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National Measurement Institute

Proficiency Test Final Report AQA 24-13 PFAS in Soil and Biosolid

February 2025

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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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TABLE OF CONTENTS

SUMMARY

This report presents the results of the proficiency test AQA 24-13 PFAS in Soil and Biosolid. This study was designed based on USEPA Method 1633 requirements and participants' requests and is focused on the measurement of 45 per- and polyfluorinated alkyl substances (PFAS): PFBS, PFPeS, total PFHxS, linear PFHxS, PFHpS, total PFOS, linear PFOS, PFNS, PFDS, PFUdS, PFDoS, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUdA, PFDoA, PFTrDA, PFTeDA, PFHxDA, PFODA, PFOSA, MeFOSA, MeFOSAA, EtFOSAA, MeFOSE, EtFOSE, 4:2FTS, 6:2FTS, 8:2FTS, 10:2FTS, 8:2diPAP, 3:3FTCA, 5:3FTCA, 7:3FTCA, GenX, ADONA, PFEESA, PFMPA, PFMBA, 9Cl-PF3ONS and 11Cl-PF3OUdS in soil and biosolid.

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

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

- two soil samples: Sample S1 with incurred PFAS contaminants, and Sample S2 spiked with 27 individual PFAS components; and
- one moist biosolid sample (S3), spiked with 24 individual PFAS analytes.

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 soil and biosolid;

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

Of 1568 z-scores, 1416 (90%) returned $|z| \leq 2.0$, indicating an acceptable performance.

Of 1567 E_n-scores, 1214 (77%) returned $|E_n| < 1.0$, indicating agreement of the participant's result with the assigned value within their respective expanded uncertainties.

Laboratory **17** reported the most results for which z-scores were calculated (78) and returned the highest number of acceptable z-scores (74). All results reported by Laboratories **32** (51), **15** (39), **6** (22), **26** (19), **34** (13), **38** (13), and **3** (3) returned acceptable z-scores.

Laboratory **35** had the highest number of acceptable E_n-scores (69). Laboratories **3**, **15**, **32**, **34** and **38** returned acceptable E_n-scores for all analytes reported that were scored.

ii. evaluate the laboratories' methods for PFAS in soil and biosolid analysis;

Measurements of PFAS analytes in the incurred soil sample S1 and biosolid sample S3 challenged more participants' analytical techniques than the spiked soil samples S2.

Seventeen laboratories reported at least one PFAS analyte that was not spiked into the test samples.

As in previous studies, the measurement of PFNS and PFDS in soil samples with high PFOS content presents difficulties to laboratories who use PFOS as their mass-labelled internal standard for these tests.

PFODA assigned value was 12.4 µg/kg. Some laboratories reported a result as less than their level of reporting (0.5 µg/kg or 0.1 µg/kg). These laboratories should review their methodology as PFODA can be lost during extraction depending on the extraction solvent composition.

Six laboratories identified and quantified PFMPA and PFMBA in the contaminated soil sample S1; their reported results were in relatively good agreement with each other. This is the first time that these two tests have been present in the soil sample and got reported.

3:3FTCA and 7:3FTCA were introduced for the first time in a NMI PT study. A small number of laboratories reported results for these tests; all performed acceptably for each analyte, with the exception of one laboratory.

This is the first time that participants' performance in measuring PFAS in a biosolid matrix has been assessed. PFDS, PFDoA, PFTrDA, 8:2diPAP, GenX and 11ClPF3OUdS were the tests which most challenged participants' analytical techniques in this matrix.

The most popular method used for the biosolid sample analysis consisted of: SLE extraction, a sample size of 5 g, methanol base as extraction solvent, an extraction temperature of 40°C and SPE cleanup followed by LC-MS/MS determination.

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 analytes in soil. Of the 52 results for which a z-score was calculated, 40 (77%) returned an acceptable z-scores. The present study includes 63 tests (over the two soil samples), and has had 1277 numerical results reported for which a z-score was calculated; of these, 1173 (92%) returned acceptable z-scores.

There was no consensus for PFNS and PFDS results in Sample S1 highlighting that participants still have difficulties to measure these analytes in soil samples with high PFOS content.

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 1689 numerical results, 1544 (91%) were reported with an associated estimate of 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 0.028% to 2109% 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.

A reference material for PFAS analytes in soil (MX019) is available for sale from NMI. (https://www.industry.gov.au/national-measurement-institute/nmi-services/chemical-and-biological-measurement-services/chemical-reference-materials/matrix-reference-materials)

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 comparison.'[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 soil and biosolid matrices;
- evaluate the laboratories' test methods for PFAS in soil and biosolid;
- 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	01 July 2024
Samples dispatched	26 August 2024
Results due	07 October 2024
Interim report issued	25 October 2024
Preliminary report issued	28 October 2024

The results due date was extended to 21 October 2024 due to sample delivery delays.

2.2 Test Material Preparation

Three test samples were provided for analysis.

- Two soil samples S1 and S2 each containing 20 g:
    - Sample S1 containing incurred PFAS contaminants; and
    - Sample S2 spiked with 27 individual PFAS components.
- One biosolid sample S3 containing 20 g of autoclaved, moist biosolid spiked with 24 individual PFAS components.
- The analytical standards used for spiking these samples were purchased from Toronto Research Chemicals and Wellington Laboratories Canada.
- Details of the spiked analytes and levels are presented in Table 1 and sample preparation details in Appendix 1.

Table 1 Formulated concentrations of test samples

PFAS	S2 Soil (Spiked) µg/kg	S3 Biosolid (Spiked) µg/kg
PFBS*	3.29	7.87
PFHxS*	3.52	5.29
PFHxS_L*	3.52	5.29
PFHpS*	Not Spiked	12.1
PFOS*	5.66	11.3
PFOS_L*	4.82	10.0
PFNS*	0.511	1.61
PFDS*	10.3	37.8
PFUdS*	20.6	Not Spiked
PFBA	4.97	11.6
PFPeA	Not Spiked	4.47
PFHxA	3.21	6.45
PFHpA	Not Spiked	3.35
PFOA	6.18	11.9
PFNA	2.70	6.64
PFDA	6.08	12.5
PFTrDA	Not Spiked	22.5
PFTeDA	10.8	Not Spiked
PFODA	16.1	Not Spiked
PFOSA	5.37	7.89
MeFOSA	3.72	Not Spiked
EtFOSAA	7.25	Not Spiked
EtFOSE	7.25	Not Spiked
4:2FTS*	6.96	Not Spiked
6:2FTS*	5.09	Not Spiked
8:2FTS*	Not Spiked	7.55
10:2FTS*	Not Spiked	53.5
8:2diPAP*	10.4	58.8

PFAS	S2 Soil (Spiked) µg/kg	S3 Biosolid (Spiked) µg/kg
5:3FTCA	37.1	Not Spiked
GenX	Not Spiked	16.8
ADONA*	20.1	26.3
PFEESA	23.7	Not Spiked
9Cl-PF3ONS*	24.8	26.0
11Cl-PF3OUdS*	25.1	26.3

* Values for these analytes are the anion concentration.

2.3 Participation

Thirty-eight laboratories participated in this study, and thirty-five 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 study 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 proficiency testing studies. Participants' results gave no reason to question the homogeneity and stability of previously used analytes.

Only 65% of the spiked value was recovered for PFDS and 58% for PFTrDA in S2 (Table 97). 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 samples were received.

2.5 Sample Storage, Dispatch and Receipt

Before dispatch, soil samples were refrigerated at 4ºC, while the biosolid samples were stored frozen at -20ºC.

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/kg on an as received basis for Samples S1 and S2 (soil), and for Sample S3 (moist biosolid).
- To avoid loss of moisture, do not leave the moist biosolid sample S3 uncovered. Mix well before subsampling.
- If analyses cannot be commenced on the day of receipt, please store S1 and S2 chilled and S3 frozen.
- The PFAS analytes that may be present in the samples were given in a list. Participants could elect not to test for all listed analytes.
- 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 0-2500 µg/kg except for PFOS (5000-25000 µg/kg), in S2 is 0-200 µg/kg, and in S3 is 0-200 µg/kg.
- 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. 0.535 ± 0.023 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 25 October 2024.

A Preliminary Report was emailed to all participants on 28 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 with the exception of the spike values for PFOS and PFOS_L in S2. The spike values for these tests have been adjusted to include the incurred values which were determined at NMI Australia using a routine method (Table 2).

Table 2 PFOS and PFOS_L expected spike values and adjusted spike values

Sample	Analyte	Expected Spike Value	Adjusted Spike Value
S2 AQA 24-13	PFOS	4.39 ± 0.22 µg/kg	5.66 ± 0.40 µg/kg
S2 AQA 24-13	PFOS_L	3.46 ± 0.17 µg/kg	4.82 ± 0.38 µg/kg

3 PARTICIPANT LABORATORY INFORMATION

3.1 Test Methods Reported by Participants

Participants were requested to provide methodology information. Responses are presented in Appendix 6 for soil and Appendix 7 for biosolid. 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). This is presented in Tables 3 and 4 (some responses have been modified so that participants cannot be identified).

Table 3 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	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - CRM Duplicate analysis Instrument calibration	CRM Instrument calibration Laboratory bias from PT studies Recoveries of SS Standard purity	NMI Uncertainty Course
2	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
3	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - CRM Duplicate analysis	Standard purity	Eurachem/CITAC Guide
4	Coverage factor not reported	Control samples - CRM		ASTM E2254-13
6	Coverage factor not reported	Control samples - SS	CRM	Other guide document
7	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS Standard purity	ISO/GUM
8	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Duplicate analysis	Instrument calibration Standard purity	Eurachem/CITAC Guide
9	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS Duplicate analysis	Laboratory bias from PT studies Recoveries of SS	ISO/GUM
10	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported			ISO/GUM
11	Bottom Up (ISO/GUM, fish bone/cause and effect diagram) Coverage factor not reported	Control samples - RM Duplicate analysis Instrument calibration	CRM Instrument calibration Laboratory bias from PT studies Recoveries of SS	
12	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

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
13	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Duplicate analysis	Recoveries of SS	Nordtest Report TR537
14	Coverage factor not reported	Standard deviation from PT studies only		ISO/GUM
			CRM Instrument calibration	
15	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	NATA-Estimating and Reporting MU of Chemical Test Resutls
16	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - CRM Duplicate analysis	CRM Recoveries of SS	Eurachem/CITAC Guide
17[a]	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Control samples - SS Duplicate analysis Instrument calibration		Eurachem/CITAC Guide
18	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	NATA - Estimating and reporting MU of chemical test results
19	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Standard deviation from PT studies only		ISO/GUM
20	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Duplicate analysis	Recoveries of SS	Eurachem/CITAC Guide
22	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS Duplicate analysis	Instrument calibration Laboratory bias from PT studies Recoveries of SS Standard purity	
23	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Standard deviation from PT studies only		ASTM E2254-13
		Control samples - CRM		
24	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS Duplicate analysis	Instrument calibration Laboratory bias from PT studies Recoveries of SS Standard purity	
25[a]	Standard deviation of replicate analyses multiplied by 2 or 3 k = 2	Control samples - SS		Statistics and Chemometrics for Analytical Chemistry, Miller and Miller, 5th Edition
26	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
27	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - RM Duplicate analysis	CRM Standard purity	ISO/GUM

Lab. Code	Approach to Estimating MU	Information Sources for MU Estimation*		Guide Document for Estimating MU
		Precision	Method Bias	
28[a]	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Control samples - SS	Recoveries of SS	SW846
29	Top Down - reproducibility (standard deviation) from PT studies used directly Coverage factor not reported			ISO/GUM
30	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
31	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - SS	Recoveries of SS	
32	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS	Eurachem/CITAC Guide
34	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - SS	Recoveries of SS	Other Guide
35	Coverage factor not reported			
36	Top Down - precision and estimates of the method and laboratory bias k = 2	Control samples - CRM Duplicate analysis Instrument calibration	CRM Instrument calibration Recoveries of SS Standard purity	Eurachem/CITAC Guide
37	Top Down - precision and estimates of the method and laboratory bias Coverage factor not reported	Control samples - RM Duplicate analysis		Eurachem/CITAC Guide
38	Standard deviation of replicate analyses multiplied by 2 or 3 Coverage factor not reported	Control samples - CRM Instrument calibration	CRM Instrument calibration Standard purity	Nordtest Report TR537

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

Table 4 Uncertainty Estimate Additional Information

Lab Code	Approach to Estimating MU
17	Calculated uncertainty as 3 x SD of replicates
25	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
28	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 5, along with the study coordinator's response where appropriate.

Table 5 Participants' Comments

Lab Code	Participants' Comments	Study coordinator's response
27	Suggest compost type sample for future sample matrix	Thank you for your valuable feedback. We will include a compost type sample in our future PFAS studies. Can the other participants please send us their expression of interest in this matrix too?

4 PRESENTATION OF RESULTS AND STATISTICAL ANALYSIS

4.1 Results Summary

Participant results are listed in Tables 6 to 96 with resultant summary statistics: robust average, median, maximum, minimum, robust standard deviation (SD_{rob}) and robust coefficient of variation (CV_{rob}). Bar charts of results and performance scores are presented in Figures 2 to 92. An example chart with interpretation guide is shown in Figure 1.

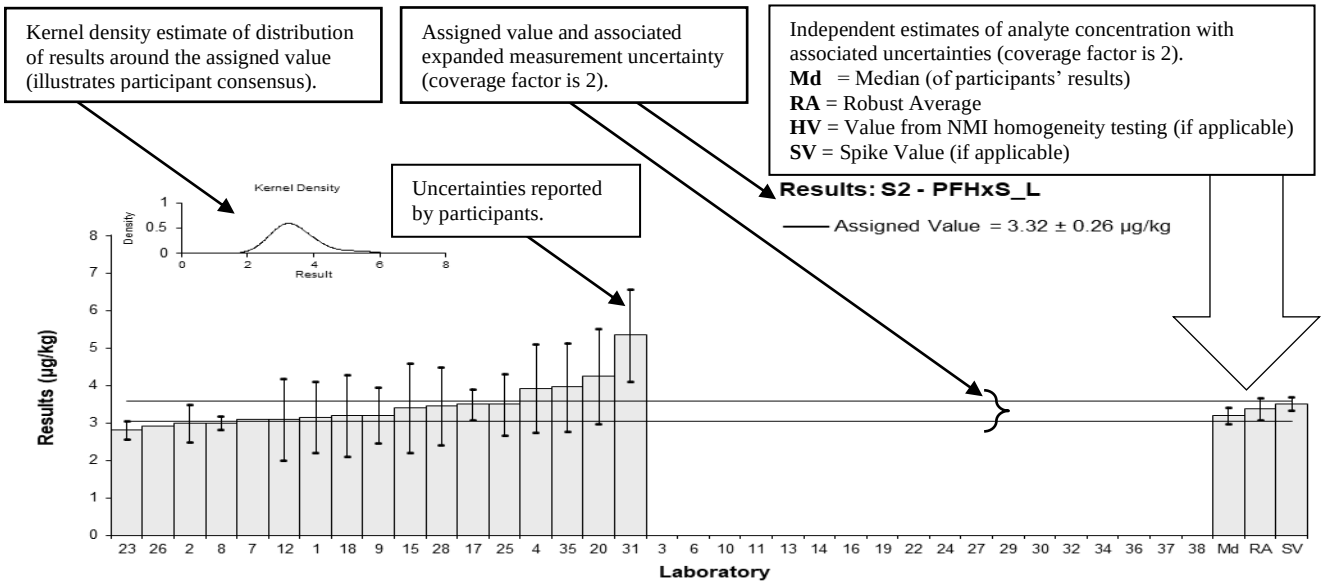


Figure 1 Guide to Presentation of Results

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.[4, 5]

4.3 Assigned Value

An example of the assigned value calculation using data from the present study is given in Appendix 2. The assigned value is defined as 'the value attributed to a particular property of a proficiency test item'.[1] In this study the property is the mass fraction of analyte. Assigned values were the robust average of participants' results; outliers removed; the expanded uncertainties were estimated from the associated robust standard deviations. [4, 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 comparisons, ISO13528.[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 ISO13528.[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.

$\sigma = (X) \times PCV$ 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 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:

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

where:

z is z-score;
χ is participants' result;
X is the study assigned value;
σ is the target standard deviation.

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.

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:

$$E_n = \frac{(\chi - X)}{\sqrt{U_\chi^2 + U_X^2}}$$ 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[7] must establish and demonstrate the traceability and measurement uncertainty associated with their test results. Guidelines for quantifying uncertainty in analytical measurement are described in the Eurachem/CITAC Guide.[8]

5 TABLES AND FIGURES

Table 6

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFBS
Unit	µg/kg

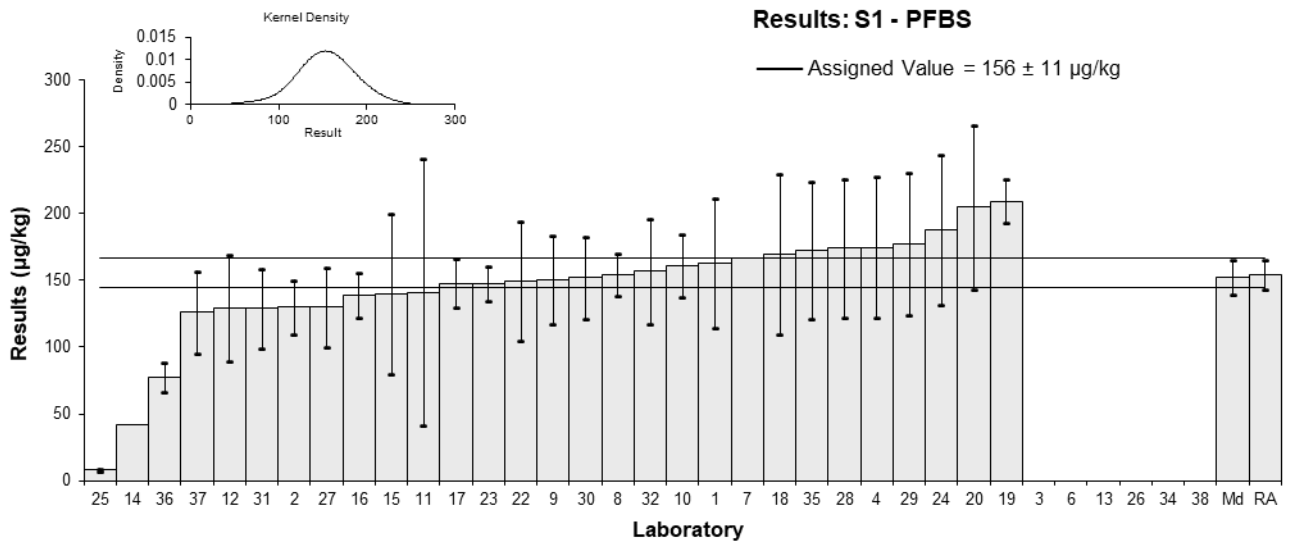
Participant Results

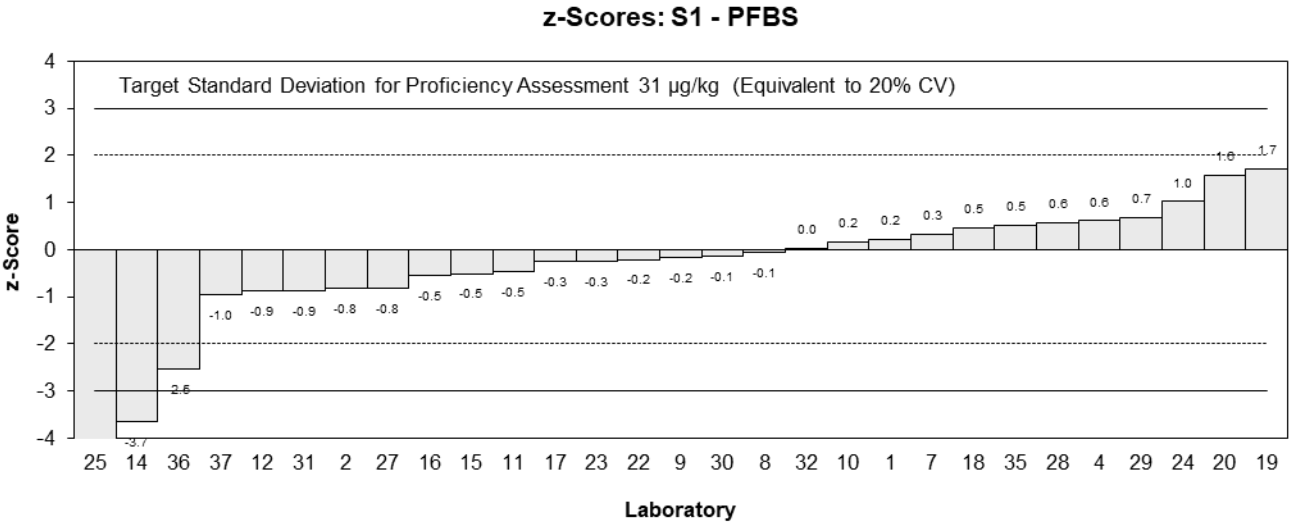
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	162.82	48.85	75	0.22	0.14
2	130	20	109	-0.83	-1.14
3	NS	NS	NS		
4	174.90	52.47	144	0.61	0.35
6	NS	NS	NS		
7	166.31	NR	106	0.33	0.94
8	154	16	76	-0.06	-0.10
9	150.39994954	33.087988899	77.336439806	-0.18	-0.16
10	161	23.35	78	0.16	0.19
11	141	100	86	-0.48	-0.15
12	129	40	95	-0.87	-0.65
13	NS	NS	NS		
14**	42.02	NR	113.37	-3.65	-10.36
15	140	60	103	-0.51	-0.26
16	139	16.54	98.15	-0.54	-0.86
17	148	18.6	99	-0.26	-0.37
18	170	60	96	0.45	0.23
19	209.50	16.2	62	1.71	2.73
20	205	61.5	NR	1.57	0.78
22	149.6	44.88	100	-0.21	-0.14
23	148	13	NR	-0.26	-0.47
24	187.7	56.31	102	1.02	0.55
25**	7.9	0.89	50	-4.75	-13.42
26	NT	NT	NT		
27	130	30	107	-0.83	-0.81
28	174	52.2	89	0.58	0.34
29	177.10	53.13	95	0.68	0.39
30	152	31	69.11	-0.13	-0.12
31	129	29.7	107	-0.87	-0.85
32	157	39.25	102	0.03	0.02
34	NS	NS	NS		
35	172.35	51.705	98	0.52	0.31
36*	77	11	185	-2.53	-5.08
37	126.35	30.7	92	-0.95	-0.91
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	156	11
Spike Value	Not Spiked	
Robust Average	154	11
Median	152	13
Mean	154	
N	27	
Max	209.5	
Min	77	
Robust SD	23	
Robust CV	15%	


Results: S1 - PFBS
Assigned Value = 156 ± 11 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 14 36 37 12 31 2 27 16 15 11 17 23 22 9 30 8 32 10 1 7 18 35 28 4 29 24 20 19 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFBS
Target Standard Deviation for Proficiency Assessment 31 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 36 37 12 31 2 27 16 15 11 17 23 22 9 30 8 32 10 1 7 18 35 28 4 29 24 20 19

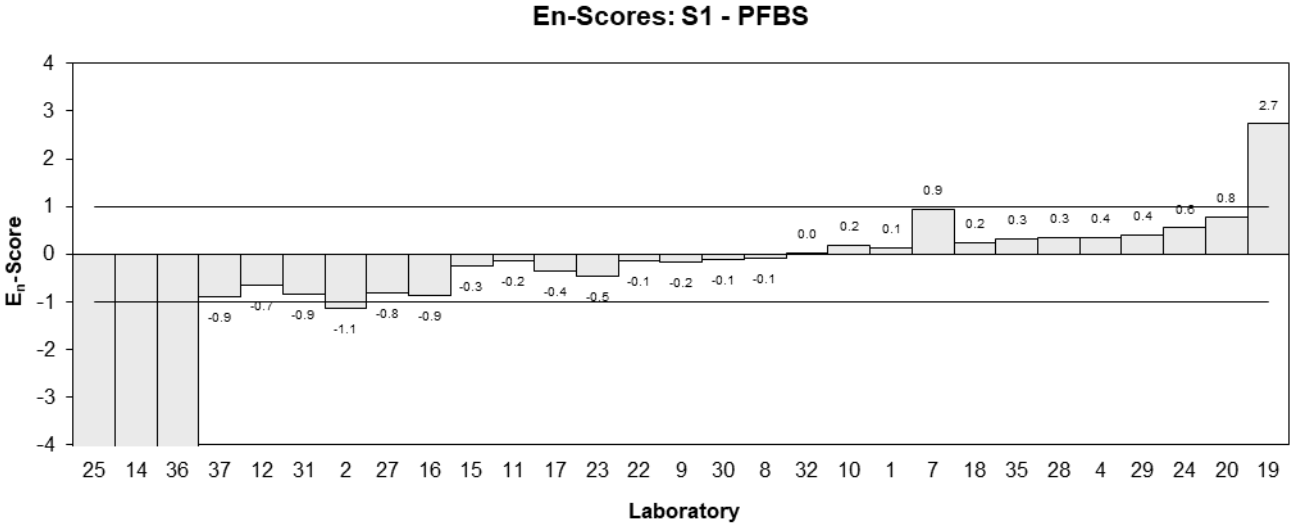

En-Scores: S1 - PFBS
En-Score
Laboratory
25 14 36 37 12 31 2 27 16 15 11 17 23 22 9 30 8 32 10 1 7 18 35 28 4 29 24 20 19

Figure 2

Table 7

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFPeS
Unit	µg/kg

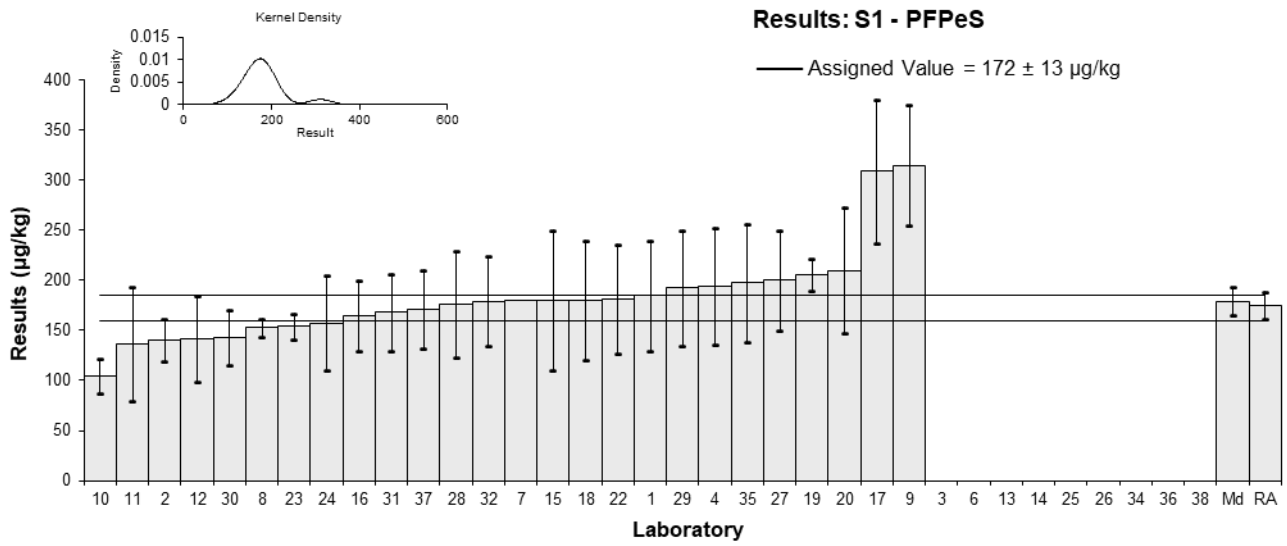
Participant Results

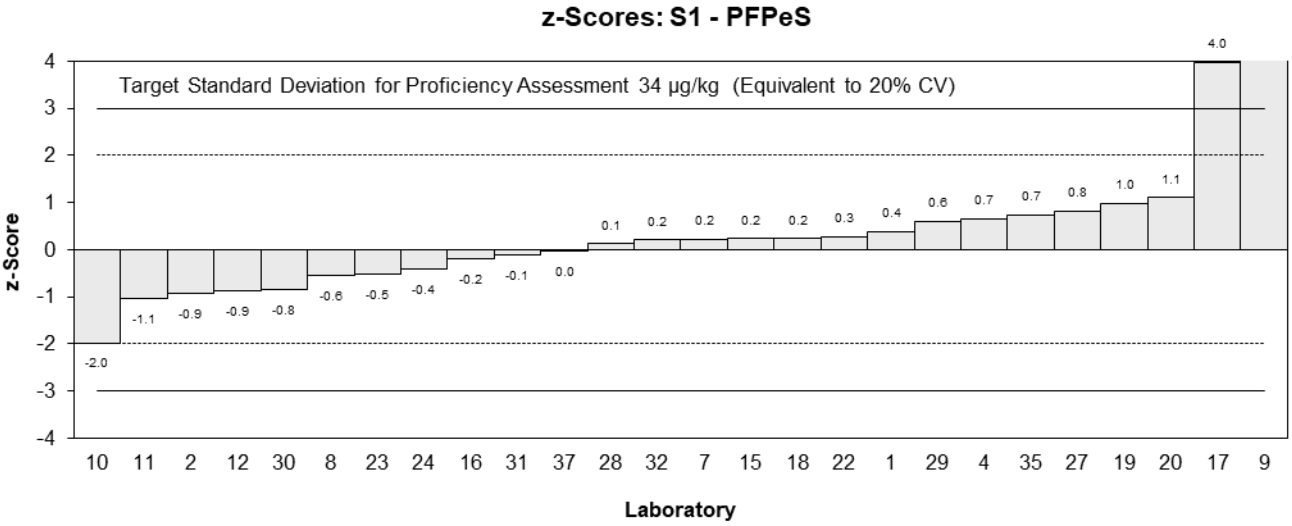
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	184.73	55.42	81	0.37	0.22
2	140	21	NR	-0.93	-1.30
3	NS	NS	NS		
4	194.57	58.37	130	0.66	0.38
6	NS	NS	NS		
7	179.72	NR	NR	0.22	0.59
8	153	8.9	80	-0.55	-1.21
9*	315.07170634	59.863624205	33.154651232	4.16	2.34
10	104	17.26	NR	-1.98	-3.15
11	136	57	86	-1.05	-0.62
12	142	43	NR	-0.87	-0.67
13	NS	NS	NS		
14	NT	NT	NT		
15	180	70	102	0.23	0.11
16	165	35.31	100.04	-0.20	-0.19
17*	309	71.8	99	3.98	1.88
18	180	60	97	0.23	0.13
19	205.70	16	62	0.98	1.63
20	210	63	NR	1.10	0.59
22	181.6	54.48	84	0.28	0.17
23	154	13	NR	-0.52	-0.98
24	157.5	47.25	135	-0.42	-0.30
25	<1.0	NR	102		
26	NT	NT	NT		
27	200	50	NR	0.81	0.54
28	176	52.8	90	0.12	0.07
29	192.59	57.78	86	0.60	0.35
30	143	28	86.13	-0.84	-0.94
31	168	38.6	107	-0.12	-0.10
32	179	44.75	74	0.20	0.15
34	NS	NS	NS		
35	197.54	59.262	98	0.74	0.42
36	NR	NR	NR		
37	170.82	39.4	81	-0.03	-0.03
38	NS	NS	NS		

* Outlier, see Section 4.2

Statistics

Assigned Value	172	13
Spike Value	Not Spiked	
Robust Average	175	14
Median	179	14
Mean	181	
N	26	
Max	315.07170634	
Min	104	
Robust SD	29	
Robust CV	16%	


Results: S1 - PFPeS
Kernel Density
Density
Result
Assigned Value = 172 ± 13 µg/kg
Results (µg/kg)
Laboratory
10 11 2 12 30 8 23 24 16 31 37 28 32 7 15 18 22 1 29 4 35 27 19 20 17 9 3 6 13 14 25 26 34 36 38 Md RA


z-Scores: S1 - PFPeS
Target Standard Deviation for Proficiency Assessment 34 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
10 11 2 12 30 8 23 24 16 31 37 28 32 7 15 18 22 1 29 4 35 27 19 20 17 9

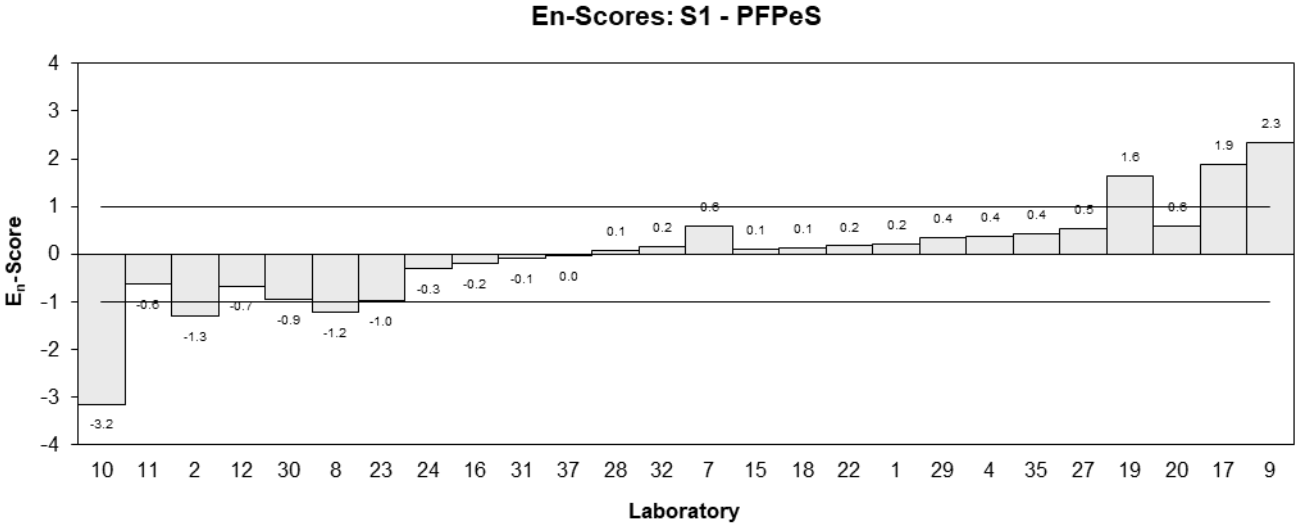

En-Scores: S1 - PFPeS
En-Score
Laboratory
10 11 2 12 30 8 23 24 16 31 37 28 32 7 15 18 22 1 29 4 35 27 19 20 17 9

Figure 3

Table 8

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFHxS
Unit	µg/kg

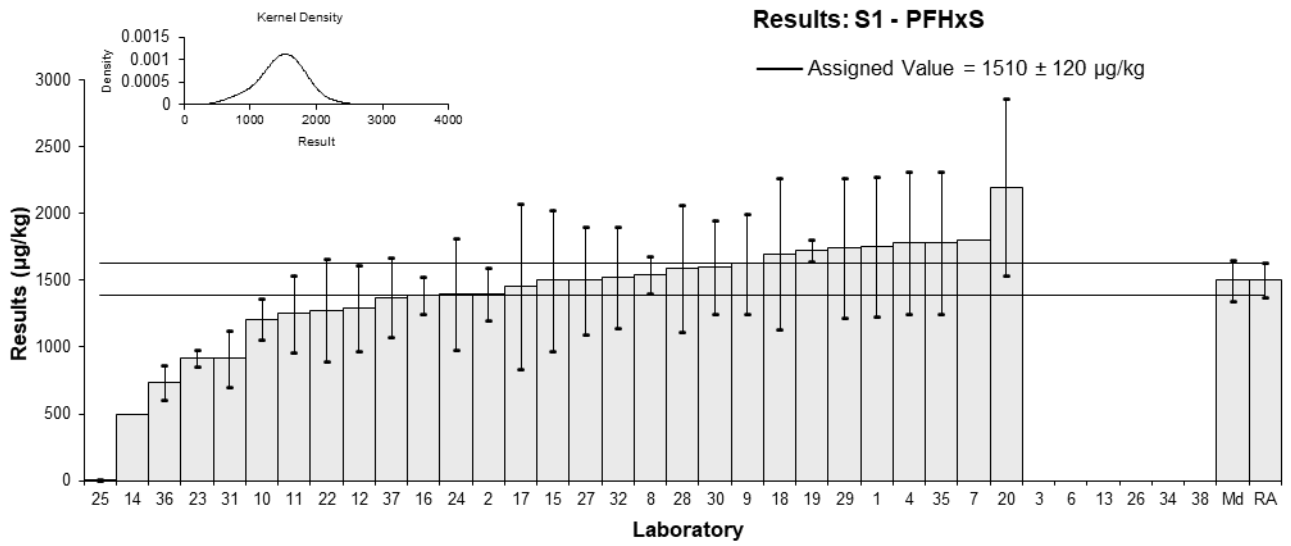
Participant Results

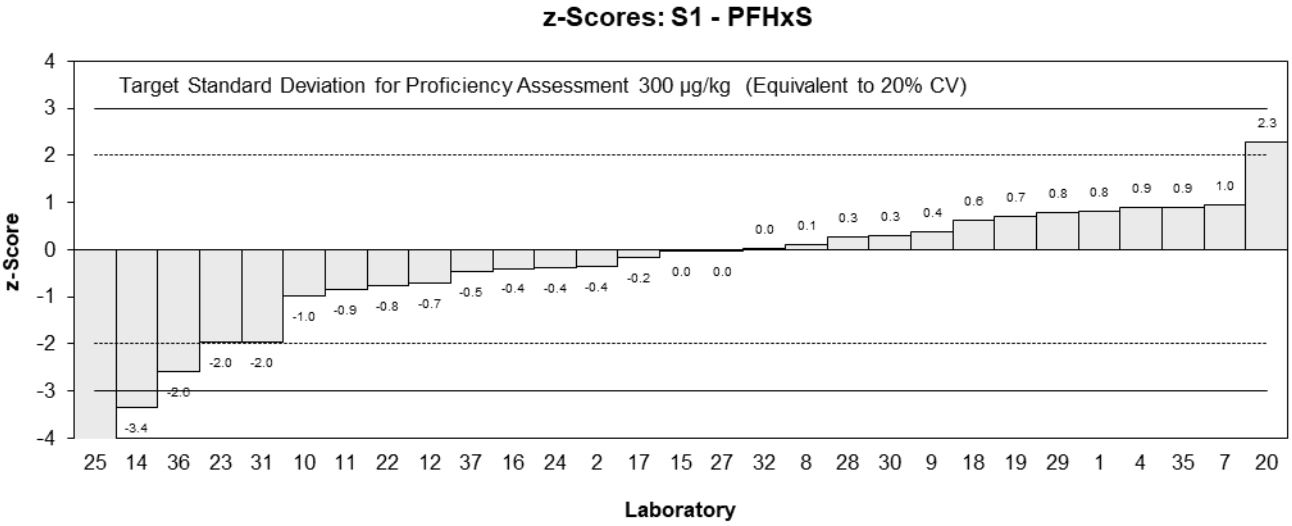
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1753.85	526.16	82	0.81	0.45
2	1400	200	111	-0.36	-0.47
3	NS	NS	NS		
4	1780.10	534.03	130	0.89	0.49
6	NS	NS	NS		
7	1800.76	NR	97	0.96	2.42
8	1540	140	80	0.10	0.16
9	1629.2113164	374.71860277	33.154651232	0.39	0.30
10	1210	153.67	91	-0.99	-1.54
11	1250	290	87	-0.86	-0.83
12	1294	324	78	-0.72	-0.63
13	NS	NS	NS		
14**	498.53	NR	109.53	-3.35	-8.43
15	1500	530	102	-0.03	-0.02
16	1390	139.55	100.04	-0.40	-0.65
17	1456	619	95	-0.18	-0.09
18	1700	570	97	0.63	0.33
19	1725.28	80.2	62	0.71	1.49
20	2200	660	NR	2.28	1.03
22	1277.6	383.28	99	-0.77	-0.58
23	917	60	NR	-1.96	-4.42
24	1396.5	418.95	99	-0.38	-0.26
25**	6.0	1.4	59	-4.98	-12.53
26	NT	NT	NT		
27	1500	400	92	-0.03	-0.02
28	1590	477	90	0.26	0.16
29	1746.61	523.98	86	0.78	0.44
30	1600	352	86.13	0.30	0.24
31	917	211	114	-1.96	-2.44
32	1520	380	113	0.03	0.03
34	NS	NS	NS		
35	1780.42	534.126	124	0.90	0.49
36*	731	130	204	-2.58	-4.40
37	1372.35	296	81	-0.46	-0.43
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1510	120
Spike Value	Not Spiked	
Robust Average	1500	130
Median	1500	150
Mean	1480	
N	27	
Max	2200	
Min	731	
Robust SD	270	
Robust CV	18%	


Kernel Density
Density
Result
Results: S1 - PFHxS
Assigned Value = 1510 ± 120 µg/kg
Results (µg/kg)
Laboratory
25 14 36 23 31 10 11 22 12 37 16 24 2 17 15 27 32 8 28 30 9 18 19 29 1 4 35 7 20 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFHxS
Target Standard Deviation for Proficiency Assessment 300 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 36 23 31 10 11 22 12 37 16 24 2 17 15 27 32 8 28 30 9 18 19 29 1 4 35 7 20

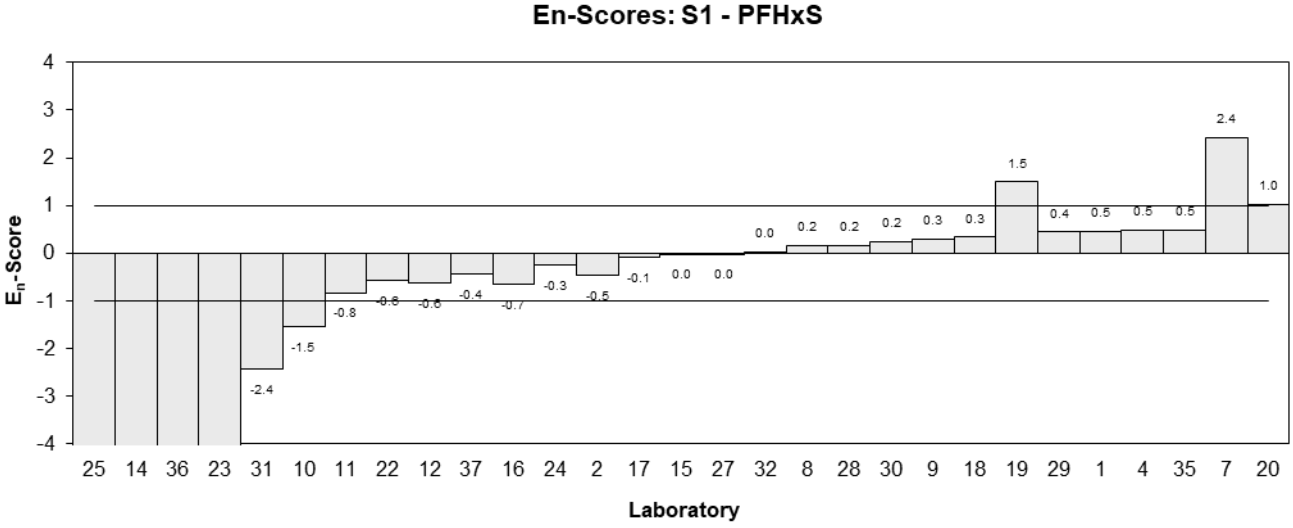

En-Scores: S1 - PFHxS
En-Score
Laboratory
25 14 36 23 31 10 11 22 12 37 16 24 2 17 15 27 32 8 28 30 9 18 19 29 1 4 35 7 20

Figure 4

Table 9

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFHxS_L
Unit	µg/kg

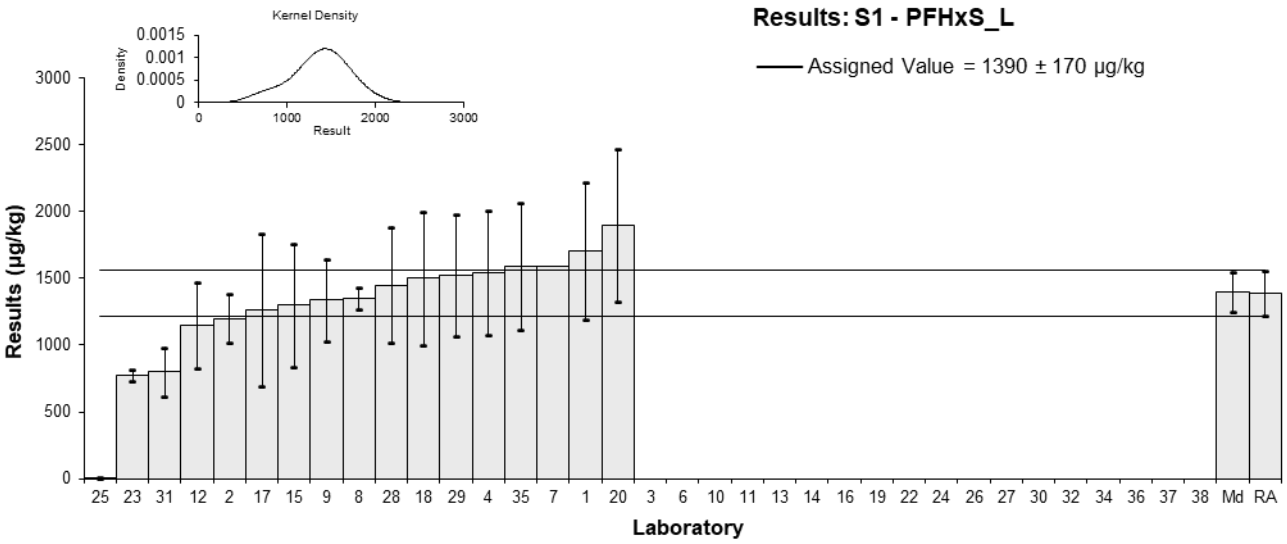
Participant Results

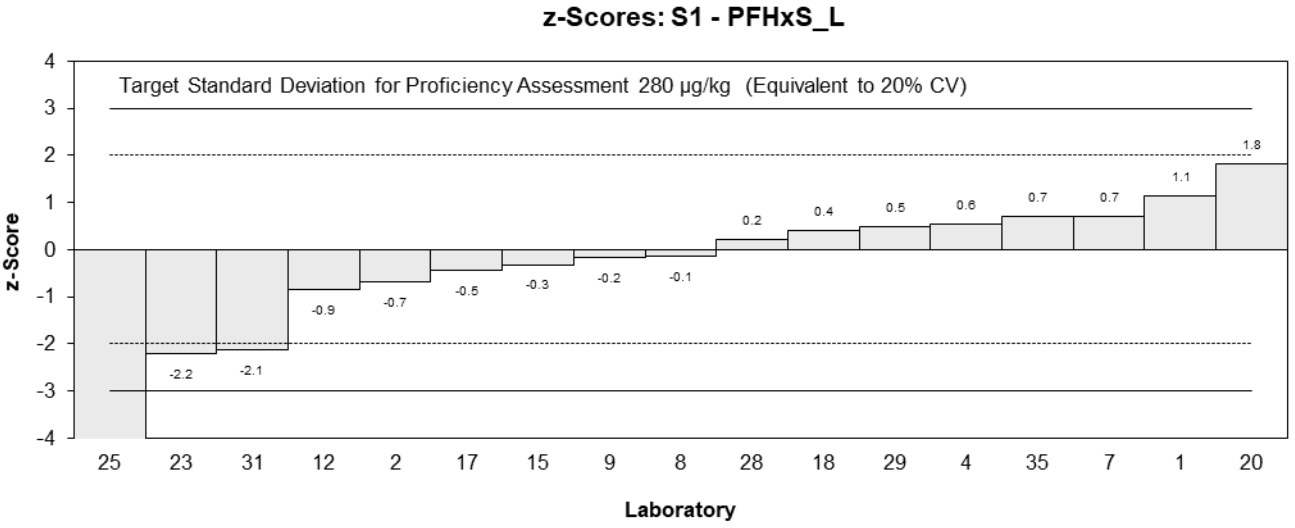
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1707.47	512.24	82	1.14	0.59
2	1200	180	NR	-0.68	-0.77
3	NS	NS	NS		
4	1543.90	463.17	130	0.55	0.31
6	NS	NS	NS		
7	1588.53	NR	97	0.71	1.17
8	1350	78	80	-0.14	-0.21
9	1339.9609810	308.19102563	33.154651232	-0.18	-0.14
10	NR	NR	NR		
11	NT	NT	NT		
12	1150	322	NR	-0.86	-0.66
13	NS	NS	NS		
14	NT	NT	NT		
15	1300	460	102	-0.32	-0.18
16	NT	NT	NT		
17	1266	569	95	-0.45	-0.21
18	1500	500	97	0.40	0.21
19	NR	NR	NR		
20	1900	570	NR	1.83	0.86
22	NT	NT	NT		
23	775	40	NR	-2.21	-3.52
24	NT	NT	NT		
25**	6.0	1.4	59	-4.98	-8.14
26	NT	NT	NT		
27	NT	NT	NT		
28	1450	435	90	0.22	0.13
29	1522.38	456.71	86	0.48	0.27
30	NT	NT	NT		
31	800	184	114	-2.12	-2.36
32	NT	NT	NT		
34	NS	NS	NS		
35	1586.66	475.998	124	0.71	0.39
36	NR	NR	NR		
37	NT	NT	NT		
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1390	170
Spike Value	Not Spiked	
Robust Average	1390	170
Median	1400	150
Mean	1370	
N	16	
Max	1900	
Min	775	
Robust SD	270	
Robust CV	19%	


Results: S1 - PFHxS_L
Assigned Value = 1390 ± 170 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 23 31 12 2 17 15 9 8 28 18 29 4 35 7 1 20 3 6 10 11 13 14 16 19 22 24 26 27 30 32 34 36 37 38 Md RA


z-Scores: S1 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 280 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 23 31 12 2 17 15 9 8 28 18 29 4 35 7 1 20
-2.2 -2.1 -0.9 -0.7 -0.5 -0.3 -0.2 -0.1 0.2 0.4 0.5 0.6 0.7 0.7 1.1 1.8

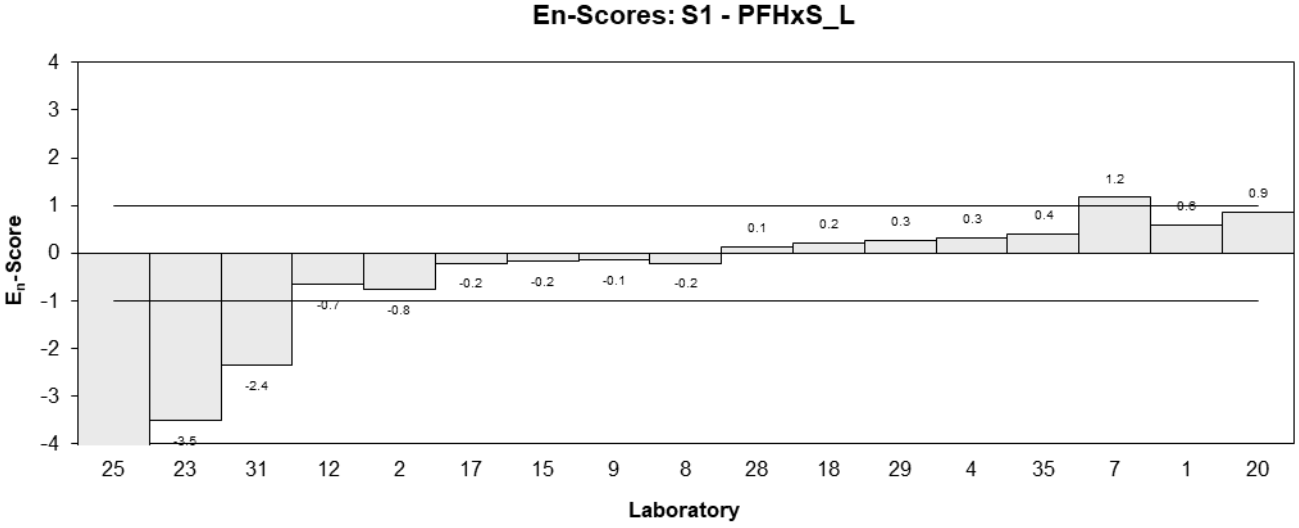

En-Scores: S1 - PFHxS_L
En-Score
Laboratory
25 23 31 12 2 17 15 9 8 28 18 29 4 35 7 1 20
-3.5 -2.4 -0.7 -0.8 -0.2 -0.2 -0.1 -0.2 0.1 0.2 0.3 0.3 0.4 1.2 0.6 0.9

Figure 5

Table 10

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFHpS
Unit	µg/kg

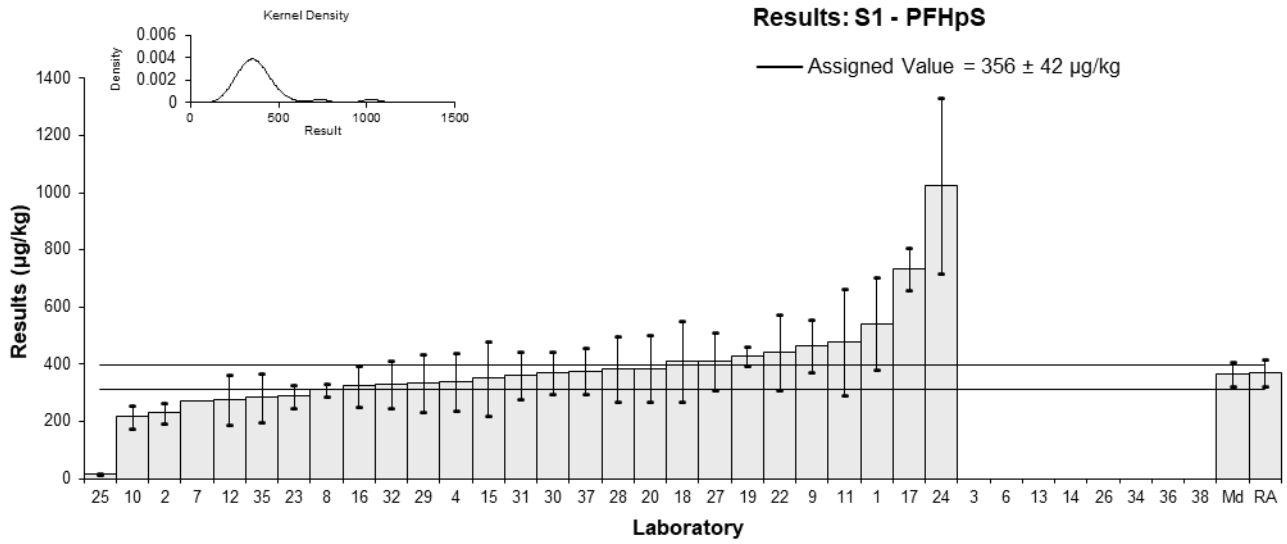
Participant Results

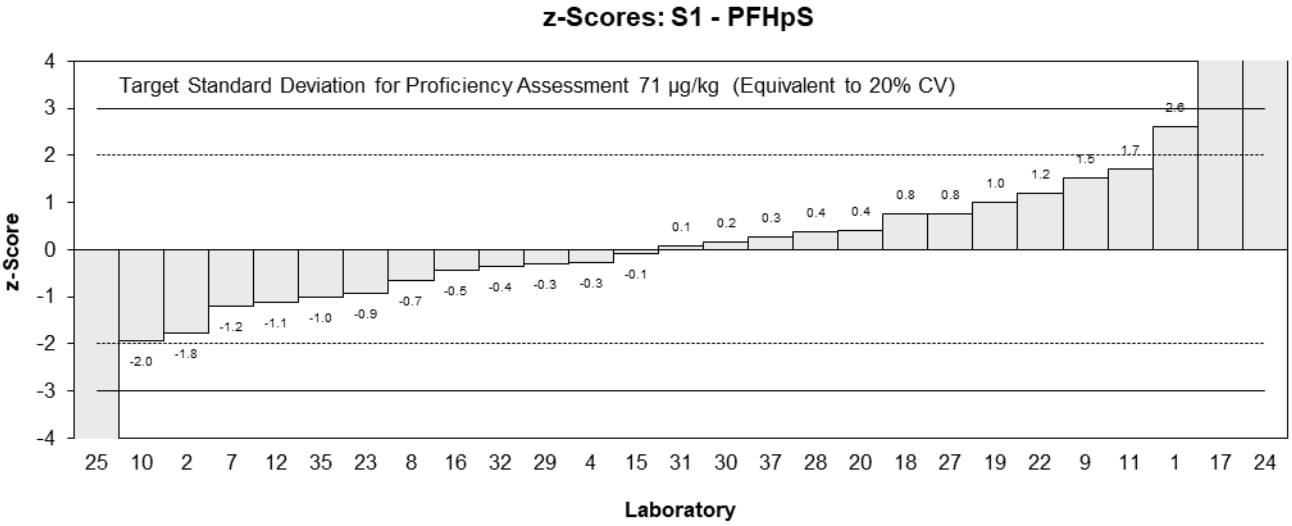
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	542.13	162.64	80	2.61	1.11
2	230	35	NR	-1.77	-2.30
3	NS	NS	NS		
4	336.72	101.02	146	-0.27	-0.18
6	NS	NS	NS		
7	270.9	NR	NR	-1.20	-2.03
8	310	24	82	-0.65	-0.95
9	464.99947588	92.999895177	33.154651232	1.53	1.07
10	217	40.36	NR	-1.95	-2.39
11	478	185	87	1.71	0.64
12	276	86	NR	-1.12	-0.84
13	NS	NS	NS		
14	NT	NT	NT		
15	350	130	107	-0.08	-0.04
16	324	70.63	97.54	-0.45	-0.39
17*	734	73.9	82	5.31	4.45
18	410	140	97	0.76	0.37
19	427.2	33.4	62	1.00	1.33
20	385	115.5	NR	0.41	0.24
22	441.5	132.45	105	1.20	0.62
23	289	40	NR	-0.94	-1.16
24*	1025	307.5	102	9.40	2.16
25**	15	2.5	59	-4.79	-8.10
26	NT	NT	NT		
27	410	100	NR	0.76	0.50
28	384	115.2	65	0.39	0.23
29	333.95	100.19	88	-0.31	-0.20
30	368	74	79.72	0.17	0.14
31	361	83	114	0.07	0.05
32	330	82.5	113	-0.37	-0.28
34	NS	NS	NS		
35	283.16	84.948	124	-1.02	-0.77
36	NR	NR	NR		
37	376.15	82	84	0.28	0.22
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	356	42
Spike Value	Not Spiked	
Robust Average	369	47
Median	365	43
Mean	398	
N	26	
Max	1025	
Min	217	
Robust SD	95	
Robust CV	26%	


Kernel Density
Density
Result
Results: S1 - PFHpS
Assigned Value = 356 ± 42 µg/kg
Results (µg/kg)
Laboratory
25 10 2 7 12 35 23 8 16 32 29 4 15 31 30 37 28 20 18 27 19 22 9 11 1 17 24 3 6 13 14 26 34 36 38 Md RA


z-Scores: S1 - PFHpS
Target Standard Deviation for Proficiency Assessment 71 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 10 2 7 12 35 23 8 16 32 29 4 15 31 30 37 28 20 18 27 19 22 9 11 1 17 24

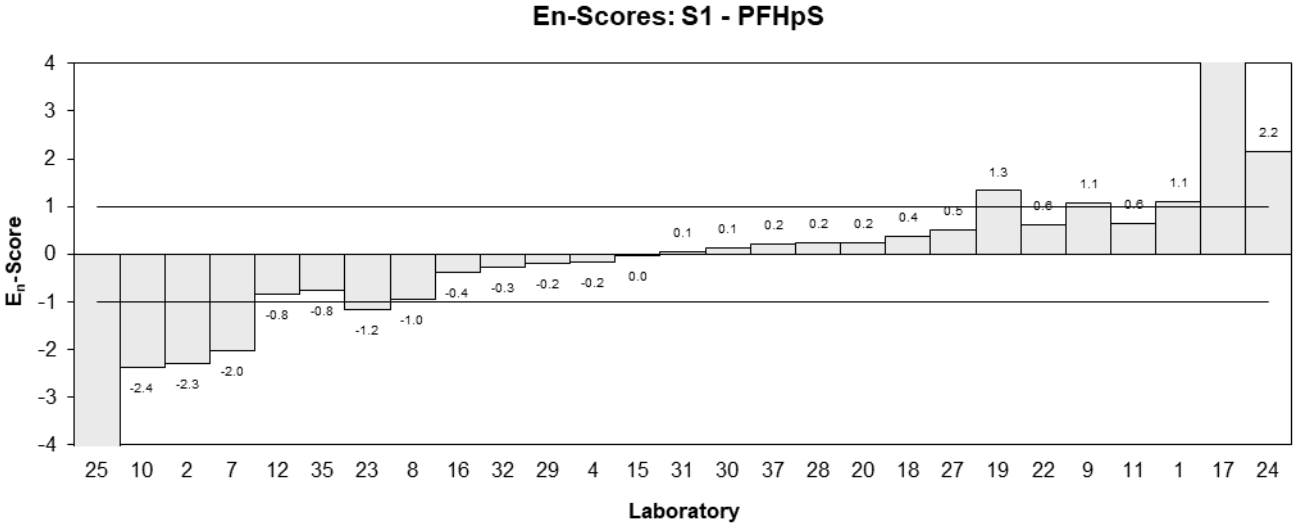

En-Scores: S1 - PFHpS
En-Score
Laboratory
25 10 2 7 12 35 23 8 16 32 29 4 15 31 30 37 28 20 18 27 19 22 9 11 1 17 24

Figure 6

Table 11

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFOS
Unit	µg/kg

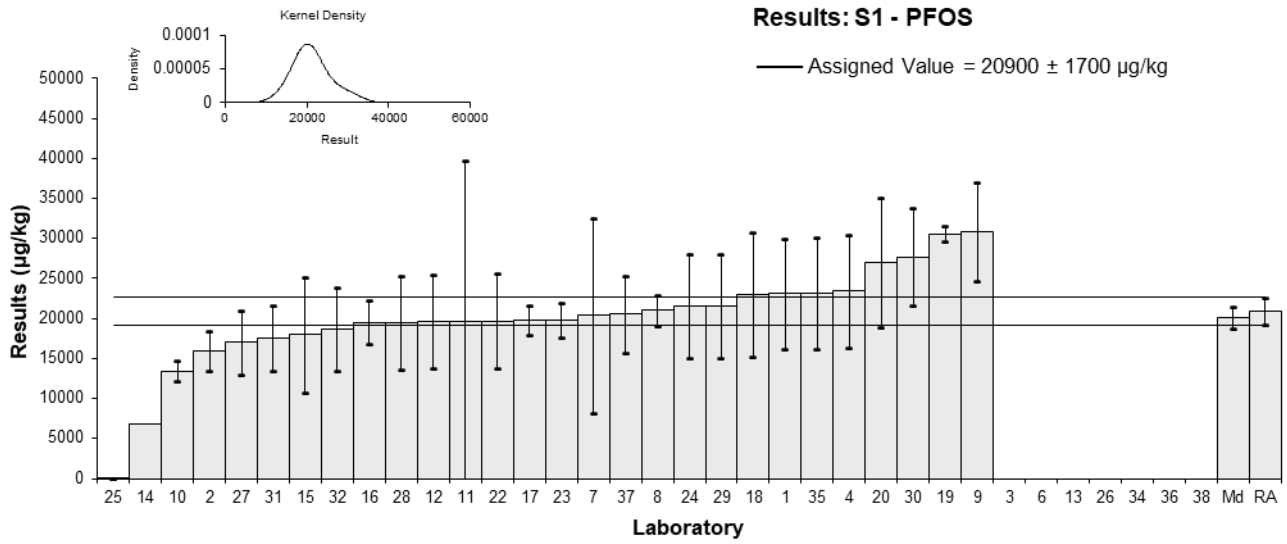
Participant Results

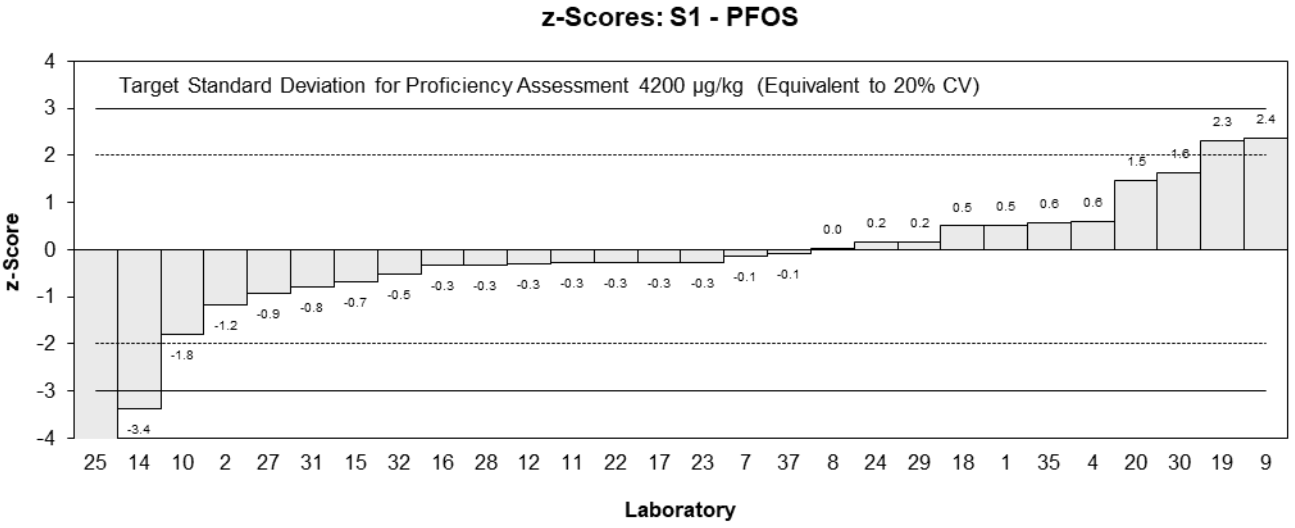
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	23077.84	6923.35	84	0.52	0.31
2	16000	2500	101	-1.17	-1.62
3	NS	NS	NS		
4	23426.10	7027.83	146	0.60	0.35
6	NS	NS	NS		
7	20367	12220	95	-0.13	-0.04
8	21000	1900	73	0.02	0.04
9	30785.990818	6157.1981636	14.338116703	2.37	1.55
10	13384	1284.86	128	-1.80	-3.53
11	19700	20000	65	-0.29	-0.06
12	19604	5881	75	-0.31	-0.21
13	NS	NS	NS		
14**	6750.5838	NR	108.13	-3.39	-8.32
15	18000	7200	107	-0.69	-0.39
16	19500	2738	97.54	-0.33	-0.43
17	19740	1850	74	-0.28	-0.46
18	23000	7700	93	0.50	0.27
19	30557	963.8	118	2.31	4.94
20	27000	8100	NR	1.46	0.74
22	19703.3	5910.99	94	-0.29	-0.19
23	19778	2200	NR	-0.27	-0.40
24	21594.5	6478.35	114	0.17	0.10
25**	13	4	83	-5.00	-12.29
26	NT	NT	NT		
27	17000	4000	82	-0.93	-0.90
28	19500	5850	90	-0.33	-0.23
29	21595.13	6478.54	88	0.17	0.10
30	27700	6040	84.37	1.63	1.08
31	17541	4034	120	-0.80	-0.77
32	18700	5236	106	-0.53	-0.40
34	NS	NS	NS		
35	23228.31	6968.493	82	0.56	0.32
36	NR	NR	NR		
37	20571	4810	84	-0.08	-0.06
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	20900	1700
Spike Value	Not Spiked	
Robust Average	20900	1700
Median	20100	1300
Mean	21200	
N	26	
Max	30785.990818	
Min	13384	
Robust SD	3400	
Robust CV	16%	


Results: S1 - PFOS
Assigned Value = 20900 ± 1700 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 14 10 2 27 31 15 32 16 28 12 11 22 17 23 7 37 8 24 29 18 1 35 4 20 30 19 9 3 6 13 26 34 36 38 Md RA


z-Scores: S1 - PFOS
Target Standard Deviation for Proficiency Assessment 4200 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 10 2 27 31 15 32 16 28 12 11 22 17 23 7 37 8 24 29 18 1 35 4 20 30 19 9

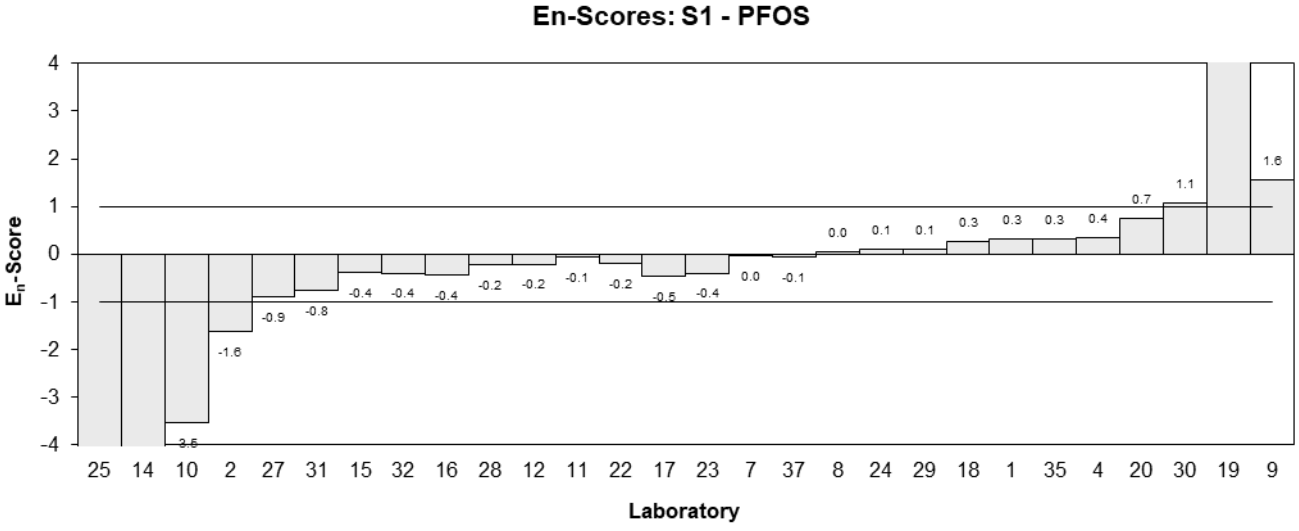

En-Scores: S1 - PFOS
En-Score
Laboratory
25 14 10 2 27 31 15 32 16 28 12 11 22 17 23 7 37 8 24 29 18 1 35 4 20 30 19 9

Figure 7

Table 12

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFOS_L
Unit	µg/kg

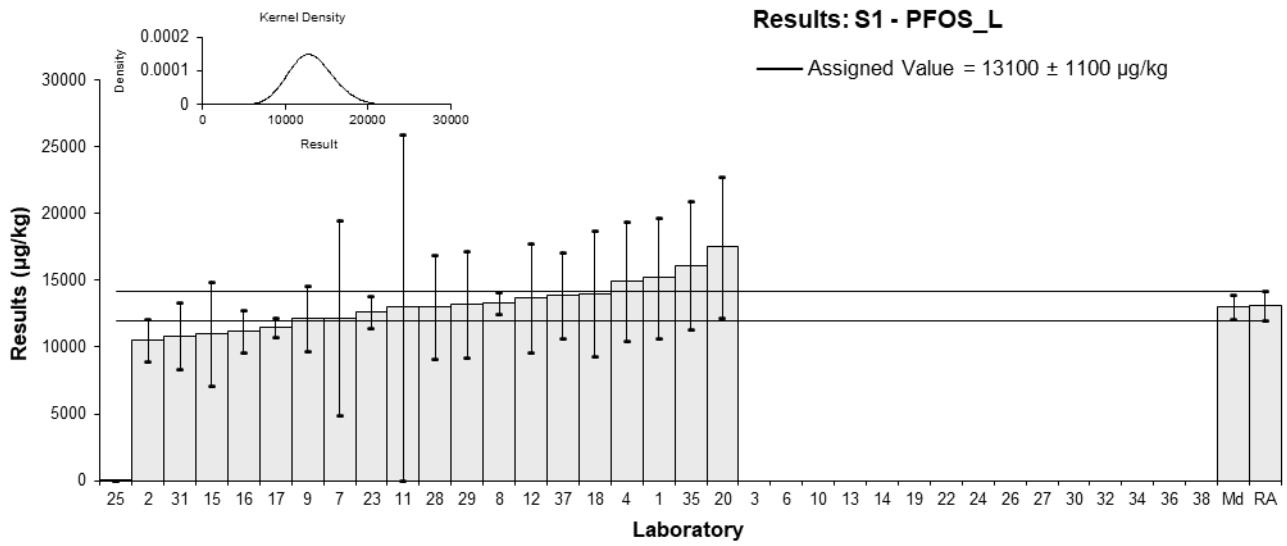
Participant Results

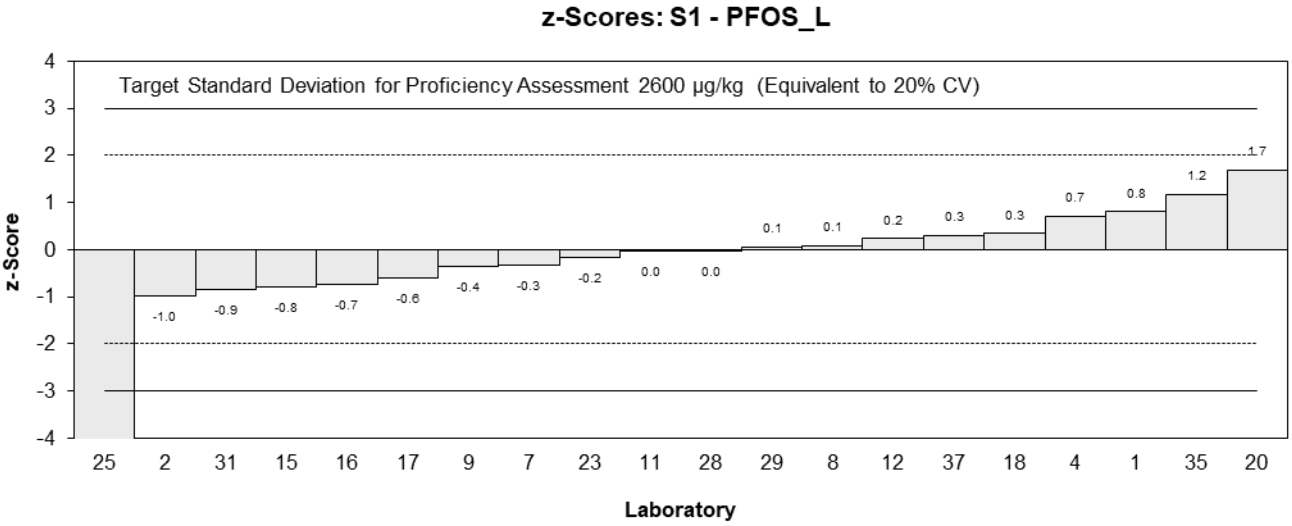
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	15189.00	4556.70	84	0.80	0.45
2	10500	1600	NR	-0.99	-1.34
3	NS	NS	NS		
4	14966.27	4489.88	146	0.71	0.40
6	NS	NS	NS		
7	12196.89	7318.13	95	-0.34	-0.12
8	13300	820	73	0.08	0.15
9	12167.730757	2433.5461515	14.338116703	-0.36	-0.35
10	NR	NR	NR		
11	13000	13000	65	-0.04	-0.01
12	13693	4108	NR	0.23	0.14
13	NS	NS	NS		
14	NT	NT	NT		
15	11000	3900	107	-0.80	-0.52
16	11200	1572	97.54	-0.73	-0.99
17	11489	751	74	-0.61	-1.21
18	14000	4700	93	0.34	0.19
19	NR	NR	NR		
20	17500	5250	NR	1.68	0.82
22	NT	NT	NT		
23	12640	1200	NR	-0.18	-0.28
24	NT	NT	NT		
25**	10	3	83	-5.00	-11.90
26	NT	NT	NT		
27	NT	NT	NT		
28	13000	3900	90	-0.04	-0.02
29	13250.45	3975.13	88	0.06	0.04
30	NT	NT	NT		
31	10848	2495	120	-0.86	-0.83
32	NT	NT	NT		
34	NS	NS	NS		
35	16146	4843.8	82	1.16	0.61
36	NR	NR	NR		
37	13880	3247	84	0.30	0.23
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	13100	1100
Spike Value	Not Spiked	
Robust Average	13100	1100
Median	13000	900
Mean	13200	
N	19	
Max	17500	
Min	10500	
Robust SD	1900	
Robust CV	14%	


Results: S1 - PFOS_L
Assigned Value = 13100 ± 1100 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 2 31 15 16 17 9 7 23 11 28 29 8 12 37 18 4 1 35 20 3 6 10 13 14 19 22 24 26 27 30 32 34 36 38 Md RA


z-Scores: S1 - PFOS_L
Target Standard Deviation for Proficiency Assessment 2600 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 2 31 15 16 17 9 7 23 11 28 29 8 12 37 18 4 1 35 20

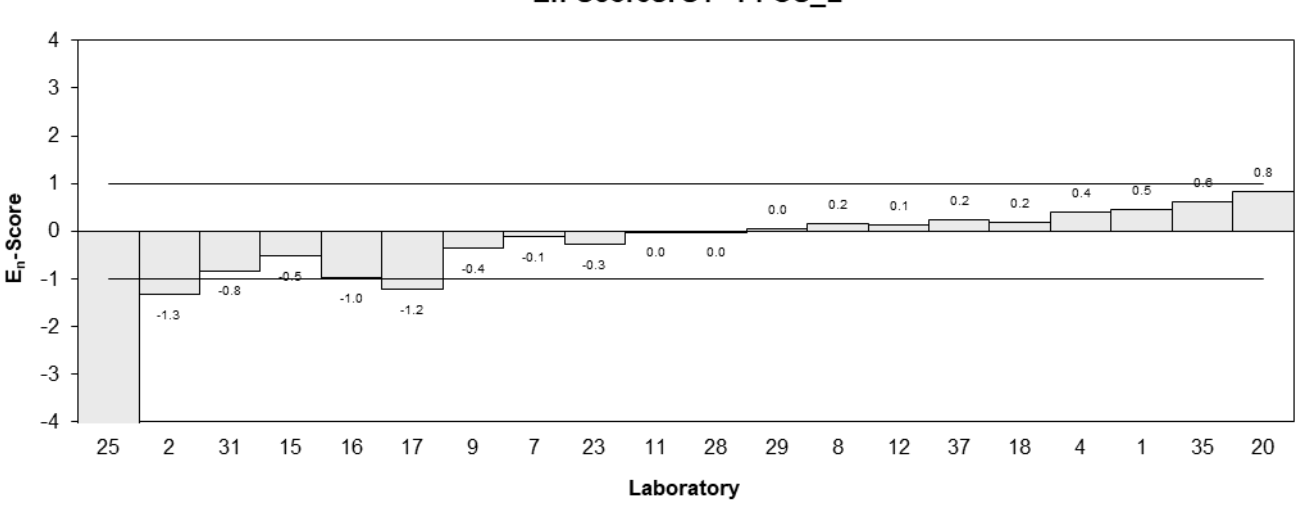

En-Scores: S1 - PFOS_L
En-Score
Laboratory
25 2 31 15 16 17 9 7 23 11 28 29 8 12 37 18 4 1 35 20

Figure 8

Table 13

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFNS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	241.63	72.49	86
2	26	4.0	NR
3	NS	NS	NS
4	266.36	74.00	146
6	NS	NS	NS
7	<1	NR	NR
8	32	2.3	88
9	91.347097716	22.836774429	14.338116703
10	25.6	6.48	NR
11	233	50	65
12	23.3	8.2	NR
13	NS	NS	NS
14	NT	NT	NT
15	NT	NT	NT
16	208	NR	97.54
17	96.5	17.7	80
18	280	90	93
19	NT	NT	NT
20	15.5	4.65	NR
22	22.9	6.87	61
23	94	32	NR
24	37.9	11.37	70
25**	1.5	0.23	83
26	NT	NT	NT
27	22	5	NR
28	22.8	6.84	65
29	265.80	79.74	92
30	265	56	79.72
31	115	26.5	120
32	268	67	80
34	NS	NS	NS
35	229.43	68.829	82
36	NR	NR	NR
37	191.35	NR	84
38	NS	NS	NS

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	134	62
Median	97	58
Mean	134	
N	23	
Max	280	
Min	15.5	
Robust SD	120	
Robust CV	89%	

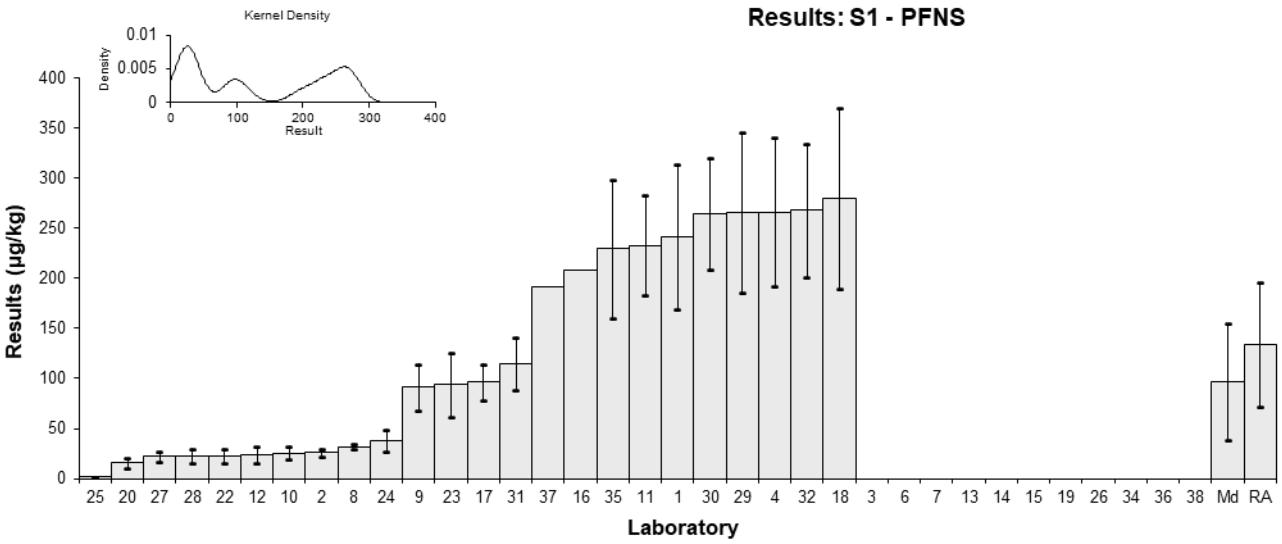

Results: S1 - PFNS
Kernel Density
Density
0.01
0.005
0
0
100
200
300
400
Result
Results (µg/kg)
400
350
300
250
200
150
100
50
0
25 20 27 28 22 12 10 2 8 24 9 23 17 31 37 16 35 11 1 30 29 4 32 18 3 6 7 13 14 15 19 26 34 36 38 Md RA
Laboratory

Figure 9

Table 14

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFDS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	98.21	29.46	82
2	25	4.0	NR
3	NS	NS	NS
4	75.40	22.64	146
6	NS	NS	NS
7	<1	NR	NR
8	26	2.1	88
9	75.971526976	18.233166474	14.338116703
10	20.4	4.94	NR
11	71	23	65
12	14.3	5	NR
13	NS	NS	NS
14	NT	NT	NT
15	68	30	107
16	82.4	12.5	97.54
17	51	17.9	80
18	97	40	93
19	NT	NT	NT
20	56.5	16.95	NR
22	17.82	5.346	31
23	34	4	NR
24	12.2	3.66	45
25**	31	7.6	83
26	NT	NT	NT
27	17	4	NR
28	18.6	5.58	65
29	80.44	24.13	92
30	63	13	79.72
31	30	6.9	120
32	86.3	21.58	80
34	NS	NS	NS
35	64.8	19.44	82
36	NR	NR	NR
37	82.75	20.8	84
38	NS	NS	NS

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	53	17
Median	60	20
Mean	52.8	
N	24	
Max	98.21	
Min	12.2	
Robust SD	33	
Robust CV	63%	

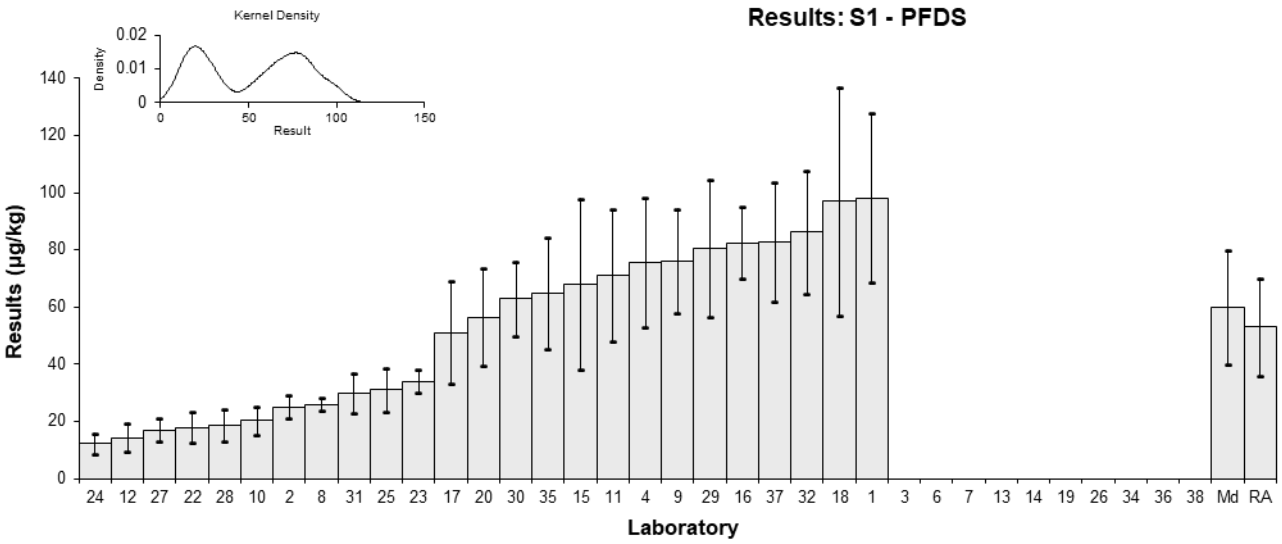

Results: S1 - PFDS
Kernel Density
Density
0.02
0.01
0
0
50
100
150
Result
Results (µg/kg)
140
120
100
80
60
40
20
0
24 12 27 22 28 10 2 8 31 25 23 17 20 30 35 15 11 4 9 29 16 37 32 18 1 3 6 7 13 14 19 26 34 36 38 Md RA
Laboratory

Figure 10

Table 15

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFDoS
Unit	µg/kg

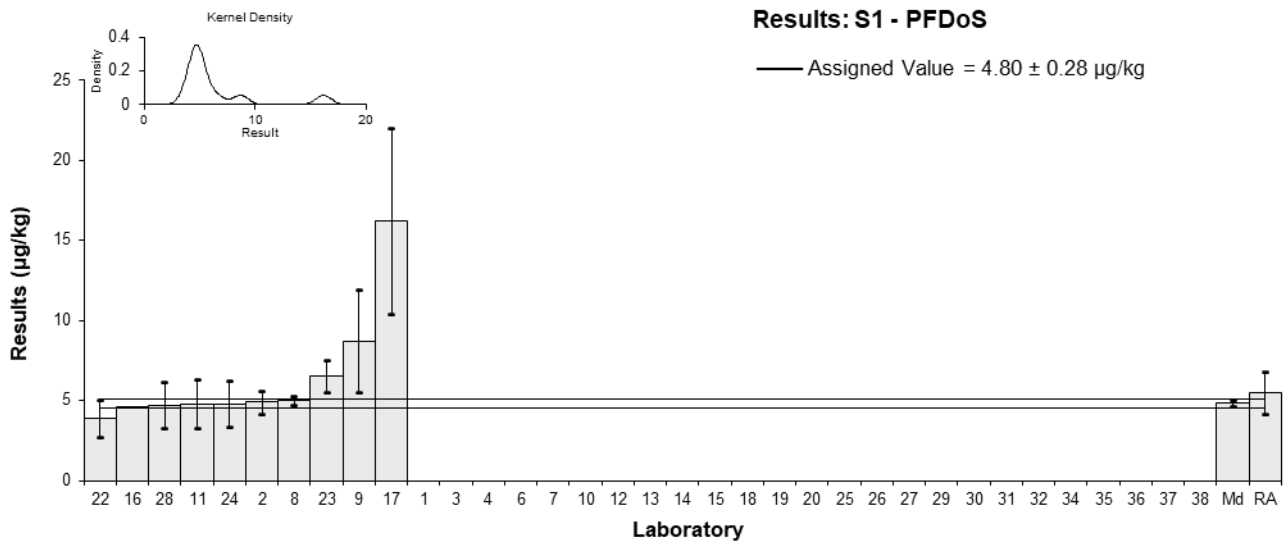
Participant Results

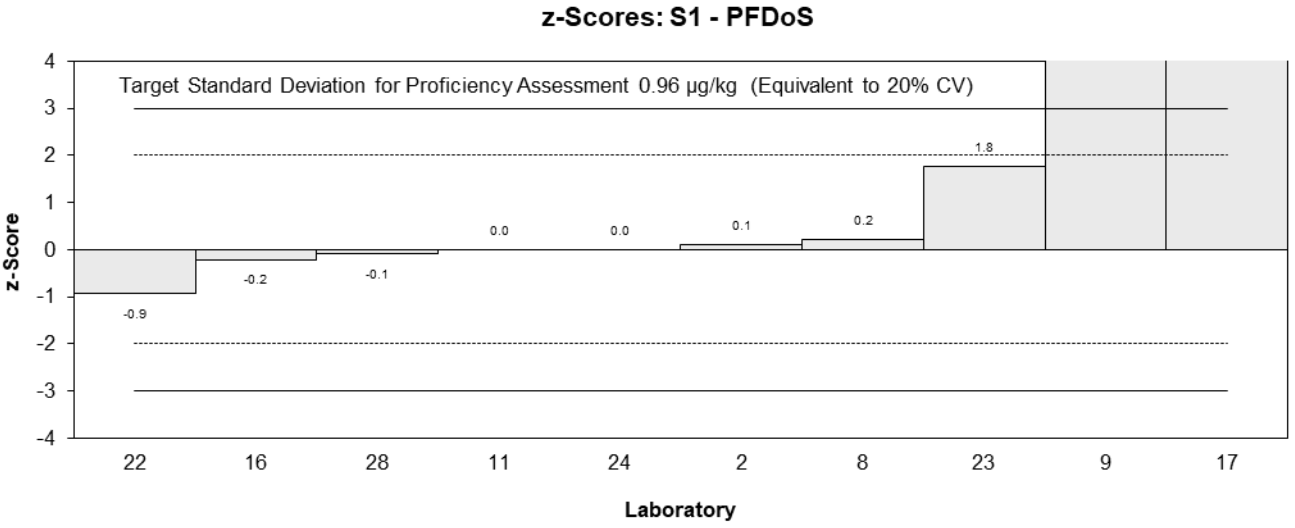
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	4.9	0.7	NR	0.10	0.13
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	<1	NR	NR		
8	5	0.25	88	0.21	0.53
9*	8.7187854469	3.2259506153	14.338116703	4.08	1.21
10	NT	NT	NT		
11	4.8	1.5	83	0.00	0.00
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	4.6	NR	93.34	-0.21	-0.71
17*	16.2	5.79	80	11.88	1.97
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
22	3.9	1.17	11	-0.94	-0.75
23	6.5	1	NR	1.77	1.64
24	4.8	1.44	30	0.00	0.00
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	4.72	1.416	65	-0.08	-0.06
29	< 5	NR	NR		
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	NT	NT	NT		
36	NR	NR	NR		
37	NT	NT	NT		
38	NS	NS	NS		

* Outlier, see Section 4.2

Statistics

Assigned Value	4.80	0.28
Spike Value	Not Spiked	
Robust Average	5.5	1.3
Median	4.85	0.23
Mean	6.41	
N	10	
Max	16.2	
Min	3.9	
Robust SD	1.6	
Robust CV	29%	


Results: S1 - PFDoS
Assigned Value = 4.80 ± 0.28 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
22 16 28 11 24 2 8 23 9 17 1 3 4 6 7 10 12 13 14 15 18 19 20 25 26 27 29 30 31 32 34 35 36 37 38 Md RA


z-Scores: S1 - PFDoS
Target Standard Deviation for Proficiency Assessment 0.96 µg/kg (Equivalent to 20% CV)
z-Score
-0.9
-0.2
-0.1
0.0
0.0
0.1
0.2
1.8
Laboratory
22 16 28 11 24 2 8 23 9 17

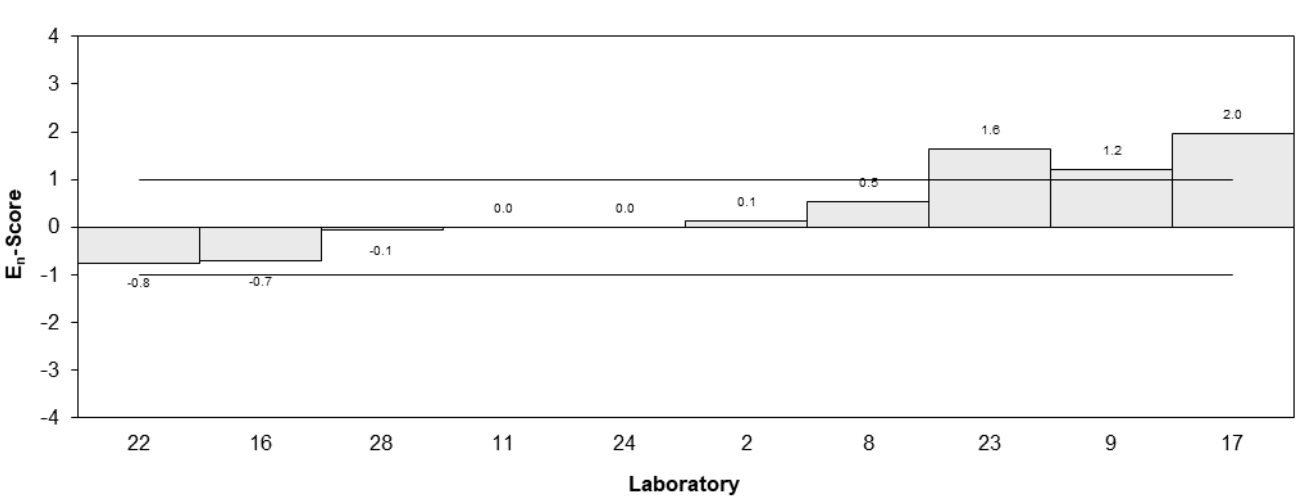

En-Scores: S1 - PFDoS
En-Score
-0.8
-0.7
-0.1
0.0
0.0
0.1
0.5
1.6
1.2
2.0
Laboratory
22 16 28 11 24 2 8 23 9 17

Figure 11

Table 16

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFBA
Unit	µg/kg

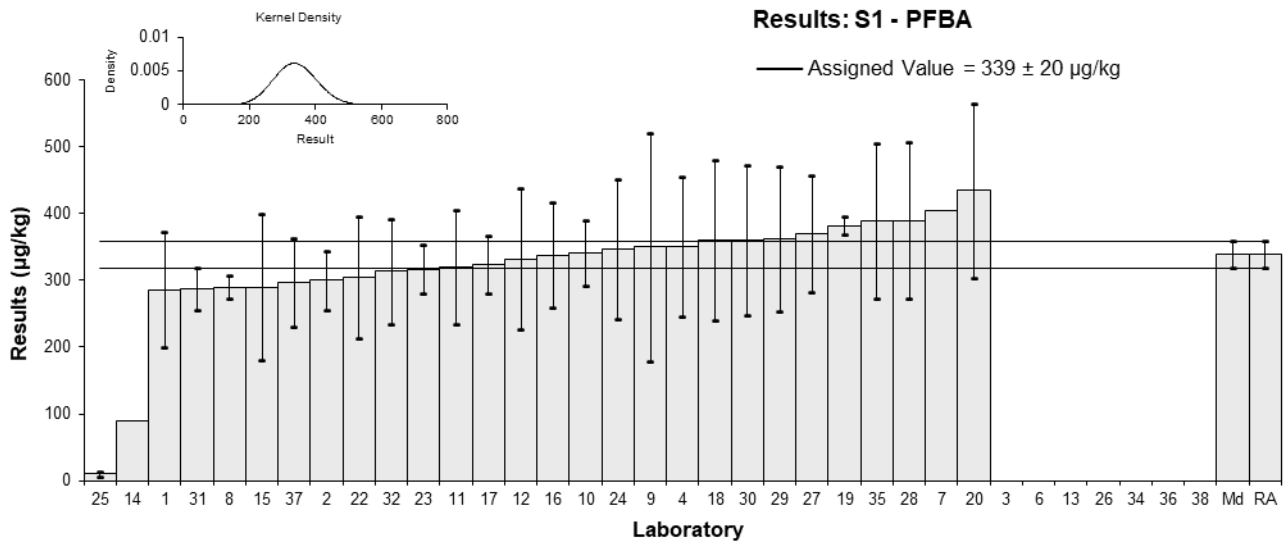
Participant Results

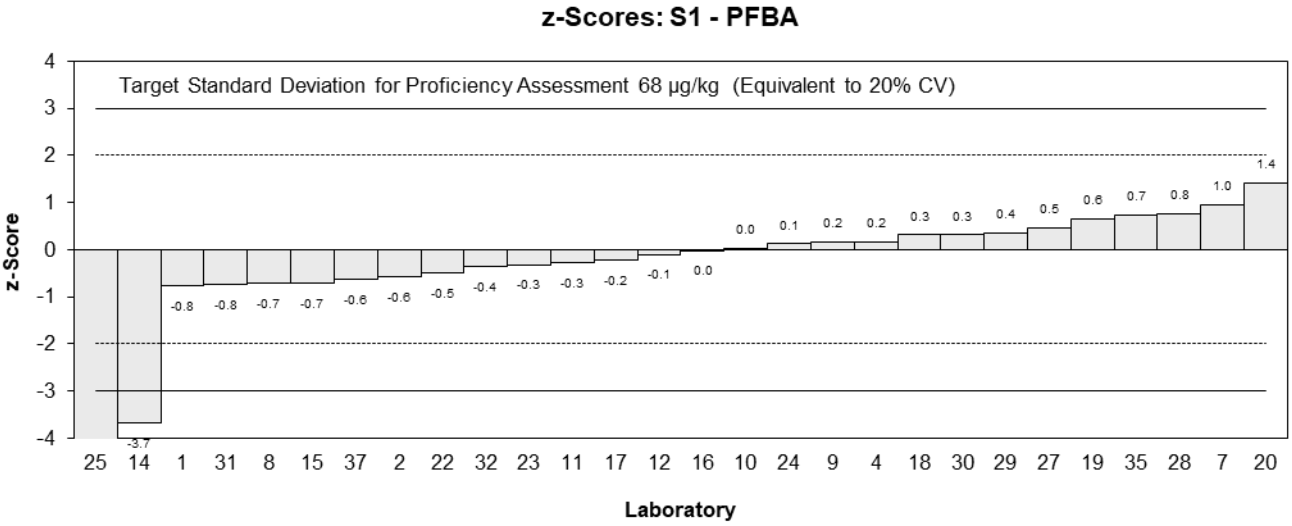
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	286.22	85.87	81	-0.78	-0.60
2	300	45	104	-0.58	-0.79
3	NS	NS	NS		
4	350.30	105.09	99	0.17	0.11
6	NS	NS	NS		
7	404.02	NR	100	0.96	3.25
8	290	17	89	-0.72	-1.87
9	350.06749185	171.53307100	20.595560317	0.16	0.06
10	341	48.76	74	0.03	0.04
11	320	85	60	-0.28	-0.22
12	332	106	93	-0.10	-0.06
13	NS	NS	NS		
14**	89.25	NR	117.00	-3.68	-12.49
15	290	110	111	-0.72	-0.44
16	338	79.1	95.54	-0.01	-0.01
17	324	42.7	95	-0.22	-0.32
18	360	120	99	0.31	0.17
19	382.12	13.12	75	0.64	1.80
20	435	130.5	NR	1.42	0.73
22	305.3	91.59	67	-0.50	-0.36
23	317	37	NR	-0.32	-0.52
24	347.2	104.16	75	0.12	0.08
25**	9.9	3.2	103	-4.85	-16.25
26	NT	NT	NT		
27	370	87	83	0.46	0.35
28	390	117	98	0.75	0.43
29	362.80	108.84	94	0.35	0.22
30	360	112	78.76	0.31	0.18
31	288	31.7	99	-0.75	-1.36
32	314	78.5	97	-0.37	-0.31
34	NS	NS	NS		
35	388.72	116.616	88	0.73	0.42
36	NR	NR	NR		
37	296.65	66.5	109	-0.62	-0.61
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	339	20
Spike Value	Not Spiked	
Robust Average	339	20
Median	340	20
Mean	340	
N	26	
Max	435	
Min	286.22	
Robust SD	42	
Robust CV	12%	


Results: S1 - PFBA
Kernel Density
Density
Result
Assigned Value = 339 ± 20 µg/kg
Results (µg/kg)
Laboratory
25 14 1 31 8 15 37 2 22 32 23 11 17 12 16 10 24 9 4 18 30 29 27 19 35 28 7 20 3 6 13 26 34 36 38 Md RA


z-Scores: S1 - PFBA
Target Standard Deviation for Proficiency Assessment 68 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 1 31 8 15 37 2 22 32 23 11 17 12 16 10 24 9 4 18 30 29 27 19 35 28 7 20

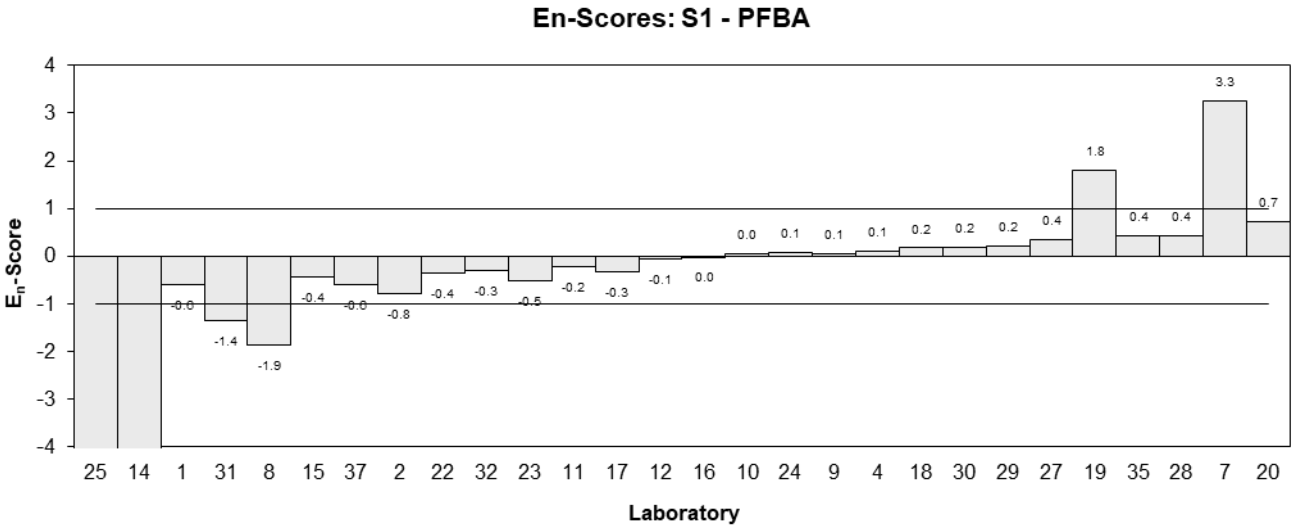

En-Scores: S1 - PFBA
En-Score
Laboratory
25 14 1 31 8 15 37 2 22 32 23 11 17 12 16 10 24 9 4 18 30 29 27 19 35 28 7 20

Figure 12

Table 17

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFPeA
Unit	µg/kg

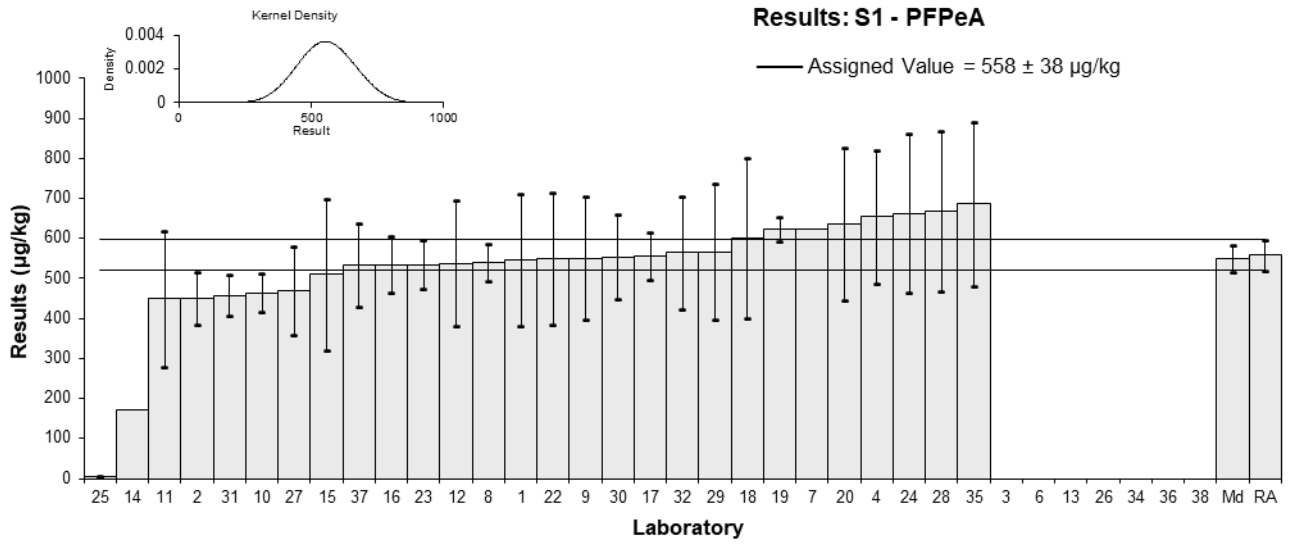
Participant Results

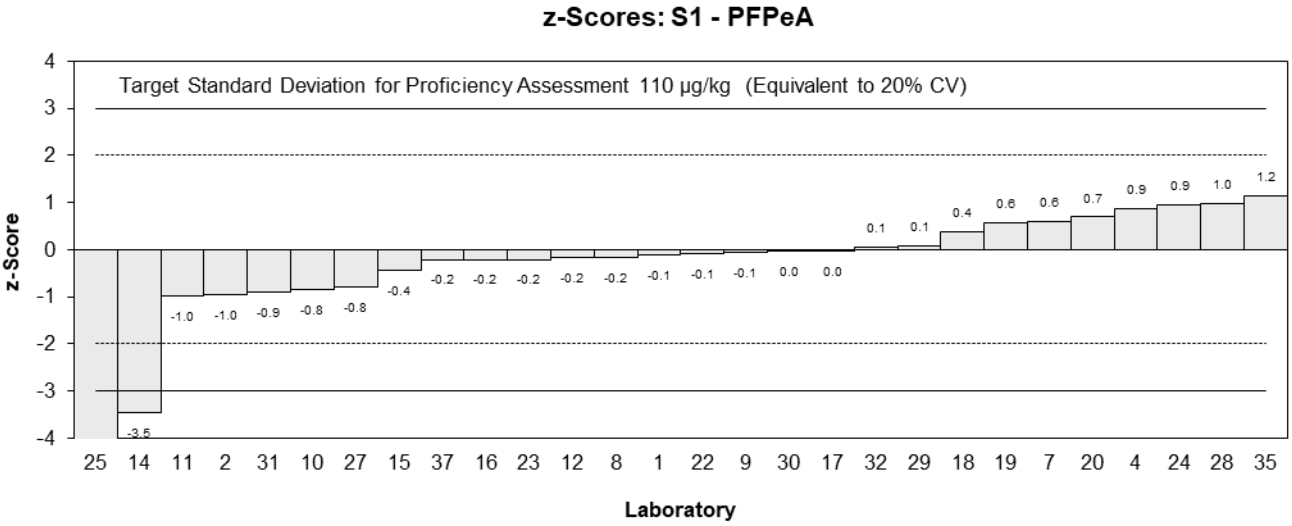
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	546.10	163.83	79	-0.11	-0.07
2	450	67	106	-0.97	-1.40
3	NS	NS	NS		
4	653.73	165.24	96	0.86	0.56
6	NS	NS	NS		
7	623.4	NR	103	0.59	1.72
8	540	45	78	-0.16	-0.31
9	550.37362957	154.10461628	44.565374131	-0.07	-0.05
10	464	48.26	89	-0.84	-1.53
11	449	170	100	-0.98	-0.63
12	538	156	87	-0.18	-0.12
13	NS	NS	NS		
14**	172.05	NR	88.49	-3.46	-10.16
15	510	190	108	-0.43	-0.25
16	535	71.3	86.26	-0.21	-0.28
17	555	59.7	93	-0.03	-0.04
18	600	200	98	0.38	0.21
19	623.18	28.88	75	0.58	1.37
20	635	190.5	NR	0.69	0.40
22	549.2	164.76	82	-0.08	-0.05
23	535	60	NR	-0.21	-0.32
24	662.9	198.87	101	0.94	0.52
25**	4.3	0.6	99	-4.96	-14.57
26	NT	NT	NT		
27	470	110	106	-0.79	-0.76
28	667	200.1	98	0.98	0.54
29	566.98	170.09	97	0.08	0.05
30	554	105	70.82	-0.04	-0.04
31	458	50.4	42	-0.90	-1.58
32	565	141.3	113	0.06	0.05
34	NS	NS	NS		
35	686.32	205.896	80	1.15	0.61
36	NR	NR	NR		
37	534.35	103.9	94	-0.21	-0.21
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	558	38
Spike Value	Not Spiked	
Robust Average	558	38
Median	550	33
Mean	559	
N	26	
Max	686.32	
Min	449	
Robust SD	78	
Robust CV	14%	


Kernel Density
Density
0.004
0.002
0
0
500
1000
Result
Results: S1 - PFPeA
Assigned Value = 558 ± 38 µg/kg
Results (µg/kg)
1000
900
800
700
600
500
400
300
200
100
0
25 14 11 2 31 10 27 15 37 16 23 12 8 1 22 9 30 17 32 29 18 19 7 20 4 24 28 35 3 6 13 26 34 36 38 Md RA
Laboratory


z-Scores: S1 - PFPeA
Target Standard Deviation for Proficiency Assessment 110 µg/kg (Equivalent to 20% CV)
z-Score
4
3
2
1
0
-1
-2
-3
-4
-3.5
-1.0 -1.0 -0.9 -0.8 -0.8 -0.4 -0.2 -0.2 -0.2 -0.2 -0.2 -0.1 -0.1 -0.1 0.0 0.0 0.1 0.1 0.4 0.6 0.6 0.7 0.9 0.9 1.0 1.2
25 14 11 2 31 10 27 15 37 16 23 12 8 1 22 9 30 17 32 29 18 19 7 20 4 24 28 35
Laboratory

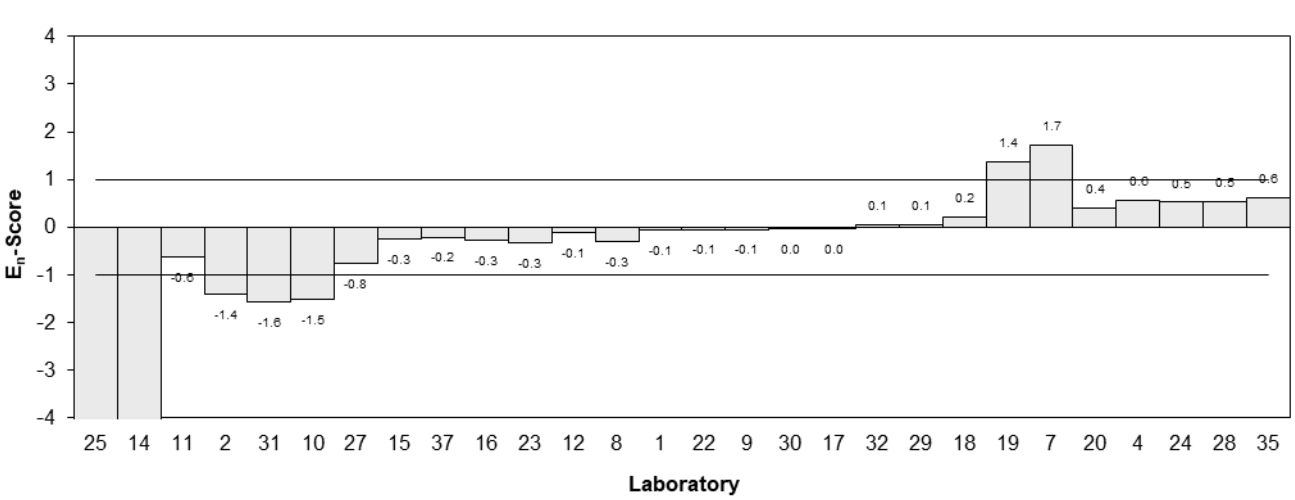

En-Scores: S1 - PFPeA
En-Score
4
3
2
1
0
-1
-2
-3
-4
-0.6 -1.4 -1.6 -1.5 -0.8 -0.3 -0.2 -0.3 -0.3 -0.1 -0.3 -0.1 -0.1 -0.1 0.0 0.0 0.1 0.1 0.2 1.4 1.7 0.4 0.6 0.5 0.5 0.6
25 14 11 2 31 10 27 15 37 16 23 12 8 1 22 9 30 17 32 29 18 19 7 20 4 24 28 35
Laboratory

Figure 13

Table 18

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFHxA
Unit	µg/kg

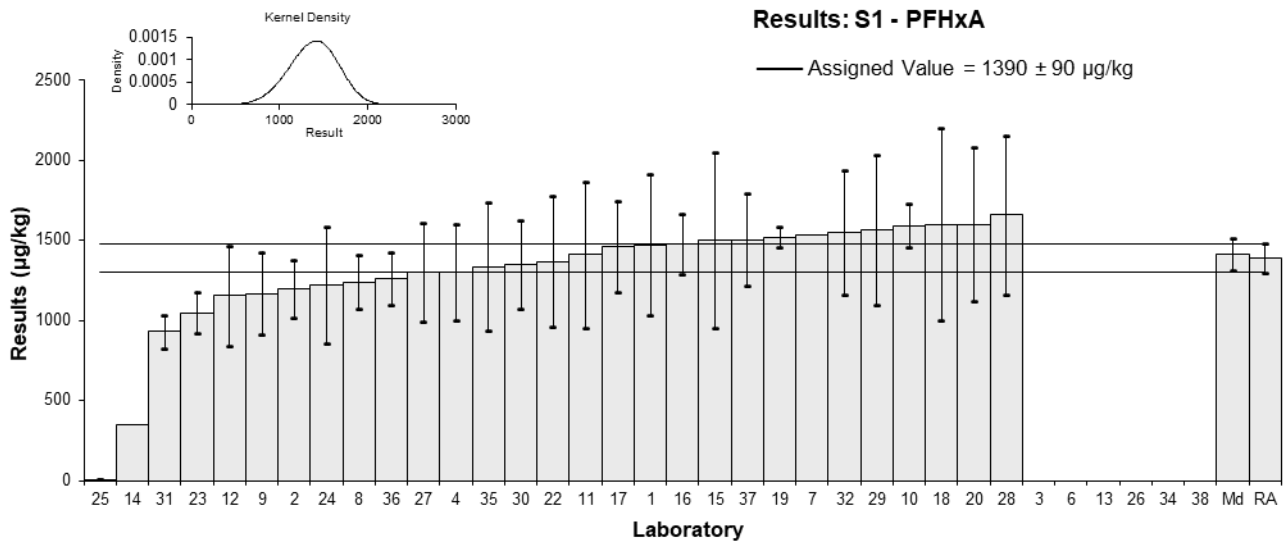
Participant Results

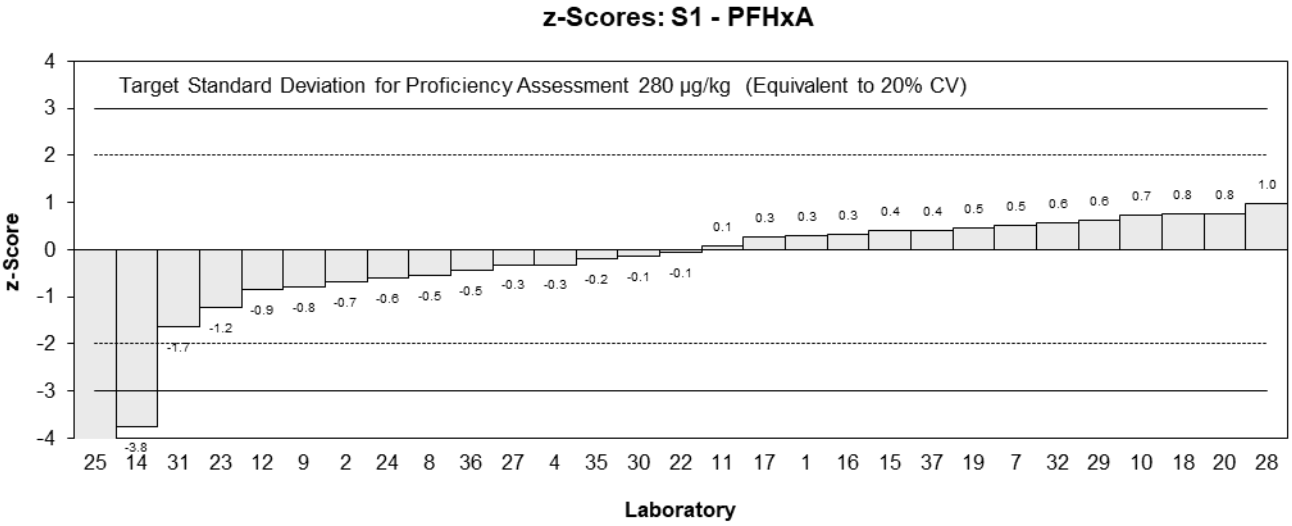
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1472.96	441.89	83	0.30	0.18
2	1200	180	113	-0.68	-0.94
3	NS	NS	NS		
4	1301.04	301.79	128	-0.32	-0.28
6	NS	NS	NS		
7	1535.39	NR	96	0.52	1.62
8	1240	170	86	-0.54	-0.78
9	1168.9145324	257.16119713	35.061876746	-0.80	-0.81
10	1593	133.81	91	0.73	1.26
11	1410	460	83	0.07	0.04
12	1155	312	76	-0.85	-0.72
13	NS	NS	NS		
14**	347.16	NR	101.04	-3.75	-11.59
15	1500	550	97	0.40	0.20
16	1480	188.6	71.03	0.32	0.43
17	1462	286	93	0.26	0.24
18	1600	600	98	0.76	0.35
19	1521.18	62.1	123	0.47	1.20
20	1600	480	NR	0.76	0.43
22	1369.5	410.85	114	-0.07	-0.05
23	1049	131	NR	-1.23	-2.15
24	1219.3	365.79	119	-0.61	-0.45
25**	7.5	1.0	102	-4.97	-15.36
26	NT	NT	NT		
27	1300	310	89	-0.32	-0.28
28	1660	498	96	0.97	0.53
29	1562.38	468.71	90	0.62	0.36
30	1350	275	65.98	-0.14	-0.14
31	930	102	105	-1.65	-3.38
32	1550	387.5	107	0.58	0.40
34	NS	NS	NS		
35	1335.92	400.776	103	-0.19	-0.13
36	1264	163	94.8	-0.45	-0.68
37	1504	289.7	80	0.41	0.38
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1390	90
Spike Value	Not Spiked	
Robust Average	1390	90
Median	1410	100
Mean	1380	
N	27	
Max	1660	
Min	930	
Robust SD	190	
Robust CV	14%	


Results: S1 - PFHxA
Kernel Density
Density
Result
Assigned Value = 1390 ± 90 µg/kg
Results (µg/kg)
Laboratory
25 14 31 23 12 9 2 24 8 36 27 4 35 30 22 11 17 1 16 15 37 19 7 32 29 10 18 20 28 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFHxA
Target Standard Deviation for Proficiency Assessment 280 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 31 23 12 9 2 24 8 36 27 4 35 30 22 11 17 1 16 15 37 19 7 32 29 10 18 20 28

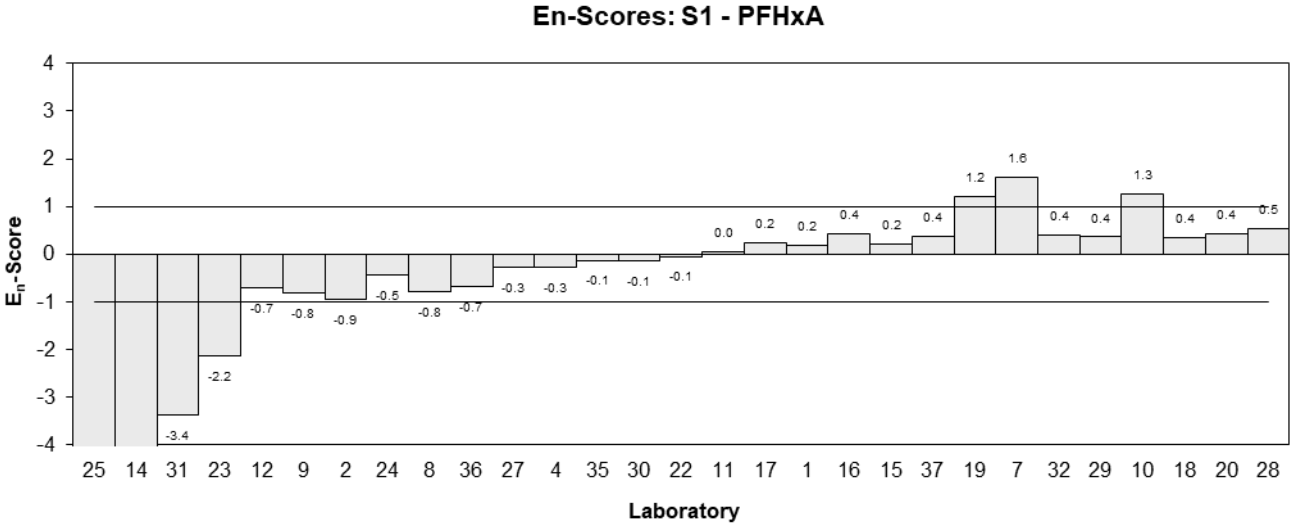

En-Scores: S1 - PFHxA
En-Score
Laboratory
25 14 31 23 12 9 2 24 8 36 27 4 35 30 22 11 17 1 16 15 37 19 7 32 29 10 18 20 28

Figure 14

Table 19

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFHpA
Unit	µg/kg

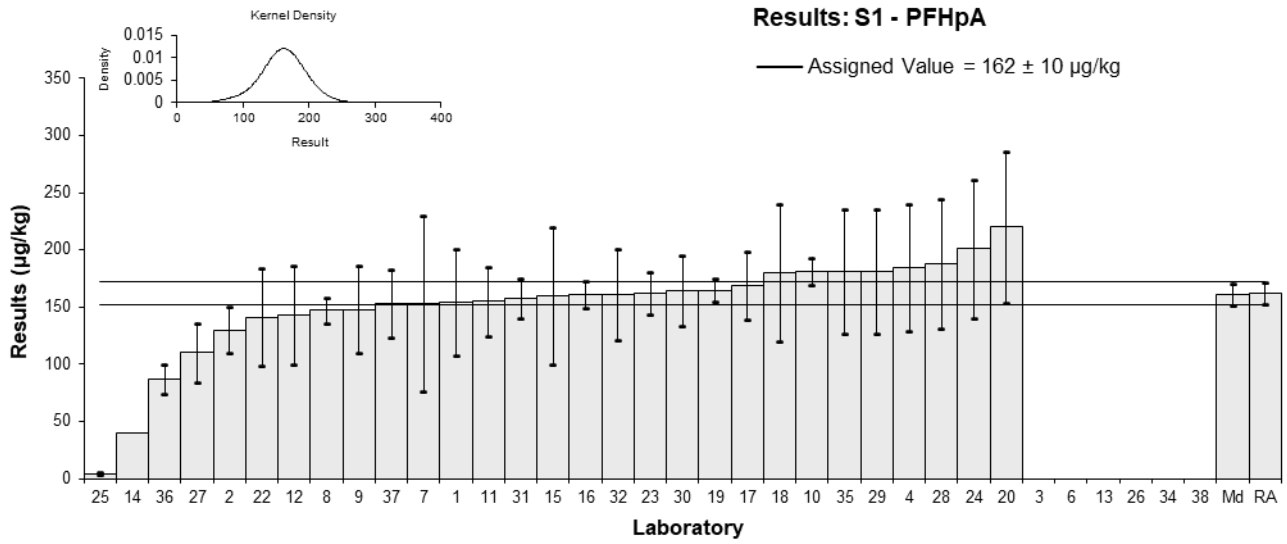
Participant Results

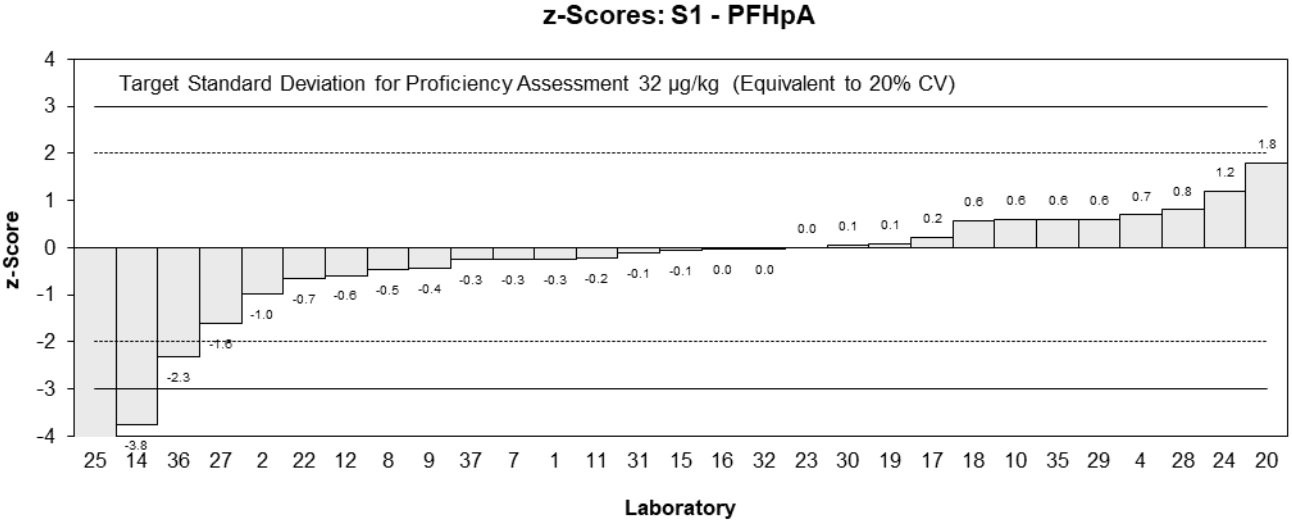
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	154.06	46.22	78	-0.25	-0.17
2	130	20	110	-0.99	-1.43
3	NS	NS	NS		
4	184.42	55.32	100	0.69	0.40
6	NS	NS	NS		
7	153.54	76.77	102	-0.26	-0.11
8	147	11	86	-0.46	-1.01
9	147.80276538	38.428719001	63.470625359	-0.44	-0.36
10	181	11.95	66	0.59	1.22
11	155	30	92	-0.22	-0.22
12	143	43	88	-0.59	-0.43
13	NS	NS	NS		
14**	39.88	NR	114.30	-3.77	-12.21
15	160	60	98	-0.06	-0.03
16	161	11.4	78.26	-0.03	-0.07
17	169	30	126	0.22	0.22
18	180	60	102	0.56	0.30
19	164.67	10.01	123	0.08	0.19
20	220	66	NR	1.79	0.87
22	141.1	42.33	84	-0.65	-0.48
23	162	19	NR	0.00	0.00
24	200.8	60.24	89	1.20	0.64
25**	4.3	1.1	50	-4.87	-15.68
26	NT	NT	NT		
27	110	26	85	-1.60	-1.87
28	188	56.4	91	0.80	0.45
29	181.37	54.41	97	0.60	0.35
30	164	31	75.5	0.06	0.06
31	158	17.4	115	-0.12	-0.20
32	161	40.25	111	-0.03	-0.02
34	NS	NS	NS		
35	181.09	54.327	88	0.59	0.35
36	87	13	134	-2.31	-4.57
37	153.42	29.8	94	-0.26	-0.27
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	162	10
Spike Value	Not Spiked	
Robust Average	162	10
Median	161	10
Mean	161	
N	27	
Max	220	
Min	87	
Robust SD	21	
Robust CV	13%	


Kernel Density
Density
Result
Results: S1 - PFHpA
Assigned Value = 162 ± 10 µg/kg
Results (µg/kg)
Laboratory
25 14 36 27 2 22 12 8 9 37 7 1 11 31 15 16 32 23 30 19 17 18 10 35 29 4 28 24 20 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFHpA
Target Standard Deviation for Proficiency Assessment 32 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 36 27 2 22 12 8 9 37 7 1 11 31 15 16 32 23 30 19 17 18 10 35 29 4 28 24 20

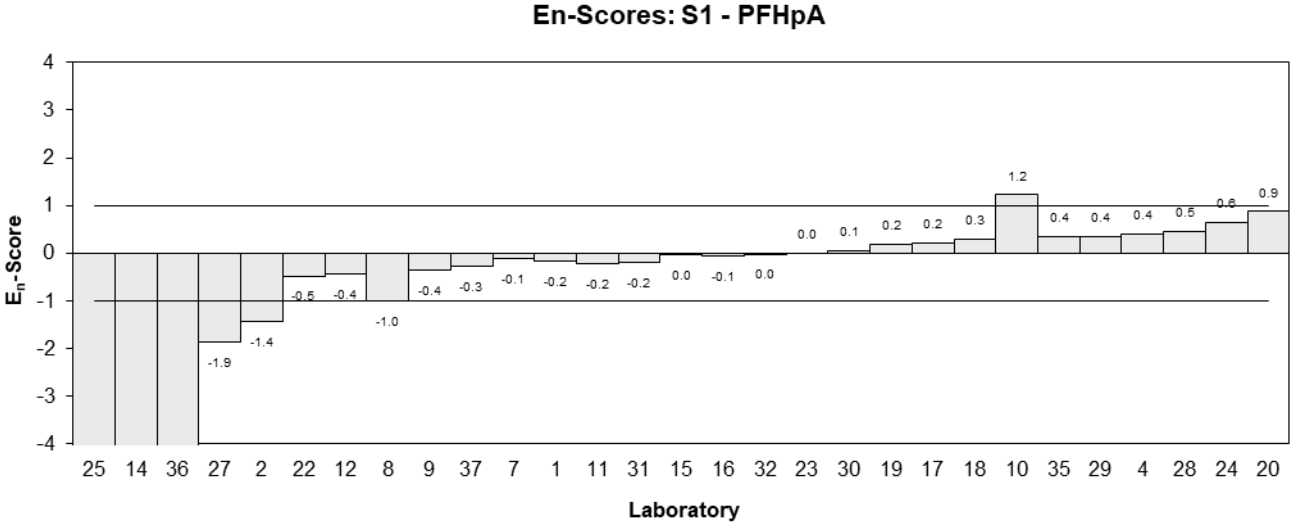

En-Scores: S1 - PFHpA
En-Score
Laboratory
25 14 36 27 2 22 12 8 9 37 7 1 11 31 15 16 32 23 30 19 17 18 10 35 29 4 28 24 20

Figure 15

Table 20

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFOA
Unit	µg/kg

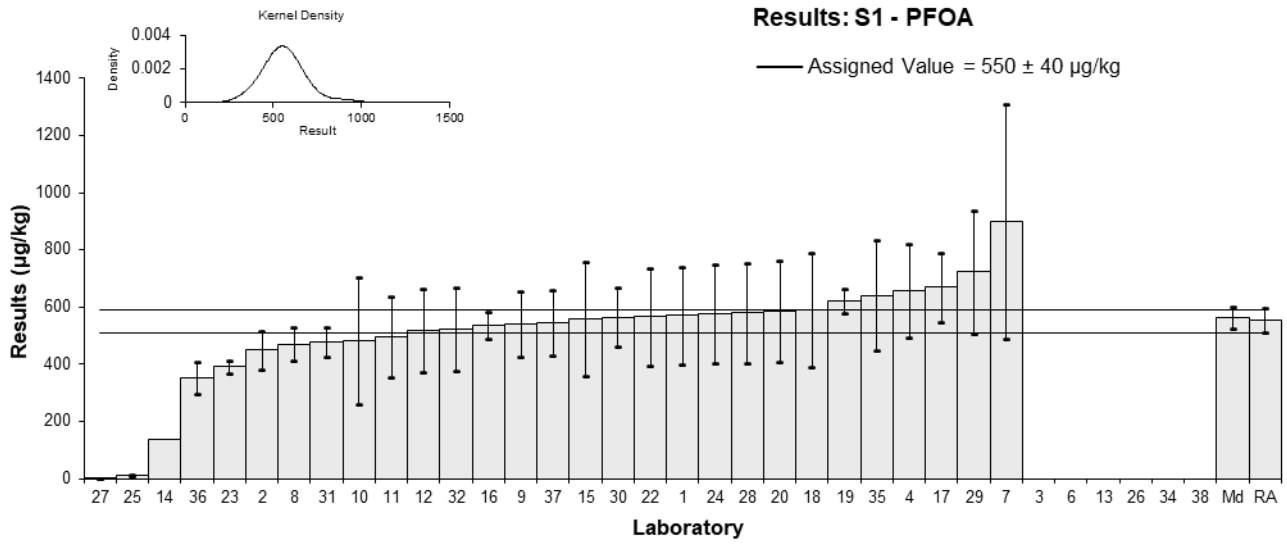
Participant Results

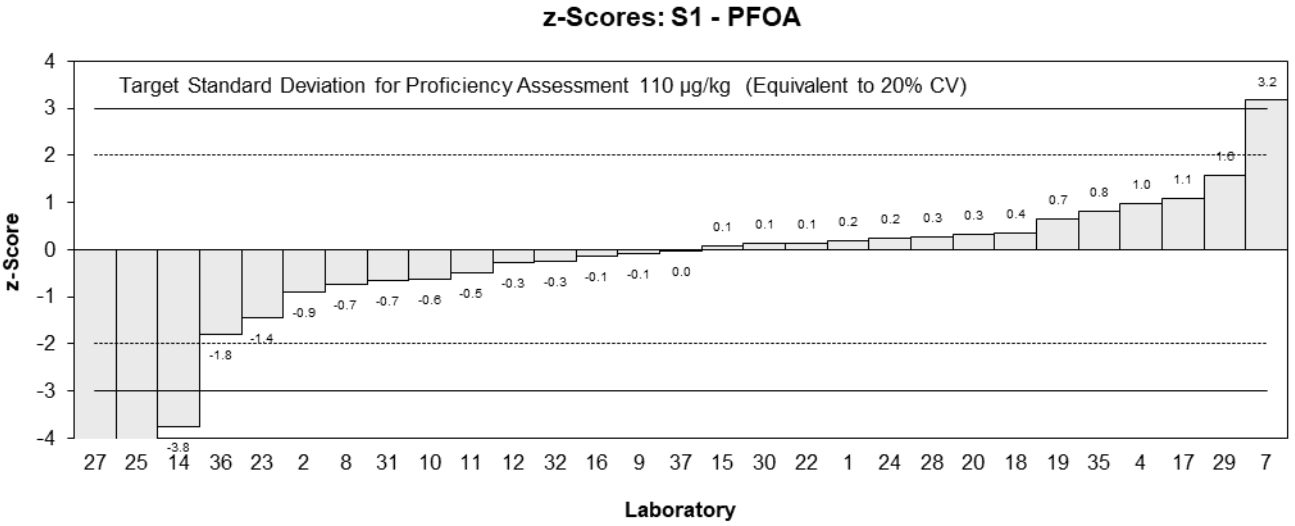
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	570.36	171.11	84	0.19	0.12
2	450	67	111	-0.91	-1.28
3	NS	NS	NS		
4	657.95	162.69	96	0.98	0.64
6	NS	NS	NS		
7*	898.98	410.83	99	3.17	0.85
8	470	59	88	-0.73	-1.12
9	541.03813517	113.61800838	47.622192797	-0.08	-0.07
10	481	221.26	95	-0.63	-0.31
11	496	140	83	-0.49	-0.37
12	520	146	84	-0.27	-0.20
13	NS	NS	NS		
14**	135	NR	110.77	-3.77	-10.38
15	560	200	99	0.09	0.05
16	536	48.8	84.35	-0.13	-0.22
17	669	121	94	1.08	0.93
18	590	200	97	0.36	0.20
19	621	41.02	NR	0.65	1.24
20	585	175.5	NR	0.32	0.19
22	565.7	169.71	106	0.14	0.09
23	392	22	NR	-1.44	-3.46
24	576.5	172.95	99	0.24	0.15
25**	13	1.9	70	-4.88	-13.41
26	NT	NT	NT		
27**	0.5	0.1	90	-5.00	-13.74
28	580	174	95	0.27	0.17
29	722.62	216.79	94	1.57	0.78
30	564	103	62.04	0.13	0.13
31	477	52.5	79	-0.66	-1.11
32	522	146.16	102	-0.25	-0.18
34	NS	NS	NS		
35	640.72	192.216	99	0.82	0.46
36	351	56	121	-1.81	-2.89
37	545.45	115.6	81	-0.04	-0.04
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	550	40
Spike Value	Not Spiked	
Robust Average	555	42
Median	562	37
Mean	561	
N	26	
Max	898.98	
Min	351	
Robust SD	85	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - PFOA
Assigned Value = 550 ± 40 µg/kg
Results (µg/kg)
Laboratory
27 25 14 36 23 2 8 31 10 11 12 32 16 9 37 15 30 22 1 24 28 20 18 19 35 4 17 29 7 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFOA
Target Standard Deviation for Proficiency Assessment 110 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
27 25 14 36 23 2 8 31 10 11 12 32 16 9 37 15 30 22 1 24 28 20 18 19 35 4 17 29 7

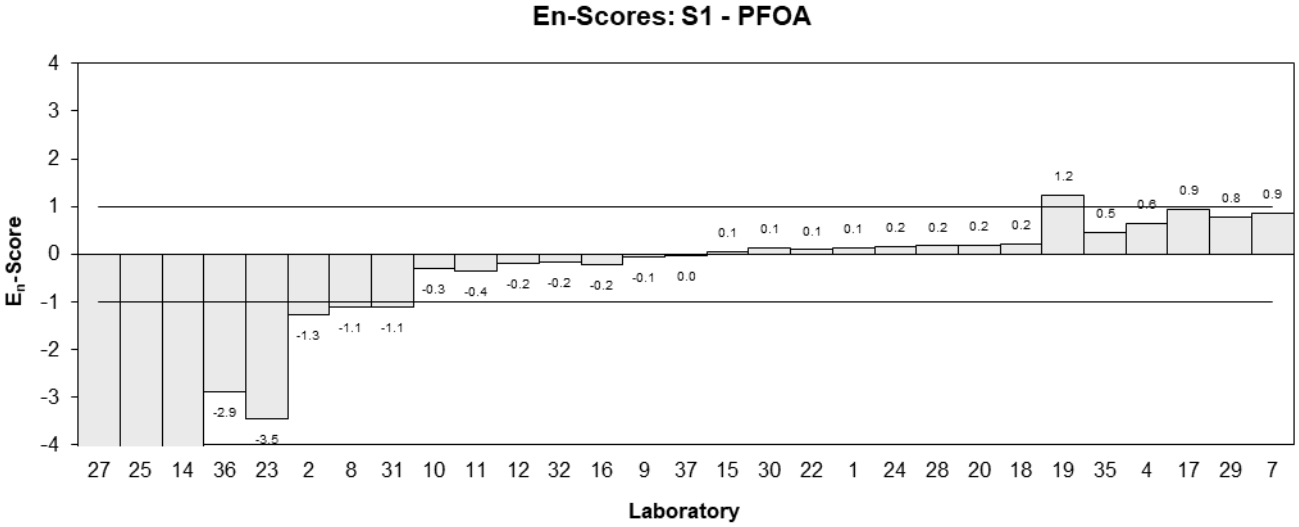

En-Scores: S1 - PFOA
En-Score
Laboratory
27 25 14 36 23 2 8 31 10 11 12 32 16 9 37 15 30 22 1 24 28 20 18 19 35 4 17 29 7

Figure 16

Table 21

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFNA
Unit	µg/kg

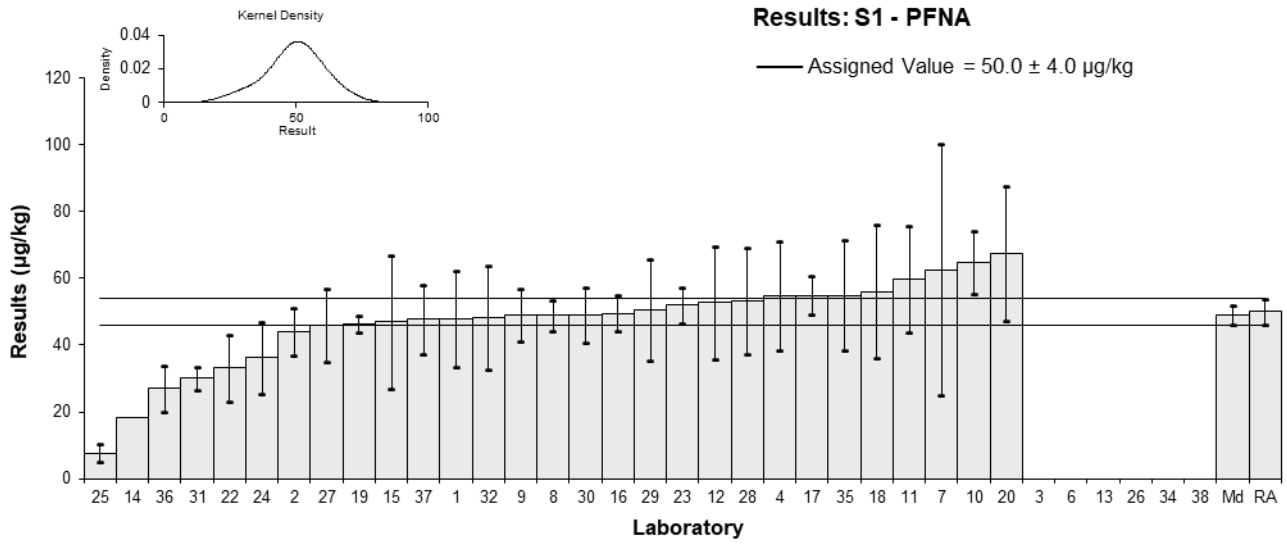
Participant Results

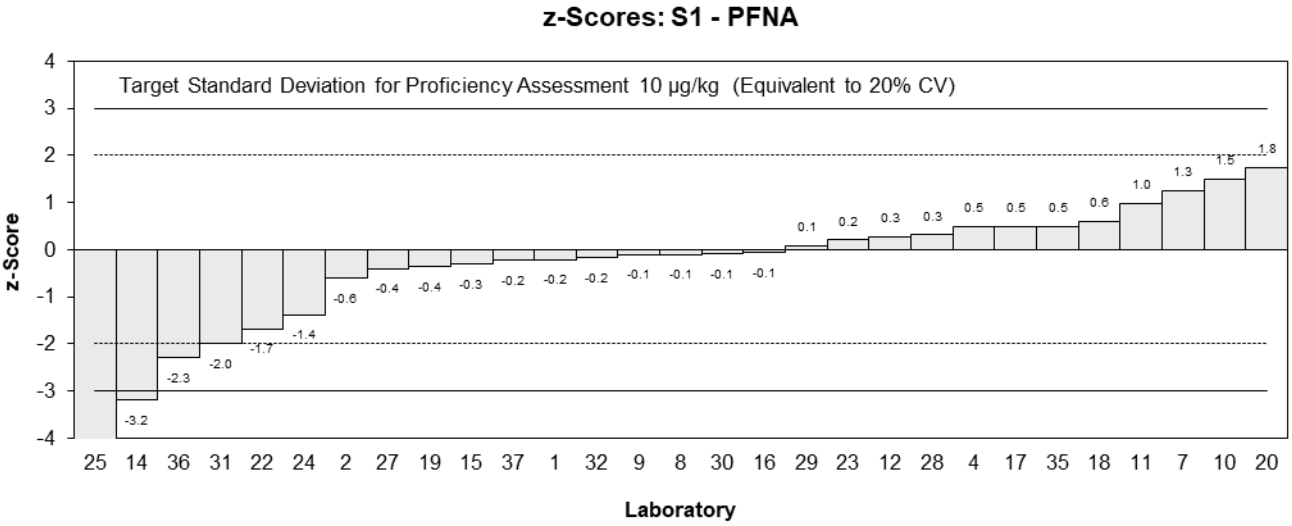
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	47.87	14.36	82	-0.21	-0.14
2	44	7.0	97	-0.60	-0.74
3	NS	NS	NS		
4	54.76	16.43	106	0.48	0.28
6	NS	NS	NS		
7	62.64	37.58	104	1.26	0.33
8	49	4.6	82	-0.10	-0.16
9	48.970118524	7.8352189638	70.931963766	-0.10	-0.12
10	64.9	9.35	51	1.49	1.47
11	59.8	16	85	0.98	0.59
12	52.7	17	35	0.27	0.15
13	NS	NS	NS		
14**	18.25	NR	48.35	-3.18	-7.94
15	47	20	76	-0.30	-0.15
16	49.5	5.32	100.14	-0.05	-0.08
17	54.9	5.8	52	0.49	0.70
18	56	20	82	0.60	0.29
19	46.31	2.53	NR	-0.37	-0.78
20	67.5	20.25	NR	1.75	0.85
22	33.2	9.96	110	-1.68	-1.57
23	52	5.4	NR	0.20	0.30
24	36.2	10.86	130	-1.38	-1.19
25**	7.6	2.7	89	-4.24	-8.79
26	NT	NT	NT		
27	46	11	52	-0.40	-0.34
28	53.1	15.93	67	0.31	0.19
29	50.70	15.21	99	0.07	0.04
30	49.1	8.2	57.12	-0.09	-0.10
31	30	3.3	140	-2.00	-3.86
32	48.3	15.46	105	-0.17	-0.11
34	NS	NS	NS		
35	54.93	16.479	79	0.49	0.29
36	27	7	122	-2.30	-2.85
37	47.83	10.34	73	-0.22	-0.20
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	50.0	4.0
Spike Value	Not Spiked	
Robust Average	50.0	4.0
Median	49.1	2.9
Mean	49.4	
N	27	
Max	67.5	
Min	27	
Robust SD	8.4	
Robust CV	17%	


Results: S1 - PFNA
Assigned Value = 50.0 ± 4.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 14 36 31 22 24 2 27 19 15 37 1 32 9 8 30 16 29 23 12 28 4 17 35 18 11 7 10 20 3 6 13 26 34 38 Md RA


z-Scores: S1 - PFNA
Target Standard Deviation for Proficiency Assessment 10 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 14 36 31 22 24 2 27 19 15 37 1 32 9 8 30 16 29 23 12 28 4 17 35 18 11 7 10 20

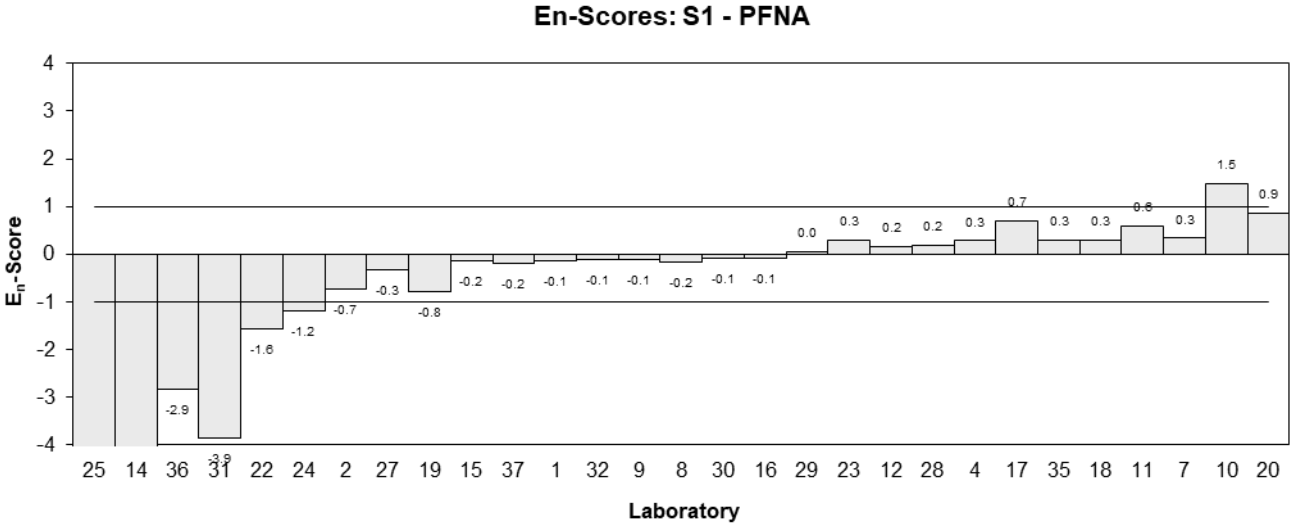

En-Scores: S1 - PFNA
En-Score
Laboratory
25 14 36 31 22 24 2 27 19 15 37 1 32 9 8 30 16 29 23 12 28 4 17 35 18 11 7 10 20

Figure 17

Table 22

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFDA
Unit	µg/kg

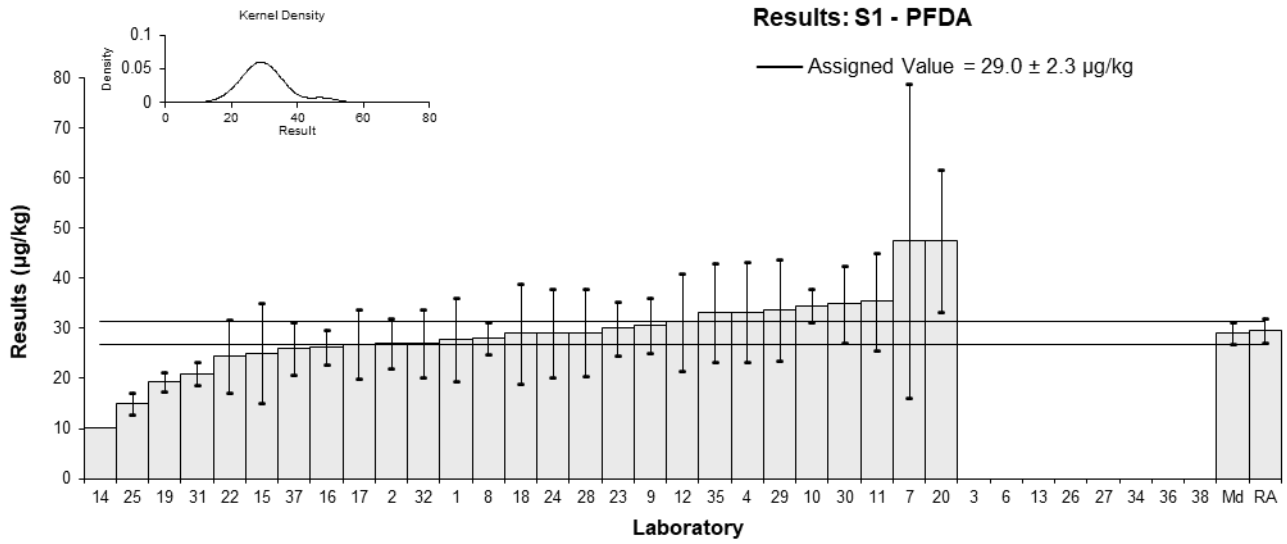
Participant Results

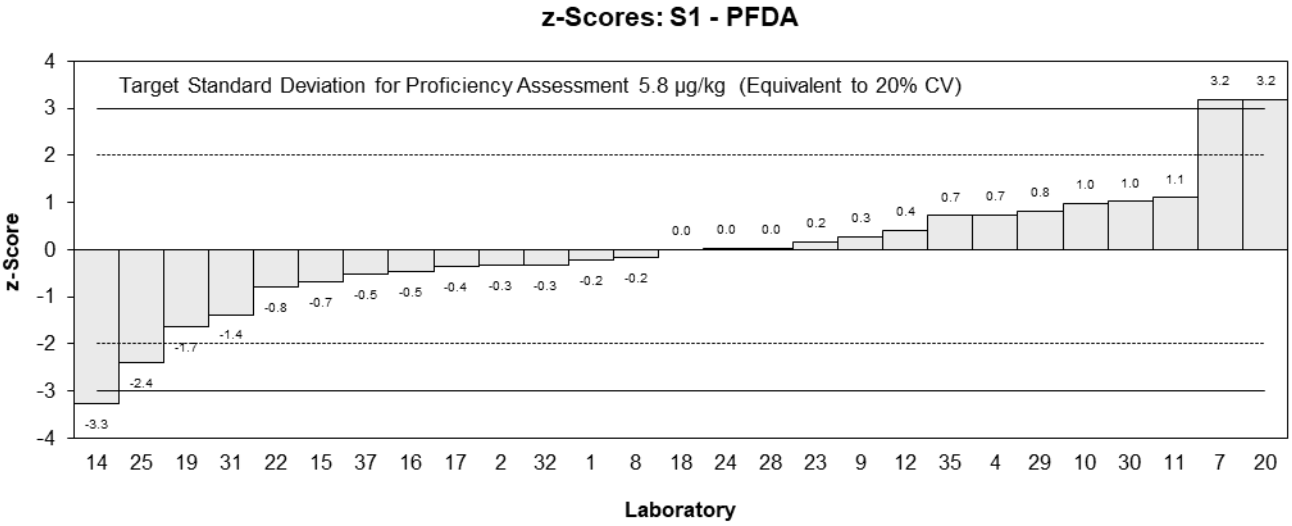
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	27.75	8.33	82	-0.22	-0.14
2	27	5.0	106	-0.34	-0.36
3	NS	NS	NS		
4	33.29	9.99	78	0.74	0.42
6	NS	NS	NS		
7*	47.49	31.35	100	3.19	0.59
8	28	3.2	88	-0.17	-0.25
9	30.645896062	5.5162612912	81.113924157	0.28	0.28
10	34.6	3.36	81	0.97	1.38
11	35.4	9.64	69	1.10	0.65
12	31.3	9.7	91	0.40	0.23
13	NS	NS	NS		
14**	10.0486	NR	126.93	-3.27	-8.24
15	25	10	96	-0.69	-0.39
16	26.3	3.47	120.22	-0.47	-0.65
17	26.84	6.91	121	-0.37	-0.30
18	29	10	99	0.00	0.00
19	19.43	1.91	NR	-1.65	-3.20
20*	47.5	14.25	NR	3.19	1.28
22	24.4	7.32	71	-0.79	-0.60
23	30	5.3	NR	0.17	0.17
24	29.1	8.73	111	0.02	0.01
25**	15	2.3	113	-2.41	-4.30
26	NT	NT	NT		
27	<0.1	0.1	89		
28	29.2	8.76	112	0.03	0.02
29	33.70	10.11	99	0.81	0.45
30	34.9	7.6	101.59	1.02	0.74
31	21	2.3	50	-1.38	-2.46
32	27	6.75	115	-0.34	-0.28
34	NS	NS	NS		
35	33.17	9.951	98	0.72	0.41
36	NR	NR	NR		
37	26	5.16	112	-0.52	-0.53
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	29.0	2.3
Spike Value	Not Spiked	
Robust Average	29.6	2.5
Median	29.1	2.3
Mean	30.3	
N	25	
Max	47.5	
Min	19.43	
Robust SD	4.9	
Robust CV	17%	


Kernel Density
Density
Result
Results: S1 - PFDA
Assigned Value = 29.0 ± 2.3 µg/kg
Results (µg/kg)
Laboratory
14 25 19 31 22 15 37 16 17 2 32 1 8 18 24 28 23 9 12 35 4 29 10 30 11 7 20 3 6 13 26 27 34 36 38 Md RA


z-Scores: S1 - PFDA
Target Standard Deviation for Proficiency Assessment 5.8 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
14 25 19 31 22 15 37 16 17 2 32 1 8 18 24 28 23 9 12 35 4 29 10 30 11 7 20

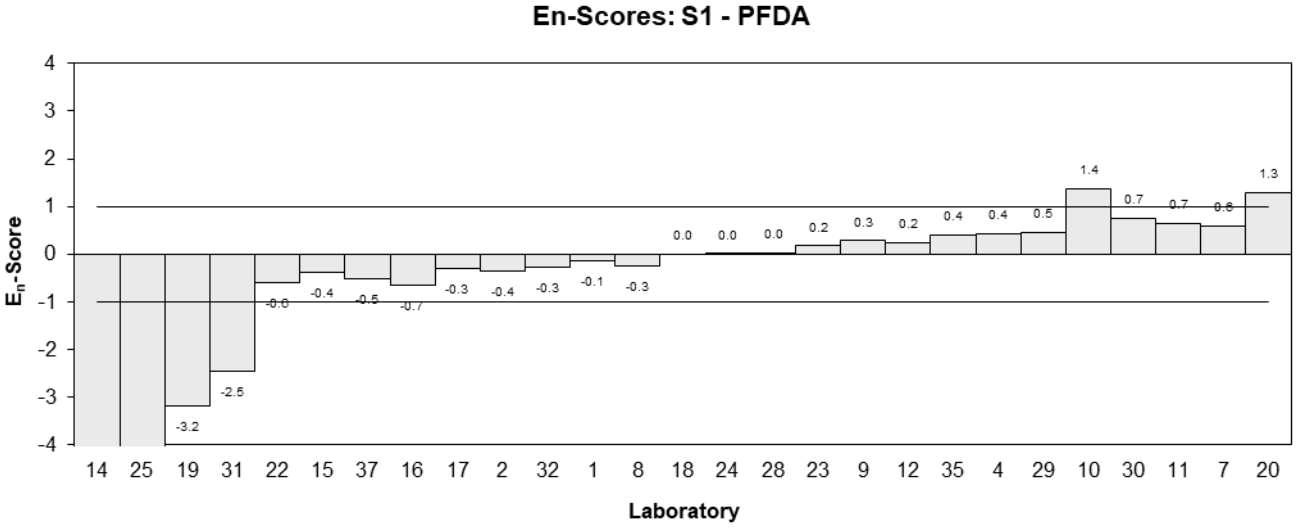

En-Scores: S1 - PFDA
En-Score
Laboratory
14 25 19 31 22 15 37 16 17 2 32 1 8 18 24 28 23 9 12 35 4 29 10 30 11 7 20

Figure 18

Table 23

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFUdA
Unit	µg/kg

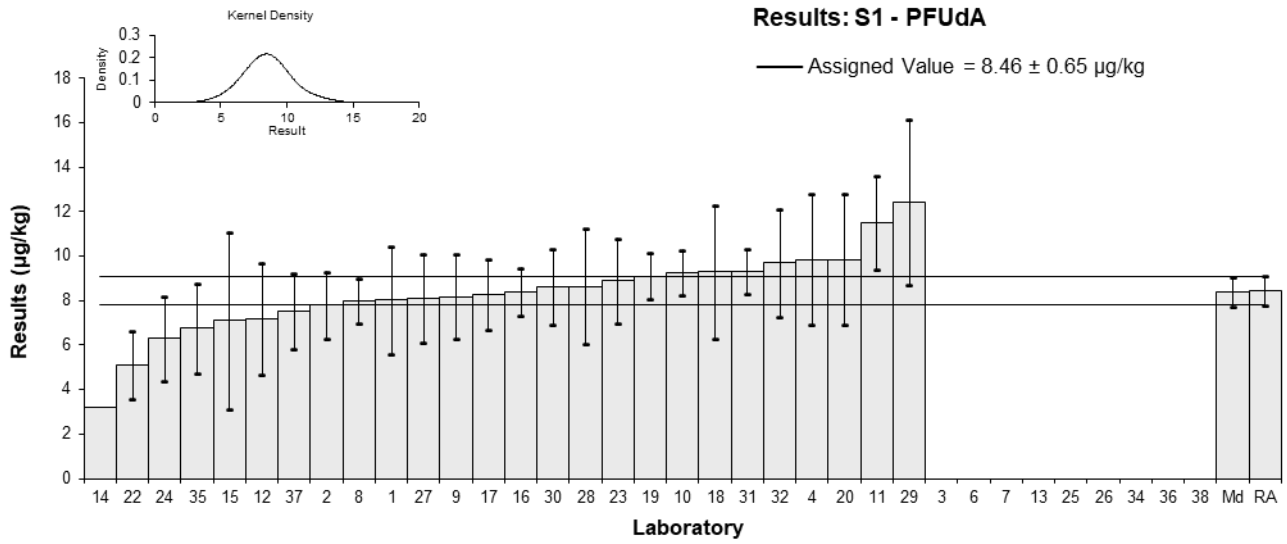
Participant Results

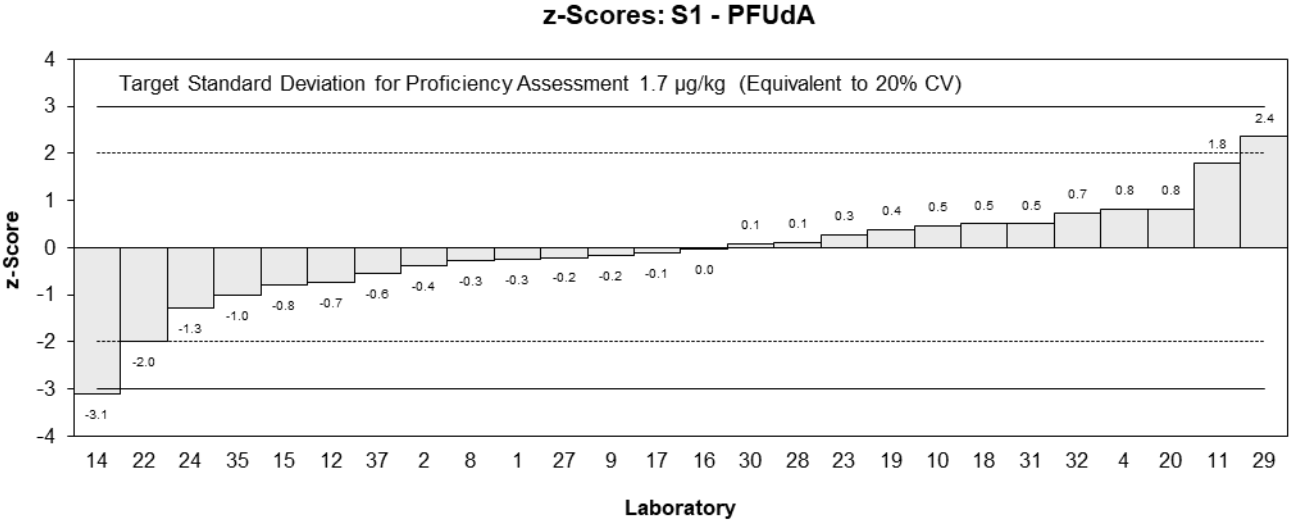
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	8.02	2.41	85	-0.26	-0.18
2	7.8	1.5	100	-0.39	-0.40
3	NS	NS	NS		
4	9.85	2.95	103	0.82	0.46
6	NS	NS	NS		
7	<1	NR	88		
8	8	1	82	-0.27	-0.39
9	8.1876653650	1.8831630339	81.630762501	-0.16	-0.14
10	9.25	1.02	86	0.47	0.65
11	11.5	2.1	73	1.80	1.38
12	7.2	2.5	93	-0.74	-0.49
13	NS	NS	NS		
14**	3.1908	NR	149.00	-3.11	-8.11
15	7.1	4	101	-0.80	-0.34
16	8.4	1.07	114.63	-0.04	-0.05
17	8.264	1.574	156	-0.12	-0.12
18	9.3	3	102	0.50	0.27
19	9.11	1.06	NR	0.38	0.52
20	9.85	2.955	NR	0.82	0.46
22	5.1	1.53	60	-1.99	-2.02
23	8.9	1.9	NR	0.26	0.22
24	6.3	1.89	70	-1.28	-1.08
25	<1.0	NR	127		
26	NT	NT	NT		
27	8.1	2	90	-0.21	-0.17
28	8.63	2.589	121	0.10	0.06
29	12.43	3.73	98	2.35	1.05
30	8.6	1.7	127.36	0.08	0.08
31	9.3	1	92	0.50	0.70
32	9.71	2.43	100	0.74	0.50
34	NS	NS	NS		
35	6.75	2.025	116	-1.01	-0.80
36	NR	NR	NR		
37	7.52	1.69	107	-0.56	-0.52
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	8.46	0.65
Spike Value	Not Spiked	
Robust Average	8.46	0.65
Median	8.40	0.65
Mean	8.53	
N	25	
Max	12.43	
Min	5.1	
Robust SD	1.3	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - PFUdA
Assigned Value = 8.46 ± 0.65 µg/kg
Results (µg/kg)
Laboratory
14 22 24 35 15 12 37 2 8 1 27 9 17 16 30 28 23 19 10 18 31 32 4 20 11 29 3 6 7 13 25 26 34 36 38 Md RA


z-Scores: S1 - PFUdA
Target Standard Deviation for Proficiency Assessment 1.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
14 22 24 35 15 12 37 2 8 1 27 9 17 16 30 28 23 19 10 18 31 32 4 20 11 29
-3.1 -2.0 -1.3 -1.0 -0.8 -0.7 -0.6 -0.4 -0.3 -0.3 -0.2 -0.2 -0.1 0.0 0.1 0.1 0.3 0.4 0.5 0.5 0.5 0.7 0.8 0.8 1.8 2.4

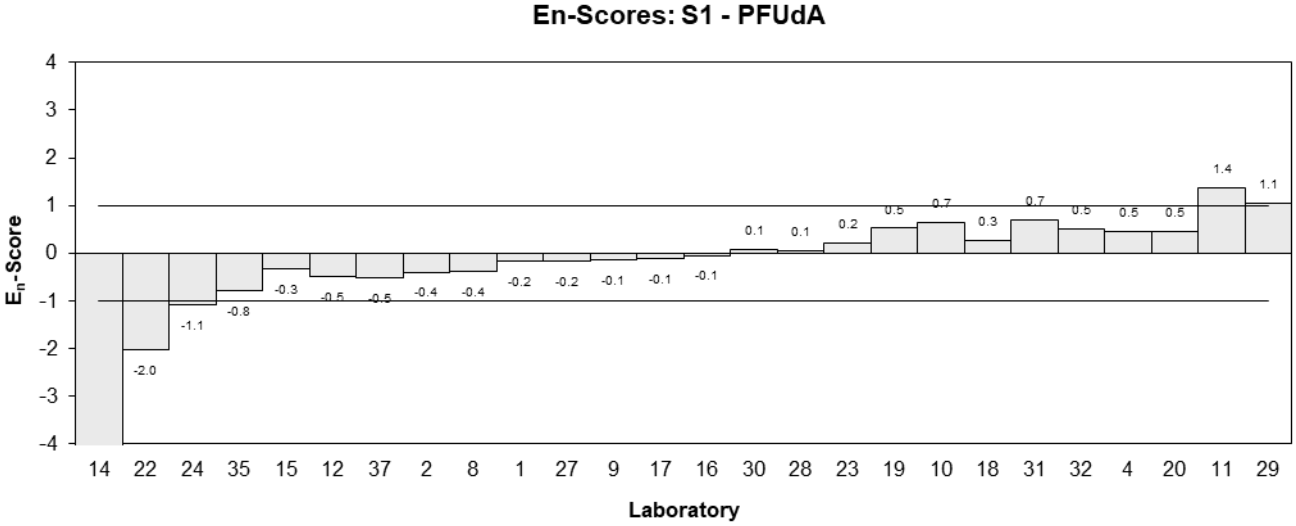

En-Scores: S1 - PFUdA
En-Score
Laboratory
14 22 24 35 15 12 37 2 8 1 27 9 17 16 30 28 23 19 10 18 31 32 4 20 11 29
-2.0 -1.1 -0.8 -0.3 -0.5 -0.5 -0.4 -0.4 -0.2 -0.2 -0.1 -0.1 -0.1 0.1 0.1 0.2 0.5 0.7 0.3 0.7 0.5 0.5 0.5 1.4 1.1

Figure 19

Table 24

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFDoA
Unit	µg/kg

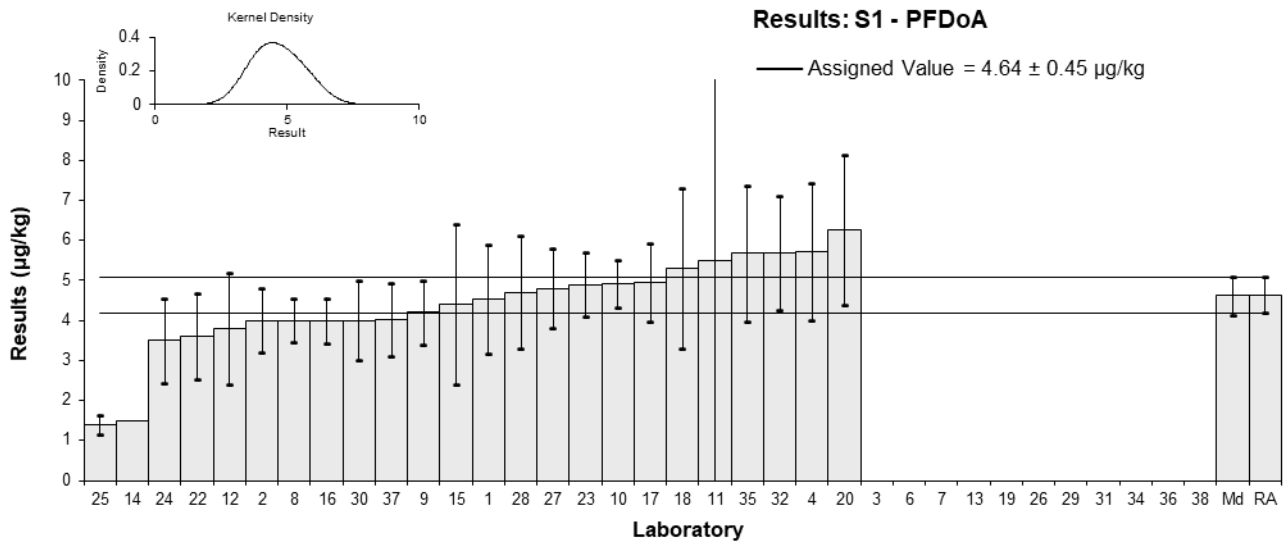
Participant Results

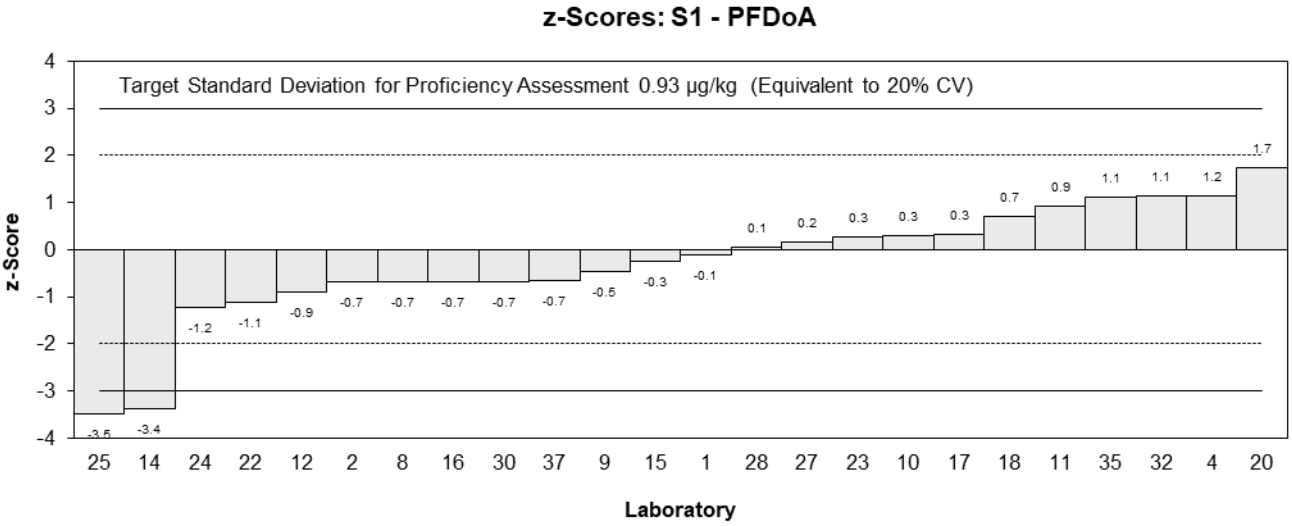
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	4.53	1.36	84	-0.12	-0.08
2	4.0	0.80	103	-0.69	-0.70
3	NS	NS	NS		
4	5.71	1.71	102	1.15	0.61
6	NS	NS	NS		
7	<1	NR	86		
8	4	0.54	82	-0.69	-0.91
9	4.1986725264	0.7977477800	87.563380112	-0.48	-0.48
10	4.92	0.59	80	0.30	0.38
11	5.5	17	72	0.93	0.05
12	3.8	1.4	93	-0.91	-0.57
13	NS	NS	NS		
14**	1.5025	NR	97.26	-3.38	-6.97
15	4.4	2	101	-0.26	-0.12
16	4	0.56	116.98	-0.69	-0.89
17	4.949	0.975	109	0.33	0.29
18	5.3	2	98	0.71	0.32
19	NR	NR	NR		
20	6.25	1.875	NR	1.73	0.83
22	3.6	1.08	80	-1.12	-0.89
23	4.9	0.8	NR	0.28	0.28
24	3.5	1.05	83	-1.23	-1.00
25**	1.4	0.24	103	-3.49	-6.35
26	NT	NT	NT		
27	4.8	1	79	0.17	0.15
28	4.70	1.41	121	0.06	0.04
29	< 5	NR	NR		
30	4	1	125.19	-0.69	-0.58
31	<5	NR	NR		
32	5.69	1.42	103	1.13	0.70
34	NS	NS	NS		
35	5.68	1.704	94	1.12	0.59
36	NR	NR	NR		
37	4.03	0.91	94	-0.66	-0.60
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	4.64	0.45
Spike Value	Not Spiked	
Robust Average	4.64	0.45
Median	4.62	0.49
Mean	4.66	
N	22	
Max	6.25	
Min	3.5	
Robust SD	0.85	
Robust CV	18%	


Results: S1 - PFDoA
Kernel Density
Density
Result
Assigned Value = 4.64 ± 0.45 µg/kg
Results (µg/kg)
25 14 24 22 12 2 8 16 30 37 9 15 1 28 27 23 10 17 18 11 35 32 4 20 3 6 7 13 19 26 29 31 34 36 38 Md RA
Laboratory


z-Scores: S1 - PFDoA
Target Standard Deviation for Proficiency Assessment 0.93 µg/kg (Equivalent to 20% CV)
z-Score
-3.5 -3.4 -1.2 -1.1 -0.9 -0.7 -0.7 -0.7 -0.7 -0.7 -0.5 -0.3 -0.1 0.1 0.2 0.3 0.3 0.3 0.7 0.9 1.1 1.1 1.2 1.7
25 14 24 22 12 2 8 16 30 37 9 15 1 28 27 23 10 17 18 11 35 32 4 20
Laboratory

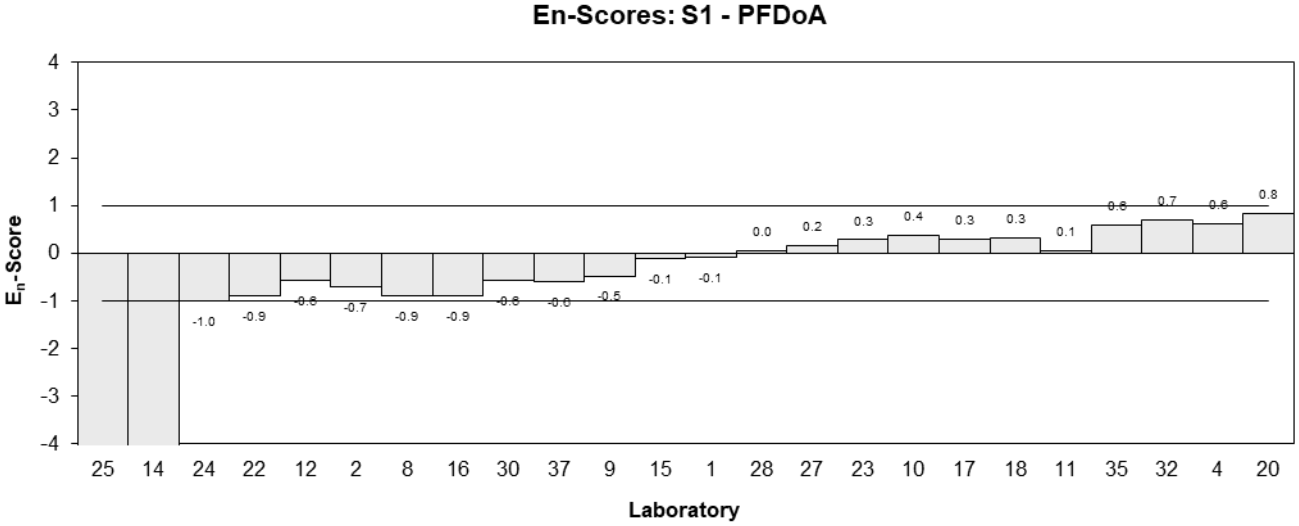

En-Scores: S1 - PFDoA
En-Score
-1.0 -0.9 -0.6 -0.7 -0.9 -0.9 -0.6 -0.6 -0.5 -0.1 -0.1 0.0 0.2 0.3 0.4 0.3 0.3 0.1 0.6 0.7 0.6 0.8
25 14 24 22 12 2 8 16 30 37 9 15 1 28 27 23 10 17 18 11 35 32 4 20
Laboratory

Figure 20

Table 25

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFTrDA
Unit	µg/kg

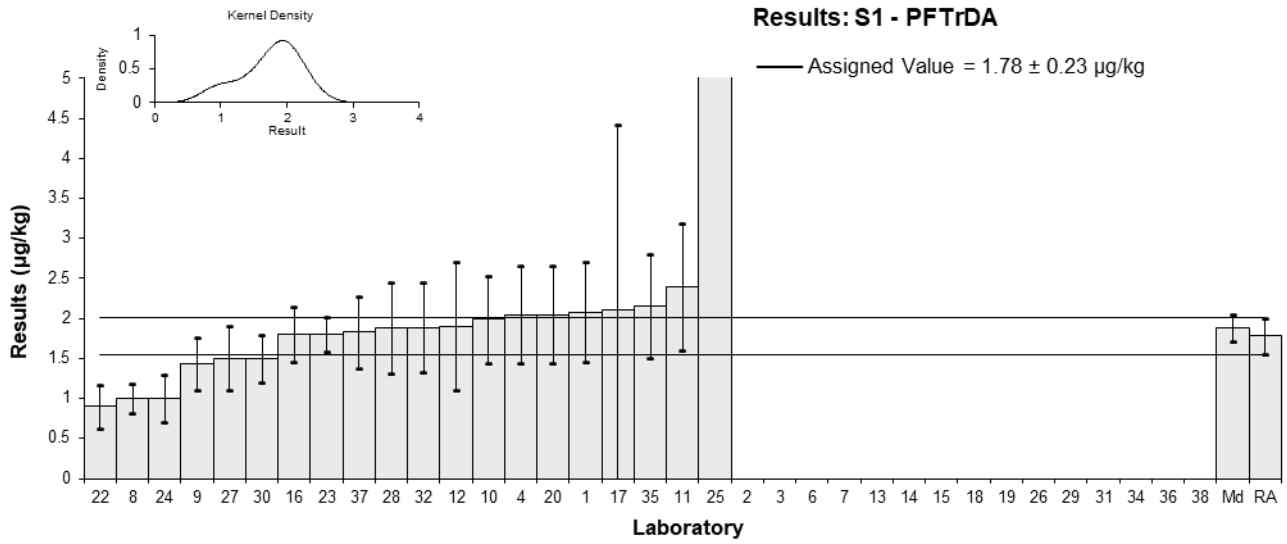
Participant Results

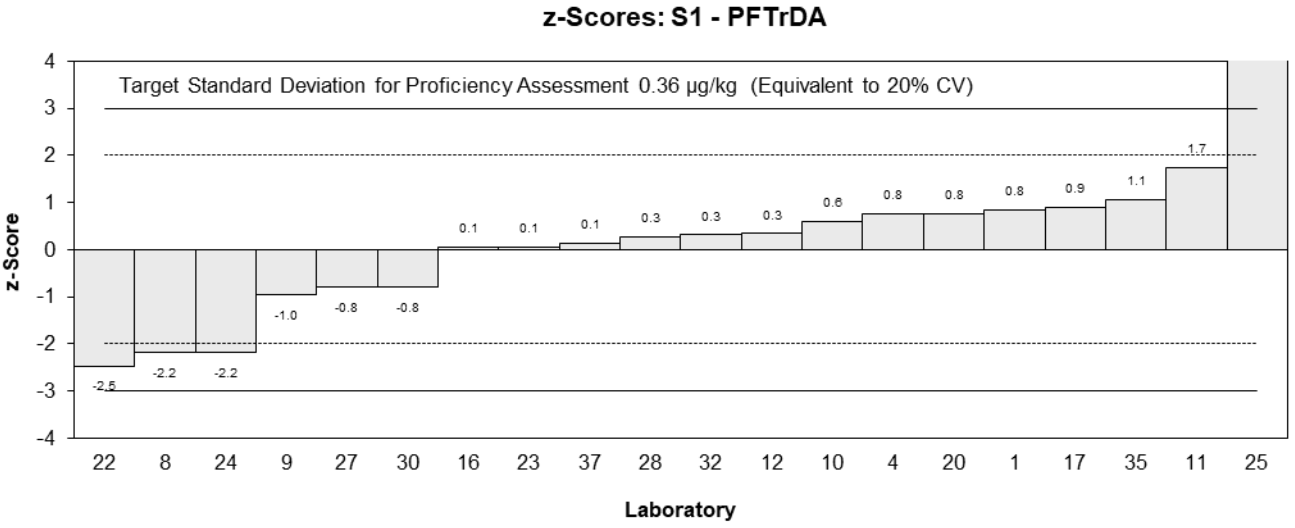
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	2.08	0.62	79	0.84	0.45
2	NR	NR	NR		
3	NS	NS	NS		
4	2.05	0.61	97	0.76	0.41
6	NS	NS	NS		
7	<1	NR	NR		
8	1	0.18	80	-2.19	-2.67
9	1.4361320437	0.3303103700	56.716525869	-0.97	-0.85
10	1.99	0.54	NR	0.59	0.36
11	2.4	0.79	72	1.74	0.75
12	1.9	0.8	NR	0.34	0.14
13	NS	NS	NS		
14	NT	NT	NT		
15	<5	NR	NR		
16	1.8	0.34	116.98	0.06	0.05
17	2.1	2.32	109	0.90	0.14
18	< 5	NR	106		
19	NR	NR	NR		
20	2.05	0.615	NR	0.76	0.41
22	0.9	0.27	55	-2.47	-2.48
23	1.8	0.22	NR	0.06	0.06
24	1	0.3	64	-2.19	-2.06
25**	16	5.5	103	39.94	2.58
26	NT	NT	NT		
27	1.5	0.4	NR	-0.79	-0.61
28	1.88	0.564	121	0.28	0.16
29	< 5	NR	NR		
30	1.5	0.3	125.19	-0.79	-0.74
31	<5	NR	NR		
32	1.89	0.567	103	0.31	0.18
34	NS	NS	NS		
35	2.16	0.648	106	1.07	0.55
36	NR	NR	NR		
37	1.83	0.45	94	0.14	0.10
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1.78	0.23
Spike Value	Not Spiked	
Robust Average	1.78	0.23
Median	1.88	0.17
Mean	1.75	
N	19	
Max	2.4	
Min	0.9	
Robust SD	0.41	
Robust CV	23%	


Results: S1 - PFTrDA
Kernel Density
Density
Result
Assigned Value = 1.78 ± 0.23 µg/kg
Results (µg/kg)
22 8 24 9 27 30 16 23 37 28 32 12 10 4 20 1 17 35 11 25 2 3 6 7 13 14 15 18 19 26 29 31 34 36 38 Md RA
Laboratory


z-Scores: S1 - PFTrDA
Target Standard Deviation for Proficiency Assessment 0.36 µg/kg (Equivalent to 20% CV)
z-Score
22 8 24 9 27 30 16 23 37 28 32 12 10 4 20 1 17 35 11 25
Laboratory

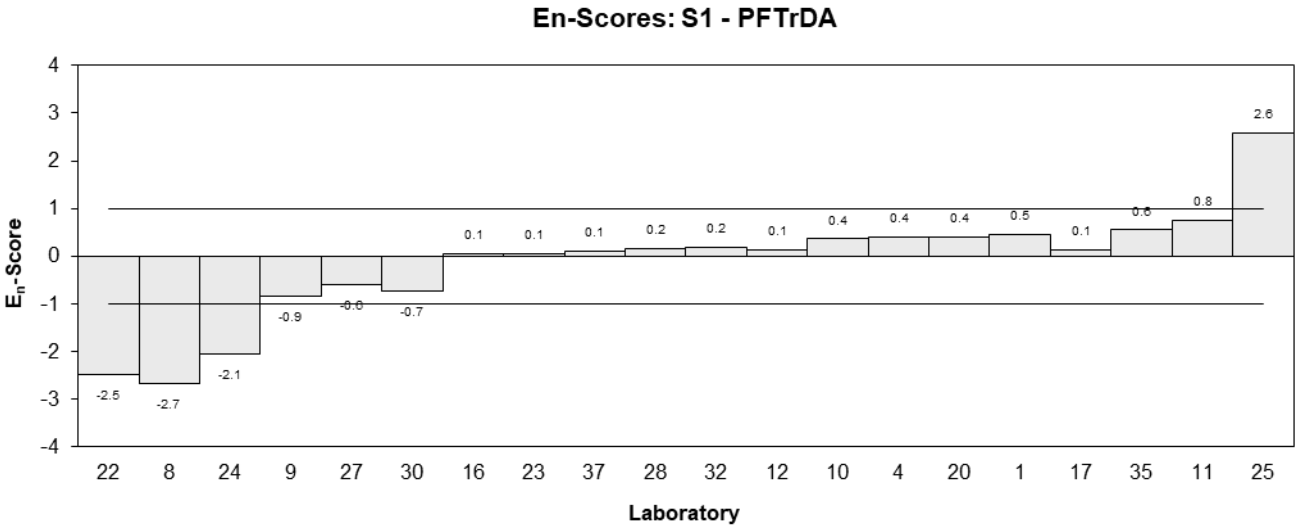

En-Scores: S1 - PFTrDA
En-Score
22 8 24 9 27 30 16 23 37 28 32 12 10 4 20 1 17 35 11 25
Laboratory

Figure 21

Table 26

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFTeDA
Unit	µg/kg

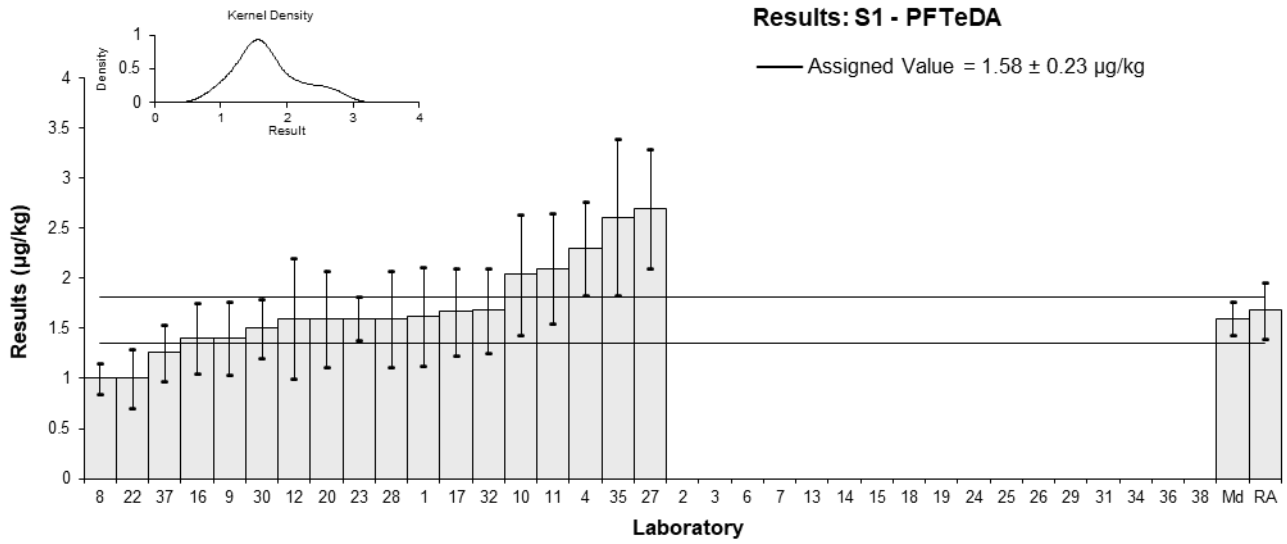
Participant Results

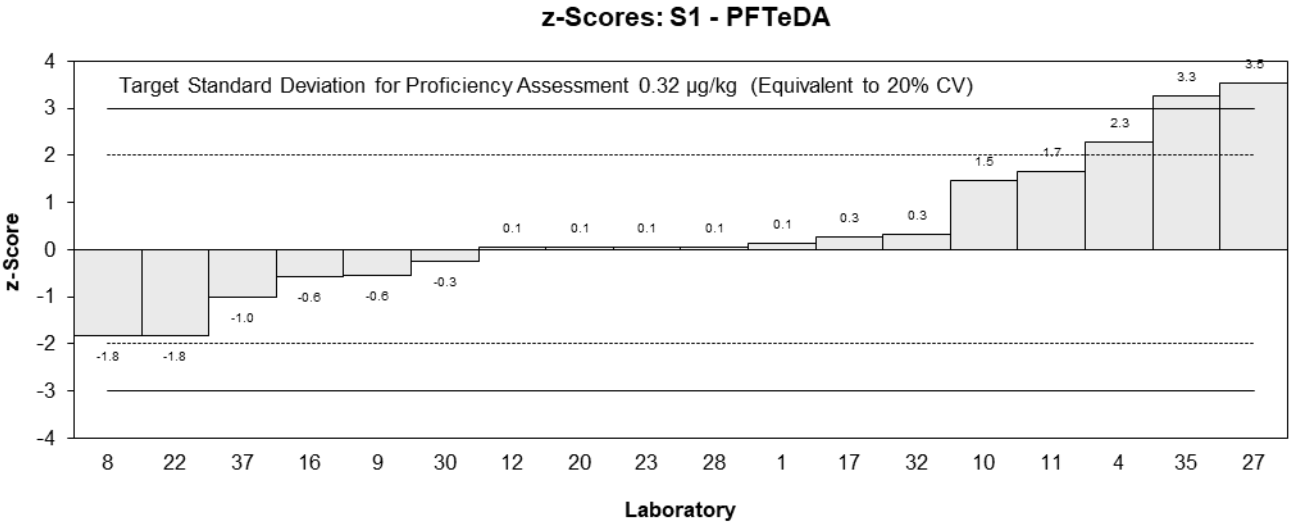
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1.62	0.49	85	0.13	0.07
2	NR	NR	NR		
3	NS	NS	NS		
4	2.30	0.47	97	2.28	1.38
6	NS	NS	NS		
7	<1	NR	113		
8	1	0.15	78	-1.84	-2.11
9	1.4064773591	0.3656841133	17.483734050	-0.55	-0.40
10	2.04	0.60	67	1.46	0.72
11	2.1	0.55	79	1.65	0.87
12	1.6	0.6	96	0.06	0.03
13	NS	NS	NS		
14	NT	NT	NT		
15	<50	NR	NR		
16	1.4	0.35	125.31	-0.57	-0.43
17	1.67	0.435	149	0.28	0.18
18	< 50	NR	106		
19	NR	NR	NR		
20	1.6	0.48	NR	0.06	0.04
22	1	0.3	54	-1.84	-1.53
23	1.6	0.22	NR	0.06	0.06
24	<0.5	NR	NR		
25	<1.0	NR	85		
26	NT	NT	NT		
27*	2.7	0.6	85	3.54	1.74
28	1.60	0.48	123	0.06	0.04
29	< 5	NR	NR		
30	1.5	0.3	116.31	-0.25	-0.21
31	<5	NR	NR		
32	1.68	0.42	104	0.32	0.21
34	NS	NS	NS		
35*	2.61	0.783	106	3.26	1.26
36	NR	NR	NR		
37	1.26	0.28	99	-1.01	-0.88
38	NS	NS	NS		

* Outlier, see Section 4.2

Statistics

Assigned Value	1.58	0.23
Spike Value	Not Spiked	
Robust Average	1.68	0.28
Median	1.60	0.17
Mean	1.70	
N	18	
Max	2.7	
Min	1	
Robust SD	0.48	
Robust CV	29%	


Results: S1 - PFTeDA
Assigned Value = 1.58 ± 0.23 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
8 22 37 16 9 30 12 20 23 28 1 17 32 10 11 4 35 27 2 3 6 7 13 14 15 18 19 24 25 26 29 31 34 36 38 Md RA


z-Scores: S1 - PFTeDA
Target Standard Deviation for Proficiency Assessment 0.32 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
8 22 37 16 9 30 12 20 23 28 1 17 32 10 11 4 35 27
-1.8 -1.8 -1.0 -0.6 -0.6 -0.3 0.1 0.1 0.1 0.1 0.1 0.3 0.3 1.5 1.7 2.3 3.3 3.6

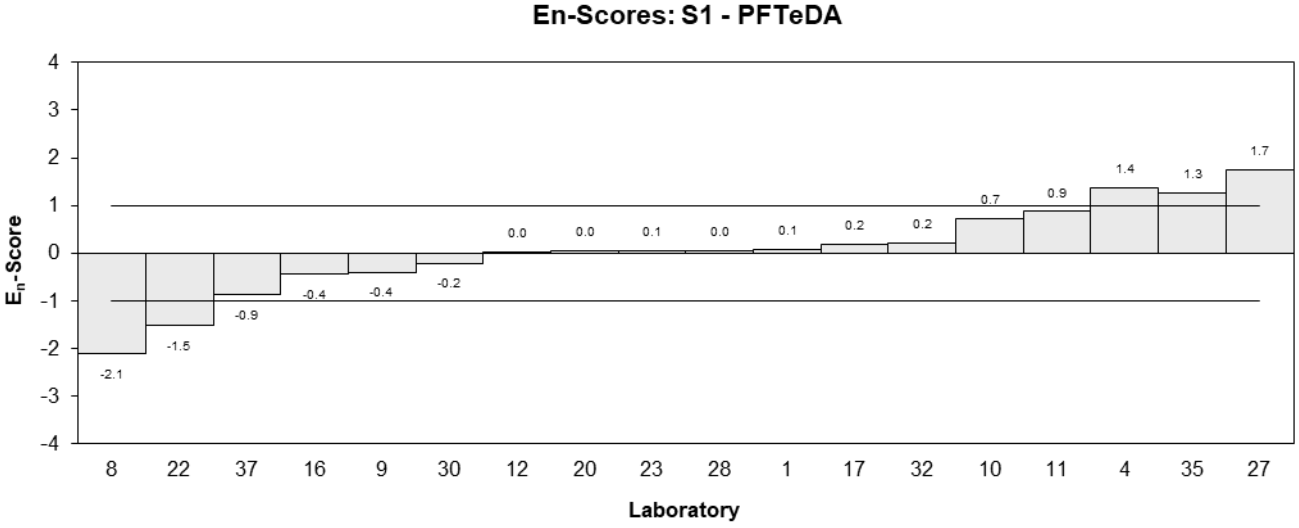

En-Scores: S1 - PFTeDA
En-Score
Laboratory
8 22 37 16 9 30 12 20 23 28 1 17 32 10 11 4 35 27
-2.1 -1.5 -0.9 -0.4 -0.4 -0.2 0.0 0.0 0.1 0.0 0.1 0.2 0.2 0.7 0.9 1.4 1.3 1.7

Figure 22

Table 27

Sample Details

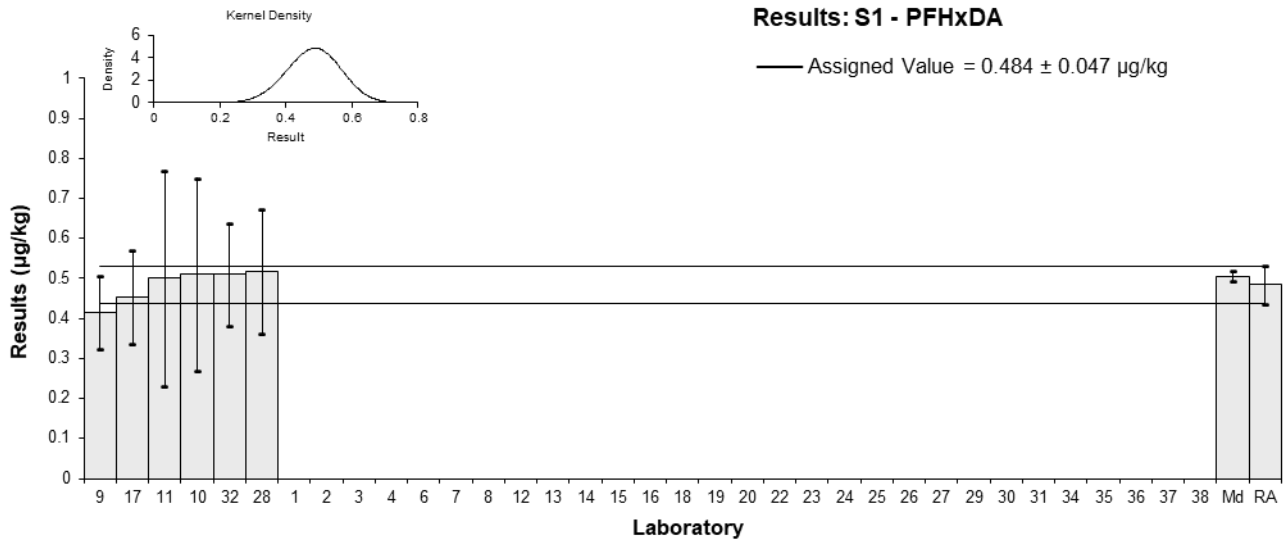
Sample No.	S1
Matrix	Soil
Analyte	PFHxDA
Unit	µg/kg

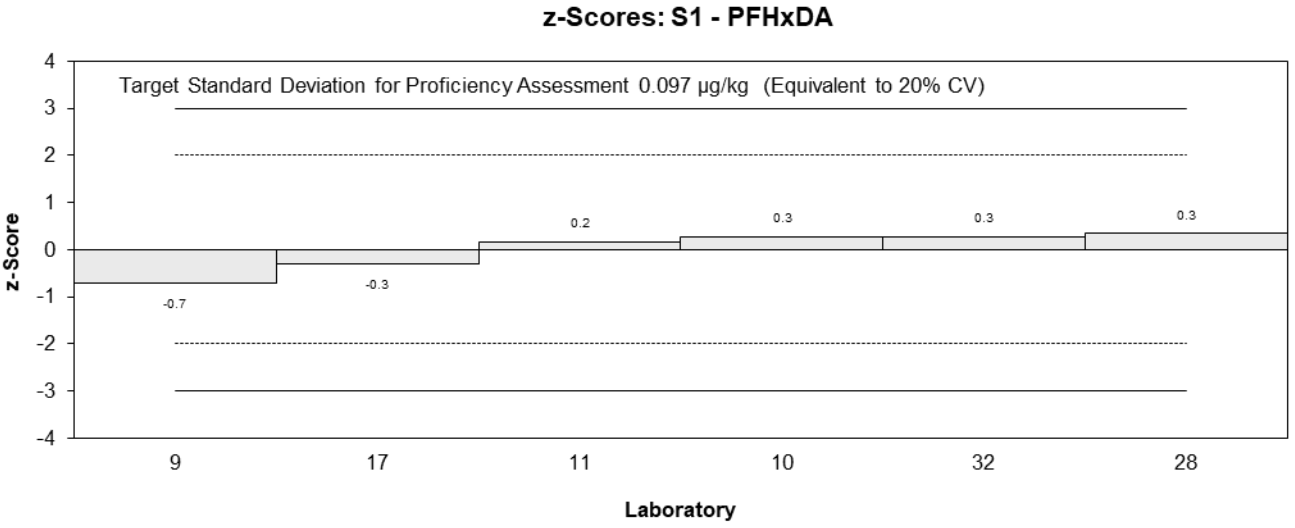
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	NR	NR	NR		
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	<1	NR	113		
8	NT	NT	NT		
9	0.4144398974	0.0091176777	77.336439806	-0.72	-0.68
10	0.51	0.24	96	0.27	0.11
11	0.5	0.27	97	0.17	0.06
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	<0.5	NR	117.69		
17	0.454	0.116	71	-0.31	-0.24
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
22	<0.5	NR	NR		
23	<2	NR	NR		
24	<0.5	NR	NR		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	0.517	0.1551	127	0.34	0.20
29	< 5	NR	NR		
30	<0.5	NR	121.65		
31	NT	NT	NT		
32	0.51	0.128	87	0.27	0.19
34	NS	NS	NS		
35	NT	NT	NT		
36	NR	NR	NR		
37	<1.2	NR	91		
38	NS	NS	NS		

Statistics

Assigned Value	0.484	0.047
Spike Value	Not Spiked	
Robust Average	0.484	0.047
Median	0.505	0.013
Mean	0.484	
N	6	
Max	0.517	
Min	0.4144398974	
Robust SD	0.047	
Robust CV	9.6%	


Kernel Density
Density
Result
Results: S1 - PFHxDA
Assigned Value = 0.484 ± 0.047 µg/kg
Results (µg/kg)
Laboratory
9 17 11 10 32 28 1 2 3 4 6 7 8 12 13 14 15 16 18 19 20 22 23 24 25 26 27 29 30 31 34 35 36 37 38 Md RA


z-Scores: S1 - PFHxDA
Target Standard Deviation for Proficiency Assessment 0.097 µg/kg (Equivalent to 20% CV)
z-Score
-0.7
-0.3
0.2
0.3
0.3
0.3
9 17 11 10 32 28
Laboratory

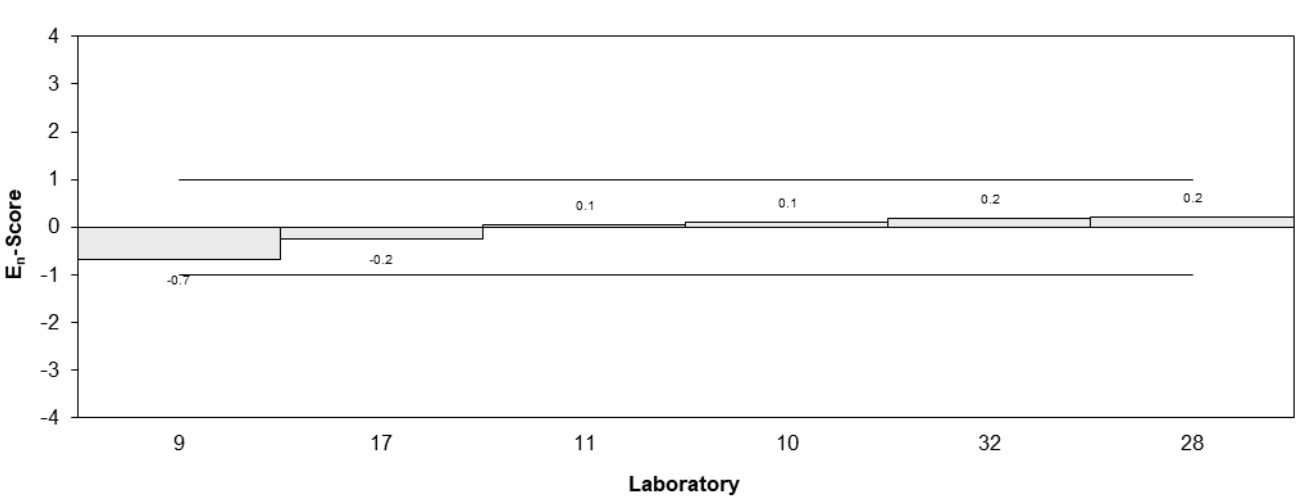

En-Scores: S1 - PFHxDA
En-Score
-0.7
-0.2
0.1
0.1
0.2
0.2
9 17 11 10 32 28
Laboratory

Figure 23

Table 28

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFOSA
Unit	µg/kg

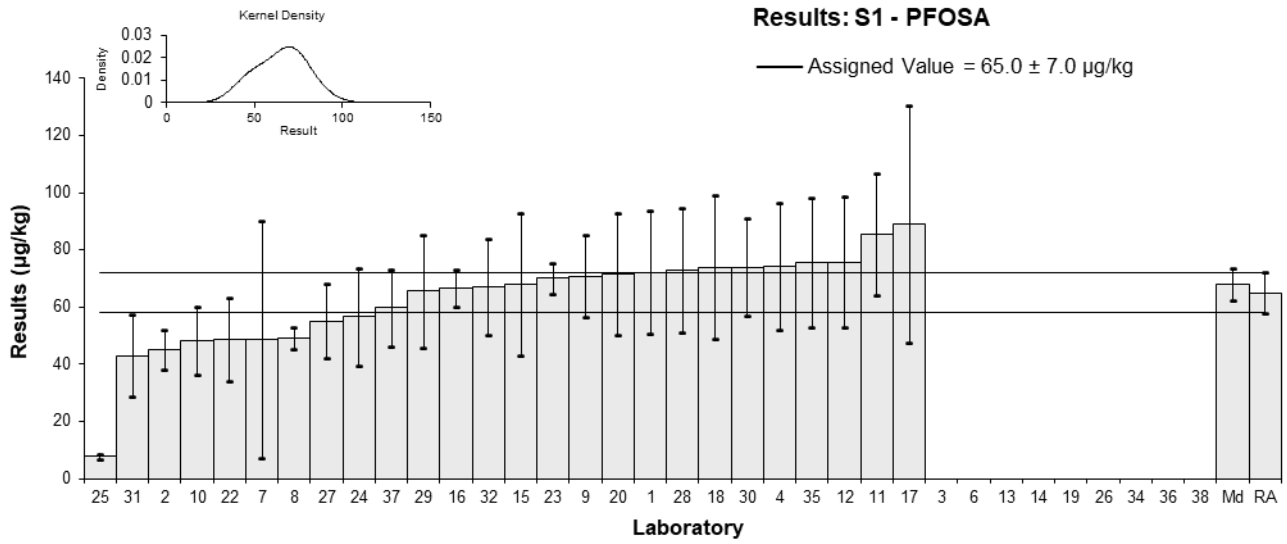
Participant Results

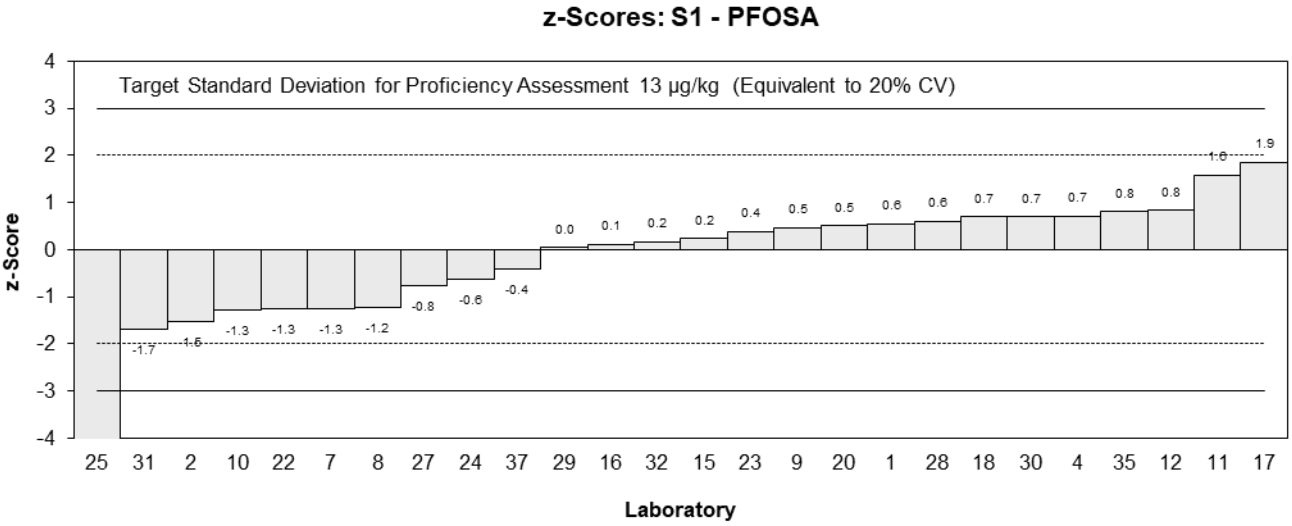
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	72.18	21.66	84	0.55	0.32
2	45	7	103	-1.54	-2.02
3	NS	NS	NS		
4	74.23	22.27	110	0.71	0.40
6	NS	NS	NS		
7	48.74	41.4	106	-1.25	-0.39
8	49	3.9	99	-1.23	-2.00
9	70.848595608	14.169719121	79.426675622	0.45	0.37
10	48.2	12.05	84	-1.29	-1.21
11	85.4	21.3	66	1.57	0.91
12	75.8	23	92	0.83	0.45
13	NS	NS	NS		
14	NT	NT	NT		
15	68	25	108	0.23	0.12
16	66.4	6.5	101.7	0.11	0.15
17	89	41.4	55	1.85	0.57
18	74	25	103	0.69	0.35
19	NT	NT	NT		
20	71.5	21.45	NR	0.50	0.29
22	48.5	14.55	101	-1.27	-1.02
23	70	5.3	NR	0.38	0.57
24	56.7	17.01	84	-0.64	-0.45
25**	7.7	0.91	66	-4.41	-8.12
26	NT	NT	NT		
27	55	13	146	-0.77	-0.68
28	72.8	21.84	82	0.60	0.34
29	65.50	19.65	84	0.04	0.02
30	74	17	74.58	0.69	0.49
31	43	14.2	150	-1.69	-1.39
32	67	16.75	103	0.15	0.11
34	NS	NS	NS		
35	75.4	22.62	99	0.80	0.44
36	NR	NR	NR		
37	59.68	13.61	113	-0.41	-0.35
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	65.0	7.0
Spike Value	Not Spiked	
Robust Average	65.0	7.0
Median	68.0	5.5
Mean	65.0	
N	25	
Max	89	
Min	43	
Robust SD	14	
Robust CV	22%	


Kernel Density
Density
Result
Results: S1 - PFOSA
Assigned Value = 65.0 ± 7.0 µg/kg
Results (µg/kg)
Laboratory
25 31 2 10 22 7 8 27 24 37 29 16 32 15 23 9 20 1 28 18 30 4 35 12 11 17 3 6 13 14 19 26 34 36 38 Md RA


z-Scores: S1 - PFOSA
Target Standard Deviation for Proficiency Assessment 13 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 31 2 10 22 7 8 27 24 37 29 16 32 15 23 9 20 1 28 18 30 4 35 12 11 17

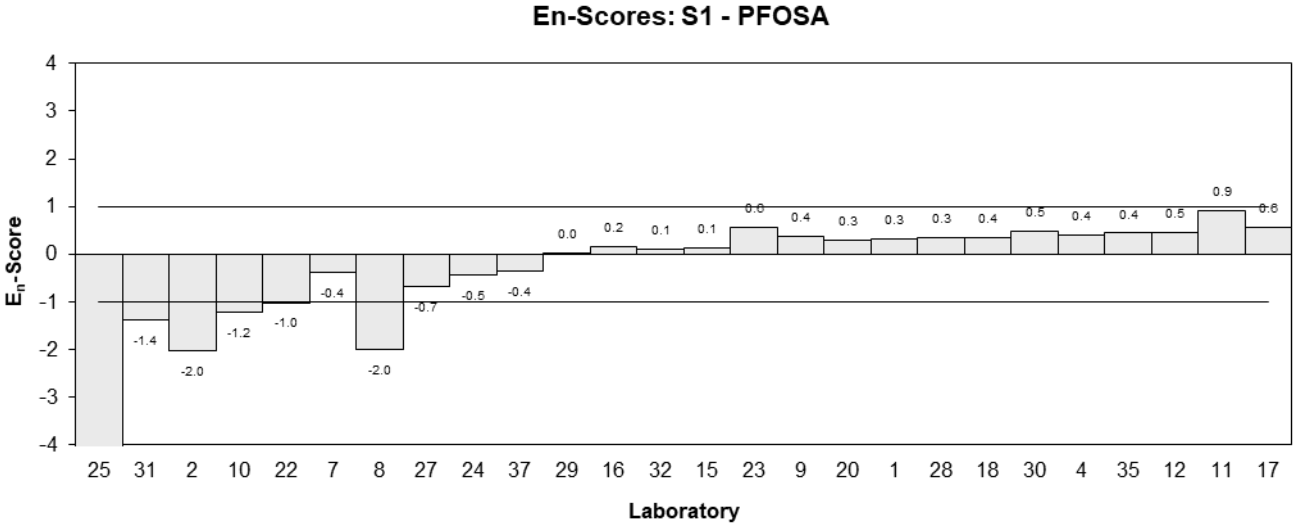

En-Scores: S1 - PFOSA
En-Score
Laboratory
25 31 2 10 22 7 8 27 24 37 29 16 32 15 23 9 20 1 28 18 30 4 35 12 11 17

Figure 24

Table 29

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	MeFOSA
Unit	µg/kg

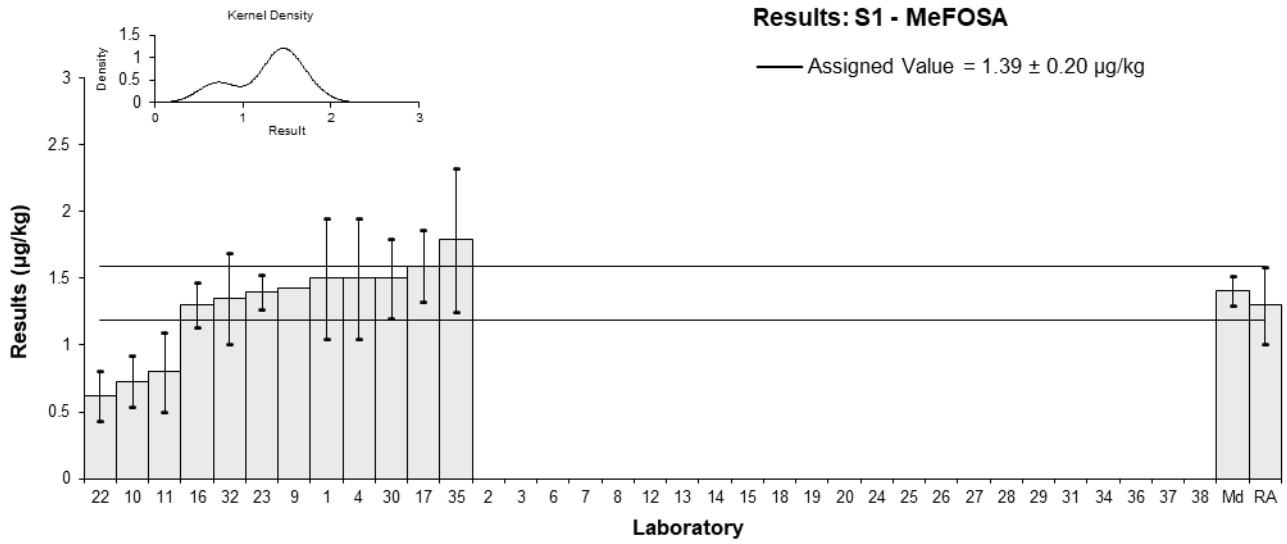
Participant Results

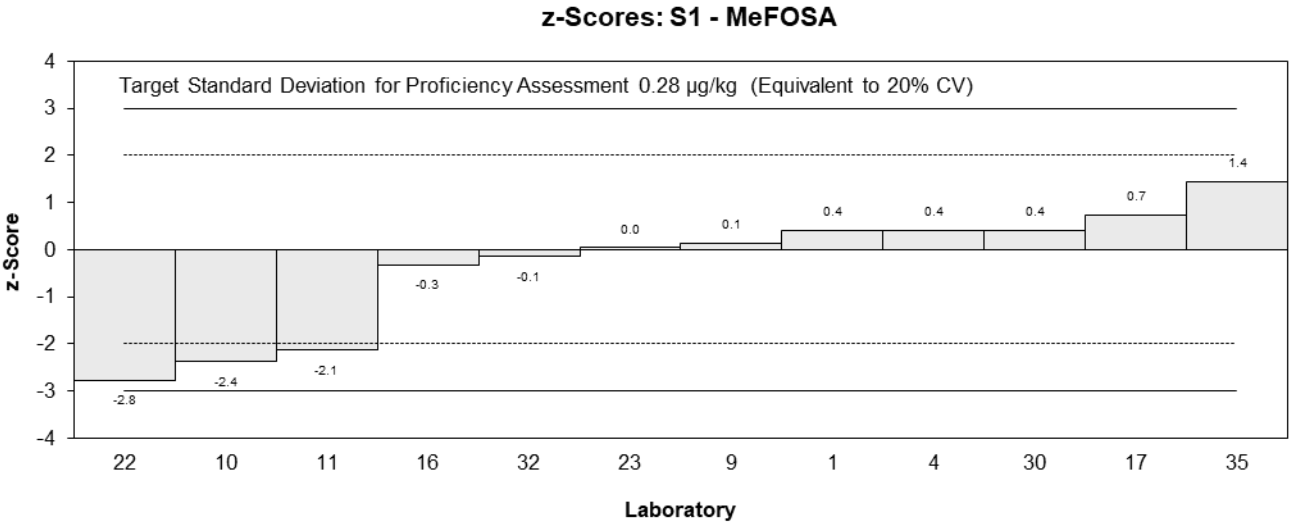
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1.50	0.45	93	0.40	0.22
2	NR	NR	NR		
3	NS	NS	NS		
4	1.50	0.45	146	0.40	0.22
6	NS	NS	NS		
7	<1	NR	90		
8	<1	NR	199		
9	1.4250730359	NR	25.111077417	0.13	0.18
10	0.73	0.19	116	-2.37	-2.39
11	0.8	0.3	92	-2.12	-1.64
12	<1	NR	92		
13	NS	NS	NS		
14	NT	NT	NT		
15	<10	NR	97		
16	1.3	0.17	96.64	-0.32	-0.34
17	1.594	0.272	42	0.73	0.60
18	< 10	NR	100		
19	NT	NT	NT		
20	<1	NR	NR		
22*	0.62	0.186	79	-2.77	-2.82
23	1.4	0.13	NR	0.04	0.04
24	<0.5	NR	NR		
25	<1.0	NR	59		
26	NT	NT	NT		
27	<20	<20	142		
28	NT	NT	NT		
29	< 10	NR	93		
30	1.5	0.3	107.68	0.40	0.31
31	<5	NR	NR		
32	1.35	0.338	107	-0.14	-0.10
34	NS	NS	NS		
35	1.79	0.537	178	1.44	0.70
36	NR	NR	NR		
37	<1.2	NR	90		
38	NS	NS	NS		

* Outlier, see Section 4.2

Statistics

Assigned Value	1.39	0.20
Spike Value	Not Spiked	
Robust Average	1.30	0.29
Median	1.41	0.11
Mean	1.29	
N	12	
Max	1.79	
Min	0.62	
Robust SD	0.41	
Robust CV	31%	


Results: S1 - MeFOSA
Assigned Value = 1.39 ± 0.20 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
22 10 11 16 32 23 9 1 4 30 17 35 2 3 6 7 8 12 13 14 15 18 19 20 24 25 26 27 28 29 31 34 36 37 38 Md RA
Laboratory


z-Scores: S1 - MeFOSA
Target Standard Deviation for Proficiency Assessment 0.28 µg/kg (Equivalent to 20% CV)
z-Score
-2.8 -2.4 -2.1 -0.3 -0.1 0.0 0.1 0.4 0.4 0.4 0.7 1.4
22 10 11 16 32 23 9 1 4 30 17 35
Laboratory

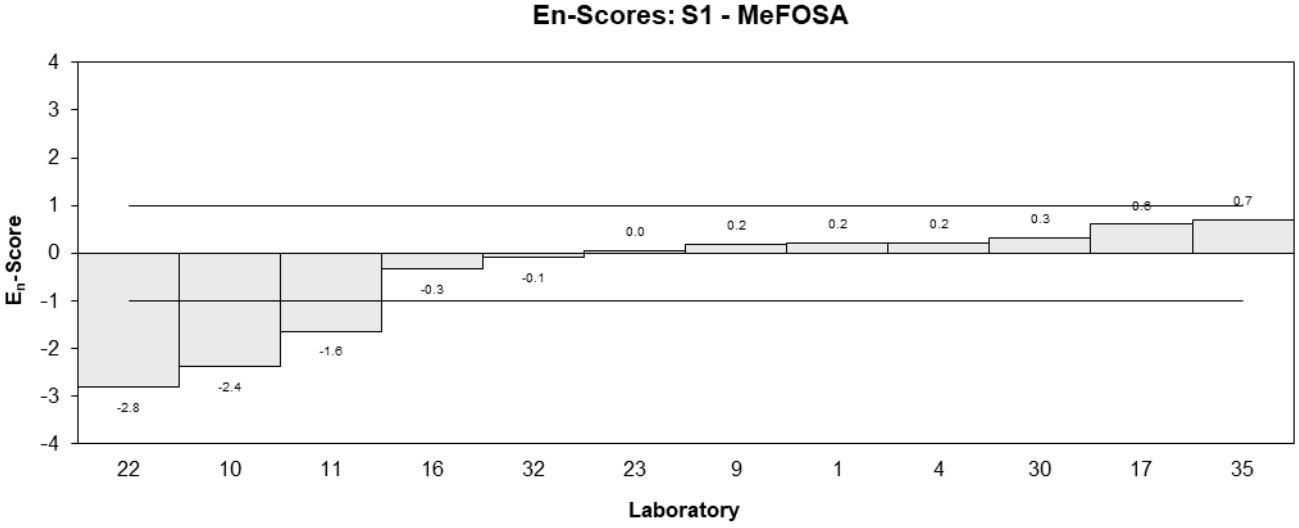

En-Scores: S1 - MeFOSA
En-Score
-2.8 -2.4 -1.6 -0.3 -0.1 0.0 0.2 0.2 0.2 0.3 0.6 0.7
22 10 11 16 32 23 9 1 4 30 17 35
Laboratory

Figure 25

Table 30

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	MeFOSAA
Unit	µg/kg

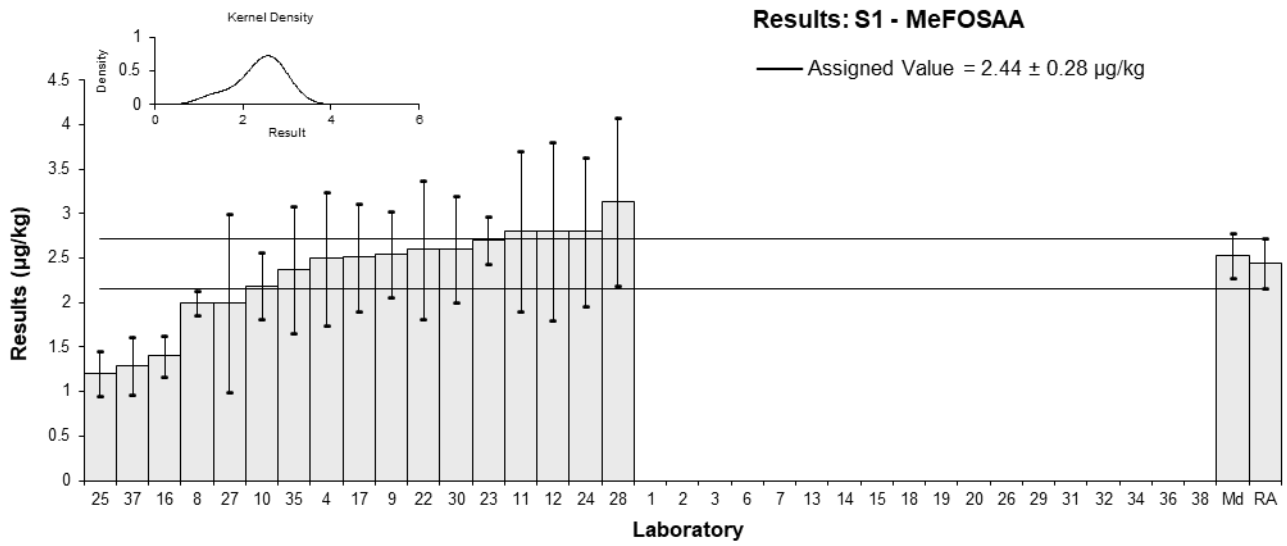
Participant Results

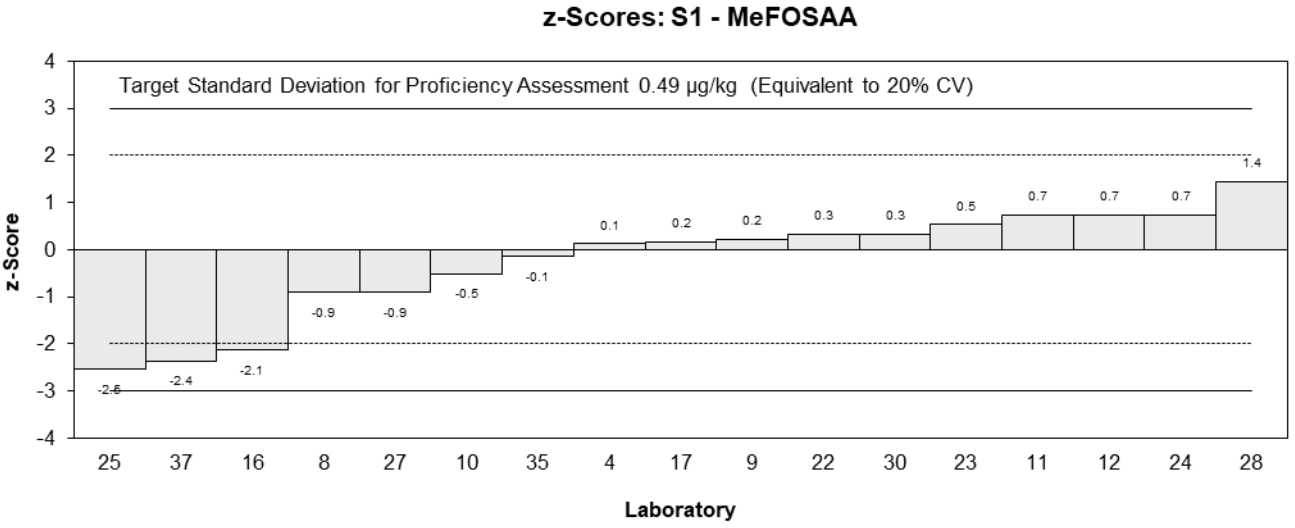
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 0.5	NR	77		
2	NR	NR	NR		
3	NS	NS	NS		
4	2.50	0.75	101	0.12	0.07
6	NS	NS	NS		
7	<1	NR	99		
8	2	0.14	193	-0.90	-1.41
9	2.5409452752	0.4827796022	80.158951605	0.21	0.18
10	2.19	0.37	88	-0.51	-0.54
11	2.8	0.9	42	0.74	0.38
12	2.8	1	89	0.74	0.35
13	NS	NS	NS		
14	NT	NT	NT		
15	<2	NR	91		
16	1.4	0.23	101.8	-2.13	-2.87
17	2.512	0.602	59	0.15	0.11
18	< 2	NR	99		
19	NT	NT	NT		
20	<1	NR	NR		
22	2.6	0.78	79	0.33	0.19
23	2.7	0.27	NR	0.53	0.67
24	2.8	0.84	87	0.74	0.41
25**	1.2	0.25	104	-2.54	-3.30
26	NT	NT	NT		
27	2	1	81	-0.90	-0.42
28	3.14	0.942	67	1.43	0.71
29	< 10	NR	77		
30	2.6	0.6	56.9	0.33	0.24
31	<5	NR	NR		
32	<3	NR	NR		
34	NS	NS	NS		
35	2.37	0.711	139	-0.14	-0.09
36	NR	NR	NR		
37	1.29	0.33	124	-2.36	-2.66
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	2.44	0.28
Spike Value	Not Spiked	
Robust Average	2.44	0.28
Median	2.53	0.25
Mean	2.39	
N	16	
Max	3.14	
Min	1.29	
Robust SD	0.45	
Robust CV	18%	


Kernel Density
Density
Result
Results: S1 - MeFOSAA
Assigned Value = 2.44 ± 0.28 µg/kg
Results (µg/kg)
25 37 16 8 27 10 35 4 17 9 22 30 23 11 12 24 28 1 2 3 6 7 13 14 15 18 19 20 26 29 31 32 34 36 38 Md RA
Laboratory


z-Scores: S1 - MeFOSAA
Target Standard Deviation for Proficiency Assessment 0.49 µg/kg (Equivalent to 20% CV)
z-Score
-2.6 -2.4 -2.1 -0.9 -0.9 -0.5 -0.1 0.1 0.2 0.2 0.3 0.3 0.5 0.7 0.7 0.7 1.4
25 37 16 8 27 10 35 4 17 9 22 30 23 11 12 24 28
Laboratory

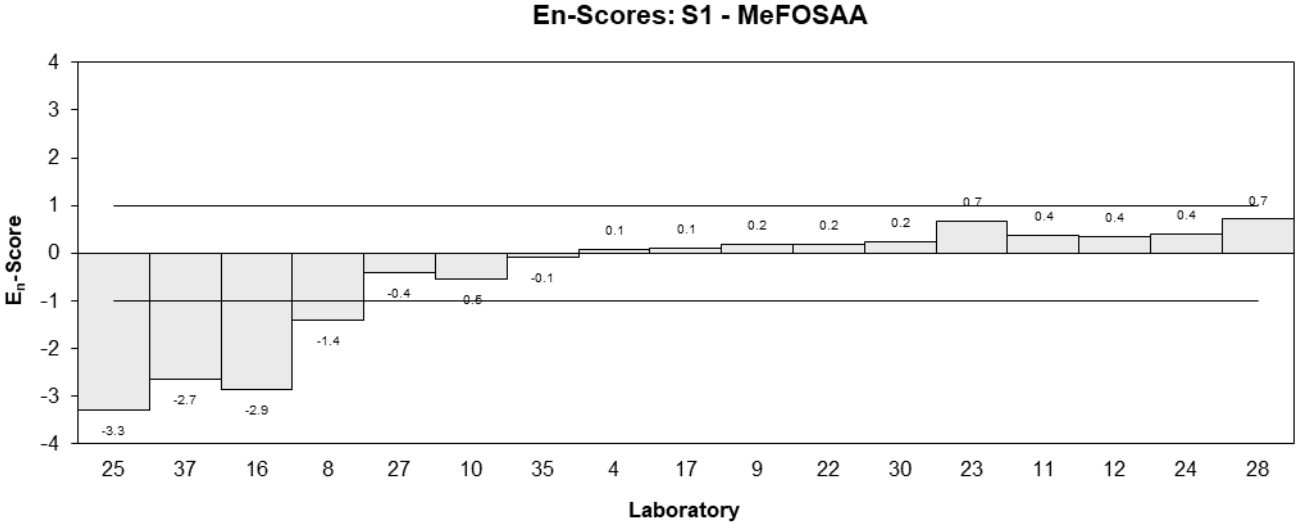

En-Scores: S1 - MeFOSAA
En-Score
-3.3 -2.7 -2.9 -1.4 -0.4 -0.5 -0.1 0.1 0.1 0.2 0.2 0.2 0.7 0.4 0.4 0.4 0.7
25 37 16 8 27 10 35 4 17 9 22 30 23 11 12 24 28
Laboratory

Figure 26

Table 31

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	MeFOSE
Unit	µg/kg

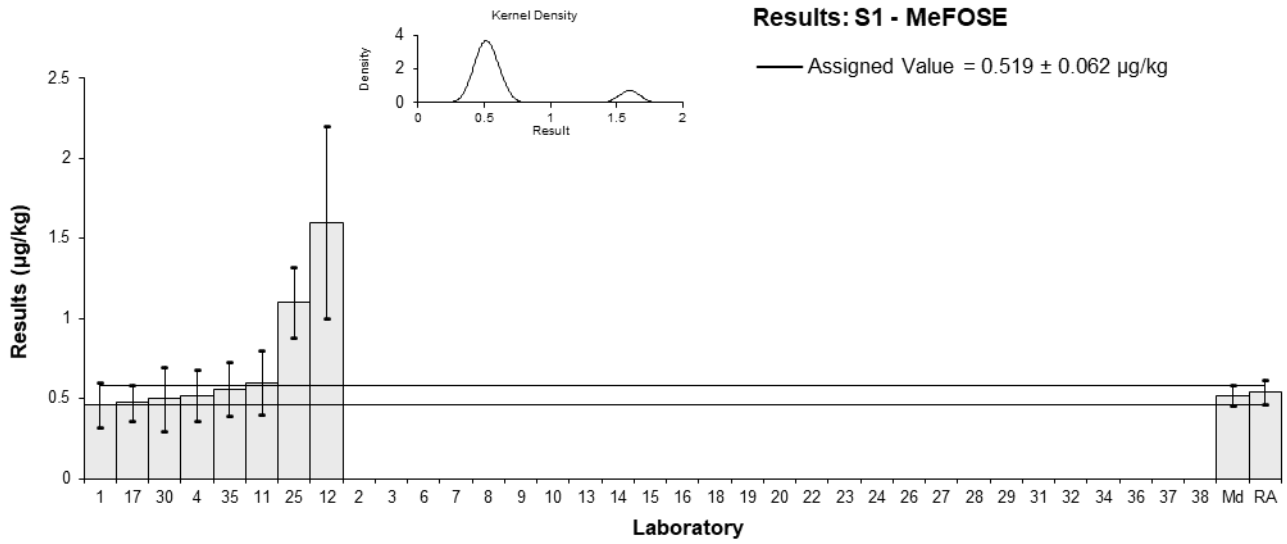
Participant Results

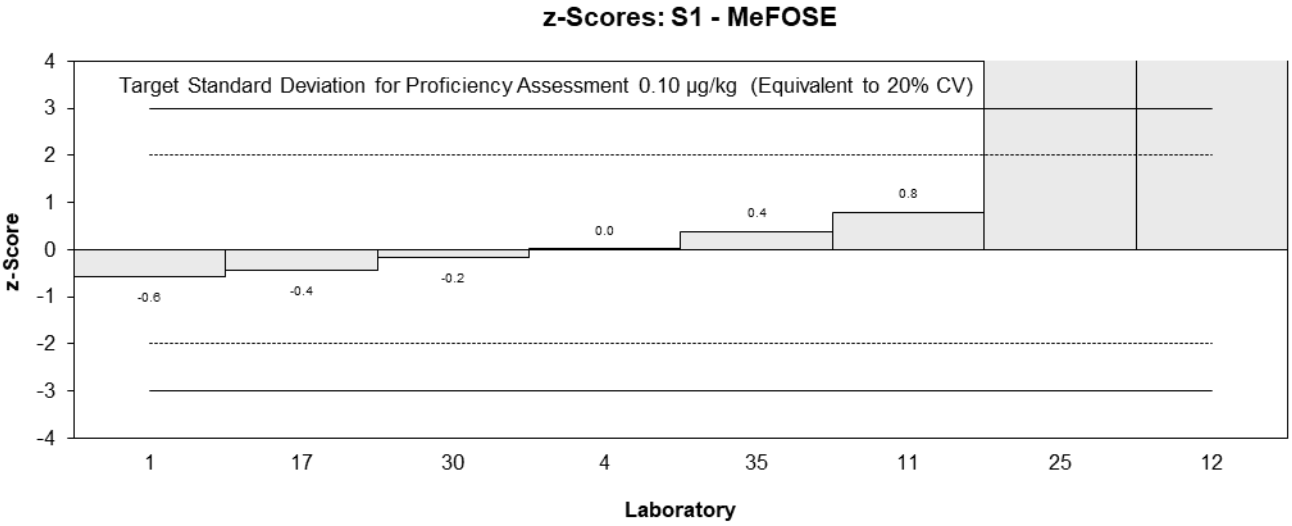
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.46	0.14	82	-0.57	-0.39
2	NR	NR	NR		
3	NS	NS	NS		
4	0.52	0.16	129	0.01	0.01
6	NS	NS	NS		
7	<2	NR	118		
8	<1	NR	184		
9	NT	NT	NT		
10	<0.0005	NR	94		
11	0.6	0.2	82	0.78	0.39
12*	1.6	0.6	NR	10.41	1.79
13	NS	NS	NS		
14	NT	NT	NT		
15	<10	NR	103		
16	<1.0	NR	109.04		
17	0.473	0.113	41	-0.44	-0.36
18	< 10	NR	111		
19	NT	NT	NT		
20	<1	NR	NR		
22	<0.5	NR	NR		
23	<1	NR	NR		
24	<0.5	NR	NR		
25**	1.1	0.22	62	5.60	2.54
26	NT	NT	NT		
27	<160	<160	119		
28	NT	NT	NT		
29	< 10	NR	82		
30	0.5	0.2	123.48	-0.18	-0.09
31	<5	NR	NR		
32	<1	NR	NR		
34	NS	NS	NS		
35	0.56	0.168	90	0.39	0.23
36	NR	NR	NR		
37	<1.2	NR	108		
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.519	0.062
Spike Value	Not Spiked	
Robust Average	0.540	0.079
Median	0.520	0.066
Mean	0.673	
N	7	
Max	1.6	
Min	0.46	
Robust SD	0.083	
Robust CV	15%	


Results: S1 - MeFOSE
Assigned Value = 0.519 ± 0.062 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
1 17 30 4 35 11 25 12 2 3 6 7 8 9 10 13 14 15 16 18 19 20 22 23 24 26 27 28 29 31 32 34 36 37 38 Md RA


z-Scores: S1 - MeFOSE
Target Standard Deviation for Proficiency Assessment 0.10 µg/kg (Equivalent to 20% CV)
z-Score
-0.6
-0.4
-0.2
0.0
0.4
0.8
Laboratory
1 17 30 4 35 11 25 12

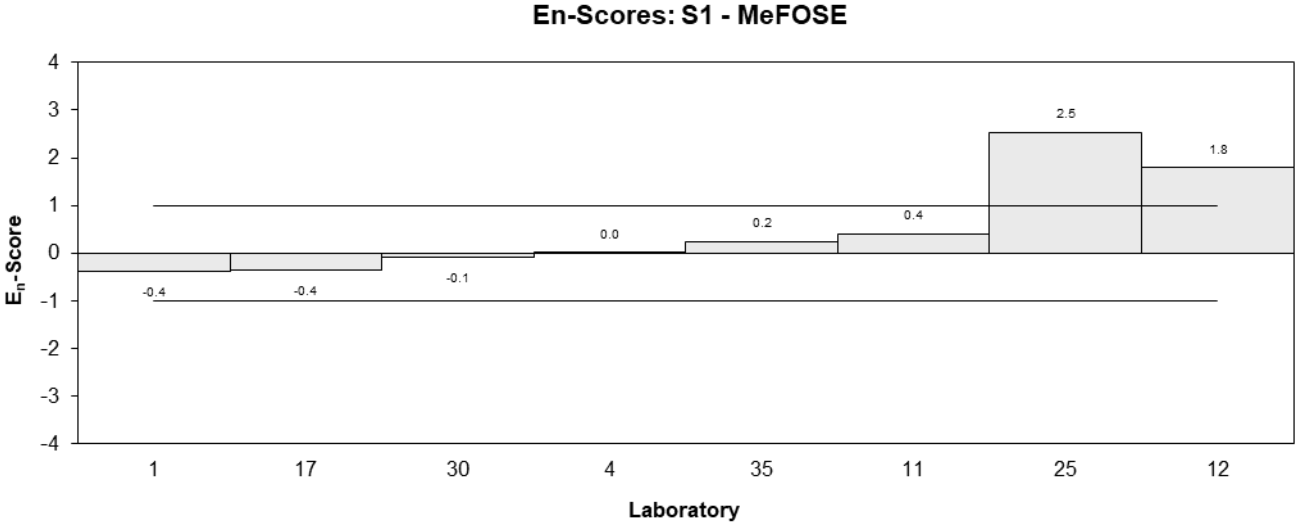

En-Scores: S1 - MeFOSE
En-Score
-0.4
-0.4
-0.1
0.0
0.2
0.4
2.5
1.8
Laboratory
1 17 30 4 35 11 25 12

Figure 27

Table 32

Sample Details

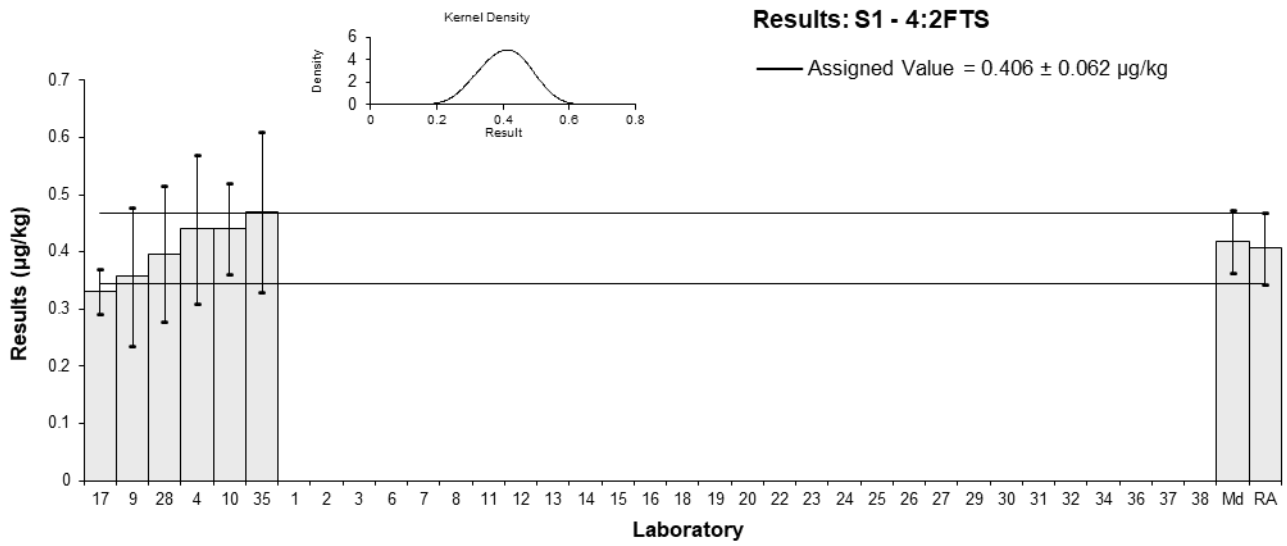
Sample No.	S1
Matrix	Soil
Analyte	4:2FTS
Unit	µg/kg

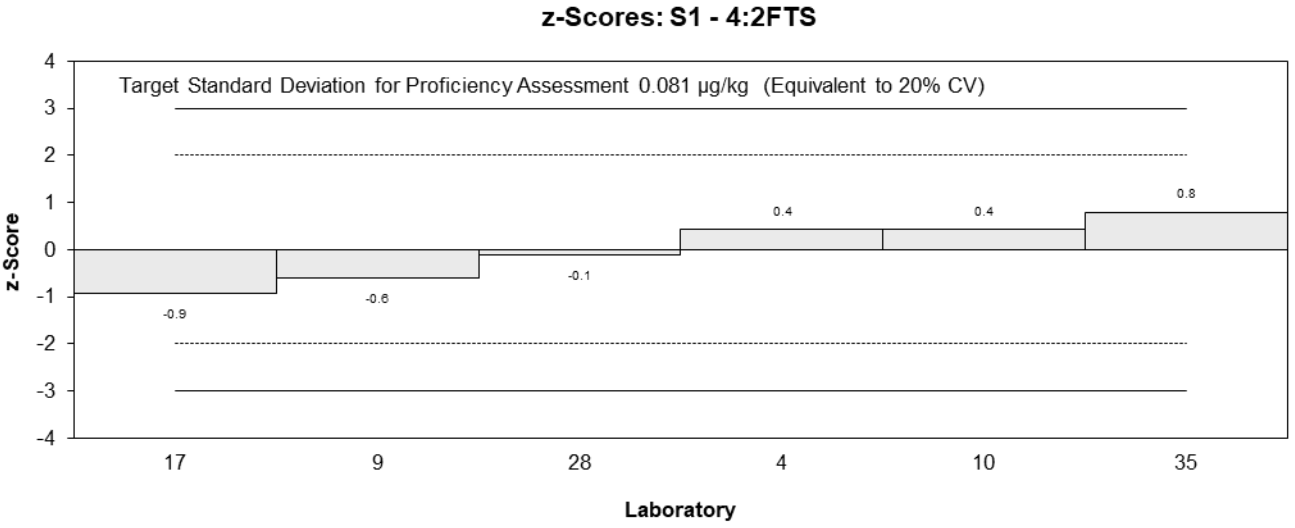
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 0.5	NR	70		
2	NR	NR	NR		
3	NS	NS	NS		
4	0.44	0.13	100	0.42	0.24
6	NS	NS	NS		
7	<1	NR	98		
8	<1	NR	109		
9	0.3567687816	0.1213013857	70.540675210	-0.61	-0.36
10	0.44	0.08	62	0.42	0.34
11	<0.5	0.1	76		
12	<1	NR	NR		
13	NS	NS	NS		
14	NT	NT	NT		
15	<1	NR	101		
16	<0.5	NR	112.5		
17	0.331	0.039	70	-0.92	-1.02
18	< 1	NR	101		
19	NT	NT	NT		
20	<1	NR	NR		
22	<0.5	NR	NR		
23	<1	NR	NR		
24	<0.5	NR	NR		
25	<1.0	NR	192		
26	NT	NT	NT		
27	<20	20	120		
28	0.397	0.1191	71	-0.11	-0.07
29	< 5	NR	70		
30	<0.5	NR	168.73		
31	<5	NR	NR		
32	<0.5	NR	NR		
34	NS	NS	NS		
35	0.47	0.141	69	0.79	0.42
36	NR	NR	NR		
37	<0.5	NR	89		
38	NS	NS	NS		

Statistics

Assigned Value	0.406	0.062
Spike Value	Not Spiked	
Robust Average	0.406	0.062
Median	0.419	0.055
Mean	0.406	
N	6	
Max	0.47	
Min	0.331	
Robust SD	0.061	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - 4:2FTS
Assigned Value = 0.406 ± 0.062 µg/kg
Results (µg/kg)
Laboratory
17 9 28 4 10 35 1 2 3 6 7 8 11 12 13 14 15 16 18 19 20 22 23 24 25 26 27 29 30 31 32 34 36 37 38 Md RA


z-Scores: S1 - 4:2FTS
Target Standard Deviation for Proficiency Assessment 0.081 µg/kg (Equivalent to 20% CV)
z-Score
-0.9
-0.6
-0.1
0.4
0.4
0.8
Laboratory
17 9 28 4 10 35

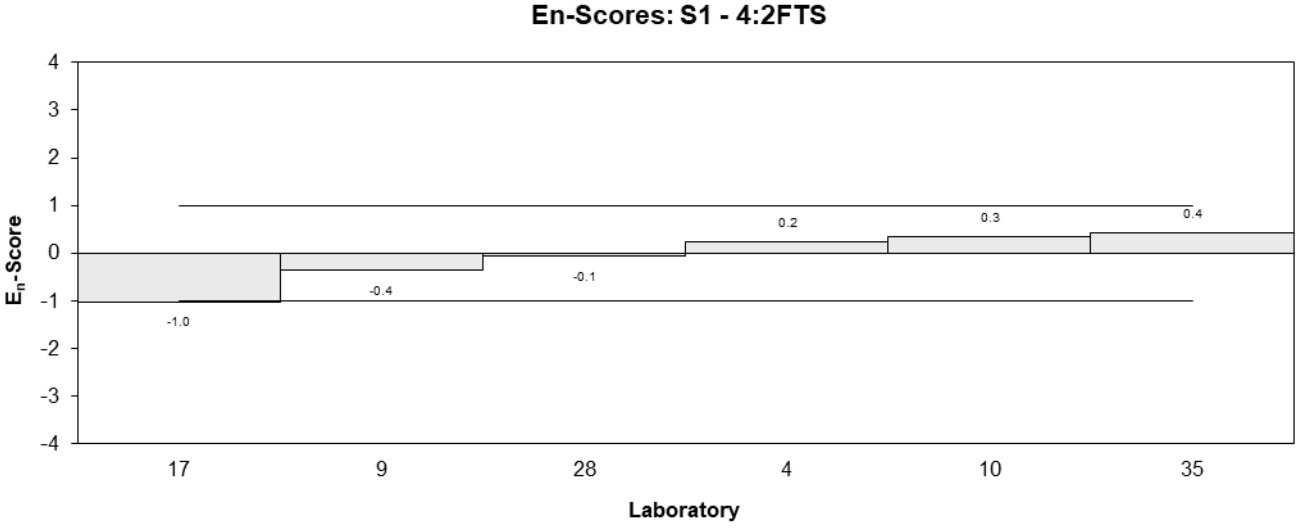

En-Scores: S1 - 4:2FTS
En-Score
-1.0
-0.4
-0.1
0.2
0.3
0.4
Laboratory
17 9 28 4 10 35

Figure 28

Table 33

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	6:2FTS
Unit	µg/kg

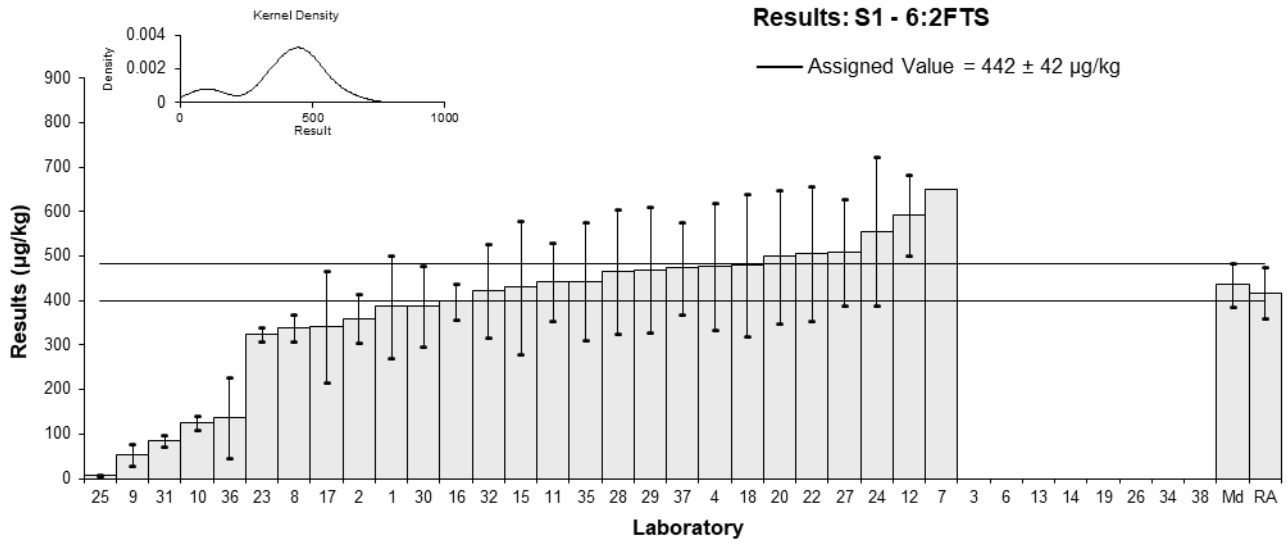
Participant Results

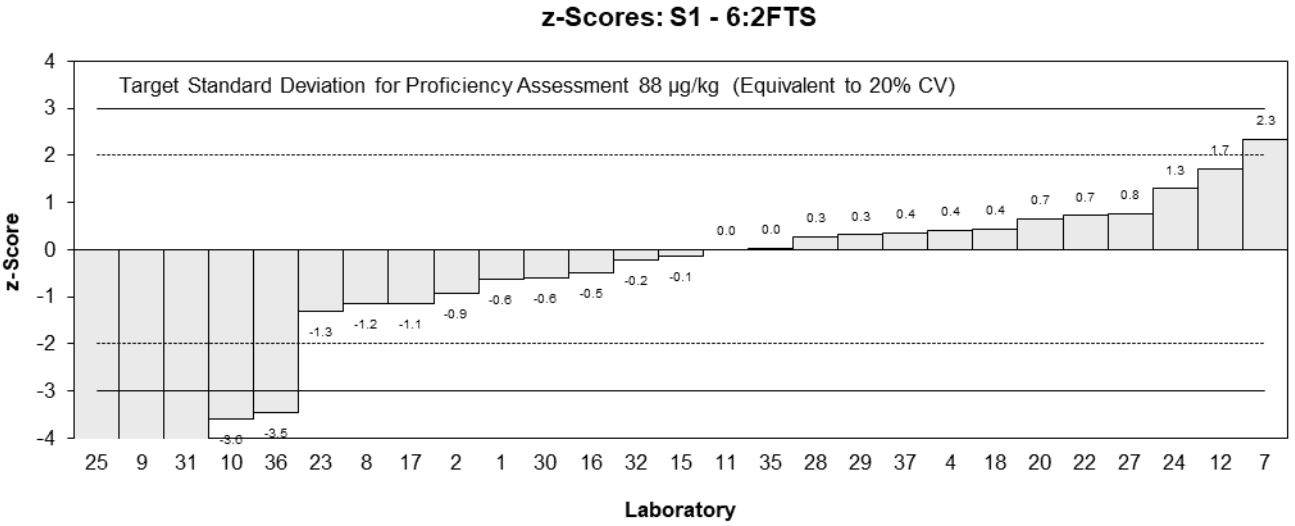
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	386.76	116.03	79	-0.62	-0.45
2	360	54	100	-0.93	-1.20
3	NS	NS	NS		
4	476.94	143.08	103	0.40	0.23
6	NS	NS	NS		
7*	648.85	NR	102	2.34	4.93
8	340	30	121	-1.15	-1.98
9*	53.710663726	24.706905314	432.17232072	-4.39	-7.97
10*	124.7	15.34	200	-3.59	-7.10
11	442	88.4	89	0.00	0.00
12	593	91	NR	1.71	1.51
13	NS	NS	NS		
14	NT	NT	NT		
15	430	150	96	-0.14	-0.08
16	398	39	125.94	-0.50	-0.77
17	341	126	80	-1.14	-0.76
18	480	160	97	0.43	0.23
19	NT	NT	NT		
20	500	150	NR	0.66	0.37
22	505.6	151.68	84	0.72	0.40
23	325	15	NR	-1.32	-2.62
24	556	166.8	114	1.29	0.66
25**	6.7	1.2	125	-4.92	-10.36
26	NT	NT	NT		
27	510	120	99	0.77	0.53
28	465	139.5	101	0.26	0.16
29	469.42	140.83	79	0.31	0.19
30	389	91	57.02	-0.60	-0.53
31*	85	11.9	614	-4.04	-8.18
32	422	105.5	101	-0.23	-0.18
34	NS	NS	NS		
35	443.7	133.11	85	0.02	0.01
36*	136	91	368	-3.46	-3.05
37	473.87	104.2	84	0.36	0.28
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	442	42
Spike Value	Not Spiked	
Robust Average	418	58
Median	436	49
Mean	398	
N	26	
Max	648.85	
Min	53.710663726	
Robust SD	120	
Robust CV	28%	


Kernel Density
Density
0.004
0.002
0
0
500
1000
Result
Results: S1 - 6:2FTS
Assigned Value = 442 ± 42 µg/kg
Results (µg/kg)
900
800
700
600
500
400
300
200
100
0
25 9 31 10 36 23 8 17 2 1 30 16 32 15 11 35 28 29 37 4 18 20 22 27 24 12 7 3 6 13 14 19 26 34 38 Md RA
Laboratory


z-Scores: S1 - 6:2FTS
Target Standard Deviation for Proficiency Assessment 88 µg/kg (Equivalent to 20% CV)
z-Score
4
3
2
1
0
-1
-2
-3
-4
-3.6
-3.5
-1.3
-1.2
-1.1
-0.9
-0.6
-0.6
-0.5
-0.2
-0.1
0.0
0.0
0.3
0.3
0.4
0.4
0.4
0.7
0.7
0.8
1.3
1.7
2.3
25 9 31 10 36 23 8 17 2 1 30 16 32 15 11 35 28 29 37 4 18 20 22 27 24 12 7
Laboratory

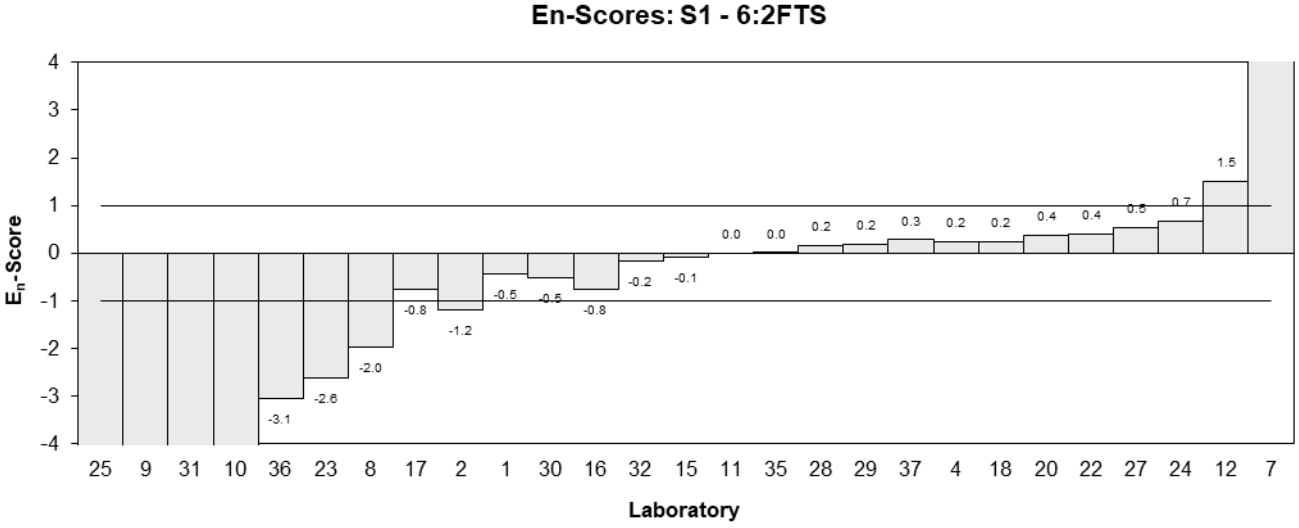

En-Scores: S1 - 6:2FTS
En-Score
4
3
2
1
0
-1
-2
-3
-4
-3.1
-2.6
-2.0
-0.8
-1.2
-0.5
-0.5
-0.8
-0.2
-0.1
0.0
0.0
0.2
0.2
0.3
0.2
0.2
0.4
0.4
0.5
0.7
1.5
25 9 31 10 36 23 8 17 2 1 30 16 32 15 11 35 28 29 37 4 18 20 22 27 24 12 7
Laboratory

Figure 29

Table 34

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	8:2FTS
Unit	µg/kg

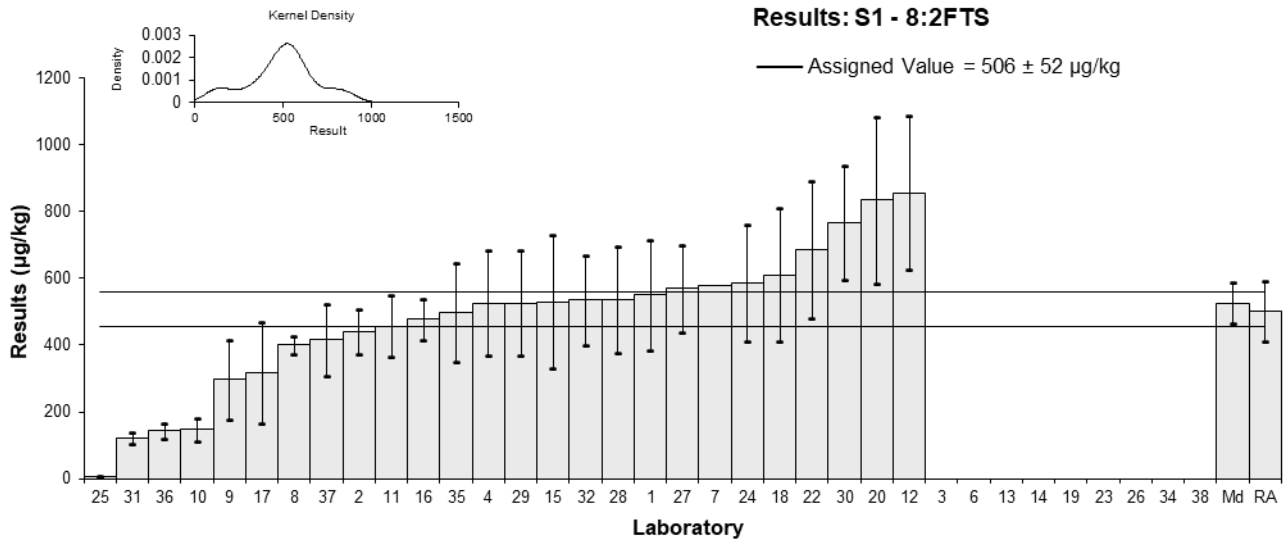
Participant Results

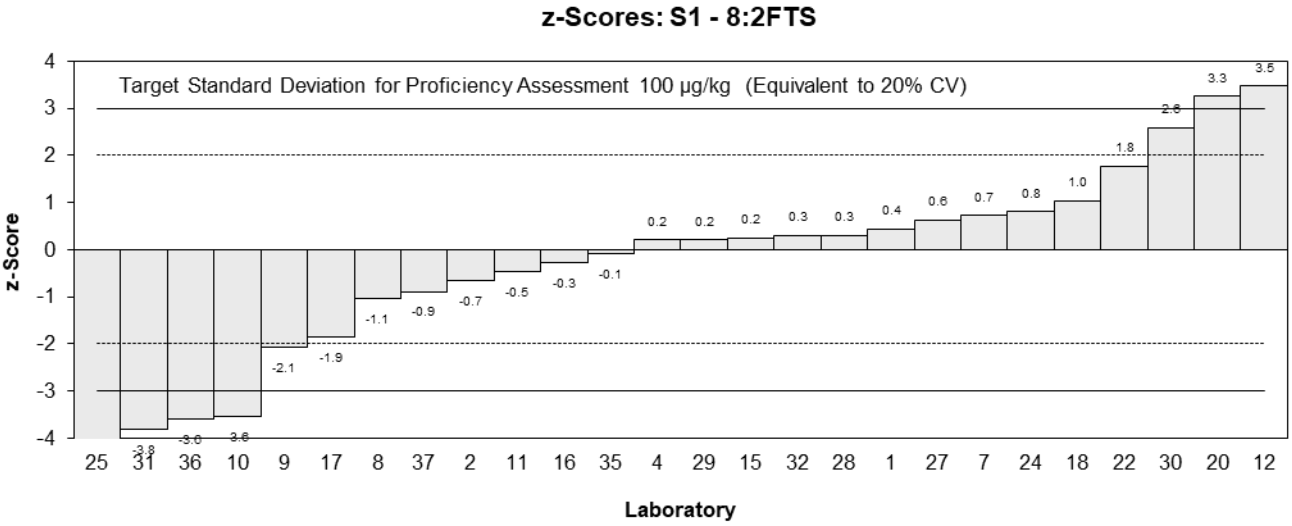
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	550.12	165.04	87	0.44	0.25
2	440	66	83	-0.65	-0.79
3	NS	NS	NS		
4	526.16	157.85	128	0.20	0.12
6	NS	NS	NS		
7	579.25	NR	94	0.72	1.41
8	400	26	132	-1.05	-1.82
9	297.00516903	118.80206761	115.13360646	-2.07	-1.61
10*	146.3	34.23	322	-3.55	-5.78
11	457	91.4	118	-0.48	-0.47
12*	857	231	127	3.47	1.48
13	NS	NS	NS		
14	NT	NT	NT		
15	530	200	96	0.24	0.12
16	478	61.7	125.19	-0.28	-0.35
17	318	151	120	-1.86	-1.18
18	610	200	94	1.03	0.50
19	NT	NT	NT		
20*	835	250.5	NR	3.25	1.29
22	684.8	205.44	81	1.77	0.84
23	NR	NR	NR		
24	586.9	176.07	86	0.80	0.44
25**	6.6	1.2	134	-4.93	-9.60
26	NT	NT	NT		
27	570	130	65	0.63	0.46
28	536	160.8	115	0.30	0.18
29	526.24	157.87	87	0.20	0.12
30*	768	171	52.28	2.59	1.47
31*	120	16.8	428	-3.81	-7.06
32	535	133.75	112	0.29	0.20
34	NS	NS	NS		
35	497.57	149.271	73	-0.08	-0.05
36*	143	24	366	-3.59	-6.34
37	416.38	107.4	157	-0.89	-0.75
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	506	52
Spike Value	Not Spiked	
Robust Average	502	90
Median	526	62
Mean	496	
N	25	
Max	857	
Min	120	
Robust SD	180	
Robust CV	36%	


Kernel Density
Density
Result
Results: S1 - 8:2FTS
Assigned Value = 506 ± 52 µg/kg
Results (µg/kg)
Laboratory
25 31 36 10 9 17 8 37 2 11 16 35 4 29 15 32 28 1 27 7 24 18 22 30 20 12 3 6 13 14 19 23 26 34 38 Md RA


z-Scores: S1 - 8:2FTS
Target Standard Deviation for Proficiency Assessment 100 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 31 36 10 9 17 8 37 2 11 16 35 4 29 15 32 28 1 27 7 24 18 22 30 20 12

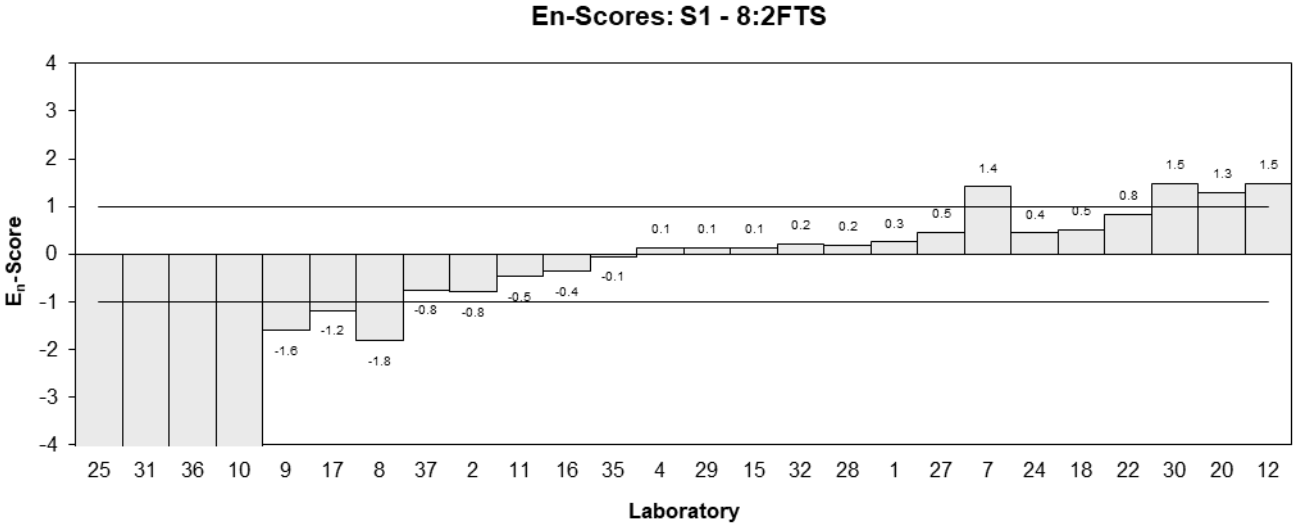

En-Scores: S1 - 8:2FTS
En-Score
Laboratory
25 31 36 10 9 17 8 37 2 11 16 35 4 29 15 32 28 1 27 7 24 18 22 30 20 12

Figure 30

Table 35

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	10:2FTS
Unit	µg/kg

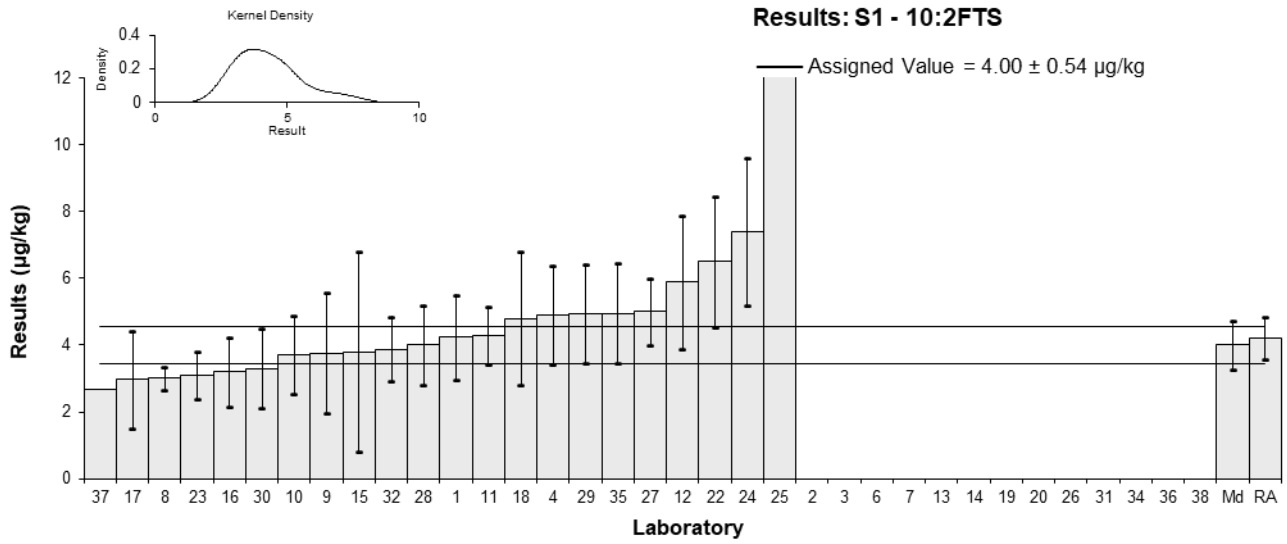
Participant Results

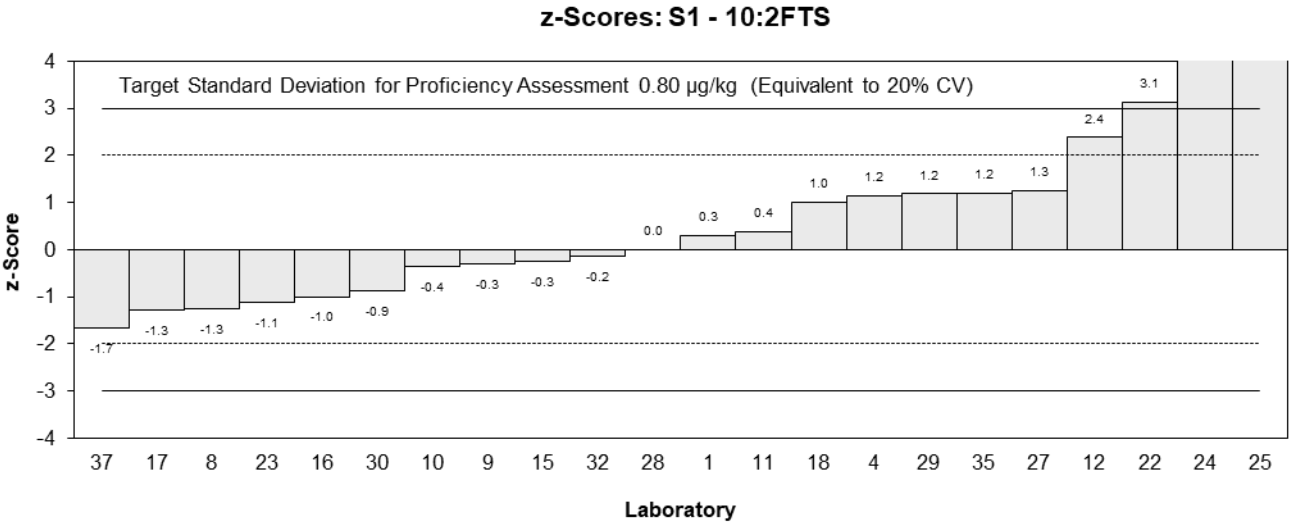
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	4.23	1.27	82	0.29	0.17
2	NR	NR	NR		
3	NS	NS	NS		
4	4.92	1.48	148	1.15	0.58
6	NS	NS	NS		
7	<1	NR	NR		
8	3	0.35	132	-1.25	-1.55
9	3.7579127478	1.8037981189	80.024038343	-0.30	-0.13
10	3.7	1.18	NR	-0.37	-0.23
11	4.3	0.86	118	0.37	0.30
12	5.9	2	NR	2.38	0.92
13	NS	NS	NS		
14	NT	NT	NT		
15	3.8	3	96	-0.25	-0.07
16	3.2	1.03	125.19	-1.00	-0.69
17	2.97	1.47	104	-1.29	-0.66
18	4.8	2	94	1.00	0.39
19	NT	NT	NT		
20	NT	NT	NT		
22*	6.5	1.95	33	3.12	1.24
23	3.1	0.70	NR	-1.12	-1.02
24*	7.4	2.22	40	4.25	1.49
25**	88	12	103	105.00	6.99
26	NT	NT	NT		
27	5	1	NR	1.25	0.88
28	4.00	1.2	115	0.00	0.00
29	4.940	1.482	82	1.18	0.60
30	3.3	1.2	149.3	-0.88	-0.53
31	<5	NR	NR		
32	3.88	0.97	129	-0.15	-0.11
34	NS	NS	NS		
35	4.96	1.488	143	1.20	0.61
36	NR	NR	NR		
37	2.67	NR	157	-1.66	-2.46
38	NS	NS	NS		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	4.00	0.54
Spike Value	Not Spiked	
Robust Average	4.21	0.63
Median	4.00	0.73
Mean	4.30	
N	21	
Max	7.4	
Min	2.67	
Robust SD	1.2	
Robust CV	27%	


Kernel Density
Density
Result
Results: S1 - 10:2FTS
Assigned Value = 4.00 ± 0.54 µg/kg
Results (µg/kg)
Laboratory
37 17 8 23 16 30 10 9 15 32 28 1 11 18 4 29 35 27 12 22 24 25 2 3 6 7 13 14 19 20 26 31 34 36 38 Md RA


z-Scores: S1 - 10:2FTS
Target Standard Deviation for Proficiency Assessment 0.80 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
37 17 8 23 16 30 10 9 15 32 28 1 11 18 4 29 35 27 12 22 24 25

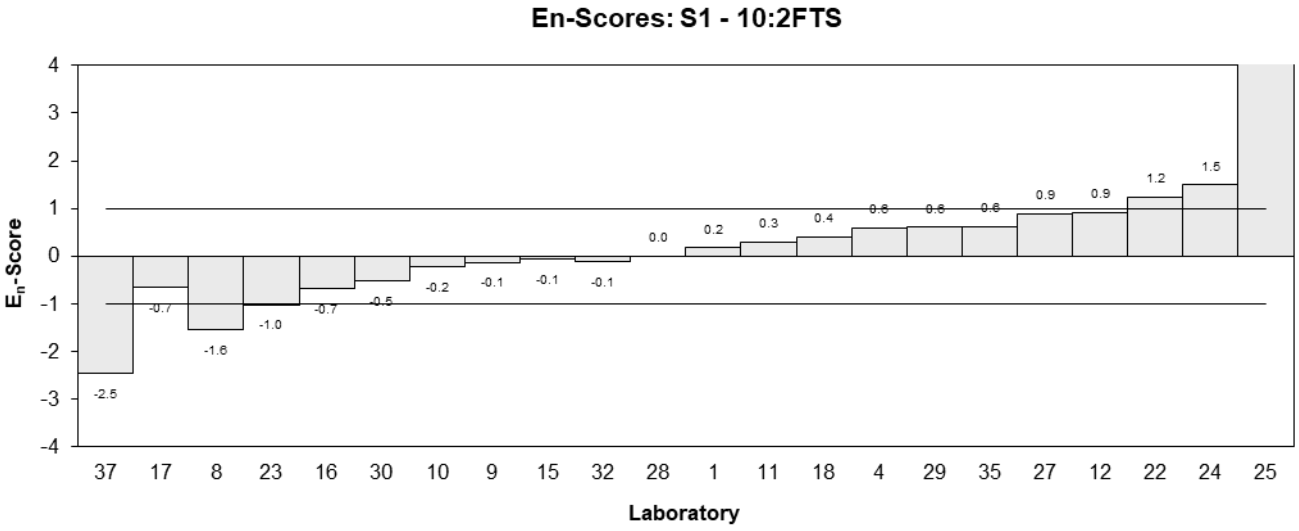

En-Scores: S1 - 10:2FTS
En-Score
Laboratory
37 17 8 23 16 30 10 9 15 32 28 1 11 18 4 29 35 27 12 22 24 25

Figure 31

Table 36

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	3:3FTCA
Unit	µg/kg

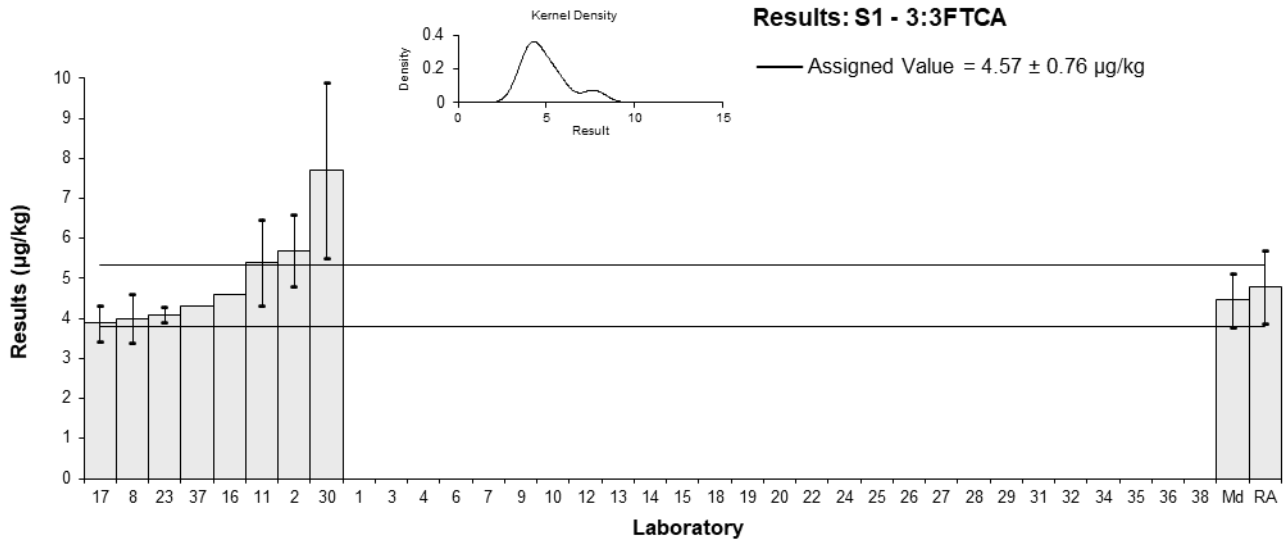
Participant Results

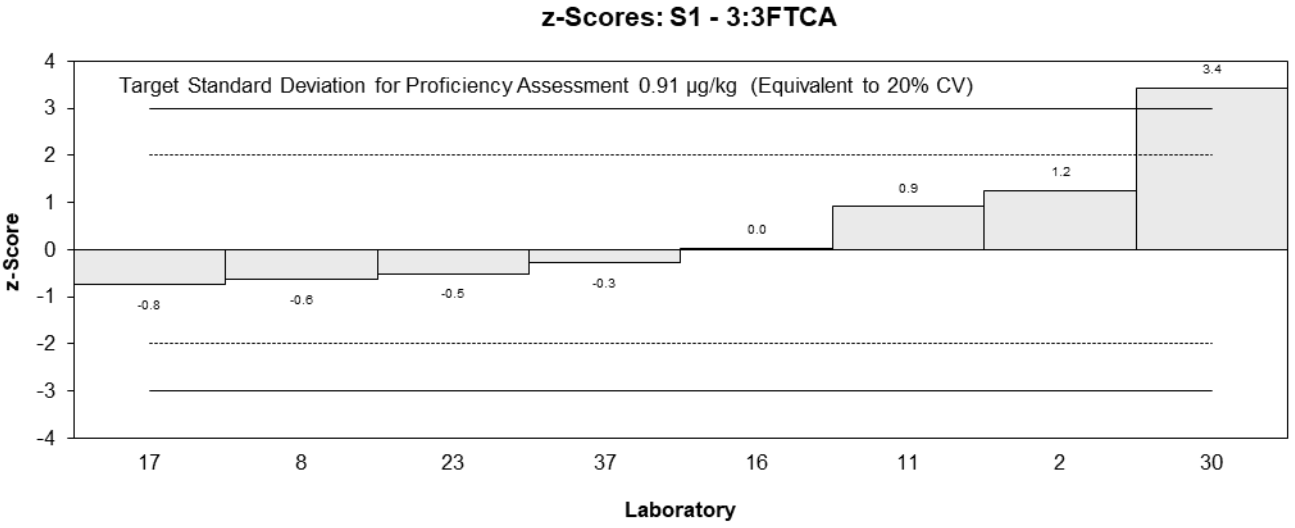
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 5	NR	NR		
2	5.7	0.9	NR	1.24	0.96
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	NT	NT	NT		
8	4	0.6	92	-0.62	-0.59
9	NT	NT	NT		
10	NT	NT	NT		
11	5.4	1.08	88	0.91	0.63
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	4.6	NR	105.04	0.03	0.04
17	3.88	0.45	94	-0.75	-0.78
18	< 10	NR	98		
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	4.1	0.20	NR	-0.51	-0.60
24	NT	NT	NT		
25	<1.0	NR	99		
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30*	7.7	2.2	56.97	3.42	1.34
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	<0.5	NR	82		
36	NR	NR	NR		
37	4.32	NR	79	-0.27	-0.33
38	NS	NS	NS		

* Outlier, see Section 4.2

Statistics

Assigned Value	4.57	0.76
Spike Value	Not Spiked	
Robust Average	4.79	0.91
Median	4.46	0.68
Mean	4.96	
N	8	
Max	7.7	
Min	3.88	
Robust SD	1.0	
Robust CV	21%	


Results: S1 - 3:3FTCA
Kernel Density
Density
Result
Assigned Value = 4.57 ± 0.76 µg/kg
Results (µg/kg)
Laboratory
17 8 23 37 16 11 2 30 1 3 4 6 7 9 10 12 13 14 15 18 19 20 22 24 25 26 27 28 29 31 32 34 35 36 38 Md RA


z-Scores: S1 - 3:3FTCA
Target Standard Deviation for Proficiency Assessment 0.91 µg/kg (Equivalent to 20% CV)
z-Score
-0.8
-0.6
-0.5
-0.3
0.0
0.9
1.2
3.4
Laboratory
17 8 23 37 16 11 2 30

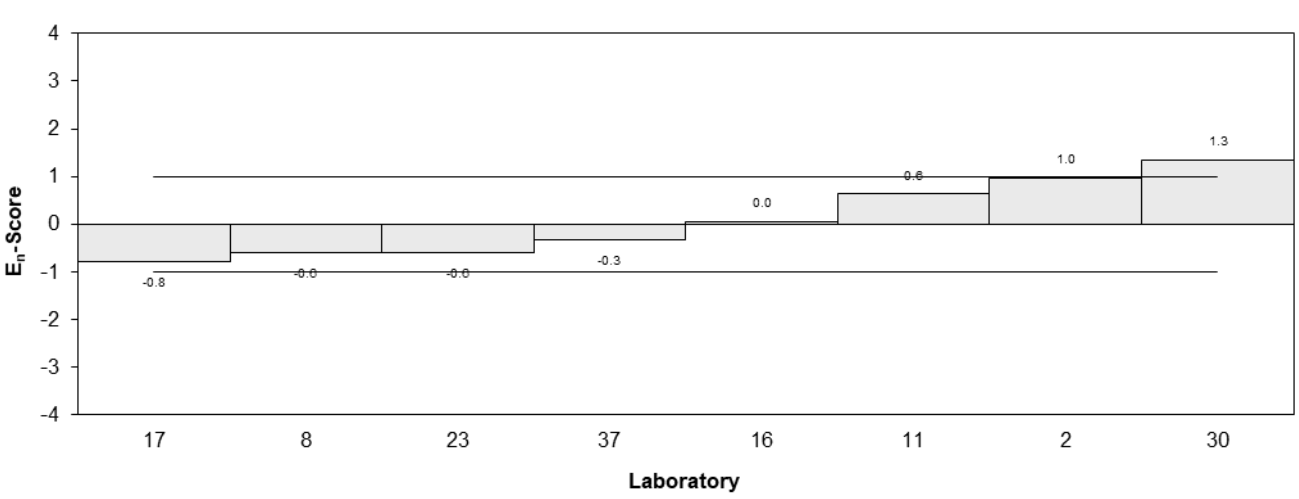

En-Scores: S1 - 3:3FTCA
En-Score
-0.8
-0.6
-0.6
-0.3
0.0
0.6
1.0
1.3
Laboratory
17 8 23 37 16 11 2 30

Figure 32

Table 37

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	5:3FTCA
Unit	µg/kg

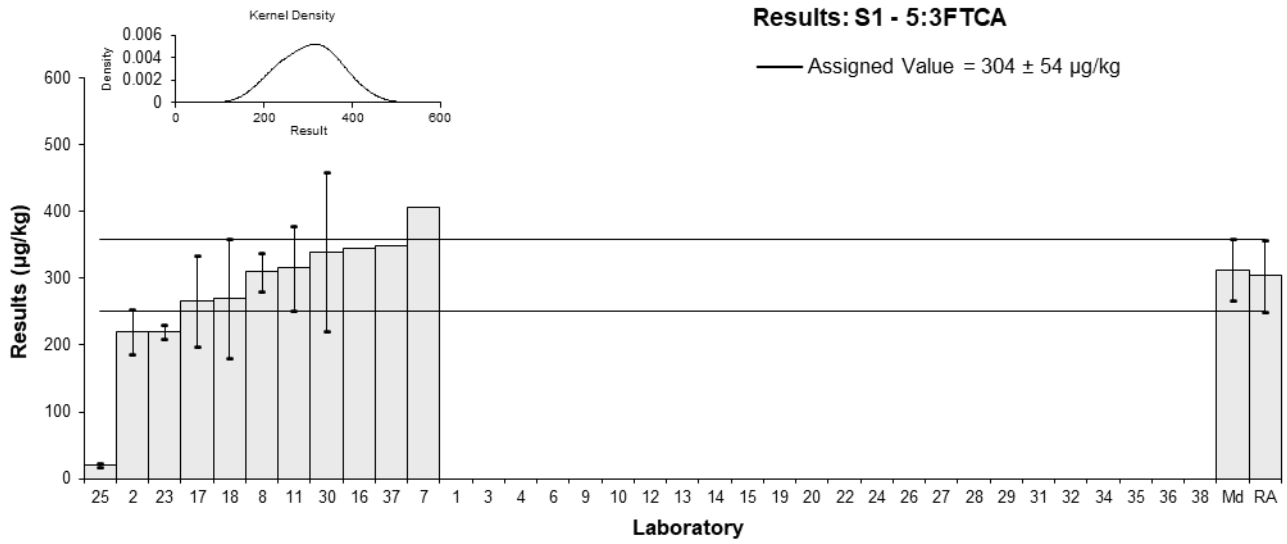
Participant Results

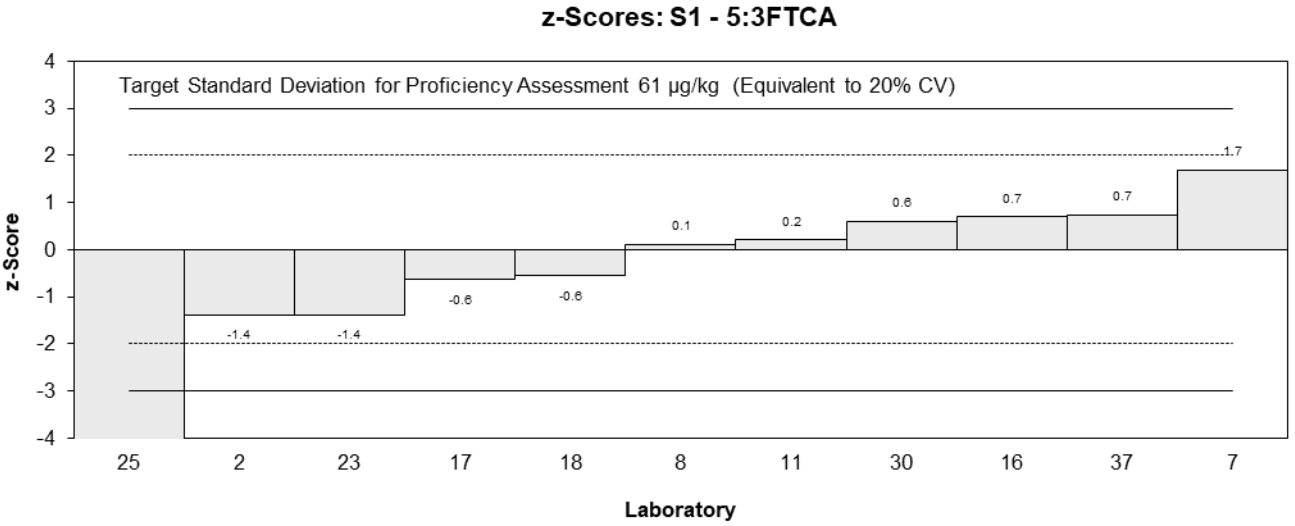
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 5	NR	NR		
2	220	33	NR	-1.38	-1.33
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	405.94	NR	NR	1.68	1.89
8	310	29	86	0.10	0.10
9	NT	NT	NT		
10	NT	NT	NT		
11	316	63.2	88	0.20	0.14
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	346	NR	99.83	0.69	0.78
17	266	68.5	93	-0.62	-0.44
18	270	90	97	-0.56	-0.32
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	220	11	NR	-1.38	-1.52
24	NT	NT	NT		
25**	20	2.2	50	-4.67	-5.25
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30	340	119	85.9	0.59	0.28
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	<0.5	NR	82		
36	NR	NR	NR		
37	348.81	NR	79	0.74	0.83
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	304	54
Spike Value	Not Spiked	
Robust Average	304	54
Median	313	46
Mean	304	
N	10	
Max	405.94	
Min	220	
Robust SD	68	
Robust CV	22%	


Kernel Density
Density
Result
Results: S1 - 5:3FTCA
Assigned Value = 304 ± 54 µg/kg
Results (µg/kg)
Laboratory
25 2 23 17 18 8 11 30 16 37 7 1 3 4 6 9 10 12 13 14 15 19 20 22 24 26 27 28 29 31 32 34 35 36 38 Md RA


z-Scores: S1 - 5:3FTCA
Target Standard Deviation for Proficiency Assessment 61 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 2 23 17 18 8 11 30 16 37 7
-1.4 -1.4 -0.6 -0.6 0.1 0.2 0.6 0.7 0.7 1.7

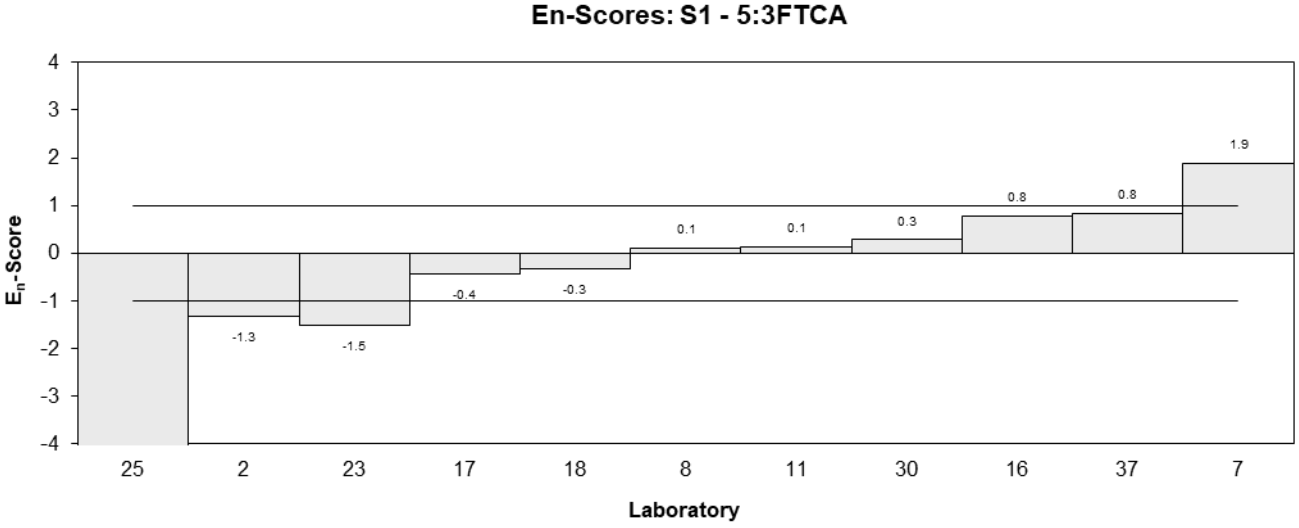

En-Scores: S1 - 5:3FTCA
En-Score
Laboratory
25 2 23 17 18 8 11 30 16 37 7
-1.3 -1.5 -0.4 -0.3 0.1 0.1 0.3 0.8 0.8 1.9

Figure 33

Table 38

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	7:3FTCA
Unit	µg/kg

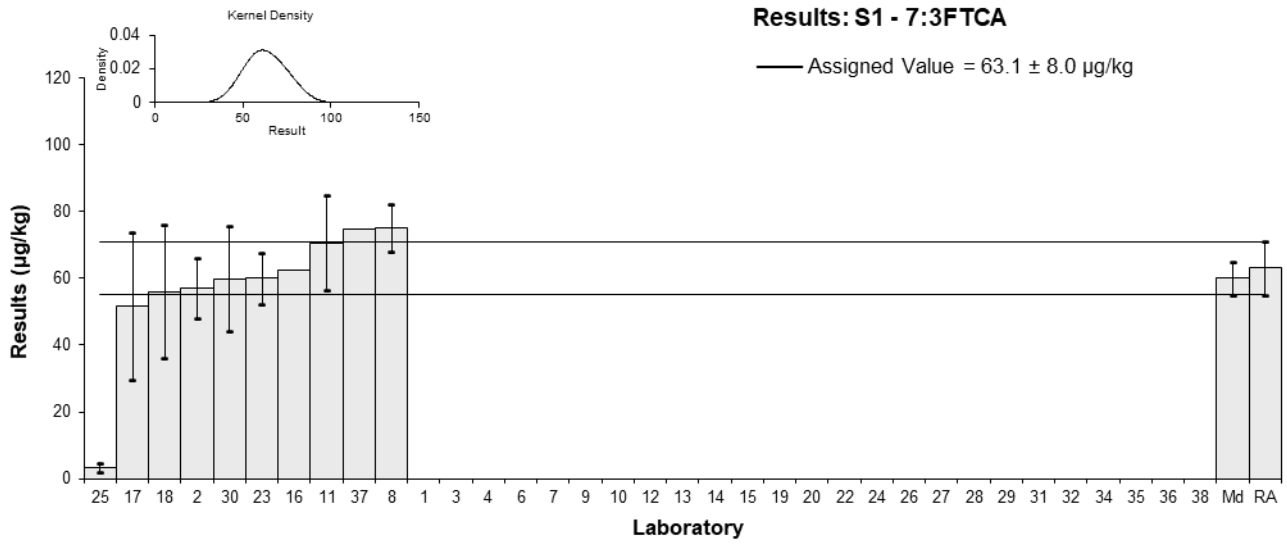
Participant Results

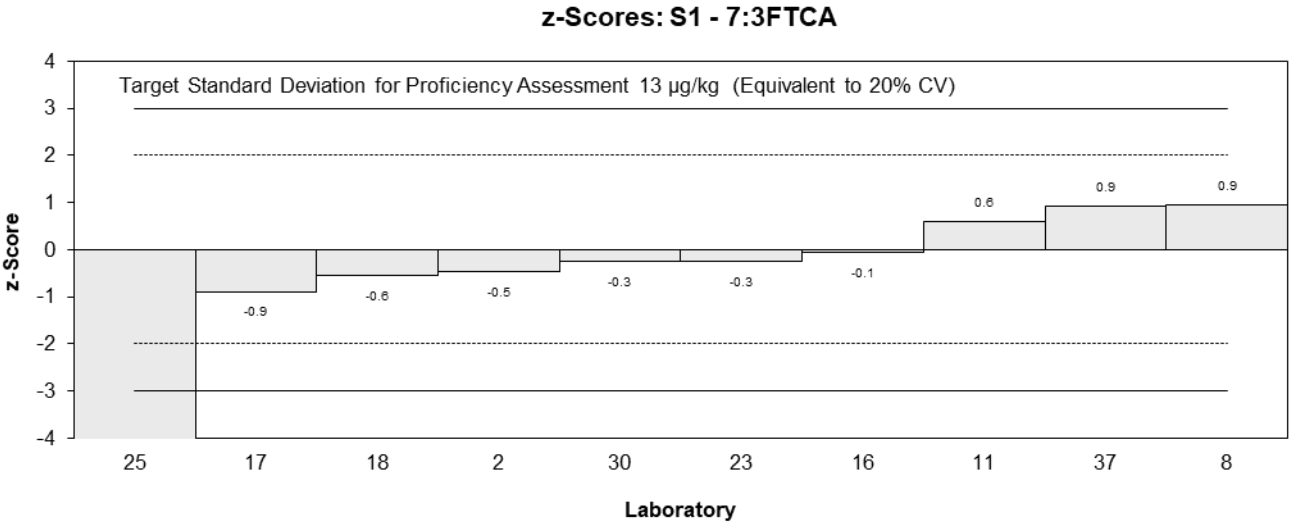
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	57	9	NR	-0.48	-0.51
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	NT	NT	NT		
8	75	7.1	86	0.94	1.11
9	NT	NT	NT		
10	NT	NT	NT		
11	70.7	14.14	88	0.60	0.47
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	62.5	NR	112.27	-0.05	-0.08
17	51.9	22.1	80	-0.89	-0.48
18	56	20	99	-0.56	-0.33
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	60	7.7	NR	-0.25	-0.28
24	NT	NT	NT		
25**	3.4	1.4	83	-4.73	-7.35
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30	59.9	15.8	118.5	-0.25	-0.18
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	NT	NT	NT		
36	NR	NR	NR		
37	74.69	NR	79	0.92	1.45
38	NS	NS	NS		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	63.1	8.0
Spike Value	Not Spiked	
Robust Average	63.1	8.0
Median	60.0	4.9
Mean	63.1	
N	9	
Max	75	
Min	51.9	
Robust SD	9.5	
Robust CV	15%	


Kernel Density
Density
Result
Results: S1 - 7:3FTCA
Assigned Value = 63.1 ± 8.0 µg/kg
Results (µg/kg)
Laboratory
25 17 18 2 30 23 16 11 37 8 1 3 4 6 7 9 10 12 13 14 15 19 20 22 24 26 27 28 29 31 32 34 35 36 38 Md RA


z-Scores: S1 - 7:3FTCA
Target Standard Deviation for Proficiency Assessment 13 µg/kg (Equivalent to 20% CV)
z-Score
-0.9 -0.6 -0.5 -0.3 -0.3 -0.1 0.6 0.9 0.9
Laboratory
25 17 18 2 30 23 16 11 37 8

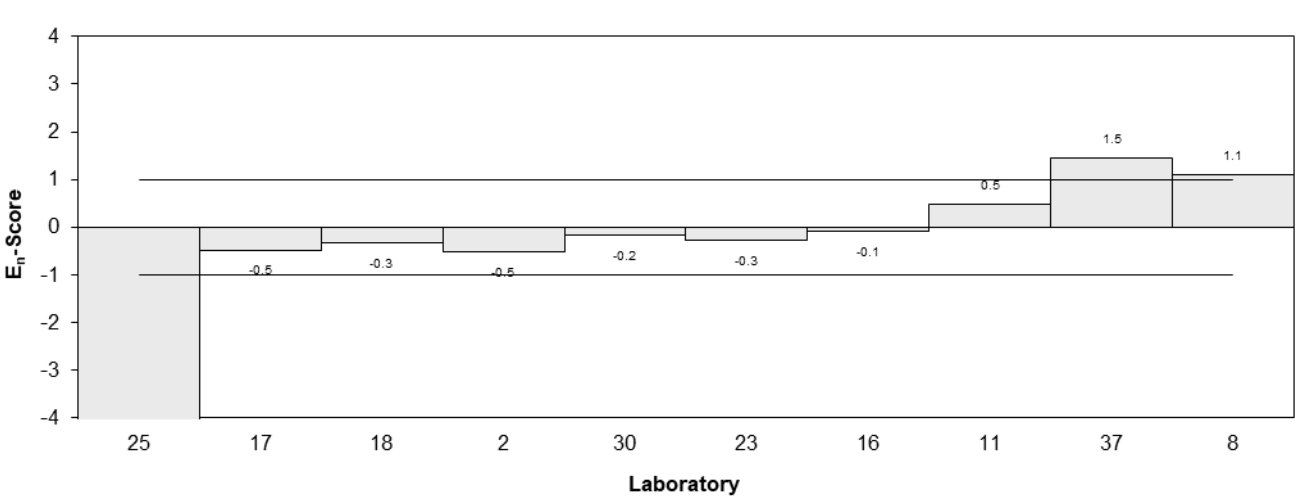

En-Scores: S1 - 7:3FTCA
En-Score
-0.5 -0.3 -0.5 -0.2 -0.3 -0.1 0.5 1.5 1.1
Laboratory
25 17 18 2 30 23 16 11 37 8

Figure 34

Table 39

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFMPA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	1.9	0.3	NR
3	NS	NS	NS
4	NT	NT	NT
6	NS	NS	NS
7	NT	NT	NT
8	<1	NR	92
9	NT	NT	NT
10	NT	NT	NT
11	1	0.2	96
12	NT	NT	NT
13	NS	NS	NS
14	NT	NT	NT
15	NT	NT	NT
16	1.1	NR	99.16
17	1.051	0.207	94
18	< 1	NR	98
19	NT	NT	NT
20	NT	NT	NT
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NR	NR	NR
30	1.1	0.3	71.31
31	NT	NT	NT
32	NT	NT	NT
34	NS	NS	NS
35	NT	NT	NT
36	NR	NR	NR
37	1.2	NR	95
38	NS	NS	NS

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	1.12	0.11
Median	1.10	0.11
Mean	1.23	
N	6	
Max	1.9	
Min	1	
Robust SD	0.11	
Robust CV	9.9%	

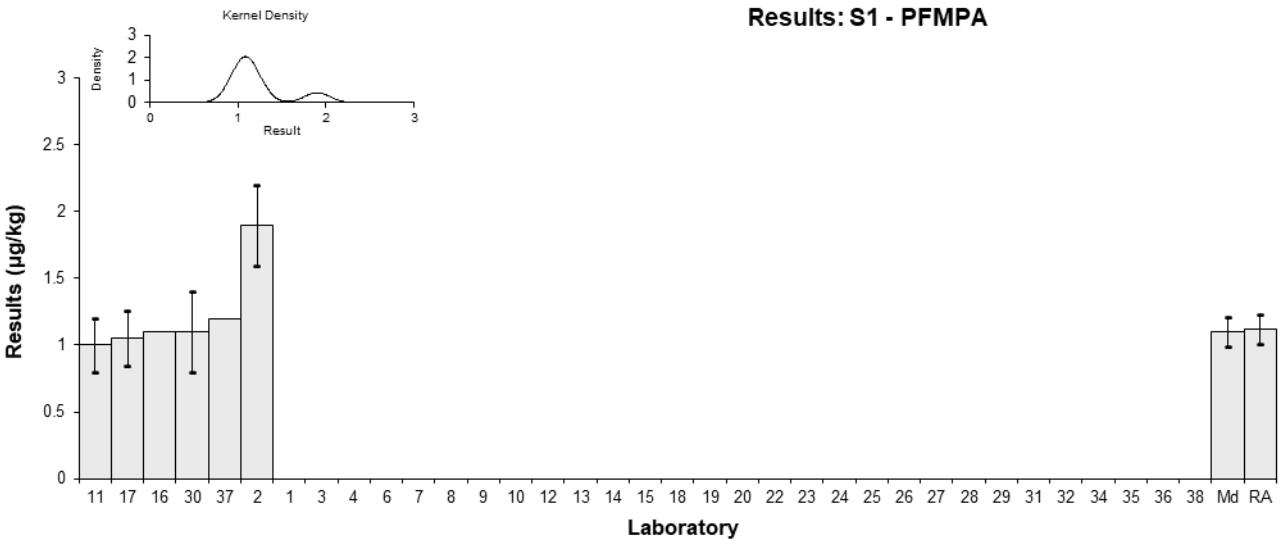

Results: S1 - PFMPA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
11 17 16 30 37 2 1 3 4 6 7 8 9 10 12 13 14 15 18 19 20 22 23 24 25 26 27 28 29 31 32 34 35 36 38 Md RA

Figure 35

Table 40

Sample Details

Sample No.	S1
Matrix	Soil
Analyte	PFMBA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	2.9	0.4	NR
3	NS	NS	NS
4	NT	NT	NT
6	NS	NS	NS
7	NT	NT	NT
8	<1	NR	92
9	NT	NT	NT
10	NT	NT	NT
11	0.9	0.18	94
12	NT	NT	NT
13	NS	NS	NS
14	NT	NT	NT
15	NT	NT	NT
16	1	NR	99.16
17	1.374	0.091	94
18	< 1	NR	98
19	NT	NT	NT
20	NT	NT	NT
22	NT	NT	NT
23	<2	NR	NR
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	NR	NR	NR
30	1.5	0.4	55.23
31	NT	NT	NT
32	NT	NT	NT
34	NS	NS	NS
35	NT	NT	NT
36	NR	NR	NR
37	1.2	NR	109
38	NS	NS	NS

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	1.33	0.47
Median	1.29	0.38
Mean	1.48	
N	6	
Max	2.9	
Min	0.9	
Robust SD	0.46	
Robust CV	34%	

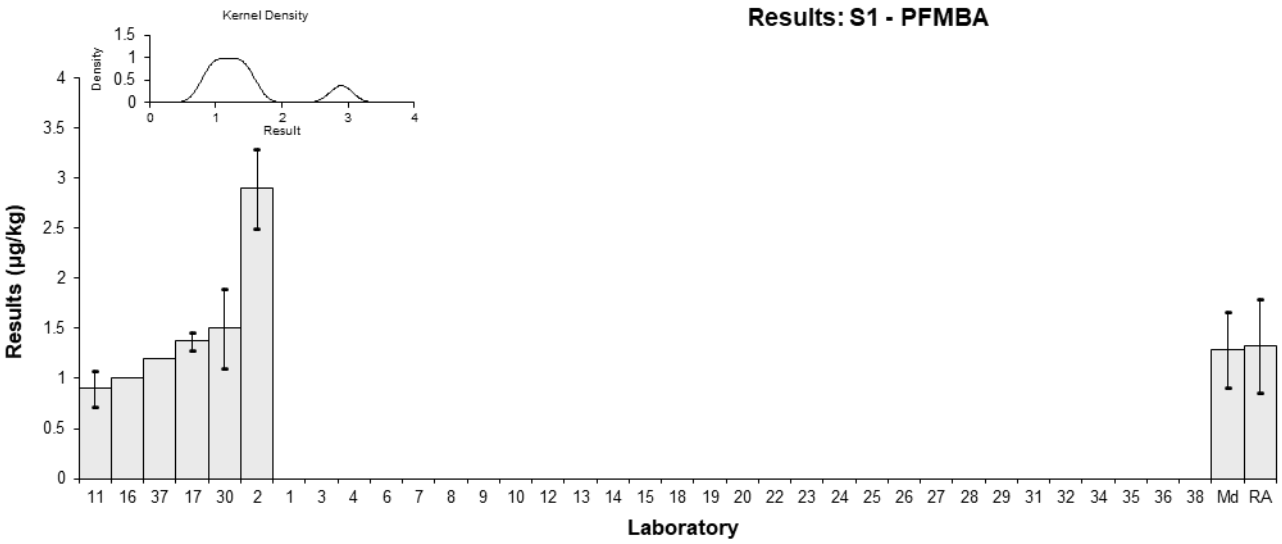

Results: S1 - PFMBA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
11 16 37 17 30 2 1 3 4 6 7 8 9 10 12 13 14 15 18 19 20 22 23 24 25 26 27 28 29 31 32 34 35 36 38 Md RA

Figure 36

Table 41

Sample Details

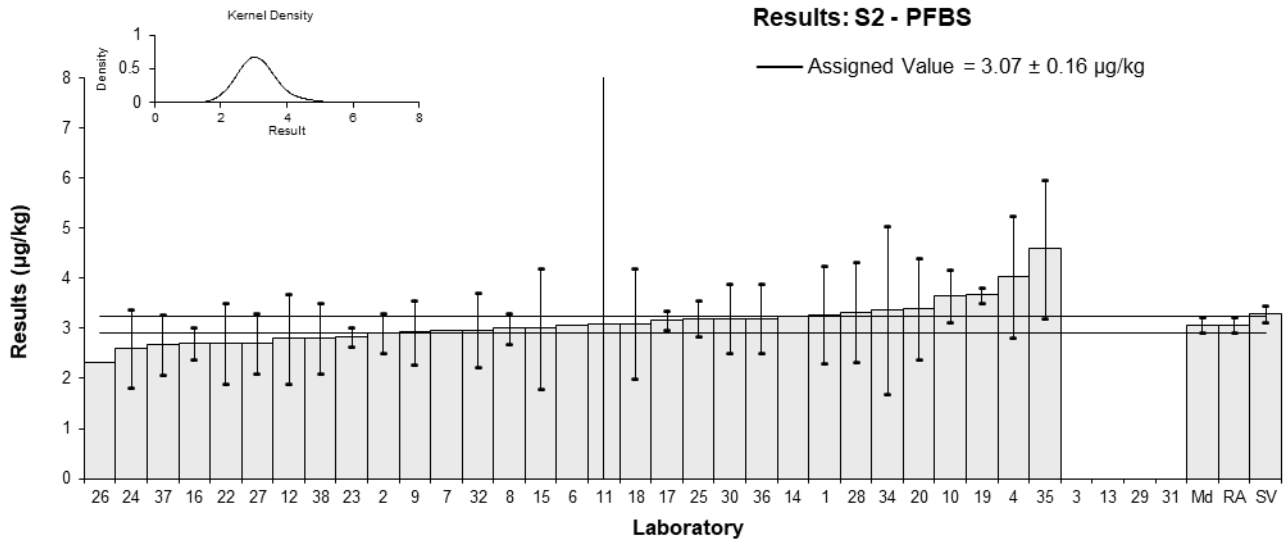
Sample No.	S2
Matrix	Soil
Analyte	PFBS
Unit	µg/kg

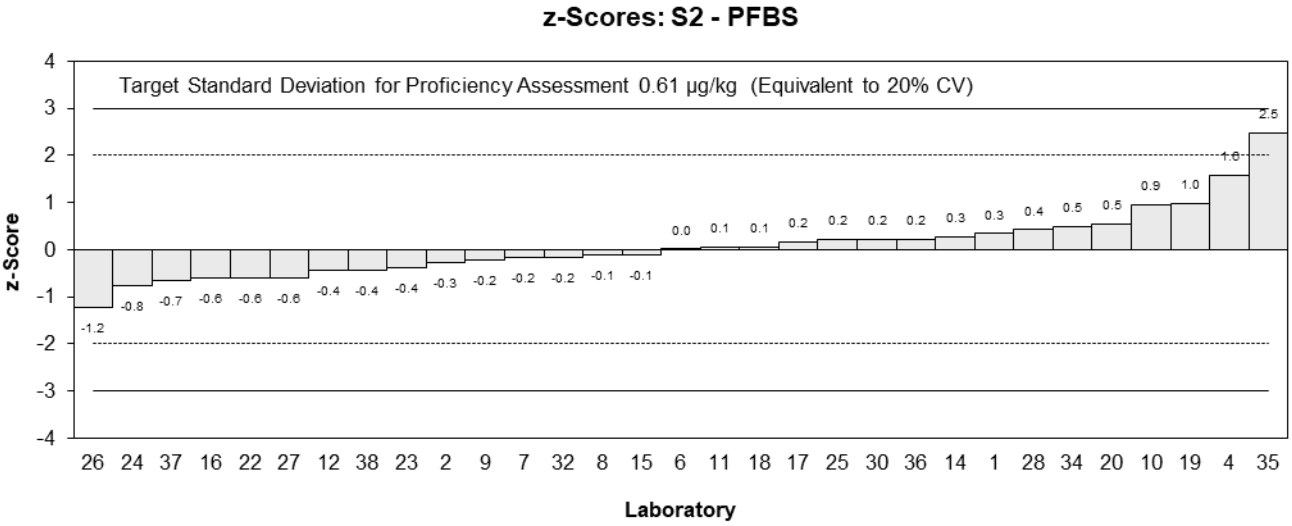
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	3.28	0.98	75	0.34	0.21
2	2.9	0.4	113	-0.28	-0.39
3	NR	NR	NR		
4	4.04	1.21	119	1.58	0.79
6	3.0748	NR	89	0.01	0.03
7	2.97	NR	102	-0.16	-0.62
8	3	0.31	77	-0.11	-0.20
9	2.9259106784	0.6437003492	84.925309908	-0.23	-0.22
10	3.65	0.53	50	0.94	1.05
11	3.1	33	82	0.05	0.00
12	2.8	0.9	96	-0.44	-0.30
13	NS	NS	NS		
14	3.24	NR	95.79	0.28	1.06
15	3.0	1.2	99	-0.11	-0.06
16	2.7	0.32	93.78	-0.60	-1.03
17	3.17	0.196	100	0.16	0.40
18	3.1	1.1	94	0.05	0.03
19	3.671	0.15	62	0.98	2.74
20	3.4	1.02	NR	0.54	0.32
22	2.7	0.81	100	-0.60	-0.45
23	2.83	0.20	NR	-0.39	-0.94
24	2.6	0.78	102	-0.77	-0.59
25	3.2	0.36	104	0.21	0.33
26	2.3160040835	NR	NR	-1.23	-4.71
27	2.7	0.6	101	-0.60	-0.60
28	3.33	0.999	79	0.42	0.26
29	< 5	NR	75		
30	3.2	0.7	99.13	0.21	0.18
31	<5	NR	NR		
32	2.97	0.743	103	-0.16	-0.13
34	3.37	1.685	NR	0.49	0.18
35	4.59	1.377	149	2.48	1.10
36	3.2	0.7	68	0.21	0.18
37	2.67	0.6	100	-0.65	-0.64
38	2.8	0.7	NR	-0.44	-0.38

Statistics

Assigned Value	3.07	0.16
Spike Value	3.29	0.16
Robust Average	3.07	0.16
Median	3.07	0.16
Mean	3.11	
N	31	
Max	4.59	
Min	2.3160040835	
Robust SD	0.35	
Robust CV	11%	


Kernel Density
Density
Result
Results: S2 - PFBS
Assigned Value = 3.07 ± 0.16 µg/kg
Results (µg/kg)
26 24 37 16 22 27 12 38 23 2 9 7 32 8 15 6 11 18 17 25 30 36 14 1 28 34 20 10 19 4 35 3 13 29 31 Md RA SV
Laboratory


z-Scores: S2 - PFBS
Target Standard Deviation for Proficiency Assessment 0.61 µg/kg (Equivalent to 20% CV)
z-Score
26 24 37 16 22 27 12 38 23 2 9 7 32 8 15 6 11 18 17 25 30 36 14 1 28 34 20 10 19 4 35
Laboratory

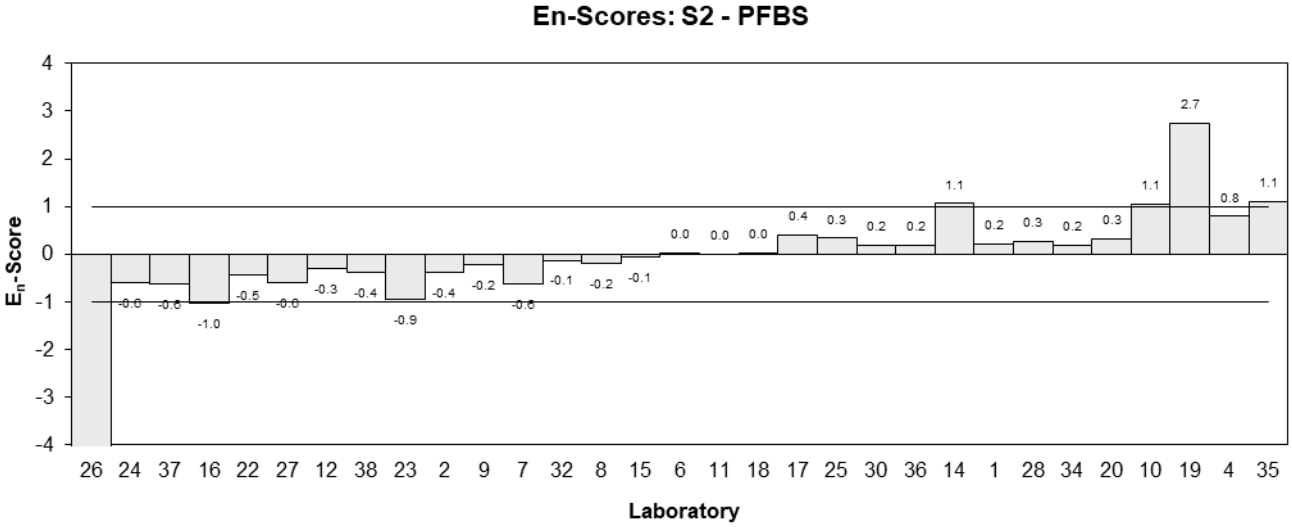

En-Scores: S2 - PFBS
En-Score
26 24 37 16 22 27 12 38 23 2 9 7 32 8 15 6 11 18 17 25 30 36 14 1 28 34 20 10 19 4 35
Laboratory

Figure 37

Table 42

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFHxS
Unit	µg/kg

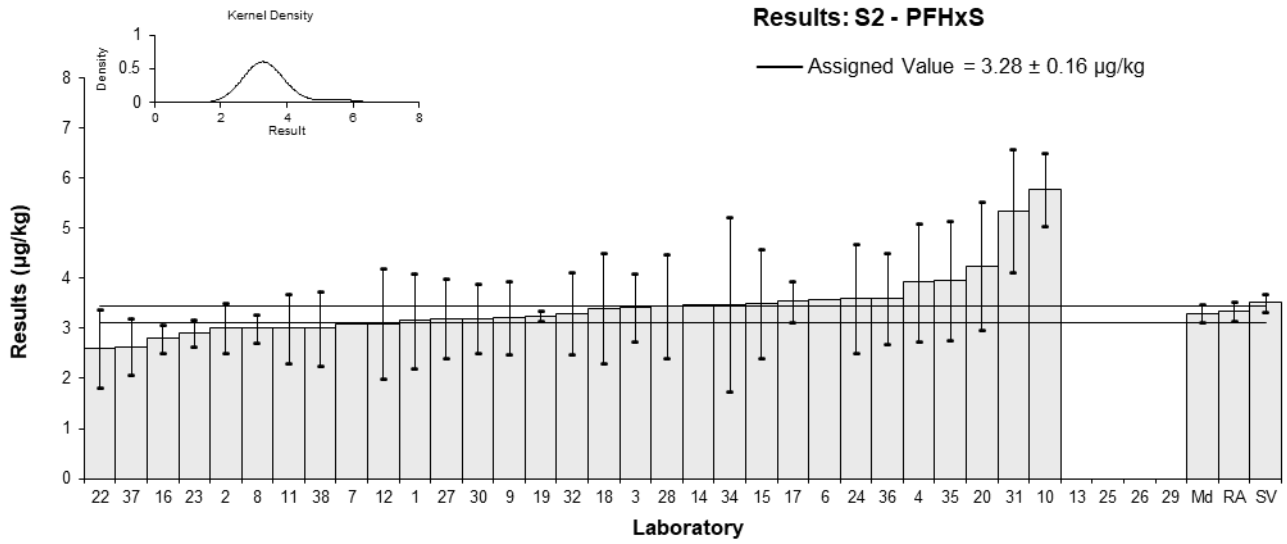
Participant Results

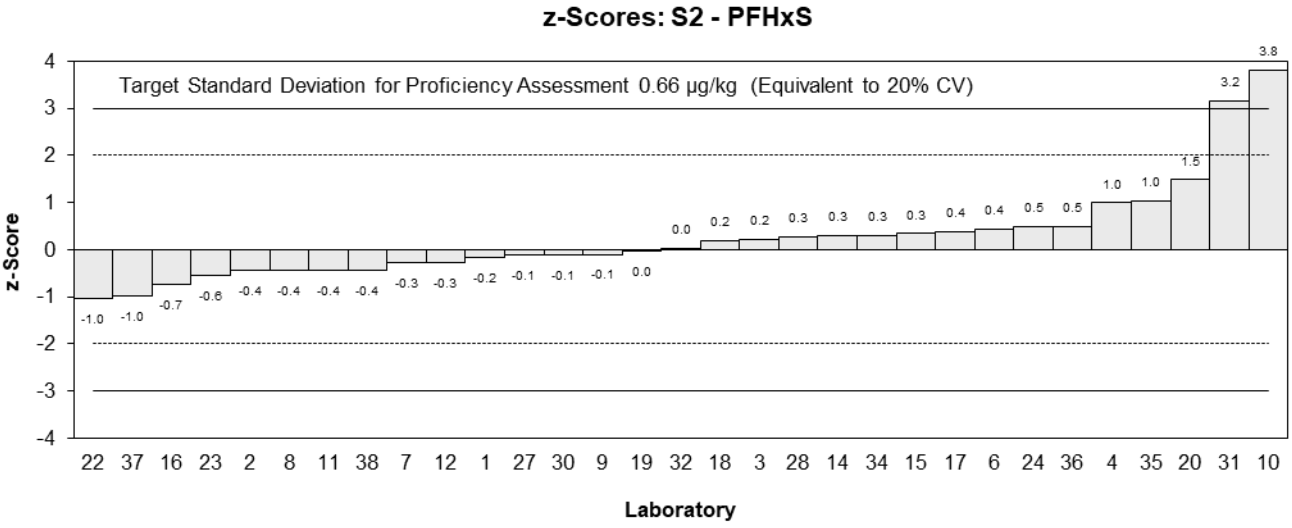
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	3.16	0.95	82	-0.18	-0.12
2	3.0	0.5	122	-0.43	-0.53
3	3.42	0.68	NR	0.21	0.20
4	3.93	1.18	114	0.99	0.55
6	3.5708	NR	NR	0.44	1.82
7	3.1	NR	100	-0.27	-1.12
8	3	0.28	79	-0.43	-0.87
9	3.2138695144	0.7391899883	84.801294218	-0.10	-0.09
10*	5.77	0.73	50	3.80	3.33
11	3	0.7	81	-0.43	-0.39
12	3.1	1.1	96	-0.27	-0.16
13	NS	NS	NS		
14	3.48	NR	100.04	0.30	1.25
15	3.5	1.1	98	0.34	0.20
16	2.8	0.28	94.74	-0.73	-1.49
17	3.538	0.414	99	0.39	0.58
18	3.4	1.1	95	0.18	0.11
19	3.255	0.10	62	-0.04	-0.13
20	4.25	1.275	NR	1.48	0.75
22	2.6	0.78	99	-1.04	-0.85
23	2.92	0.27	NR	-0.55	-1.15
24	3.6	1.08	99	0.49	0.29
25	<1.0	NR	102		
26	NT	NT	NT		
27	3.2	0.8	98	-0.12	-0.10
28	3.46	1.038	80	0.27	0.17
29	< 5	NR	82		
30	3.2	0.7	108.57	-0.12	-0.11
31*	5.35	1.23	124	3.16	1.67
32	3.3	0.825	101	0.03	0.02
34	3.48	1.74	NR	0.30	0.11
35	3.96	1.188	133	1.04	0.57
36	3.6	0.9	73	0.49	0.35
37	2.64	0.57	104	-0.98	-1.08
38	3	0.75	NR	-0.43	-0.37

* Outlier, see Section 4.2

Statistics

Assigned Value	3.28	0.16
Spike Value	3.52	0.18
Robust Average	3.34	0.19
Median	3.30	0.18
Mean	3.45	
N	31	
Max	5.77	
Min	2.6	
Robust SD	0.43	
Robust CV	13%	


Kernel Density
Density
Result
Results: S2 - PFHxS
Assigned Value = 3.28 ± 0.16 µg/kg
Results (µg/kg)
22 37 16 23 2 8 11 38 7 12 1 27 30 9 19 32 18 3 28 14 34 15 17 6 24 36 4 35 20 31 10 13 25 26 29 Md RA SV
Laboratory


z-Scores: S2 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.66 µg/kg (Equivalent to 20% CV)
z-Score
-1.0 -1.0 -0.7 -0.6 -0.4 -0.4 -0.4 -0.4 -0.3 -0.3 -0.2 -0.1 -0.1 -0.1 0.0 0.0 0.2 0.2 0.3 0.3 0.3 0.3 0.4 0.4 0.5 0.5 1.0 1.0 1.5 3.2 3.8
22 37 16 23 2 8 11 38 7 12 1 27 30 9 19 32 18 3 28 14 34 15 17 6 24 36 4 35 20 31 10
Laboratory

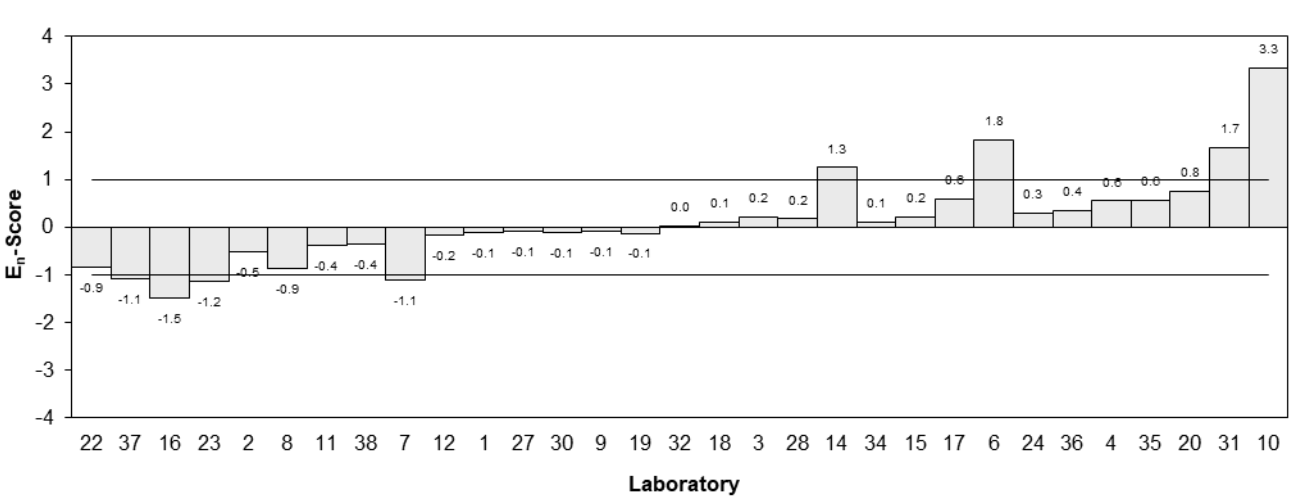

En-Scores: S2 - PFHxS
En-Score
-0.9 -1.1 -1.5 -1.2 -0.5 -0.9 -0.4 -0.4 -1.1 -0.2 -0.1 -0.1 -0.1 -0.1 -0.1 0.0 0.1 0.2 0.2 1.3 0.1 0.2 0.6 1.8 0.3 0.4 0.6 0.6 0.8 1.7 3.3
22 37 16 23 2 8 11 38 7 12 1 27 30 9 19 32 18 3 28 14 34 15 17 6 24 36 4 35 20 31 10
Laboratory

Figure 38

Table 43

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFHxS_L
Unit	µg/kg

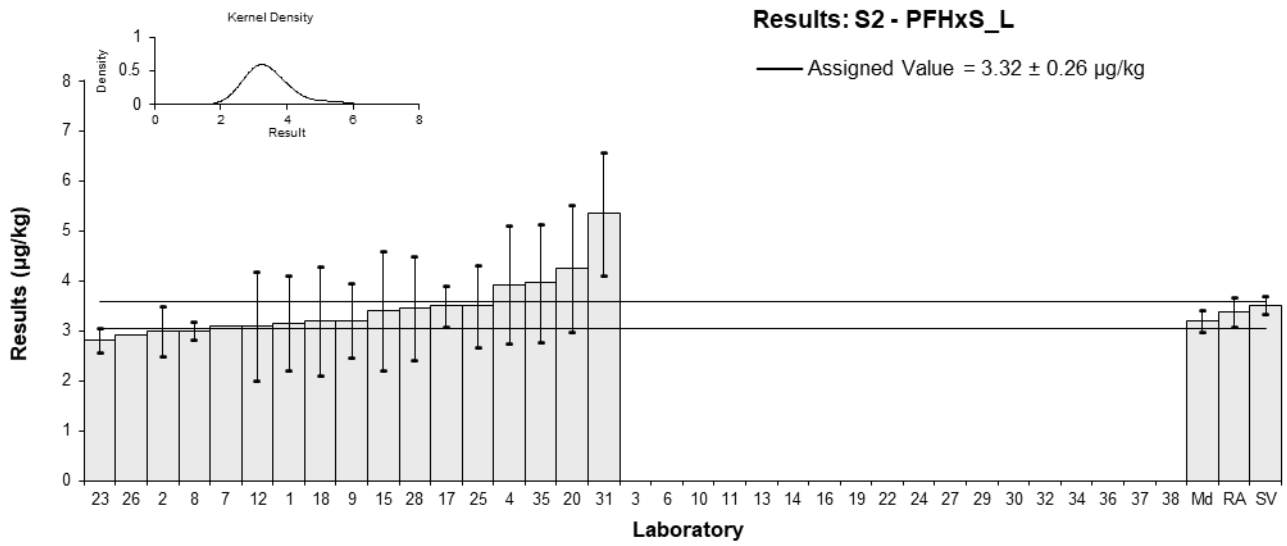
Participant Results

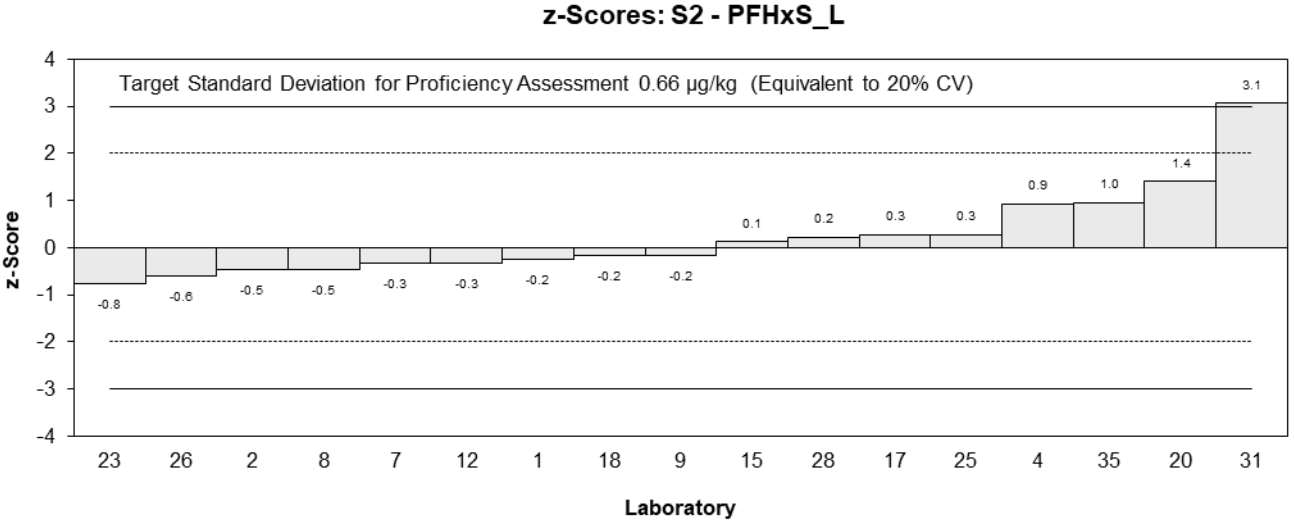
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	3.16	0.95	82	-0.24	-0.16
2	3.0	0.5	NR	-0.48	-0.57
3	NR	NR	NR		
4	3.93	1.18	114	0.92	0.50
6	NR	NR	NR		
7	3.1	NR	100	-0.33	-0.85
8	3	0.18	79	-0.48	-1.01
9	3.2138695144	0.7391899883	84.801294218	-0.16	-0.14
10	NR	NR	NR		
11	NT	NT	NT		
12	3.1	1.1	NR	-0.33	-0.19
13	NS	NS	NS		
14	NT	NT	NT		
15	3.4	1.2	98	0.12	0.07
16	NT	NT	NT		
17	3.498	0.414	99	0.27	0.36
18	3.2	1.1	95	-0.18	-0.11
19	NR	NR	NR		
20	4.25	1.275	NR	1.40	0.71
22	NT	NT	NT		
23	2.81	0.24	NR	-0.77	-1.44
24	NT	NT	NT		
25	3.5	0.83	102	0.27	0.21
26	2.9134414524	NR	NR	-0.61	-1.56
27	NT	NT	NT		
28	3.46	1.038	80	0.21	0.13
29	< 5	NR	82		
30	NT	NT	NT		
31*	5.35	1.23	124	3.06	1.61
32	NT	NT	NT		
34	NT	NT	NT		
35	3.96	1.188	133	0.96	0.53
36	NR	NR	NR		
37	NT	NT	NT		
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	3.32	0.26
Spike Value	3.52	0.18
Robust Average	3.38	0.29
Median	3.21	0.22
Mean	3.46	
N	17	
Max	5.35	
Min	2.81	
Robust SD	0.47	
Robust CV	14%	


Kernel Density
Density
Result
Results: S2 - PFHxS_L
Assigned Value = 3.32 ± 0.26 µg/kg
Results (µg/kg)
Laboratory
23 26 2 8 7 12 1 18 9 15 28 17 25 4 35 20 31 3 6 10 11 13 14 16 19 22 24 27 29 30 32 34 36 37 38 Md RA SV


z-Scores: S2 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 0.66 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
23 26 2 8 7 12 1 18 9 15 28 17 25 4 35 20 31
-0.8 -0.6 -0.5 -0.5 -0.3 -0.3 -0.2 -0.2 -0.2 0.1 0.2 0.3 0.3 0.9 1.0 1.4 3.1

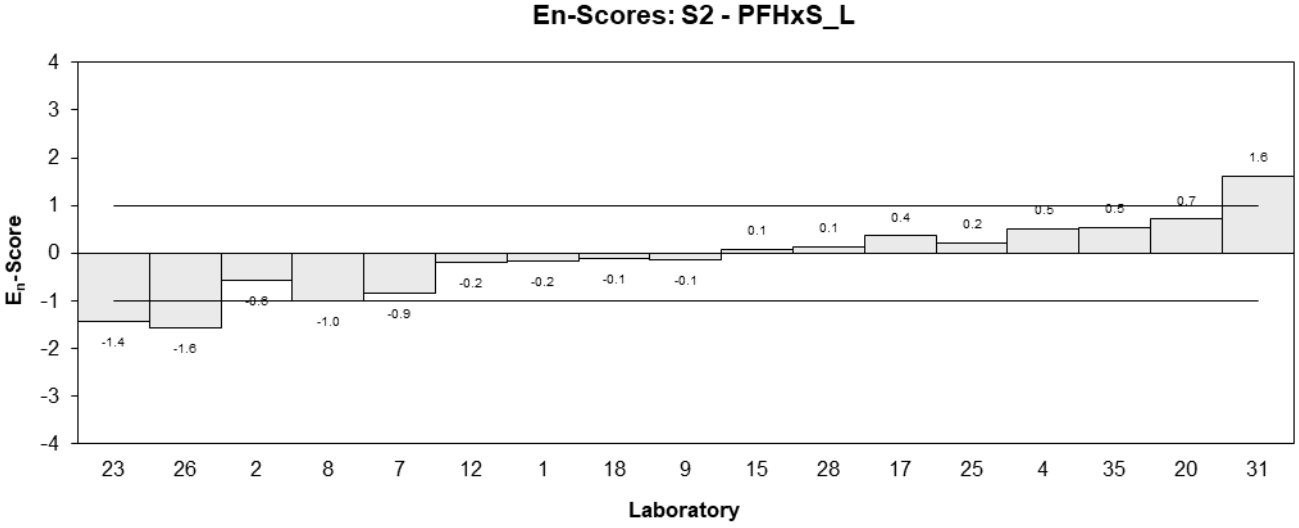

En-Scores: S2 - PFHxS_L
En-Score
Laboratory
23 26 2 8 7 12 1 18 9 15 28 17 25 4 35 20 31
-1.4 -1.6 -0.6 -1.0 -0.9 -0.2 -0.2 -0.1 -0.1 0.1 0.1 0.4 0.2 0.5 0.5 0.7 1.6

Figure 39

Table 44

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFOS
Unit	µg/kg

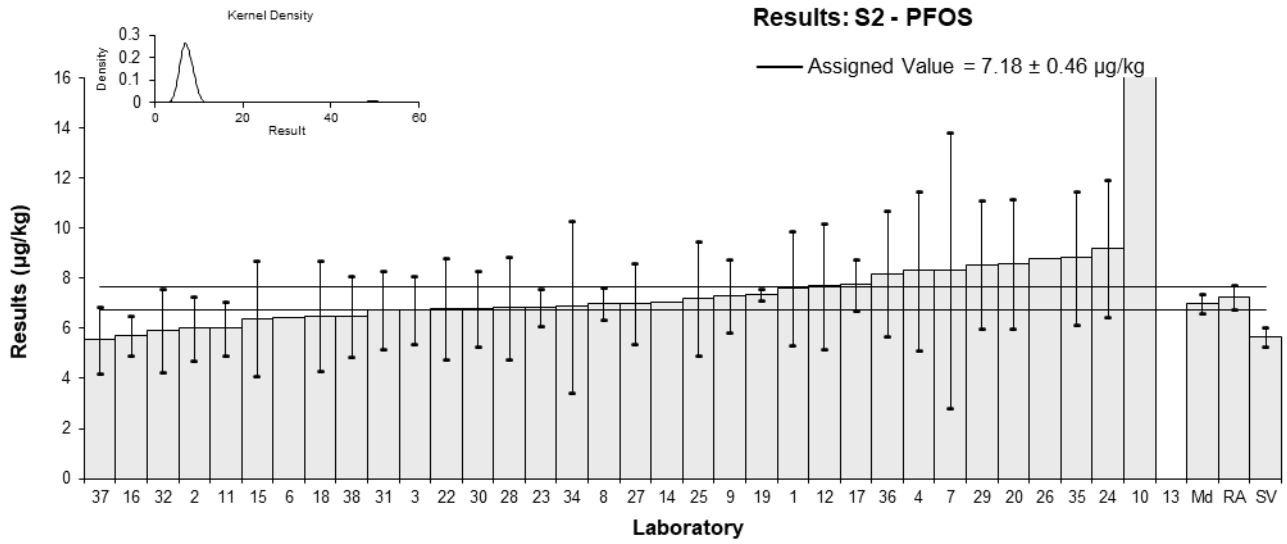
Participant Results

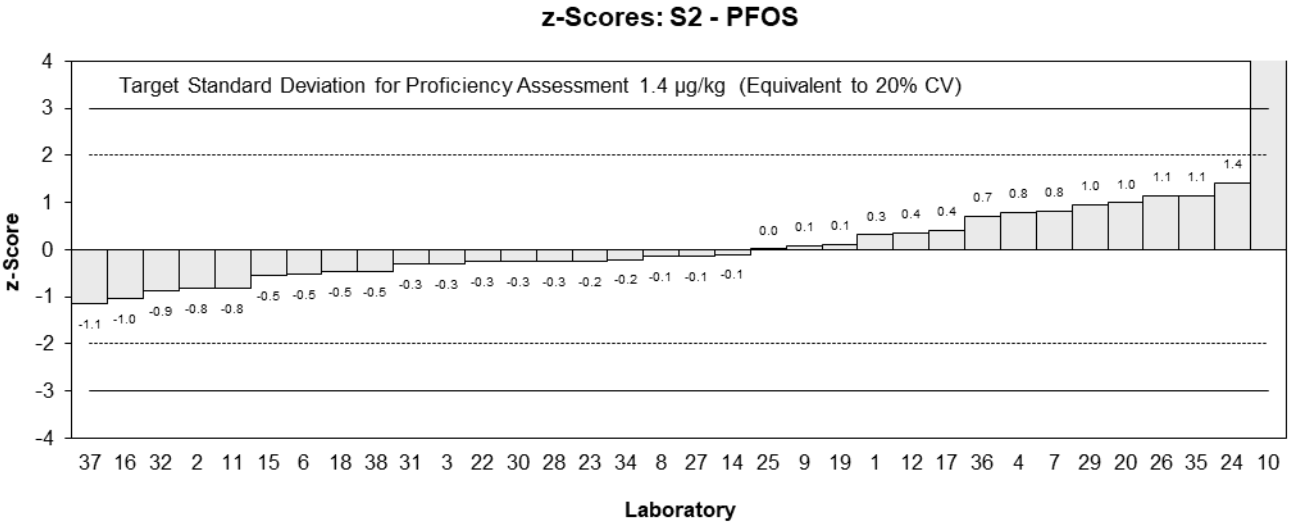
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	7.62	2.29	84	0.31	0.19
2	6.0	1.3	107	-0.82	-0.86
3	6.74	1.35	NR	-0.31	-0.31
4	8.32	3.18	118	0.79	0.35
6	6.4205	NR	NR	-0.53	-1.65
7	8.34	5.5	106	0.81	0.21
8	7	0.63	81	-0.13	-0.23
9	7.2984911405	1.4596982281	86.918125528	0.08	0.08
10*	49.4	4.74	52	29.40	8.87
11	6	1.1	83	-0.82	-0.99
12	7.7	2.5	96	0.36	0.20
13	NS	NS	NS		
14	7.03	NR	116.98	-0.10	-0.33
15	6.4	2.3	96	-0.54	-0.33
16	5.7	0.8	97.22	-1.03	-1.60
17	7.751	1.017	94	0.40	0.51
18	6.5	2.2	97	-0.47	-0.30
19	7.342	0.24	118	0.11	0.31
20	8.6	2.58	NR	0.99	0.54
22	6.8	2.04	94	-0.26	-0.18
23	6.83	0.75	NR	-0.24	-0.40
24	9.2	2.76	114	1.41	0.72
25	7.2	2.3	105	0.01	0.01
26	8.8130010141	NR	NR	1.14	3.55
27	7	1.6	96	-0.13	-0.11
28	6.82	2.046	80	-0.25	-0.17
29	8.55	2.57	84	0.95	0.52
30	6.8	1.5	104.73	-0.26	-0.24
31	6.73	1.55	121	-0.31	-0.28
32	5.92	1.66	104	-0.88	-0.73
34	6.88	3.44	NR	-0.21	-0.09
35	8.82	2.646	126	1.14	0.61
36	8.2	2.5	78	0.71	0.40
37	5.54	1.32	105	-1.14	-1.17
38	6.5	1.625	NR	-0.47	-0.40

* Outlier, see Section 4.2

Statistics

Assigned Value	7.18	0.46
Spike Value	5.66	0.40
Robust Average	7.24	0.48
Median	7.00	0.39
Mean	8.4	
N	34	
Max	49.4	
Min	5.54	
Robust SD	1.1	
Robust CV	15%	


Results: S2 - PFOS
Kernel Density
Density
Result
Assigned Value = 7.18 ± 0.46 µg/kg
Results (µg/kg)
Laboratory
37 16 32 2 11 15 6 18 38 31 3 22 30 28 23 34 8 27 14 25 9 19 1 12 17 36 4 7 29 20 26 35 24 10 13 Md RA SV


z-Scores: S2 - PFOS
Target Standard Deviation for Proficiency Assessment 1.4 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
37 16 32 2 11 15 6 18 38 31 3 22 30 28 23 34 8 27 14 25 9 19 1 12 17 36 4 7 29 20 26 35 24 10

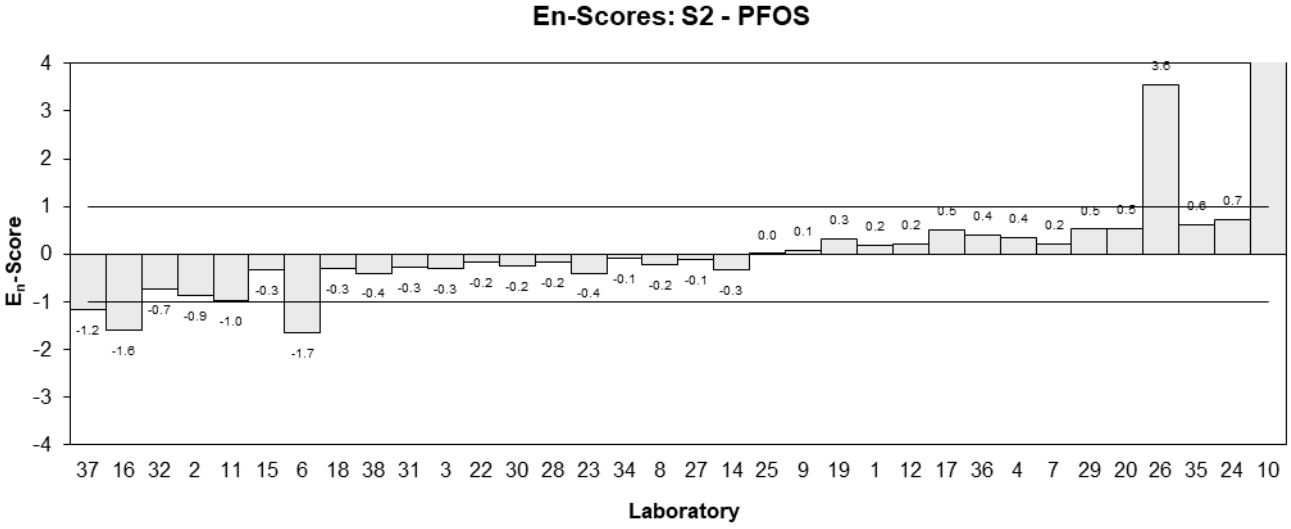

En-Scores: S2 - PFOS
En-Score
Laboratory
37 16 32 2 11 15 6 18 38 31 3 22 30 28 23 34 8 27 14 25 9 19 1 12 17 36 4 7 29 20 26 35 24 10

Figure 40

Table 45

Sample Details

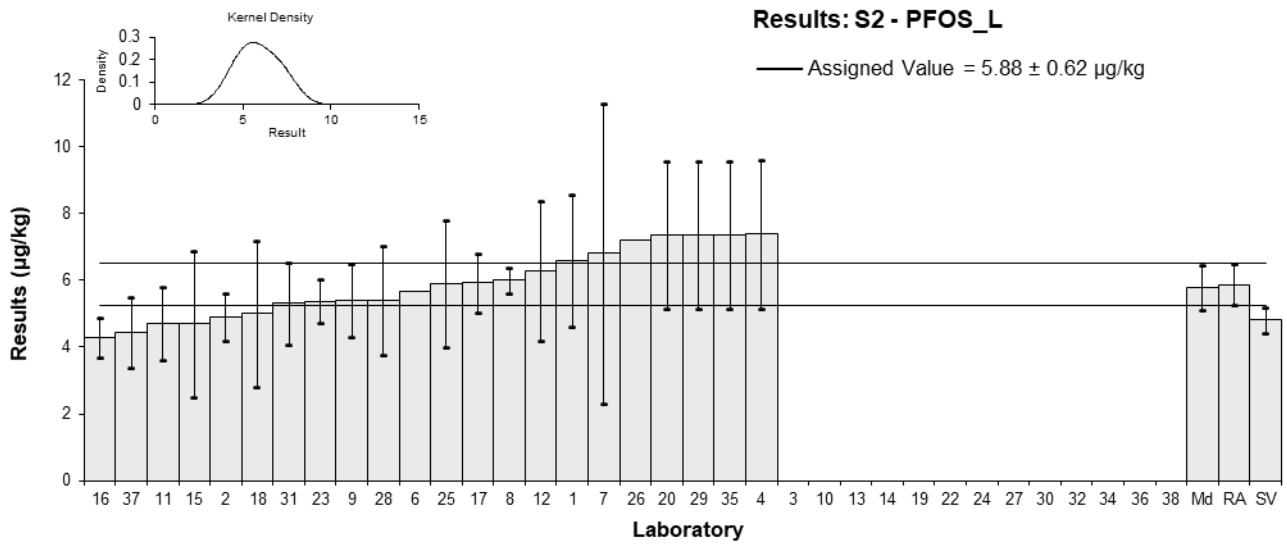
Sample No.	S2
Matrix	Soil
Analyte	PFOS_L
Unit	µg/kg

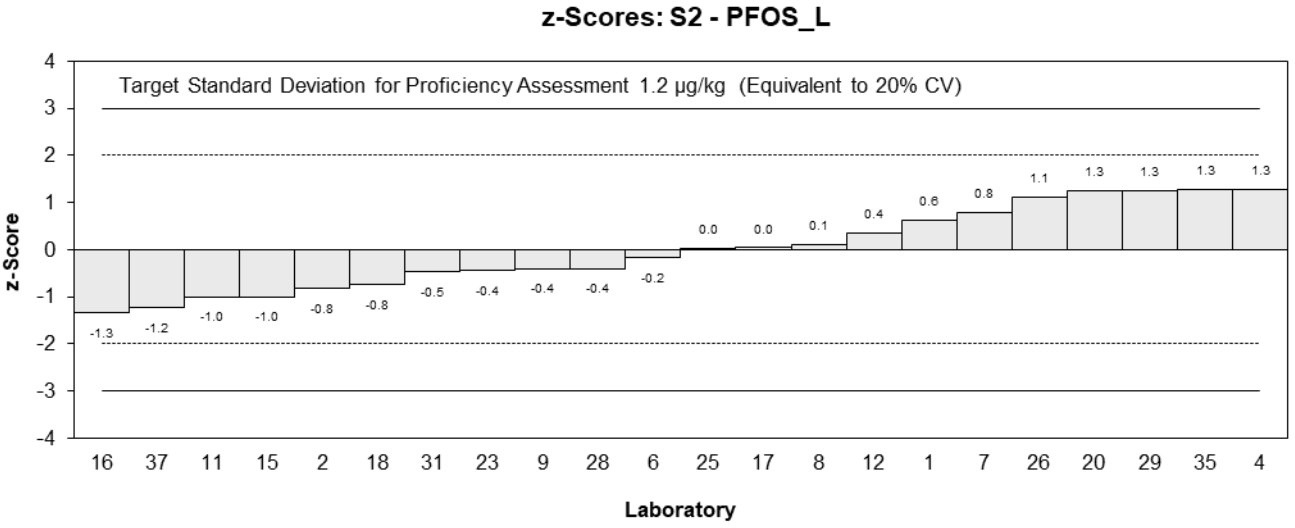
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.61	1.98	84	0.62	0.35
2	4.9	0.7	NR	-0.83	-1.05
3	NR	NR	NR		
4	7.39	2.22	118	1.28	0.66
6	5.6685	NR	96	-0.18	-0.34
7	6.81	4.49	106	0.79	0.21
8	6	0.37	81	0.10	0.17
9	5.4037490350	1.0807498070	86.918125528	-0.40	-0.38
10	NR	NR	NR		
11	4.7	1.1	83	-1.00	-0.93
12	6.3	2.1	NR	0.36	0.19
13	NS	NS	NS		
14	NT	NT	NT		
15	4.7	2.2	96	-1.00	-0.52
16	4.3	0.6	97.22	-1.34	-1.83
17	5.923	0.875	94	0.04	0.04
18	5.0	2.2	97	-0.75	-0.39
19	NR	NR	NR		
20	7.35	2.205	NR	1.25	0.64
22	NT	NT	NT		
23	5.38	0.65	NR	-0.43	-0.56
24	NT	NT	NT		
25	5.9	1.9	105	0.02	0.01
26	7.1950871134	NR	NR	1.12	2.12
27	NT	NT	NT		
28	5.41	1.623	80	-0.40	-0.27
29	7.36	2.21	109	1.26	0.64
30	NT	NT	NT		
31	5.31	1.22	121	-0.48	-0.42
32	NT	NT	NT		
34	NT	NT	NT		
35	7.37	2.211	126	1.27	0.65
36	NR	NR	NR		
37	4.44	1.06	105	-1.22	-1.17
38	NT	NT	NT		

Statistics

Assigned Value	5.88	0.62
Spike Value	4.82	0.38
Robust Average	5.88	0.62
Median	5.78	0.68
Mean	5.88	
N	22	
Max	7.39	
Min	4.3	
Robust SD	1.2	
Robust CV	20%	


Results: S2 - PFOS_L
Assigned Value = 5.88 ± 0.62 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
16 37 11 15 2 18 31 23 9 28 6 25 17 8 12 1 7 26 20 29 35 4 3 10 13 14 19 22 24 27 30 32 34 36 38 Md RA SV


z-Scores: S2 - PFOS_L
Target Standard Deviation for Proficiency Assessment 1.2 µg/kg (Equivalent to 20% CV)
z-Score
-1.3 -1.2 -1.0 -1.0 -0.8 -0.8 -0.5 -0.4 -0.4 -0.4 -0.2 0.0 0.0 0.1 0.4 0.6 0.8 1.1 1.3 1.3 1.3 1.3
Laboratory
16 37 11 15 2 18 31 23 9 28 6 25 17 8 12 1 7 26 20 29 35 4

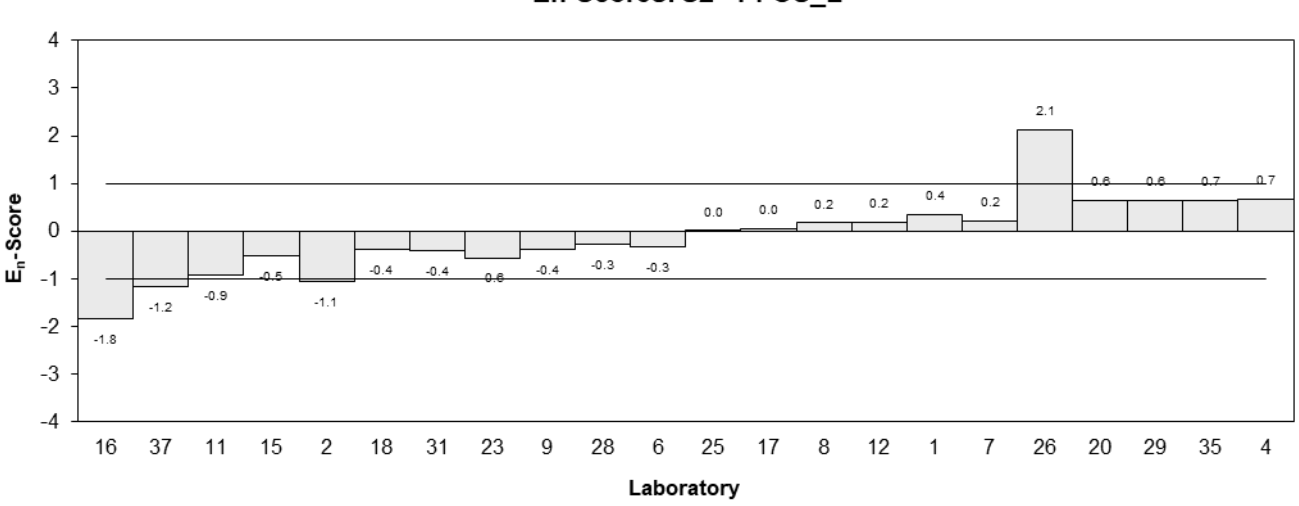

En-Scores: S2 - PFOS_L
En-Score
-1.8 -1.2 -0.9 -0.5 -1.1 -0.4 -0.4 -0.6 -0.4 -0.3 -0.3 0.0 0.0 0.2 0.2 0.4 0.2 2.1 0.6 0.6 0.7 0.7
Laboratory
16 37 11 15 2 18 31 23 9 28 6 25 17 8 12 1 7 26 20 29 35 4

Figure 41

Table 46

Sample Details

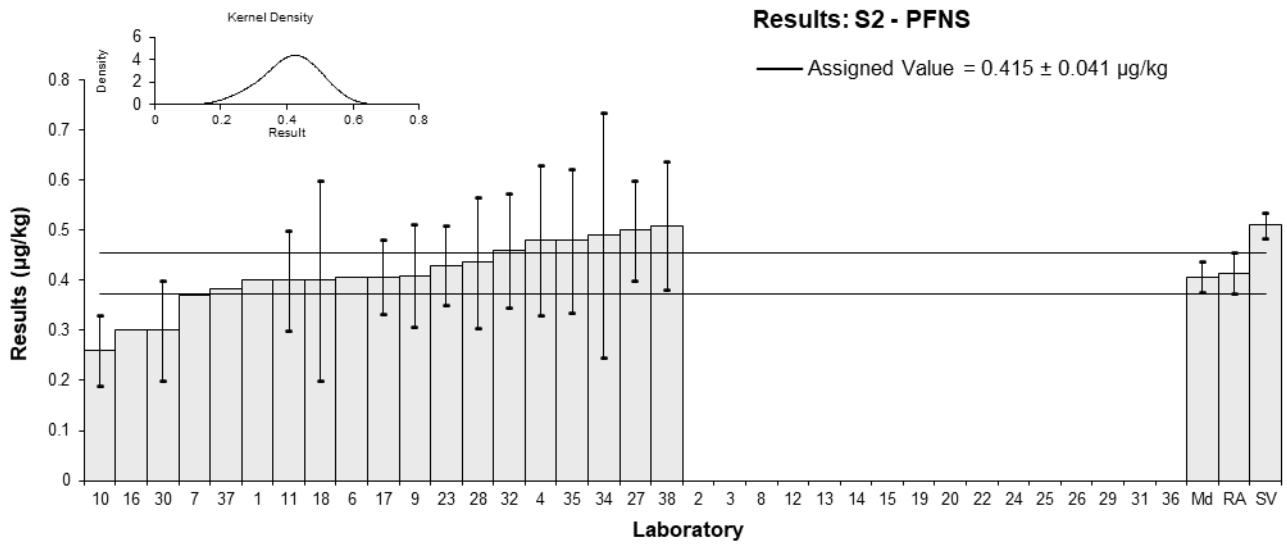
Sample No.	S2
Matrix	Soil
Analyte	PFNS
Unit	µg/kg

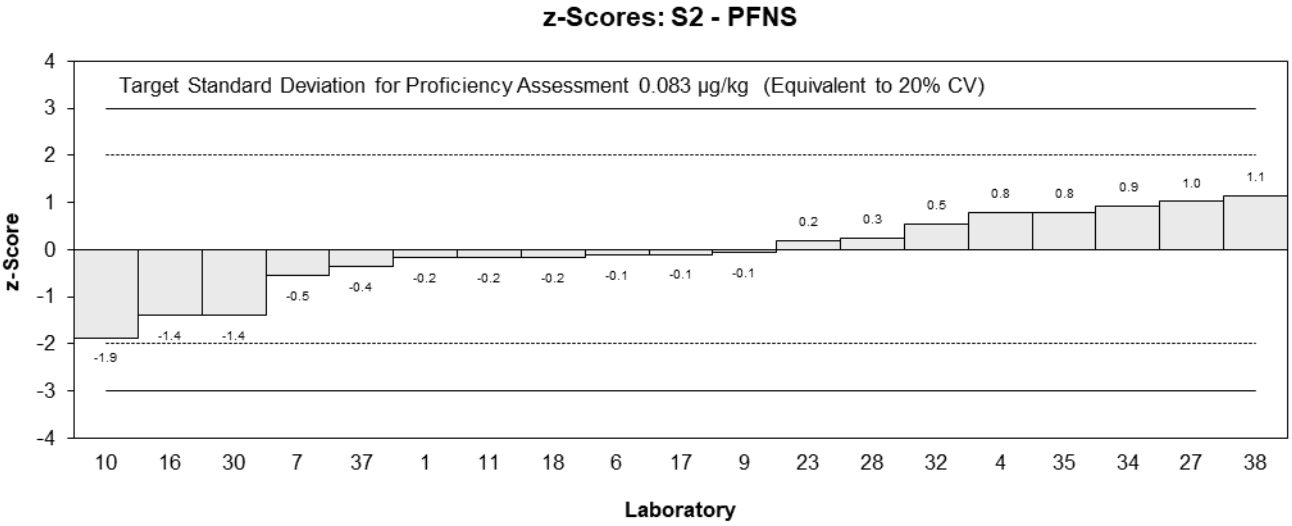
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.40	NR	86	-0.18	-0.37
2	NR	NR	NR		
3	NR	NR	NR		
4	0.48	0.15	128	0.78	0.42
6	0.4062	NR	90	-0.11	-0.21
7	0.37	NR	NR	-0.54	-1.10
8	<1	NR	81		
9	0.4099756312	0.1024939078	86.918125528	-0.06	-0.05
10	0.26	0.07	NR	-1.87	-1.91
11	0.4	0.1	83	-0.18	-0.14
12	<1	NR	NR		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	0.3	NR	97.22	-1.39	-2.80
17	0.407	0.075	94	-0.10	-0.09
18	0.4	0.2	97	-0.18	-0.07
19	NT	NT	NT		
20	<1	NR	NR		
22	<0.5	NR	NR		
23	0.43	0.08	NR	0.18	0.17
24	<0.5	NR	NR		
25	<1.0	NR	105		
26	NT	NT	NT		
27	0.5	0.1	NR	1.02	0.79
28	0.436	0.1308	80	0.25	0.15
29	< 5	NR	86		
30	0.3	0.1	104.73	-1.39	-1.06
31	<5	NR	NR		
32	0.46	0.115	96	0.54	0.37
34	0.491	0.2455	NR	0.92	0.31
35	0.48	0.144	126	0.78	0.43
36	NR	NR	NR		
37	0.384	NR	105	-0.37	-0.76
38	0.51	0.1275	NR	1.14	0.71

Statistics

Assigned Value	0.415	0.041
Spike Value	0.511	0.026
Robust Average	0.415	0.041
Median	0.407	0.031
Mean	0.412	
N	19	
Max	0.51	
Min	0.26	
Robust SD	0.071	
Robust CV	17%	


Results: S2 - PFNS
Assigned Value = 0.415 ± 0.041 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
10 16 30 7 37 1 11 18 6 17 9 23 28 32 4 35 34 27 38 2 3 8 12 13 14 15 19 20 22 24 25 26 29 31 36 Md RA SV


z-Scores: S2 - PFNS
Target Standard Deviation for Proficiency Assessment 0.083 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
10 16 30 7 37 1 11 18 6 17 9 23 28 32 4 35 34 27 38

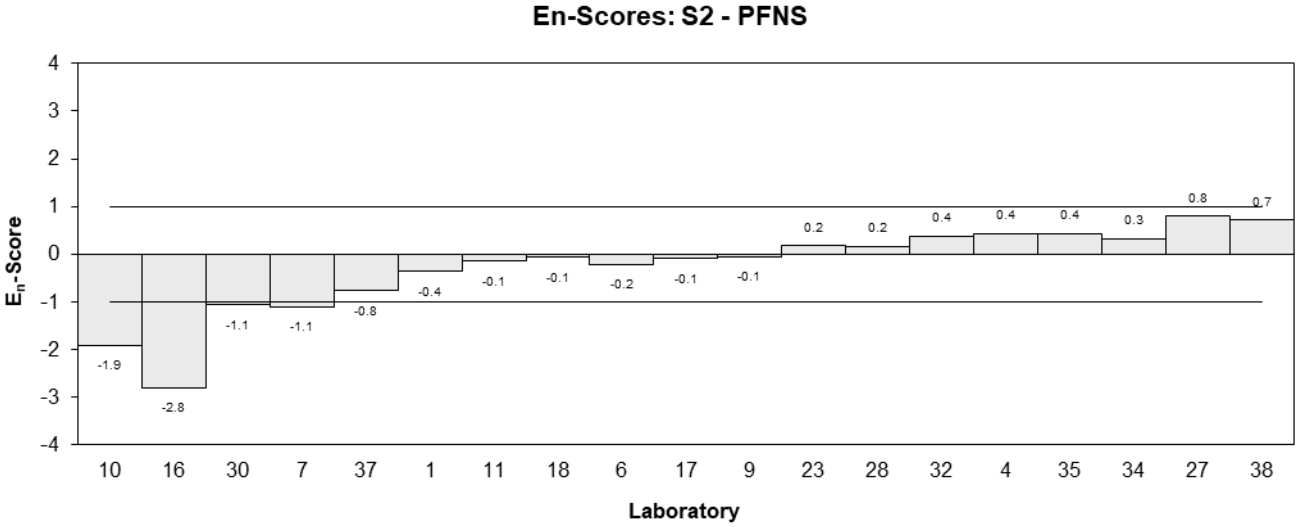

En-Scores: S2 - PFNS
En-Score
Laboratory
10 16 30 7 37 1 11 18 6 17 9 23 28 32 4 35 34 27 38

Figure 42

Table 47

Sample Details

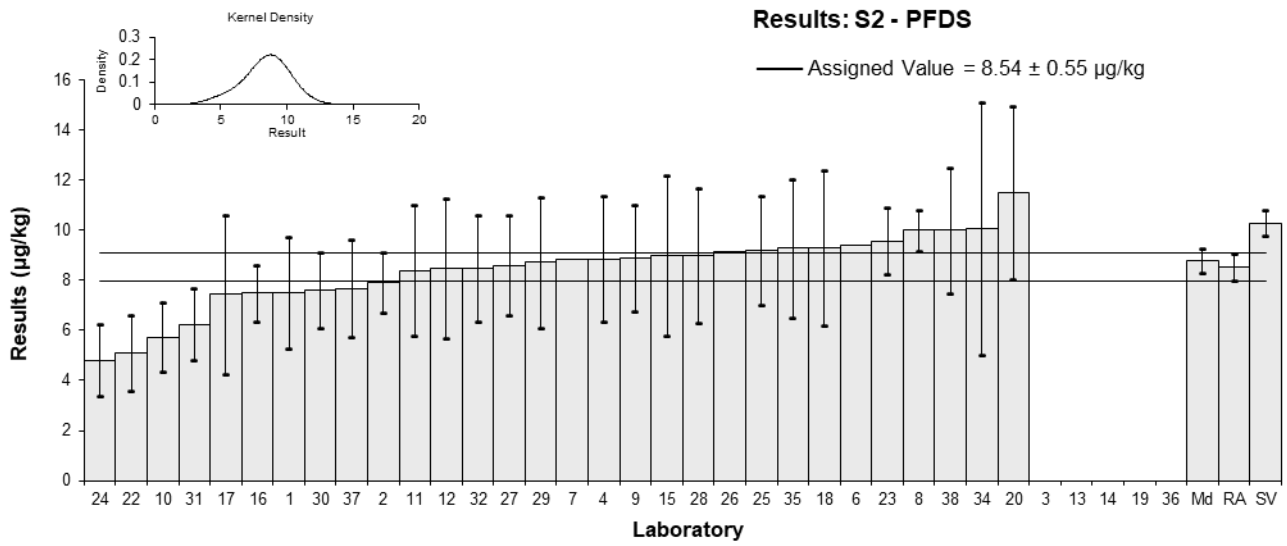
Sample No.	S2
Matrix	Soil
Analyte	PFDS
Unit	µg/kg

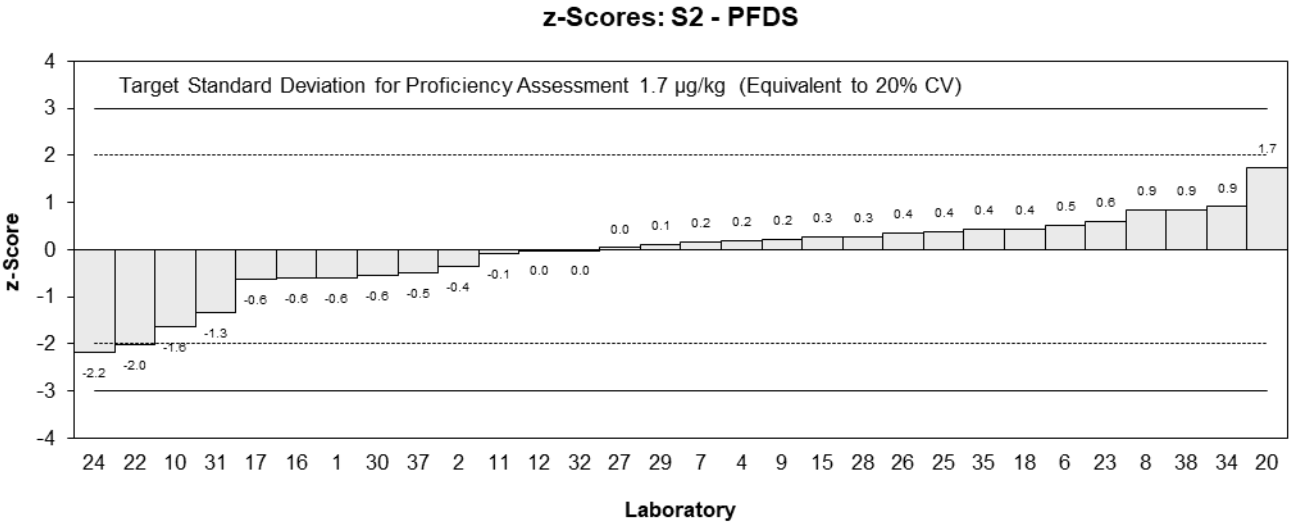
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	7.51	2.25	82	-0.60	-0.44
2	7.9	1.2	NR	-0.37	-0.48
3	NR	NR	NR		
4	8.85	2.51	114	0.18	0.12
6	9.4119	NR	96	0.51	1.59
7	8.83	NR	NR	0.17	0.53
8	10	0.8	81	0.85	1.50
9	8.9019775181	2.1364746043	86.918125528	0.21	0.16
10	5.74	1.39	NR	-1.64	-1.87
11	8.4	2.6	83	-0.08	-0.05
12	8.5	2.8	NR	-0.02	-0.01
13	NS	NS	NS		
14	NT	NT	NT		
15	9.0	3.2	96	0.27	0.14
16	7.5	1.13	97.22	-0.61	-0.83
17	7.448	3.185	94	-0.64	-0.34
18	9.3	3.1	97	0.44	0.24
19	NT	NT	NT		
20	11.5	3.45	NR	1.73	0.85
22	5.1	1.53	31	-2.01	-2.12
23	9.57	1.33	NR	0.60	0.72
24	4.8	1.44	45	-2.19	-2.43
25	9.2	2.2	105	0.39	0.29
26	9.1465122164	NR	NR	0.36	1.10
27	8.6	2	NR	0.04	0.03
28	9.00	2.7	80	0.27	0.17
29	8.73	2.62	124	0.11	0.07
30	7.6	1.5	104.73	-0.55	-0.59
31	6.25	1.44	121	-1.34	-1.49
32	8.5	2.125	104	-0.02	-0.02
34	10.09	5.045	NR	0.91	0.31
35	9.28	2.784	126	0.43	0.26
36	NR	NR	NR		
37	7.68	1.94	105	-0.50	-0.43
38	10	2.5	NR	0.85	0.57

Statistics

Assigned Value	8.54	0.55
Spike Value	10.3	0.5
Robust Average	8.54	0.55
Median	8.78	0.48
Mean	8.41	
N	30	
Max	11.5	
Min	4.8	
Robust SD	1.2	
Robust CV	14%	


Results: S2 - PFDS
Assigned Value = 8.54 ± 0.55 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
24 22 10 31 17 16 1 30 37 2 11 12 32 27 29 7 4 9 15 28 26 25 35 18 6 23 8 38 34 20 3 13 14 19 36 Md RA SV
Laboratory


z-Scores: S2 - PFDS
Target Standard Deviation for Proficiency Assessment 1.7 µg/kg (Equivalent to 20% CV)
z-Score
-2.2 -2.0 -1.8 -1.3 -0.6 -0.6 -0.6 -0.6 -0.5 -0.4 -0.1 0.0 0.0 0.0 0.1 0.2 0.2 0.2 0.3 0.3 0.4 0.4 0.4 0.4 0.5 0.6 0.9 0.9 0.9 1.7
24 22 10 31 17 16 1 30 37 2 11 12 32 27 29 7 4 9 15 28 26 25 35 18 6 23 8 38 34 20
Laboratory

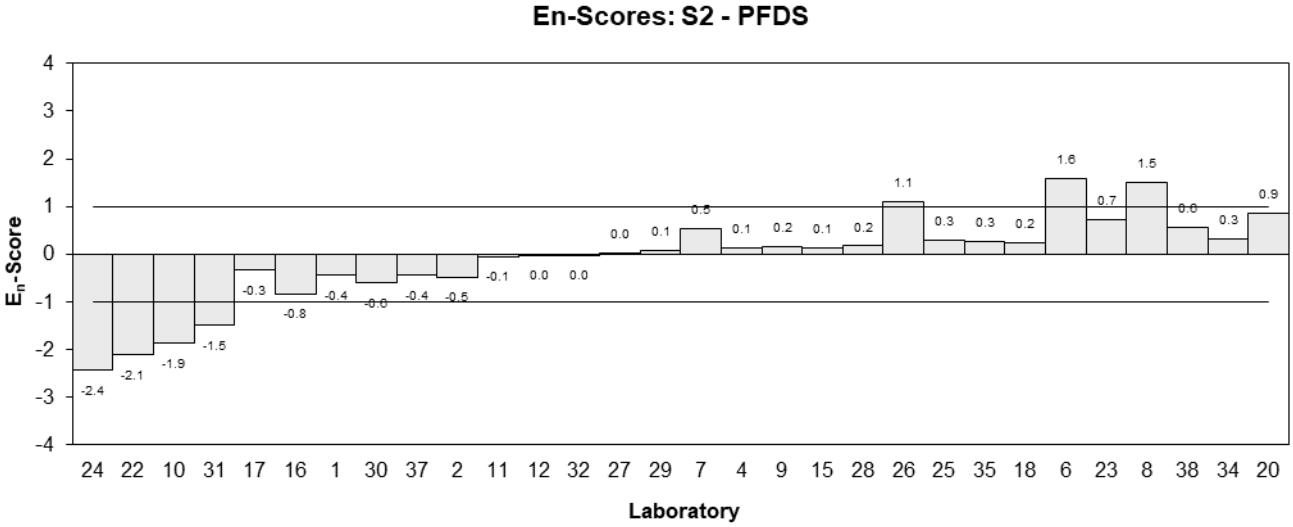

En-Scores: S2 - PFDS
En-Score
-2.4 -2.1 -1.9 -1.5 -0.3 -0.8 -0.4 -0.6 -0.4 -0.5 -0.1 0.0 0.0 0.0 0.1 0.5 0.1 0.2 0.1 0.2 1.1 0.3 0.3 0.2 1.6 0.7 1.5 0.6 0.3 0.9
24 22 10 31 17 16 1 30 37 2 11 12 32 27 29 7 4 9 15 28 26 25 35 18 6 23 8 38 34 20
Laboratory

Figure 43

Table 48

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFUdS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	NR	NR	NR
3	NR	NR	NR
4	NT	NT	NT
6	NR	NR	NR
7	NT	NT	NT
8	NT	NT	NT
9	17.606666274	6.5144665216	86.918125528
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NS	NS	NS
14	NT	NT	NT
15	NT	NT	NT
16	NT	NT	NT
17	NT	NT	NT
18	NT	NT	NT
19	NT	NT	NT
20	NT	NT	NT
22	NT	NT	NT
23	NT	NT	NT
24	NT	NT	NT
25	NT	NT	NT
26	NT	NT	NT
27	NT	NT	NT
28	NT	NT	NT
29	< 5	NR	NR
30	NT	NT	NT
31	NT	NT	NT
32	NT	NT	NT
34	NT	NT	NT
35	NT	NT	NT
36	NR	NR	NR
37	NT	NT	NT
38	15	3.75	NR

Statistics

Assigned Value	Not Set	
Spike Value	20.6	1.0
Robust Average	NA (N<6)	
Median	NA (N<3)	
Mean	16.3	
N	2	
Max	17.606666274	
Min	15	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

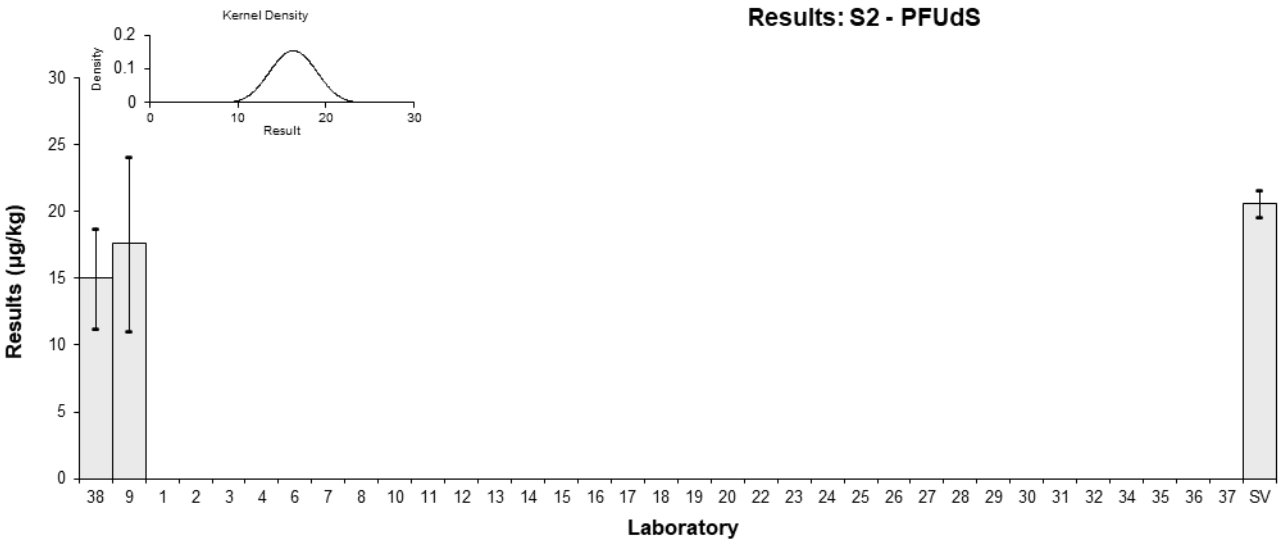

Results: S2 - PFUdS
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
38 9 1 2 3 4 6 7 8 10 11 12 13 14 15 16 17 18 19 20 22 23 24 25 26 27 28 29 30 31 32 34 35 36 37 SV

Figure 44

Table 49

Sample Details

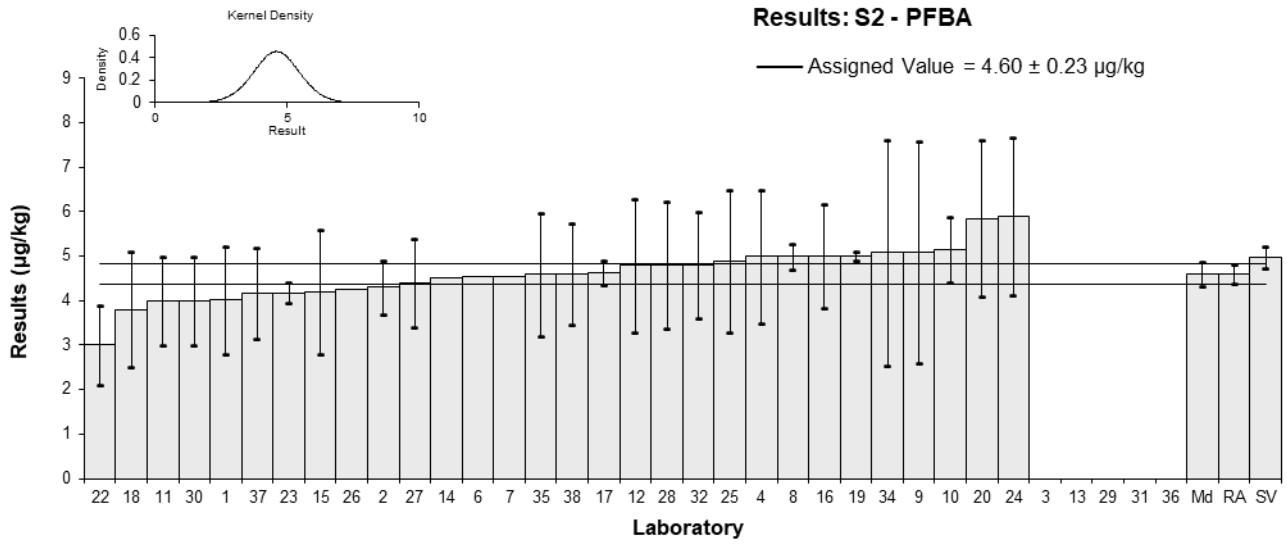
Sample No.	S2
Matrix	Soil
Analyte	PFBA
Unit	µg/kg

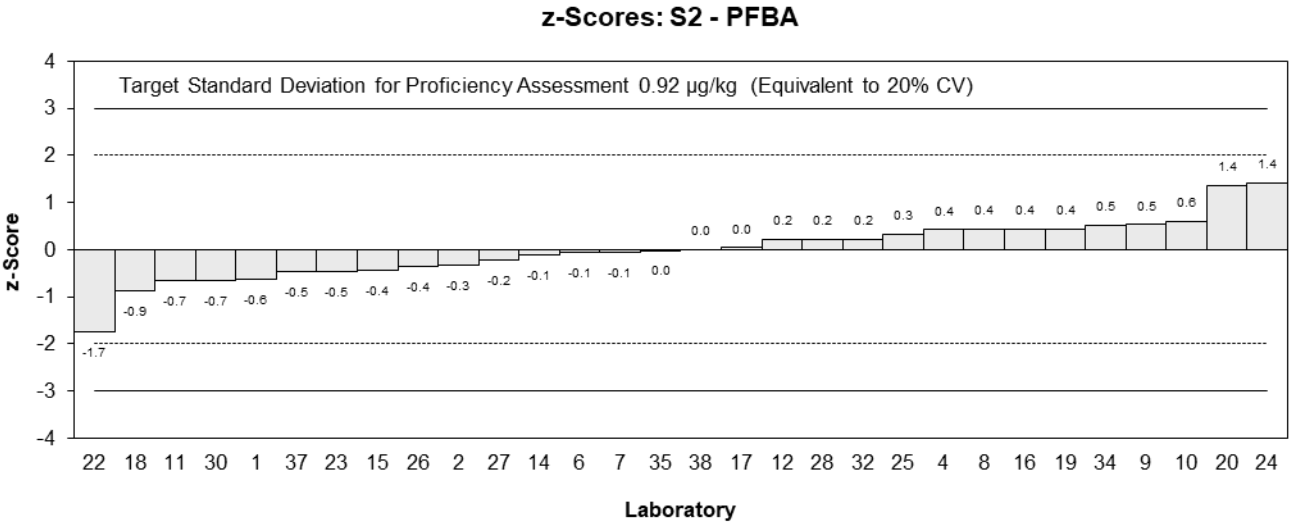
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	4.02	1.21	81	-0.63	-0.47
2	4.3	0.6	107	-0.33	-0.47
3	NR	NR	NR		
4	4.99	1.50	106	0.42	0.26
6	4.5471	NR	81	-0.06	-0.23
7	4.55	NR	99	-0.05	-0.22
8	5	0.29	88	0.43	1.08
9	5.0862048066	2.4922403552	48.783533195	0.53	0.19
10	5.15	0.74	65	0.60	0.71
11	4	1	87	-0.65	-0.58
12	4.8	1.5	93	0.22	0.13
13	NS	NS	NS		
14	4.5	NR	89.08	-0.11	-0.43
15	4.2	1.4	92	-0.43	-0.28
16	5	1.17	86.85	0.43	0.34
17	4.636	0.269	92	0.04	0.10
18	3.8	1.3	97	-0.87	-0.61
19	5.008	0.11	75	0.44	1.60
20	5.85	1.755	NR	1.36	0.71
22	3	0.9	67	-1.74	-1.72
23	4.18	0.22	NR	-0.46	-1.32
24	5.9	1.77	75	1.41	0.73
25	4.9	1.6	104	0.33	0.19
26	4.2645116260	NR	NR	-0.36	-1.46
27	4.4	1	91	-0.22	-0.19
28	4.80	1.44	82	0.22	0.14
29	< 5	NR	82		
30	4	1	100.26	-0.65	-0.58
31	<5	NR	NR		
32	4.8	1.2	48	0.22	0.16
34	5.08	2.54	NR	0.52	0.19
35	4.59	1.377	101	-0.01	-0.01
36	NR	NR	NR		
37	4.17	1.02	118	-0.47	-0.41
38	4.6	1.15	NR	0.00	0.00

Statistics

Assigned Value	4.60	0.23
Spike Value	4.97	0.25
Robust Average	4.60	0.23
Median	4.60	0.27
Mean	4.60	
N	30	
Max	5.9	
Min	3	
Robust SD	0.51	
Robust CV	11%	


Kernel Density
Density
Result
Results: S2 - PFBA
Assigned Value = 4.60 ± 0.23 µg/kg
Results (µg/kg)
22 18 11 30 1 37 23 15 26 2 27 14 6 7 35 38 17 12 28 32 25 4 8 16 19 34 9 10 20 24 3 13 29 31 36 Md RA SV
Laboratory


z-Scores: S2 - PFBA
Target Standard Deviation for Proficiency Assessment 0.92 µg/kg (Equivalent to 20% CV)
z-Score
22 18 11 30 1 37 23 15 26 2 27 14 6 7 35 38 17 12 28 32 25 4 8 16 19 34 9 10 20 24
Laboratory

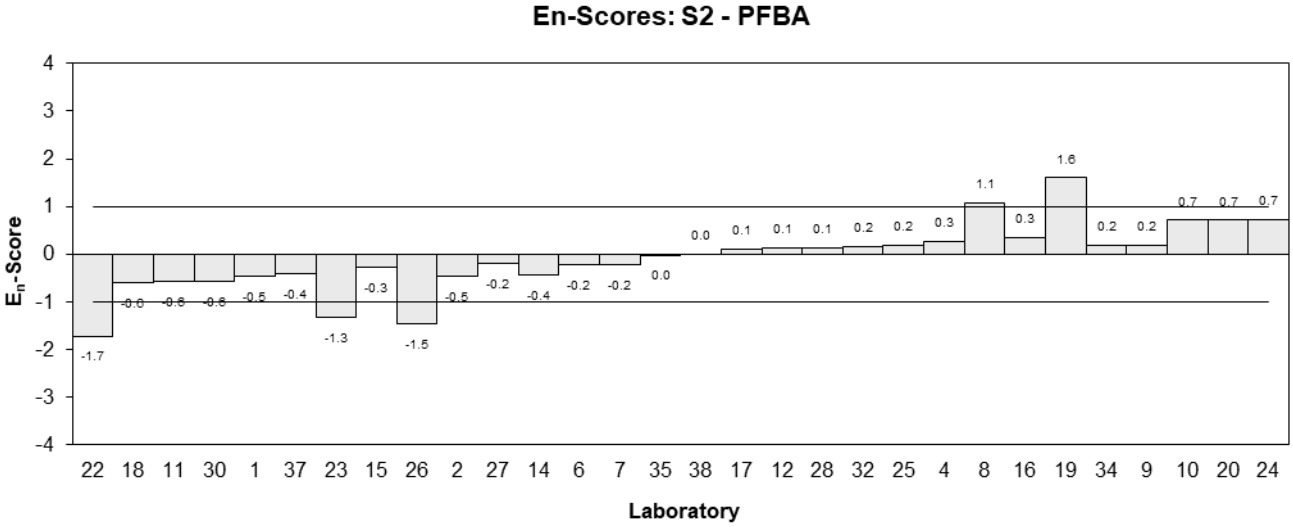

En-Scores: S2 - PFBA
En-Score
22 18 11 30 1 37 23 15 26 2 27 14 6 7 35 38 17 12 28 32 25 4 8 16 19 34 9 10 20 24
Laboratory

Figure 45

Table 50

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFHxA
Unit	µg/kg

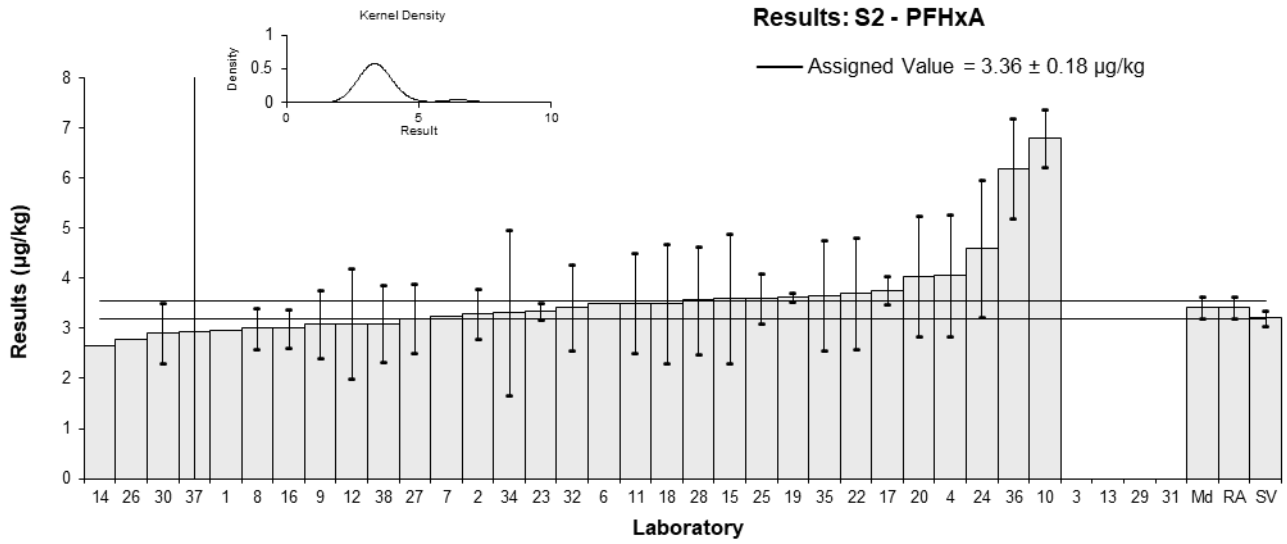
Participant Results

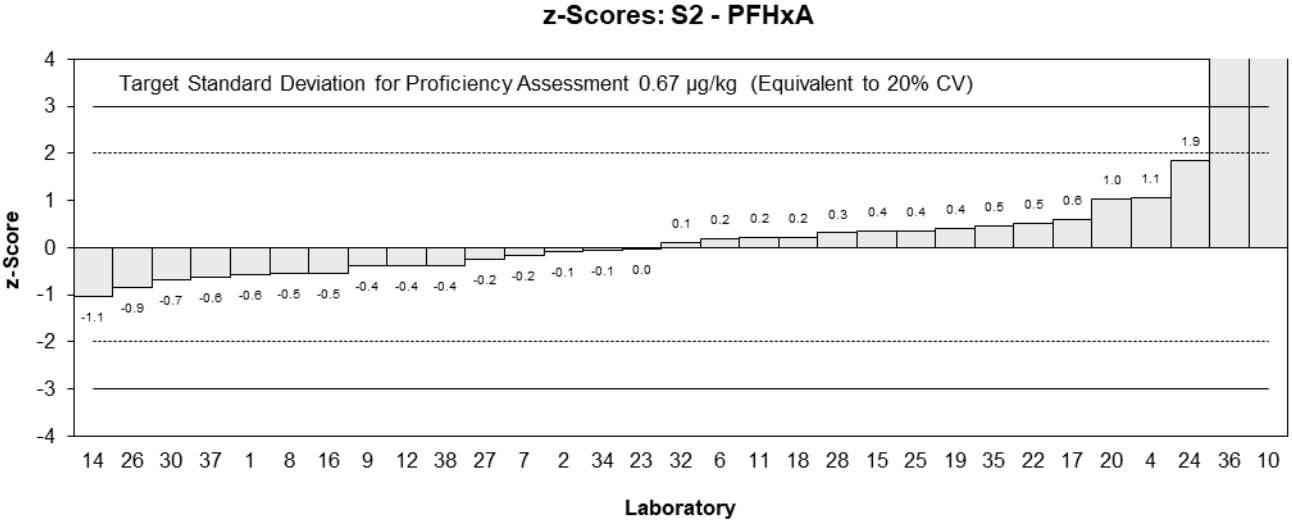
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	2.97	NR	83	-0.58	-2.17
2	3.3	0.5	104	-0.09	-0.11
3	NR	NR	NR		
4	4.07	1.22	109	1.06	0.58
6	3.4898	NR	89	0.19	0.72
7	3.25	NR	102	-0.16	-0.61
8	3	0.42	87	-0.54	-0.79
9	3.0964382787	0.6812164213	80.846662741	-0.39	-0.37
10*	6.81	0.57	46	5.13	5.77
11	3.5	1	73	0.21	0.14
12	3.1	1.1	96	-0.39	-0.23
13	NS	NS	NS		
14	2.6531	NR	95.14	-1.05	-3.93
15	3.6	1.3	94	0.36	0.18
16	3	0.38	81.34	-0.54	-0.86
17	3.764	0.278	86	0.60	1.22
18	3.5	1.2	93	0.21	0.12
19	3.636	0.09	123	0.41	1.37
20	4.05	1.215	NR	1.03	0.56
22	3.7	1.11	114	0.51	0.30
23	3.34	0.17	NR	-0.03	-0.08
24	4.6	1.38	119	1.85	0.89
25	3.6	0.51	105	0.36	0.44
26	2.7913083843	NR	NR	-0.85	-3.16
27	3.2	0.7	97	-0.24	-0.22
28	3.57	1.071	85	0.31	0.19
29	< 5	NR	80		
30	2.9	0.6	94.43	-0.68	-0.73
31	<5	NR	NR		
32	3.43	0.858	105	0.10	0.08
34	3.32	1.66	NR	-0.06	-0.02
35	3.66	1.098	114	0.45	0.27
36*	6.2	1	42	4.23	2.80
37	2.94	62	106	-0.62	-0.01
38	3.1	0.775	NR	-0.39	-0.33

* Outlier, see Section 4.2

Statistics

Assigned Value	3.36	0.18
Spike Value	3.21	0.16
Robust Average	3.42	0.21
Median	3.43	0.22
Mean	3.59	
N	31	
Max	6.81	
Min	2.6531	
Robust SD	0.46	
Robust CV	14%	


Kernel Density
Density
Result
Results: S2 - PFHxA
Assigned Value = 3.36 ± 0.18 µg/kg
Results (µg/kg)
14 26 30 37 1 8 16 9 12 38 27 7 2 34 23 32 6 11 18 28 15 25 19 35 22 17 20 4 24 36 10 3 13 29 31 Md RA SV
Laboratory


z-Scores: S2 - PFHxA
Target Standard Deviation for Proficiency Assessment 0.67 µg/kg (Equivalent to 20% CV)
z-Score
-1.1 -0.9 -0.7 -0.6 -0.6 -0.5 -0.5 -0.4 -0.4 -0.4 -0.2 -0.2 -0.1 -0.1 0.0 0.1 0.2 0.2 0.2 0.3 0.4 0.4 0.4 0.5 0.5 0.6 1.0 1.1 1.9
14 26 30 37 1 8 16 9 12 38 27 7 2 34 23 32 6 11 18 28 15 25 19 35 22 17 20 4 24 36 10
Laboratory

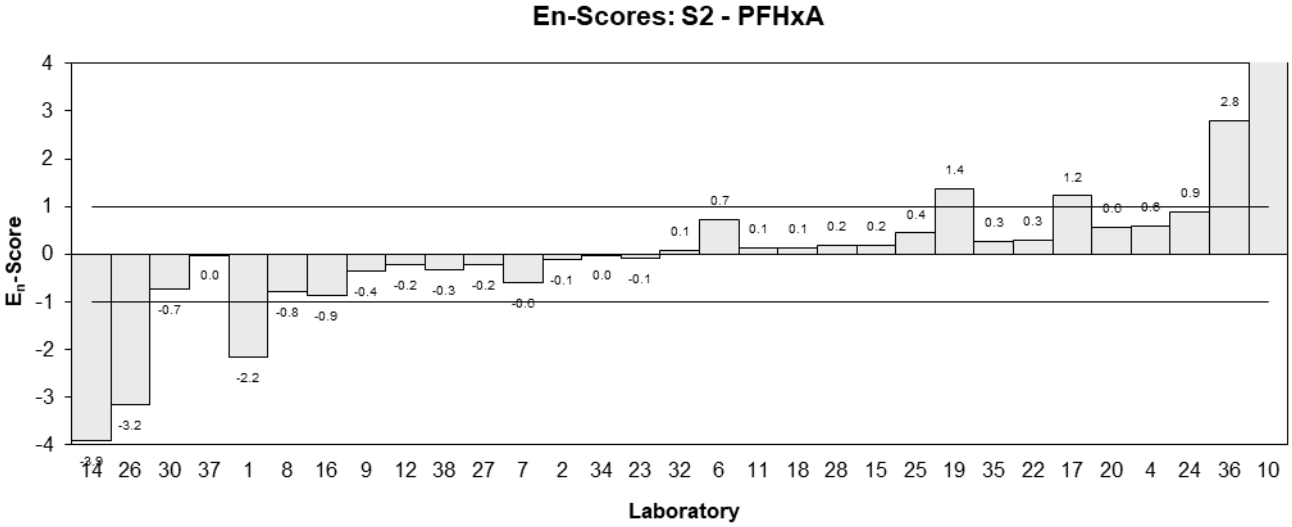

En-Scores: S2 - PFHxA
En-Score
-3.9 -3.2 -0.7 0.0 -2.2 -0.8 -0.9 -0.4 -0.2 -0.3 -0.2 -0.6 -0.1 0.0 -0.1 0.1 0.7 0.1 0.1 0.2 0.2 0.4 1.4 0.3 0.3 1.2 0.6 0.6 0.9 2.8
14 26 30 37 1 8 16 9 12 38 27 7 2 34 23 32 6 11 18 28 15 25 19 35 22 17 20 4 24 36 10
Laboratory

Figure 46

Table 51

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFHpA
Unit	µg/kg

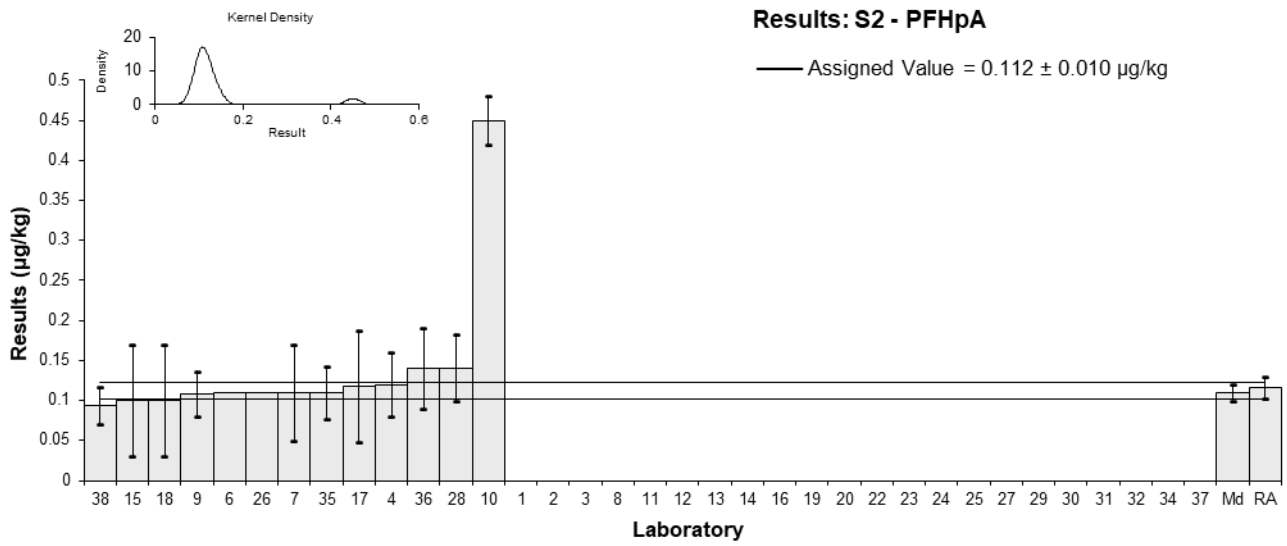
Participant Results

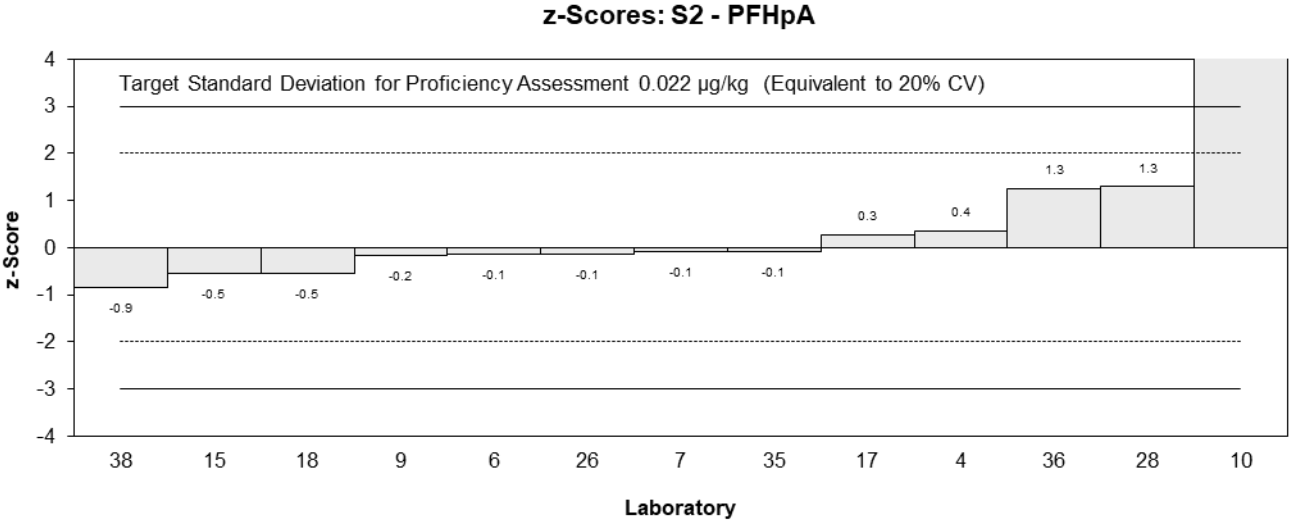
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 0.1	NR	78		
2	NR	NR	NR		
3	NR	NR	NR		
4	0.12	0.04	146	0.36	0.19
6	0.1091	NR	91	-0.13	-0.29
7	0.11	0.06	105	-0.09	-0.03
8	<1	NR	83		
9	0.1081168830	0.0281103895	86.222511255	-0.17	-0.13
10*	0.45	0.03	46	15.09	10.69
11	<0.2	0.1	79		
12	<1	NR	95		
13	NS	NS	NS		
14	<0.1	NR	92.77		
15	0.1	0.07	100	-0.54	-0.17
16	<0.2	NR	91.42		
17	0.118	0.07	95	0.27	0.08
18	0.1	0.07	94	-0.54	-0.17
19	NR	NR	NR		
20	<1	NR	NR		
22	<0.5	NR	NR		
23	<0.5	NR	NR		
24	<0.5	NR	NR		
25	<1.0	NR	105		
26	0.1091445057	NR	NR	-0.13	-0.29
27	<0.1	0.1	95		
28	0.141	0.0423	81	1.29	0.67
29	< 5	NR	84		
30	<0.2	NR	114.72		
31	<5	NR	NR		
32	<0.2	NR	NR		
34	<0.1	NR	NR		
35	0.11	0.033	157	-0.09	-0.06
36	0.14	0.05	87	1.25	0.55
37	<0.2	NR	104		
38	0.093	0.02325	NR	-0.85	-0.75

* Outlier, see Section 4.2

Statistics

Assigned Value	0.112	0.010
Spike Value	Not Spiked	
Robust Average	0.116	0.013
Median	0.110	0.010
Mean	0.139	
N	13	
Max	0.45	
Min	0.093	
Robust SD	0.019	
Robust CV	16%	


Results: S2 - PFHpA
Assigned Value = 0.112 ± 0.010 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
38 15 18 9 6 26 7 35 17 4 36 28 10 1 2 3 8 11 12 13 14 16 19 20 22 23 24 25 27 29 30 31 32 34 37 Md RA


z-Scores: S2 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.022 µg/kg (Equivalent to 20% CV)
z-Score
-0.9 -0.5 -0.5 -0.2 -0.1 -0.1 -0.1 -0.1 0.3 0.4 1.3 1.3
Laboratory
38 15 18 9 6 26 7 35 17 4 36 28 10

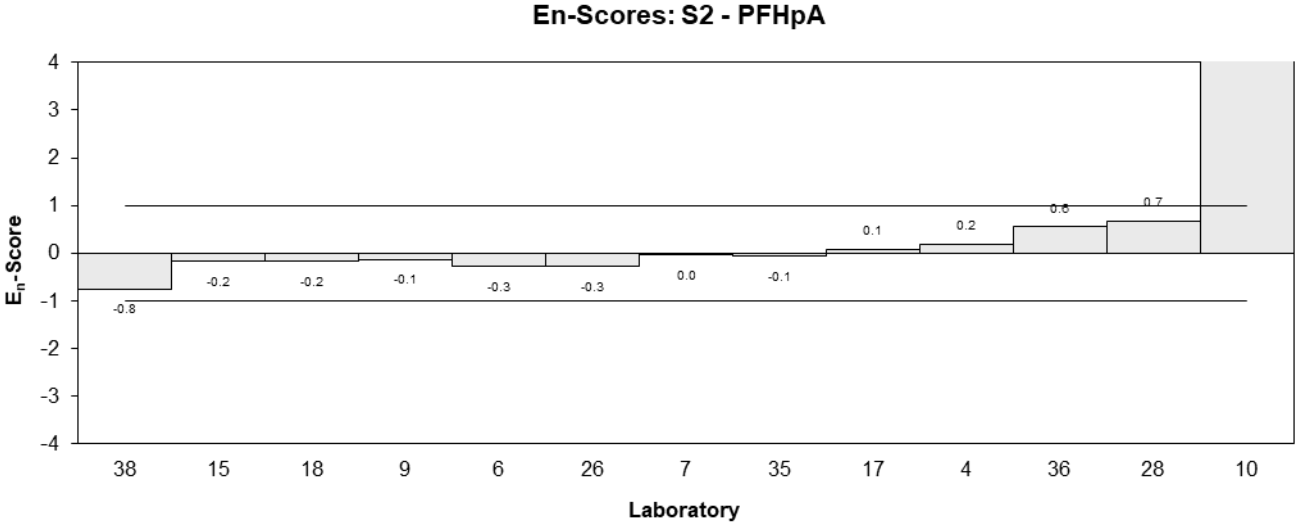

En-Scores: S2 - PFHpA
En-Score
-0.8 -0.2 -0.2 -0.1 -0.3 -0.3 0.0 -0.1 0.1 0.2 0.6 0.7
Laboratory
38 15 18 9 6 26 7 35 17 4 36 28 10

Figure 47

Table 52

Sample Details

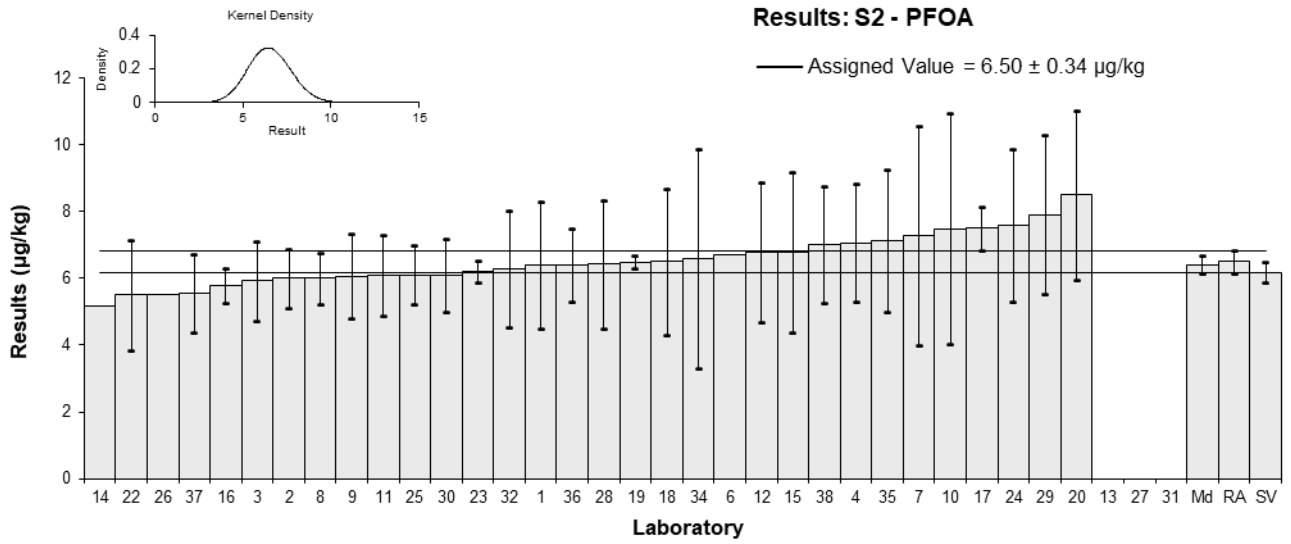
Sample No.	S2
Matrix	Soil
Analyte	PFOA
Unit	µg/kg

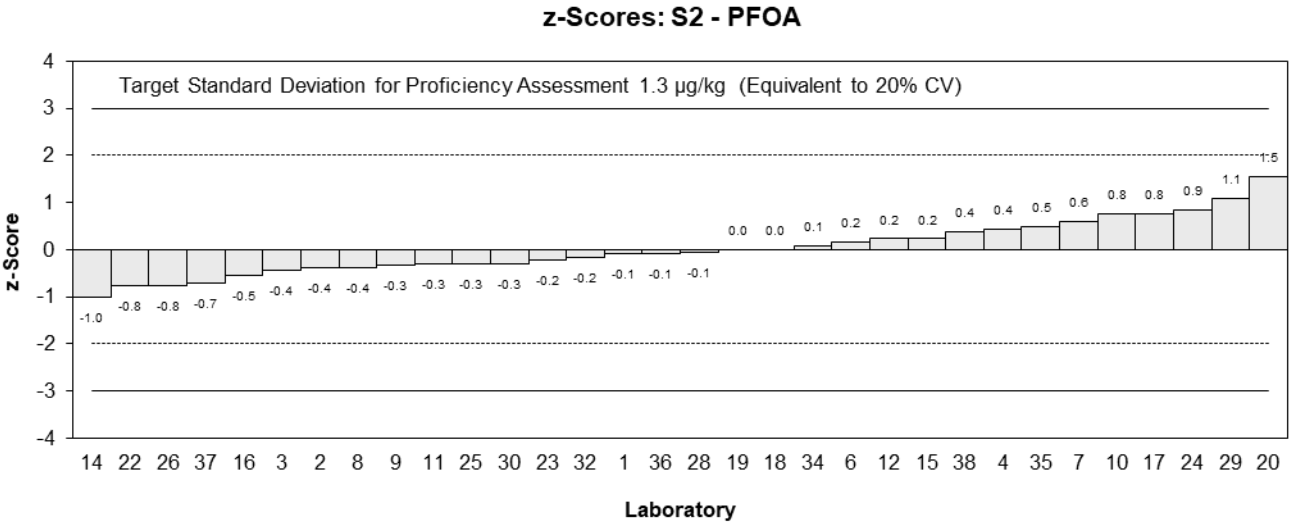
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.40	1.92	84	-0.08	-0.05
2	6.0	0.9	115	-0.38	-0.52
3	5.93	1.19	NR	-0.44	-0.46
4	7.07	1.78	112	0.44	0.31
6	6.7008	NR	87	0.15	0.59
7	7.28	3.28	100	0.60	0.24
8	6	0.76	87	-0.38	-0.60
9	6.0683867310	1.2743612135	88.970974450	-0.33	-0.33
10	7.49	3.45	58	0.76	0.29
11	6.1	1.2	76	-0.31	-0.32
12	6.8	2.1	95	0.23	0.14
13	NS	NS	NS		
14	5.19	NR	93.27	-1.01	-3.85
15	6.8	2.4	102	0.23	0.12
16	5.8	0.52	104.21	-0.54	-1.13
17	7.5	0.644	92	0.77	1.37
18	6.5	2.2	96	0.00	0.00
19	6.497	0.19	NR	0.00	-0.01
20	8.5	2.55	NR	1.54	0.78
22	5.5	1.65	106	-0.77	-0.59
23	6.21	0.31	NR	-0.22	-0.63
24	7.6	2.28	99	0.85	0.48
25	6.1	0.88	107	-0.31	-0.42
26	5.5060609666	NR	NR	-0.76	-2.92
27	<0.1	0.1	95		
28	6.43	1.929	86	-0.05	-0.04
29	7.92	2.38	109	1.09	0.59
30	6.1	1.1	100.8	-0.31	-0.35
31	<5	NR	NR		
32	6.29	1.76	100	-0.16	-0.12
34	6.6	3.3	NR	0.08	0.03
35	7.12	2.136	143	0.48	0.29
36	6.4	1.1	84	-0.08	-0.09
37	5.56	1.18	99	-0.72	-0.77
38	7	1.75	NR	0.38	0.28

Statistics

Assigned Value	6.50	0.34
Spike Value	6.18	0.30
Robust Average	6.50	0.34
Median	6.42	0.27
Mean	6.53	
N	32	
Max	8.5	
Min	5.19	
Robust SD	0.76	
Robust CV	12%	


Results: S2 - PFOA
Kernel Density
Density
Result
Assigned Value = 6.50 ± 0.34 µg/kg
Results (µg/kg)
Laboratory
14 22 26 37 16 3 2 8 9 11 25 30 23 32 1 36 28 19 18 34 6 12 15 38 4 35 7 10 17 24 29 20 13 27 31 Md RA SV


z-Scores: S2 - PFOA
Target Standard Deviation for Proficiency Assessment 1.3 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
14 22 26 37 16 3 2 8 9 11 25 30 23 32 1 36 28 19 18 34 6 12 15 38 4 35 7 10 17 24 29 20

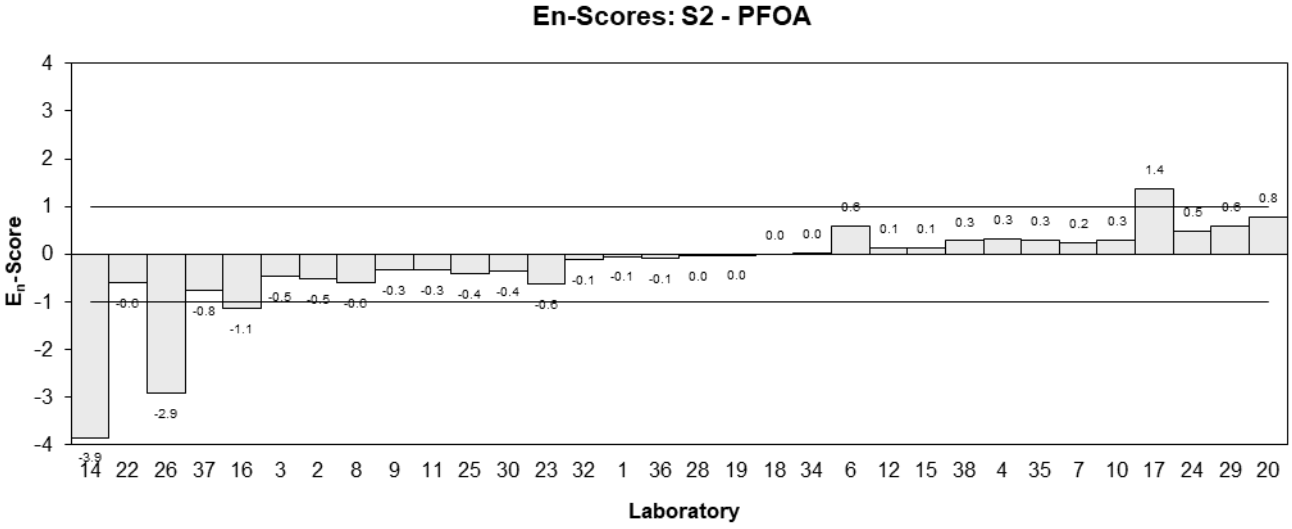

En-Scores: S2 - PFOA
En-Score
Laboratory
14 22 26 37 16 3 2 8 9 11 25 30 23 32 1 36 28 19 18 34 6 12 15 38 4 35 7 10 17 24 29 20

Figure 48

Table 53

Sample Details

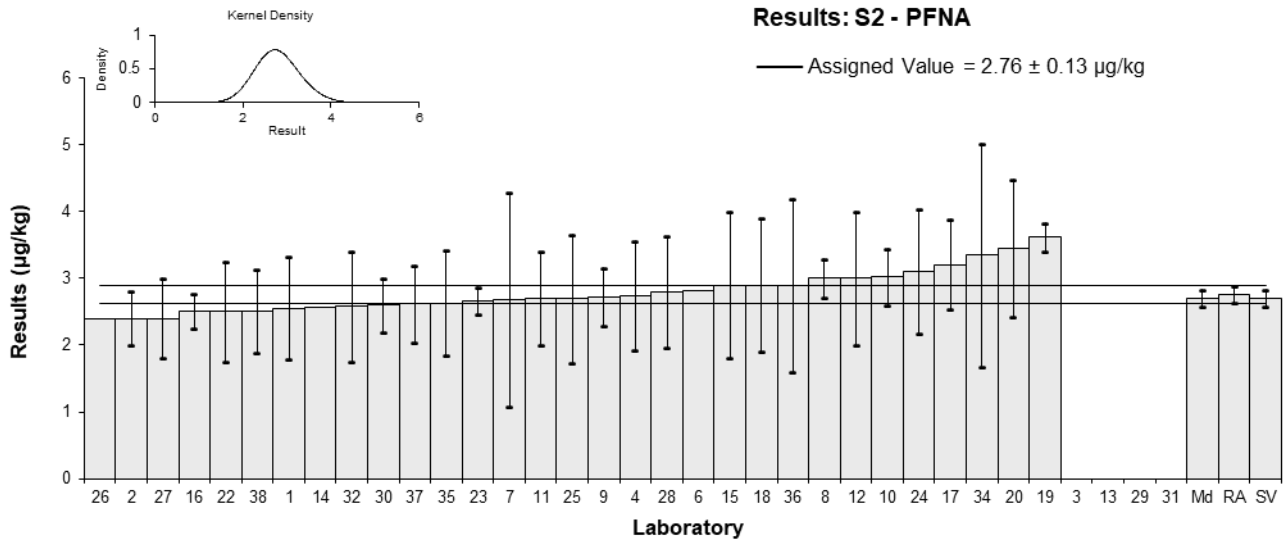
Sample No.	S2
Matrix	Soil
Analyte	PFNA
Unit	µg/kg

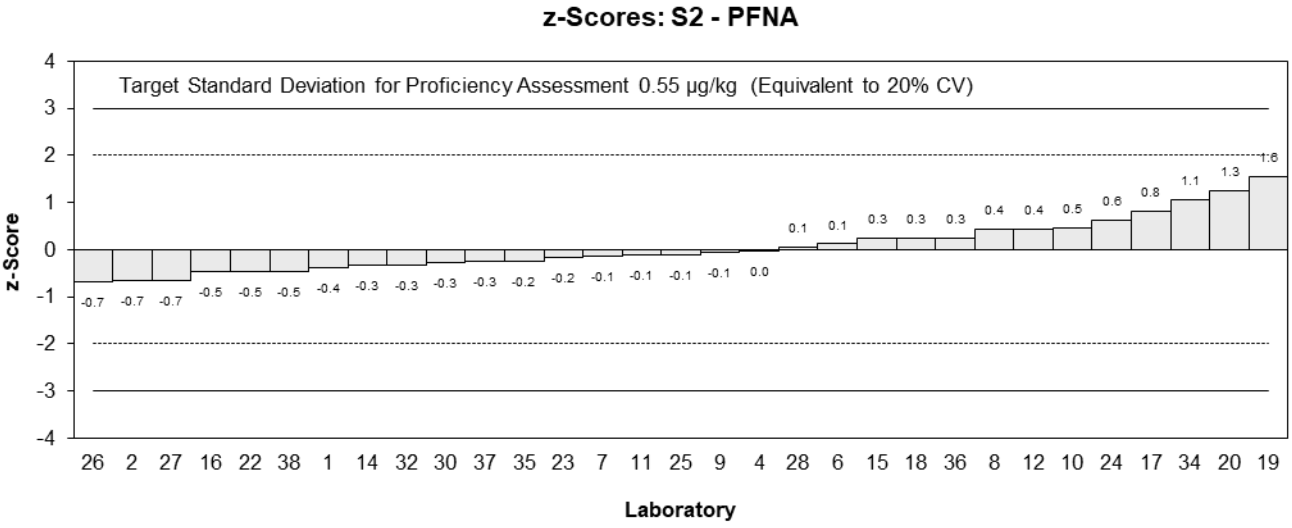
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	2.55	0.77	82	-0.38	-0.27
2	2.4	0.4	117	-0.65	-0.86
3	NR	NR	NR		
4	2.74	0.82	109	-0.04	-0.02
6	2.826	NR	91	0.12	0.51
7	2.68	1.6	95	-0.14	-0.05
8	3	0.29	85	0.43	0.76
9	2.7244088181	0.4359054109	85.471065028	-0.06	-0.08
10	3.02	0.43	62	0.47	0.58
11	2.7	0.7	76	-0.11	-0.08
12	3	1	97	0.43	0.24
13	NS	NS	NS		
14	2.57	NR	89.91	-0.34	-1.46
15	2.9	1.1	96	0.25	0.13
16	2.5	0.26	107.75	-0.47	-0.89
17	3.21	0.675	115	0.82	0.65
18	2.9	1	107	0.25	0.14
19	3.618	0.21	NR	1.55	3.47
20	3.45	1.035	NR	1.25	0.66
22	2.5	0.75	110	-0.47	-0.34
23	2.67	0.20	NR	-0.16	-0.38
24	3.1	0.93	130	0.62	0.36
25	2.7	0.96	101	-0.11	-0.06
26	2.3844743810	NR	NR	-0.68	-2.89
27	2.4	0.6	93	-0.65	-0.59
28	2.79	0.837	83	0.05	0.04
29	< 5	NR	86		
30	2.6	0.4	96.81	-0.29	-0.38
31	<5	NR	NR		
32	2.58	0.826	109	-0.33	-0.22
34	3.35	1.675	NR	1.07	0.35
35	2.63	0.789	141	-0.24	-0.16
36	2.9	1.3	82	0.25	0.11
37	2.62	0.58	118	-0.25	-0.24
38	2.5	0.625	NR	-0.47	-0.41

Statistics

Assigned Value	2.76	0.13
Spike Value	2.70	0.13
Robust Average	2.76	0.13
Median	2.70	0.13
Mean	2.79	
N	31	
Max	3.618	
Min	2.3844743810	
Robust SD	0.29	
Robust CV	10%	


Kernel Density
Density
Result
Results: S2 - PFNA
Assigned Value = 2.76 ± 0.13 µg/kg
Results (µg/kg)
Laboratory
26 2 27 16 22 38 1 14 32 30 37 35 23 7 11 25 9 4 28 6 15 18 36 8 12 10 24 17 34 20 19 3 13 29 31 Md RA SV


z-Scores: S2 - PFNA
Target Standard Deviation for Proficiency Assessment 0.55 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
26 2 27 16 22 38 1 14 32 30 37 35 23 7 11 25 9 4 28 6 15 18 36 8 12 10 24 17 34 20 19

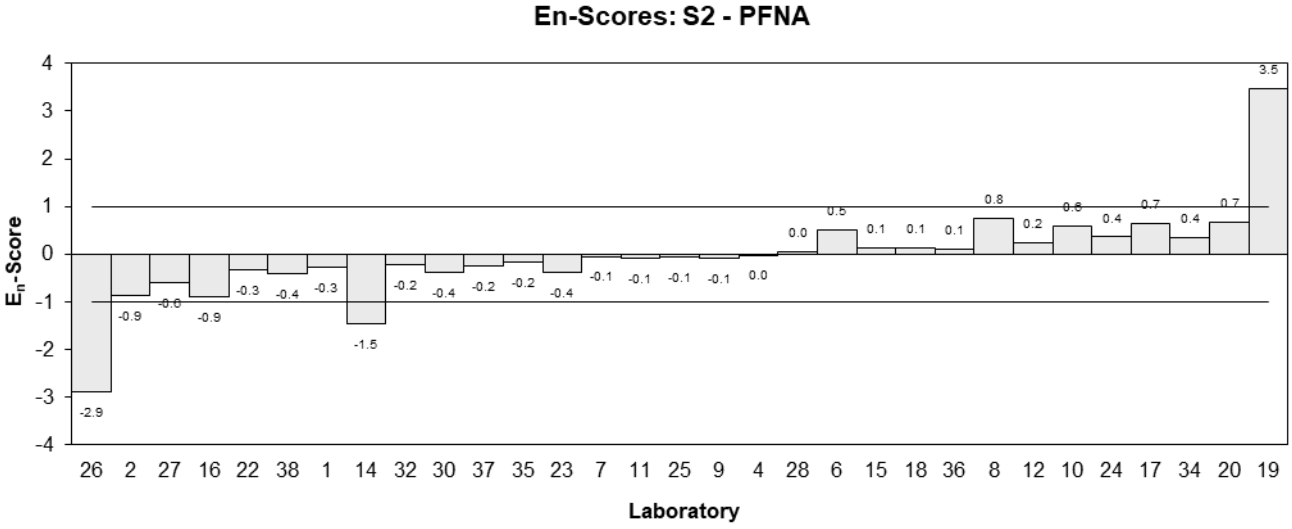

En-Scores: S2 - PFNA
En-Score
Laboratory
26 2 27 16 22 38 1 14 32 30 37 35 23 7 11 25 9 4 28 6 15 18 36 8 12 10 24 17 34 20 19

Figure 49

Table 54

Sample Details

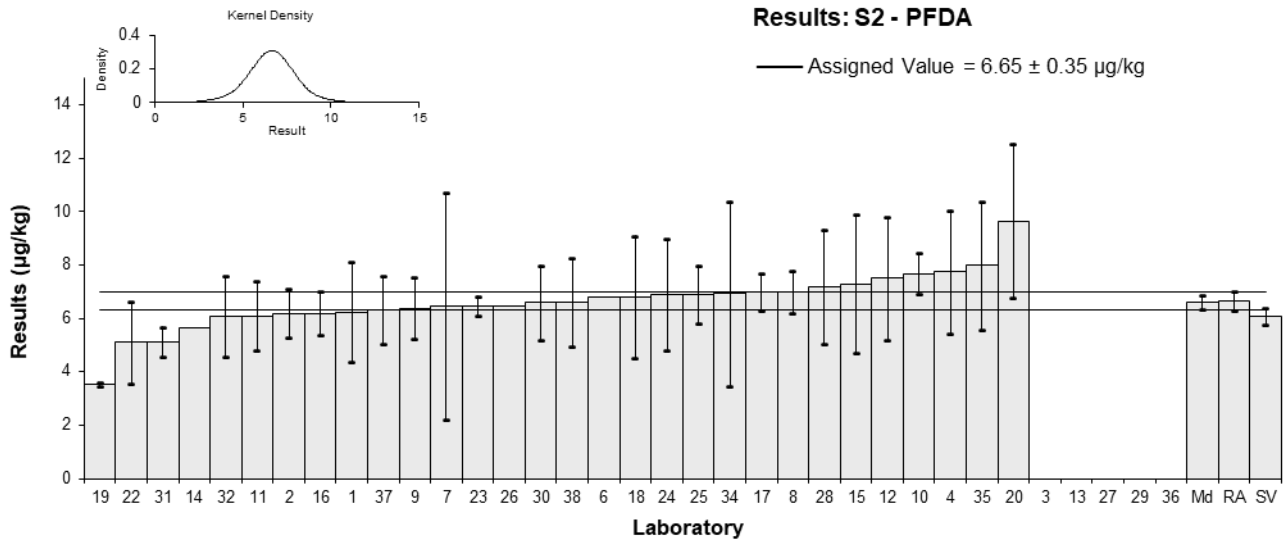
Sample No.	S2
Matrix	Soil
Analyte	PFDA
Unit	µg/kg

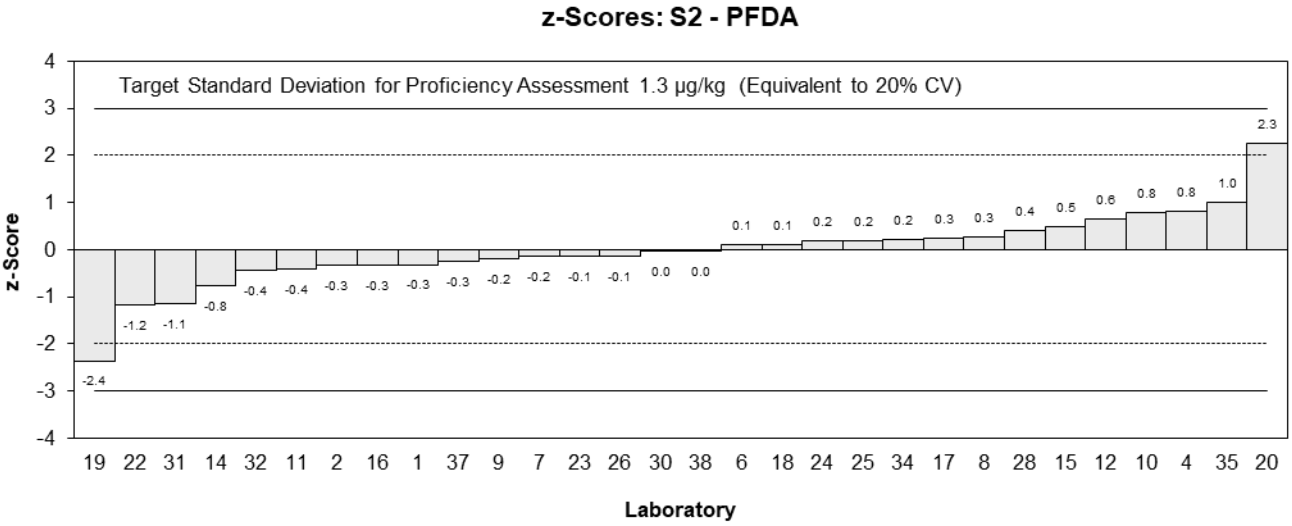
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.23	1.87	82	-0.32	-0.22
2	6.2	0.9	114	-0.34	-0.47
3	NR	NR	NR		
4	7.74	2.32	105	0.82	0.46
6	6.7958	NR	97	0.11	0.42
7	6.45	4.26	107	-0.15	-0.05
8	7	0.8	89	0.26	0.40
9	6.3784854686	1.1481273843	87.534312951	-0.20	-0.23
10	7.69	0.75	66	0.78	1.26
11	6.1	1.3	85	-0.41	-0.41
12	7.5	2.3	97	0.64	0.37
13	NS	NS	NS		
14	5.63	NR	96.32	-0.77	-2.91
15	7.3	2.6	96	0.49	0.25
16	6.2	0.81	102.54	-0.34	-0.51
17	6.98	0.707	70	0.25	0.42
18	6.8	2.3	100	0.11	0.06
19	3.514	0.07	NR	-2.36	-8.79
20	9.65	2.895	NR	2.26	1.03
22	5.1	1.53	71	-1.17	-0.99
23	6.47	0.36	NR	-0.14	-0.36
24	6.9	2.07	111	0.19	0.12
25	6.9	1.1	101	0.19	0.22
26	6.4759686013	NR	NR	-0.13	-0.50
27	<0.1	0.1	97		
28	7.19	2.157	81	0.41	0.25
29	< 5	NR	82		
30	6.6	1.4	100.58	-0.04	-0.03
31	5.13	0.56	147	-1.14	-2.30
32	6.07	1.52	114	-0.44	-0.37
34	6.93	3.465	NR	0.21	0.08
35	7.98	2.394	138	1.00	0.55
36	NR	NR	NR		
37	6.32	1.26	125	-0.25	-0.25
38	6.6	1.65	NR	-0.04	-0.03

Statistics

Assigned Value	6.65	0.35
Spike Value	6.08	0.30
Robust Average	6.65	0.35
Median	6.60	0.27
Mean	6.63	
N	30	
Max	9.65	
Min	3.514	
Robust SD	0.77	
Robust CV	12%	


Results: S2 - PFDA
Kernel Density
Density
Result
Assigned Value = 6.65 ± 0.35 µg/kg
Results (µg/kg)
19 22 31 14 32 11 2 16 1 37 9 7 23 26 30 38 6 18 24 25 34 17 8 28 15 12 10 4 35 20 3 13 27 29 36 Md RA SV
Laboratory


z-Scores: S2 - PFDA
Target Standard Deviation for Proficiency Assessment 1.3 µg/kg (Equivalent to 20% CV)
z-Score
19 22 31 14 32 11 2 16 1 37 9 7 23 26 30 38 6 18 24 25 34 17 8 28 15 12 10 4 35 20
Laboratory

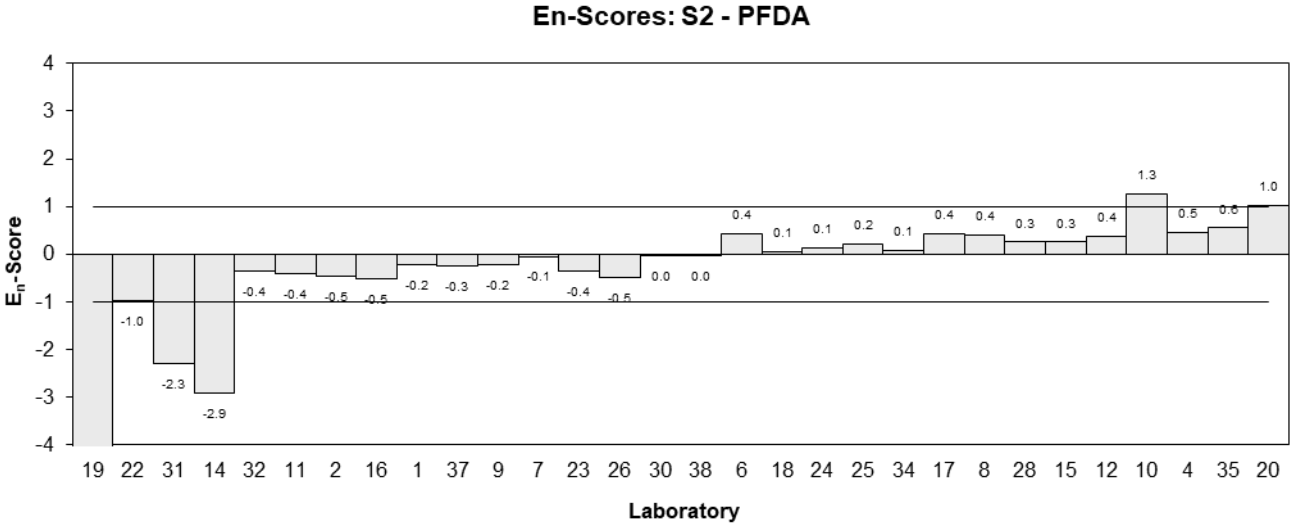

En-Scores: S2 - PFDA
En-Score
19 22 31 14 32 11 2 16 1 37 9 7 23 26 30 38 6 18 24 25 34 17 8 28 15 12 10 4 35 20
Laboratory

Figure 50

Table 55

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFTeDA
Unit	µg/kg

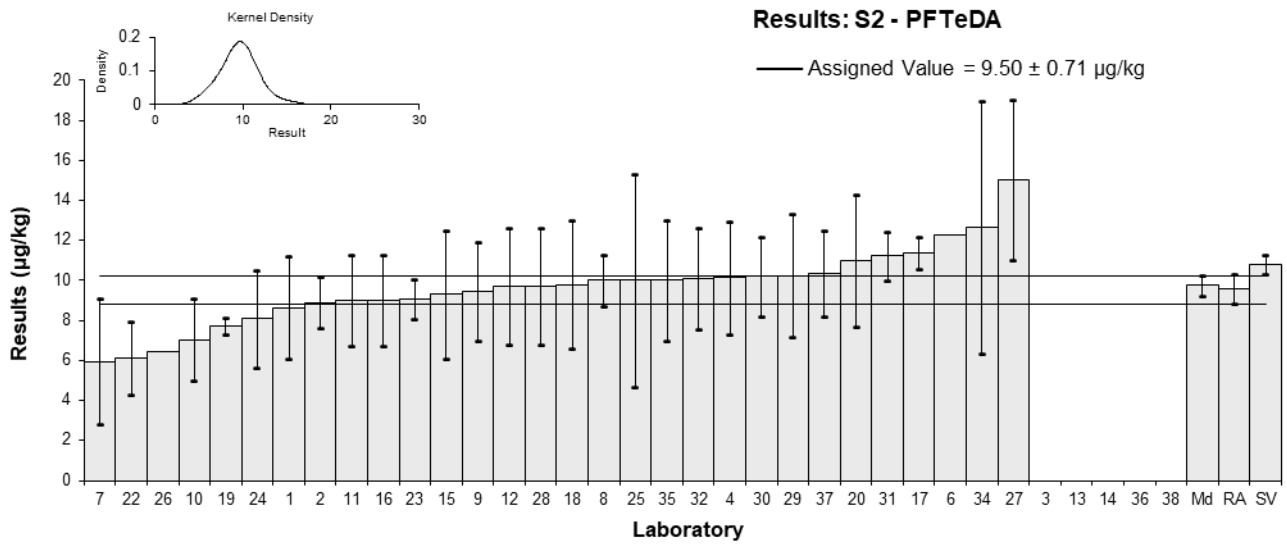
Participant Results

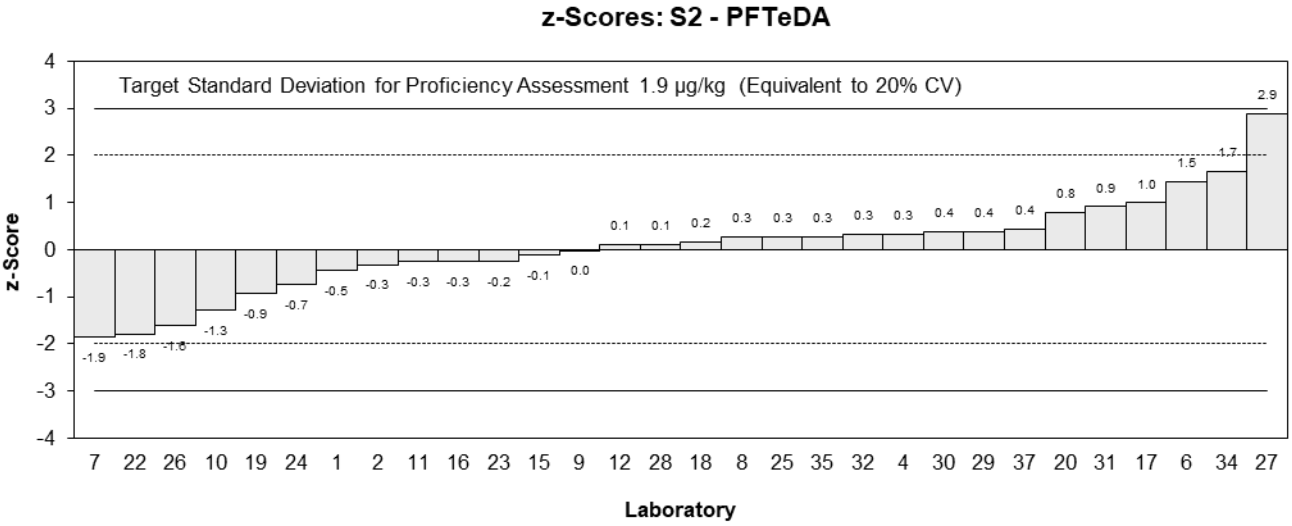
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	8.65	2.59	85	-0.45	-0.32
2	8.9	1.3	136	-0.32	-0.41
3	NR	NR	NR		
4	10.13	2.82	124	0.33	0.22
6	12.2482	NR	98	1.45	3.87
7	5.96	3.16	101	-1.86	-1.09
8	10	1.3	85	0.26	0.34
9	9.4651975692	2.4609513680	57.324415594	-0.02	-0.01
10	7.04	2.06	86	-1.29	-1.13
11	9	2.3	86	-0.26	-0.21
12	9.7	2.9	115	0.11	0.07
13	NS	NS	NS		
14	NT	NT	NT		
15	9.3	3.2	118	-0.11	-0.06
16	9	2.25	113.36	-0.26	-0.21
17	11.389	0.797	34	0.99	1.77
18	9.8	3.2	100	0.16	0.09
19	7.707	0.43	NR	-0.94	-2.16
20	11	3.3	NR	0.79	0.44
22	6.1	1.83	54	-1.79	-1.73
23	9.05	1.00	NR	-0.24	-0.37
24	8.1	2.43	60	-0.74	-0.55
25	10	5.3	93	0.26	0.09
26	6.4313926334	NR	NR	-1.62	-4.32
27*	15	4	94	2.89	1.35
28	9.71	2.913	76	0.11	0.07
29	10.25	3.07	109	0.39	0.24
30	10.2	2	101.07	0.37	0.33
31	11.23	1.23	180	0.91	1.22
32	10.1	2.53	88	0.32	0.23
34	12.64	6.32	NR	1.65	0.49
35	10.02	3.006	224	0.27	0.17
36	NR	NR	NR		
37	10.34	2.14	97	0.44	0.37
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	9.50	0.71
Spike Value	10.8	0.5
Robust Average	9.59	0.75
Median	9.76	0.51
Mean	9.62	
N	30	
Max	15	
Min	5.96	
Robust SD	1.6	
Robust CV	17%	


Results: S2 - PFTeDA
Assigned Value = 9.50 ± 0.71 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
7 22 26 10 19 24 1 2 11 16 23 15 9 12 28 18 8 25 35 32 4 30 29 37 20 31 17 6 34 27 3 13 14 36 38 Md RA SV


z-Scores: S2 - PFTeDA
Target Standard Deviation for Proficiency Assessment 1.9 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
7 22 26 10 19 24 1 2 11 16 23 15 9 12 28 18 8 25 35 32 4 30 29 37 20 31 17 6 34 27

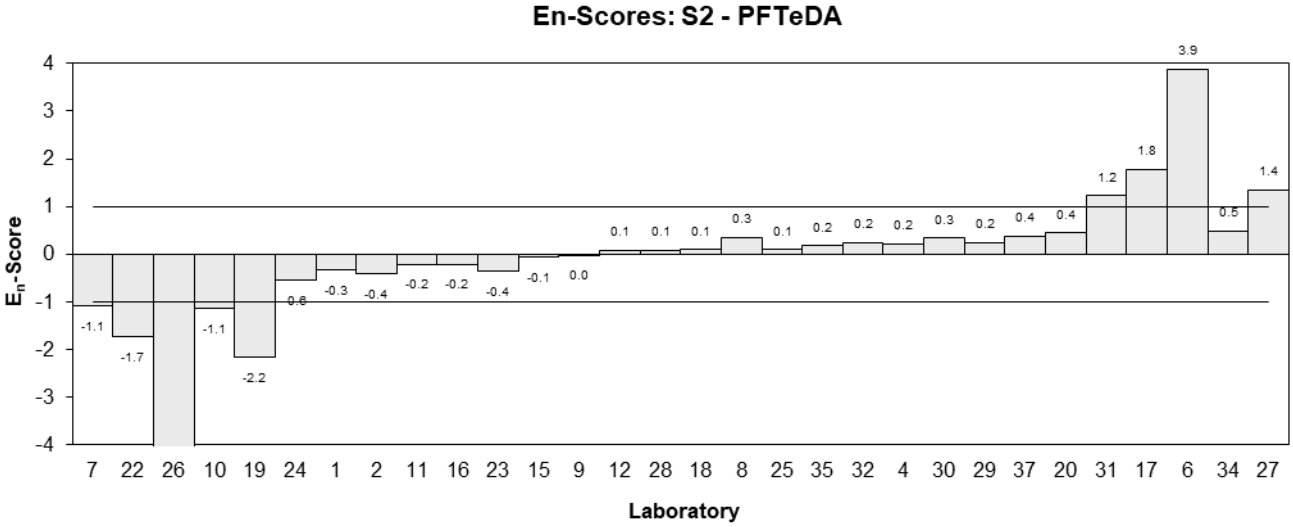

En-Scores: S2 - PFTeDA
En-Score
Laboratory
7 22 26 10 19 24 1 2 11 16 23 15 9 12 28 18 8 25 35 32 4 30 29 37 20 31 17 6 34 27

Figure 51

Table 56

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	PFODA
Unit	µg/kg

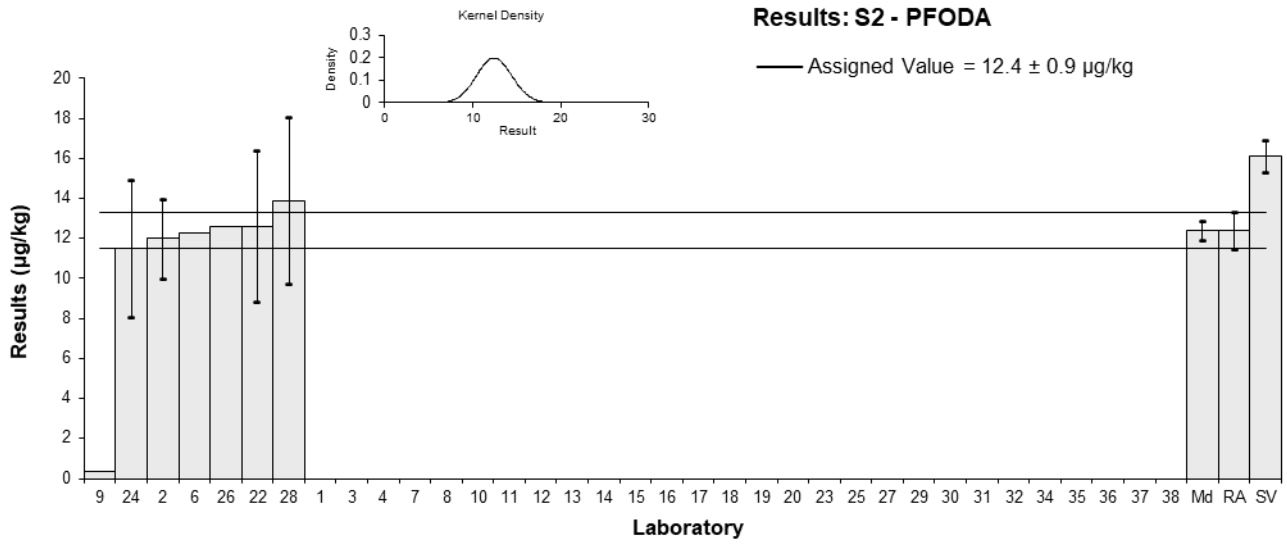
Participant Results

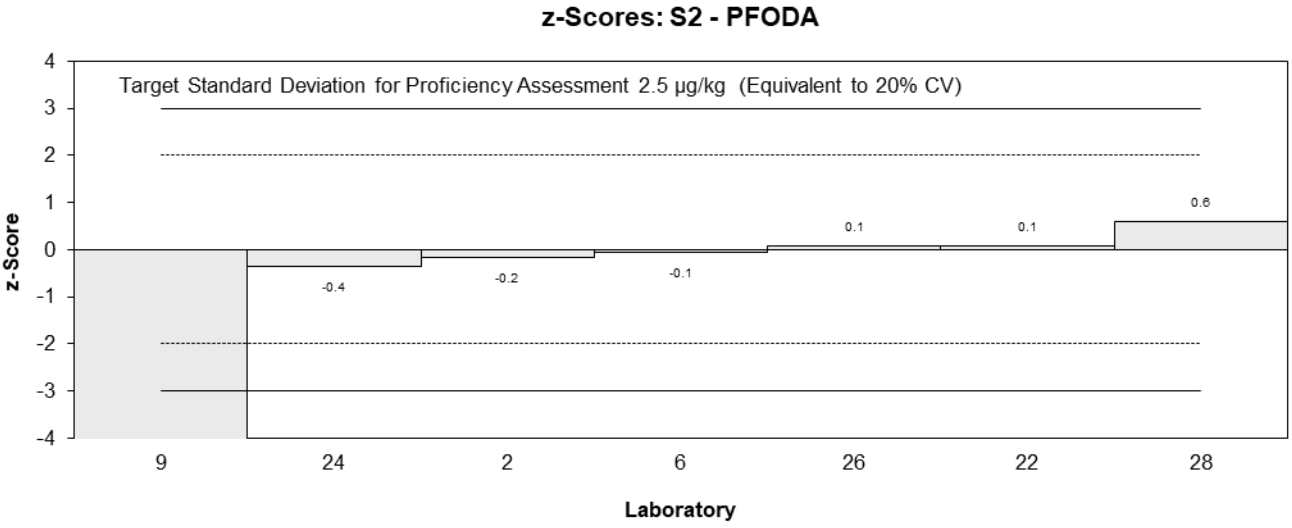
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	12	2	NR	-0.16	-0.18
3	NR	NR	NR		
4	NT	NT	NT		
6	12.2482	NR	98	-0.06	-0.17
7	NT	NT	NT		
8	NT	NT	NT		
9**	0.3840032961	NR	84.925309908	-4.85	-13.35
10	NT	NT	NT		
11	NT	NT	NT		
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	NT	NT	NT		
17	NT	NT	NT		
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
22	12.6	3.78	NR	0.08	0.05
23	NT	NT	NT		
24	11.5	3.45	NR	-0.36	-0.25
25	NT	NT	NT		
26	12.594361439	NR	NR	0.08	0.22
27	NT	NT	NT		
28	13.9	4.17	68	0.60	0.35
29	< 5	NR	NR		
30	NT	NT	NT		
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	NT	NT	NT		
36	NR	NR	NR		
37	NT	NT	NT		
38	< 0.1	0.025	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	12.4	0.9
Spike Value	16.1	0.8
Robust Average	12.4	0.9
Median	12.4	0.5
Mean	12.5	
N	6	
Max	13.9	
Min	11.5	
Robust SD	0.84	
Robust CV	6.8%	


Results: S2 - PFODA
Assigned Value = 12.4 ± 0.9 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
9 24 2 6 26 22 28 1 3 4 7 8 10 11 12 13 14 15 16 17 18 19 20 23 25 27 29 30 31 32 34 35 36 37 38 Md RA SV


z-Scores: S2 - PFODA
Target Standard Deviation for Proficiency Assessment 2.5 µg/kg (Equivalent to 20% CV)
z-Score
-0.4
-0.2
-0.1
0.1
0.1
0.6
Laboratory
9 24 2 6 26 22 28

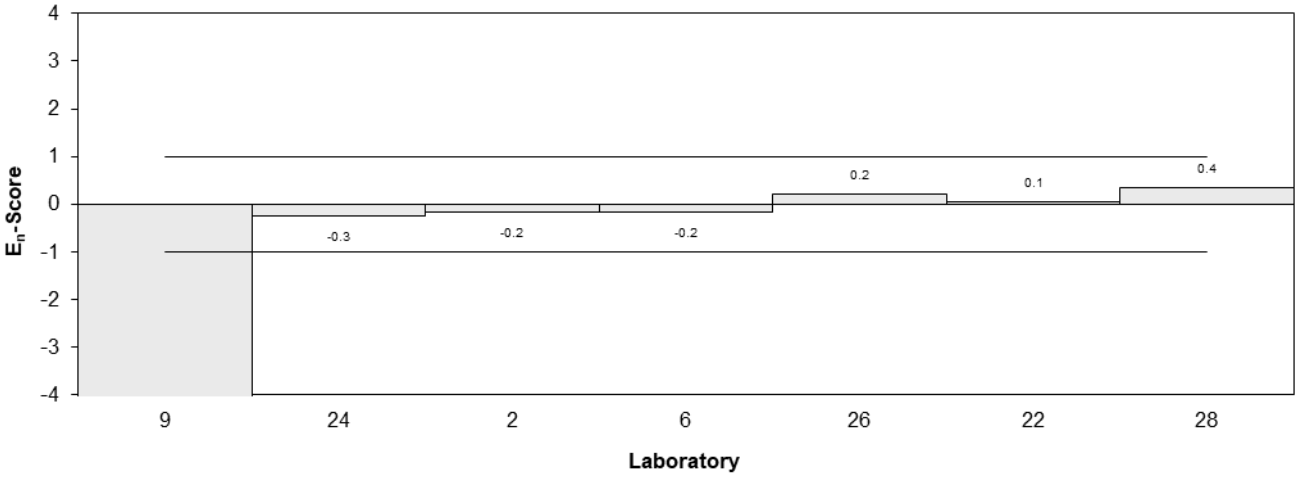

En-Scores: S2 - PFODA
En-Score
-0.3
-0.2
-0.2
0.2
0.1
0.4
Laboratory
9 24 2 6 26 22 28

Figure 52

Table 57

Sample Details

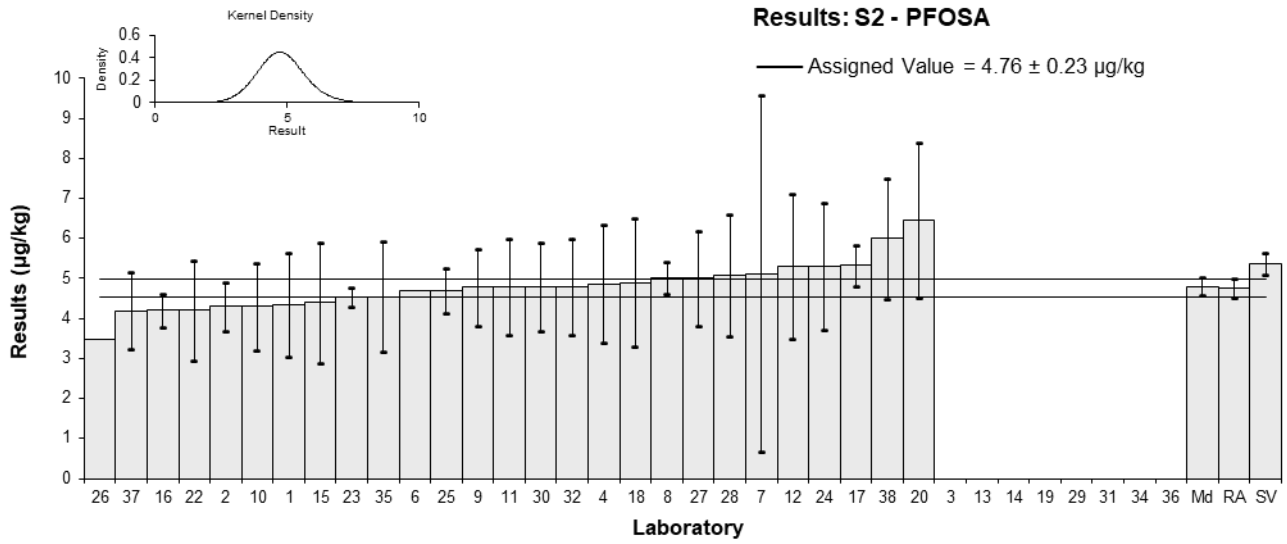
Sample No.	S2
Matrix	Soil
Analyte	PFOSA
Unit	µg/kg

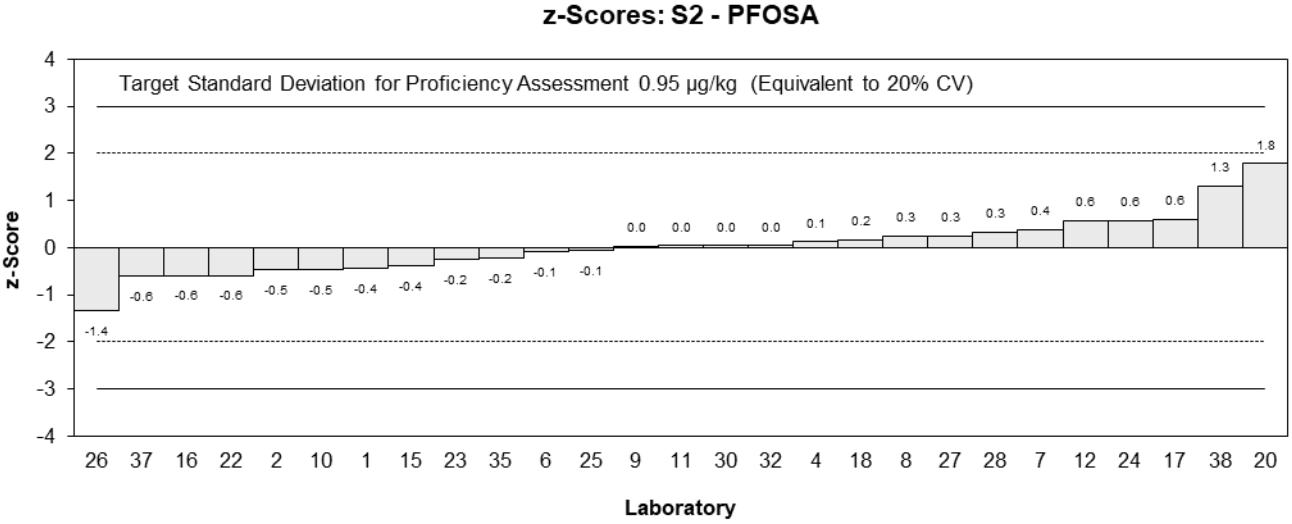
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	4.34	1.30	84	-0.44	-0.32
2	4.3	0.6	114	-0.48	-0.72
3	NR	NR	NR		
4	4.87	1.46	101	0.12	0.07
6	4.687	NR	89	-0.08	-0.32
7	5.12	4.45	89	0.38	0.08
8	5	0.4	82	0.25	0.52
9	4.7860990019	0.9572198003	73.616983812	0.03	0.03
10	4.3	1.08	66	-0.48	-0.42
11	4.8	1.2	71	0.04	0.03
12	5.3	1.8	NR	0.57	0.30
13	NS	NS	NS		
14	NT	NT	NT		
15	4.4	1.5	101	-0.38	-0.24
16	4.2	0.41	83.17	-0.59	-1.19
17	5.32	0.509	71	0.59	1.00
18	4.9	1.6	106	0.15	0.09
19	NT	NT	NT		
20	6.45	1.935	NR	1.78	0.87
22	4.2	1.26	101	-0.59	-0.44
23	4.53	0.23	NR	-0.24	-0.71
24	5.3	1.59	84	0.57	0.34
25	4.7	0.56	100	-0.06	-0.10
26	3.4772358524	NR	NR	-1.35	-5.58
27	5	1.2	91	0.25	0.20
28	5.07	1.521	70	0.33	0.20
29	< 5	NR	94		
30	4.8	1.1	102.77	0.04	0.04
31	<5	NR	NR		
32	4.8	1.2	97	0.04	0.03
34	NT	NT	NT		
35	4.55	1.365	125	-0.22	-0.15
36	NR	NR	NR		
37	4.19	0.96	123	-0.60	-0.58
38	6	1.5	NR	1.30	0.82

Statistics

Assigned Value	4.76	0.23
Spike Value	5.37	0.27
Robust Average	4.76	0.23
Median	4.80	0.23
Mean	4.79	
N	27	
Max	6.45	
Min	3.4772358524	
Robust SD	0.48	
Robust CV	10%	


Kernel Density
Density
Result
Results: S2 - PFOSA
Assigned Value = 4.76 ± 0.23 µg/kg
Results (µg/kg)
26 37 16 22 2 10 1 15 23 35 6 25 9 11 30 32 4 18 8 27 28 7 12 24 17 38 20 3 13 14 19 29 31 34 36 Md RA SV
Laboratory


z-Scores: S2 - PFOSA
Target Standard Deviation for Proficiency Assessment 0.95 µg/kg (Equivalent to 20% CV)
z-Score
-1.4 -0.6 -0.6 -0.6 -0.5 -0.5 -0.4 -0.4 -0.2 -0.2 -0.1 -0.1 0.0 0.0 0.0 0.0 0.1 0.2 0.3 0.3 0.3 0.4 0.6 0.6 0.6 1.3 1.8
26 37 16 22 2 10 1 15 23 35 6 25 9 11 30 32 4 18 8 27 28 7 12 24 17 38 20
Laboratory

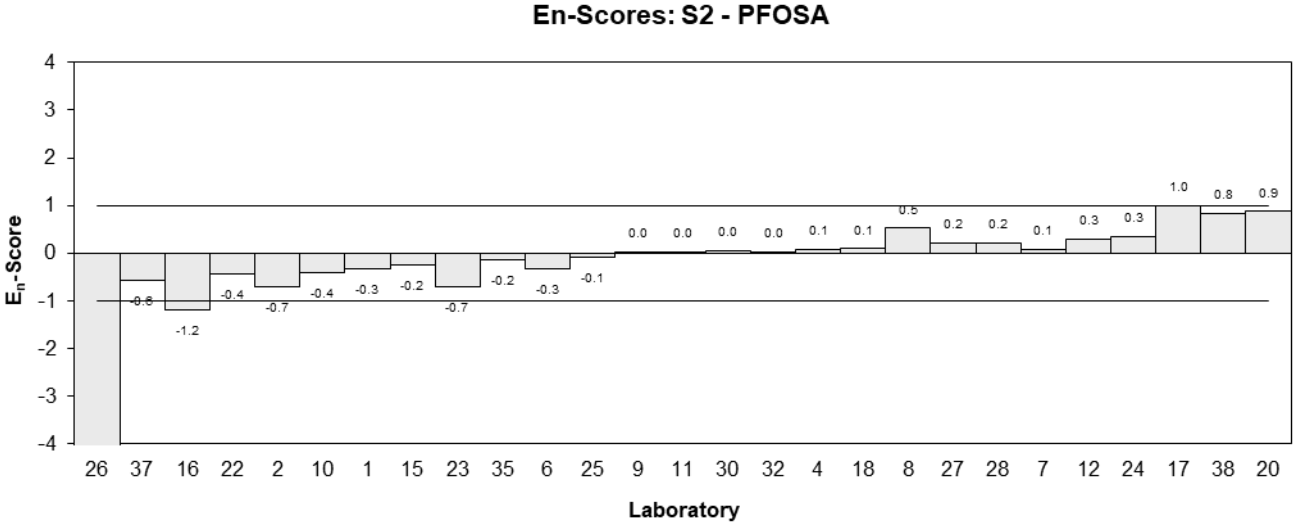

En-Scores: S2 - PFOSA
En-Score
-0.6 -1.2 -0.4 -0.7 -0.4 -0.3 -0.2 -0.7 -0.2 -0.3 -0.1 0.0 0.0 0.0 0.0 0.1 0.1 0.5 0.2 0.2 0.1 0.3 0.3 1.0 0.8 0.9
26 37 16 22 2 10 1 15 23 35 6 25 9 11 30 32 4 18 8 27 28 7 12 24 17 38 20
Laboratory

Figure 53

Table 58

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	MeFOSA
Unit	µg/kg

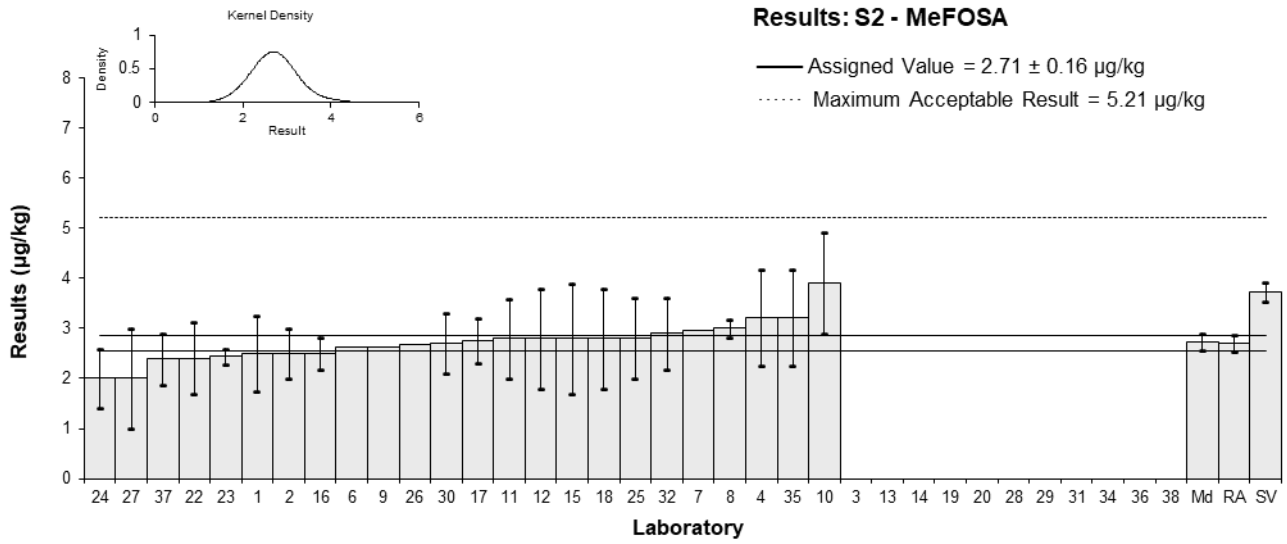
Participant Results

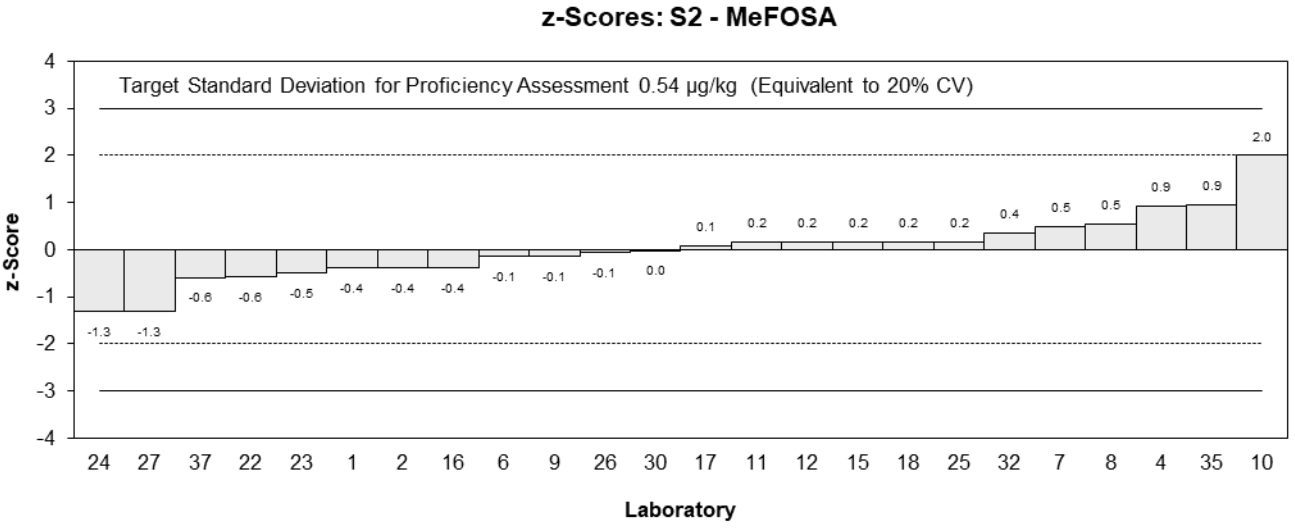
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	2.50	0.75	93	-0.39	-0.27
2	2.5	0.5	98	-0.39	-0.40
3	NR	NR	NR		
4	3.21	0.96	106	0.92	0.51
6	2.632	NR	84	-0.14	-0.49
7	2.97	NR	87	0.48	1.63
8	3	0.18	77	0.54	1.20
9	2.6377589501	NR	14.502689589	-0.13	-0.45
10	3.9	1.01	86	2.00▼	
11	2.8	0.8	80	0.17	0.11
12	2.8	1	94	0.17	0.09
13	NS	NS	NS		
14	NT	NT	NT		
15	2.8	1.1	82	0.17	0.08
16	2.5	0.32	84.13	-0.39	-0.59
17	2.753	0.456	44	0.08	0.09
18	2.8	1	114	0.17	0.09
19	NT	NT	NT		
20	<1	NR	NR		
22	2.4	0.72	79	-0.57	-0.42
23	2.44	0.15	NR	-0.50	-1.23
24	2	0.6	99	-1.31	-1.14
25	2.8	0.81	97	0.17	0.11
26	2.6760883545	NR	NR	-0.06	-0.21
27	2	1	96	-1.31	-0.70
28	NT	NT	NT		
29	< 10	NR	93		
30	2.7	0.6	104.66	-0.02	-0.02
31	<5	NR	NR		
32	2.9	0.725	86	0.35	0.26
34	NT	NT	NT		
35	3.22	0.966	229	0.94	0.52
36	NR	NR	NR		
37	2.39	0.51	94	-0.59	-0.60
38	NT	NT	NT		

▼ Adjusted Score, see Section 6.3

Statistics

Assigned Value	2.71	0.16
Spike Value	3.72	0.19
Robust Average	2.71	0.16
Max Acceptable	5.21	
Median	2.73	0.17
Mean	2.72	
N	24	
Max	3.9	
Min	2	
Robust SD	0.31	
Robust CV	12%	


Kernel Density
Density
Result
Results: S2 - MeFOSA
Assigned Value = 2.71 ± 0.16 µg/kg
Maximum Acceptable Result = 5.21 µg/kg
Results (µg/kg)
24 27 37 22 23 1 2 16 6 9 26 30 17 11 12 15 18 25 32 7 8 4 35 10 3 13 14 19 20 28 29 31 34 36 38 Md RA SV
Laboratory


z-Scores: S2 - MeFOSA
Target Standard Deviation for Proficiency Assessment 0.54 µg/kg (Equivalent to 20% CV)
z-Score
-1.3 -1.3 -0.6 -0.6 -0.5 -0.4 -0.4 -0.4 -0.1 -0.1 -0.1 0.0 0.1 0.2 0.2 0.2 0.2 0.2 0.4 0.5 0.5 0.9 0.9 2.0
24 27 37 22 23 1 2 16 6 9 26 30 17 11 12 15 18 25 32 7 8 4 35 10
Laboratory

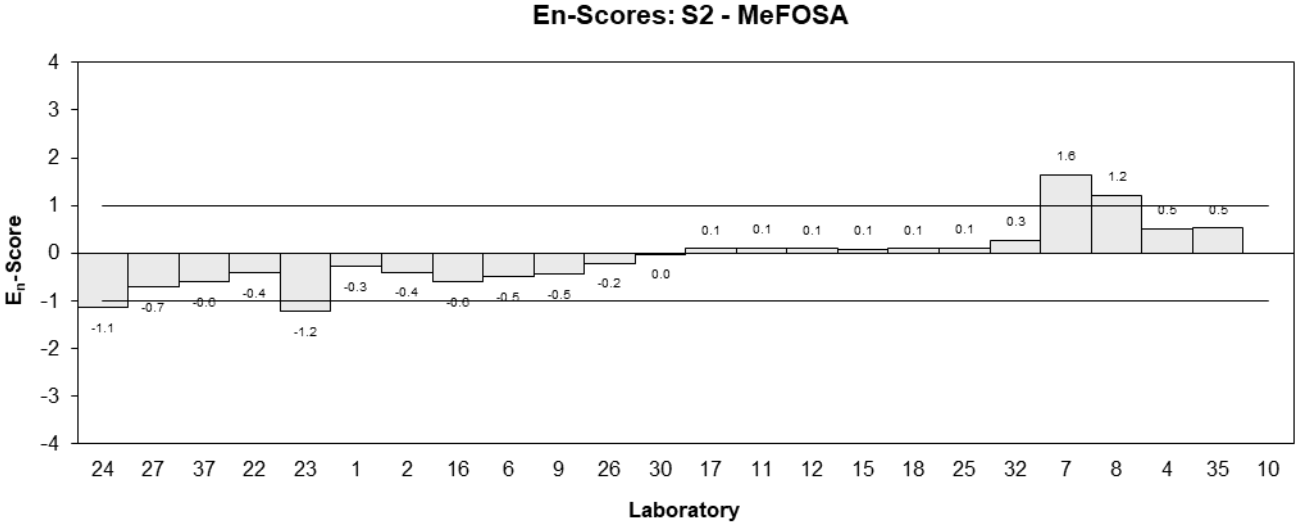

En-Scores: S2 - MeFOSA
En-Score
-1.1 -0.7 -0.6 -0.4 -1.2 -0.3 -0.4 -0.6 -0.5 -0.5 -0.2 0.0 0.1 0.1 0.1 0.1 0.1 0.1 0.3 1.6 1.2 0.5 0.5
24 27 37 22 23 1 2 16 6 9 26 30 17 11 12 15 18 25 32 7 8 4 35 10
Laboratory

Figure 54

Table 59

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	EtFOSAA
Unit	µg/kg

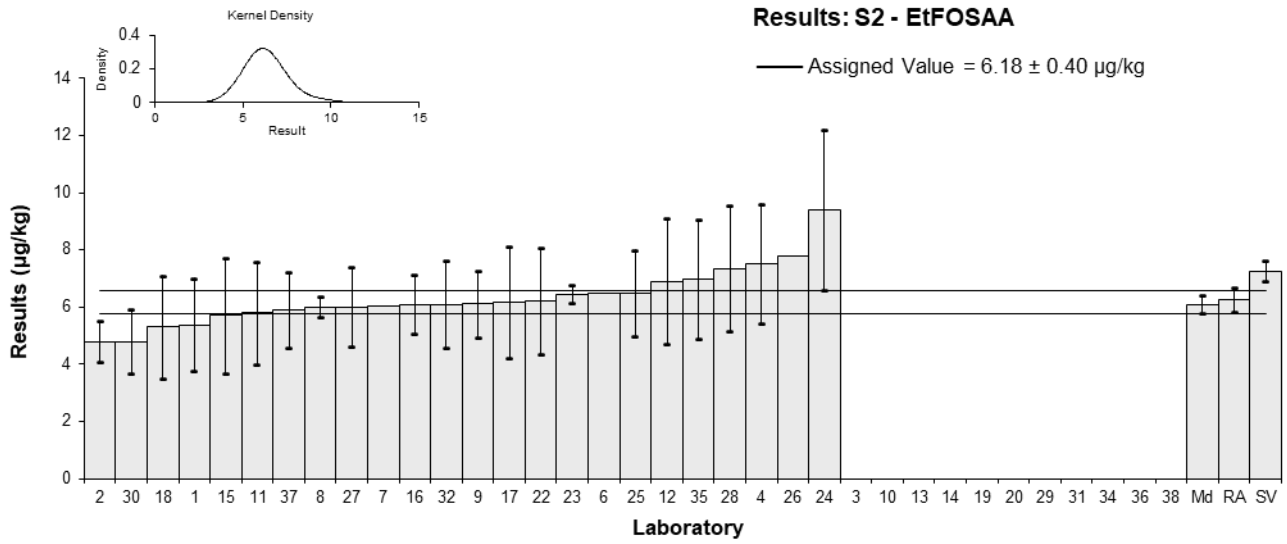
Participant Results

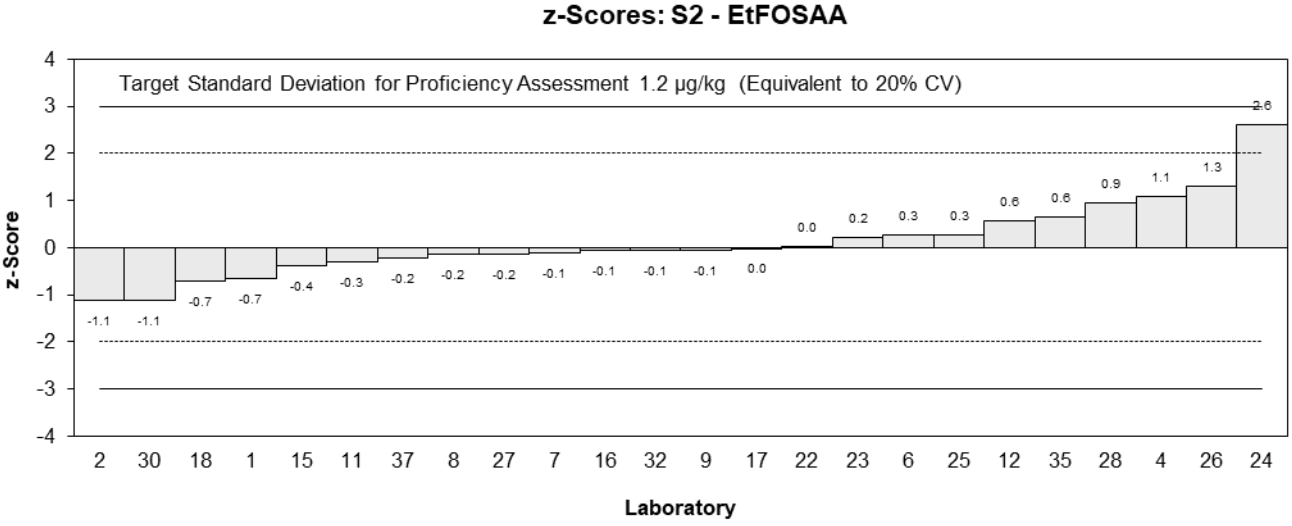
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	5.38	1.62	77	-0.65	-0.48
2	4.8	0.7	129	-1.12	-1.71
3	NR	NR	NR		
4	7.51	2.09	101	1.08	0.63
6	6.4972	NR	94	0.26	0.79
7	6.05	NR	83	-0.11	-0.32
8	6	0.35	96	-0.15	-0.34
9	6.1025823999	1.1594906559	80.924743598	-0.06	-0.06
10	<0.0005	NR	64		
11	5.8	1.8	82	-0.31	-0.21
12	6.9	2.2	91	0.58	0.32
13	NS	NS	NS		
14	NT	NT	NT		
15	5.7	2	89	-0.39	-0.24
16	6.1	1.03	81.33	-0.06	-0.07
17	6.163	1.95	53	-0.01	-0.01
18	5.3	1.8	97	-0.71	-0.48
19	NT	NT	NT		
20	<1	NR	NR		
22	6.2	1.86	NR	0.02	0.01
23	6.45	0.32	NR	0.22	0.53
24*	9.4	2.82	49	2.61	1.13
25	6.5	1.5	107	0.26	0.21
26	7.7818436279	NR	NR	1.30	4.00
27	6	1.4	73	-0.15	-0.12
28	7.34	2.202	85	0.94	0.52
29	< 10	NR	73		
30	4.8	1.1	149.08	-1.12	-1.18
31	<5	NR	NR		
32	6.1	1.525	108	-0.06	-0.05
34	NT	NT	NT		
35	6.97	2.091	91	0.64	0.37
36	NR	NR	NR		
37	5.9	1.31	128	-0.23	-0.20
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	6.18	0.40
Spike Value	7.25	0.36
Robust Average	6.25	0.43
Median	6.10	0.30
Mean	6.32	
N	24	
Max	9.4	
Min	4.8	
Robust SD	0.85	
Robust CV	14%	


Kernel Density
Density
Result
Results: S2 - EtFOSAA
Assigned Value = 6.18 ± 0.40 µg/kg
Results (µg/kg)
Laboratory
2 30 18 1 15 11 37 8 27 7 16 32 9 17 22 23 6 25 12 35 28 4 26 24 3 10 13 14 19 20 29 31 34 36 38 Md RA SV


z-Scores: S2 - EtFOSAA
Target Standard Deviation for Proficiency Assessment 1.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
2 30 18 1 15 11 37 8 27 7 16 32 9 17 22 23 6 25 12 35 28 4 26 24
-1.1 -1.1 -0.7 -0.7 -0.4 -0.3 -0.2 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 0.0 0.0 0.2 0.3 0.3 0.6 0.6 0.9 1.1 1.3 2.6

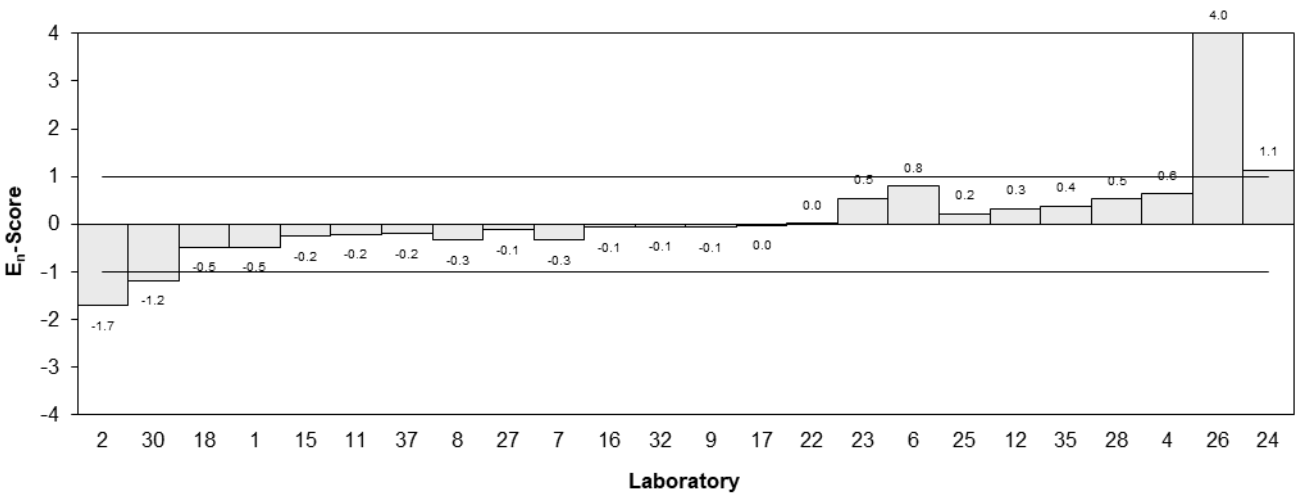

En-Scores: S2 - EtFOSAA
En-Score
Laboratory
2 30 18 1 15 11 37 8 27 7 16 32 9 17 22 23 6 25 12 35 28 4 26 24
-1.7 -1.2 -0.5 -0.5 -0.2 -0.2 -0.2 -0.3 -0.1 -0.3 -0.1 -0.1 -0.1 0.0 0.0 0.5 0.8 0.2 0.3 0.4 0.5 0.6 4.0 1.1

Figure 55

Table 60

Sample Details

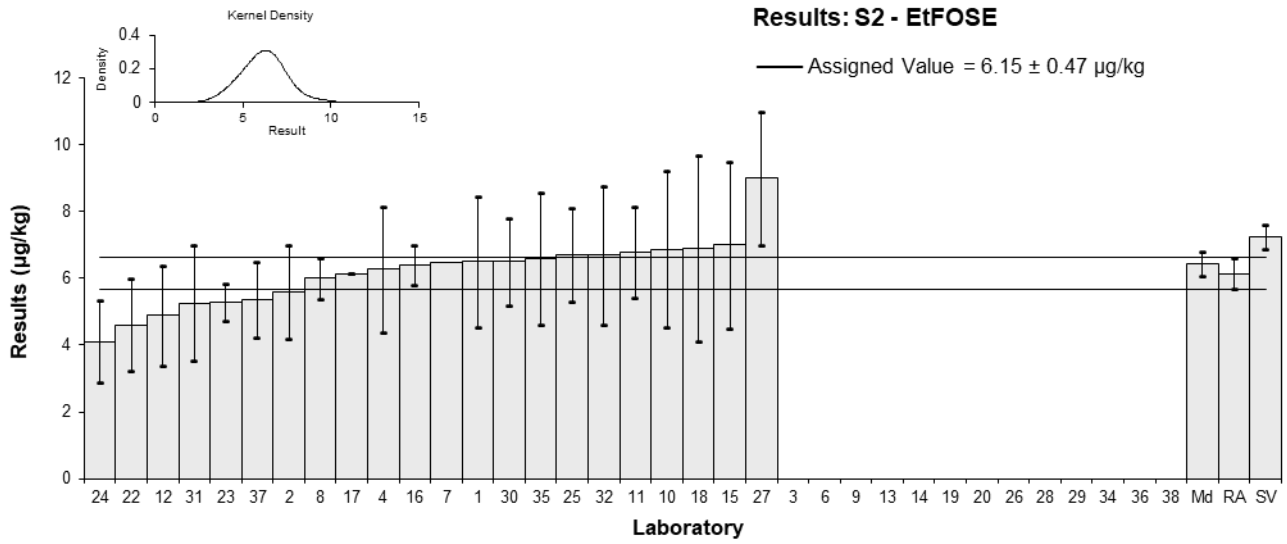
Sample No.	S2
Matrix	Soil
Analyte	EtFOSE
Unit	µg/kg

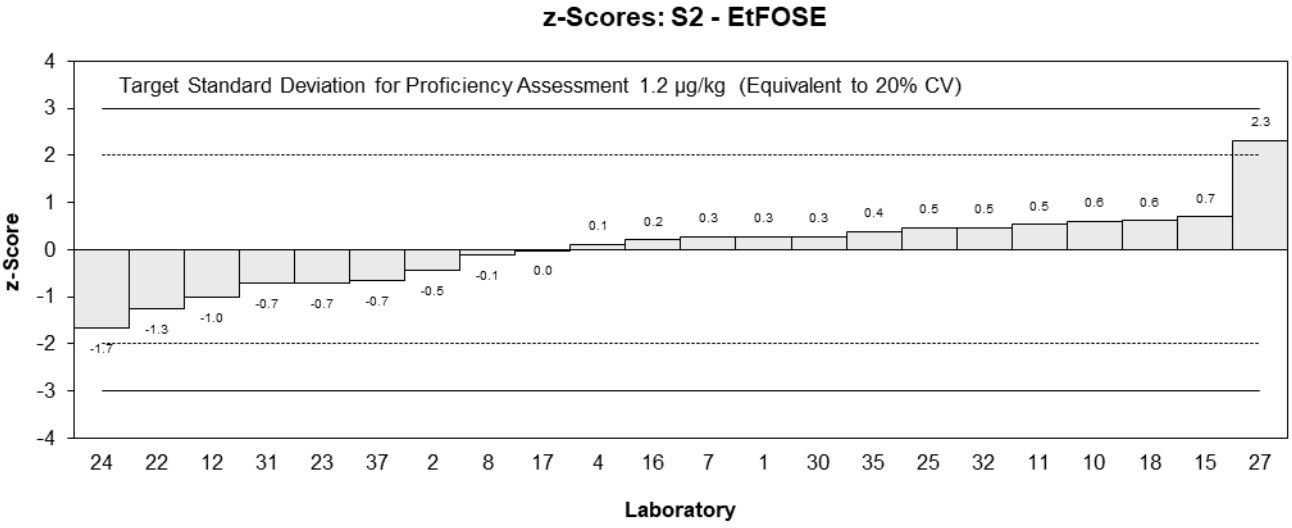
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.50	1.95	86	0.28	0.17
2	5.6	1.4	87	-0.45	-0.37
3	NR	NR	NR		
4	6.28	1.88	95	0.11	0.07
6	NR	NR	NR		
7	6.47	NR	76	0.26	0.68
8	6	0.6	74	-0.12	-0.20
9	NT	NT	NT		
10	6.88	2.35	64	0.59	0.30
11	6.8	1.36	71	0.53	0.45
12	4.9	1.5	95	-1.02	-0.80
13	NS	NS	NS		
14	NT	NT	NT		
15	7	2.5	78	0.69	0.33
16	6.4	0.58	67.25	0.20	0.33
17	6.142	0.0017	46	-0.01	-0.02
18	6.9	2.8	94	0.61	0.26
19	NT	NT	NT		
20	<1	NR	NR		
22	4.6	1.38	NR	-1.26	-1.06
23	5.28	0.55	NR	-0.71	-1.20
24	4.1	1.23	NR	-1.67	-1.56
25	6.7	1.4	99	0.45	0.37
26	NT	NT	NT		
27	9	2	88	2.32	1.39
28	NT	NT	NT		
29	< 10	NR	94		
30	6.5	1.3	103.34	0.28	0.25
31	5.26	1.74	115	-0.72	-0.49
32	6.7	2.077	90	0.45	0.26
34	NT	NT	NT		
35	6.6	1.98	135	0.37	0.22
36	NR	NR	NR		
37	5.35	1.13	94	-0.65	-0.65
38	NT	NT	NT		

Statistics

Assigned Value	6.15	0.47
Spike Value	7.25	0.36
Robust Average	6.15	0.47
Median	6.44	0.35
Mean	6.18	
N	22	
Max	9	
Min	4.1	
Robust SD	0.89	
Robust CV	14%	


Results: S2 - EtFOSE
Assigned Value = 6.15 ± 0.47 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
24 22 12 31 23 37 2 8 17 4 16 7 1 30 35 25 32 11 10 18 15 27 3 6 9 13 14 19 20 26 28 29 34 36 38 Md RA SV


z-Scores: S2 - EtFOSE
Target Standard Deviation for Proficiency Assessment 1.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
24 22 12 31 23 37 2 8 17 4 16 7 1 30 35 25 32 11 10 18 15 27
-1.7 -1.3 -1.0 -0.7 -0.7 -0.7 -0.5 -0.1 0.0 0.1 0.2 0.3 0.3 0.3 0.4 0.5 0.5 0.5 0.6 0.6 0.7 2.3

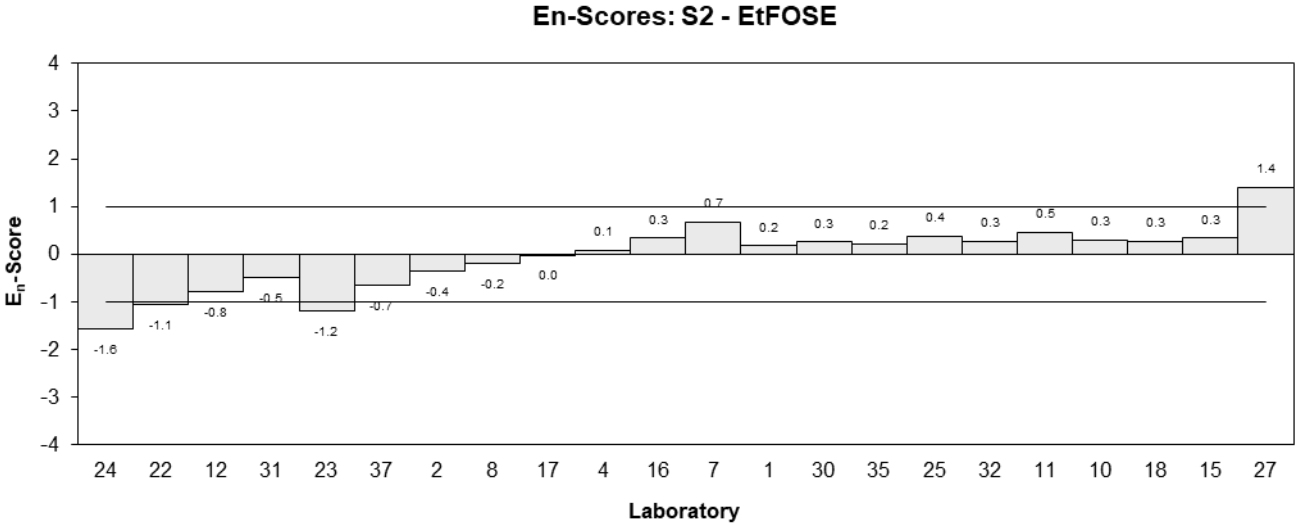

En-Scores: S2 - EtFOSE
En-Score
Laboratory
24 22 12 31 23 37 2 8 17 4 16 7 1 30 35 25 32 11 10 18 15 27
-1.6 -1.1 -0.8 -0.5 -1.2 -0.7 -0.4 -0.2 0.0 0.1 0.3 0.7 0.2 0.3 0.2 0.4 0.3 0.5 0.3 0.3 0.3 1.4

Figure 56

Table 61

Sample Details

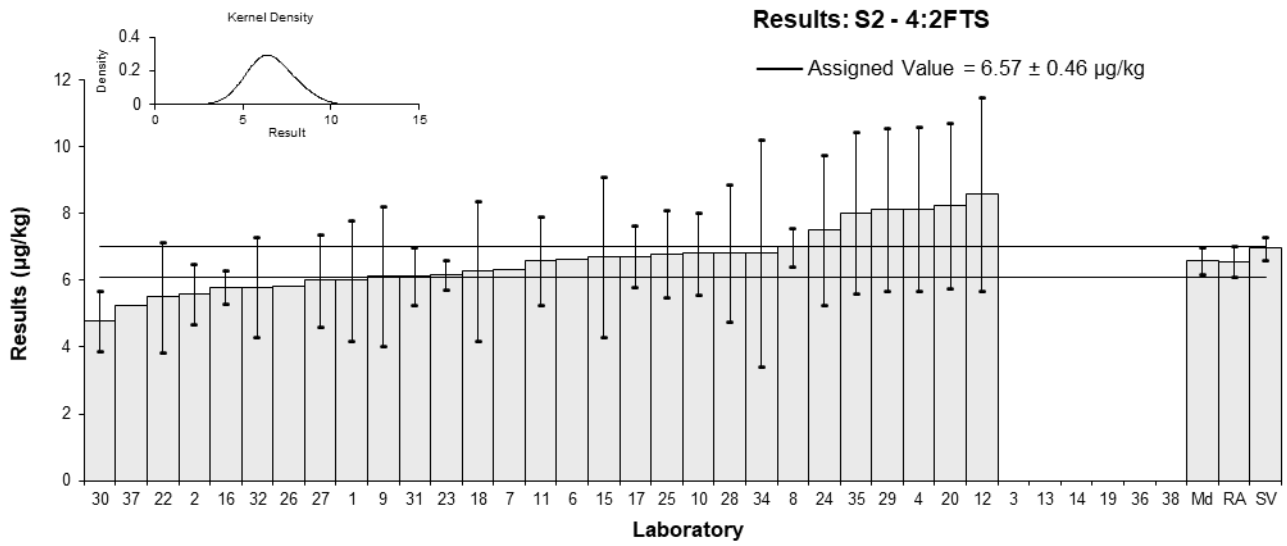
Sample No.	S2
Matrix	Soil
Analyte	4:2FTS
Unit	µg/kg

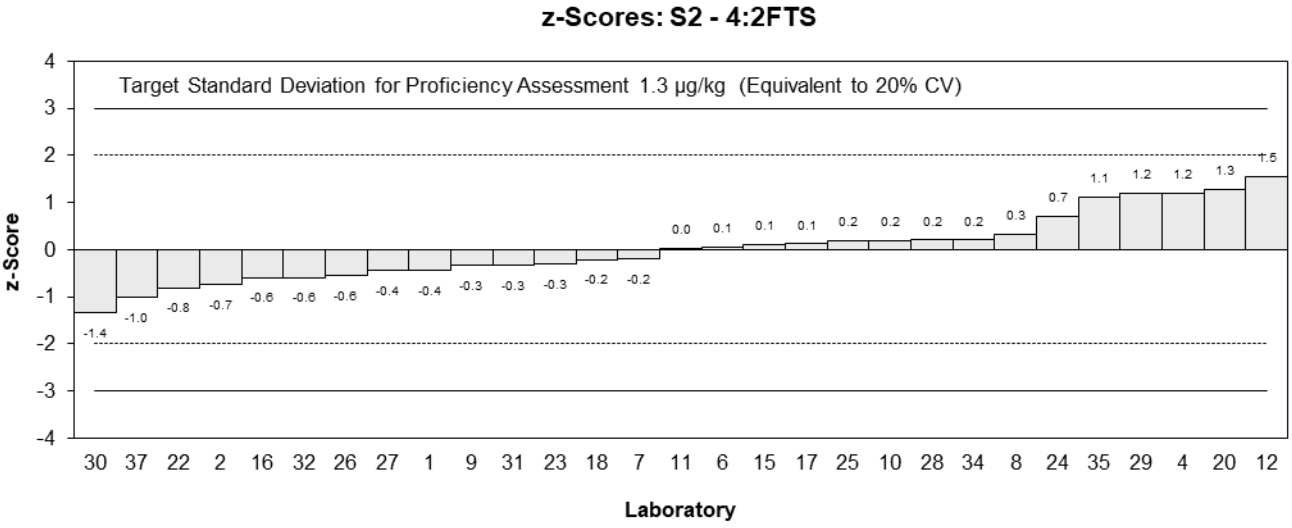
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.01	1.80	70	-0.43	-0.30
2	5.6	0.9	153	-0.74	-0.96
3	NR	NR	NR		
4	8.15	2.45	105	1.20	0.63
6	6.6328	NR	79	0.05	0.14
7	6.32	NR	93	-0.19	-0.54
8	7	0.56	207	0.33	0.59
9	6.1272940619	2.0832799810	76.667370493	-0.34	-0.21
10	6.82	1.23	58	0.19	0.19
11	6.6	1.32	75	0.02	0.02
12	8.6	2.9	NR	1.54	0.69
13	NS	NS	NS		
14	NT	NT	NT		
15	6.7	2.4	118	0.10	0.05
16	5.8	0.51	100.64	-0.59	-1.12
17	6.726	0.935	135	0.12	0.15
18	6.3	2.1	105	-0.21	-0.13
19	NT	NT	NT		
20	8.25	2.475	NR	1.28	0.67
22	5.5	1.65	69	-0.81	-0.62
23	6.18	0.45	NR	-0.30	-0.61
24	7.5	2.25	91	0.71	0.40
25	6.8	1.3	116	0.18	0.17
26	5.8368650200	NR	NR	-0.56	-1.59
27	6	1.4	85	-0.43	-0.39
28	6.83	2.049	94	0.20	0.12
29	8.14	2.44	102	1.19	0.63
30	4.8	0.9	128.26	-1.35	-1.75
31	6.13	0.86	324	-0.33	-0.45
32	5.8	1.508	127	-0.59	-0.49
34	6.83	3.415	NR	0.20	0.08
35	8.03	2.409	402	1.11	0.60
36	NR	NR	NR		
37	5.23	NR	115	-1.02	-2.91
38	NT	NT	NT		

Statistics

Assigned Value	6.57	0.46
Spike Value	6.96	0.35
Robust Average	6.57	0.46
Median	6.60	0.41
Mean	6.59	
N	29	
Max	8.6	
Min	4.8	
Robust SD	1.0	
Robust CV	15%	


Kernel Density
Density
Result
Results: S2 - 4:2FTS
Assigned Value = 6.57 ± 0.46 µg/kg
Results (µg/kg)
Laboratory
30 37 22 2 16 32 26 27 1 9 31 23 18 7 11 6 15 17 25 10 28 34 8 24 35 29 4 20 12 3 13 14 19 36 38 Md RA SV


z-Scores: S2 - 4:2FTS
Target Standard Deviation for Proficiency Assessment 1.3 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
30 37 22 2 16 32 26 27 1 9 31 23 18 7 11 6 15 17 25 10 28 34 8 24 35 29 4 20 12

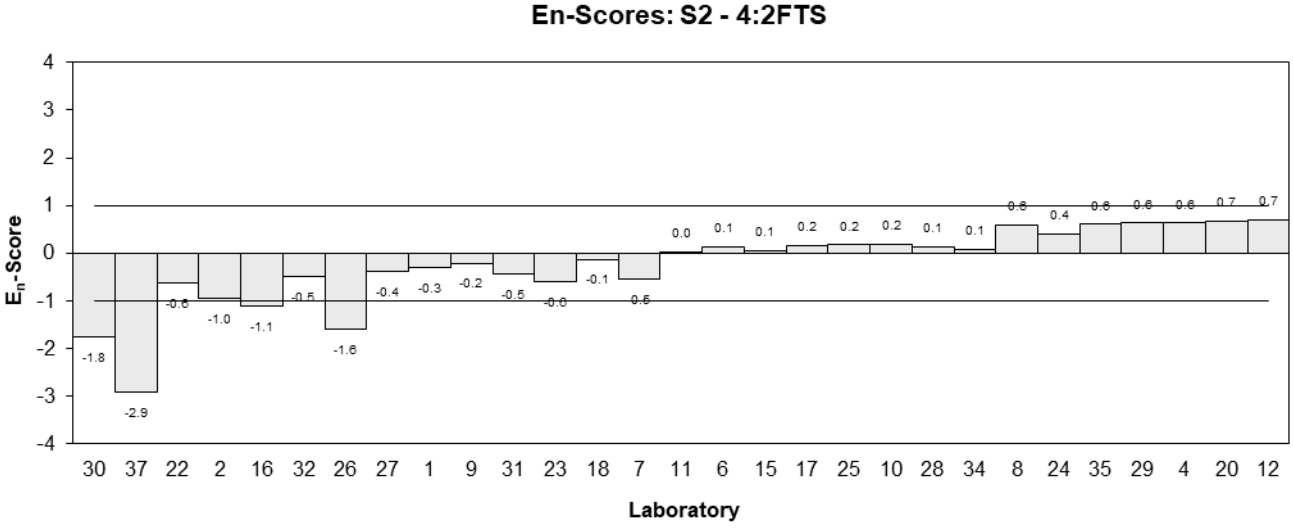

En-Scores: S2 - 4:2FTS
En-Score
Laboratory
30 37 22 2 16 32 26 27 1 9 31 23 18 7 11 6 15 17 25 10 28 34 8 24 35 29 4 20 12

Figure 57

Table 62

Sample Details

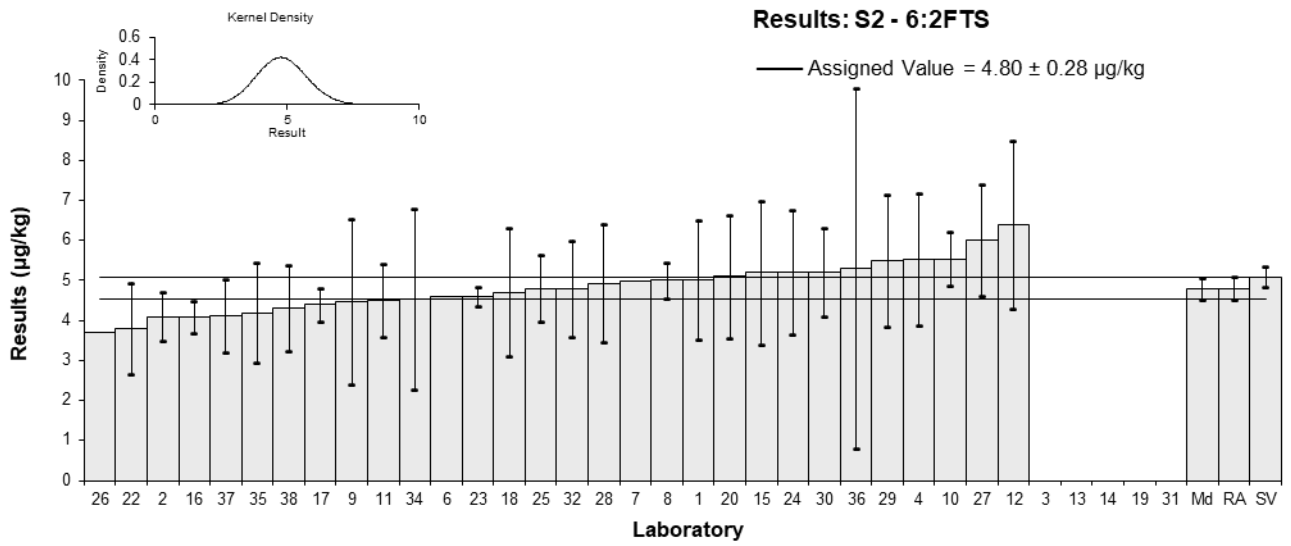
Sample No.	S2
Matrix	Soil
Analyte	6:2FTS
Unit	µg/kg

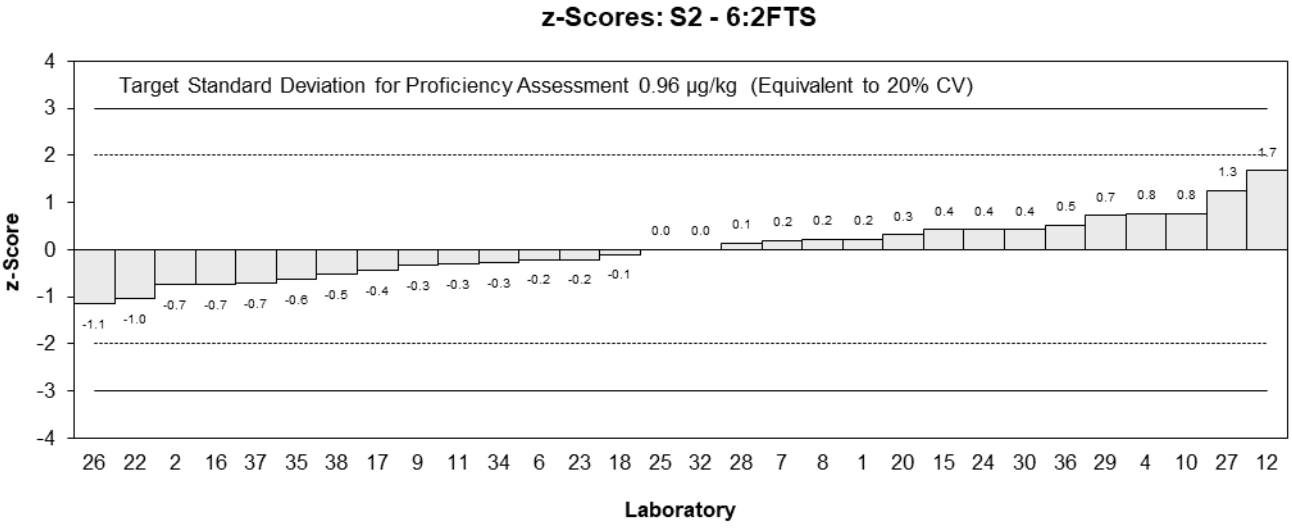
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	5.01	1.50	79	0.22	0.14
2	4.1	0.6	143	-0.73	-1.06
3	NR	NR	NR		
4	5.53	1.66	104	0.76	0.43
6	4.5952	NR	85	-0.21	-0.73
7	4.98	NR	100	0.19	0.64
8	5	0.44	169	0.21	0.38
9	4.4794771820	2.0605595037	86.462448229	-0.33	-0.15
10	5.54	0.68	72	0.77	1.01
11	4.5	0.9	87	-0.31	-0.32
12	6.4	2.1	NR	1.67	0.76
13	NS	NS	NS		
14	NT	NT	NT		
15	5.2	1.8	133	0.42	0.22
16	4.1	0.4	149.47	-0.73	-1.43
17	4.39	0.414	97	-0.43	-0.82
18	4.7	1.6	110	-0.10	-0.06
19	NT	NT	NT		
20	5.1	1.53	NR	0.31	0.19
22	3.8	1.14	84	-1.04	-0.85
23	4.6	0.23	NR	-0.21	-0.55
24	5.2	1.56	114	0.42	0.25
25	4.8	0.84	114	0.00	0.00
26	3.7018044645	NR	NR	-1.14	-3.92
27	6	1.4	91	1.25	0.84
28	4.93	1.479	94	0.14	0.09
29	5.49	1.65	108	0.72	0.41
30	5.2	1.1	138.66	0.42	0.35
31	<5	NR	NR		
32	4.8	1.2	242	0.00	0.00
34	4.52	2.26	NR	-0.29	-0.12
35	4.19	1.257	398	-0.64	-0.47
36	5.3	4.5	101	0.52	0.11
37	4.12	0.91	155	-0.71	-0.71
38	4.3	1.075	NR	-0.52	-0.45

Statistics

Assigned Value	4.80	0.28
Spike Value	5.09	0.25
Robust Average	4.80	0.28
Median	4.80	0.27
Mean	4.82	
N	30	
Max	6.4	
Min	3.7018044645	
Robust SD	0.61	
Robust CV	13%	


Kernel Density
Density
Result
Results: S2 - 6:2FTS
Assigned Value = 4.80 ± 0.28 µg/kg
Results (µg/kg)
26 22 2 16 37 35 38 17 9 11 34 6 23 18 25 32 28 7 8 1 20 15 24 30 36 29 4 10 27 12 3 13 14 19 31 Md RA SV
Laboratory


z-Scores: S2 - 6:2FTS
Target Standard Deviation for Proficiency Assessment 0.96 µg/kg (Equivalent to 20% CV)
z-Score
-1.1 -1.0 -0.7 -0.7 -0.7 -0.6 -0.5 -0.4 -0.3 -0.3 -0.3 -0.2 -0.2 -0.1 0.0 0.0 0.1 0.2 0.2 0.2 0.3 0.4 0.4 0.4 0.5 0.7 0.8 0.8 1.3 1.7
26 22 2 16 37 35 38 17 9 11 34 6 23 18 25 32 28 7 8 1 20 15 24 30 36 29 4 10 27 12
Laboratory

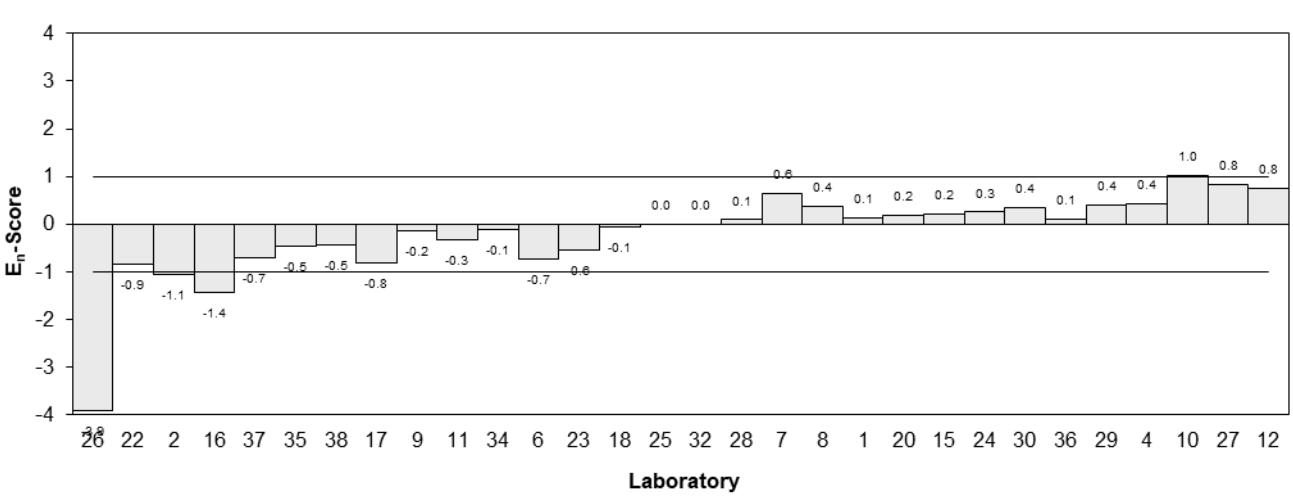

En-Scores: S2 - 6:2FTS
En-Score
-3.8 -0.9 -1.1 -1.4 -0.7 -0.5 -0.5 -0.8 -0.2 -0.3 -0.1 -0.7 -0.6 -0.1 0.0 0.0 0.1 0.6 0.4 0.1 0.2 0.2 0.3 0.4 0.1 0.4 0.4 1.0 0.8 0.8
26 22 2 16 37 35 38 17 9 11 34 6 23 18 25 32 28 7 8 1 20 15 24 30 36 29 4 10 27 12
Laboratory

Figure 58

Table 63

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	8:2diPAP
Unit	µg/kg

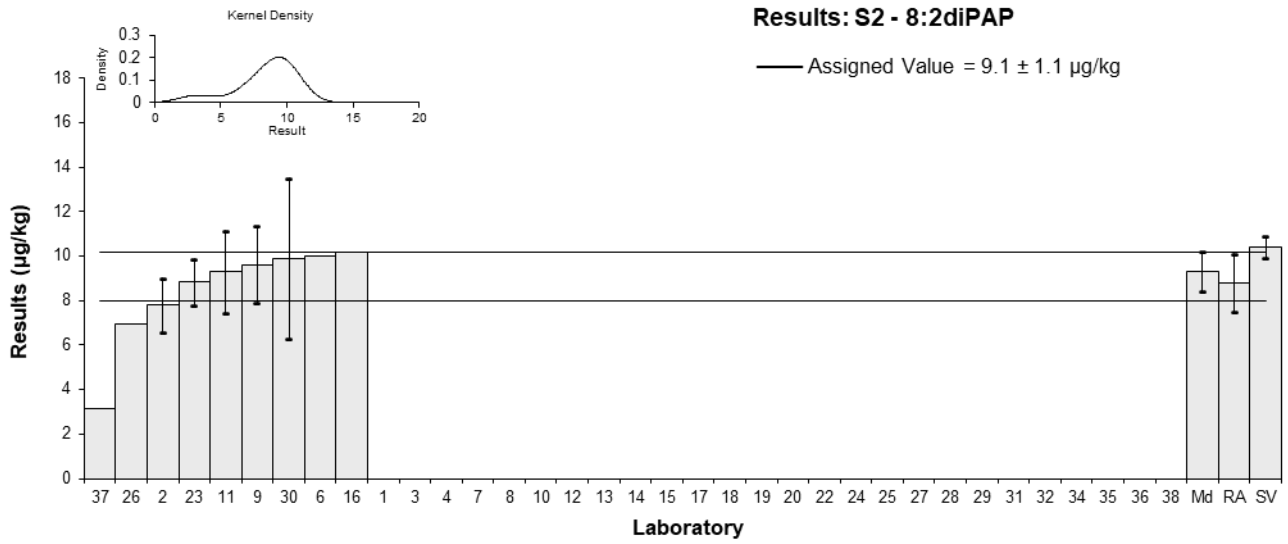
Participant Results

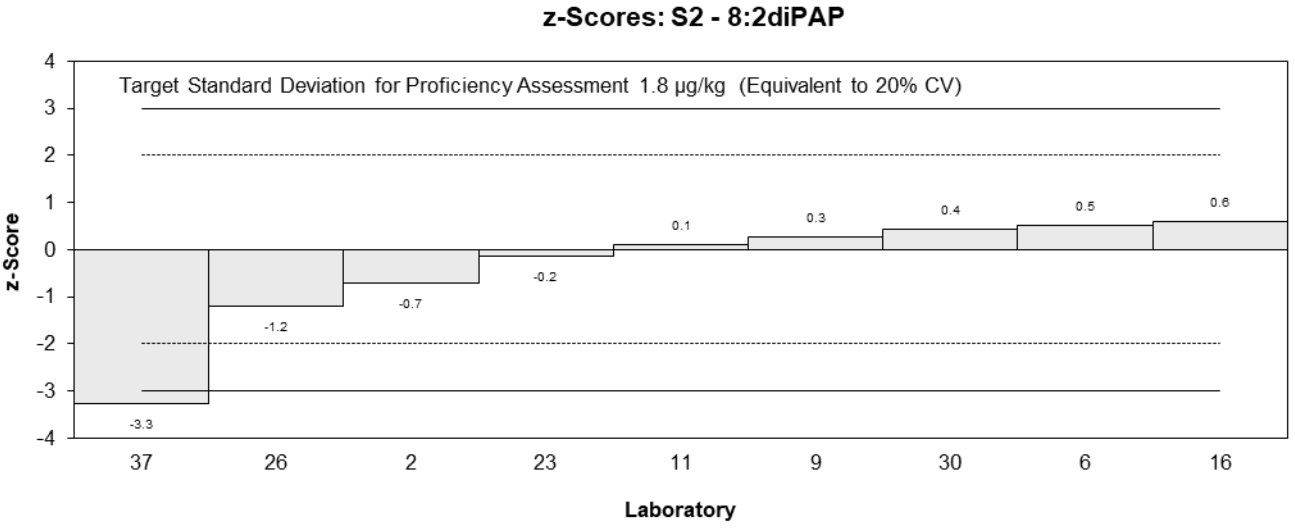
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	7.8	1.2	157	-0.71	-0.80
3	NR	NR	NR		
4	NT	NT	NT		
6	10.0229	NR	146	0.51	0.84
7	NT	NT	NT		
8	NT	NT	NT		
9	9.6117879406	1.7301218293	62.210796630	0.28	0.25
10	NT	NT	NT		
11	9.3	1.86	47	0.11	0.09
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	10.2	NR	56.35	0.60	1.00
17	NT	NT	NT		
18	NT	NT	NT		
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	8.83	1.04	NR	-0.15	-0.18
24	NT	NT	NT		
25	NT	NT	NT		
26	6.9220173163	NR	NR	-1.20	-1.98
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30	9.9	3.6	89	0.44	0.21
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	NT	NT	NT		
36	NR	NR	NR		
37*	3.16	NR	14	-3.26	-5.40
38	NT	NT	NT		

* Outlier, see Section 4.2

Statistics

Assigned Value	9.1	1.1
Spike Value	10.4	0.5
Robust Average	8.8	1.3
Median	9.30	0.89
Mean	8.42	
N	9	
Max	10.2	
Min	3.16	
Robust SD	1.6	
Robust CV	18%	


Kernel Density
Density
Result
Results: S2 - 8:2diPAP
Assigned Value = 9.1 ± 1.1 µg/kg
Results (µg/kg)
Laboratory
37 26 2 23 11 9 30 6 16 1 3 4 7 8 10 12 13 14 15 17 18 19 20 22 24 25 27 28 29 31 32 34 35 36 38 Md RA SV


z-Scores: S2 - 8:2diPAP
Target Standard Deviation for Proficiency Assessment 1.8 µg/kg (Equivalent to 20% CV)
z-Score
-3.3
-1.2
-0.7
-0.2
0.1
0.3
0.4
0.5
0.6
Laboratory
37 26 2 23 11 9 30 6 16

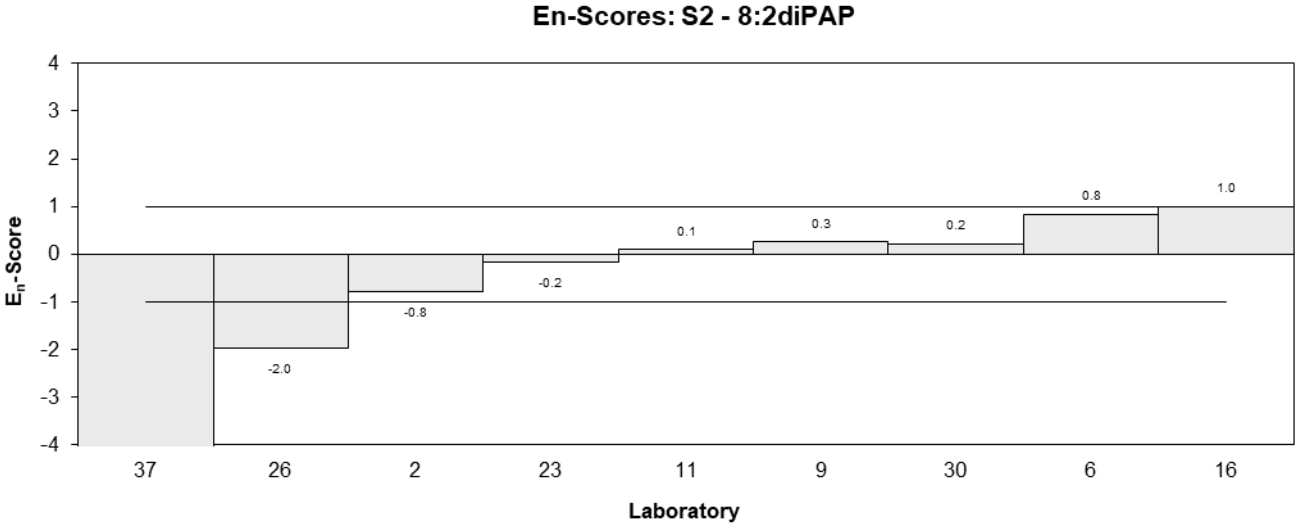

En-Scores: S2 - 8:2diPAP
En-Score
-2.0
-0.8
-0.2
0.1
0.3
0.2
0.8
1.0
Laboratory
37 26 2 23 11 9 30 6 16

Figure 59

Table 64

Sample Details

Sample No.	S2
Matrix	Soil
Analyte	5:3FTCA
Unit	µg/kg

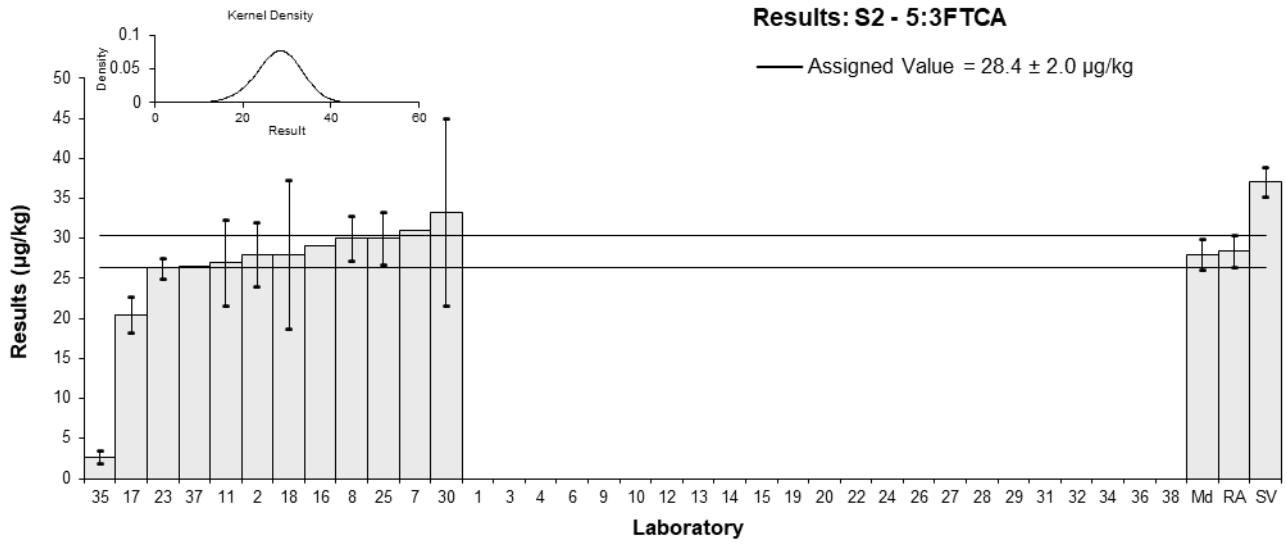
Participant Results

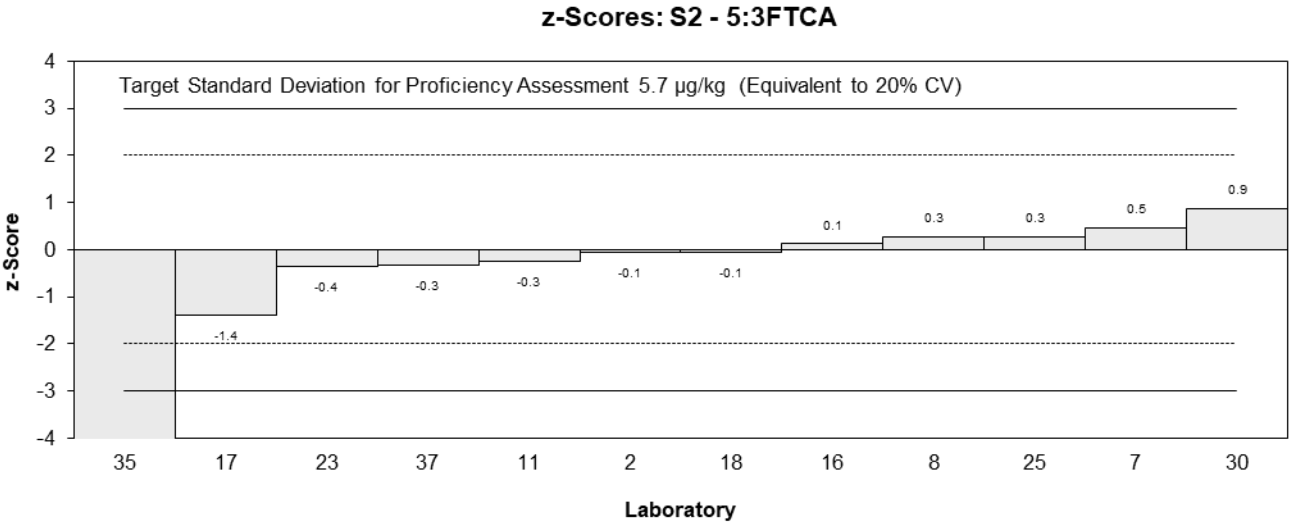
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	< 5	NR	NR		
2	28	4	NR	-0.07	-0.09
3	NR	NR	NR		
4	NT	NT	NT		
6	NR	NR	NR		
7	31.03	NR	NR	0.46	1.32
8	30	2.8	82	0.28	0.46
9	NT	NT	NT		
10	NT	NT	NT		
11	27	5.4	86	-0.25	-0.24
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	29.1	NR	107.34	0.12	0.35
17	20.503	2.192	86	-1.39	-2.66
18	28	9.3	96	-0.07	-0.04
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	26.31	1.32	NR	-0.37	-0.87
24	NT	NT	NT		
25	30	3.3	105	0.28	0.41
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30	33.3	11.7	112.56	0.86	0.41
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35**	2.7	0.81	126	-4.52	-11.91
36	NR	NR	NR		
37	26.46	NR	101	-0.34	-0.97
38	NT	NT	NT		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	28.4	2.0
Spike Value	37.1	1.9
Robust Average	28.4	2.0
Median	28.0	1.9
Mean	28.2	
N	11	
Max	33.3	
Min	20.503	
Robust SD	2.6	
Robust CV	9.3%	


Kernel Density
Density
Result
Results: S2 - 5:3FTCA
Assigned Value = 28.4 ± 2.0 µg/kg
Results (µg/kg)
Laboratory
35 17 23 37 11 2 18 16 8 25 7 30 1 3 4 6 9 10 12 13 14 15 19 20 22 24 26 27 28 29 31 32 34 36 38 Md RA SV


z-Scores: S2 - 5:3FTCA
Target Standard Deviation for Proficiency Assessment 5.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
35 17 23 37 11 2 18 16 8 25 7 30
-1.4
-0.4
-0.3
-0.3
-0.1
-0.1
0.1
0.3
0.3
0.5
0.9

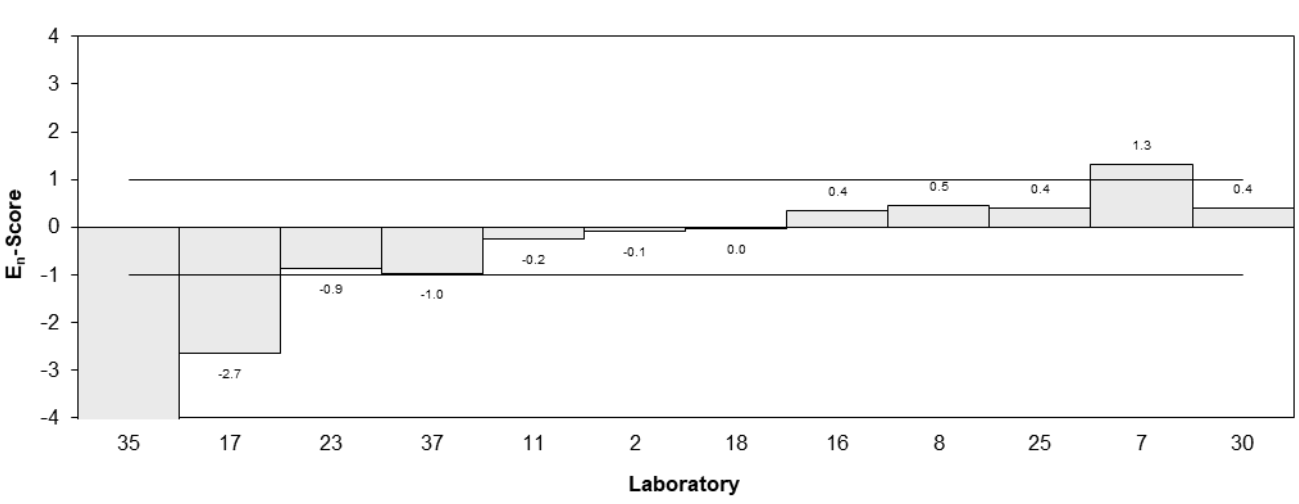

En-Scores: S2 - 5:3FTCA
En-Score
Laboratory
35 17 23 37 11 2 18 16 8 25 7 30
-2.7
-0.9
-1.0
-0.2
-0.1
0.0
0.4
0.5
0.4
1.3
0.4

Figure 60

Table 65

Sample Details

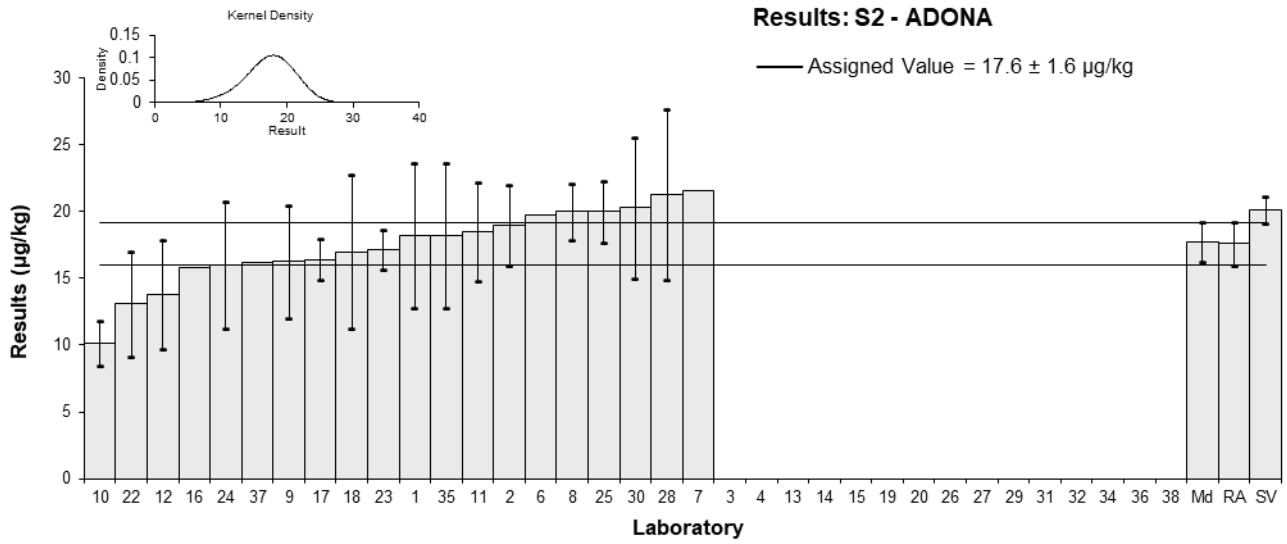
Sample No.	S2
Matrix	Soil
Analyte	ADONA
Unit	µg/kg

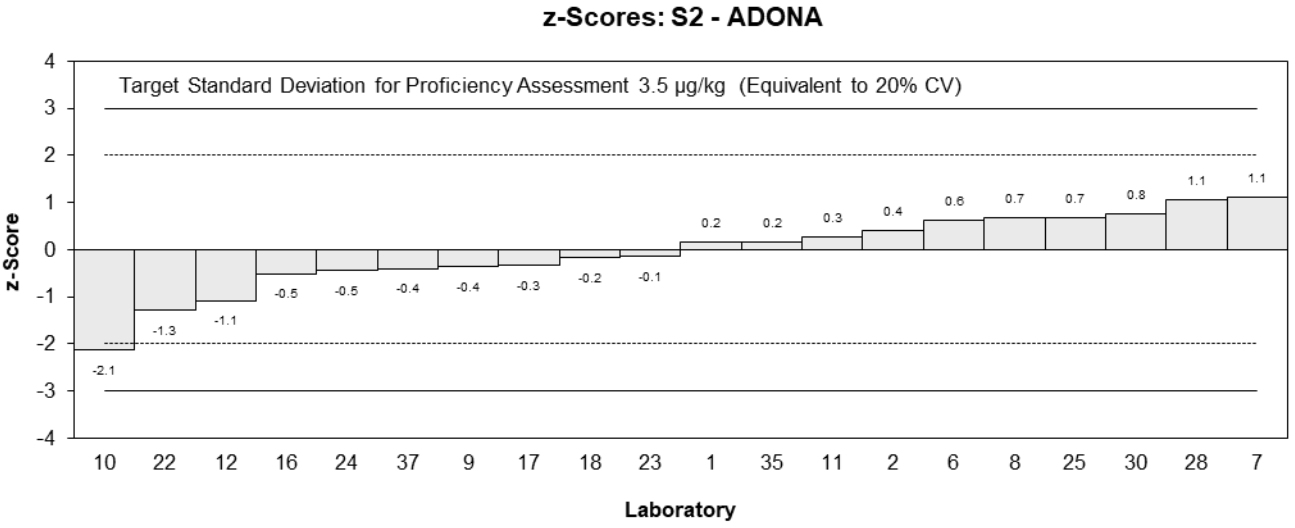
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	18.20	5.46	86	0.17	0.11
2	19	3	98	0.40	0.41
3	NR	NR	NR		
4	NT	NT	NT		
6	19.7656	NR	91	0.62	1.35
7	21.54	NR	NR	1.12	2.46
8	20	2.1	76	0.68	0.91
9	16.283629093	4.2337435644	88.970974450	-0.37	-0.29
10	10.13	1.69	NR	-2.12	-3.21
11	18.5	3.7	82	0.26	0.22
12	13.8	4.1	NR	-1.08	-0.86
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	15.8	NR	103.86	-0.51	-1.13
17	16.41	1.54	124	-0.34	-0.54
18	17	5.8	94	-0.17	-0.10
19	NT	NT	NT		
20	NT	NT	NT		
22	13.1	3.93	91	-1.28	-1.06
23	17.14	1.51	NR	-0.13	-0.21
24	16	4.8	89	-0.45	-0.32
25	20	2.3	105	0.68	0.86
26	NT	NT	NT		
27	NT	NT	NT		
28	21.3	6.39	80	1.05	0.56
29	NR	NR	NR		
30	20.3	5.3	93.04	0.77	0.49
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	18.2	5.46	126	0.17	0.11
36	NR	NR	NR		
37	16.19	NR	92	-0.40	-0.88
38	NT	NT	NT		

Statistics

Assigned Value	17.6	1.6
Spike Value	20.1	1.0
Robust Average	17.6	1.6
Median	17.7	1.5
Mean	17.4	
N	20	
Max	21.54	
Min	10.13	
Robust SD	2.8	
Robust CV	16%	


Results: S2 - ADONA
Assigned Value = 17.6 ± 1.6 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
10 22 12 16 24 37 9 17 18 23 1 35 11 2 6 8 25 30 28 7 3 4 13 14 15 19 20 26 27 29 31 32 34 36 38 Md RA SV


z-Scores: S2 - ADONA
Target Standard Deviation for Proficiency Assessment 3.5 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
10 22 12 16 24 37 9 17 18 23 1 35 11 2 6 8 25 30 28 7
-2.1 -1.3 -1.1 -0.5 -0.5 -0.4 -0.4 -0.3 -0.2 -0.1 0.2 0.2 0.3 0.4 0.6 0.7 0.7 0.8 1.1 1.1

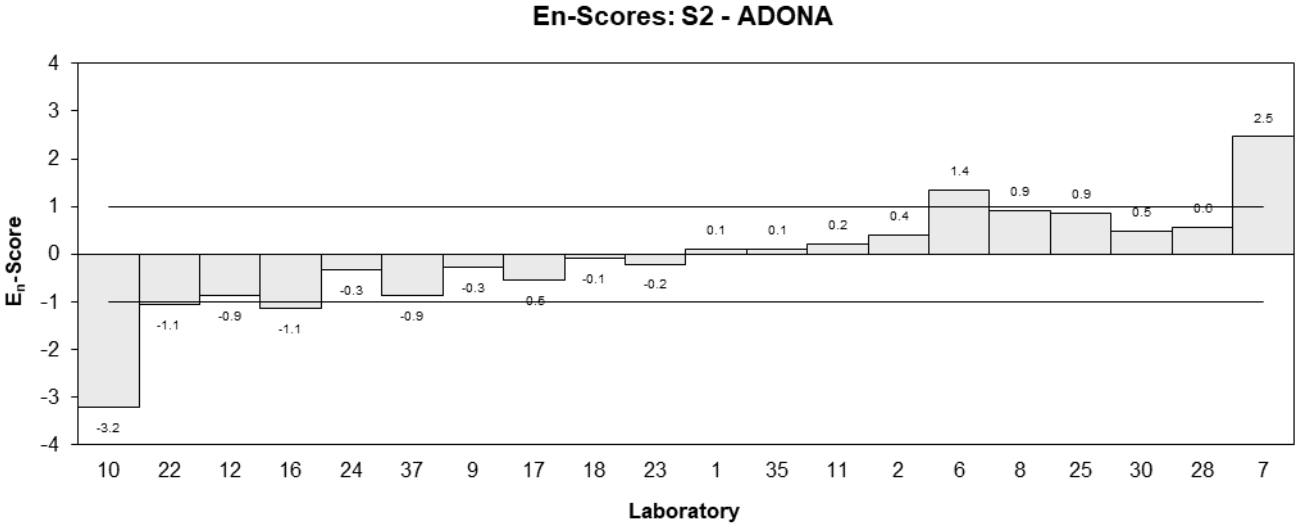

En-Scores: S2 - ADONA
En-Score
Laboratory
10 22 12 16 24 37 9 17 18 23 1 35 11 2 6 8 25 30 28 7
-3.2 -1.1 -0.9 -1.1 -0.3 -0.9 -0.3 -0.5 -0.1 -0.2 0.1 0.1 0.2 0.4 1.4 0.9 0.9 0.5 0.6 2.5

Figure 61

Table 66

Sample Details

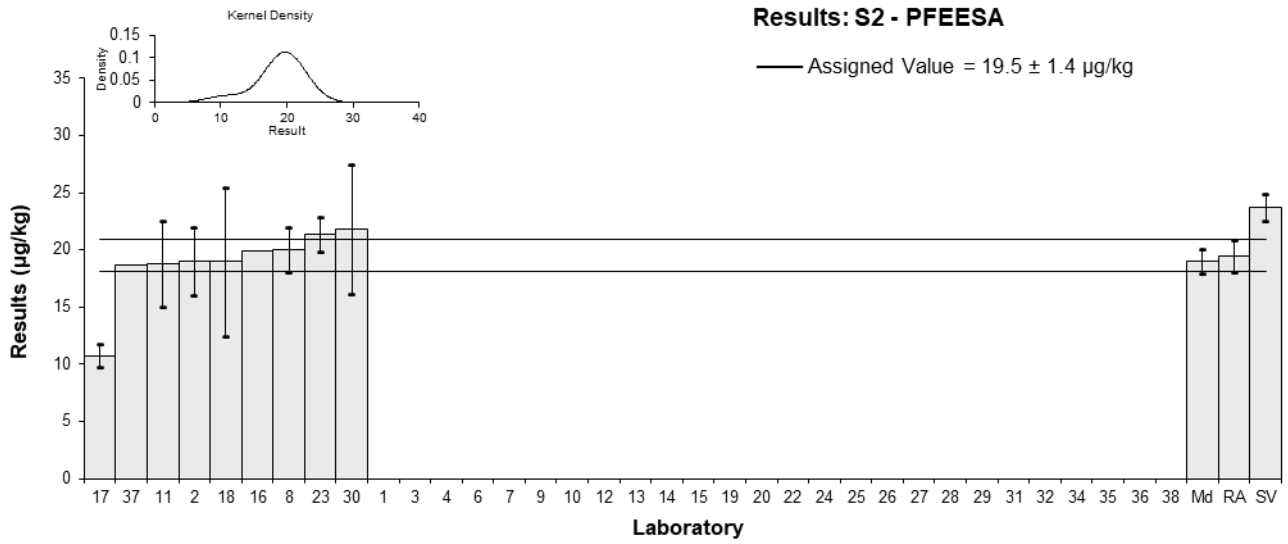
Sample No.	S2
Matrix	Soil
Analyte	PFEESA
Unit	µg/kg

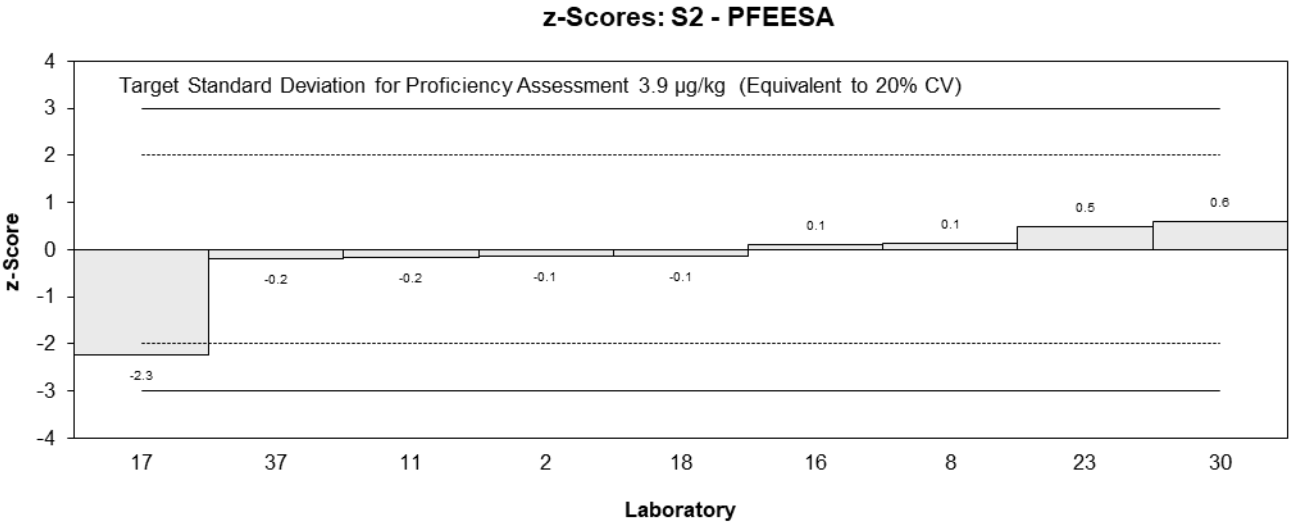
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	NT	NT	NT		
2	19	3	NR	-0.13	-0.15
3	NR	NR	NR		
4	NT	NT	NT		
6	NR	NR	NR		
7	NT	NT	NT		
8	20	2	82	0.13	0.20
9	NT	NT	NT		
10	NT	NT	NT		
11	18.8	3.76	96	-0.18	-0.17
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	19.9	NR	111.7	0.10	0.29
17	10.735	1.029	94	-2.25	-5.04
18	19	6.5	93	-0.13	-0.08
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	21.38	1.51	NR	0.48	0.91
24	NT	NT	NT		
25	NT	NT	NT		
26	NT	NT	NT		
27	NT	NT	NT		
28	NT	NT	NT		
29	NR	NR	NR		
30	21.8	5.7	99.42	0.59	0.39
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	NT	NT	NT		
36	NR	NR	NR		
37	18.71	NR	87	-0.20	-0.56
38	NT	NT	NT		

Statistics

Assigned Value	19.5	1.4
Spike Value	23.7	1.2
Robust Average	19.5	1.4
Median	19.0	1.1
Mean	18.8	
N	9	
Max	21.8	
Min	10.735	
Robust SD	1.6	
Robust CV	8.4%	


Kernel Density
Density
Result
Results: S2 - PFEESA
Assigned Value = 19.5 ± 1.4 µg/kg
Results (µg/kg)
Laboratory
17 37 11 2 18 16 8 23 30 1 3 4 6 7 9 10 12 13 14 15 19 20 22 24 25 26 27 28 29 31 32 34 35 36 38 Md RA SV


z-Scores: S2 - PFEESA
Target Standard Deviation for Proficiency Assessment 3.9 µg/kg (Equivalent to 20% CV)
z-Score
-2.3
-0.2
-0.2
-0.1
-0.1
0.1
0.1
0.5
0.6
Laboratory
17 37 11 2 18 16 8 23 30

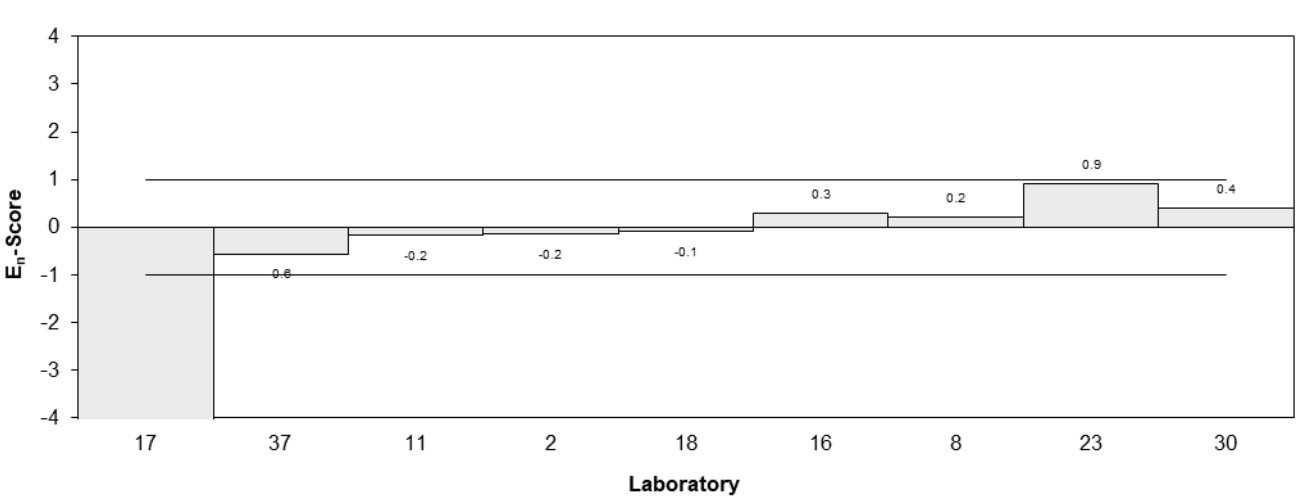

En-Scores: S2 - PFEESA
En-Score
-0.6
-0.2
-0.2
-0.1
0.3
0.2
0.9
0.4
Laboratory
17 37 11 2 18 16 8 23 30

Figure 62

Table 67

Sample Details

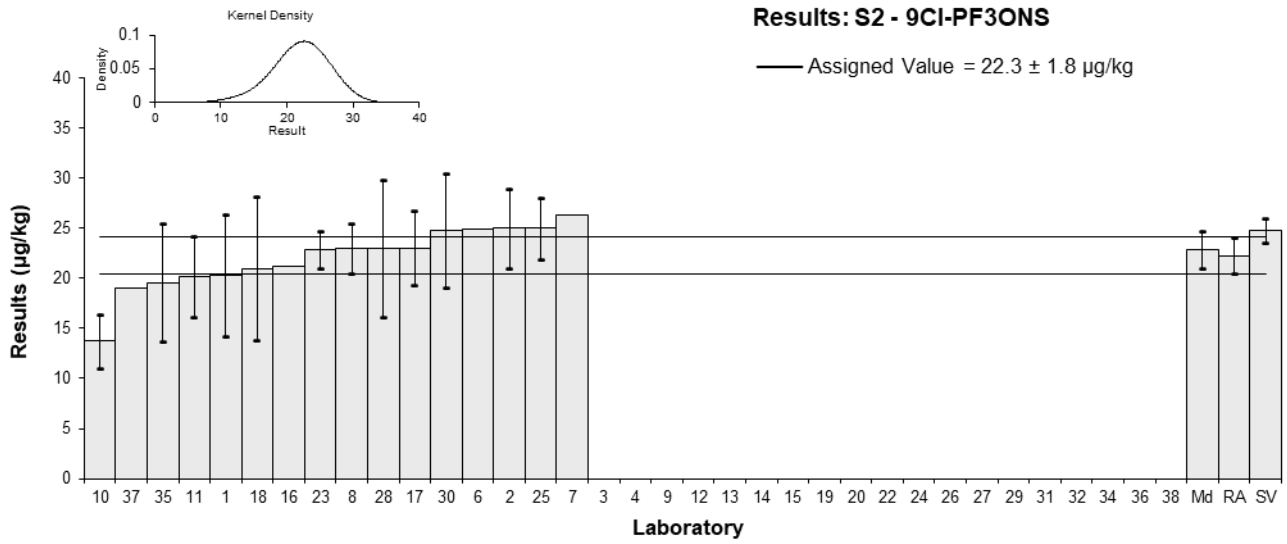
Sample No.	S2
Matrix	Soil
Analyte	9Cl-PF3ONS
Unit	µg/kg

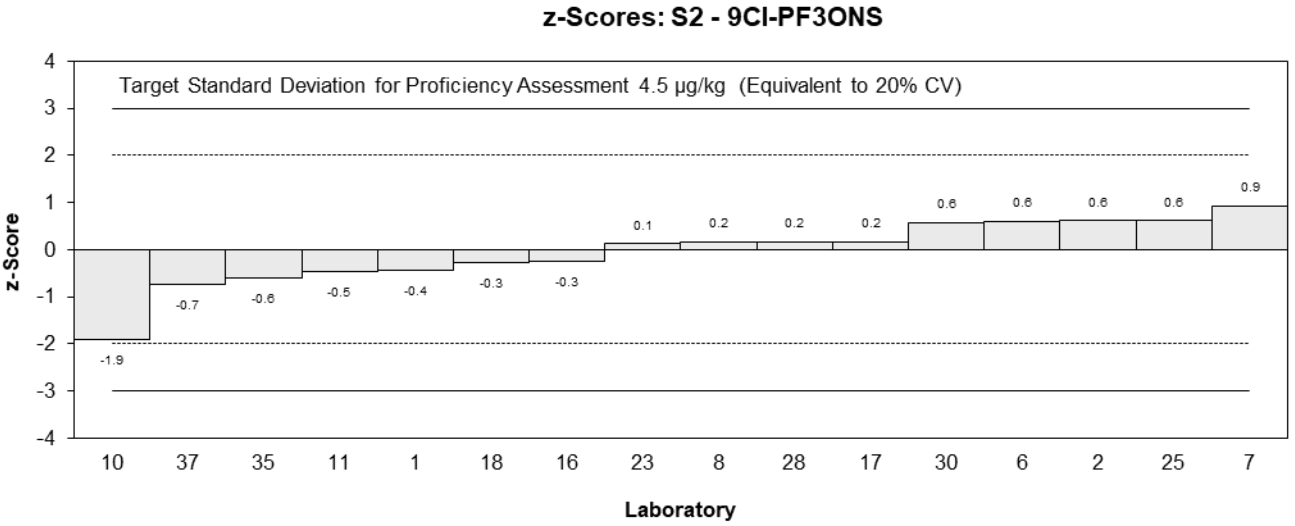
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	20.32	6.10	80	-0.44	-0.31
2	25	4	NR	0.61	0.62
3	NR	NR	NR		
4	NT	NT	NT		
6	24.9701	NR	96	0.60	1.48
7	26.39	NR	NR	0.92	2.27
8	23	2.5	76	0.16	0.23
9	NT	NT	NT		
10	13.74	2.67	NR	-1.92	-2.66
11	20.2	4.04	80	-0.47	-0.47
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	21.2	NR	107.32	-0.25	-0.61
17	23.051	3.69	94	0.17	0.18
18	21	7.2	97	-0.29	-0.18
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	22.84	1.86	NR	0.12	0.21
24	NT	NT	NT		
25	25	3.1	105	0.61	0.75
26	NT	NT	NT		
27	NT	NT	NT		
28	23.0	6.9	80	0.16	0.10
29	NR	NR	NR		
30	24.8	5.7	100.1	0.56	0.42
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	19.6	5.88	126	-0.61	-0.44
36	NR	NR	NR		
37	19.02	NR	73	-0.74	-1.82
38	NT	NT	NT		

Statistics

Assigned Value	22.3	1.8
Spike Value	24.8	1.2
Robust Average	22.3	1.8
Median	22.9	1.9
Mean	22.1	
N	16	
Max	26.39	
Min	13.74	
Robust SD	2.8	
Robust CV	13%	


Kernel Density
Density
Result
Results: S2 - 9Cl-PF3ONS
Assigned Value = 22.3 ± 1.8 µg/kg
Results (µg/kg)
Laboratory
10 37 35 11 1 18 16 23 8 28 17 30 6 2 25 7 3 4 9 12 13 14 15 19 20 22 24 26 27 29 31 32 34 36 38 Md RA SV


z-Scores: S2 - 9Cl-PF3ONS
Target Standard Deviation for Proficiency Assessment 4.5 µg/kg (Equivalent to 20% CV)
z-Score
-1.9 -0.7 -0.6 -0.5 -0.4 -0.3 -0.3 0.1 0.2 0.2 0.2 0.6 0.6 0.6 0.6 0.9
Laboratory
10 37 35 11 1 18 16 23 8 28 17 30 6 2 25 7

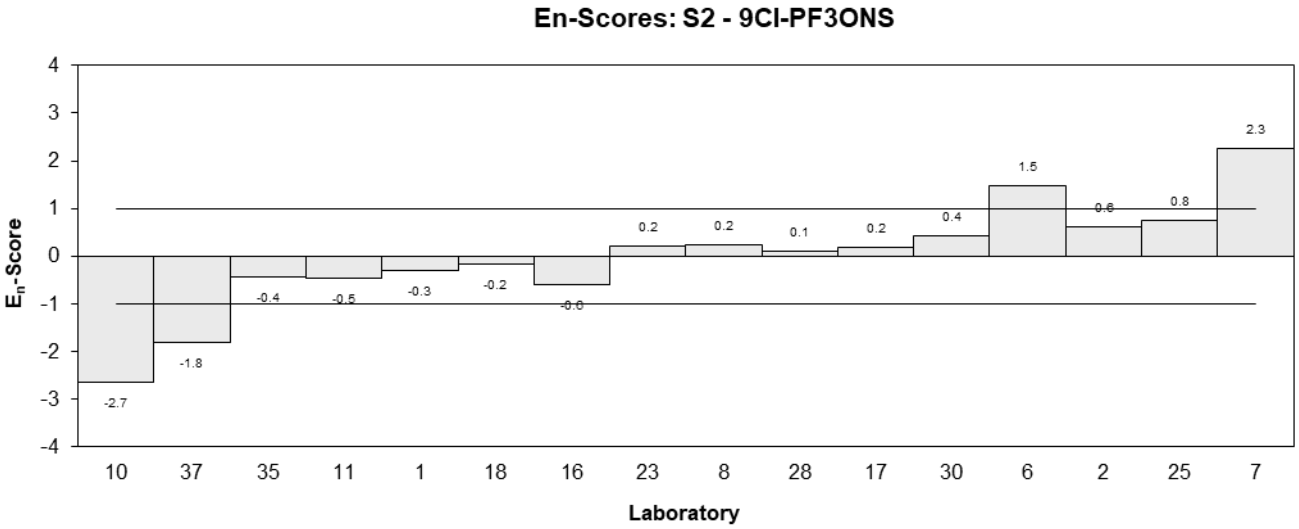

En-Scores: S2 - 9Cl-PF3ONS
En-Score
-2.7 -1.8 -0.4 -0.5 -0.3 -0.2 -0.6 0.2 0.2 0.1 0.2 0.4 1.5 0.6 0.8 2.3
Laboratory
10 37 35 11 1 18 16 23 8 28 17 30 6 2 25 7

Figure 63

Table 68

Sample Details

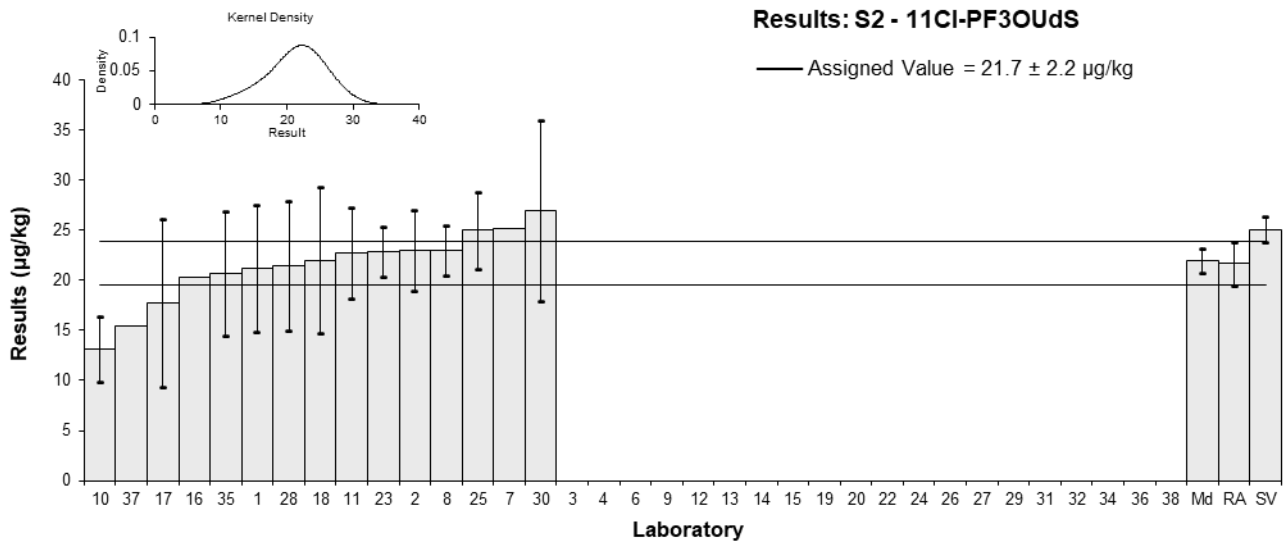
Sample No.	S2
Matrix	Soil
Analyte	11Cl-PF3OUdS
Unit	µg/kg

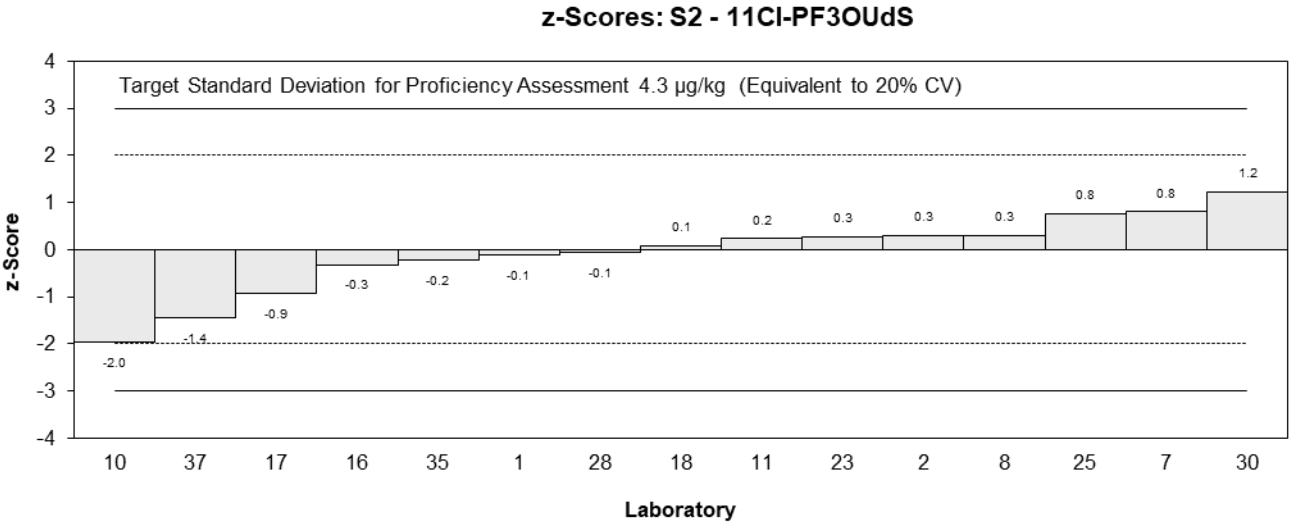
Participant Results

Lab. Code	Result	Uncertainty	Rec	z	E_n
1	21.17	6.35	72	-0.12	-0.08
2	23	4	NR	0.30	0.28
3	NR	NR	NR		
4	NT	NT	NT		
6	NR	NR	NR		
7	25.18	NR	NR	0.80	1.58
8	23	2.5	76	0.30	0.39
9	NT	NT	NT		
10	13.16	3.28	NR	-1.97	-2.16
11	22.7	4.54	80	0.23	0.20
12	NT	NT	NT		
13	NS	NS	NS		
14	NT	NT	NT		
15	NT	NT	NT		
16	20.3	NR	88.63	-0.32	-0.64
17	17.728	8.431	94	-0.92	-0.46
18	22	7.3	97	0.07	0.04
19	NT	NT	NT		
20	NT	NT	NT		
22	NT	NT	NT		
23	22.91	2.50	NR	0.28	0.36
24	NT	NT	NT		
25	25	3.8	106	0.76	0.75
26	NT	NT	NT		
27	NT	NT	NT		
28	21.5	6.45	80	-0.05	-0.03
29	NR	NR	NR		
30	27	9	100.1	1.22	0.57
31	NT	NT	NT		
32	NT	NT	NT		
34	NT	NT	NT		
35	20.7	6.21	126	-0.23	-0.15
36	NR	NR	NR		
37	15.45	NR	73	-1.44	-2.84
38	NT	NT	NT		

Statistics

Assigned Value	21.7	2.2
Spike Value	25.1	1.3
Robust Average	21.7	2.2
Median	22.0	1.2
Mean	21.4	
N	15	
Max	27	
Min	13.16	
Robust SD	3.4	
Robust CV	16%	


Results: S2 - 11Cl-PF3OUdS
Assigned Value = 21.7 ± 2.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
10 37 17 16 35 1 28 18 11 23 2 8 25 7 30 3 4 6 9 12 13 14 15 19 20 22 24 26 27 29 31 32 34 36 38 Md RA SV
Laboratory


z-Scores: S2 - 11Cl-PF3OUdS
Target Standard Deviation for Proficiency Assessment 4.3 µg/kg (Equivalent to 20% CV)
z-Score
-2.0 -1.4 -0.9 -0.3 -0.2 -0.1 -0.1 0.1 0.2 0.3 0.3 0.3 0.8 0.8 1.2
10 37 17 16 35 1 28 18 11 23 2 8 25 7 30
Laboratory

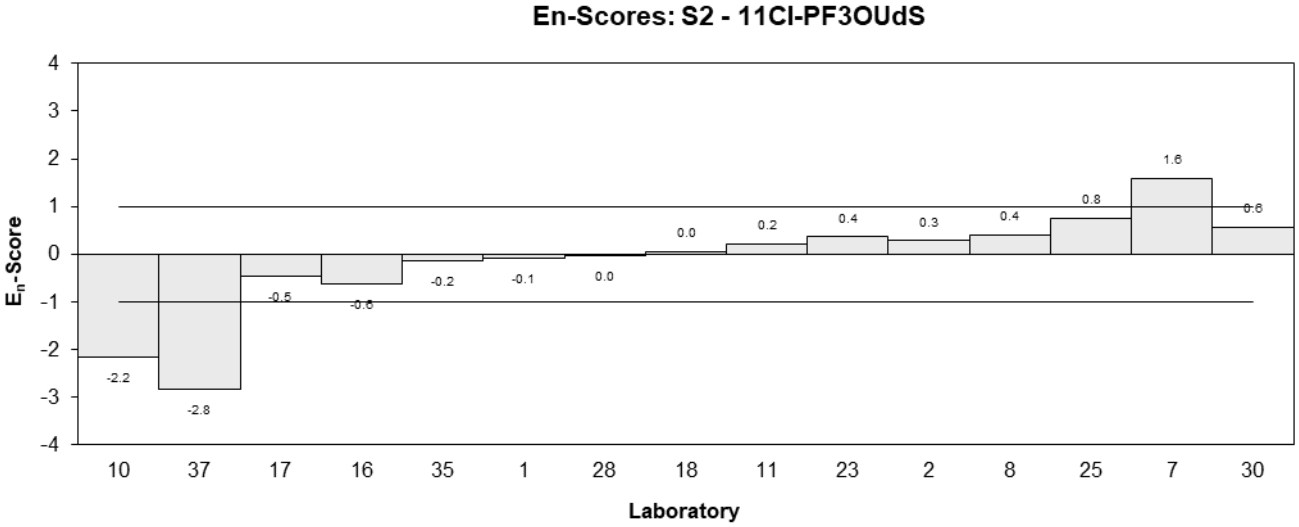

En-Scores: S2 - 11Cl-PF3OUdS
En-Score
-2.2 -2.8 -0.5 -0.6 -0.2 -0.1 0.0 0.0 0.2 0.4 0.3 0.4 0.8 1.6 0.6
10 37 17 16 35 1 28 18 11 23 2 8 25 7 30
Laboratory

Figure 64

Table 69

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFBS
Unit	µg/kg

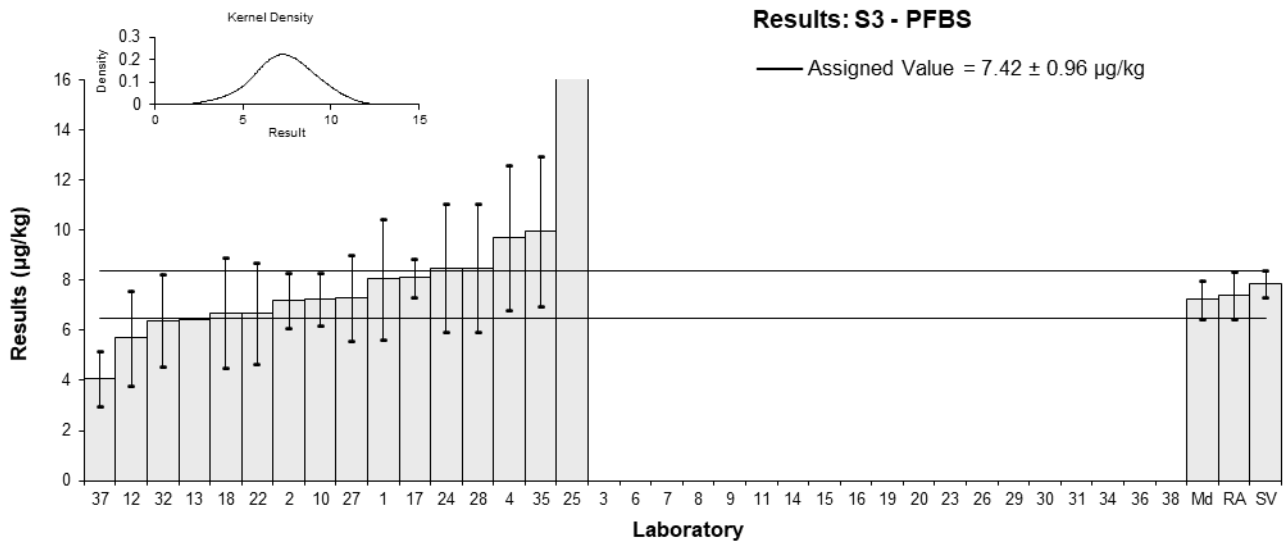
Participant Results

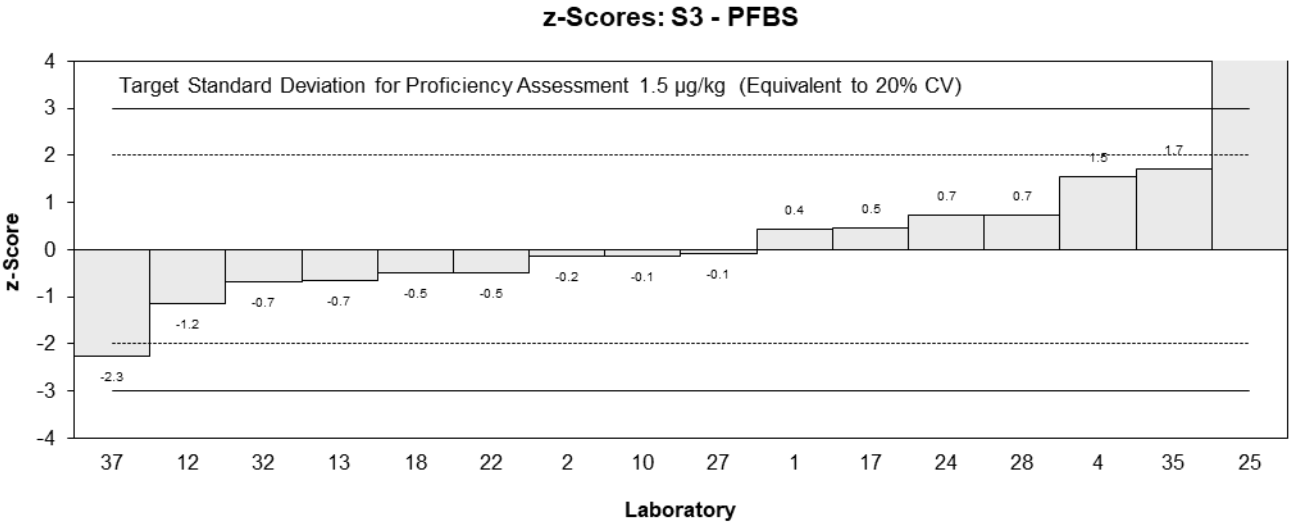
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	8.06	2.42	75	0.43	0.25
2	7.2	1.1	107	-0.15	-0.15
3	NS	NS	NS		
4	9.71	2.91	95	1.54	0.75
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	7.23	1.05	66	-0.13	-0.13
11	NT	NT	NT		
12	5.7	1.9	70	-1.16	-0.81
13	6.4536	NR	NR	-0.65	-1.01
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	8.115	0.765	33	0.47	0.57
18	6.7	2.2	75	-0.49	-0.30
19	NT	NT	NT		
20	NS	NS	NS		
22	6.7	2.01	100	-0.49	-0.32
23	NS	NS	NS		
24	8.5	2.55	102	0.73	0.40
25**	150	17	98	96.08	8.37
26	NS	NS	NS		
27	7.3	1.7	71	-0.08	-0.06
28	8.51	2.553	76	0.73	0.40
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	6.4	1.856	85	-0.69	-0.49
34	NS	NS	NS		
35	9.96	2.988	43	1.71	0.81
36	NT	NT	NT		
37	4.07	1.1	103	-2.26	-2.29
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	7.42	0.96
Spike Value	7.87	0.53
Robust Average	7.42	0.96
Median	7.23	0.79
Mean	7.37	
N	15	
Max	9.96	
Min	4.07	
Robust SD	1.5	
Robust CV	20%	


Results: S3 - PFBS
Assigned Value = 7.42 ± 0.96 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
37 12 32 13 18 22 2 10 27 1 17 24 28 4 35 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFBS
Target Standard Deviation for Proficiency Assessment 1.5 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
37 12 32 13 18 22 2 10 27 1 17 24 28 4 35 25
-2.3 -1.2 -0.7 -0.7 -0.5 -0.5 -0.2 -0.1 -0.1 0.4 0.5 0.7 0.7 1.5 1.7

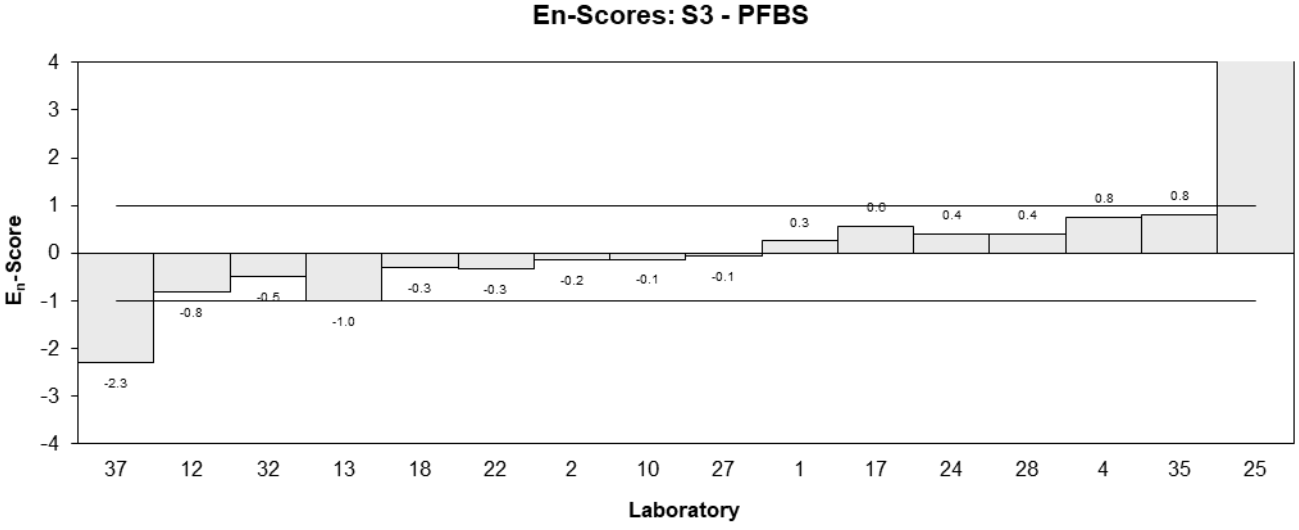

En-Scores: S3 - PFBS
En-Score
Laboratory
37 12 32 13 18 22 2 10 27 1 17 24 28 4 35 25
-2.3 -0.8 -0.5 -1.0 -0.3 -0.3 -0.2 -0.1 -0.1 0.3 0.6 0.4 0.4 0.8 0.8

Figure 65

Table 70

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHxS
Unit	µg/kg

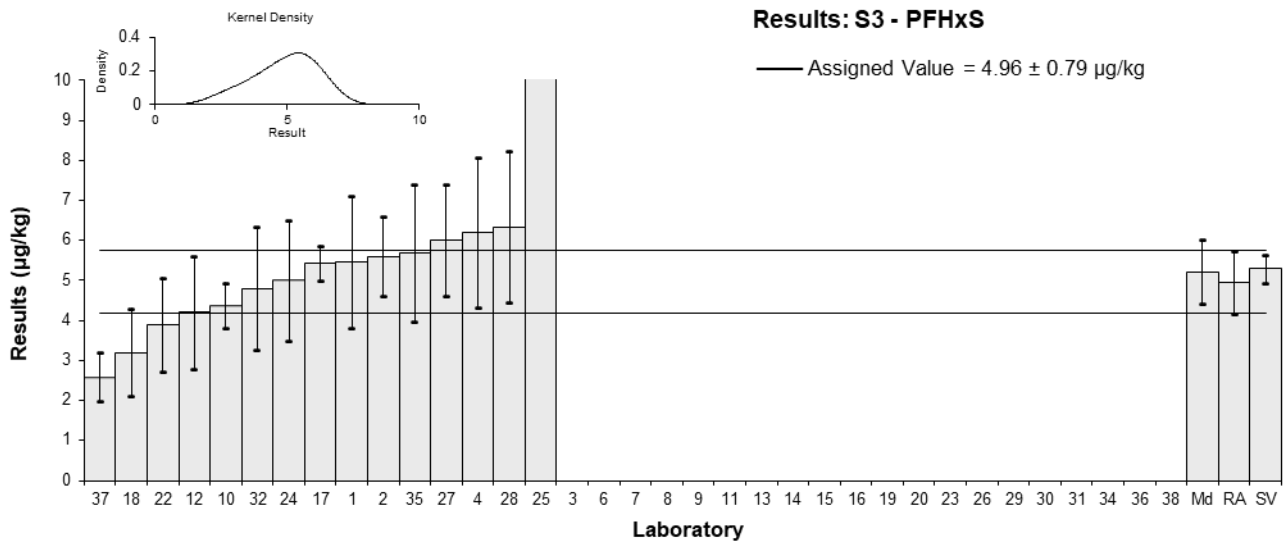
Participant Results

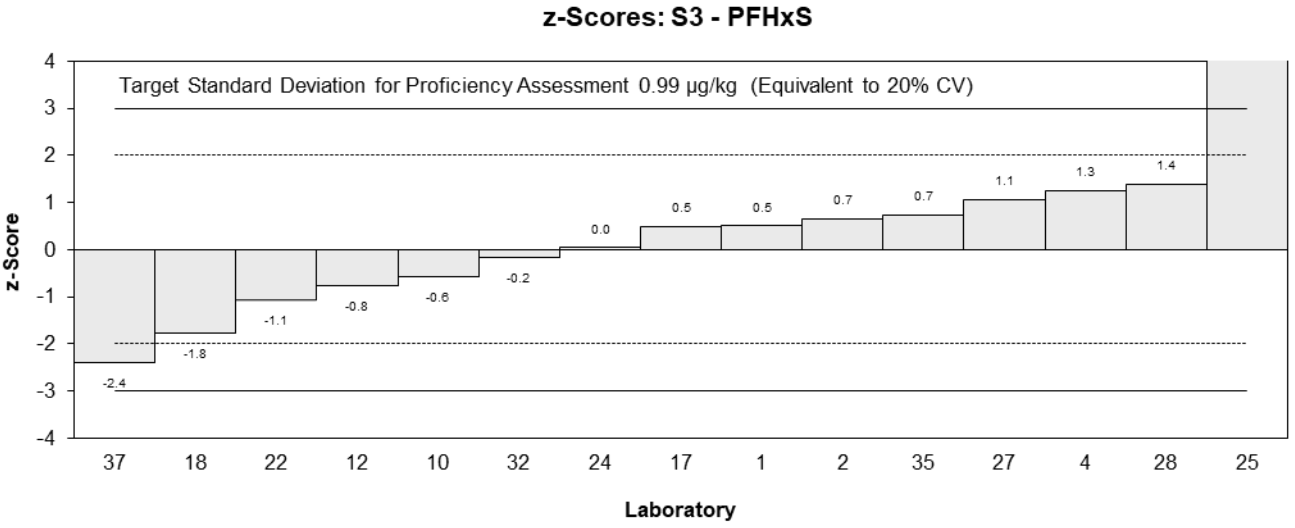
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	5.46	1.64	82	0.50	0.27
2	5.6	1.0	118	0.65	0.50
3	NS	NS	NS		
4	6.20	1.86	116	1.25	0.61
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	4.38	0.56	88	-0.58	-0.60
11	NT	NT	NT		
12	4.2	1.4	82	-0.77	-0.47
13	NT	NT	NT		
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	5.434	0.431	50	0.48	0.53
18	3.2	1.1	74	-1.77	-1.30
19	NT	NT	NT		
20	NS	NS	NS		
22	3.9	1.17	99	-1.07	-0.75
23	NS	NS	NS		
24	5	1.5	99	0.04	0.02
25**	1500	350	67	1,507.10	4.27
26	NS	NS	NS		
27	6	1.4	85	1.05	0.65
28	6.34	1.902	83	1.39	0.67
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	4.8	1.536	87	-0.16	-0.09
34	NS	NS	NS		
35	5.69	1.707	57	0.74	0.39
36	NT	NT	NT		
37	2.59	0.6	107	-2.39	-2.39
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	4.96	0.79
Spike Value	5.29	0.36
Robust Average	4.96	0.79
Median	5.22	0.80
Mean	4.91	
N	14	
Max	6.34	
Min	2.59	
Robust SD	1.2	
Robust CV	24%	


Results: S3 - PFHxS
Assigned Value = 4.96 ± 0.79 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
37 18 22 12 10 32 24 17 1 2 35 27 4 28 25 3 6 7 8 9 11 13 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFHxS
Target Standard Deviation for Proficiency Assessment 0.99 µg/kg (Equivalent to 20% CV)
z-Score
-2.4 -1.8 -1.1 -0.8 -0.6 -0.2 0.0 0.5 0.5 0.7 0.7 1.1 1.3 1.4
Laboratory
37 18 22 12 10 32 24 17 1 2 35 27 4 28 25

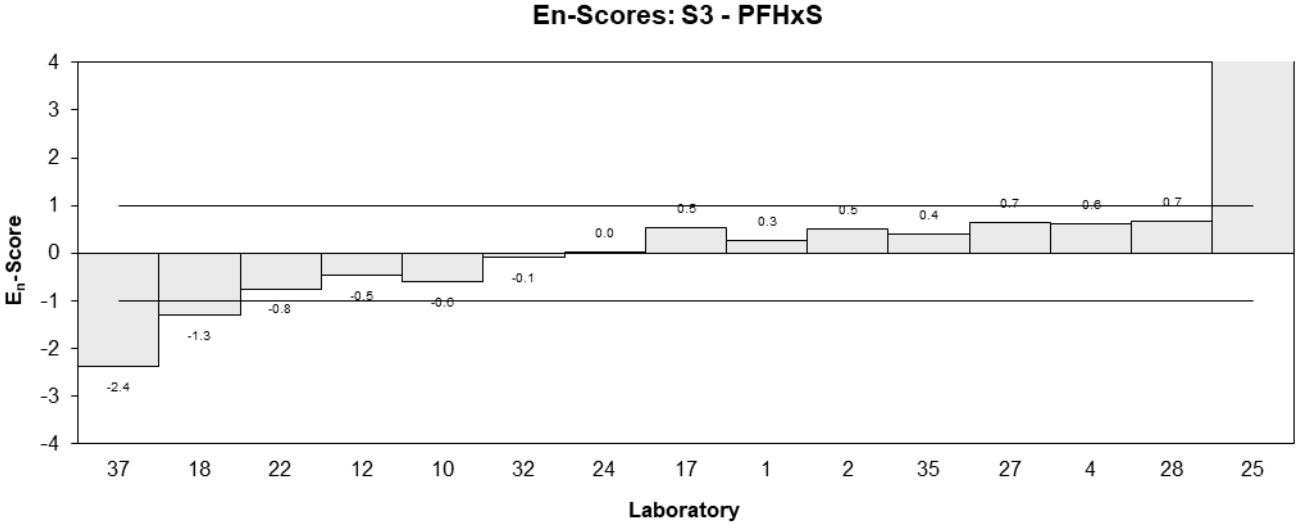

En-Scores: S3 - PFHxS
En-Score
-2.4 -1.3 -0.8 -0.5 -0.6 -0.1 0.0 0.5 0.3 0.5 0.4 0.7 0.6 0.7
Laboratory
37 18 22 12 10 32 24 17 1 2 35 27 4 28 25

Figure 66

Table 71

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHxS_L
Unit	µg/kg

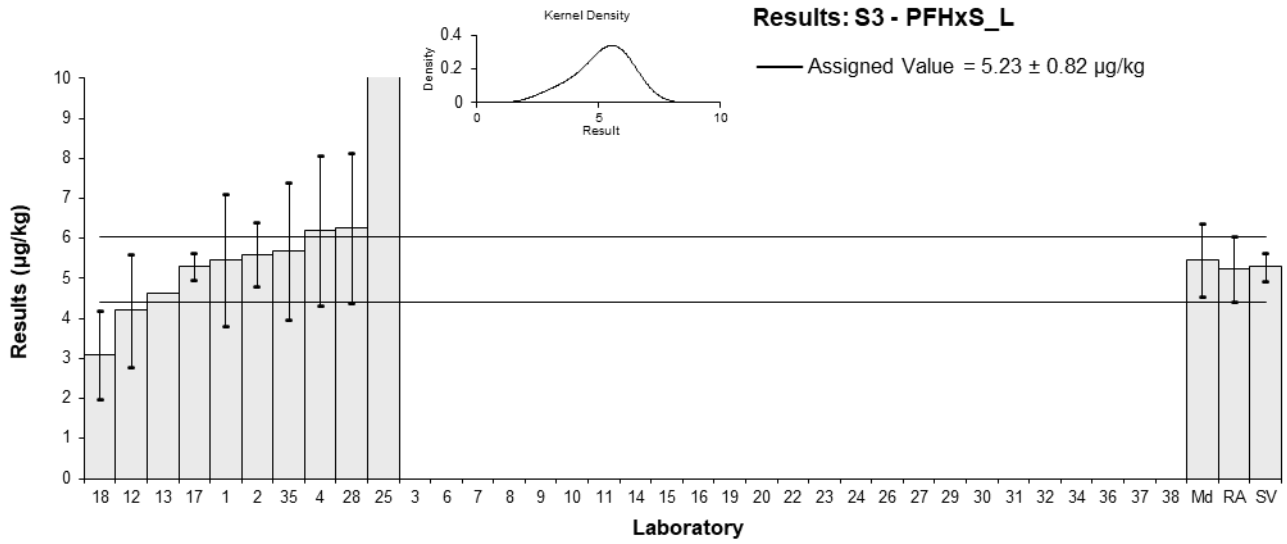
Participant Results

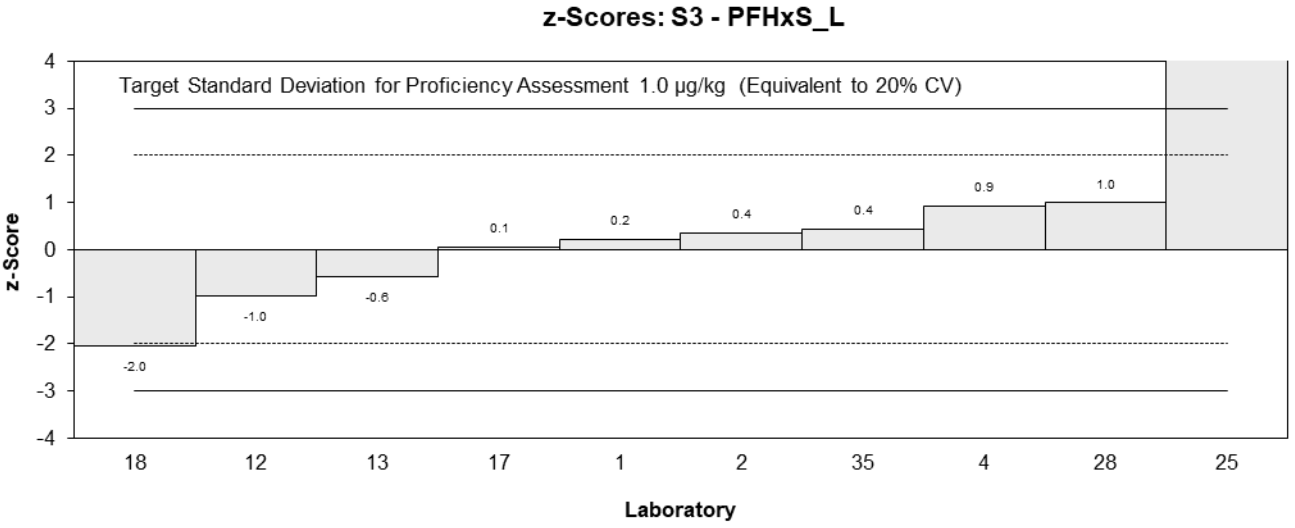
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	5.46	1.64	82	0.22	0.13
2	5.6	0.8	NR	0.35	0.32
3	NS	NS	NS		
4	6.20	1.86	116	0.93	0.48
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	NR	NR	NR		
11	NT	NT	NT		
12	4.2	1.4	NR	-0.98	-0.63
13	4.6365	NR	NR	-0.57	-0.72
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	5.294	0.335	50	0.06	0.07
18	3.1	1.1	74	-2.04	-1.55
19	NT	NT	NT		
20	NS	NS	NS		
22	NT	NT	NT		
23	NS	NS	NS		
24	NT	NT	NT		
25**	1200	290	67	1,142.23	4.12
26	NS	NS	NS		
27	NT	NT	NT		
28	6.27	1.881	83	0.99	0.51
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	5.69	1.707	57	0.44	0.24
36	NT	NT	NT		
37	NT	NT	NT		
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	5.23	0.82
Spike Value	5.29	0.36
Robust Average	5.23	0.82
Median	5.46	0.91
Mean	5.16	
N	9	
Max	6.27	
Min	3.1	
Robust SD	0.98	
Robust CV	19%	


Kernel Density
Density
Result
Results: S3 - PFHxS_L
Assigned Value = 5.23 ± 0.82 µg/kg
Results (µg/kg)
Laboratory
18 12 13 17 1 2 35 4 28 25 3 6 7 8 9 10 11 14 15 16 19 20 22 23 24 26 27 29 30 31 32 34 36 37 38 Md RA SV


z-Scores: S3 - PFHxS_L
Target Standard Deviation for Proficiency Assessment 1.0 µg/kg (Equivalent to 20% CV)
z-Score
-2.0
-1.0
-0.6
0.1
0.2
0.4
0.4
0.9
1.0
Laboratory
18 12 13 17 1 2 35 4 28 25

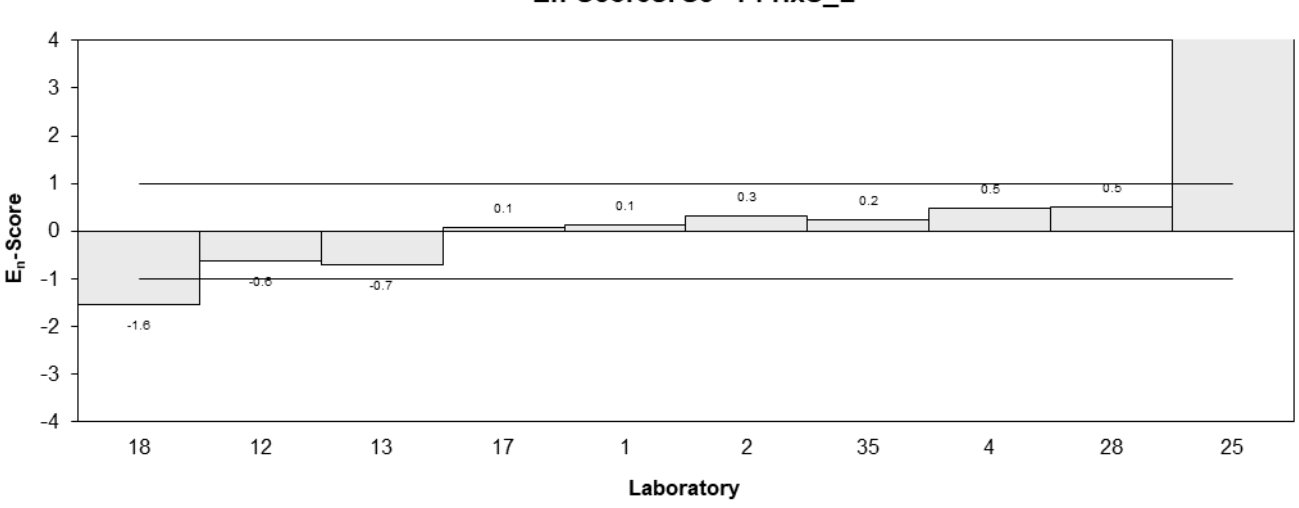

En-Scores: S3 - PFHxS_L
En-Score
-1.6
-0.6
-0.7
0.1
0.1
0.3
0.2
0.5
0.5
Laboratory
18 12 13 17 1 2 35 4 28 25

Figure 67

Table 72

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHpS
Unit	µg/kg

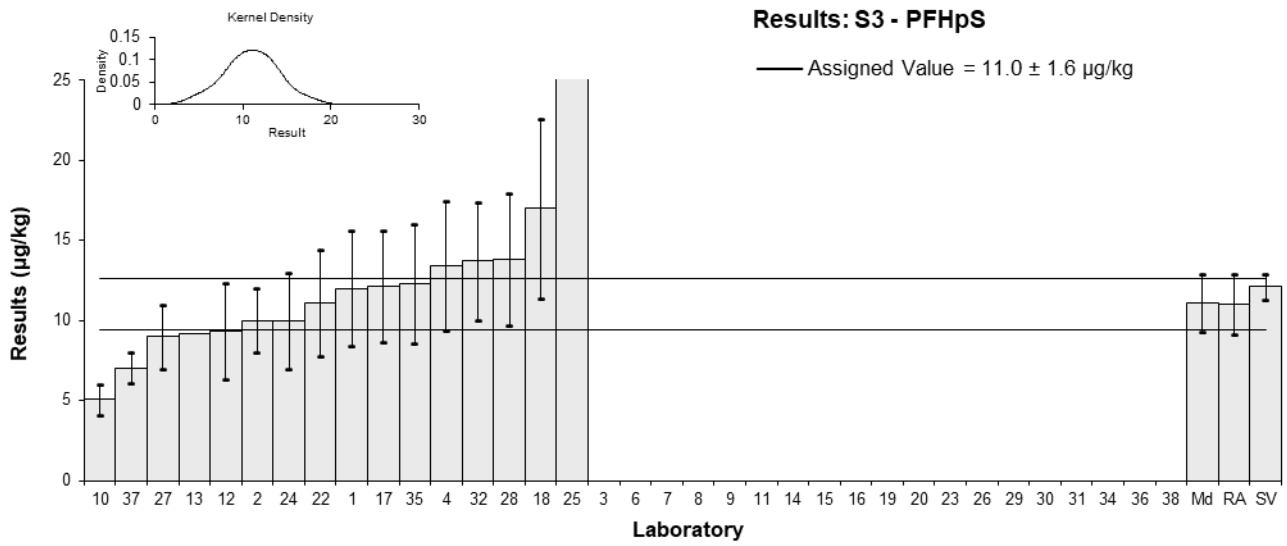
Participant Results

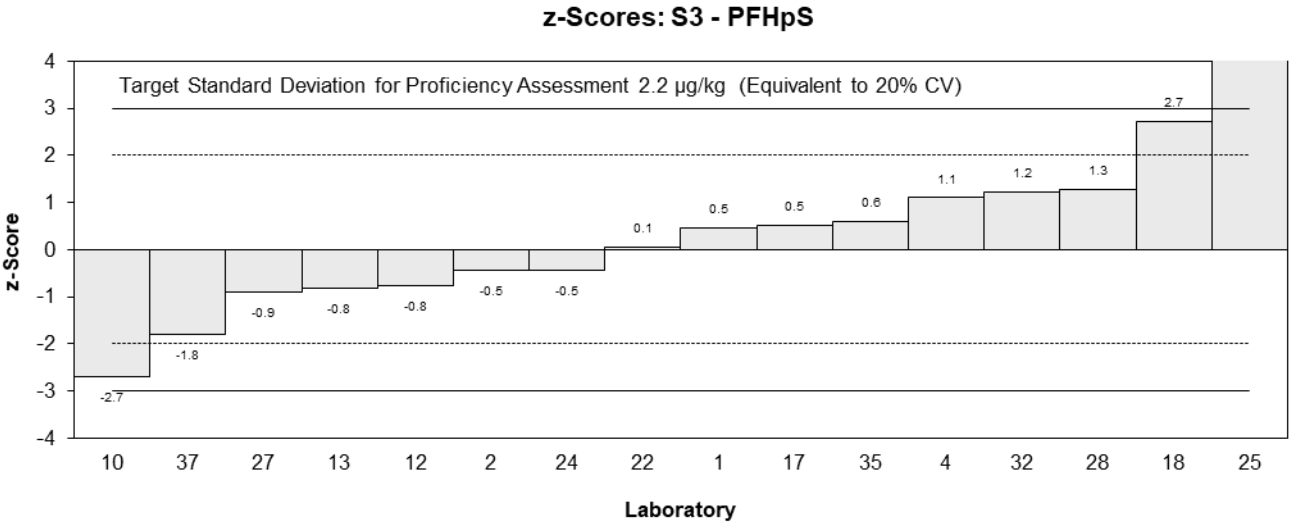
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	12.01	3.60	80	0.46	0.26
2	10	2	NR	-0.45	-0.39
3	NS	NS	NS		
4	13.42	4.03	114	1.10	0.56
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10*	5.06	0.94	NR	-2.70	-3.20
11	NT	NT	NT		
12	9.3	3	NR	-0.77	-0.50
13	9.1794	NR	NR	-0.83	-1.14
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	12.123	3.48	44	0.51	0.29
18*	17	5.6	74	2.73	1.03
19	NT	NT	NT		
20	NS	NS	NS		
22	11.1	3.33	105	0.05	0.03
23	NS	NS	NS		
24	10	3	102	-0.45	-0.29
25**	340	59	67	149.55	5.57
26	NS	NS	NS		
27	9	2	NR	-0.91	-0.78
28	13.8	4.14	84	1.27	0.63
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	13.7	3.699	97	1.23	0.67
34	NS	NS	NS		
35	12.3	3.69	57	0.59	0.32
36	NT	NT	NT		
37	7.05	0.97	116	-1.80	-2.11
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	11.0	1.6
Spike Value	12.1	0.8
Robust Average	11.0	1.9
Median	11.1	1.8
Mean	11.0	
N	15	
Max	17	
Min	5.06	
Robust SD	2.9	
Robust CV	26%	


Results: S3 - PFHpS
Assigned Value = 11.0 ± 1.6 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
10 37 27 13 12 2 24 22 1 17 35 4 32 28 18 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV
Laboratory


z-Scores: S3 - PFHpS
Target Standard Deviation for Proficiency Assessment 2.2 µg/kg (Equivalent to 20% CV)
z-Score
-2.7 -1.8 -0.9 -0.8 -0.8 -0.5 -0.5 0.1 0.5 0.5 0.6 1.1 1.2 1.3 2.7
10 37 27 13 12 2 24 22 1 17 35 4 32 28 18 25
Laboratory

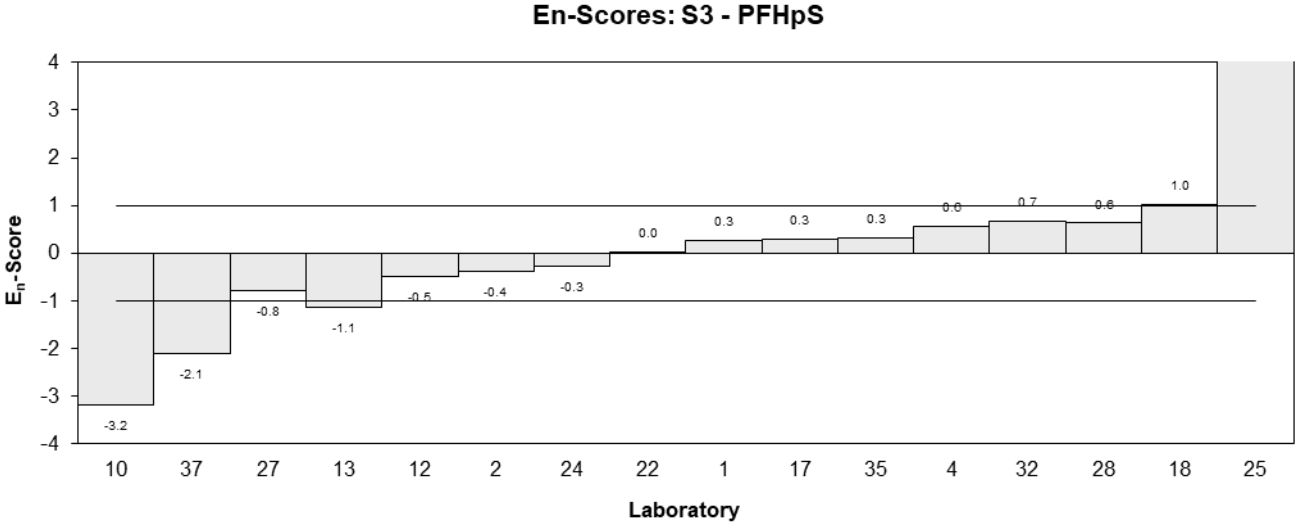

En-Scores: S3 - PFHpS
En-Score
-3.2 -2.1 -0.8 -1.1 -0.5 -0.4 -0.3 0.0 0.3 0.3 0.3 0.6 0.7 0.6 1.0
10 37 27 13 12 2 24 22 1 17 35 4 32 28 18 25
Laboratory

Figure 68

Table 73

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOS
Unit	µg/kg

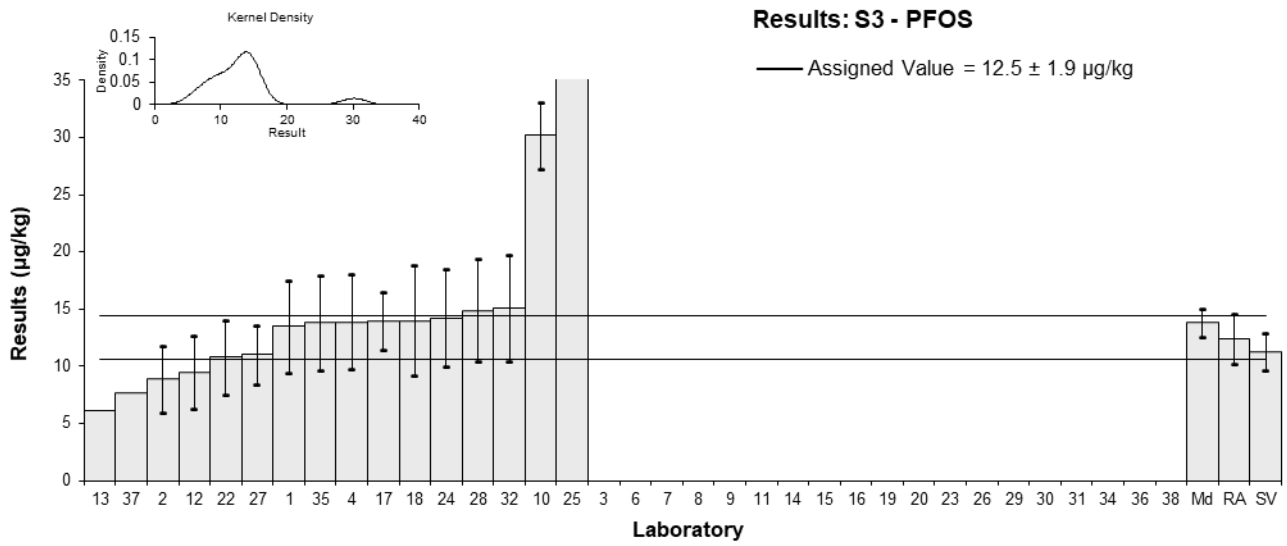
Participant Results

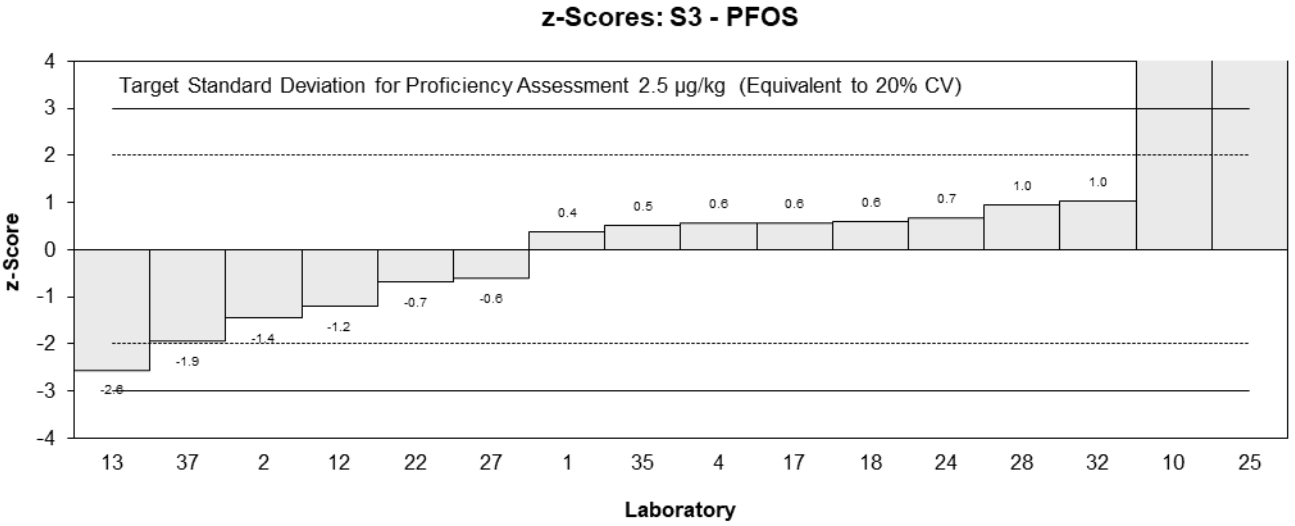
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	13.47	4.04	84	0.39	0.22
2	8.9	2.9	108	-1.44	-1.04
3	NS	NS	NS		
4	13.89	4.17	114	0.56	0.30
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10*	30.18	2.90	50	7.07	5.10
11	NT	NT	NT		
12	9.5	3.2	102	-1.20	-0.81
13*	6.1185	NR	NR	-2.55	-3.36
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	13.954	2.562	44	0.58	0.46
18	14	4.8	80	0.60	0.29
19	NT	NT	NT		
20	NS	NS	NS		
22	10.8	3.24	94	-0.68	-0.45
23	NS	NS	NS		
24	14.2	4.26	114	0.68	0.36
25**	20000	6400	97	7,995.00	3.12
26	NS	NS	NS		
27	11	2.6	109	-0.60	-0.47
28	14.9	4.47	84	0.96	0.49
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	15.1	4.681	106	1.04	0.51
34	NS	NS	NS		
35	13.8	4.14	52	0.52	0.29
36	NT	NT	NT		
37	7.66	NR	116	-1.94	-2.55
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	12.5	1.9
Spike Value	11.3	1.6
Robust Average	12.4	2.2
Median	13.8	1.2
Mean	13.2	
N	15	
Max	30.18	
Min	6.1185	
Robust SD	3.4	
Robust CV	28%	


Results: S3 - PFOS
Assigned Value = 12.5 ± 1.9 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
13 37 2 12 22 27 1 35 4 17 18 24 28 32 10 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV
Laboratory


z-Scores: S3 - PFOS
Target Standard Deviation for Proficiency Assessment 2.5 µg/kg (Equivalent to 20% CV)
z-Score
-2.6 -1.9 -1.4 -1.2 -0.7 -0.6 0.4 0.5 0.6 0.6 0.6 0.7 1.0 1.0
13 37 2 12 22 27 1 35 4 17 18 24 28 32 10 25
Laboratory

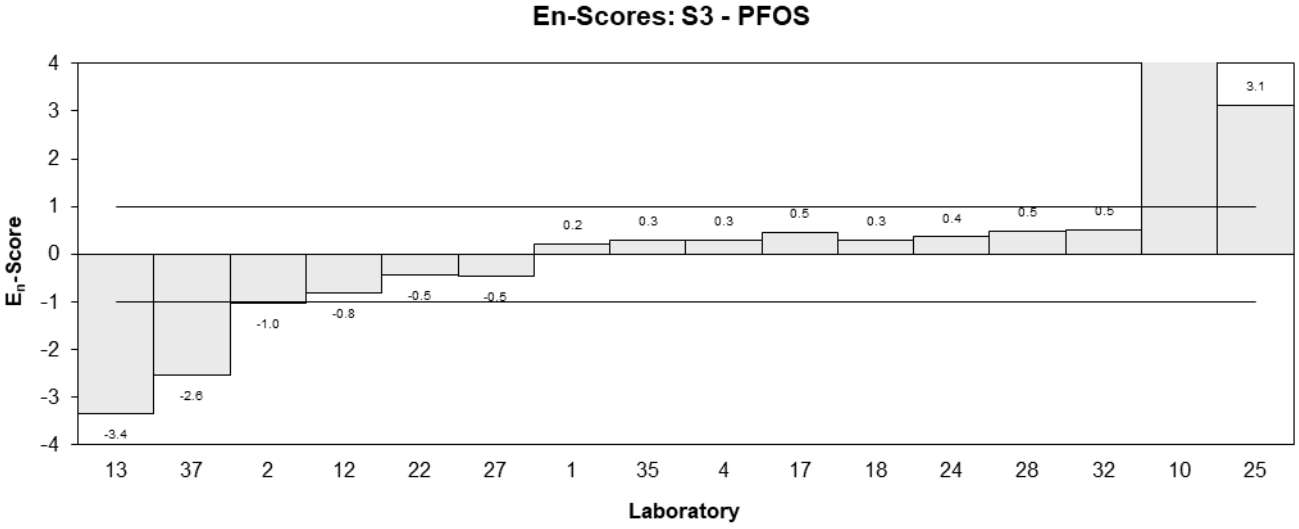

En-Scores: S3 - PFOS
En-Score
-3.4 -2.6 -1.0 -0.8 -0.5 -0.5 0.2 0.3 0.3 0.5 0.3 0.4 0.5 0.5 3.1
13 37 2 12 22 27 1 35 4 17 18 24 28 32 10 25
Laboratory

Figure 69

Table 74

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOS_L
Unit	µg/kg

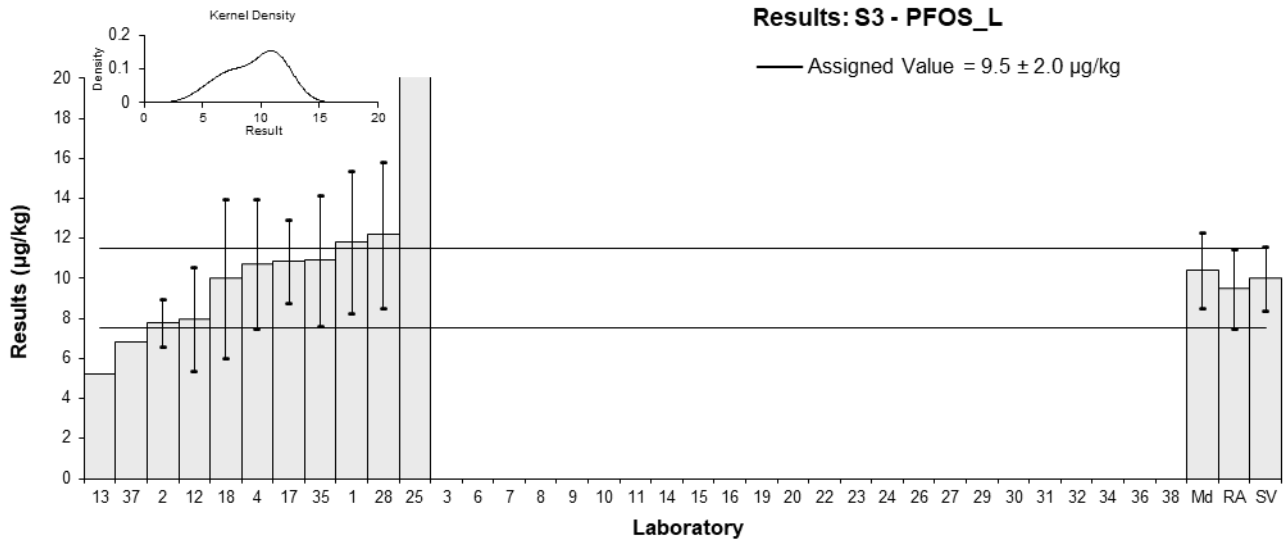
Participant Results

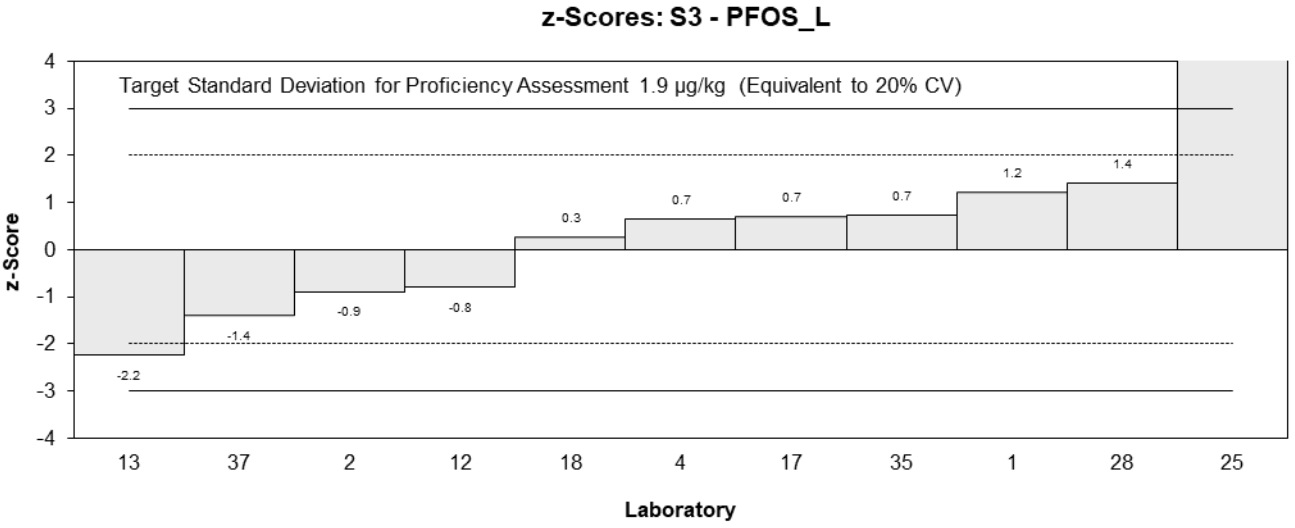
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	11.83	3.55	84	1.23	0.57
2	7.8	1.2	NR	-0.89	-0.73
3	NS	NS	NS		
4	10.75	3.23	114	0.66	0.33
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	NR	NR	NR		
11	NT	NT	NT		
12	8	2.6	NR	-0.79	-0.46
13	5.2431	NR	NR	-2.24	-2.13
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	10.853	2.096	44	0.71	0.47
18	10	4	80	0.26	0.11
19	NT	NT	NT		
20	NS	NS	NS		
22	NT	NT	NT		
23	NS	NS	NS		
24	NT	NT	NT		
25**	14000	4400	97	7,363.42	3.18
26	NS	NS	NS		
27	NT	NT	NT		
28	12.2	3.66	84	1.42	0.65
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	10.9	3.27	52	0.74	0.37
36	NT	NT	NT		
37	6.84	NR	116	-1.40	-1.33
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	9.5	2.0
Spike Value	10.0	1.6
Robust Average	9.5	2.0
Median	10.4	1.9
Mean	9.44	
N	10	
Max	12.2	
Min	5.2431	
Robust SD	2.5	
Robust CV	27%	


Results: S3 - PFOS_L
Assigned Value = 9.5 ± 2.0 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
13 37 2 12 18 4 17 35 1 28 25 3 6 7 8 9 10 11 14 15 16 19 20 22 23 24 26 27 29 30 31 32 34 36 38 Md RA SV


z-Scores: S3 - PFOS_L
Target Standard Deviation for Proficiency Assessment 1.9 µg/kg (Equivalent to 20% CV)
z-Score
-2.2
-1.4
-0.9
-0.8
0.3
0.7
0.7
0.7
1.2
1.4
Laboratory
13 37 2 12 18 4 17 35 1 28 25

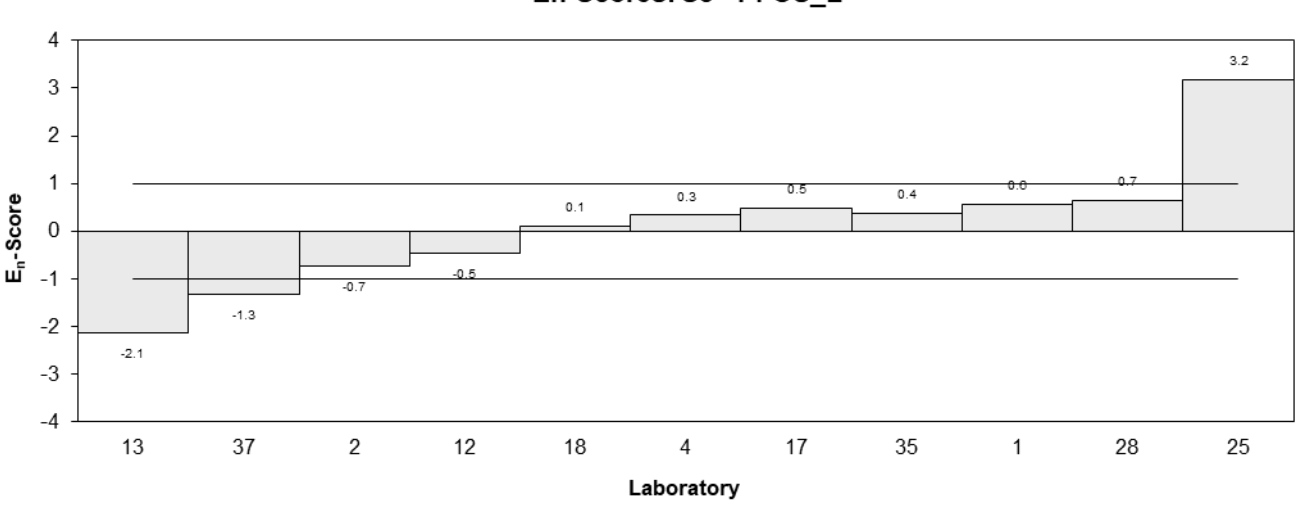

En-Scores: S3 - PFOS_L
En-Score
-2.1
-1.3
-0.7
-0.5
0.1
0.3
0.5
0.4
0.6
0.7
3.2
Laboratory
13 37 2 12 18 4 17 35 1 28 25

Figure 70

Table 75

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFNS
Unit	µg/kg

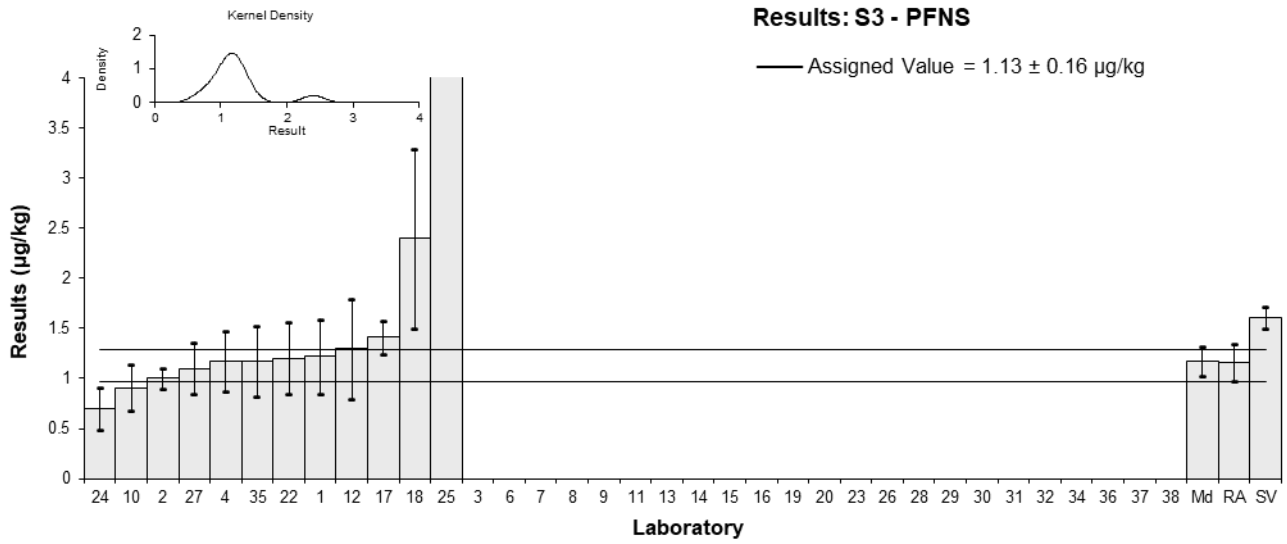
Participant Results

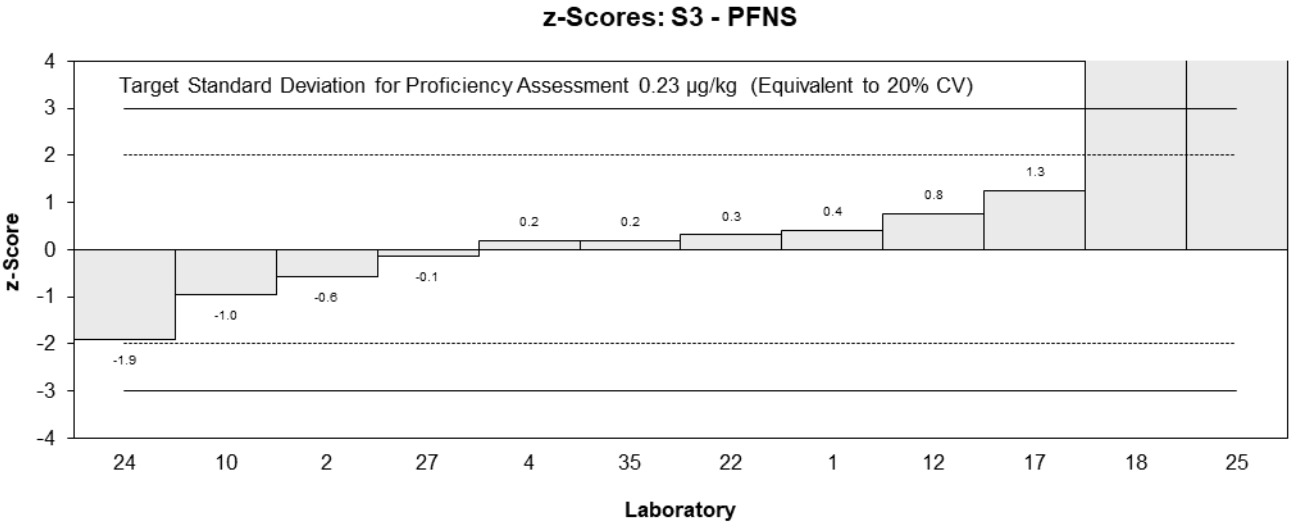
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1.22	0.37	86	0.40	0.22
2	1.0	0.1	NR	-0.58	-0.69
3	NS	NS	NS		
4	1.17	0.30	114	0.18	0.12
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	0.91	0.23	NR	-0.97	-0.79
11	NT	NT	NT		
12	1.3	0.5	NR	0.75	0.32
13	<1	NR	NR		
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	1.412	0.168	44	1.25	1.22
18*	2.4	0.9	80	5.62	1.39
19	NT	NT	NT		
20	NS	NS	NS		
22	1.2	0.36	61	0.31	0.18
23	NS	NS	NS		
24	0.7	0.21	70	-1.90	-1.63
25**	8.1	1.3	97	30.84	5.32
26	NS	NS	NS		
27	1.1	0.26	NR	-0.13	-0.10
28	<1.89	0.567	84		
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	1.17	0.351	52	0.18	0.10
36	NT	NT	NT		
37	<2.5	NR	116		
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1.13	0.16
Spike Value	1.61	0.11
Robust Average	1.16	0.18
Median	1.17	0.15
Mean	1.23	
N	11	
Max	2.4	
Min	0.7	
Robust SD	0.23	
Robust CV	20%	


Results: S3 - PFNS
Assigned Value = 1.13 ± 0.16 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
24 10 2 27 4 35 22 1 12 17 18 25 3 6 7 8 9 11 13 14 15 16 19 20 23 26 28 29 30 31 32 34 36 37 38 Md RA SV
Laboratory


z-Scores: S3 - PFNS
Target Standard Deviation for Proficiency Assessment 0.23 µg/kg (Equivalent to 20% CV)
z-Score
-1.9 -1.0 -0.6 -0.1 0.2 0.2 0.3 0.4 0.8 1.3
24 10 2 27 4 35 22 1 12 17 18 25
Laboratory

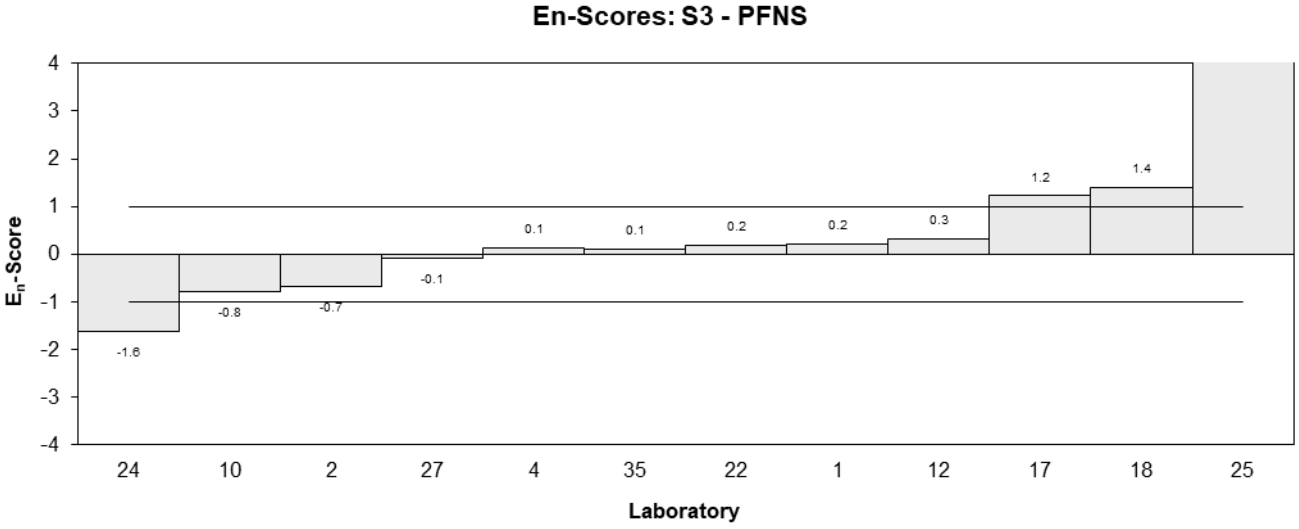

En-Scores: S3 - PFNS
En-Score
-1.6 -0.8 -0.7 -0.1 0.1 0.1 0.2 0.2 0.3 1.2 1.4
24 10 2 27 4 35 22 1 12 17 18 25
Laboratory

Figure 71

Table 76

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFDS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	17.32	5.20	82
2	16	2	NR
3	NS	NS	NS
4	16.66	4.34	114
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	16.56	4.01	NR
11	NT	NT	NT
12	23	6.9	NR
13	19.9225	NR	NR
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	30.45	5.371	44
18	38	13	80
19	NT	NT	NT
20	NS	NS	NS
22	33.4	10.02	31
23	NS	NS	NS
24	23.1	6.93	45
25**	2.7	0.65	97
26	NS	NS	NS
27	17	4	NR
28	40.3	12.09	84
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	36.6	12.078	106
34	NS	NS	NS
35	16.83	5.049	52
36	NT	NT	NT
37	21.26	2.27	116
38	NR	NR	NR

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	37.8	2.6
Robust Average	24.3	6.4
Median	21.3	4.4
Mean	24.4	
N	15	
Max	40.3	
Min	16	
Robust SD	9.8	
Robust CV	40%	

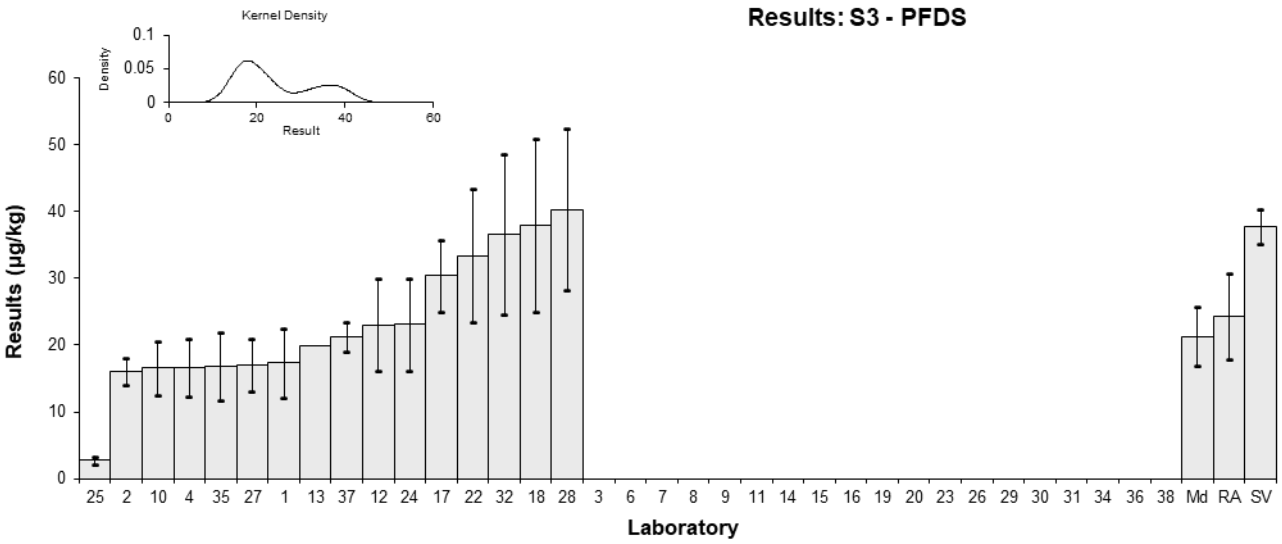

Results: S3 - PFDS
Kernel Density
Density
0.1
0.05
0
0
20
40
60
Result
Results (µg/kg)
60
50
40
30
20
10
0
25 2 10 4 35 27 1 13 37 12 24 17 22 32 18 28 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV
Laboratory

Figure 72

Table 77

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFBA
Unit	µg/kg

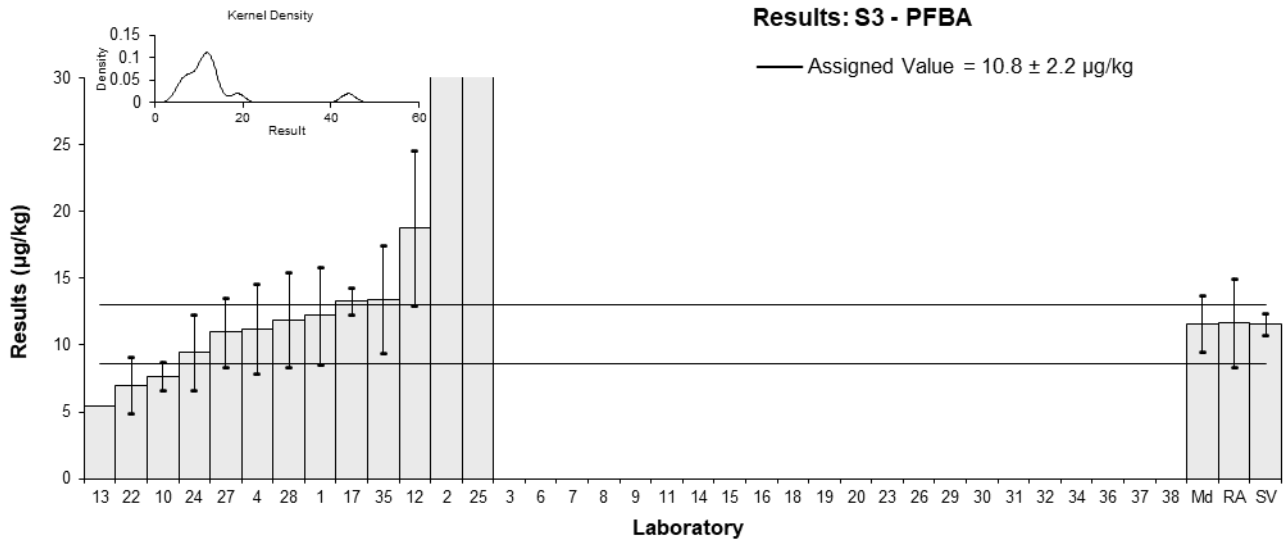
Participant Results

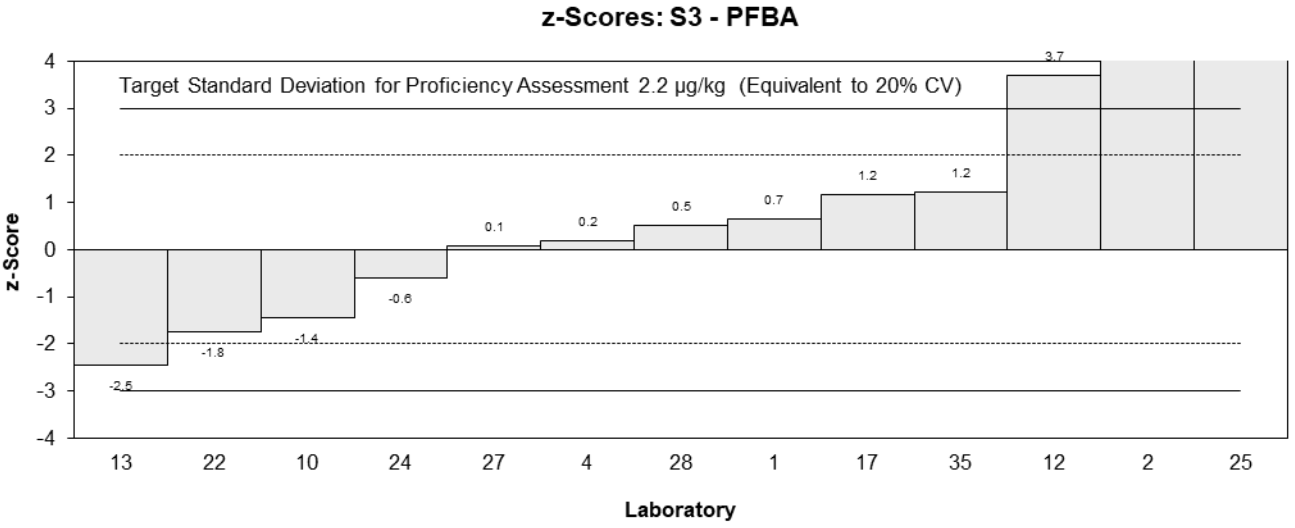
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	12.22	3.67	81	0.66	0.33
2*	44	11	93	15.37	2.96
3	NS	NS	NS		
4	11.22	3.37	120	0.19	0.10
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	7.69	1.10	99	-1.44	-1.26
11	NT	NT	NT		
12*	18.8	5.8	31	3.70	1.29
13*	5.4774	NR	NR	-2.46	-2.42
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	13.3	1.02	36	1.16	1.03
18	< 2	NR	77		
19	NT	NT	NT		
20	NS	NS	NS		
22	7.01	2.103	67	-1.75	-1.25
23	NS	NS	NS		
24	9.5	2.85	75	-0.60	-0.36
25**	340	110	95	152.41	2.99
26	NS	NS	NS		
27	11	2.6	10	0.09	0.06
28	11.9	3.57	61	0.51	0.26
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	<12	NR	NR		
34	NS	NS	NS		
35	13.44	4.032	43	1.22	0.57
36	NT	NT	NT		
37	<10	NR	102		
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	10.8	2.2
Spike Value	11.6	0.8
Robust Average	11.7	3.3
Median	11.6	2.1
Mean	13.8	
N	12	
Max	44	
Min	5.4774	
Robust SD	4.6	
Robust CV	40%	


Results: S3 - PFBA
Assigned Value = 10.8 ± 2.2 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
13 22 10 24 27 4 28 1 17 35 12 2 25 3 6 7 8 9 11 14 15 16 18 19 20 23 26 29 30 31 32 34 36 37 38 Md RA SV


z-Scores: S3 - PFBA
Target Standard Deviation for Proficiency Assessment 2.2 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
13 22 10 24 27 4 28 1 17 35 12 2 25
-2.5 -1.8 -1.4 -0.6 0.1 0.2 0.5 0.7 1.2 1.2 3.7

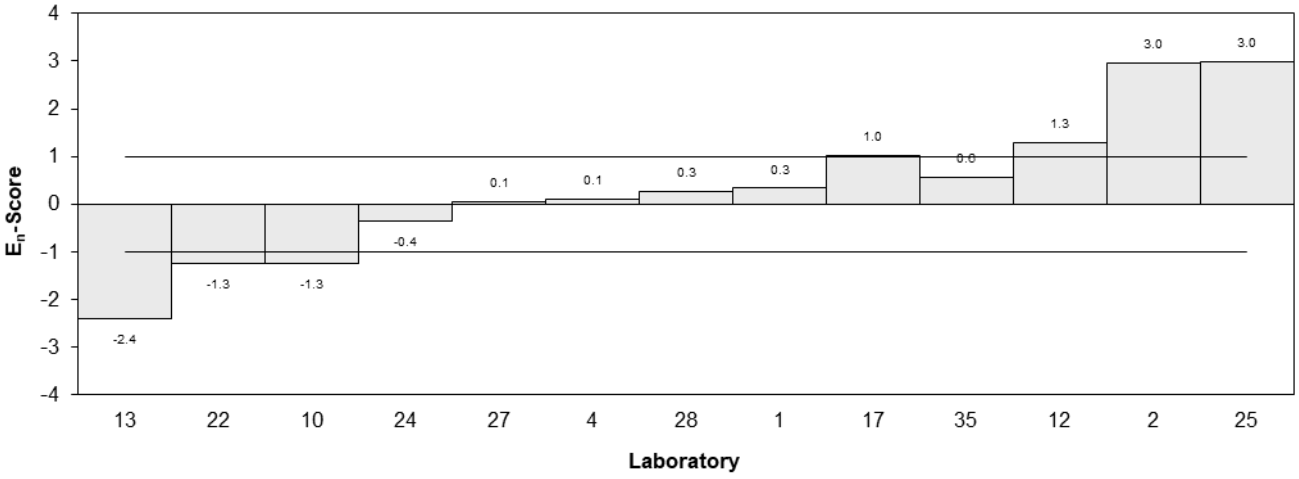

En-Scores: S3 - PFBA
En-Score
Laboratory
13 22 10 24 27 4 28 1 17 35 12 2 25
-2.4 -1.3 -1.3 -0.4 0.1 0.1 0.3 0.3 1.0 0.6 1.3 3.0 3.0

Figure 73

Table 78

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFPeA
Unit	µg/kg

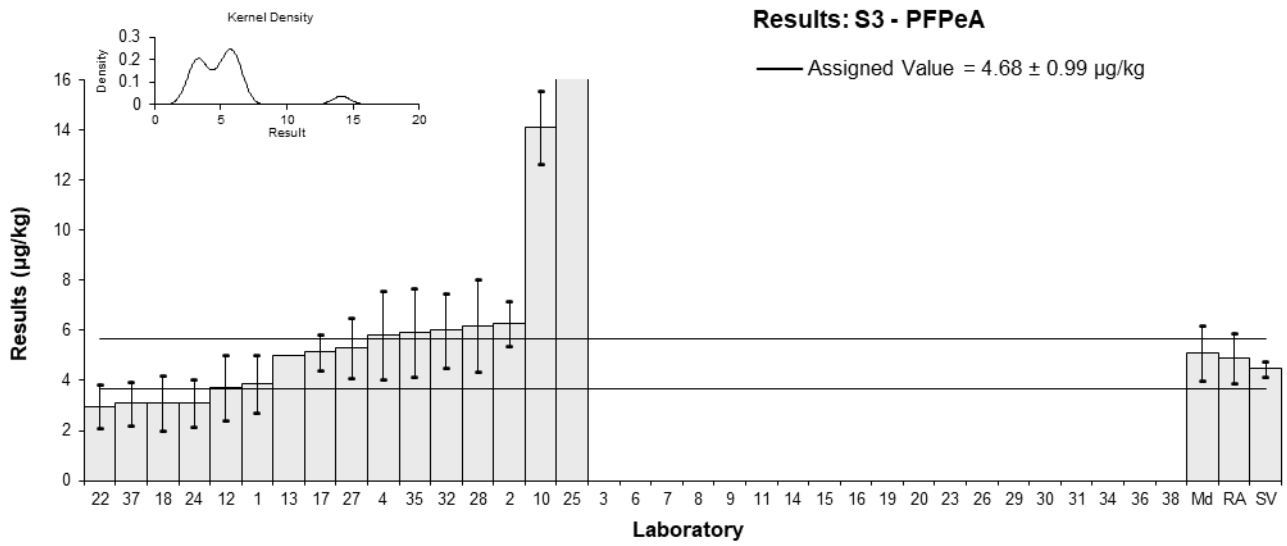
Participant Results

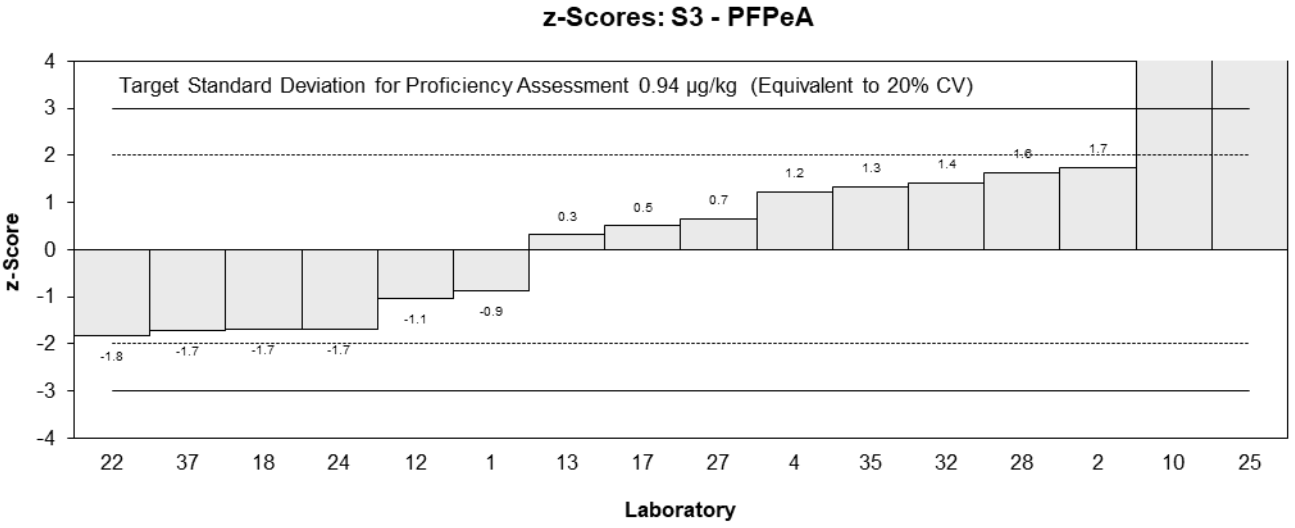
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	3.86	1.16	79	-0.88	-0.54
2	6.3	0.9	167	1.73	1.21
3	NS	NS	NS		
4	5.82	1.75	105	1.22	0.57
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10*	14.14	1.47	48	10.11	5.34
11	NT	NT	NT		
12	3.7	1.3	47	-1.05	-0.60
13	4.974	NR	NR	0.31	0.30
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	5.144	0.714	48	0.50	0.38
18	3.1	1.1	74	-1.69	-1.07
19	NT	NT	NT		
20	NS	NS	NS		
22	2.97	0.891	82	-1.83	-1.28
23	NS	NS	NS		
24	3.1	0.93	101	-1.69	-1.16
25**	530	71	92	561.24	7.40
26	NS	NS	NS		
27	5.3	1.2	61	0.66	0.40
28	6.20	1.86	81	1.62	0.72
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	6.0	1.5	67	1.41	0.73
34	NS	NS	NS		
35	5.93	1.779	45	1.34	0.61
36	NT	NT	NT		
37	3.08	0.89	102	-1.71	-1.20
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	4.68	0.99
Spike Value	4.47	0.30
Robust Average	4.9	1.0
Median	5.1	1.1
Mean	5.31	
N	15	
Max	14.14	
Min	2.97	
Robust SD	1.6	
Robust CV	33%	


Kernel Density
Density
Result
Results: S3 - PFPeA
Assigned Value = 4.68 ± 0.99 µg/kg
Results (µg/kg)
Laboratory
22 37 18 24 12 1 13 17 27 4 35 32 28 2 10 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFPeA
Target Standard Deviation for Proficiency Assessment 0.94 µg/kg (Equivalent to 20% CV)
z-Score
-1.8 -1.7 -1.7 -1.7 -1.1 -0.9 0.3 0.5 0.7 1.2 1.3 1.4 1.6 1.7
Laboratory
22 37 18 24 12 1 13 17 27 4 35 32 28 2 10 25

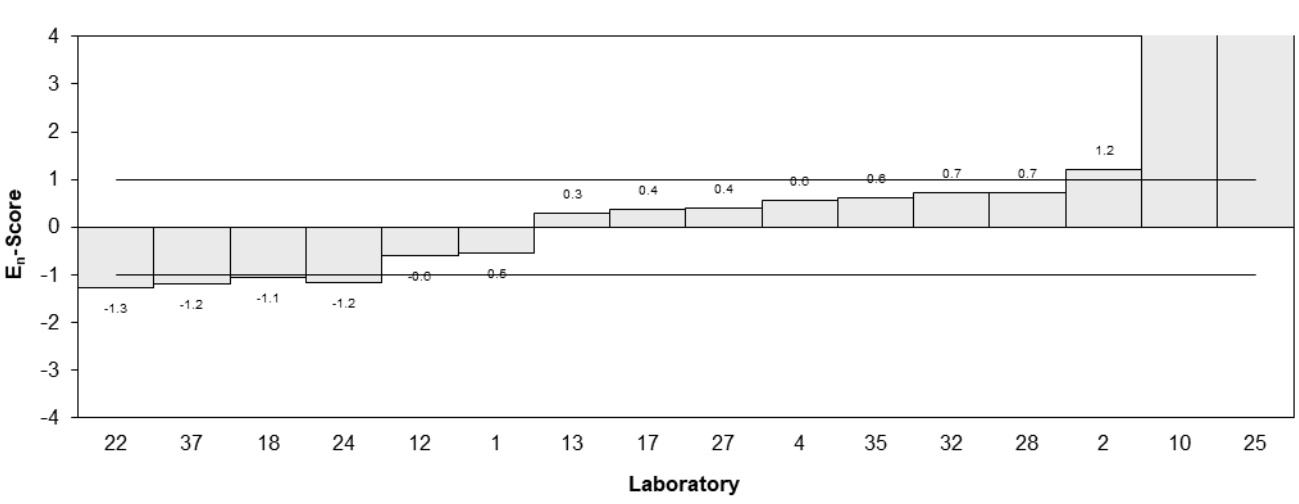

En-Scores: S3 - PFPeA
En-Score
-1.3 -1.2 -1.1 -1.2 -0.6 -0.5 0.3 0.4 0.4 0.6 0.6 0.7 0.7 1.2
Laboratory
22 37 18 24 12 1 13 17 27 4 35 32 28 2 10 25

Figure 74

Table 79

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHxA
Unit	µg/kg

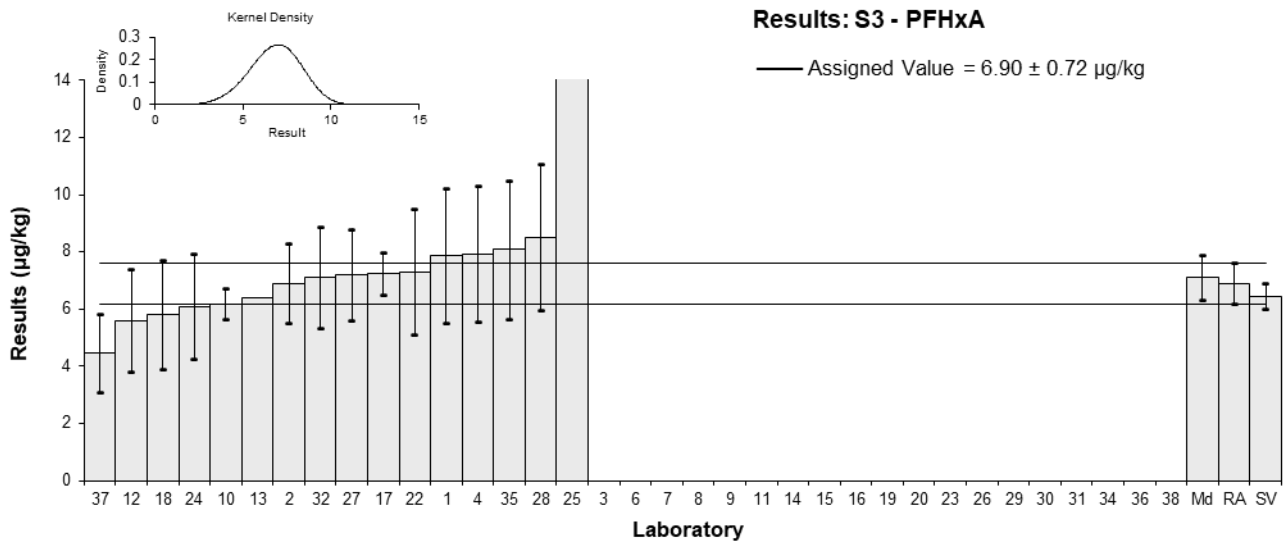
Participant Results

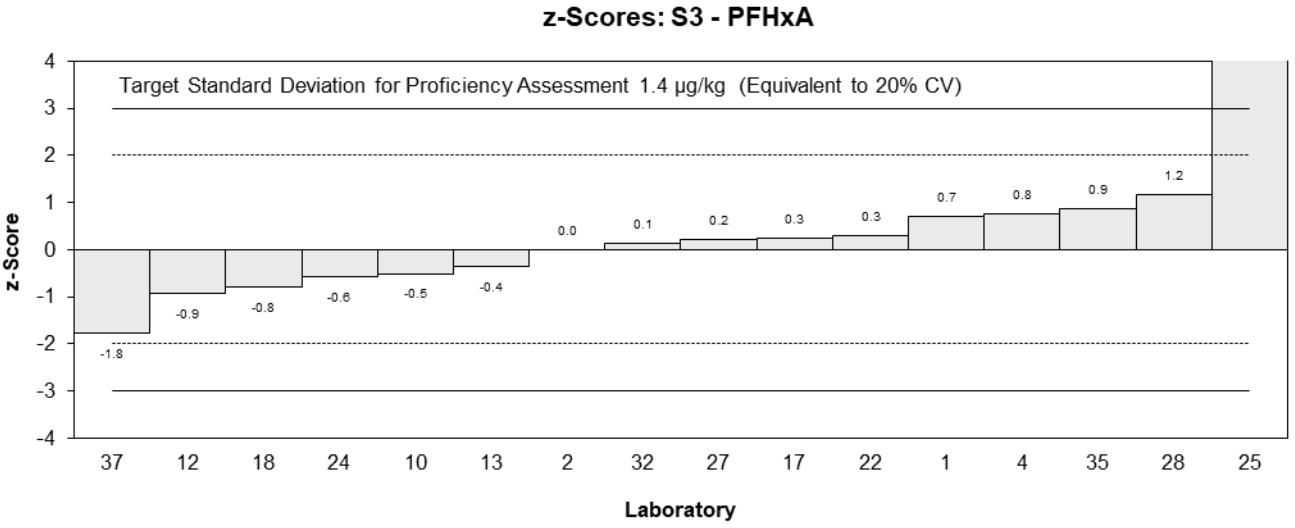
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	7.86	2.36	83	0.70	0.39
2	6.9	1.4	112	0.00	0.00
3	NS	NS	NS		
4	7.93	2.38	125	0.75	0.41
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	6.19	0.52	50	-0.51	-0.80
11	NT	NT	NT		
12	5.6	1.8	67	-0.94	-0.67
13	6.4035	NR	NR	-0.36	-0.69
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	7.241	0.726	68	0.25	0.33
18	5.8	1.9	74	-0.80	-0.54
19	NT	NT	NT		
20	NS	NS	NS		
22	7.3	2.19	114	0.29	0.17
23	NS	NS	NS		
24	6.1	1.83	119	-0.58	-0.41
25**	1200	160	65	864.57	7.46
26	NS	NS	NS		
27	7.2	1.6	83	0.22	0.17
28	8.51	2.553	87	1.17	0.61
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	7.1	1.775	90	0.14	0.10
34	NS	NS	NS		
35	8.09	2.427	60	0.86	0.47
36	NT	NT	NT		
37	4.45	1.36	97	-1.78	-1.59
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	6.90	0.72
Spike Value	6.45	0.45
Robust Average	6.90	0.72
Median	7.10	0.79
Mean	6.84	
N	15	
Max	8.51	
Min	4.45	
Robust SD	1.1	
Robust CV	16%	


Results: S3 - PFHxA
Assigned Value = 6.90 ± 0.72 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
37 12 18 24 10 13 2 32 27 17 22 1 4 35 28 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFHxA
Target Standard Deviation for Proficiency Assessment 1.4 µg/kg (Equivalent to 20% CV)
z-Score
-1.8 -0.9 -0.8 -0.6 -0.5 -0.4 0.0 0.1 0.2 0.3 0.3 0.7 0.8 0.9 1.2
Laboratory
37 12 18 24 10 13 2 32 27 17 22 1 4 35 28 25

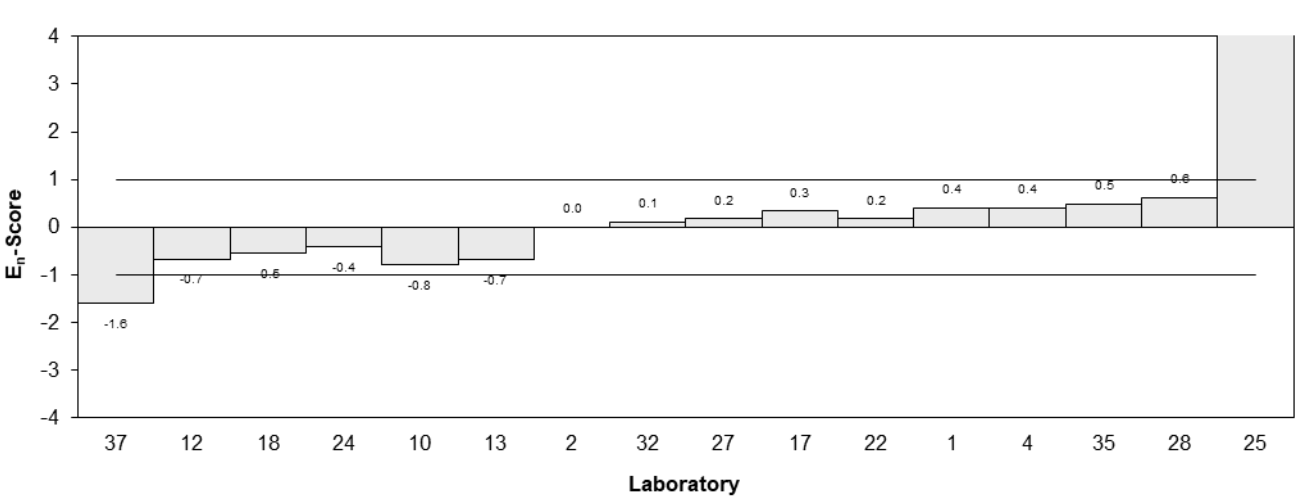

En-Scores: S3 - PFHxA
En-Score
-1.6 -0.7 -0.5 -0.4 -0.8 -0.7 0.0 0.1 0.2 0.3 0.2 0.4 0.4 0.5 0.6
Laboratory
37 12 18 24 10 13 2 32 27 17 22 1 4 35 28 25

Figure 75

Table 80

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFHpA
Unit	µg/kg

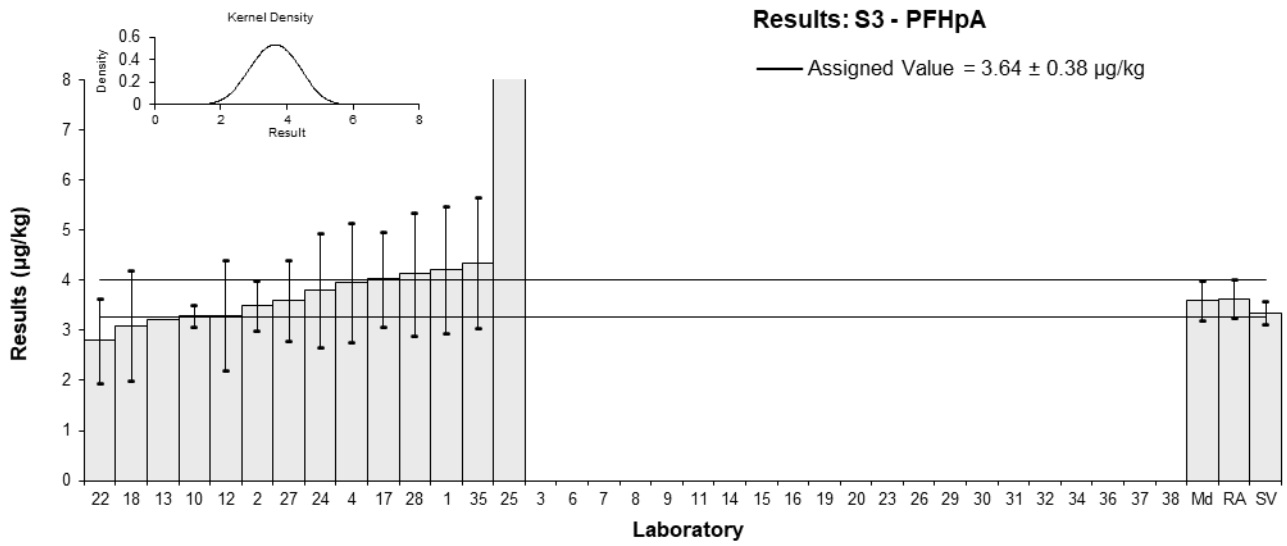
Participant Results

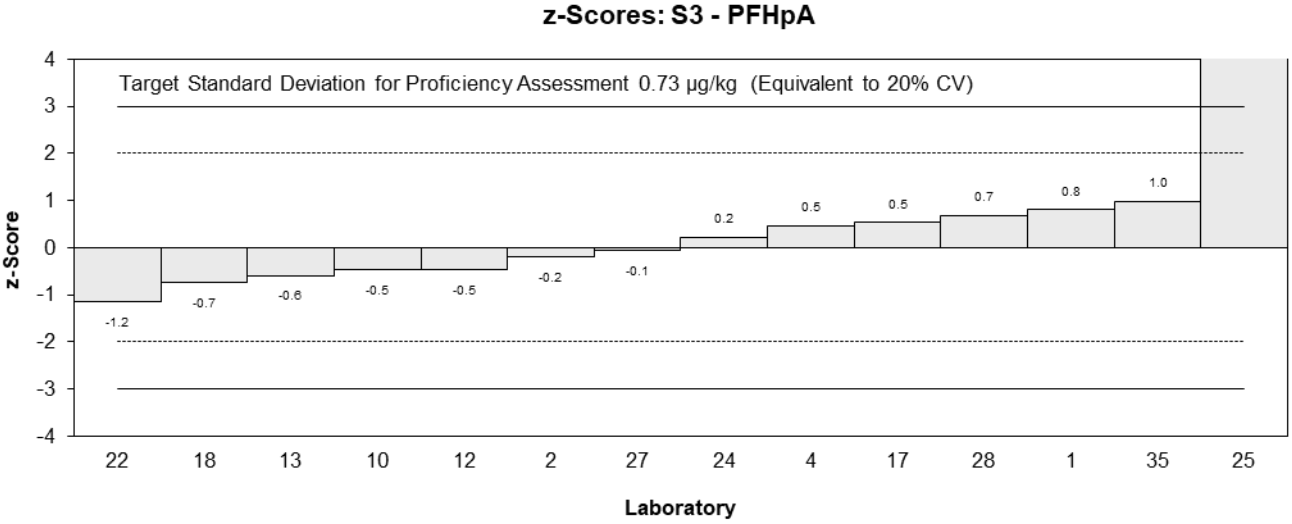
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	4.22	1.27	78	0.80	0.44
2	3.5	0.5	120	-0.19	-0.22
3	NS	NS	NS		
4	3.97	1.19	131	0.45	0.26
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	3.3	0.22	70	-0.47	-0.77
11	NT	NT	NT		
12	3.3	1.1	78	-0.47	-0.29
13	3.212	NR	NR	-0.59	-1.13
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	4.028	0.955	38	0.53	0.38
18	3.1	1.1	75	-0.74	-0.46
19	NT	NT	NT		
20	NS	NS	NS		
22	2.8	0.84	84	-1.15	-0.91
23	NS	NS	NS		
24	3.8	1.14	89	0.22	0.13
25**	160	40	95	214.78	3.91
26	NS	NS	NS		
27	3.6	0.8	89	-0.05	-0.05
28	4.13	1.239	88	0.67	0.38
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	<5	NR	NR		
34	NS	NS	NS		
35	4.35	1.305	46	0.98	0.52
36	NT	NT	NT		
37	<2.5	NR	97		
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	3.64	0.38
Spike Value	3.35	0.23
Robust Average	3.64	0.38
Median	3.60	0.40
Mean	3.64	
N	13	
Max	4.35	
Min	2.8	
Robust SD	0.54	
Robust CV	15%	


Results: S3 - PFHpA
Assigned Value = 3.64 ± 0.38 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
22 18 13 10 12 2 27 24 4 17 28 1 35 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 32 34 36 37 38 Md RA SV
Laboratory


z-Scores: S3 - PFHpA
Target Standard Deviation for Proficiency Assessment 0.73 µg/kg (Equivalent to 20% CV)
z-Score
-1.2 -0.7 -0.6 -0.5 -0.5 -0.2 -0.1 0.2 0.5 0.5 0.7 0.8 1.0
22 18 13 10 12 2 27 24 4 17 28 1 35 25
Laboratory

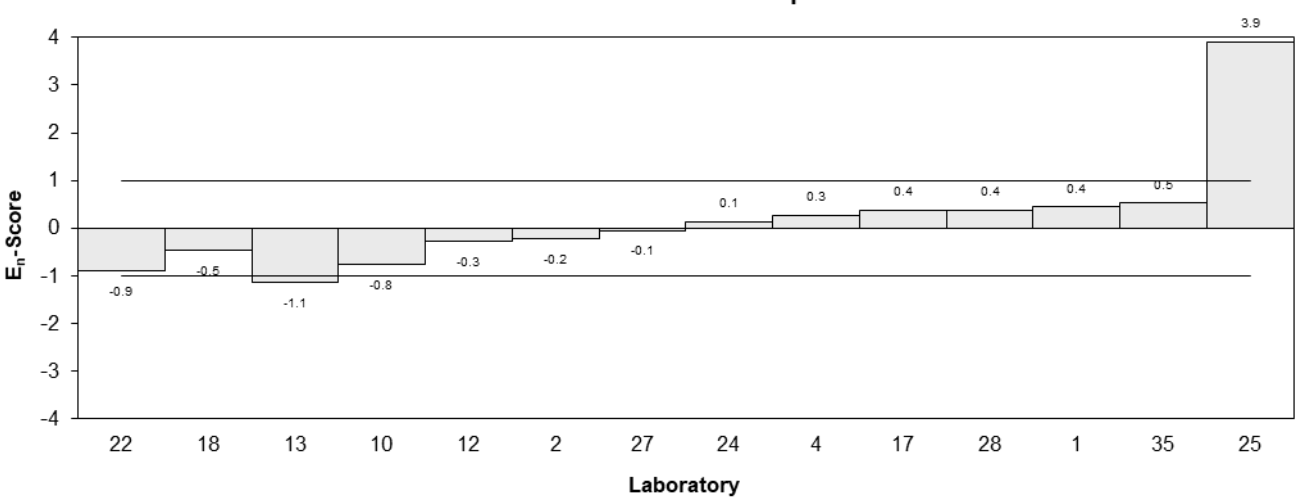

En-Scores: S3 - PFHpA
En-Score
-0.9 -0.5 -1.1 -0.8 -0.3 -0.2 -0.1 0.1 0.3 0.4 0.4 0.4 0.5 3.9
22 18 13 10 12 2 27 24 4 17 28 1 35 25
Laboratory

Figure 76

Table 81

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOA
Unit	µg/kg

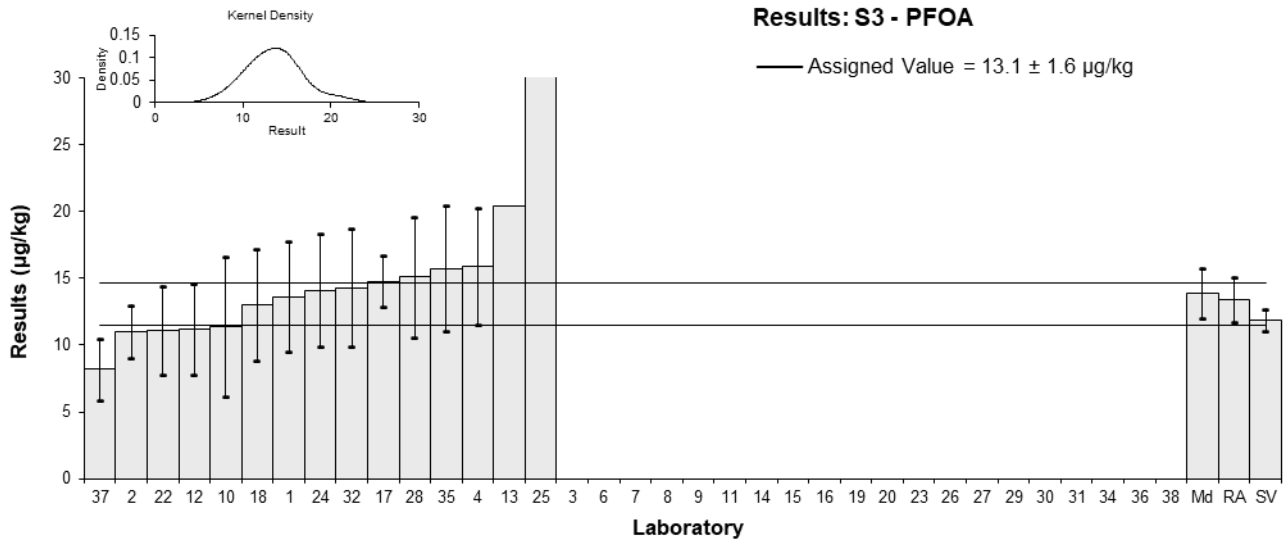
Participant Results

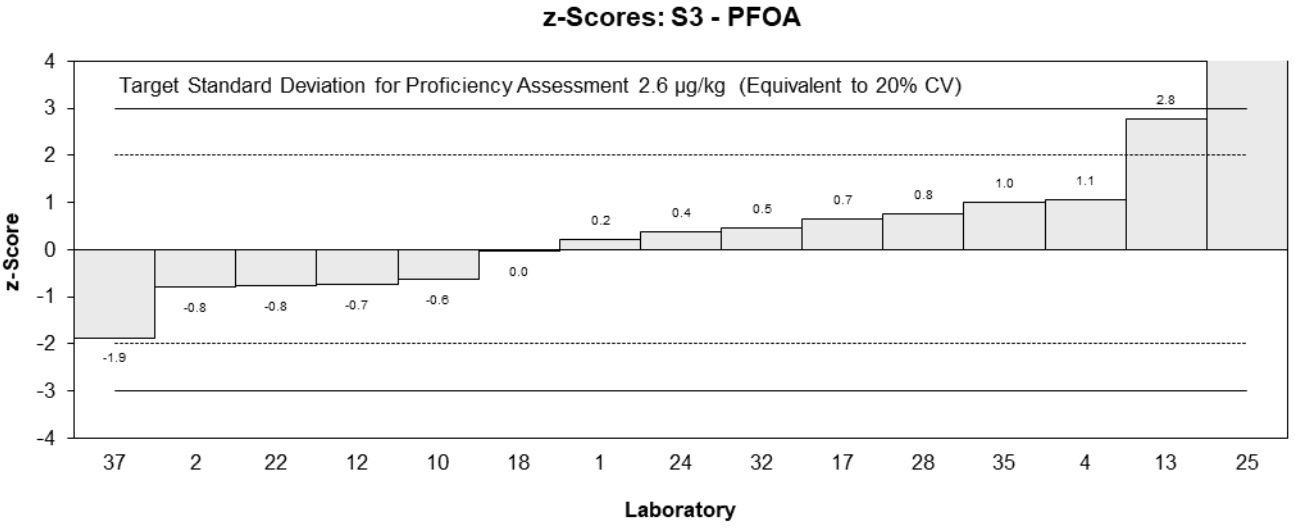
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	13.65	4.10	84	0.21	0.12
2	11	2	104	-0.80	-0.82
3	NS	NS	NS		
4	15.90	4.39	128	1.07	0.60
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	11.42	5.25	94	-0.64	-0.31
11	NT	NT	NT		
12	11.2	3.4	86	-0.73	-0.51
13*	20.3832	NR	NR	2.78	4.55
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	14.8	1.91	46	0.65	0.68
18	13	4.2	76	-0.04	-0.02
19	NT	NT	NT		
20	NS	NS	NS		
22	11.1	3.33	106	-0.76	-0.54
23	NS	NS	NS		
24	14.1	4.23	99	0.38	0.22
25**	490	70	75	182.02	6.81
26	NS	NS	NS		
27	<0.1	0.1	82		
28	15.1	4.53	92	0.76	0.42
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	14.3	4.433	86	0.46	0.25
34	NS	NS	NS		
35	15.73	4.719	57	1.00	0.53
36	NT	NT	NT		
37	8.21	2.3	100	-1.87	-1.75
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	13.1	1.6
Spike Value	11.9	0.8
Robust Average	13.4	1.7
Median	13.9	1.9
Mean	13.6	
N	14	
Max	20.3832	
Min	8.21	
Robust SD	2.6	
Robust CV	19%	


Results: S3 - PFOA
Assigned Value = 13.1 ± 1.6 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
37 2 22 12 10 18 1 24 32 17 28 35 4 13 25 3 6 7 8 9 11 14 15 16 19 20 23 26 27 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFOA
Target Standard Deviation for Proficiency Assessment 2.6 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
37 2 22 12 10 18 1 24 32 17 28 35 4 13 25
-1.9 -0.8 -0.8 -0.7 -0.6 0.0 0.2 0.4 0.5 0.7 0.8 1.0 1.1 2.8

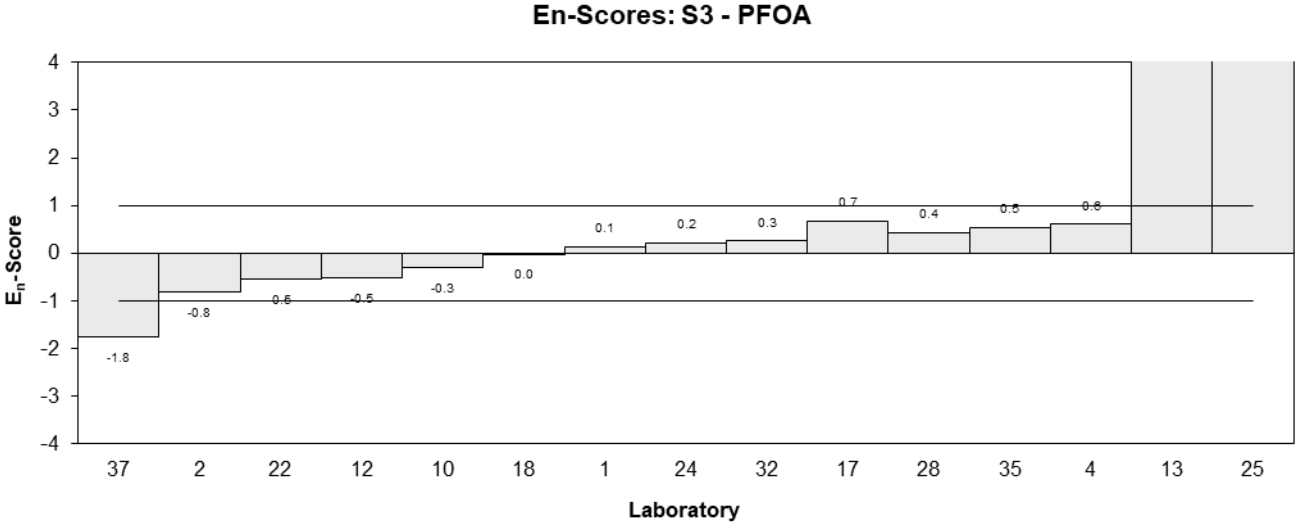

En-Scores: S3 - PFOA
En-Score
Laboratory
37 2 22 12 10 18 1 24 32 17 28 35 4 13 25
-1.8 -0.8 -0.6 -0.5 -0.3 0.0 0.1 0.2 0.3 0.7 0.4 0.5 0.6

Figure 77

Table 82

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFNA
Unit	µg/kg

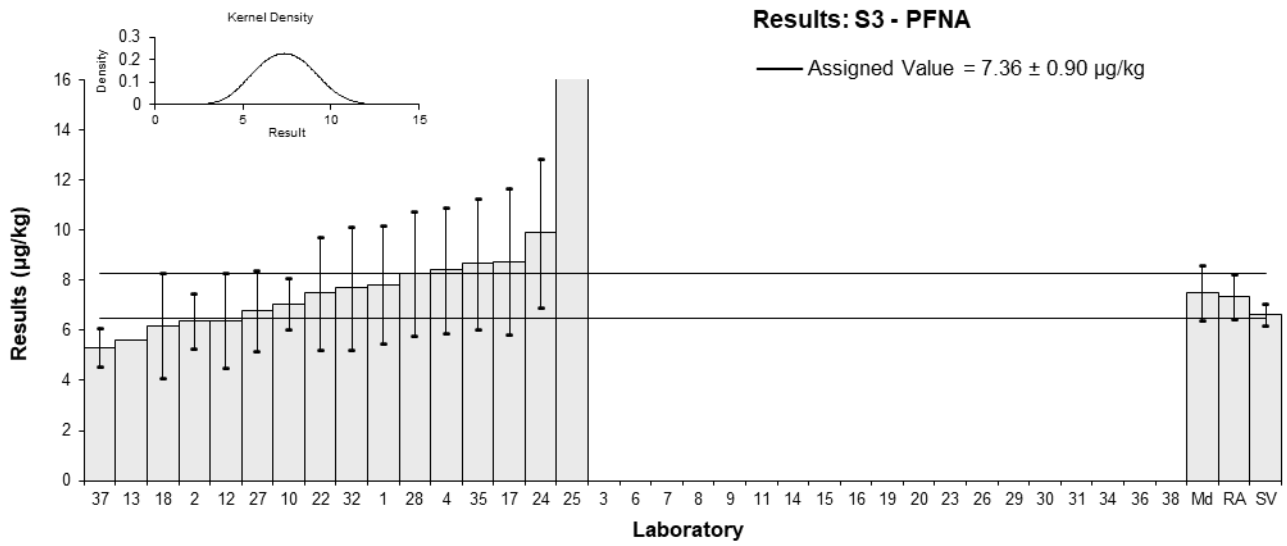
Participant Results

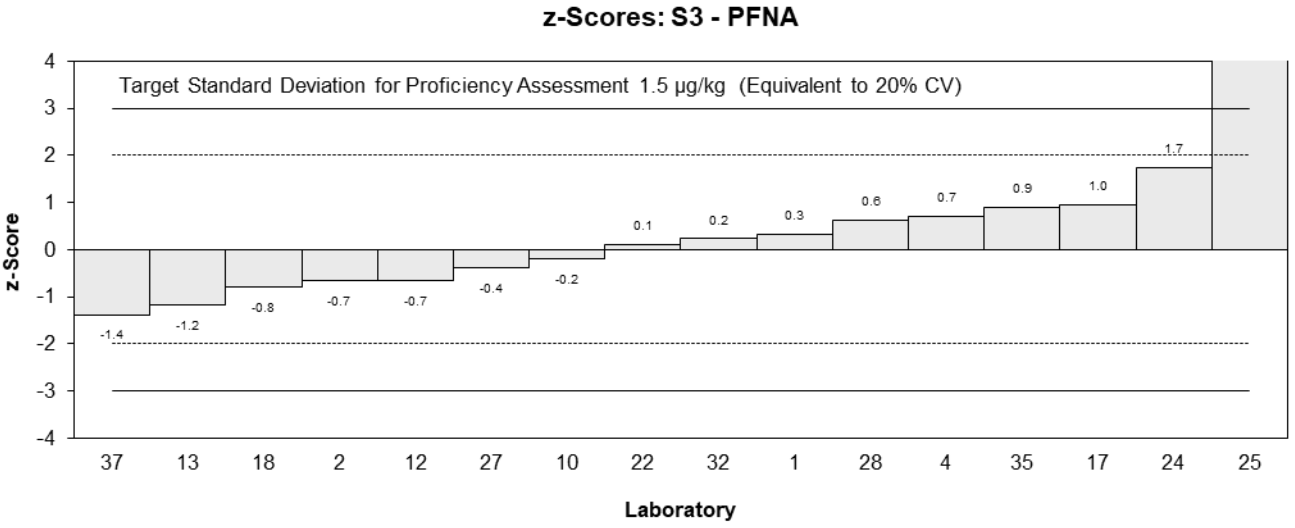
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	7.84	2.35	82	0.33	0.19
2	6.4	1.1	88	-0.65	-0.68
3	NS	NS	NS		
4	8.41	2.52	124	0.71	0.39
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	7.06	1.02	138	-0.20	-0.22
11	NT	NT	NT		
12	6.4	1.9	100	-0.65	-0.46
13	5.6217	NR	NR	-1.18	-1.93
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	8.76	2.94	56	0.95	0.46
18	6.2	2.1	85	-0.79	-0.51
19	NT	NT	NT		
20	NS	NS	NS		
22	7.5	2.25	110	0.10	0.06
23	NS	NS	NS		
24	9.9	2.97	130	1.73	0.82
25**	61	21	95	36.44	2.55
26	NS	NS	NS		
27	6.8	1.6	83	-0.38	-0.31
28	8.27	2.481	95	0.62	0.34
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	7.7	2.464	74	0.23	0.13
34	NS	NS	NS		
35	8.67	2.601	60	0.89	0.48
36	NT	NT	NT		
37	5.33	0.78	122	-1.38	-1.70
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	7.36	0.90
Spike Value	6.64	0.45
Robust Average	7.36	0.90
Median	7.5	1.1
Mean	7.39	
N	15	
Max	9.9	
Min	5.33	
Robust SD	1.4	
Robust CV	19%	


Results: S3 - PFNA
Assigned Value = 7.36 ± 0.90 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
37 13 18 2 12 27 10 22 32 1 28 4 35 17 24 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFNA
Target Standard Deviation for Proficiency Assessment 1.5 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
37 13 18 2 12 27 10 22 32 1 28 4 35 17 24 25
-1.4 -1.2 -0.8 -0.7 -0.7 -0.4 -0.2 0.1 0.2 0.3 0.6 0.7 0.9 1.0 1.7

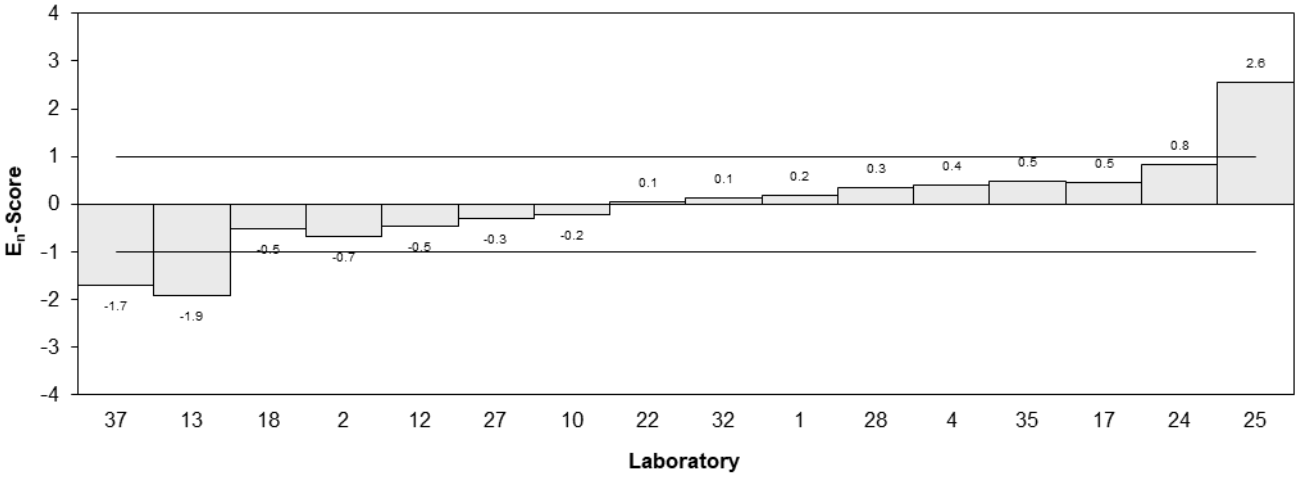

En-Scores: S3 - PFNA
En-Score
Laboratory
37 13 18 2 12 27 10 22 32 1 28 4 35 17 24 25
-1.7 -1.9 -0.5 -0.7 -0.5 -0.3 -0.2 0.1 0.1 0.2 0.3 0.4 0.5 0.5 0.8 2.6

Figure 78

Table 83

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFDA
Unit	µg/kg

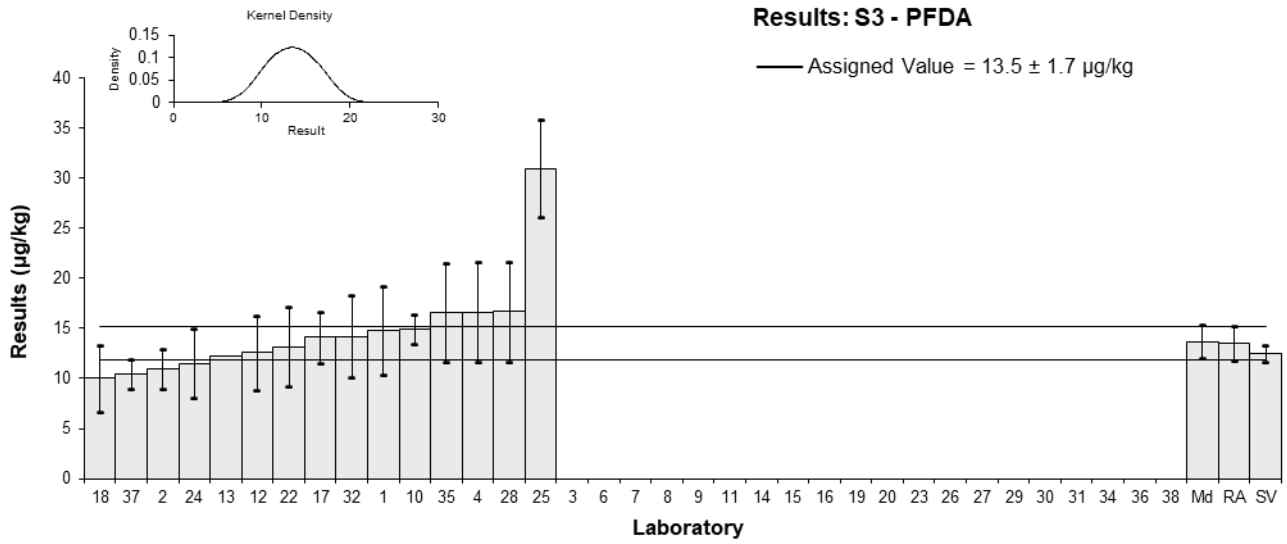
Participant Results

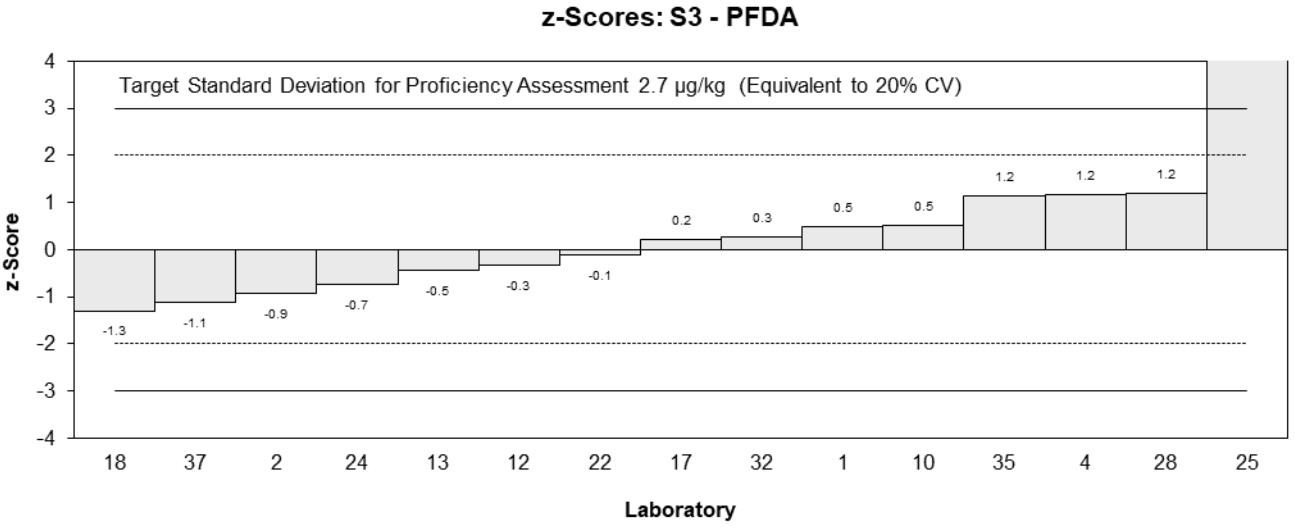
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	14.80	4.44	82	0.48	0.27
2	11	2	100	-0.93	-0.95
3	NS	NS	NS		
4	16.66	5.00	138	1.17	0.60
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	14.9	1.45	86	0.52	0.63
11	NT	NT	NT		
12	12.6	3.7	113	-0.33	-0.22
13	12.2867	NR	NR	-0.45	-0.71
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	14.1	2.5	40	0.22	0.20
18	10	3.3	80	-1.30	-0.94
19	NT	NT	NT		
20	NS	NS	NS		
22	13.2	3.96	71	-0.11	-0.07
23	NS	NS	NS		
24	11.5	3.45	111	-0.74	-0.52
25**	31	4.9	97	6.48	3.37
26	NS	NS	NS		
27	<0.1	0.1	83		
28	16.7	5.01	102	1.19	0.60
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	14.2	4.118	121	0.26	0.16
34	NS	NS	NS		
35	16.6	4.98	52	1.15	0.59
36	NT	NT	NT		
37	10.46	1.49	122	-1.13	-1.34
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	13.5	1.7
Spike Value	12.5	0.8
Robust Average	13.5	1.7
Median	13.7	1.7
Mean	13.5	
N	14	
Max	16.7	
Min	10	
Robust SD	2.6	
Robust CV	19%	


Results: S3 - PFDA
Assigned Value = 13.5 ± 1.7 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
18 37 2 24 13 12 22 17 32 1 10 35 4 28 25 3 6 7 8 9 11 14 15 16 19 20 23 26 27 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFDA
Target Standard Deviation for Proficiency Assessment 2.7 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
18 37 2 24 13 12 22 17 32 1 10 35 4 28 25
-1.3 -1.1 -0.9 -0.7 -0.5 -0.3 -0.1 0.2 0.3 0.5 0.5 1.2 1.2 1.2

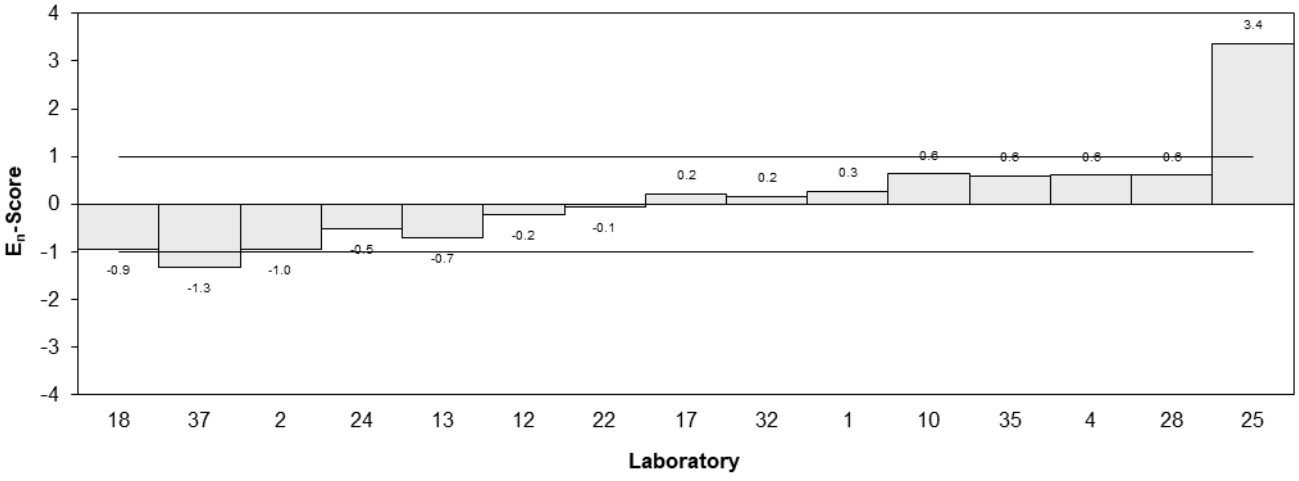

En-Scores: S3 - PFDA
En-Score
Laboratory
18 37 2 24 13 12 22 17 32 1 10 35 4 28 25
-0.9 -1.3 -1.0 -0.5 -0.7 -0.2 -0.1 0.2 0.2 0.3 0.6 0.6 0.6 0.6 3.4

Figure 79

Table 84

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFUdA
Unit	µg/kg

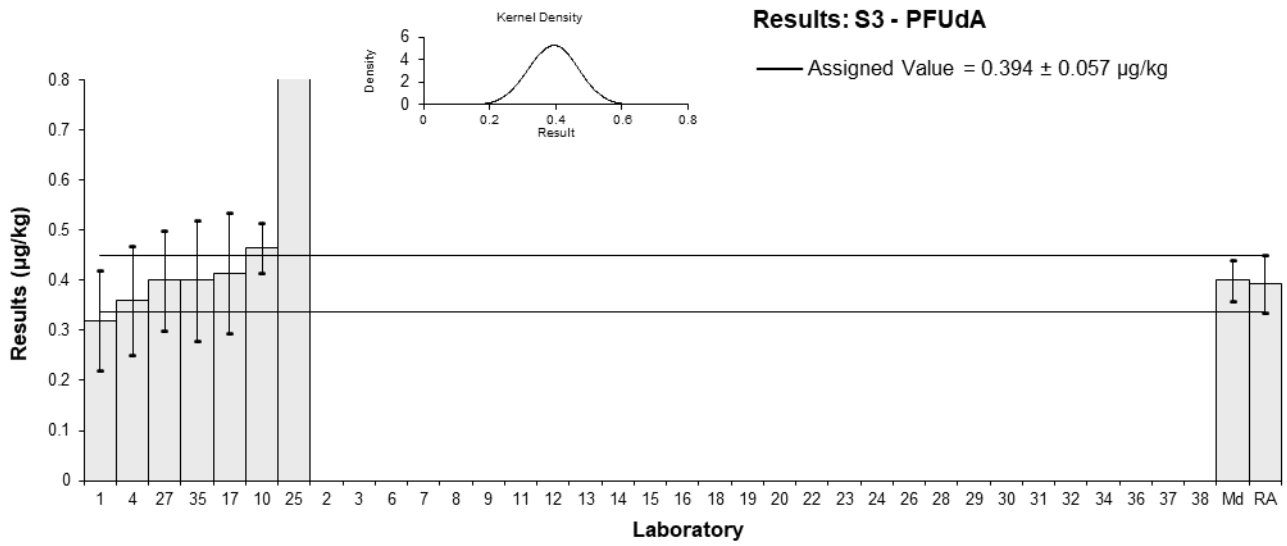
Participant Results

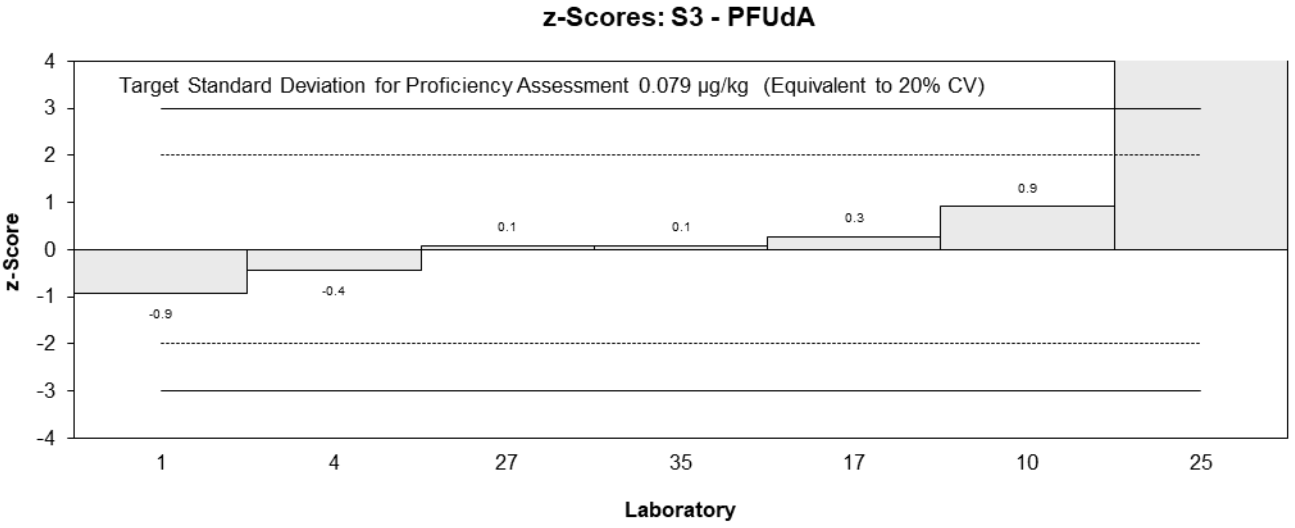
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.32	0.10	85	-0.94	-0.64
2	NR	NR	NR		
3	NS	NS	NS		
4	0.36	0.11	80	-0.43	-0.27
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	0.466	0.05	78	0.91	0.95
11	NT	NT	NT		
12	<1	NR	111		
13	<1	NR	NR		
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	0.415	0.12	41	0.27	0.16
18	< 5	NR	80		
19	NT	NT	NT		
20	NS	NS	NS		
22	<0.5	NR	NR		
23	NS	NS	NS		
24	<0.5	NR	NR		
25**	8.7	2.0	87	105.41	4.15
26	NS	NS	NS		
27	0.4	0.1	62	0.08	0.05
28	<1.89	0.567	91		
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	<2.5	NR	NR		
34	NS	NS	NS		
35	0.4	0.12	47	0.08	0.05
36	NT	NT	NT		
37	<2.5	NR	58		
38	NR	NR	NR		

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	0.394	0.057
Spike Value	Not Spiked	
Robust Average	0.394	0.057
Median	0.400	0.042
Mean	0.394	
N	6	
Max	0.466	
Min	0.32	
Robust SD	0.056	
Robust CV	14%	


Kernel Density
Density
Result
Results: S3 - PFUdA
Assigned Value = 0.394 ± 0.057 µg/kg
Results (µg/kg)
Laboratory
1 4 27 35 17 10 25 2 3 6 7 8 9 11 12 13 14 15 16 18 19 20 22 23 24 26 28 29 30 31 32 34 36 37 38 Md RA


z-Scores: S3 - PFUdA
Target Standard Deviation for Proficiency Assessment 0.079 µg/kg (Equivalent to 20% CV)
z-Score
-0.9
-0.4
0.1
0.1
0.3
0.9
Laboratory
1 4 27 35 17 10 25

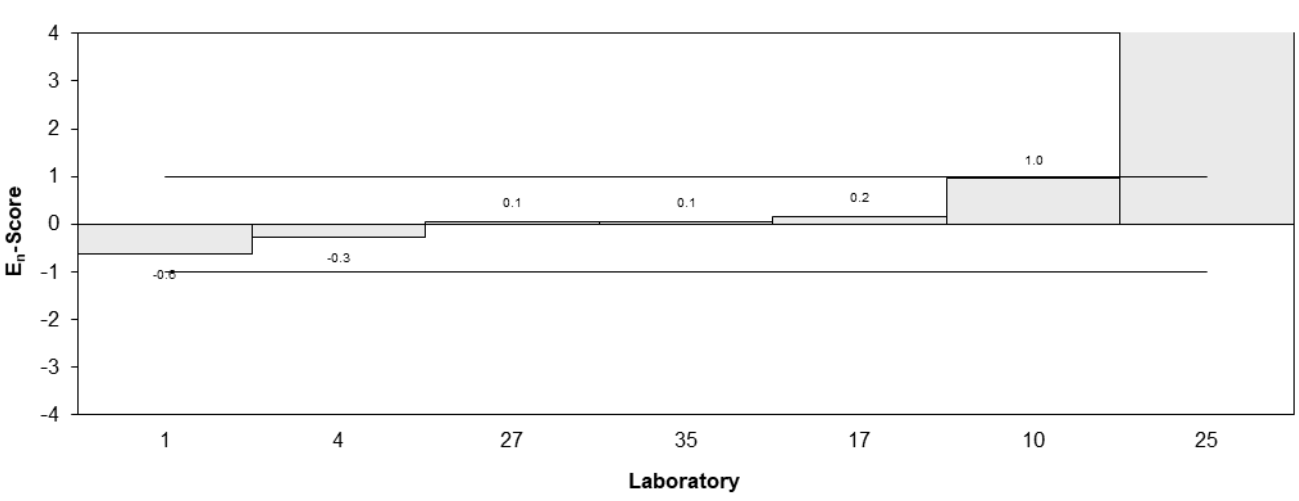

En-Scores: S3 - PFUdA
En-Score
-0.6
-0.3
0.1
0.1
0.2
1.0
Laboratory
1 4 27 35 17 10 25

Figure 80

Table 85

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFDoA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	0.78	0.24	84
2	NR	NR	NR
3	NS	NS	NS
4	0.90	0.27	79
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	1.55	0.18	52
11	NT	NT	NT
12	1.1	0.6	100
13	<1	NR	NR
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	1.93	0.398	28
18	< 5	NR	98
19	NT	NT	NT
20	NS	NS	NS
22	<0.5	NR	NR
23	NS	NS	NS
24	<0.5	NR	NR
25**	1.7	0.29	141
26	NS	NS	NS
27	1.7	0.4	38
28	1.72	0.516	64
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	<2.5	NR	NR
34	NS	NS	NS
35	1.04	0.312	48
36	NT	NT	NT
37	<2.5	NR	44
38	NR	NR	NR

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	Not Spiked	
Robust Average	1.34	0.44
Median	1.33	0.50
Mean	1.34	
N	8	
Max	1.93	
Min	0.78	
Robust SD	0.49	
Robust CV	37%	

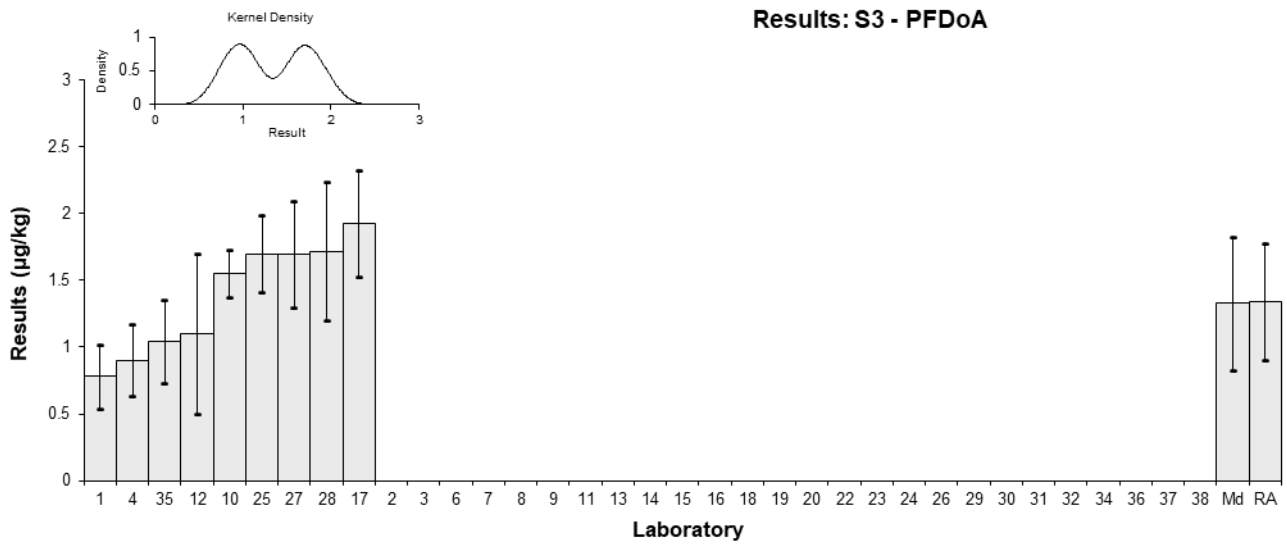

Results: S3 - PFDoA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
1 4 35 12 10 25 27 28 17 2 3 6 7 8 9 11 13 14 15 16 18 19 20 22 23 24 26 29 30 31 32 34 36 37 38 Md RA

Figure 81

Table 86

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFTrDA
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	8.64	2.59	79
2	7.3	1.1	119
3	NS	NS	NS
4	5.55	1.66	129
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	10.18	2.74	NR
11	NT	NT	NT
12	17.3	5.5	NR
13	17.5552	NR	NR
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	28.5	18.3	28
18	22	7.4	80
19	NT	NT	NT
20	NS	NS	NS
22	5.6	1.68	55
23	NS	NS	NS
24	4.5	1.35	64
25	<1.0	NR	141
26	NS	NS	NS
27	35	8	NR
28	16.8	5.04	64
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	14.2	4.828	39
34	NS	NS	NS
35	4.28	1.284	169
36	NT	NT	NT
37	9.14	0.83	44
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	22.5	1.5
Robust Average	13.0	5.5
Median	10.2	5.4
Mean	13.8	
N	15	
Max	35	
Min	4.28	
Robust SD	8.6	
Robust CV	66%	

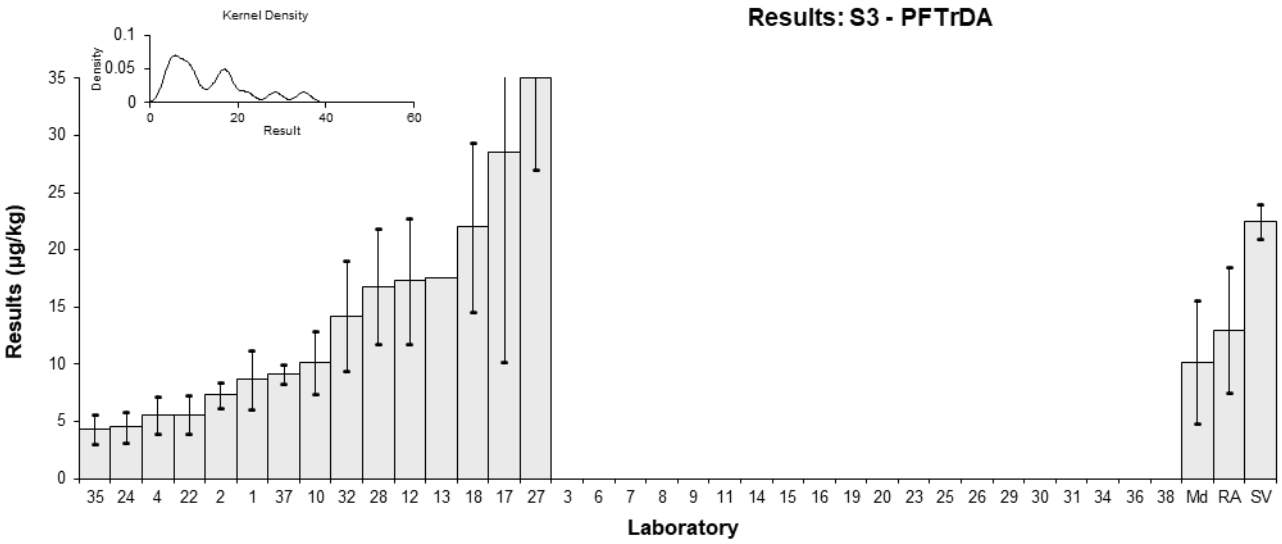

Results: S3 - PFTrDA
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
35 24 4 22 2 1 37 10 32 28 12 13 18 17 27 3 6 7 8 9 11 14 15 16 19 20 23 25 26 29 30 31 34 36 38 Md RA SV

Figure 82

Table 87

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	PFOSA
Unit	µg/kg

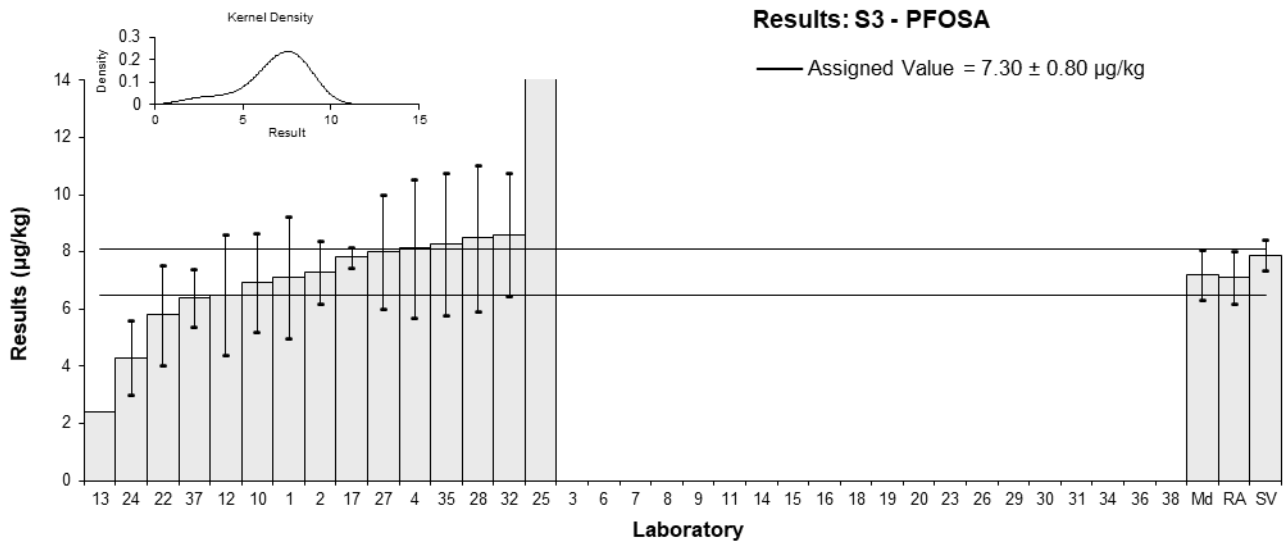
Participant Results

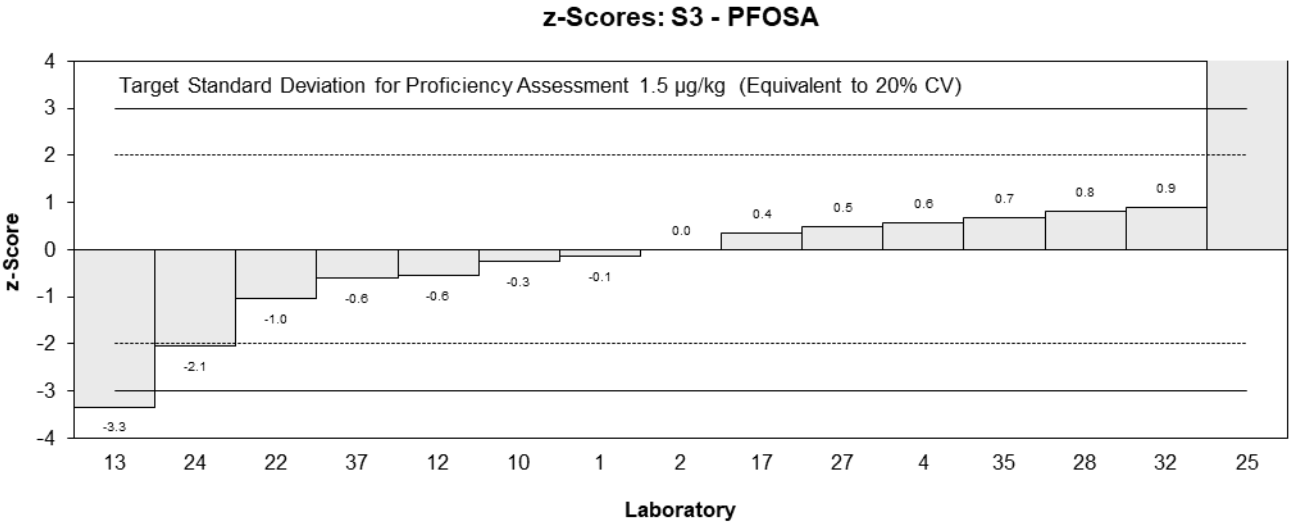
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	7.09	2.13	84	-0.14	-0.09
2	7.3	1.1	102	0.00	0.00
3	NS	NS	NS		
4	8.12	2.44	110	0.56	0.32
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	6.92	1.73	140	-0.26	-0.20
11	NT	NT	NT		
12	6.5	2.1	NR	-0.55	-0.36
13*	2.4179	NR	NR	-3.34	-6.10
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	7.81	0.35	37	0.35	0.58
18	< 10	NR	84		
19	NT	NT	NT		
20	NS	NS	NS		
22	5.8	1.74	101	-1.03	-0.78
23	NS	NS	NS		
24	4.3	1.29	84	-2.05	-1.98
25**	60	7.1	86	36.10	7.38
26	NS	NS	NS		
27	8	2	68	0.48	0.32
28	8.49	2.547	70	0.82	0.45
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	8.6	2.15	46	0.89	0.57
34	NS	NS	NS		
35	8.28	2.484	15	0.67	0.38
36	NT	NT	NT		
37	6.41	1.01	60	-0.61	-0.69
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	7.30	0.80
Spike Value	7.89	0.53
Robust Average	7.10	0.91
Median	7.20	0.86
Mean	6.86	
N	14	
Max	8.6	
Min	2.4179	
Robust SD	1.4	
Robust CV	19%	


Results: S3 - PFOSA
Assigned Value = 7.30 ± 0.80 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
13 24 22 37 12 10 1 2 17 27 4 35 28 32 25 3 6 7 8 9 11 14 15 16 18 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - PFOSA
Target Standard Deviation for Proficiency Assessment 1.5 µg/kg (Equivalent to 20% CV)
z-Score
-3.3 -2.1 -1.0 -0.6 -0.6 -0.3 -0.1 0.0 0.4 0.5 0.6 0.7 0.8 0.9
Laboratory
13 24 22 37 12 10 1 2 17 27 4 35 28 32 25

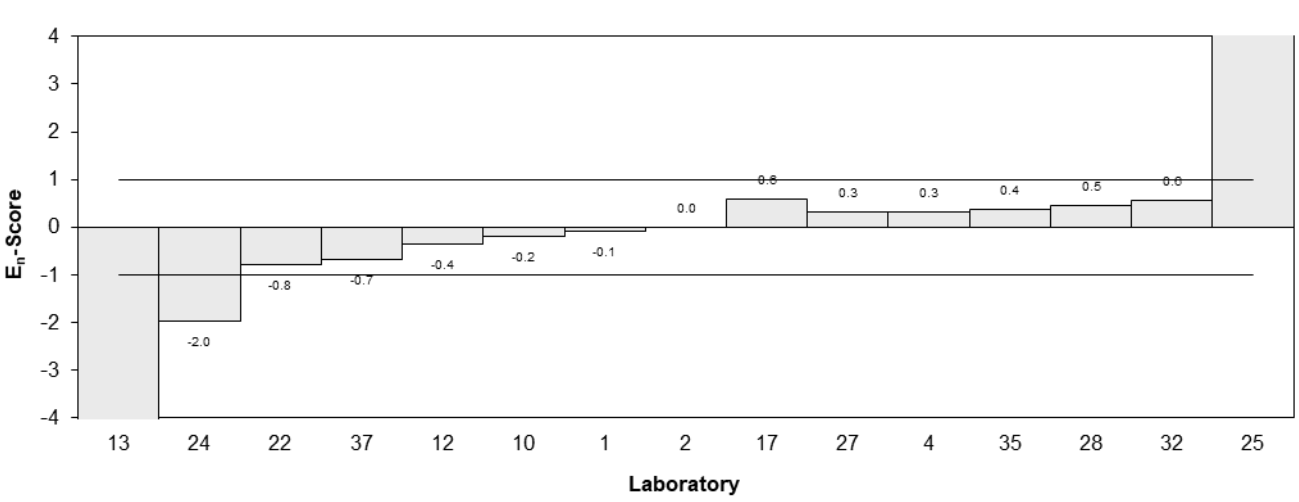

En-Scores: S3 - PFOSA
En-Score
-2.0 -0.8 -0.7 -0.4 -0.2 -0.1 0.0 0.6 0.3 0.3 0.4 0.5 0.6
Laboratory
13 24 22 37 12 10 1 2 17 27 4 35 28 32 25

Figure 83

Table 88

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	MeFOSAA
Unit	µg/kg

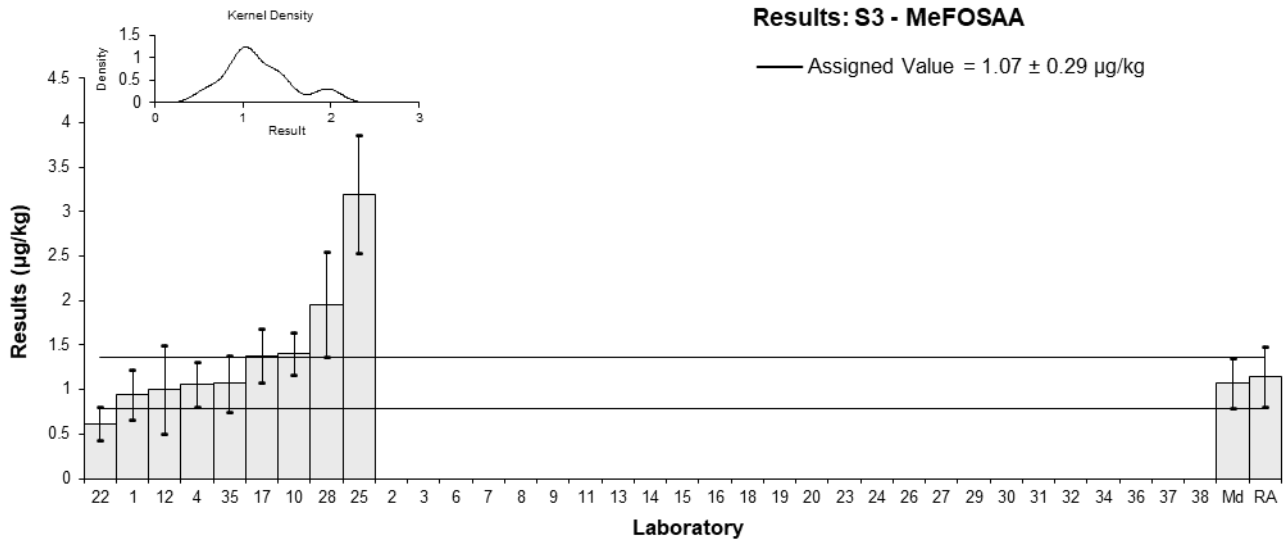
Participant Results

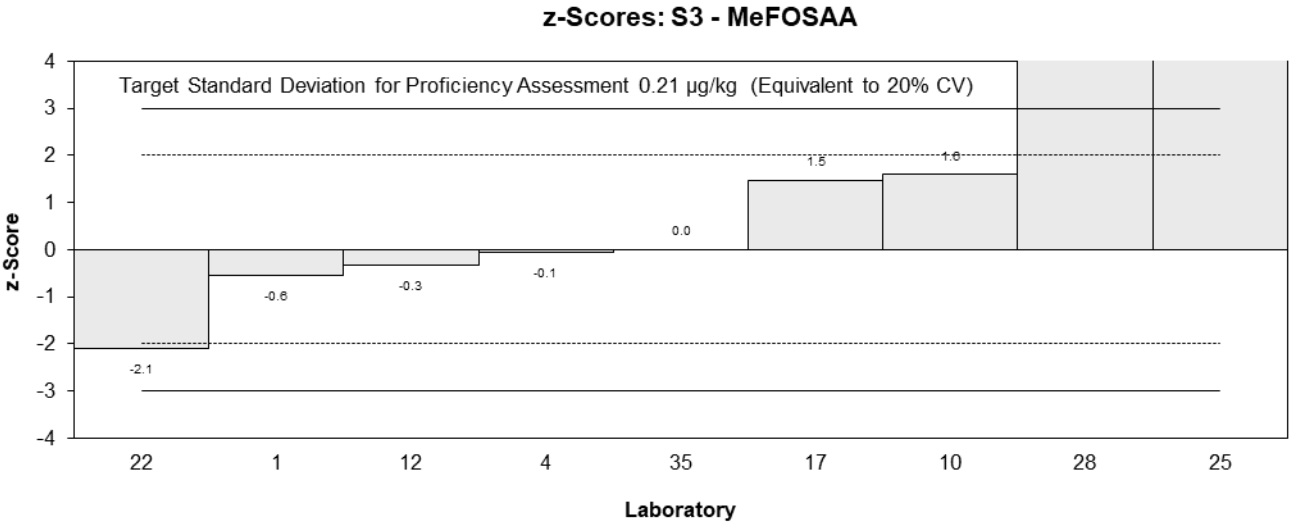
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	0.95	0.28	77	-0.56	-0.30
2	NR	NR	NR		
3	NS	NS	NS		
4	1.06	0.25	131	-0.05	-0.03
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	1.41	0.24	206	1.59	0.90
11	NT	NT	NT		
12	1	0.5	123	-0.33	-0.12
13	<1	NR	NR		
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	1.382	0.3	40	1.46	0.75
18	< 2	NR	80		
19	NT	NT	NT		
20	NS	NS	NS		
22	0.62	0.186	79	-2.10	-1.31
23	NS	NS	NS		
24	<0.5	NR	NR		
25**	3.2	0.66	151	9.95	2.95
26	NS	NS	NS		
27	<5	5	53		
28*	1.96	0.588	112	4.16	1.36
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	<10	NR	NR		
34	NS	NS	NS		
35	1.07	0.321	13	0.00	0.00
36	NT	NT	NT		
37	<10	NR	70		
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	1.07	0.29
Spike Value	Not Spiked	
Robust Average	1.15	0.34
Median	1.07	0.28
Mean	1.18	
N	8	
Max	1.96	
Min	0.62	
Robust SD	0.39	
Robust CV	34%	


Results: S3 - MeFOSAA
Assigned Value = 1.07 ± 0.29 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
22 1 12 4 35 17 10 28 25 2 3 6 7 8 9 11 13 14 15 16 18 19 20 23 24 26 27 29 30 31 32 34 36 37 38 Md RA
Laboratory


z-Scores: S3 - MeFOSAA
Target Standard Deviation for Proficiency Assessment 0.21 µg/kg (Equivalent to 20% CV)
z-Score
-2.1
-0.6
-0.3
-0.1
0.0
1.5
1.6
22 1 12 4 35 17 10 28 25
Laboratory

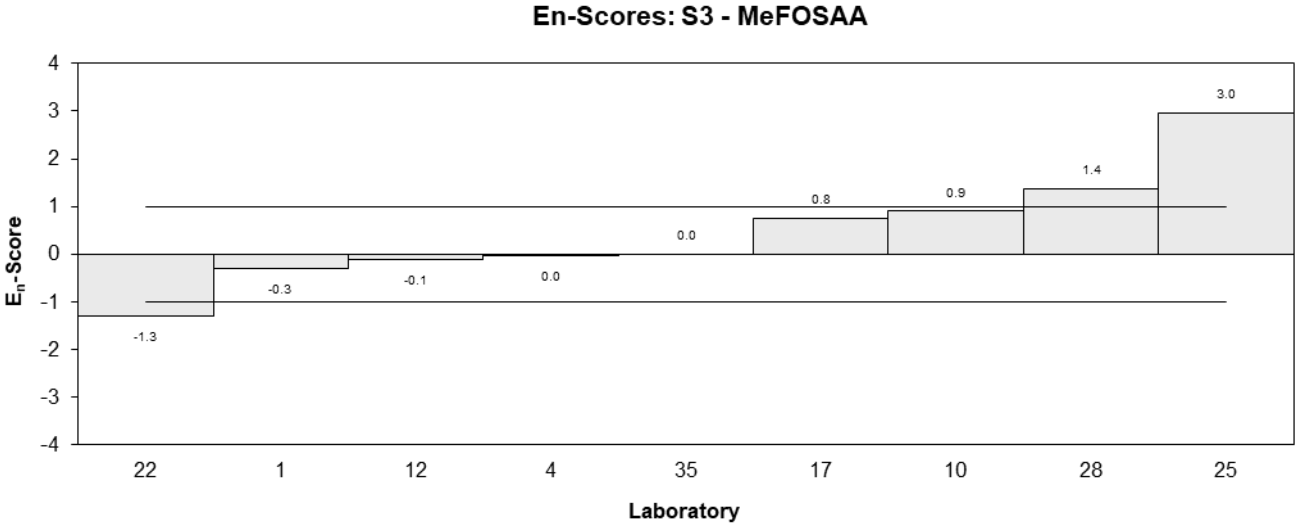

En-Scores: S3 - MeFOSAA
En-Score
-1.3
-0.3
-0.1
0.0
0.0
0.8
0.9
1.4
3.0
22 1 12 4 35 17 10 28 25
Laboratory

Figure 84

Table 89

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	EtFOSAA
Unit	µg/kg

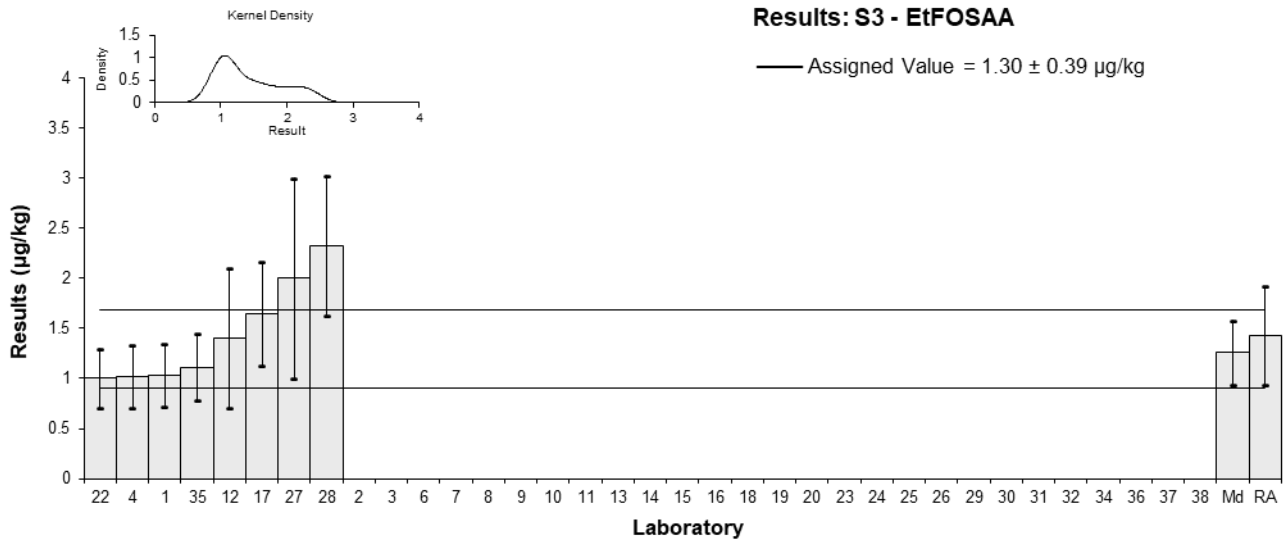
Participant Results

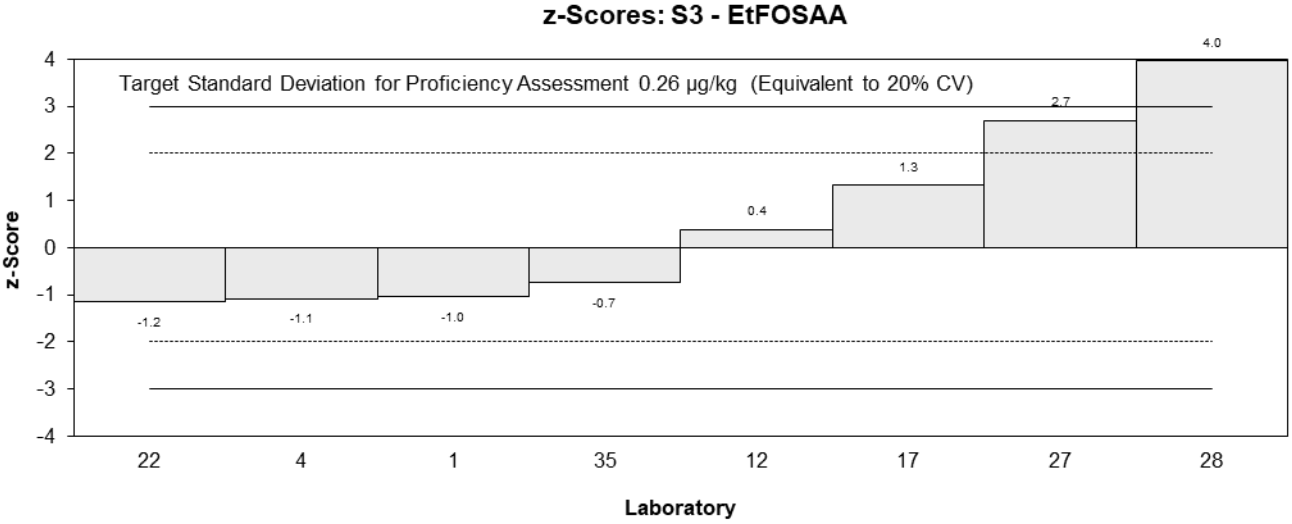
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	1.03	0.31	77	-1.04	-0.54
2	NR	NR	NR		
3	NS	NS	NS		
4	1.02	0.31	119	-1.08	-0.56
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	<0.0005	NR	162		
11	NT	NT	NT		
12	1.4	0.7	126	0.38	0.12
13	<1	NR	NR		
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	1.644	0.521	42	1.32	0.53
18	< 2	NR	77		
19	NT	NT	NT		
20	NS	NS	NS		
22	1	0.3	154	-1.15	-0.61
23	NS	NS	NS		
24	<0.5	NR	NR		
25	<1.0	NR	164		
26	NS	NS	NS		
27	2	1	67	2.69	0.65
28*	2.33	0.699	132	3.96	1.29
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	<5	NR	NR		
34	NS	NS	NS		
35	1.11	0.333	55	-0.73	-0.37
36	NT	NT	NT		
37	<5	NR	21		
38	NR	NR	NR		

* Outlier, see Section 4.2

Statistics

Assigned Value	1.30	0.39
Spike Value	Not Spiked	
Robust Average	1.43	0.49
Median	1.26	0.32
Mean	1.44	
N	8	
Max	2.33	
Min	1	
Robust SD	0.56	
Robust CV	39%	


Kernel Density
Density
Result
Results: S3 - EtFOSAA
Assigned Value = 1.30 ± 0.39 µg/kg
Results (µg/kg)
22 4 1 35 12 17 27 28 2 3 6 7 8 9 10 11 13 14 15 16 18 19 20 23 24 25 26 29 30 31 32 34 36 37 38 Md RA
Laboratory


z-Scores: S3 - EtFOSAA
Target Standard Deviation for Proficiency Assessment 0.26 µg/kg (Equivalent to 20% CV)
z-Score
-1.2
-1.1
-1.0
-0.7
0.4
1.3
2.7
4.0
22 4 1 35 12 17 27 28
Laboratory

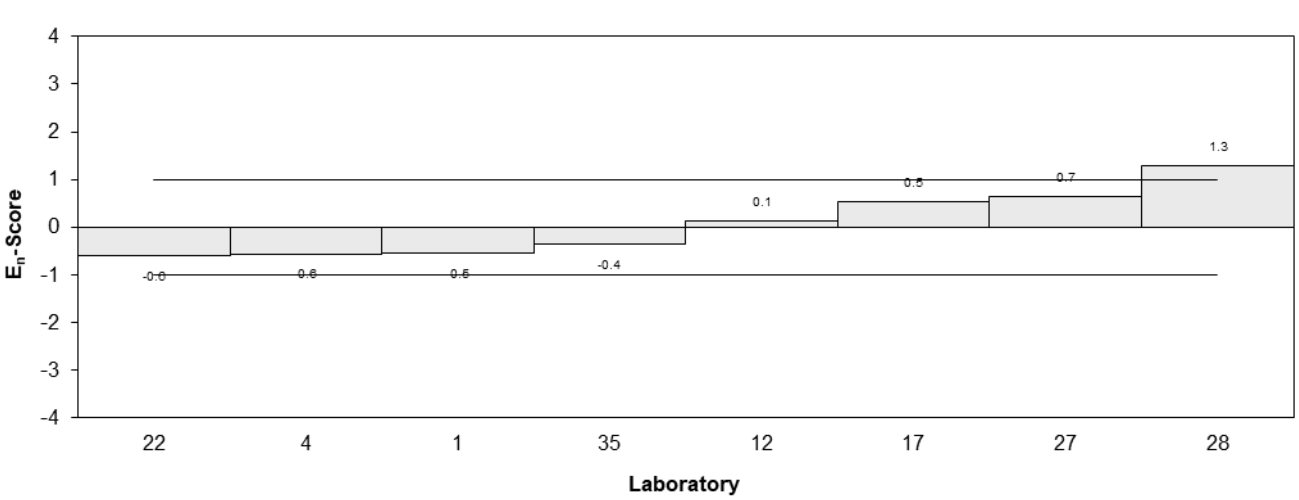

En-Scores: S3 - EtFOSAA
En-Score
-0.6
-0.6
-0.5
-0.4
0.1
0.5
0.7
1.3
22 4 1 35 12 17 27 28
Laboratory

Figure 85

Table 90

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	8:2FTS
Unit	µg/kg

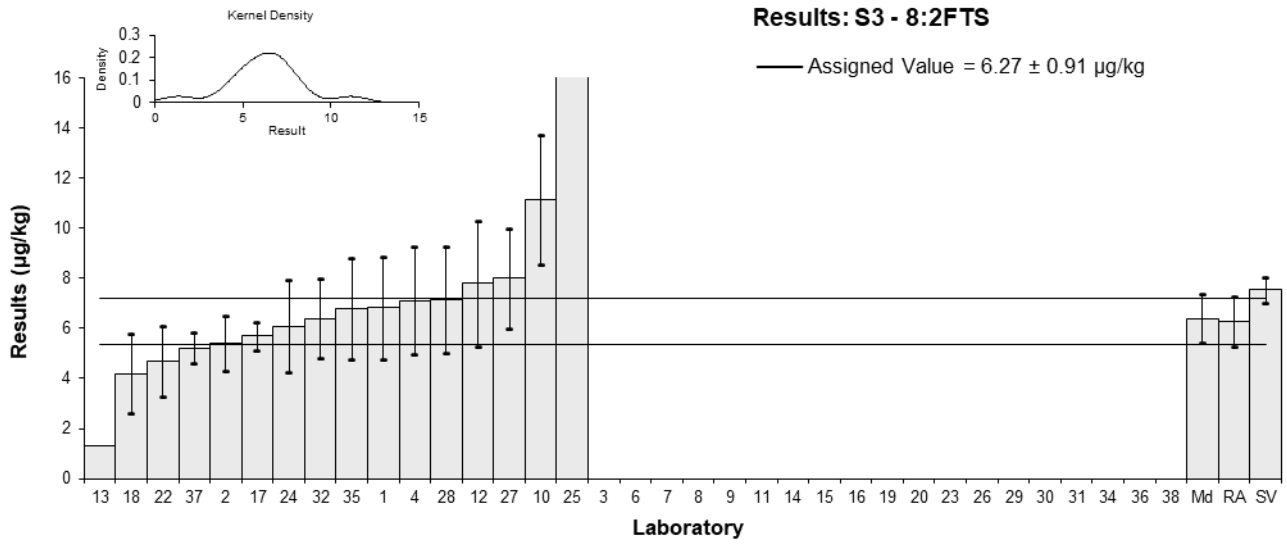
Participant Results

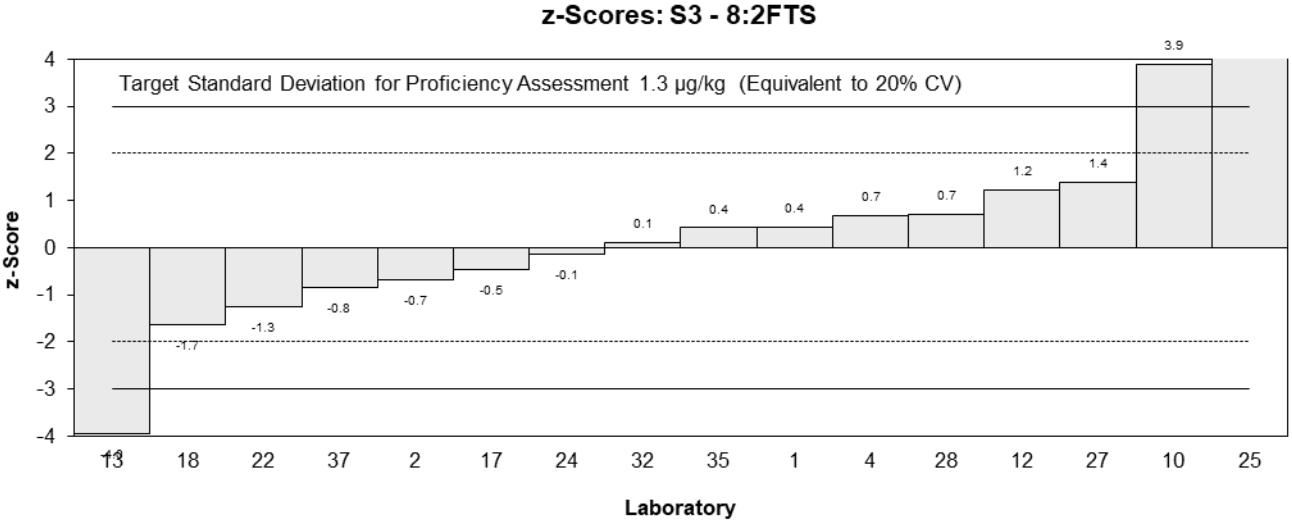
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	6.82	2.05	87	0.44	0.25
2	5.4	1.1	154	-0.69	-0.61
3	NS	NS	NS		
4	7.12	2.14	79	0.68	0.37
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10*	11.15	2.61	160	3.89	1.77
11	NT	NT	NT		
12	7.8	2.5	322	1.22	0.58
13*	1.3104	NR	NR	-3.96	-5.45
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	5.696	0.561	69	-0.46	-0.54
18	4.2	1.6	81	-1.65	-1.12
19	NT	NT	NT		
20	NS	NS	NS		
22	4.7	1.41	81	-1.25	-0.94
23	NS	NS	NS		
24	6.1	1.83	86	-0.14	-0.08
25**	530	96	125	417.65	5.46
26	NS	NS	NS		
27	8	2	84	1.38	0.79
28	7.15	2.145	206	0.70	0.38
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	6.4	1.6	259	0.10	0.07
34	NS	NS	NS		
35	6.8	2.04	236	0.42	0.24
36	NT	NT	NT		
37	5.22	0.63	633	-0.84	-0.95
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	6.27	0.91
Spike Value	7.55	0.51
Robust Average	6.3	1.0
Median	6.40	0.96
Mean	6.26	
N	15	
Max	11.15	
Min	1.3104	
Robust SD	1.6	
Robust CV	26%	


Results: S3 - 8:2FTS
Assigned Value = 6.27 ± 0.91 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
13 18 22 37 2 17 24 32 35 1 4 28 12 27 10 25 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - 8:2FTS
Target Standard Deviation for Proficiency Assessment 1.3 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
13 18 22 37 2 17 24 32 35 1 4 28 12 27 10 25
-1.7 -1.3 -0.8 -0.7 -0.5 -0.1 0.1 0.4 0.4 0.7 0.7 1.2 1.4 3.9

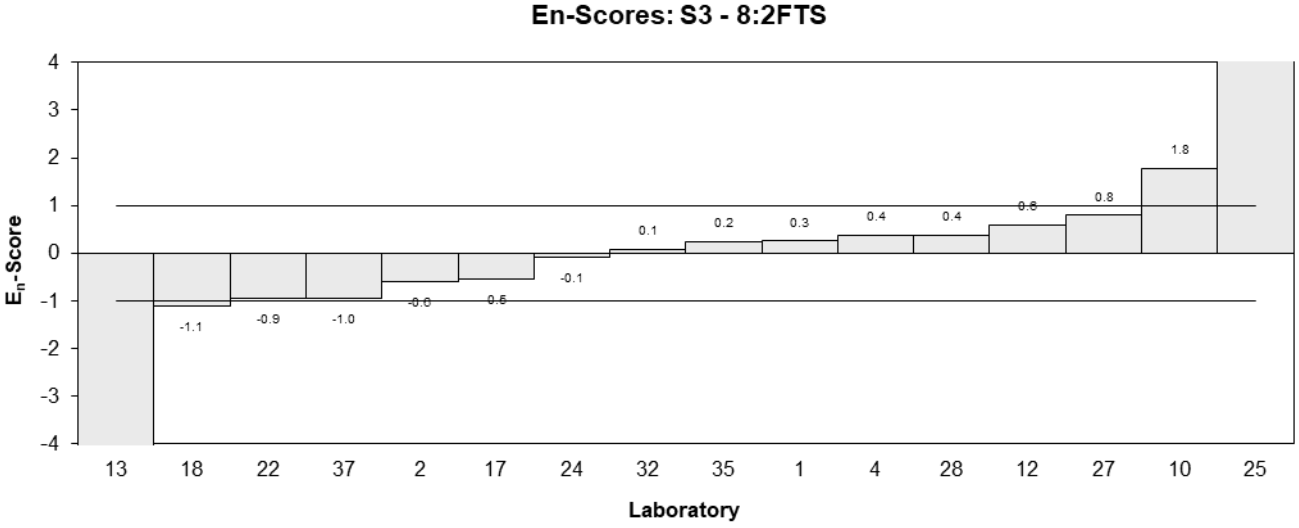

En-Scores: S3 - 8:2FTS
En-Score
Laboratory
13 18 22 37 2 17 24 32 35 1 4 28 12 27 10 25
-1.1 -0.9 -1.0 -0.6 -0.1 0.1 0.2 0.3 0.4 0.4 0.6 0.8 1.8

Figure 86

Table 91

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	10:2FTS
Unit	µg/kg

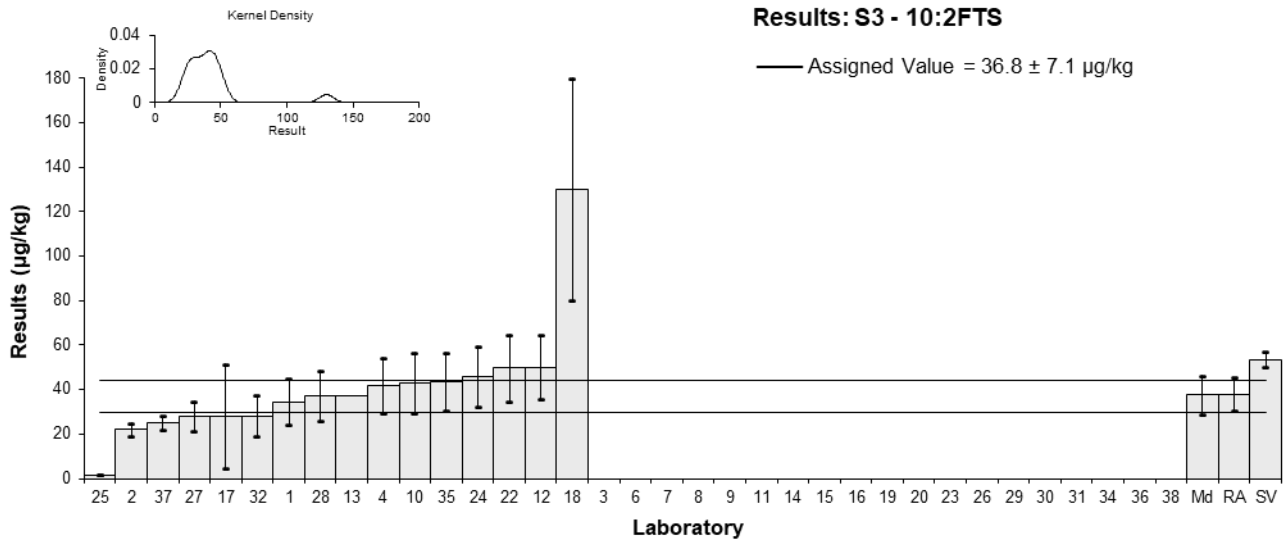
Participant Results

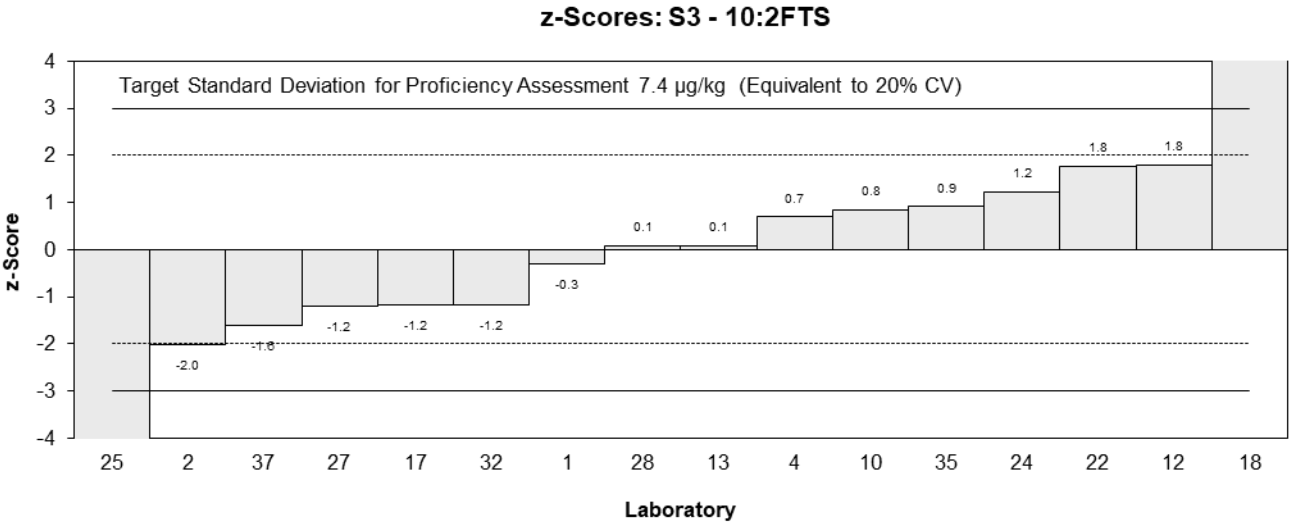
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	34.58	10.38	82	-0.30	-0.18
2	22	3	NR	-2.01	-1.92
3	NS	NS	NS		
4	41.89	12.57	95	0.69	0.35
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	42.99	13.71	NR	0.84	0.40
11	NT	NT	NT		
12	50	14.5	NR	1.79	0.82
13	37.4736	NR	NR	0.09	0.09
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	28.1	23.5	69	-1.18	-0.35
18*	130	50	81	12.66	1.85
19	NT	NT	NT		
20	NS	NS	NS		
22	49.8	14.94	33	1.77	0.79
23	NS	NS	NS		
24	45.8	13.74	40	1.22	0.58
25**	1.7	0.24	141	-4.77	-4.94
26	NS	NS	NS		
27	28	6.7	NR	-1.20	-0.90
28	37.4	11.22	206	0.08	0.05
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	28.2	9.024	296	-1.17	-0.75
34	NS	NS	NS		
35	43.53	13.059	102	0.91	0.45
36	NT	NT	NT		
37	24.93	3.08	633	-1.61	-1.53
38	NR	NR	NR		

* Outlier, ** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	36.8	7.1
Spike Value	53.5	3.6
Robust Average	38.0	7.4
Median	37.5	8.9
Mean	43.0	
N	15	
Max	130	
Min	22	
Robust SD	12	
Robust CV	30%	


Results: S3 - 10:2FTS
Assigned Value = 36.8 ± 7.1 µg/kg
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
25 2 37 27 17 32 1 28 13 4 10 35 24 22 12 18 3 6 7 8 9 11 14 15 16 19 20 23 26 29 30 31 34 36 38 Md RA SV


z-Scores: S3 - 10:2FTS
Target Standard Deviation for Proficiency Assessment 7.4 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
25 2 37 27 17 32 1 28 13 4 10 35 24 22 12 18

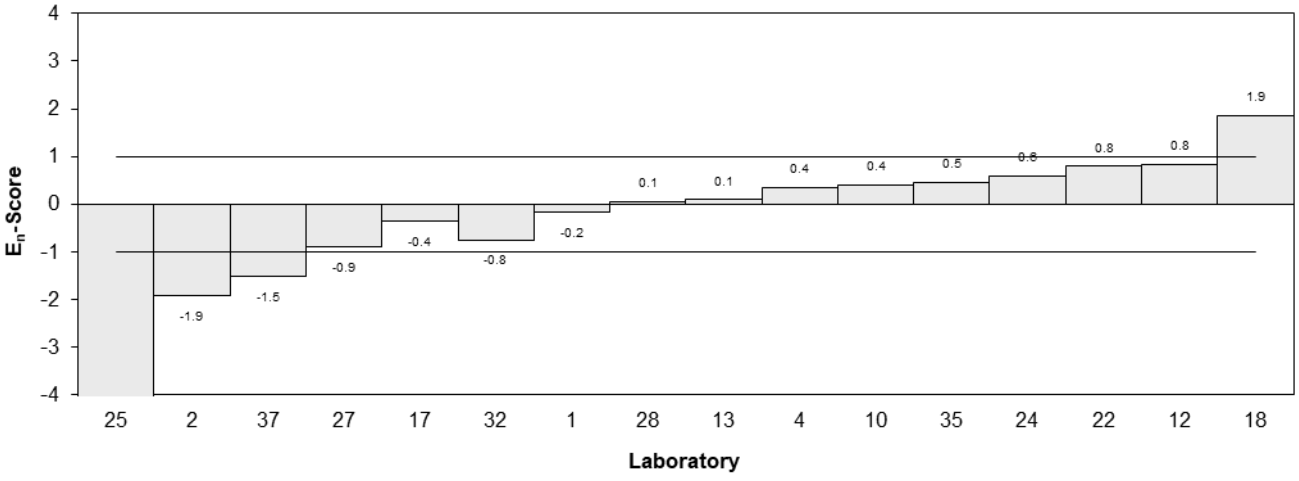

En-Scores: S3 - 10:2FTS
En-Score
Laboratory
25 2 37 27 17 32 1 28 13 4 10 35 24 22 12 18

Figure 87

Table 92

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	8:2diPAP
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	NT	NT	NT
2	51	8	199
3	NS	NS	NS
4	NT	NT	NT
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	NT	NT	NT
11	NT	NT	NT
12	NT	NT	NT
13	NT	NT	NT
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	NT	NT	NT
18	NT	NT	NT
19	NT	NT	NT
20	NS	NS	NS
22	NT	NT	NT
23	NS	NS	NS
24	NT	NT	NT
25	NT	NT	NT
26	NS	NS	NS
27	NT	NT	NT
28	NT	NT	NT
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	NT	NT	NT
34	NS	NS	NS
35	NT	NT	NT
36	NT	NT	NT
37	NT	NT	NT
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	58.8	3.9
Robust Average	NA (N<6)	
Median	NA (N<3)	
Mean	NA (N<2)	
N	1	
Max	51	
Min	51	
Robust SD	NA (N<6)	
Robust CV	NA (N<6)	

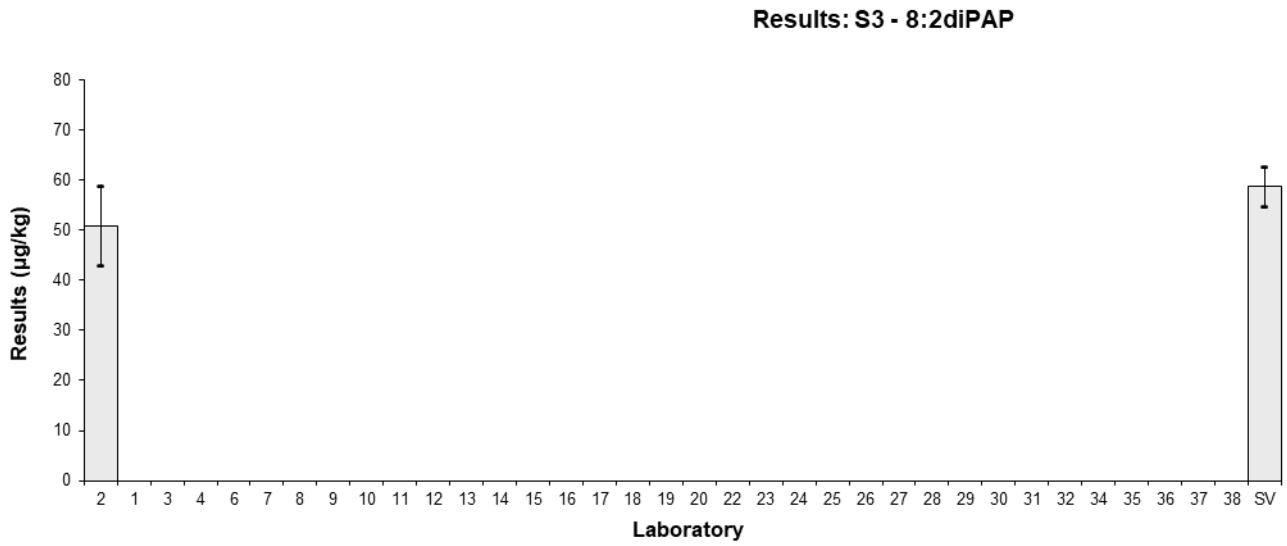

Results: S3 - 8:2diPAP
Results (µg/kg)
80
70
60
50
40
30
20
10
0
2 1 3 4 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 22 23 24 25 26 27 28 29 30 31 32 34 35 36 37 38 SV
Laboratory

Figure 88

Table 93

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	GenX
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	20.33	6.10	84
2	16	2	73
3	NS	NS	NS
4	NT	NT	NT
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	21.01	4.01	50
11	NT	NT	NT
12	9.5	3.1	49
13	9.1286	NR	NR
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	NT	NT	NT
18	< 50	NR	77
19	NT	NT	NT
20	NS	NS	NS
22	3.7	1.11	60
23	NS	NS	NS
24	5.22	1.566	81
25	<1.0	NR	106
26	NS	NS	NS
27	NT	NT	NT
28	16.9	5.07	82
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	NT	NT	NT
34	NS	NS	NS
35	20.55	6.165	52
36	NT	NT	NT
37	NT	NT	NT
38	NR	NR	NR

Statistics

Assigned Value	Not Set	
Spike Value	16.8	1.1
Robust Average	13.6	6.4
Median	16.0	6.2
Mean	13.6	
N	9	
Max	21.01	
Min	3.7	
Robust SD	7.7	
Robust CV	57%	

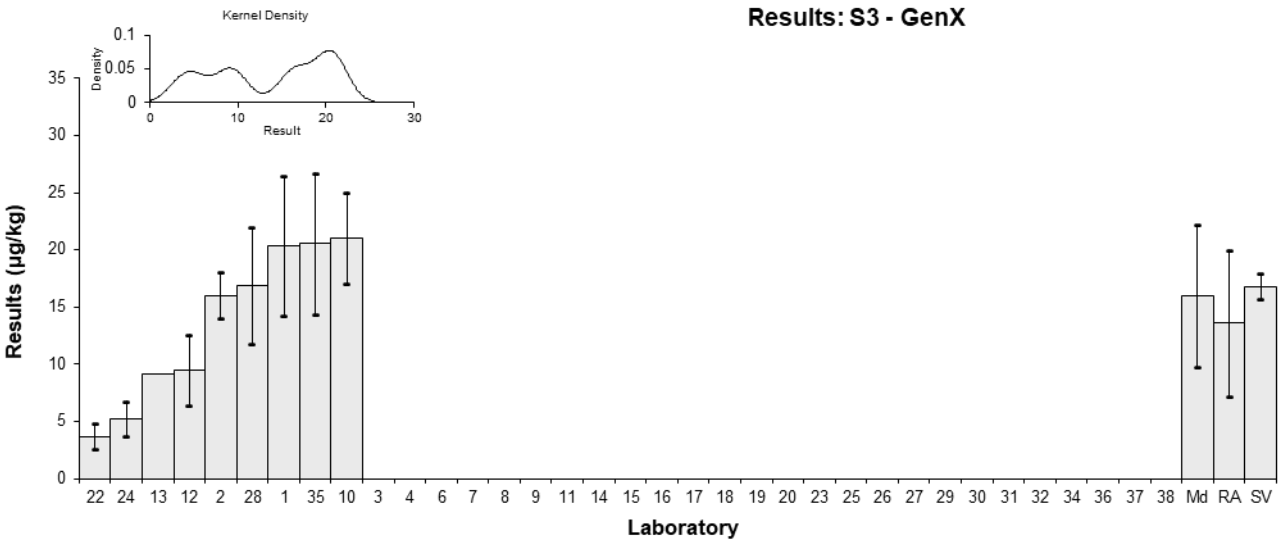

Results: S3 - GenX
Kernel Density
Density
Result
Results (µg/kg)
Laboratory
22 24 13 12 2 28 1 35 10 3 4 6 7 8 9 11 14 15 16 17 18 19 20 23 25 26 27 29 30 31 32 34 36 37 38 Md RA SV

Figure 89

Table 94

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	ADONA
Unit	µg/kg

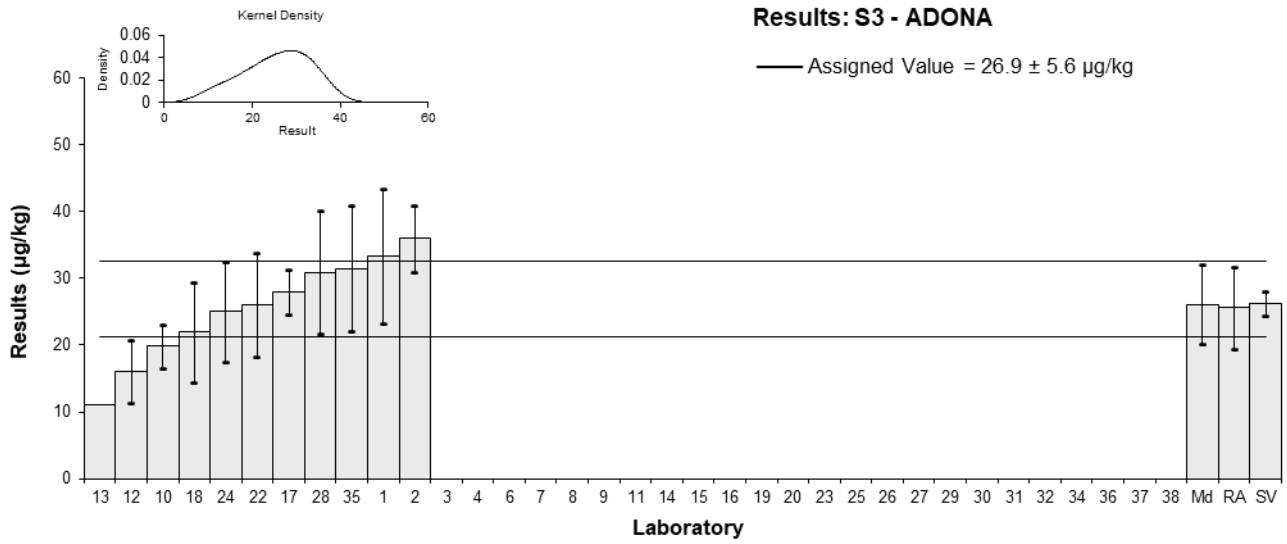
Participant Results

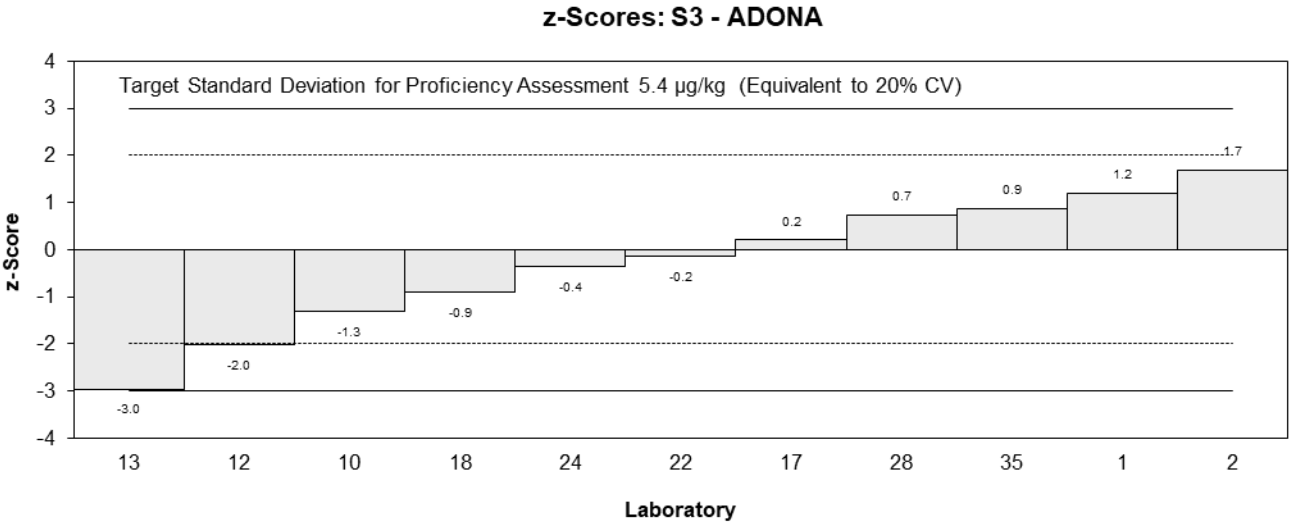
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	33.36	10.01	86	1.20	0.56
2	36	5	NR	1.69	1.21
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	19.81	3.31	NR	-1.32	-1.09
11	NT	NT	NT		
12	16.1	4.7	NR	-2.01	-1.48
13*	10.9993	NR	NR	-2.96	-2.84
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	27.96	3.29	46	0.20	0.16
18	22	7.5	75	-0.91	-0.52
19	NT	NT	NT		
20	NS	NS	NS		
22	26.1	7.83	91	-0.15	-0.08
23	NS	NS	NS		
24	25	7.5	89	-0.35	-0.20
25	<1.0	NR	95		
26	NS	NS	NS		
27	NT	NT	NT		
28	30.9	9.27	84	0.74	0.37
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	31.51	9.453	52	0.86	0.42
36	NT	NT	NT		
37	NT	NT	NT		
38	NR	NR	NR		

* Outlier, see Section 4.2

Statistics

Assigned Value	26.9	5.6
Spike Value	26.3	1.8
Robust Average	25.6	6.2
Median	26.1	6.0
Mean	25.4	
N	11	
Max	36	
Min	10.9993	
Robust SD	8.2	
Robust CV	32%	


Kernel Density
Density
Result
Results: S3 - ADONA
Assigned Value = 26.9 ± 5.6 µg/kg
Results (µg/kg)
Laboratory
13 12 10 18 24 22 17 28 35 1 2 3 4 6 7 8 9 11 14 15 16 19 20 23 25 26 27 29 30 31 32 34 36 37 38 Md RA SV


z-Scores: S3 - ADONA
Target Standard Deviation for Proficiency Assessment 5.4 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
13 12 10 18 24 22 17 28 35 1 2
-3.0 -2.0 -1.3 -0.9 -0.4 -0.2 0.2 0.7 0.9 1.2 1.7

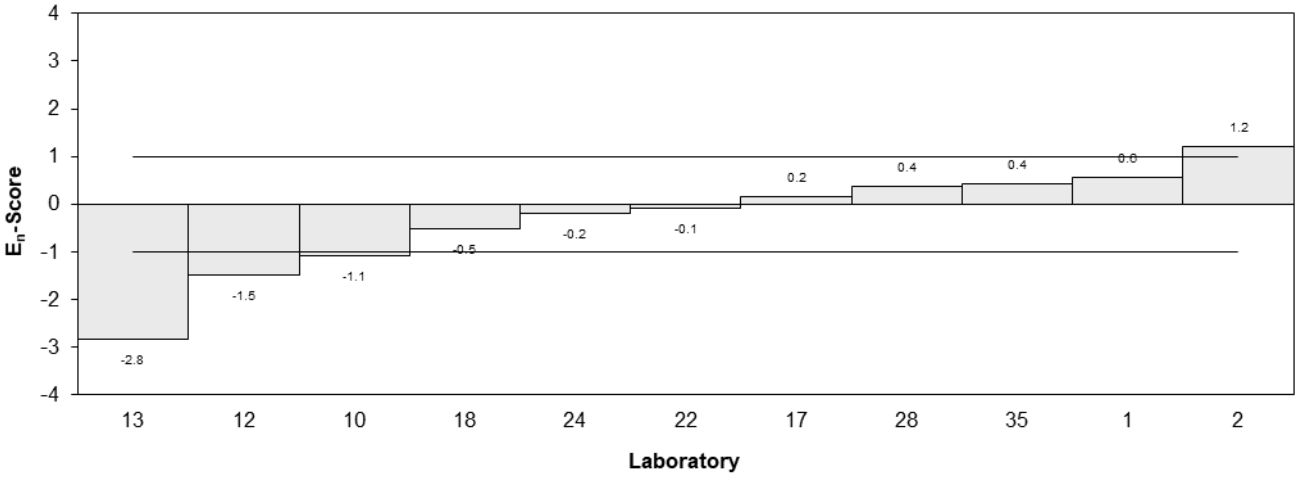

En-Scores: S3 - ADONA
En-Score
Laboratory
13 12 10 18 24 22 17 28 35 1 2
-2.8 -1.5 -1.1 -0.5 -0.2 -0.1 0.2 0.4 0.4 0.6 1.2

Figure 90

Table 95

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	9Cl-PF3ONS
Unit	µg/kg

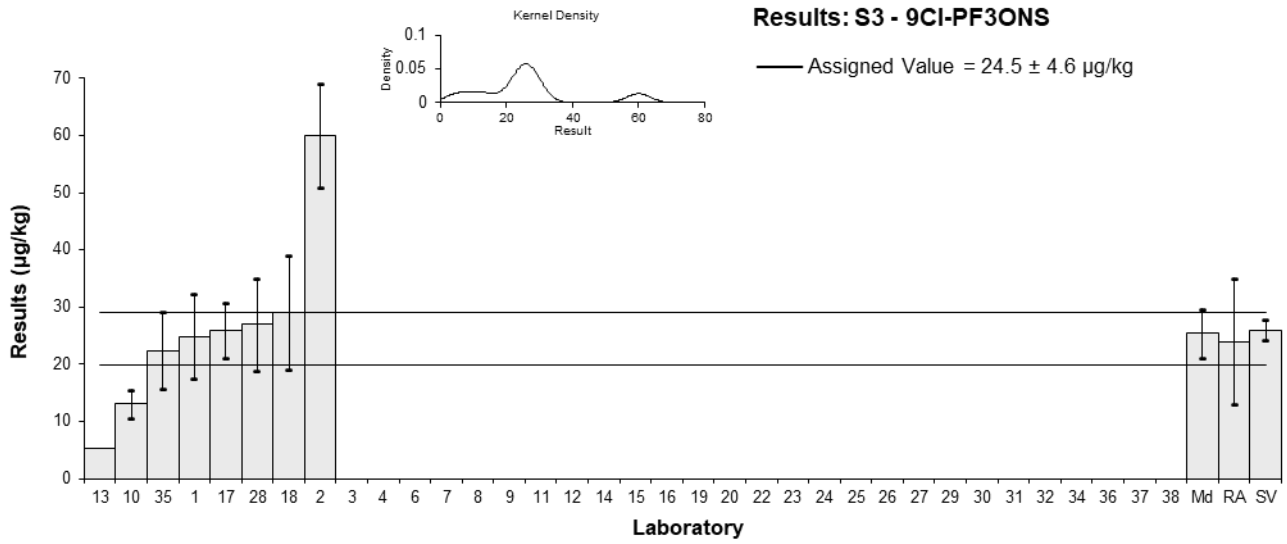
Participant Results

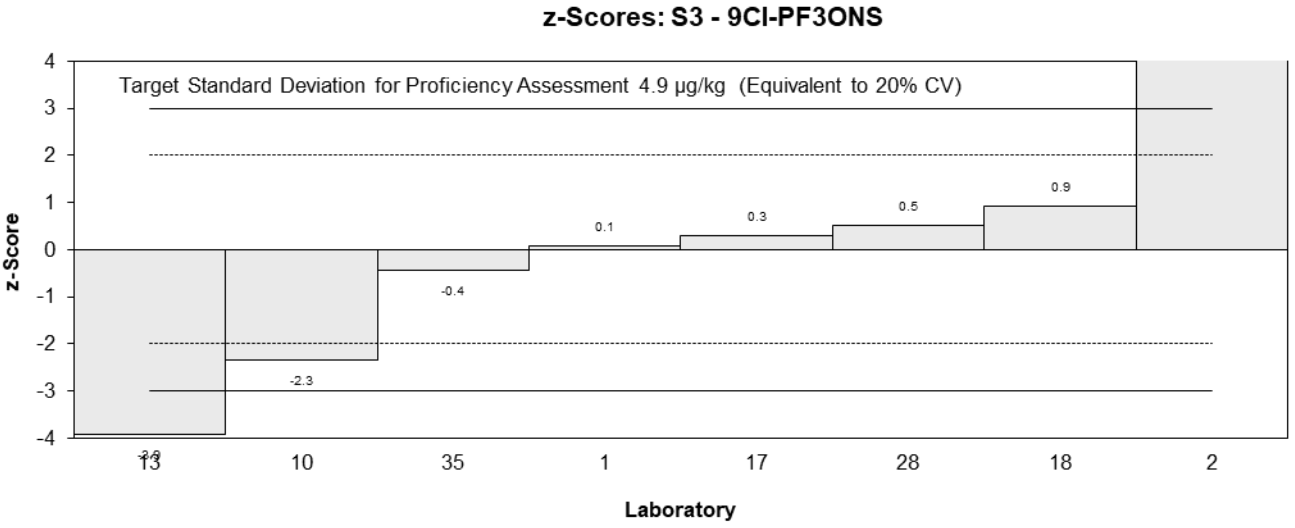
Lab. Code	Result	Uncertainty	Rec	z	E_n
1	24.86	7.46	80	0.07	0.04
2*	60	9	NR	7.24	3.51
3	NS	NS	NS		
4	NT	NT	NT		
6	NS	NS	NS		
7	NS	NS	NS		
8	NS	NS	NS		
9	NR	NR	NR		
10	13.02	2.53	NR	-2.34	-2.19
11	NT	NT	NT		
12	NT	NT	NT		
13*	5.2498	NR	NR	-3.93	-4.18
14	NT	NT	NT		
15	NT	NT	NT		
16	NS	NS	NS		
17	25.93	4.85	44	0.29	0.21
18	29	10	80	0.92	0.41
19	NT	NT	NT		
20	NS	NS	NS		
22	NT	NT	NT		
23	NS	NS	NS		
24	NT	NT	NT		
25	<1.0	NR	97		
26	NS	NS	NS		
27	NT	NT	NT		
28	27.0	8.1	84	0.51	0.27
29	NT	NT	NT		
30	NS	NS	NS		
31	NT	NT	NT		
32	NT	NT	NT		
34	NS	NS	NS		
35	22.4	6.72	52	-0.43	-0.26
36	NT	NT	NT		
37	NT	NT	NT		
38	NR	NR	NR		

* Outlier, see Section 4.2

Statistics

Assigned Value	24.5	4.6
Spike Value	26.0	1.8
Robust Average	24	11
Median	25.4	4.3
Mean	25.9	
N	8	
Max	60	
Min	5.2498	
Robust SD	13	
Robust CV	53%	


Kernel Density
Density
Result
Results: S3 - 9Cl-PF3ONS
Assigned Value = 24.5 ± 4.6 µg/kg
Results (µg/kg)
Laboratory
13 10 35 1 17 28 18 2 3 4 6 7 8 9 11 12 14 15 16 19 20 22 23 24 25 26 27 29 30 31 32 34 36 37 38 Md RA SV


z-Scores: S3 - 9Cl-PF3ONS
Target Standard Deviation for Proficiency Assessment 4.9 µg/kg (Equivalent to 20% CV)
z-Score
Laboratory
13 10 35 1 17 28 18 2
-2.3
-0.4
0.1
0.3
0.5
0.9

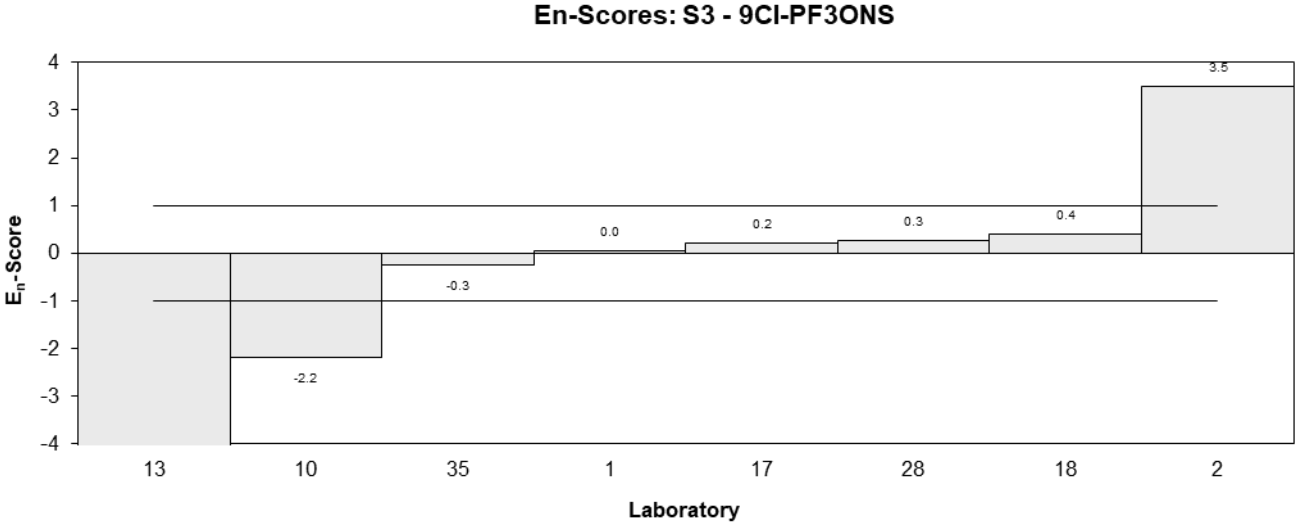

En-Scores: S3 - 9Cl-PF3ONS
En-Score
Laboratory
13 10 35 1 17 28 18 2
-2.2
-0.3
0.0
0.2
0.3
0.4
3.5

Figure 91

Table 96

Sample Details

Sample No.	S3
Matrix	Biosolid
Analyte	11Cl-PF3OUdS
Unit	µg/kg

Participant Results

Lab. Code	Result	Uncertainty	Rec
1	15.45	4.64	72
2	55	8	NR
3	NS	NS	NS
4	NT	NT	NT
6	NS	NS	NS
7	NS	NS	NS
8	NS	NS	NS
9	NR	NR	NR
10	8.73	2.17	NR
11	NT	NT	NT
12	NT	NT	NT
13**	1.2841	NR	NR
14	NT	NT	NT
15	NT	NT	NT
16	NS	NS	NS
17	20.58	4.87	44
18	30	10	80
19	NT	NT	NT
20	NS	NS	NS
22	NT	NT	NT
23	NS	NS	NS
24	NT	NT	NT
25	<1.0	NR	141
26	NS	NS	NS
27	NT	NT	NT
28	25.3	7.59	84
29	NT	NT	NT
30	NS	NS	NS
31	NT	NT	NT
32	NT	NT	NT
34	NS	NS	NS
35	14.1	4.23	52
36	NT	NT	NT
37	NT	NT	NT
38	NR	NR	NR

** Extreme Outlier, see Section 4.2

Statistics

Assigned Value	Not Set	
Spike Value	26.3	1.8
Robust Average	22	12
Median	20.6	9.1
Mean	24.2	
N	7	
Max	55	
Min	8.73	
Robust SD	12	
Robust CV	55%	

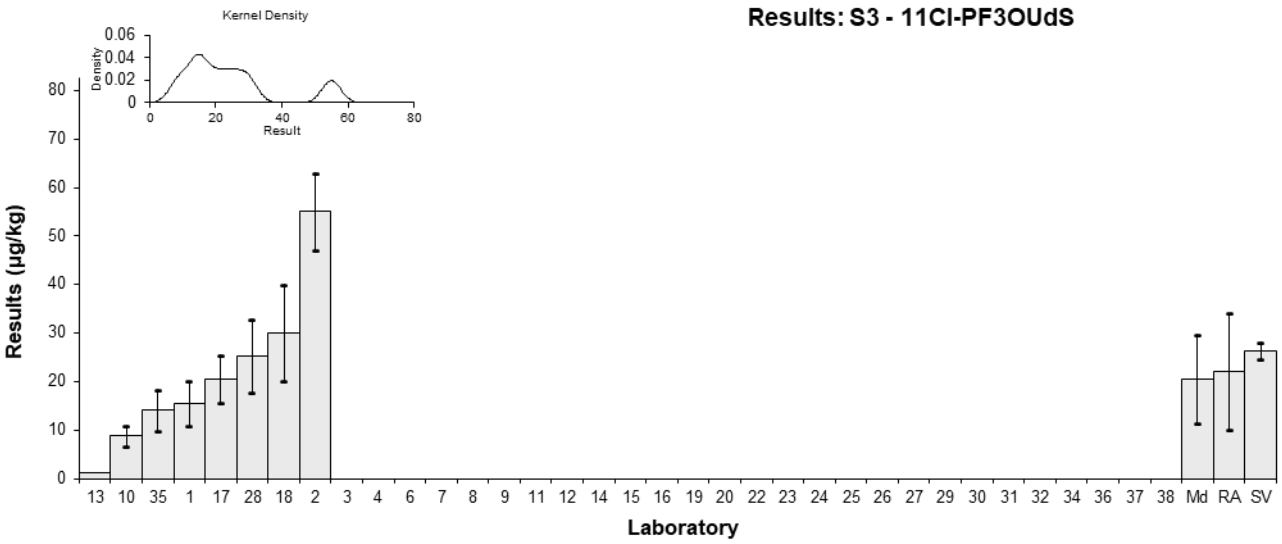

Results: S3 - 11Cl-PF3OUdS
Kernel Density
Density
0.06
0.04
0.02
0
0
20
40
60
80
Result
Results (µg/kg)
0
10
20
30
40
50
60
70
80
13 10 35 1 17 28 18 2 3 4 6 7 8 9 11 12 14 15 16 19 20 22 23 24 25 26 27 29 30 31 32 34 36 37 38 Md RA SV
Laboratory

Figure 92

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 PFNA in S2.

The results from Laboratory 14 in Sample S1 were consistently lower than the robust average. Laboratory 25 may have accidentally reported their Sample S1 results as Sample S3, and Sample S3 results as Sample S1. To avoid unfair scoring, these results were excluded from robust average calculations as it will bias the assigned value; they were also excluded from the calculation of all summary statistics.

No assigned values were set for PFNS, PFDS, PFMPA and PFMBA in S1, for PFUdS in S2 and for PFDS, PFDoA, PFTrDA, 8:2diPAP, GenX and 11Cl-PF3OUdS in S3 because the results were too variable or too few.

A comparison of the assigned value versus spiked value for all fortified analytes in S2 and S3 are presented in Table 97. The soil sample S2 and the bisolid sample S3 contained some incurred analytes which may explain the assigned value being higher than the spike value.

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 97 Comparison of Assigned Value and Spiked Concentration.

Sample	Matrix	Analyte	Spiked Concentration (µg/kg)	Assigned Value (µg/kg)	Assigned/ Spike (%)
S2	Soil	PFBS	3.29	3.07	93%
S2	Soil	PFHxS	3.52	3.28	93%
S2	Soil	PFHxS_L	3.52	3.32	94%
S2	Soil	PFOS	5.66	7.18	127%
S2	Soil	PFOS_L	4.82	5.88	122%
S2	Soil	PFNS	0.511	0.415	81%
S2	Soil	PFDS	10.3	8.54	83%
S2	Soil	PFBA	4.97	4.60	93%
S2	Soil	PFHxA	3.21	3.36	105%
S2	Soil	PFOA	6.18	6.50	105%
S2	Soil	PFNA	2.70	2.76	102%
S2	Soil	PFDA	6.08	6.65	109%
S2	Soil	PFTeDA	10.8	9.50	88%
S2	Soil	PFODA	16.1	12.4	77%
S2	Soil	PFOSA	5.37	4.76	89%
S2	Soil	MeFOSA	3.72	2.71	73%
S2	Soil	EtFOSAA	7.25	6.18	85%
S2	Soil	EtFOSE	7.25	6.15	85%
S2	Soil	4:2FTS	6.96	6.57	94%
S2	Soil	6:2FTS	5.09	4.80	94%
S2	Soil	8:2diPAP	10.4	9.1	88%
S2	Soil	5:3FTCA	37.1	28.4	77%
S2	Soil	ADONA	20.1	17.6	88%
S2	Soil	PFEESA	23.7	19.5	82%

Sample	Matrix	Analyte	Spiked Concentration (µg/kg)	Assigned Value (µg/kg)	Assigned/ Spike (%)
S2	Soil	9Cl-PF3ONS	24.8	22.3	90%
S2	Soil	11Cl-PF3OUdS	25.1	21.7	86%
S3	Biosolid	PFBS	7.87	7.42	94%
S3	Biosolid	PFHxS	5.29	4.96	94%
S3	Biosolid	PFHxS_L	5.29	5.23	99%
S3	Biosolid	PFHpS	12.1	11.0	91%
S3	Biosolid	PFOS	11.3	12.5	111%
S3	Biosolid	PFOS_L	10.0	9.5	95%
S3	Biosolid	PFNS	1.61	1.13	70%
S3	Biosolid	PFDS	37.8	24.3*	64%
S3	Biosolid	PFBA	11.6	10.8	93%
S3	Biosolid	PFPeA	4.47	4.68	105%
S3	Biosolid	PFHxA	6.45	6.90	107%
S3	Biosolid	PFHpA	3.35	3.64	109%
S3	Biosolid	PFOA	11.9	13.1	110%
S3	Biosolid	PFNA	6.64	7.36	111%
S3	Biosolid	PFDA	12.5	13.5	108%
S3	Biosolid	PFTrDA	22.5	13.0*	58%
S3	Biosolid	PFOSA	7.89	7.30	93%
S3	Biosolid	8:2FTS	7.55	6.27	83%
S3	Biosolid	10:2FTS	53.5	36.8	69%
S3	Biosolid	GenX	16.8	13.6*	81%
S3	Biosolid	ADONA	26.3	26.9	102%
S3	Biosolid	9Cl-PF3ONS	26.0	24.5	94%
S3	Biosolid	11Cl-PF3OUdS	26.3	22.1*	84%

* Robust Average outliers excluded (Assigned Value not set);
NA = Not Available.

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 1689 numerical results, 1544 (91%) were reported with an expanded measurement uncertainty. The magnitude of the reported expanded uncertainties was within the range 0.028% to 2109% of the reported value. The participants used a wide variety of procedures to estimate expanded measurement uncertainty. These are presented in Tables 3 and 4.

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 92).

Laboratories 8, 10, 16, 17, 19, 23, and 37 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 7, 11, 12, 15, 17, 18, 25, 36, and 37 who reported estimates of uncertainty greater than 50% should also review their procedure as it might not be fit-for-purpose.

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

Laboratories 11, 27, 28 and 38 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]

Laboratories 9 and 26 reported some results, uncertainties, and recoveries with a large number of significant figures. Although all significant figures were used for results assessment, (z-score and E_n-score calculation), the last digits were omitted from the tables in Chapter 5, due to lack of space.

In some cases results were reported with an inappropriate number of significant figures. 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 "12.808 ± 2.818 µg/kg", should instead be expressed as "12.8 ± 2.8 µg/kg").[8]

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% coefficient of variation (CV) was used to calculate z-scores. 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 98.

To account for possible bias in the consensus values due to laboratories using inefficient analytical/extraction techniques, z-scores were adjusted for MeFOSA in Sample S2.

Where the assigned value is less than 80% of the spiked value, a maximum acceptable concentration is set to two target standard deviations more than the spiked level and z-scores greater than 2 are adjusted to a value of 2. E_n-scores could not be calculated. When the results are higher than the maximum acceptable concentration, z-scores were not adjusted. This approach ensures that laboratories reporting results close to the spiked concentration were not penalised. z-Scores of less than 2 were left unaltered.

The dispersal of participants' z-scores is graphically presented by laboratory in Figure 93 and by analyte in Figure 94. Of the 1568 results for which z-scores were calculated, 1416 (90%) returned an acceptable z-score of $|z| \leq 2.0$ and 52 (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.

Table 98 Performance Target standard deviation, modified Horwitz values and between-laboratory CV

Sample	Analyte	Assigned value (µg/kg)	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S1	PFBS	156	20	21	14
S1	PFPeS	172	20	21	15
S1	PFHxS	1510	20	15	16
S1	PFHxS_L	1390	20	15	19
S1	PFHpS	356	20	19	23
S1	PFOS	20900	20	10	16

Sample	Analyte	Assigned value (µg/kg)	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S1	PFOS_L	13100	20	11	14
S1	PFNS**	134	Not Set	22	89
S1	PFDS**	53	Not Set	22	63
S1	PFDoS	4.80	20	22	6.6
S1	PFBA	339	20	19	12
S1	PFPeA	558	20	17	14
S1	PFHxA	1390	20	15	14
S1	PFHpA	162	20	21	13
S1	PFOA	550	20	18	15
S1	PFNA	50.0	20	22	17
S1	PFDA	29.0	20	22	15
S1	PFUdA	8.46	20	22	15
S1	PFDoA	4.64	20	22	18
S1	PFTrDA	1.78	20	22	23
S1	PFTeDA	1.58	20	22	23
S1	PFHxDA	0.484	20	22	9.6
S1	PFOSA	65.0	20	22	22
S1	MeFOSA	1.39	20	22	19
S1	MeFOSAA	2.44	20	22	18
S1	MeFOSE	0.519	20	22	12
S1	4:2FTS	0.406	20	22	15
S1	6:2FTS	442	20	18	17
S1	8:2FTS	506	20	18	18
S1	10:2FTS	4.00	20	22	24
S1	3:3FTCA	4.57	20	22	18
S1	5:3FTCA	304	20	19	22
S1	7:3FTCA	63.1	20	22	15
S1	PFMPA**	1.12	Not Set	22	9.9
S1	PFMBA**	1.33	Not Set	22	34
S2	PFBS	3.07	20	22	11
S2	PFHxS	3.28	20	22	11
S2	PFHxS_L	3.32	20	22	13
S2	PFOS	7.18	20	22	15
S2	PFOS_L	5.88	20	22	20
S2	PFNS	0.415	20	22	17
S2	PFDS	8.54	20	22	14
S2	PFBA	4.60	20	22	11
S2	PFHxA	3.36	20	22	12
S2	PFHpA	0.112	20	22	12
S2	PFOA	6.50	20	22	12
S2	PFNA	2.76	20	22	10
S2	PFDA	6.65	20	22	12
S2	PFTeDA	9.50	20	22	16
S2	PFODA	12.4	20	22	6.8
S2	PFOSA	4.76	20	22	10
S2	MeFOSA	2.71	20	22	12
S2	EtFOSAA	6.18	20	22	12
S2	EtFOSE	6.15	20	22	14
S2	4:2FTS	6.57	20	22	15
S2	6:2FTS	4.80	20	22	13

Sample	Analyte	Assigned value (µg/kg)	Target SD (as PCV, %)	Modified Horwitz CV (%)	Between-laboratory CV* (%)
S2	8:2diPAP	9.1	20	22	13
S2	5:3FTCA	28.4	20	22	9.3
S2	ADONA	17.6	20	22	16
S2	PFEESA	19.5	20	22	8.4
S2	9Cl-PF3ONS	22.3	20	22	13
S2	11Cl-PF3OUdS	21.7	20	22	16
S3	PFBS	7.42	20	22	20
S3	PFHxS	4.96	20	22	24
S3	PFHxS_L	5.23	20	22	19
S3	PFHpS	11.0	20	22	21
S3	PFOS	12.5	20	22	22
S3	PFOS_L	9.5	20	22	27
S3	PFNS	1.13	20	22	18
S3	PFDS**	24.3	Not Set	22	40
S3	PFBA	10.8	20	22	24
S3	PFPeA	4.68	20	22	32
S3	PFHxA	6.90	20	22	16
S3	PFHpA	3.64	20	22	15
S3	PFOA	13.1	20	22	18
S3	PFNA	7.36	20	22	19
S3	PFDA	13.5	20	22	19
S3	PFUdA	0.394	20	22	14
S3	PFDoA**	1.34	Not Set	22	37
S3	PFTrDA**	13.0	Not Set	22	66
S3	PFOSA	7.30	20	22	16
S3	MeFOSAA	1.07	20	22	29
S3	EtFOSAA	1.30	20	22	32
S3	8:2FTS	6.27	20	22	21
S3	10:2FTS	36.8	20	22	29
S3	GenX**	13.6	Not Set	22	57
S3	ADONA	26.9	20	22	27
S3	9Cl-PF3ONS	24.5	20	22	18
S3	11Cl-PF3OUdS**	22.1	Not Set	22	55

NA = Not Available, *Robust between-laboratory CV with outliers removed; **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).

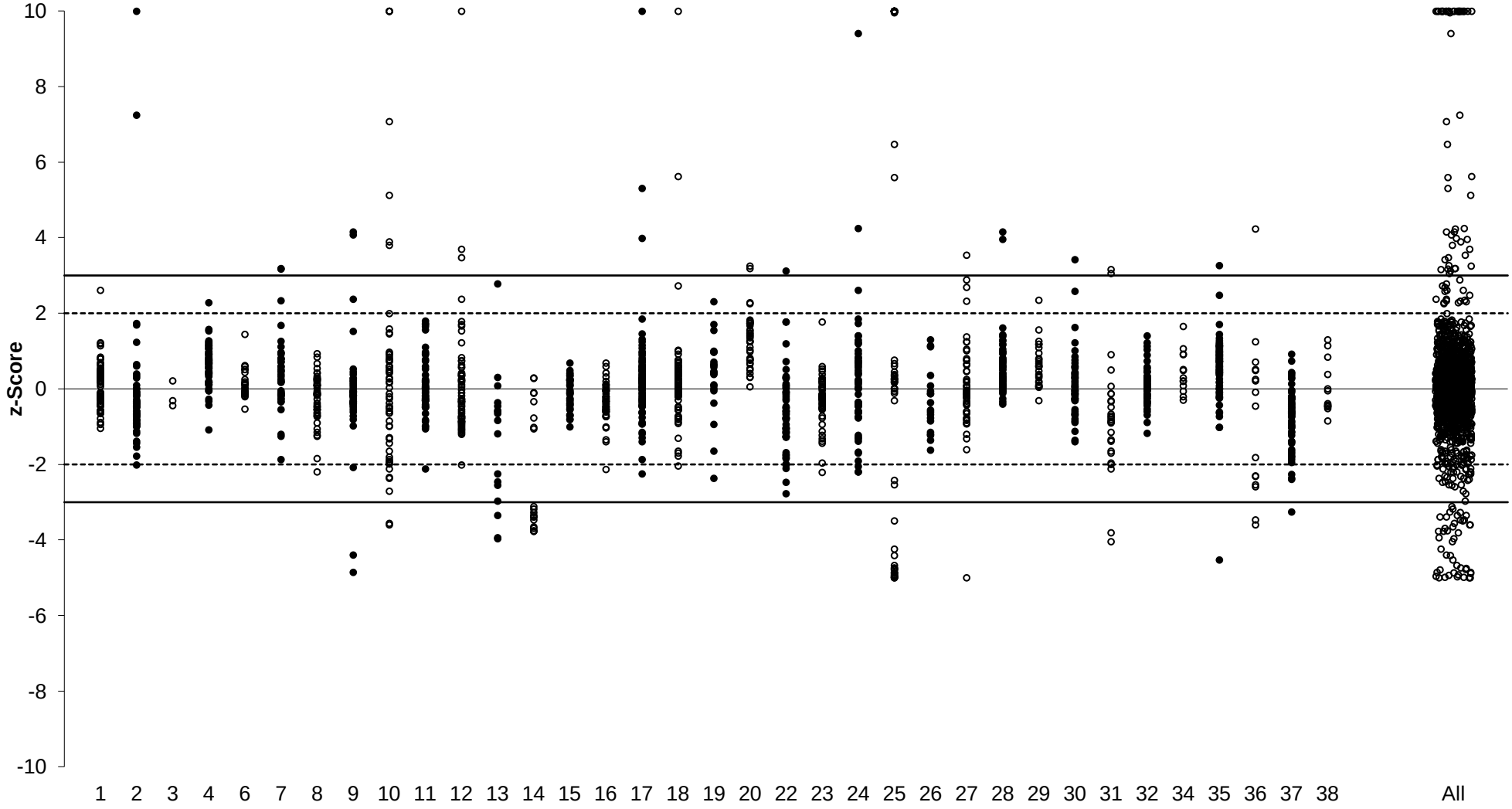
6.4 E_n-Score

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 95. 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.

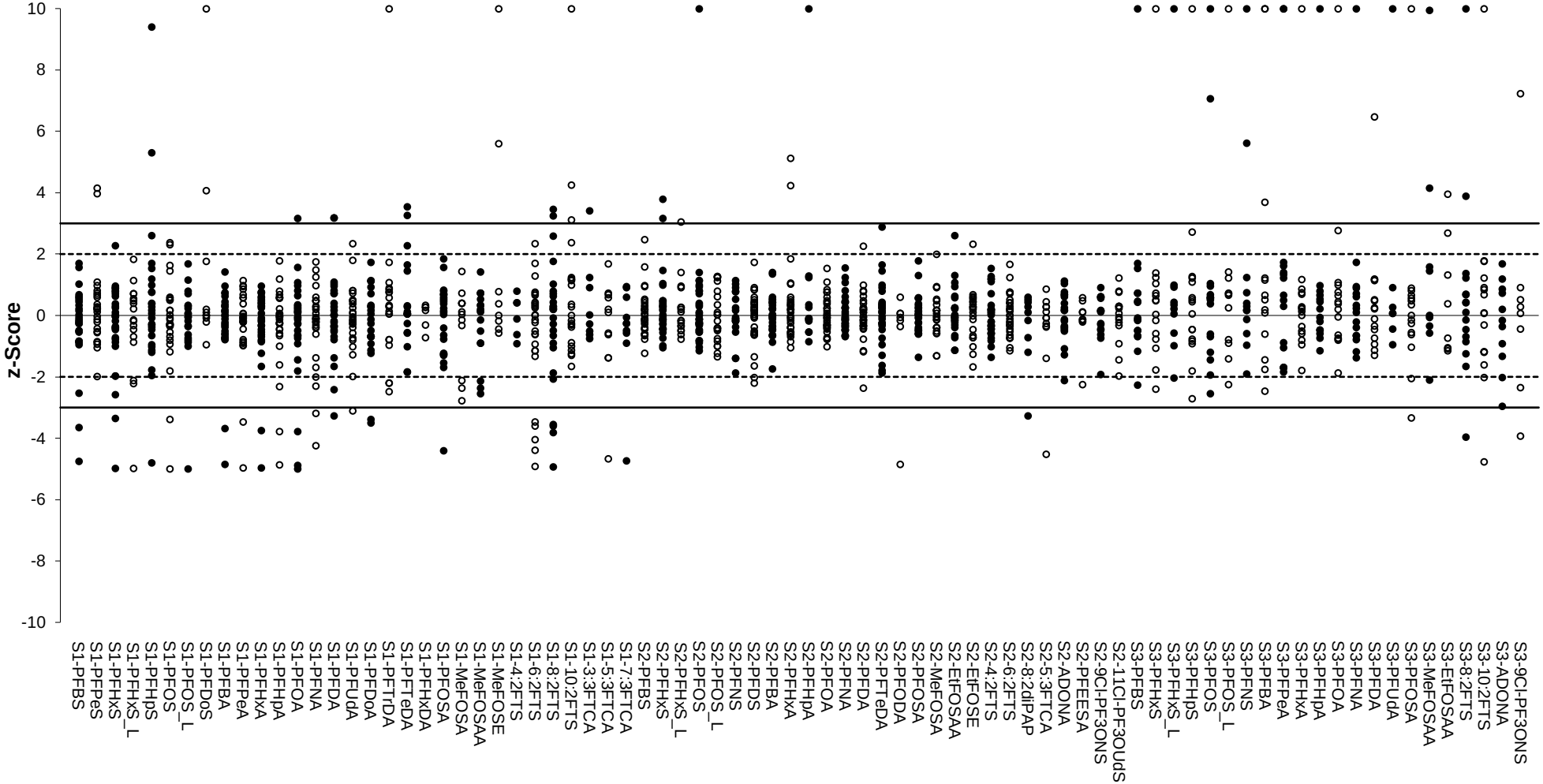
For results whose z-scores were adjusted, no E_n-score has been calculated.

Of 1567 results for which E_n-scores were calculated, 1214 (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.



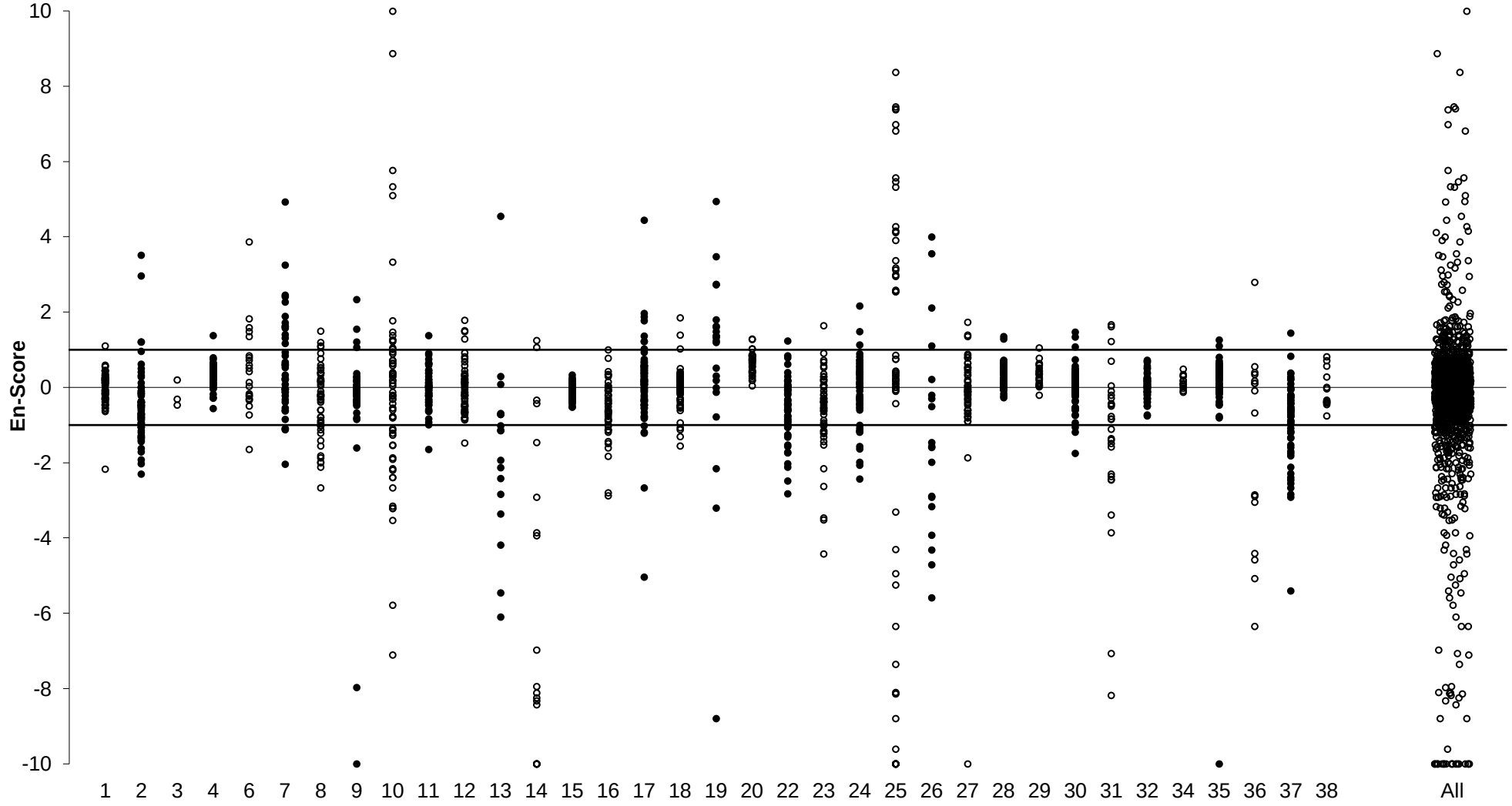
Scores greater than 10 have been plotted as 10.

Figure 93 z-Score Dispersal by Laboratory for Samples S1, S2, and S3



Scores greater than 10 have been plotted as 10.

Figure 94 z-Score Dispersal by Analyte for Samples S1, S2, and S3

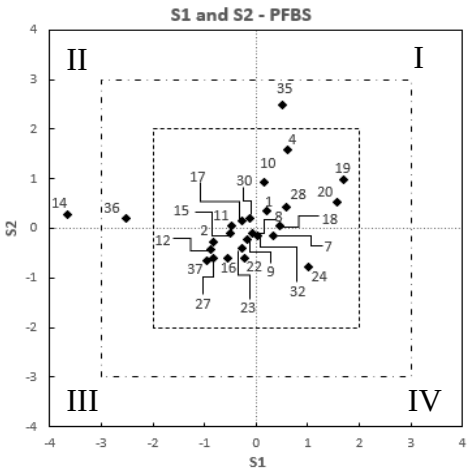


Scores greater than 10 or less than -10 have been plotted as 10 or -10 respectively.

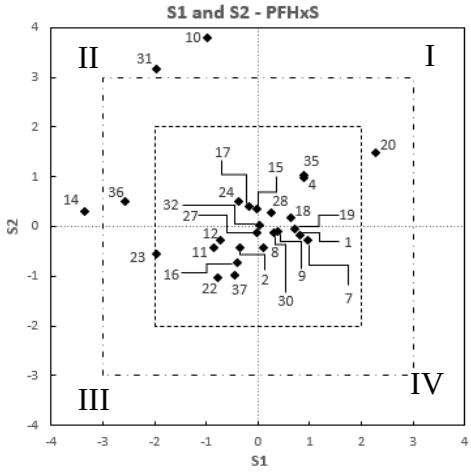
Figure 95 E_n-Score Dispersal by Laboratory

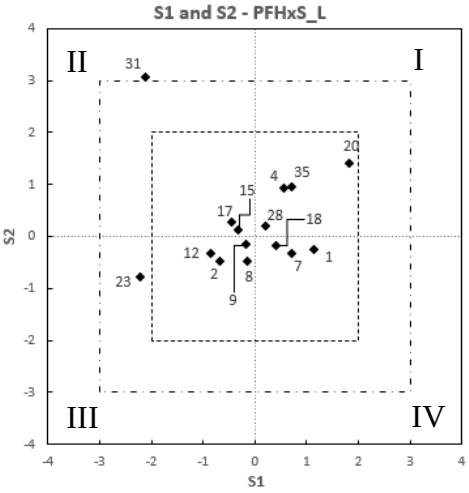
6.5 z-Score Scatter Plots

Scatter plots of z-scores for all analytes in soil samples S1 and S2 are presented in Figure 96. 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

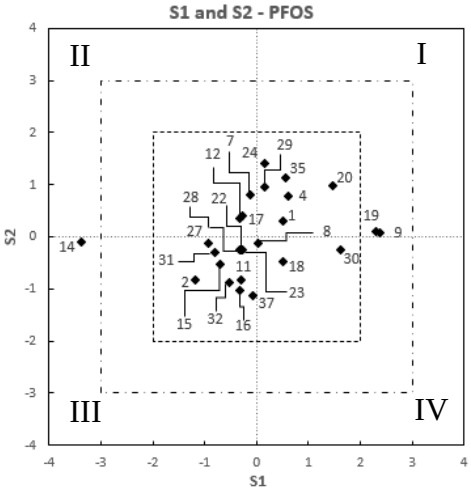


Laboratory 25 is off scale.

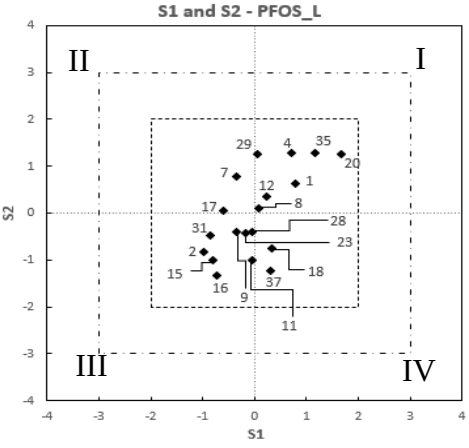




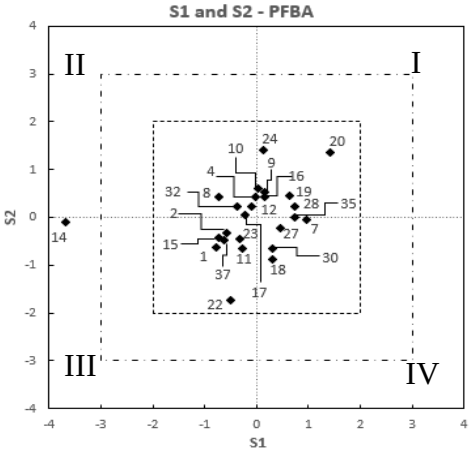
Laboratory 25 is off scale.



Laboratories 10 and 25 are off scale.

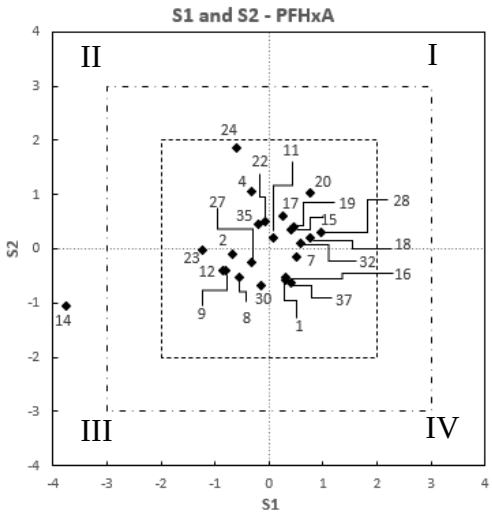


Laboratory 25 is off scale.

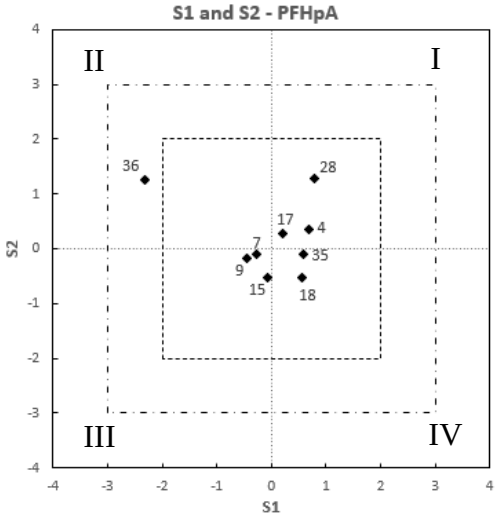


Laboratory 25 is off scale.

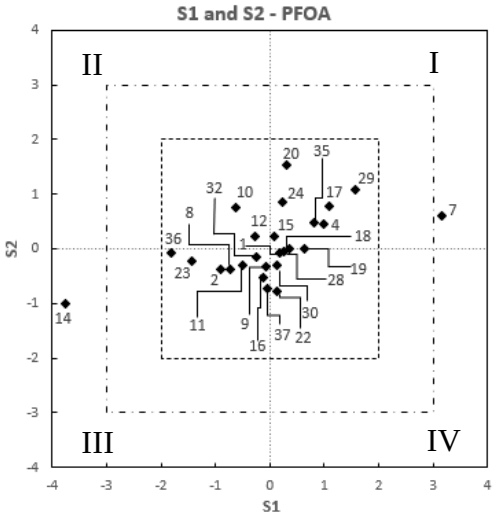
Figure 96 z-Score Scatter Plots



Laboratories 10, 25 and 36 are off scale.



Laboratory 10 is off scale.



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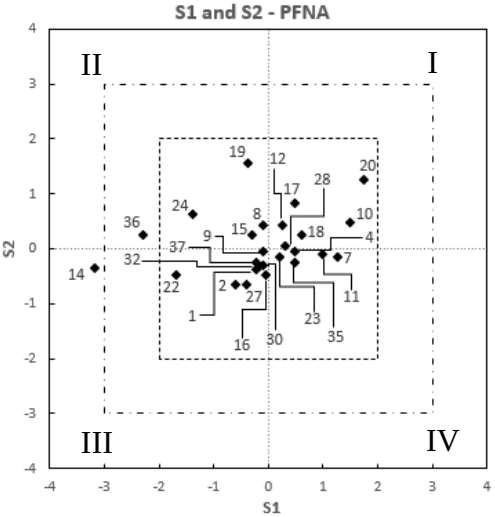

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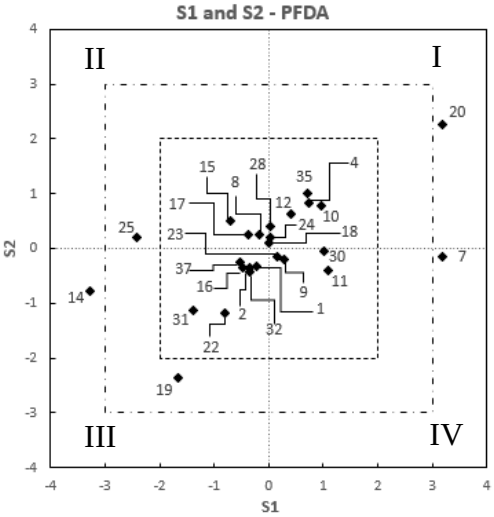


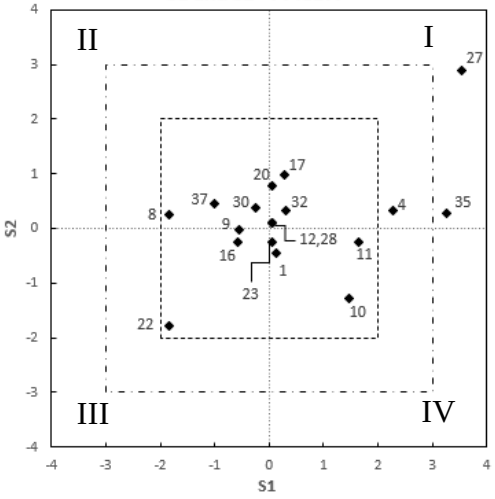
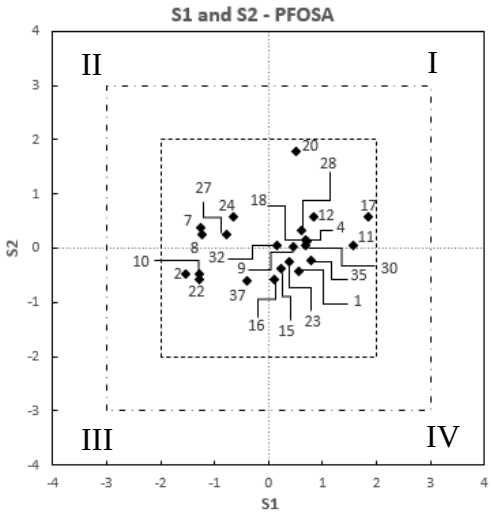
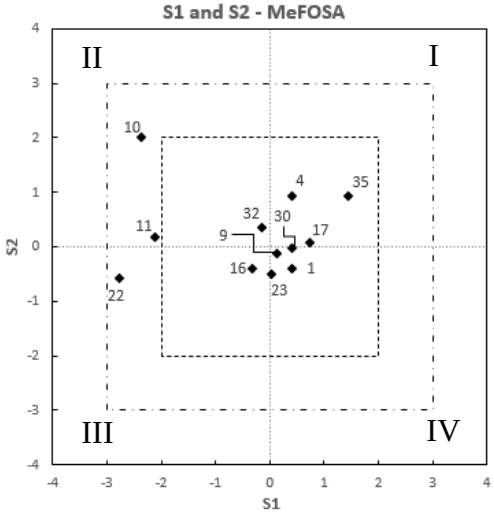
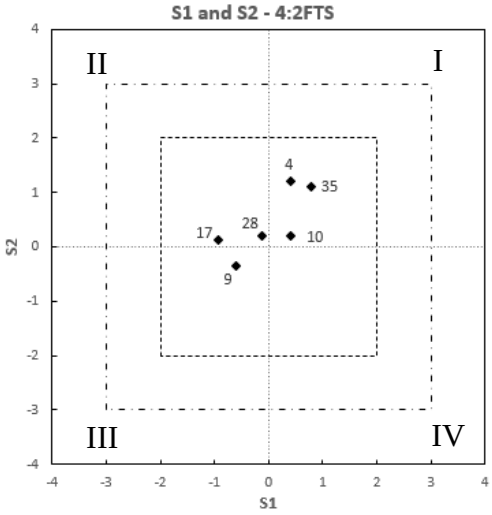


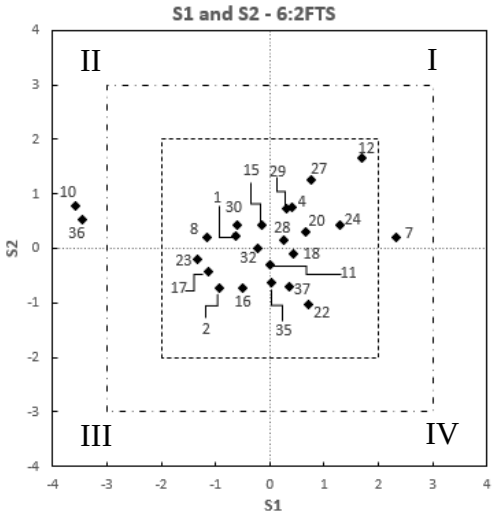
Figure 96 z-Score Scatter Plots (continued)



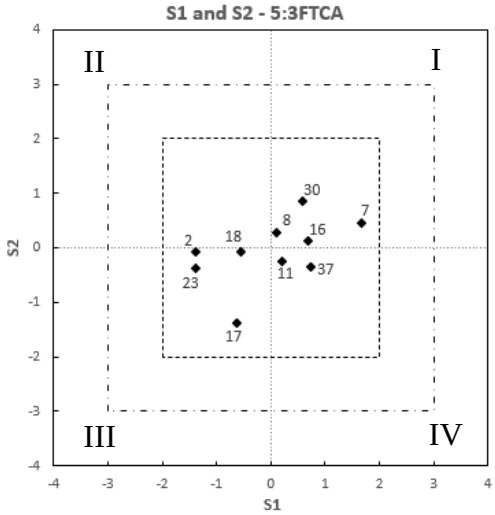


Laboratory 25 is off scale.





Laboratories 9 and 25 are off scale.



Laboratory 25 is off scale.

Figure 96 z-Score Scatter Plots (continued)

Table 99 Summary of Participants' Results and Performance for Sample S1*

Lab. Code	PFBS (µg/kg)	PFPeS (µg/kg)	PFHxS (µg/kg)	PFHxS_L (µg/kg)	PFHpS (µg/kg)	PFOS (µg/kg)	PFOS_L (µg/kg)	PFNS (µg/kg)	PFDS (µg/kg)	PFDoS (µg/kg)	PFBA (µg/kg)	PFPeA (µg/kg)	PFHxA (µg/kg)	PFHpA (µg/kg)	PFOA (µg/kg)	PFNA (µg/kg)	PFDA (µg/kg)	PFUdA (µg/kg)
AV	156	172	1510	1390	356	20900	13100	Not Set	Not Set	4.80	339	558	1390	162	550	50.0	29.0	8.46
1	162.82	184.73	1753.85	1707.47	542.13	23077.84	15189.00	241.63	98.21	NT	286.22	546.10	1472.96	154.06	570.36	47.87	27.75	8.02
2	130	140	1400	1200	230	16000	10500	26	25	4.9	300	450	1200	130	450	44	27	7.8
3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	174.90	194.57	1780.10	1543.90	336.72	23426.10	14966.27	266.36	75.40	NT	350.30	653.73	1301.04	184.42	657.95	54.76	33.29	9.85
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	166.31	179.72	1800.76	1588.53	270.9	20367	12196.89	<1	<1	<1	404.02	623.4	1535.39	153.54	898.98	62.64	47.49	<1
8	154	153	1540	1350	310	21000	13300	32	26	5	290	540	1240	147	470	49	28	8
9	150.3999	315.0717	1629.211	1339.960	464.9994	30785.990	12167.730	91.34709	75.97152	8.718785	350.0674	550.3736	1168.914	147.8027	541.0381	48.97011	30.64589	8.187665
10	161	104	1210	NR	217	13384	NR	25.6	20.4	NT	341	464	1593	181	481	64.9	34.6	9.25
11	141	136	1250	NT	478	19700	13000	233	71	4.8	320	449	1410	155	496	59.8	35.4	11.5
12	129	142	1294	1150	276	19604	13693	23.3	14.3	NT	332	538	1155	143	520	52.7	31.3	7.2
13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
14	42.02	NT	498.53	NT	NT	6750.5838	NT	NT	NT	NT	89.25	172.05	347.16	39.88	135	18.25	10.0486	3.1908
15	140	180	1500	1300	350	18000	11000	NT	68	NT	290	510	1500	160	560	47	25	7.1
16	139	165	1390	NT	324	19500	11200	208	82.4	4.6	338	535	1480	161	536	49.5	26.3	8.4
17	148	309	1456	1266	734	19740	11489	96.5	51	16.2	324	555	1462	169	669	54.9	26.84	8.264
18	170	180	1700	1500	410	23000	14000	280	97	NT	360	600	1600	180	590	56	29	9.3
19	209.50	205.70	1725.28	NR	427.2	30557	NR	NT	NT	NT	382.12	623.18	1521.18	164.67	621	46.31	19.43	9.11
20	205	210	2200	1900	385	27000	17500	15.5	56.5	NT	435	635	1600	220	585	67.5	47.5	9.85
22	149.6	181.6	1277.6	NT	441.5	19703.3	NT	22.9	17.82	3.9	305.3	549.2	1369.5	141.1	565.7	33.2	24.4	5.1
23	148	154	917	775	289	19778	12640	94	34	6.5	317	535	1049	162	392	52	30	8.9
24	187.7	157.5	1396.5	NT	1025	21594.5	NT	37.9	12.2	4.8	347.2	662.9	1219.3	200.8	576.5	36.2	29.1	6.3
25	7.9	<1.0	6.0	6.0	15	13	10	1.5	31	NT	9.9	4.3	7.5	4.3	13	7.6	15	<1.0
26	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
27	130	200	1500	NT	410	17000	NT	22	17	NT	370	470	1300	110	0.5	46	<0.1	8.1
28	174	176	1590	1450	384	19500	13000	22.8	18.6	4.72	390	667	1660	188	580	53.1	29.2	8.63
29	177.10	192.59	1746.61	1522.38	333.95	21595.13	13250.45	265.80	80.44	< 5	362.80	566.98	1562.38	181.37	722.62	50.70	33.70	12.43
30	152	143	1600	NT	368	27700	NT	265	63	NT	360	554	1350	164	564	49.1	34.9	8.6
31	129	168	917	800	361	17541	10848	115	30	NT	288	458	930	158	477	30	21	9.3
32	157	179	1520	NT	330	18700	NT	268	86.3	NT	314	565	1550	161	522	48.3	27	9.71
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	172.35	197.54	1780.42	1586.66	283.16	23228.31	16146	229.43	64.8	NT	388.72	686.32	1335.92	181.09	640.72	54.93	33.17	6.75
36	77	NR	731	NR	NR	NR	NR	NR	NR	NR	NR	NR	1264	87	351	27	NR	NR
37	126.35	170.82	1372.35	NT	376.15	20571	13880	191.35	82.75	NT	296.65	534.35	1504	153.42	545.45	47.83	26	7.52
38	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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

Table 99 Summary of Participants' Results and Performance for Sample S1* (continued)

Lab. Code	PFDoA (µg/kg)	PFTrDA (µg/kg)	PFTeDA (µg/kg)	PFHxDA (µg/kg)	PFOSA (µg/kg)	MeFOSA (µg/kg)	MeFOSAA (µg/kg)	MeFOSE (µg/kg)	4:2FTS (µg/kg)	6:2FTS (µg/kg)	8:2FTS (µg/kg)	10:2FTS (µg/kg)	3:3FTCA (µg/kg)	5:3FTCA (µg/kg)	7:3FTCA (µg/kg)	PFMPA (µg/kg)	PFMBA (µg/kg)
AV	4.64	1.78	1.58	0.484	65.0	1.39	2.44	0.519	0.406	442	506	4.00	4.57	304	63.1	Not Set	Not Set
1	4.53	2.08	1.62	NT	72.18	1.50	< 0.5	0.46	< 0.5	386.76	550.12	4.23	< 5	< 5	NT	NT	NT
2	4.0	NR	NR	NR	45	NR	NR	NR	NR	360	440	NR	5.7	220	57	1.9	2.9
3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	5.71	2.05	2.30	NT	74.23	1.50	2.50	0.52	0.44	476.94	526.16	4.92	NT	NT	NT	NT	NT
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	<1	<1	<1	<1	48.74	<1	<1	<2	<1	648.85	579.25	<1	NT	405.94	NT	NT	NT
8	4	1	1	NT	49	<1	2	<1	<1	340	400	3	4	310	75	<1	<1
9	4.1986725	1.4361320	1.4064773	0.4144398	70.848595	1.4250730	2.5409452	NT	0.3567687	53.710663	297.00516	3.7579127	NT	NT	NT	NT	NT
10	4.92	1.99	2.04	0.51	48.2	0.73	2.19	<0.0005	0.44	124.7	146.3	3.7	NT	NT	NT	NT	NT
11	5.5	2.4	2.1	0.5	85.4	0.8	2.8	0.6	<0.5	442	457	4.3	5.4	316	70.7	1	0.9
12	3.8	1.9	1.6	NT	75.8	<1	2.8	1.6	<1	593	857	5.9	NT	NT	NT	NT	NT
13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
14	1.5025	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
15	4.4	<5	<50	NT	68	<10	<2	<10	<1	430	530	3.8	NT	NT	NT	NT	NT
16	4	1.8	1.4	<0.5	66.4	1.3	1.4	<1.0	<0.5	398	478	3.2	4.6	346	62.5	1.1	1
17	4.949	2.1	1.67	0.454	89	1.594	2.512	0.473	0.331	341	318	2.97	3.88	266	51.9	1.051	1.374
18	5.3	< 5	< 50	NT	74	< 10	< 2	< 10	< 1	480	610	4.8	< 10	270	56	< 1	< 1
19	NR	NR	NR	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
20	6.25	2.05	1.6	NT	71.5	<1	<1	<1	<1	500	835	NT	NT	NT	NT	NT	NT
22	3.6	0.9	1	<0.5	48.5	0.62	2.6	<0.5	<0.5	505.6	684.8	6.5	NT	NT	NT	NT	NT
23	4.9	1.8	1.6	<2	70	1.4	2.7	<1	<1	325	NR	3.1	4.1	220	60	<2	<2
24	3.5	1	<0.5	<0.5	56.7	<0.5	2.8	<0.5	<0.5	556	586.9	7.4	NT	NT	NT	NT	NT
25	1.4	16	<1.0	NT	7.7	<1.0	1.2	1.1	<1.0	6.7	6.6	88	<1.0	20	3.4	NT	NT
26	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
27	4.8	1.5	2.7	NT	55	<20	2	<160	<20	510	570	5	NT	NT	NT	NT	NT
28	4.70	1.88	1.60	0.517	72.8	NT	3.14	NT	0.397	465	536	4.00	NT	NT	NT	NT	NT
29	< 5	< 5	< 5	< 5	65.50	< 10	< 10	< 10	< 5	469.42	526.24	4.940	NR	NR	NR	NR	NR
30	4	1.5	1.5	<0.5	74	1.5	2.6	0.5	<0.5	389	768	3.3	7.7	340	59.9	1.1	1.5
31	<5	<5	<5	NT	43	<5	<5	<5	<5	85	120	<5	NT	NT	NT	NT	NT
32	5.69	1.89	1.68	0.51	67	1.35	<3	<1	<0.5	422	535	3.88	NT	NT	NT	NT	NT
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	5.68	2.16	2.61	NT	75.4	1.79	2.37	0.56	0.47	443.7	497.57	4.96	<0.5	<0.5	NT	NT	NT
36	NR	NR	NR	NR	NR	NR	NR	NR	NR	136	143	NR	NR	NR	NR	NR	NR
37	4.03	1.83	1.26	<1.2	59.68	<1.2	1.29	<1.2	<0.5	473.87	416.38	2.67	4.32	348.81	74.69	1.2	1.2
38	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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

Table 100 Summary of Participants' Results and Performance for Sample S2*

Lab. Code	PFBS (µg/kg)	PFHxS (µg/kg)	PFHxS_L (µg/kg)	PFOS (µg/kg)	PFOS_L (µg/kg)	PFNS (µg/kg)	PFDS (µg/kg)	PFUdS (µg/kg)	PFBA (µg/kg)	PFHxA (µg/kg)	PFHpA (µg/kg)	PFOA (µg/kg)	PFNA (µg/kg)	PFDA (µg/kg)
AV	3.07	3.28	3.32	7.18	5.88	0.415	8.54	Not Set	4.60	3.36	0.112	6.50	2.76	6.65
SV	3.29	3.52	3.52	5.66	4.82	0.511	10.3	20.6	4.97	3.21	Not Spiked	6.18	2.70	6.08
1	3.28	3.16	3.16	7.62	6.61	0.40	7.51	NT	4.02	2.97	< 0.1	6.40	2.55	6.23
2	2.9	3.0	3.0	6.0	4.9	NR	7.9	NR	4.3	3.3	NR	6.0	2.4	6.2
3	NR	3.42	NR	6.74	NR	NR	NR	NR	NR	NR	NR	5.93	NR	NR
4	4.04	3.93	3.93	8.32	7.39	0.48	8.85	NT	4.99	4.07	0.12	7.07	2.74	7.74
6	3.0748	3.5708	NR	6.4205	5.6685	0.4062	9.4119	NR	4.5471	3.4898	0.1091	6.7008	2.826	6.7958
7	2.97	3.1	3.1	8.34	6.81	0.37	8.83	NT	4.55	3.25	0.11	7.28	2.68	6.45
8	3	3	3	7	6	<1	10	NT	5	3	<1	6	3	7
9	2.925910678	3.213869514	3.213869514	7.298491140	5.403749035	0.409975631	8.901977518	17.60666627	5.086204806	3.096438278	0.108116883	6.068386731	2.724408818	6.378485468
10	3.65	5.77	NR	49.4	NR	0.26	5.74	NT	5.15	6.81	0.45	7.49	3.02	7.69
11	3.1	3	NT	6	4.7	0.4	8.4	NT	4	3.5	<0.2	6.1	2.7	6.1
12	2.8	3.1	3.1	7.7	6.3	<1	8.5	NT	4.8	3.1	<1	6.8	3	7.5
13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
14	3.24	3.48	NT	7.03	NT	NT	NT	NT	4.5	2.6531	<0.1	5.19	2.57	5.63
15	3.0	3.5	3.4	6.4	4.7	NT	9.0	NT	4.2	3.6	0.1	6.8	2.9	7.3
16	2.7	2.8	NT	5.7	4.3	0.3	7.5	NT	5	3	<0.2	5.8	2.5	6.2
17	3.17	3.538	3.498	7.751	5.923	0.407	7.448	NT	4.636	3.764	0.118	7.5	3.21	6.98
18	3.1	3.4	3.2	6.5	5.0	0.4	9.3	NT	3.8	3.5	0.1	6.5	2.9	6.8
19	3.671	3.255	NR	7.342	NR	NT	NT	NT	5.008	3.636	NR	6.497	3.618	3.514
20	3.4	4.25	4.25	8.6	7.35	<1	11.5	NT	5.85	4.05	<1	8.5	3.45	9.65
22	2.7	2.6	NT	6.8	NT	<0.5	5.1	NT	3	3.7	<0.5	5.5	2.5	5.1
23	2.83	2.92	2.81	6.83	5.38	0.43	9.57	NT	4.18	3.34	<0.5	6.21	2.67	6.47
24	2.6	3.6	NT	9.2	NT	<0.5	4.8	NT	5.9	4.6	<0.5	7.6	3.1	6.9
25	3.2	<1.0	3.5	7.2	5.9	<1.0	9.2	NT	4.9	3.6	<1.0	6.1	2.7	6.9
26	2.316004083	NT	2.913441452	8.813001014	7.195087113	NT	9.146512216	NT	4.264511626	2.791308384	0.109144505	5.506060966	2.384474381	6.475968601
27	2.7	3.2	NT	7	NT	0.5	8.6	NT	4.4	3.2	<0.1	<0.1	2.4	<0.1
28	3.33	3.46	3.46	6.82	5.41	0.436	9.00	NT	4.80	3.57	0.141	6.43	2.79	7.19
29	< 5	< 5	< 5	8.55	7.36	< 5	8.73	< 5	< 5	< 5	< 5	7.92	< 5	< 5
30	3.2	3.2	NT	6.8	NT	0.3	7.6	NT	4	2.9	<0.2	6.1	2.6	6.6
31	<5	5.35	5.35	6.73	5.31	<5	6.25	NT	<5	<5	<5	<5	<5	5.13
32	2.97	3.3	NT	5.92	NT	0.46	8.5	NT	4.8	3.43	<0.2	6.29	2.58	6.07
34	3.37	3.48	NT	6.88	NT	0.491	10.09	NT	5.08	3.32	<0.1	6.6	3.35	6.93
35	4.59	3.96	3.96	8.82	7.37	0.48	9.28	NT	4.59	3.66	0.11	7.12	2.63	7.98
36	3.2	3.6	NR	8.2	NR	NR	NR	NR	NR	6.2	0.14	6.4	2.9	NR
37	2.67	2.64	NT	5.54	4.44	0.384	7.68	NT	4.17	2.94	<0.2	5.56	2.62	6.32
38	2.8	3	NT	6.5	NT	0.51	10	15	4.6	3.1	0.093	7	2.5	6.6

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

Table 100 Summary of Participants' Results and Performance for Sample S2* (continued)

Lab. Code	PFTeDA (µg/kg)	PFODA (µg/kg)	PFOSA (µg/kg)	MeFOSA (µg/kg)	EtFOSAA (µg/kg)	EtFOSE (µg/kg)	4:2FTS (µg/kg)	6:2FTS (µg/kg)	8:2diPAP (µg/kg)	5:3FTCA (µg/kg)	ADONA (µg/kg)	PFEESA (µg/kg)	9Cl-PF3ONS (µg/kg)	11Cl-PF3OUdS (µg/kg)
AV	9.50	12.4	4.76	2.71	6.18	6.15	6.57	4.80	9.1	28.4	17.6	19.5	22.3	21.7
SV	10.8	16.1	5.37	3.72	7.25	7.25	6.96	5.09	10.4	37.1	20.1	23.7	24.8	25.1
1	8.65	NT	4.34	2.50	5.38	6.50	6.01	5.01	NT	< 5	18.20	NT	20.32	21.17
2	8.9	12	4.3	2.5	4.8	5.6	5.6	4.1	7.8	28	19	19	25	23
3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
4	10.13	NT	4.87	3.21	7.51	6.28	8.15	5.53	NT	NT	NT	NT	NT	NT
6	12.2482	12.2482	4.687	2.632	6.4972	NR	6.6328	4.5952	10.0229	NR	19.7656	NR	24.9701	NR
7	5.96	NT	5.12	2.97	6.05	6.47	6.32	4.98	NT	31.03	21.54	NT	26.39	25.18
8	10	NT	5	3	6	6	7	5	NT	30	20	20	23	23
9	9.465197569	0.384003296	4.786099001	2.637758950	6.102582399	NT	6.127294061	4.479477182	9.611787940	NT	16.28362909	NT	NT	NT
10	7.04	NT	4.3	3.9	<0.0005	6.88	6.82	5.54	NT	NT	10.13	NT	13.74	13.16
11	9	NT	4.8	2.8	5.8	6.8	6.6	4.5	9.3	27	18.5	18.8	20.2	22.7
12	9.7	NT	5.3	2.8	6.9	4.9	8.6	6.4	NT	NT	13.8	NT	NT	NT
13	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
14	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
15	9.3	NT	4.4	2.8	5.7	7	6.7	5.2	NT	NT	NT	NT	NT	NT
16	9	NT	4.2	2.5	6.1	6.4	5.8	4.1	10.2	29.1	15.8	19.9	21.2	20.3
17	11.389	NT	5.32	2.753	6.163	6.142	6.726	4.39	NT	20.503	16.41	10.735	23.051	17.728
18	9.8	NT	4.9	2.8	5.3	6.9	6.3	4.7	NT	28	17	19	21	22
19	7.707	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
20	11	NT	6.45	<1	<1	<1	8.25	5.1	NT	NT	NT	NT	NT	NT
22	6.1	12.6	4.2	2.4	6.2	4.6	5.5	3.8	NT	NT	13.1	NT	NT	NT
23	9.05	NT	4.53	2.44	6.45	5.28	6.18	4.6	8.83	26.31	17.14	21.38	22.84	22.91
24	8.1	11.5	5.3	2	9.4	4.1	7.5	5.2	NT	NT	16	NT	NT	NT
25	10	NT	4.7	2.8	6.5	6.7	6.8	4.8	NT	30	20	NT	25	25
26	6.431392633	12.59436143	3.477235852	2.676088354	7.781843627	NT	5.836865020	3.701804464	6.922017316	NT	NT	NT	NT	NT
27	15	NT	5	2	6	9	6	6	NT	NT	NT	NT	NT	NT
28	9.71	13.9	5.07	NT	7.34	NT	6.83	4.93	NT	NT	21.3	NT	23.0	21.5
29	10.25	< 5	< 5	< 10	< 10	< 10	8.14	5.49	NR	NR	NR	NR	NR	NR
30	10.2	NT	4.8	2.7	4.8	6.5	4.8	5.2	9.9	33.3	20.3	21.8	24.8	27
31	11.23	NT	<5	<5	<5	5.26	6.13	<5	NT	NT	NT	NT	NT	NT
32	10.1	NT	4.8	2.9	6.1	6.7	5.8	4.8	NT	NT	NT	NT	NT	NT
34	12.64	NT	NT	NT	NT	NT	6.83	4.52	NT	NT	NT	NT	NT	NT
35	10.02	NT	4.55	3.22	6.97	6.6	8.03	4.19	NT	2.7	18.2	NT	19.6	20.7
36	NR	NR	NR	NR	NR	NR	NR	5.3	NR	NR	NR	NR	NR	NR
37	10.34	NT	4.19	2.39	5.9	5.35	5.23	4.12	3.16	26.46	16.19	18.71	19.02	15.45
38	NT	< 0.1	6	NT	NT	NT	NT	4.3	NT	NT	NT	NT	NT	NT

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

Table 101 Summary of Participants' Results and Performance for Sample S3*

Lab. Code	PFBS (µg/kg)	PFHxS (µg/kg)	PFHxS_L (µg/kg)	PFHpS (µg/kg)	PFOS (µg/kg)	PFOS_L (µg/kg)	PFNS (µg/kg)	PFDS (µg/kg)	PFBA (µg/kg)	PFPeA (µg/kg)	PFHxA (µg/kg)	PFHpA (µg/kg)	PFOA (µg/kg)	PFNA (µg/kg)
AV	7.42	4.96	5.23	11.0	12.5	9.5	1.13	Not Set	10.8	4.68	6.90	3.64	13.1	7.36
SV	7.87	5.29	5.29	12.1	11.3	10.0	1.61	37.8	11.6	4.47	6.45	3.35	11.9	6.64
1	8.06	5.46	5.46	12.01	13.47	11.83	1.22	17.32	12.22	3.86	7.86	4.22	13.65	7.84
2	7.2	5.6	5.6	10	8.9	7.8	1.0	16	44	6.3	6.9	3.5	11	6.4
3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	9.71	6.20	6.20	13.42	13.89	10.75	1.17	16.66	11.22	5.82	7.93	3.97	15.90	8.41
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
10	7.23	4.38	NR	5.06	30.18	NR	0.91	16.56	7.69	14.14	6.19	3.3	11.42	7.06
11	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
12	5.7	4.2	4.2	9.3	9.5	8	1.3	23	18.8	3.7	5.6	3.3	11.2	6.4
13	6.4536	NT	4.6365	9.1794	6.1185	5.2431	<1	19.9225	5.4774	4.974	6.4035	3.212	20.3832	5.6217
14	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
15	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
16	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
17	8.115	5.434	5.294	12.123	13.954	10.853	1.412	30.45	13.3	5.144	7.241	4.028	14.8	8.76
18	6.7	3.2	3.1	17	14	10	2.4	38	< 2	3.1	5.8	3.1	13	6.2
19	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22	6.7	3.9	NT	11.1	10.8	NT	1.2	33.4	7.01	2.97	7.3	2.8	11.1	7.5
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	8.5	5	NT	10	14.2	NT	0.7	23.1	9.5	3.1	6.1	3.8	14.1	9.9
25	150	1500	1200	340	20000	14000	8.1	2.7	340	530	1200	160	490	61
26	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
27	7.3	6	NT	9	11	NT	1.1	17	11	5.3	7.2	3.6	<0.1	6.8
28	8.51	6.34	6.27	13.8	14.9	12.2	<1.89	40.3	11.9	6.20	8.51	4.13	15.1	8.27
29	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
30	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
32	6.4	4.8	NT	13.7	15.1	NT	NT	36.6	<12	6.0	7.1	<5	14.3	7.7
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	9.96	5.69	5.69	12.3	13.8	10.9	1.17	16.83	13.44	5.93	8.09	4.35	15.73	8.67
36	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
37	4.07	2.59	NT	7.05	7.66	6.84	<2.5	21.26	<10	3.08	4.45	<2.5	8.21	5.33
38	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

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

Table 101 Summary of Participants' Results and Performance for Sample S3* (continued)

Lab. Code	PFDA (µg/kg)	PFUdA (µg/kg)	PFDoA (µg/kg)	PFTrDA (µg/kg)	PFOSA (µg/kg)	MeFOSAA (µg/kg)	EtFOSAA (µg/kg)	8:2FTS (µg/kg)	10:2FTS (µg/kg)	8:2diPAP (µg/kg)	GenX (µg/kg)	ADONA (µg/kg)	9Cl-PF3ONS (µg/kg)	11Cl-PF3OUdS (µg/kg)
AV	13.5	0.394	Not Set	Not Set	7.30	1.07	1.30	6.27	36.8	Not Set	Not Set	26.9	24.5	Not Set
SV	12.5	Not Spiked	Not Spiked	22.5	7.89	Not Spiked	Not Spiked	7.55	53.5	58.8	16.8	26.3	26.0	26.3
1	14.80	0.32	0.78	8.64	7.09	0.95	1.03	6.82	34.58	NT	20.33	33.36	24.86	15.45
2	11	NR	NR	7.3	7.3	NR	NR	5.4	22	51	16	36	60	55
3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
4	16.66	0.36	0.90	5.55	8.12	1.06	1.02	7.12	41.89	NT	NT	NT	NT	NT
6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
9	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
10	14.9	0.466	1.55	10.18	6.92	1.41	<0.0005	11.15	42.99	NT	21.01	19.81	13.02	8.73
11	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
12	12.6	<1	1.1	17.3	6.5	1	1.4	7.8	50	NT	9.5	16.1	NT	NT
13	12.2867	<1	<1	17.5552	2.4179	<1	<1	1.3104	37.4736	NT	9.1286	10.9993	5.2498	1.2841
14	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
15	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
16	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
17	14.1	0.415	1.93	28.5	7.81	1.382	1.644	5.696	28.1	NT	NT	27.96	25.93	20.58
18	10	< 5	< 5	22	< 10	< 2	< 2	4.2	130	NT	< 50	22	29	30
19	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
20	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
22	13.2	<0.5	<0.5	5.6	5.8	0.62	1	4.7	49.8	NT	3.7	26.1	NT	NT
23	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
24	11.5	<0.5	<0.5	4.5	4.3	<0.5	<0.5	6.1	45.8	NT	5.22	25	NT	NT
25	31	8.7	1.7	<1.0	60	3.2	<1.0	530	1.7	NT	<1.0	<1.0	<1.0	<1.0
26	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
27	<0.1	0.4	1.7	35	8	<5	2	8	28	NT	NT	NT	NT	NT
28	16.7	<1.89	1.72	16.8	8.49	1.96	2.33	7.15	37.4	NT	16.9	30.9	27.0	25.3
29	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
30	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
31	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
32	14.2	<2.5	<2.5	14.2	8.6	<10	<5	6.4	28.2	NT	NT	NT	NT	NT
34	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
35	16.6	0.4	1.04	4.28	8.28	1.07	1.11	6.8	43.53	NT	20.55	31.51	22.4	14.1
36	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
37	10.46	<2.5	<2.5	9.14	6.41	<10	<5	5.22	24.93	NT	NT	NT	NT	NT
38	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

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

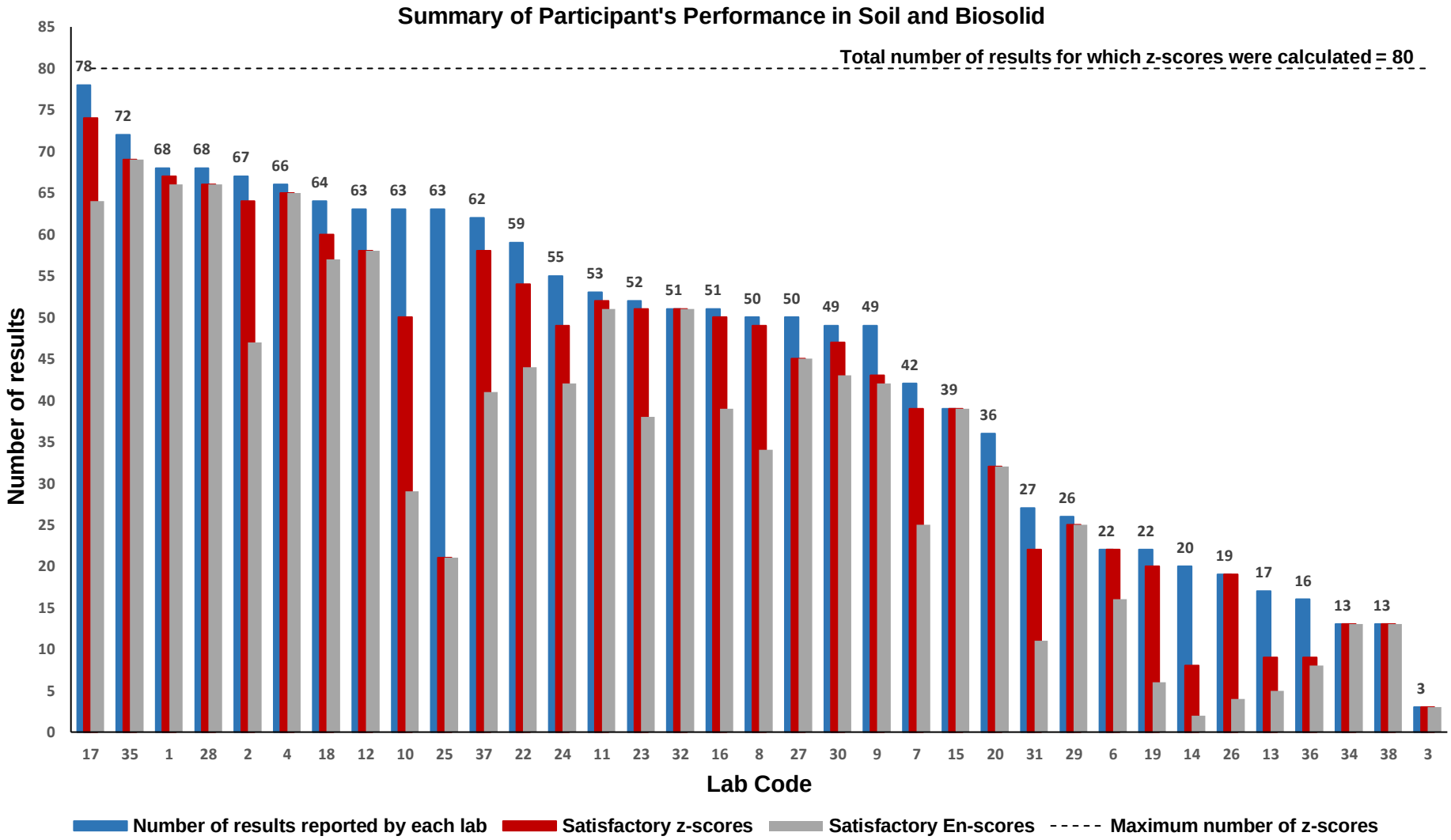


Figure 97 Summary of Participants' Performance in Soil and Biosolid

6.6 Summary of Participants' Results and Performances

Summaries of participants' results and performance for scored analytes in this PT study are presented in Tables 99 to 101 and Figures 93 to 97.

Seventeen laboratories reported at least one PFAS analyte that was not spiked into test samples S2 and S3. These results are presented in Appendix 4.

Thirty-four laboratories reported results for at least one of the two soil samples and 15 reported results for the biosolid sample S3. No laboratory reported results for all of the analytes for which z-scores were calculated (80).

Laboratory **17** returned the highest number of acceptable z-scores with 74 out of 78 reported.

All results reported by Laboratories **32** (51), **15** (39), **6** (22), **26** (19), **34** (13), **38** (13), and **3** (3) returned acceptable z-scores (Figure 97).

Laboratory **35** had the highest number of acceptable E_n-scores with 69 out of 72 reported. Laboratories **3**, **15**, **32**, **34**, and **38** returned acceptable E_n-scores for all analytes scored.

The results reported by Laboratory **14** for sample S1 were also lower than the robust average by approximately the same factor. Laboratory **25** may have accidentally reported their Sample S1 results as Sample S3, and Sample S3 results as Sample S1. Their results were not included in the analyses of extraction methods and of instrumental techniques employed by participants.

6.7 Participants' Results and Analytical Methods for PFAS in Soil

Thirty-four laboratories reported results for at least one of the two soil samples. Participants were requested to analyse the samples using their normal test method and to report a single result as they would normally report to a client. The method descriptions provided by participants for PFAS measurements in soil are presented in Appendix 6.

Overall, the between-laboratory coefficients of variation for PFAS analytes in S1 were larger than those of S2, an indication that PFAS measurements in the incurred soil sample S1 presented more difficulty to participants than in the fortified soil sample S2.

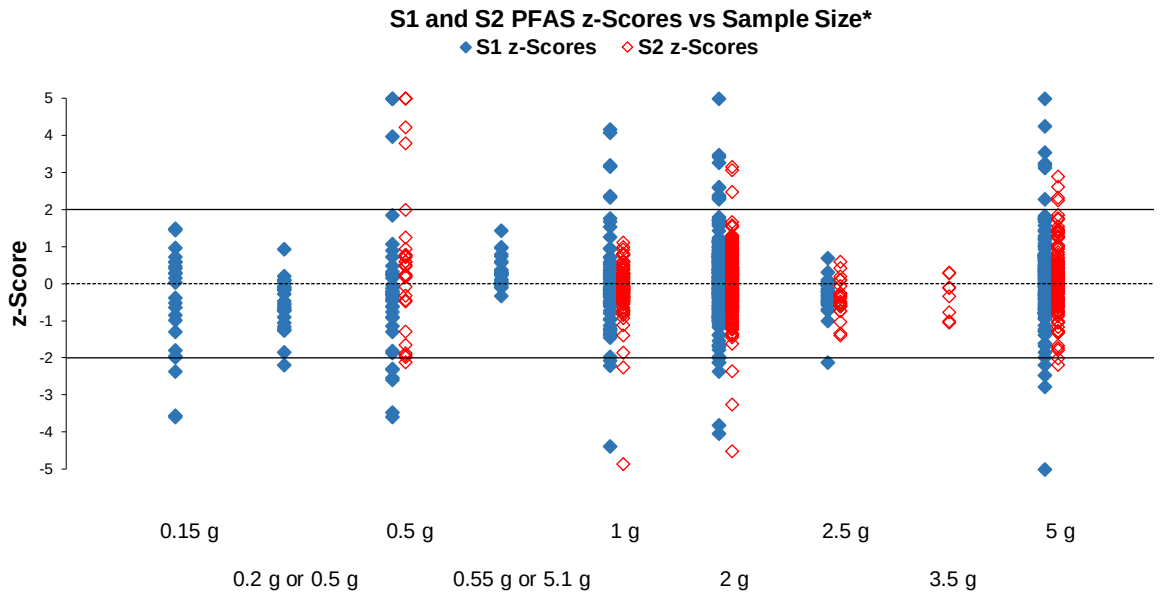
Extraction

Sample S1 was contaminated soil, whereas Sample S2 was soil fortified for 27 individual PFAS components.

Several laboratories homogenised the soil sample before subsampling and two reported wetting the soil prior to analysis. All the results reported by these two laboratories returned acceptable z-scores but one. Small amounts of water can be added to dry soil samples to facilitate extraction.[9]

Analytes' mass fraction in S1 other than PFOS were between 0.406 µg/kg and 1510 µg/kg (mass fraction for linear PFOS was 13100 µg/kg and for total PFOS 20900 µg/kg). For sample S2 the mass fractions were between 0.112 µg/kg and 28.4 µg/kg. Of 29 participants who reported results for both soil samples, 25 used the same sample size for extraction in S1 as they did in S2.

Laboratories used a wide variety of sample sizes from 0.154 g to 5 g in S1 and from 0.4701 g to 5 g in S2. Plots of participants' performance in S1 and S2 versus the amount of sample taken for analysis are presented in Figure 98. Caution should be exercised when a small sample size is taken for analysis as this might not be representative of the whole sample.

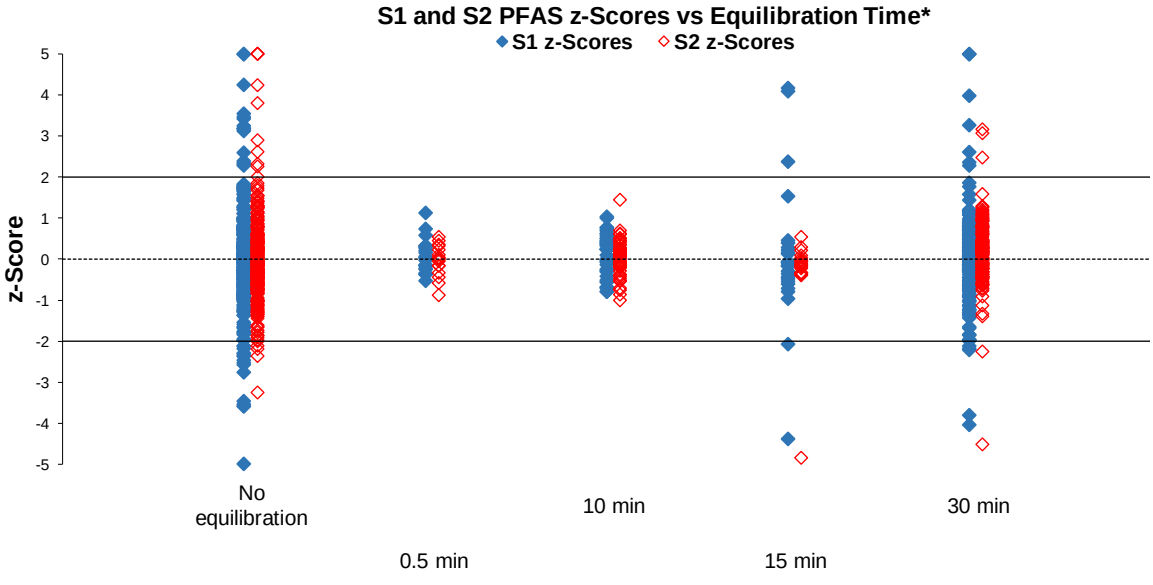


*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 98 S1 and S2 PFAS z-Scores vs Sample Size

Thirty-three participants reported adding isotopically labelled internal standards before extraction and 15 of them left the sample to equilibrate. Plots of participants' z-scores versus equilibration time are presented in Figure 99. No significant differences were evident between the performance of those participants who left the sample to equilibrate and those who didn't.

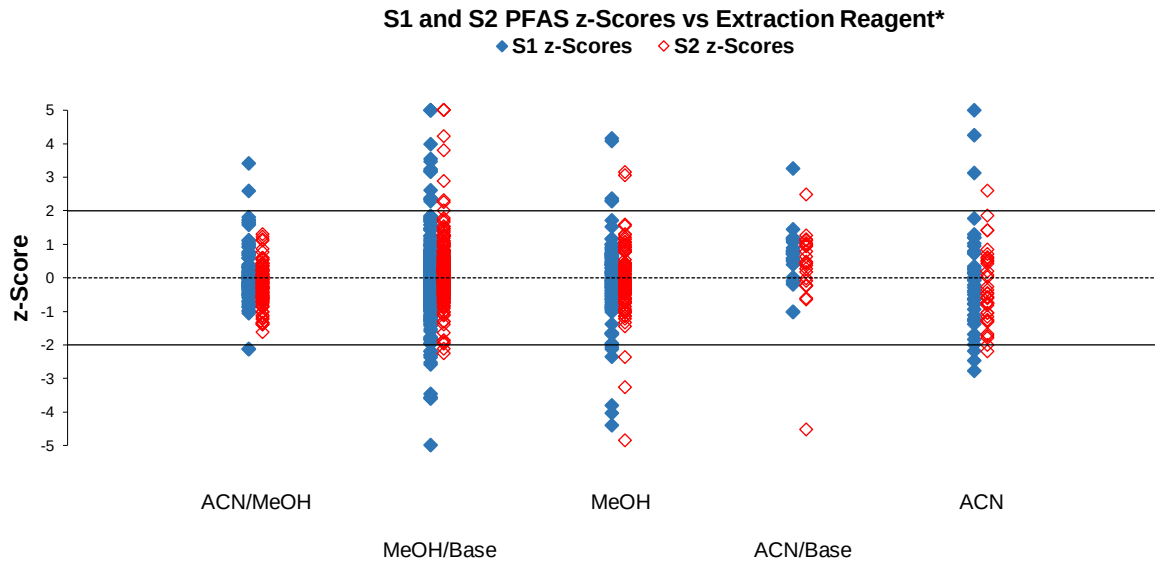
Six laboratories did not correct the result for the internal standard recovery.



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 99 S1 and S2 PFAS z-Scores vs Equilibration Time

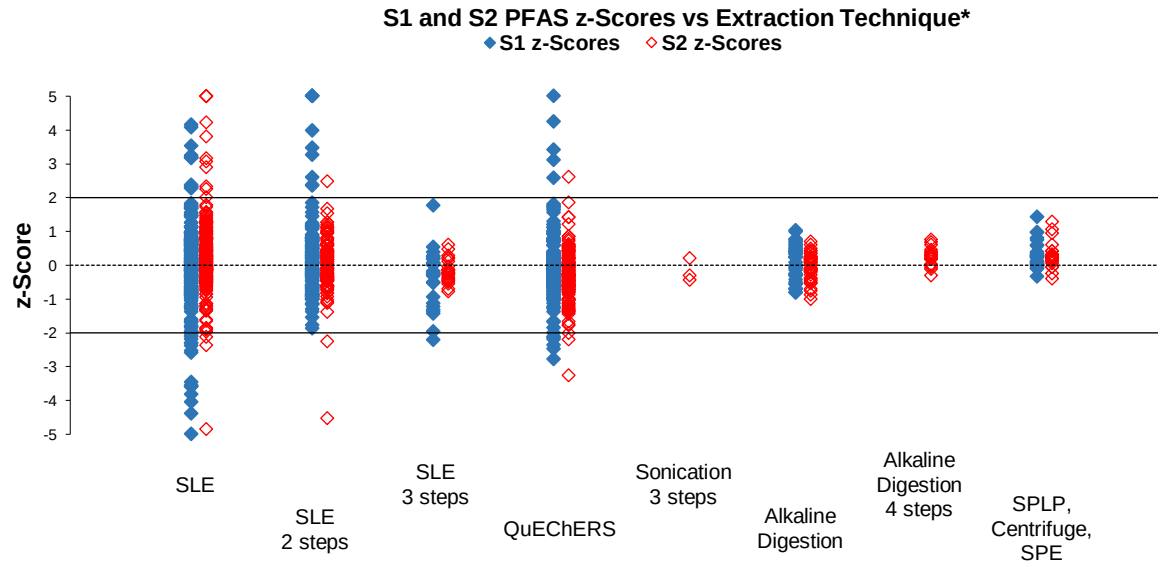
Methanol and base modified methanol were the preferred extraction reagents. In general, PFAS results were compatible with each other regardless of the extraction reagent used (Figure 100).



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 100 S1 and S2 PFAS z-Scores vs Extraction Reagent

Participants used a wide variety of extraction procedures based on SLE, alkaline digestion, QuEChERS, or accelerated solvent extraction (sonication). The use of mass labelled standards played a significant role in correcting the difference between these in-house analytical methods. Nine participants reported using a staggered extraction: 6 conducted SLE extraction over 2 steps, one laboratory used a staggered SLE extraction over 3 steps, one sonicated their sample across 3 rounds, and one conducted alkaline digestion over 4 steps. There was no obvious trend between laboratories' performance and the extraction technique used (Figure 101).

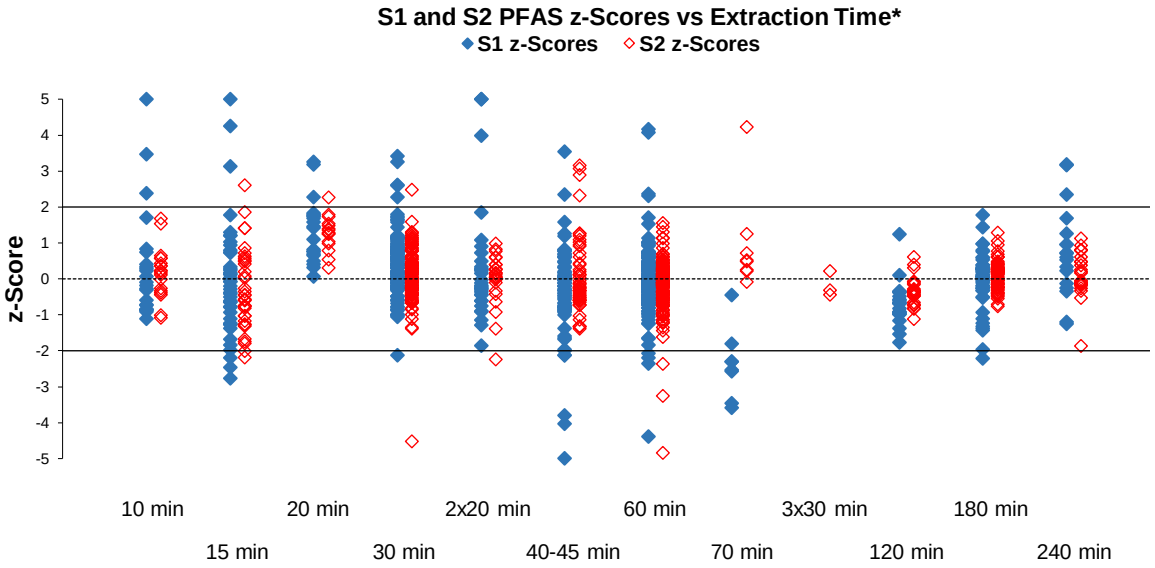


*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 101 S1 and S2 PFAS z-Scores vs Extraction Technique

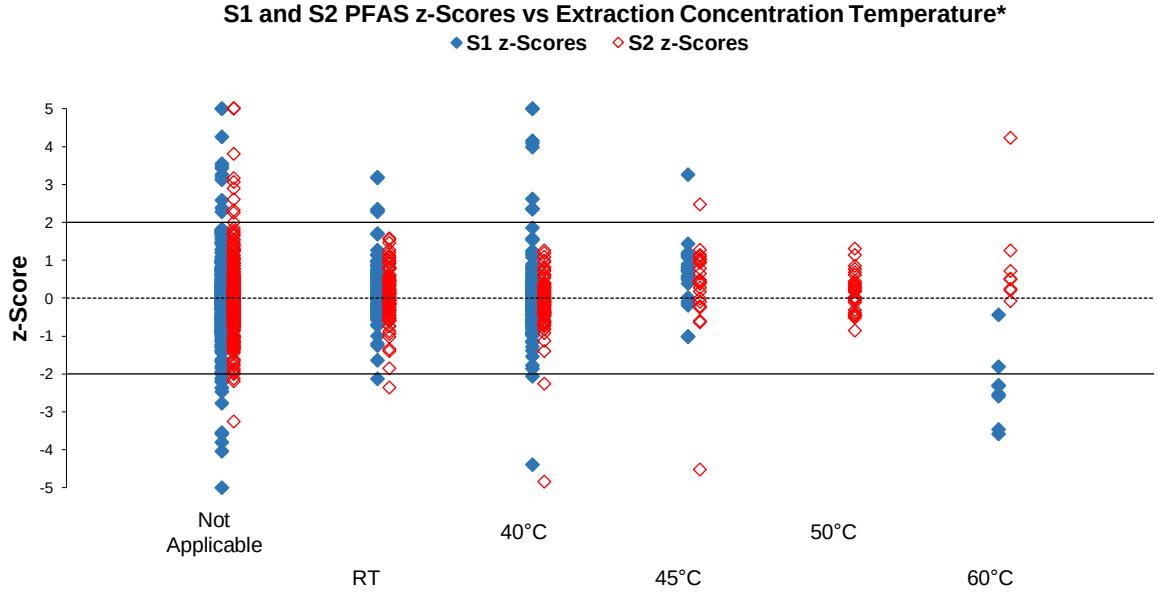
Nineteen laboratories added loose carbon to the sample extract to facilitate better adsorption of interferent organics.[9]

Laboratories reported extracting their sample for 10 to 240 min. The majority of laboratories however performed extraction for 60 minutes (Figure 102). Nine participants concentrated their sample extract at a temperature of 40°C to 60°C (Figure 103). According to the USEPA Method 1633, if all methanol is evaporated then the extract can be too concentrated and/or losses of neutral compounds can occur (FOSEs and FOSAs). Alternatively, if excess methanol is present during SPE cleanup then long chain carboxylic acids and sulfonates are likely to have poor recovery.[9]



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

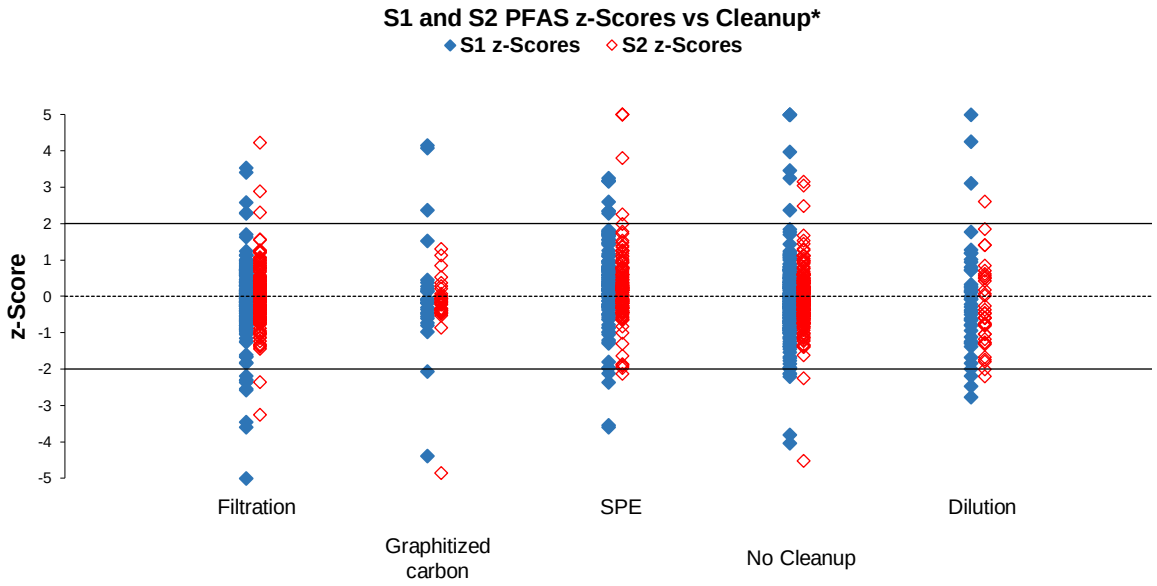
Figure 102 S1 and S2 PFAS z-Scores vs Extraction Time



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 103 S1 and S2 PFAS z-Scores vs Extraction Concentration Temperature

Cleanup of the crude extracts is an important step in the removal of matrix constituents that may interfere in instrumental determination. Almost half (11) of the laboratories who reported results in soil, did not cleanup after extraction. (Figure 104).



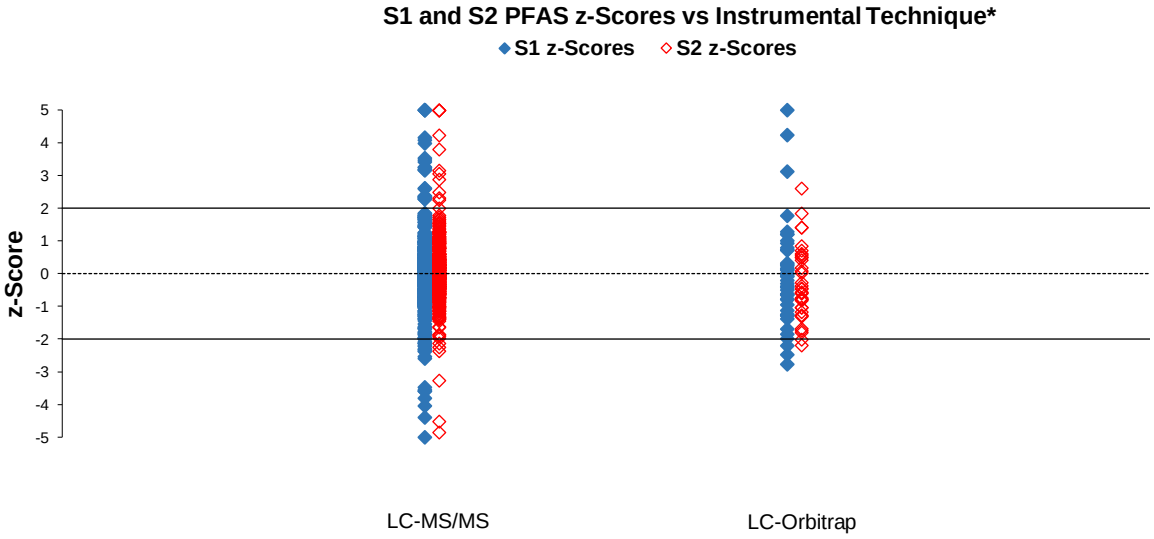
*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 104 S1 and S2 PFAS z-Scores vs Extraction Cleanup Procedure

The most popular sample preparation method was a SLE extraction based on the method that involved a sample size of 2 g, methanol base as extraction solvent, and a cleanup step using active carbon.

Instrumental Technique

The analytical detection method of choice was LC-MS/MS (Figure 105). With the exception of two, all participants reported using LC-MS/MS (QQQ) for PFAS measurements. Laboratories 22 and 24 used Orbitrap.



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

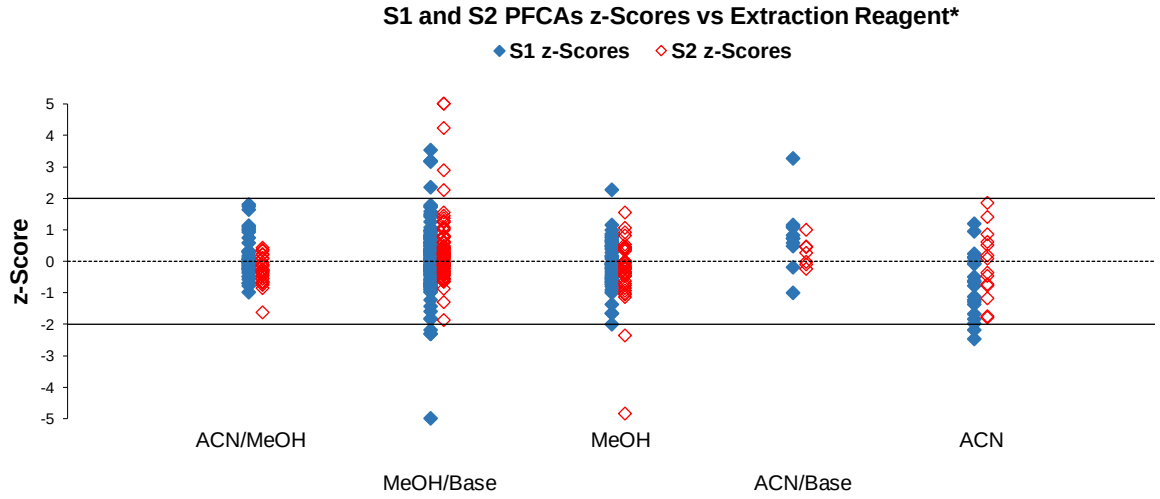
Figure 105 Participants' Performance for PFAS in S1 and S2 vs Instrumental Technique

6.7.1 Individual PFCA Analytes in Soil

Overall measurement of PFCAs in the two soil samples did not challenge participants' analytical techniques; the between laboratory CVs varied from 6.8% to 23%.

PFTrDA and PFTeDA in S1 were the analytes with a between laboratory CV higher than the Horwitz predicted CV of 22% (Table 98). The low level of these analytes in the sample (1.78 µg/kg for PFTrDA and 1.58 µg/kg for PFTeDA) may explain the variability in participants' results.

Figure 106 presents plots of participants' z-scores for PFCAs in S1 and S2 versus the extraction reagent used. No trends were evident between the overall PFCAs results and reagents used.



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 106 S1 and S2 PFCAs z-Scores vs Extraction Reagent

PFODA This is the second time PFODA has been introduced in a PT study. As in the previous study a small number of participants (7) reported results for this analyte in S2. All laboratories performed acceptably but one.

The labelled standards used by participants as reported by them are presented in Figure 107.

The assigned value for PFODA was 12.4 ±0.9 µg/kg. Two laboratories reported a result as less than their level of reporting (5 µg/kg or 0.1 µg/kg). These laboratories should review their methodology as PFODA can be lost from extracts depending on extract solvent composition.

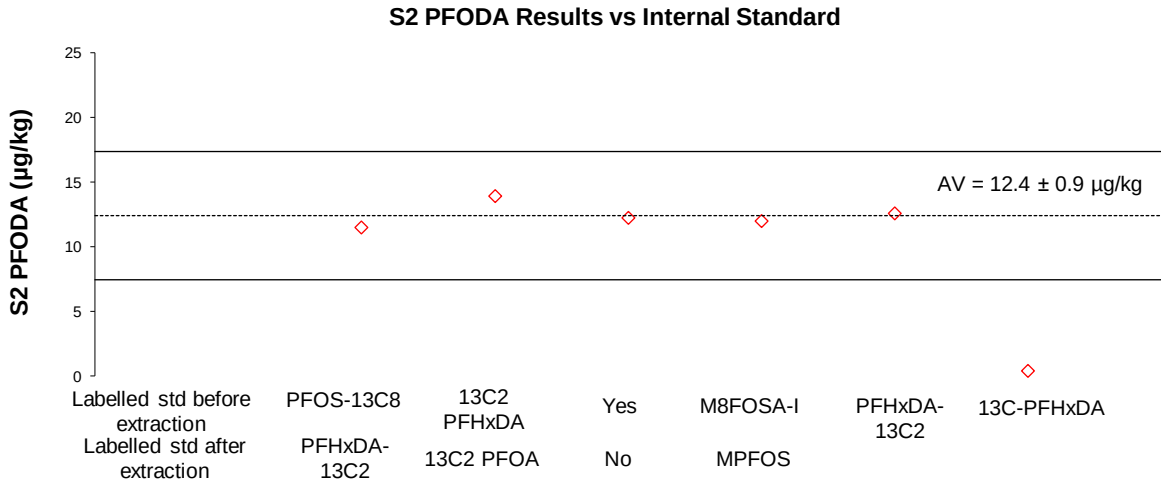


Figure 107 S2 PFODA Results vs Labelled Standards

6.7.2 Individual PFECA and PFESA Analytes in Soil

ADONA was introduced in a PT study for the first time in 2019. Twenty laboratories reported results for this analyte in S2 for the present study and all performed acceptably but one. The reported results were in excellent agreement with each other. The between-laboratory CV was 16%.

9Cl-PF3ONS and 11Cl-PF3OUdS Measurements of 9Cl-PF3ONS and 11Cl-PF3OUdS in soil no longer challenge participants' analytical techniques. A larger number of laboratories reported results for these analytes in the present study than in previous studies and all performed acceptably.

PFMPA and PFMBA were incurred in the contaminated soil sample, S1. This is the first time that these two tests have been included in a PT study. Six laboratories identified and quantified PFMPA and PFMBA in S1; their reported results were in relatively good agreement with each other. Too few results were reported for these tests for an assigned value to be set. Figures 108 and 109 presents plots of participants' results versus the internal standard used.

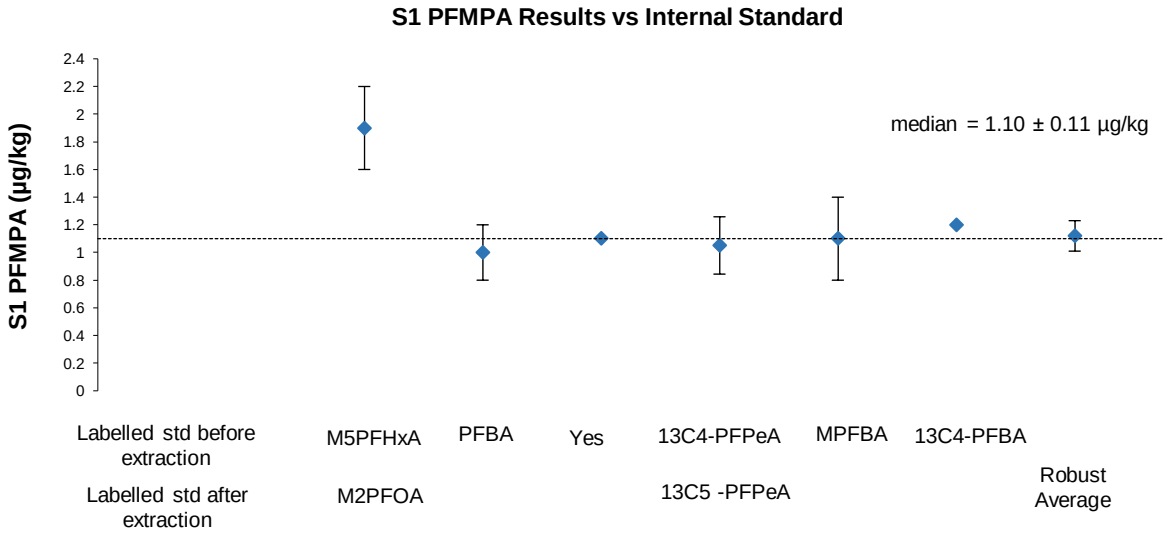


Figure 108 S1 PFMPA Results vs Internal Standards

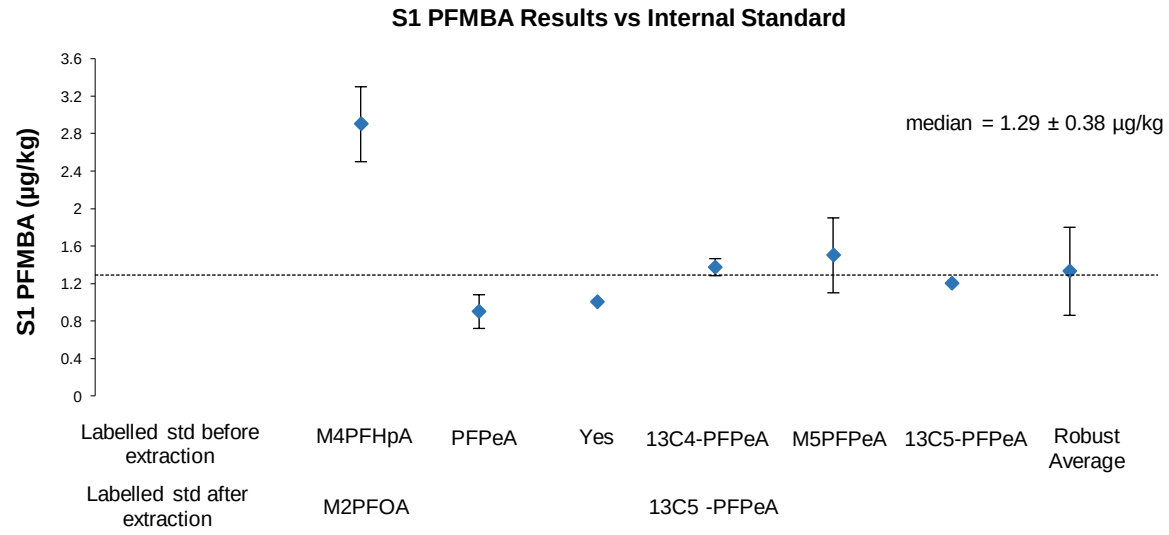
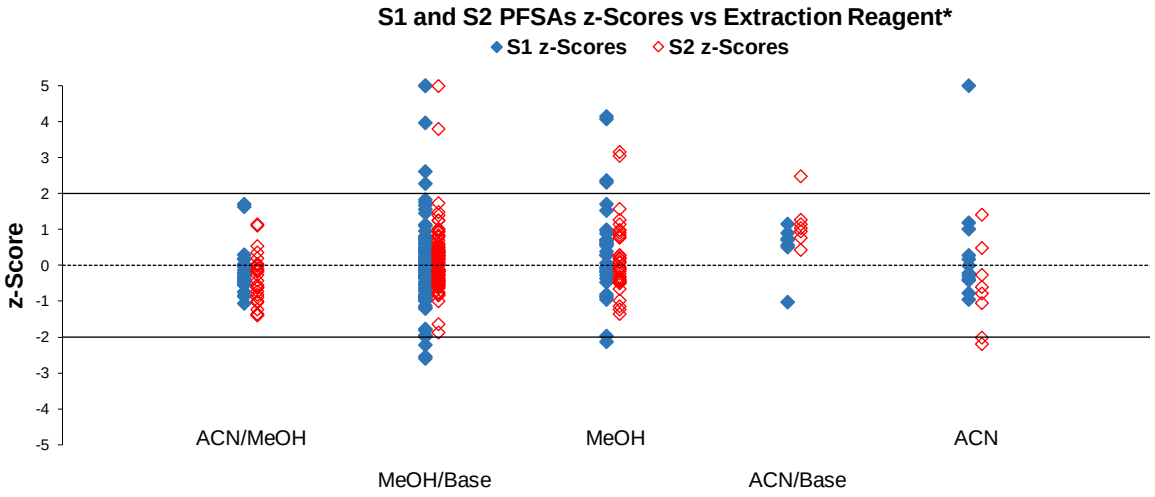


Figure 109 S1 PFMBA Results vs Internal Standards

6.7.3 Individual PFSA Analytes in Soil

Plots of participants' z-scores for PFSAs in S1 and S2 versus the extraction solvent used are presented in Figure 110. No relationship was evident between results produced using extraction solvents containing methanol and those produced by the other extraction solvents.



*The results reported by Laboratories 14 and 25 for PFAS in S1 were excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 110 Participants' Performance for PFSA in S1 and S2 vs Extraction Reagent

PFNS and PFDS As in the previous studies, no assigned value could be set for PFNS and PFDS in the contaminated soil sample high in PFOS, because the results reported for these analytes were not compatible.

PFOS level in S1 was high, at 20900 µg/kg which may have resulted in suppression of the PFOS labelled internal standards used for these analytes. This might introduce a bias for analytes for which these labelled internal standards were used. The spread of results might be influenced by the number of internal standards used.

Laboratories should consider using matrix matched reference materials with high PFOS content to monitor the accuracy of their measurement results for analytes for which labelled PFOS internal standards were used and reassess their estimates of uncertainty for these tests.

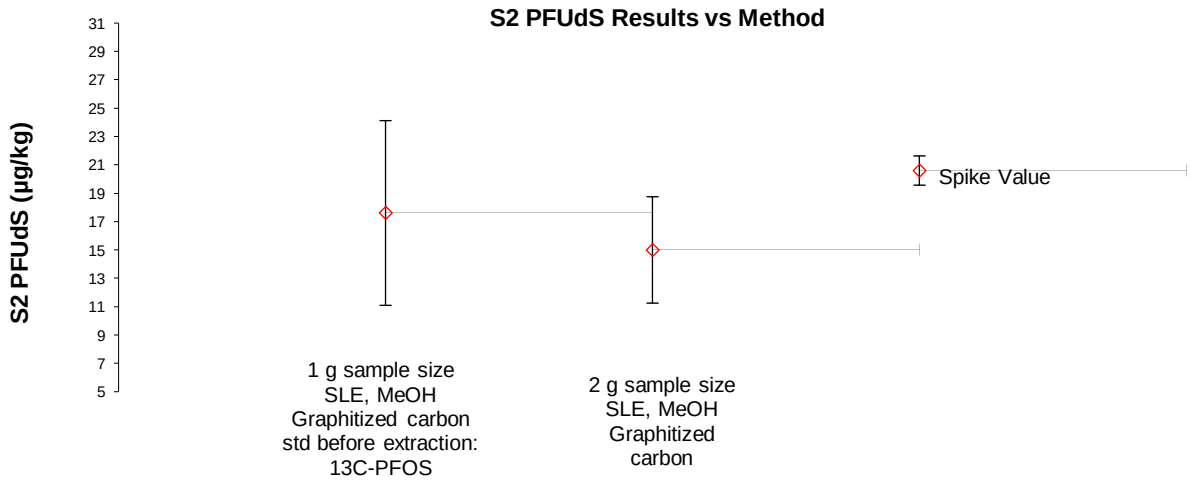
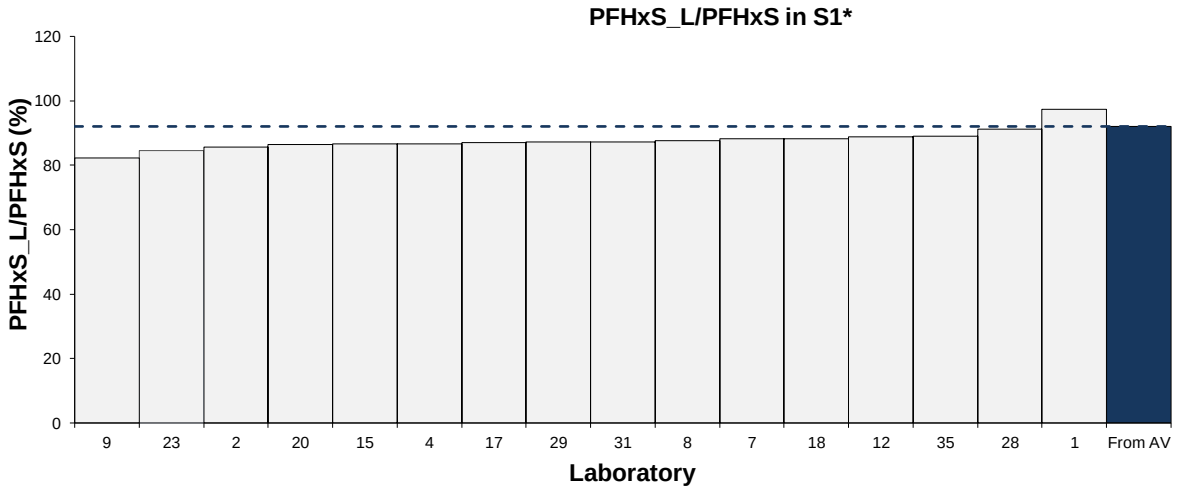


Figure 111 S2 PFUdS Results vs Method

PFUdS spike level in S2 was 20.6 ± 1.0 µg/kg. Only two laboratories reported results for this analyte. The two results were in relatively good agreement with each other and with the spike value (Figure 111).

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 isomer only) results.

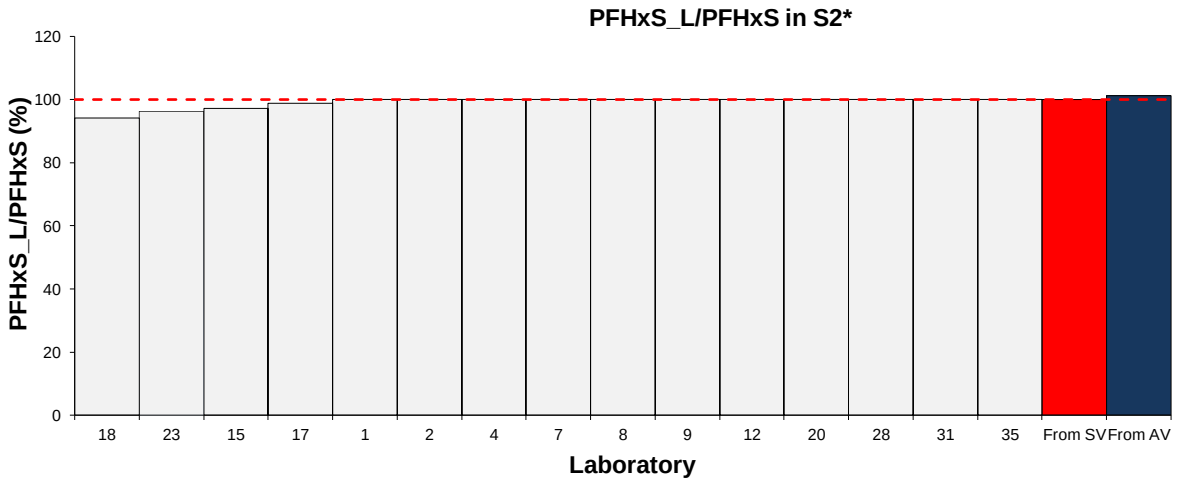
Of 29 participants who reported results in contaminated soil sample S1, 16 reported results for both total and linear PFHxS. The ratios of linear PFHxS versus total PFHxS in S1 were between 82% and 97% while the assigned value ratio between the two isomers was 92% (Figure 112).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte. The results reported by Laboratory 25 for PFHxS and PFHxS_L in S1 were excluded.

Figure 112 Bar Charts of PFHxS_L/PFHxS_T in S1

The soil sample S2 was spiked with linear PFHxS; the ratio of linear PFHxS to total was expected to be 100% for this sample.



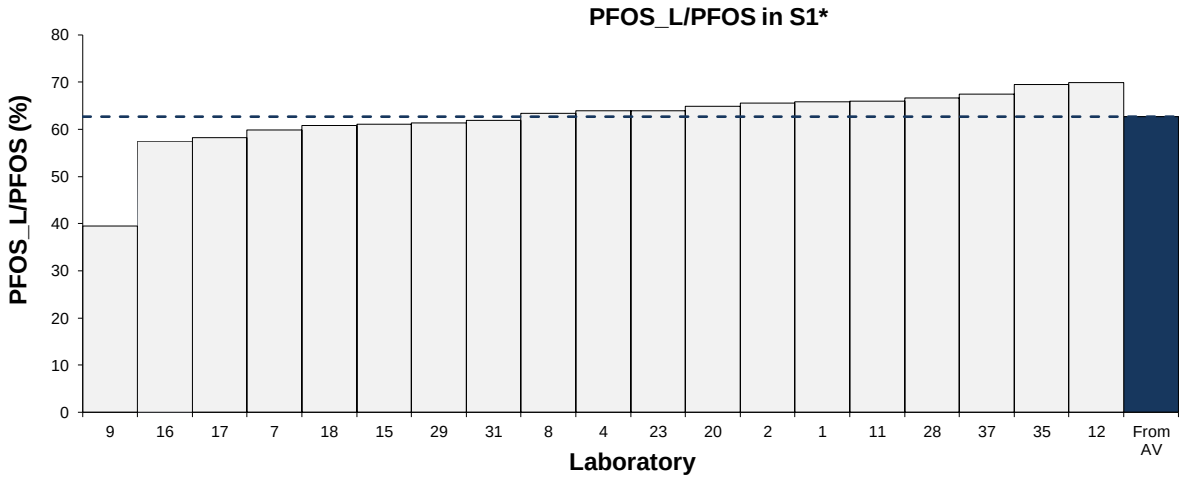
*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte

Figure 113 Bar Charts of PFHxS_L/PFHxS_T in S2

Fifteen participants reported results for both PFHxS total and linear in S2. The linear to total ratio of the results reported for PFHxS isomers was between 94% and 100% (Figure 113).

Figures 114 and 115 present bar charts with ratios of linear PFOS results versus total PFOS results in S1 and S2 respectively. Nineteen participants reported results for both PFOS isotopes in S1 and 22 in S2.

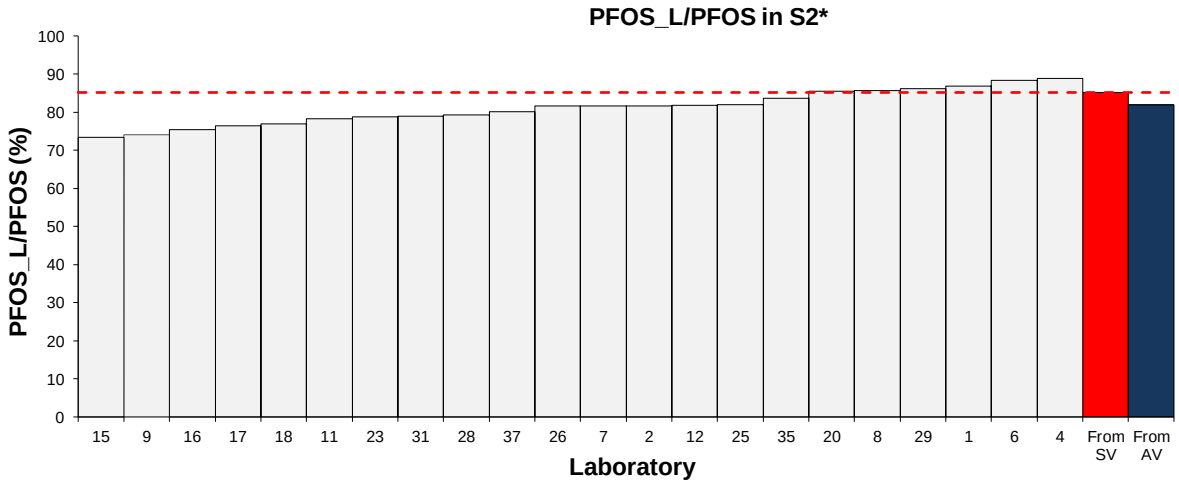
The reported ratios of linear PFOS versus total PFOS in S1 were between 40% and 70% while the assigned value ratio between the two isomers was 63% (Figure 114).



*The ratio from the AV is calculated based on the results reported by all participants including those who reported results for only one analyte. The results reported by Laboratory 25 for PFOS and PFOS_L in S1 were excluded.

Figure 114 Bar Charts o f PFOS_L/PFOS_T in S1

The soil sample S2 was spiked with a PFOS standard that contained both linear and branched isomers. The assigned values were 7.18 µg/kg for total PFOS and 5.88 µg/kg for linear PFOS, with the ratio of linear PFOS to total PFOS being 82%. The expected ratio of linear PFOS to total PFOS after spiking was 85%. Figure 115 presents bar charts of linear PFOS results versus total PFOS results in S2 as reported by participants. The linear to total ratio of the results was between 73% and 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 115 Bar of Charts PFOS_L/PFOS_T in S2

When a laboratory is using a combined branched/linear standard and integrate branched/linear together for totals, the result could be different to a linear only result due to response factor differences between the isomers.[9]

6.7.4 Individual PFAA Precursors or Related Compounds

Measurements of PFAA precursors or of the related compounds did not present analytical difficulty to participating laboratories. The between-laboratory CVs for these analytes were between 9.3% and 24%.

4:2FTS Only 6 laboratories reported results for 4:2FTS in S1. Although they used various methods, all produced compatible results (Figure 116).

6:2FTS in S1 was 444 µg/kg and in S2 was 4.8 µg/kg. O 27 participants who reported results for 6:2FTS in S1, 23 had an acceptable performance (laboratory 25 excluded). All unsatisfactory results were lower than the assigned value. All 30 results reported for 6:2FTS in S2 returned acceptable z-scores.

10:2FTS Of 29 participants who analysed the soil sample S1, 22 reported results for 10:2FTS and 18 of them performed acceptably. The between-laboratory CV was 24%, larger than predicted by Thompson and Horwitz.

The telomer sulfonates are referenced to their $^{13}C_2$ isotope dilution analogue (labelled internal standard added before extraction). The product ions of the telomer sulfonate dilution analogues would contain a small contribution from the ^{34}S analogue of the native sulfonates if a correction equation is not used. [9]

Figure 117 presents plots of participants' results reported for 10:2FTS in S1 versus the labelled internal standard added before extraction.

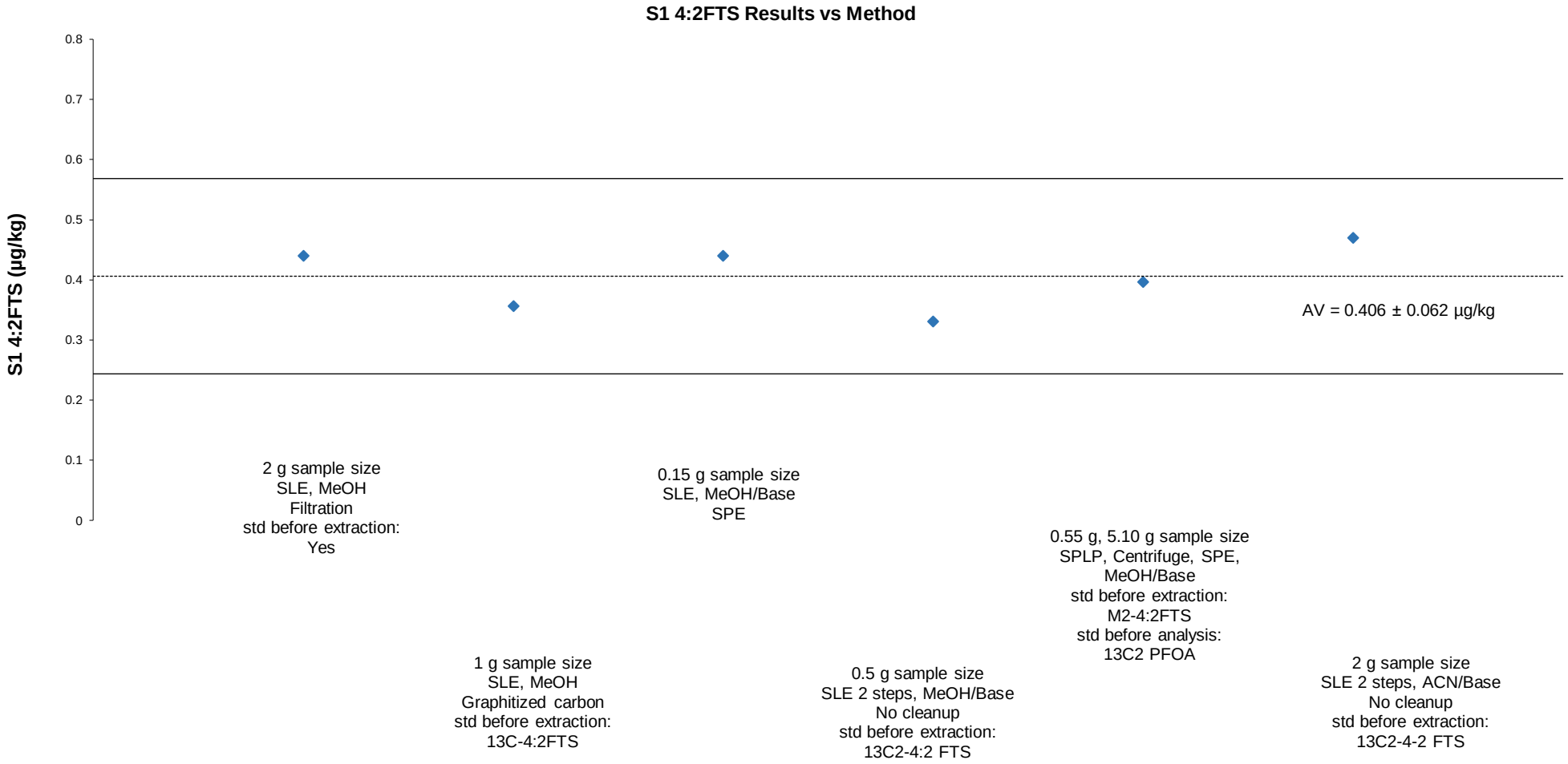
8:2diPAP is not within the analytical suite of many laboratories. Only 9 participants reported results for the fluorotelomer-based PFAA precursor in S2 and all performed acceptably but one.

5:3FTCA is an important analte as it is a major degradation product of fluorotelomer-based compounds, particularly 6:2 fluorotelomer alcohols and 6:2 fluorotelomers acrylates found in consumer products. It was introduced for the first time in the previous PT study (AQA 23-14) based on participants' feedback. Twelve laboratories reported results for this analyte (double last year's participation) and all had an acceptable performance but one.

3:3FTCA and 7:3FTCA This is the first time that 3:3FTCA and 7:3FTCA have been introduced in a PT study. A small number of laboratories reported results for these tests in S1, (8 and 10 respectively) and all but one performed acceptably for each analyte. Figures 118 and 119 presents plots of participants results reported for 3:3FTCA and 7:3FTCA respectively versus the method used.

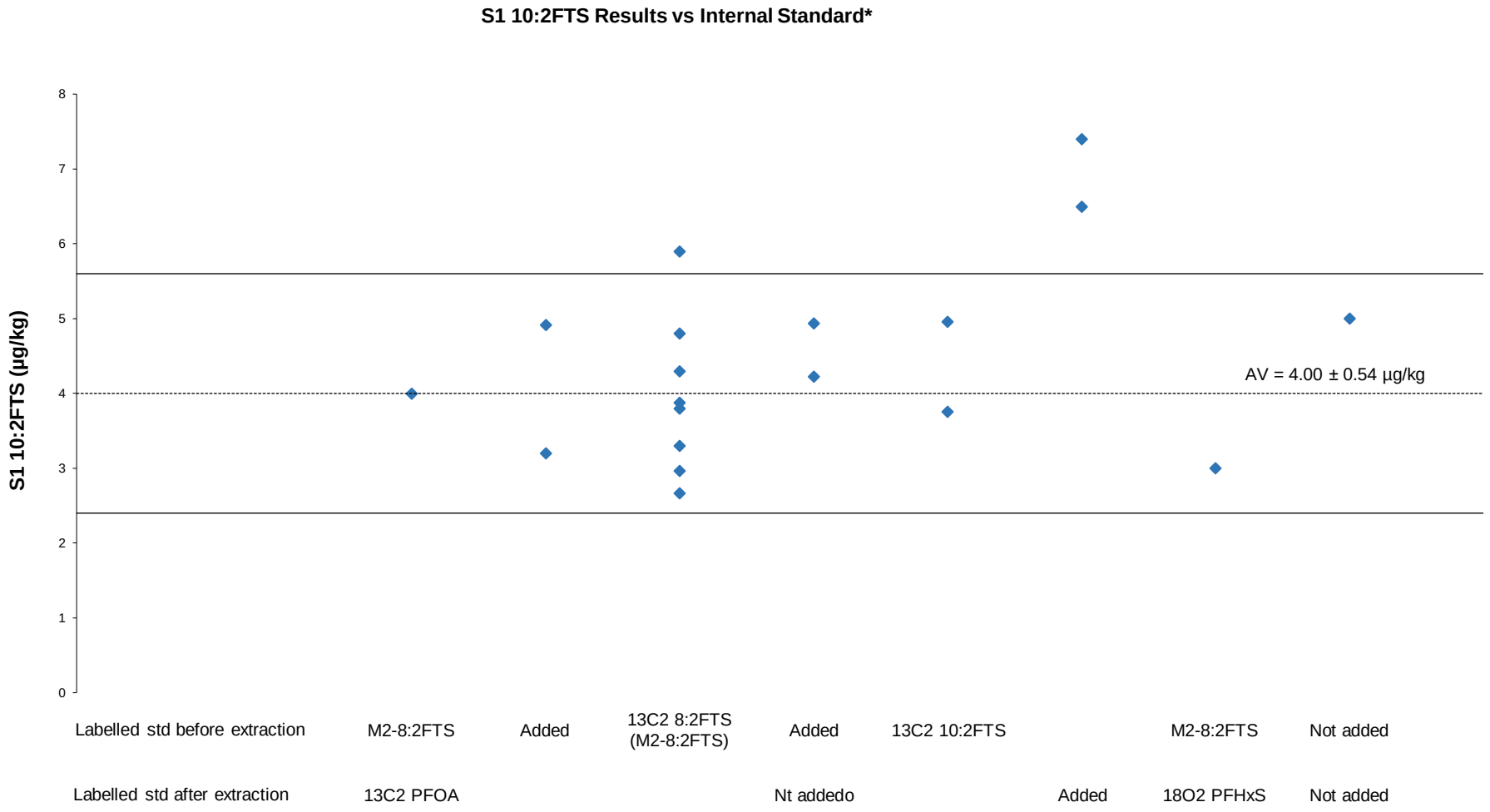
It is known that zwitterionic PFAS can be expected to sorb soils and sediment more strongly than anionic PFAS, but less strongly than cationic PFAS, owing to the mixed charges o the functional group. Without labelled FTCAs standards being commercially available, recovery of these analytes cannot be determined easily.

Some laboratories reported results as less than the robust average set for these analytes. There is some evidence that dry soil requires the addition of water to the extraction solvents, such as 80:20 Methanol/Water with 0.1% formic acid that enhances extraction of PFAS such as the ffluorotelomer acrylates found in consumer products.



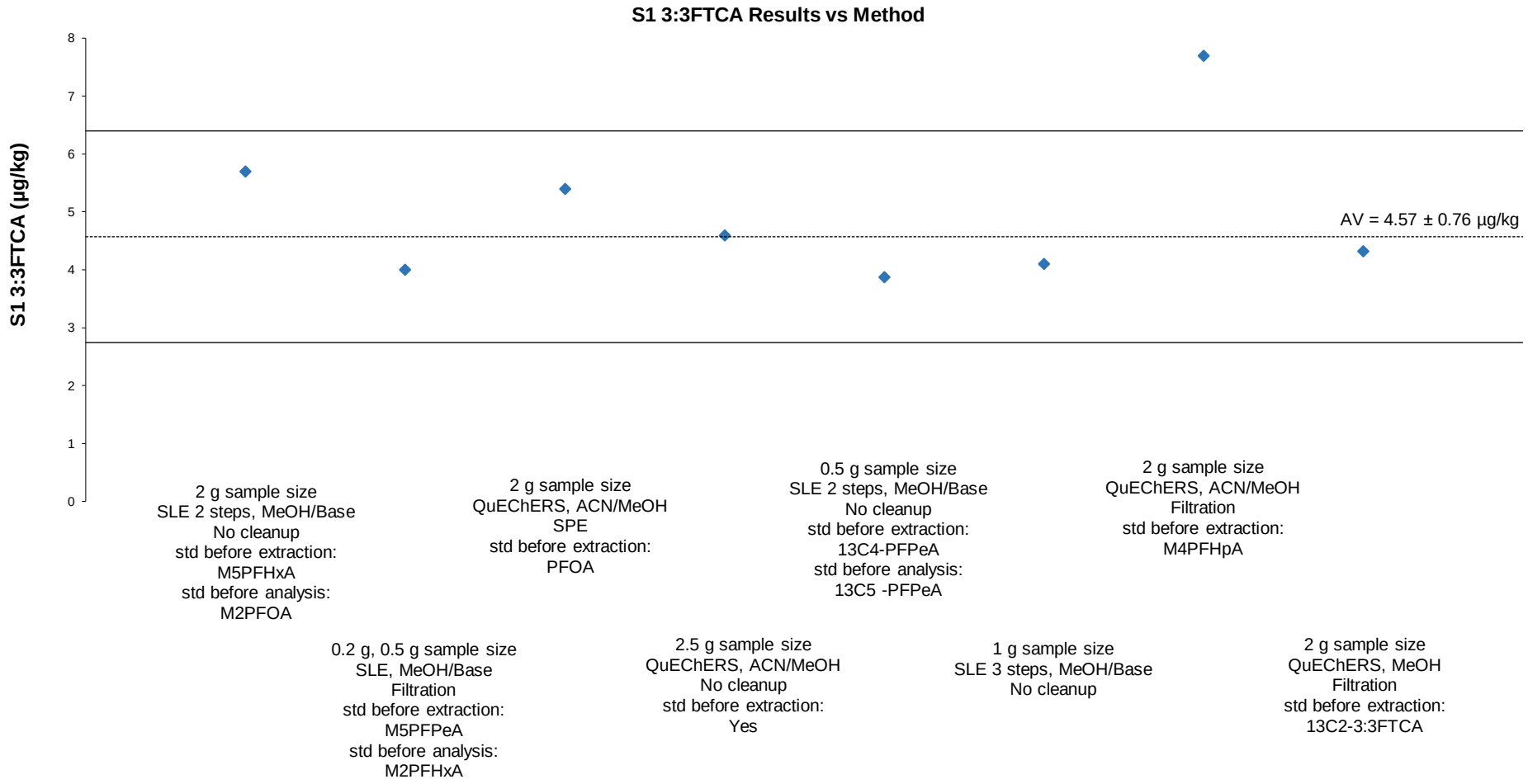
Horizontal lines correspond with a z-score of 2 and -2.

Figure 116 S1 4:2FTS Results vs Method



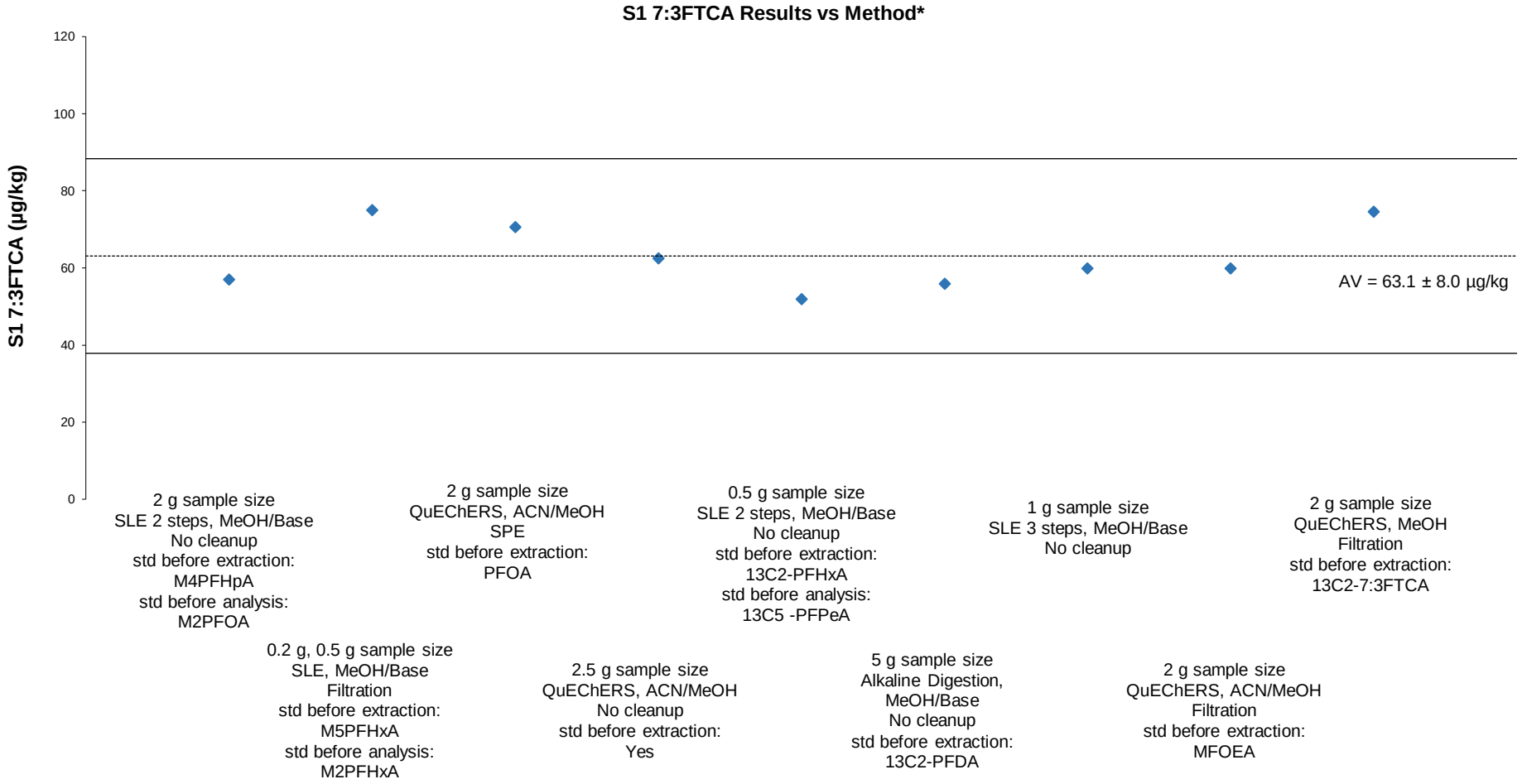
*The result reported by Laboratory 25 for 10:2FTS in S1 was excluded. Horizontal lines correspond with a z-score of 2 and -2.

Figure 117 S1 10:2FTS Results vs Method



Horizontal lines correspond with a z-score of 2 and -2.

Figure 118 S1 3:3FTCA Results vs Method



*The result reported by Laboratory 25 for 7:3FTCA in S1 was excluded. Horizontal lines correspond with a z-score of 2 and -2.

Figure 119 S1 7:3FTCA Results vs Method

6.8 Participants' Results and Analytical Methods for PFAS in Biosolid

A biosolid sample was introduced for the first time in 2023 PT study for PFAS in Soil as a pilot sample, and no participants' performance assessement was conducted for the 20 laboratories that reported results. The pilot sample was aimed at helping laboratories to assess/develop their methods for PFAS analytes in biosolid and to investigate the effect of sample matrices on their results. This is the second time that a biosolid sample has been introduced in a NMI PT study for PFAS and the first time that participants' performance in measuring PFAS in biosolid matrix has been assessed.

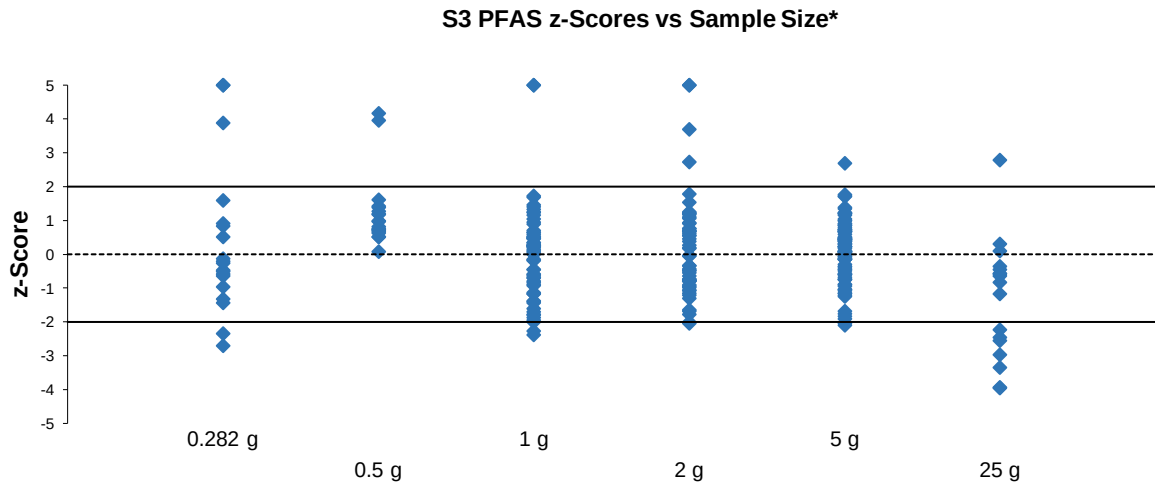
In the present study, 16 participants reported results for PFAS in biosolid. Overall, the between-laboratory CVs of the biosolid Sample S3 were higher than those of the soil sample S2, ranging between 14% and 66%.

As in the previous study, the sample was moist and participants were asked to report results on as received basis (not corrected for moisture content).The method descriptions provided by participants are presented in Appendix 7.

Of 15 participants who reported results in the soil sample S2 and biosolid sample S3, 5 used the same analytical method. The most frequent changes seen in the methods used for biosolid when compared to the methods used for soil are: a larger sample size, addition of loose carbon and cleanup of crude extract.

Extraction

Laboratories used a wide variety of sample sizes from 0.282 g to 25 g. Plots of participants' performance in Sample S3 versus the amount of sample taken for analysis are presented in Figure 120. Caution should be exercised when a small sample size is taken for analysis as this might not be representative of the whole sample.

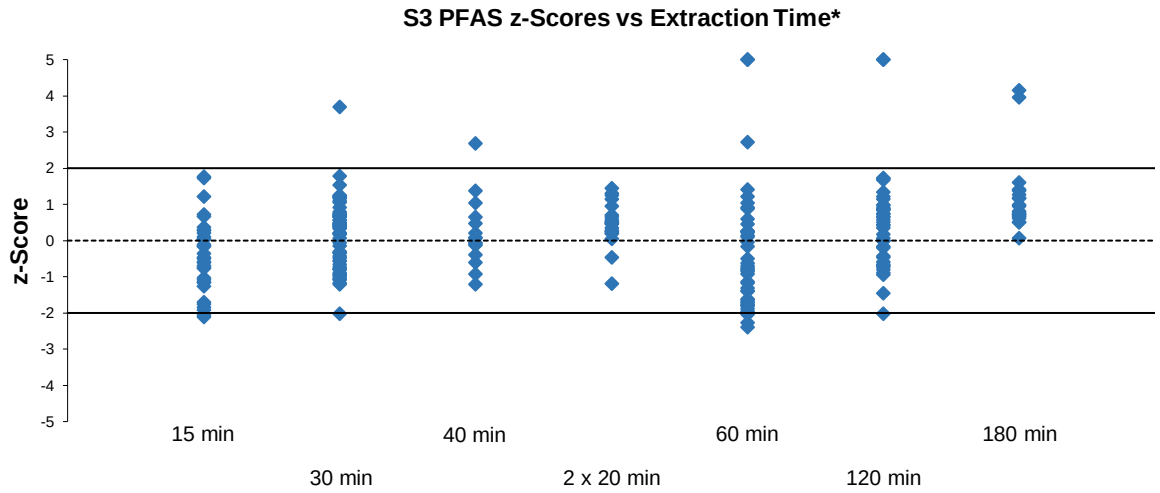


*The result reported by Laboratory 25 for PFAS in S3 was excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 120 S3 PFAS z-Scores vs Sample Size

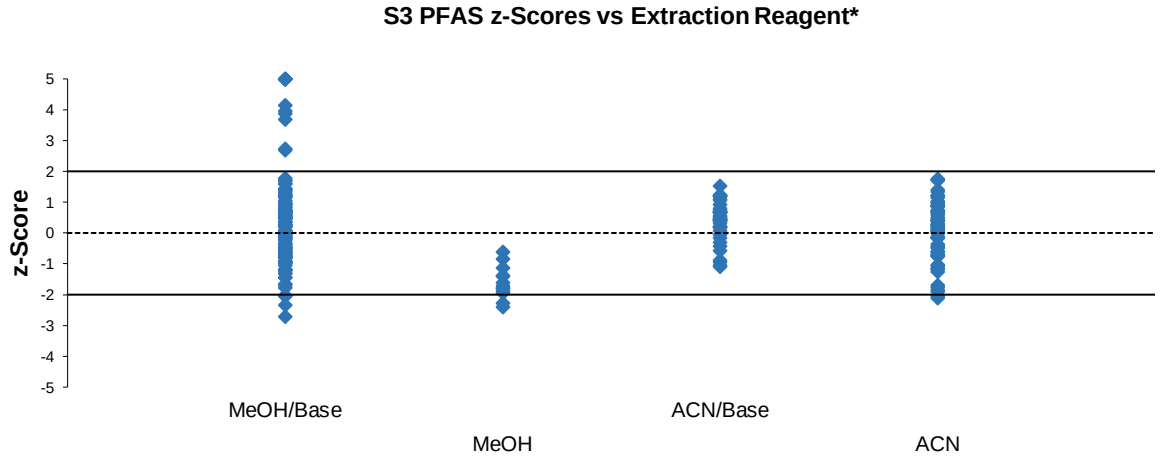
The extraction time used by participants varied from 15 minutes to 180 minutes (Figure 121).

As for soil, methanol and base modified methanol were the preferred extraction reagents (Figure 122). Two laboratories used a different reagent than the one used for soil extraction. They used instead of methanol or base modified methanol, acetonitrile or basic acetonitrile with acetone.



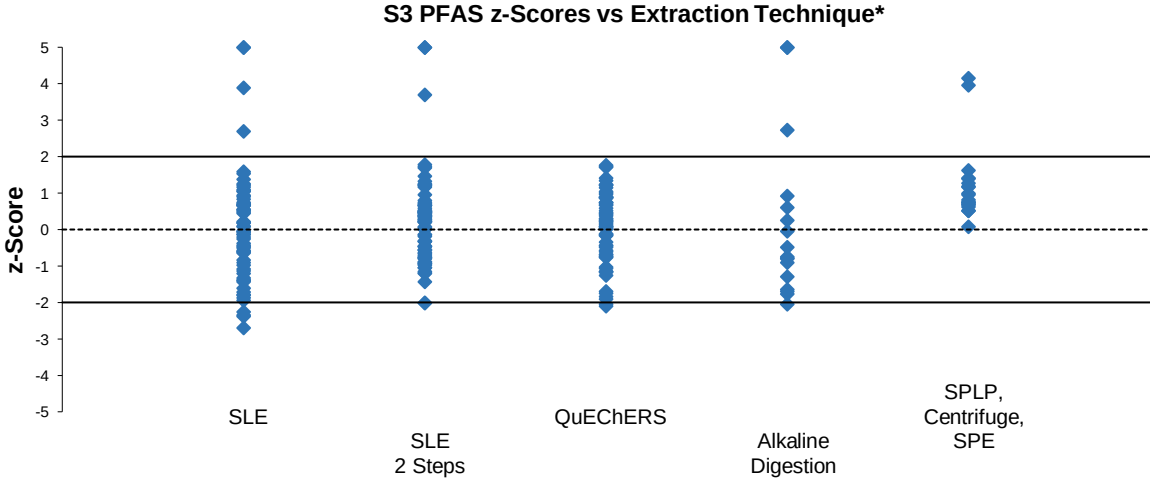
*The result reported by Laboratory 25 for PFAS in S3 was excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 121 S3 PFAS z-Scores vs Extraction Time



*The result reported by Laboratory 25 for PFAS in S3 was excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 122 S3 PFAS z-Scores vs Extraction Reagent



*The result reported by Laboratory 25 for PFAS in S3 was excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 123 S3 PFAS z-Scores vs Extraction Technique

With the exception of two, all laboratories used the same extraction technique as for soil: SLE, alkaline digestion or QuEChERS. One laboratory used QuEChERS for biosolid and SLE for soil while another one used SLE for biosolid but QuEChERS for soil. Plots of participants' performance for PFAS in S3 versus the extraction technique used are presented in Figure 123.

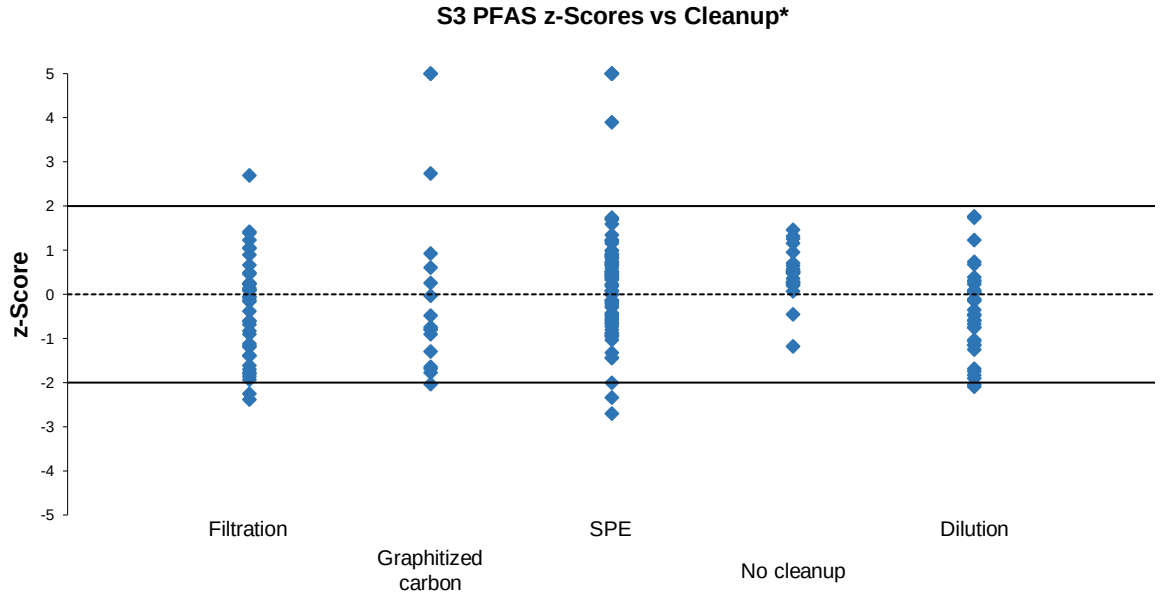
Of 16 participants who reported results for the biosolid sample S3, 11 added loose carbon to the biosolid extract.

Most participants did not concentrate their sample extract.

A larger proportion of laboratories cleaned up the biosolid crude extract rather than the soil extract. The majority used SPE (Figure 124).

The analytical detection method of choice was LC-MS/MS. Two laboratories reported using LC-Orbitrap.

The most popular method used for the biosolid sample analysis consisted of: SLE extraction, a sample size of 5 g, methanol base as extraction solvent, SPE cleanup followed by LC-MS/MS determination.



* The result reported by Laboratory 25 for PFAS in S3 was excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 124 S3 PFAS z-Scores vs Cleanup Procedure

Although participants used a wide variety of methods, most produced compatible results for most analytes in the biosolid sample S3. No agreement was found between the results reported for PFDS, PFDoA, PFTrDA, GenX and 11Cl-PF3OUdS.

6.8.1 Individual PFCA Analytes in Biosolid

The between-laboratory coefficient of variation for PFCAs in S3 was between 14% and 66% .

PFDoA and PFTrDA were the analytes which most challenged participants' analytical techniques. No agreement was found between the results reported for these two analytes and hence no assigned value was set.

PFDoA level in S3 was low, with a robust average of 1.34 µg/kg, below the level of reporting of many participants. This combined with matrix complexity might have challenged laboratories' analytical techniques.

Fifteen laboratories reported numerical results for PFTrDA in S3. A small number of laboratories reported results in good agreement with the spike value (Figure 125). Participants used various methods and there was no particular trend between their results and the method used (Figures 126, 127 and 128).

PFBA and PFPeA results were variable, the between laboratory CV was of 24% and 32% respectively. Plots of participants' z-scores for these two analytes versus the reagent used are presented in Figures 129 and 130. Due to the limited amount of data, no significant trend could be identified.

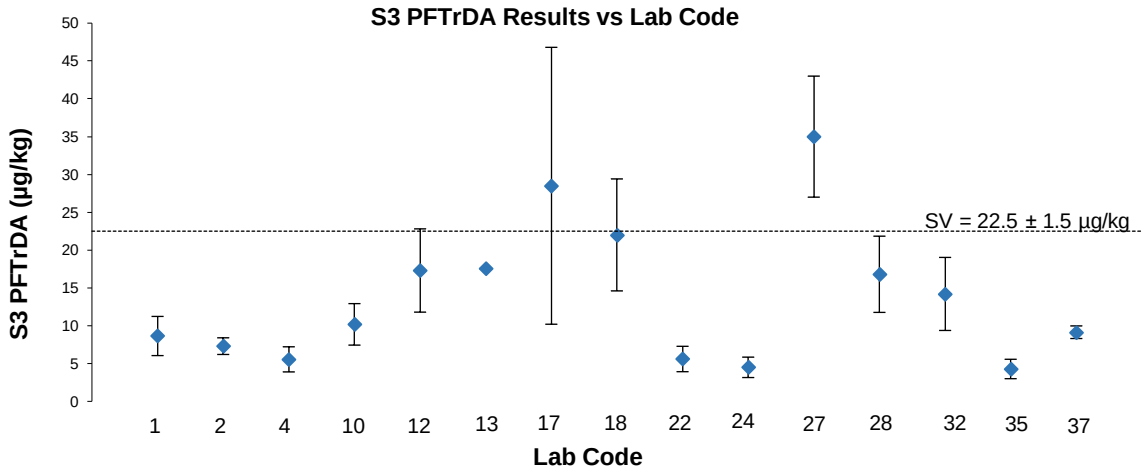


Figure 125 S3 PFTrDA Results vs Laboratory Code

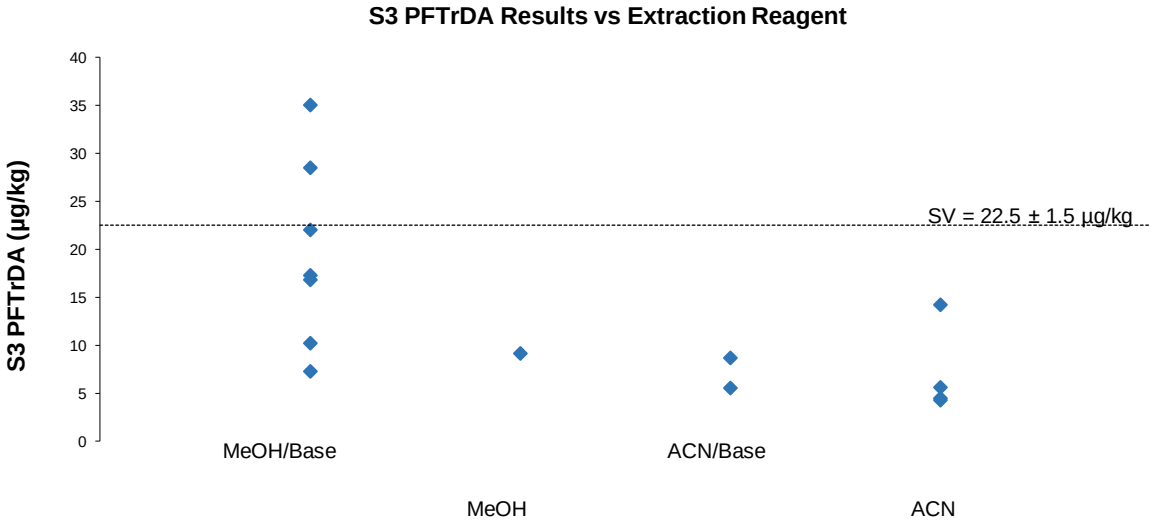


Figure 126 S3 PFTrDA Results vs Extraction Reagent

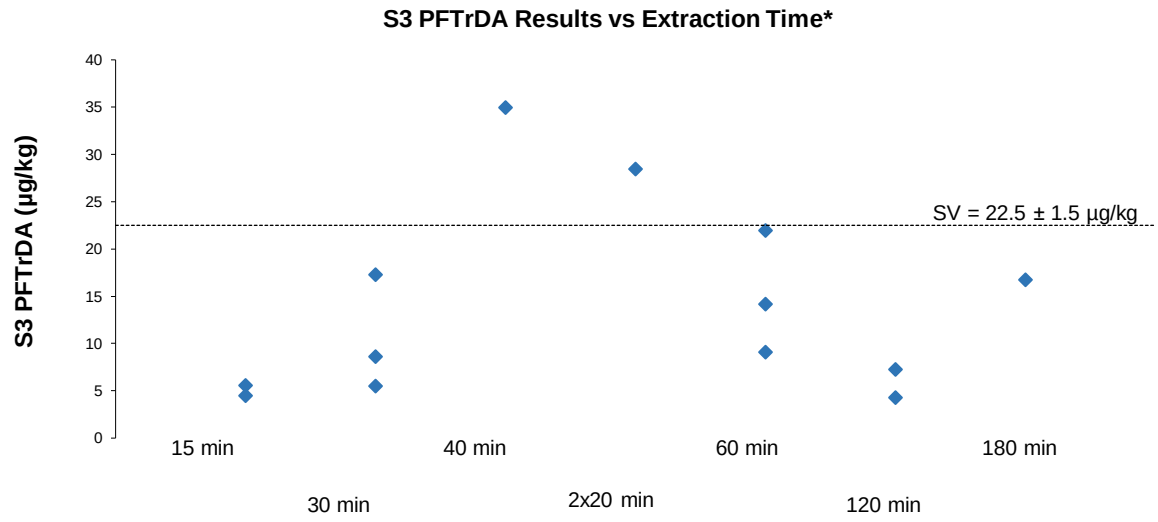


Figure 127 S3 PFTrDA Results vs Extraction Time

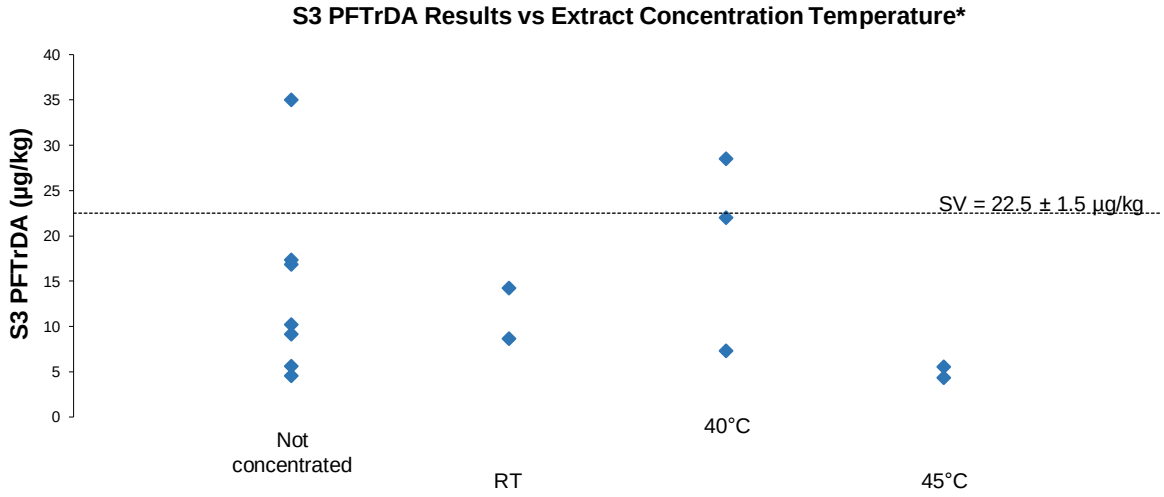
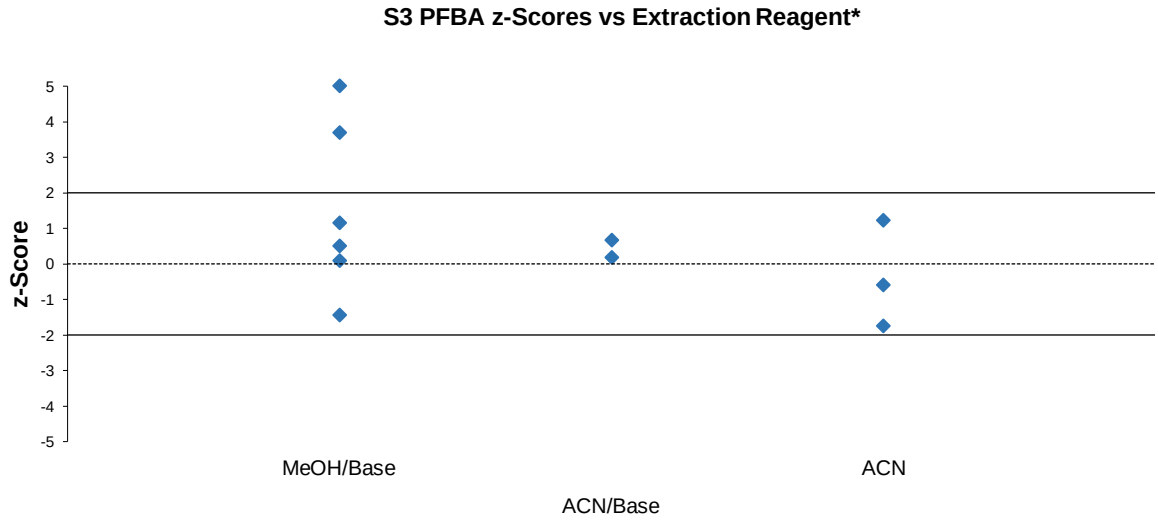
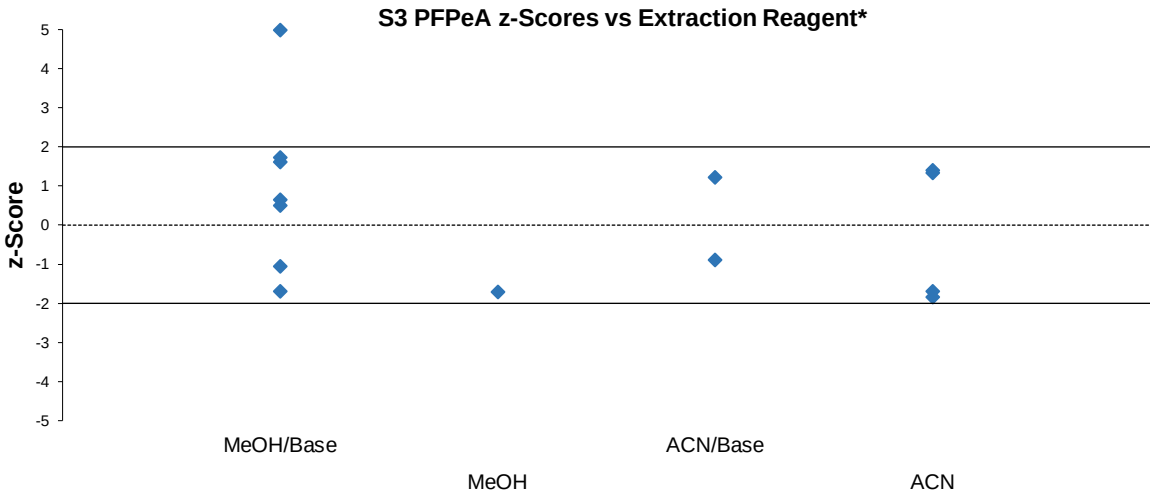


Figure 128 S3 PFTrDA Results vs Concentration Temperature



* Laboratory 25 excluded. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 129 S3 PFBA z-Scores vs Extraction Reagent



* The result reported by Laboratory 25 for PFPeA in S3 was excluded.. Scores greater than 5 or smaller than -5 have been plotted as 5 and -5 respectively.

Figure 130 S3 PFPeA z-Scores vs Extraction Reagent

6.8.2 Individual PFECA and PFESA Analytes in Biosolid

Measurement of PFECA and PFESA analytes in biosolid challenged participants' analytical techniques. The concentration of ADONA, 9Cl-PF3ONS and 11Cl-PF3OUdS in the soil Sample S2 and in the biosolid Sample S3 was similar, however the between-laboratory CVs in S3 were approximately 1.5 to 3.5 times larger than in S2.

GenX was not spiked in S2. In S3 the results were variable, and hence no assigned value could be set. Nine laboratories reported numerical results and a small number of them were in good agreement with the spike value. Participants used various methods and there was no particular trend between their results and the method used (Figure 131).

11Cl-PF3OUdS level in S2 and S3 was similar.As most participants used the same method in both samples, matrix effects may explain the big variation in the results reported in S3 when compared to S2 (Figure 132).

9Cl-PF3ONS Plots of participants' performance for 9Cl-PF3ONS in S3 versus method used are presented in Figure 133.

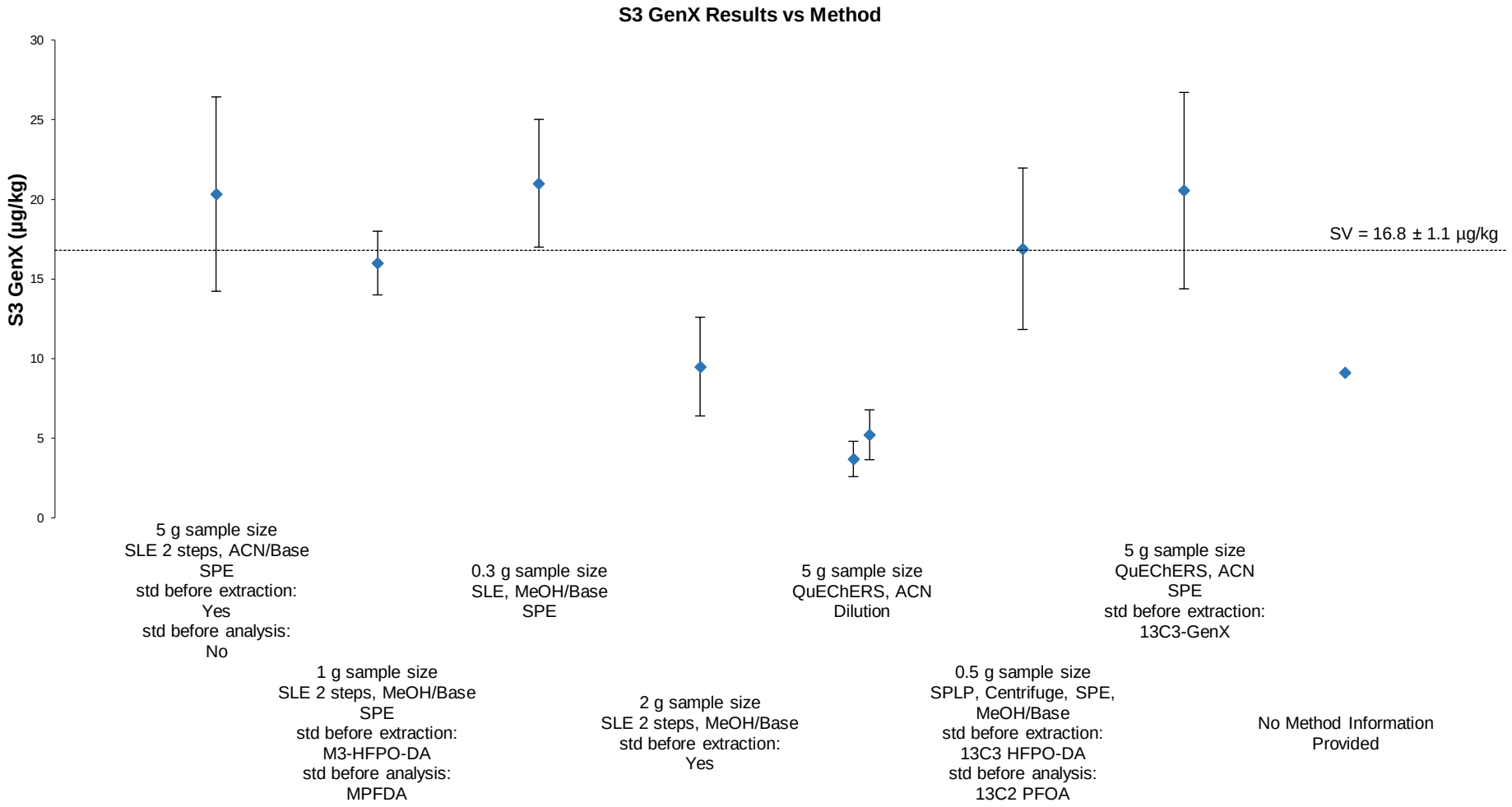


Figure 131 S3 GenX Results vs Methods

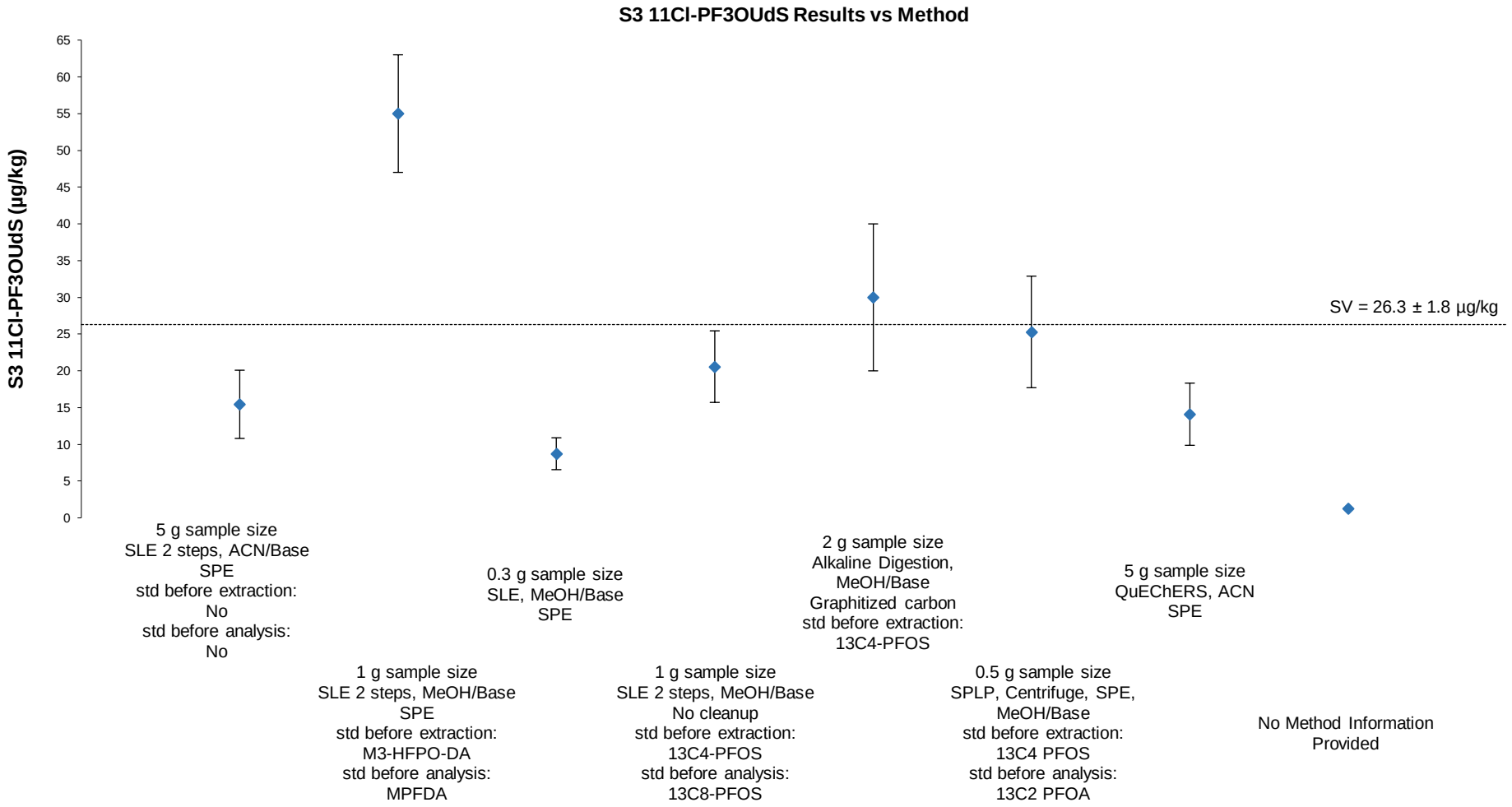


Figure 132 S2 11Cl-PF3OUdS z-Scores vs Methods

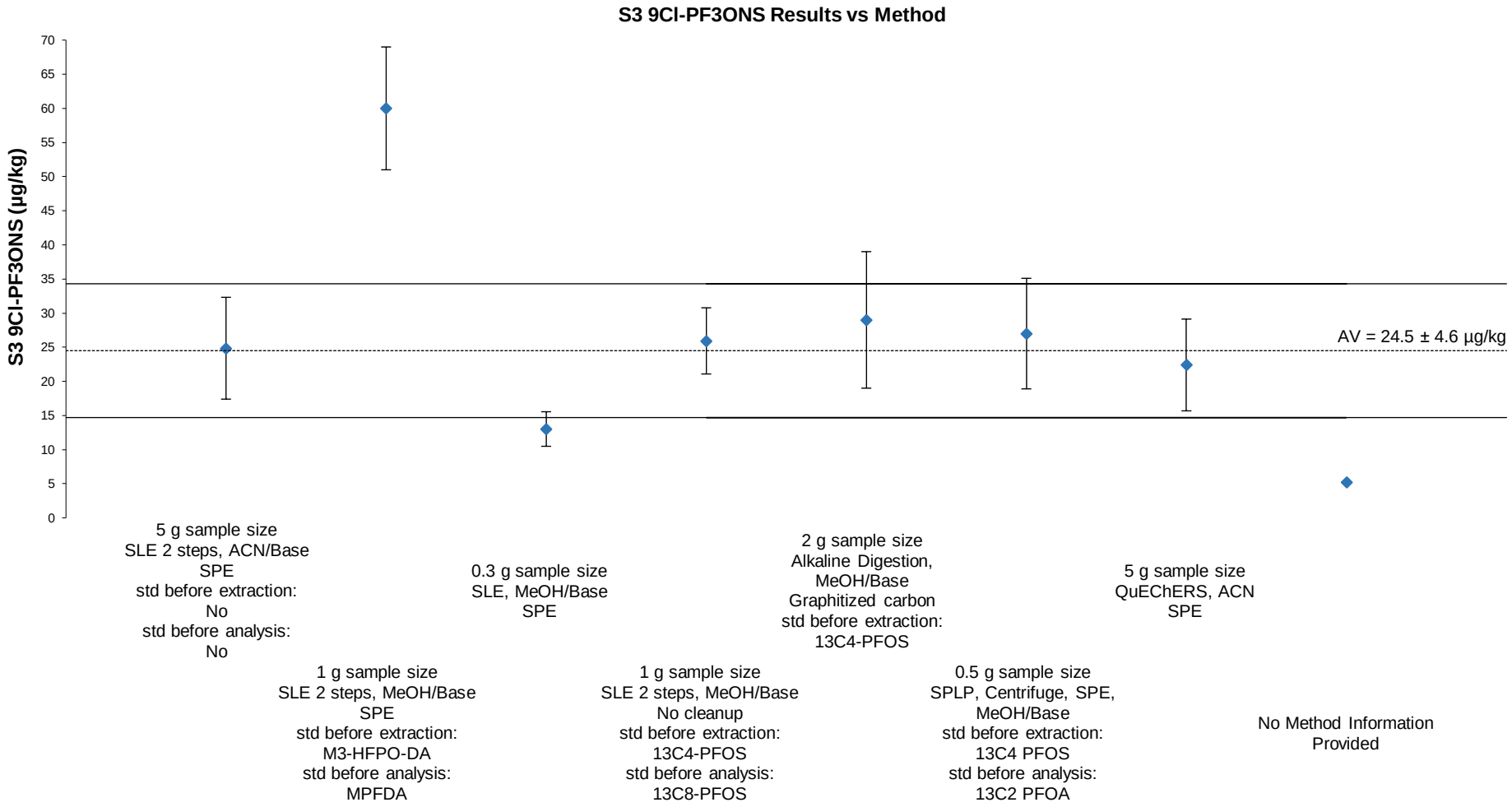


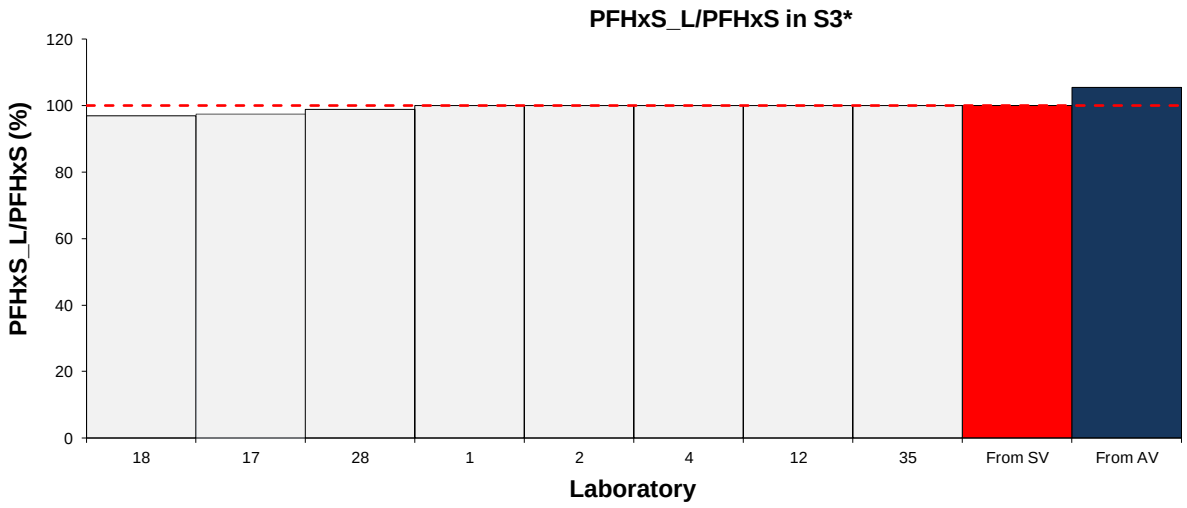
Figure 133 S2 9Cl-PF3OUdS z-Scores vs Methods

6.8.3 Individual PFSA Analytes in Biosolid

PFDS level in the biosolid sample S3 was 24.3 µg/kg and in the soil Sample S2 was 8.54 µg/kg. Although participants' results for PFDS in S2 were in excellent agreement with each other, no agreement was found between the results reported for PFDS in S3. Matrix effects may explain the discrepancy between participants' performance in the two matrices.

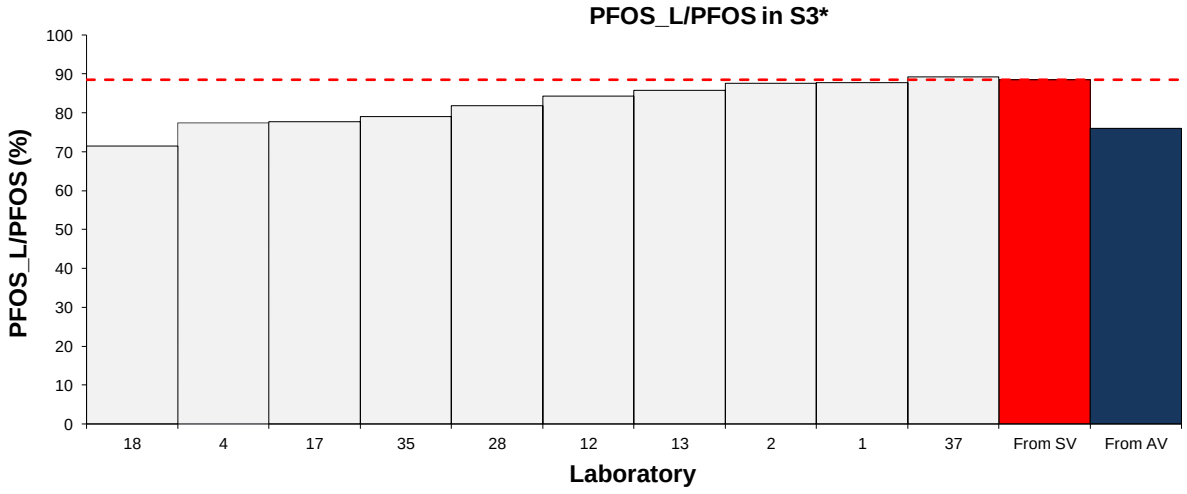
PFHxS and PFHxS_L and PFOS and PFOS_L Participants were asked to report for PHxS and PFOS both isomers total (the sum of linear and branched isomers) and linear (the linear isomers only).

Figure 134 presents bar charts with ratios of linear PFHxS results versus total PFHxS results in S3. The biosolid sample S3 was spiked with linear PFHxS only; the ratio of linear PFHxS to total was expected to be 100% for this sample.



*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 134 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 135 Bar Charts of PFOS_L/PFOS_T in S3

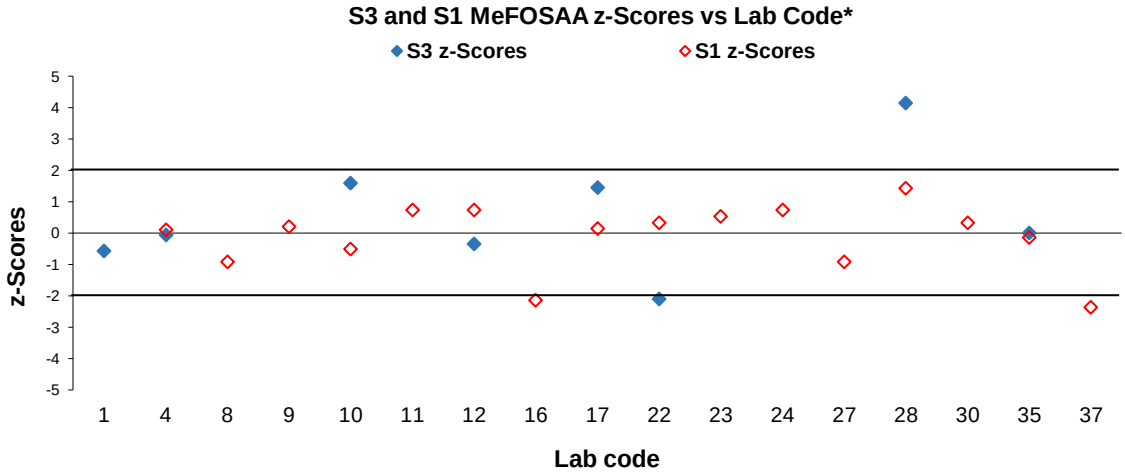
The ratios of linear PFOS versus total PFOS in S3 were between 71% and 88% (Figure 135).

The PFOS standard used for spiking the biosolid sample contained both linear and branched isomers. The assigned values were 12.5 µg/kg for total PFOS and 9.5 µg/kg for linear PFOS, with the ratio of linear PFOS to total PFOS being 76%. The expected ratio of linear PFOS to total PFOS after spiking was 88.5%.

6.8.4 Individual PFAA Precursors Analytes in Biosolid

MeFOSAA and **EtFOSAA** measurements in S3 presented analytical difficulty to participating laboratories. The between-laboratory CV for these analytes was 29% and 32% respectively. Unsolved matrix effects may explain results variability in the biosolid sample S3. MeFOSAA results were also reported by participants in the soil sample S1. The between laboratory CV for this analyte was lower than in the biosolid sample at 18%. The between laboratory CV of 12% for the results reported for EtFOSAA in S2 was also lower than in S3. Plots of participants' performance for EtFOSAA and MeFOSAA in the soil and biosolid samples versus laboratory code number are presented in Figures 136 and 137. Laboratories who reported an acceptable result in soil and unacceptable score in biosolid may have not overcome the matrix effects for these analytes and should review their cleanup procedure.

8:2diPAP Only one laboratory (Laboratory 2) reported a result for 8:2diPAP in the biosolid sample. The result of 51 µg/kg, was in good agreement with the spike value of 58.8 µg/kg.



* Laboratory 25 excluded.

Figure 136 S3 and S1 MeFOSAA z-Scores vs Laboratory Code

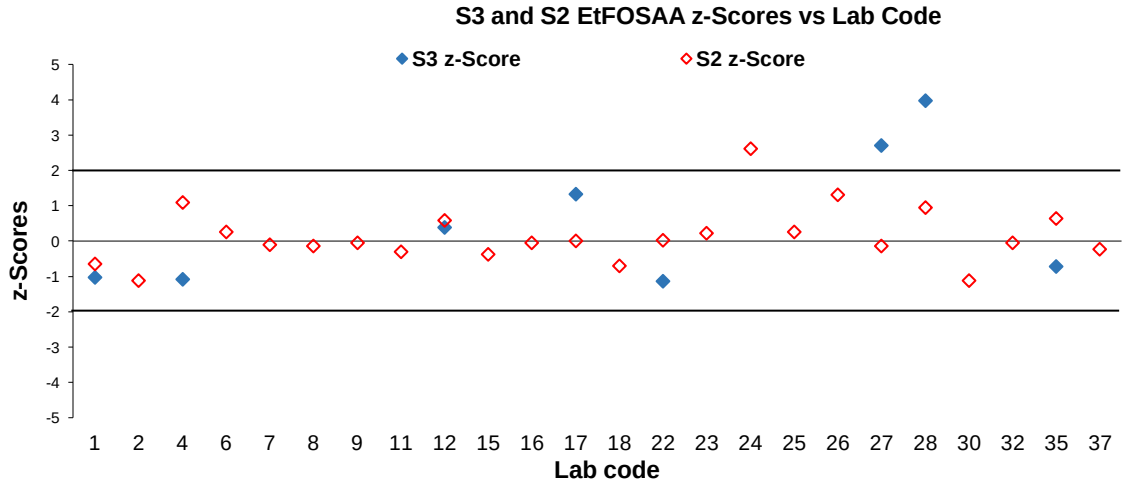


Figure 137 S3 and S2 EtFOSAA z-Scores vs Laboratory Code

6.9 Effects of Sample Matrix

Measurements of PFAS analytes in the incurred soil sample S1 and biosolid sample S3 challenged more participants' analytical techniques than in the spiked soil samples S2 (Table 102).

Table 102 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 acceptable z-Scores)
S1 Soil (incurred)	1050	652 (62%)	568 (87%)
S2 Soil (spiked)	952	625 (66%)	605 (97%)
S3 Biosolid (spiked)	700	291 (42%)	243 (84%)

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 Soil and Water

In the first study conducted by NMI for PFAS analytes in soil AQA 15-03, participants were asked to report results for PFOA and for total and linear PFOS. Eleven laboratories enrolled in this study of which 10 reported results. The lack of mass-labelled linear and branched standards was the main problem encountered by participants at that time. Since then, a large number of standards and labelled standards have become available and so more analytes have been added each year to follow-up PT studies. Laboratories have developed methods for the analysis of a wide spectrum of PFAS contaminants and in general the reported results are 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 in NMI proficiency tests of PFAS in soil over the last 10 studies (2015 to 2024) is presented in Figure 138.

AQA 24-13 is the tenth NMI proficiency test of PFAS analytes in soil. 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.

Participants still have difficulties to measure PFNS and PFDS in soil samples with high PFOS content. As in previous studies, no assigned value was set for these analytes in the incurred soil sample because the reported results were too variable.

A summary of participants' performance in the measurement of PFAS analytes in soil over time is presented in Figure 139.

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.

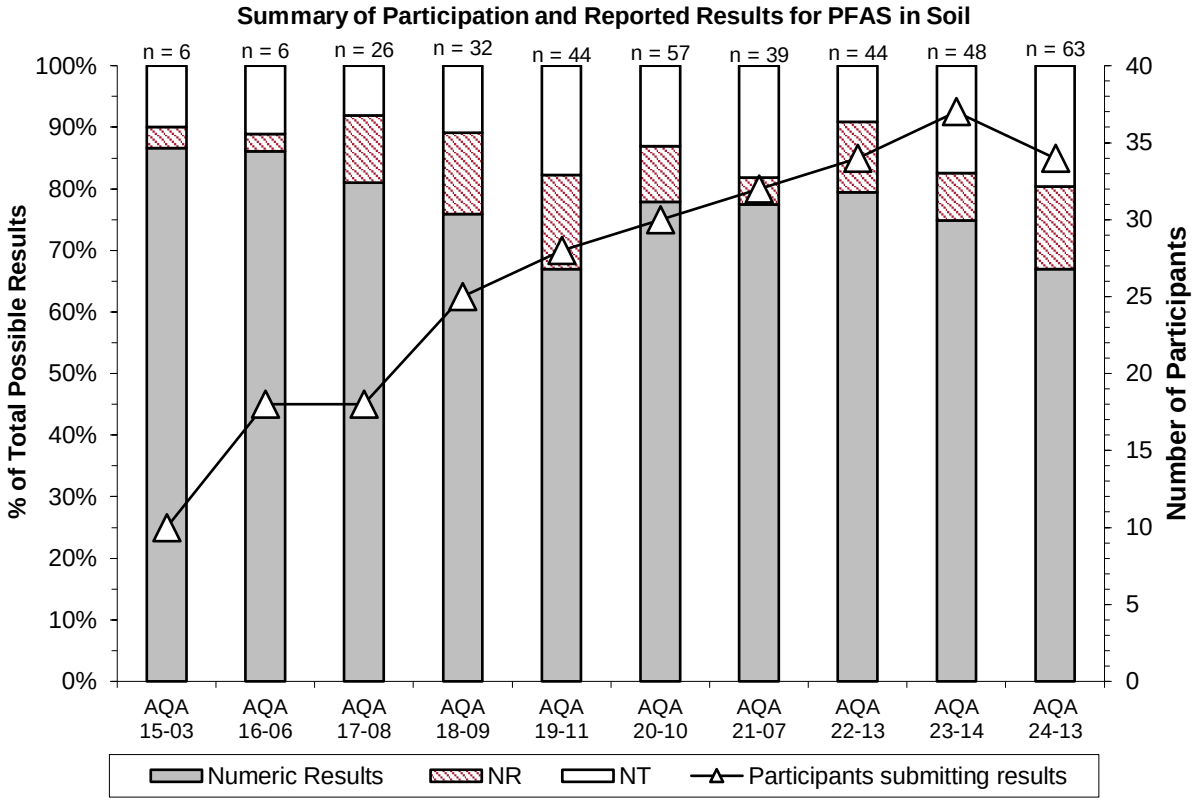


Figure 138 Summary of Participation and Reported Results for PFAS in Soil PT Studies (n = number of analytes).

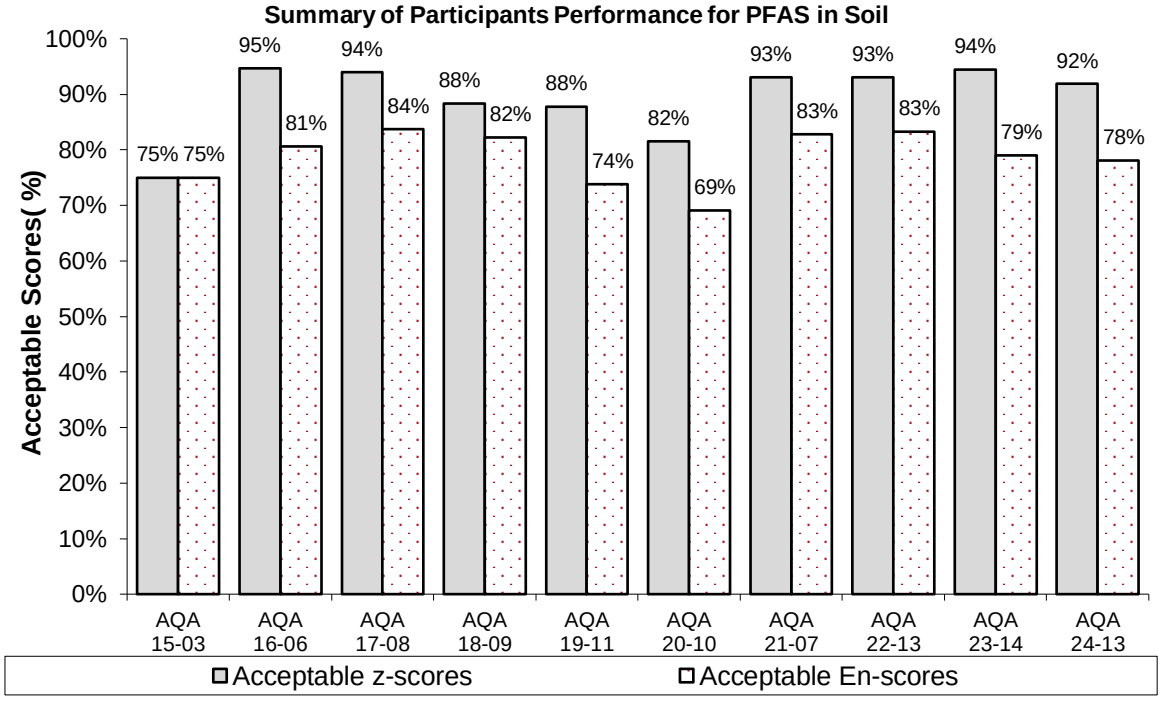


Figure 139 Summary of Participants' Performance for PFAS in Soil PT Studies

7 REFERENCES

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

[1] ISO/IEC 17043, *Conformity assessment – General requirements for proficiency testing*.

[2] NMI Chemical Proficiency Testing Study Protocol, viewed January 2025, < https://www.industry.gov.au >.

[3] NMI, Chemical Proficiency Testing Statistical Manual, viewed January 2025, < https://www.industry.gov.au >.

[4] Thompson, M., Ellison, S.L.R. & Wood, R. 2006, 'The International Harmonized Protocol for the Proficiency Testing of Analytical Chemistry Laboratories', *Pure Appl. Chem.*, vol. 78, pp. 145-196

[5] ISO 13528, *Statistical methods for use in proficiency testing by interlaboratory comparisons*.

[6] Thompson, M., 2000, 'Recent trends in inter-laboratory precision at ppb and sub-ppb concentrations in relation to fitness for purpose criteria in proficiency testing', *Analyst*, vol. 125, pp. 385-386.

[7] AS ISO/IEC 17025. *General requirements for the competence of testing and calibration laboratories.*

[8] Eurachem/CITAC Guide, Quantifying Uncertainty in Analytical Measurement, 3rd ed., viewed January 2025, , <http://www.eurachem.org>.

[9] USEPA Office of Water, 2024, Analysis of PFAS in Aqueous, Solid, Biosolid, and Tissue Samples by LC-MS/MS

[10] Taniyasu, S. & Kannan, K. 2005, 'Analysis of fluorotelomer alcohols, fluorotelomer acids, and short- and long-chain perfluorinated acids in water and biota' *Journal of Chromatography*, vol. 1093, pp.89-97.

[11] Powley, C.R. & George, S.W. 2005, 'Matrix Effect-Free Analytical Methods for Determination of Perfluorinated Carboxylic Acids in Environmental Matrices,' *Anal.Chem*, vol. 77 pp. 6353-6358.

[12] Gonzales-Barreiro, C. & Martinez-Carballo, E. 2006, 'Method optimization for determination of selected perfluorinated alkylated substances in water sample', *Analytical and Bioanalytical Chemistry*, vol. 386, pp. 2123-2132,

[13] Van Leeuwen, S.P.J. and de Boer, J. 2007, 'Extraction and Clean-up Strategies for the Analysis of Poly- and Perfluoroalkyl Substances in Environmental and Human Matrices', J. Chromatogr. A, vol 1153, pp 172-185.

[14] Taniyasu, S. et al. 2013, 'Inter-laboratory Trials for Analysis of Perfluorooctanesulfonate and Perfluorooctanoate in Water Samples: Performance and Recommendations', Anal. Chim. Acta, vol 770, pp 111-120.

[15] NMI, Proficiency Test Report AQA 18-09 PFAS in Soil, Water, Fish and Prawn, viewed January 2025, < https://www.industry.gov.au >.

[16] Bertil, M, Näykki, T, Hovind, H & Krysell, M 2012, 'Nordtest Report Handbook for Calculation of Measurement Uncertainty in Environmental Laboratories TR 537', 4th Edition, Nordest Tekniikantie, Finland, Esopo.

APPENDIX 1 – SAMPLE PREPARATION

Sample S1: 2300 g of contaminated soil was ground, sieved, mixed and then divided into equal portions of approximately 20 g each.

Sample S2: 2000 g of dried and sieved uncontaminated soil was fortified for 27 PFAS analytes, mixed and divided into portions of approximately 20 g each.

Sample S3: 3000 g of moist biosolid was autoclaved and fortified for 24 PFAS analytes. The moist fortified biosolid was then divided into portions of approximately 20 g each.

Soil and water samples were stored at 4°C prior to dispatch to participants. The biosolid sample was stored at -20°C.

APPENDIX 2 – ROBUST AVERAGE AND ASSOCIATED UNCERTAINTY, Z-SCORE AND E_N-SCORE CALCULATIONS

A3.1 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 103.

Table 103 Uncertainty Estimate for PFNA in Sample S2

No. results (p)*	31
Robust Average	2.76 µg/kg
$S_{rob\ av}$	0.29 µg/kg
$u_{rob\ av}$	0.065 µg/kg
k	2
$U_{rob\ av}$	0.13 µg/kg

*Outliers excluded

Therefore, the robust average for PFNA in Sample S2 is **2.76 ± 0.13 µg/kg**.

A3.2 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 104.

Table 104 z-Score and E_n-Score for Sample S2 PFNA Result Reported by Laboratory 23

Participant Result (µg/kg)	Assigned Value (µg/kg)	Target Standard Deviation	z-Score	E_n-Score
2.67 ± 0.2	2.76 ± 0.13	20% as PCV, or: 0.2 × 2.76 = 0.552 µg/kg	z-Score = $\frac{2.67 - 2.76}{0.552}$ = - 0.16	E_n-Score = $\frac{2.67 - 2.76}{\sqrt{0.2^2+0.13^2}}$ = - 0.38

APPENDIX 3 – USING PT DATA FOR UNCERTAINTY ESTIMATION

When a laboratory has successfully participated in at least 6 proficiency testing studies (e.g. is demonstrating control of bias and verification of repeatability), the standard deviation from proficiency testing studies (the reproducibility between laboratories variation) 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 soil. 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 105). The pooled standard deviation of the robust CV over these PT samples gives an estimate of the relative standard uncertainty of 14%. Using a coverage factor of two gives relative expanded uncertainty of 28%, at a level of confidence of approximately 95%.

Table 105 Laboratory X Reported Results for PFOA

Study No.	Sample	Laboratory result µg/kg	Assigned value* µg/kg	Number of Results	Robust CV of all results (%)
AQA 15-03	S2 - Soil	8.34	8.9	9	19
AQA 16-06	S3 - Soil	7.45	5.83	17	9.7
AQA 18-09	S1 - Soil	6.2	6.55	23	9.7
AQA 18-09	S2 - Soil	65.4	80.5	22	11
AQA 19-11	S1 - Soil	91.5	104	24	21
AQA 19-11	S2 - Soil	1.59	1.70	24	19
AQA 20-10	S1 - Soil	520	466	22	16
AQA 20-10	S2 - Soil	7.4	7.82	27	16
AQA 21-07	S1 - Soil	4.05	3.70	29	15
AQA 21-07	S2 - Soil	12.1	12.0	29	9.7
AQA 22-13	S1 - Soil	20.8	20.4	32	17
AQA 22-13	S2 - Soil	9.71	9.67	32	11
AQA 23-14	S1 - Soil	36	41.3	36	16
AQA 23-14	S2 - Soil	10	10.5	37	11
AQA 24-13	S1 - Soil	545.45	550	25	15
AQA 24-13	S2 - Soil	5.56	6.50	32	12
Average					14%*
$\boldsymbol{pooled\ s}\% = \sqrt{\frac{(\mathbf{9}-\mathbf{1})\times\mathbf{19^2}+(\mathbf{17}-\mathbf{1})\times\mathbf{9.7^2}+\cdots\ldots\ldots\ldots\ldots+(\mathbf{32}-\mathbf{1})\times\mathbf{12^2})}{\mathbf{420}-\mathbf{16}}}$					14%

* The pooled standard deviation was used.

Table 106 sets out the expanded uncertainty for results of the measurement of PFOA in soil over the range 1 – 1000 µg/kg.

Table 106 Uncertainty of PFOA Results Estimated Using PT Data.

Results µg/kg	Uncertainty µg/kg
1.00	0.28
20.0	5.6
100	28
500	140
1000	280

The estimate of 28% passes the test of being reasonable, and the analysis of the 16 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 107 Additional Analytes

Lab. Code	Sample	Analyte	Result (µg/kg)	Uncertainty (µg/kg)	Recovery (%)
1	S3	PFTeDA	0.16	0.05	85
		MeFOSE	0.88	0.27	82
		5:3FTCA	20.85	6.25	NR
2	S1	FOUEA	2.7	0.4	106
	S3	5:3FTCA	37	6	NR
		7:3FTCA	7.3	1.1	NR
4	S3	PFTeDA	0.15	0.05	129
		MeFOSE	1.12	0.34	100
		EtFOSE	0.28	0.08	74
7	S2	PFHpS	0.025	NR	NR
		PFDoA	0.06	0.046	97
		MeFOSAA	0.02	NR	91
9	S1	PFUdS	9.46898987916451	3.50352625529087	14.3381167034578
		PFTrDS	2.33752854161589	0.86488556039788	14.3381167034578
		EtFOSAA	0.432573809951165	0.0821890238907214	81.6447679809674
	S2	PFHpS	0.0244372261195327	0.00488744522390654	84.8012942186349
		PFDoS	0.0200228544098676	0.00740845613165103	86.9181255282738
		PFUdA	0.0181556455458343	0.00417579847554189	80.0677608571101
		PFDoA	0.0518303775893665	0.00984777174197963	81.2701938399483
		PFTrDA	0.0121590713298677	0.00279658640586957	83.4777598493498
		PFHxDA	0.0129653634870435	0.00285237996714957	84.9253099089542
		MeFOSAA	0.0102186996941137	0.0019415529418816	80.3516799116537

Lab. Code	Sample	Analyte	Result (µg/kg)	Uncertainty (µg/kg)	Recovery (%)
10	S1	EtFOSA	1.16	0.28	125
		EtFOSAA	0.26	0.05	82
		EtFOSE	0.103	0.04	88
	S2	PFPeS	0.099	0.02	NR
		PFHpS	0.33	0.06	NR
		PFPeA	1.10	0.11	58
		PFUdA	0.06	0.01	70
		PFDoA	0.107	0.01	70
		PFTrDA	0.046	0.01	NR
		PFHxDA	0.068	0.03	58
		8:2FTS	1.08	0.25	64
	S3	PFTeDA	0.49	0.14	50
		PFHxDA	0.212	0.10	54
		6:2FTS	0.24	0.03	98
11	S1	FOUEA	1	0.2	69
		EtFOSAA	0.4	0.2	48
12	S3	MeFOSE	2.2	0.9	NR
		EtFOSE	2.4	1	78
13	S3	5:3FTCA	4.2045	NR	NR
		7:3FTCA	1.4157	NR	NR
17	S3	PFTeDA	0.461	0.151	31
		MeFOSE	1.093	0.35	24
		EtFOSE	0.43	0.318	21
		5:3FTCA	13.035	2.9	68
		7:3FTCA	2.864	1.593	72

Lab. Code	Sample	Analyte	Result (µg/kg)	Uncertainty (µg/kg)	Recovery (%)
18	S3	5:3FTCA	18	6.1	76
		7:3FTCA	2.6	0.9	80
20	S1	EtFOSAA	2.45	0.735	NR
	S2	EtFOSA	2.9	0.87	NR
		MeFOSAA	7.15	2.145	NR
		MeFOSE	6.85	2.055	NR
25	S1	EtFOSAA	1.5	0.36	130
		EtFOSE	1.9	0.40	165
		GenX	17	1.7	113
		ADONA	34	3.8	50
		9Cl-PF3ONS	30	3.8	83
		11Cl-PF3OUdS	19	2.9	103
	S3	PFPeS	230	31	65
		6:2FTS	410	72	95
		3:3FTCA	4.5	0.74	92
		5:3FTCA	330	37	95
		7:3FTCA	320	130	97
27	S3	PFTeDA	0.5	0.1	13
		MeFOSE	2	1	23
28	S1	PFODA	0.142	0.0426	127
		EtFOSAA	0.750	0.225	73
	S3	PFDoS	1.7	0.51	84
		PFODA	1.36	0.408	20
29	S2	8:2FTS	6.68	2.00	127
30	S1	FOUEA	0.8	0.2	60.21

Lab. Code	Sample	Analyte	Result (µg/kg)	Uncertainty (µg/kg)	Recovery (%)
30	S1	EtFOSAA	0.2	0.1	73.72
35	S3	PFTeDA	3.46	1.038	169
		MeFOSE	0.99	0.297	16
36	S2	8:2FTS	0.16	0.5	75

APPENDIX 5 – FALSE NEGATIVES

Table 108 False Negatives

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
1	S1	MeFOSAA	2.44	Not Spiked	< 0.5
		5:3FTCA	304	Not Spiked	< 5
	S2	PFHpA	0.112	Not Spiked	< 0.1
		5:3FTCA	28.4	37.1	< 5
2	S1	PFTrDA	1.78	Not Spiked	NR
		PFTeDA	1.58	Not Spiked	NR
		PFHxDA	0.484	Not Spiked	NR
		MeFOSA	1.39	Not Spiked	NR
		MeFOSAA	2.44	Not Spiked	NR
		MeFOSE	0.519	Not Spiked	NR
		4:2FTS	0.406	Not Spiked	NR
		10:2FTS	4.00	Not Spiked	NR
	S2	PFNS	0.415	0.511	NR
		PFUdS	16.3*	20.6	NR
		PFHpA	0.112	Not Spiked	NR
	S3	PFUdA	0.394	Not Spiked	NR
		MeFOSAA	1.07	Not Spiked	NR
		EtFOSAA	1.30	Not Spiked	NR
3	S2	PFBS	3.07	3.29	NR
		PFHxS_L	3.32	3.52	NR
		PFOS_L	5.88	4.82	NR
		PFNS	0.415	0.511	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
3	S2	PFDS	8.54	10.3	NR
		PFUdS	16.3*	20.6	NR
		PFBA	4.60	4.97	NR
		PFHxA	3.36	3.21	NR
		PFHpA	0.112	Not Spiked	NR
		PFNA	2.76	2.70	NR
		PFDA	6.65	6.08	NR
		PFTeDA	9.50	10.8	NR
		PFODA	12.4	16.1	NR
		PFOSA	4.76	5.37	NR
		MeFOSA	2.71	3.72	NR
		EtFOSAA	6.18	7.25	NR
		EtFOSE	6.15	7.25	NR
		4:2FTS	6.57	6.96	NR
		6:2FTS	4.80	5.09	NR
		8:2diPAP	9.1	10.4	NR
		5:3FTCA	28.4	37.1	NR
		ADONA	17.6	20.1	NR
		PFEESA	19.5	23.7	NR
		9Cl-PF3ONS	22.3	24.8	NR
		11Cl-PF3OUdS	21.7	25.1	NR
6	S2	PFHxS_L	3.32	3.52	NR
		PFUdS	16.3*	20.6	NR
		EtFOSE	6.15	7.25	NR
		5:3FTCA	28.4	37.1	

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
6	S2	PFEESA	19.5	23.7	NR
		11Cl-PF3OUdS	21.7	25.1	NR
7	S1	PFDoS	4.80	Not Spiked	<1
		PFUdA	8.46	Not Spiked	<1
		PFDoA	4.64	Not Spiked	<1
		PFTrDA	1.78	Not Spiked	<1
		PFTeDA	1.58	Not Spiked	<1
		MeFOSA	1.39	Not Spiked	<1
		MeFOSAA	2.44	Not Spiked	<1
		10:2FTS	4.00	Not Spiked	<1
8	S1	MeFOSA	1.39	Not Spiked	<1
9	S3	PFBS	7.42	7.87	NR
		PFHxS	4.96	5.29	NR
		PFHxS_L	5.23	5.29	NR
		PFHpS	11.0	12.1	NR
		PFOS	12.5	11.3	NR
		PFOS_L	9.5	10.0	NR
		PFNS	1.13	1.61	NR
		PFDS	24.3*	37.8	NR
		PFBA	10.8	11.6	NR
		PFPeA	4.68	4.47	NR
		PFHxA	6.90	6.45	NR
		PFHpA	3.64	3.35	NR
		PFOA	13.1	11.9	NR
		PFNA	7.36	6.64	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
9	S3	PFDA	13.5	12.5	NR
		PFUdA	0.394	Not Spiked	NR
		PFTrDA	13.0*	22.5	NR
		PFOSA	7.30	7.89	NR
		MeFOSAA	1.07	Not Spiked	NR
		EtFOSAA	1.30	Not Spiked	NR
		8:2FTS	6.27	7.55	NR
		10:2FTS	36.8	53.5	NR
		8:2diPAP	NA	58.8	NR
		GenX	13.6*	16.8	NR
		ADONA	26.9	26.3	NR
		9Cl-PF3ONS	24.5	26.0	NR
		11Cl-PF3OUdS	22*	26.3	NR
10	S1	PFHxS_L	1390	Not Spiked	NR
		PFOS_L	13100	Not Spiked	NR
		MeFOSE	0.519	Not Spiked	<0.0005
	S2	PFHxS_L	3.32	3.52	NR
		PFOS_L	5.88	4.82	NR
		EtFOSAA	6.18	7.25	<0.0005
	S3	PFHxS_L	5.23	5.29	NR
		PFOS_L	9.5	10.0	NR
		EtFOSAA	1.30	Not Spiked	<0.0005
12	S1	MeFOSA	1.39	Not Spiked	<1
13	S3	PFNS	1.13	1.61	<1
		MeFOSAA	1.07	Not Spiked	<1

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
13	S3	EtFOSAA	1.30	Not Spiked	<1
14	S2	PFHpA	0.112	Not Spiked	<0.1
15	S1	MeFOSAA	2.44	Not Spiked	<2
18	S1	MeFOSAA	2.44	Not Spiked	< 2
	S3	PFBA	10.8	11.6	< 2
19	S1	PFHxS_L	1390	Not Spiked	NR
		PFOS_L	13100	Not Spiked	NR
		PFDoA	4.64	Not Spiked	NR
		PFTrDA	1.78	Not Spiked	NR
		PFTeDA	1.58	Not Spiked	NR
	S2	PFHxS_L	3.32	3.52	NR
		PFOS_L	5.88	4.82	NR
		PFHpA	0.112	Not Spiked	NR
20	S1	MeFOSA	1.39	Not Spiked	<1
		MeFOSAA	2.44	Not Spiked	<1
	S2	MeFOSA	2.71	3.72	<1
		EtFOSAA	6.18	7.25	<1
		EtFOSE	6.15	7.25	<1
22	S1	MeFOSE	0.519	Not Spiked	<0.5
23	S1	8:2FTS	506	Not Spiked	NR
24	S1	PFTeDA	1.58	Not Spiked	<0.5
		MeFOSA	1.39	Not Spiked	<0.5
		MeFOSE	0.519	Not Spiked	<0.5
	S3	MeFOSAA	1.07	Not Spiked	<0.5
		EtFOSAA	1.30	Not Spiked	<0.5

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
25	S1	PFPeS	172	Not Spiked	<1.0
		PFUdA	8.46	Not Spiked	<1.0
		PFTeDA	1.58	Not Spiked	<1.0
		MeFOSA	1.39	Not Spiked	<1.0
		3:3FTCA	4.57	Not Spiked	<1.0
	S2	PFHxS	3.28	3.52	<1.0
	S3	PFTrDA	13.0*	22.5	<1.0
		EtFOSAA	1.30	Not Spiked	<1.0
		GenX	13.6*	16.8	<1.0
		ADONA	26.9	26.3	<1.0
		9Cl-PF3ONS	24.5	26.0	<1.0
		11Cl-PF3OUdS	22*	26.3	<1.0
27	S1	PFDA	29.0	Not Spiked	<0.1
	S2	PFHpA	0.112	Not Spiked	<0.1
		PFOA	6.50	6.18	<0.1
		PFDA	6.65	6.08	<0.1
	S3	PFOA	13.1	11.9	<0.1
		PFDA	13.5	12.5	<0.1
29	S1	3:3FTCA	4.57	Not Spiked	NR
		5:3FTCA	304	Not Spiked	NR
		7:3FTCA	63.1	Not Spiked	NR
	S2	PFUdS	16.3*	20.6	< 5
		PFDA	6.65	6.08	< 5
		PFODA	12.4	16.1	< 5
		8:2diPAP	9.1	10.4	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
29	S2	5:3FTCA	28.4	37.1	NR
		ADONA	17.6	20.1	NR
		PFEESA	19.5	23.7	NR
		9Cl-PF3ONS	22.3	24.8	NR
		11Cl-PF3OUdS	21.7	25.1	NR
31	S2	PFOA	6.50	6.18	<5
		EtFOSAA	6.18	7.25	<5
34	S2	PFHpA	0.112	Not Spiked	<0.1
35	S1	3:3FTCA	4.57	Not Spiked	<0.5
		5:3FTCA	304	Not Spiked	<0.5
36	S1	PFPeS	172	Not Spiked	NR
		PFHxS_L	1390	Not Spiked	NR
		PFHpS	356	Not Spiked	NR
		PFOS	20900	Not Spiked	NR
		PFOS_L	13100	Not Spiked	NR
		PFDoS	4.80	Not Spiked	NR
		PFBA	339	Not Spiked	NR
		PFPeA	558	Not Spiked	NR
		PFDA	29.0	Not Spiked	NR
		PFUdA	8.46	Not Spiked	NR
		PFDoA	4.64	Not Spiked	NR
		PFTrDA	1.78	Not Spiked	NR
		PFTeDA	1.58	Not Spiked	NR
		PFHxDA	0.484	Not Spiked	NR
		PFOSA	65.0	Not Spiked	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
36	S1	MeFOSA	1.39	Not Spiked	NR
		MeFOSAA	2.44	Not Spiked	NR
		MeFOSE	0.519	Not Spiked	NR
		4:2FTS	0.406	Not Spiked	NR
		10:2FTS	4.00	Not Spiked	NR
		3:3FTCA	4.57	Not Spiked	NR
		5:3FTCA	304	Not Spiked	NR
		7:3FTCA	63.1	Not Spiked	NR
	S2	PFHxS_L	3.32	3.52	NR
		PFOS_L	5.88	4.82	NR
		PFNS	0.415	0.511	NR
		PFDS	8.54	10.3	NR
		PFUdS	16.3*	20.6	NR
		PFBA	4.60	4.97	NR
		PFDA	6.65	6.08	NR
		PFTeDA	9.50	10.8	NR
		PFODA	12.4	16.1	NR
		PFOSA	4.76	5.37	NR
		MeFOSA	2.71	3.72	NR
		EtFOSAA	6.18	7.25	NR
		EtFOSE	6.15	7.25	NR
		4:2FTS	6.57	6.96	NR
		8:2diPAP	9.1	10.4	NR
		5:3FTCA	28.4	37.1	NR
		ADONA	17.6	20.1	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
36	S2	PFEESA	19.5	23.7	NR
		9Cl-PF3ONS	22.3	24.8	NR
		11Cl-PF3OUdS	21.7	25.1	NR
37	S1	MeFOSA	1.39	Not Spiked	<1.2
	S3	PFBA	10.8	11.6	<10
		PFHpA	3.64	3.35	<2.5
38	S2	PFODA	12.4	16.1	< 0.1
	S3	PFBS	7.42	7.87	NR
		PFHxS	4.96	5.29	NR
		PFHxS_L	5.23	5.29	NR
		PFHpS	11.0	12.1	NR
		PFOS	12.5	11.3	NR
		PFOS_L	9.5	10.0	NR
		PFNS	1.13	1.61	NR
		PFDS	24.3*	37.8	NR
		PFBA	10.8	11.6	NR
		PFPeA	4.68	4.47	NR
		PFHxA	6.90	6.45	NR
		PFHpA	3.64	3.35	NR
		PFOA	13.1	11.9	NR
		PFNA	7.36	6.64	NR
		PFDA	13.5	12.5	NR
		PFUdA	0.394	Not Spiked	NR
		PFTrDA	13.0*	22.5	NR
		PFOSA	7.30	7.89	NR

Lab. Code	Sample	Analyte	Assigned Value (µg/kg)	Spiked Value (µg/kg)	Reported Result** (µg/kg)
38	S3	MeFOSAA	1.07	Not Spiked	NR
		EtFOSAA	1.30	Not Spiked	NR
		8:2FTS	6.27	7.55	NR
		10:2FTS	36.8	53.5	NR
		8:2diPAP	NA	58.8	NR
		GenX	13.6*	16.8	NR
		ADONA	26.9	26.3	NR
		9Cl-PF3ONS	24.5	26.0	NR
		11Cl-PF3OUdS	22*	26.3	NR

NA = Not Available, *Robust Average (assigned value not set for this analyte); ** Results reported as NR may or may not be false negatives, depending on the participant's actual LOR.

APPENDIX 6 – PARTICIPANTS' TEST METHODS FOR SOIL SAMPLES

Participants' methods for soil samples are presented in Tables 134 to 183

Table 109 Participant Methodology – Extraction

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std(s) Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
1	2	2	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	15mL, 2 steps	MeOH, 0.3% NH3	30	Yes	40	1	Solid-Phase Extraction	Basic ACN and Acetone	No
2	1.98	1.02	No	Yes	0		Solid-Liquid Extraction (vortexed and centrifuged)	2	KOH/MeOH	120	No	40		None	Not Applicable	No
3	NA	0.5 g	NA	Yes	30 mins	Homogenisation	Sonication	3 times	Methanol	30 min x 3 times	Yes	Room temperature	30 mins	Solid-Phase Extraction	Methanol	NA
4	2	2	NA	Yes	30 mins		Solid-Liquid Extraction (vortexed and centrifuged)		MeOH	30 mins	No	Room Temp 22 °C	NA	Filtration	Not Applicable	NA
6	5	5	No	Yes	10		Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3	60	No	20		None		Yes
7	1	1	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		0.3% NH4OH/MeOH, 3% AcOH/DI	240 minutes	Yes	23	Online SPE 15 minutes	Solid-Phase Extraction	NH4C2H3O2/MeOH	No
8	0.2 g & 0.5 g	2 g	Yes	Yes	30	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	N/A	Methanol/Water 75/25, pH10	60	No	N/A	N/A	Filtration	Not Applicable	Yes

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std(s) Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
9*	1.0503	1.0297	No	Yes	15	No	Solid liquid extraction (vortex 30s/shaking 1h)		NH4C2H3O2/MeOH	60	Yes	40	30-120	Carbon (Envicarb 1000 mg)	ACN	No
10	0.154 g	0.4701	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3		Yes			Solid-Phase Extraction	NH4OH/ MeOH	
11	2	2	No	Yes	NA	NA	QuEChERS	NA	ACN/MeOH	30	Yes	NA	NA	Dispersive solid phase extraction	Not Applicable	No
12	2	2	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)	2	NH4OH/MeOH	10	No			None		Yes
13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
14	3.52	3.49	No	Yes							Yes	samples are not concentrated		Filtration	MeOH	No
15	5	5	No	Yes	10	Homogenisation	Alkaline Digestion	N/A	Basic MeOH	60	No	N/A	N/A	None	N/A	Yes
16	2.57	2.67	No	Yes	No	No	QuEChERS		ACN/MeOH	45	No	Room temp	10	None	ACN/MeOH	No

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std(s) Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
17	0.5	1	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	99/1 methanol/ammonium hydroxide (v/v)	2 x 20 min	Yes	40		None		No
18	5	5	No	Yes	10	Homogenisation	Alkaline Digestion	N/A	Basic MeOH	60	No	N/A	N/A	None	N/A	Yes
19*	2	2	No	Yes		Homogenisation	Solid-Liquid Extraction (vortexed and centrifuged)		MeOH and Water	60	No	Room Temperature		Filtration		Yes
20	5	5	No	Yes	No	No	Solid-Liquid Extraction (vortexed and centrifuged)	No	NH4OH/MeOH	20 minutes	Yes	N/A	N/A	Solid-Phase Extraction	N/A	Yes
22	5g	5g	No	Yes			QuEChERS		ACN	15	No	NA	NA	Dilution		
23	1	1	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	3	MeOH, 0.3% NH3	3 hrs	Yes			None		Yes
24	5g	5g	No	Yes			QuEChERS		ACN	15	No	NA	NA	Dilution		
25	2	2	No	Yes	30	NA	Alkaline Digestion	4	NaOH/MeOH	180	Yes	50	60	dSPE	MeOH	No
26	NT	2.01	Yes	Yes	No		Solid-Liquid Extraction (vortexed and centrifuged)		ACN/MeOH in 0.1% NH4OH	60	Yes	-	-	None	Not Applicable	Yes
27	5 g	5 g	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3	40	No	N/A	0	Filtration	N/A	

Lab Code	S1 Sample Weight (g)	S2 Sample Weight (g)	Sample Moistened?	Labelled Std(s) Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
28*	5.10 & 0.55	5.02	No	Yes			3hr cycle in SPLP Tumbler (30rev/min)/Centrifugation/SPE		KOH/MeOH	180	Yes				MeOH, 0.3% NH3	Yes
29	2	2	No	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	15mL, 2 steps	MeOH, 0.3% NH3	45	Yes	40	5	Solid-Phase Extraction	Basic ACN and Acetone	No
30	2	2	NA	Yes	NA	Homogenisation	QuEChERS	NA	ACN/MeOH	30	No	NA	NA	Filtration	ACN/Ammonium	NA
31	2	2	No	Yes	30 mins	No	Solid-Liquid Extraction (vortexed and centrifuged)		4:1 MeOH : Ultrapure water	~45	No	Not Applicable	Not Applicable	None	Not Applicable	No
32	2	2	No	Yes	0.5		QuEChERS		Ammonium acetate in ACN:MeOH	1hr	Yes	Ambient	N/A	Filtration	Not Applicable	No
34	NA															
35	2g	2g	NA	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	Basic ACN and Acetone	30	Yes	45	30	None		No
36	0.5	0.5	NA	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3		Yes	60	1hr	Filtration	MeOH, 0.3% NH3	No
37	2	2	No	Yes			QuEChERS		MeOH	60	Yes			Filtration		No
38	NA	2 g	No	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH	30	Yes	50	Till dryness	Envicarb		

*Additional Information in Table 135.

Table 110 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
9	After clean-up the solvent is exchanged to MeOH:H2O 1:1
19	2g soil + 5mL MeOH + 5mL H2O + 233 uL surrogate + 20 uL Ammonium Hydroxide then 1 hr Tumbling then centrifuged for 10 min @2000 rpm then filtered 1 mL then added 0.48 mL acedified water then added 20uL internal standard then vortex then transfer into the LC
28	Following Centrifugation, extn solvent is back-extracted into RW and adjusted to pH 5-9 with acetic acid. This solution is extracted like a water sample via SPE.

Table 111 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Correction?
1	LC-MSMS or LC-QQQ	0.375	No
2	LC-MSMS or LC-QQQ		No
3	LC-MSMS or LC-QQQ	No	No
4	LC-MSMS or LC-QQQ	Yes, 10x	No
6	LC-MSMS or LC-QQQ		Yes
7	LC-MSMS or LC-QQQ	S1:11, 110, 1100, 11000; S2: 11, 110	Yes
8	LC-MSMS or LC-QQQ	Varied based on analyte concentration 2-500x	No
9	LC-MSMS or LC-QQQ	No	No
10	LC-MSMS or LC-QQQ		No
11	LC-MSMS or LC-QQQ		No
12	LC-MSMS or LC-QQQ	2	No
14	LC-MS/MS	No	No
15	LC-MSMS or LC-QQQ	5	No
16	LC-MSMS or LC-QQQ	Dilution x10, x100	No
17	LC-MSMS or LC-QQQ	No	No
18	LC-MSMS or LC-QQQ	5	No

Lab. Code	Instrument	Dilution Factor	Blank Correction?
19*	LC-MSMS or LC-QQQ		
20	LC-MSMS or LC-QQQ	yes. One to five.	No
22	LC-Orbitrap	8	Yes
23	LC-MSMS or LC-QQQ	2	No
24	LC-Orbitrap	8	No
25	LC-MSMS or LC-QQQ	No	No
26	LC-MSMS or LC-QQQ	Dilution 10-times	No
27	LC-MSMS or LC-QQQ	No	No
28*	LC-MSMS or LC-QQQ		No
29	LC-MSMS or LC-QQQ	0.375	No
30	LC-MSMS or LC-QQQ	No	No
31	LC-MSMS or LC-QQQ	0.625	Yes
32	LC-MSMS or LC-QQQ	Neat, 10x, 100x, 1000x, 10000x	No
35	LC-MSMS or LC-QQQ		No
36	LC-MSMS or LC-QQQ		Yes
37	LC-MSMS or LC-QQQ	No	No
38	LC-MSMS or LC-QQQ		Yes

*Additional Information in Table 137.

Table 112 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
19	Column HPLC EC100/2 Nucleodur 100-3 PFAS, 3um, 100mmL x 2mmID
28	IDA Analysis utilized

Table 113 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	Wellington	Yes	Isotope Dilution	
2	Wellington	Yes	USEPA 537	
7	Wellington Laboratories	No		
8	Wellington Labs	Yes	ASTM D7968 modified	
9	Chiron, Wellington, Cambridge Isotope Laboratories	Yes	Flemish Standard Method CMA/3/D	
11	Wellington	Yes	No	
12	Wellington	No		
14	Greyhound	No	yes	
15	Wellington	Yes	No. In-house	
16	Wellington laboratory	No	N/A	
17	Wellington	Yes	Isotopic dilution	
18	Wellington	Yes	No. In-house	
20	Wellington Labs	Yes	No.	
23	Wellington	No	USEPA 1633	
25	Wellington	Yes	No	
26	Wellington	Yes	No	IS-correction using the above labelled standards
27	Accustandard and Wellington	Yes	USEPA 1633	
28	Wellington Labs	Yes	Modified EPA Method 537	
29	Wellington	Yes	Isotope Dilution	
30	Wellington Laboratories	Yes	In-House	
31	Wellington laboratories	Yes		
32	Wellington	Yes		

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
35	Wellington, Cambridge Isotope Laboratories	No		
36		Yes		
37	Wellington Laboratories	Yes		
38	Wellington	Yes		

Table 114 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFBS	MPFDA
3		
4	YES	
6		
7	PFBS - 13C3	PFHxS-18O2
8	M3PFBS	18O2 PFHxS
9	13C-PFBS	
10		
11	PFBS	
12	yes	
13	NA	NA
14	Sodium perfluoro-1-(2,3,4-13C3)butanesulfonate	
15	13C3-PFBS	N/A
16	YES	
17	13C3-PFBS	13C3-PFHxS
18	13C3-PFBS	N/A
19	M3PFBS	M8PFOS
20		13C3-PFBS-Na
22		Yes
23	M3PFBS	
24		Yes
25	M3PFBS	NA
26	PFBS-13C3	
27	Yes	No
28	13C3 PFBS	13C2 PFOA
29	Y	N
30	M3PFBS	NA
31	13C3-PFBS	
32	13C3-PFBS	-
34		
35	13C3-PFBS	
36		
37	13C3-PFBS	
38	x	

Table 115 Labelled Standards for PFPeS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3PFBS	MPFDA
3		
4	YES	
6		
7	PFHxS - 13C3	PFHxS-18O2
8	M3PFHxS	18O2 PFHxS
9	13C-PFHxS	
10		
11	PFBS	
12		
13	NA	NA
14	Perfluoro-n-(13C5)pentanoic acid	
15	18O2-PFHxS	N/A
16	YES	
17	18O2-PFHxS	13C3-PFHxS
18	18O2-PFHxS	N/A
19	M3PFBS	M8PFOS
20		
22		
23		
24		
25	M3PFBS	NA
26	PFHxS-13C3	
27	No	No
28	18O2 PFHxS	13C2 PFOA
29	N	N
30	MPFHxS	NA
31	13C3-PFBS	
32	16O2-PFHxS	-
34		
35	N/A	
36		
37	16O2-PFHxS	
38	x	

Table 116 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3	[13C3]-PFHxS	[13C3]-PFHxS
4	NO	
6		
7	PFHxS - 13C3	PFHxS-18O2
8	M3PFHxS	18O2 PFHxS
9	13C-PFHxS	
10		
11	PFHxS	
12	yes	
13	NA	NA
14	Sodium perfluoro-1-(1,2,3-13C3)hexanesulfonate	
15	18O2-PFHxS	N/A
16	YES	
17	18O2-PFHxS	13C3-PFHxS
18	18O2-PFHxS	N/A
19	M3PFBS	M8PFOS
20		13C3-PFHxS-Na
22	Yes	Yes
23	M3PFHxS	
24	Yes	Yes
25	M3PFHxS	NA
26	NT	
27	Yes	Yes
28	18O2 PFHxS	13C2 PFOA
29	Y	N
30	MPFHxS	NA
31	18O2-PFHxS	
32	16O2-PFHxS	-
34		
35	18O2-PFHxS	
36		
37	16O2-PFHxS	
38		

Table 117 Labelled Standards for PFHxS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3		
4	YES	
6		
7	PFHxS - 13C3	PFHxS-18O2
8	M3PFHxS	18O2 PFHxS
9	13C-PFHxS	
10		
11	NR	
12	yes	
13	NA	NA
14	Sodium perfluoro-1-(1,2,3-13C3)hexanesulfonate	
15	18O2-PFHxS	N/A
16	NT	
17	18O2-PFHxS	13C3-PFHxS
18	18O2-PFHxS	N/A
19		
20		
22		
23	M3PFHxS	
24		
25	M3PFHxS	NA
26	PFHxS-13C3	
27	No	No
28	18O2 PFHxS	13C2 PFOA
29	Y	N
30	NA	NA
31	18O2-PFHxS	
32	NT	-
34		
35	18O2-PFHxS	
36		
37	NT	
38	x	

Table 118 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3		
4	YES	
6		
7	PFHxS - 13C3	PFHxS-18O2
8	M8PFOS	MPFOS
9	13C-PFHxS	
10		
11	PFHxS	
12		
13	NA	NA
14		
15	13C4-PFOS	N/A
16	YES	
17	18O2-PFHxS	13C3-PFHxS
18	13C4-PFOS	N/A
19	M3PFBS	M8PFOS
20		
22		
23		
24		
25	M3PFHxS	NA
26	PFOS-13C4	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	Y	N
30	M8PFOS	NA
31	18O2-PFHxS	
32	16O2-PFHxS	-
34		
35	N/A	
36		
37	13C8-PFOS	
38	x	

Table 119 Labelled Standards for PFOS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M8PFOS	MPFOS
3	[13C4]-PFOS	[13C4]-PFOS
4	NO	
6		
7	PFOS - 13C8	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-PFOS	
10		
11	PFOS	
12	yes	
13	NA	NA
14	Sodium perfluoro-1-(13C8)octanesulfonate	
15	13C4-PFOS	N/A
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19	MPFOS	M8PFOS
20	PFOS-13C4	13C8-PFOS-Na
22	Yes	Yes
23	M8PFOS	MPFOS
24	Yes	Yes
25	M8PFOS	NA
26	PFOS-13C4	
27	Yes	Yes
28	13C4 PFOS	13C2 PFOA
29	N	N
30	M8PFOS	NA
31	13C8-PFOS	
32	13C8-PFOS	-
34		
35	13C8-PFOS	
36		
37	13C4-PFOS	
38		

Table 120 Labelled Standards for PFOS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8PFOS	MPFOS
3		
4	YES	
6		
7	PFOS - 13C8	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-PFOS	
10		
11	PFOS	
12	yes	
13	NA	NA
14	Sodium perfluoro-1-(13C8)octanesulfonate	
15	13C4-PFOS	N/A
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20		
22		
23	M8PFOS	MPFOS
24		
25	M8PFOS	NA
26	PFOS-13C4	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	Y	N
30	NA	NA
31	13C8-PFOS	
32	NT	-
34		
35	13C8-PFOS	
36		
37	13C8-PFOS	
38	x	

Table 121 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M8PFOS	MPFOS
3		
4	YES	
6		
7	PFOS - 13C8	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-PFOS	
10		
11	PFOS	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20		
22		
23		
24		
25	M8PFOS	NA
26	NT	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	N	N
30	M8PFOS	NA
31	13C8-PFOS	
32	13C8-PFOS	-
34		
35	N/A	
36		
37	13C8-PFOS	
38		

Table 122 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M8PFOS	MPFOS
3		
4	YES	
6		
7	PFOS - 13C8	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-PFOS	
10		
11	PFOS	
12		
13	NA	NA
14		
15	13C4-PFOS	N/A
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20		
22		
23		
24		
25	M8PFOS	NA
26	PFOS-13C4	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	N	N
30	M8PFOS	NA
31	13C8-PFOS	
32	13C8-PFOS	-
34		
35	N/A	
36		
37	13C8-PFOS	
38		

Table 123 Labelled Standards for PFUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	NT	NT
3		
4		
6		
7		
8	-	-
9	13C-PFOS	
10		
11	NR	
12		
13	NA	NA
14		
15	NT	NT
16	NT	
17		
18	NT	NT
19		
20		
22		
23		
24		
25	NT	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	NA	NA
31	NT	
32	NT	-
34		
35	N/A	
36		
37	NT	
38		

Table 124 Labelled Standards for PFDoS

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M8PFOS	MPFOS
3		
4		
6		
7		
8	M8PFOS	MPFOS
9	13C-PFOS	
10		
11	PFNA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFOS	13C8-PFOS
18	NT	NT
19		
20		
22		
23		
24		
25	NT	NA
26	NT	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	NT	NT
30	NA	NA
31	NT	
32	13C2-PFTeDA	-
34		
35	N/A	
36		
37	NT	
38		

Table 125 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	MPFBA	M3PFBA
3		
4	YES	
6		
7	PFBA-13C4	PFBA-13C3
8	M4PFBA	M3PFBA
9	13C-PFBA	
10		
11	PFBA	
12	yes	
13	NA	NA
14	Perfluoro-n-(13C4)butanoic acid	
15	13C4-PFBA	N/A
16	YES	
17	13C4-PFBA	13C3-PFBA
18	13C4-PFBA	N/A
19	MPFBA	MPFDA
20		13C4-PFBA
22		Yes
23	MPFBA	M3PFBA
24		Yes
25	M4PFBA	NA
26	PFBA-13C4	
27	Yes	Yes
28	13C4 PFBA	13C2 PFOA
29	Y	N
30	MPFBA	NA
31	13C4-PFBA	
32	13C4-PFBA	-
34		
35	13C4-PFBA	
36		
37	13C4-PFBA	
38	x	

Table 126 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M5PFPeA	M3PFBA
3		
4	YES	
6		
7	PFPeA - 13C5	PFBA-13C3
8	M5PFPeA	M2PFHxA
9	13C-PFPeA	
10		
11	PFPeA	
12	yes	
13	NA	NA
14	Perfluoro-n-(13C5)pentanoic acid	
15	13C3-PFPeA	N/A
16	YES	
17	13C4-PFPeA	13C5 -PFPeA
18	13C3-PFPeA	N/A
19	MPFBA	MPFDA
20		13C5-PFPeA
22		Yes
23	M5PFPeA	
24		Yes
25	M5PFPeA	NA
26	PFPeA-13C3	
27	Yes	No
28	13C5 PFPeA	13C2 PFOA
29	N	N
30	M5PFPeA	NA
31	13C5-PFPeA	
32	13C5-PFPeA	-
34		
35	13C5-PFPeA	
36		
37	13C5-PFPeA	
38	x	

Table 127 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M5PFHxA	M3PFBA
3		
4	YES	
6		
7	PFHxA - 13C5	PFOA-13C2
8	M5PFHxA	M2PFHxA
9	13C-PFHxA	
10		
11	PFHxA	
12	yes	
13	NA	NA
14	Perfluoro-n-(1,2,3,4,6-13C5)hexanoic acid	
15	13C2-PFHxA	N/A
16	YES	
17	13C2-PFHxA	13C5 -PFPeA
18	13C2-PFHxA	N/A
19	MPFHxA	MPFDA
20		13C5-PFHxA
22		Yes
23	M5PFHxA	
24		Yes
25	M5PFHxA	NA
26	PFHxA-13C2	
27	Yes	Yes
28	13C2 PFHxA	13C2 PFOA
29	Y	N
30	M5PFHxA	NA
31	13C2-PFHxA	
32	13C5-PFHxA	-
34		
35	13C2-PFHxA	
36		
37	13C5-PFHxA	
38	x	

Table 128 Labelled Standards for PFHpA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M4PFHpA	M3PFBA
3		
4	YES	
6		
7	PFHpA - 13C4	PFOA-13C2
8	M4PFHpA	M2PFHxA
9	13C-PFHpA	
10		
11	PFHpA	
12	yes	
13	NA	NA
14	Perfluoro-n-(1,2,3,4-13C4)heptanoic acid	
15	13C4-PFHpA	N/A
16	YES	
17	13C3-PFHpA	13C8-PFOA
18	13C4-PFHpA	N/A
19	MPFHxA	MPFDA
20		
22		Yes
23	M4PFHpA	
24		Yes
25	MPFHpA	NA
26	PFHpA-13C4	
27	Yes	No
28	13C4 PFHpA	13C2 PFOA
29	Y	N
30	M4PFHpA	NA
31	13C4-PFHpA	
32	13C4-PFHpA	-
34		
35	13C4-PFHpA	
36		
37	13C4-PFHpA	
38	x	

Table 129 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8PFOA	M2PFOA
3	[13C4]-PFOA	[13C4]-PFOA
4	YES	
6		
7	PFOA - 13C4	PFOA-13C2
8	M8PFOA	M2PFOA
9	13C-PFOA	
10		
11	PFOA	
12	yes	
13	NA	NA
14	Perfluoro-n-(13C8)octanoic acid	
15	13C4-PFOA	N/A
16	YES	
17	13C4-PFOA	13C8-PFOA
18	13C4-PFOA	N/A
19	MPFOA	MPFDA
20	PFOA-13C4	13C8-PFOA
22		Yes
23	M8PFOA	M2PFOA
24		Yes
25	M8PFOA	NA
26	PFOA-13C8	
27	Yes	Yes
28	13C4 PFOA	13C2 PFOA
29	Y	N
30	MPFOA	NA
31	13C8-PFOA	
32	13C4-PFOA	-
34		
35	13C8-PFOA	
36		
37	13C8-PFOA	
38	x	

Table 130 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M9PFNA	M2PFOA
3		
4	YES	
6		
7	PFNA - 13C9	PFNA-13C5
8	M9PFNA	M5PFNA
9	13C-PFNA	
10		
11	PFNA	
12	yes	
13	NA	NA
14	Perfluoro-n-(13C9)nonanoic acid	
15	13C5-PFNA	N/A
16	YES	
17	13C5-PFNA	13C8-PFOA
18	13C5-PFNA	N/A
19	MPFOA	MPFDA
20		13C9-PFNA
22	Yes	Yes
23	M9PFNA	
24	Yes	Yes
25	M9PFNA	NA
26	PFDA-13C2	
27	Yes	No
28	13C5 PFNA	13C2 PFOA
29	Y	N
30	MPFNA	NA
31	13C5-PFNA	
32	13C5-PFNA	-
34		
35	13C5-PFNA	
36		
37	13C5-PFNA	
38	x	

Table 131 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M6PFDA	MPFDA
3		
4	YES	
6		
7	PFDA - 13C6	PFDA-13C2
8	M6PFDA	M2PFDA
9	13C-PFDA	
10		
11	PFDA	
12	yes	
13	NA	NA
14	Perfluoro-n-(1,2,3,4,5,6-13C6)decanoic acid	
15	13C2-PFDA	N/A
16	YES	
17	13C2-PFDA	13C8-PFOA
18	13C2-PFDA	N/A
19	MPFUdA	MPFDA
20		13C6-PFDA
22		Yes
23	M6PFDA	MPFDA
24		Yes
25	M6PFDA	NA
26	PFDA-13C2	
27	Yes	Yes
28	13C2 PFDA	13C2 PFOA
29	Y	N
30	M6PFDA	NA
31	13C6-PFDA	
32	13C6-PFDA	-
34		
35	13C6-PFDA	
36		
37	13C6-PFDA	
38	x	

Table 132 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M7PFUdA	MPFDA
3		
4	YES	
6		
7	PFUdA - 13C7	PFDA-13C2
8	M7PFUnDA	M2PFDA
9	13C-PFUnDA	
10		
11	PFUdA	
12	yes	
13	NA	NA
14		
15	13C2-PFUdA	N/A
16	YES	
17	13C2-PFUdA	13C8-PFOA
18	13C2-PFUdA	N/A
19	MPFUdA	MPFDA
20		13C7-PFUdA
22		Yes
23	M7PFUdA	
24		Yes
25	M6PFUnDA	NA
26	PFDA-13C2	
27	Yes	No
28	13C2 PFudA	13C2 PFOA
29	Y	N
30	MPFUdA	NA
31	13C2-PFUnA	
32	13C2-PFUnDA	-
34		
35	13C2-PFUnA	
36		
37	13C2-PFUnDA	
38		

Table 133 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	MPFDoA	MPFDA
3		
4	YES	
6		
7	PFDoA - 13C2	PFDA-13C2
8	M2PFDoDA	M2PFDA
9	13C-PFDoDA	
10		
11	PFDoA	
12	yes	
13	NA	NA
14		
15	13C2-PFDoDA	N/A
16	YES	
17	13C2-PFDoA	13C8-PFOA
18	13C2-PFDoDA	N/A
19	MPFUdA	MPFDA
20		13C2-PFDoA
22		Yes
23	MPFDoA	
24		Yes
25	MPFDoDA	NA
26	PFDoA-13C2	
27	Yes	No
28	13C2 PFDoA	13C2 PFOA
29	Y	N
30	M3HFPODA	NA
31	13C2-PFDoA	
32	13C2-PFDoDA	-
34		
35	13C2-PFDoA	
36		
37	13C2-PFDoDA	
38		

Table 134 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	MPFDoA	MPFDA
3		
4	YES	
6		
7	PFTeDA - 13C2	PFDA-13C2
8	Avg M2PFDoDA & M2PFTeDA	M2PFDA
9	13C-PFDoDA	
10		
11	PFDoA	
12	yes	
13	NA	NA
14		
15	13C2-PFTeDA	N/A
16	YES	
17	13C2-PFDoA	13C8-PFOA
18	13C2-PFTeDA	N/A
19	M2PFTeDA	MPFDA
20		
22		
23		
24		
25	MPFDoDA	NA
26	PFTeDA-13C2	
27	No	No
28	13C2 PFDoA	13C2 PFOA
29	N	N
30	M3HFPODA	NA
31	13C2-PFTeDA	
32	13C2-PFDoDA	-
34		
35	N/A	
36		
37	13C2-PFTeDA	
38		

Table 135 Labelled Standards for PFTeDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2PFTeDA	MPFDA
3		
4	YES	
6		
7	PFTeDA - 13C2	PFDA-13C2
8	M2PFTeDA	M2PFDA
9	13C-PFTeDA	
10		
11	PFTeDA	
12	yes	
13	NA	NA
14		
15	13C2-PFTeDA	N/A
16	YES	
17	13C2-PFTeDA	13C8-PFOA
18	13C2-PFTeDA	N/A
19	M2PFTeDA	MPFDA
20		13C2-PFTeDA
22		Yes
23	M2PFTeDA	
24		Yes
25	MPFTeDA	NA
26	PFTeDA-13C2	
27	Yes	No
28	13C2 PFTeDA	13C2 PFOA
29	Y	N
30	M2PFTeDA	NA
31	13C2-PFTeDA	
32	13C2-PFTeDA	-
34		
35	13C2-PFTeDA	
36		
37	13C2-PFTeDA	
38		

Table 136 Labelled Standards for PFHxDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M2PFHxDA	M2PFOA
3		
4		
6		
7		
8	-	-
9	13C-PFHxDA	
10		
11	PFHxDA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C2-PFHxDA	13C8-PFOA
18	NT	NT
19		
20		
22		Yes
23		
24		Yes
25	NT	NA
26	PFHxDA-13C2	
27	No	No
28	13C2 PFHxDA	13C2 PFOA
29	NT	NT
30	M2PFHxDA	NA
31	NT	
32	13C2-PFHxDA	-
34		
35	N/A	
36		
37	13C2-PFHxDA	
38		

Table 137 Labelled Standards for PFODA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M8FOSA-I	MPFOS
3		
4		
6		
7		
8	-	-
9	13C-PFHxDA	
10		
11	NT	
12		
13	NA	NA
14		
15	NT	NT
16	NT	
17		
18	NT	NT
19		
20		
22		
23		
24		
25	NT	NA
26	PFHxDA-13C2	
27	No	No
28	13C2 PFHxDA	13C2 PFOA
29	NT	NT
30	NA	NA
31	NT	
32	NT	-
34		
35	N/A	
36		
37	NT	
38		

Table 138 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8FOSA-I	MPFDA
3		
4	YES	
6		
7	PFOSA - 13C8	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-PFOSA	
10		
11	PFOSA	
12	yes	
13	NA	NA
14		
15	13C8-FOSA	N/A
16	YES	
17	13C8-FOSA	
18	13C8-FOSA	N/A
19		
20		13C8-FOSA
22		Yes
23	M8-FOSA	
24		Yes
25	MPFOSA	NA
26	PFOSA-13C8	
27	Yes	No
28	13C8 FOSA	13C2 PFOA
29	Y	N
30	M8FOSA-I	NA
31	13C8-FOSA	
32	13C8-FOSA	-
34		
35	13C8-FOSA	
36		
37	13C8-FOSA	
38	x	

Table 139 Labelled Standards for MeFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d-N-MeFOSA-M	MPFOS
3		
4	YES	
6		
7	N-MeFOSA - 2H3	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-MePFOSA	
10		
11	N-MeFOSA	
12	yes	
13	NA	NA
14		
15	D3-M PFOSA	N/A
16	YES	
17	D3-N-Me FOSA	
18	D3-M PFOSA	N/A
19		
20		d3-N-MeFOSA
22		Yes
23	d-N-MeFOSA	
24		Yes
25	d-NMeFOSA	NA
26	N-MeFOSA-D3	
27	Yes	No
28	NT	NT
29	Y	N
30	d-N-MeFOSA-M	NA
31	d3-MeFOSA	
32	d3-MeFOSA	-
34		
35	d3-N-MeFOSA	
36		
37	d3-MeFOSA	
38		

Table 140 Labelled Standards for MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d3-N-MeFOSAA	MPFOS
3		
4	YES	
6		
7	N-MeFOSAA - 2H3	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-MePFOSAA	
10		
11	N-MeFOSAA	
12	yes	
13	NA	NA
14		
15	D3-Me-FOSAA	N/A
16	YES	
17	D3-N-Me FOSAA	
18	D3-Me-FOSAA	N/A
19		
20		D3-N-MeFOSAA
22		Yes
23	d3-N-MeFOSAA	
24		Yes
25	d3-NMeFOSAA	NA
26	N-MeFOSAA-D3	
27	Yes	No
28	d3-NMeFOSAA	13C2 PFOA
29	Y	N
30	d3-N-MeFOSAA	NA
31	d3-N-MeFOSAA	
32	d3-MeFOSAA	-
34		
35	d3-N-MeFOSAA	
36		
37	d3-MeFOSAA	
38		

Table 141 Labelled Standards for EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d5-N-EtFOSAA	MPFOS
3		
4	YES	
6		
7	N-EtFOSA - 2H5	PFOS-13C4
8	M8PFOS	MPFOS
9	13C-EtPFOSAA	
10		
11	N-EtFOSAA	
12	yes	
13	NA	NA
14		
15	D5-Et-FOSAA	N/A
16	YES	
17	D5-N-Et FOSAA	
18	D5-Et-FOSAA	N/A
19		
20		D5-N-EtFOSAA
22		Yes
23	d5-N-EtFOSAA	
24		Yes
25	d5-NEtFOSAA	NA
26	N-EtFOSAA-D5	
27	Yes	No
28	d5-NEtFOSAA	13C2 PFOA
29	Y	N
30	d5-N-EtFOSAA	NA
31	d5-N-EtFOSAA	
32	d5-EtFOSAA	-
34		
35	d5-NEtFOSAA	
36		
37	d5-EtFOSAA	
38		

Table 142 Labelled Standards for MeFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d7-N-MeFOSE-M	MPFOS
3		
4	YES	
6		
7	N-MeFOSE - D7	PFOS-13C4
8	M8PFOS	MPFOS
9		
10		
11	N-MeFOSE	
12	yes	
13	NA	NA
14		
15	D7-Me-FOSE	N/A
16	YES	
17	D7-N-Me FOSE	
18	D7-Me-FOSE	N/A
19		
20		d7-N-MeFOSE
22		Yes
23	d7-N-MeFOSE	
24		Yes
25	d7-NMeFOSE	NA
26	NT	
27	Yes	No
28	NT	NT
29	Y	N
30	d7-N-MeFOSE-M	NA
31	d7-MeFOSE	
32	d7-MeFOSE	-
34		
35	d7-N-MeFOSE	
36		
37	d7-MeFOSE	
38		

Table 143 Labelled Standards for EtFOSE

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d9-N-EtFOSE-M	MPFOS
3		
4	YES	
6		
7	N-EtFOSE - 2H9	PFOS-13C4
8	M8PFOS	MPFOS
9		
10		
11	N-EtFOSE	
12	yes	
13	NA	NA
14		
15	D9-Et-FOSE	N/A
16	YES	
17	D9-N-Et FOSE	
18	D9-Et-FOSE	N/A
19		
20		d9-N-EtFOSE
22		Yes
23	d9-N-EtFOSE	
24		Yes
25	d9-NEtFOSE	NA
26	NT	
27	Yes	No
28	NT	NT
29	Y	N
30	d9-N-EtFOSE-M	NA
31	d9-EtFOSE	
32	d3-EtFOSE	-
34		
35	d9-N-EtFOSE	
36		
37	d3-EtFOSE	
38		

Table 144 Labelled Standards for 4:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-4:2 FTS	MPFOS
3		
4	YES	
6		
7		
8	M2-4:2 FTS	18O2 PFHxS
9	13C-4:2FTS	
10		
11	4:2FTS	
12		
13	NA	NA
14		
15	13C2 4:2-FTS	N/A
16	YES	
17	13C2-4:2 FTS	
18	13C2 4:2-FTS	N/A
19		
20		13C2-4:2 FTS-Na
22		Yes
23	M2-4:2FTS	
24		Yes
25	M4:2 FTS	NA
26	4:2 FTS-13C2	
27	Yes	No
28	M2-4:2FTS	13C2 PFOA
29	Y	N
30	M2-4:2FTS	NA
31	13C2-42FTS	
32	13C2-6:2 FTS	-
34		
35	13C2-4-2 FTS	
36		
37	13C2-4:2 FTS	
38		

Table 145 Labelled Standards for 6:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-6:2 FTS	MPFOS
3		
4	YES	
6		
7	6:2 FTS - 13C2	PFHxS-18O2
8	M2-6:2 FTS	18O2 PFHxS
9	13C-6:2FTS	
10		
11	6:2FTS	
12	yes	
13	NA	NA
14		
15	13C2,12C6 6:2-FTS	N/A
16	YES	
17	13C2-6:2 FTS	
18	13C2,12C6 6:2-FTS	N/A
19		
20		13C2-6:2 FTS-Na
22		Yes
23	M2-6:2FTS	
24		Yes
25	M6:2 FTS	NA
26	6:2 FTS-13C2	
27	Yes	No
28	M2-6:2FTS	13C2 PFOA
29	Y	N
30	M2-6:2FTS	NA
31	13C2-62FTS	
32	13C2-8:2 FTS	-
34		
35	13C2-6-2 FTS	
36		
37	13C2-6:2 FTS	
38	x	

Table 146 Labelled Standards for 8:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-8:2 FTS	MPFOS
3		
4	YES	
6		
7	8:2 FTS - 13C2	PFHxS-18O2
8	M2-8:2 FTS	18O2 PFHxS
9	13C-8:2FTS	
10		
11	8:2FTS	
12	yes	
13	NA	NA
14		
15	13C2 8:2-FTS	N/A
16	YES	
17	13C2-8:2 FTS	
18	13C2 8:2-FTS	N/A
19		
20		13C2-8:2 FTS-Na
22		Yes
23	M2-8:2FTS	
24		Yes
25	M8:2 FTS	NA
26	8:2 FTS-13C2	
27	Yes	No
28	M2-8:2FTS	13C2 PFOA
29	Y	N
30	M2-8:2FTS	NA
31	13C2-82FTS	
32	13C2-8:2 FTS	-
34		
35	13C2-8-2 FTS	
36		
37	13C2-8:2 FTS	
38		

Table 147 Labelled Standards for 10:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-8:2 FTS	MPFOS
3		
4	YES	
6		
7		
8	M2-8:2 FTS	18O2 PFHxS
9	13C-10:2FTS	
10		
11	8:2FTS	
12		
13	NA	NA
14		
15	13C2 8:2-FTS	N/A
16	YES	
17	13C2-8:2 FTS	
18	13C2 8:2-FTS	N/A
19		
20		
22		Yes
23		
24		Yes
25	MPFDoDA	NA
26	10:2 FTS-13C2-D4	
27	No	No
28	M2-8:2FTS	13C2 PFOA
29	Y	N
30	M2-8:2FTS	NA
31	13C2-PFDoA	
32	13C2-8:2 FTS	-
34		
35	13C2-10-2 FTS	
36		
37	13C2-8:2 FTS	
38		

Table 148 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M4-8:2diPAP	M2PFOA
3		
4		
6		
7		
8	-	-
9	13C-8:2diPAP	
10		
11	8:2diPAP	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-8:2 diPAP	
18	NT	NT
19		
20		
22		
23		
24		
25	NT	NA
26	8:2-diPAP-13C4	
27	No	No
28	NT	NT
29	NT	NT
30	M4-8:2 diPAP	NA
31	NT	
32	13C2-8:2 diPAP	-
34		
35	N/A	
36		
37	13C2-8:2diPAP	
38		

Table 149 Labelled Standards for 3:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M5PFHxA	M2PFOA
3		
4		
6		
7		
8	M5PFPeA	M2PFHxA
9		
10		
11	PFOA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFPeA	13C5 -PFPeA
18	13C2-PFHxA	N/A
19		
20		
22		
23		
24		
25	M5PFPeA	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	M4PFHpA	NA
31	NT	
32	13C5-PFNA	-
34		
35	N/A	
36		
37	13C2-3:3FTCA	
38		

Table 150 Labelled Standards for 5:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M5PFHxA	M2PFOA
3		
4		
6		
7		
8	M5PFHxA	M2PFHxA
9		
10		
11	PFOA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C2-PFHxA	13C5 -PFPeA
18	13C4-PFOA	N/A
19		
20		
22		
23		
24		
25	MPFHpA	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	MFHEA	NA
31	NT	
32	13C4-PFOA	-
34		
35	N/A	
36		
37	13C2-5:3FTCA	
38		

Table 151 Labelled Standards for 7:3FTCA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M4PFHpA	M2PFOA
3		
4		
6		
7		
8	M5PFHxA	M2PFHxA
9		
10		
11	PFOA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C2-PFHxA	13C5 -PFPeA
18	13C2-PFDA	N/A
19		
20		
22		
23		
24		
25	M8PFOS	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	MFOEA	NA
31	NT	
32	13C6-PFDA	-
34		
35	N/A	
36		
37	13C2-7:3FTCA	
38		

Table 152 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3		
4		
6		
7		
8	M3HFPO-DA	M2PFHxA
9	13C-PFOA	
10		
11	PFHxS	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C3-PFHpA	13C8-PFOA
18	13C4-PFHpA	N/A
19		
20		
22		
23		
24		
25	MPFHpA	NA
26	NT	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	NT	NT
30	M4PFHpA	NA
31	NT	
32	13C4-PFHpA	-
34		
35	N/A	
36		
37	13C4-PFHpA	
38		

Table 153 Labelled Standards for PFEESA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M5PFHxA	M2PFOA
3		
4		
6		
7		
8	M5PFHxA	M2PFHxA
9		
10		
11	PFBS	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C2-PFHxA	13C5 -PFPeA
18	13C3-PFPeA	N/A
19		
20		
22		
23		
24		
25	NT	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	M3PFBS	NA
31	NT	
32	13C3-PFBS	-
34		
35	N/A	
36		
37	13C3-PFBS	
38		

Table 154 Labelled Standards for PFMPA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M5PFHxA	M2PFOA
3		
4		
6		
7		
8	M5PFPeA	M2PFHxA
9		
10		
11	PFBA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFPeA	13C5 -PFPeA
18	13C3-PFPeA	N/A
19		
20		
22		
23		
24		
25	NT	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	MPFBA	NA
31	NT	
32	13C4-PFBA	-
34		
35	N/A	
36		
37	13C4-PFBA	
38		

Table 155 Labelled Standards for PFMBA

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M4PFHpA	M2PFOA
3		
4		
6		
7		
8	M5PFPeA	M2PFHxA
9		
10		
11	PFPeA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFPeA	13C5 -PFPeA
18	13C3-PFPeA	N/A
19		
20		
22		
23		
24		
25	NT	NA
26	NT	
27	No	No
28	NT	NT
29	NT	NT
30	M5PFPeA	NA
31	NT	
32	13C5-PFPeA	-
34		
35	N/A	
36		
37	13C5-PFPeA	
38		

Table 156 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3		
4		
6		
7		
8	M3HFPO-DA	M2PFHxA
9		
10		
11	PFNA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20		
22		
23		
24		
25	M8PFOS	NA
26	NT	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	NT	NT
30	M8PFOS	NA
31	NT	
32	13C5-PFNA	-
34		
35	N/A	
36		
37	13C8-PFOS	
38		

Table 157 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3		
4		
6		
7		
8	M3HFPO-DA	M2PFHxA
9		
10		
11	PFDoA	
12		
13	NA	NA
14		
15	NT	NT
16	YES	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20		
22		
23		
24		
25	MPFDoDA	NA
26	NT	
27	No	No
28	13C4 PFOS	13C2 PFOA
29	NT	NT
30	M8PFOS	NA
31	NT	
32	13C5-PFNA	-
34		
35	N/A	
36		
37	13C8-PFOS	
38		

Table 158 Participant Methodology for Soil Samples– Additional Information

Lab. Code	Sample	Additional Information
9	All	The laboratory is accredited for following PFAS in soil samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFOSA, 4:2 FTS, 8:2 diPAP, HFPO-DA, DONA, PFECHS.
17	S1	Reporting linear isomer only for PFDS, PFNS, PFDoS and PFTrDA due to interference in chromatograms. Used smaller volume injection on LCMS (0.5ul, normal injection volume is 5ul) or manual sample dilution to quantify analytes with concentrations above 100 µg/kg.
34	S2	PFHxS and PFOS always reported Total.

APPENDIX 7 – PARTICIPANTS' TEST METHODS FOR BIOSOLID SAMPLES

Participants' methods for soil samples are presented in Tables 184 to 217.

Table 159 Participant Methodology – Extraction

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
1	5	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	15mL, 2 steps	Basic ACN and Acetone	30	Yes	22	N/A	Solid-Phase Extraction	N/A	No
2	1.01	Yes	N/A	N/A	Solid-Liquid Extraction (vortexed and centrifuged)	2	KOH/MeOH	120	Yes	40		Carbon SPE	KOH/MeOH	No
3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	2g	Yes	15mins	No			Basic ACN and Acetone	30mins	Yes	45	40		Basic ACN	No
6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	0.282 g	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3		Yes			Solid-Phase Extraction	NH4OH/MeOH	
12	2	Yes			Solid-Liquid Extraction	2	NH4OH/MeOH	30	No					Yes

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
					(vortexed and centrifuged)									
13*	25													
16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17*	1	Yes	30		Solid-Liquid Extraction (vortexed and centrifuged)	2	99/1 methanol/ammonium hydroxide (v/v)	2 x 20 min	Yes	40		None		No
18	2	Yes	10	Homogenisation	Alkaline Digestion	N/A	Basic MeOH	60	Yes	40	20	Enviroc arb	N/A	Yes
20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
22	5g				QuEChERS		ACN	15	No	NA	NA	Dilution		
23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	5g				QuEChERS		ACN	15	No	NA	NA	Dilution		
25	2	Yes	30	NA	Alkaline Digestion	4	NaOH/MeOH	180	Yes	50	60	dSPE	MeOH	No
26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27	5	Yes			Solid-Liquid Extraction (vortexed and centrifuged)		MeOH, 0.3% NH3	40	Yes	N/A	0	Filtration	N/A	
28*	0.53	Yes			3hr cycle in SPLP Tumbler		KOH/MeOH	180	Yes				MeOH, 0.3% NH3	

Lab Code	S3 Sample Weight (g)	Labelled Std Added Before Extraction?	Equilibration Time for Labelled Std (min)	Other Sample Pretreatment	Extraction Technique	Staggered Extraction Steps	Extraction Solvent	Total Extraction Time (min)	Carbon Cleanup?	Extraction Temperature (°C)	Extraction Time (min)	Extraction Cleanup	Elution Solvent	Final pH adjustment?
					(30rev/min)/Centrifugation/SPE									
30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
32	1g	Yes	0.5		QuEChERS		ACN	1hr	Yes	Ambient	N/A	Filtration	Not Applicable	No
34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
35	5g	Yes	30		QuEChERS		ACN	120	Yes	45	45	Solid-Phase Extraction	Basic ACN and Acetone	
37	1	Yes		Homogenisation	Solid-Liquid Extraction (vortexed and centrifuged)		MeOH	60				Filtration		No

*Additional Information in Table 185.

Table 160 Participant Methodology – Extraction Additional Information

Lab. Code	Extraction Additional Information
13	Used as part of validation, method still in development
17	Centrifuged samples before transferring to LCMS vials to remove some particulates
28	Following Centrifugation, extn solvent is back-extracted into RW and adjusted to pH 5-9 with acetic acid. This solution is extracted like a water sample via SPE.

Table 161 Participant Methodology – Instrumental Technique and Analysis

Lab. Code	Instrument	Dilution Factor	Blank Correction?
1	LC-MSMS or LC-QQQ	0.3	No
2	LC-MSMS or LC-QQQ		No
4	LC-MSMS or LC-QQQ	No	No
10	LC-MSMS or LC-QQQ		No
12	LC-MSMS or LC-QQQ	2	No
13*	LC-MSMS or LC-QQQ	No	
17	LC-MSMS or LC-QQQ	No	No
18	LC-MSMS or LC-QQQ	10	NA
22	LC-Orbitrap	8	Yes
24	LC-Orbitrap	8	No
25	LC-MSMS or LC-QQQ	No	No
27	LC-MSMS or LC-QQQ	No	No
28*	LC-MSMS or LC-QQQ		No
32	LC-MSMS or LC-QQQ	Neat, 5x, 10x	No
35	LC-MSMS or LC-QQQ		No
37	LC-MSMS or LC-QQQ	No	No

*Additional Information in Table 187.

Table 162 Participant Methodology – Instrumental Technique Additional Information

Lab. Code	Instrumental Technique Additional Information
13	Used as part of validation, method still in development
28	IDA Analysis utilized

Table 163 Participant Methodology – Labelled Standards

Lab. Code	Labelled Standard Source	Recovery Correction?	Standard Method?	Labelled Standards Additional Information
1	Wellington	Yes	Isotope Dilution	
2	Wellington	Yes	USEPA 537	
12	Wellington	No		
13	Wellington	No	Yes, SPE	
17	Wellington	Yes	Isotopic dilution	
18	Wellington	Yes	No. Inhouse.	
25	Wellington	Yes	No	
27	Accustandard and Wellington	Yes	USEPA 1633	
28	Wellington Labs	Yes	Modified EPA Method 537	
35	Wellington, Cambridge Isotope Laboratories	No		
37	Wellington Laboratories	Yes		

Table 164 Labelled Standards for PFBS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFBS	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C3-PFBS	13C3-PFHxS
18	13C3-PFBS	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M3PFBS	NA
26	NA	NA
27	Yes	No
28	13C3 PFBS	13C2 PFOA
29		
30	NA	NA
31		
32	13C3-PFBS	-
34	NA	NA
35	13C3-PFBS	
36		
37	13C3-PFBS	
38		

Table 165 Labelled Standards for PFHxS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3	NA	NA
4	NO	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	18O2-PFHxS	13C3-PFHxS
18	18O2-PFHxS	N/A
19		
20	NA	NA
22	Yes	Yes
23	NA	NA
24	Yes	Yes
25	M3PFHxS	NA
26	NA	NA
27	Yes	Yes
28	18O2 PFHxS	13C2 PFOA
29		
30	NA	NA
31		
32	16O2-PFHxS	-
34	NA	NA
35	18O2-PFHxS	
36		
37	16O2-PFHxS	
38		

Table 166 Labelled Standards for PFHxS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	18O2-PFHxS	13C3-PFHxS
18	18O2-PFHxS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M3PFHxS	NA
26	NA	NA
27	No	No
28	18O2 PFHxS	13C2 PFOA
29		
30	NA	NA
31		
32	NT	-
34	NA	NA
35	18O2-PFHxS	
36		
37	NT	
38		

Table 167 Labelled Standards for PFHpS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3PFHxS	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	18O2-PFHxS	13C3-PFHxS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M3PFHxS	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	16O2-PFHxS	-
34	NA	NA
35	N/A	
36		
37	13C8-PFOS	
38		

Table 168 Labelled Standards for PFOS

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

Table 169 Labelled Standards for PFOS_L

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8PFOS	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M8PFOS	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	NT	-
34	NA	NA
35	13C8-PFOS	
36		
37	13C8-PFOS	
38		

Table 170 Labelled Standards for PFNS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M8PFOS	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M8PFOS	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	13C8-PFOS	-
34	NA	NA
35	N/A	
36		
37	13C8-PFOS	
38		

Table 171 Labelled Standards for PFDS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M8PFOS	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M8PFOS	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	13C8-PFOS	-
34	NA	NA
35	N/A	
36		
37	13C8-PFOS	
38		

Table 172 Labelled Standards for PFBA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	MPFBA	M3PFBA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C4-PFBA	13C3-PFBA
18	13C4-PFBA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M4PFBA	NA
26	NA	NA
27	Yes	Yes
28	13C4 PFBA	13C2 PFOA
29		
30	NA	NA
31		
32	13C4-PFBA	-
34	NA	NA
35	13C4-PFBA	
36		
37	13C4-PFBA	
38		

Table 173 Labelled Standards for PFPeA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M5PFPeA	M3PFBA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C4-PFPeA	13C5 -PFPeA
18	13C3-PFPeA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M5PFPeA	NA
26	NA	NA
27	Yes	No
28	13C5 PFPeA	13C2 PFOA
29		
30	NA	NA
31		
32	13C5-PFPeA	-
34	NA	NA
35	13C5-PFPeA	
36		
37	13C5-PFPeA	
38		

Table 174 Labelled Standards for PFHxA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M5PFHxA	M3PFBA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-PFHxA	13C5 -PFPeA
18	13C2-PFHxA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M5PFHxA	NA
26	NA	NA
27	Yes	Yes
28	13C2 PFHxA	13C2 PFOA
29		
30	NA	NA
31		
32	13C5-PFHxA	-
34	NA	NA
35	13C2-PFHxA	
36		
37	13C5-PFHxA	
38		

Table 175 Labelled Standards for PFHpA

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

Table 176 Labelled Standards for PFOA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8PFOA	M2PFOA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C4-PFOA	13C8-PFOA
18	13C4-PFOA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M8PFOA	NA
26	NA	NA
27	Yes	Yes
28	13C4 PFOA	13C2 PFOA
29		
30	NA	NA
31		
32	13C4-PFOA	-
34	NA	NA
35	13C8-PFOA	
36		
37	13C8-PFOA	
38		

Table 177 Labelled Standards for PFNA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M9PFNA	M2PFOA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C5-PFNA	13C8-PFOA
18	13C5-PFNA	N/A
19		
20	NA	NA
22	Yes	Yes
23	NA	NA
24	Yes	Yes
25	M9PFNA	NA
26	NA	NA
27	Yes	No
28	13C5 PFNA	13C2 PFOA
29		
30	NA	NA
31		
32	13C5-PFNA	-
34	NA	NA
35	13C5-PFNA	
36		
37	13C5-PFNA	
38		

Table 178 Labelled Standards for PFDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M6PFDA	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-PFDA	13C8-PFOA
18	13C2-PFDA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M6PFDA	NA
26	NA	NA
27	Yes	Yes
28	13C2 PFDA	13C2 PFOA
29		
30	NA	NA
31		
32	13C6-PFDA	-
34	NA	NA
35	13C6-PFDA	
36		
37	13C6-PFDA	
38		

Table 179 Labelled Standards for PFUdA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M7PFUdA	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-PFUdA	13C8-PFOA
18	13C2-PFUdA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M6PFUnDA	NA
26	NA	NA
27	Yes	No
28	13C2 PFudA	13C2 PFOA
29		
30	NA	NA
31		
32	13C2-PFUnDA	-
34	NA	NA
35	13C2-PFUnA	
36		
37	13C2-PFUnDA	
38		

Table 180 Labelled Standards for PFDoA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	MPFDoA	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-PFDoA	13C8-PFOA
18	13C2-PFDoDA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	MPFDoDA	NA
26	NA	NA
27	Yes	No
28	13C2 PFDoA	13C2 PFOA
29		
30	NA	NA
31		
32	13C2-PFDoDA	-
34	NA	NA
35	13C2-PFDoA	
36		
37	13C2-PFDoDA	
38		

Table 181 Labelled Standards for PFTrDA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	MPFDoA	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-PFDoA	13C8-PFOA
18	13C2-PFTeDA	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	MPFDoDA	NA
26	NA	NA
27	No	No
28	13C2 PFDoA	13C2 PFOA
29		
30	NA	NA
31		
32	13C2-PFDoDA	-
34	NA	NA
35	N/A	
36		
37	13C2-PFTeDA	
38		

Table 182 Labelled Standards for PFOSA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M8FOSA-I	MPFDA
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C8-FOSA	
18	13C8-FOSA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	MPFOSA	NA
26	NA	NA
27	Yes	No
28	13C8 FOSA	13C2 PFOA
29		
30	NA	NA
31		
32	13C8-FOSA	-
34	NA	NA
35	13C8-FOSA	
36		
37	13C8-FOSA	
38		

Table 183 Labelled Standards for MeFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d3-N-MeFOSAA	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	D3-N-Me FOSAA	
18	D3-Me-FOSAA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	d3-NMeFOSAA	NA
26	NA	NA
27	Yes	No
28	d3-NMeFOSAA	13C2 PFOA
29		
30	NA	NA
31		
32	d3-MeFOSAA	-
34	NA	NA
35	d3-N-MeFOSAA	
36		
37	d3-MeFOSAA	
38		

Table 184 Labelled Standards for EtFOSAA

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	d5-N-EtFOSAA	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	D5-N-Et FOSAA	
18	D5-Et-FOSAA	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	d5-NEtFOSAA	NA
26	NA	NA
27	Yes	No
28	d5-NEtFOSAA	13C2 PFOA
29		
30	NA	NA
31		
32	d5-EtFOSAA	-
34	NA	NA
35	d5-NEtFOSAA	
36		
37	d5-EtFOSAA	
38		

Table 185 Labelled Standards for 8:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-8:2 FTS	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C2-8:2 FTS	
18	13C2 8:2-FTS	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	M8:2 FTS	NA
26	NA	NA
27	Yes	No
28	M2-8:2FTS	13C2 PFOA
29		
30	NA	NA
31		
32	13C2-8:2 FTS	-
34	NA	NA
35	13C2-8-2 FTS	
36		
37	13C2-8:2 FTS	
38		

Table 186 Labelled Standards for 10:2FTS

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M2-8:2 FTS	MPFOS
3	NA	NA
4	YES	
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C2-8:2 FTS	
18	13C2 8:2-FTS	N/A
19		
20	NA	NA
22		Yes
23	NA	NA
24		Yes
25	MPFDoDA	NA
26	NA	NA
27	No	No
28	M2-8:2FTS	13C2 PFOA
29		
30	NA	NA
31		
32	13C2-8:2 FTS	-
34	NA	NA
35	13C2-10-2 FTS	
36		
37	13C2-8:2 FTS	
38		

Table 187 Labelled Standards for 8:2diPAP

Lab. Code	Before Extraction	Before Instrument Analysis
1	NT	NT
2	M4-8:2diPAP	M2PFOA
3	NA	NA
4		
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C4-8:2 diPAP	
18	NT	NT
19		
20	NA	NA
22		
23	NA	NA
24		
25	NT	NA
26	NA	NA
27	No	No
28	NT	NT
29		
30	NA	NA
31		
32	13C2-8:2 diPAP	-
34	NA	NA
35	N/A	
36		
37	13C2-8:2diPAP	
38		

Table 188 Labelled Standards for GenX

Lab. Code	Before Extraction	Before Instrument Analysis
1	Y	N
2	M3-HFPO-DA	MPFDA
3	NA	NA
4		
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12	yes	
13		
14		
15		
16	N/A	
17	13C3-GenX	
18	13C312C3HF11O3	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M3HFPO-DA	NA
26	NA	NA
27	No	No
28	13C3 HFPO-DA	13C2 PFOA
29		
30	NA	NA
31		
32	13C3-GenX	-
34	NA	NA
35	13C3-GenX	
36		
37	M3HFPO-DA	
38		

Table 189 Labelled Standards for ADONA

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3	NA	NA
4		
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C3-PFHpA	13C8-PFOA
18	13C4-PFHpA	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	MPFHpA	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	13C4-PFHpA	-
34	NA	NA
35	N/A	
36		
37	13C4-PFHpA	
38		

Table 190 Labelled Standards for 9Cl-PF3ONS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3	NA	NA
4		
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	M8PFOS	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	13C5-PFNA	-
34	NA	NA
35	N/A	
36		
37	13C8-PFOS	
38		

Table 191 Labelled Standards for 11Cl-PF3OUdS

Lab. Code	Before Extraction	Before Instrument Analysis
1	N	N
2	M3-HFPO-DA	MPFDA
3	NA	NA
4		
6	NA	NA
7	NA	NA
8	NA	NA
9		
10		
11		
12		
13		
14		
15		
16	N/A	
17	13C4-PFOS	13C8-PFOS
18	13C4-PFOS	N/A
19		
20	NA	NA
22		
23	NA	NA
24		
25	MPFDoDA	NA
26	NA	NA
27	No	No
28	13C4 PFOS	13C2 PFOA
29		
30	NA	NA
31		
32	13C5-PFNA	-
34	NA	NA
35	N/A	
36		
37	13C8-PFOS	
38		

Table 192 Participant Methodology for Biosolid Samples– Additional Information

Lab. Code	Sample	Additional Information
9	All	The laboratory is accredited for following PFAS in soil samples: PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFHxDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFOSA, 4:2 FTS, 8:2 diPAP, HFPO-DA, DONA, PFECHS.
25	S3	PFTeDA not reported (NR) due to poor recovery in our QC sample.

APPENDIX 8 – ACRONYMS AND ABBREVIATIONS

10:2FTS	1H, 1H, 2H, 2H-perfluorododecane sulfonate
11Cl-PF3OUdS	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid
3:3FTCA	2H, 2H, 3H, 3H-perfluorohexanoic 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
7:3FTCA	2H, 2H, 3H, 3H-perfluorodecanoic acid
8:2diPAP	Fluorotelomer phosphate diester
8:2FTS	1H, 1H, 2H, 2H-perfluorodecane sulfonate
9Cl-PF3ONS	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid
ACN	Acetonitrile
ACN/Base	Base modified acetonitrile
ACN/MeOH	Base modified acetonitrile
AcOH/DI	Acetic acid in Deionised Water
ADONA	Ammonium 4,8-dioxa-3H-perfluorononanoate
AQA	Analytical and Quality Assurance
AS	Australian Standard
ASTM	American Society for Testing and Materials
AV	Assigned Value
CITAC	Co-Operation on International Traceability in Analytical Chemistry
CRM	Certified Reference Material
CV	Coefficient of Variation
dSPE	Dispersive Solid Phase Extraction
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
HFPO-DA	Hexafluoropropylene Oxide-Dimer Acid
HPLC	High Performance Liquid Chromotography
HV	Homogeneity Value
ISO	International Standards Organisation
IS	Internal Standard
KOH	Potassium Hydroxide
LC	Liquid Chromatography
LC-MSMS	Liquid Chromatography with Tandem Mass Spectrometry

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
NEN	Dutch Standard
NH4C2H3O2	Ammonium acetate
NH4OH	Ammonium hydroxide
NMI	National Measurement Institute (of Australia)
NR	Not Reported
NS	Not Sent
NT	Not Tested
PAA	Phenylacetic Acid
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
PFEESA	Perfluoro(2-ethoxyethane)sulfonic acid
PFESA	Polyfluorinated ether sulfonic acid
PFHpA	Perfluoro-n-heptanoic acid
PFHpS	Perfluoroheptane sulfonate
PFHxA	Perfluoro-n-hexanoic acid
PFHxDA	Perfluorohexadecanoic acid
PFHxS	Potassium perfluorohexanesulfonate
PFHxS_L	Potassium perfluorohexanesulfonate linear
PFMBA	Perfluoro-4-methoxybutanoic acid

PFMPA	Perfluoro-3-methoxypropanoic acid
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
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
RT	Room Temperature
SD	Standard Deviation
SLE	Solid-Liquid Extraction
SPE	Solid Phase Extraction
SPLP	Synthetic Precipitation Leaching Procedure
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