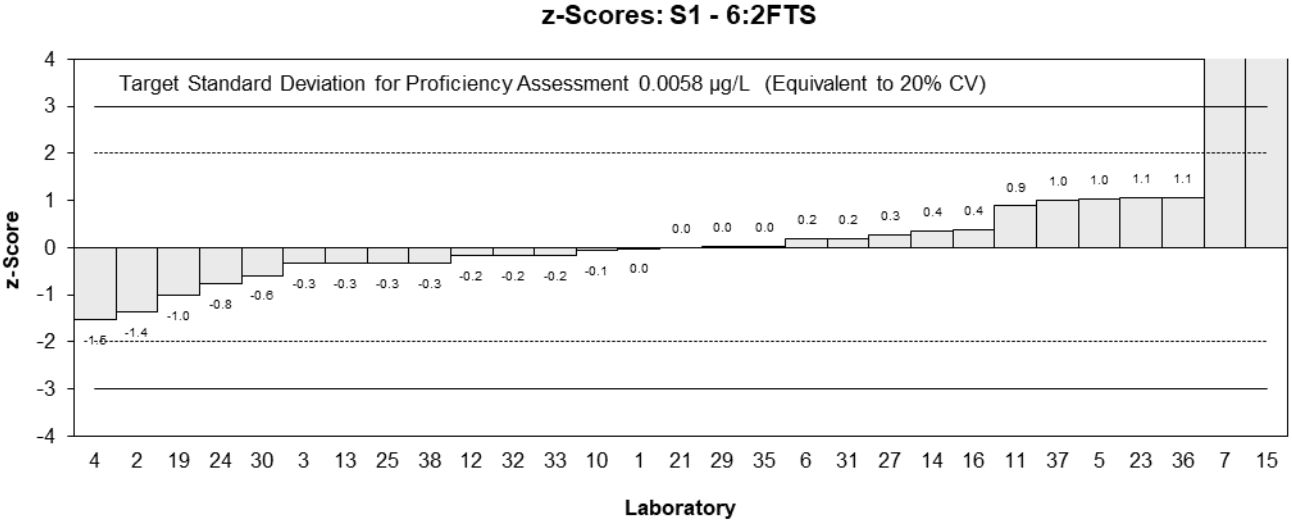
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0288	NR	NR	-0.02	-0.05
2	0.021	0.007	NR	-1.37	-1.09
3	0.027	0.004	102	-0.33	-0.42
4	0.02	0.01	76	-1.54	-0.87
5	0.0349	0.01047	101	1.04	0.56
6	0.03	0.01	135.16	0.19	0.11
7*	0.070	0.002	95.13	7.11	14.53
8	<0.05	NR	NR		
9	<0.03	NR	119		
10	0.02862	NR	104	-0.05	-0.14
11	0.034	0.0102	116	0.88	0.49
12	0.028	0.0030	NR	-0.16	-0.25
13	0.0270	0.0081	89	-0.33	-0.23
14	0.0309	0.009	110	0.35	0.22
15*	0.115	0.0345	101	14.90	2.49
16	0.0311	0.004	103	0.38	0.49
17	NS	NS	NS		
18	NR	NR	NR		
19	0.023	0.0046	NR	-1.02	-1.18
21	0.0289	NR	NR	0.00	0.00
23	0.035	0.007	89.87	1.06	0.84
24	0.0244	0.0171	128.33	-0.78	-0.26
25	0.027	0.01	113	-0.33	-0.19
27	0.0305	0.009	142	0.28	0.17
28	<0.1	NR	NR		
29	0.029	0.00032	105	0.02	0.05
30	0.0254818884	0.0052947587	133	-0.59	-0.60
31	0.03	0.0059	133	0.19	0.18
32	0.028	0.006	183	-0.16	-0.14
33	0.028	0.0084	NR	-0.16	-0.10
35	0.029	0.0044	107.05	0.02	0.02
36	0.035	0.01	117	1.06	0.60
37	0.0347	0.01041	110	1.00	0.55
38	0.027	0.003	94	-0.33	-0.53

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0289	0.0020
Spike Value	0.0284	0.0014
Robust Average	0.0294	0.0021
Median	0.0289	0.0013
Mean	0.0331	
N	29	
Max	0.115	
Min	0.02	
Robust SD	0.0045	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - 6:2FTS
Assigned Value = 0.0289 ± 0.0020 µg/L
Results (µg/L)
Laboratory
4 2 19 24 30 3 13 25 38 12 32 33 10 1 21 29 35 6 31 27 14 16 11 37 5 23 36 7 15 8 9 17 18 28 Md RA SV


z-Scores: S1 - 6:2FTS
Target Standard Deviation for Proficiency Assessment 0.0058 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
4 2 19 24 30 3 13 25 38 12 32 33 10 1 21 29 35 6 31 27 14 16 11 37 5 23 36 7 15

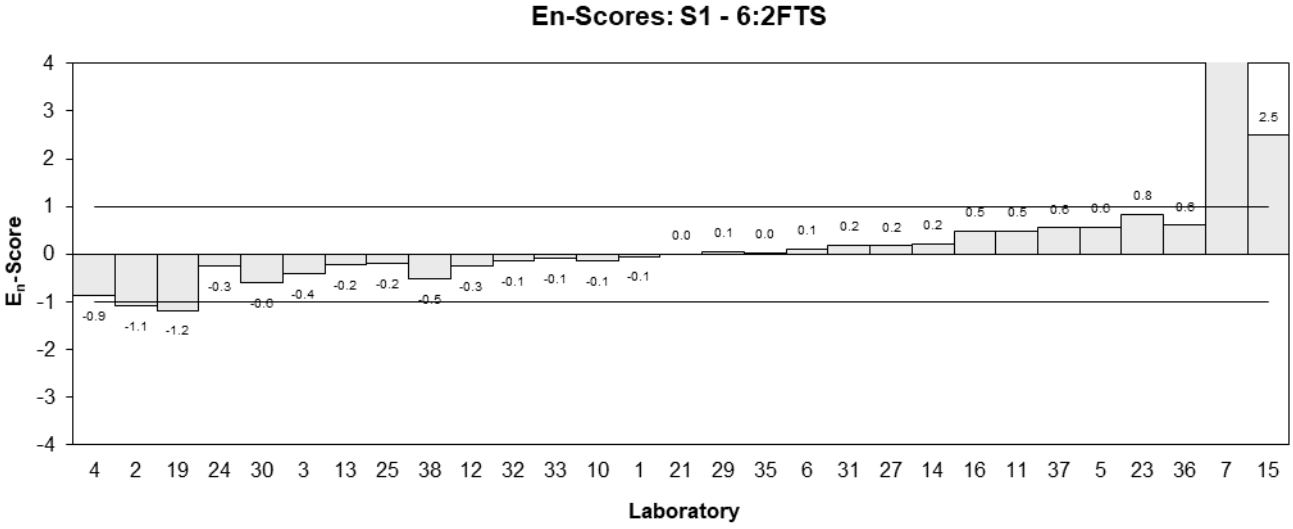

En-Scores: S1 - 6:2FTS
En-Score
Laboratory
4 2 19 24 30 3 13 25 38 12 32 33 10 1 21 29 35 6 31 27 14 16 11 37 5 23 36 7 15

Figure 22

Table 26

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	8:2diPAP
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	NT	NT	NT
6	<0.025	NR	35.65
7	NT	NT	NT
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	<0.1	0.0200	NR
13	NT	NT	NT
14	NR	NR	NR
15	NT	NT	NT
16	NR	NR	NR
17	NS	NS	NS
18	NR	NR	NR
19	NT	NT	NT
21	0.0185	NR	NR
23	0.042	0.008	101
24	<0.37	NR	45.50
25	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	0.0391477897	0.0626544288	79
31	0.053	0.0106	23
32	<0.1	NR	68
33	NT	NT	NT
35	0.052	NR	93.92
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0489	0.0024
Robust Average	NA (N<6)	
Median	0.042	0.017
Mean	0.041	
N	5	
Max	0.053	
Min	0.0185	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

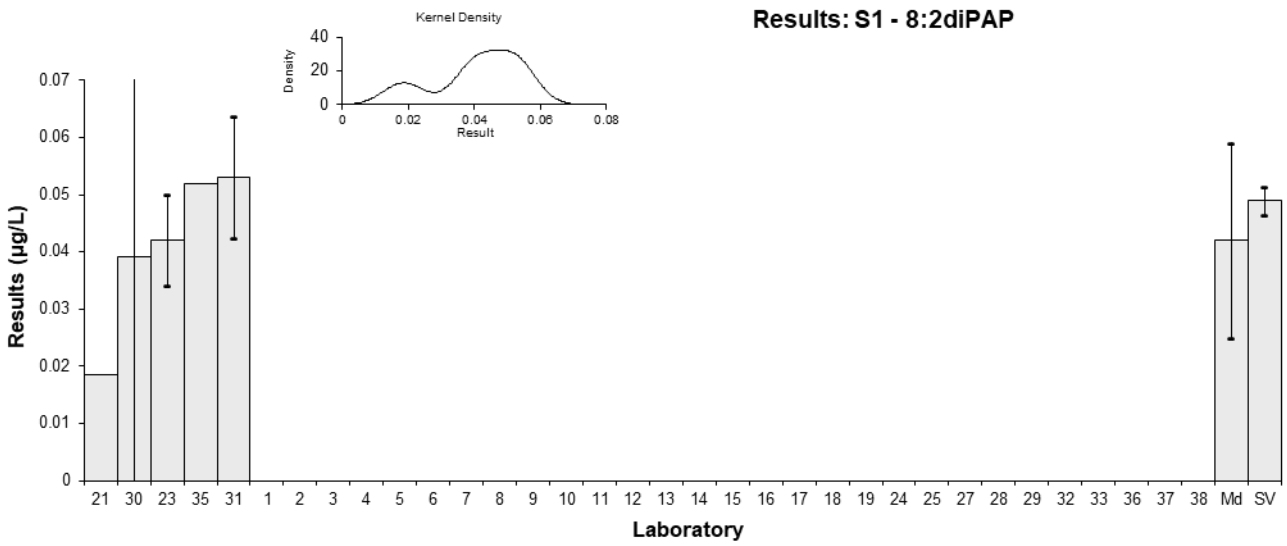

Results: S1 - 8:2diPAP
Kernel Density
Density
Result
Results (µg/L)
Laboratory
21 30 23 35 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 24 25 27 28 29 32 33 36 37 38 Md SV

Figure 23

Table 27

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	5:3FTCA
Unit	µg/L

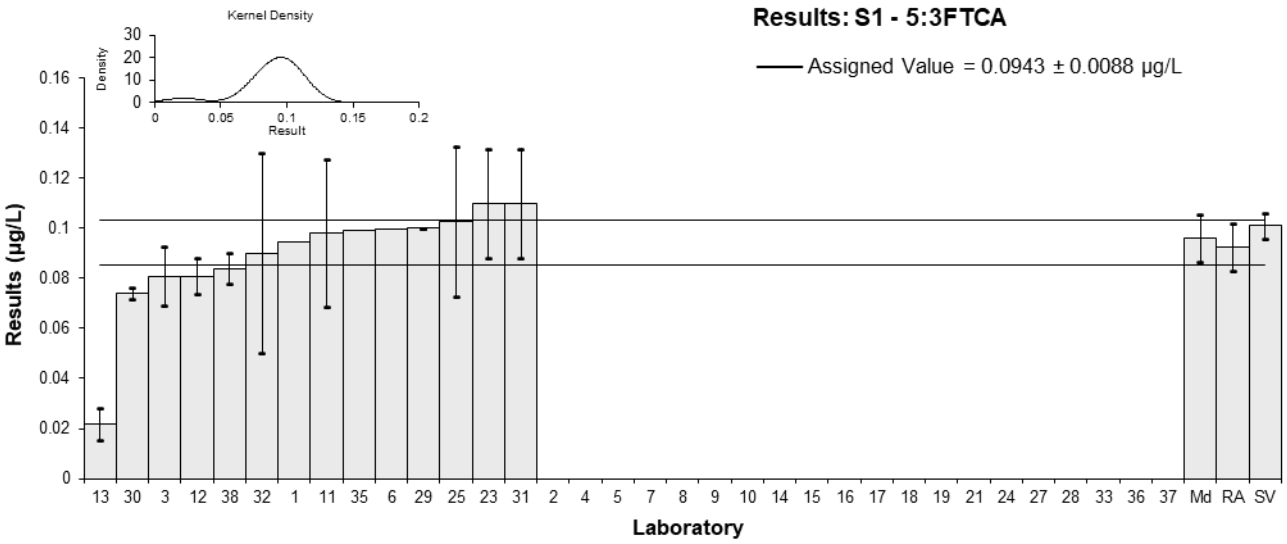
Participant Results

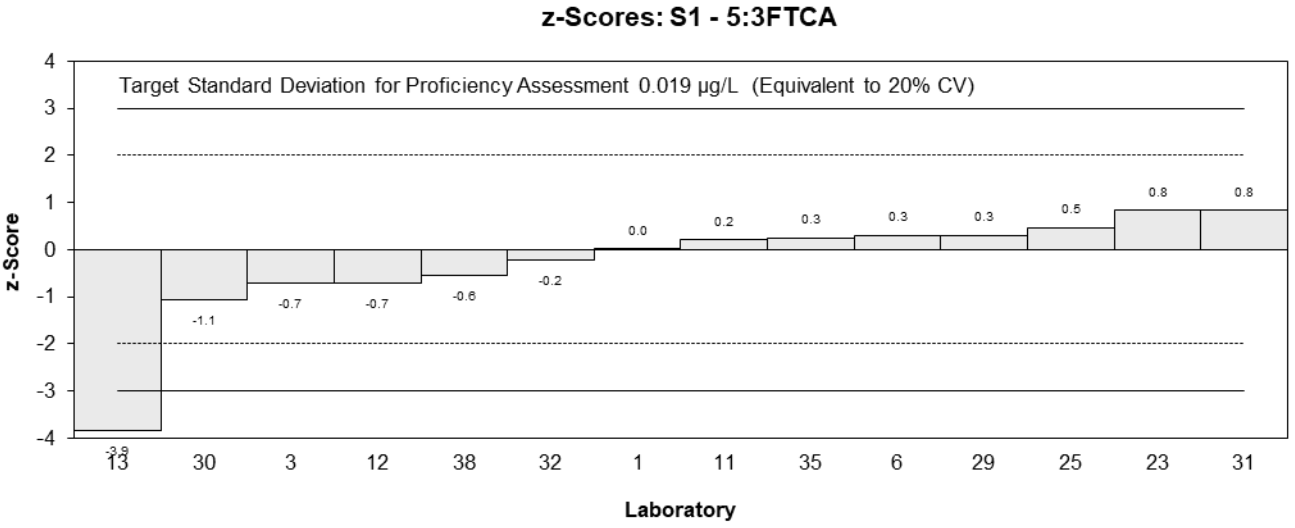
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0944	NR	NR	0.01	0.01
2	NR	NR	NR		
3	0.081	0.012	NR	-0.71	-0.89
4	NT	NT	NT		
5	NT	NT	NT		
6	0.0998	NR	88.47	0.29	0.63
7	NT	NT	NT		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	0.098	0.0294	109	0.20	0.12
12	0.0810	0.0072	NR	-0.71	-1.17
13*	0.0217	0.0065	NR	-3.85	-6.64
14	NR	NR	NR		
15	NT	NT	NT		
16	NR	NR	NR		
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	NT	NT	NT		
23	0.11	0.022	87.44	0.83	0.66
24	NT	NT	NT		
25	0.103	0.03	98	0.46	0.28
27	NT	NT	NT		
28	NT	NT	NT		
29	0.10	0.00020	95	0.30	0.65
30	0.0741034086	0.0021504104	102	-1.07	-2.23
31	0.11	0.022	92	0.83	0.66
32	0.09	0.04	123	-0.23	-0.10
33	NT	NT	NT		
35	0.099	NR	97.11	0.25	0.53
36	NT	NT	NT		
37	NT	NT	NT		
38	0.084	0.006	111	-0.55	-0.97

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0943	0.0088
Spike Value	0.101	0.005
Robust Average	0.0925	0.0095
Median	0.0962	0.0094
Mean	0.089	
N	14	
Max	0.11	
Min	0.0217	
Robust SD	0.014	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - 5:3FTCA
Assigned Value = 0.0943 ± 0.0088 µg/L
Results (µg/L)
Laboratory
13 30 3 12 38 32 1 11 35 6 29 25 23 31 2 4 5 7 8 9 10 14 15 16 17 18 19 21 24 27 28 33 36 37 Md RA SV


z-Scores: S1 - 5:3FTCA
Target Standard Deviation for Proficiency Assessment 0.019 µg/L (Equivalent to 20% CV)
z-Score
-3.9 -1.1 -0.7 -0.7 -0.6 -0.2 0.0 0.2 0.3 0.3 0.3 0.5 0.8 0.8
Laboratory
13 30 3 12 38 32 1 11 35 6 29 25 23 31

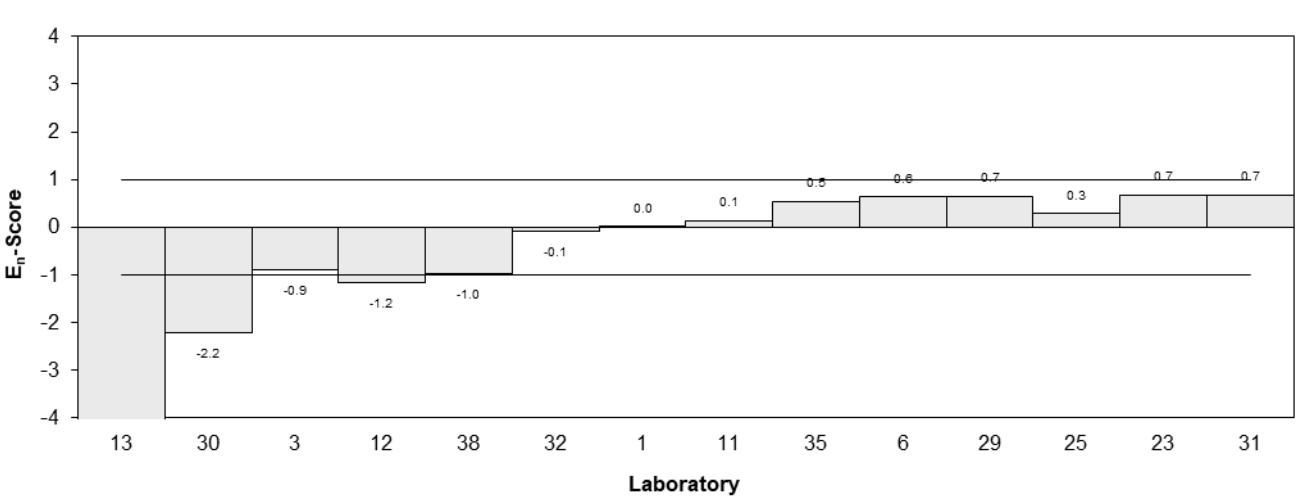

En-Scores: S1 - 5:3FTCA
En-Score
-2.2 -0.9 -1.2 -1.0 -0.1 0.0 0.1 0.5 0.6 0.7 0.3 0.7 0.7
Laboratory
13 30 3 12 38 32 1 11 35 6 29 25 23 31

Figure 24

Table 28

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	GenX
Unit	µg/L

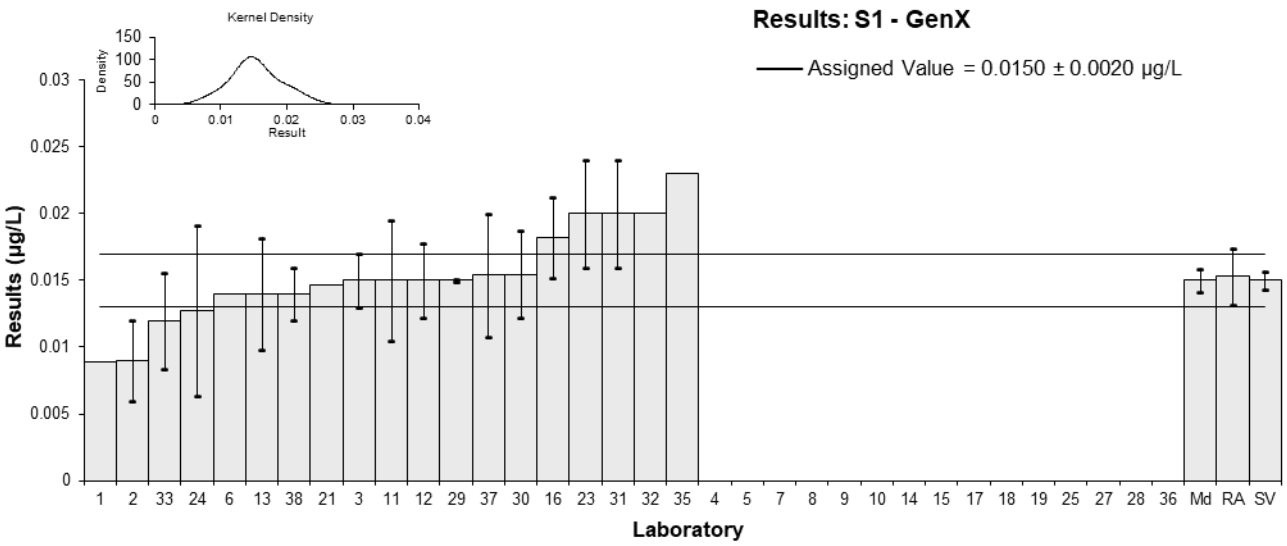
Participant Results

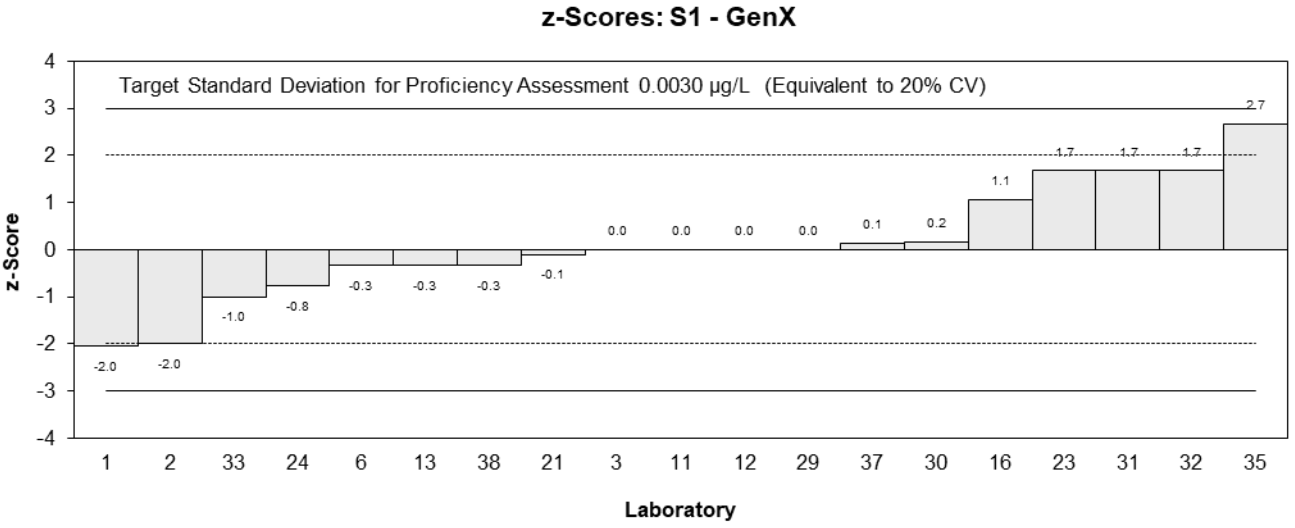
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00887	NR	NR	-2.04	-3.06
2	0.009	0.003	110	-2.00	-1.66
3	0.015	0.002	96	0.00	0.00
4	NT	NT	NT		
5	NT	NT	NT		
6	0.014	NR	98.49	-0.33	-0.50
7	NT	NT	NT		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	0.015	0.0045	109	0.00	0.00
12	0.015	0.0028	NR	0.00	0.00
13	0.0140	0.0042	83	-0.33	-0.21
14	NR	NR	NR		
15	NT	NT	NT		
16	0.0182	0.003	77	1.07	0.89
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	0.0147	NR	NR	-0.10	-0.15
23	0.02	0.004	90.46	1.67	1.12
24	0.0127	0.0064	103.59	-0.77	-0.34
25	< 0.02	NR	75		
27	NT	NT	NT		
28	<0.1	NR	NR		
29	0.015	0.00010	96	0.00	0.00
30	0.0154472683	0.0032648824	72	0.15	0.12
31	0.02	0.004	82	1.67	1.12
32	0.02	NR	99	1.67	2.50
33	0.012	0.0036	NR	-1.00	-0.73
35*	0.023	NR	79.91	2.67	4.00
36	NT	NT	NT		
37	0.0154	0.00462	95	0.13	0.08
38	0.014	0.002	109	-0.33	-0.35

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0150	0.0020
Spike Value	0.0150	0.0007
Robust Average	0.0153	0.0021
Median	0.0150	0.0009
Mean	0.0153	
N	19	
Max	0.023	
Min	0.00887	
Robust SD	0.0037	
Robust CV	24%	


Results: S1 - GenX
Assigned Value = 0.0150 ± 0.0020 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 2 33 24 6 13 38 21 3 11 12 29 37 30 16 23 31 32 35 4 5 7 8 9 10 14 15 17 18 19 25 27 28 36 Md RA SV


z-Scores: S1 - GenX
Target Standard Deviation for Proficiency Assessment 0.0030 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
1 2 33 24 6 13 38 21 3 11 12 29 37 30 16 23 31 32 35

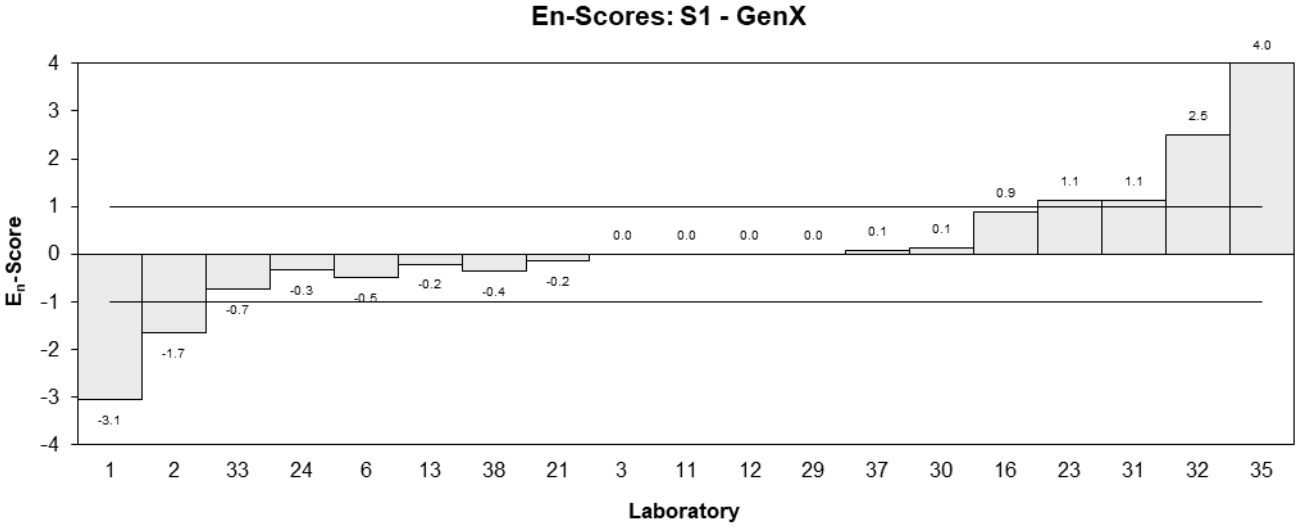

En-Scores: S1 - GenX
En-Score
Laboratory
1 2 33 24 6 13 38 21 3 11 12 29 37 30 16 23 31 32 35

Figure 25

Table 29

Sample Details

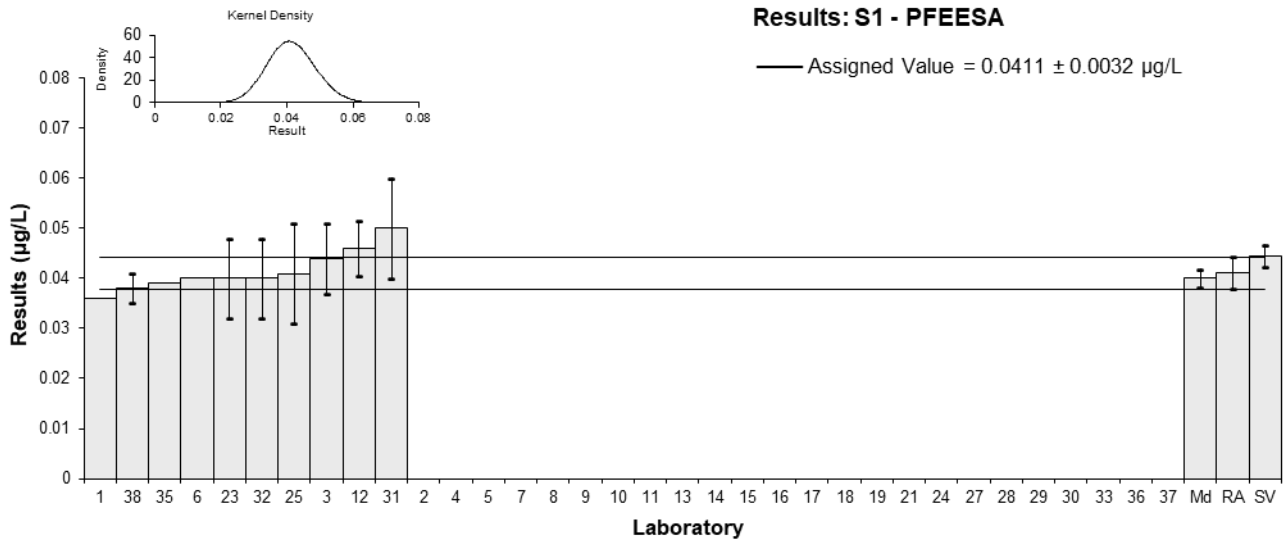
Sample No.	S1
Matrix	Potable Water
Analyte	PFEESA
Unit	µg/L

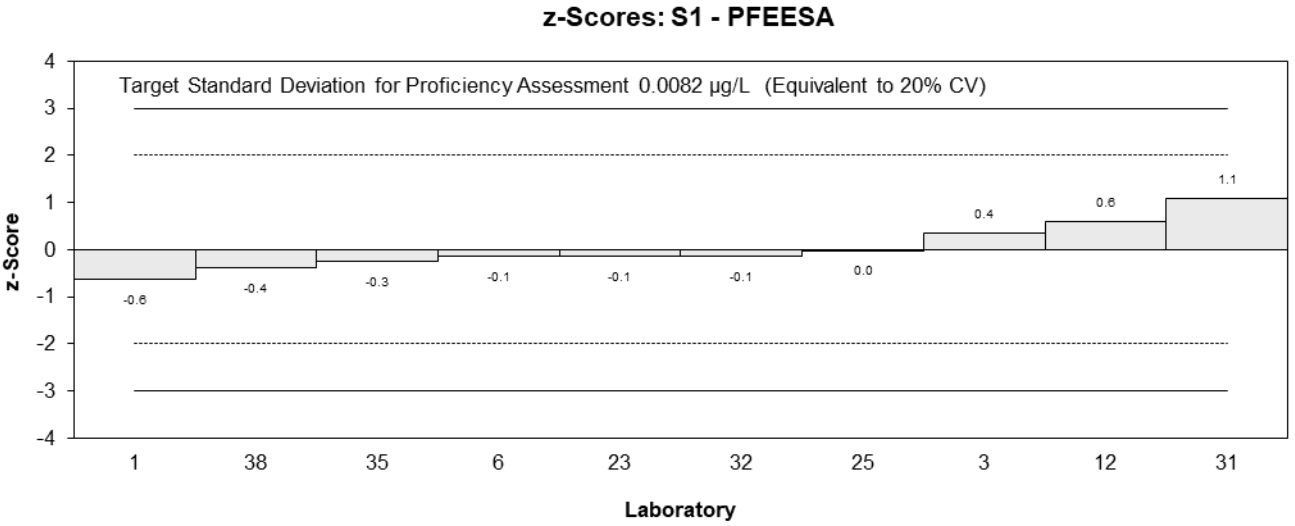
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.036	NR	NR	-0.62	-1.59
2	NR	NR	NR		
3	0.044	0.007	NR	0.35	0.38
4	NT	NT	NT		
5	NT	NT	NT		
6	0.04	NR	91.48	-0.13	-0.34
7	NT	NT	NT		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	NT	NT	NT		
12	0.046	0.0054	NR	0.60	0.78
13	NT	NT	NT		
14	NR	NR	NR		
15	NT	NT	NT		
16	NR	NR	NR		
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	NT	NT	NT		
23	0.04	0.008	94.67	-0.13	-0.13
24	NT	NT	NT		
25	0.041	0.01	66	-0.01	-0.01
27	NT	NT	NT		
28	NT	NT	NT		
29	NT	NT	NT		
30	NT	NT	NT		
31	0.05	0.01	74	1.08	0.85
32	0.04	0.008	102	-0.13	-0.13
33	NT	NT	NT		
35	0.039	NR	95.21	-0.26	-0.66
36	NT	NT	NT		
37	NT	NT	NT		
38	0.038	0.003	111	-0.38	-0.71

Statistics

Assigned Value	0.0411	0.0032
Spike Value	0.0445	0.0022
Robust Average	0.0411	0.0032
Median	0.0400	0.0018
Mean	0.0414	
N	10	
Max	0.05	
Min	0.036	
Robust SD	0.0040	
Robust CV	9.7%	


Kernel Density
Density
Result
Results: S1 - PFEESA
Assigned Value = 0.0411 ± 0.0032 µg/L
Results (µg/L)
Laboratory
1 38 35 6 23 32 25 3 12 31 2 4 5 7 8 9 10 11 13 14 15 16 17 18 19 21 24 27 28 29 30 33 36 37 Md RA SV


z-Scores: S1 - PFEESA
Target Standard Deviation for Proficiency Assessment 0.0082 µg/L (Equivalent to 20% CV)
z-Score
-0.6 -0.4 -0.3 -0.1 -0.1 -0.1 0.0 0.4 0.6 1.1
Laboratory
1 38 35 6 23 32 25 3 12 31

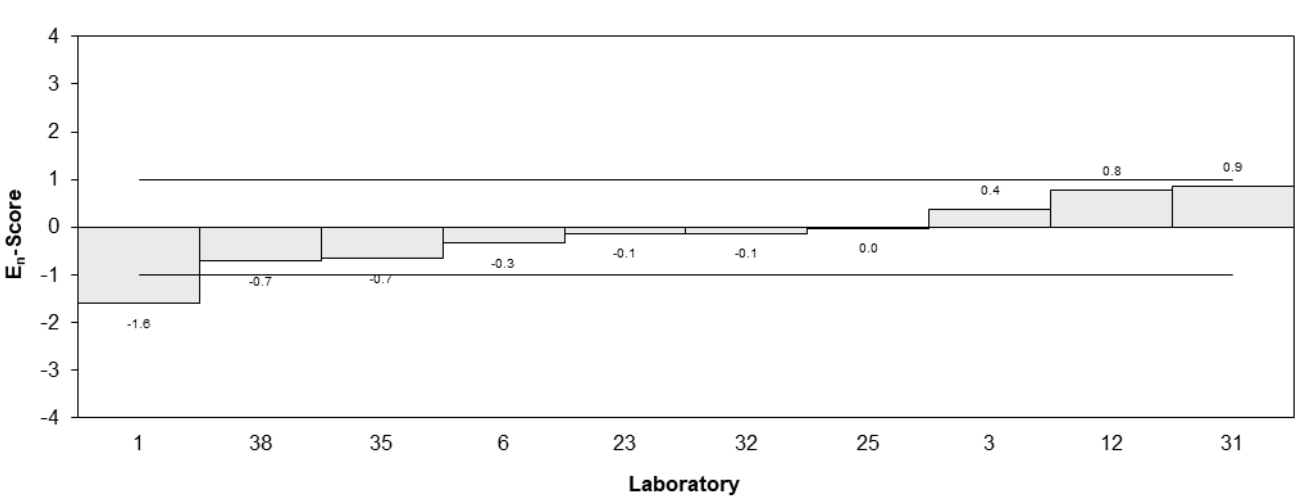

En-Scores: S1 - PFEESA
En-Score
-1.6 -0.7 -0.7 -0.3 -0.1 -0.1 0.0 0.4 0.8 0.9
Laboratory
1 38 35 6 23 32 25 3 12 31

Figure 26

Table 30

Sample Details

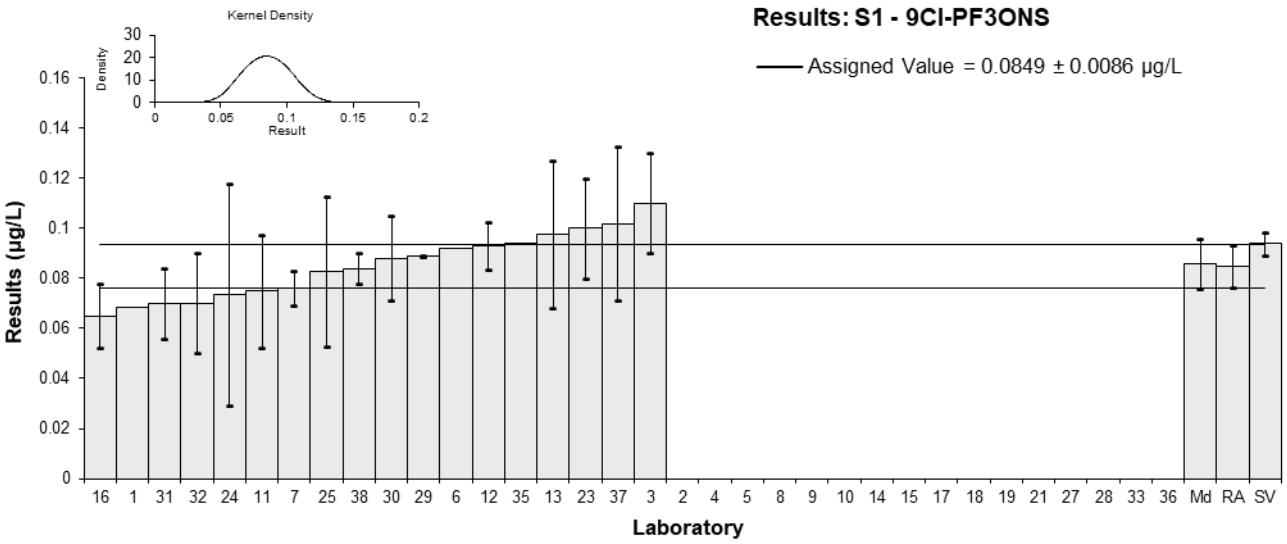
Sample No.	S1
Matrix	Potable Water
Analyte	9Cl-PF3ONS
Unit	µg/L

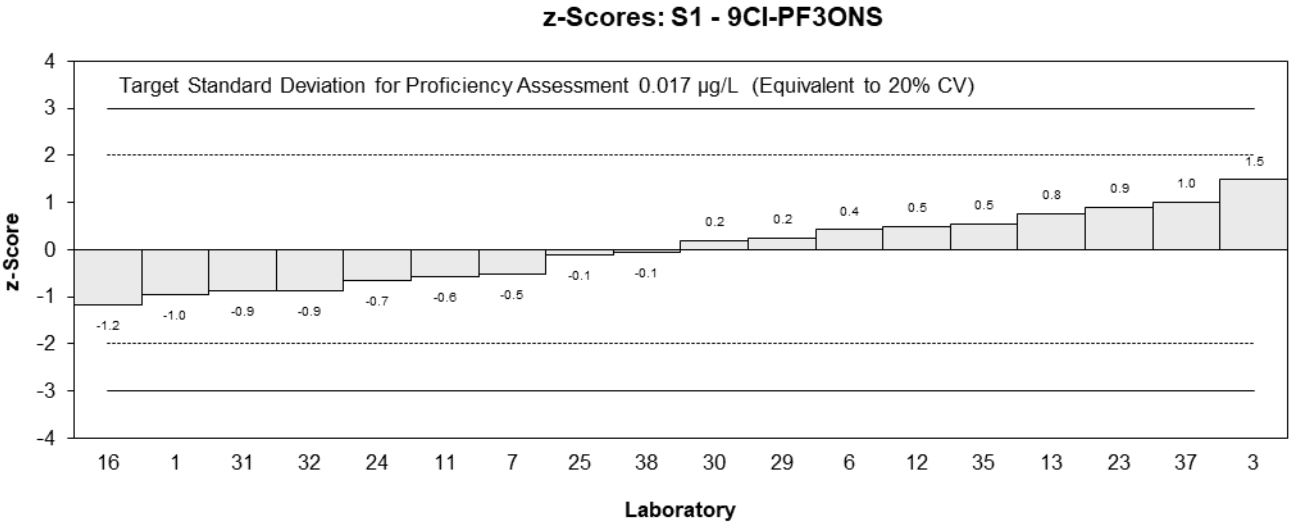
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0685	NR	NR	-0.97	-1.91
2	NR	NR	NR		
3	0.11	0.02	NR	1.48	1.15
4	NT	NT	NT		
5	NT	NT	NT		
6	0.092	NR	93.36	0.42	0.83
7	0.076	0.007	103.13	-0.52	-0.80
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	0.075	0.0225	109	-0.58	-0.41
12	0.093	0.0094	NR	0.48	0.64
13	0.0976	0.0293	NR	0.75	0.42
14	NR	NR	NR		
15	NT	NT	NT		
16	0.0651	0.013	NR	-1.17	-1.27
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	NT	NT	NT		
23	0.1	0.02	103.05	0.89	0.69
24	0.0736	0.0442	98.48	-0.67	-0.25
25	0.083	0.03	85	-0.11	-0.06
27	NT	NT	NT		
28	NT	NT	NT		
29	0.089	0.00029	110	0.24	0.48
30	0.0880755981	0.0170576807	91	0.19	0.17
31	0.07	0.014	107	-0.88	-0.91
32	0.07	0.02	115	-0.88	-0.68
33	NT	NT	NT		
35	0.094	NR	98.57	0.54	1.06
36	NT	NT	NT		
37	0.102	0.0306	94	1.01	0.54
38	0.084	0.006	109	-0.05	-0.09

Statistics

Assigned Value	0.0849	0.0086
Spike Value	0.0939	0.0047
Robust Average	0.0849	0.0086
Median	0.0860	0.0099
Mean	0.0850	
N	18	
Max	0.11	
Min	0.0651	
Robust SD	0.015	
Robust CV	17%	


Results: S1 - 9Cl-PF3ONS
Assigned Value = 0.0849 ± 0.0086 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
16 1 31 32 24 11 7 25 38 30 29 6 12 35 13 23 37 3 2 4 5 8 9 10 14 15 17 18 19 21 27 28 33 36 Md RA SV


z-Scores: S1 - 9Cl-PF3ONS
Target Standard Deviation for Proficiency Assessment 0.017 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
16 1 31 32 24 11 7 25 38 30 29 6 12 35 13 23 37 3
-1.2 -1.0 -0.9 -0.9 -0.7 -0.6 -0.5 -0.1 -0.1 0.2 0.2 0.4 0.5 0.5 0.8 0.9 1.0 1.5

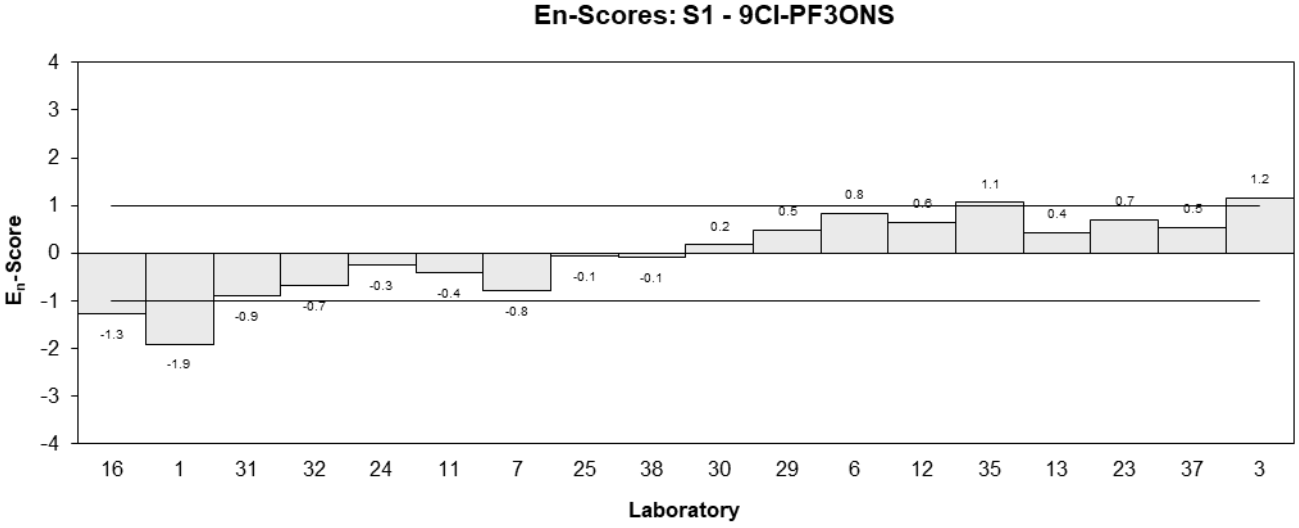

En-Scores: S1 - 9Cl-PF3ONS
En-Score
Laboratory
16 1 31 32 24 11 7 25 38 30 29 6 12 35 13 23 37 3
-1.3 -1.9 -0.9 -0.7 -0.3 -0.4 -0.8 -0.1 -0.1 0.2 0.5 0.8 0.6 1.1 0.4 0.7 0.5 1.2

Figure 27

Table 31

Sample Details

Sample No.	S1
Matrix	Potable Water
Analyte	11Cl-PF3OUdS
Unit	µg/L

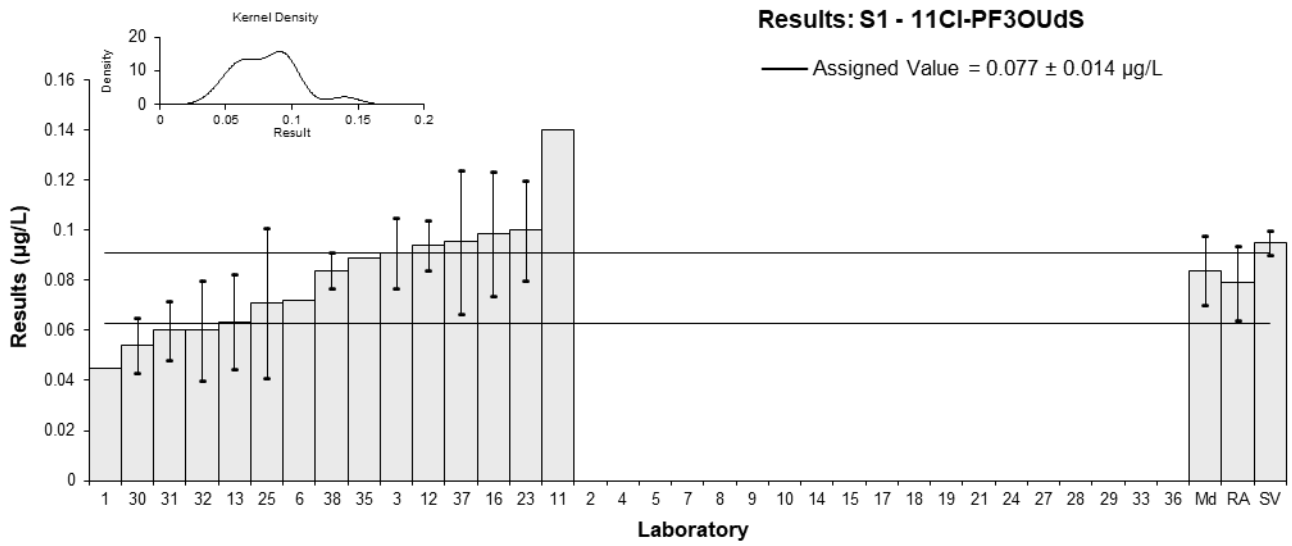
Participant Results

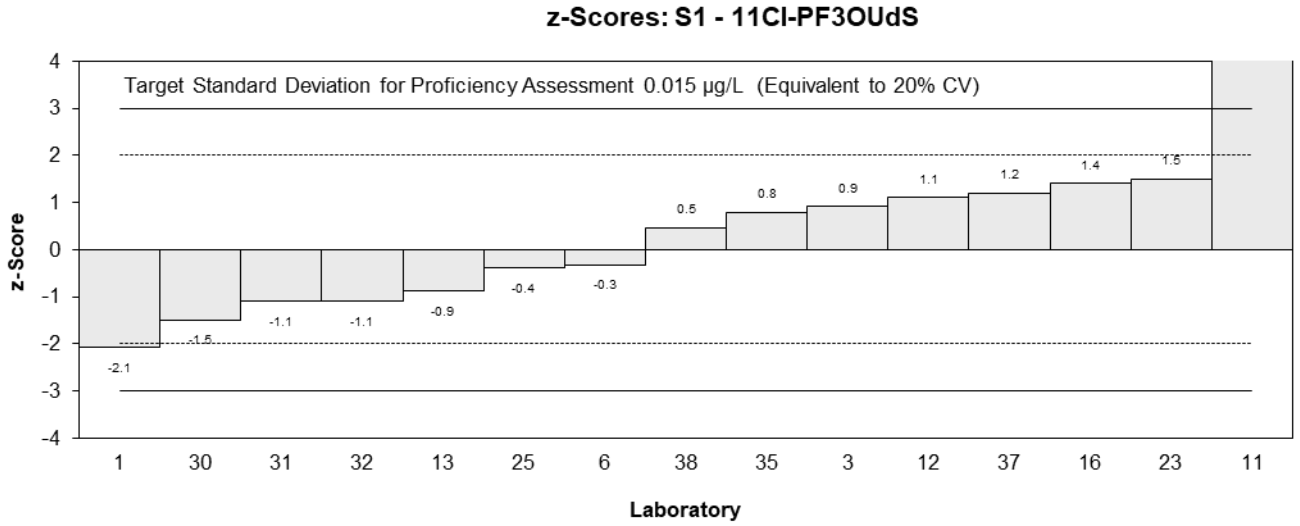
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0449	NR	NR	-2.08	-2.29
2	NR	NR	NR		
3	0.091	0.014	NR	0.91	0.71
4	NT	NT	NT		
5	NT	NT	NT		
6	0.072	NR	93.36	-0.32	-0.36
7	NR	NR	NR		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11*	0.14	NR	109	4.09	4.50
12	0.094	0.0100	NR	1.10	0.99
13	0.0635	0.0191	NR	-0.88	-0.57
14	NR	NR	NR		
15	NT	NT	NT		
16	0.0986	0.025	NR	1.40	0.75
17	NS	NS	NS		
18	NR	NR	NR		
19	NT	NT	NT		
21	NT	NT	NT		
23	0.1	0.02	103.05	1.49	0.94
24	<0.13	NR	71.50		
25	0.071	0.03	85	-0.39	-0.18
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	287		
30	0.0539878031	0.0109816718	91	-1.49	-1.29
31	0.06	0.012	93	-1.10	-0.92
32	0.06	0.02	115	-1.10	-0.70
33	NT	NT	NT		
35	0.089	NR	99.77	0.78	0.86
36	NT	NT	NT		
37	0.0955	0.02865	94	1.20	0.58
38	0.084	0.007	109	0.45	0.45

* Outlier, see Section 4.2

Statistics

Assigned Value	0.077	0.014
Spike Value	0.0950	0.0048
Robust Average	0.079	0.015
Median	0.084	0.014
Mean	0.081	
N	15	
Max	0.14	
Min	0.0449	
Robust SD	0.023	
Robust CV	29%	


Results: S1 - 11Cl-PF3OUdS
Assigned Value = 0.077 ± 0.014 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 30 31 32 13 25 6 38 35 3 12 37 16 23 11 2 4 5 7 8 9 10 14 15 17 18 19 21 24 27 28 29 33 36 Md RA SV


z-Scores: S1 - 11Cl-PF3OUdS
Target Standard Deviation for Proficiency Assessment 0.015 µg/L (Equivalent to 20% CV)
z-Score
-2.1 -1.5 -1.1 -1.1 -0.9 -0.4 -0.3 0.5 0.8 0.9 1.1 1.2 1.4 1.5
Laboratory
1 30 31 32 13 25 6 38 35 3 12 37 16 23 11

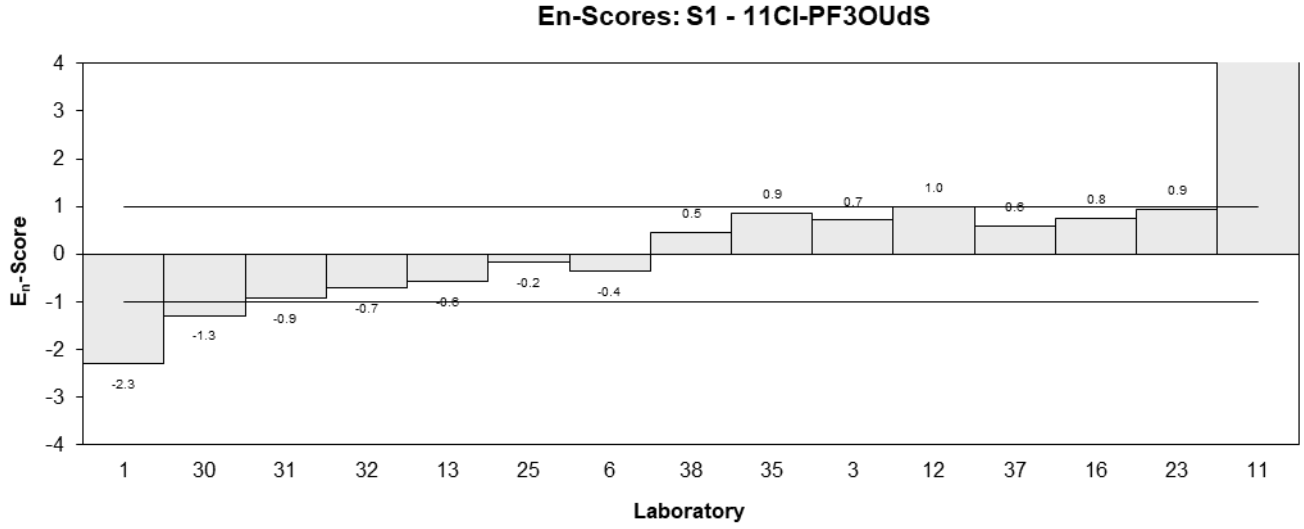

En-Scores: S1 - 11Cl-PF3OUdS
En-Score
-2.3 -1.3 -0.9 -0.7 -0.6 -0.2 -0.4 0.5 0.9 0.7 1.0 0.6 0.8 0.9
Laboratory
1 30 31 32 13 25 6 38 35 3 12 37 16 23 11

Figure 28

Table 32

Sample Details

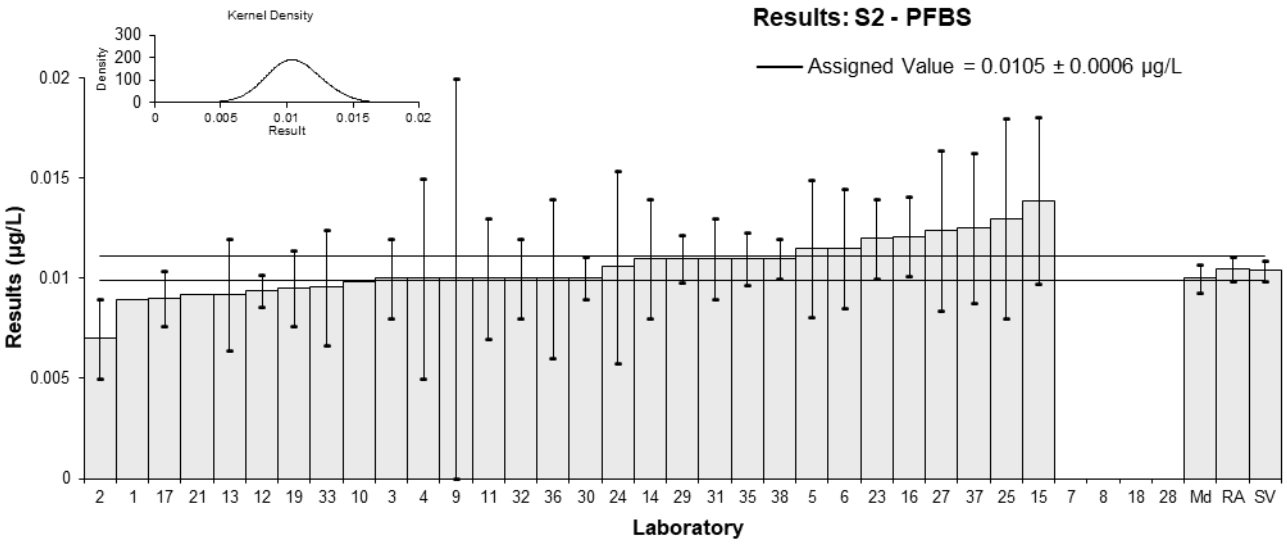
Sample No.	S2
Matrix	River Water
Analyte	PFBS
Unit	µg/L

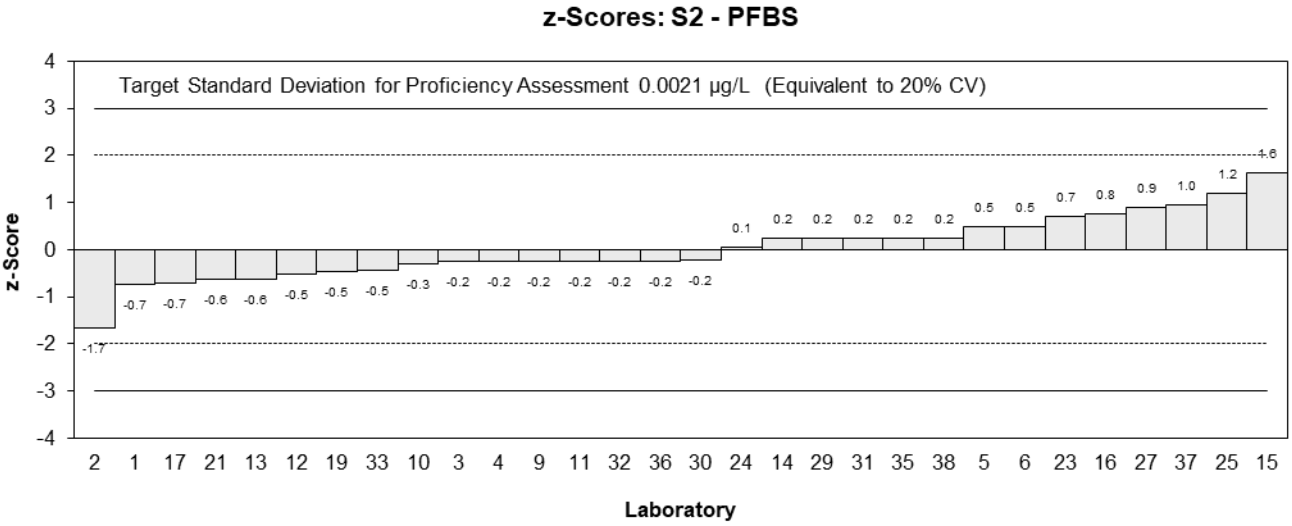
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00895	NR	NR	-0.74	-2.58
2	0.007	0.002	103	-1.67	-1.68
3	0.010	0.002	98	-0.24	-0.24
4	0.01	0.005	91	-0.24	-0.10
5	0.0115	0.00345	75	0.48	0.29
6	0.0115	0.003	82.86	0.48	0.33
7	NR	NR	NR		
8	<0.01	NR	NR		
9	0.01	0.01	82	-0.24	-0.05
10	0.009858	NR	109	-0.31	-1.07
11	0.01	0.0030	109	-0.24	-0.16
12	0.0094	0.0008	NR	-0.52	-1.10
13	0.0092	0.0028	128	-0.62	-0.45
14	0.0110	0.003	73	0.24	0.16
15	0.0139	0.00417	105	1.62	0.81
16	0.0121	0.002	87	0.76	0.77
17	0.0090	0.0014	104	-0.71	-0.98
18	NS	NS	NS		
19	0.0095	0.0019	NR	-0.48	-0.50
21	0.00918	NR	NR	-0.63	-2.20
23	0.012	0.002	93.39	0.71	0.72
24	0.0106	0.0048	98.48	0.05	0.02
25	0.013	0.005	68	1.19	0.50
27	0.0124	0.004	119	0.90	0.47
28	NS	NS	NS		
29	0.011	0.0012	89	0.24	0.37
30	0.0100175874	0.0010553687	94	-0.23	-0.40
31	0.011	0.002	61	0.24	0.24
32	0.010	0.002	67	-0.24	-0.24
33	0.00955	0.0029	NR	-0.45	-0.32
35	0.011	0.0013	70.45	0.24	0.35
36	0.01	0.004	101	-0.24	-0.12
37	0.0125	0.00375	88	0.95	0.53
38	0.011	0.001	112	0.24	0.43

Statistics

Assigned Value	0.0105	0.0006
Spike Value	0.0104	0.0005
Robust Average	0.0105	0.0006
Median	0.0100	0.0007
Mean	0.0105	
N	30	
Max	0.0139	
Min	0.007	
Robust SD	0.0014	
Robust CV	13%	


Results: S2 - PFBS
Kernel Density
Density
Result
Assigned Value = 0.0105 ± 0.0006 µg/L
Results (µg/L)
Laboratory
2 1 17 21 13 12 19 33 10 3 4 9 11 32 36 30 24 14 29 31 35 38 5 6 23 16 27 37 25 15 7 8 18 28 Md RA SV


z-Scores: S2 - PFBS
Target Standard Deviation for Proficiency Assessment 0.0021 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 1 17 21 13 12 19 33 10 3 4 9 11 32 36 30 24 14 29 31 35 38 5 6 23 16 27 37 25 15

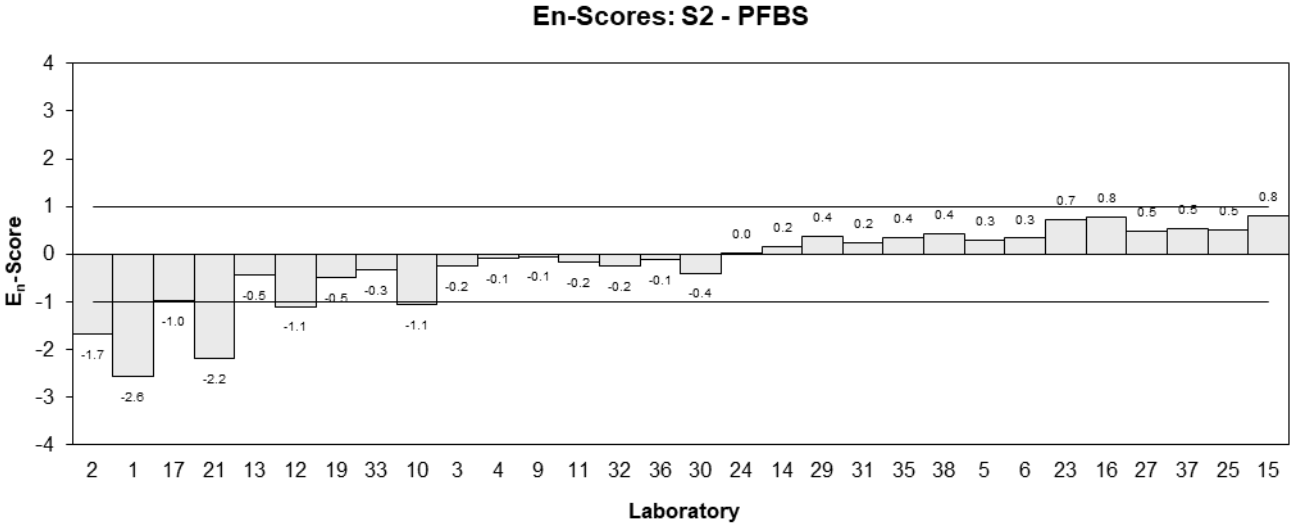

En-Scores: S2 - PFBS
En-Score
Laboratory
2 1 17 21 13 12 19 33 10 3 4 9 11 32 36 30 24 14 29 31 35 38 5 6 23 16 27 37 25 15

Figure 29

Table 33

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFHxS
Unit	µg/L

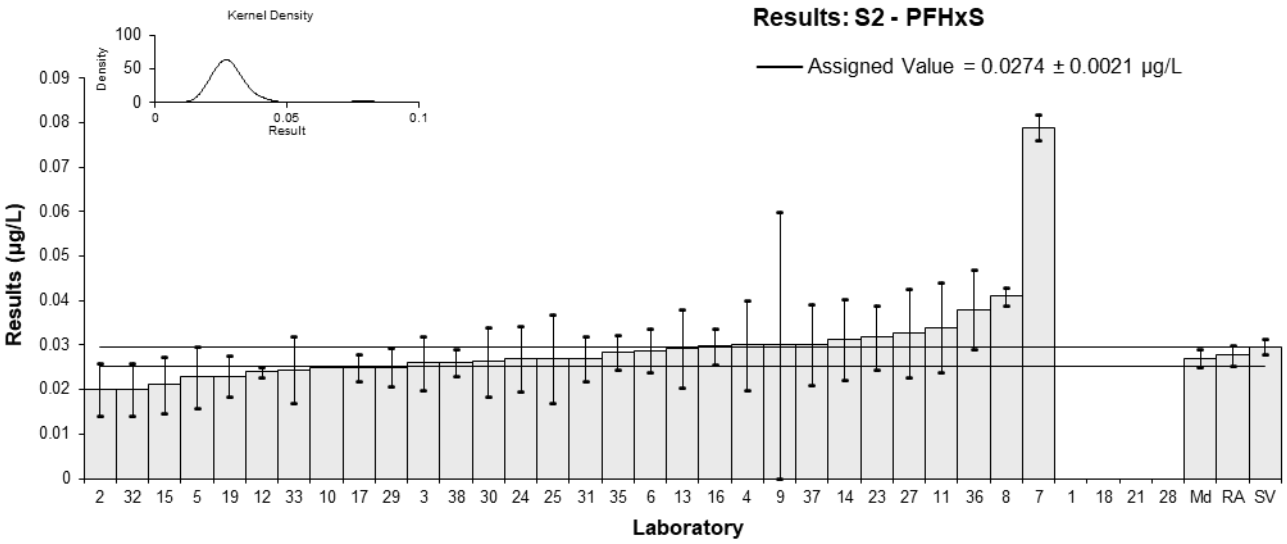
Participant Results

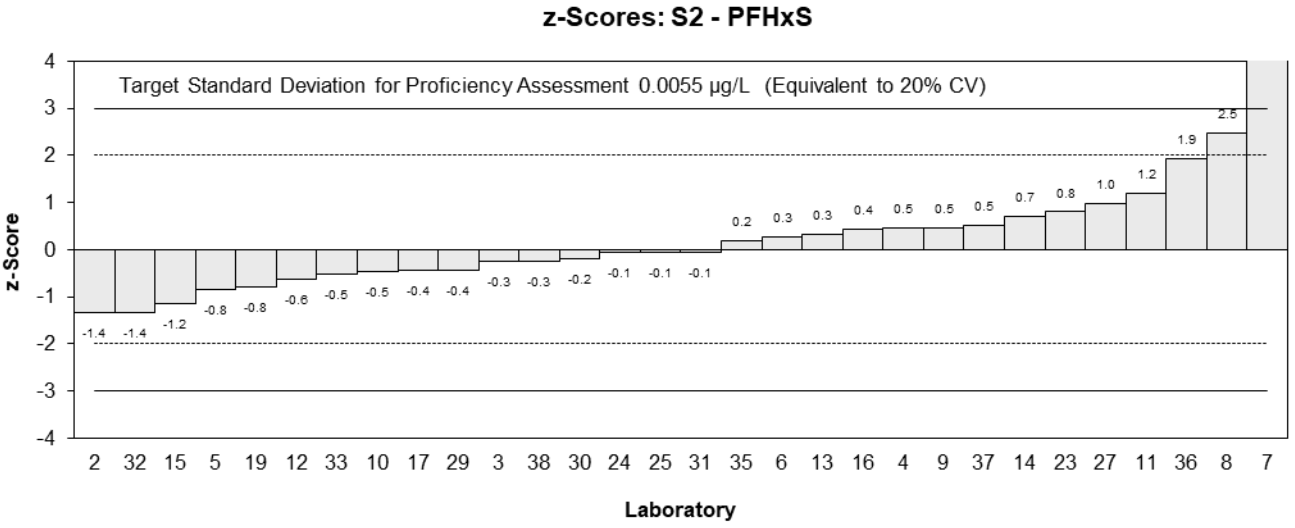
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	0.02	0.006	102	-1.35	-1.16
3	0.026	0.006	116	-0.26	-0.22
4	0.03	0.01	86	0.47	0.25
5	0.0228	0.00684	83	-0.84	-0.64
6	0.0288	0.005	89.83	0.26	0.26
7*	0.079	0.003	67.00	9.42	14.09
8	0.041	0.002	91	2.48	4.69
9	0.03	0.03	84	0.47	0.09
10	0.024809	NR	111	-0.47	-1.23
11	0.034	0.0102	88	1.20	0.63
12	0.0240	0.0012	NR	-0.62	-1.41
13	0.0292	0.0088	109	0.33	0.20
14	0.03126	0.009	89	0.70	0.42
15	0.0211	0.00633	105	-1.15	-0.94
16	0.0298	0.004	85	0.44	0.53
17	0.0250	0.0030	100	-0.44	-0.66
18	NS	NS	NS		
19	0.023	0.0046	NR	-0.80	-0.87
21	NT	NT	NT		
23	0.0318	0.0072	109.81	0.80	0.59
24	0.027	0.0073	98.48	-0.07	-0.05
25	0.027	0.01	86	-0.07	-0.04
27	0.0327	0.010	114	0.97	0.52
28	NS	NS	NS		
29	0.025	0.0043	101	-0.44	-0.50
30	0.0262807819	0.0078015982	104	-0.20	-0.14
31	0.027	0.005	93	-0.07	-0.07
32	0.02	0.006	103	-1.35	-1.16
33	0.0245	0.0074	NR	-0.53	-0.38
35	0.0284	0.0039	80.36	0.18	0.23
36	0.038	0.009	74	1.93	1.15
37	0.0302	0.00906	90	0.51	0.30
38	0.026	0.003	NR	-0.26	-0.38

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0274	0.0021
Spike Value	0.0296	0.0017
Robust Average	0.0277	0.0022
Median	0.0270	0.0020
Mean	0.0295	
N	30	
Max	0.079	
Min	0.02	
Robust SD	0.0048	
Robust CV	17%	


Kernel Density
Density
Result
Results: S2 - PFHxS
Assigned Value = 0.0274 ± 0.0021 µg/L
Results (µg/L)
Laboratory
2 32 15 5 19 12 33 10 17 29 3 38 30 24 25 31 35 6 13 16 4 9 37 14 23 27 11 36 8 7 1 18 21 28 Md RA SV


z-Scores: S2 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.0055 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 32 15 5 19 12 33 10 17 29 3 38 30 24 25 31 35 6 13 16 4 9 37 14 23 27 11 36 8 7

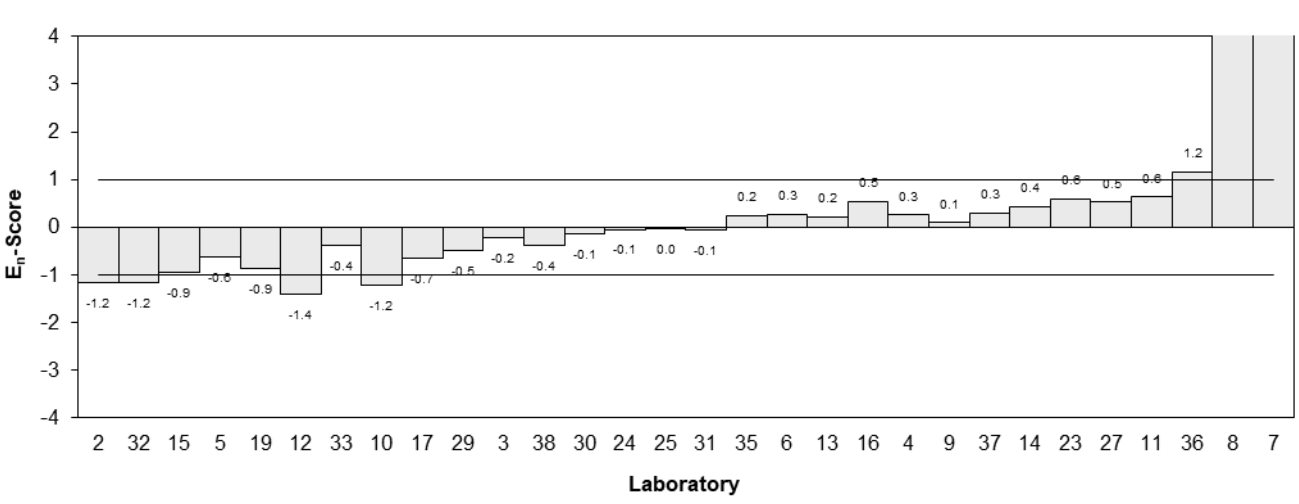

En-Scores: S2 - PFHxS
En-Score
Laboratory
2 32 15 5 19 12 33 10 17 29 3 38 30 24 25 31 35 6 13 16 4 9 37 14 23 27 11 36 8 7

Figure 30

Table 34

Sample Details

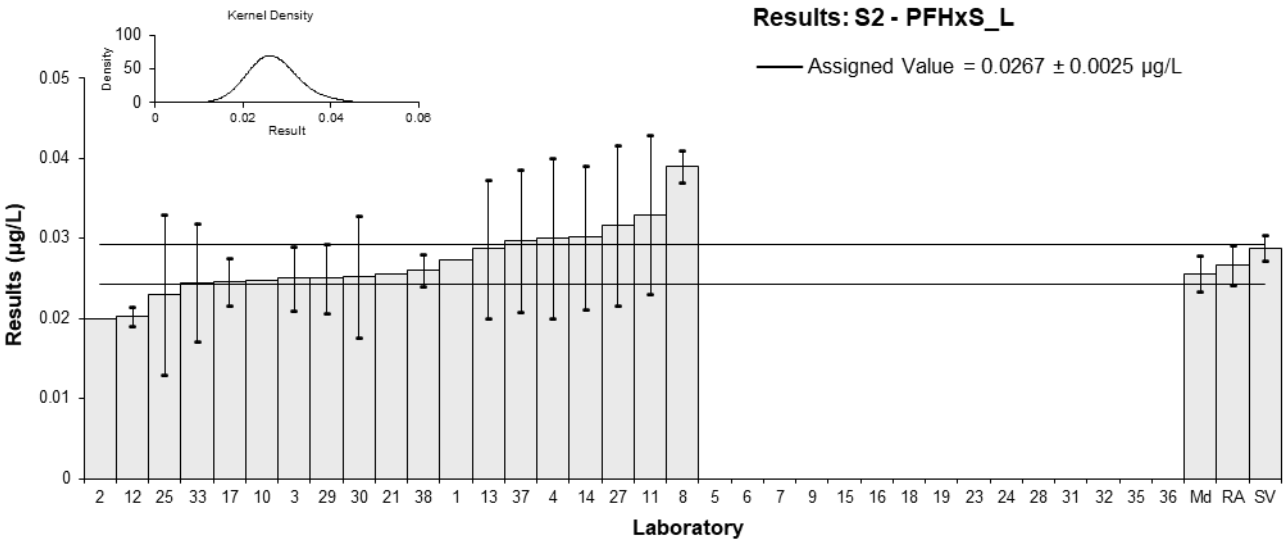
Sample No.	S2
Matrix	River Water
Analyte	PFHxS_L
Unit	µg/L

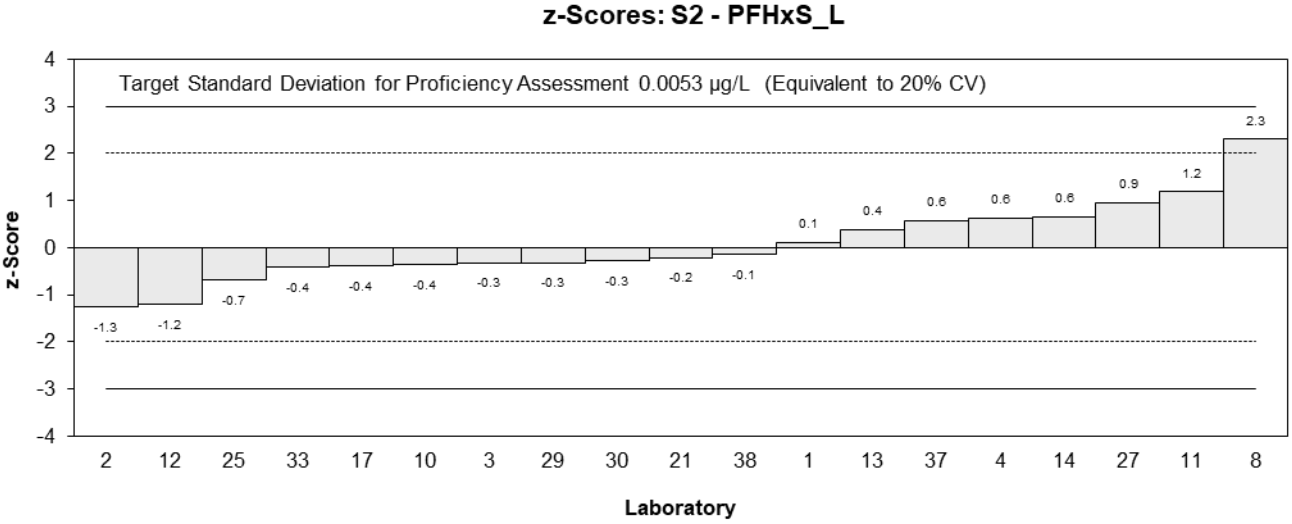
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0273	NR	NR	0.11	0.24
2	0.02	NR	NR	-1.25	-2.68
3	0.025	0.004	NR	-0.32	-0.36
4	0.03	0.01	86	0.62	0.32
5	NT	NT	NT		
6	NT	NT	NT		
7	NR	NR	NR		
8	0.039	0.002	91	2.30	3.84
9	NT	NT	NT		
10	0.024809	NR	111	-0.35	-0.76
11	0.033	0.0099	88	1.18	0.62
12	0.0203	0.0012	NR	-1.20	-2.31
13	0.0287	0.0086	109	0.37	0.22
14	0.03012	0.009	89	0.64	0.37
15	NT	NT	NT		
16	NR	NR	NR		
17	0.0246	0.0029	100	-0.39	-0.55
18	NS	NS	NS		
19	NT	NT	NT		
21	0.0256	NR	NR	-0.21	-0.44
23	NT	NT	NT		
24	NT	NT	NT		
25	0.023	0.01	86	-0.69	-0.36
27	0.0317	0.010	114	0.94	0.49
28	NS	NS	NS		
29	0.025	0.0043	101	-0.32	-0.34
30	0.0252397700	0.0076475952	104	-0.27	-0.18
31	NT	NT	NT		
32	NT	NT	NT		
33	0.0245	0.0074	NR	-0.41	-0.28
35	NT	NT	NT		
36	NT	NT	NT		
37	0.0297	0.00891	90	0.56	0.32
38	0.026	0.002	101	-0.13	-0.22

Statistics

Assigned Value	0.0267	0.0025
Spike Value	0.0288	0.0016
Robust Average	0.0267	0.0025
Median	0.0256	0.0022
Mean	0.0270	
N	19	
Max	0.039	
Min	0.02	
Robust SD	0.0043	
Robust CV	16%	


Kernel Density
Density
Result
Results: S2 - PFHxS_L
Assigned Value = 0.0267 ± 0.0025 µg/L
Results (µg/L)
Laboratory
2 12 25 33 17 10 3 29 30 21 38 1 13 37 4 14 27 11 8 5 6 7 9 15 16 18 19 23 24 28 31 32 35 36 Md RA SV


z-Scores: S2 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.0053 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 12 25 33 17 10 3 29 30 21 38 1 13 37 4 14 27 11 8

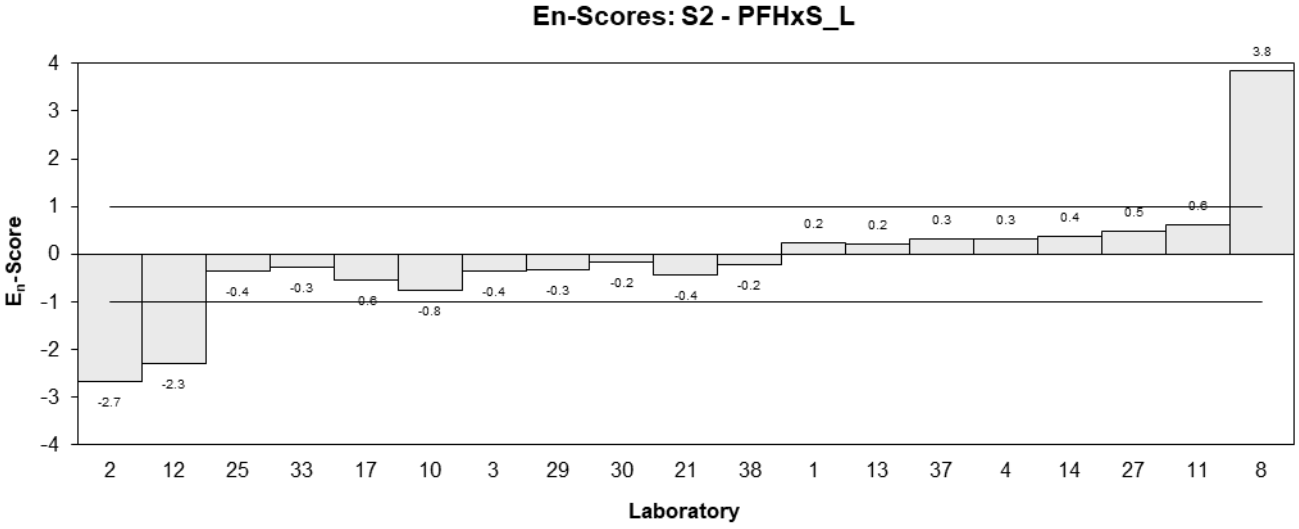

En-Scores: S2 - PFHxS_L
En-Score
Laboratory
2 12 25 33 17 10 3 29 30 21 38 1 13 37 4 14 27 11 8

Figure 31

Table 35

Sample Details

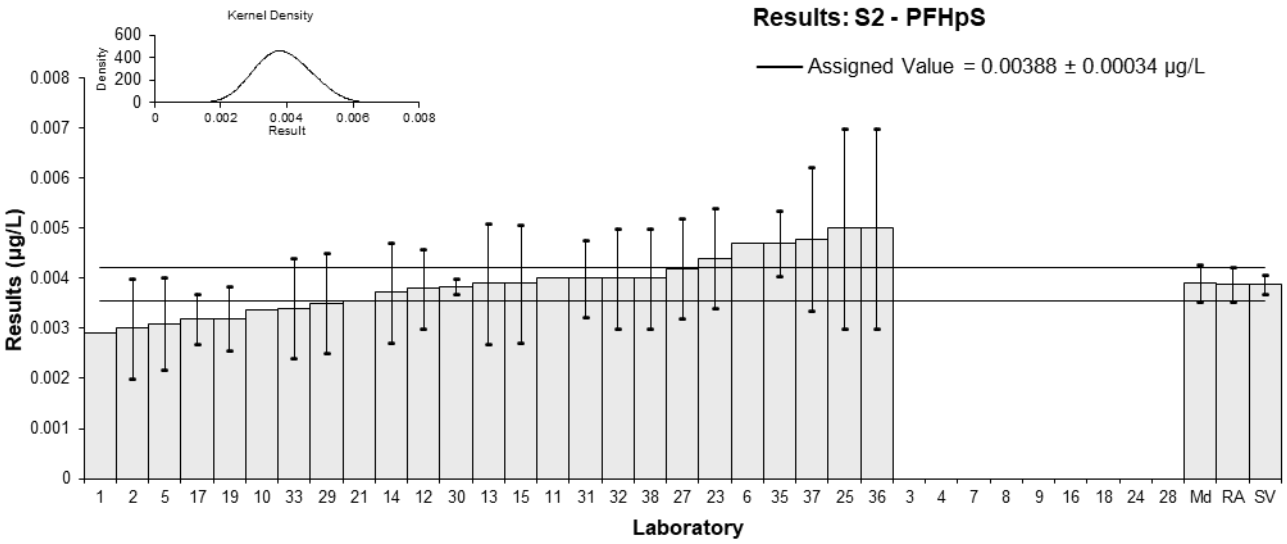
Sample No.	S2
Matrix	River Water
Analyte	PFHpS
Unit	µg/L

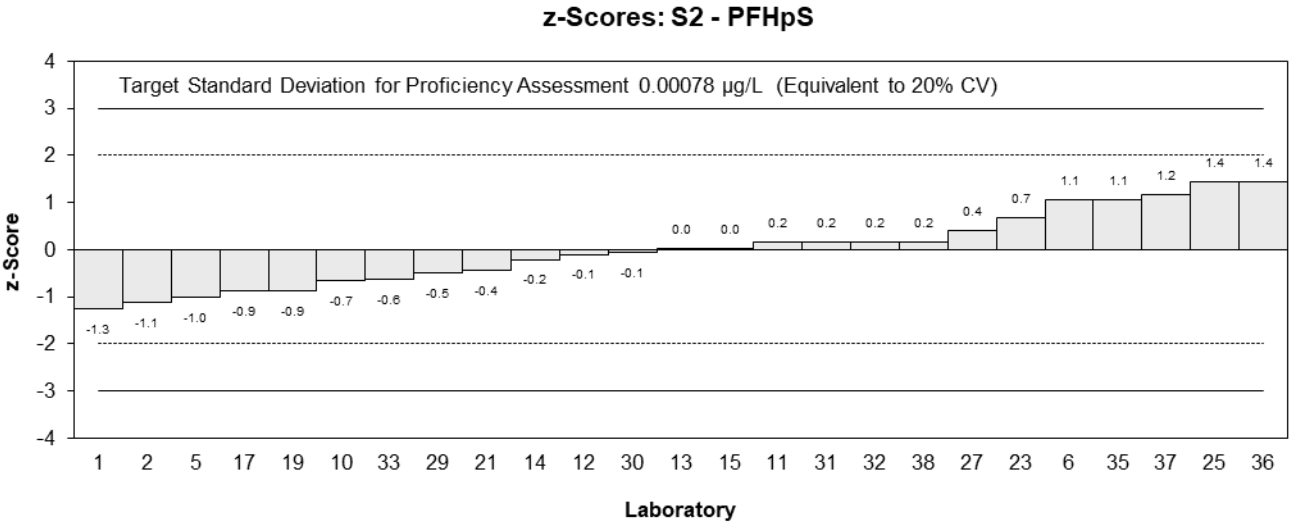
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0029	NR	NR	-1.26	-2.88
2	0.003	0.001	NR	-1.13	-0.83
3	NR	NR	NR		
4	<0.01	NR	86		
5	0.0031	0.00093	78	-1.01	-0.79
6	0.0047	NR	87.49	1.06	2.41
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	0.003363	NR	NR	-0.67	-1.52
11	0.004	NR	88	0.15	0.35
12	0.0038	0.0008	NR	-0.10	-0.09
13	0.0039	0.0012	NR	0.03	0.02
14	0.00372	0.001	92	-0.21	-0.15
15	0.0039	0.00117	110	0.03	0.02
16	<0.005	0.001	NR		
17	0.0032	0.0005	110	-0.88	-1.12
18	NS	NS	NS		
19	0.0032	0.00064	NR	-0.88	-0.94
21	0.00354	NR	NR	-0.44	-1.00
23	0.0044	0.001	99.62	0.67	0.49
24	<0.01	NR	98.48		
25	0.005	0.002	84	1.44	0.55
27	0.0042	0.001	135	0.41	0.30
28	NS	NS	NS		
29	0.0035	0.0010	101	-0.49	-0.36
30	0.0038353284	0.0001514047	104	-0.06	-0.12
31	0.004	0.00078	93	0.15	0.14
32	0.004	0.001	95	0.15	0.11
33	0.0034	0.001	NR	-0.62	-0.45
35	0.0047	0.00066	80.36	1.06	1.10
36	0.005	0.002	NR	1.44	0.55
37	0.00479	0.001437	91	1.17	0.62
38	0.004	0.001	105	0.15	0.11

Statistics

Assigned Value	0.00388	0.00034
Spike Value	0.00388	0.00019
Robust Average	0.00388	0.00034
Median	0.00390	0.00037
Mean	0.00389	
N	25	
Max	0.005	
Min	0.0029	
Robust SD	0.00069	
Robust CV	18%	


Kernel Density
Density
Result
Results: S2 - PFHpS
Assigned Value = 0.00388 ± 0.00034 µg/L
Results (µg/L)
Laboratory
1 2 5 17 19 10 33 29 21 14 12 30 13 15 11 31 32 38 27 23 6 35 37 25 36 3 4 7 8 9 16 18 24 28 Md RA SV


z-Scores: S2 - PFHpS
Target Standard Deviation for Proficiency Assessment 0.00078 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
1 2 5 17 19 10 33 29 21 14 12 30 13 15 11 31 32 38 27 23 6 35 37 25 36

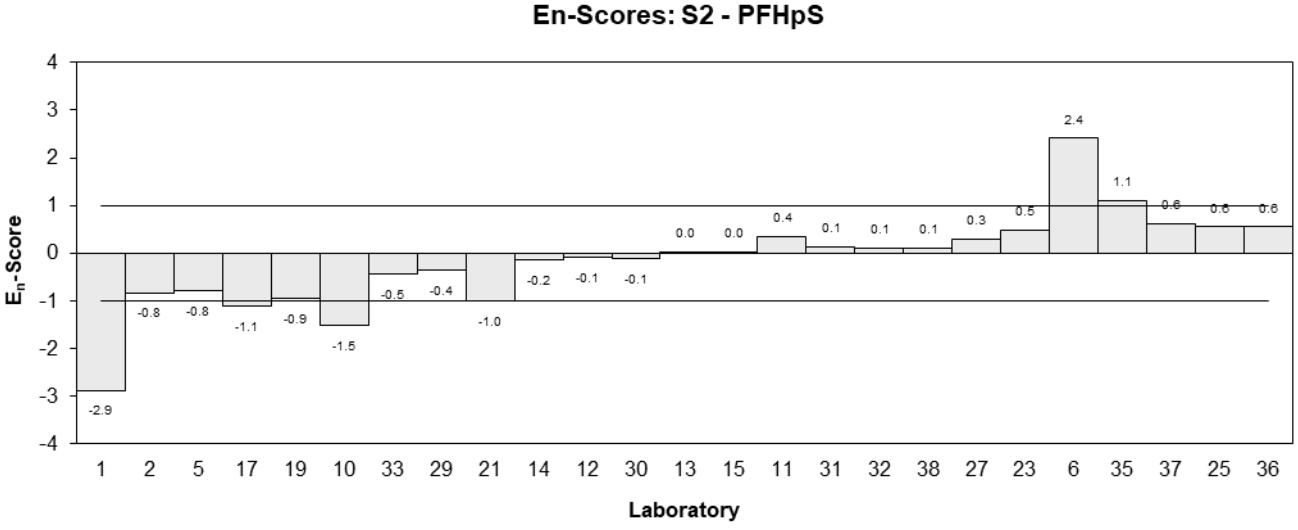

En-Scores: S2 - PFHpS
En-Score
Laboratory
1 2 5 17 19 10 33 29 21 14 12 30 13 15 11 31 32 38 27 23 6 35 37 25 36

Figure 32

Table 36

Sample Details

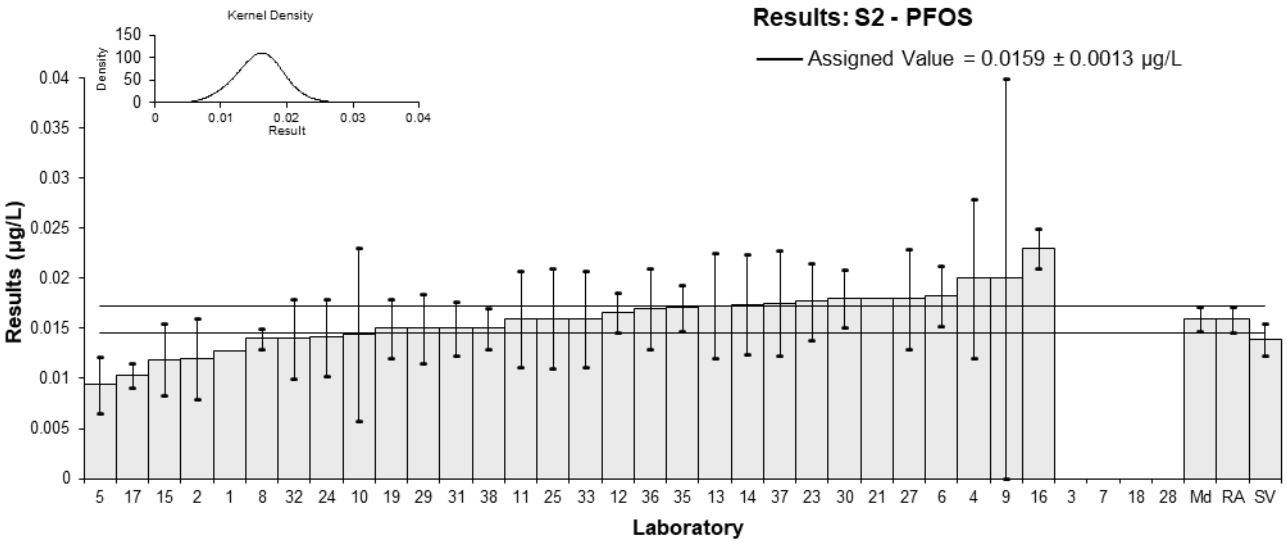
Sample No.	S2
Matrix	River Water
Analyte	PFOS
Unit	µg/L

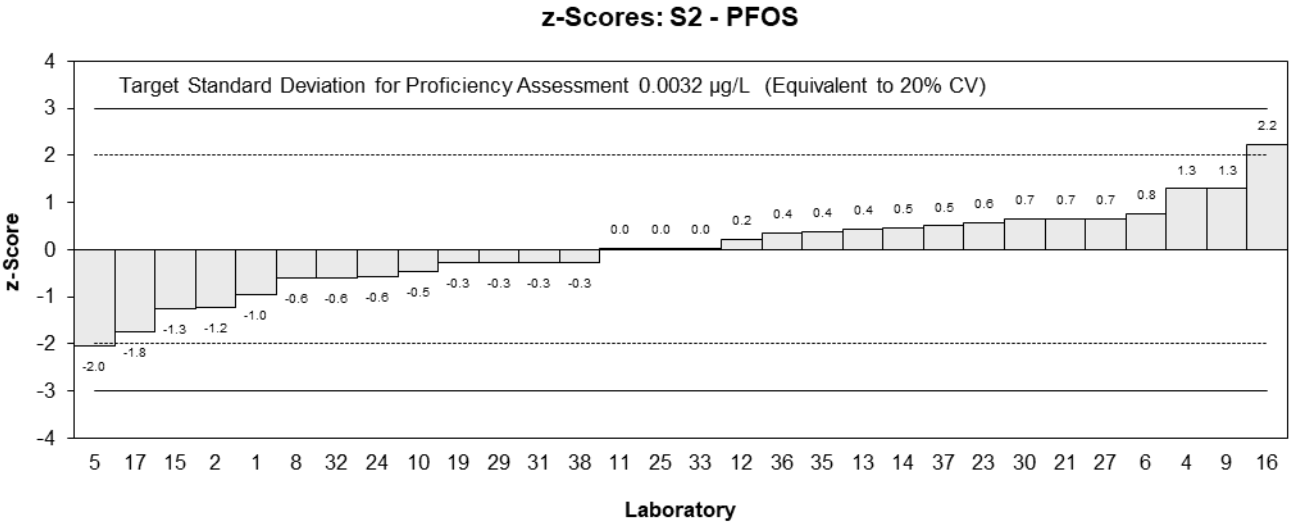
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0128	NR	NR	-0.97	-2.38
2	0.012	0.004	106	-1.23	-0.93
3	NR	NR	NR		
4	0.02	0.008	95	1.29	0.51
5	0.0094	0.00282	82	-2.04	-2.09
6	0.0183	0.003	87.49	0.75	0.73
7	NR	NR	NR		
8	0.014	0.001	91	-0.60	-1.16
9	0.02	0.02	80	1.29	0.20
10	0.014439	0.0086634	94	-0.46	-0.17
11	0.016	0.0048	95	0.03	0.02
12	0.0166	0.0020	NR	0.22	0.29
13	0.0173	0.0052	97	0.44	0.26
14	0.01737	0.005	92	0.46	0.28
15	0.0119	0.00357	90	-1.26	-1.05
16	0.023	0.002	62	2.23	2.98
17	0.0103	0.0012	110	-1.76	-3.17
18	NS	NS	NS		
19	0.015	0.003	NR	-0.28	-0.28
21	0.0180	NR	NR	0.66	1.62
23	0.0177	0.0038	99.62	0.57	0.45
24	0.0141	0.0038	98.48	-0.57	-0.45
25	0.016	0.005	84	0.03	0.02
27	0.0180	0.005	135	0.66	0.41
28	NS	NS	NS		
29	0.015	0.0034	109	-0.28	-0.25
30	0.0179988359	0.0029224417	92	0.66	0.66
31	0.015	0.0027	91	-0.28	-0.30
32	0.014	0.004	108	-0.60	-0.45
33	0.016	0.0048	NR	0.03	0.02
35	0.0171	0.0023	90.28	0.38	0.45
36	0.017	0.004	102	0.35	0.26
37	0.0175	0.00525	91	0.50	0.30
38	0.015	0.002	NR	-0.28	-0.38

Statistics

Assigned Value	0.0159	0.0013
Spike Value	0.0139	0.0016
Robust Average	0.0159	0.0013
Median	0.0160	0.0012
Mean	0.0159	
N	30	
Max	0.023	
Min	0.0094	
Robust SD	0.0028	
Robust CV	17%	


Kernel Density
Density
Result
Results: S2 - PFOS
Assigned Value = 0.0159 ± 0.0013 µg/L
Results (µg/L)
Laboratory
5 17 15 2 1 8 32 24 10 19 29 31 38 11 25 33 12 36 35 13 14 37 23 30 21 27 6 4 9 16 3 7 18 28 Md RA SV


z-Scores: S2 - PFOS
Target Standard Deviation for Proficiency Assessment 0.0032 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
5 17 15 2 1 8 32 24 10 19 29 31 38 11 25 33 12 36 35 13 14 37 23 30 21 27 6 4 9 16

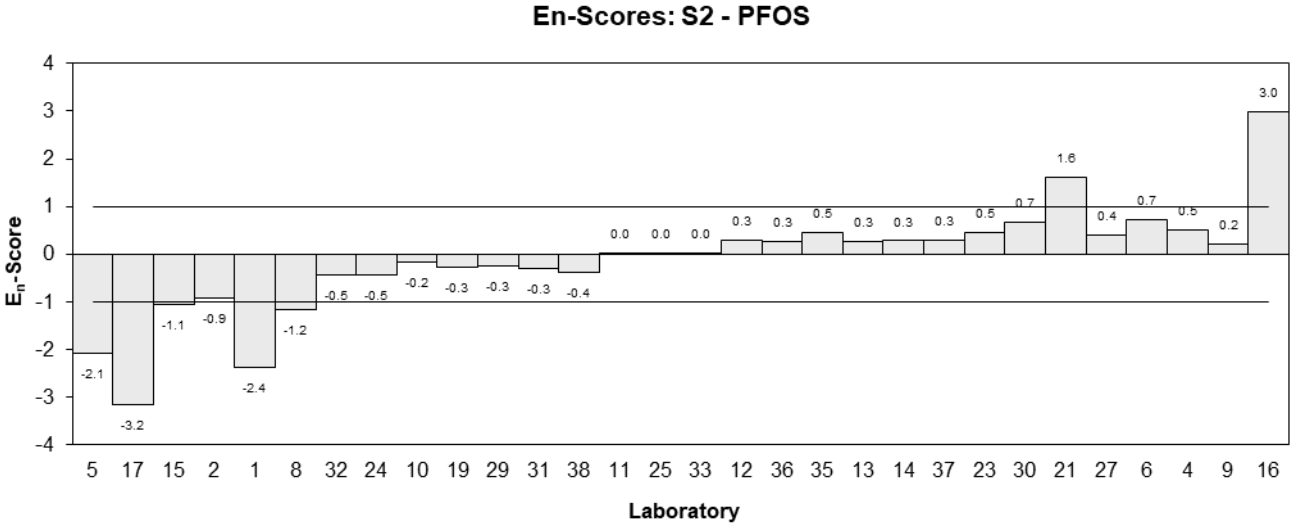

En-Scores: S2 - PFOS
En-Score
Laboratory
5 17 15 2 1 8 32 24 10 19 29 31 38 11 25 33 12 36 35 13 14 37 23 30 21 27 6 4 9 16

Figure 33

Table 37

Sample Details

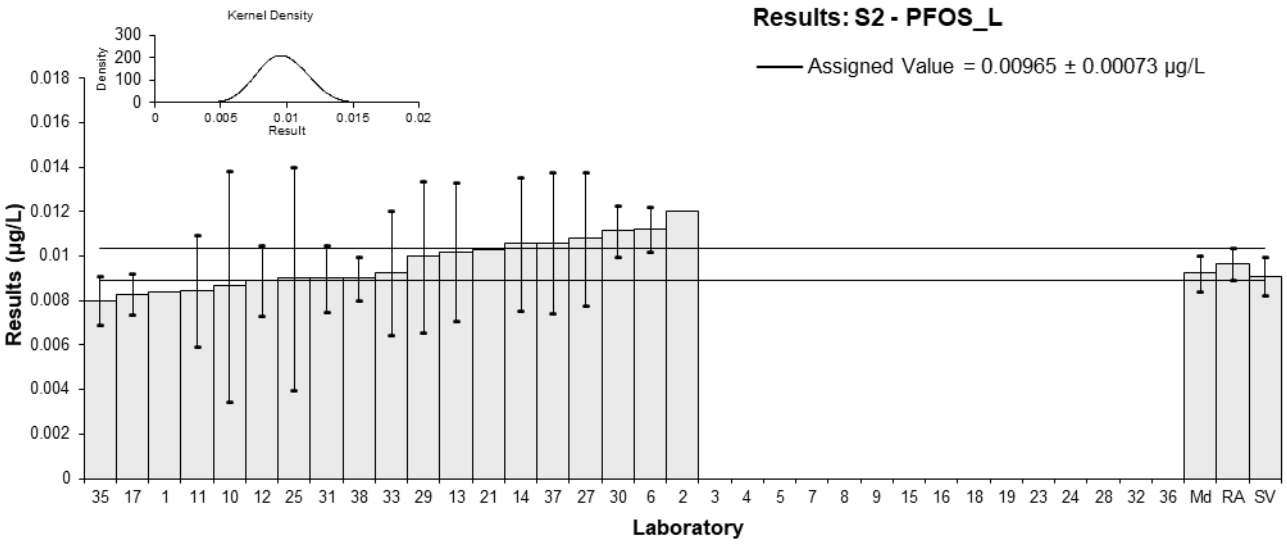
Sample No.	S2
Matrix	River Water
Analyte	PFOS_L
Unit	µg/L

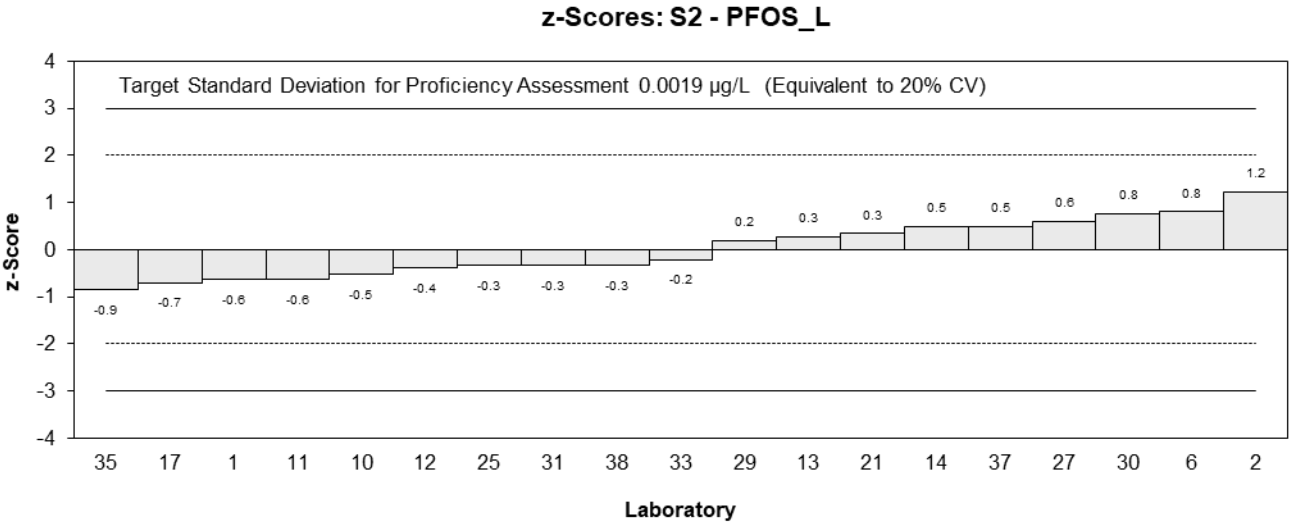
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.00841	NR	NR	-0.64	-1.70
2	0.012	NR	NR	1.22	3.22
3	NR	NR	NR		
4	<0.01	NR	95		
5	NT	NT	NT		
6	0.0112	0.001	87.49	0.80	1.25
7	NR	NR	NR		
8	<0.01	NR	NR		
9	NT	NT	NT		
10	0.008652	0.0051912	94	-0.52	-0.19
11	0.00846	0.0025	95	-0.62	-0.46
12	0.0089	0.0016	NR	-0.39	-0.43
13	0.0102	0.0031	97	0.28	0.17
14	0.01058	0.003	92	0.48	0.30
15	NT	NT	NT		
16	NR	NR	NR		
17	0.0083	0.0009	110	-0.70	-1.16
18	NS	NS	NS		
19	NT	NT	NT		
21	0.0103	NR	NR	0.34	0.89
23	NT	NT	NT		
24	NT	NT	NT		
25	0.009	0.005	84	-0.34	-0.13
27	0.0108	0.003	135	0.60	0.37
28	NS	NS	NS		
29	0.010	0.0034	109	0.18	0.10
30	0.0111407991	0.0011726413	92	0.77	1.08
31	0.009	0.0015	91	-0.34	-0.39
32	NT	NT	NT		
33	0.00925	0.0028	NR	-0.21	-0.14
35	0.008	0.0011	90.28	-0.85	-1.25
36	NT	NT	NT		
37	0.0106	0.00318	91	0.49	0.29
38	0.009	0.001	105	-0.34	-0.52

Statistics

Assigned Value	0.00965	0.00073
Spike Value	0.00909	0.00086
Robust Average	0.00965	0.00073
Median	0.00925	0.00081
Mean	0.00967	
N	19	
Max	0.012	
Min	0.008	
Robust SD	0.0013	
Robust CV	13%	


Kernel Density
Density
Result
Results: S2 - PFOS_L
Assigned Value = 0.00965 ± 0.00073 µg/L
Results (µg/L)
Laboratory
35 17 1 11 10 12 25 31 38 33 29 13 21 14 37 27 30 6 2 3 4 5 7 8 9 15 16 18 19 23 24 28 32 36 Md RA SV


z-Scores: S2 - PFOS_L
Target Standard Deviation for Proficiency Assessment 0.0019 µg/L (Equivalent to 20% CV)
z-Score
-0.9 -0.7 -0.6 -0.6 -0.5 -0.4 -0.3 -0.3 -0.3 -0.2 0.2 0.3 0.3 0.5 0.5 0.6 0.8 0.8 1.2
Laboratory
35 17 1 11 10 12 25 31 38 33 29 13 21 14 37 27 30 6 2

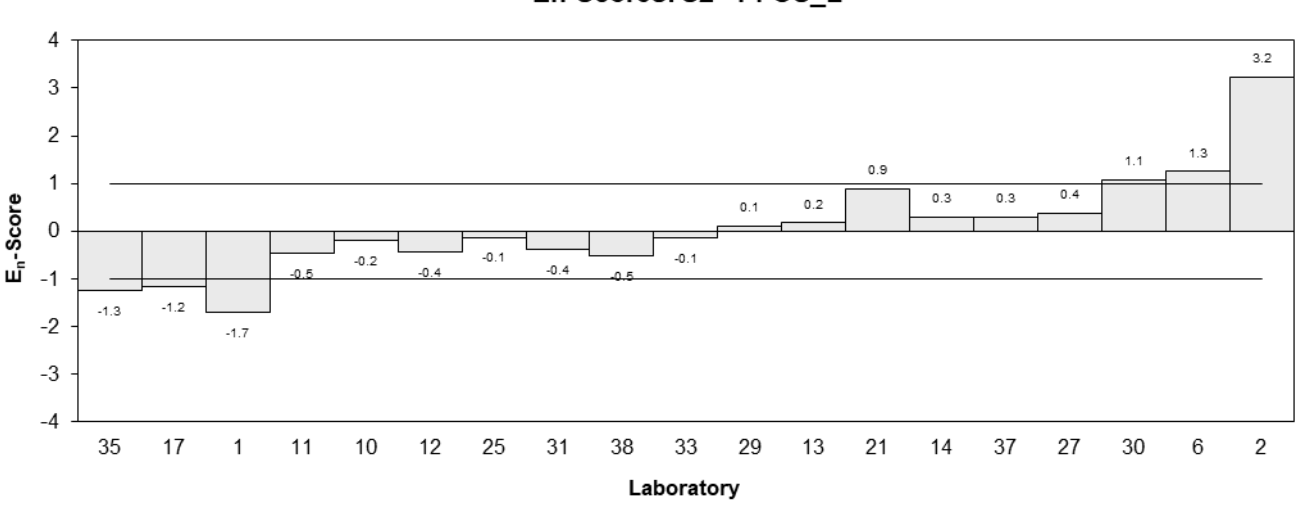

En-Scores: S2 - PFOS_L
En-Score
-1.3 -1.2 -1.7 -0.5 -0.2 -0.4 -0.1 -0.4 -0.5 -0.1 0.1 0.2 0.9 0.3 0.3 0.4 1.1 1.3 3.2
Laboratory
35 17 1 11 10 12 25 31 38 33 29 13 21 14 37 27 30 6 2

Figure 34

Table 38

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFDS
Unit	µg/L

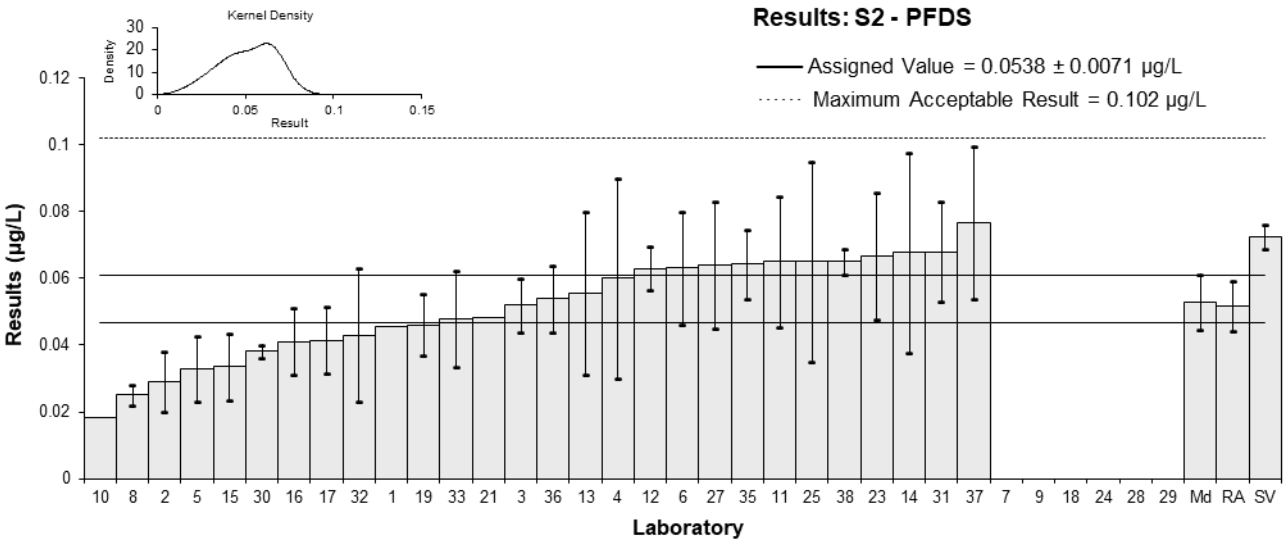
Participant Results

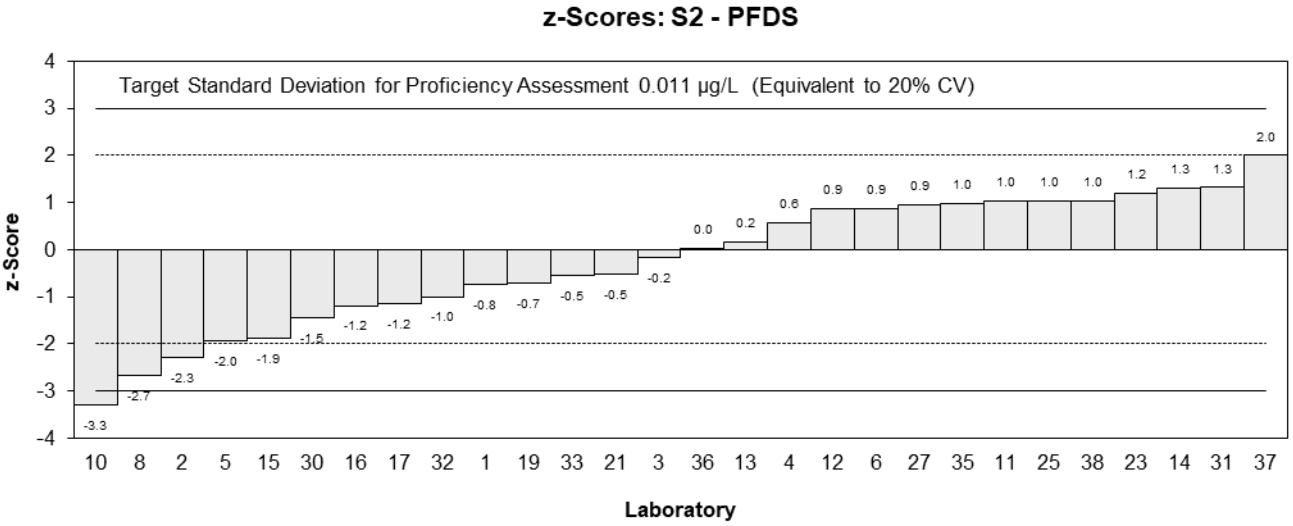
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0457	NR	NR	-0.75	-1.14
2	0.029	0.009	NR	-2.30	-2.16
3	0.052	0.008	NR	-0.17	-0.17
4	0.06	0.03	81	0.58	0.20
5	0.0328	0.00984	57	-1.95	-1.73
6	0.0631	0.017	87.49	0.86	0.50
7	NR	NR	NR		
8*	0.025	0.003	84	-2.68	-3.74
9	NT	NT	NT		
10*	0.018451	NR	NR	-3.29	-4.98
11	0.065	0.0195	95	1.04	0.54
12	0.063	0.0066	NR	0.86	0.95
13	0.0556	0.0245	NR	0.17	0.07
14	0.0678	0.030	165	1.30	0.45
15	0.0335	0.01005	75	-1.89	-1.65
16	0.041	0.010	NR	-1.19	-1.04
17	0.0414	0.0100	110	-1.15	-1.01
18	NS	NS	NS		
19	0.046	0.0092	NR	-0.72	-0.67
21	0.0481	NR	NR	-0.53	-0.80
23	0.0667	0.0189	99.62	1.20	0.64
24	<0.1	NR	71.50		
25	0.065	0.03	84	1.04	0.36
27	0.0639	0.019	135	0.94	0.50
28	NS	NS	NS		
29	NR	NR	109		
30	0.0381982224	0.0019339122	92	-1.45	-2.12
31	0.068	0.015	91	1.32	0.86
32	0.043	0.02	93	-1.00	-0.51
33	0.048	0.0144	NR	-0.54	-0.36
35	0.0643	0.0104	90.28	0.98	0.83
36	0.054	0.01	NR	0.02	0.02
37	0.0767	0.02301	91	2.00▼	
38	0.065	0.004	105	1.04	1.37

* Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.0538	0.0071
Spike Value	0.0725	0.0036
Robust Average	0.0518	0.0076
Max Acceptable Result	0.102	
Median	0.0530	0.0083
Mean	0.0514	
N	28	
Max	0.0767	
Min	0.018451	
Robust SD	0.016	
Robust CV	31%	


Kernel Density
Density
Result
Results: S2 - PFDS
Assigned Value = 0.0538 ± 0.0071 µg/L
Maximum Acceptable Result = 0.102 µg/L
Results (µg/L)
Laboratory
10 8 2 5 15 30 16 17 32 1 19 33 21 3 36 13 4 12 6 27 35 11 25 38 23 14 31 37 7 9 18 24 28 29 Md RA SV


z-Scores: S2 - PFDS
Target Standard Deviation for Proficiency Assessment 0.011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 8 2 5 15 30 16 17 32 1 19 33 21 3 36 13 4 12 6 27 35 11 25 38 23 14 31 37

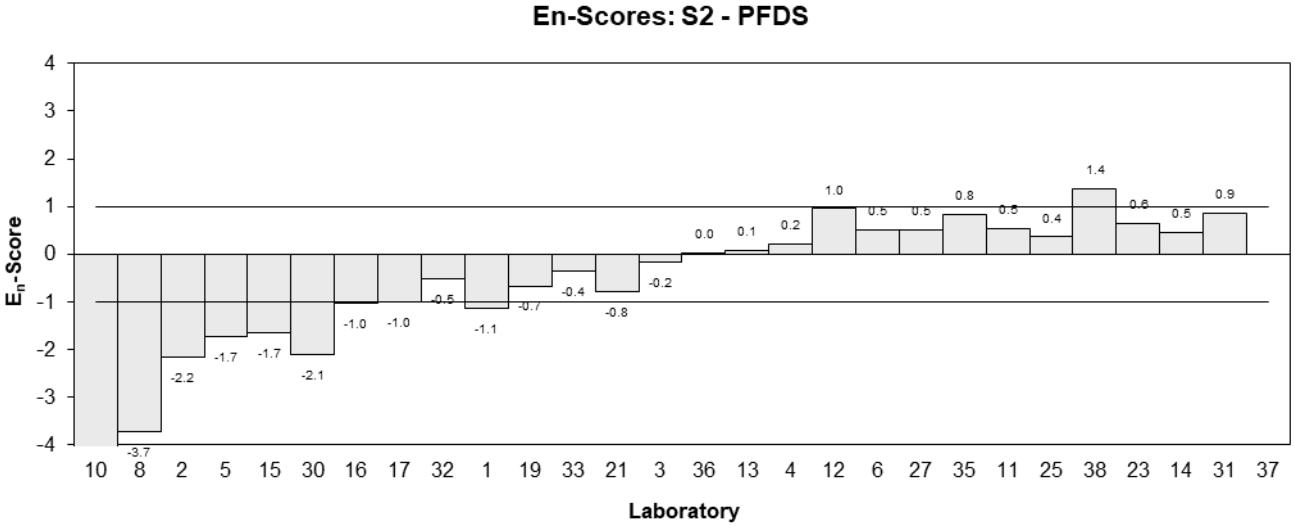

En-Scores: S2 - PFDS
En-Score
Laboratory
10 8 2 5 15 30 16 17 32 1 19 33 21 3 36 13 4 12 6 27 35 11 25 38 23 14 31 37

Figure 35

Table 39

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFDoS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.0107	NR	NR
2	NR	NR	NR
3	0.015	0.002	NR
4	NT	NT	NT
5	0.0256	0.00768	16
6	0.031	NR	87.49
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	<0.0005	NR	NR
11	NT	NT	NT
12	0.048	0.0084	NR
13	NT	NT	NT
14	NT	NT	NT
15	0.0338	0.01014	30
16	NR	NR	NR
17	0.0167	0.0072	100
18	NS	NS	NS
19	0.03	0.006	NR
21	NT	NT	NT
23	NT	NT	NT
24	0.0214	0.0064	62.08
25	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	NT	NT	NT
30	0.0054789319	0.0023194703	92
31	0.045	0.0009	100
32	0.032	0.01	68
33	NT	NT	NT
35	0.052	NR	90.28
36	NT	NT	NT
37	0.0682	0.02046	91
38	0.063	0.007	105

Statistics

Assigned Value	Not Set	
Spike Value	0.0729	0.0036
Robust Average	0.033	0.013
Median	0.031	0.014
Mean	0.0332	
N	15	
Max	0.0682	
Min	0.0054789319	
Robust SD	0.021	
Robust CV	63%	

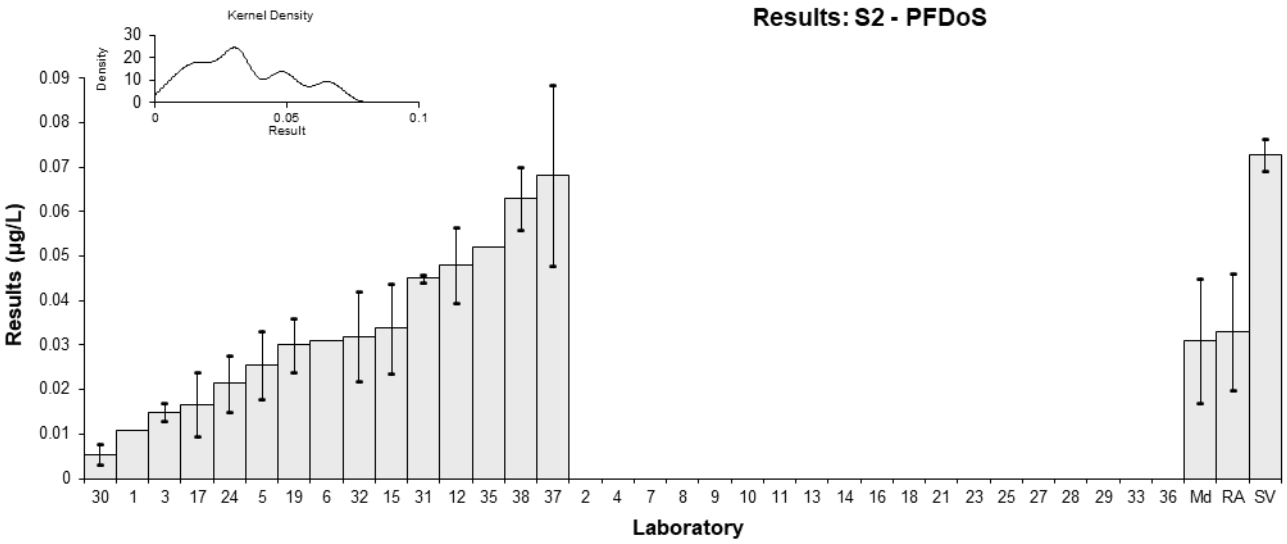

Results: S2 - PFDoS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
30 1 3 17 24 5 19 6 32 15 31 12 35 38 37 2 4 7 8 9 10 11 13 14 16 18 21 23 25 27 28 29 33 36 Md RA SV

Figure 36

Table 40

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFTrDS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.00645	NR	NR
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	NT	NT	NT
6	NT	NT	NT
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NR	NR	NR
16	NR	NR	NR
17	NT	NT	NT
18	NS	NS	NS
19	NT	NT	NT
21	NT	NT	NT
23	NT	NT	NT
24	0.0145	0.0043	62.08
25	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0731	0.0037
Robust Average	NA (N<6)	
Median	NA (N<3)	
Mean	0.0105	
N	2	
Max	NA (N<3)	
Min	NA (N<3)	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

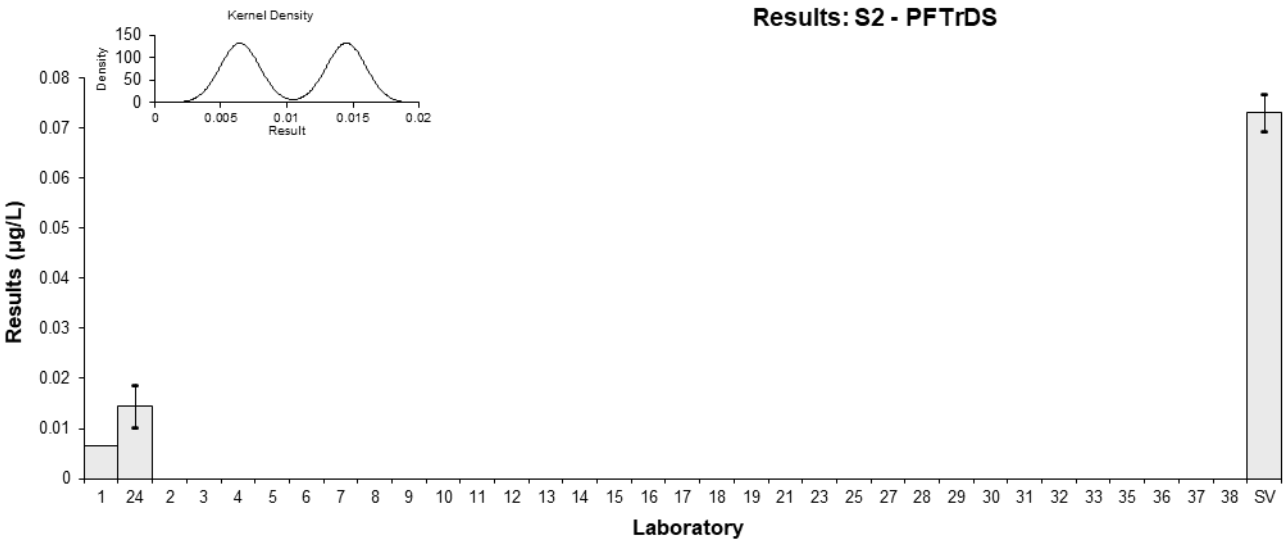

Results: S2 - PFTrDS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 24 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 23 25 27 28 29 30 31 32 33 35 36 37 38 SV

Figure 37

Table 41

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFBA
Unit	µg/L

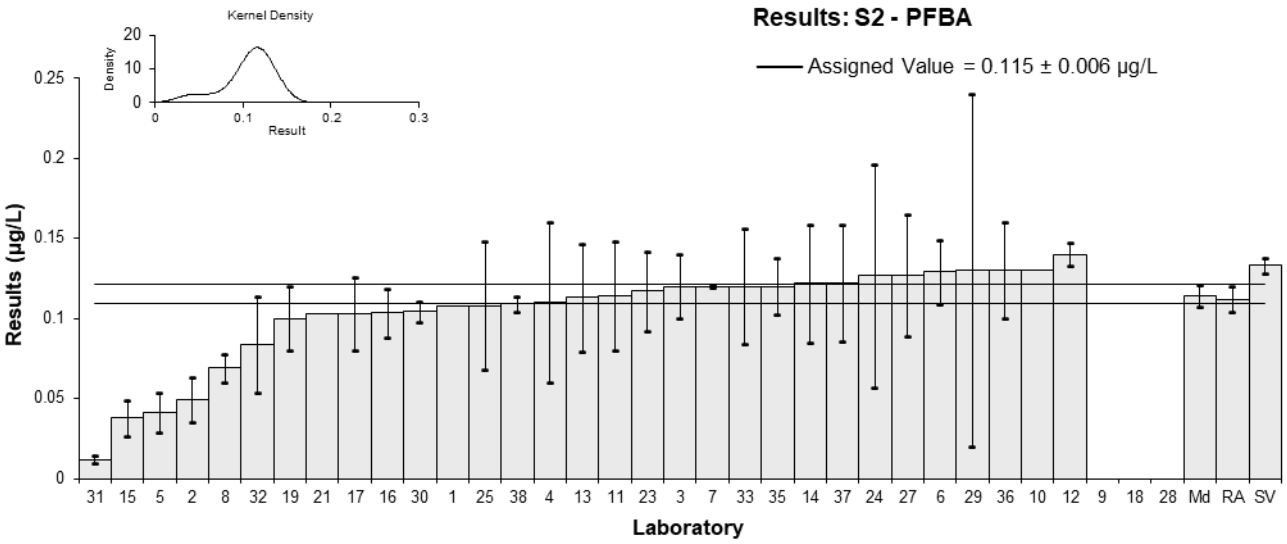
Participant Results

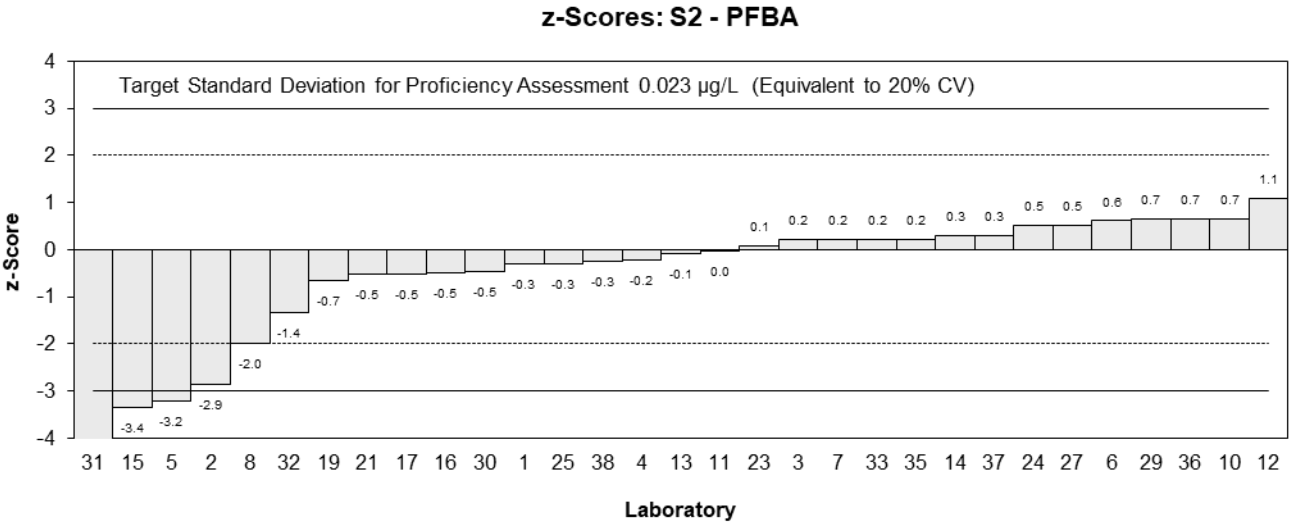
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.108	NR	NR	-0.30	-1.17
2*	0.049	0.014	92	-2.87	-4.33
3	0.12	0.02	105	0.22	0.24
4	0.11	0.05	70	-0.22	-0.10
5*	0.0411	0.01233	27	-3.21	-5.39
6	0.129	0.02	45.89	0.61	0.67
7	0.120	0.001	69.18	0.22	0.82
8	0.069	0.009	73	-2.00	-4.25
9	NT	NT	NT		
10	0.130061	NR	95	0.65	2.51
11	0.114	0.0342	21	-0.04	-0.03
12	0.14	0.0070	NR	1.09	2.71
13	0.1130	0.0339	92	-0.09	-0.06
14	0.1219	0.037	28	0.30	0.18
15*	0.0378	0.01134	75	-3.36	-6.02
16	0.1035	0.015	59	-0.50	-0.71
17	0.1031	0.0227	81	-0.52	-0.51
18	NS	NS	NS		
19	0.1	0.02	NR	-0.65	-0.72
21	0.103	NR	NR	-0.52	-2.00
23	0.117	0.025	53.47	0.09	0.08
24	0.1267	0.0697	NR	0.51	0.17
25	0.108	0.04	54	-0.30	-0.17
27	0.1269	0.038	106	0.52	0.31
28	NS	NS	NS		
29	0.13	0.11	59	0.65	0.14
30	0.1043214867	0.0066057822	24	-0.46	-1.20
31**	0.012	0.0025	31	-4.48	-15.85
32	0.084	0.03	66	-1.35	-1.01
33	0.12	0.036	NR	0.22	0.14
35	0.12	0.0174	27.59	0.22	0.27
36	0.13	0.03	92	0.65	0.49
37	0.122	0.0366	90	0.30	0.19
38	0.109	0.005	108	-0.26	-0.77

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.115	0.006
Spike Value	0.133	0.005
Robust Average	0.112	0.008
Median	0.114	0.007
Mean	0.107	
N	30	
Max	0.14	
Min	0.0378	
Robust SD	0.017	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - PFBA
Assigned Value = 0.115 ± 0.006 µg/L
Results (µg/L)
Laboratory
31 15 5 2 8 32 19 21 17 16 30 1 25 38 4 13 11 23 3 7 33 35 14 37 24 27 6 29 36 10 12 9 18 28 Md RA SV


z-Scores: S2 - PFBA
Target Standard Deviation for Proficiency Assessment 0.023 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
31 15 5 2 8 32 19 21 17 16 30 1 25 38 4 13 11 23 3 7 33 35 14 37 24 27 6 29 36 10 12

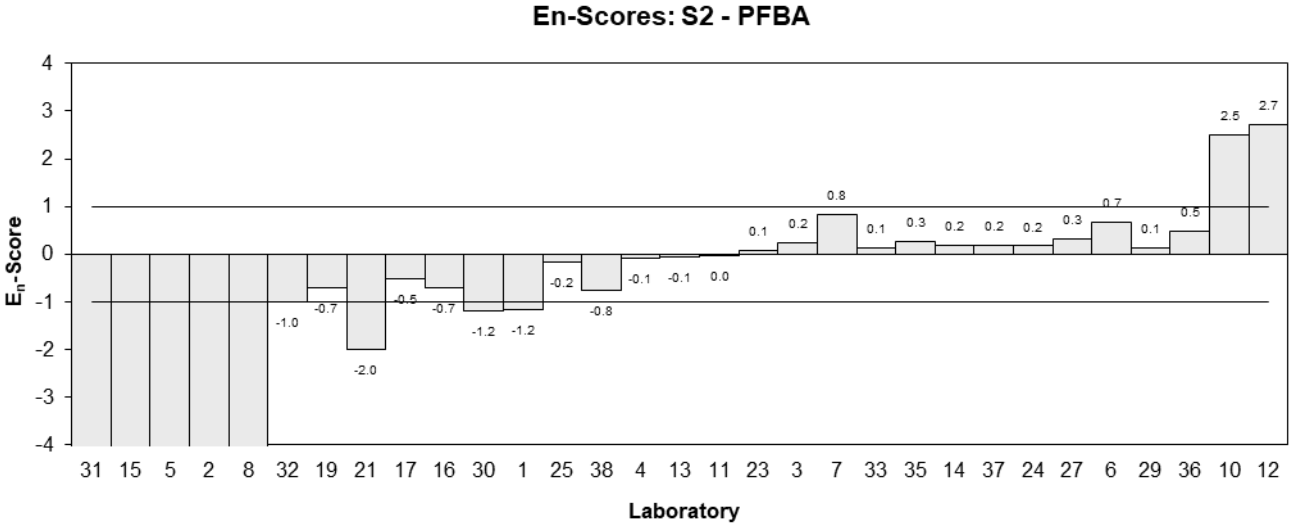

En-Scores: S2 - PFBA
En-Score
Laboratory
31 15 5 2 8 32 19 21 17 16 30 1 25 38 4 13 11 23 3 7 33 35 14 37 24 27 6 29 36 10 12

Figure 38

Table 42

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFPeA
Unit	µg/L

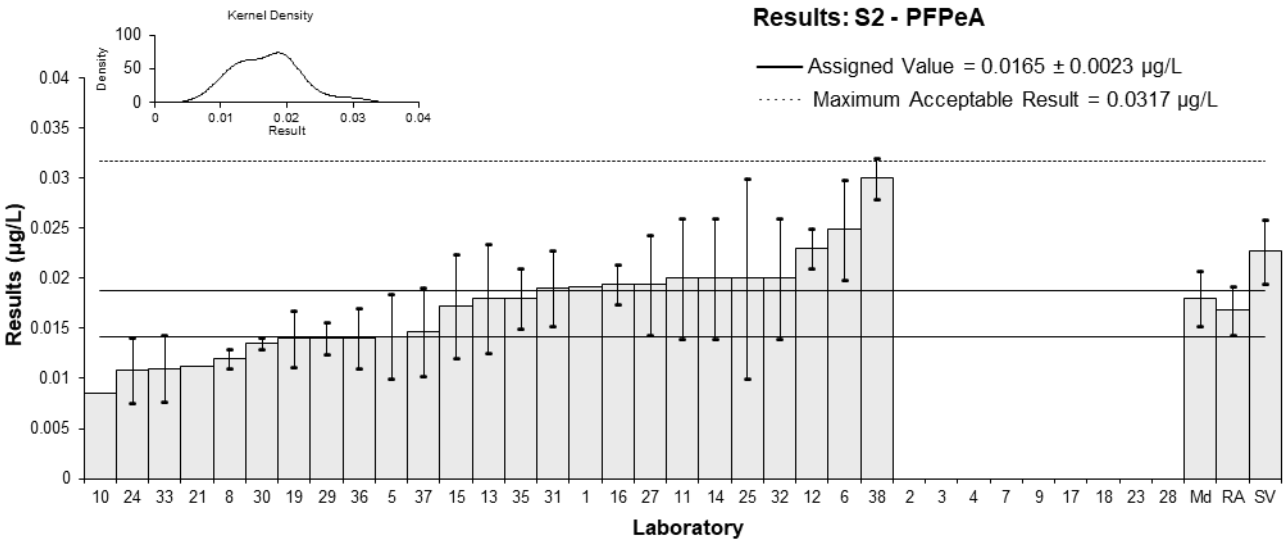
Participant Results

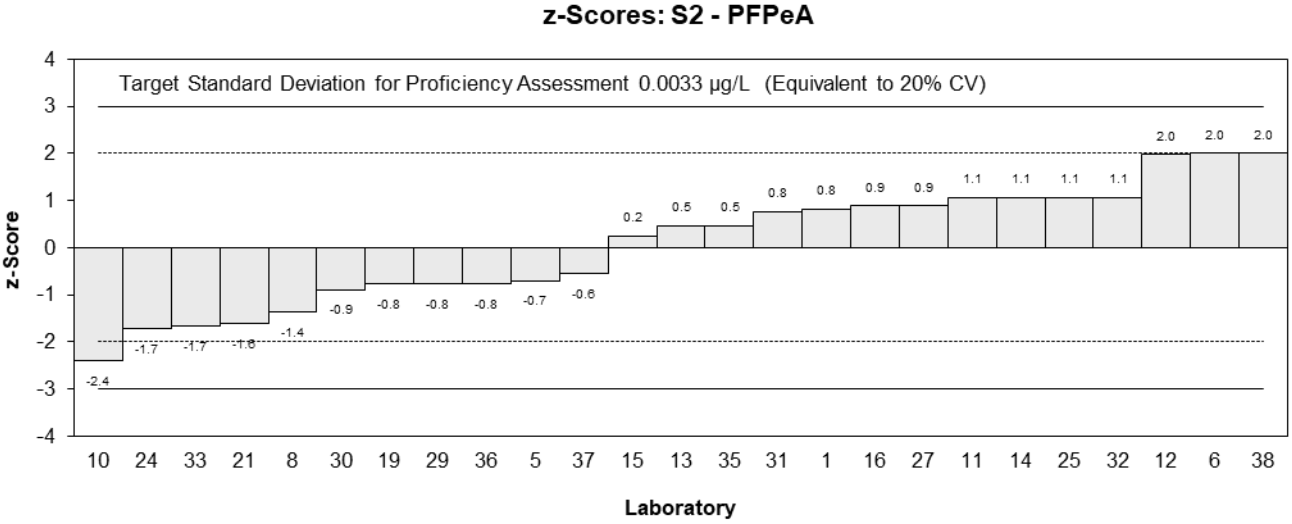
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0192	NR	NR	0.82	1.17
2	<0.01	NR	106		
3	NR	NR	NR		
4	<0.02	NR	88		
5	0.0142	0.00426	24	-0.70	-0.48
6	0.0249	0.005	68.52	2.00▼	
7	NR	NR	NR		
8	0.012	0.001	89	-1.36	-1.79
9	NT	NT	NT		
10	0.008582	NR	89	-2.40	-3.44
11	0.02	0.0060	110	1.06	0.54
12	0.023	0.0020	NR	1.97	2.13
13	0.0180	0.0054	135	0.45	0.26
14	0.0200	0.006	44	1.06	0.54
15	0.0173	0.00519	105	0.24	0.14
16	0.0194	0.002	82	0.88	0.95
17	<0.004	NR	104		
18	NS	NS	NS		
19	0.014	0.0028	NR	-0.76	-0.69
21	0.0112	NR	NR	-1.61	-2.30
23	<0.0055	NR	68.86		
24	0.0108	0.0033	92.24	-1.73	-1.42
25	0.020	0.01	64	1.06	0.34
27	0.01940	0.005	99	0.88	0.53
28	NS	NS	NS		
29	0.014	0.0016	84	-0.76	-0.89
30	0.0135515500	0.0005549990	103	-0.89	-1.25
31	0.019	0.0038	51	0.76	0.56
32	0.020	0.006	79	1.06	0.54
33	0.011	0.0033	NR	-1.67	-1.37
35	0.018	0.003	49.51	0.45	0.40
36	0.014	0.003	112	-0.76	-0.66
37	0.0147	0.00441	94	-0.55	-0.36
38*	0.03	0.002	100	2.00▼	

* Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.0165	0.0023
Spike Value	0.0227	0.0032
Robust Average	0.0168	0.0024
Max Acceptable Result	0.0317	
Median	0.0180	0.0028
Mean	0.0170	
N	25	
Max	0.03	
Min	0.008582	
Robust SD	0.0048	
Robust CV	29%	


Kernel Density
Density
Result
Results: S2 - PFPeA
Assigned Value = 0.0165 ± 0.0023 µg/L
Maximum Acceptable Result = 0.0317 µg/L
Results (µg/L)
Laboratory
10 24 33 21 8 30 19 29 36 5 37 15 13 35 31 1 16 27 11 14 25 32 12 6 38 2 3 4 7 9 17 18 23 28 Md RA SV


z-Scores: S2 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.0033 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
10 24 33 21 8 30 19 29 36 5 37 15 13 35 31 1 16 27 11 14 25 32 12 6 38

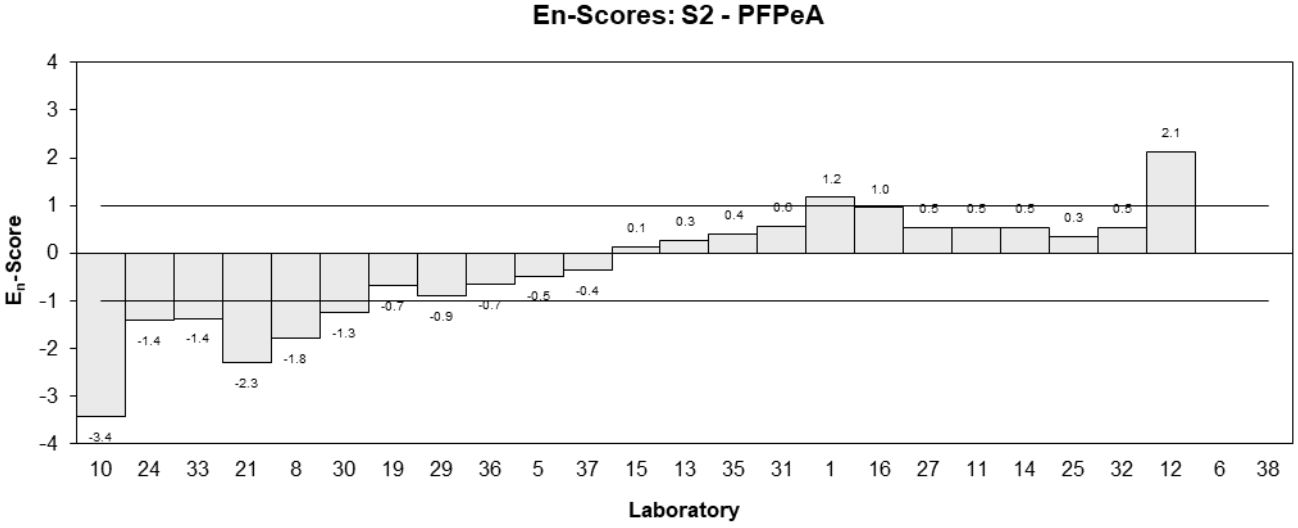

En-Scores: S2 - PFPeA
En-Score
Laboratory
10 24 33 21 8 30 19 29 36 5 37 15 13 35 31 1 16 27 11 14 25 32 12 6 38

Figure 39

Table 43

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFHxA
Unit	µg/L

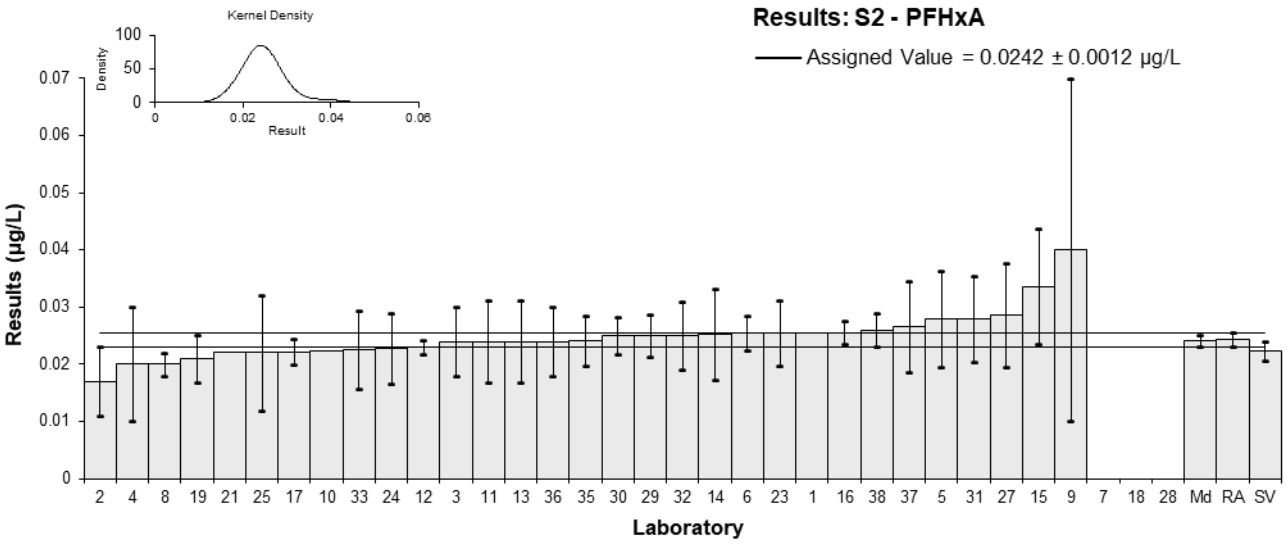
Participant Results

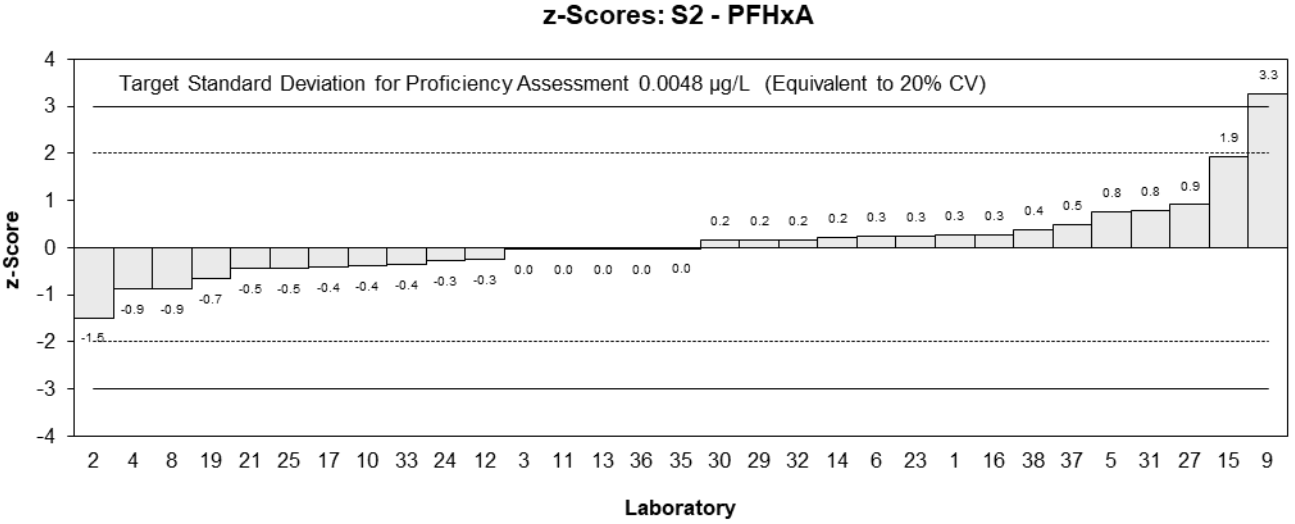
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0255	NR	NR	0.27	1.08
2	0.017	0.006	105	-1.49	-1.18
3	0.024	0.006	89	-0.04	-0.03
4	0.02	0.01	89	-0.87	-0.42
5	0.0279	0.00837	70	0.76	0.44
6	0.0254	0.003	85.68	0.25	0.37
7	NR	NR	NR		
8	0.02	0.002	104	-0.87	-1.80
9*	0.04	0.03	40	3.26	0.53
10	0.02234	NR	110	-0.38	-1.55
11	0.024	0.0072	84	-0.04	-0.03
12	0.023	0.0012	NR	-0.25	-0.71
13	0.0240	0.0072	127	-0.04	-0.03
14	0.0252	0.008	58	0.21	0.12
15	0.0336	0.01008	115	1.94	0.93
16	0.0255	0.002	86	0.27	0.56
17	0.0222	0.0022	103	-0.41	-0.80
18	NS	NS	NS		
19	0.021	0.0042	NR	-0.66	-0.73
21	0.0220	NR	NR	-0.45	-1.83
23	0.0254	0.0057	70.65	0.25	0.21
24	0.0228	0.0062	92.24	-0.29	-0.22
25	0.022	0.01	95	-0.45	-0.22
27	0.0286	0.009	118	0.91	0.48
28	NS	NS	NS		
29	0.025	0.0037	82	0.17	0.21
30	0.0249207210	0.0032388198	100	0.15	0.21
31	0.028	0.0075	62	0.79	0.50
32	0.025	0.006	95	0.17	0.13
33	0.0225	0.0068	NR	-0.35	-0.25
35	0.0241	0.0044	70.57	-0.02	-0.02
36	0.024	0.006	101	-0.04	-0.03
37	0.0265	0.00795	98	0.48	0.29
38	0.026	0.003	104	0.37	0.56

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0242	0.0012
Spike Value	0.0223	0.0016
Robust Average	0.0243	0.0013
Median	0.0241	0.0011
Mean	0.0248	
N	31	
Max	0.04	
Min	0.017	
Robust SD	0.0028	
Robust CV	12%	


Kernel Density
Density
Result
Results: S2 - PFHxA
Assigned Value = 0.0242 ± 0.0012 µg/L
Results (µg/L)
Laboratory
2 4 8 19 21 25 17 10 33 24 12 3 11 13 36 35 30 29 32 14 6 23 1 16 38 37 5 31 27 15 9 7 18 28 Md RA SV


z-Scores: S2 - PFHxA
Target Standard Deviation for Proficiency Assessment 0.0048 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 4 8 19 21 25 17 10 33 24 12 3 11 13 36 35 30 29 32 14 6 23 1 16 38 37 5 31 27 15 9

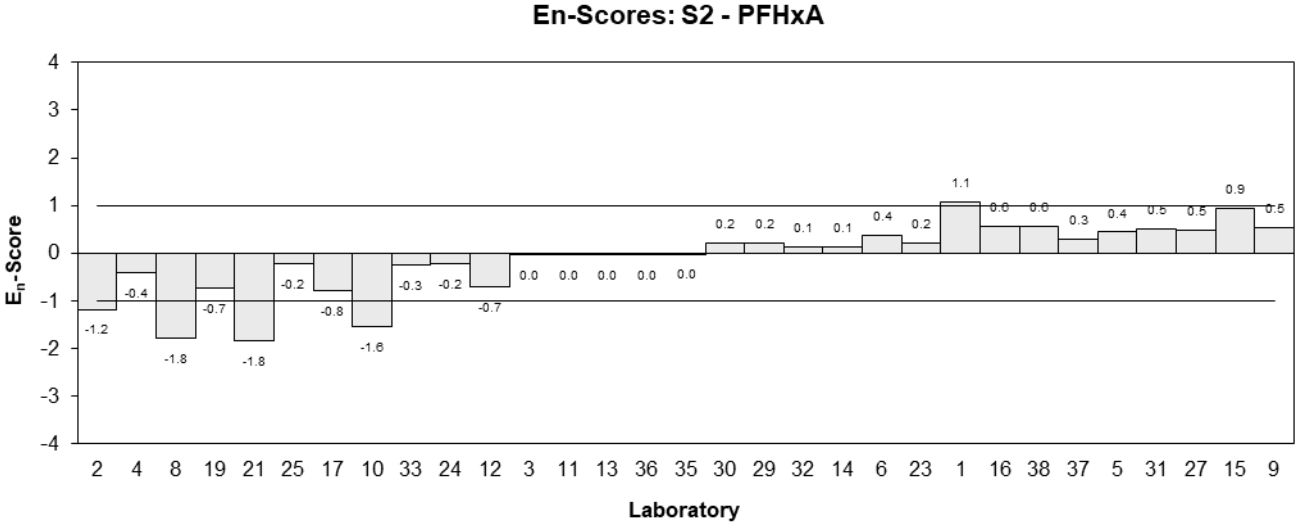

En-Scores: S2 - PFHxA
En-Score
Laboratory
2 4 8 19 21 25 17 10 33 24 12 3 11 13 36 35 30 29 32 14 6 23 1 16 38 37 5 31 27 15 9

Figure 40

Table 44

Sample Details

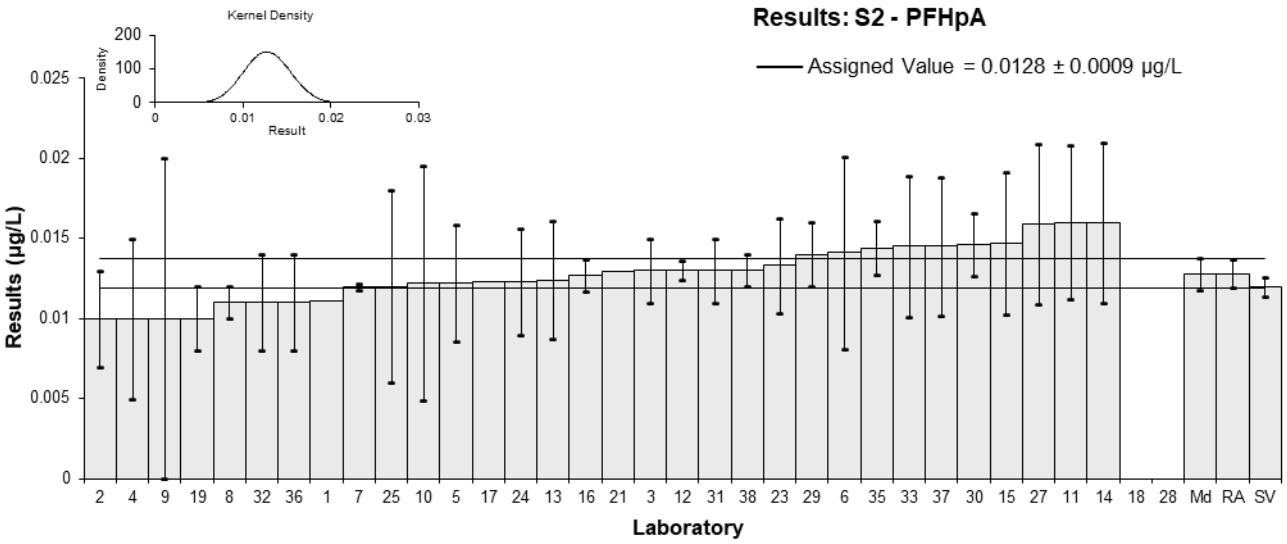
Sample No.	S2
Matrix	River Water
Analyte	PFHpA
Unit	µg/L

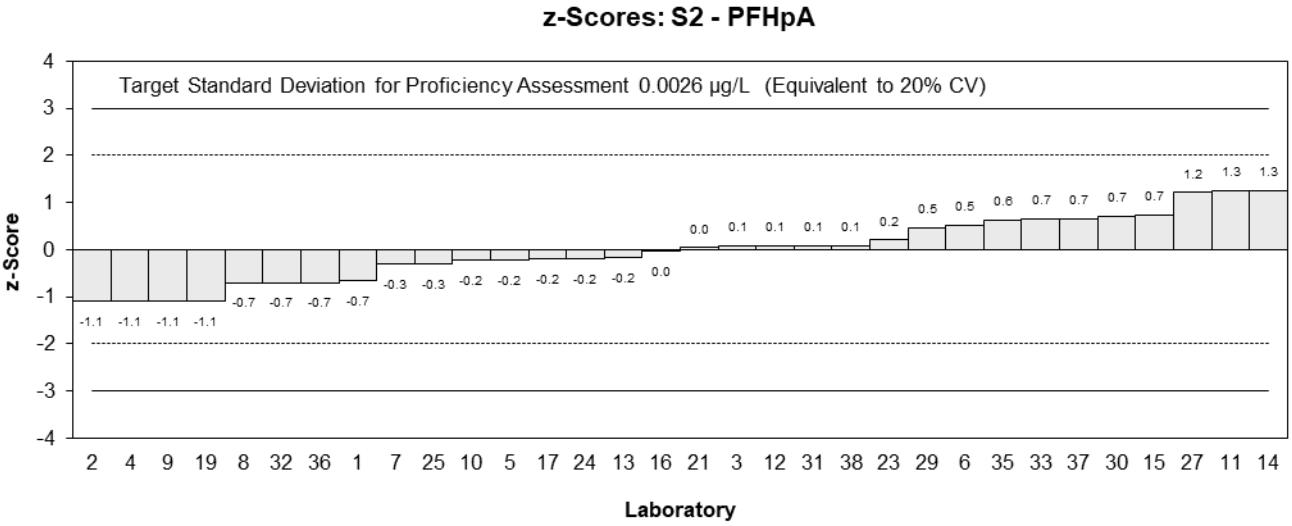
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.01109	NR	NR	-0.67	-1.90
2	0.01	0.003	105	-1.09	-0.89
3	0.013	0.002	102	0.08	0.09
4	0.01	0.005	92	-1.09	-0.55
5	0.0122	0.00366	92	-0.23	-0.16
6	0.0141	0.006	93.63	0.51	0.21
7	0.012	0.0002	79.09	-0.31	-0.87
8	0.011	0.001	141	-0.70	-1.34
9	0.01	0.01	95	-1.09	-0.28
10	0.012199	0.0073194	105	-0.23	-0.08
11	0.016	0.0048	81	1.25	0.66
12	0.013	0.0006	NR	0.08	0.18
13	0.0124	0.0037	127	-0.16	-0.11
14	0.016	0.005	71	1.25	0.63
15	0.0147	0.00441	90	0.74	0.42
16	0.0127	0.001	93	-0.04	-0.07
17	0.0123	NR	99	-0.20	-0.56
18	NS	NS	NS		
19	0.01	0.002	NR	-1.09	-1.28
21	0.0129	NR	NR	0.04	0.11
23	0.0133	0.003	81.07	0.20	0.16
24	0.0123	0.0033	102.86	-0.20	-0.15
25	0.012	0.006	122	-0.31	-0.13
27	0.0159	0.005	91	1.21	0.61
28	NS	NS	NS		
29	0.014	0.0020	92	0.47	0.55
30	0.0146200392	0.0019894741	93	0.71	0.83
31	0.013	0.002	57	0.08	0.09
32	0.011	0.003	68	-0.70	-0.57
33	0.0145	0.0044	NR	0.66	0.38
35	0.0144	0.0017	78.46	0.62	0.83
36	0.011	0.003	111	-0.70	-0.57
37	0.0145	0.00435	96	0.66	0.38
38	0.013	0.001	90	0.08	0.15

Statistics

Assigned Value	0.0128	0.0009
Spike Value	0.0120	0.0006
Robust Average	0.0128	0.0009
Median	0.0128	0.0010
Mean	0.0128	
N	32	
Max	0.016	
Min	0.01	
Robust SD	0.0019	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - PFHpA
Assigned Value = 0.0128 ± 0.0009 µg/L
Results (µg/L)
Laboratory
2 4 9 19 8 32 36 1 7 25 10 5 17 24 13 16 21 3 12 31 38 23 29 6 35 33 37 30 15 27 11 14 18 28 Md RA SV


z-Scores: S2 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.0026 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 4 9 19 8 32 36 1 7 25 10 5 17 24 13 16 21 3 12 31 38 23 29 6 35 33 37 30 15 27 11 14

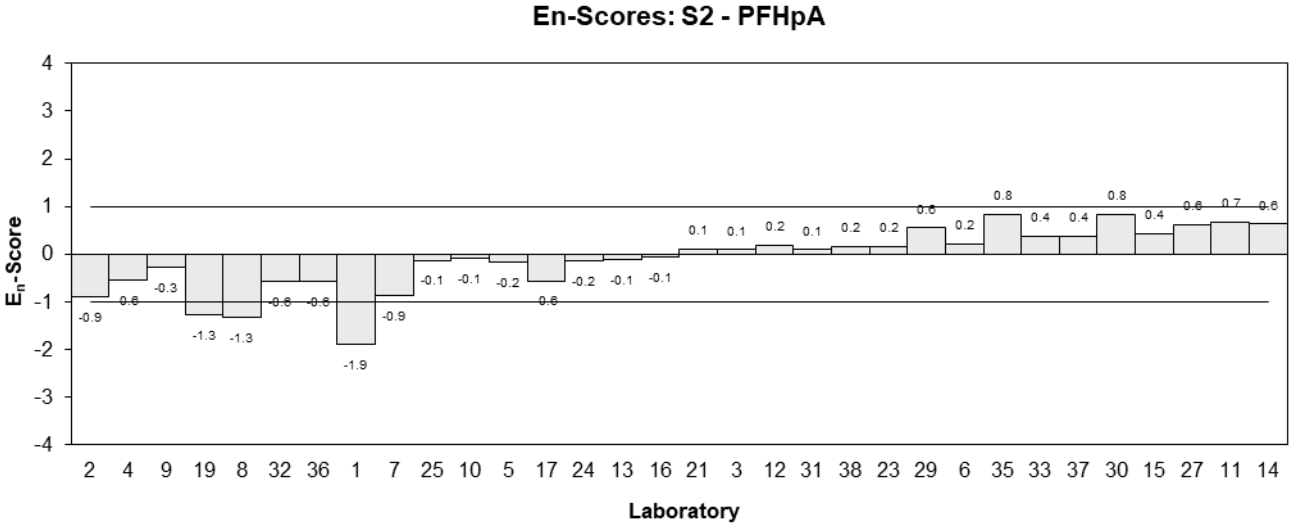

En-Scores: S2 - PFHpA
En-Score
Laboratory
2 4 9 19 8 32 36 1 7 25 10 5 17 24 13 16 21 3 12 31 38 23 29 6 35 33 37 30 15 27 11 14

Figure 41

Table 45

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFOA
Unit	µg/L

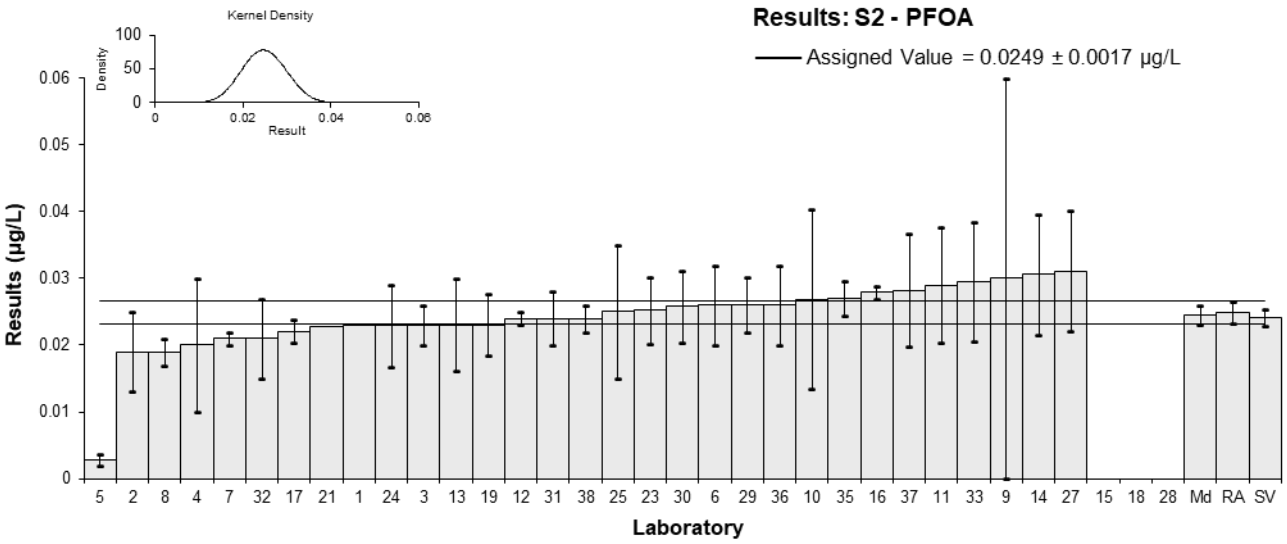
Participant Results

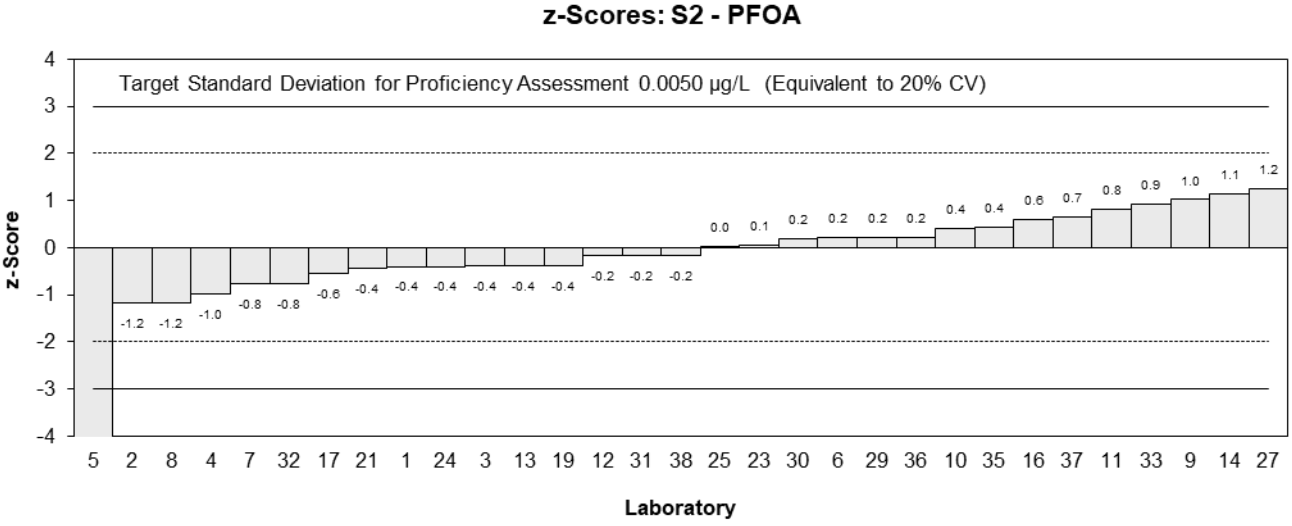
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0229	NR	NR	-0.40	-1.18
2	0.019	0.006	105	-1.18	-0.95
3	0.023	0.003	98	-0.38	-0.55
4	0.02	0.01	95	-0.98	-0.48
5**	0.0028	0.00084	102	-4.44	-11.65
6	0.026	0.006	109.71	0.22	0.18
7	0.021	0.001	87.44	-0.78	-1.98
8	0.019	0.002	117	-1.18	-2.25
9	0.03	0.03	94	1.02	0.17
10	0.026878	0.013439	100	0.40	0.15
11	0.029	0.0087	82	0.82	0.46
12	0.024	0.0010	NR	-0.18	-0.46
13	0.0230	0.0069	102	-0.38	-0.27
14	0.0306	0.009	78	1.14	0.62
15	NR	NR	NR		
16	0.0279	0.001	90	0.60	1.52
17	0.0221	0.0017	107	-0.56	-1.16
18	NS	NS	NS		
19	0.023	0.0046	NR	-0.38	-0.39
21	0.0227	NR	NR	-0.44	-1.29
23	0.0252	0.005	73.06	0.06	0.06
24	0.0229	0.0062	102.86	-0.40	-0.31
25	0.025	0.01	81	0.02	0.01
27	0.0311	0.009	110	1.24	0.68
28	NS	NS	NS		
29	0.026	0.0041	94	0.22	0.25
30	0.0258431382	0.0053705286	99	0.19	0.17
31	0.024	0.004	80	-0.18	-0.21
32	0.021	0.006	121	-0.78	-0.63
33	0.0295	0.0089	NR	0.92	0.51
35	0.0271	0.0026	100.11	0.44	0.71
36	0.026	0.006	102	0.22	0.18
37	0.0282	0.00846	102	0.66	0.38
38	0.024	0.002	108	-0.18	-0.34

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.0249	0.0017
Spike Value	0.0241	0.0013
Robust Average	0.0249	0.0017
Median	0.0245	0.0014
Mean	0.0249	
N	30	
Max	0.0311	
Min	0.019	
Robust SD	0.0037	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - PFOA
Assigned Value = 0.0249 ± 0.0017 µg/L
Results (µg/L)
Laboratory
5 2 8 4 7 32 17 21 1 24 3 13 19 12 31 38 25 23 30 6 29 36 10 35 16 37 11 33 9 14 27 15 18 28 Md RA SV


z-Scores: S2 - PFOA
Target Standard Deviation for Proficiency Assessment 0.0050 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
5 2 8 4 7 32 17 21 1 24 3 13 19 12 31 38 25 23 30 6 29 36 10 35 16 37 11 33 9 14 27

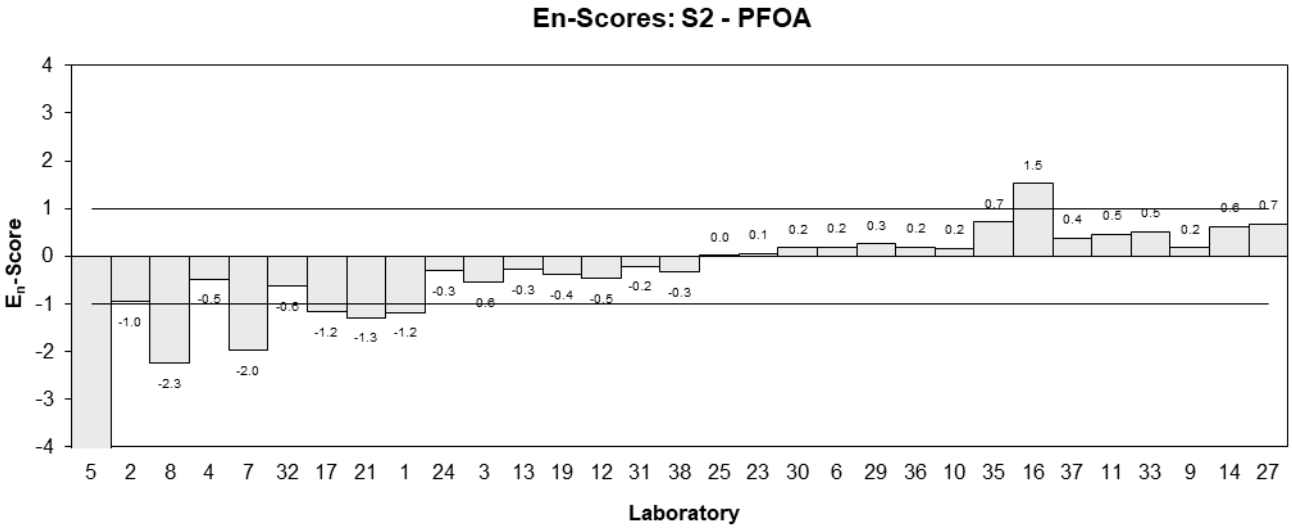

En-Scores: S2 - PFOA
En-Score
Laboratory
5 2 8 4 7 32 17 21 1 24 3 13 19 12 31 38 25 23 30 6 29 36 10 35 16 37 11 33 9 14 27

Figure 42

Table 46

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFDA
Unit	µg/L

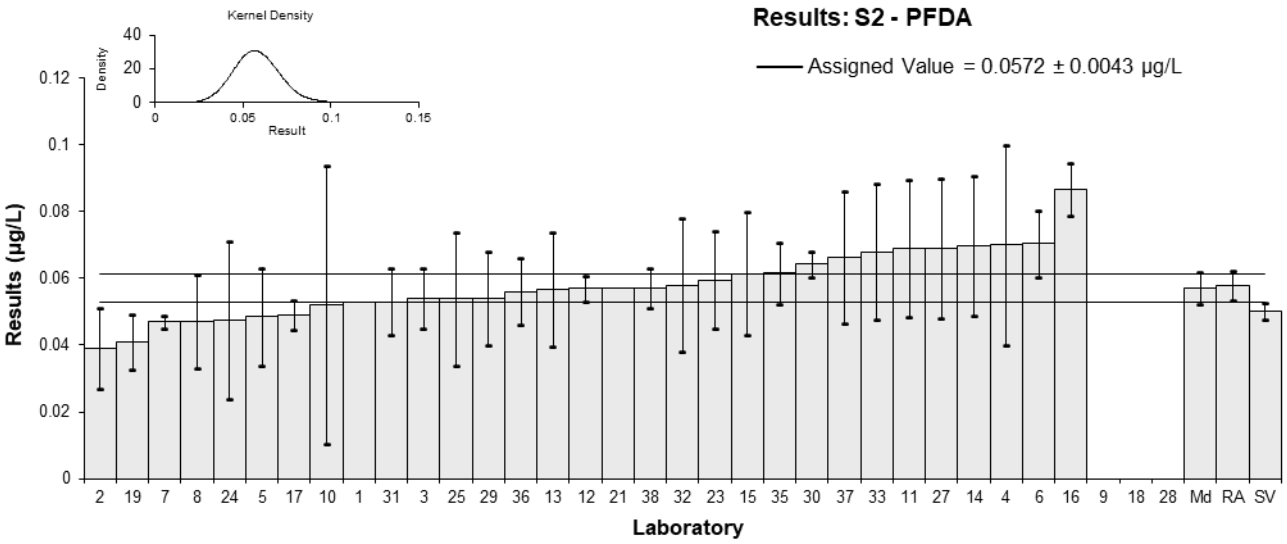
Participant Results

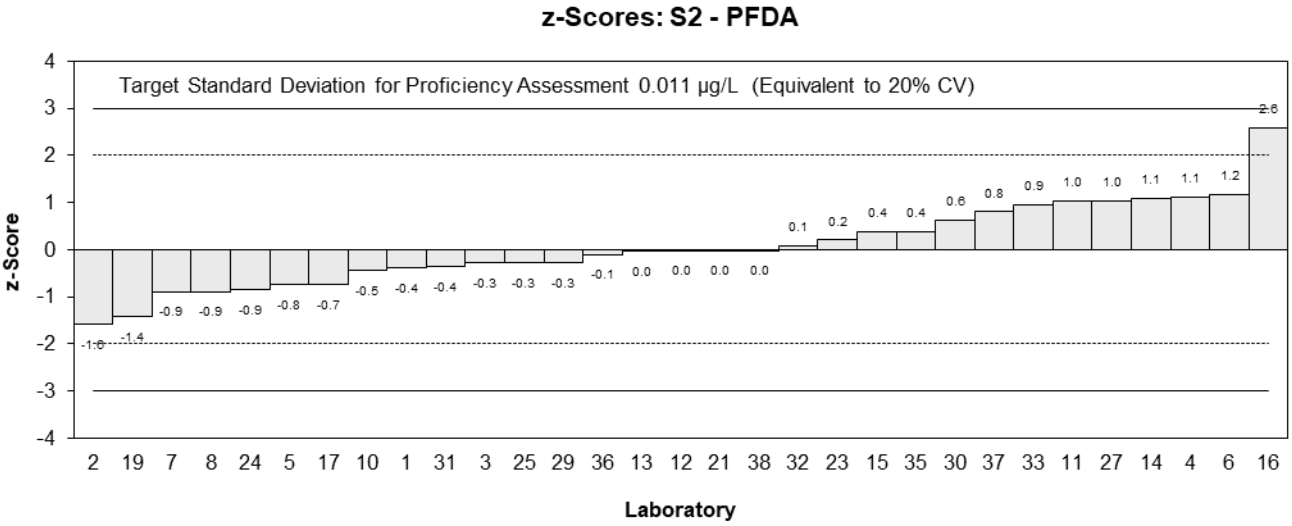
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0528	NR	NR	-0.38	-1.02
2	0.039	0.012	105	-1.59	-1.43
3	0.054	0.009	93	-0.28	-0.32
4	0.07	0.03	88	1.12	0.42
5	0.0486	0.01458	83	-0.75	-0.57
6	0.0705	0.01	95.16	1.16	1.22
7	0.047	0.002	105.28	-0.89	-2.15
8	0.047	0.014	84	-0.89	-0.70
9	NT	NT	NT		
10	0.052102	0.0416808	97	-0.45	-0.12
11	0.069	0.0207	78	1.03	0.56
12	0.057	0.0038	NR	-0.02	-0.03
13	0.0567	0.0170	85	-0.04	-0.03
14	0.0697	0.021	86	1.09	0.58
15	0.0614	0.01842	90	0.37	0.22
16*	0.0867	0.008	63	2.58	3.25
17	0.0489	0.0044	112	-0.73	-1.35
18	NS	NS	NS		
19	0.041	0.0082	NR	-1.42	-1.75
21	0.0570	NR	NR	-0.02	-0.05
23	0.0595	0.0146	83.29	0.20	0.15
24	0.0474	0.0237	102.86	-0.86	-0.41
25	0.054	0.02	124	-0.28	-0.16
27	0.0691	0.021	120	1.04	0.56
28	NS	NS	NS		
29	0.054	0.014	119	-0.28	-0.22
30	0.0642512168	0.0039340170	77	0.62	1.21
31	0.053	0.0099	91	-0.37	-0.39
32	0.058	0.02	87	0.07	0.04
33	0.068	0.0204	NR	0.94	0.52
35	0.0616	0.0092	107.02	0.38	0.43
36	0.056	0.01	96	-0.10	-0.11
37	0.0663	0.01989	104	0.80	0.45
38	0.057	0.006	108	-0.02	-0.03

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0572	0.0043
Spike Value	0.0501	0.0025
Robust Average	0.0577	0.0044
Median	0.0570	0.0048
Mean	0.0580	
N	31	
Max	0.0867	
Min	0.039	
Robust SD	0.0098	
Robust CV	17%	


Kernel Density
Density
Result
Results: S2 - PFDA
Assigned Value = 0.0572 ± 0.0043 µg/L
Results (µg/L)
Laboratory
2 19 7 8 24 5 17 10 1 31 3 25 29 36 13 12 21 38 32 23 15 35 30 37 33 11 27 14 4 6 16 9 18 28 Md RA SV


z-Scores: S2 - PFDA
Target Standard Deviation for Proficiency Assessment 0.011 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 19 7 8 24 5 17 10 1 31 3 25 29 36 13 12 21 38 32 23 15 35 30 37 33 11 27 14 4 6 16

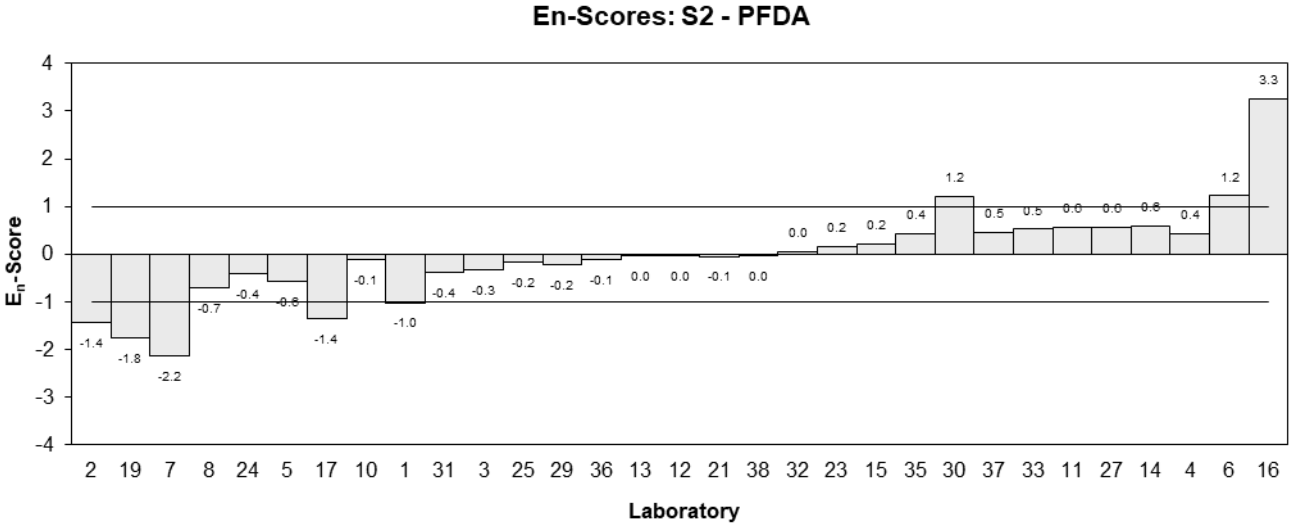

En-Scores: S2 - PFDA
En-Score
Laboratory
2 19 7 8 24 5 17 10 1 31 3 25 29 36 13 12 21 38 32 23 15 35 30 37 33 11 27 14 4 6 16

Figure 43

Table 47

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFUdA
Unit	µg/L

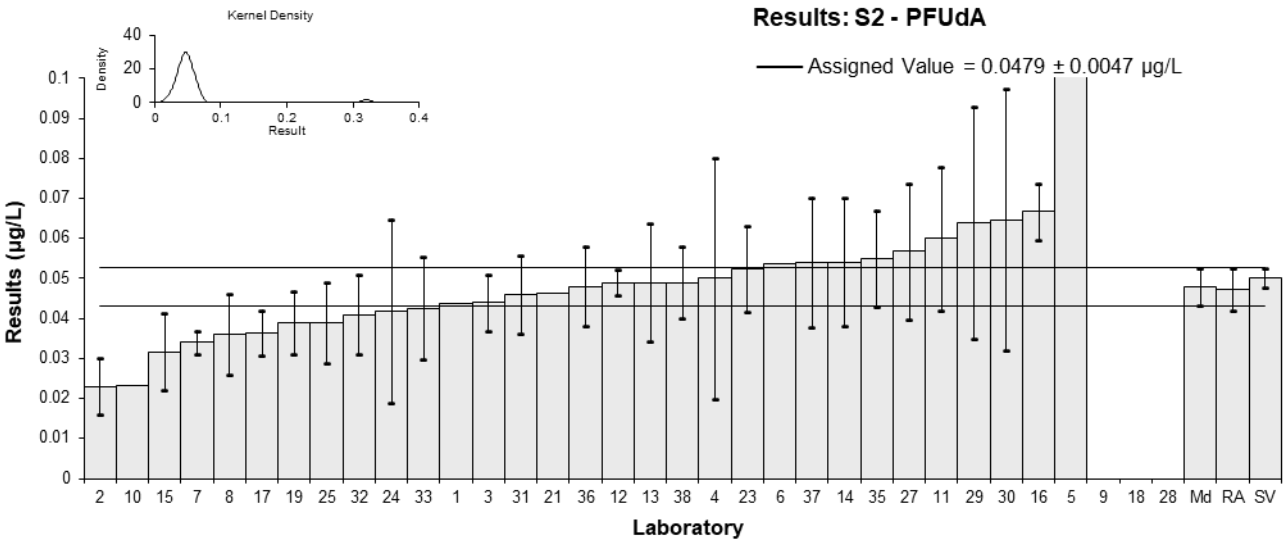
Participant Results

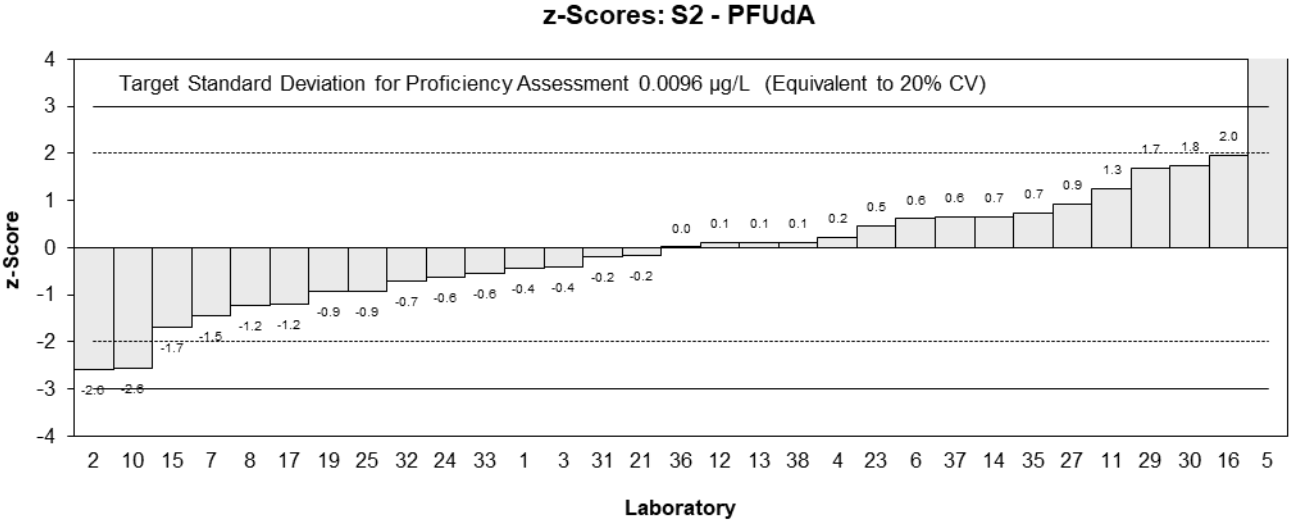
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0437	NR	NR	-0.44	-0.89
2*	0.023	0.007	99	-2.60	-2.95
3	0.044	0.007	69	-0.41	-0.46
4	0.05	0.03	90	0.22	0.07
5*	0.32	0.096	78	28.40	2.83
6	0.0537	NR	93.83	0.61	1.23
7	0.034	0.003	105.28	-1.45	-2.49
8	0.036	0.01	61	-1.24	-1.08
9	NT	NT	NT		
10*	0.023373	NR	116	-2.56	-5.22
11	0.06	0.0180	82	1.26	0.65
12	0.049	0.0032	NR	0.11	0.19
13	0.0490	0.0147	96	0.11	0.07
14	0.0541	0.016	77	0.65	0.37
15	0.0317	0.00951	155	-1.69	-1.53
16	0.0667	0.007	61	1.96	2.23
17	0.0364	0.0057	110	-1.20	-1.56
18	NS	NS	NS		
19	0.039	0.0078	NR	-0.93	-0.98
21	0.0464	NR	NR	-0.16	-0.32
23	0.0524	0.0107	85.07	0.47	0.39
24	0.0418	0.023	89.97	-0.64	-0.26
25	0.039	0.01	124	-0.93	-0.81
27	0.0568	0.017	127	0.93	0.50
28	NS	NS	NS		
29	0.064	0.029	119	1.68	0.55
30	0.0646271057	0.0327202272	57	1.75	0.51
31	0.046	0.0097	104	-0.20	-0.18
32	0.041	0.01	126	-0.72	-0.62
33	0.0425	0.0128	NR	-0.56	-0.40
35	0.055	0.012	92.53	0.74	0.55
36	0.048	0.01	97	0.01	0.01
37	0.0540	0.0162	100	0.64	0.36
38	0.049	0.009	103	0.11	0.11

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0479	0.0047
Spike Value	0.0501	0.0025
Robust Average	0.0474	0.0053
Median	0.0480	0.0047
Mean	0.055	
N	31	
Max	0.32	
Min	0.023	
Robust SD	0.012	
Robust CV	25%	


Results: S2 - PFUdA
Kernel Density
Density
Result
Assigned Value = 0.0479 ± 0.0047 µg/L
Results (µg/L)
Laboratory
2 10 15 7 8 17 19 25 32 24 33 1 3 31 21 36 12 13 38 4 23 6 37 14 35 27 11 29 30 16 5 9 18 28 Md RA SV


z-Scores: S2 - PFUdA
Target Standard Deviation for Proficiency Assessment 0.0096 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 10 15 7 8 17 19 25 32 24 33 1 3 31 21 36 12 13 38 4 23 6 37 14 35 27 11 29 30 16 5

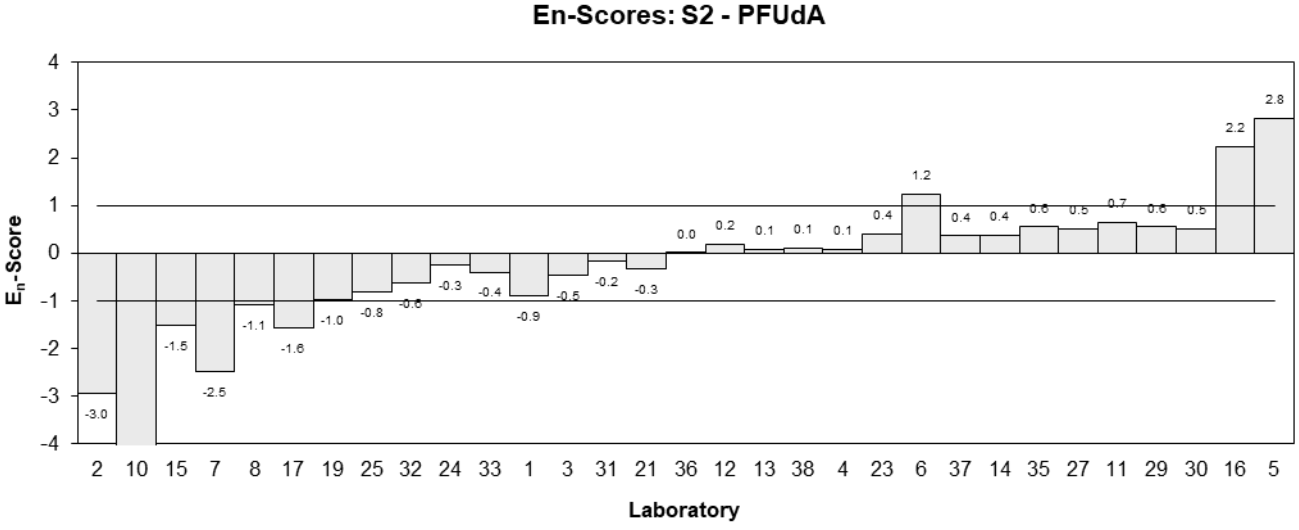

En-Scores: S2 - PFUdA
En-Score
Laboratory
2 10 15 7 8 17 19 25 32 24 33 1 3 31 21 36 12 13 38 4 23 6 37 14 35 27 11 29 30 16 5

Figure 44

Table 48

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFDoA
Unit	µg/L

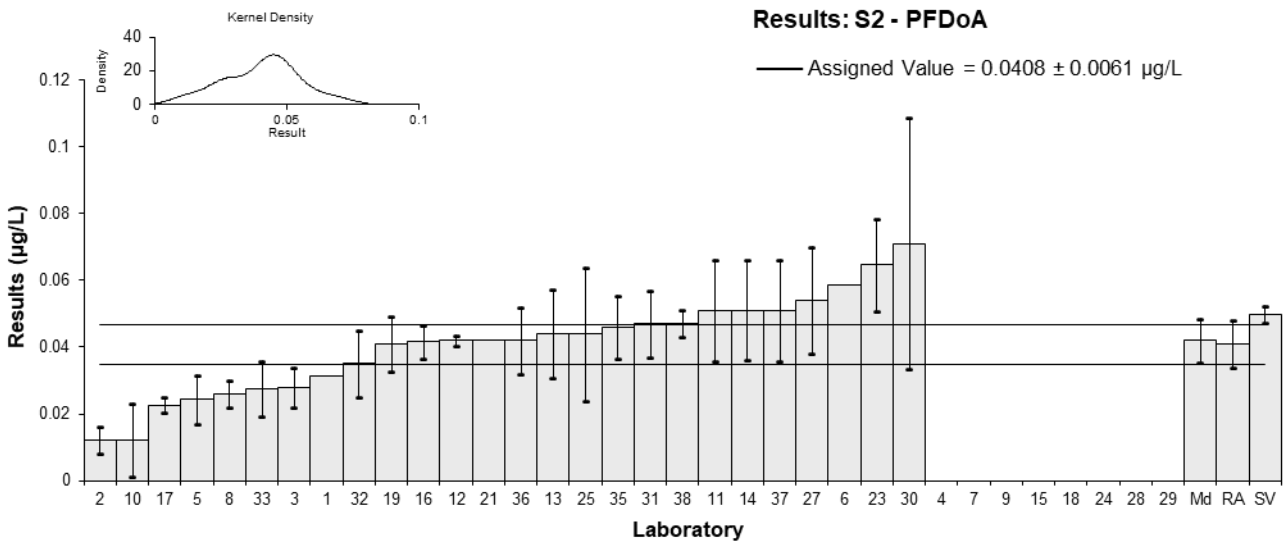
Participant Results

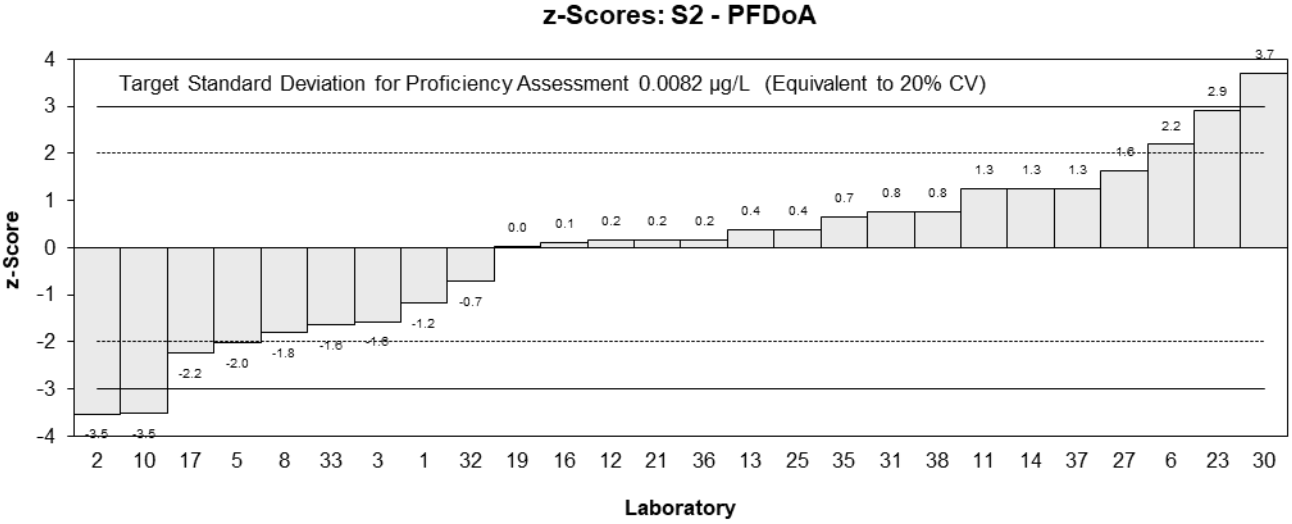
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0312	NR	NR	-1.18	-1.57
2*	0.012	0.004	106	-3.53	-3.95
3	0.028	0.006	71	-1.57	-1.50
4	<0.05	NR	99		
5	0.0244	0.00732	64	-2.01	-1.72
6	0.0587	NR	71.9	2.19	2.93
7	NR	NR	NR		
8	0.026	0.004	46	-1.81	-2.03
9	NT	NT	NT		
10*	0.01217	0.010953	108	-3.51	-2.28
11	0.051	0.0153	101	1.25	0.62
12	0.042	0.0016	NR	0.15	0.19
13	0.0440	0.0132	70	0.39	0.22
14	0.0510	0.015	73	1.25	0.63
15	NR	NR	NR		
16	0.0416	0.005	57	0.10	0.10
17	0.0226	0.0023	132	-2.23	-2.79
18	NS	NS	NS		
19	0.041	0.0082	NR	0.02	0.02
21	0.0420	NR	NR	0.15	0.20
23*	0.0646	0.0137	61.8	2.92	1.59
24	<0.06	NR	71.50		
25	0.044	0.02	107	0.39	0.15
27	0.0540	0.016	140	1.62	0.77
28	NS	NS	NS		
29	NR	NR	323		
30*	0.0710104595	0.0377239769	41	3.70	0.79
31	0.047	0.01	96	0.76	0.53
32	0.035	0.01	90	-0.71	-0.50
33	0.0275	0.0083	NR	-1.63	-1.29
35	0.0461	0.0094	96.78	0.65	0.47
36	0.042	0.01	77	0.15	0.10
37	0.0510	0.0153	94	1.25	0.62
38	0.047	0.004	98	0.76	0.85

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0408	0.0061
Spike Value	0.0499	0.0025
Robust Average	0.0408	0.0071
Median	0.0420	0.0065
Mean	0.0406	
N	26	
Max	0.0710104595	
Min	0.012	
Robust SD	0.015	
Robust CV	36%	


Kernel Density
Density
Result
Results: S2 - PFDoA
Assigned Value = 0.0408 ± 0.0061 µg/L
Results (µg/L)
Laboratory
2 10 17 5 8 33 3 1 32 19 16 12 21 36 13 25 35 31 38 11 14 37 27 6 23 30 4 7 9 15 18 24 28 29 Md RA SV


z-Scores: S2 - PFDoA
Target Standard Deviation for Proficiency Assessment 0.0082 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 10 17 5 8 33 3 1 32 19 16 12 21 36 13 25 35 31 38 11 14 37 27 6 23 30

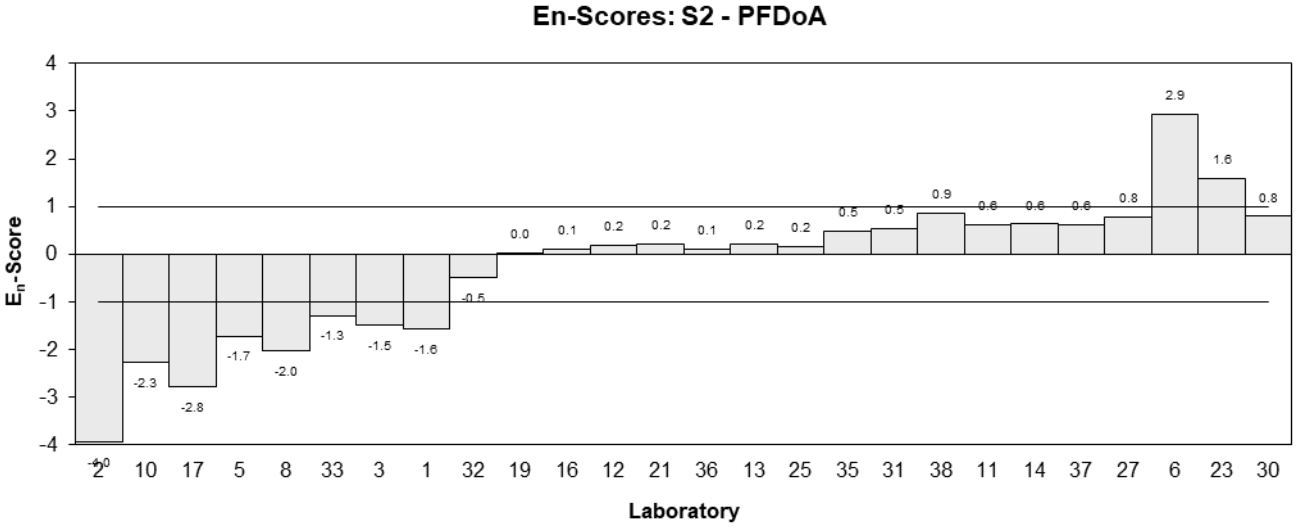

En-Scores: S2 - PFDoA
En-Score
Laboratory
2 10 17 5 8 33 3 1 32 19 16 12 21 36 13 25 35 31 38 11 14 37 27 6 23 30

Figure 45

Table 49

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFTeDA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.00804	NR	NR
2	0.005	0.002	108
3	NR	NR	NR
4	<0.5	NR	95
5	0.0212	0.00636	26
6	0.0527	0.009	35.02
7	NR	NR	NR
8	<0.02	NR	NR
9	NT	NT	NT
10	<0.001	NR	89
11	0.03	0.0090	83
12	0.044	0.0026	NR
13	0.0350	0.0105	131
14	0.0313	0.009	59
15	0.0177	0.00531	25
16	0.0175	0.005	53
17	0.0051	0.0014	266
18	NS	NS	NS
19	0.022	0.0044	NR
21	0.0168	NR	NR
23	0.028	0.009	88.82
24	<0.02	NR	71.50
25	< 0.05	NR	135
27	0.02190	0.006	129
28	NS	NS	NS
29	NR	NR	103
30	0.0375221844	0.0036456718	12
31	0.047	0.0091	82
32	0.027	0.008	68
33	0.00875	0.0026	NR
35	0.0486	0.0106	85.52
36	0.017	0.004	75
37	0.0524	0.01572	92
38	0.044	0.006	123

Statistics

Assigned Value	Not Set	
Spike Value	0.0500	0.0025
Robust Average	0.0278	0.0090
Median	0.0270	0.0079
Mean	0.0278	
N	23	
Max	0.0527	
Min	0.005	
Robust SD	0.017	
Robust CV	62%	

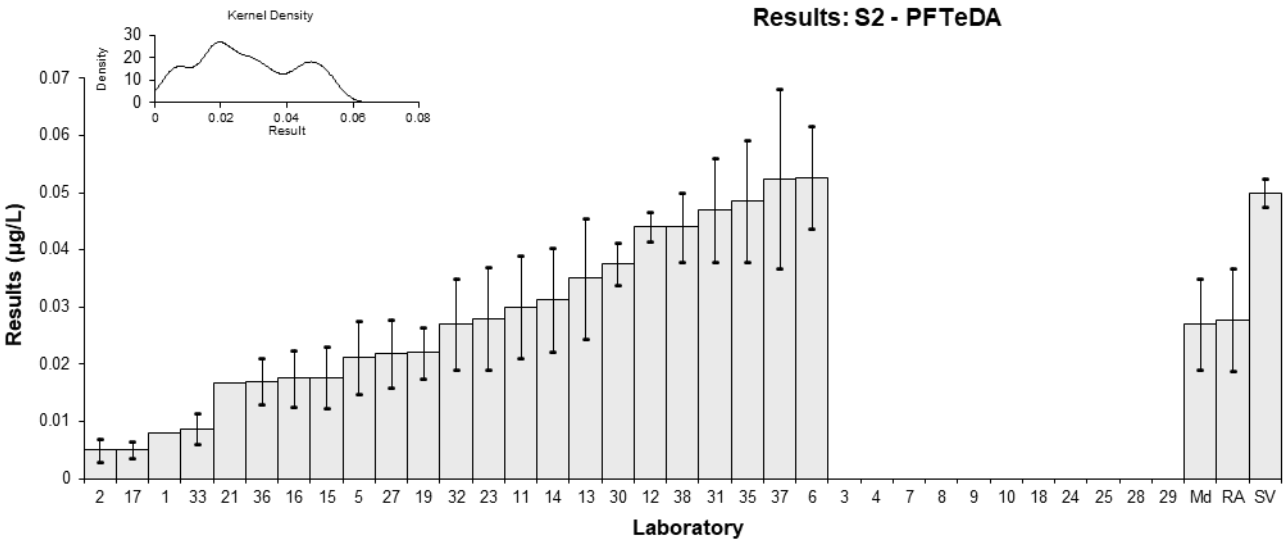

Results: S2 - PFTeDA
Kernel Density
Density
Result
Results (µg/L)
Laboratory
2 17 1 33 21 36 16 15 5 27 19 32 23 11 14 13 30 12 38 31 35 37 6 3 4 7 8 9 10 18 24 25 28 29 Md RA SV

Figure 46

Table 50

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFODA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.0239	NR	NR
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	0.0355	0.0106363636	11
6	NT	NT	NT
7	NR	NR	NR
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	0.2118	0.06354	72
16	NR	NR	NR
17	NT	NT	NT
18	NS	NS	NS
19	NT	NT	NT
21	0.0206	NR	NR
23	NT	NT	NT
24	<0.16	NR	71.50
25	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	NT	NT	NT
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
33	NT	NT	NT
35	NT	NT	NT
36	NT	NT	NT
37	0.0813	0.02439	96
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0699	0.0035
Robust Average	NA (N<6)	
Median	0.036	0.025
Mean	0.075	
N	5	
Max	0.2118	
Min	0.0206	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

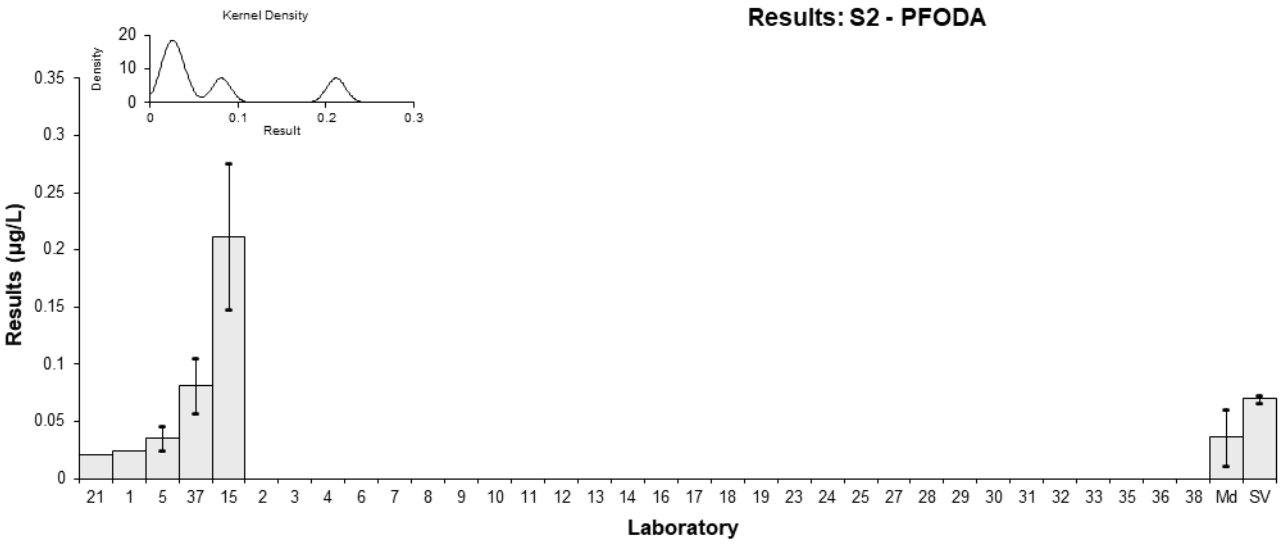

Results: S2 - PFODA
Kernel Density
Density
Result
Results (µg/L)
Laboratory
21 1 5 37 15 2 3 4 6 7 8 9 10 11 12 13 14 16 17 18 19 23 24 25 27 28 29 30 31 32 33 35 36 38 Md SV

Figure 47

Table 51

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	PFOSA
Unit	µg/L

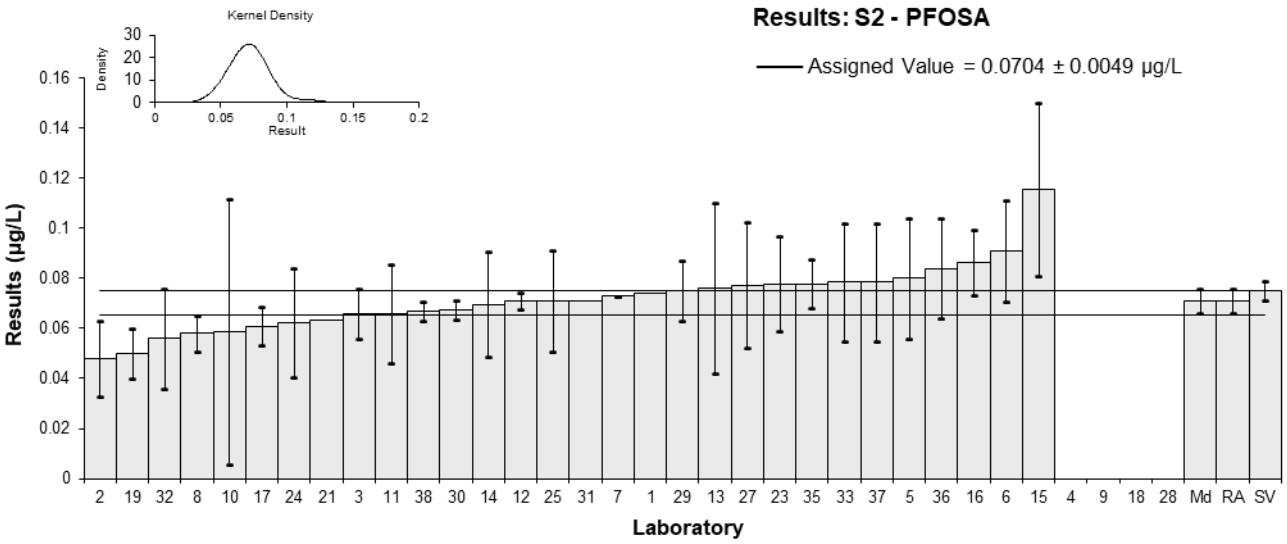
Participant Results

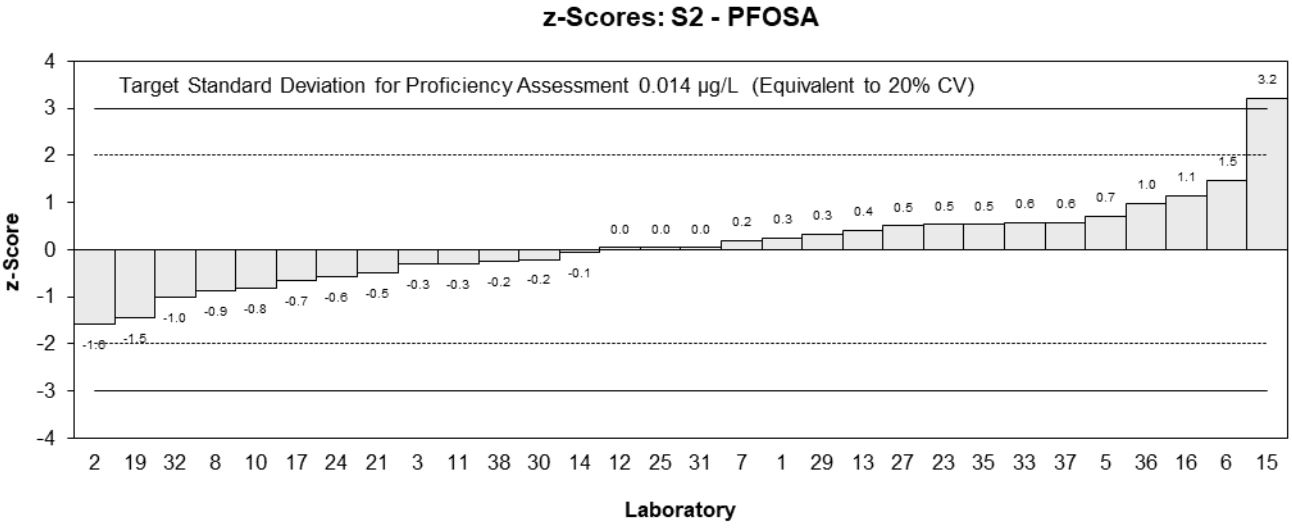
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0739	NR	NR	0.25	0.71
2	0.048	0.015	NR	-1.59	-1.42
3	0.066	0.010	68	-0.31	-0.40
4	<0.1	NR	97		
5	0.0802	0.02406	65	0.70	0.40
6	0.091	0.02	76.19	1.46	1.00
7	0.073	0.00004	98.89	0.18	0.53
8	0.058	0.007	71	-0.88	-1.45
9	NT	NT	NT		
10	0.058696	0.0528264	98	-0.83	-0.22
11	0.066	0.0198	82	-0.31	-0.22
12	0.071	0.0032	NR	0.04	0.10
13	0.0760	0.0342	81	0.40	0.16
14	0.0697	0.021	84	-0.05	-0.03
15*	0.1157	0.03471	30	3.22	1.29
16	0.0865	0.013	67	1.14	1.16
17	0.0610	0.0075	110	-0.67	-1.05
18	NS	NS	NS		
19	0.05	0.01	NR	-1.45	-1.83
21	0.0634	NR	NR	-0.50	-1.43
23	0.0778	0.0189	74.64	0.53	0.38
24	0.0622	0.0218	62.08	-0.58	-0.37
25	0.071	0.02	93	0.04	0.03
27	0.07740	0.025	108	0.50	0.27
28	NS	NS	NS		
29	0.075	0.012	124	0.33	0.35
30	0.0674381927	0.0038207521	70	-0.21	-0.48
31	0.071	NR	75	0.04	0.12
32	0.056	0.02	98	-1.02	-0.70
33	0.0785	0.0236	NR	0.58	0.34
35	0.0779	0.0097	84.27	0.53	0.69
36	0.084	0.02	114	0.97	0.66
37	0.0785	0.02355	86	0.58	0.34
38	0.067	0.004	103	-0.24	-0.54

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0704	0.0049
Spike Value	0.0753	0.0038
Robust Average	0.0710	0.0050
Median	0.0710	0.0049
Mean	0.0717	
N	30	
Max	0.1157	
Min	0.048	
Robust SD	0.011	
Robust CV	16%	


Results: S2 - PFOSA
Assigned Value = 0.0704 ± 0.0049 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
2 19 32 8 10 17 24 21 3 11 38 30 14 12 25 31 7 1 29 13 27 23 35 33 37 5 36 16 6 15 4 9 18 28 Md RA SV


z-Scores: S2 - PFOSA
Target Standard Deviation for Proficiency Assessment 0.014 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 19 32 8 10 17 24 21 3 11 38 30 14 12 25 31 7 1 29 13 27 23 35 33 37 5 36 16 6 15

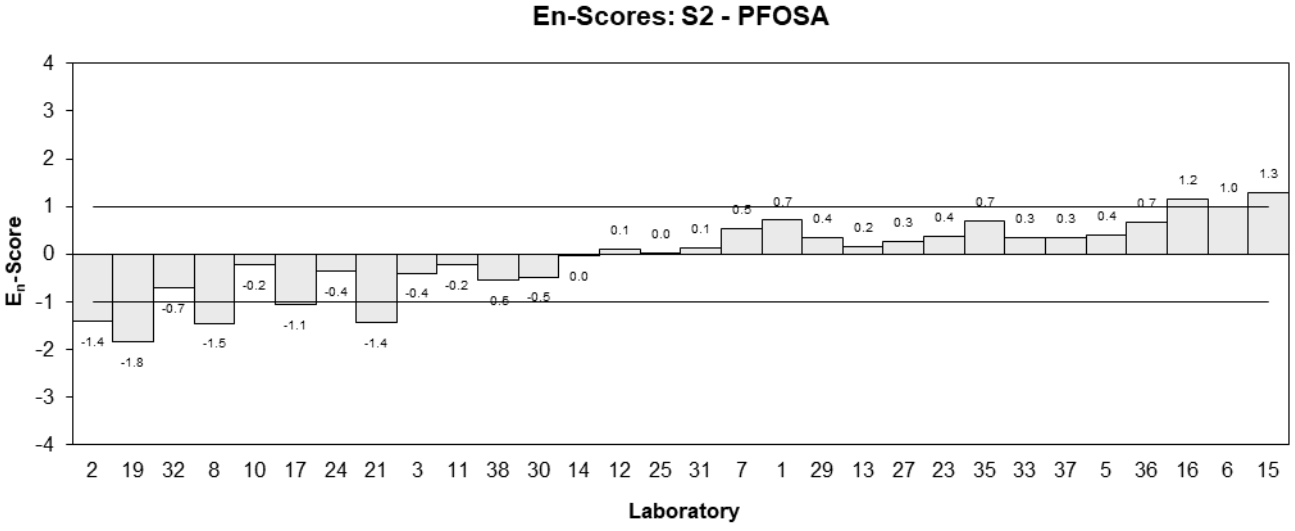

En-Scores: S2 - PFOSA
En-Score
Laboratory
2 19 32 8 10 17 24 21 3 11 38 30 14 12 25 31 7 1 29 13 27 23 35 33 37 5 36 16 6 15

Figure 48

Table 52

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	4:2FTS
Unit	µg/L

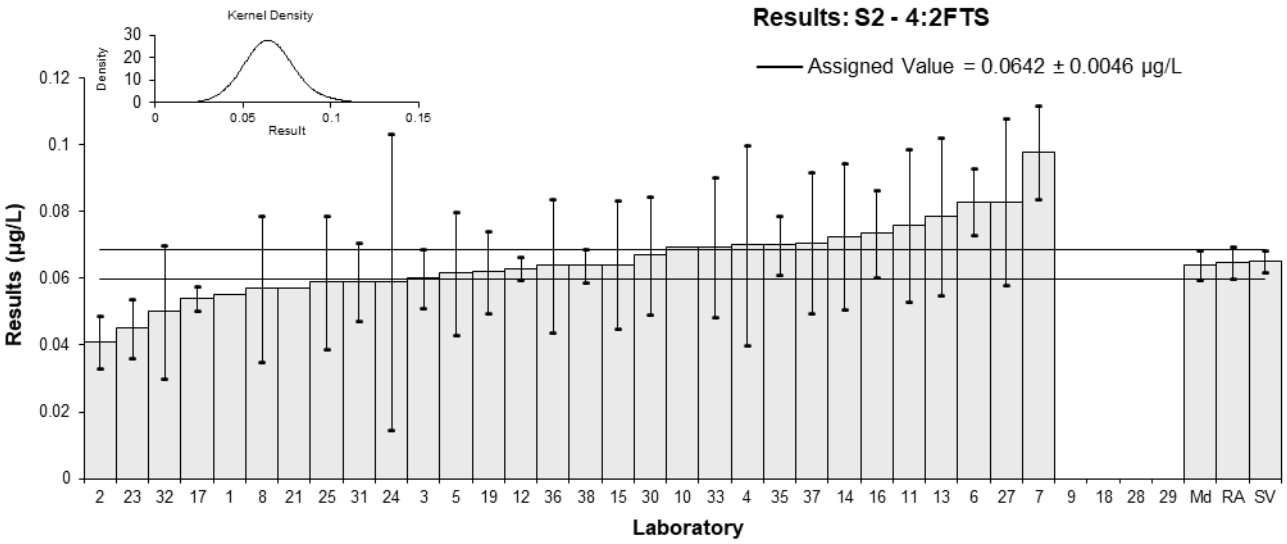
Participant Results

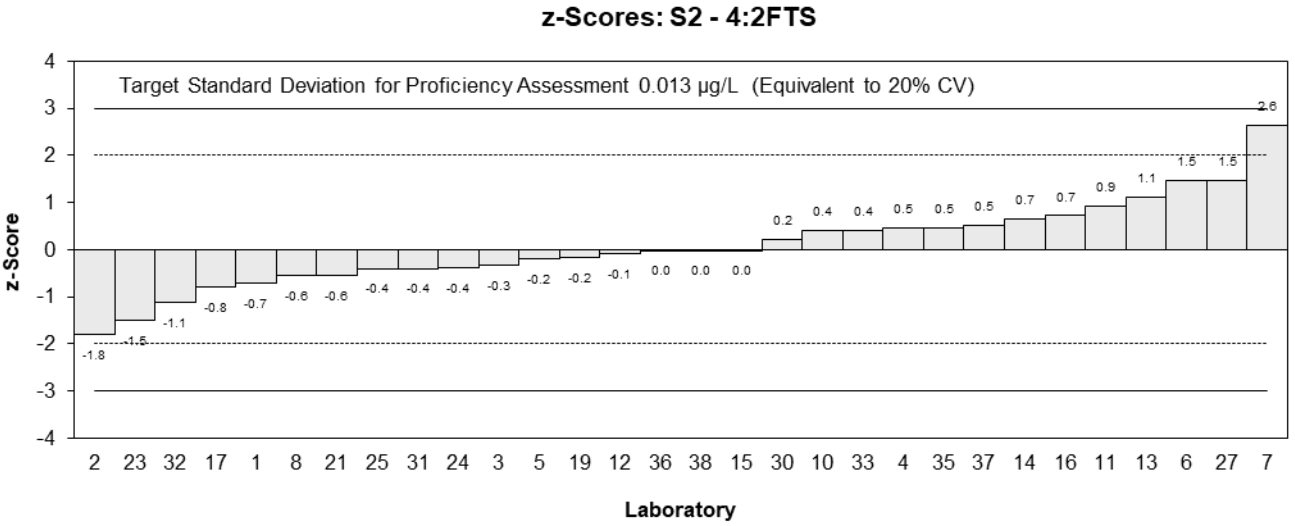
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.055	NR	NR	-0.72	-2.00
2	0.041	0.008	NR	-1.81	-2.51
3	0.060	0.009	154	-0.33	-0.42
4	0.07	0.03	80	0.45	0.19
5	0.0616	0.0184698795	83	-0.20	-0.14
6	0.083	0.01	196.37	1.46	1.71
7*	0.098	0.014	108.42	2.63	2.29
8	0.057	0.022	231	-0.56	-0.32
9	NT	NT	NT		
10	0.069488	NR	125	0.41	1.15
11	0.076	0.0228	76	0.92	0.51
12	0.063	0.0034	NR	-0.09	-0.21
13	0.0785	0.0236	112	1.11	0.59
14	0.0726	0.022	86	0.65	0.37
15	0.0641	0.01923	95	-0.01	-0.01
16	0.0735	0.013	93	0.72	0.67
17	0.0540	0.0037	92	-0.79	-1.73
18	NS	NS	NS		
19	0.062	0.0124	NR	-0.17	-0.17
21	0.0571	NR	NR	-0.55	-1.54
23	0.045	0.009	109.05	-1.50	-1.90
24	0.0592	0.0444	128.33	-0.39	-0.11
25	0.059	0.02	122	-0.40	-0.25
27	0.0830	0.025	176	1.46	0.74
28	NS	NS	NS		
29	NR	NR	184		
30	0.0669275350	0.0177676661	165	0.21	0.15
31	0.059	0.0118	90	-0.40	-0.41
32	0.050	0.02	79	-1.11	-0.69
33	0.0695	0.0209	NR	0.41	0.25
35	0.07	0.0087	68.19	0.45	0.59
36	0.064	0.02	104	-0.02	-0.01
37	0.0707	0.02121	107	0.51	0.30
38	0.064	0.005	96	-0.02	-0.03

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0642	0.0046
Spike Value	0.0653	0.0033
Robust Average	0.0649	0.0048
Median	0.0640	0.0043
Mean	0.0652	
N	30	
Max	0.098	
Min	0.041	
Robust SD	0.011	
Robust CV	16%	


Kernel Density
Density
Result
Results: S2 - 4:2FTS
Assigned Value = 0.0642 ± 0.0046 µg/L
Results (µg/L)
Laboratory
2 23 32 17 1 8 21 25 31 24 3 5 19 12 36 38 15 30 10 33 4 35 37 14 16 11 13 6 27 7 9 18 28 29 Md RA SV


z-Scores: S2 - 4:2FTS
Target Standard Deviation for Proficiency Assessment 0.013 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 23 32 17 1 8 21 25 31 24 3 5 19 12 36 38 15 30 10 33 4 35 37 14 16 11 13 6 27 7

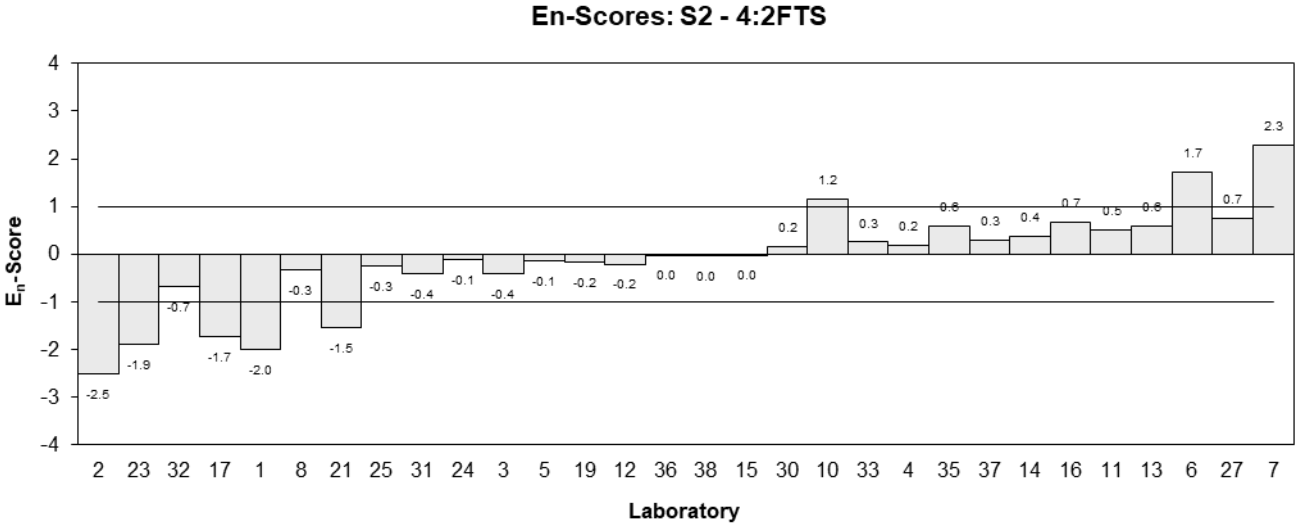

En-Scores: S2 - 4:2FTS
En-Score
Laboratory
2 23 32 17 1 8 21 25 31 24 3 5 19 12 36 38 15 30 10 33 4 35 37 14 16 11 13 6 27 7

Figure 49

Table 53

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	6:2FTS
Unit	µg/L

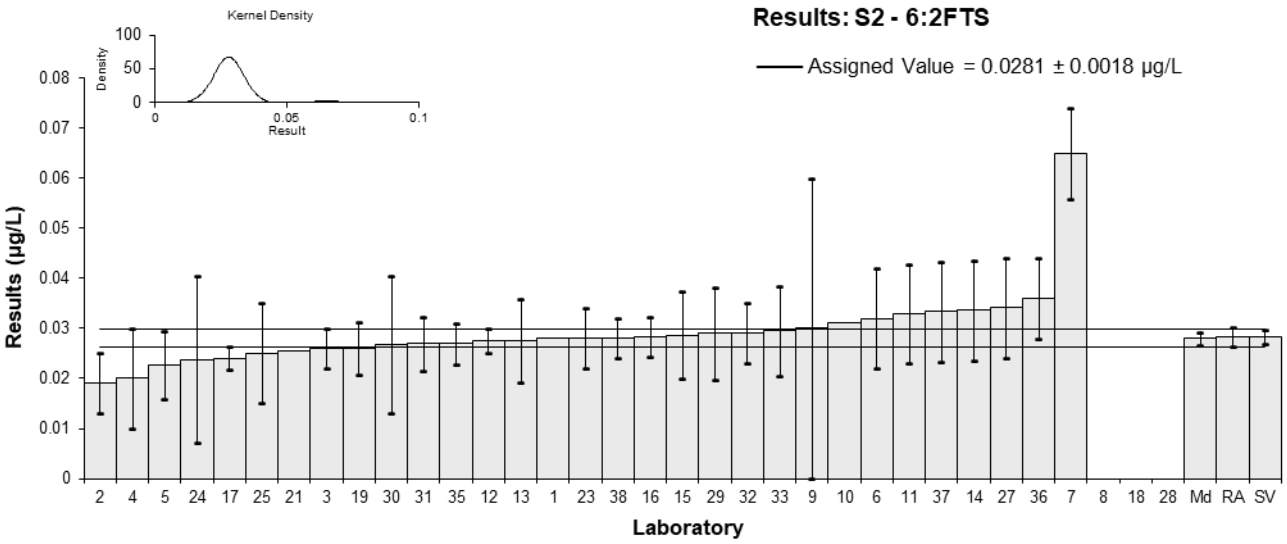
Participant Results

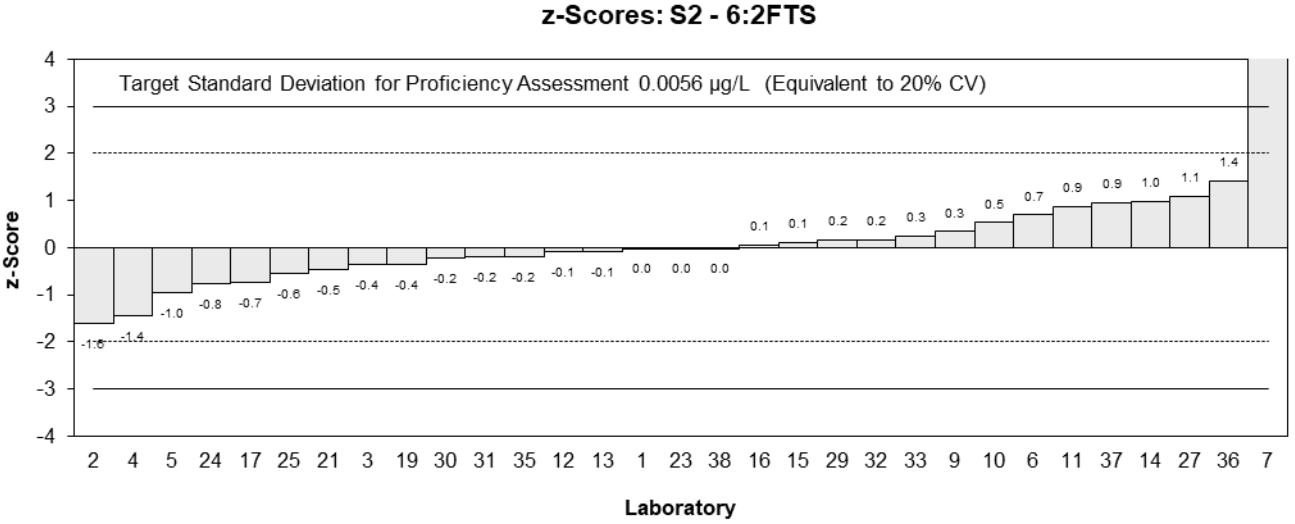
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.028	NR	NR	-0.02	-0.06
2	0.019	0.006	NR	-1.62	-1.45
3	0.026	0.004	92	-0.37	-0.48
4	0.02	0.01	79	-1.44	-0.80
5	0.0227	0.0068019801	101	-0.96	-0.77
6	0.032	0.01	194.96	0.69	0.38
7*	0.065	0.009	89.38	6.57	4.02
8	<0.05	NR	NR		
9	0.03	0.03	119	0.34	0.06
10	0.031082	NR	106	0.53	1.66
11	0.033	0.0099	118	0.87	0.49
12	0.0276	0.0024	NR	-0.09	-0.17
13	0.0276	0.0083	113	-0.09	-0.06
14	0.0336	0.010	118	0.98	0.54
15	0.0287	0.00861	101	0.11	0.07
16	0.0284	0.004	90	0.05	0.07
17	0.0240	0.0023	104	-0.73	-1.40
18	NS	NS	NS		
19	0.026	0.0052	NR	-0.37	-0.38
21	0.0254	NR	NR	-0.48	-1.50
23	0.028	0.006	120.72	-0.02	-0.02
24	0.0238	0.01669	128.33	-0.77	-0.26
25	0.025	0.01	138	-0.55	-0.31
27	0.0342	0.010	141	1.09	0.60
28	NS	NS	NS		
29	0.029	0.0092	130	0.16	0.10
30	0.0268663228	0.0136624277	154	-0.22	-0.09
31	0.027	0.0054	141	-0.20	-0.19
32	0.029	0.006	158	0.16	0.14
33	0.0295	0.0089	NR	0.25	0.15
35	0.027	0.0041	123.18	-0.20	-0.25
36	0.036	0.008	120	1.41	0.96
37	0.0334	0.01002	106	0.94	0.52
38	0.028	0.004	90	-0.02	-0.02

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0281	0.0018
Spike Value	0.0284	0.0014
Robust Average	0.0283	0.0019
Median	0.0280	0.0013
Mean	0.0292	
N	31	
Max	0.065	
Min	0.019	
Robust SD	0.0041	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - 6:2FTS
Assigned Value = 0.0281 ± 0.0018 µg/L
Results (µg/L)
Laboratory
2 4 5 24 17 25 21 3 19 30 31 35 12 13 1 23 38 16 15 29 32 33 9 10 6 11 37 14 27 36 7 8 18 28 Md RA SV


z-Scores: S2 - 6:2FTS
Target Standard Deviation for Proficiency Assessment 0.0056 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
2 4 5 24 17 25 21 3 19 30 31 35 12 13 1 23 38 16 15 29 32 33 9 10 6 11 37 14 27 36 7

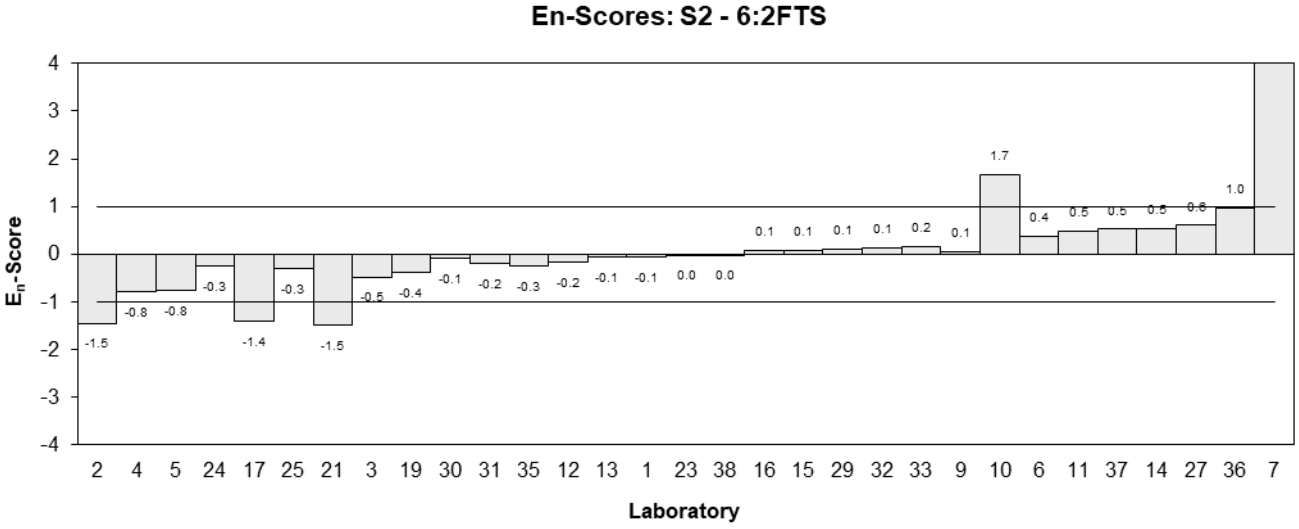

En-Scores: S2 - 6:2FTS
En-Score
Laboratory
2 4 5 24 17 25 21 3 19 30 31 35 12 13 1 23 38 16 15 29 32 33 9 10 6 11 37 14 27 36 7

Figure 50

Table 54

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	8:2diPAP
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
5	NT	NT	NT
6	<0.025	NR	19.51
7	NT	NT	NT
8	NT	NT	NT
9	NT	NT	NT
10	NT	NT	NT
11	NT	NT	NT
12	<0.1	0.0200	NR
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NR	NR	NR
17	NT	NT	NT
18	NS	NS	NS
19	NR	NR	NR
21	0.00764	NR	NR
23	<0.025	NR	62.33
24	<0.16	NR	45.50
25	NT	NT	NT
27	NT	NT	NT
28	NS	NS	NS
29	NT	NT	NT
30	0.0207843710	0.0097050124	45
31	0.051	0.0102	23
32	<0.1	NR	62
33	NT	NT	NT
35	0.051	NR	19.81
36	NT	NT	NT
37	NT	NT	NT
38	NT	NT	NT

Statistics

Assigned Value	Not Set	
Spike Value	0.0489	0.0024
Robust Average	NA (N<6)	
Median	0.036	0.028
Mean	0.033	
N	4	
Max	0.051	
Min	0.00764	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

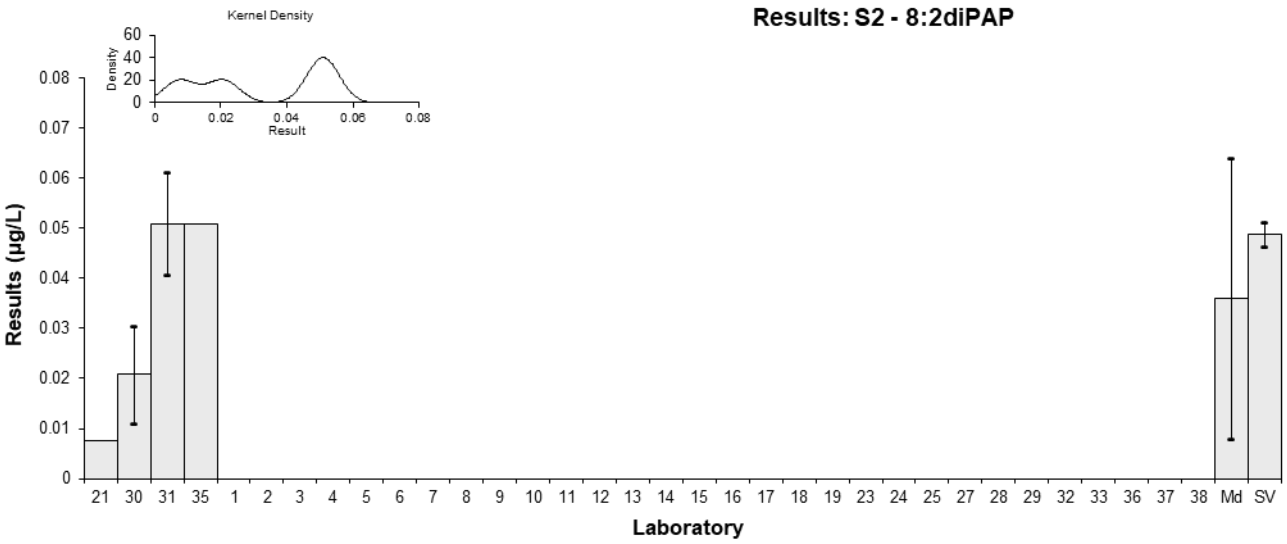

Results: S2 - 8:2diPAP
Kernel Density
Density
Result
Results (µg/L)
Laboratory
21 30 31 35 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 23 24 25 27 28 29 32 33 36 37 38 Md SV

Figure 51

Table 55

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	5:3FTCA
Unit	µg/L

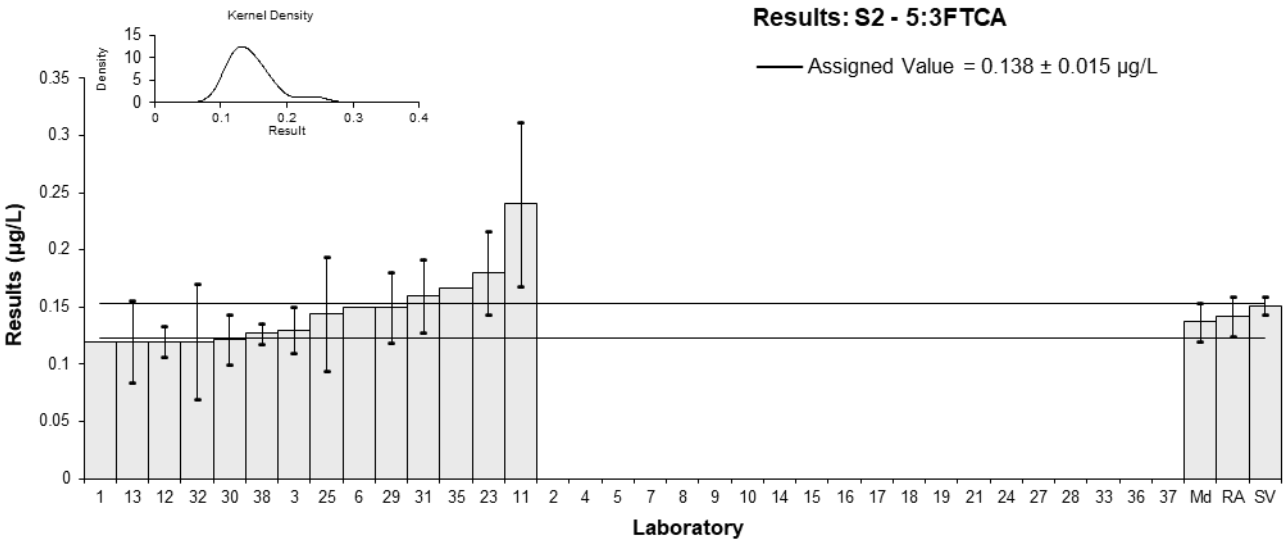
Participant Results

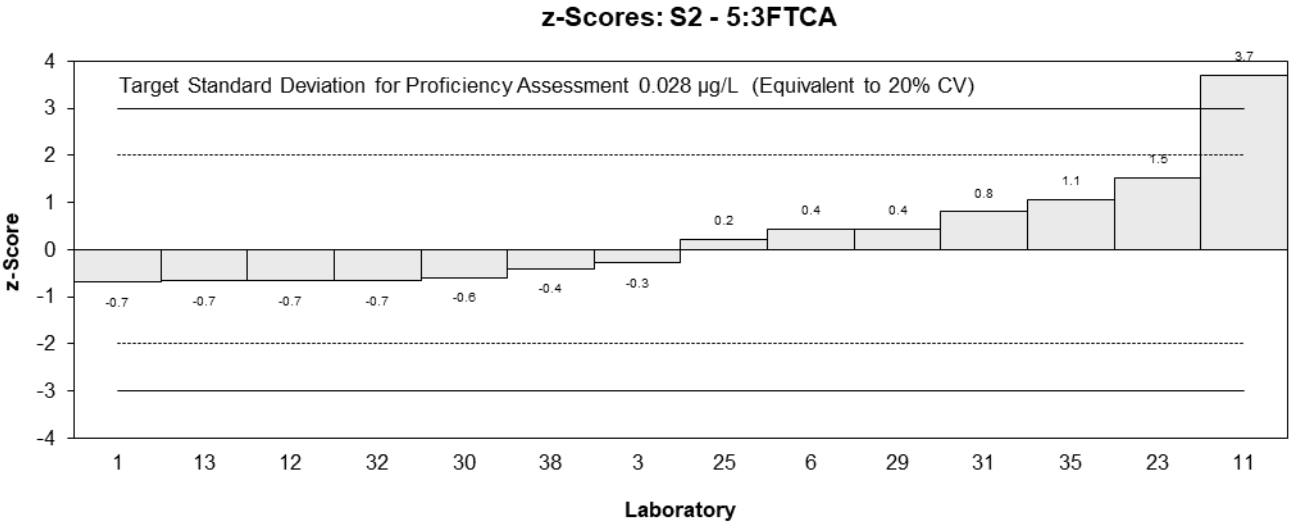
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.119	NR	NR	-0.69	-1.27
2	NR	NR	NR		
3	0.13	0.02	NR	-0.29	-0.32
4	NT	NT	NT		
5	NT	NT	NT		
6	0.15	NR	85.68	0.43	0.80
7	NT	NT	NT		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11*	0.24	0.0720	95	3.70	1.39
12	0.12	0.0140	NR	-0.65	-0.88
13	0.1196	0.0359	NR	-0.67	-0.47
14	NT	NT	NT		
15	NT	NT	NT		
16	NR	NR	NR		
17	NT	NT	NT		
18	NS	NS	NS		
19	NR	NR	NR		
21	NT	NT	NT		
23	0.18	0.036	74.65	1.52	1.08
24	NT	NT	NT		
25	0.144	0.05	81	0.22	0.11
27	NT	NT	NT		
28	NS	NS	NS		
29	0.15	0.031	92	0.43	0.35
30	0.1217639482	0.0223515557	100	-0.59	-0.60
31	0.16	0.032	80	0.80	0.62
32	0.12	0.05	121	-0.65	-0.34
33	NT	NT	NT		
35	0.167	NR	82.8	1.05	1.93
36	NT	NT	NT		
37	NT	NT	NT		
38	0.127	0.009	104	-0.40	-0.63

* Outlier, see Section 4.2

Statistics

Assigned Value	0.138	0.015
Spike Value	0.151	0.008
Robust Average	0.142	0.017
Median	0.137	0.017
Mean	0.146	
N	14	
Max	0.24	
Min	0.119	
Robust SD	0.026	
Robust CV	18%	


Kernel Density
Density
Result
Results: S2 - 5:3FTCA
Assigned Value = 0.138 ± 0.015 µg/L
Results (µg/L)
Laboratory
1 13 12 32 30 38 3 25 6 29 31 35 23 11 2 4 5 7 8 9 10 14 15 16 17 18 19 21 24 27 28 33 36 37 Md RA SV


z-Scores: S2 - 5:3FTCA
Target Standard Deviation for Proficiency Assessment 0.028 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
1 13 12 32 30 38 3 25 6 29 31 35 23 11
-0.7 -0.7 -0.7 -0.7 -0.6 -0.4 -0.3 0.2 0.4 0.4 0.8 1.1 1.5 3.7

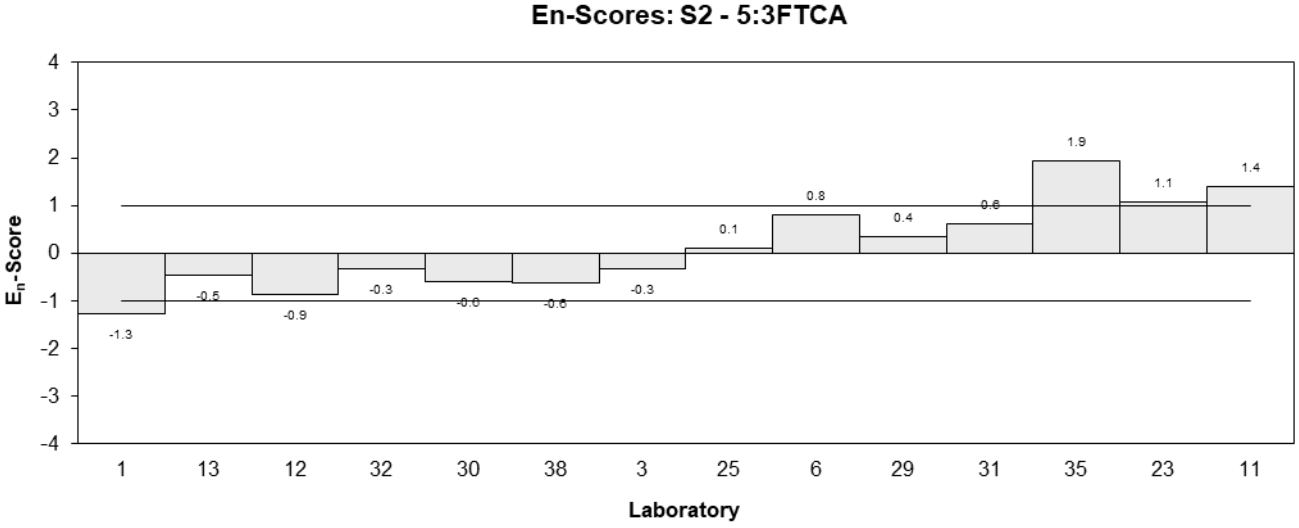

En-Scores: S2 - 5:3FTCA
En-Score
Laboratory
1 13 12 32 30 38 3 25 6 29 31 35 23 11
-1.3 -0.5 -0.9 -0.3 -0.6 -0.6 -0.3 0.1 0.8 0.4 0.6 1.9 1.1 1.4

Figure 52

Table 56

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	ADONA
Unit	µg/L

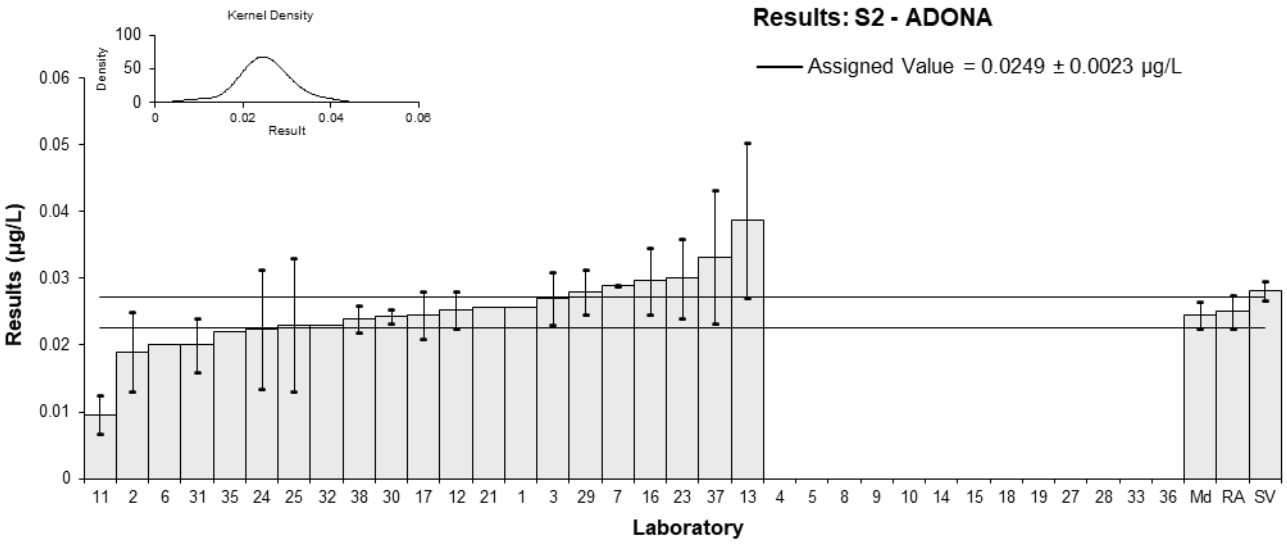
Participant Results

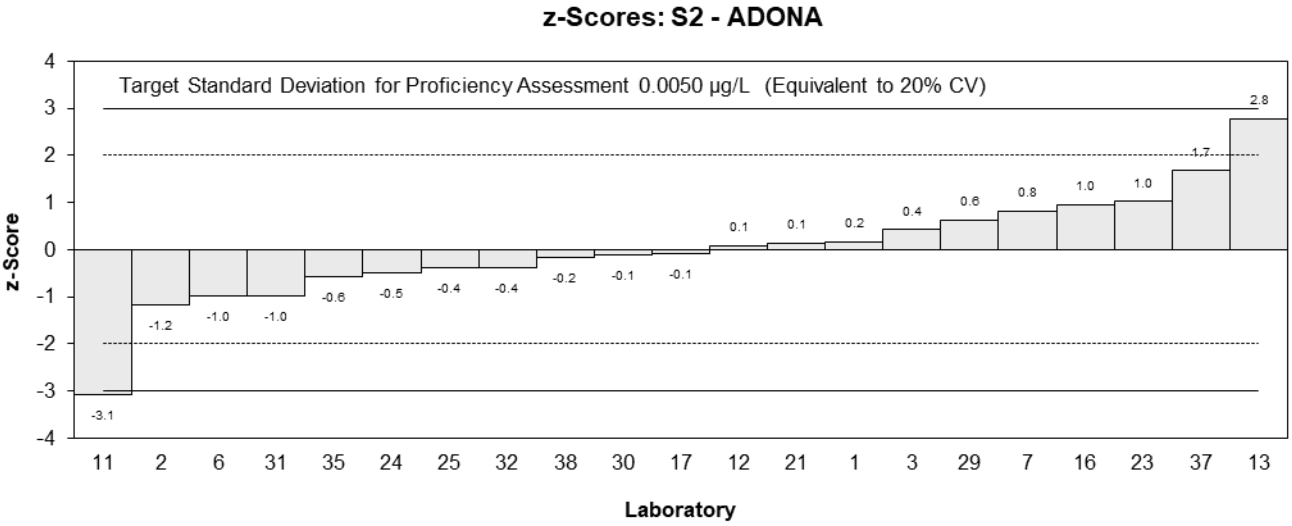
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0257	NR	NR	0.16	0.35
2	0.019	0.006	NR	-1.18	-0.92
3	0.027	0.004	82	0.42	0.46
4	NT	NT	NT		
5	NR	NR	NR		
6	0.02	NR	93.63	-0.98	-2.13
7	0.029	0.0001	91.17	0.82	1.78
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11*	0.0096	0.0029	95	-3.07	-4.13
12	0.0253	0.0028	NR	0.08	0.11
13*	0.0387	0.0116	NR	2.77	1.17
14	NT	NT	NT		
15	NR	NR	NR		
16	0.0297	0.005	NR	0.96	0.87
17	0.0245	0.0035	99	-0.08	-0.10
18	NS	NS	NS		
19	NR	NR	NR		
21	0.0256	NR	NR	0.14	0.30
23	0.03	0.006	81.07	1.02	0.79
24	0.0224	0.009	102.86	-0.50	-0.27
25	0.023	0.01	122	-0.38	-0.19
27	NT	NT	NT		
28	NS	NS	NS		
29	0.028	0.0034	92	0.62	0.76
30	0.0242995376	0.0011009453	93	-0.12	-0.24
31	0.02	0.004	85	-0.98	-1.06
32	0.023	NR	68	-0.38	-0.83
33	NT	NT	NT		
35	0.022	NR	65.18	-0.58	-1.26
36	NT	NT	NT		
37	0.0332	0.00996	91	1.67	0.81
38	0.024	0.002	99	-0.18	-0.30

* Outlier, see Section 4.2

Statistics

Assigned Value	0.0249	0.0023
Spike Value	0.0282	0.0014
Robust Average	0.0250	0.0025
Median	0.0245	0.0020
Mean	0.0250	
N	21	
Max	0.0387	
Min	0.0096	
Robust SD	0.0046	
Robust CV	18%	


Results: S2 - ADONA
Assigned Value = 0.0249 ± 0.0023 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
11 2 6 31 35 24 25 32 38 30 17 12 21 1 3 29 7 16 23 37 13 4 5 8 9 10 14 15 18 19 27 28 33 36 Md RA SV


z-Scores: S2 - ADONA
Target Standard Deviation for Proficiency Assessment 0.0050 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
11 2 6 31 35 24 25 32 38 30 17 12 21 1 3 29 7 16 23 37 13
-3.1 -1.2 -1.0 -1.0 -0.6 -0.5 -0.4 -0.4 -0.2 -0.1 -0.1 0.1 0.1 0.2 0.4 0.6 0.8 1.0 1.0 1.7 2.8

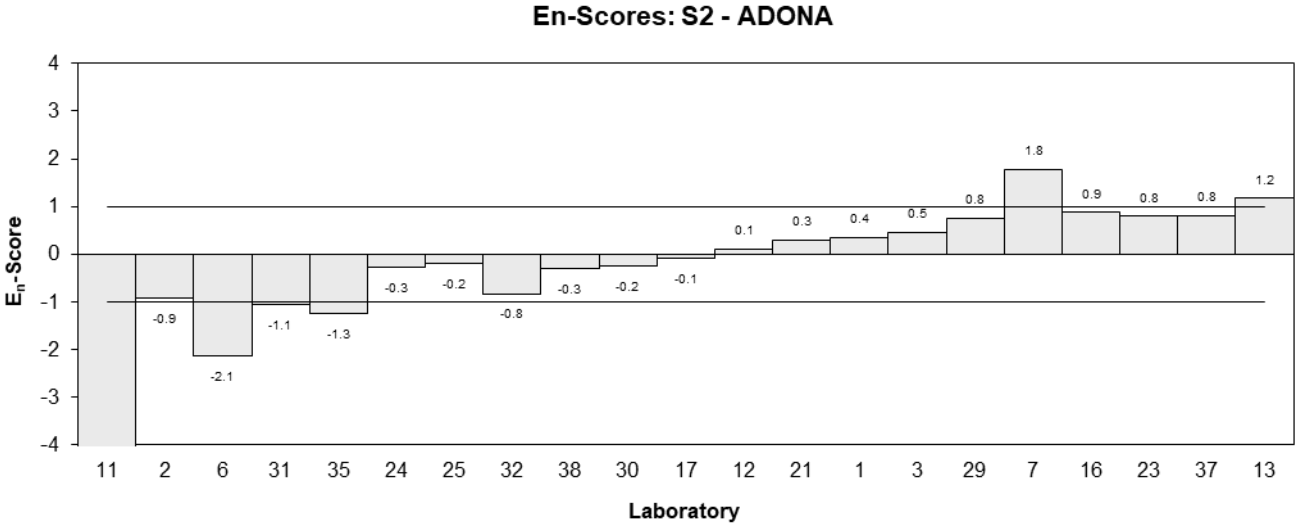

En-Scores: S2 - ADONA
En-Score
Laboratory
11 2 6 31 35 24 25 32 38 30 17 12 21 1 3 29 7 16 23 37 13
-0.9 -2.1 -1.1 -1.3 -0.3 -0.2 -0.8 -0.3 -0.2 -0.1 0.1 0.3 0.4 0.5 0.8 1.8 0.9 0.8 0.8 1.2

Figure 53

Table 57

Sample Details

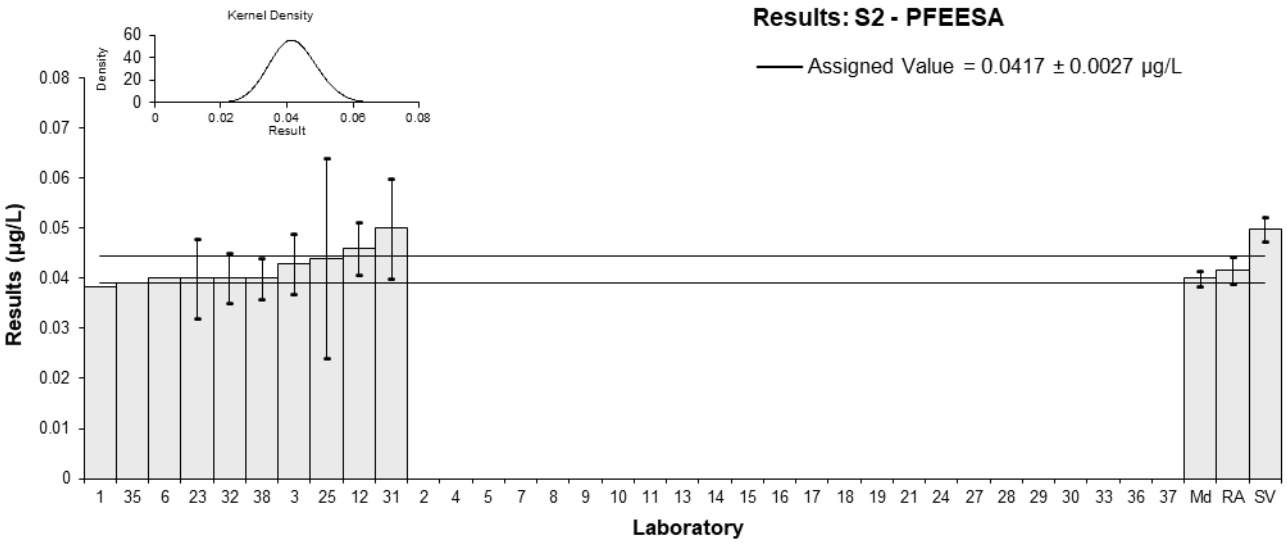
Sample No.	S2
Matrix	River Water
Analyte	PFEESA
Unit	µg/L

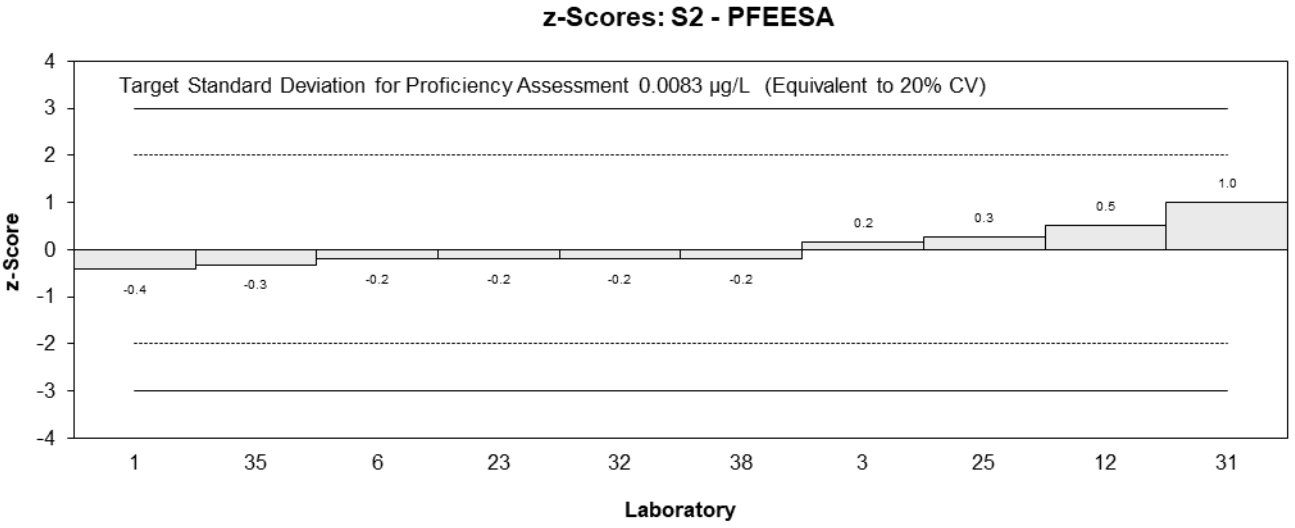
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0382	NR	NR	-0.42	-1.30
2	NR	NR	NR		
3	0.043	0.006	NR	0.16	0.20
4	NT	NT	NT		
5	NT	NT	NT		
6	0.04	NR	82.86	-0.20	-0.63
7	NT	NT	NT		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	NT	NT	NT		
12	0.046	0.0052	NR	0.52	0.73
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	NR	NR	NR		
17	NT	NT	NT		
18	NS	NS	NS		
19	NR	NR	NR		
21	NT	NT	NT		
23	0.04	0.008	93.39	-0.20	-0.20
24	NT	NT	NT		
25	0.044	0.02	64	0.28	0.11
27	NT	NT	NT		
28	NS	NS	NS		
29	NT	NT	NT		
30	NT	NT	NT		
31	0.05	0.01	61	1.00	0.80
32	0.04	0.005	67	-0.20	-0.30
33	NT	NT	NT		
35	0.039	NR	58.26	-0.32	-1.00
36	NT	NT	NT		
37	NT	NT	NT		
38	0.040	0.004	104	-0.20	-0.35

Statistics

Assigned Value	0.0417	0.0027
Spike Value	0.0499	0.0025
Robust Average	0.0417	0.0027
Median	0.0400	0.0016
Mean	0.0420	
N	10	
Max	0.05	
Min	0.0382	
Robust SD	0.0035	
Robust CV	8.3%	


Results: S2 - PFEESA
Assigned Value = 0.0417 ± 0.0027 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
1 35 6 23 32 38 3 25 12 31 2 4 5 7 8 9 10 11 13 14 15 16 17 18 19 21 24 27 28 29 30 33 36 37 Md RA SV


z-Scores: S2 - PFEESA
Target Standard Deviation for Proficiency Assessment 0.0083 µg/L (Equivalent to 20% CV)
z-Score
-0.4 -0.3 -0.2 -0.2 -0.2 -0.2 0.2 0.3 0.5 1.0
Laboratory
1 35 6 23 32 38 3 25 12 31

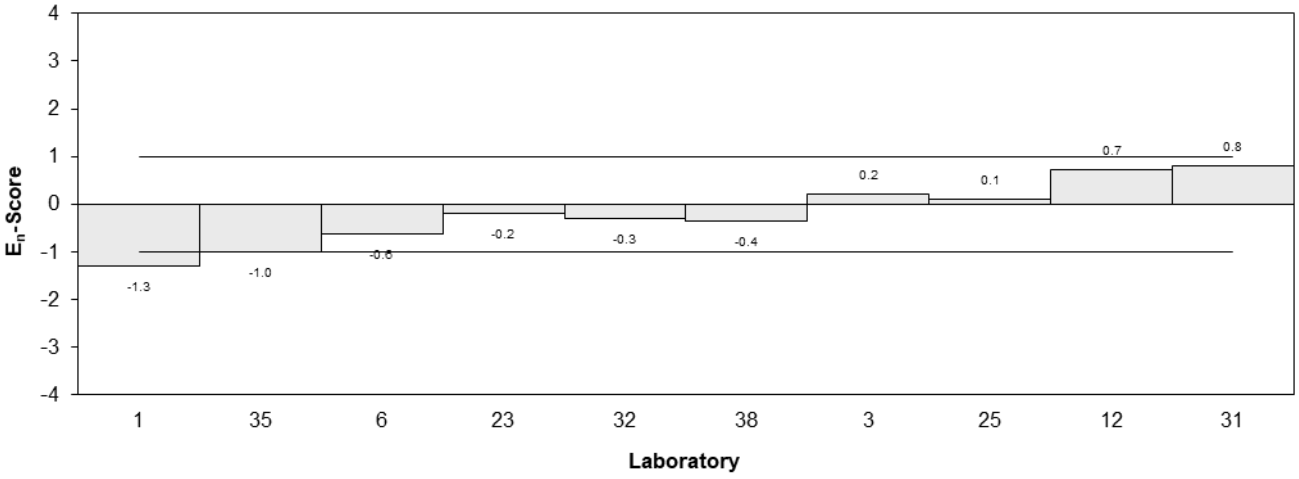

En-Scores: S2 - PFEESA
En-Score
-1.3 -1.0 -0.6 -0.2 -0.3 -0.4 0.2 0.1 0.7 0.8
Laboratory
1 35 6 23 32 38 3 25 12 31

Figure 54

Table 58

Sample Details

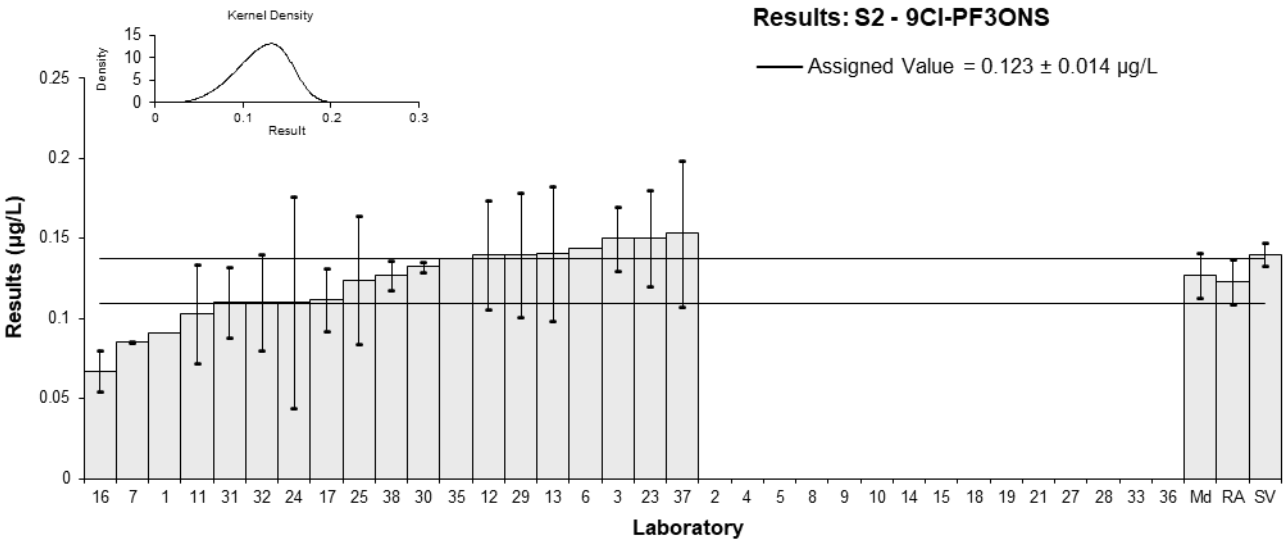
Sample No.	S2
Matrix	River Water
Analyte	9Cl-PF3ONS
Unit	µg/L

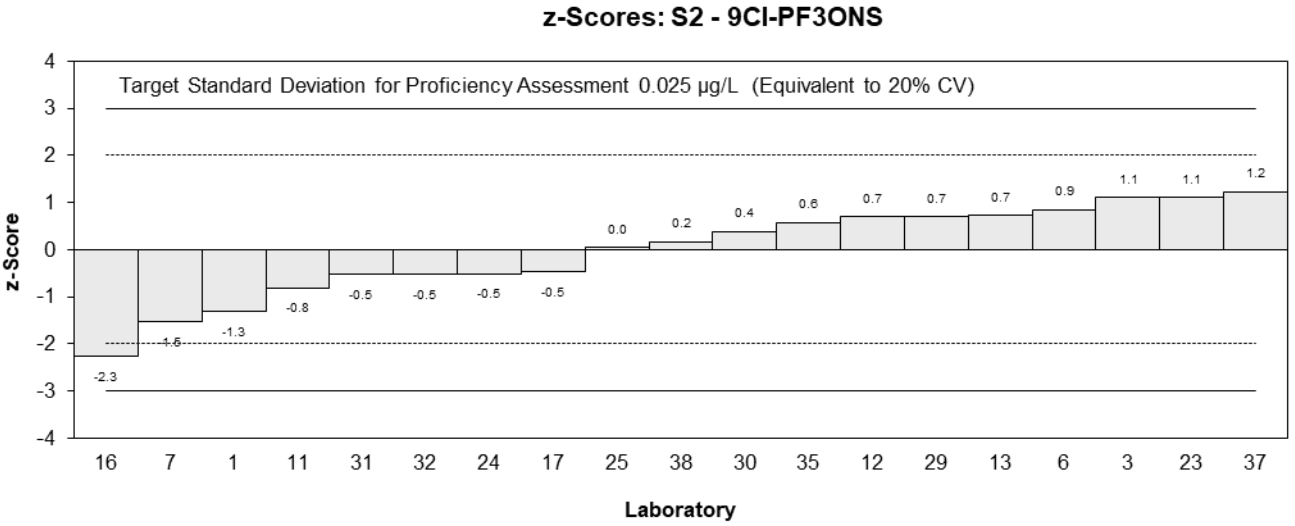
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0907	NR	NR	-1.31	-2.31
2	NR	NR	NR		
3	0.15	0.02	NR	1.10	1.11
4	NT	NT	NT		
5	NT	NT	NT		
6	0.144	NR	87.49	0.85	1.50
7	0.085	0.0004	103.13	-1.54	-2.71
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11	0.103	0.0309	95	-0.81	-0.59
12	0.14	0.0340	NR	0.69	0.46
13	0.1407	0.0422	NR	0.72	0.40
14	NT	NT	NT		
15	NT	NT	NT		
16	0.0672	0.013	NR	-2.27	-2.92
17	0.1117	0.0194	110	-0.46	-0.47
18	NS	NS	NS		
19	NR	NR	NR		
21	NT	NT	NT		
23	0.15	0.03	99.62	1.10	0.82
24	0.1104	0.0662	98.48	-0.51	-0.19
25	0.124	0.04	84	0.04	0.02
27	NT	NT	NT		
28	NS	NS	NS		
29	0.14	0.039	109	0.69	0.41
30	0.1322458961	0.0028989685	92	0.38	0.65
31	0.11	0.022	100	-0.53	-0.50
32	0.11	0.03	91	-0.53	-0.39
33	NT	NT	NT		
35	0.137	NR	85.73	0.57	1.00
36	NT	NT	NT		
37	0.153	0.0459	91	1.22	0.63
38	0.127	0.009	99	0.16	0.24

Statistics

Assigned Value	0.123	0.014
Spike Value	0.140	0.007
Robust Average	0.123	0.014
Median	0.127	0.014
Mean	0.122	
N	19	
Max	0.153	
Min	0.0672	
Robust SD	0.025	
Robust CV	20%	


Results: S2 - 9Cl-PF3ONS
Assigned Value = 0.123 ± 0.014 µg/L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
16 7 1 11 31 32 24 17 25 38 30 35 12 29 13 6 3 23 37 2 4 5 8 9 10 14 15 18 19 21 27 28 33 36 Md RA SV


z-Scores: S2 - 9Cl-PF3ONS
Target Standard Deviation for Proficiency Assessment 0.025 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
16 7 1 11 31 32 24 17 25 38 30 35 12 29 13 6 3 23 37

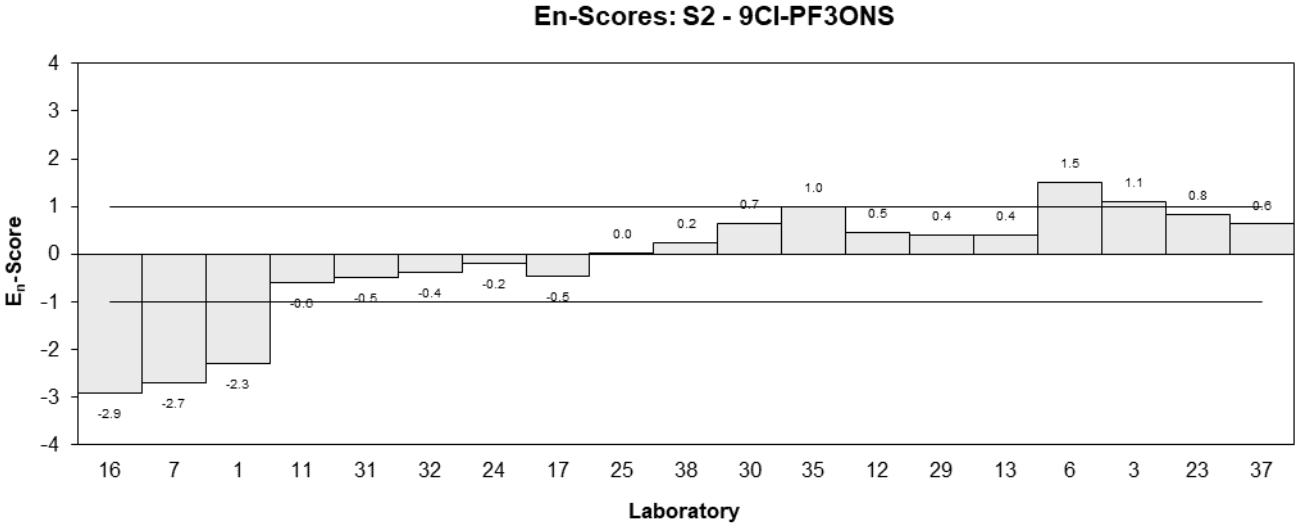

En-Scores: S2 - 9Cl-PF3ONS
En-Score
Laboratory
16 7 1 11 31 32 24 17 25 38 30 35 12 29 13 6 3 23 37

Figure 55

Table 59

Sample Details

Sample No.	S2
Matrix	River Water
Analyte	11Cl-PF3OUdS
Unit	µg/L

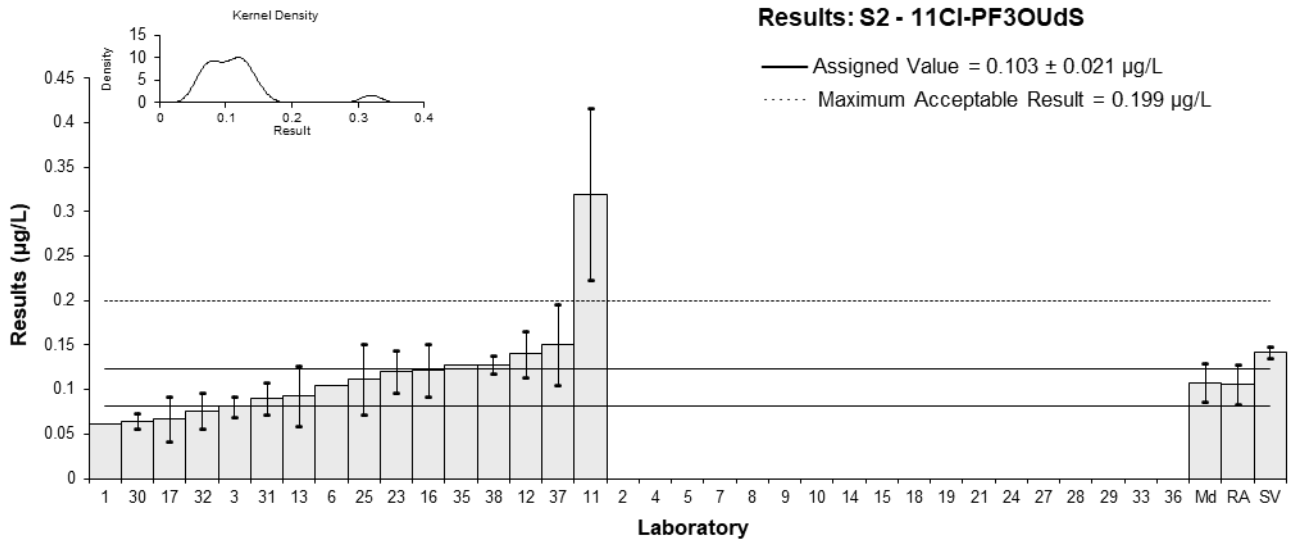
Participant Results

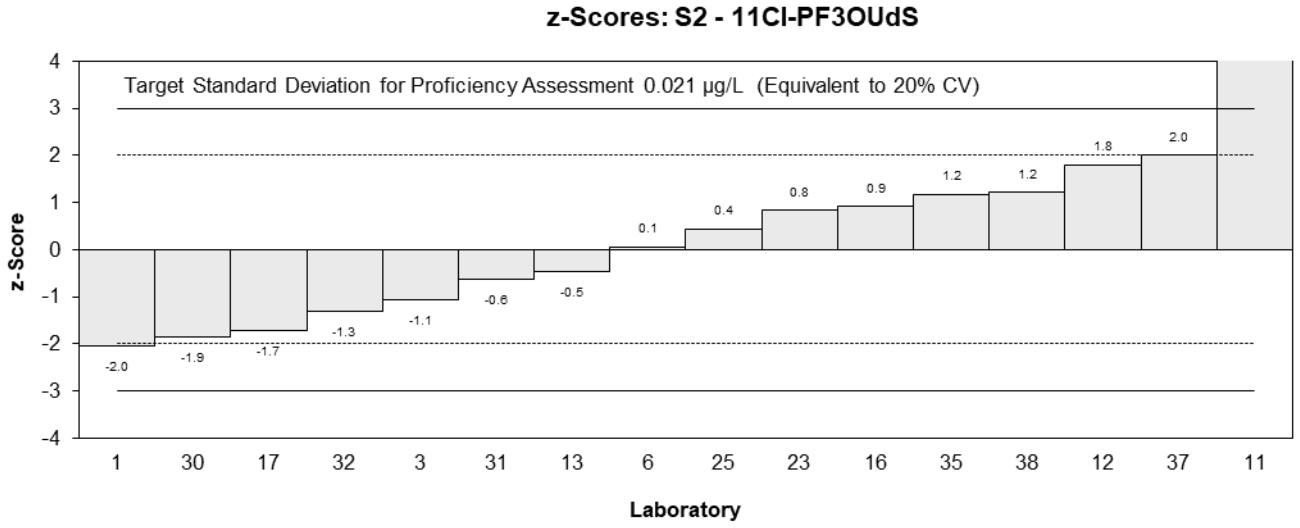
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.0609	NR	NR	-2.04	-2.00
2	NR	NR	NR		
3	0.081	0.012	NR	-1.07	-0.91
4	NT	NT	NT		
5	NT	NT	NT		
6	0.104	NR	87.49	0.05	0.05
7	NR	NR	NR		
8	NT	NT	NT		
9	NT	NT	NT		
10	NT	NT	NT		
11*	0.32	0.0960	95	10.53	2.21
12	0.14	0.0260	NR	1.80	1.11
13	0.0934	0.0336	NR	-0.47	-0.24
14	NT	NT	NT		
15	NT	NT	NT		
16	0.1218	0.030	NR	0.91	0.51
17	0.0676	0.0253	132	-1.72	-1.08
18	NS	NS	NS		
19	NR	NR	NR		
21	NT	NT	NT		
23	0.12	0.024	99.62	0.83	0.53
24	<0.16	NR	71.50		
25	0.112	0.04	84	0.44	0.20
27	NT	NT	NT		
28	NS	NS	NS		
29	NR	NR	323		
30	0.0648906917	0.0088161977	92	-1.85	-1.67
31	0.09	0.018	96	-0.63	-0.47
32	0.076	0.02	91	-1.31	-0.93
33	NT	NT	NT		
35	0.127	NR	56.77	1.17	1.14
36	NT	NT	NT		
37	0.151	0.0453	91	2.00▼	
38	0.128	0.01	99	1.21	1.07

* Outlier, see Section 4.2; ▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	0.103	0.021
Spike Value	0.142	0.007
Robust Average	0.106	0.022
Max Acceptable Result	0.199	
Median	0.108	0.022
Mean	0.116	
N	16	
Max	0.32	
Min	0.0609	
Robust SD	0.035	
Robust CV	33%	


Kernel Density
Density
Result
Results: S2 - 11Cl-PF3OUdS
Assigned Value = 0.103 ± 0.021 µg/L
Maximum Acceptable Result = 0.199 µg/L
Results (µg/L)
Laboratory
1 30 17 32 3 31 13 6 25 23 16 35 38 12 37 11 2 4 5 7 8 9 10 14 15 18 19 21 24 27 28 29 33 36 Md RA SV


z-Scores: S2 - 11Cl-PF3OUdS
Target Standard Deviation for Proficiency Assessment 0.021 µg/L (Equivalent to 20% CV)
z-Score
Laboratory
1 30 17 32 3 31 13 6 25 23 16 35 38 12 37 11
-2.0 -1.9 -1.7 -1.3 -1.1 -0.6 -0.5 0.1 0.4 0.8 0.9 1.2 1.2 1.8 2.0

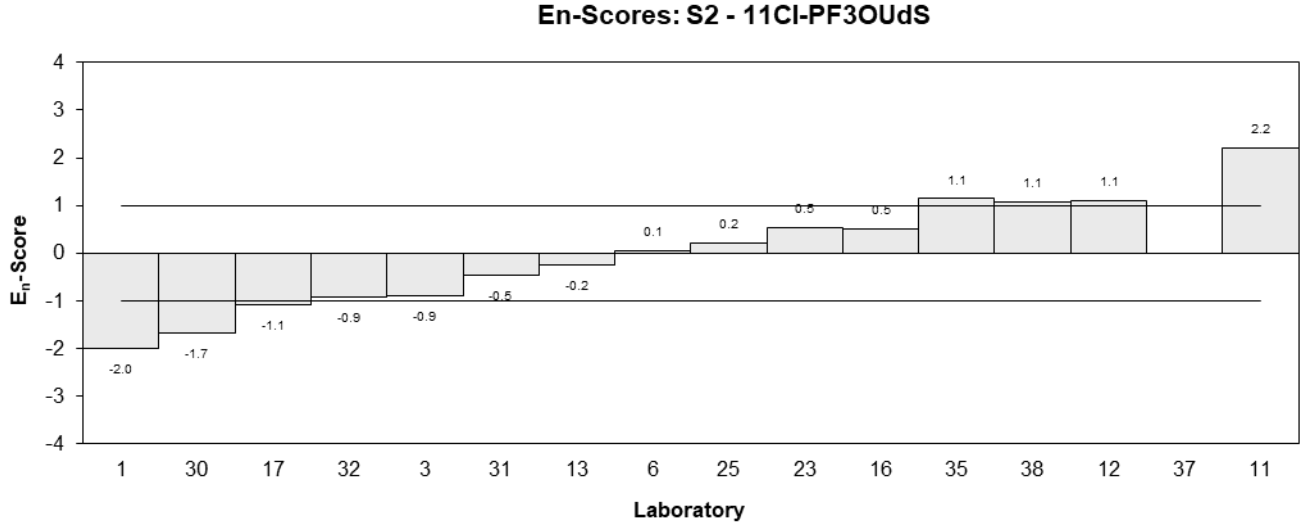

En-Scores: S2 - 11Cl-PF3OUdS
En-Score
Laboratory
1 30 17 32 3 31 13 6 25 23 16 35 38 12 37 11
-2.0 -1.7 -1.1 -0.9 -0.9 -0.5 -0.2 0.1 0.2 0.5 0.5 1.1 1.1 1.1 2.2

Figure 56

Table 60

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFHxS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	0.0035	0.0014	67
3	0.0038	0.0006	104
4	NT	NT	NT
5	0.00325	0.0009759036	83
6	0.0036	0.0007	102.39
7	0.0022	0.0001	67.50
8	0.0038	0.0002	53
9	<0.01	NR	70
10	0.002377	NR	104
11	0.005	0.001110	103
12	<0.00005	0.00002	NR
13	0.0033	0.0010	95
14	0.0041	0.001	89
15	0.0036	0.00108	105
16	0.004	0.001	75
17	0.00370180	0.000574	103
18	NR	NR	NR
19	0.003	0.0006	NR
21	NT	NT	NT
23	0.0044	0.001	102.94
24	NS	NS	NS
25	0.0035	0.001	101
27	0.0046	0.0014	112
28	NS	NS	NS
29	0.003123	0.00053091	96
30	0.0034424291	0.0005448787	105
31	0.0032	0.00059	83
32	0.0036	0.001	91
33	NS	NS	NS
35	0.0034	0.00046	107.11
36	0.0036	0.0008	99
37	0.00409	0.001227	85
38	0.004	0.002	NR

Statistics

Assigned Value	Not Set	
Spike Value	0.00377	0.00019
Robust Average	0.00362	0.00026
Median	0.00360	0.00026
Mean	0.00361	
N	25	
Max	0.005	
Min	0.0022	
Robust SD	0.00052	
Robust CV	14%	

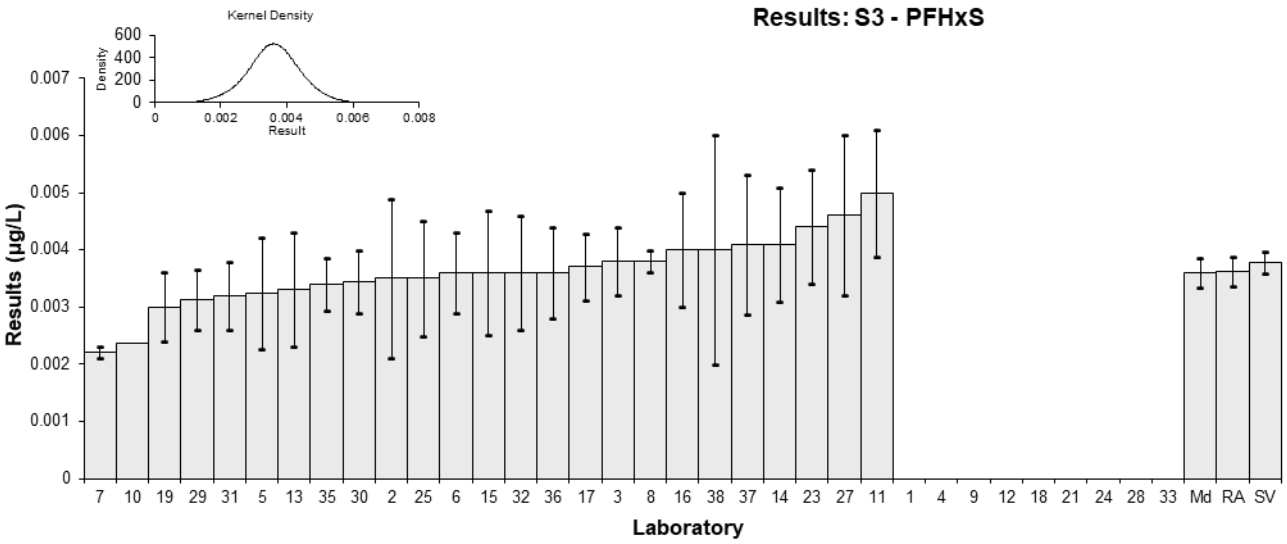

Results: S3 - PFHxS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
7 10 19 29 31 5 13 35 30 2 25 6 15 32 36 17 3 8 16 38 37 14 23 27 11 1 4 9 12 18 21 24 28 33 Md RA SV

Figure 57

Table 61

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFHxS_L
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.00344	NR	NR
2	0.0035	0.0014	NR
3	0.0038	0.0006	NR
4	NT	NT	NT
5	NT	NT	NT
6	NT	NT	NT
7	NR	NR	NR
8	0.0038	0.0002	53
9	NT	NT	NT
10	0.002377	NR	104
11	0.005	0.001110	103
12	0.003	0.0006	NR
13	0.0033	0.0010	95
14	0.0041	0.001	89
15	NT	NT	NT
16	NR	NR	NR
17	0.00368900	0.000572	103
18	NR	NR	NR
19	NT	NT	NT
21	0.00352	NR	NR
23	NT	NT	NT
24	NS	NS	NS
25	0.0034	0.001	101
27	0.0046	0.0014	112
28	NS	NS	NS
29	0.003123	0.00053091	96
30	0.0034234570	0.0005068134	105
31	NT	NT	NT
32	NT	NT	NT
33	NS	NS	NS
35	NT	NT	NT
36	NT	NT	NT
37	0.00409	0.001227	85
38	0.004	0.001	94

Statistics

Assigned Value	Not Set	
Spike Value	0.00377	0.00019
Robust Average	0.00364	0.00032
Median	0.00352	0.00025
Mean	0.00366	
N	17	
Max	0.005	
Min	0.002377	
Robust SD	0.00052	
Robust CV	14%	

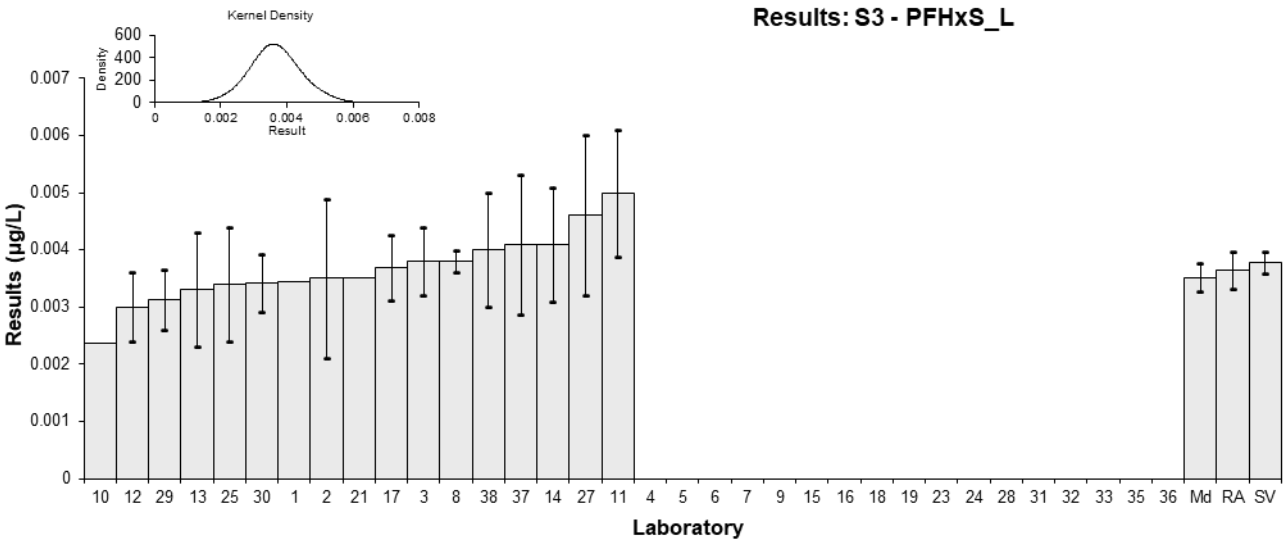

Results: S3 - PFHxS_L
Kernel Density
Density
Result
Results (µg/L)
Laboratory
10 12 29 13 25 30 1 2 21 17 3 8 38 37 14 27 11 4 5 6 7 9 15 16 18 19 23 24 28 31 32 33 35 36 Md RA SV

Figure 58

Table 62

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFOS
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	<0.004	NR	NR
2	0.005	0.002	66
3	0.0015	0.0006	95
4	NT	NT	NT
5	0.00110	0.0003292682	82
6	0.0016	0.0002	91.21
7	0.0012	0.0001	128.00
8	0.0015	0.0001	31
9	<0.01	NR	75
10	<0.0005	NR	91
11	0.0018	0.000540	115
12	0.0016	0.0004	NR
13	0.0028	0.0008	80
14	0.0015	0.000	89
15	0.0016	0.00048	90
16	<0.005	0.000	67
17	0.00122510	0.000223	102
18	NR	NR	NR
19	0.0016	0.00032	NR
21	0.00231	NR	NR
23	0.0018	0.0004	97.33
24	NS	NS	NS
25	0.0017	0.0008	94
27	0.00160	0.0005	109
28	NS	NS	NS
29	0.001516	0.00051544	103
30	0.0016993193	0.0000792552	97
31	0.0017	0.0003	86
32	0.0017	0.0005	89
33	NS	NS	NS
35	0.002	0.00027	103.93
36	0.0017	0.0004	94
37	0.00182	0.000546	89
38	0.002	0.002	NR

Statistics

Assigned Value	Not Set	
Spike Value	0.00139	0.00007
Robust Average	0.00168	0.00014
Median	0.00170	0.00009
Mean	0.00182	
N	25	
Max	0.005	
Min	0.0011	
Robust SD	0.00027	
Robust CV	16%	

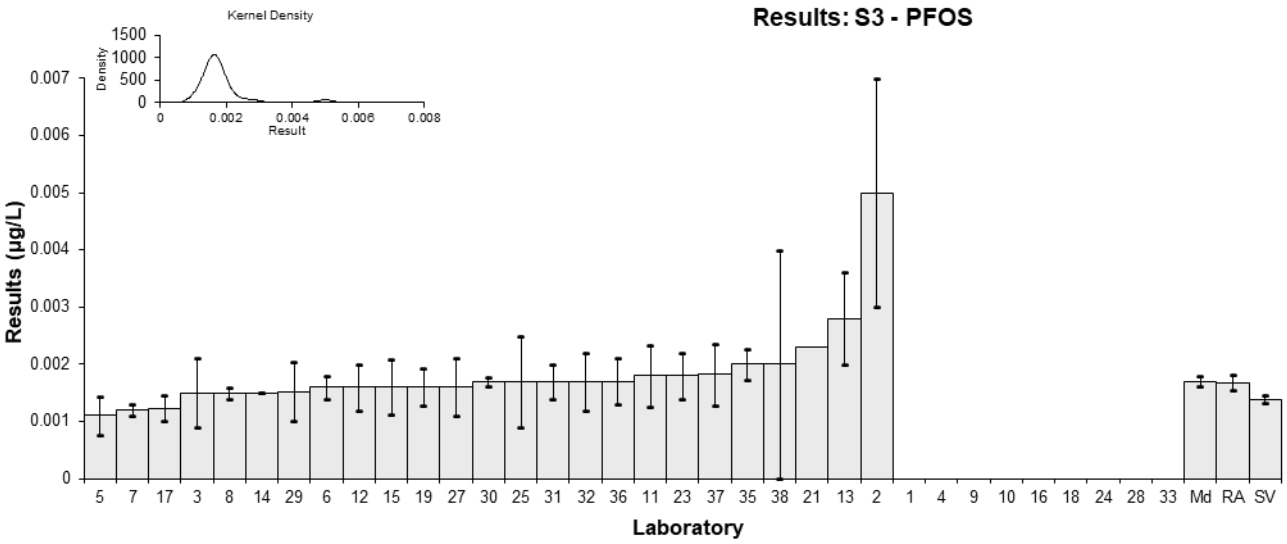

Results: S3 - PFOS
Kernel Density
Density
Result
Results (µg/L)
Laboratory
5 7 17 3 8 14 29 6 12 15 19 27 30 25 31 32 36 11 23 37 35 38 21 13 2 1 4 9 10 16 18 24 28 33 Md RA SV

Figure 59

Table 63

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFOS_L
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	<0.002	NR	NR
2	0.004	0.002	NR
3	0.0012	0.0002	NR
4	NT	NT	NT
5	NT	NT	NT
6	0.0012	0.0002	91.2
7	NR	NR	NR
8	0.0011	0.0001	31
9	NT	NT	NT
10	<0.0005	NR	91
11	0.0015	0.000390	115
12	0.0012	0.0003	NR
13	0.0022	0.0007	80
14	0.0015	0.000	89
15	NT	NT	NT
16	NR	NR	NR
17	0.00107900	0.000196	102
18	NR	NR	NR
19	NT	NT	NT
21	0.00144	NR	NR
23	NT	NT	NT
24	NS	NS	NS
25	0.0012	0.0006	94
27	0.0016	0.0005	109
28	NS	NS	NS
29	0.001516	0.00051544	103
30	0.0012677924	0.0002554391	97
31	0.0013	0.00023	86
32	NT	NT	NT
33	NS	NS	NS
35	<0.002	NR	103.93
36	NT	NT	NT
37	0.00135	0.000405	89
38	0.001	0.001	99

Statistics

Assigned Value	Not Set	
Spike Value	0.00110	0.00005
Robust Average	0.00135	0.00015
Median	0.00130	0.00018
Mean	0.00151	
N	17	
Max	0.004	
Min	0.001	
Robust SD	0.00025	
Robust CV	19%	

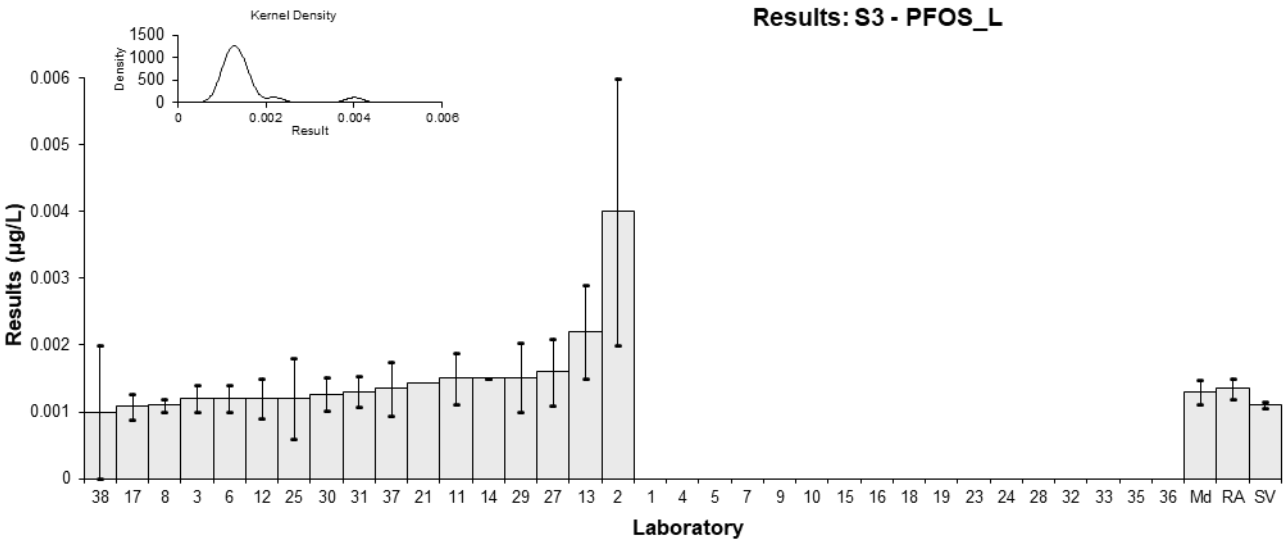

Results: S3 - PFOS_L
Kernel Density
Density
1500
1000
500
0
0
0.002
0.004
0.006
Result
Results (µg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0
38 17 8 3 6 12 25 30 31 37 21 11 14 29 27 13 2 1 4 5 7 9 10 15 16 18 19 23 24 28 32 33 35 36 Md RA SV
Laboratory

Figure 60

Table 64

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFOA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	<0.002	NR	NR
2	0.0037	0.0015	67
3	0.0020	0.0001	100
4	NT	NT	NT
5**	0.00020	0.0000588235	102
6	0.002	NR	93.66
7	0.0013	0.00004	92
8	0.0018	0.0002	54
9	<0.01	NR	110
10	0.001596	0.000798	101
11	0.0019	0.000570	89
12	0.0021	0.0004	NR
13	0.0018	0.0005	72
14	0.0021	0.001	90
15	NR	NR	NR
16	0.0022	0.0001	78
17	0.0023183	0.000496	106
18	NR	NR	NR
19	0.0022	0.00044	NR
21	0.00225	NR	NR
23	0.002	0.0004	83.9
24	NS	NS	NS
25	0.0023	0.001	91
27	0.00220	0.0007	129
28	NS	NS	NS
29	0.002066	0.00033056	98
30	0.0022407984	0.0001663182	102
31	0.0021	0.0035	88
32	0.0024	0.0007	92
33	NS	NS	NS
35	0.002	0.00019	114.75
36	0.0023	0.0005	95
37	0.00231	0.000693	94
38	0.002	0.001	98

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	0.00201	0.00010
Robust Average	0.00210	0.00011
Median	0.00210	0.00010
Mean	0.00213	
N	25	
Max	0.0037	
Min	0.0013	
Robust SD	0.00022	
Robust CV	11%	

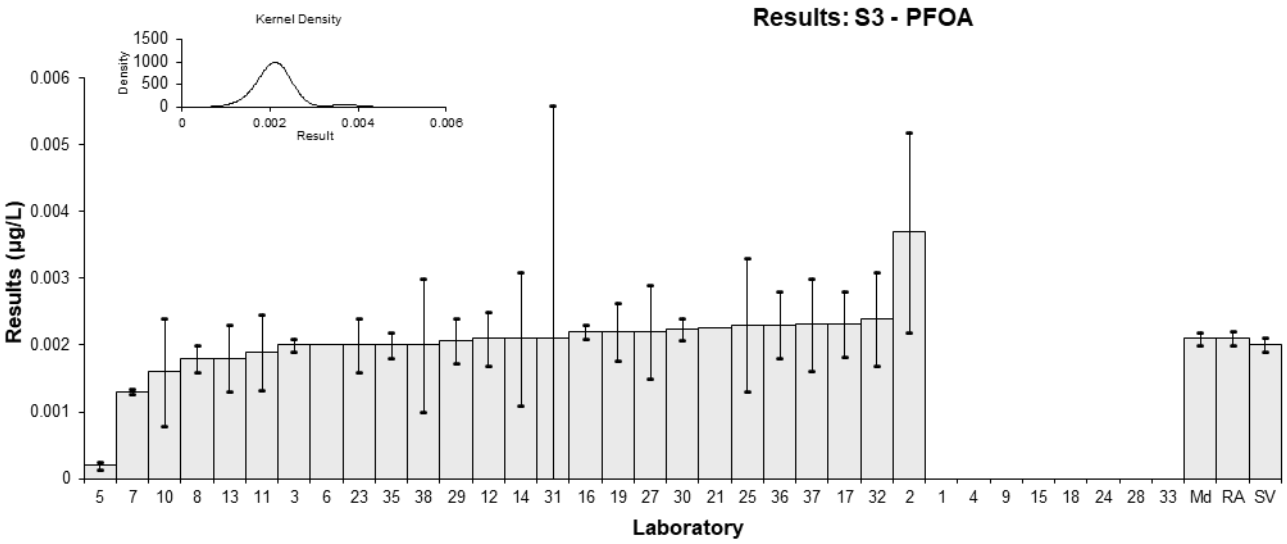

Results: S3 - PFOA
Kernel Density
Density
1500
1000
500
0
0
0.002
0.004
0.006
Result
Results (µg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0
5 7 10 8 13 11 3 6 23 35 38 29 12 14 31 16 19 27 30 21 25 36 37 17 32 2 1 4 9 15 18 24 28 33 Md RA SV
Laboratory

Figure 61

Table 65

Sample Details

Sample No.	S3
Matrix	Reagent Grade Water
Analyte	PFNA
Unit	µg/L

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	<0.001	NR	NR
2	<0.001	NR	67
3	0.0010	0.0002	92
4	NT	NT	NT
5	0.00056	0.0001685393	89
6	0.00105	0.0002	93.03
7	NR	NR	NR
8	<0.001	NR	NR
9	<0.02	NR	95
10	<0.001	NR	96
11	0.0013	0.000390	82.000000
12	0.001	0.0002	NR
13	0.0012	0.0004	65
14	0.0013	0.000	102
15	0.0009	0.00027	85
16	0.0009	0.0002	74
17	0.0010565	0.000313	99
18	NR	NR	NR
19	0.0009	0.00018	NR
21	0.00114	NR	NR
23	0.0011	0.0003	86.2
24	NS	NS	NS
25	0.0013	0.0005	96
27	0.0013	0.0004	137
28	NS	NS	NS
29	0.0013385	0.000254315	87
30	0.0009760958	0.0003050636	101
31	0.0011	0.00018	93
32	0.0013	0.0005	96
33	NS	NS	NS
35	0.0011	0.00017	104.23
36	<0.001	0.001	93
37	0.00148	0.000444	93
38	0.002	0.001	92

Statistics

Assigned Value	Not Set	
Spike Value	0.00100	0.00005
Robust Average	0.00114	0.00011
Median	0.00110	0.00016
Mean	0.00115	
N	22	
Max	0.002	
Min	0.00056	
Robust SD	0.00021	
Robust CV	19%	

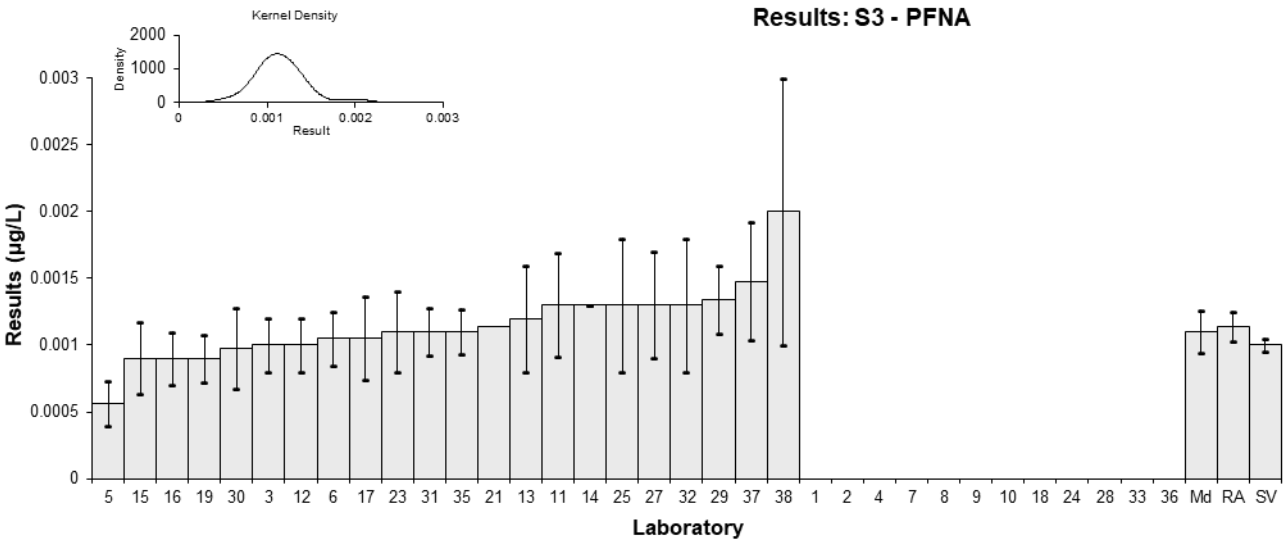

Results: S3 - PFNA
Kernel Density
Density
2000
1000
0
0
0.001
0.002
0.003
Result
Results (µg/L)
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
5 15 16 19 30 3 12 6 17 23 31 35 21 13 11 14 25 27 32 29 37 38 1 2 4 7 8 9 10 18 24 28 33 36 Md RA SV
Laboratory

Figure 62

6 DISCUSSION OF RESULTS

6.1 Assigned Value

Assigned values for the tests in the study samples were the robust averages of participants' results. The robust averages and their associated expanded uncertainties were calculated using the procedures described in ISO 13528. Results less than 50% or more than 150% of the robust average were removed before calculation of the assigned value.[5] Appendix 2 sets out the calculation for the expanded uncertainty of the robust average of PFHpS in S2.

No assigned value was set for PFudS, PFTrDS, PFODA and 8:2diPAP in S1 and for PFDoS, PFTrDS, PFTeDA, PFODA and 8:2diPAP and in S2 because the reported results were too few or too variable.

A comparison of the assigned value versus spike value for all fortified analytes in the three samples is presented in Table 66. The potable water S1 and the river water S2 contained some incurred analytes which may explain the assigned value being higher than the spike value.

Sample S3 was a pilot sample designed to assess laboratories' capabilities in measuring PFAS at trace level in water and no assigned value was set and performance assessment was conducted for this sample. However, participants can still compare their results against those of other participants as well as the median and robust average of reported results in Chapter 5. Participants can also assess whether their reported results fall within the z-score acceptable range which is presented in Appendix 6 for information only.

Traceability: The consensus of participants' results is not traceable to any external reference, so although expressed in SI units, metrological traceability has not been established.

Table 66 Comparison of Assigned Value and Spiked Concentration

Sample	Matrix	Analyte	Spiked Concentration (µg/L)	Assigned Value (µg/L)	Assigned/Spike (%)
S1	Potable Water	PFPeS	0.00554	0.00544	98
S1	Potable Water	PFHxS	0.0120	0.0119	99
S1	Potable Water	PFHxS_L	0.0120	0.0118	98
S1	Potable Water	PFOS	0.00468	0.00507	108
S1	Potable Water	PFOS_L	0.00349	0.00347	99
S1	Potable Water	PFNS	0.00362	0.0326	90
S1	Potable Water	PFDS	0.0363	0.0300	83
S1	Potable Water	PFBA	0.0730	0.0712	98
S1	Potable Water	PFPeA	0.0161	0.0140	87
S1	Potable Water	PFHxA	0.00746	0.00784	105
S1	Potable Water	PFOA	0.0105	0.0110	105
S1	Potable Water	PFNA	0.00502	0.00528	105
S1	Potable Water	PFDA	0.0251	0.0279	111
S1	Potable Water	PFTrDA	0.0200	0.0175	70
S1	Potable Water	PFTeDA	0.0250	0.0166	66
S1	Potable Water	PFODA	0.0700	0.0682*	97
S1	Potable Water	PFOSA	0.0377	0.0362	96
S1	Potable Water	4:2FTS	0.0654	0.0671	103
S1	Potable Water	6:2FTS	0.0248	0.0289	102
S1	Potable Water	8:2diPAP	0.0489	0.042*	86
S1	Potable Water	5:3FTCA	0.101	0.0943	93
S1	Potable Water	GenX	0.0150	0.0150	100
S1	Potable Water	PFEESA	0.0445	0.0411	92

Sample	Matrix	Analyte	Spiked Concentration (µg/L)	Assigned Value (µg/L)	Assigned/Spike (%)
S1	Potable Water	9Cl-PF3ONS	0.0939	0.0849	90
S1	Potable Water	11Cl-PF3OUdS	0.0950	0.0770	81
S2	River Water	PFBS	0.0104	0.0105	101
S2	River Water	PFHxS	0.0296	0.0274	93
S2	River Water	PFHxS_L	0.0288	0.0267	93
S2	River Water	PFHpS	0.00388	0.00389	100
S2	River Water	PFOS	0.0139	0.0159	114
S2	River Water	PFOS_L	0.00909	0.00965	106
S2	River Water	PFDS	0.0725	0.00538	74
S2	River Water	PFDoS	0.0729	0.033**	45
S2	River Water	PFBA	0.133	0.115	87
S2	River Water	PFPeA	0.0227	0.0165	73
S2	River Water	PFHxA	0.0223	0.0242	109
S2	River Water	PFHpA	0.0120	0.0128	106
S2	River Water	PFOA	0.0241	0.0249	103
S2	River Water	PFDA	0.0501	0.0272	114
S2	River Water	PFUdA	0.0501	0.0479	96
S2	River Water	PFDoA	0.0499	0.0408	82
S2	River Water	PFTeDA	0.0500	0.0278**	56
S2	River Water	PFODA	0.0699	0.036*	52
S2	River Water	PFOSA	0.0753	0.0704	93
S2	River Water	4:2FTS	0.0653	0.0642	98
S2	River Water	6:2FTS	0.0248	0.0281	99
S2	River Water	5:3FTCA	0.151	0.138	92
S2	River Water	ADONA	0.0282	0.0249	88
S2	River Water	PFEESA	0.0499	0.0417	84
S2	River Water	9Cl-PF3ONS	0.140	0.123	88
S2	River Water	11Cl-PF3OUdS	0.142	0.103	73
S3	Reagent Grade Water	PFHxS	0.00377	0.00362***	96
S3	Reagent Grade Water	PFHxS_L	0.00377	0.00364***	97
S3	Reagent Grade Water	PFOS	0.00139	0.00168***	121
S3	Reagent Grade Water	PFOS_L	0.00110	0.00135***	123
S3	Reagent Grade Water	PFOA	0.00201	0.00210***	104
S3	Reagent Grade Water	PFNA	0.00100	0.00114***	114

*Median Value (Assigned Value not set), **Robust Average (Assigned Value not set).***Robust Average outliers excluded (Assigned Value not set).

6.2 Measurement Uncertainty Reported by Participants

Participants were asked to report an estimate of the expanded measurement uncertainty associated with their results. It is a requirement of ISO/IEC 17025 that laboratories have procedures to estimate the uncertainty of chemical measurements and to report this in specific circumstances, including when the client's instruction so requires.[7]

Of 1317 numerical results for spiked analytes in this study, 1161 (88%) were reported with an expanded measurement uncertainty. The magnitude of the reported expanded uncertainties was within the range 0% to 300% of the reported value. The participants used a wide variety of procedures to estimate expanded measurement uncertainty. These are presented in Tables 2 and 3.

Participation in proficiency testing programs allows participants to check how reasonable their estimates of uncertainty are. Results and the expanded MU are presented in the bar charts for each analyte in this study (Figures 2 to 62).

Laboratories **3**, **6**, **7**, **8**, **12**, **14**, **16**, **17**, **29**, **30**, **31**, **35** and **38** should review their procedure for estimating measurement uncertainty as some of the relative uncertainties reported by them were lower than 10%, which the study coordinator believes is unrealistically small for a routine PFAS measurement.

Laboratories **2**, **3**, **4**, **9**, **10**, **24**, **25**, **29**, **30**, **31**, **36** and **38** who reported some estimates of uncertainty greater than 50% should also review their procedure as it might not be fit-for-purpose. In particular, Laboratory **2** reported two results with relative uncertainties of 300%.

Results that returned an acceptable z-score but an unacceptable E_n-score may have the underestimated the uncertainty.

Laboratories **12**, **16** and **36** attached an estimate of the expanded measurement uncertainty to a result reported as being less than their limit of reporting. An estimate of uncertainty expressed as a numerical value cannot be attached to a result expressed as a range.[8]

In some cases results were reported with an inappropriate number of significant figures. Including too many significant figures may inaccurately reflect measurement precision. The recommended format is to write uncertainty to no more than two significant figures and then to write the result with the corresponding number of decimal places (for example, a result of 0.0118798816 ± 0.0034464144 µg/L', should instead be expressed as '0.0119 ± 0.0034µg/L').[8]

Laboratories **5** and **30** reported results and/or uncertainties with large numbers of significant figures. Although all significant figures were used for results assessment (z and E_n-score calculation), the last few digits were omitted for some of these values presented in the tables in Section 5 due to lack of space.

6.3 z-Score

The z-score compares the participant's deviation from the assigned value with the target standard deviation set for proficiency assessment.

A target standard deviation equivalent to 20% PCV was used to calculate z-scores for all scored analytes, except for Sample S1 PFTeDA and PFTrDA where a target standard deviation equivalent to 25% PCV was used instead. Unlike the standard deviation based on between-laboratory CV, setting the target standard deviation as a realistic set value enables z-scores to be used as fixed reference value points for assessment of laboratory performance, independent of group performance.

The between-laboratory coefficient of variation predicted by the modified Horwitz equation,[6] and the between-laboratory CV are presented for comparison in Table 67.

To account for possible bias in the consensus values due to laboratories using inefficient analytical/extraction techniques, z-scores were adjusted for Sample S1 PFTeDA, and Sample S2 PFDS, PFPeA and 11Cl-PF3OUdS. A maximum acceptable result was set to two target standard deviations more than the spiked level. Results less than the maximum acceptable result but with z-scores greater than 2.0, had their z-scores adjusted to a value of 2.0. When the results were higher than the maximum acceptable result, z-scores were not adjusted. This approach ensured that participants reporting results close to the spiked concentration were not penalised. z-Scores of less than 2.0 were left unaltered.

The dispersal of participants' z-scores is graphically presented by laboratory in Figure 63 and by analyte in Figure 64.

Of the 1122 results for which z-scores were calculated, 1060 (94%) returned an acceptable z-score of $|z| \leq 2.0$ and 31 (3%) were questionable with a z-score of $2.0 < |z| < 3.0$.

Participants with multiple z-scores larger than 2.0 or smaller than -2.0 should check for method or laboratory bias.

6.4 E_n-Score

E_n-score can be interpreted in conjunction with z-scores. The E_n-score indicates how closely a result agrees with the assigned value taking into account the respective uncertainties. An unacceptable E_n-score for an analyte can either be caused by an inappropriate measurement, an inappropriate estimation of measurement uncertainty, or both.

The dispersal of participants' E_n-scores is graphically presented in Figure 65. Where a laboratory did not report an expanded uncertainty with a result, an expanded uncertainty of zero (0) was used to calculate the E_n-score.

For results whose *z*-scores were adjusted (see Section 6.3), no E_n-score has been calculated.

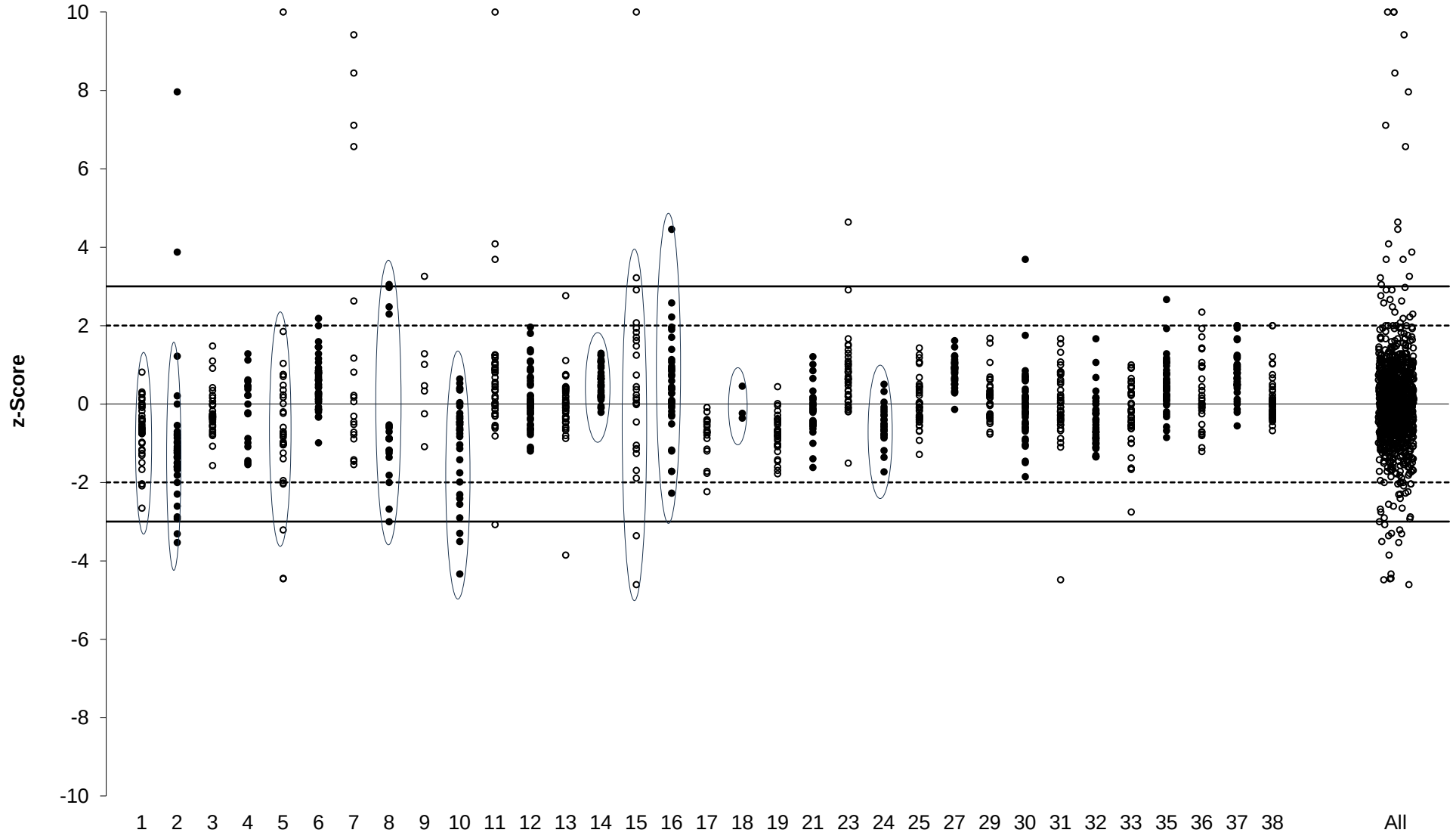
Of 1116 results for which E_n-scores were calculated, 858 (77%) returned an acceptable score of $|E_n| < 1.0$, indicating agreement of the participants' results with the assigned values within their respective expanded measurement uncertainties.

Table 67 Performance Target Standard Deviation, Thompson/ Horwitz and Between-Laboratory CV

Sample	Analyte	Assigned value (µg/L)	Target SD (as PCV, %)	Thompson/ Horwitz CV (%)	Between-laboratory CV* (%)
S1	PFPeS	0.00544	20	22	16
S1	PFHxS	0.0119	20	22	17
S1	PFHxS_L	0.0118	20	22	16
S1	PFOS	0.00507	20	22	13
S1	PFOS_L	0.00347	20	22	13
S1	PFNS	0.0326	20	22	20
S1	PFDS	0.0300	20	22	21
S1	PFBA	0.0712	20	22	10
S1	PFPeA	0.0140	20	22	23
S1	PFHxA	0.00784	20	22	9.0
S1	PFOA	0.0110	20	22	8.9
S1	PFNA	0.00528	20	22	13
S1	PFDA	0.0279	20	22	15
S1	PFTrDA	0.0175	25	22	30
S1	PFTeDA	0.0166	25	22	30
S1	PFODA	0.0682**	Not Set	22	28
S1	PFOSA	0.0362	20	22	16
S1	4:2FTS	0.0671	20	22	14
S1	6:2FTS	0.0289	20	22	14
S1	8:2diPAP	0.0420**	Not Set	22	39
S1	5:3FTCA	0.0943	20	22	13
S1	GenX	0.0150	20	22	23
S1	PFEESA	0.0411	20	22	9.7
S1	9Cl-PF3ONS	0.0849	20	22	17
S1	11Cl-PF3OUdS	0.0770	20	22	27

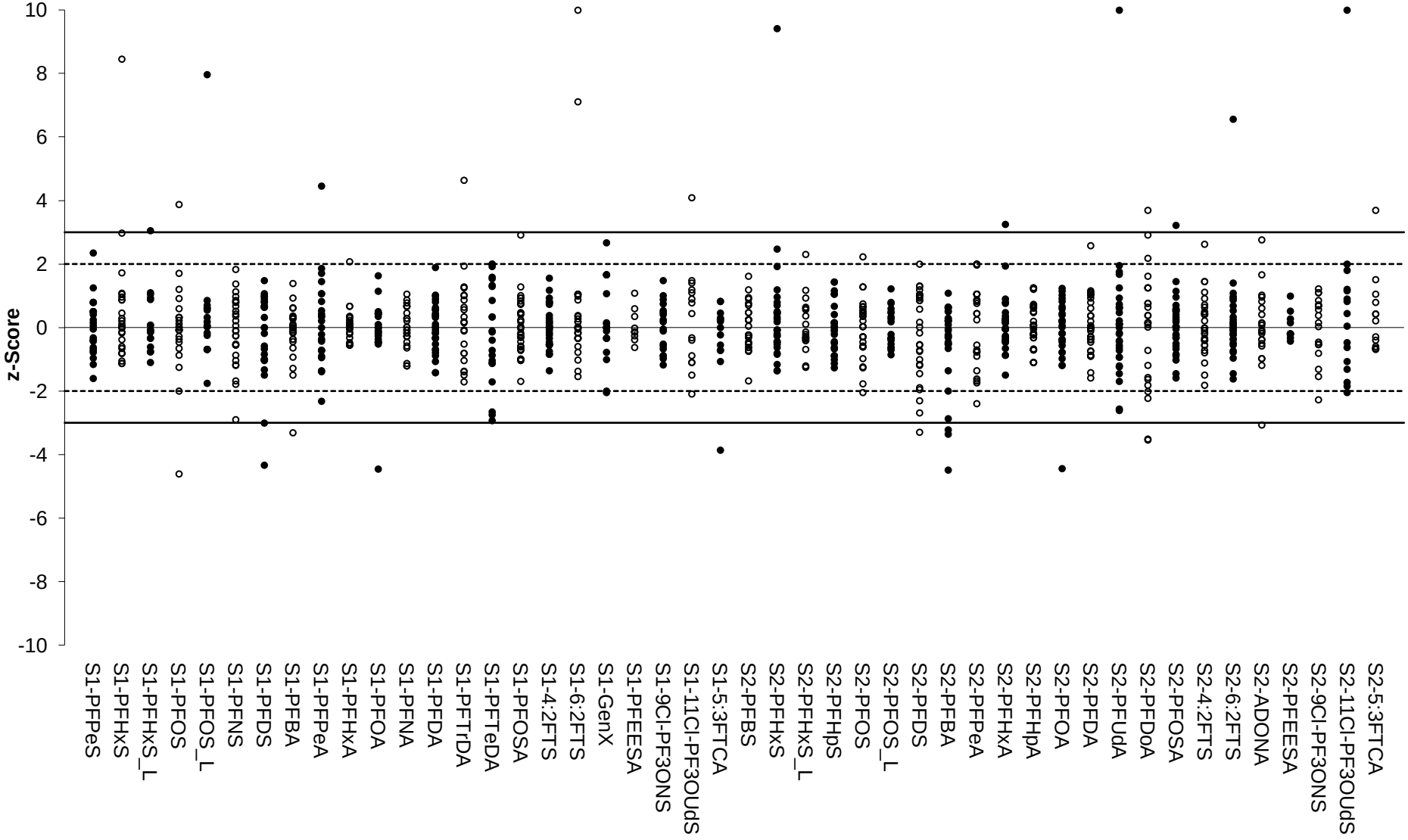
Sample	Analyte	Assigned value (µg/L)	Target SD (as PCV, %)	Thompson/ Horwitz CV (%)	Between-laboratory CV* (%)
S2	PFBS	0.0105	20	22	13
S2	PFHxS	0.0274	20	22	17
S2	PFHxS_L	0.0267	20	22	16
S2	PFHpS	0.00388	20	22	18
S2	PFOS	0.0159	20	22	17
S2	PFOS_L	0.00965	20	22	13
S2	PFDS	0.0538	20	22	27
S2	PFDoS	0.0329***	Not Set	22	63
S2	PFBA	0.115	20	22	11
S2	PFPeA	0.0165	20	22	27
S2	PFHxA	0.0242	20	22	11
S2	PFHpA	0.0128	20	22	15
S2	PFOA	0.0249	20	22	15
S2	PFDA	0.0572	20	22	17
S2	PFUdA	0.0479	20	22	21
S2	PFDoA	0.0408	20	22	28
S2	PFTeDA	0.0278***	Not Set	22	62
S2	PFODA	0.0355**	Not Set	22	120
S2	PFOSA	0.0704	20	22	15
S2	4:2FTS	0.0642	20	22	16
S2	6:2FTS	0.0281	20	22	14
S2	5:3FTCA	0.138	20	22	16
S2	ADONA	0.0249	20	22	16
S2	PFEESA	0.0417	20	22	8.3
S2	9Cl-PF3ONS	0.123	20	22	20
S2	11Cl-PF3OUdS	0.103	20	22	32
S3	PFHxS	0.00362****	Not Set	22	14
S3	PFHxS_L	0.00364****	Not Set	22	14
S3	PFOS	0.00168****	Not Set	22	16
S3	PFOS_L	0.00135****	Not Set	22	19
S3	PFOA	0.00210****	Not Set	22	11
S3	PFNA	0.00114****	Not Set	22	19

*Robust between-laboratory CV with outliers removed; **Median value (Assigned Value not set); ***Robust Average (Assigned Value not set), ****Robust Average (Assigned Value not set). Note: Shaded cells are between participant laboratories' CV which were higher than the target SD established by the study coordinator and the coefficient of variation from the predictive mathematical model (modified Horwitz equation).



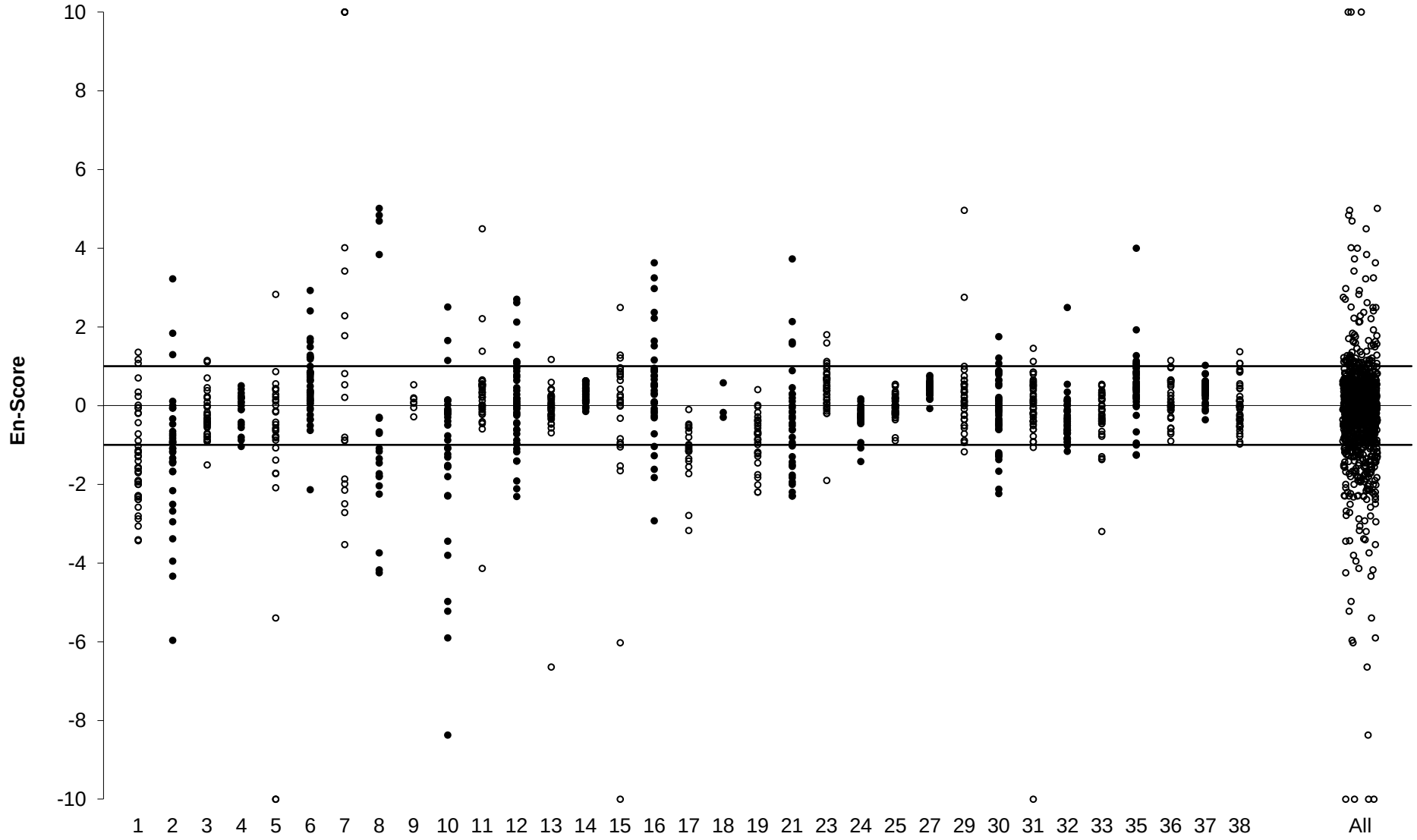
Scores greater than 10.0 have been plotted as 10.0. Circled laboratories did not add labelled standards directly into the sample bottle (see Section 6.7)

Figure 63 z-Score Dispersal by Laboratory for S1 and S2



Scores greater than 10.0 have been plotted as 10.0.

Figure 64 z-Score Dispersal by Analyte for S1 and S2

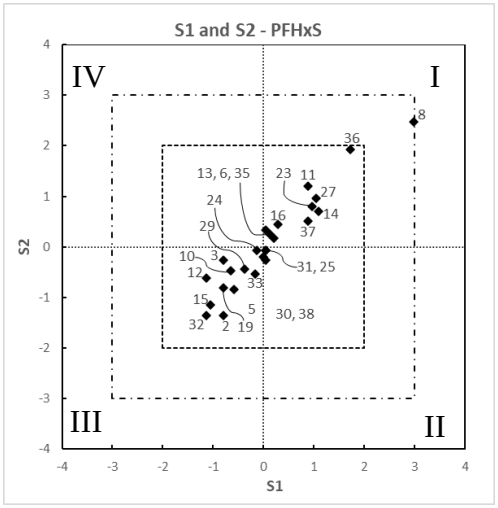


Scores greater than 10.0 have been plotted as 10.0 and scores less than -10.0 have been plotted as -10.0.

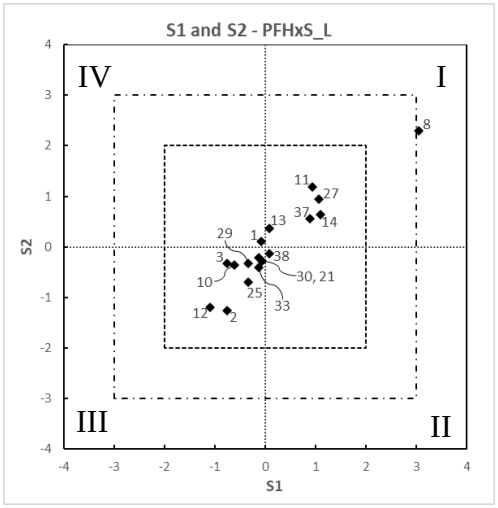
Figure 65 E_n-Score Dispersal by Laboratory

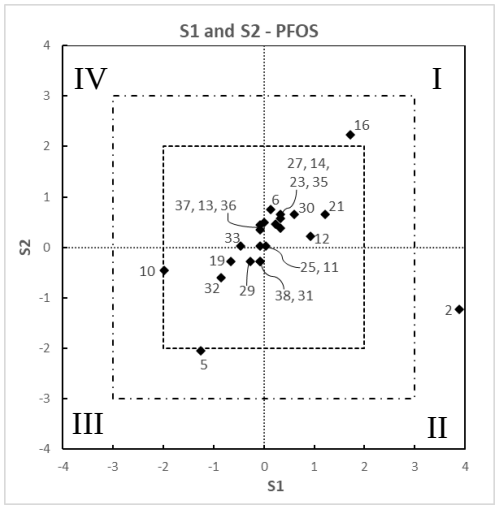
6.5 z-Score Scatter Plots

Scatter plots of z-scores for all analytes are presented in Figure 66. Scores are predominantly plotted in quadrants I and III, indicating that laboratory bias is the major contributor to the variability of results. Points close to the diagonal axis demonstrate excellent repeatability, while points close to the zero demonstrate excellent repeatability and accuracy

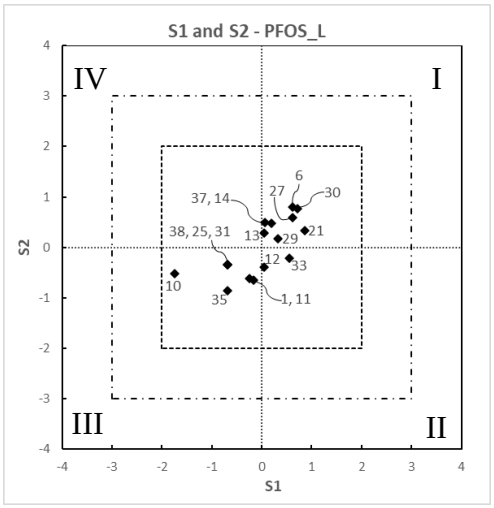


Laboratory 7 is off scale

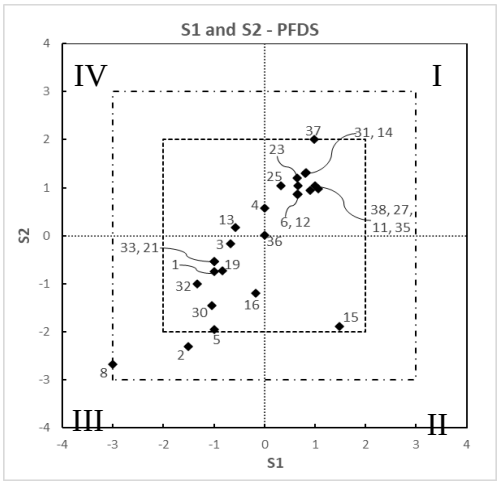




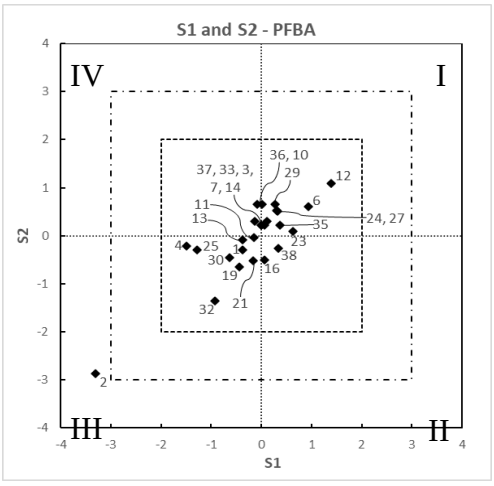
Laboratory 15 is off scale



Laboratory 2 is off scale

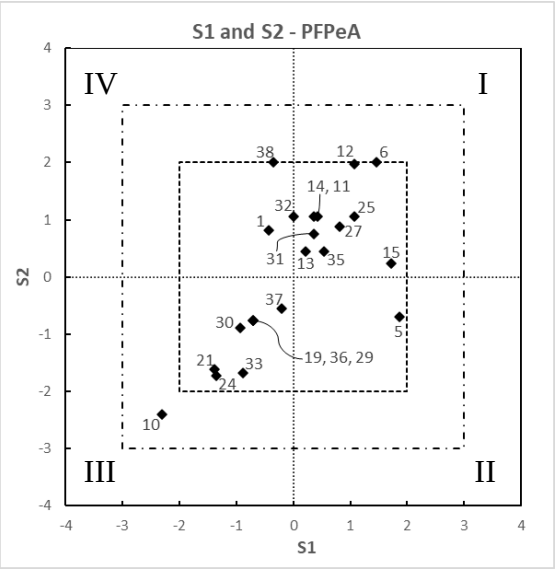


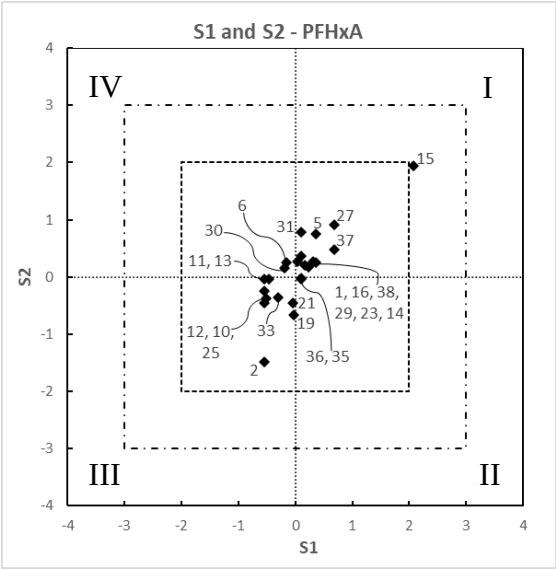
Laboratory 10 is off scale



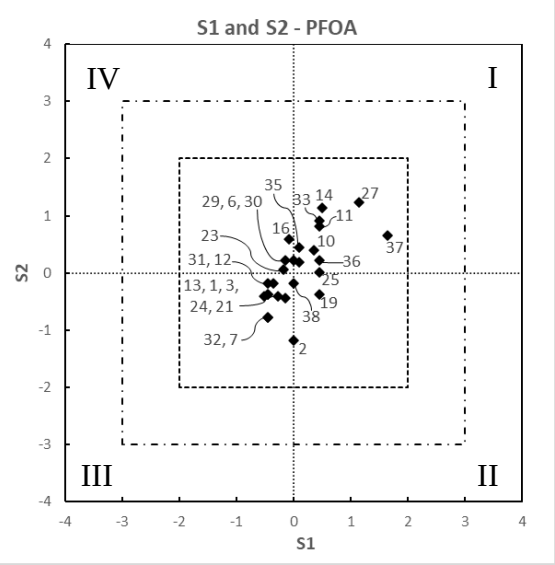
Laboratory 31 is off scale

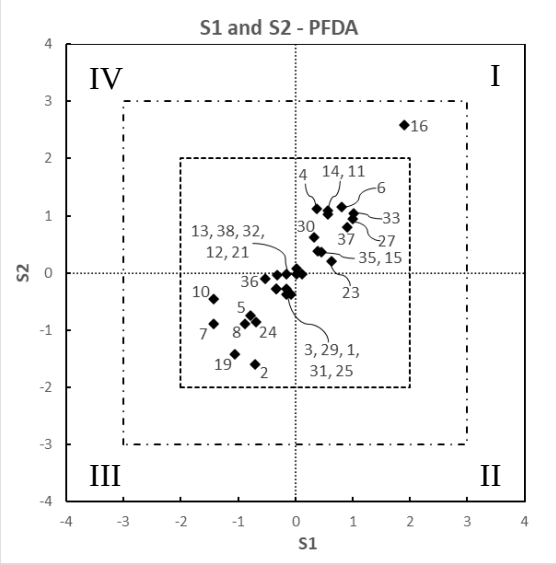
Figure 66 *z*-Score Scatter Plots



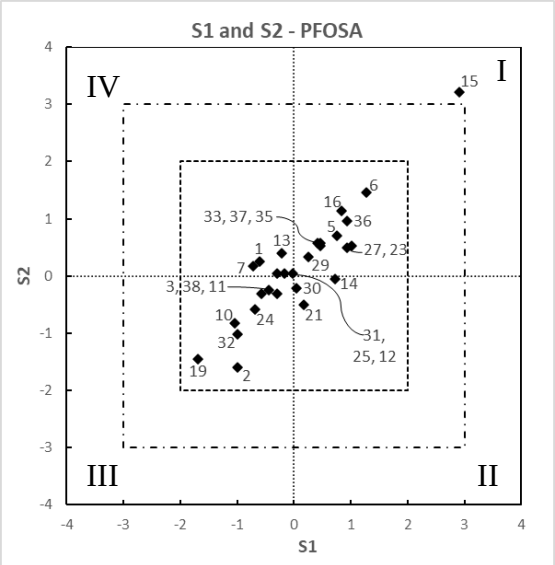


Laboratory 16 is off scale





Laboratory 5 is off scale



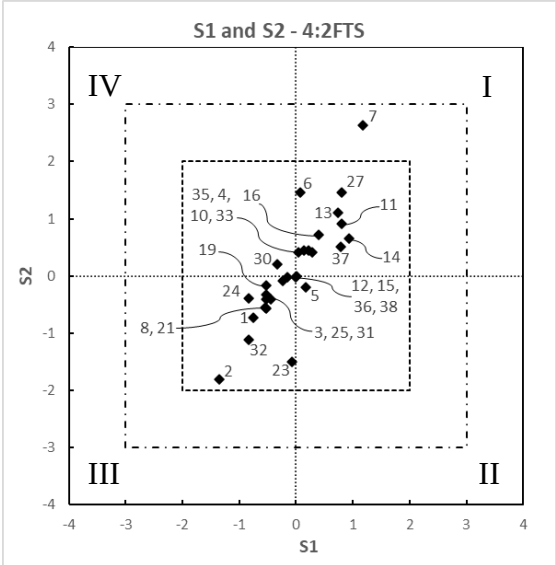
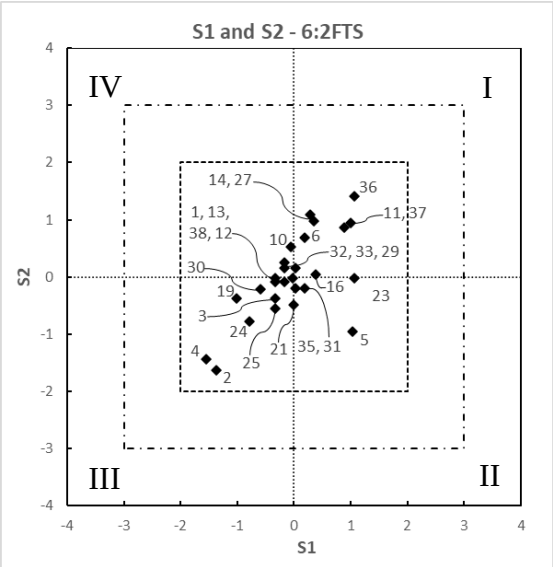
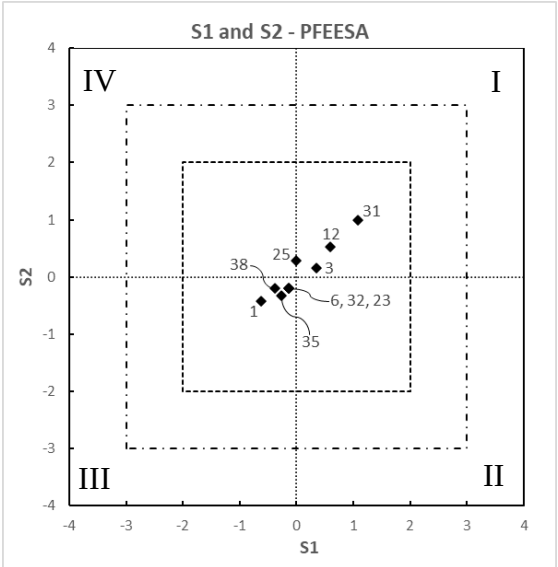
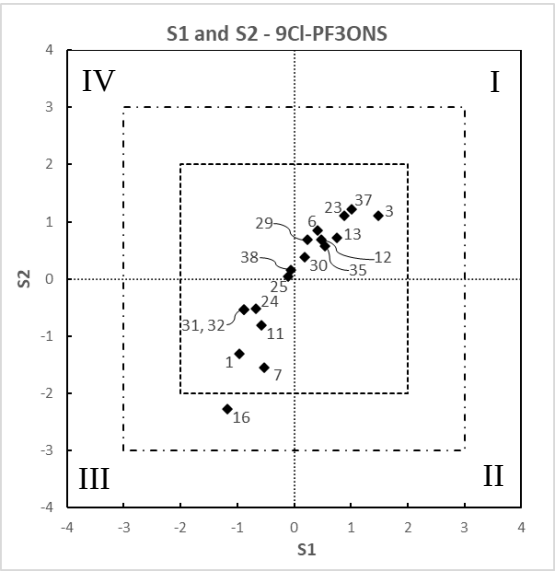


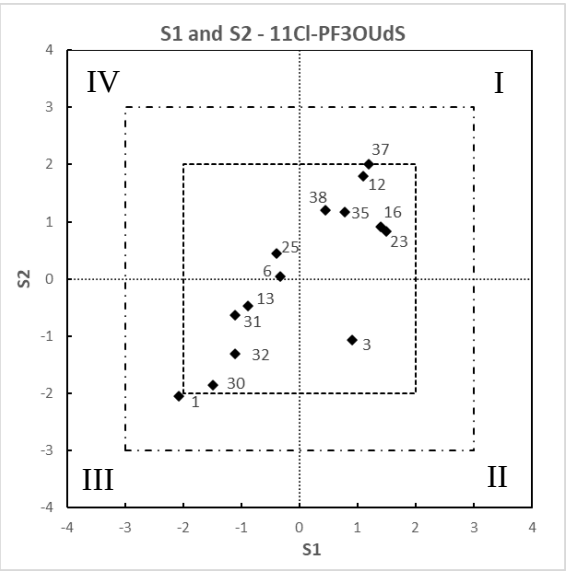
Figure 66 *z*-Score Scatter Plots (continued)





Laboratories 7 and 15 are off scale





Laboratory 11 is off scale

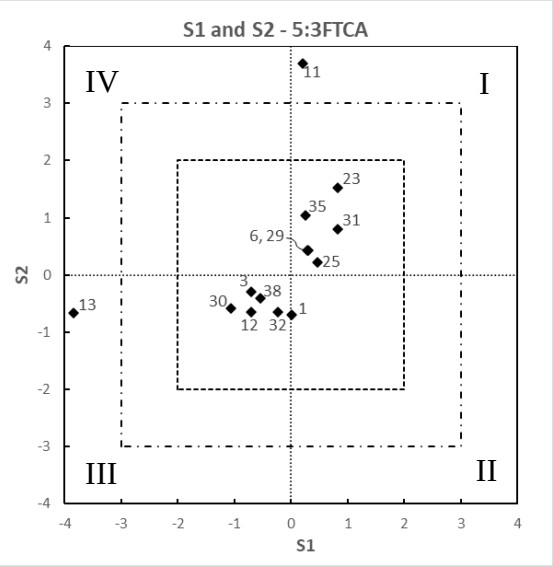


Figure 66 *z*-Score Scatter Plots (continued)

Table 68 Summary of Participants' Results and Performance for Sample S1 (all values are in µg/L)*

Lab	PFPeS	PFHxS	PFHxS_L	PFOS	PFOS_L	PFNS	PFDS	PFUdS	PFTrDS	PFBA	PFPeA	PFHxA	PFOA	PFNA	PFDA
AV	0.00544	0.0119	0.0118	0.00507	0.00347	0.0326	0.0300	Not Set	Not Set	0.0712	0.0140	0.00784	0.0110	0.00528	0.0279
SV	0.00554	0.0120	0.0120	0.00468	0.00349	0.0362	0.0363	0.0364	0.0366	0.0730	0.0161	0.00746	0.0105	0.00502	0.0251
1	0.00418	NT	0.0116	<0.00535	0.00335	0.0217	0.024	0.0132	0.01	0.066	0.0128	0.00833	0.00986	0.00468	0.0275
2	0.0044	0.01	0.01	0.009	0.009	0.027	0.021	NR	NR	0.024	<0.01	0.007	0.011	0.0055	0.024
3	NR	0.010	0.010	NR	NR	0.029	0.026	NR	NR	0.071	NR	NR	0.010	NR	0.026
4	<0.01	<0.01	<0.01	<0.01	<0.01	NT	0.03	NT	NT	0.05	<0.02	<0.01	<0.01	<0.01	0.03
5	0.0057	0.0105	NT	0.0038	NR	0.0258	0.024	NT	NT	NR	0.0192	0.0084	0.0012	0.0053	0.0235
6	0.0063	0.0122	NT	0.0052	0.0039	0.0378	0.0339	NT	NT	0.0845	0.0181	0.0076	0.0107	0.0056	0.0324
7	NT	0.032	NR	NR	NR	NR	NR	NR	NR	0.072	NR	NR	0.010	NR	0.020
8	<0.01	0.019	0.019	<0.01	<0.01	0.025	0.012	NT	NT	<0.06	<0.01	<0.01	<0.01	<0.01	0.023
9	NT	<0.01	NT	<0.01	NT	NT	NT	NT	NT	NT	NT	<0.01	<0.01	<0.02	NT
10	0.004629	0.010361	0.010361	0.003055	0.002258	0.013712	0.004042	NT	NT	0.071295	0.007543	0.007017	0.011795	0.004084	0.019964
11	0.006	0.014	0.014	0.0051	0.0033	0.035	0.036	NT	NT	0.069	0.015	0.007	0.012	0.006	0.031
12	0.0046	0.0092	0.0092	0.0060	0.0035	0.034	0.034	NT	NT	0.091	0.0170	0.0070	0.0102	0.0046	0.028
13	0.0059	0.0120	0.0120	0.0050	0.0035	0.0319	0.0265	NT	NT	0.0660	0.0146	0.0071	0.0100	0.0051	0.0261
14	0.0056	0.0145	0.0144	0.0053	0.0036	0.0370	0.0348	NT	NT	0.0728	0.0152	0.0081	0.0121	0.0052	0.0310
15	0.0068	0.0094	NT	0.0004	NR	0.0445	0.0389	NR	NR	NR	0.0188	0.0111	NR	0.0048	0.0304
16	0.0051	0.0126	NR	0.0068	NR	0.0354	0.0289	NR	NR	0.0722	0.0265	0.0079	0.0108	0.005	0.0385
17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
18	NR	0.0130	NR	0.0047	NR	NR	NR	NR	NR	NR	NR	NR	0.0105	NR	NR
19	0.0037	0.01	NT	0.0044	NT	0.021	0.025	NT	NT	0.065	0.012	0.0078	0.012	0.004	0.022
21	0.00498	NT	0.0115	0.00630	0.00407	NT	0.0240	NT	NT	0.0689	0.0101	0.00778	0.0107	0.00510	0.0285
23	0.0055	0.0142	NT	0.0054	NT	0.0416	0.0339	NT	NT	0.0801	<0.0040	0.0084	0.0106	0.0052	0.0314
24	<0.01	0.0116	NT	<0.01	NT	0.0249	<0.06	0.0193	0.0135	0.0757	0.0102	<0.01	0.0104	<0.01	0.0241
25	0.006	0.012	0.011	0.005	0.003	0.032	0.032	NT	NT	0.053	0.017	0.007	0.012	0.006	0.027
27	0.0060	0.0144	0.0143	0.0054	0.0039	0.0382	0.0354	NT	NT	0.0756	0.0163	0.0089	0.0135	0.0061	0.0336
28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NT	NT	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1
29	0.0054	0.011	0.011	0.0048	0.0037	0.031	NR	NT	NT	0.075	0.012	0.0082	0.011	0.0064	0.026
30	0.004689728	0.011879882	0.011624356	0.005675219	0.003959748	0.029286408	0.023777345	NT	NT	0.062121144	0.011377643	0.007545281	0.011212907	0.005300873	0.029698133
31	0.005	0.012	NT	0.005	0.003	0.036	0.035	NT	NT	0.08	0.015	0.008	0.01	0.005	0.027
32	0.005	0.0092	NT	0.0042	NT	0.031	0.022	NT	NT	0.058	0.014	<0.01	0.010	0.006	0.028
33	0.00475	0.0115	0.0115	0.0046	0.00385	0.029	0.024	NT	NT	0.071	0.0115	0.00735	0.012	0.0056	0.0335
35	0.0063	0.0124	NT	0.0054	0.003	0.04	0.0364	NT	NT	0.0764	0.0155	0.008	0.0112	0.0062	0.0301
36	0.008	0.016	NT	0.005	NT	0.039	0.03	NT	NT	0.07	0.012	0.008	0.012	0.004	0.025
37	0.00630	0.0140	0.0139	0.00507	0.00351	0.0379	0.0359	NT	NT	0.0693	0.0134	0.00890	0.0146	0.00577	0.0329
38	0.006	0.012	0.012	0.005	0.003	0.033	0.034	NT	NT	0.076	0.013	0.008	0.011	0.005	0.027

* AV = Assigned Value, SV = Spiked Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unacceptable z-score.

Table 68 Summary of Participants' Results and Performance for Sample S1 (all values are in µg/L)* (continued)

Lab	PFTrDA	PFTeDA	PFODA	PFOSA	4:2FTS	6:2FTS	8:2diPAP	5:3FTCA	GenX	PFEESA	9Cl-PF3ONS	11Cl-PF3OUdS
AV	0.0175	0.0166	Not Set	0.0362	0.0671	0.0289	Not Set	0.0943	0.0150	0.0411	0.0849	0.077
SV	0.0250	0.0250	0.0700	0.0377	0.0654	0.0284	0.0489	0.101	0.0150	0.0445	0.0939	0.0950
1	0.011	0.00561	0.0423	0.0318	0.0571	0.0288	NT	0.0944	0.00887	0.036	0.0685	0.0449
2	<0.002	0.0045	NR	0.029	0.049	0.021	NR	NR	0.009	NR	NR	NR
3	NR	NR	NR	0.032	0.060	0.027	NR	0.081	0.015	0.044	0.11	0.091
4	<0.1	<0.5	NT	<0.1	0.07	0.02	NT	NT	NT	NT	NT	NT
5	0.0114	0.0123	0.0682	0.0417	0.0694	0.0349	NT	NT	NT	NT	NT	NT
6	0.0172	0.0232	NT	0.0455	0.068	0.03	<0.025	0.0998	0.014	0.04	0.092	0.072
7	NR	NR	NR	0.031	0.083	0.070	NT	NT	NT	NT	0.076	NR
8	<0.01	<0.01	NT	<0.05	0.06	<0.05	NT	NT	NT	NT	NT	NT
9	NT	NT	NT	NT	NT	<0.03	NT	NT	NT	NT	NT	NT
10	<0.001	<0.001	NT	0.028675	0.067695	0.02862	NT	NT	NT	NT	NT	NT
11	0.017	0.018	NT	0.034	0.078	0.034	NT	0.098	0.015	NT	0.075	0.14
12	0.0213	0.0221	NT	0.0360	0.064	0.028	<0.1	0.0810	0.015	0.046	0.093	0.094
13	0.0140	0.0180	NT	0.0346	0.0770	0.0270	NT	0.0217	0.0140	NT	0.0976	0.0635
14	0.0183	0.0162	NT	0.0415	0.0796	0.0309	NR	NR	NR	NR	NR	NR
15	0.0182	0.0119	0.072	0.0573	0.0672	0.115	NT	NT	NT	NT	NT	NT
16	0.01	0.0095	NR	0.0423	0.0723	0.0311	NR	NR	0.0182	NR	0.0651	0.0986
17	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
19	0.013	0.015	NT	0.024	0.06	0.023	NT	NT	NT	NT	NT	NT
21	0.0219	0.0136	0.0468	0.0375	0.0597	0.0289	0.0185	NT	0.0147	NT	NT	NT
23	0.0378	0.022	NT	0.0435	0.066	0.035	0.042	0.11	0.02	0.04	0.1	0.1
24	<0.03	<0.02	<0.19	0.0313	0.0558	0.0244	<0.37	NT	0.0127	NT	0.0736	<0.13
25	0.023	< 0.05	NT	0.035	0.061	0.027	NT	0.103	< 0.02	0.041	0.083	0.071
27	0.02030	0.01600	NT	0.0430	0.0780	0.0305	NT	NT	NT	NT	NT	NT
28	<0.1	<0.1	NT	NT	<0.1	<0.1	NT	NT	<0.1	NT	NT	NT
29	NR	NR	NT	0.038	0.088	0.029	NT	0.1	0.015	NT	0.089	NR
30	0.015272518	0.020135838	NT	0.036467286	0.062628394	0.025481888	0.03914779	0.074103409	0.015447268	NT	0.088075598	0.053987803
31	0.02	0.023	NT	0.034	0.06	0.03	0.053	0.11	0.02	0.05	0.07	0.06
32	0.019	0.013	NT	0.029	0.056	0.028	<0.1	0.09	0.02	0.04	0.07	0.06
33	0.0115	0.0052	NT	0.0395	0.071	0.028	NT	NT	0.012	NT	NT	NT
35	0.0231	0.0246	NT	0.0396	0.069	0.029	0.052	0.099	0.023	0.039	0.094	0.089
36	0.014	0.012	NT	0.043	0.065	0.035	NT	NT	NT	NT	NT	NT
37	0.0260	0.0253	0.0742	0.0392	0.0776	0.0347	NT	NT	0.0154	NT	0.102	0.0955
38	0.022	0.025	NT	0.033	0.067	0.027	NT	0.084	0.014	0.038	0.084	0.084

Table 69 Summary of Participants' Results and Performance for Sample S2 (all values are in µg/L)*

Lab	PFBS	PFHxS	PFHxS_L	PFHpS	PFOS	PFOS_L	PFDS	PFDoS	PFTrDS	PFBA	PFPeA	PFHxA	PFHpA	PFOA	PFDA
AV	0.0105	0.0274	0.0267	0.00388	0.0159	0.00965	0.0538	Not Set	Not Set	0.115	0.0165	0.0242	0.0128	0.0249	0.0572
SV	0.0104	0.0296	0.0288	0.00388	0.0139	0.00909	0.0725	0.0729	0.0731	0.133	0.0227	0.0223	0.0120	0.0241	0.0501
1	0.00895	NT	0.0273	0.0029	0.0128	0.00841	0.0457	0.0107	0.00645	0.108	0.0192	0.0255	0.01109	0.0229	0.0528
2	0.007	0.02	0.02	0.003	0.012	0.012	0.029	NR	NR	0.049	<0.01	0.017	0.01	0.019	0.039
3	0.010	0.026	0.025	NR	NR	NR	0.052	0.015	NR	0.12	NR	0.024	0.013	0.023	0.054
4	0.01	0.03	0.03	<0.01	0.02	<0.01	0.06	NT	NT	0.11	<0.02	0.02	0.01	0.02	0.07
5	0.0115	0.0228	NT	0.0031	0.0094	NT	0.0328	0.0256	NT	0.0411	0.0142	0.0279	0.0122	0.0028	0.0486
6	0.0115	0.0288	NT	0.0047	0.0183	0.0112	0.0631	0.031	NT	0.129	0.0249	0.0254	0.0141	0.026	0.0705
7	NR	0.079	NR	NR	NR	NR	NR	NR	NR	0.120	NR	NR	0.012	0.021	0.047
8	<0.01	0.041	0.039	<0.01	0.014	<0.01	0.025	NT	NT	0.069	0.012	0.02	0.011	0.019	0.047
9	0.01	0.03	NT	NT	0.02	NT	NT	NT	NT	NT	NT	0.04	0.01	0.03	NT
10	0.009858	0.024809	0.024809	0.003363	0.014439	0.008652	0.018451	<0.0005	NT	0.130061	0.008582	0.02234	0.012199	0.026878	0.052102
11	0.01	0.034	0.033	0.004	0.016	0.00846	0.065	NT	NT	0.114	0.02	0.024	0.016	0.029	0.069
12	0.0094	0.0240	0.0203	0.0038	0.0166	0.0089	0.063	0.048	NT	0.14	0.023	0.023	0.013	0.024	0.057
13	0.0092	0.0292	0.0287	0.0039	0.0173	0.0102	0.0556	NT	NT	0.1130	0.0180	0.0240	0.0124	0.0230	0.0567
14	0.0110	0.03126	0.03012	0.00372	0.01737	0.01058	0.0678	NT	NT	0.1219	0.0200	0.0252	0.016	0.0306	0.0697
15	0.0139	0.0211	NT	0.0039	0.0119	NT	0.0335	0.0338	NR	0.0378	0.0173	0.0336	0.0147	NR	0.0614
16	0.0121	0.0298	NR	<0.005	0.023	NR	0.041	NR	NR	0.1035	0.0194	0.0255	0.0127	0.0279	0.0867
17	0.0090	0.0250	0.0246	0.0032	0.0103	0.0083	0.0414	0.0167	NT	0.1031	<0.004	0.0222	0.0123	0.0221	0.0489
18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
19	0.0095	0.023	NT	0.0032	0.015	NT	0.046	0.03	NT	0.1	0.014	0.021	0.01	0.023	0.041
21	0.00918	NT	0.0256	0.00354	0.0180	0.0103	0.0481	NT	NT	0.103	0.0112	0.0220	0.0129	0.0227	0.0570
23	0.012	0.0318	NT	0.0044	0.0177	NT	0.0667	NT	NT	0.117	<0.0055	0.0254	0.0133	0.0252	0.0595
24	0.0106	0.027	NT	<0.01	0.0141	NT	<0.1	0.0214	0.0145	0.1267	0.0108	0.0228	0.0123	0.0229	0.0474
25	0.013	0.027	0.023	0.005	0.016	0.009	0.065	NT	NT	0.108	0.020	0.022	0.012	0.025	0.054
27	0.0124	0.0327	0.0317	0.0042	0.0180	0.0108	0.0639	NT	NT	0.1269	0.01940	0.0286	0.0159	0.0311	0.0691
28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
29	0.011	0.025	0.025	0.0035	0.015	0.010	NR	NT	NT	0.13	0.014	0.025	0.014	0.026	0.054
30	0.01001758	0.02628078	0.02523977	0.00383532	0.01799883	0.01114079	0.03819822	0.00547893	NT	0.10432148	0.01355155	0.02492072	0.014620039	0.025843138	0.06425121
31	0.011	0.027	NT	0.004	0.015	0.009	0.068	0.045	NT	0.012	0.019	0.028	0.013	0.024	0.053
32	0.010	0.02	NT	0.004	0.014	NT	0.043	0.032	NT	0.084	0.020	0.025	0.011	0.021	0.058
33	0.00955	0.0245	0.0245	0.0034	0.016	0.00925	0.048	NT	NT	0.12	0.011	0.0225	0.0145	0.0295	0.068
35	0.011	0.0284	NT	0.0047	0.0171	0.008	0.0643	0.052	NT	0.12	0.018	0.0241	0.0144	0.0271	0.0616
36	0.01	0.038	NT	0.005	0.017	NT	0.054	NT	NT	0.13	0.014	0.024	0.011	0.026	0.056
37	0.0125	0.0302	0.0297	0.00479	0.0175	0.0106	0.0767	0.0682	NT	0.122	0.0147	0.0265	0.0145	0.0282	0.0663
38	0.011	0.026	0.026	0.004	0.015	0.009	0.065	0.063	NT	0.109	0.03	0.026	0.013	0.024	0.057

* AV = Assigned Value, SV = Spiked Value, NS = Not Sent, NT = Not Tested, NR = Not Reported. Shaded cells are results which returned a questionable or unacceptable z-score.

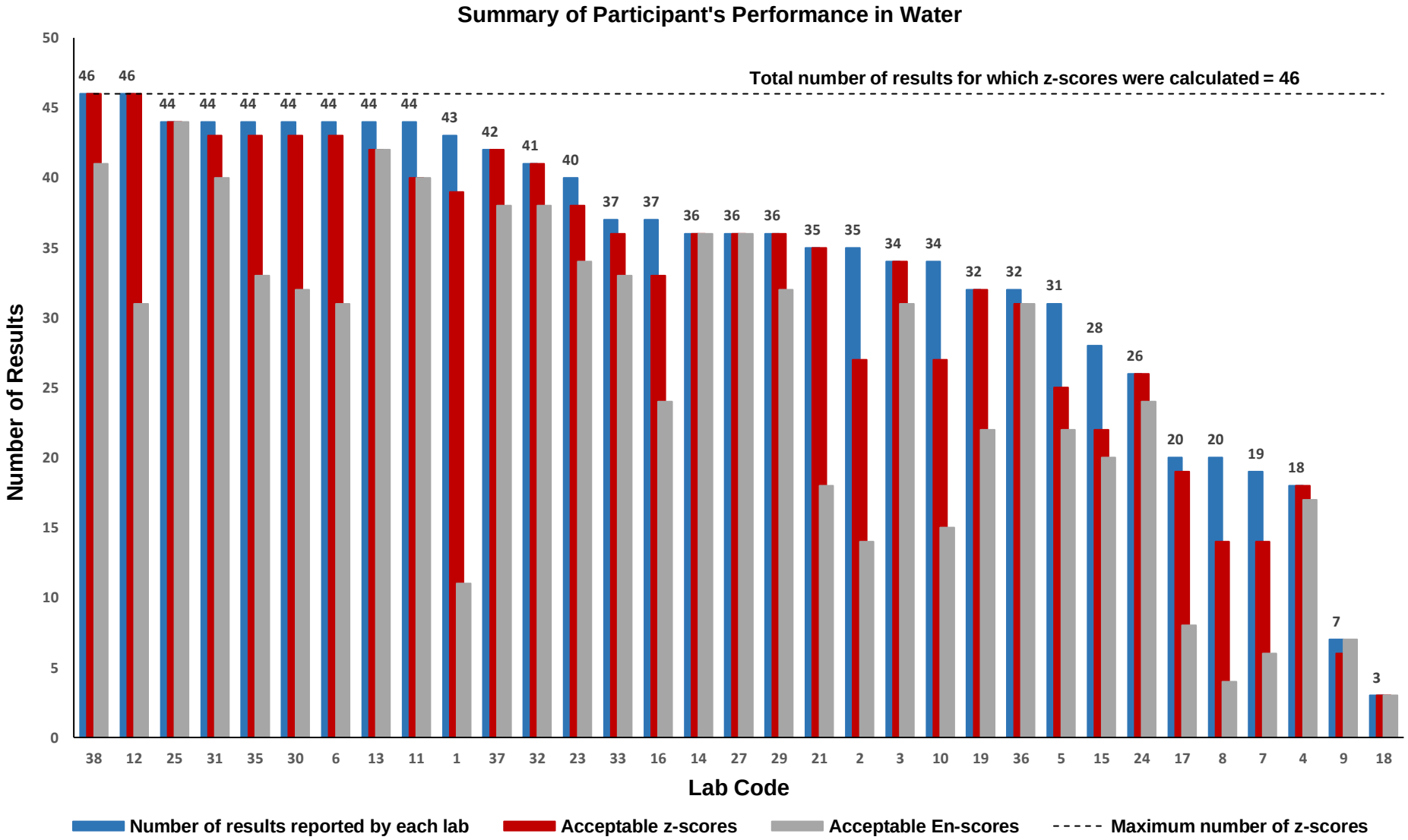
Table 69 Summary of Participants' Results for Sample S2 (all values are in µg/L)* (continued)

Lab	PFUdA	PFDoA	PFTeDA	PFODA	PFOSA	4:2FTS	6:2FTS	8:2diPAP	5:3FTCA	ADONA	PFEESA	9Cl-PF3ONS	11Cl-PF3OUdS
AV	0.0479	0.0408	Not Set	Not Set	0.0704	0.0642	0.0281	Not Set	0.138	0.0249	0.0417	0.123	0.103
SV	0.0501	0.0499	0.0500	0.0699	0.0753	0.0653	0.0284	0.0489	0.151	0.0282	0.0499	0.140	0.142
1	0.0437	0.0312	0.00804	0.0239	0.0739	0.055	0.028	NT	0.119	0.0257	0.0382	0.0907	0.0609
2	0.023	0.012	0.005	NR	0.048	0.041	0.019	NR	NR	0.019	NR	NR	NR
3	0.044	0.028	NR	NR	0.066	0.060	0.026	NR	0.13	0.027	0.043	0.15	0.081
4	0.05	<0.05	<0.5	NT	<0.1	0.07	0.02	NT	NT	NT	NT	NT	NT
5	0.32	0.0244	0.0212	0.0355	0.0802	0.0616	0.0227	NT	NT	NR	NT	NT	NT
6	0.0537	0.0587	0.0527	NT	0.091	0.083	0.032	<0.025	0.15	0.02	0.04	0.144	0.104
7	0.034	NR	NR	NR	0.073	0.098	0.065	NT	NT	0.029	NT	0.085	NR
8	0.036	0.026	<0.02	NT	0.058	0.057	<0.05	NT	NT	NT	NT	NT	NT
9	NT	NT	NT	NT	NT	NT	0.03	NT	NT	NT	NT	NT	NT
10	0.023373	0.01217	<0.001	NT	0.058696	0.069488	0.031082	NT	NT	NT	NT	NT	NT
11	0.06	0.051	0.03	NT	0.066	0.076	0.033	NT	0.24	0.0096	NT	0.103	0.32
12	0.049	0.042	0.044	NT	0.071	0.063	0.0276	<0.1	0.12	0.0253	0.046	0.14	0.14
13	0.0490	0.0440	0.0350	NT	0.0760	0.0785	0.0276	NT	0.1196	0.0387	NT	0.1407	0.0934
14	0.0541	0.0510	0.0313	NT	0.0697	0.0726	0.0336	NT	NT	NT	NT	NT	NT
15	0.0317	NR	0.0177	0.2118	0.1157	0.0641	0.0287	NT	NT	NR	NT	NT	NT
16	0.0667	0.0416	0.0175	NR	0.0865	0.0735	0.0284	NR	NR	0.0297	NR	0.0672	0.1218
17	0.0364	0.0226	0.0051	NT	0.0610	0.0540	0.0240	NT	NT	0.0245	NT	0.1117	0.0676
18	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
19	0.039	0.041	0.022	NT	0.05	0.062	0.026	NR	NR	NR	NR	NR	NR
21	0.0464	0.0420	0.0168	0.0206	0.0634	0.0571	0.0254	0.00764	NT	0.0256	NT	NT	NT
23	0.0524	0.0646	0.028	NT	0.0778	0.045	0.028	<0.025	0.18	0.03	0.04	0.15	0.12
24	0.0418	<0.06	<0.02	<0.16	0.0622	0.0592	0.0238	<0.16	NT	0.0224	NT	0.1104	<0.16
25	0.039	0.044	< 0.05	NT	0.071	0.059	0.025	NT	0.144	0.023	0.044	0.124	0.112
27	0.0568	0.0540	0.02190	NT	0.07740	0.0830	0.0342	NT	NT	NT	NT	NT	NT
28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
29	0.064	NR	NR	NT	0.075	NR	0.029	NT	0.15	0.028	NT	0.14	NR
30	0.064627106	0.07101046	0.037522184	NT	0.067438193	0.066927535	0.026866323	0.020784371	0.121763948	0.024299538	NT	0.132245896	0.064890692
31	0.046	0.047	0.047	NT	0.071	0.059	0.027	0.051	0.16	0.02	0.05	0.11	0.09
32	0.041	0.035	0.027	NT	0.056	0.050	0.029	<0.1	0.12	0.023	0.04	0.11	0.076
33	0.0425	0.0275	0.00875	NT	0.0785	0.0695	0.0295	NT	NT	NT	NT	NT	NT
35	0.055	0.0461	0.0486	NT	0.0779	0.07	0.027	0.051	0.167	0.022	0.039	0.137	0.127
36	0.048	0.042	0.017	NT	0.084	0.064	0.036	NT	NT	NT	NT	NT	NT
37	0.0540	0.0510	0.0524	0.0813	0.0785	0.0707	0.0334	NT	NT	0.0332	NT	0.153	0.151
38	0.049	0.047	0.044	NT	0.067	0.064	0.028	NT	0.127	0.024	0.04	0.127	0.128

Table 70 Summary of Participants' Results for Sample S3 (all values are in µg/L)*

Lab	PFHxS	PFHxS_L	PFOS	PFOS_L	PFOA	PFNA
RA	0.00362	0.00364	0.00168	0.00135	0.00210	0.00114
SV	0.00377	0.00377	0.00139	0.00110	0.00201	0.00100
1	NT	0.00344	<0.004	<0.002	<0.002	<0.001
2	0.0035	0.0035	0.005	0.004	0.0037	<0.001
3	0.0038	0.0038	0.0015	0.0012	0.0020	0.0010
4	NT	NT	NT	NT	NT	NT
5	0.00325	NT	0.00110	NT	0.00020	0.00056
6	0.0036	NT	0.0016	0.0012	0.002	0.00105
7	0.0022	NR	0.0012	NR	0.0013	NR
8	0.0038	0.0038	0.0015	0.0011	0.0018	<0.001
9	<0.01	NT	<0.01	NT	<0.01	<0.02
10	0.002377	0.002377	<0.0005	<0.0005	0.001596	<0.001
11	0.005	0.005	0.0018	0.0015	0.0019	0.0013
12	<0.00005	0.003	0.0016	0.0012	0.0021	0.001
13	0.0033	0.0033	0.0028	0.0022	0.0018	0.0012
14	0.0041	0.0041	0.0015	0.0015	0.0021	0.0013
15	0.0036	NT	0.0016	NT	NR	0.0009
16	0.004	NR	<0.005	NR	0.0022	0.0009
17	0.00370180	0.00368900	0.00122510	0.00107900	0.0023183	0.0010565
18	NR	NR	NR	NR	NR	NR
19	0.003	NT	0.0016	NT	0.0022	0.0009
21	NT	0.00352	0.00231	0.00144	0.00225	0.00114
23	0.0044	NT	0.0018	NT	0.002	0.0011
24	NS	NS	NS	NS	NS	NS
25	0.0035	0.0034	0.0017	0.0012	0.0023	0.0013
27	0.0046	0.0046	0.00160	0.0016	0.00220	0.0013
28	NS	NS	NS	NS	NS	NS
29	0.003123	0.003123	0.001516	0.001516	0.002066	0.0013385
30	0.00344242914171657	0.00342345708582834	0.00169931936127744	0.00126779241516966	0.00224079840319361	0.000976095808383234
31	0.0032	NT	0.0017	0.0013	0.0021	0.0011
32	0.0036	NT	0.0017	NT	0.0024	0.0013
33	NS	NS	NS	NS	NS	NS
35	0.0034	NT	0.002	<0.002	0.002	0.0011
36	0.0036	NT	0.0017	NT	0.0023	<0.001
37	0.00409	0.00409	0.00182	0.00135	0.00231	0.00148
38	0.004	0.004	0.002	0.001	0.002	0.002

* RA = Robust Average Value, SV = Spiked Value, NS = Not Sent, NT = Not Tested, NR = Not Reported.



Of the scored samples, Laboratories **17** and **18** received only Sample S2 and S1 respectively. The total number of results for which z-scores were calculated for these participants was 23.

Figure 67 Summary of Participants' Performance in Water

6.6 Summary of Participants' Results and Performances

Summaries of participants' results and performance for scored analytes in this study are presented in Tables 68 to 70 and Figure 67.

Laboratories **12** and **38** reported numeric results for all 46 scored analytes. Both participants returned acceptable z-scores for all of these.

All results reported by Laboratories **25** (44), **37** (42), **32** (41), **14** (36), **27** (36), **29** (36), **21** (35), **3** (34), **19** (32), **24** (26), **4** (18) and **18** (3) returned acceptable (z-scores).

Laboratory **25** returned the highest number of acceptable E_n-scores (44 out of 44 reported).

All results reported by Laboratories **14** (36), **27** (36) and **18** (3) returned acceptable E_n-scores.

Laboratory **9** also returned acceptable E_n-scores for all analytes they reported numeric results for (7), however all their relative uncertainties were unreralistcally large (75% to 100% relative to the reported value).

Results reported by Laboratory **5** for PFOA in all three samples were lower than the robust average by the same factor of approximately 0.1. This participant should check their calculation and/or sample preparation procedures. Using a matrix matched reference materials which is taken through every single step of the analytical process with the routine sample will also help to check the calculation/reporting procedure.

Eleven participants reported at least one PFAS analyte that was not spiked into the test samples by the study coordinator. These results are presented in Appendix 4.

Twenty participants did not report numeric results for analytes that they tested for and were present in the test samples. These results are presented in Appendix 5.

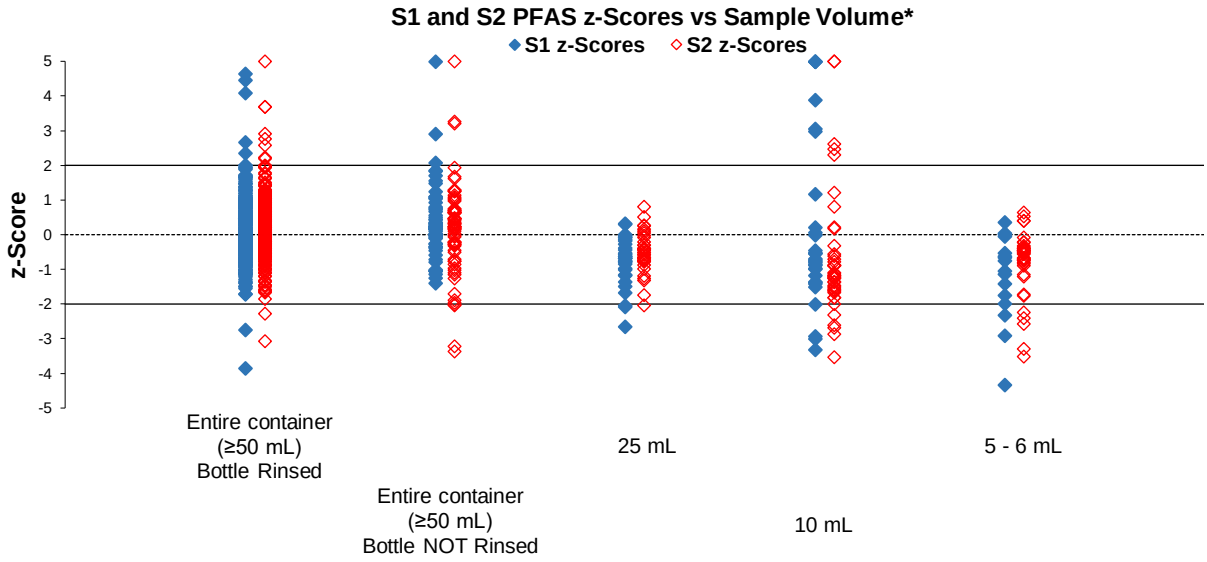
6.7 Participants' Results and Analytical Methods for PFAS in Water Samples S1 and S2

The method descriptions provided by participants for PFAS measurements are presented in Appendix 7.

Extraction

Sample S1 was potable water fortified for 27 individual PFAS compounds, whereas sample S2 was river water fortified for 28 individual PFAS compounds. Analytes' concentration in the two water samples was between 0.00347 µg/L and 0.138 µg/L. Of 31 participants who reported results for both water samples, 29 reported using the same sample size for both samples.

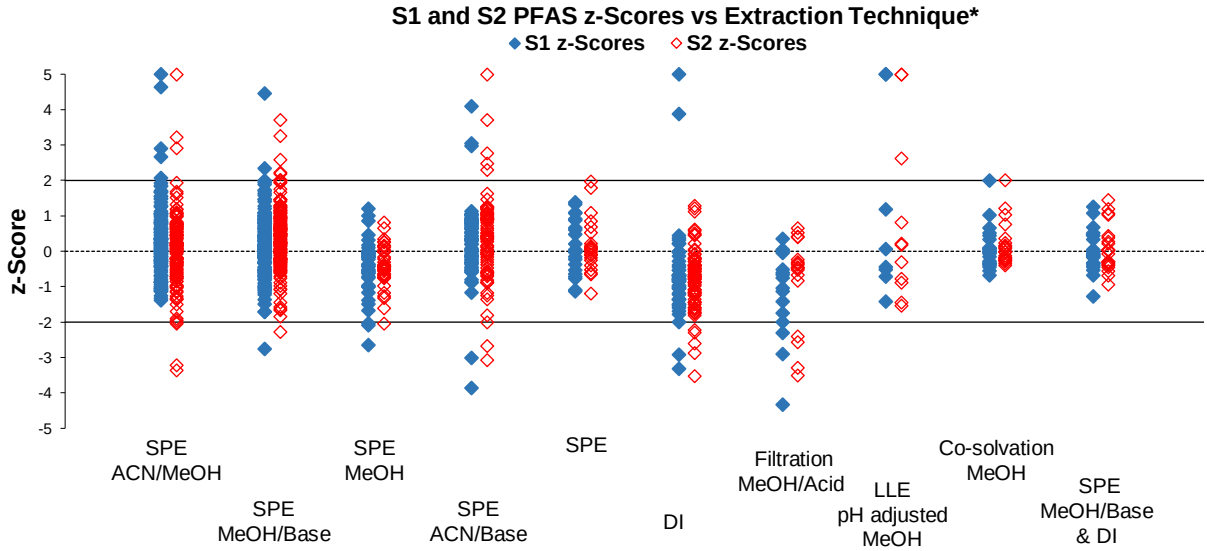
In order to account for analyte absorption into the wall of the container, participants were instructed to use the entire content of the bottle for analysis. Two bottles of potable or/and river water of approximately 50 mL each were sent to participating laboratories. Of 33 laboratories who reported numerical results, 25 reported using the entire container or 50 mL or 100 mL of the provided water sample, 3 laboratories used 10 mL from each sample, 1 used 25 mL and 5 used only 5 or 6 mL. Laboratory 1 reported using the entire container but they also reported using 25 mL per method. Laboratory 18 reported using the entire container but also reported using a sample size of 25 mL and 50 mL. These laboratories might have exhausted the entire container but did not use the entire sample for analysis. Plots of participants' performance versus amount of sample used for analysis are presented in Figure 68. Most of the results reported by laboratories who did not use the entire sample for analysis were biased low.



*The results reported by Laboratory 15 for S1 PFOS, Laboratory 5 for S1 and S2 PFOA and Laboratory 31 for S2 PFBA, were excluded. Scores greater than 5 have been plotted as 5.

Figure 68 S1 and S2 Performance vs Sample Volume

Most laboratories chose to enrich the test samples using SPE (Figure 69).



*The results reported by Laboratory 15 for S1 PFOS, Laboratory 5 for S1 and S2 PFOA and Laboratory 31 for S2 PFBA, were excluded. Scores greater than 5 have been plotted as 5.

Figure 69 S1 and S2 Performance vs Extraction Technique

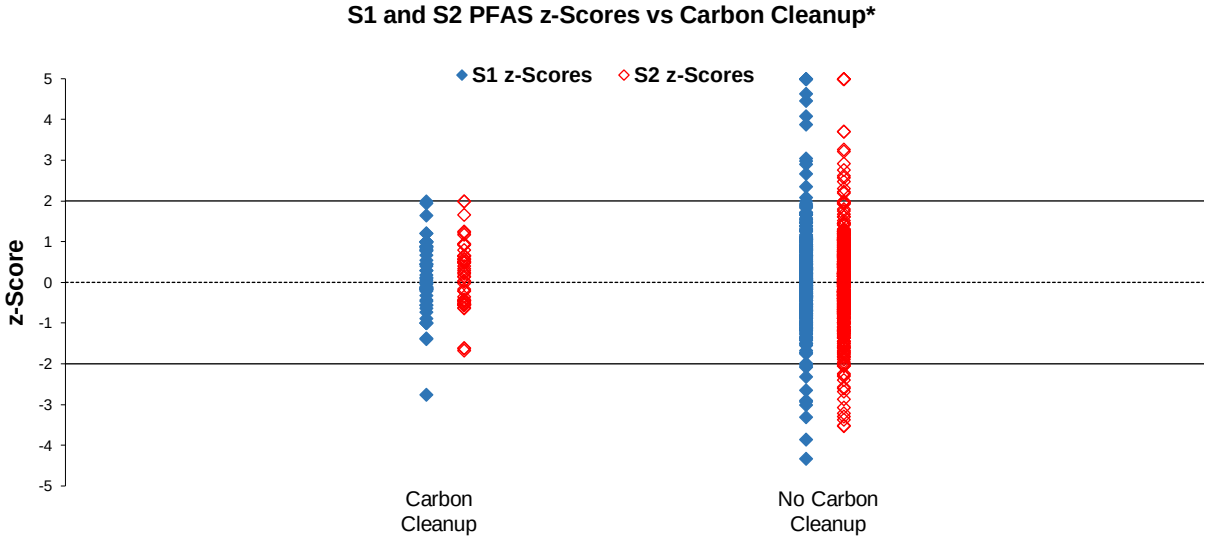
Most of the PFAS results from SPE extraction with only methanol were biased low. Use of methanol alone may suppress extraction.

Most of the results reported by participants who used direct injections were also lower than the assigned values (biased low).

Laboratory 38 reported using the ASTM Method D8421 modified which involves co-solving the analytes using a sample/methanol ratio of 1 to 1; they also reported taking the entire sample for analysis. Laboratory 38 might have used more than one method for the determination of PFAS compounds. The level of analytes in our study was between 0.00347 µg/L and 0.138 µg/L and the ASTM Method is recommended to be used for PFAS analytes at a concentration range of 10000 µg/L to 400000 µg/L.[9]

Laboratories 2, 4, 17 and 24 reported using direct injection without sample enrichment, however Laboratory 4 also reported taking the entire sample for analysis. Most of the results reported by Laboratory 2,4 and 17 for the long chain carboxylic acids were lower than the spike value. Laboratories 24 did not report numerical results for these tests.

Laboratory 10 reported taking 5 mL for analysis of sample, filtering it and then extracting with AcOH/MeOH at 20ºC. This may explain the questionable and unacceptable results they reported for PFUdA and PFDoA in S2 as these long chain carboxylic acids stick to the walls of the bottle or filter used. [10-16]



*The results reported by Laboratory 15 for S1 PFOS, Laboratory 5 for S1 and S2 PFOA and Laboratory 31 for S2 PFBA, were excluded. Scores greater than 5 have been plotted as 5.

Figure 70 S1 and S2 Performance vs Carbon Cleanup

Of 33 laboratories who reported numerical results in at least one of the two water samples, only 3 conducted a carbon cleanup (Figure 70). USEPA Method 1633 employs both SPE and carbon cleanup to remove interferences in water samples, but notes that the use of carbon cleanup may remove analytes if there is low organic carbon content.[10] All results reported by these three labs returned acceptable z-scores with the exception of one.

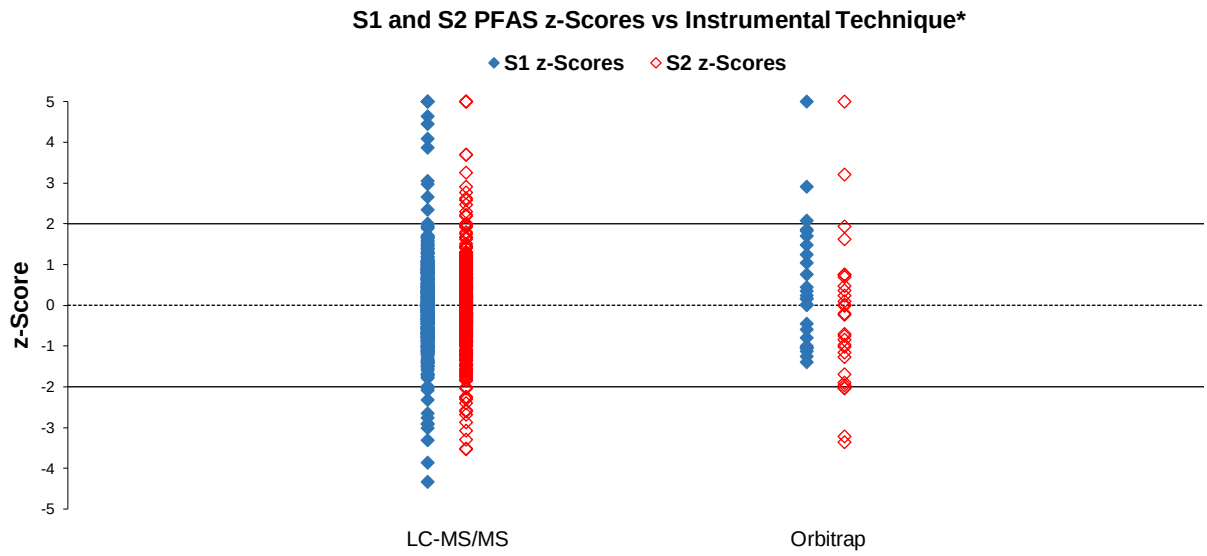
Twenty-nine laboratories reported adding labelled standards before extractions. However of these 29 laboratories, 10 did not add the standards directly into the sample container to adjust for errors that might be introduced during sample preparation before extraction. The results reported by most of these laboratories were either biased low or high (Figure 63).

Laboratory 23 reported: ”*The low Is* [internal standard] *recoveries that fall below 50% recovery were deemed acceptable as the results were less than the limit of reporting. It is suspected that there is supression for these compounds, where the ratio between internal standard and target compound is still accurate. This is also within the QWI criteria.”*

The most popular sample preparation method used for water samples S1 and S2 was an SPE extraction procedure which involved taking for analysis the entire sample, methanol or methanol base as elution solvent, and no carbon cleanup step.

Instrumental Technique

With the exception of 2 participants, all laboratories reported using LC-MS/MS(QQQ) for PFAS measurements. Laboratories 5 and 15 used Orbitrap (Figure 71).



*The results reported by Laboratory 15 for S1 PFOS, Laboratory 5 for S1 and S2 PFOA and Laboratory 31 for S2 PFBA, were excluded. Scores greater than 5 have been plotted as 5.

Figure 71 S1 and S2 Performance vs Instrumental Technique

6.7.1 Individual PFCAs Analytes in Water

The between-laboratory coefficient of variation for scored PFCAs in S1 and S2 was between 8.9% and 30% .

PFBA was spiked in potable water Sample S1 at 0.0730 µg/L and in the river water Sample S2 at 0.133 µg/L. Plots of participants performance for PFBA in S1 and S2 versus laboratory code number are presented in Figure 72.

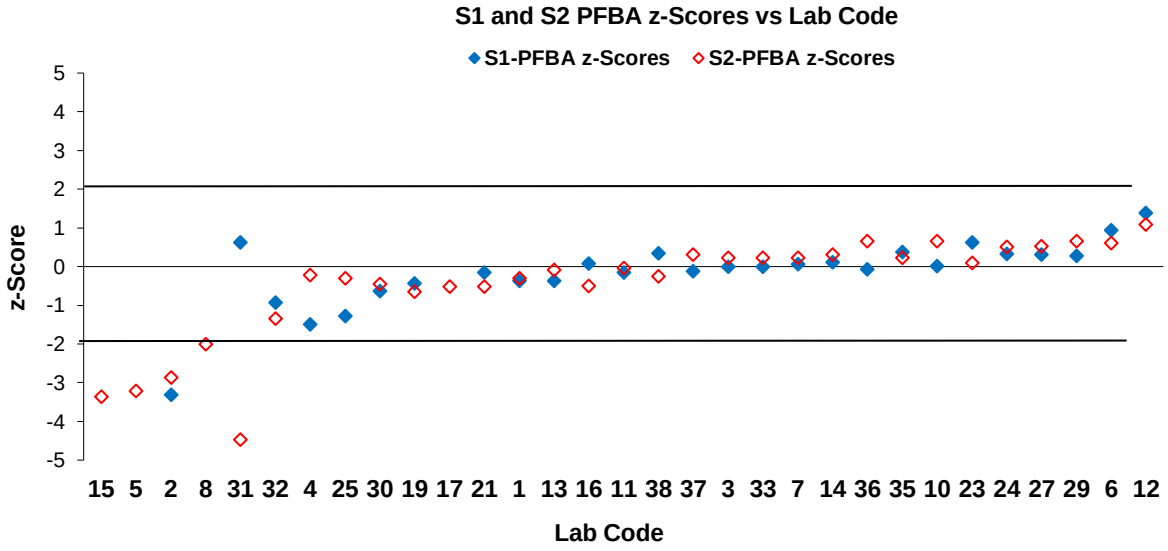


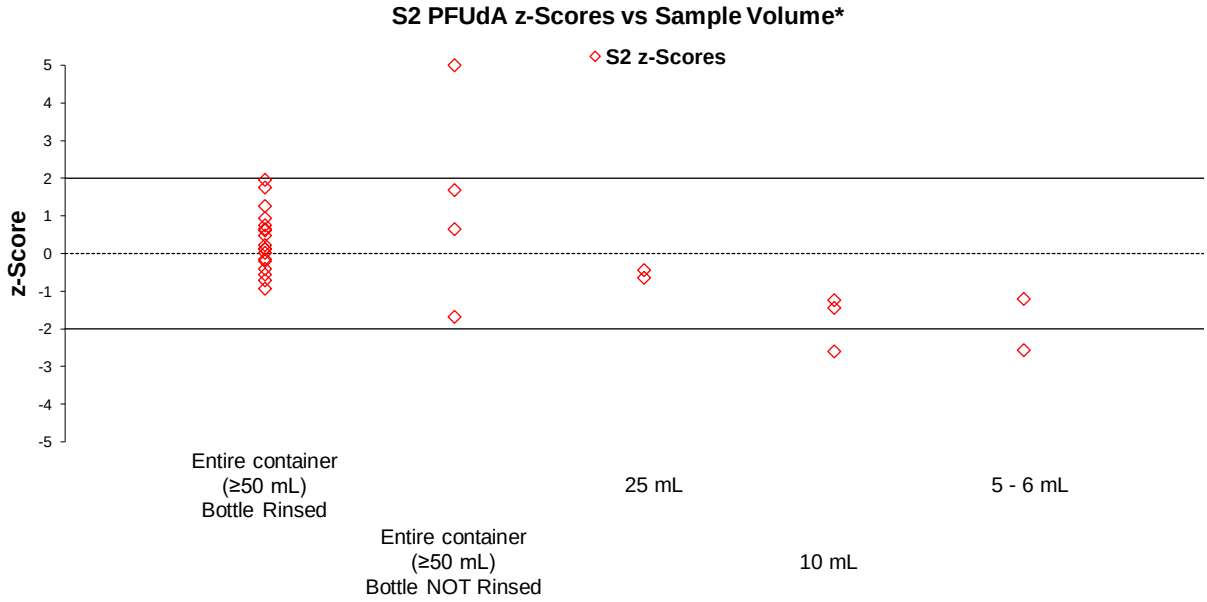
Figure 72 S1 and S2 PFBA z-Scores vs Laboratory

Laboratories 5 and 15 reported using ACN/MeOH as extraction reagents. When ACN is used in LC-MS/MS the chromatographic performance for the short chain carboxylic acids may be reduced, and a decrease in sensitivity for these analytes' responses is sometimes noted.[11]

PFUdA, PFDoA, PFTrDA and PFTeDA were identified from literature as well as previous experience as being analytes which are at risk of being absorbed into the wall of the container during sample preparation and/or during analysis.[10-16] All analytes including these long chain

PFCAs were spiked directly into each bottle with the aim of minimising loss during preparation. The assigned values for these analytes were between 66% and 96% of the spiked value. No assigned value was set for PFTeDA in S2 because the results were too variable. Only 56% of the spiked value was recovered for PFTeDA in S2. However, the results were variable and the robust average might not be a clear indication of the analyte level in the sample. No relationship was evident between the reported results and the date when the sample was received or analysed.

Plots of participants' z-scores versus sample volume are presented in Figures 73 to 76. Most of the low z-scores were from laboratories who did not use the entire sample.



* z-Score greater than 5.0 was plotted at 5.0.

Figure 73 S2 PFUdA z-Scores vs Sample Volume

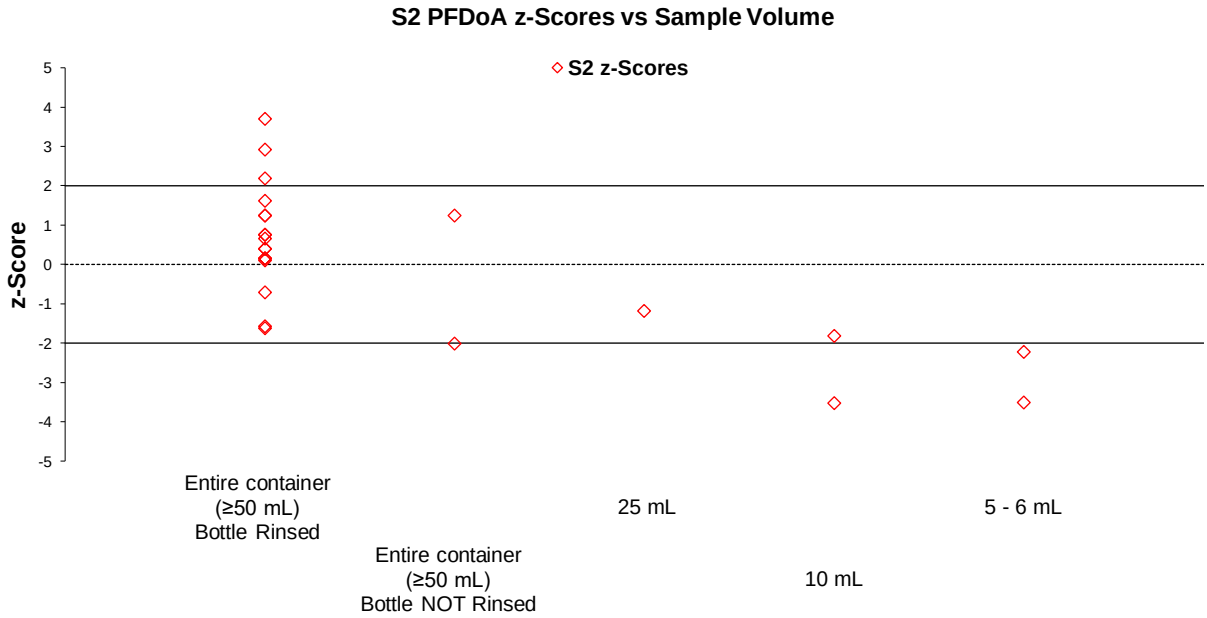


Figure 74 S2 PFDoA z-Scores vs Sample Volume

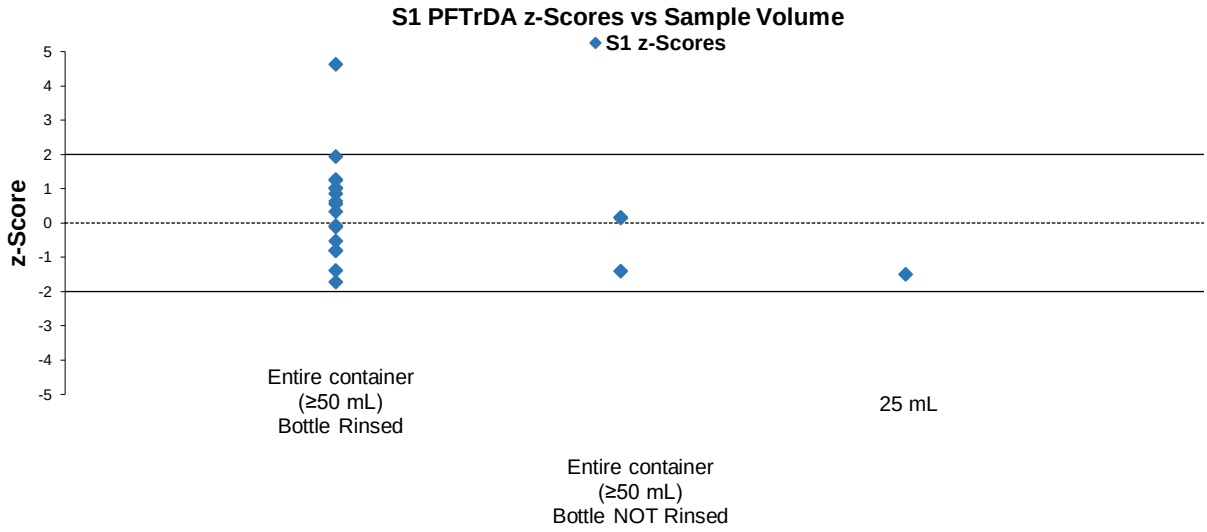


Figure 75 S1 PFTrDA z-Scores vs Sample Volume

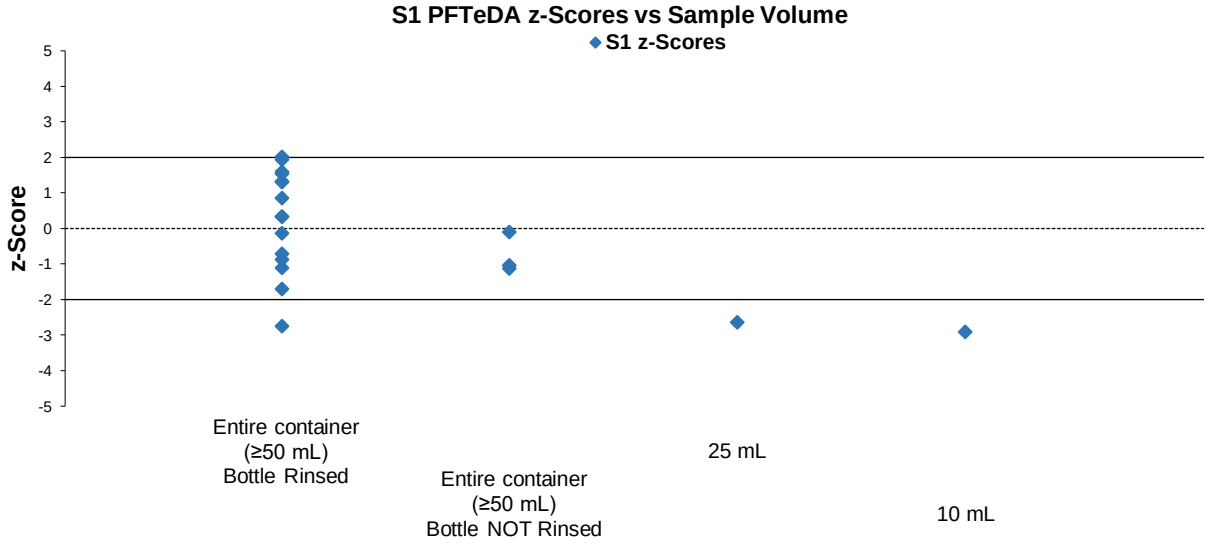
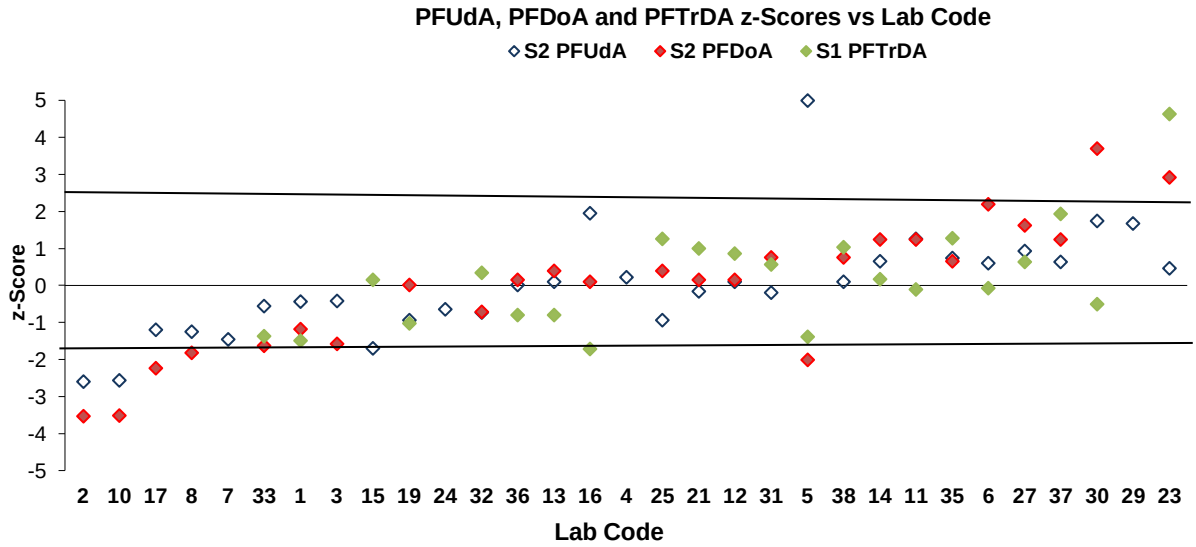


Figure 76 S1 PFTeDA z-Scores vs Sample Volume



* z-Scores greater than 5.0 were plotted at 5.0.

Figure 77 S2 PFUdA, S2 PFDoA, S1-PFTrDA z-Scores vs Laboratory Code Number

Plots of participants' z-scores for PFUdA, PFDoA and PFTrDA versus laboratory code number are presented in Figure 77. Participants with multiple z-scores larger than 2.0 or smaller than -2.0 should review their method of analysis for long chain carboxylic acids.

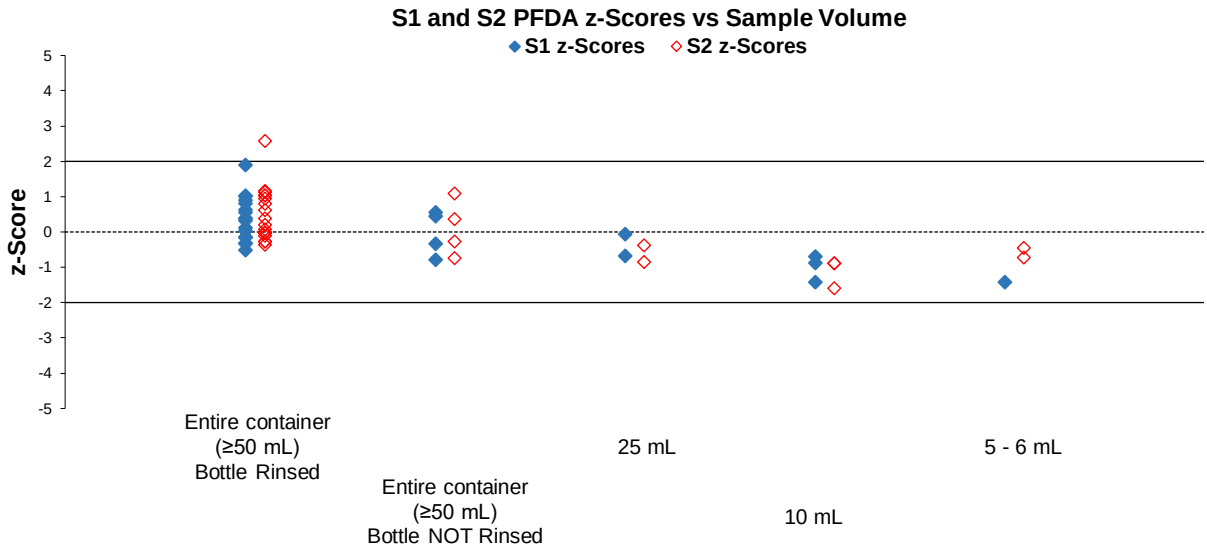
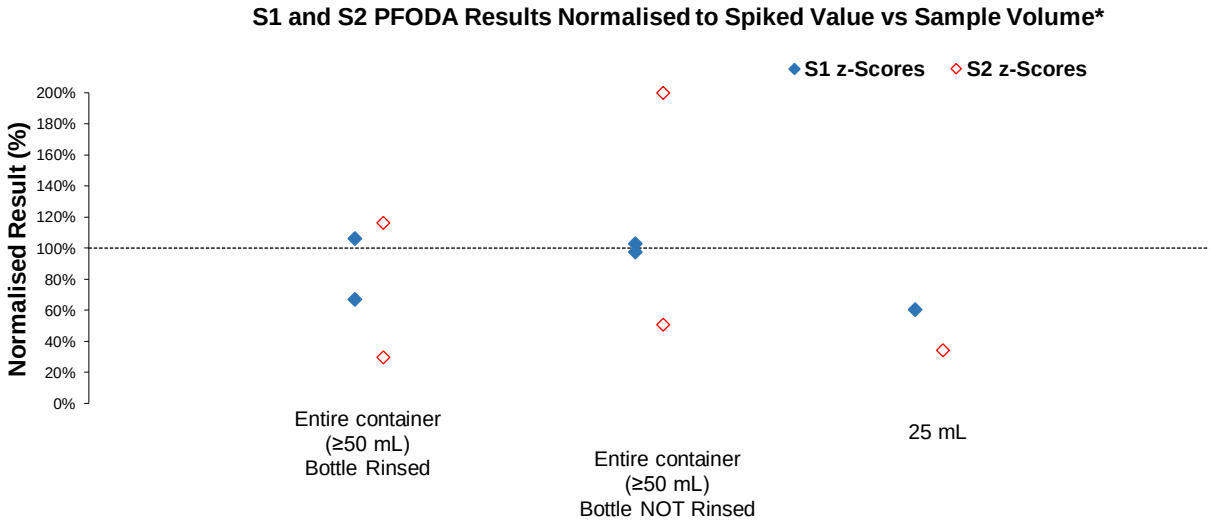


Figure 78 S1 and S2 PFDA z-scores vs Amount of Sample Taken for Analysis

PFDA As in the previous studies plots of participants' z-scores versus the amount of sample taken for analyses indicate that this analyte might also stick to the bottle walls (Figure 78).[16]



*The normalised result greater than 200% has been plotted as 200%

Figure 79 S1 and S2 PFODA Results Normalised to Spiked Value vs Amount of Sample Taken for Analysis

PFODA This is the first time that PFODA has been tested in a water sample in a our PFAS PT program, with 5 laboratories reporting results for it. The spiking level in the two water samples S1 and S2 were similar at 0.0700 µg/L and 0.0699 µg/L respectively. While the 5 results reported for the potable water sample were in excellent agreement with each other and with the spike value, no agreement was found between PFODA results reported in the river water sample.

One laboratory reported using as a labelled standard before extraction 13C2-PFHxDA, and one reported using 13C2-PFHxDA before extraction and 13C2-PFOA before instrumental analysis.

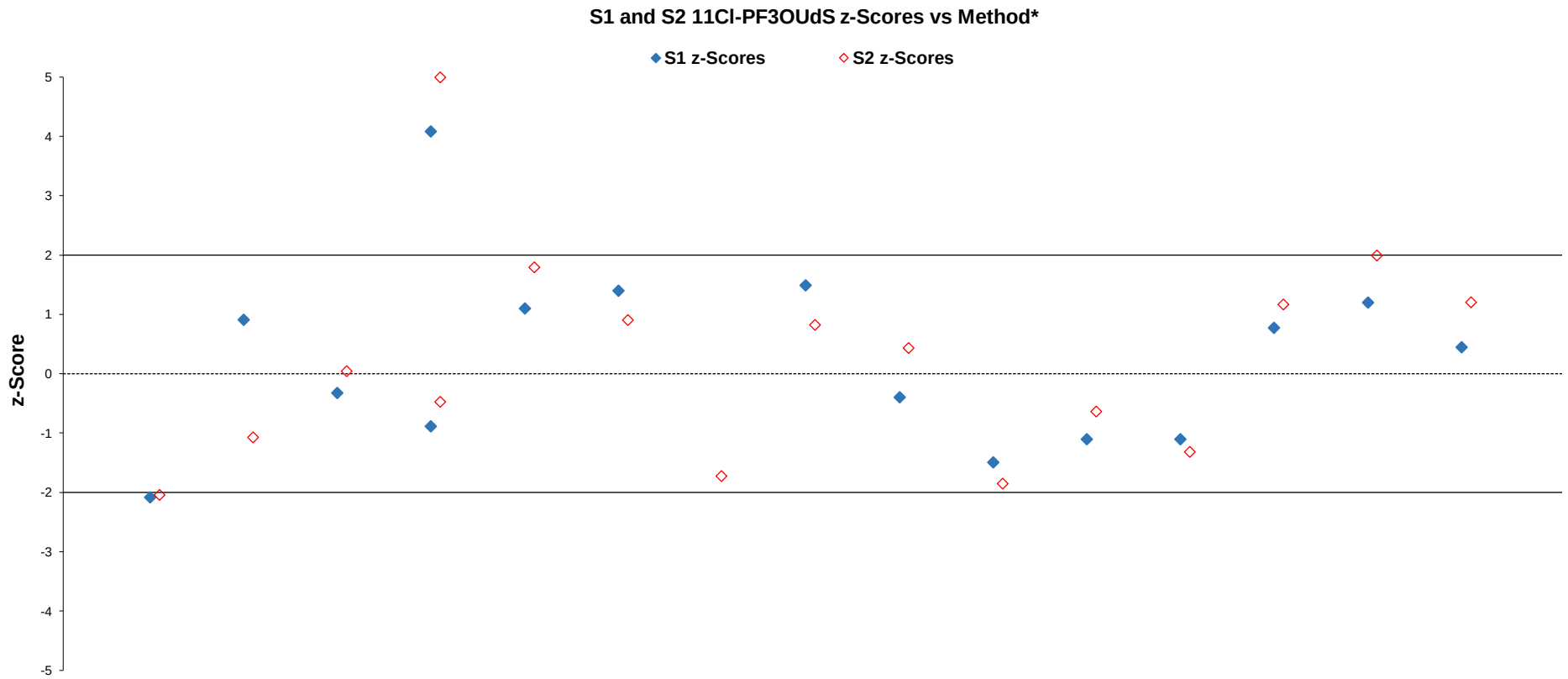
Plots of participants' results in the two water samples normalised to the spike value versus sample volume are presented in Figure 79.

6.7.2 Individual PFECA and PFESA Analytes in Water

GenX and ADONA 100% of the spike value was recovered for GenX and 88% for ADONA. Two thirds of the participating laboratories reported results for these tests and all but two performed satisfactorily. Most participants reported adding a labelled internal standard before extraction. The majority used 13C3 HFPO-DA for GenX and 13C4-PFHpA for ADONA. Only 3 laboratories reported adding an internal standard both before extraction and before instrumental analyses for GenX, and 5 reporting doing so for ADONA.

9Cl-PF3ONS and 11Cl-PF3OUdS Participants significantly improved their capabilities in measuring 9Cl-PF3ONS and 11Cl-PF3OUdS in water. Compared to previous studies a larger number of laboratories reported results for these tests. However measurements of 11Cl-PF3OUdS in the two water samples still challenged participants' analytical techniques, with large between laboratory CVs of 27% and 32% in S1 and S2 respectively**.** Plots of participants' z-scores versus method used are presented in Figure 80.

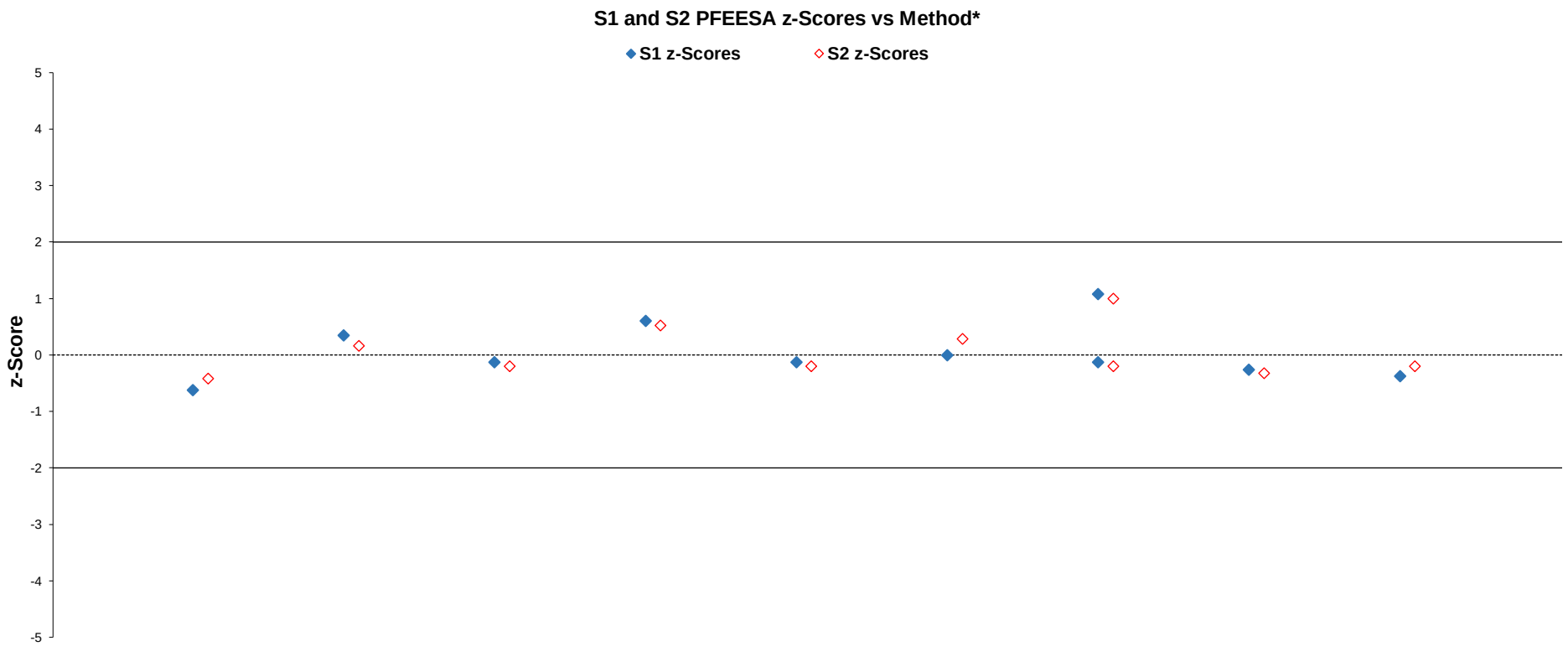
PFEESA This is the first time PFEESA was tested in a water sample in our PFAS PT program. 92% of the spike value was recovered for this analyte in S1 and 84% in the river water sample S2. Ten results were reported for PFEESA in each sample, and all were in good agreement with each other. Figure 81 presents plots of participants' results reported for PFEESA in S1 and S2 versus method used.



Sample Amount Used	25 mL	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	6 mL	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed
Extraction Technique	SPE	SPE	SPE	SPE	SPE	SPE	DI	SPE	SPE & DI	SPE	SPE	SPE	SPE	SPE	Co-solvation
Extraction Solvent	MeOH	MeOH/ Base	MeOH/ Base	ACN/ Base	NR	MeOH/ Base		ACN/ MeOH	MeOH/ Base	MeOH/ Base	ACN/ MeOH	ACN/ MeOH	ACN/ MeOH	MeOH/ Base	MeOH
Labelled std BE		M3-HFPO-DA	13C8-PFOS				Yes		13C4-PFOS	13C4-PFOS	PFDoA	13C5-PFNA	Yes	13C4 PFOS	M3HFPO-DA
Labelled std BA		MPFDA								13C8-PFOS				13C2 PFOA	M2 PFHxA

* z-Scores greater than 5.0 were plotted at 5.0. EC = entire container, BE = before extraction, BA = before analysis.

Figure 80 S1 and S2 11Cl-PF3OUdS z-scores vs Method Used



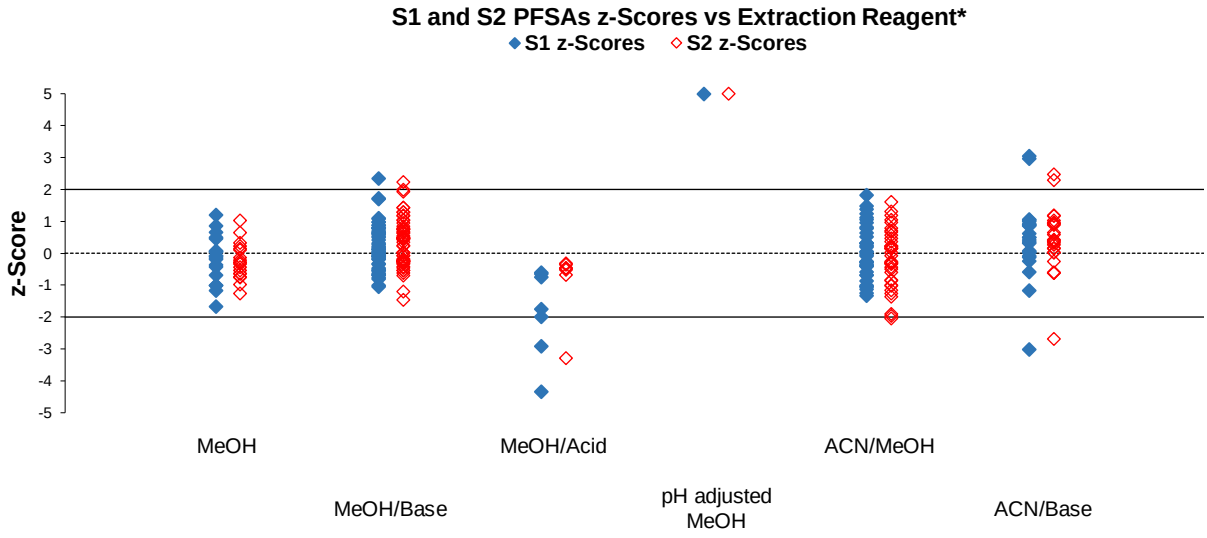
Sample Amount Used	25 mL	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed
Extraction Technique	SPE	SPE	SPE	SPE	SPE	SPE & DI	SPE	SPE	Co-solvation
Extraction Solvent	MeOH	MeOH/Base	MeOH/Base	NR	ACN/MeOH	MeOH/Base	ACN/MeOH	ACN/MeOH	MeOH
Labelled std BE		M5PFHxA	13C3-PFBS			13C3-PFPeA	13C3-PFBS	Yes	M5PFHxA
Labelled std BA		M2PFOA							M2PFHxA

* EC = entire container, BE = before extraction, BA = before analysis.

Figure 81 S1 and S2 PFEESA z-scores vs Method Used

6.7.3 Individual PFSA Analyte in Water

The between-laboratory coefficient of variation for scored PFSAs in S1 and S2 was between 13% and 27%. Plots of participants' performance versus extraction reagent used for PFSAs measurements in S1 and S2 are presented in Figure 82.



*The result reported by Laboratory 15 for S1 PFOS was excluded. Scores greater than 5 were plotted as 5.

Figure 82 S1 and S2 PFSA z-Scores vs Extraction Reagent

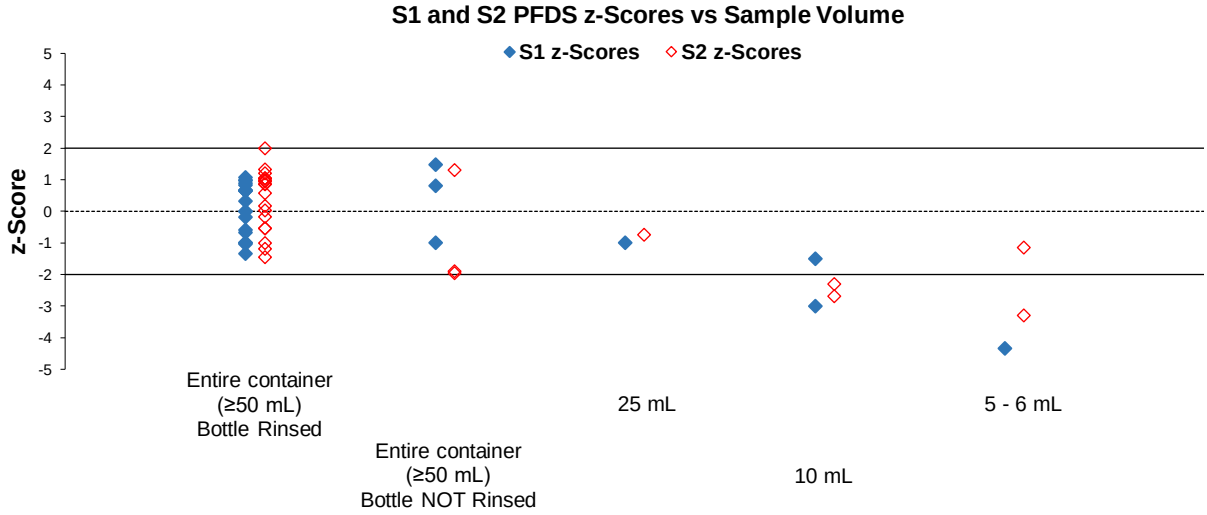


Figure 83 S1 and S2 PFDS z-Scores vs Sample Volume

PFDS Measurements of PFDS in S2 challenged participants' analytical techniques. The PFDS level in S1 was 0.0300 µg/L and 0.0538 µg/L in the river water Sample S2. While the between laboratory CV for PFDS in S1 was 21%, lower than that predicted by Thompson and Harwitz (see Table 67), the between laboratory CV for PFDS in S2 was large, at 27%.

Plots of participants' z-scores for PFDS in S1 and S2 versus the amount of sample taken for analysis indicate that this analyte might also stick to the bottle walls (Figure 83).

PFUdS, PFDoS and PFTrDS were the PFSAs which presented the most analytical difficulty to participating laboratories.

Fifteen laboratories reported results for PFDoS, in S2. The between-laboratory CV was large, 63%. Figure 84 presents plots of participants' results versus the labelled standards used while Figure 85 presents plots of participants' normalised results to the spike value versus the

sample volume used. The large variation of participants' results hampered any attempts to identify a trend between the normalised results and the amount of sample used for analysis.

This is the first time that PFUdS and PFTrDS have been introduced in a water sample in our PT studies. Only 2 laboratories reported results for PFUdS in S1 and for PFTrDS in S1 and S2. There was no agreement between the two reported results and between the results and the spiked value for any of these analytes.

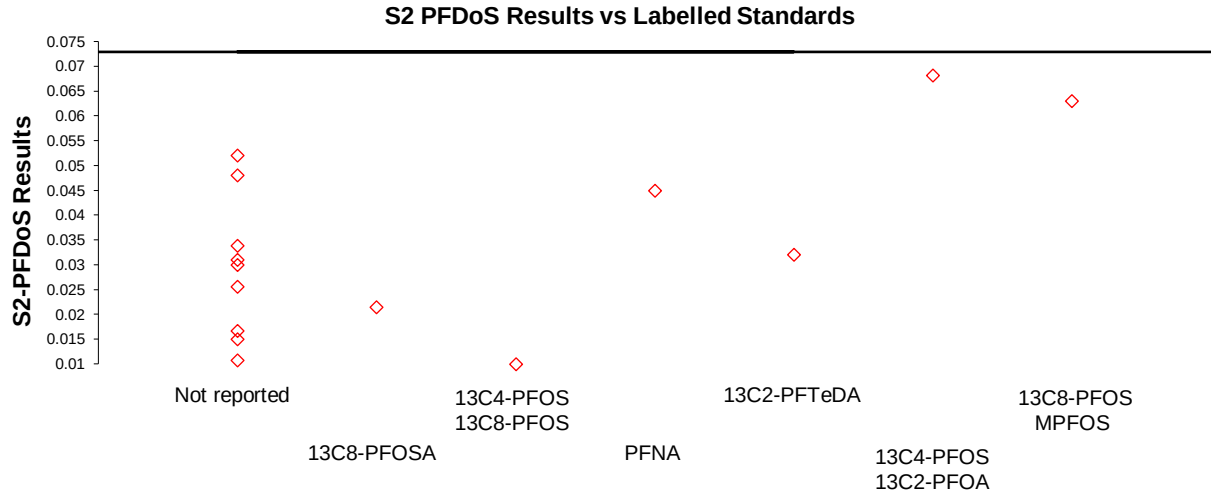


Figure 84 S2-PFDoS Results vs Labelled Standards

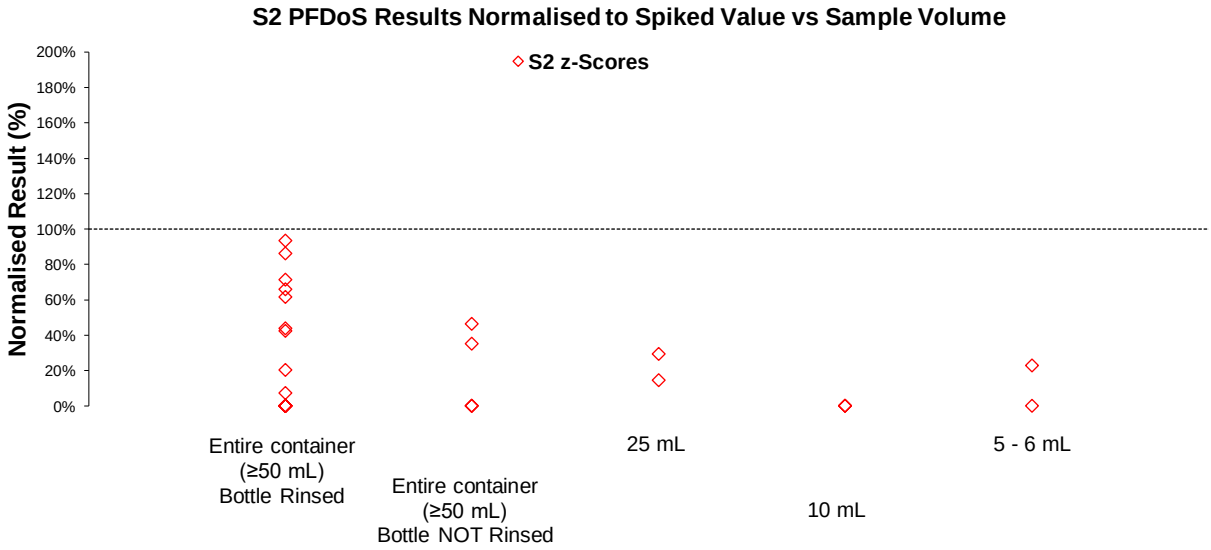
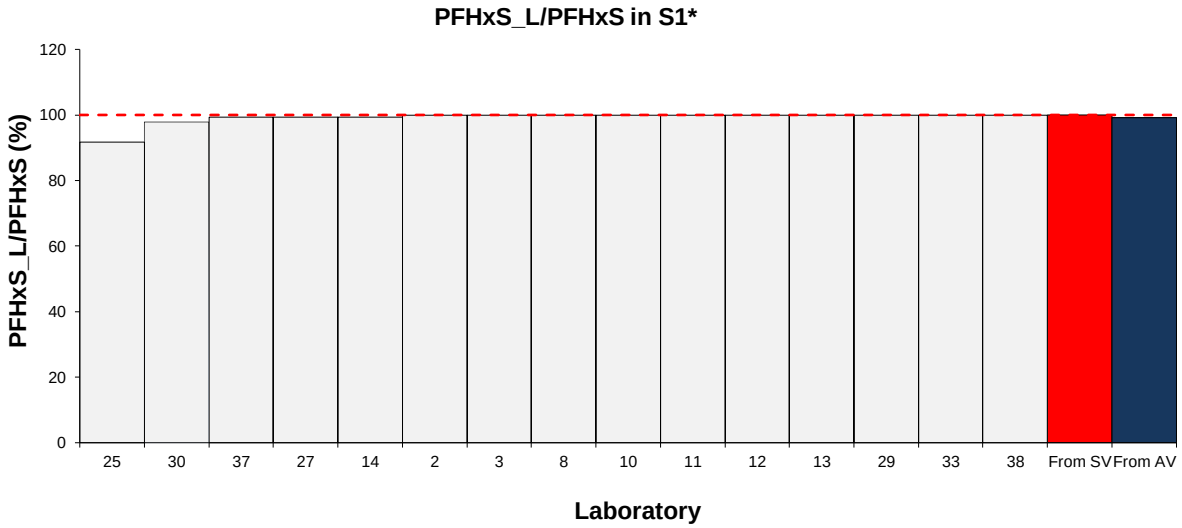


Figure 85 S2-PFDoS Normalised Results to Spiked Value vs Sample Volume

PFHxS and PFHxS_L and PFOS and PFOS_L For PFAS that contain linear and branched isomers, participants were asked to report total results (the sum of linear and branched) whereas for PFOS and PFHxS they were asked to report both total (the sum of linear and branched isomers) and linear (the linear isomers only) results.

The water Samples S1 and S2 were spiked with the linear PFHxS standard, and therefore the linear to total ratio for PFHxS in the two water samples was expected to be 100%. Fifteen participants reported results for both total and linear PFHxS in S1. The ratios of PFHxS linear versus PFHxS total in S1 were between 91% and 100% while the assigned value ratio

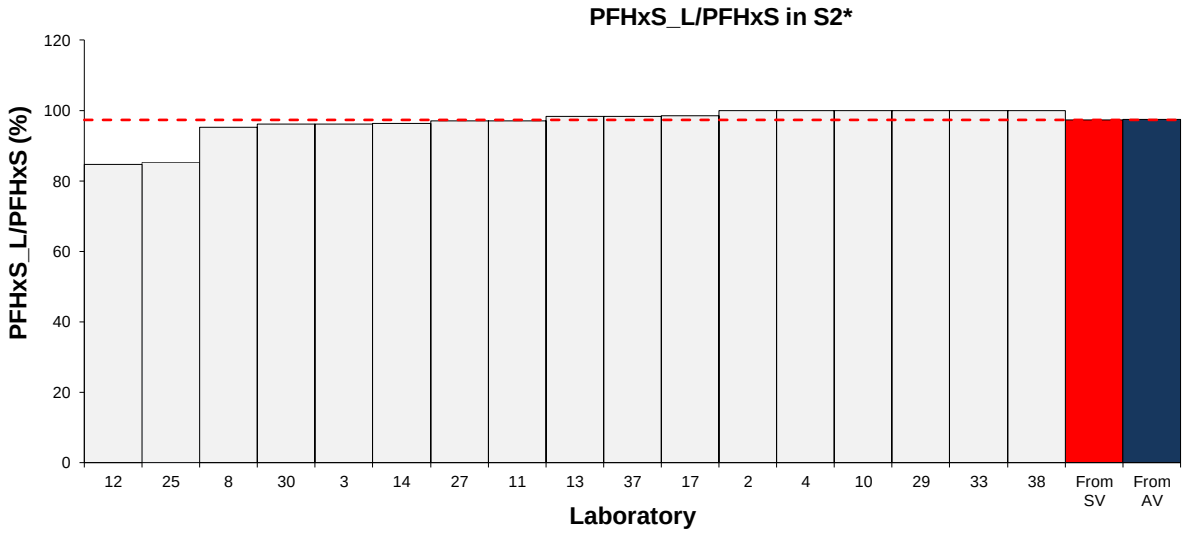
between the two isomers was 99% (Figure 86).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte.

Figure 86 Bar Charts of PFHxS_L/PFHxS in S1

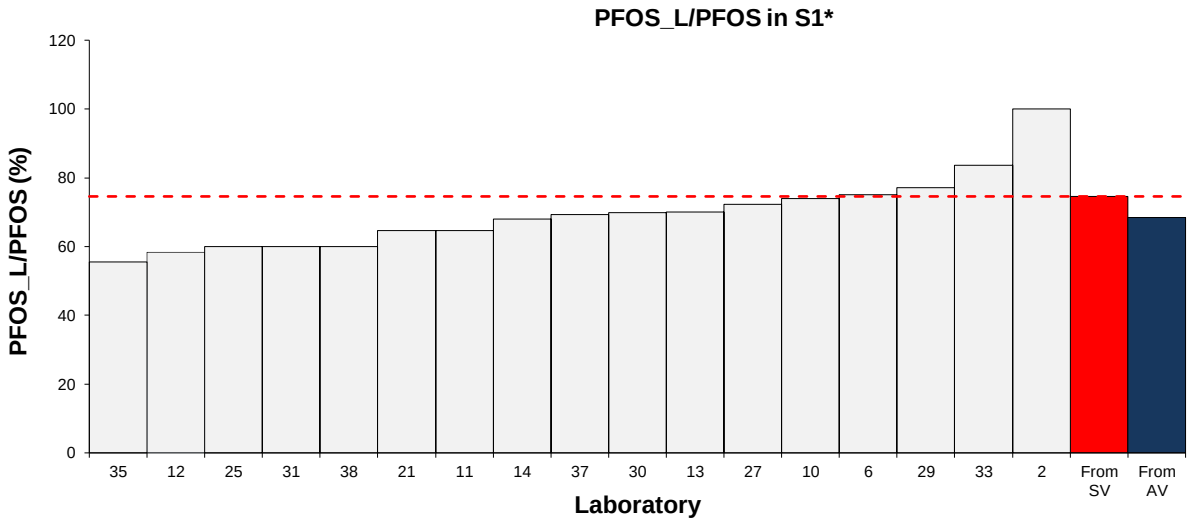
Of 30 laboratories who reported results for total PFHxS in the river water sample S2, 17 reported results for both PFHxS total and linear. The linear to total ratio of the results was between 85% and 100%. The assigned value ratio of the two isomers was 97% (Figure 87).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte.

Figure 87 Bar Charts of PFHxS_L/PFHxS in S2

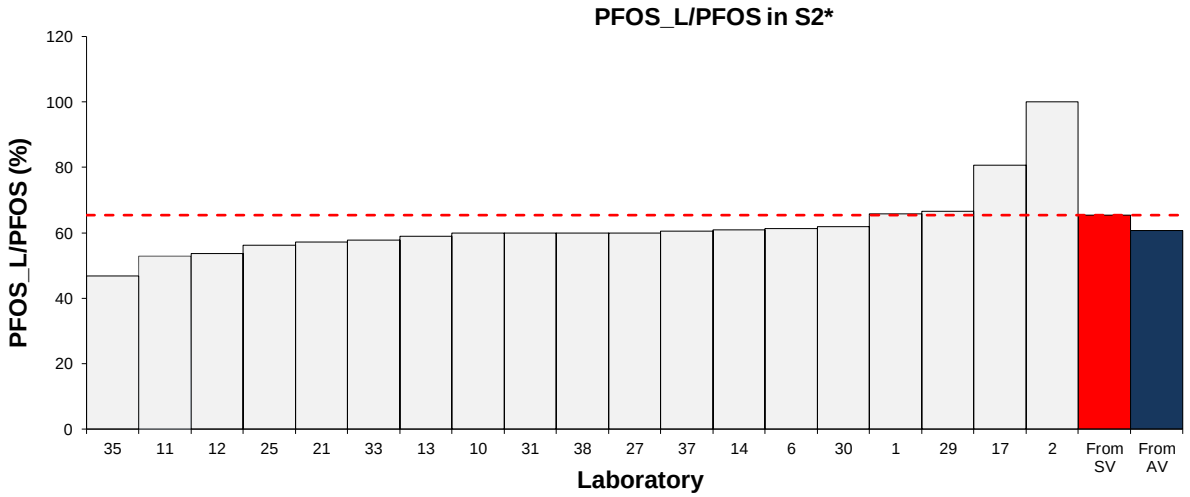
The water Samples S1 and S2 were spiked with a PFOS standard that contained both linear and branched isomers. 17 laboratories reported results for the two PFOS isomers in S1. The assigned values were 0.00507 µg/L for total PFOS and 0.00347 µg/L for linear PFOS, with the ratio of linear PFOS to total PFOS being 68%. The expected ratio of linear PFOS to total PFOS after spiking was 75%. Figure 88 presents bar charts of linear PFOS results versus total PFOS results in S1 as reported by participants. The linear to total ratio of the results was between 56% to 100% .



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 88 Bar Charts of PFOS_L/PFOS in S1

Thirty laboratories reported results for total PFOS in S2 and of these only 19 also reported results for the linear isomer. The linear to total ratio of the results was between 47% and 100% while the assigned value ratio between the two isomers was 61% (Figure 89).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 89 Bar Charts of PFOS_L/PFOS in S2

When a laboratory uses a combined branched/linear standard and integrated branched/linear together for totals, the result could be different to a linear only result due to response factor differences between the isomers.

6.7.4 Individual PFAA Precursors Analytes in Water

8:2diPAP spike values in the two study samples S1 and S2 were similar, at 0.0489 µg/L. Five participants reported results for 8:2 diPAP in S1 and all but one were in good agreement with each other and with the spike value. Four results were reported for 8:2diPAP in S2 of which only two were in agreement with the spiked value.
Plots of normalised results to spiked value versus lab code number are presented in Figure 90. Laboratories 21, 30 and 31 reported using 13C4-8:2 diPAP as labelled internal standard before extraction. Althought Laboratories 21 and 30 used the appropriate internal standards they still should check their method for bias.

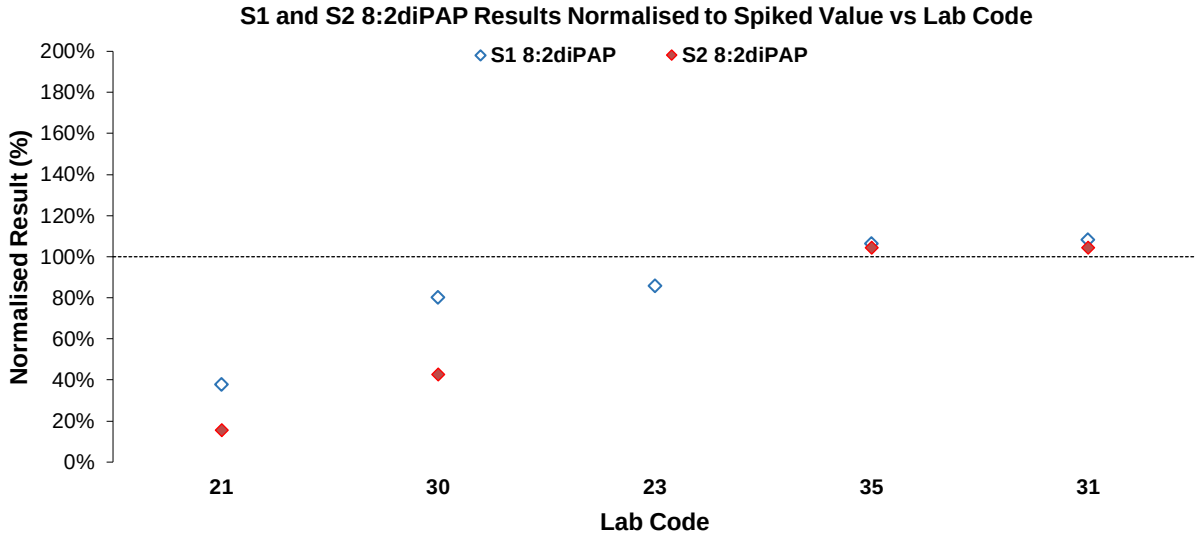
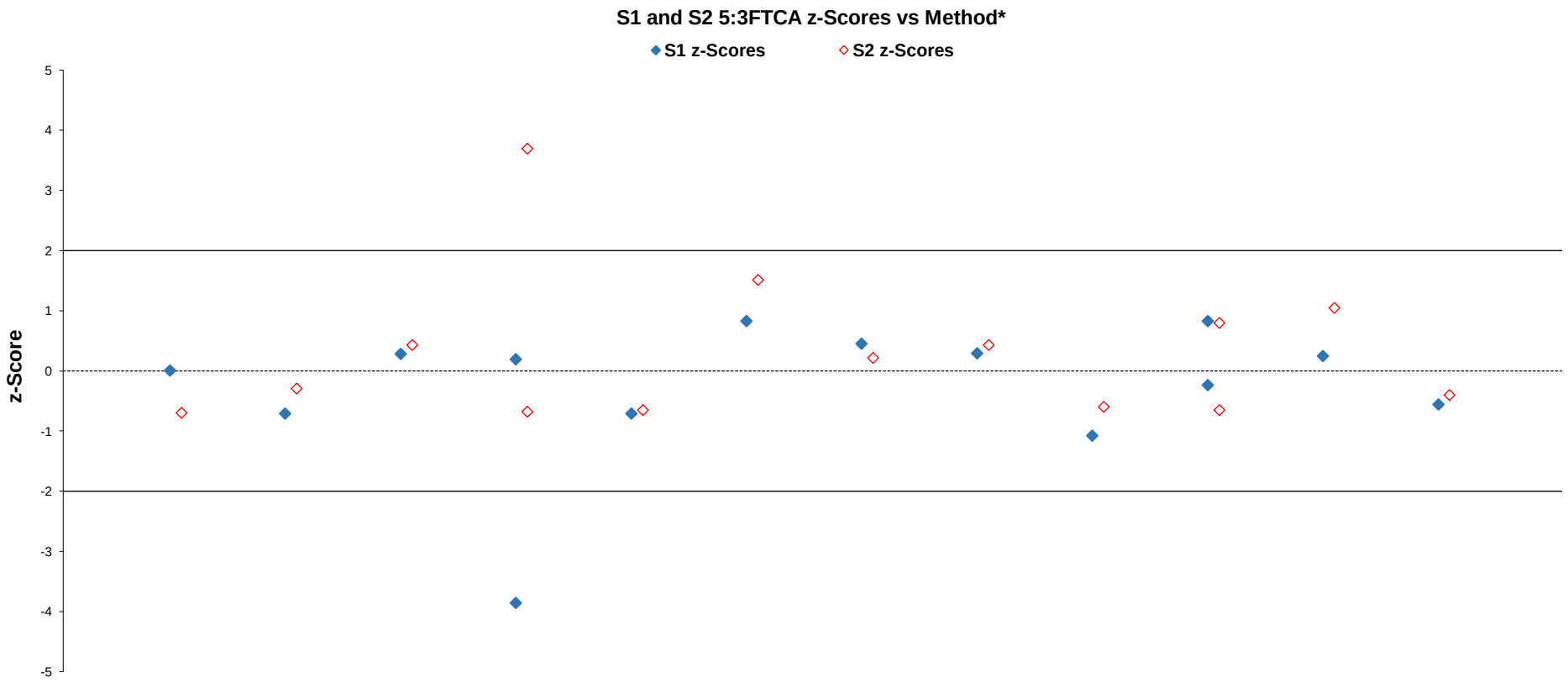


Figure 90 S1 and S2 8:2diPAP Results Normalised to Spike Value vs Laboratory Code

5:3FTCA was introduced for the first time in our PFAS program last year in the PT study AQA 23-14.[16] Seven laboratories reported results in the previous study and 14 in the present one. 93% of the spiked value was recovered for this analyte in in S1 and 91% in S2. All the reported results in the two study samples returned satisfactory z-scores but two. Participants used a variety of labelled standards before extraction, and before instrumental analysis (Figure 91).



Sample Amount Used	25 mL	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, not rinsed	EC, rinsed	EC, rinsed	EC, rinsed	EC, rinsed
Extraction Technique	SPE	SPE	SPE	SPE	SPE	SPE	SPE & DI	SPE	SPE	SPE	SPE	Co-solvation
Extraction Solvent	MeOH	MeOH/Base	MeOH/Base	ACN/Base	NR	ACN/MeOH	MeOH/Base	ACN/MeOH	MeOH/Base	ACN/MeOH	ACN/MeOH	MeOH
Labelled std BE		M5PFHxA	13C2-5:3FTCA				13C4-PFOA		13C2-PFHxA	13C4-PFOA	Yes	M5PFHxA
Labelled std BA		M2PFOA							13C5-PFPeA			M2PFHxA

* EC = entire container, BE = before extraction, BA = before analysis.

Figure 91 S1 and S2 5:3FTCA z-scores vs Method Used

6.8 Participants' Results and Analytical Methods for PFAS in Water Sample S3

The reagent water Sample S3 was fortified for 6 individual PFAS components (PFHxS, PFHxS_L, PFOS, PFOS_L, PFOA, PFNA) spiked at trace level, between 0.00100 µg/L to 0.00377 µg/L. This study's design was aimed at helping laboratories assess their capabilities in measuring PFAS at trace levels in water. No individual assessment was conducted for this sample and so no assigned value was set for any of the PFAS analytes in S3. However, participants still can assess whether their reported results fall within the z-score acceptable range presented as information in Appendix 6.

Twenty-sevent participants reported numerical results for PFAS analytes in S3. These results tohether with their corresponding unceraities are presented in Tables 60 to 65. Owing to the low level and increase chance for background/contamination, laboratories should be reasonably expected to have higher uncertainties than in S1 and S2 .

The method descriptions provided by participants are presented in Appendix 7.

Of 27 laboratories who reported results for PFAS in S3, 16 reported taking for analysis the entire amount of sample. Eleven laboratories used a wide variety of sample sizes, ranging from 5 mL to 250 mL.

With the exception of one, all laboratories used the same extraction and instrumental technique as for the other two water samples. Laboratory 17 used direct injection for the river water analysis and SPE extraction for the trace level PFAS analysis in the reagent water sample S3.

Overall, measurements of the 6 PFAS analytes in water at trace level did not challenge participants' analytical techniques. The majority of the reported results were in good agreement with each other and with the spike value; the between laboratory CVs were low, ranging from 11% to 19% (Table 67).

The robust average of participants' results for PFOS in the reagent grade water sample S3, was higher than the spike value, possibly indicating background PFOS contamination in the laboratories. PFOS was also the analyte with the largest number of results that were not in agreement with the spiked value (Appendix 6, Figure 94).

Bar charts of PFHxS_L and PFHxS_T ratios of the reported results and of the PFOS_L and PFOS_T results ratios together with the expected ratio after spiking for these analytes are presented in Appendix 6 (Figures 95 and 96).

Some participants reported results being below their level of reporting for analytes that were spiked above the reporting level (Appendix 5).

Individual assessments of participants' performance measuring PFAS analytes at trace level in water samples will be conducted in our next PT study for PFAS in water.

6.9 Effects of Sample Matrix

Overall the participants' performance in the water samples was comparable (Table 71).

Table 71 Acceptable z-Scores for Each Matrix

Sample	Expected nr of z-Scores	Actual nr of z-Scores (% of expected nr. of z-Scores)	Nr. of Acceptable z-Scores (% of actual nr. of z-Scores)
S1 Potable Water (spiked)	759	532 (70%)	505 (95%)
S2 River Water (spiked)	736	590 (80%)	555 (94%)

6.10 False Negatives

Appendix 5 presents false negative results. These are analytes present in the samples which a participant tested for, but did not report a result; for example, when participants reported a 'less-than' result (< *x*) when the assigned value was higher than their limit of reporting (LOR), or did not report anything (NR). However results reported as NR may or may not be false negatives as this is depending on the participant's actual LOR.

For analytes where no assigned value was set, results were only considered to be false negatives where the robust average and spiked value were significantly higher than the participants' LOR, or if no value was reported.

6.11 Comparison with Previous PFAS in Water Studies

In the first study conducted by NMI for PFAS analytes in water AQA 15-03, participants were asked to report results for total and linear PFOS and PFOA only. 11 laboratories enrolled of which 10 reported results. The lack of mass-labelled linear and branched standards was the main problem encountered by participants. Since then, a large number of high-quality standards and labelled standards have become available and so more analytes have been added each year to subsequent PT studies. Laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the reported results were compatible, showing that the mass-labelled standards are capable of correcting for the differences between these methods. A summary of the rates of participation and reported results over the last 10 studies (2015 to 2024) is presented in Figure 92.

AQA 24-12 is the tenth NMI proficiency test of PFAS analytes in water. Participants had the option to report 67 analytes across three water samples. For all analytes, the same fixed target standard deviation was used in the present study as in previous studies. This allows for a comparison of participants' performance over time and provides a benchmark for progressive improvement.

The analytes' level in the present study were lower than in previous studies however overall, most laboratories performed similarly or better.

11Cl-PF3OUdS has been introduced in all PFAS PT studies in water since PT Study AQA 21-07. Laboratories significantly improved their capabilities in measuring this analyte in water. Compared to previous studies a larger number of laboratories reported results for this analyte. The majority of reported results were in good agreement with each other and the spiked value.

5:3FTCA was introduced for the first time in our PFAS program last year in the PT study AQA 23-14. 7 laboratories reported results in the previous study and 14 in the present one. 93% in S1 and 92% in S2 of the spiked value was recovered for this analyte in the present study.

A summary of participants' performance in the measurement of PFAS analytes in water over time is presented in Figure 93.

Over time, laboratories should expect at least 95% of their scores to lay within the range $|z| \leq 2.0$. Scores in the range $2.0 < |z| < 3.0$ can occasionally occur, however these should be interpreted in conjunction with the other scores obtained by that laboratory. For example, a trend of z-scores on one side of the zero line is an indication of method or laboratory bias. Individual performance history reports are emailed to each participant at the end of the study; the consideration of z-scores for an analyte over time provides much more useful information than a single z-score.

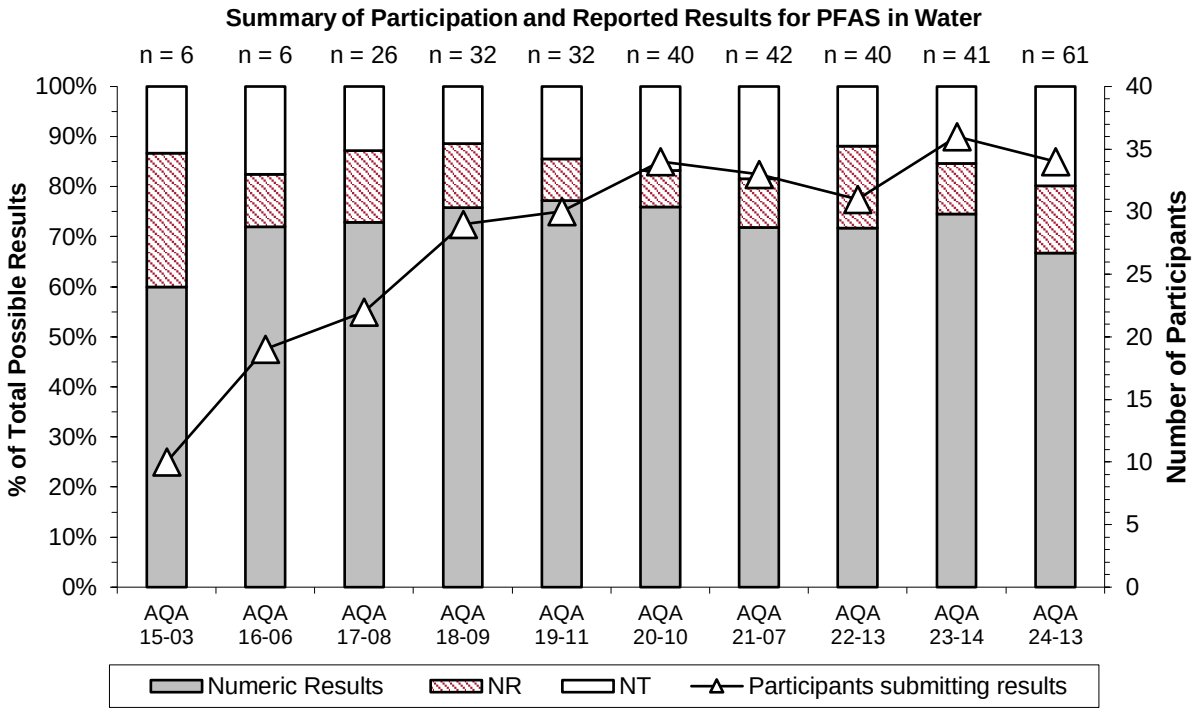


Figure 92 Summary of Participation and Reported Results for PFAS Water PT Studies (n = number of analytes).

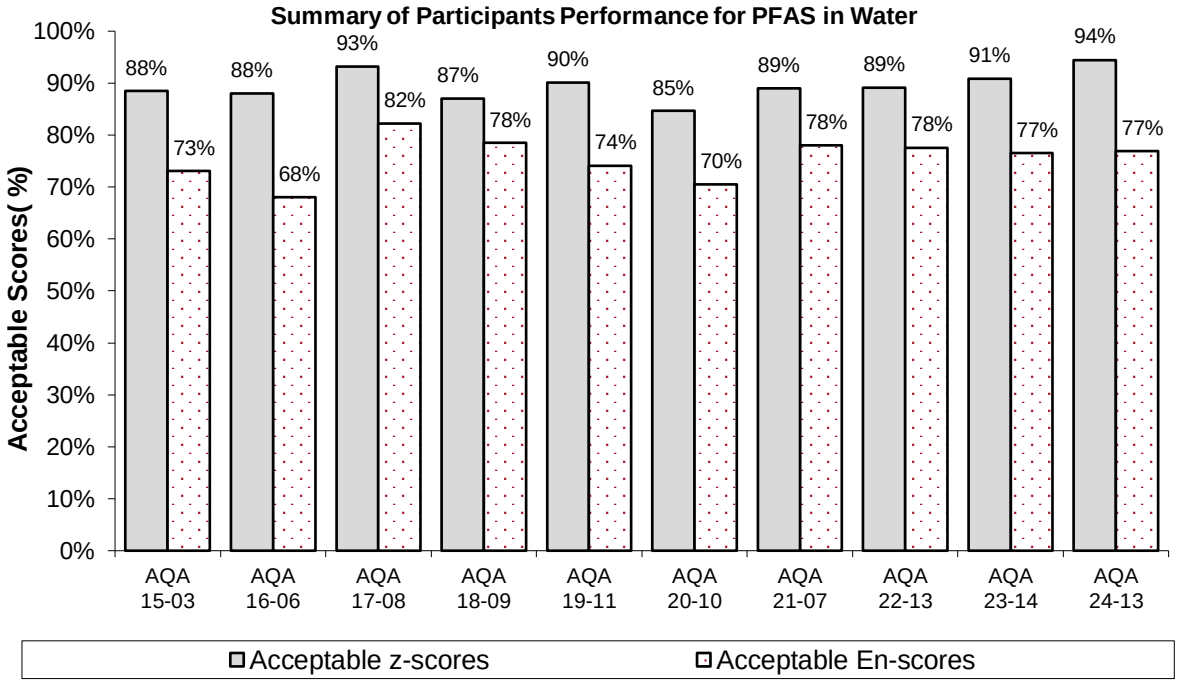


Figure 93 Summary of Participants' Performance for PFAS in Soil and Water PT Studies

7 REFERENCES

Note: For all undated references, the latest edition of the referenced document (including any amendments) applies

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APPENDIX 1 – SAMPLE PREPARATION

Sample S1: Potable water was autoclaved and dispensed into 60 mL HDPE bottles. A composite spike solution containing the 27 target analytes in 0.03 M KOH in methanol was prepared. Each of the 60 mL HDPE bottles was spiked individually with the composite solution.

Sample S2: River water was filtered, autoclaved and dispensed into 60 mL HDPE bottles. Each container was individually spiked with a composite spike solution containing the 28 target analytes.

Sample S3: Reagent grade water was dispensed into 500 mL HDPE bottels. As for S1 and S2, a composite spike solution containing the six target analytes in methanol was prepared and then tumbled for 15 minutes. The 500 mL HDPE bottles were then individually spiked and inverted to ensure even distribution of the composite spike solution throughout the sample.

The samples were stored in a coolroom at 4°C prior to dispatch.

APPENDIX 2 – ROBUST AVERAGE AND ASSOCIATED UNCERTAINTY, z-SCORE AND E_n-SCORE CALCULATIONS

A2.1 Robust Average and Associated Uncertainty

The robust average was calculated using the procedure described in ISO 13528:2015 Annex C.[5] The uncertainty was estimated as:

$$u_{rob\ average} = 1.25 \times S_{rob\ average} / \sqrt{p} \qquad \textit{Equation 4}$$

where:

$u_{rob\ average}$ is the standard uncertainty of the robust average

$S_{rob\ average}$ is the standard deviation of the robust average

p is the number of results

The expanded uncertainty ($U_{rob\ average}$) is the standard uncertainty multiplied by a coverage factor of 2 at approximately 95% confidence level.

A worked example is set out below in Table 72.

Table 72 Uncertainty Estimate for PFHpS in Sample S2

No. results (p)	25
Robust Average	0.00388 µg/L
$S_{rob\ av}$	0.00069 µg/L
$u_{rob\ av}$	0.00017 µg/L
k	2
$U_{rob\ av}$	0.00034 µg/L

Therefore, the robust average for PFHpS in Sample S2 is **0.00388 ± 0.00034 µg/L**.

A2.2 z-Score and E_n-Score Calculations

For each participant's result, a z-score and E_n-score are calculated according to Equations 2 and 3 respectively (see page 12).

A worked example is set out below in Table 73.

Table 73 z-Score and E_n-Score for Sample S2 PFHxA Result Reported by Laboratory 29

Participant Result (µg/L)	Assigned Value (µg/L)	Target Standard Deviation	z-Score	E_n-Score
0.025 ± 0.0037	0.0242 ± 0.0012	20% as PCV, or: 0.2 × 0.0242 = 0.00484 µg/L	z-Score = $\frac{0.025 - 0.0242}{0.00484}$ = 0.17	E_n-Score = $\frac{0.025 - 0.0242}{\sqrt{0.0037^2 + 0.0012^2}}$ = 0.21

APPENDIX 3 – USING PT DATA FOR UNCERTAINTY ESTIMATION

When a laboratory has successfully participated in at least 6 proficiency testing studies, the standard deviation from proficiency testing studies can also be used to estimate the uncertainty of their measurement results.[16] An example is given. Between 2015 and 2024 NMI carried out 10 proficiency tests of PFAS in water. These studies involved analyses of PFAS analytes at low and high levels.

Laboratory X submitted results for PFOA in most of these PTs. All reported results below returned acceptable z-scores (Table 74).

Table 74 Laboratory X Reported Results for PFOA

Study No.	Sample	Laboratory result µg/L	Assigned value µg/L	Number of Results	Robust CV of all results (%)
AQA 15-03	S4	3.92 ± 0.666	3.7 ± 0.2	10	6.8
AQA 16-06	S6	13.54 ± 2.302	10.83 ± 0.89	17	16
AQA 18-09	S3	0.846 ± 0.218	0.735 ± 0.062	26	17
	S4	0.038 ± 0.010	0.036 ± 0.002	26	13
AQA 19-11	S3	0.39 ± 0.109	0.404 ± 0.041	28	22
	S4	0.064 ± 0.0183	0.0696 ± 0.0024	29	13
AQA 20-10	S3	0.53 ± 0.13	0.503 ± 0.038	31	17
	S4	0.047 ± 0.011	0.0443 ± 0.033	29	16
AQA 21-07	S3	0.284 ± 0.07	0.225 ± 0.016	30	16
	S4	0.0365 ± 0.011	0.0292 ± 0.0015	30	11
AQA 22-13	S4	0.0222 ± 0.008	0.0225 ± 0.0019	26	17
AQA 23-14	S4	0.0079 ± NR	0.00914 ± 0.00067	28	15
	S5	0.0345 ± 0.012	0.0342 ± 0.0016	35	11
AQA 24-12	S1	0.0107 ± 0.003	0.0110 ± 0.0005	27	8.9
	S2	0.026 ± 0.006	0.0249 ± 0.0017	30	15
				Average	14*
$\boldsymbol{pooled\ s\%} = \sqrt{\frac{(\mathbf{10}-\mathbf{1})\times\mathbf{6.8^2}+(\mathbf{17}-\mathbf{1})\times\mathbf{16^2}+\cdots\cdots+(\mathbf{30}-\mathbf{1})\times\mathbf{15^2})}{\mathbf{417}-\mathbf{402}}}$					15

* The pooled standard deviation was used

Taking the pooled standard deviation of the robust CV over these PT samples gives an estimate of the relative standard uncertainty of 15%. Using a coverage factor of two gives a relative expanded uncertainty of 30%, at a level of confidence of approximately 95%.

Table 75sets out the expanded uncertainty for results of the measurement of PFOA in soil over the range 0.001-15 µg/L.

Table 75 Uncertainty of PFOA Results Estimated Using PT Data.

Results µg/kg	Uncertainty µg/kg
0.0010	0.0003
0.10	0.03
1.0	0.3
7.5	2.3
15	5

The estimate of 30% passes the test of being reasonable, and the analysis of the 15 different PT samples over ten years can be assumed to include all the relevant uncertainty components

(different matrices, operators, reagents, calibrators etc.), and so complies with AS ISO/IEC 17025:2018.[7]

APPENDIX 4 – ADDITIONAL ANALYTES

Table 76 Additional Analytes

Lab. Code	Sample	Analyte	Result (µg/L)	Uncertainty (µg/L)	Recovery (%)
6	S1	PFHpA	0.0007	NR	97.87
	S2	PFNA	0.0007	0.0001	105.83
10	S1	PFHpA	0.000507	0.0003042	94
14	S2	PFNA	0.0012	NR	NR
15	S1	PFHpA	0.0002	0.00006	90
	S2	PFPeS	0.0003	0.00009	95
17	S2	PFHpA	0.0002	0.00006	90
19	S2	PFPeS	0.0003	0.00009	95
21	S1	PFBS	0.000424	NR	NR
		PFHpA	0.000827	NR	NR
	S2	PFPeS	0.000722	NR	NR
		PFNA	0.000956	NR	NR
	S3	PFPeA	0.000125	NR	NR
23	S1	PFDoS	0.332	0.06	66
	S2	PFDoA	0.63	0.092	10
30	S1	PFBS	0.0002554676207965	0.0000008603376461	102
		PFHpA	0.0006569312237288	0.0000796306769639	105
	S2	PFPeS	0.0004383201590876	0.0000770779316182	104
	S3	PFPeA	0.000024	0.0000086	94
35	S2	PFNA	0.0006	0.000096	90.88
38	S1	PFHpA	0.002	0.001	105

APPENDIX 5 – FALSE NEGATIVES

Table 77 False Negatives

Lab. Code	Sample	Analyte	Assigned Value (µg/L)	Spiked Value (µg/L)	Reported Result** (µg/L)
1	S3	PFOA	0.00210*	0.00201	<0.002
2	S1	PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR
		PFPeA	0.0140	0.0161	<0.01
		PFTrDA	0.0175	0.0250	<0.002
		PFODA	NA	0.0700	NR
		8:2diPAP	NA	0.0489	NR
		PFEESA	0.0411	0.0445	NR
		9Cl-PF3ONS	0.0849	0.0939	NR
		11Cl-PF3OUdS	0.077	0.0950	NR
		5:3FTCA	0.0943	0.101	NR
	S2	PFDoS	NA	0.0729	NR
		PFTrDS	NA	0.0731	NR
		PFPeA	0.0165	0.0227	<0.01
		PFODA	NA	0.0699	NR
		8:2diPAP	NA	0.0489	NR
		PFEESA	0.0417	0.0499	NR
		9Cl-PF3ONS	0.123	0.140	NR
		11Cl-PF3OUdS	0.103	0.142	NR
		5:3FTCA	0.138	0.151	NR
3	S1	PFPeS	0.00544	0.00554	NR
		PFOS	0.00507	0.00468	NR
		PFOS_L	0.00347	0.00349	NR
		PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR
		PFPeA	0.0140	0.0161	NR
		PFHxA	0.00784	0.00746	NR
		PFNA	0.00528	0.00502	NR
		PFTrDA	0.0175	0.0250	NR
		PFTeDA	0.0166	0.0250	NR
		PFODA	NA	0.0700	NR
		8:2diPAP	NA	0.0489	NR
	S2	PFHpS	0.00388	0.00388	NR
		PFOS	0.0159	0.0139	NR
		PFOS_L	0.00965	0.00909	NR
		PFTrDS	NA	0.0731	NR
		PFPeA	0.0165	0.0227	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/L)	Spiked Value (µg/L)	Reported Result** (µg/L)
		PFTeDA	NA	0.0500	NR
		PFODA	NA	0.0699	NR
		8:2diPAP	NA	0.0489	NR
4	S1	PFHxS	0.0119	0.0120	<0.01
		PFHxS_L	0.0118	0.0120	<0.01
		PFOA	0.0110	0.0105	<0.01
5	S1	PFOS_L	0.00347	0.00349	NR
		PFBA	0.0712	0.0730	NR
	S2	ADONA	0.0249	0.0282	NR
6	S1	8:2diPAP	NA	0.0489	<0.025
	S2	8:2diPAP	NA	0.0489	<0.025
7	S1	PFHxS_L	0.0118	0.0120	NR
		PFOS	0.00507	0.00468	NR
		PFOS_L	0.00347	0.00349	NR
		PFNS	0.0326	0.0362	NR
		PFDS	0.0300	0.0363	NR
		PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR
		PFPeA	0.0140	0.0161	NR
		PFHxA	0.00784	0.00746	NR
		PFNA	0.00528	0.00502	NR
		PFTrDA	0.0175	0.0250	NR
		PFTeDA	0.0166	0.0250	NR
		PFODA	NA	0.0700	NR
		11Cl-PF3OUdS	0.077	0.0950	NR
	S2	PFBS	0.0105	0.0104	NR
		PFHxS_L	0.0267	0.0288	NR
		PFHpS	0.00388	0.00388	NR
		PFOS	0.0159	0.0139	NR
		PFOS_L	0.00965	0.00909	NR
		PFDS	0.0538	0.0725	NR
		PFDoS	NA	0.0729	NR
		PFTrDS	NA	0.0731	NR
		PFPeA	0.0165	0.0227	NR
		PFHxA	0.0242	0.0223	NR
		PFDoA	0.0408	0.0499	NR
		PFTeDA	NA	0.0500	NR
		PFODA	NA	0.0699	NR
		11Cl-PF3OUdS	0.103	0.142	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/L)	Spiked Value (µg/L)	Reported Result** (µg/L)
	S3	PFHxS_L	0.00364*	0.00377	NR
		PFOS_L	0.00135*	0.00110	NR
		PFNA	0.00114*	0.00100	NR
8	S1	PFBA	0.0712	0.0730	<0.06
		PFPeA	0.0140	0.0161	<0.01
		PFOA	0.0110	0.0105	<0.01
		PFTrDA	0.0175	0.0250	<0.01
		PFTeDA	0.0166	0.0250	<0.01
	S2	PFBS	0.0105	0.0104	<0.01
		PFTeDA	NA	0.0500	<0.02
9	S1	PFHxS	0.0119	0.0120	<0.01
		PFOA	0.0110	0.0105	<0.01
10	S1	PFTrDA	0.0175	0.0250	<0.001
		PFTeDA	0.0166	0.0250	<0.001
	S2	PFDoS	NA	0.0729	<0.0005
		PFTeDA	NA	0.0500	<0.001
	S3	PFOS	0.00168*	0.00139	<0.0005
		PFOS_L	0.00135*	0.00110	<0.0005
12	S3	PFHxS	0.00362*	0.00377	<0.00005
14	S1	8:2diPAP	NA	0.0489	NR
		GenX	0.0150	0.0150	NR
		PFEESA	0.0411	0.0445	NR
		9Cl-PF3ONS	0.0849	0.0939	NR
		11Cl-PF3OUdS	0.077	0.0950	NR
		5:3FTCA	0.0943	0.101	NR
15	S1	PFOS_L	0.00347	0.00349	NR
		PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR
		PFBA	0.0712	0.0730	NR
		PFOA	0.0110	0.0105	NR
	S2	PFTrDS	NA	0.0731	NR
		PFOA	0.0249	0.0241	NR
		PFDoA	0.0408	0.0499	NR
		ADONA	0.0249	0.0282	NR
	S3	PFOA	0.00210*	0.00201	NR
16	S1	PFHxS_L	0.0118	0.0120	NR
		PFOS_L	0.00347	0.00349	NR
		PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/L)	Spiked Value (µg/L)	Reported Result** (µg/L)
		PFODA	NA	0.0700	NR
		8:2diPAP	NA	0.0489	NR
		PFEESA	0.0411	0.0445	NR
		5:3FTCA	0.0943	0.101	NR
	S2	PFHxS_L	0.0267	0.0288	NR
		PFOS_L	0.00965	0.00909	NR
		PFDoS	NA	0.0729	NR
		PFTrDS	NA	0.0731	NR
		PFODA	NA	0.0699	NR
		8:2diPAP	NA	0.0489	NR
		PFEESA	0.0417	0.0499	NR
		5:3FTCA	0.138	0.151	NR
	S3	PFHxS_L	0.00364*	0.00377	NR
		PFOS_L	0.00130*	0.00110	NR
17	S2	PFPeA	0.0165	0.0227	<0.004
18	S1	PFPeS	0.00544	0.00554	NR
		PFHxS_L	0.0118	0.0120	NR
		PFOS_L	0.00347	0.00349	NR
		PFNS	0.0326	0.0362	NR
		PFDS	0.0300	0.0363	NR
		PFUdS	NA	0.0364	NR
		PFTrDS	NA	0.0366	NR
		PFBA	0.0712	0.0730	NR
		PFPeA	0.0140	0.0161	NR
		PFHxA	0.00784	0.00746	NR
		PFNA	0.00528	0.00502	NR
		PFDA	0.0279	0.0251	NR
		PFTrDA	0.0175	0.0250	NR
		PFTeDA	0.0166	0.0250	NR
		PFODA	NA	0.0700	NR
		PFOSA	0.0362	0.0377	NR
		4:2FTS	0.0671	0.0654	NR
		6:2FTS	0.0289	0.0284	NR
		8:2diPAP	NA	0.0489	NR
		GenX	0.0150	0.0150	NR
		PFEESA	0.0411	0.0445	NR
		9Cl-PF3ONS	0.0849	0.0939	NR
		11Cl-PF3OUdS	0.077	0.0950	NR
		5:3FTCA	0.0943	0.101	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/L)	Spiked Value (µg/L)	Reported Result** (µg/L)
	S3	PFHxS	0.00362*	0.00377	NR
		PFHxS_L	0.00364*	0.00377	NR
		PFOS	0.00168*	0.00139	NR
		PFOS_L	0.00135*	0.00110	NR
		PFOA	0.00210*	0.00201	NR
		PFNA	0.00114*	0.00100	NR
19	S2	8:2diPAP	NA	0.0489	NR
		ADONA	0.0249	0.0282	NR
		PFEESA	0.0417	0.0499	NR
		9Cl-PF3ONS	0.123	0.140	NR
		11Cl-PF3OUdS	0.103	0.142	NR
		5:3FTCA	0.138	0.151	NR
23	S1	PFPeA	0.0140	0.0161	<0.0040
	S2	PFPeA	0.0165	0.0227	<0.0055
		8:2diPAP	NA	0.0489	<0.025
24	S2	PFTeDA	NA	0.0500	<0.02
29	S1	PFDS	0.0300	0.0363	NR
		PFTrDA	0.0175	0.0250	NR
		PFTeDA	0.0166	0.0250	NR
		11Cl-PF3OUdS	0.077	0.0950	NR
	S2	PFDS	0.0538	0.0725	NR
		PFDoA	0.0408	0.0499	NR
		PFTeDA	0.0278	0.0500	NR
		4:2FTS	0.0642	0.0653	NR
		11Cl-PF3OUdS	0.103	0.142	NR

*Robust Average (assigned value not set); S3 results do not have an assigned value as it is part of a pilot program. NA -not available. **Results reported as NR may or may not be false negatives, depending on the participant's actual LOR.

APPENDIX 6 – ASSESSMENT OF LABORATORIES' CAPABILITIES FOR PFAS MEASUREMENTS IN S3

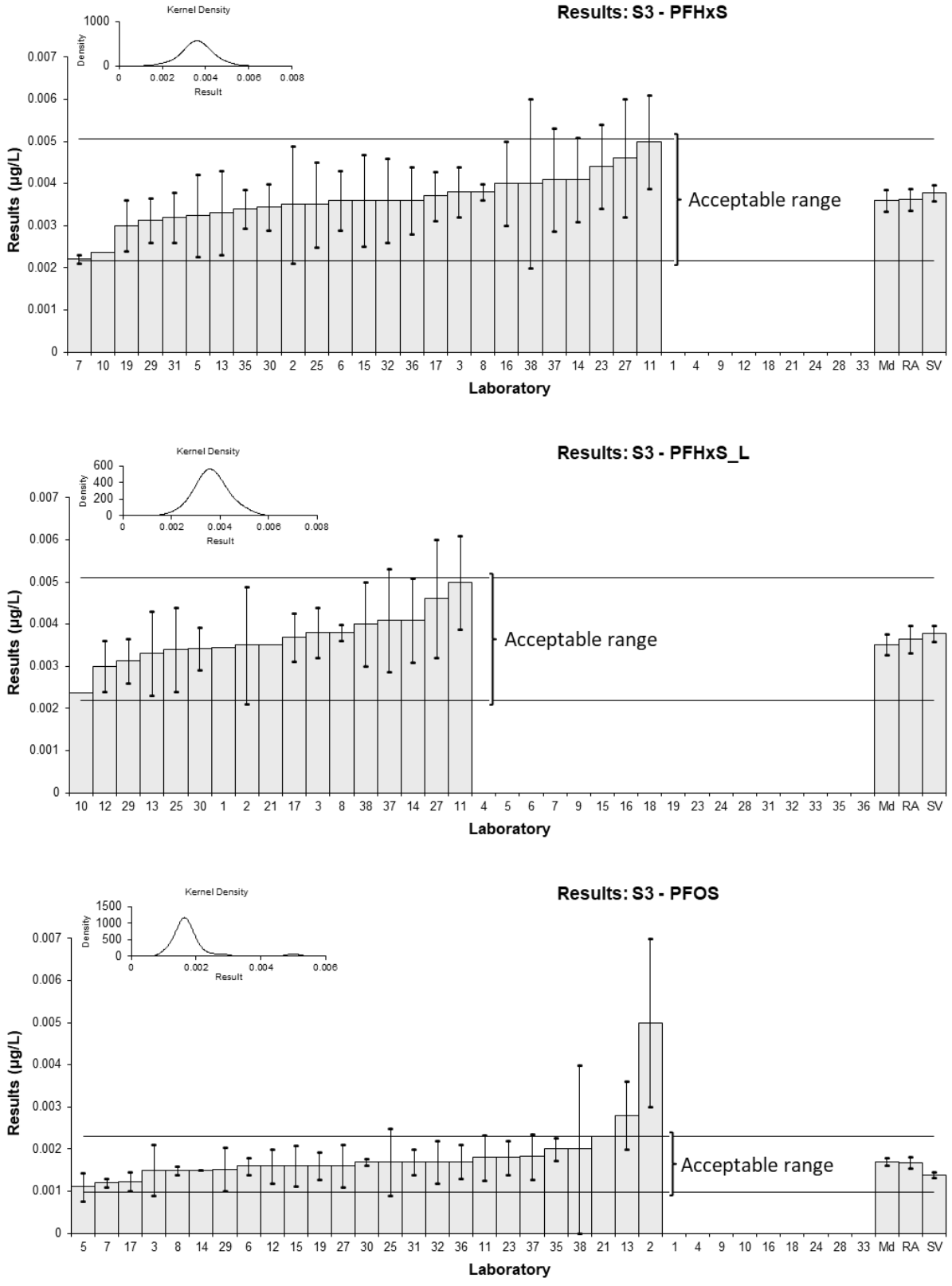
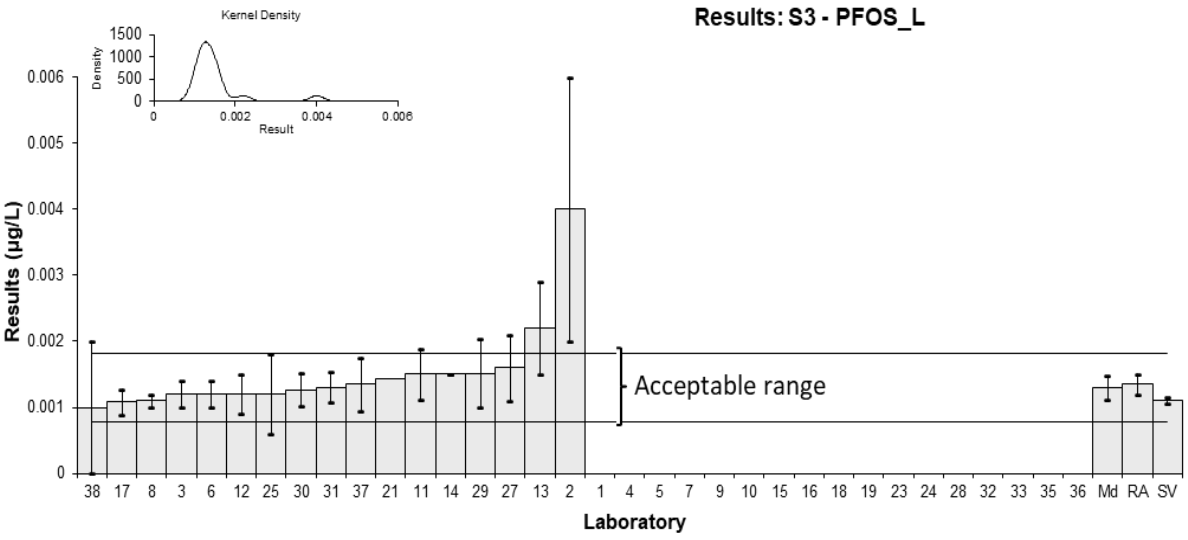
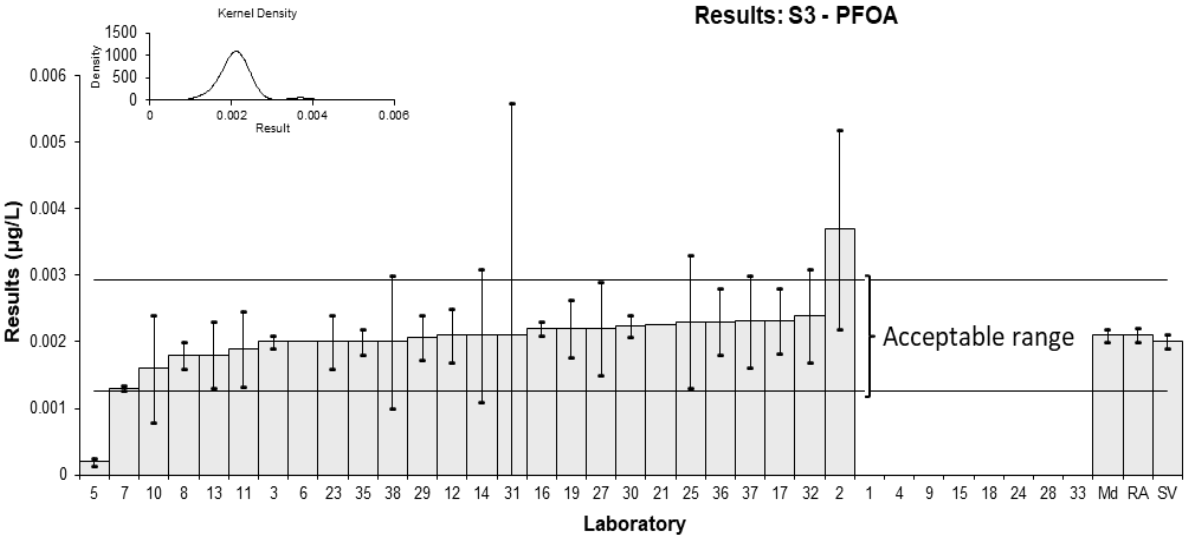


Figure 94 Comparison Charts of Participants Results in S3





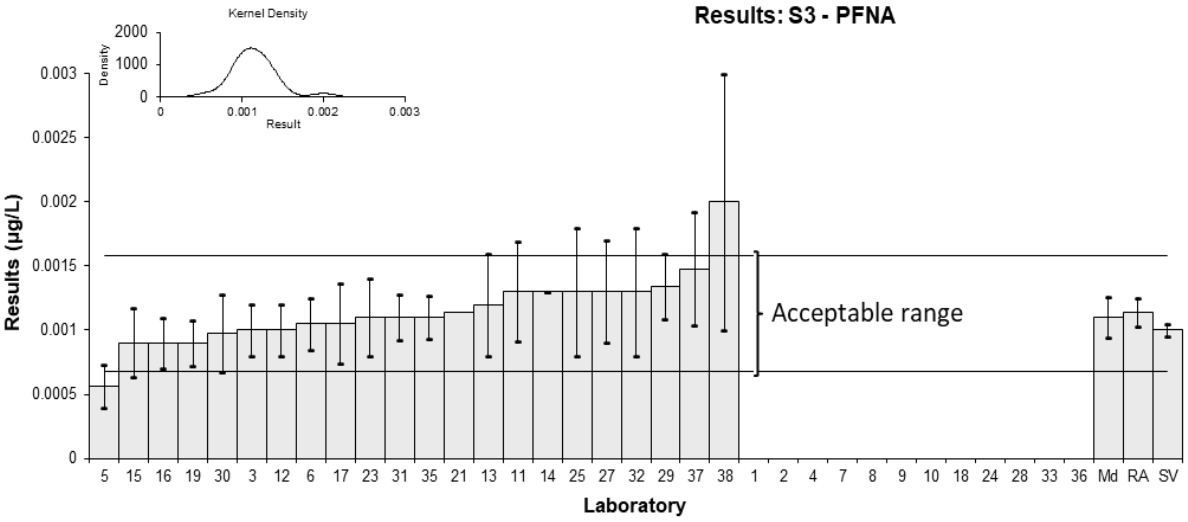
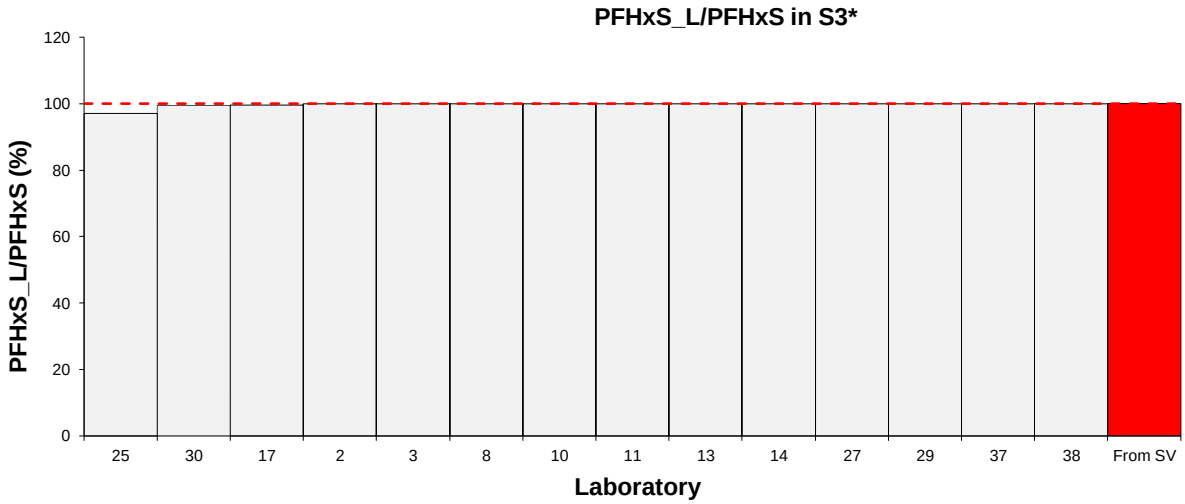
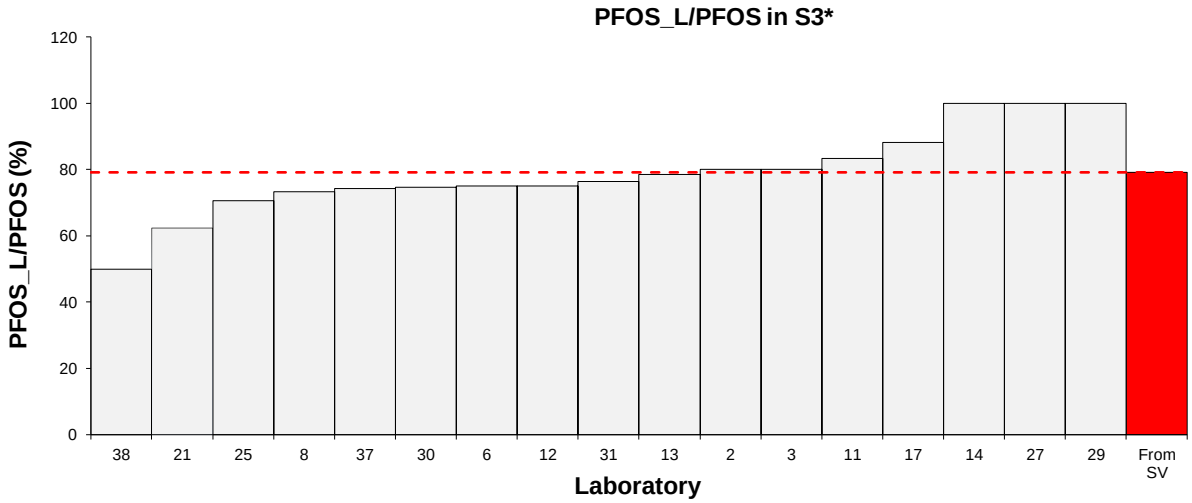


Figure 94 Comparison Charts of Participants Results in S3 (continued)



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 95 Bar Charts of PFHxS_L/PFHxS_T in S3



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 96 Bar Charts of PFOS_L/PFOS_T in S3

APPENDIX 7 – PARTICIPANTS' TEST METHODS FOR WATER SAMPLES

Participants' methods for water samples are presented in Tables 260 to 307.

Table 78 Participant Methodology – Extraction

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
1	Yes	No	25mL per method	Yes	No	25mL per method	No	NA	25mL per method	No	No	pH Adjustment	Solid-Phase Extraction: C18	Methanol	Methanol	ambient	1 day	Yes	No
2	No		10		No	10	No	No	10	Yes	No		Direct Injection					Yes	No
3	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	pH adjustment	Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/ MeOH		40		No	No
4	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	No	Direct Injection	Basified Methanol	Approx. 10 mins	Ambient	No	No	No
5	No		50	No		50	Yes	Yes		Yes	No		Solid-Phase Extraction: HLB type (hydrophilic lipophilic balance)	ACN/MeOH	15		15	No	No
6	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type	NH4OH/ MeOH	60		30	Yes	No

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
													(weak anion exchange)						
7*	No	No	10mL	No	No	10ml	No	No	10mL			Homogenisation	Liquid-Liquid Extraction	pH adjusted MeOH	3	Room Temperature			No
8*	No	No	10	No	No	10	No	No	125	Yes	No	No	Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN		45	40	No	No
9	No	No	50	No	No	50	Yes	No	50	Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/ MeOH		Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/ MeOH		ambient		No	No
10	No	No	5 mL	No	No	5 mL	No	No	5 mL	Yes	No	No	Filtration	0.2% AcOH/MeOH	NA	20	Not Applicable	No	No
11	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	90 minutes	45	30	No	No

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
12	Yes	Yes		Yes	Yes			Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	Not Applicable				Yes	No
13*	Yes	Yes		Yes	Yes		No	No	50	Yes	Yes	See Table 105.	Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	VARIED	40	Approx. 60	No	No
14	Yes	No	n	Yes	No	No	No	No	200mL	Yes	No	None	Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	10min	NA	40min	No	No
15	No		50	No		50	Yes	Yes		Yes	No		Solid Phase Extraction: HLB Type (hydrophilic lipophilic balance)	ACN/MeOH	15		15	No	No

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
16*	Yes	Yes		Yes	Yes		Yes	Yes		Yes	No	Surrogate standards were added in reserve vials, after adding the samples.	Solid-Phase Extraction: WAX type (weak anion exchange)	1%-ammonia-methanol				Yes	No
17*	NA	NA	NA	No	NA	6	Yes	No		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	NH4OH/ MeOH	15 min	roomtemperature		Yes	No
18	Yes	Yes	25, 50	NA	NA	NA				Yes	No	No	Solid-Phase Extraction: Oasis WAX	Methanol	NA	Room temperature	30 mins	No	No
21*	Yes	Yes		Yes	Yes		No		100	Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	first MeOH and then MeOH (1% AmOH)		Room		Yes	Yes
23*	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	pH Adjustment	Solid-Phase Extraction: WAX type	ACN/MeOH	Approximately 1 hour	30°C	variable	NA	NA

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
													(weak anion exchange)						
24	No	No	25	No	No	25	NA	NA	NA	Yes	No		Direct Injection	MeOH, 0.3% NH3	10	40	60	No	No
25	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	NA	Yes	Yes	pH adjustment	SPE and Direct Injection	Basified Methanol	approx. 60 mins	40°C	approx. 20 mins	No	No
27	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	NO	Solid-Phase Extraction: WAX type (weak anion exchange)	Basic ACN and Acetone	20mins	40 °C	30 mins	No	No
29*	No	NA	100	No	NA	100	No	NA	100	Yes	No	NA	Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH in 0.1% NH4OH	NA	50°C	Variable	No	No
30	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	0.2% ammonia in methanol	45			No	No
31	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	pH adjusted	Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH in 0.1% NH4OH				Yes	No

Lab. Code	S1 Entire Container Used?	S1 Was the Container Rinsed?	S1 Sample Amount Used (mL)	S2 Entire Container Used?	S2 Was the Container Rinsed?	S2 Sample Amount Used (mL)	S3 Entire Container Used?	S3 Was the Container Rinsed?	S3 Sample Amount Used (mL)	Labelled Standard Added Before Extraction?	Labelled Standard Directly into Bottle?	Other Sample Pre-treatment?	Extraction Technique	Extraction/Elution Solvent	Extraction Time (min)	Extract Concentration Temperature	Extract Concentration Time	Final pH Adjustement?	Carbon cleanup?
32	Yes	Yes	N/A	Yes	Yes	N/A	No	N/A	125	Yes	Yes	Acidification	Solid-Phase Extraction: WAX type (weak anion exchange)	ACN/MeOH in 0.1% NH4OH	~45min	40 degree blowdown	~2hrs	No	No
33	Yes	Yes	A/N	Yes	Yes	N/A	NA	NA	NA	Yes	Yes	No	Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	N/A	N/A	N/A	Yes	Yes
35	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	45	Room temp	50	No	No
36	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	None	Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	N/A	N/A	N/A	Yes	No
37*	Yes	Yes		Yes	Yes		No		250	Yes	Yes		Solid-Phase Extraction: WAX type (weak anion exchange)	MeOH, 0.3% NH3	45	NA	NA	NA	Yes
38	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes		Co-solvation	MeOH	20 min			Yes	No

*Additional Information in Table 163.

Table 79 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
7	1 mL filtered water + 460uL pH adjusted MeOH + 20uL surrogate + 20 uL internal standard + 1 min vortex then transfer into the LC vial for analysis
8	S1 and S2 - Not extracted whole bottle. Extracted 10 mL of sample. S3 - Not extracted whole bottle. Extracted 125 mL of sample.
13	Other Sample Pre-treatment information: Measure appropriate sample by volume (mL) or weight (target mass ± 0.1 g) into a tared sample bottle or tube. For samples requiring whole-of-bottle extraction, an indirect measurement may be performed by (1) marking the level of the sample on the bottle; or (2) weighing the sample + bottle to the nearest 0.1 gram performed by weighing the sample+ bottle to the nearest 0.1 gram.
16	1%-ammonia-methanol was used for extraction.
17	S2 - Direct injection (6ml sample +3ml Methanol + 1ml acetonitril) S3 - SPE extraction (see above)
21	Elution solvent: first MeOH and then MeOH (1% AmOH)
23	S1, S2, S3 - The low Is recoveries that fall below 50% recovery were deemed acceptable as the results were less than the limit of reporting. It is suspected that there is supression for these compounds, where the ratio between internal standard and target compound is still accurate. This is also within the QWI criteria.
28	S1: From the following compounds there are found traces below our reporting limits: PFHxA, PFDA, PFTrDA, PFTeDA, L-PFBS, L-PFHxS, L-PFOS, PFOA, L-PFDS, HFPO-DA (GenX), L-PFNS, L-PFPeS, 4:2FTS en 6:2FTS
29	S1, S2: PFDS, PFDoDA, PFTrDA, PFTeDA, 8:2 FTS, 10:2 FTS, 11Cl-PF3OUdS not reported (NR) due to poor recovery in our QC sample. NT = Not Tested S3: PFDS not reported (NR) due to poor recovery in our QC sample.
37	S3-Aqueous volume was split evenly between 2 250mL poly bottles; original container rinsate (0.3% NH3-MeOH) was also split evenly between the two containers.

Table 80 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Corrected?
1*	LC-MSMS or LC-QQQ	1:25	
2	LC-MSMS or LC-QQQ	2	No
3	LC-MSMS or LC-QQQ		No
4	LC-MSMS or LC-QQQ	No	No
5	LC-Orbitrap	0.02	Yes
6	LC-MSMS or LC-QQQ	No	No

Lab. Code	Instrument	Dilution Factor	Blank Corrected?
7*	LC-MSMS or LC-QQQ		Yes
8*	LC-MSMS or LC-QQQ	5	Yes
9	LC-MSMS or LC-QQQ	No	No
10	LC-MSMS or LC-QQQ	No	Yes
11	LC-MSMS or LC-QQQ		No
12	LC-MSMS or LC-QQQ		No
13	LC-MSMS or LC-QQQ	0.001	No
14	LC-MSMS or LC-QQQ	No	No
15	LC-Orbitrap	0.02	No
16	LC-MSMS or LC-QQQ	No	No
17	LC-MSMS or LC-QQQ	1.66 (S2)	Yes
18	LC-MSMS or LC-QQQ	No	No
19	LC-MSMS or LC-QQQ		Yes
21	LC-MSMS or LC-QQQ	Delution water: 2	No
23	LC-MSMS or LC-QQQ	No	No
24	LC-MSMS or LC-QQQ	No	Yes
25	LC-MSMS or LC-QQQ	No	No
27	LC-MSMS or LC-QQQ	NO	No
29	LC-MSMS or LC-QQQ	NA	No
30	LC-MSMS or LC-QQQ	No	No
31	LC-MSMS or LC-QQQ		No
32	LC-MSMS or LC-QQQ		No
33	LC-MSMS or LC-QQQ		No
35	LC-MSMS or LC-QQQ	No	No

Lab. Code	Instrument	Dilution Factor	Blank Corrected?
36	LC-MSMS or LC-QQQ	No	No
37*	LC-MSMS or LC-QQQ		No
38	LC-MSMS or LC-QQQ		No

*Additional Information in Table 165.

Table 81 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
1	Dynamic MRM
7	Coloumn HPLC EC100/2 Nucleodur 100-3 PFAS, 3um, 100mmL x 2mmID
8	Extracted diluted and undiluted samples S1 and S2
37	IDA Analysis utilized

Table 82 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	Wellington	No	Yes, SPE	
2	Wellington	No	Direct Injection	
3	Wellington	Yes	USEPA 537	
4	Wellington	Yes	No. In-house	
5	Wellington Laboratories	Yes		
6	Wellington Laboratories	Yes		
8	Wellington Laboratory	Yes	No	
9	Wellington	Yes	No	
10	Wellington laboratories	No		
11	Wellington. Cambridge Isotope laborotories	No		
12	Wellington	No	USEPA 1633	

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
13	Wellington	Yes	Isotope Dilution	
14	Wellington	Yes		
15	Wellington laboratories	NO		
16	Yes	Yes	Method USEPA 1633	
17	Wellington	Yes	No	
18	Wellington	No	NA	NA
21	Wellington	Yes	No	IS-correction using the above labelled standards
23	Wellington Laboratories	Yes	In-House	
24	Wellington	Yes	method LC-MS/MS after SPE	
25	Wellington	Yes	No. In-house	
27	Wellington	No		
29	Wellington	Yes	No	NA
30	Wellington	Yes	Isotopic dilution	
31	Wellington	Yes		
32	Wellington	Yes		
33	Wellington Labs.	Yes		
35	Wellington laboratory	No	n/a	n/a
36	Accustandard and Wellington	Yes	USEPA 1633	
37	Wellington Labs	Yes	Modified EPA Method 537	
38	Wellington Labs	Yes	ASTM D8421 modified	

Table 83 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3PFBS	MPFDA
4	13C3-PFBS	N/A
5		Yes
6	13C3-PFBS	
7	M3PFBS	M8PFOS
8	Yes	
9	M3PFBS	M8PFOS
10	PFBS - 13C3	PFHxS-18O2
11	13C3-PFBS	
12		M3PFBS
13	Y	N
14	13C3_PFBS.IS	
15		Yes
16	M3-PFBS	
17	Yes	No
18		
19		
21	PFBS-13C3	
23	13C3-PFBS	
24	13C4-PFOS	
25	13C3-PFBS	N/A
27	YES	
28		
29	M3PFBS	NA
30	13C3-PFBS	13C3-PFHxS
31	PFBS	
32	13C3-PFBS	-
33		No
35	yes	
36	Yes	No
37	13C3 PFBS	13C2 PFOA
38	M3PFBS	18O2 PFHxS

Table 84 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3PFBS	MPFDA
4	18O2-PFHxS	N/A
5		
6	16O2-PFHxS	
7	M3PFBS	M8PFOS
8	Yes	
9		
10	PFHxS - 13C3	PFHxS-18O2
11	N/A	
12		
13	N	N
14	13C2_6:2FTS.IS	
15		
16		
17	Yes	No
18		
19		
21	PFHxS-13C3	
23	16O2-PFHxS	
24	13C4-PFOS	
25	18O2-PFHxS	N/A
27	YES	
28		
29	M5PFHxA	NA
30	18O2-PFHxS	13C3-PFHxS
31	PFBS	
32	16O2-PFHxS	-
33		No
35	yes	
36	No	No
37	18O2 PFHxS	13C2 PFOA
38	M3PFHxS	18O2 PFHxS

Table 85 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3PFHxS	MPFDA
4	18O2-PFHxS	N/A
5	Yes	Yes
6	16O2-PFHxS	
7	M3PFBS	M8PFOS
8	Yes	
9	MPFHxS	M8PFOS
10	PFHxS - 13C3	PFHxS-18O2
11	18O2-PFHxS	
12		M3PFHxS
13	Y	N
14	18O2_PFHxS.IS	
15	Yes	Yes
16	M3_PFHxS	
17	Yes	No
18	[13C3]-PFHxS	[13C3]-PFHxS
19		
21	NT	
23	16O2-PFHxS	
24	13C4-PFOS	
25	18O2-PFHxS	N/A
27	No	
28		
29	M3PFHxS	NA
30	18O2-PFHxS	13C3-PFHxS
31	PFHxS	
32	16O2-PFHxS	-
33		No
35	yes	
36	Yes	Yes
37	18O2 PFHxS	13C2 PFOA
38	M3PFHxS	18O2 PFHxS

Table 86 Labelled Standards for PFHxS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3PFHxS	MPFDA
4	18O2-PFHxS	N/A
5		
6	NT	
7		
8	Yes	
9		
10	PFHxS - 13C3	PFHxS-18O2
11	18O2-PFHxS	
12		M3PFHxS
13	Y	N
14	18O2_PFHxS.IS	
15		
16		
17	Yes	No
18		
19		
21	PFHxS-13C3	
23	--	
24	NT	
25	18O2-PFHxS	N/A
27	YES	
28		
29	M3PFHxS	NA
30	18O2-PFHxS	13C3-PFHxS
31	NR	
32	NT	-
33		No
35	yes	
36	No	No
37	18O2 PFHxS	13C2 PFOA
38	M3PFHxS	18O2 PFHxS

Table 87 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3PFHxS	MPFDA
4	13C4-PFOS	N/A
5		
6	13C8-PFOS	
7	M3PFBS	M8PFOS
8	Yes	
9		
10	PFHxS - 13C3	PFHxS-18O2
11	N/A	
12		
13	N	N
14	13C2_8:2FTS.IS	
15		
16		
17	Yes	No
18		
19		
21	PFOS-13C4	
23	13C8-PFOS	
24	13C4-PFOS	
25	13C4-PFOS	N/A
27	YES	
28		
29	M3PFHxS	NA
30	18O2-PFHxS	13C3-PFHxS
31	PFHxS	
32	16O2-PFHxS	-
33		No
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 88 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8PFOS	MPFOS
4	13C4-PFOS	N/A
5	Yes	Yes
6	13C4-PFOS	
7	MPFOS	M8PFOS
8	Yes	
9	M4PFOS	M8PFOS
10	PFOS - 13C8	PFOS-13C4
11	13C8-PFOS	
12	MPFOS	M8PFOS
13	Y	N
14	13C8_PFOS.IS	
15	Yes	Yes
16	M8PFOS	
17	Yes	No
18	[13C4]-PFOS	[13C4]-PFOS
19		
21	PFOS-13C4	
23	13C8-PFOS	
24	13C4-PFOS	
25	13C4-PFOS	N/A
27	No	
28		
29	M8PFOS	NA
30	13C4-PFOS	13C8-PFOS
31	PFOS	
32	13C8-PFOS	-
33		No
35	yes	
36	Yes	Yes
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 89 Labelled Standards for PFOS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8PFOS	MPFOS
4	13C4-PFOS	N/A
5		
6	13C8-PFOS	
7		
8	Yes	
9		
10	PFOS - 13C8	PFOS-13C4
11	13C8-PFOS	
12	MPFOS	M8PFOS
13	Y	N
14	13C8_PFOS.IS	
15		
16		
17	Yes	No
18		
19		
21	PFOS-13C4	
23	13C8-PFOS	
24	NT	
25	13C4-PFOS	N/A
27	YES	
28		
29	M8PFOS	NA
30	13C4-PFOS	13C8-PFOS
31	PFOS	
32	NT	-
33		No
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 90 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8PFOS	MPFOS
4	NT	NT
5		
6	13C8-PFOS	
7		
8	Yes	
9		
10	PFOS - 13C8	PFOS-13C4
11	N/A	
12		
13	N	N
14	d5_N-EtFOSAA.IS	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	13C8-PFOS	
24	13C4-PFOS	
25	13C4-PFOS	N/A
27	YES	
28		
29	M8PFOS	NA
30	13C4-PFOS	13C8-PFOS
31	PFOS	
32	13C8-PFOS	-
33		No
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 91 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8PFOS	MPFOS
4	13C4-PFOS	N/A
5		
6	13C8-PFOS	
7		
8	Yes	
9		
10	PFOS - 13C8	PFOS-13C4
11	N/A	
12		
13	N	N
14	d7_N-MeFOSE.IS	
15		
16		
17	Yes	No
18		
19		
21	PFOS-13C4	
23	13C8-PFOS	
24	13C2-PFDoDA	
25	13C4-PFOS	N/A
27	YES	
28		
29	M8PFOS	NA
30	13C4-PFOS	13C8-PFOS
31	PFOS	
32	13C8-PFOS	-
33		No
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 92 Labelled Standards for PFUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	NT	NT
4	NT	NT
5		
6	NT	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	13C2_PFUdA.IS	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	13C8-PFOSA	
25	NT	NT
27	NT	
28		
29	NT	NA
30		
31	NR	
32	NT	-
33		No
35	yes	
36	No	No
37	NT	NT
38	-	-

Table 93 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	NT	NT
4	NT	NT
5		
6	NT	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	13C8-PFOSA	
25	NT	NT
27	NT	
28		
29	NT	NA
30	13C4-PFOS	13C8-PFOS
31	PFNA	
32	13C2-PFTeDA	-
33		No
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M8PFOS	MPFOS

Table 94 Labelled Standards for PFTrDS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	NT	NT
4	NT	NT
5		
6	NT	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	13C8-PFOSA	
25	NT	NT
27	NT	
28		
29	NT	NA
30		
31	NT	
32	NT	-
33		
35	yes	
36	No	No
37	NT	NT
38	-	-

Table 95 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	MPFBA	M3PFBA
4	13C4-PFBA	N/A
5		Yes
6	13C4-PFBA	
7	MPFBA	MPFDA
8	Yes	
9		
10	PFBA-13C4	PFBA-13C3
11	13C4-PFBA	
12		MPFBA
13	Y	N
14	13C4_PFBA.IS	
15		Yes
16	MPFBA	
17	Yes	No
18		
19		
21	PFBA-13C4	
23	13C4-PFBA	
24	13C4-PFBA	
25	13C4-PFBA	N/A
27	YES	
28		
29	M4PFBA	NA
30	13C4-PFBA	13C3-PFBA
31	PFBA	
32	13C4-PFBA	-
33		No
35	yes	
36	Yes	Yes
37	13C4 PFBA	13C2 PFOA
38	M4PFBA	M3PFBA

Table 96 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M5PFPeA	M3PFBA
4	13C3-PFPeA	N/A
5		Yes
6	13C5-PFPeA	
7	MPFBA	MPFDA
8	Yes	
9		
10	PFPeA - 13C5	PFBA-13C3
11	13C5-PFPeA	
12		M5PFPeA
13	N	N
14	13C5_PFPeA.IS	
15		Yes
16	M5PFPeA	
17	Yes	No
18		
19		
21	PFPeA-13C3	
23	13C5-PFPeA	
24	13C2-PFHxA	
25	13C3-PFPeA	N/A
27	YES	
28		
29	M5PFPeA	NA
30	13C4-PFPeA	13C5 -PFPeA
31	PFPeA	
32	13C5-PFPeA	-
33		No
35	yes	
36	Yes	No
37	13C5 PFPeA	13C2 PFOA
38	M5PFPeA	M2PFHxA

Table 97 Labelled Standards for PFHxA

Lab. Code	Before extraction	Before Instrument Analysis
1		
2	yes	
3	M5PFHxA	M3PFBA
4	13C2-PFHxA	N/A
5		Yes
6	13C5-PFHxA	
7	MPFHxA	MPFDA
8	Yes	
9	M2PFHxA	M8PFOA
10	PFHxA - 13C5	PFOA-13C2
11	13C2-PFHxA	
12		M5PFHxA
13	Y	N
14	13C2_PFHxA.IS	
15		Yes
16	M5PFHxA	
17	Yes	No
18		
19		
21	PFHxA-13C2	
23	13C5-PFHxA	
24	13C2-PFHxA	
25	13C2-PFHxA	N/A
27	YES	
28		
29	M5PFHxA	NA
30	13C2-PFHxA	13C5 -PFPeA
31	PFHxA	
32	13C5-PFHxA	-
33		No
35	yes	
36	Yes	Yes
37	13C2 PFHxA	13C2 PFOA
38	M5PFHxA	M2PFHxA

Table 98 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M4PFHpA	M3PFBA
4	13C4-PFHpA	N/A
5		Yes
6	13C4-PFHpA	
7	MPFHxA	MPFDA
8	Yes	
9	M4PFHpA	M8PFOA
10	PFHpA - 13C4	PFOA-13C2
11	13C4-PFHpA	
12		M4PFHpA
13	Y	N
14	13C4_PFHpA.IS	
15		Yes
16	M4PFHpA	
17	Yes	No
18		
19		
21	PFHpA-13C4	
23	13C4-PFHpA	
24	13C4-PFOA	
25	13C4-PFHpA	N/A
27	YES	
28		
29	MPFHpA	NA
30	13C3-PFHpA	13C8-PFOA
31	PFHpA	
32	13C4-PFHpA	-
33		No
35	yes	
36	Yes	No
37	13C4 PFHpA	13C2 PFOA
38	M4PFHpA	M2PFHxA

Table 99 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8PFOA	M2PFOA
4	13C4-PFOA	N/A
5		Yes
6	13C8-PFOA	
7	MPFOA	MPFDA
8	Yes	
9	M4PFOA	M8PFOA
10	PFOA - 13C4	PFOA-13C2
11	13C8-PFOA	
12		M8PFOA
13	Y	N
14	13C8_PFOA.IS	
15		Yes
16	M8PFOA	
17	Yes	No
18	[13C4]-PFOA	[13C4]-PFOA
19		
21	PFOA-13C8	
23	13C4-PFOA	
24	13C4-PFOA	
25	13C4-PFOA	N/A
27	YES	
28		
29	M8PFOA	NA
30	13C4-PFOA	13C8-PFOA
31	PFOA	
32	13C4-PFOA	-
33		No
35	yes	
36	Yes	Yes
37	13C4 PFOA	13C2 PFOA
38	M8PFOA	M2PFOA

Table 100 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M9PFNA	M2PFOA
4	13C5-PFNA	N/A
5	Yes	Yes
6	13C5-PFNA	
7	MPFOA	MPFDA
8	Yes	
9	M5PFNA	M8PFOA
10	PFNA - 13C9	PFNA-13C5
11	13C5-PFNA	
12		M9PFNA
13	Y	N
14	13C5_PFNA.IS	
15	Yes	Yes
16	M9PFNA	
17	Yes	No
18		
19		
21	PFDA-13C2	
23	13C5-PFNA	
24	13C4-PFOA	
25	13C5-PFNA	N/A
27	YES	
28		
29	M9PFNA	NA
30	13C5-PFNA	13C8-PFOA
31	PFNA	
32	13C5-PFNA	-
33		No
35	yes	
36	Yes	No
37	13C5 PFNA	13C2 PFOA
38	M9PFNA	M5PFNA

Table 101 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M6PFDA	MPFDA
4	13C2-PFDA	N/A
5		Yes
6	13C6-PFDA	
7	MPFUdA	MPFDA
8	Yes	
9	M2PFDA	M8PFOA
10	PFDA - 13C6	PFDA-13C2
11	13C6-PFDA	
12		M6PFDA
13	Y	N
14	13C6_PFDA.IS	
15		Yes
16	M6PFDA	
17	Yes	No
18		
19		
21	PFDA-13C2	
23	13C6-PFDA	
24	13C4-PFOA	
25	13C2-PFDA	N/A
27	YES	
28		
29	M6PFDA	NA
30	13C2-PFDA	13C8-PFOA
31	PFDA	
32	13C6-PFDA	-
33		No
35	yes	
36	Yes	Yes
37	13C2 PFDA	13C2 PFOA
38	M6PFDA	M2PFDA

Table 102 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M7PFUdA	MPFDA
4	13C2-PFUdA	N/A
5		Yes
6	13C2-PFUnDA	
7	MPFUdA	MPFDA
8	Yes	
9		
10	PFUdA - 13C7	PFDA-13C2
11	13C2-PFUnA	
12		M7PFUdA
13	Y	N
14	13C2_PFUdA.IS	
15		Yes
16	M7PFUdA	
17	Yes	No
18		
19		
21	PFDA-13C2	
23	13C2-PFUnDA	
24	13C2-PFUnDA	
25	13C2-PFUdA	N/A
27	YES	
28		
29	M7PFUnDA	NA
30	13C2-PFUdA	13C8-PFOA
31	PFUdA	
32	13C2-PFUnDA	-
33		No
35	yes	
36	Yes	No
37	13C2 PFudA	13C2 PFOA
38	M7PFUnDA	M2PFDA

Table 103 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Snalysis
1		
2	yes	
3	MPFDoA	MPFDA
4	13C2-PFDoDA	N/A
5		Yes
6	13C2-PFDoDA	
7	MPFUdA	MPFDA
8	Yes	
9		
10	PFDoA - 13C2	PFDA-13C2
11	13C2-PFDoA	
12		MPFDoA
13	Y	N
14	13C2_PFDoA.IS	
15		Yes
16	MPFDoA	
17	Yes	No
18		
19		
21	PFDoA-13C2	
23	13C2-PFDoDA	
24	13C2-PFDoDA	
25	13C2-PFDoDA	N/A
27	YES	
28		
29	MPFDoDA	NA
30	13C2-PFDoA	13C8-PFOA
31	PFDoA	
32	13C2-PFDoDA	-
33		No
35	yes	
36	Yes	No
37	13C2 PFDoA	13C2 PFOA
38	M2PFDoDA	M2PFDA

Table 104 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	MPFDoA	MPFDA
4	13C2-PFTeDA	N/A
5		
6	13C2-PFTeDA	
7	M2PFTeDA	MPFDA
8	Yes	
9		
10	PFTeDA - 13C2	PFDA-13C2
11	N/A	
12		
13	N	N
14	d3_MeFOSA.IS	
15		
16		
17	Yes	No
18		
19		
21	PFTeDA-13C2	
23	13C2-PFDoDA	
24	13C2-PFDoDA	
25	13C2-PFTeDA	N/A
27	YES	
28		
29	MPFDoDA	NA
30	13C2-PFDoA	13C8-PFOA
31	PFDoA	
32	13C2-PFDoDA	-
33		No
35	yes	
36	No	No
37	13C2 PFDoA	13C2 PFOA
38	Avg M2PFDoDA & M2PFTeDA	M2PFDA

Table 105 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M2PFTeDA	MPFDA
4	13C2-PFTeDA	N/A
5		Yes
6	13C2-PFTeDA	
7	M2PFTeDA	MPFDA
8	Yes	
9		
10	PFTeDA - 13C2	PFDA-13C2
11	13C2-PFTeDA	
12		M2PFTeDA
13	Y	N
14	13C2_PFTeDA.IS	
15		Yes
16	M2PFTeDA	
17	Yes	No
18		
19		
21	PFTeDA-13C2	
23	13C2-PFTeDA	
24	13C2-PFDoDA	
25	13C2-PFTeDA	N/A
27	YES	
28		
29	MPFTeDA	NA
30	13C2-PFTeDA	13C8-PFOA
31	PFTeDA	
32	13C2-PFTeDA	-
33		No
35	yes	
36	Yes	No
37	13C2 PFTeDA	13C2 PFOA
38	M2PFTeDA	M2PFDA

Table 106 Labelled Standards for PFODA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M8FOSA-I	MPFOS
4	NT	NT
5		
6	NT	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	PFHxDA-13C2	
23	13C8-FOSA	
24	13C2-PFDoDA	
25	NT	NT
27	NT	
28		
29	NT	NA
30		
31	NT	
32	NT	-
33		
35	yes	
36	No	No
37	13C2 PFHxDA	13C2 PFOA
38	-	-

Table 107 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M8FOSA-I	MPFDA
4	13C8-FOSA	N/A
5		Yes
6	13C8-FOSA	
7	M8FOSA	MPFDA
8	Yes	
9		
10	PFOSA - 13C8	PFOS-13C4
11	13C8-FOSA	
12		M8-FOSA
13	Y	N
14	13C8_PFOSA.IS	
15		Yes
16	M8FOSA	
17	Yes	No
18		
19		
21	PFOSA-13C8	
23	d3-MeFOSA	
24	13C8-PFOSA	
25	13C8-FOSA	N/A
27	YES	
28		
29	MPFOSA	NA
30	13C8-FOSA	
31	PFOSA	
32	13C8-FOSA	-
33		No
35	yes	
36	Yes	No
37	13C8 FOSA	13C2 PFOA
38	M8PFOS	MPFOS

Table 108 Labelled Standards for 4:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M2-4:2 FTS	MPFOS
4	13C2 4:2-FTS	N/A
5		Yes
6	13C2-4:2 FTS	
7	M2 4 2 FTSA	MPFDA
8	Yes	
9		
10		
11	13C2-4-2 FTS	
12		M2-4:2FTS
13	Y	N
14	13C2_4:2 FTS.IS	
15		Yes
16	M2-4:2FTS	
17	Yes	No
18		
19		
21	4:2 FTS-13C2	
23	--	
24	13C2-6:2 FTS	
25	13C2 4:2-FTS	N/A
27	YES	
28		
29	M4:2 FTS	NA
30	13C2-4:2 FTS	
31	4:2FTS	
32	13C2-6:2 FTS	-
33		No
35	yes	
36	Yes	No
37	M2-4:2FTS	13C2 PFOA
38	M2-4:2 FTS	18O2 PFHxS

Table 109 Labelled Standards for 6:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M2-6:2 FTS	MPFOS
4	13C2,12C6 6:2-FTS	N/A
5		Yes
6	13C2-6:2 FTS	
7	M2 4 2 FTSA	MPFDA
8	Yes	
9	M2-6:2 FTS	M8PFOS
10	6:2 FTS - 13C2	PFHxS-18O2
11	13C2-6-2 FTS	
12		M2-6:2FTS
13	Y	N
14	13C2_6:2FTS.IS	
15		Yes
16	M2-6:2FTS	
17	Yes	No
18		
19		
21	6:2 FTS-13C2	
23	13C2-6:2 FTS	
24	13C2-6:2 FTS	
25	13C2,12C6 6:2-FTS	N/A
27	YES	
28		
29	M6:2 FTS	NA
30	13C2-6:2 FTS	
31	6:2FTS	
32	13C2-8:2 FTS	-
33		No
35	yes	
36	Yes	No
37	M2-6:2FTS	13C2 PFOA
38	M2-6:2 FTS	18O2 PFHxS

Table 110 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M4-8:2diPAP	M2PFOA
4	NT	NT
5		
6	13C2-8:2diPAP	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	8:2-diPAP-13C4	
23	--	
24	13C2-8:2diPAP	
25	NT	NT
27	NT	
28		
29	NT	NA
30	13C4-8:2 diPAP	
31	8:2diPAP	
32	13C2-8:2 diPAP	-
33		
35	yes	
36	No	No
37	NT	NT
38	-	-

Table 111 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2	yes	
3	M3-HFPO-DA	MPFDA
4	NT	NT
5		
6	M3HFPO-DA	
7		
8	Yes	
9		
10		
11	13C3-GenX	
12		
13	Y	N
14	NT	
15		
16	M3-HFPO-DA	
17	Yes	No
18		
19		
21	HFPO-DA-13C3	
23	--	
24	NT	
25	13C312C3HF11O3	N/A
27	NT	
28		
29	M3HFPO-DA	NA
30	13C3-GenX	
31	GenX	
32	13C3-GenX	-
33		No
35	yes	
36	No	No
37	13C3 HFPO-DA	13C2 PFOA
38	M3HFPO-DA	M2PFHxA

Table 112 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M3-HFPO-DA	MPFDA
4	NT	NT
5		
6	13C4-PFHpA	
7	MPFOA	MPFDA
8	Yes	
9		
10		
11	N/A	
12		
13	N	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	HFPO-DA-13C3	
23	--	
24	13C4-PFOA	
25	13C4-PFHpA	N/A
27	NT	
28		
29	MPFHpA	NA
30	13C3-PFHpA	13C8-PFOA
31	PFHxS	
32	13C4-PFHpA	-
33		
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M3HFPO-DA	M2PFHxA

Table 113 Labelled Standards for PFEESA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M5PFHxA	M2PFOA
4	NT	NT
5		
6	13C3-PFBS	
7		
8	Yes	
9		
10		
11	N/A	
12		
13	NT	NT
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	NT	
25	13C3-PFPeA	N/A
27	NT	
28		
29	NT	NA
30		
31	PFBS	
32	13C3-PFBS	-
33		
35	yes	
36	No	No
37	NT	NT
38	M5PFHxA	M2PFHxA

Table 114 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M3-HFPO-DA	MPFDA
4	NT	NT
5		
6	13C8-PFOS	
7		
8		
9		
10		
11	N/A	
12		
13	N	N
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	13C4-PFOS	
25	13C4-PFOS	N/A
27	NT	
28		
29	M8PFOS	NA
30	13C4-PFOS	13C8-PFOS
31	PFNA	
32	13C5-PFNA	-
33		
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M3HFPO-DA	M2PFHxA

Table 115 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M3-HFPO-DA	MPFDA
4	NT	NT
5		
6	13C8-PFOS	
7		
8		
9		
10		
11	N/A	
12		
13	N	N
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	13C2-PFDoDA	
25	13C4-PFOS	N/A
27	NT	
28		
29	MPFDoDA	NA
30	13C4-PFOS	13C8-PFOS
31	PFDoA	
32	13C5-PFNA	-
33		
35	yes	
36	No	No
37	13C4 PFOS	13C2 PFOA
38	M3HFPO-DA	M2PFHxA

Table 116 Labelled Standards for 5:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1		
2		
3	M5PFHxA	M2PFOA
4	NT	NT
5		
6	13C2-5:3FTCA	
7		
8		
9		
10		
11	N/A	
12		
13	N	N
14	NT	
15		
16		
17	Yes	No
18		
19		
21	NT	
23	--	
24	NT	
25	13C4-PFOA	N/A
27	NT	
28		
29	NT	NA
30	13C2-PFHxA	13C5 -PFPeA
31	PFOA	
32	13C4-PFOA	-
33		
35	yes	
36	No	No
37	NT	NT
38	M5PFHxA	M2PFHxA

APPENDIX 8 – ACRONYMS AND ABBREVIATIONS

10:2FTS	1H, 1H, 2H, 2H-perfluorododecane sulfonate
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
4:2FTS	1H, 1H, 2H, 2H-perfluorohexane sulfonate
5:3FTCA	2H, 2H, 3H, 3H-perfluorooctanoic acid
6:2FTS	1H, 1H, 2H, 2H-perfluorooctane sulfonate
8:2diPAP	Fluorotelomer phosphate diester
8:2FTS	1H, 1H, 2H, 2H-perfluorodecane sulfonate
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ACN	Acetonitrile
ADONA	Ammonium 4,8-dioxa-3H-perfluorononanoate
AQA	Analytical and Quality Assurance
AV	Assigned Value
CRM	Certified Reference Material
CV	Coefficient of Variation
DI	Direct Injection
EPA	Environment Protection Authority
EtFOSA	N-Ethyl perfluorooctane sulfonamide
EtFOSAA	N-Ethyl perfluorooctane sulfonamido acetic acid
EtFOSE	N-Ethyl perfluorooctane sulfonamidoethanol
FOSA	Perfluoro-1-octanesulfonamide
GenX	Ammonium 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propanoate
GUM	Guide for Uncertainty Measurement
HV	Homogeneity Value
ISO	International Standards Organisation
ISTD	Internal Standard
LC	Liquid Chromatography
LC-MSMS	Liquid Chromatography with Tandem Mass Spectrometry
LLE	Liquid-Liquid Extraction
LOR	Limit of Reporting
Max	Maximum value in a set of results
Md	Median
MeFOSA	N-Methyl perfluorooctane sulfonamide
MeFOSAA	N-Methyl perfluorooctane sulfonamidoacetic acid
MeFOSE	N-Methyl perfluorooctane sulfonamidoethanol
MeOH	Methanol
MeOH/Base	Base modified methanol
Min	Minimum value in a set of results
MS	Mass Spectrometry

MU	Measurement Uncertainty
NATA	National Association of Testing Authorities, Australia
NMI	National Measurement Institute (of Australia)
NR	Not Reported
NT	Not Tested
PCV	Performance Coefficient of Variation
PFAA	Perfluoroalkyl acids
PFAS	Per- and poly fluorinated alkyl substances
PFBA	Perfluoro-n-butanoic acid
PFBS	Potassium perfluoro-1-butanesulfonate
PFCA	Perfluorinated carboxylic acids
PFDA	Perfluoro-n-decanoic acid
PFDoA	Perfluorododecanoic acid
PFDoS	Perfluorododecane sulfonate
PFDS	Perfluorodecane sulfonate
PFECA	Perfluoroalkyl ether carboxylic acid
PFESA	Polyfluorinated ether sulfonic acid
PFHpA	Perfluoro-n-heptanoic acid
PFHpS	Perfluoroheptane sulfonate
PFHxA	Perfluoro-n-hexanoic acid
PFHxS	Potassium perfluorohexanesulfonate
PFHxS_L	Potassium perfluorohexanesulfonate linear
PFNA	Perfluoro-n-nonanoic acid
PFNS	Perfluorononane sulfonate
PFOA	Perfluorooctanoic acid
PFODA	Perfluorooctadecanoic acid
PFOS	Perfluorooctane sulfonate
PFOS_L	Perfluorooctane sulfonate linear
PFOSA	Perfluoro-1-octanesulfonamide
PFPeA	Perfluoro-n-pentanoic acid
PFPeS	Perfluoropentane sulfonate
PFSA	Perfluorosulfonic acid
PFTeDA	Perfluorotetradecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFTrDS	Perfluorotridecane sulfonate
PFUdA	Perfluoroundecanoic acid
PFUdS	Perfluoroundecane sulfonate
PT	Proficiency Test
PTFE	Polytetrafluoroethylene
Q	Quadrupole mass analyser

QC	Quality Control
QQQ	Triple Quadrupole (mass spectrometry)
QuEChERS	Quick, Easy, Cheap, Effective, Rugged and Safe extraction method
RA	Robust Average
RM	Reference Material
Robust CV	Robust Coefficient of Variation
Robust SD	Robust Standard Deviation
SD	Standard Deviation
SLE	Solid-Liquid Extraction
SPE	Solid Phase Extraction
SS	Spiked Samples
SV	Spiked or formulated concentration of a PT sample (Spike Value)
Target SD	Target standard deviation
USEPA	United States Environmental Protection Agency

END OF REPORT