NILU Norsk institutt for luftforskning
Norwegian Institute for Air Research

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Investigation of outdoor textiles and gear with respect to determine the content of ionic perfluorinated substances (PFASs)

Evaluation of results

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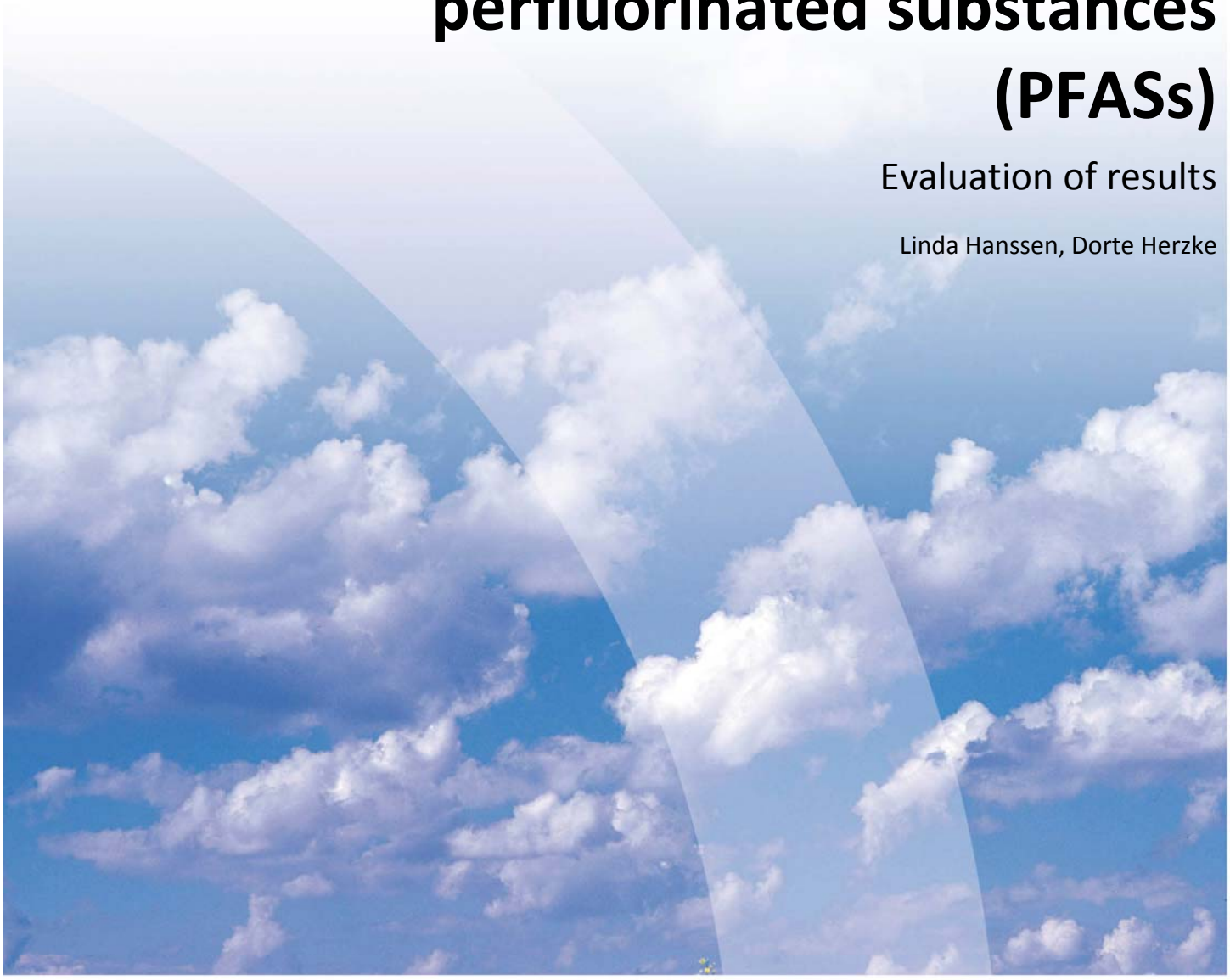


Scientific report

Preface

Extract from § 2-32. Consumer products containing perfluorooctanoic acid (PFOA), (Product regulation FOR 2004-06-01 Nr. 922, **§** 2-32)

From June 1 2014 there is a prohibition against production, import, export and distribution of consumer products which contains PFOA, as a pure substance or as a mixture when the mixture contains 0.001 weight percentage or more of the substance.

From the June 1 2014 there is a prohibition against production, import, export and distribution of textiles, carpets and other surface coated consumer products which contain PFOA, when the concentration in some parts of the product is higher or equal 1 µg/m^2. Parts of the product means the materials of which the product is produced, and the product's individual components.

This prohibition does not apply to food containers, food contact material and medical equipment. It does not apply to spare parts of consumer products made available for trade prior to 1st of June 2014.

NILU has on behalf of the Norwegian Environment Agency determined the concentration of ionic PFASs, including PFOA, in outdoor gear.

Contents

Summary

NILU has, on behalf of the Norwegian Environment Agency, determined the concentration of ionic perfluorinated substances (PFASs), including PFOA, in outdoor gear. Of the investigated 18 items, PFAS could not be detected at all in nine of them. Two samples contained PFOA exceeding the limit of 1 µg/m^2. The quality assurance where three replicates of one sample were extracted, had a relative standard deviation (RSD) less than 10%, for all detected substances, except one (PFTrDA). Other quality measures such as recovery calculations and blanks, show that the method used for extraction is suitable for these types of matrixes and substances. PFOS was not present in the items investigated, indicating that the textile industry manages to effectively avoid PFOS in their production processes.

Investigation of outdoor textiles and gear with respect to determine the content of ionic perfluorinated substances (PFASs)

Evaluation of results

1 Samples

Samples was purchased by the Norwegian Environmental Agency, and a subsample was cut out, wrapped in alumina foil, and shipped to NILU for analysis.

Table 1: Overview of the analysed outdoor equipment.

Sample ID NILU	Customer ID	Type of product	Part of product analysed
1	A	Telt	Rødt innertelt
2	B	Telt	Grønt yttertelt
3	C	Telt	Grå bunn
4	D	Vindsekk	Rød duk
5	E	Vindsekk	Gul duk
6	F	Telt	Blått yttertelt
7	G	Telt	Gult innertelt
8	H	Lavvo	Teltduk
9	I	Gapahuk	Grønn teltduk
10	J	Badedrakt	
11	K	Badedrakt	
12	L	Badedrakt	
13	M	Badebukse	
14	N	Gapahuk	
15	O	Vindsekk	
16	P	Telt	Mørk grønn (bunn)
17	Q	Telt	Lys grønn (telt)
18	R	Hengekøye	Tak

2 Methods

To reduce the analytical uncertainty caused by inhomogeneity of the fabric, three pieces (10 x 10 cm) of each outdoor gear, were cut out and homogenised. A subsample representing 100 cm^2 was used for analyses. To give insight into the variations of the chemical analyses as well as the inhomogeneous distribution of PFASs, all three sub samples were analysed for one textile item. More details about this is presented in the quality assurance section.

The samples were transferred to a 50 mL polypropylene tube, followed by addition of internal standard (25 ng) and 20 mL of methanol (Lichrosolv quality). The following PFASs were analysed using the internal standard method: PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTeDA, PFBS, PFHxS, PFHpS, PFOS, PFDS, 6:2 FTS, 8:2 FTS and FOSA (the abbreviations are listed in Table 4 in the appendix). After vortexing thoroughly, the samples were put in an ultrasonic bath for 30 minutes. Afterwards the methanol was transferred to a new polypropylene tube and reduced to 2 mL. An aliquot was cleaned up with acidified Envicarb prior to the addition of recovery standard (brPFDA) and analysed on a UPLC-MSMS system. More details about the instrumental analysis can be found in Hanssen *et al.* (2013).

3 Results

The PFAS concentrations are presented in Table 2. Of the investigated 18 items, no PFASs could be detected above the limit of detection (LOD) in 9 of them. Whereas the perfluorocarboxylate concentrations varied, PFOA was detected above LOD in the remaining samples. Two samples contained PFOA exceeding the limit of 1 $\mu g/m^2$. PFOA distribution for the different samples is presented in Figure 1. For one sample (sample 11) the sulfonate (PFBS) and fluortelomer sulfonate (8: FTS) were above the detection limit.

Table 2: The concentration of ionic PFAS (µg/m^2). Numbers in bold are concentrations above the limit of 1 µg/m^2 for PFOA. Concentrations below LOD are designated with "<" and the respective LOD concentration.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4:2 FTS	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
6:2 FTS	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
8:2 FTS	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.51	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFBS	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
PFHxS	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFHpS	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFOS	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFDcS	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
FOSA	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFHxA	<0.60	<0.60	0.77	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60	<0.60
PFHpA	<0.06	<0.06	0.26	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.06	<0.06	<0.06	<0.06	0.07	<0.06	<0.06
PFOA	0.09	<0.06	**3.07**	<0.06	<0.06	0.08	<0.06	0.55	<0.06	<0.06	**2.38**	0.46	<0.06	<0.06	0.29	0.75	0.32	<0.06
PFNA	<0.15	<0.15	0.21	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFDA	<0.15	<0.15	1.47	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.34	0.15	<0.15
PFUnDA	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
PFDoDA	<0.09	<0.09	0.76	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	0.16	<0.09	<0.09
PFTrDA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
PFTeDA	<0.09	<0.09	0.25	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09

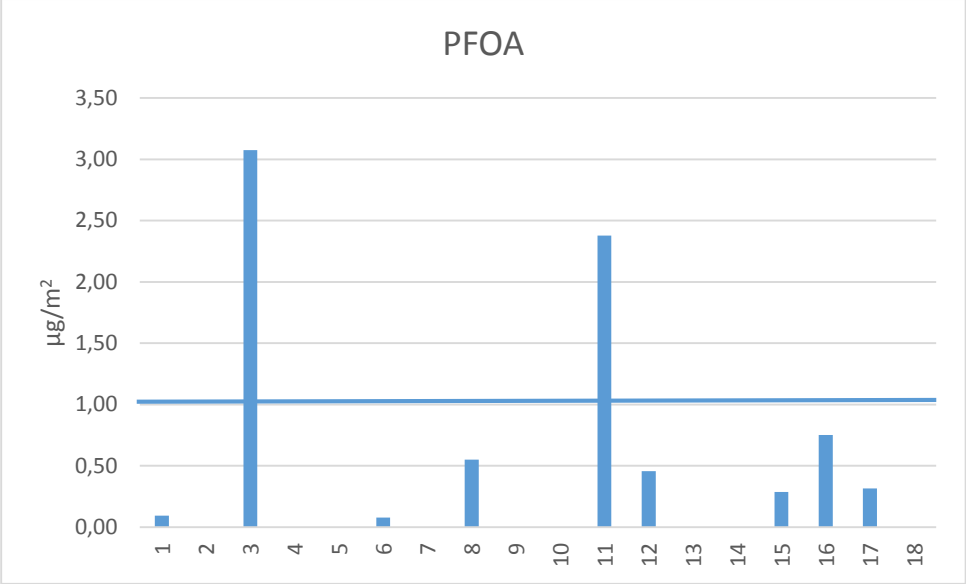


Figure 1: PFOA concentrations ($\mu g/m^2$) in the different items. The bold line indicate the 1 $\mu g/m^2$ concentration.

4 Quality Assurance

The extraction method applied only allows for the determination of the extractable PFAS. All PFAS chemically bound to a fluoropolymer are not accessible for the applied method. Using ^{13}C labelled internal standards for as many PFAS congeners as possible allows for a control of potential suppression of the analytical signal caused by matrix. Therefore, NILU uses a total of 14 ^{13}C labelled internal standards, which were added to the sample. To further assure the quality of the method, a certified reference material or a laboratory comparison test is part of PFAS analyses in general. However, for textiles no such material is available. To compensate for that, the recovery of the 14 ^{13}C labelled internal standards was used as an additional quality measure. The recovery differed between sample material and varied from 29 to 137%, with an average of 49%. Finally, blank controls give insight into possible contamination in the laboratory. Four blank samples were run together with the samples. None of the investigated PFASs were detected in blank samples.

The LOD was determined by using three times the noise of the mass transition of each PFAS in every sample. The LODs are presented together with the results in Table 2, and ranged between 0.03 and 0.60 µg/m^2. The achieved LOD for PFOA of 0.06 µg/m^2 is well below the threshold of 1 µg/m^2 ensuring good quality of the data.

To further investigate the variation in concentration between three samples of the same textile we have used a sample which was uniform in texture and colour and detectable PFAS concentrations of a broad variety were found as well as slightly exceeding of the PFOA threshold. The results are presented in Table 3.

Table 3: Three analysed replicates of a textile sample. Concentrations in µg/m^2.

	Parallel 1	Parallel 2	Parallel 3	Average	Stdev	% RSD
4:2 FTS	<0.10	<0.10	<0.10	-	-	-
6:2 FTS	<0.10	<0.10	<0.10	-	-	-
8:2 FTS	<0.15	<0.15	<0.15	-	-	-
PFBS	<0.03	<0.03	<0.03	-	-	-
PFHxS	<0.15	<0.15	<0.15	-	-	-
PFHpS	<0.15	<0.15	<0.15	-	-	-
PFOS	<0.15	<0.15	<0.15	-	-	-
PFDcS	<0.30	<0.30	<0.30	-	-	-
FOSA	<0.15	<0.15	<0.15	-	-	-
PFHxA	<0.90	<0.90	<0.90	-	-	-
PFHpA	0.15	0.15	0.15	0.15	0.003	1.8
PFOA	1.08	1.07	1.10	1.09	0.02	1.1
PFNA	1.22	1.38	1.38	1.33	0.09	7.0
PFDA	0.84	0.83	0.82	0.83	0.01	1.1
PFUnDA	0.60	0.54	0.57	0.57	0.03	4.9
PFDoDA	0.63	0.63	0.64	0.64	0.01	0.9
PFTrDA	0.29	0.55	0.57	0.47	0.16	33
PFTeDA	0.24	0.28	0.27	0.26	0.02	8.5

RSD: relative standard deviation

5 Discussion

On general terms, an analytical method with uncertainties below 20% is accepted. As shown in Table 3, the method applied by NILU results in relative standard deviations ranging between 0.9 and 8.5% which is well below the accepted uncertainty, with the exception of PFTrDA where the RSD was 33%.The increased uncertainty for PFTrDA could be explained by concentrations close to LOD and no ^{13}C labelled internal standard available for this compound.
The difference in PFAS content on fabrics within one sample could have an impact on the concentrations, therefore three pieces of each fabric were cut out and mixed together before extraction.

6 Conclusion

The PFOA concentration was for the majority (16 of 18) of the samples below the threshold of 1 µg/m^2. The quality assurance where three replicates of one sample were extracted, had a relative standard deviation less than 10% for all detected compounds except one (PFTrDA). Other quality measures such as recovery calculations and blanks, show that the method used for extraction are suitable for these type of matrices and compounds. None of the other analysed PFAS had concentrations that were similar to or exceeded the PFOA concentration. No PFOS was present in the items investigated, indicating that the textile industry manages to effectively avoid PFOS in their production processes.

7 References

Produktforskriften *[Product regulation]* (2004) Forskrift om begrensning i bruk av helse- og miljøfarlige kjemikalier og andre produkter (produktforskriften). Fastsatt av Miljøverndepartementet (nå Klima- og miljødepartementet) 1. juni 2004. FOR 2004-06-01 Nr. 922, § 2-32. URL: https://lovdata.no/dokument/SF/forskrift/2004-06-01-922/KAPITTEL_2?q=PFOA#KAPITTEL_2 [accessed 09 December 2014].

Hanssen, L., Dudarev, A.A., Huber, S., Odland, J.Ø., Nieboer, E., Sandanger, T.M. (2013) Partition of perfluoroalkyl substances (PFASs) in whole blood and plasma, assessed in maternal and umbilical cord samples from inhabitants of arctic Russia and Uzbekistan. *Sci. Total Environ.*, *447*, 430-437.

Appendix A

PFAS abbreviations and analytical reports

Table 4: PFAS abbreviations.

Abbrevation	Full name
PFBA*	Perfluorobutanoic acid
PFPeA*	Perfluoropentanoic acid
PFHxA*	Perfluorohexanoic acid
PFHpA*	Perfluoroheptanoic acid
PFOA*	Perfluorooctanoic acid
PFNA*	Perfluorononanoic acid
PFDA*	Perfluorodecanoic acid
PFUnDA*	Perfluoroundecanoic acid
PFDoDA*	Perfluorododecanoic acid
PFTrDA	Perfluorotridecanoic acid
PFTeDA*	Perfluorotetradecanoic acid
PFBS	Perfluoro butane sulfonic acid
PFHxS*	Perfluorohexane sulfonic acid
PFHpS	Perfluoroheptane sulfonic acid
PFOS*	Perfluorooctane sulfonic acid
PFDcS	Perfluorododecanoic sulfonic acid
4:2 FTS	4:2 fluorotelomersulfonate
6:2 FTS*	6:2 fluorotelomersulfonate
8:2 FTS	8:2 fluorotelomersulfonate
FOSA*	perflourooctanesulfonamide
brPFDA	3,7-dimethyl perfluorooctanoic acid (branched perfluorodecanoic acid)

*Also as ^{13}C labelled ISTD

Analytical reports

PFASs analysis results

Appendix to report: T-281

NILU sample number: 1
Customer: Miljødirektoratet

Customers sample ID: A

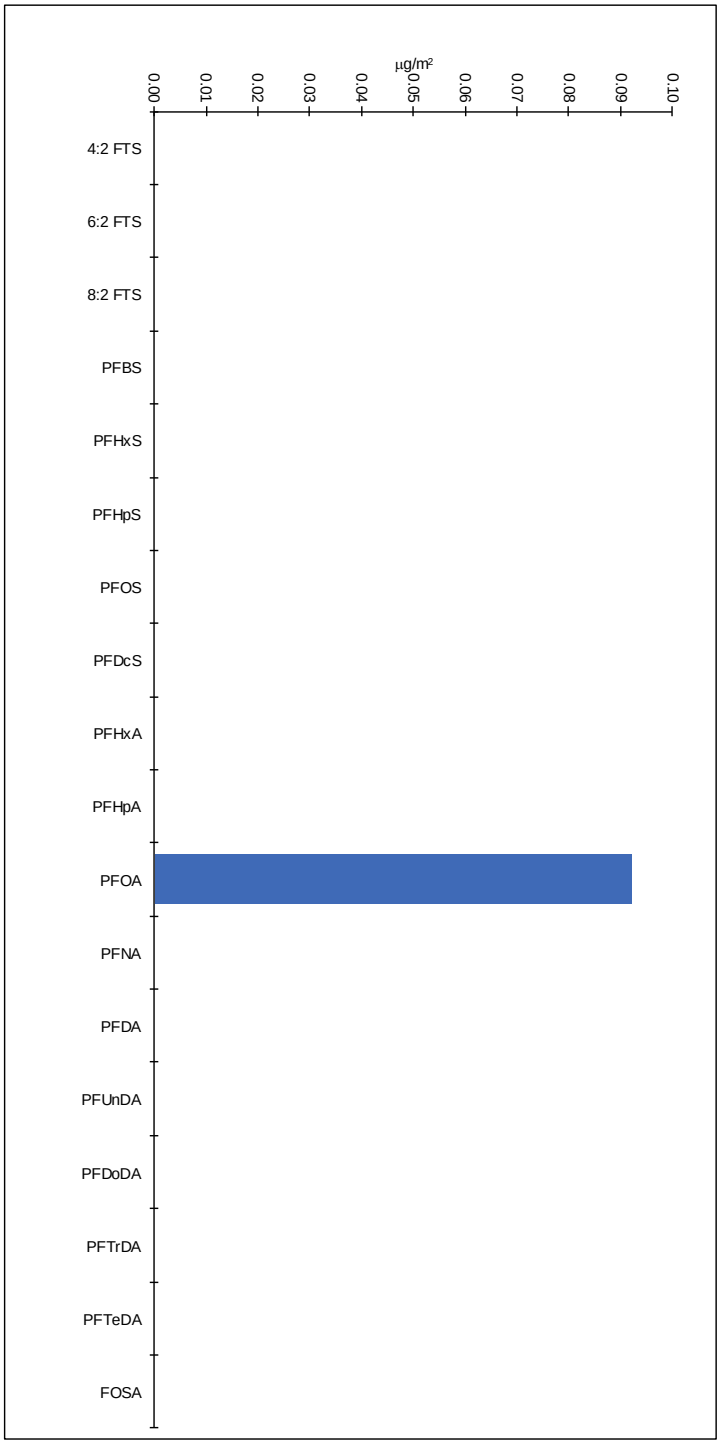
Type of sample: Telt (rødt innertelt)
Sample amount (g): 0.52
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**0.09**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.1***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 1



PFASs analysis results

Appendix to report: T-281

NILU sample number: 2
Customer: Miljødirektoratet

Customers sample ID: B

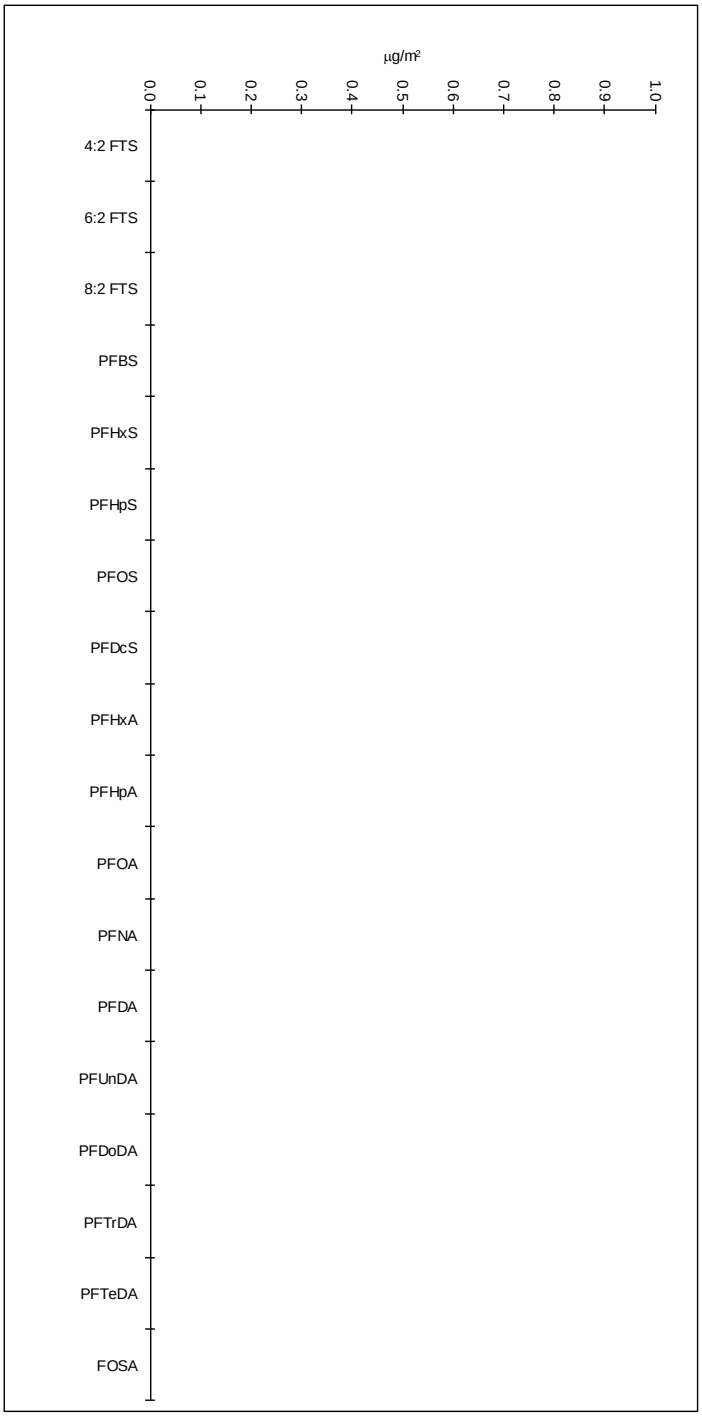
Type of sample: Telt (grønt yttertelt)
Sample amount (g): 0.53
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 2



PFASs analysis results

Appendix to report: T-281

NILU sample number: 3
Customer: Miljødirektoratet

Customers sample ID: C

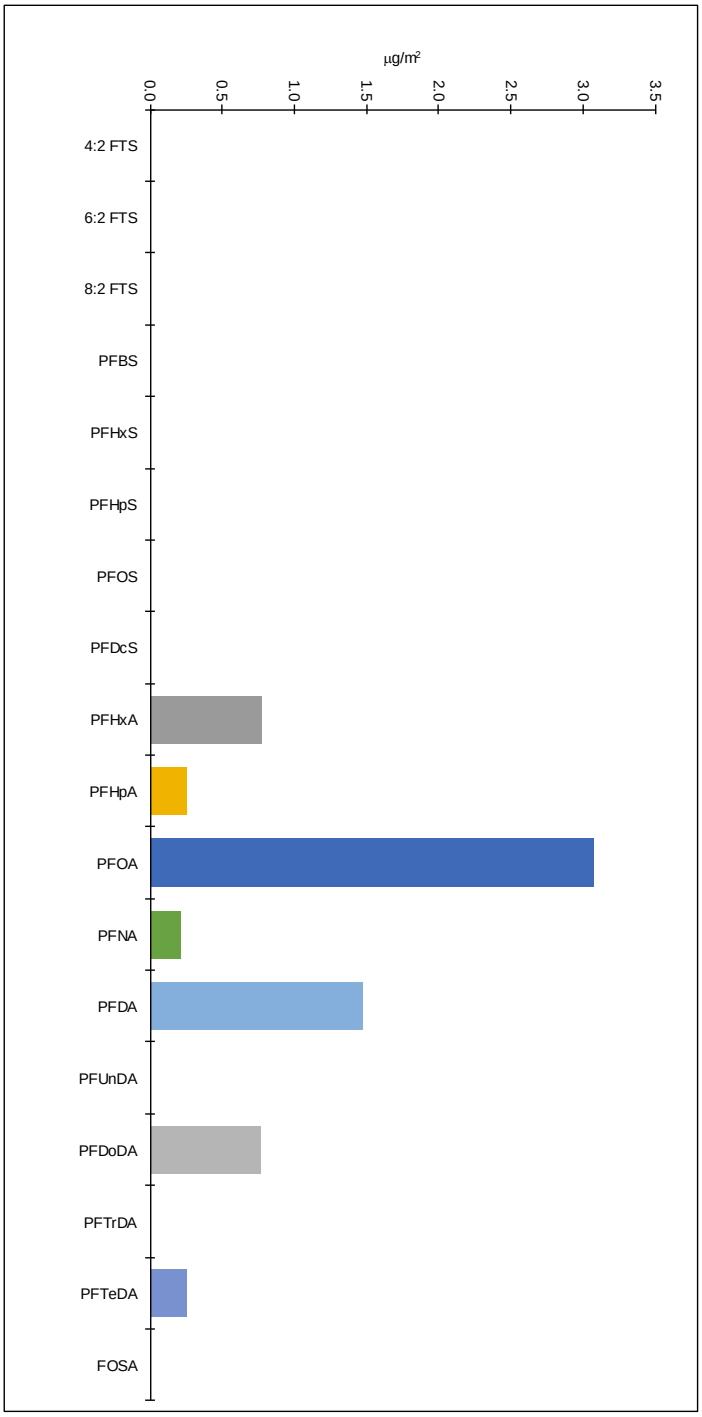
Type of sample: Telt (grå bunn)
Sample amount (g): 0.84
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**0.77**
Perfluoroheptanoate	**PFHpA**	**0.255**
Perfluorooctanoate	**PFOA**	**3.074**
Perfluorononanoate	**PFNA**	**0.21**
Perfluorodecanoate	**PFDA**	**1.468**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**0.761**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**0.252**
Sum-PFCA		***6.8***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 3



PFASs analysis results

Appendix to report: T-281

NILU sample number: 4
Customer: Miljødirektoratet

Customers sample ID: D

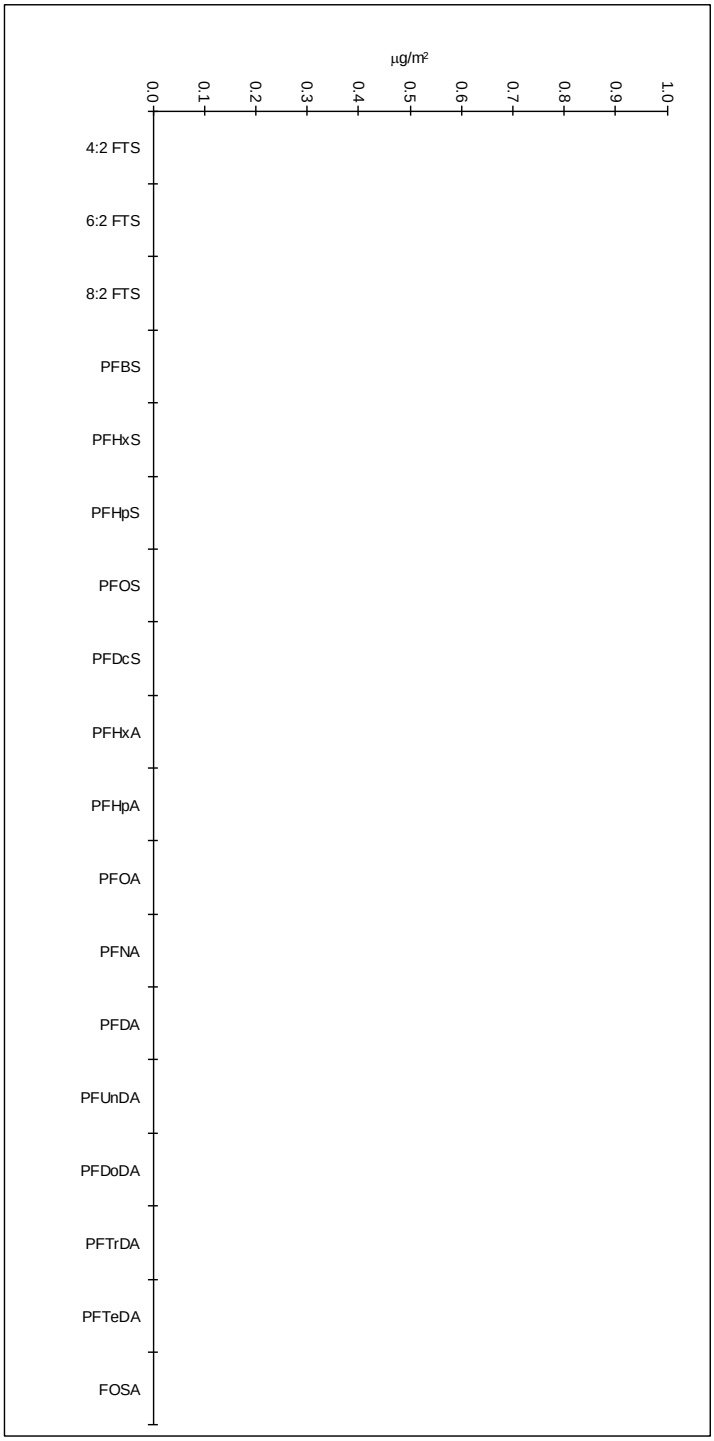
Type of sample: Vindsekk (rød duk)
Sample amount (g): 0.35
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 4



PFASs analysis results

Appendix to report: T-281

NILU sample number: 5
Customer: Miljødirektoratet

Customers sample ID: E

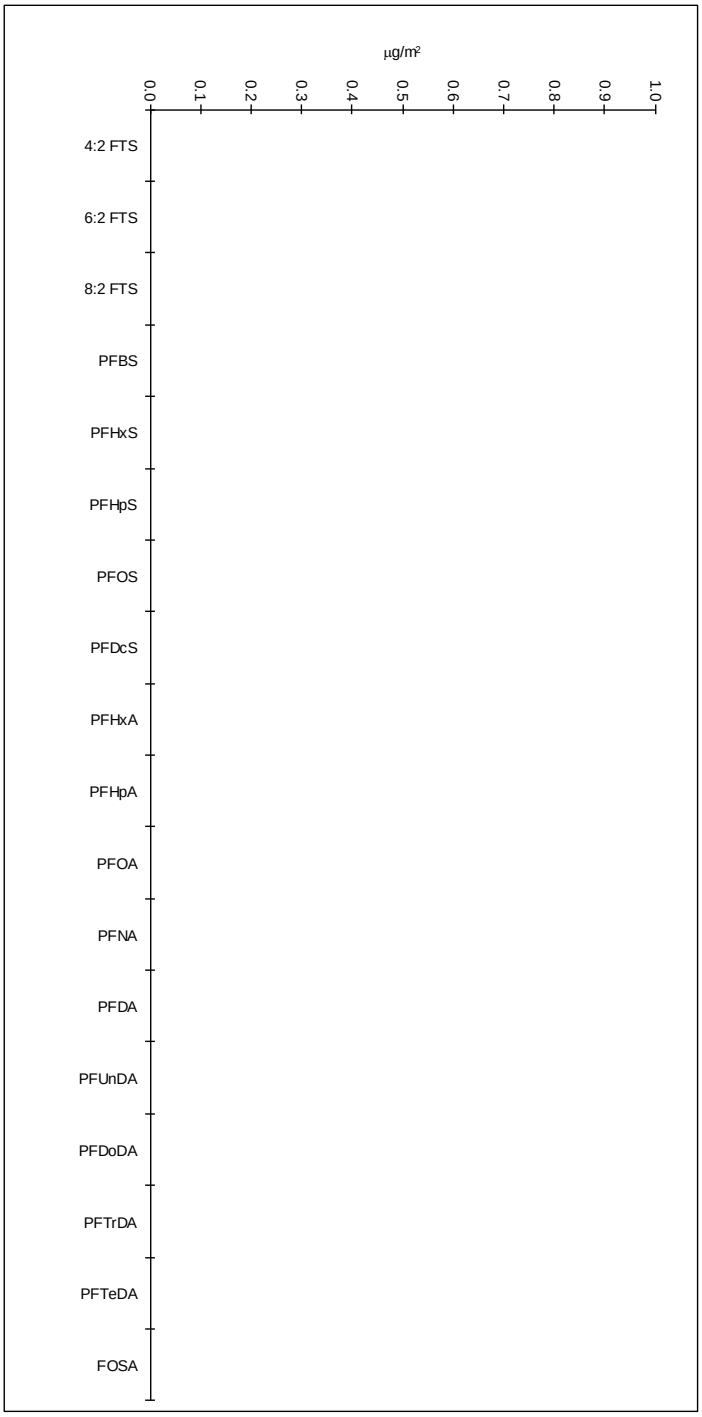
Type of sample: Vindsekk (gul duk)
Sample amount (g): 0.36
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 5



PFASs analysis results

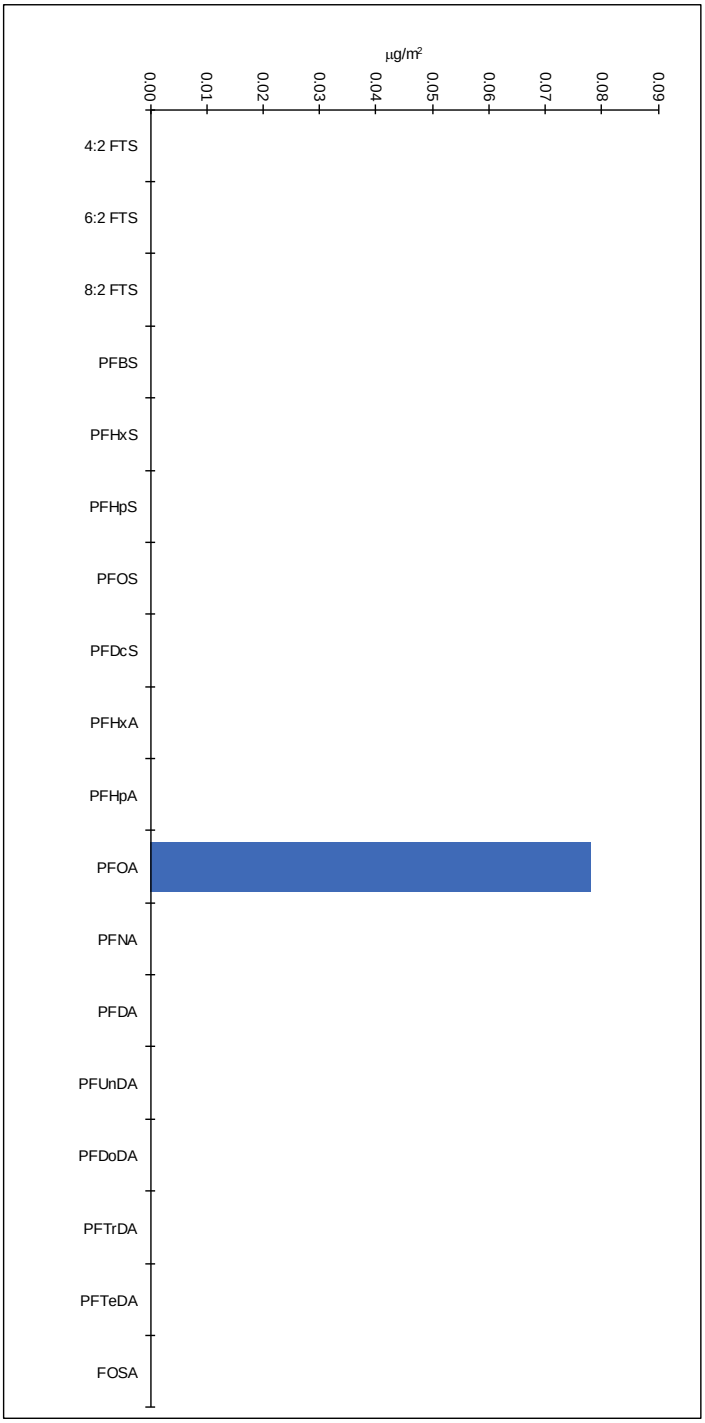
Appendix to report: T-281
NILU sample number: 6
Customer: Miljødirektoratet
Customers sample ID: F
Type of sample: Telt (blått yttertelt)
Sample amount (g): 0.77
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**0.078**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.1***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 6



PFASs analysis results

Appendix to report: T-281

NILU sample number: 7
Customer: Miljødirektoratet

Customers sample ID: G

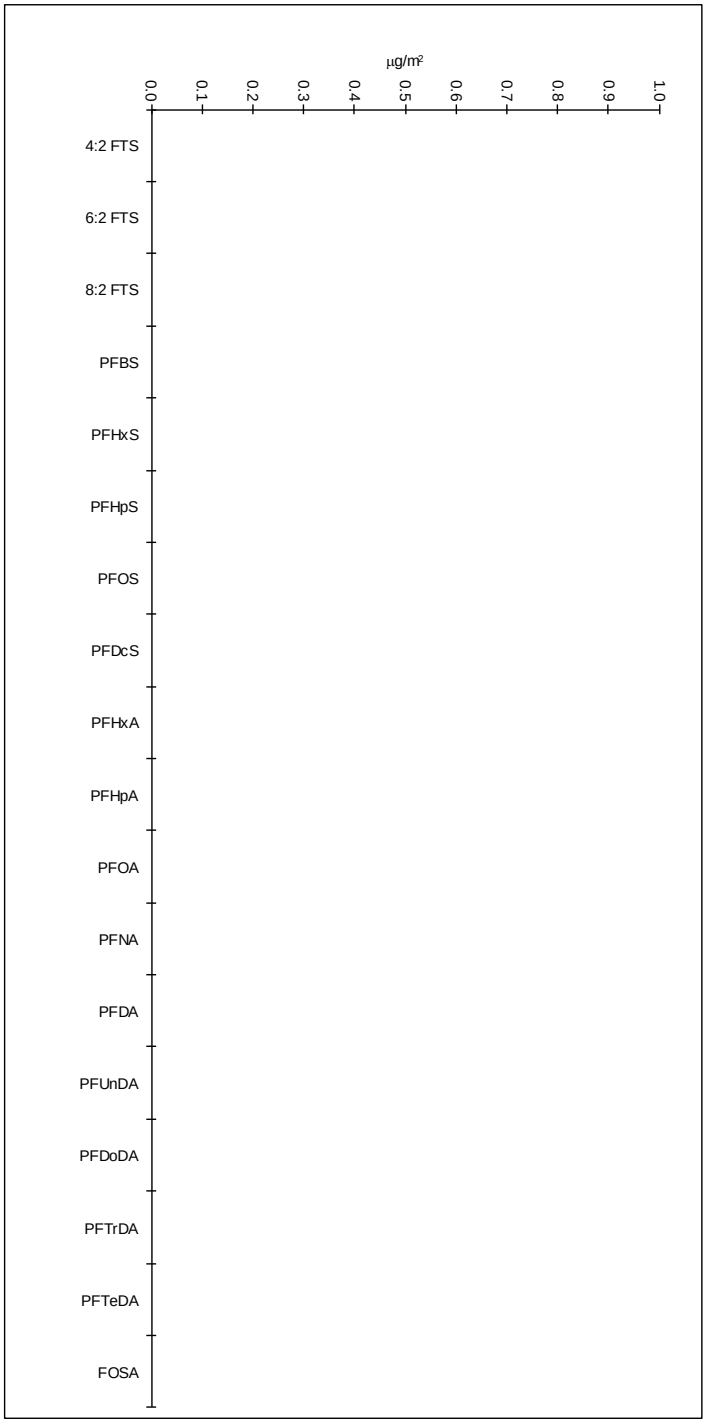
Type of sample: Telt (gult innertelt)
Sample amount (g): 0.55
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 7



PFASs analysis results

Appendix to report: T-281

NILU sample number: 8
Customer: Miljødirektoratet

Customers sample ID: H

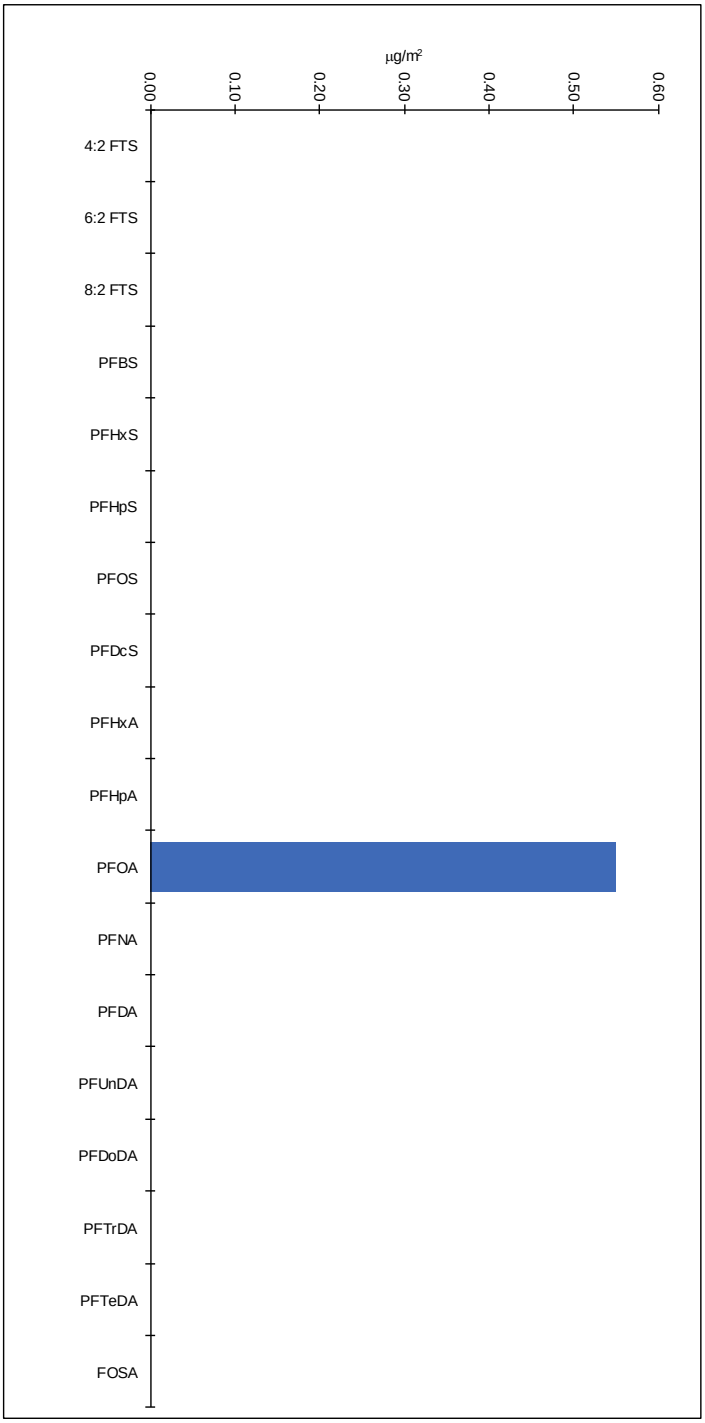
Type of sample: Lavvo (teltduk)
Sample amount (g):
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**0.551**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.6***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 8



PFASs analysis results

Appendix to report: T-281

NILU sample number: 9
Customer: Miljødirektoratet

Customers sample ID: I

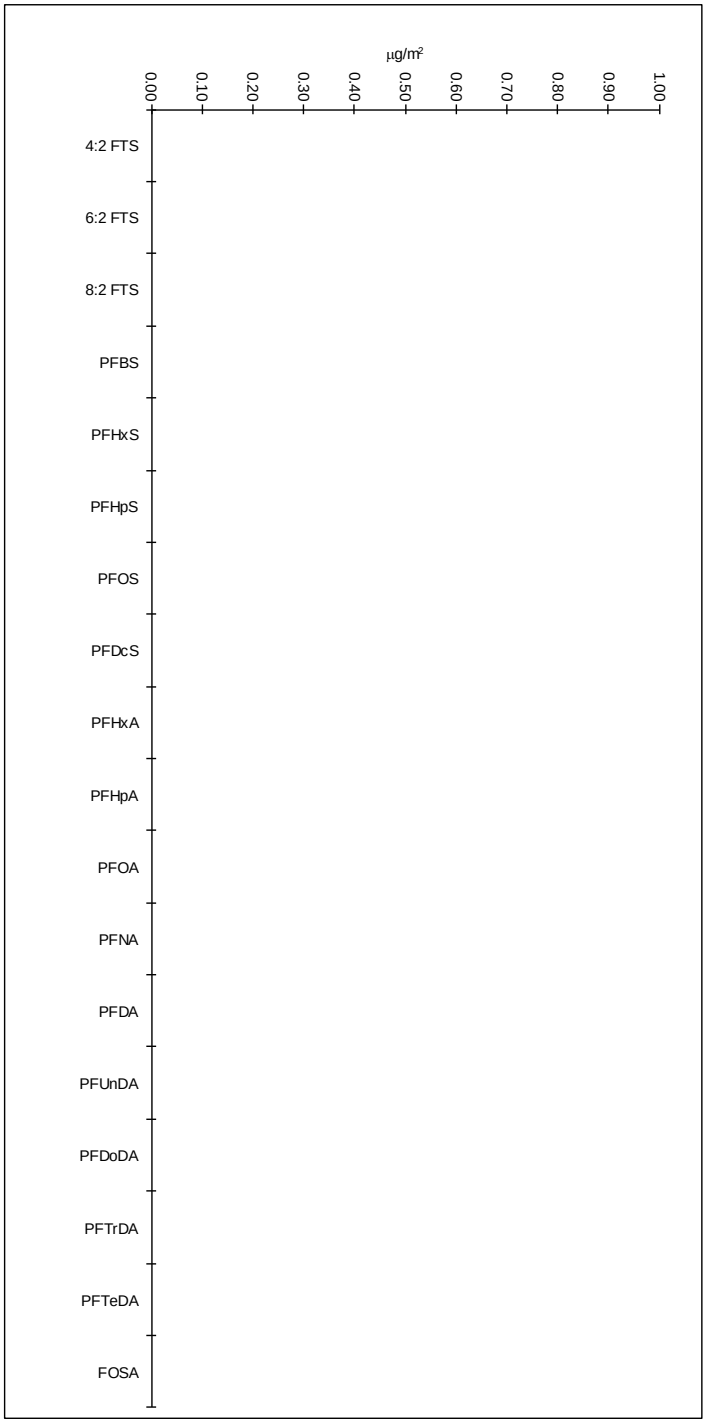
Type of sample: Gapahuk
Sample amount (g): 0.62
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 9



PFASs analysis results

Appendix to report: T-281

NILU sample number: 10
Customer: Miljødirektoratet

Customers sample ID: J

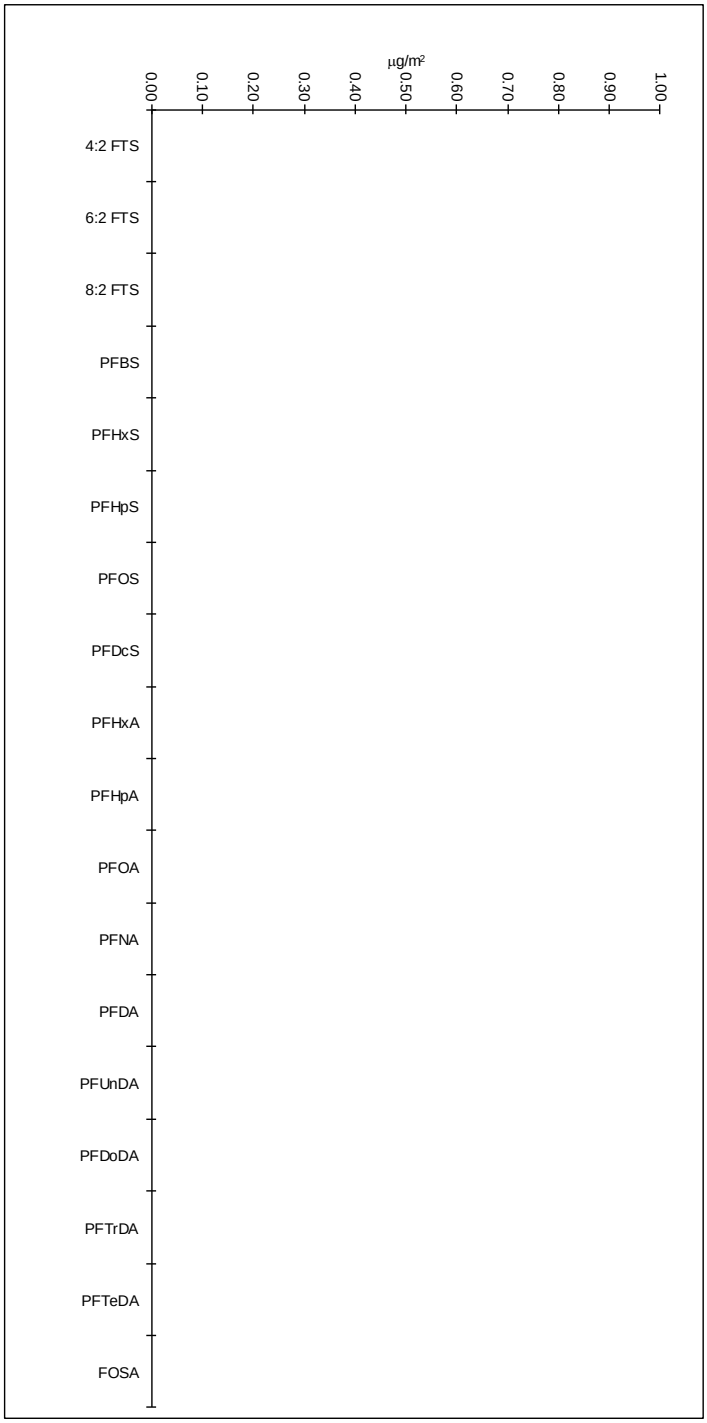
Type of sample: Badedrakt
Sample amount (g): 2.13
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 10



PFASs analysis results

Appendix to report: T-281

NILU sample number: 11
Customer: Miljødirektoratet

Customers sample ID: K

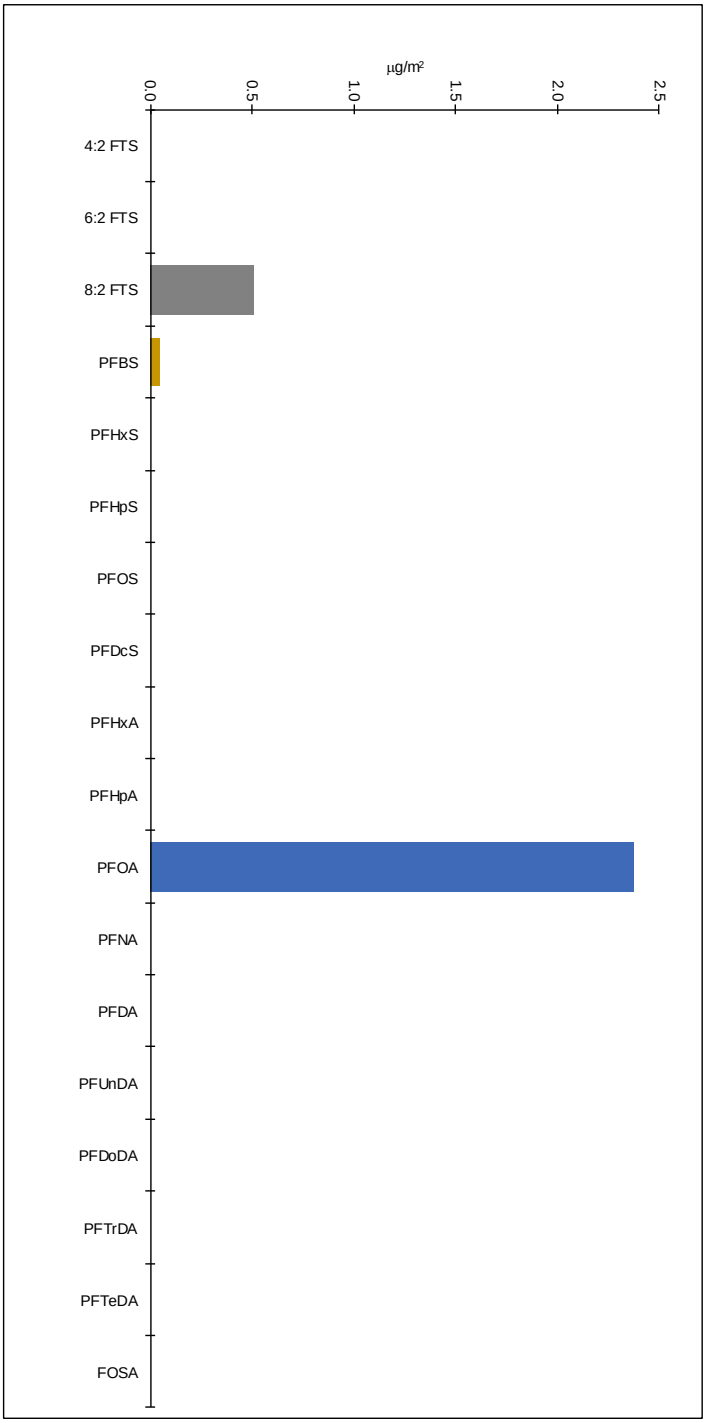
Type of sample: Badedrakt
Sample amount (g): 2.05
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**0.510**
Sum-FTS and FTCAs		***0.51***
Perfluorobutane sulfonate	**PFBS**	**0.05**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.05***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**2.378**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***2.4***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 11



PFASs analysis results

Appendix to report: T-281

NILU sample number: 12
Customer: Miljødirektoratet

Customers sample ID: L

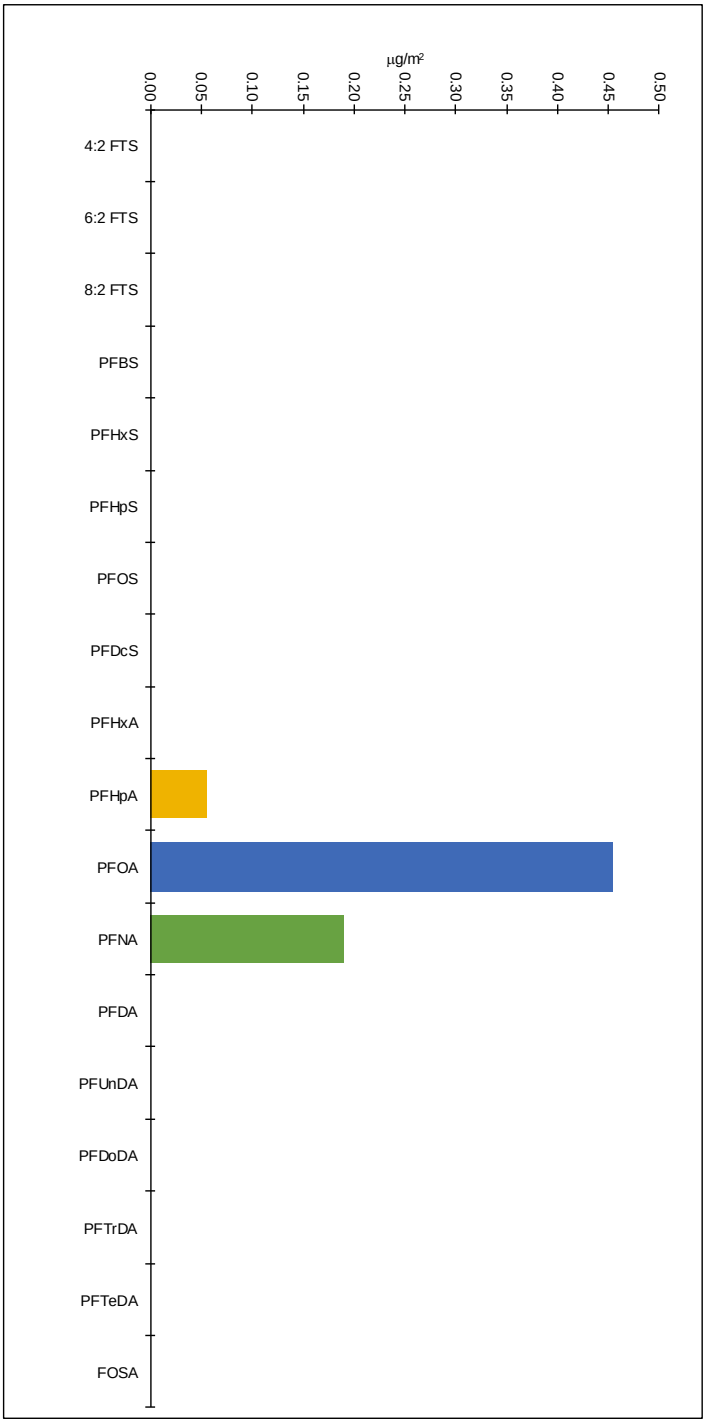
Type of sample: Badedrakt
Sample amount (g): 2.04
Measuring unit: μg/m^2

Compound		Concentration
Full name	Abbreviation	μg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**0.055**
Perfluorooctanoate	**PFOA**	**0.455**
Perfluorononanoate	**PFNA**	**0.190**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.7***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 12



PFASs analysis results

Appendix to report: T-281

NILU sample number: 13
Customer: Miljødirektoratet

Customers sample ID: M

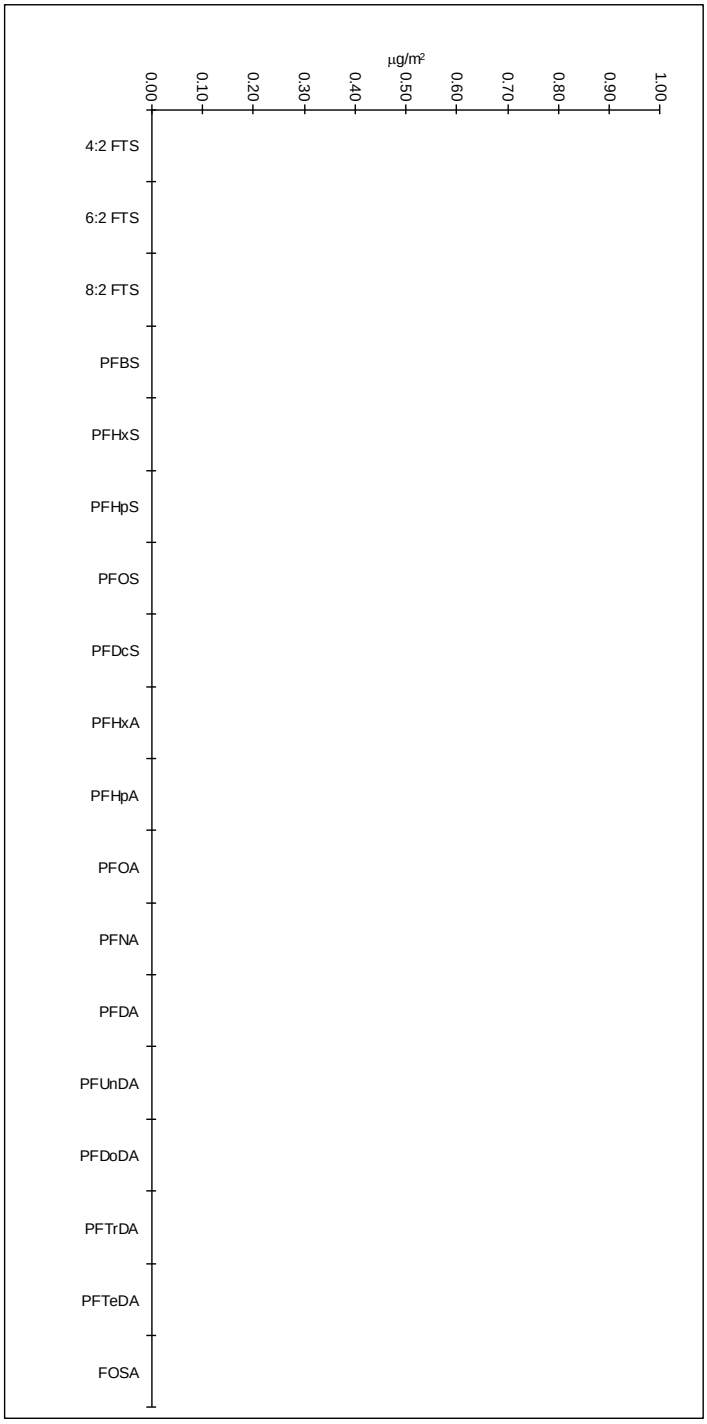
Type of sample: Badedrakt
Sample amount (g): 1.94
Measuring unit: $\mu g/m^2$

Compound		Concentration
Full name	Abbreviation	$\mu g/m^2$
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 13



PFASs analysis results

Appendix to report: T-281

NILU sample number: 14
Customer: Miljødirektoratet

Customers sample ID: N

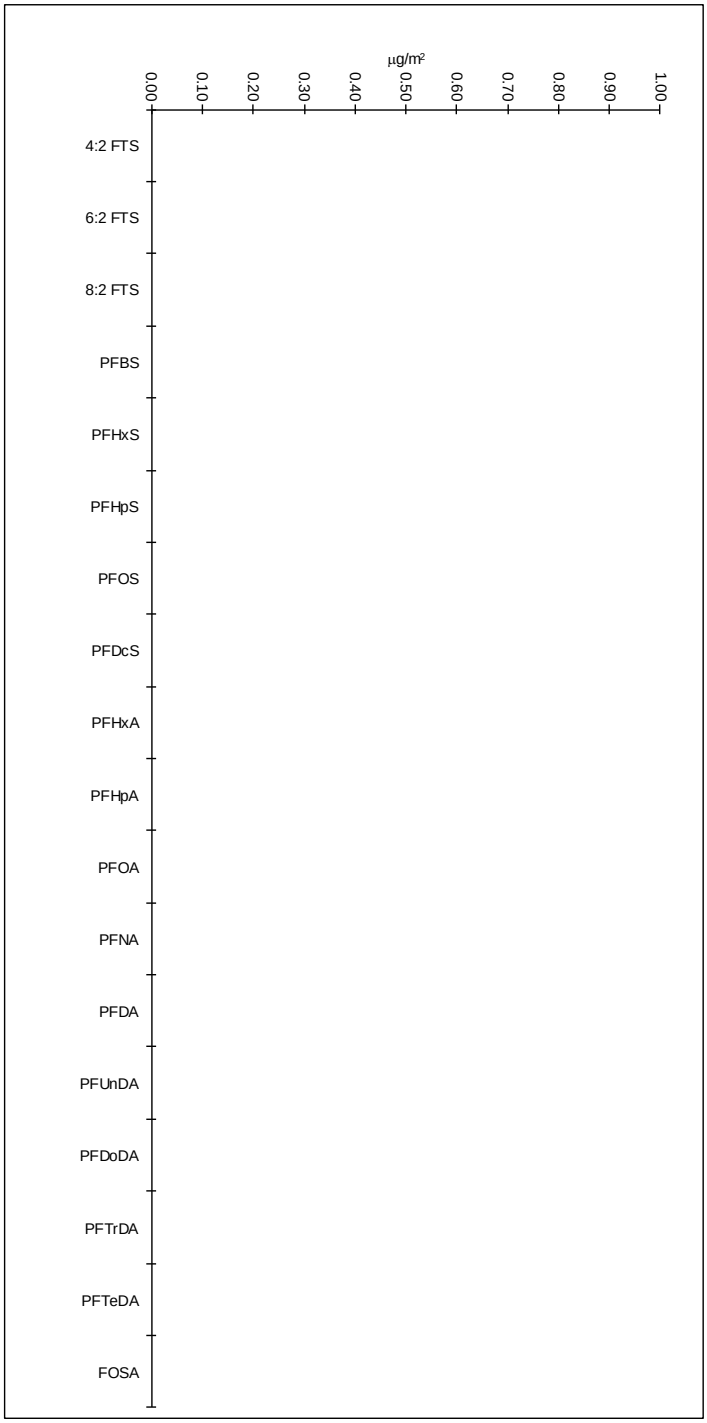
Type of sample: Gapahuk
Sample amount (g): 0.64
Measuring unit: $\mu g/m^2$

Compound		Concentration
Full name	Abbreviation	$\mu g/m^2$
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 14



PFASs analysis results

Appendix to report: T-281

NILU sample number: 15
Customer: Miljødirektoratet

Customers sample ID: O

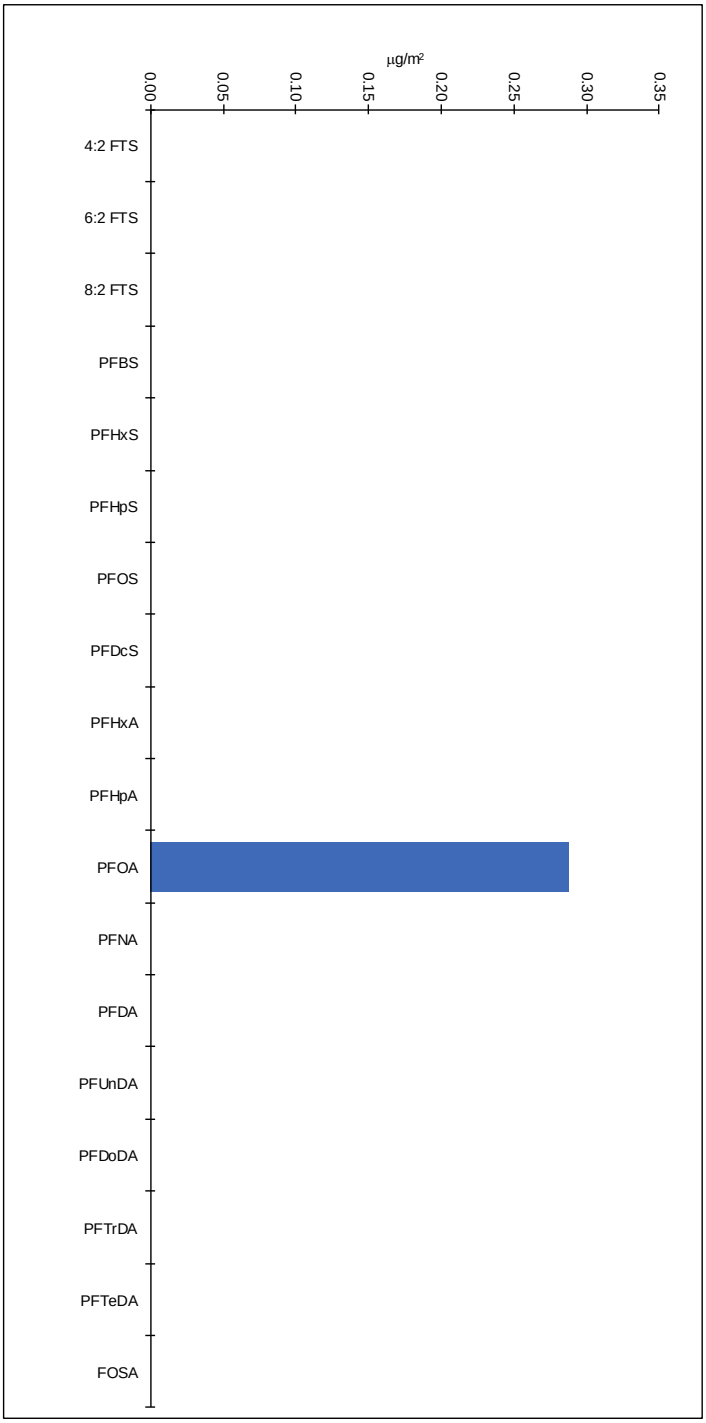
Type of sample: Vindsekk
Sample amount (g): 0.80
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**0.288**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.3***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 15



PFASs analysis results

Appendix to report: T-281

NILU sample number: 16
Customer: Miljødirektoratet

Customers sample ID: P

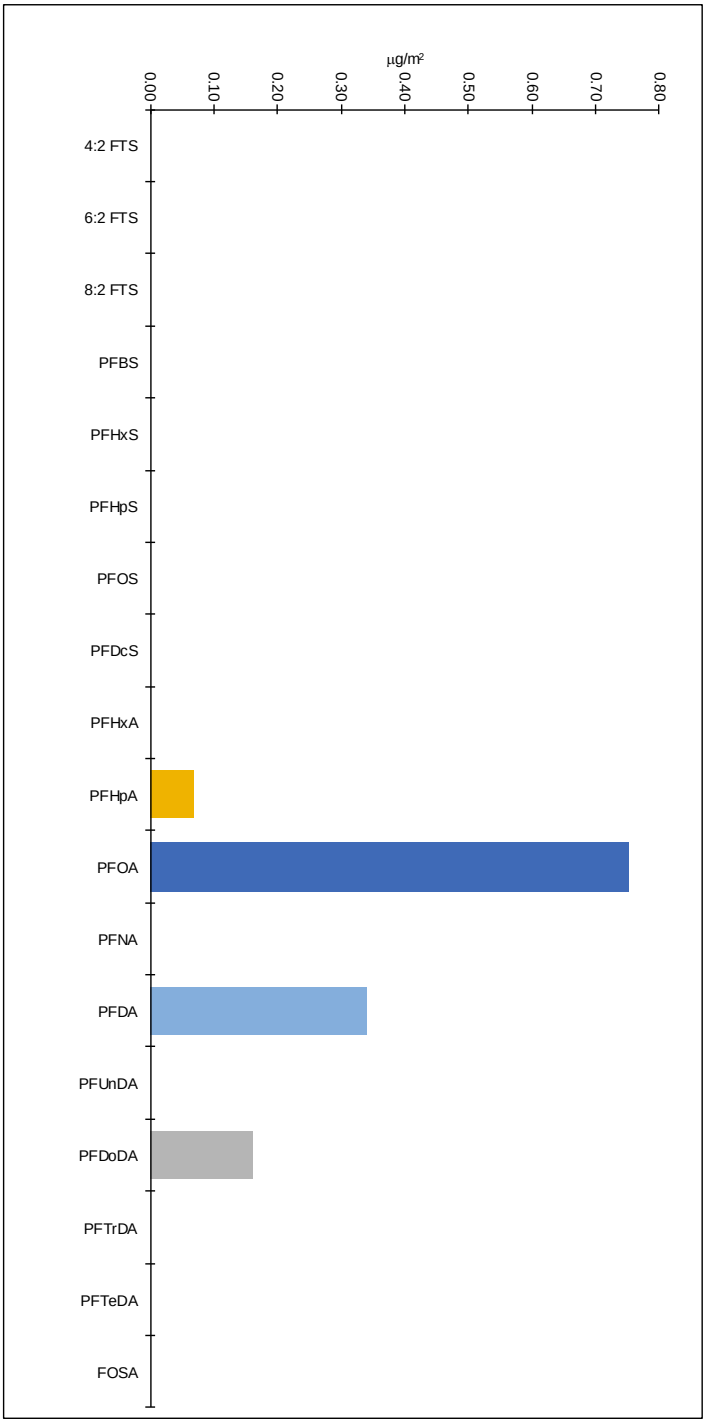
Type of sample: Telt (bunn)
Sample amount (g): 0.97
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**0.067**
Perfluorooctanoate	**PFOA**	**0.751**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**0.339**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**0.161**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***1.3***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 16



PFASs analysis results

Appendix to report: T-281

NILU sample number: 17
Customer: Miljødirektoratet

Customers sample ID: Q

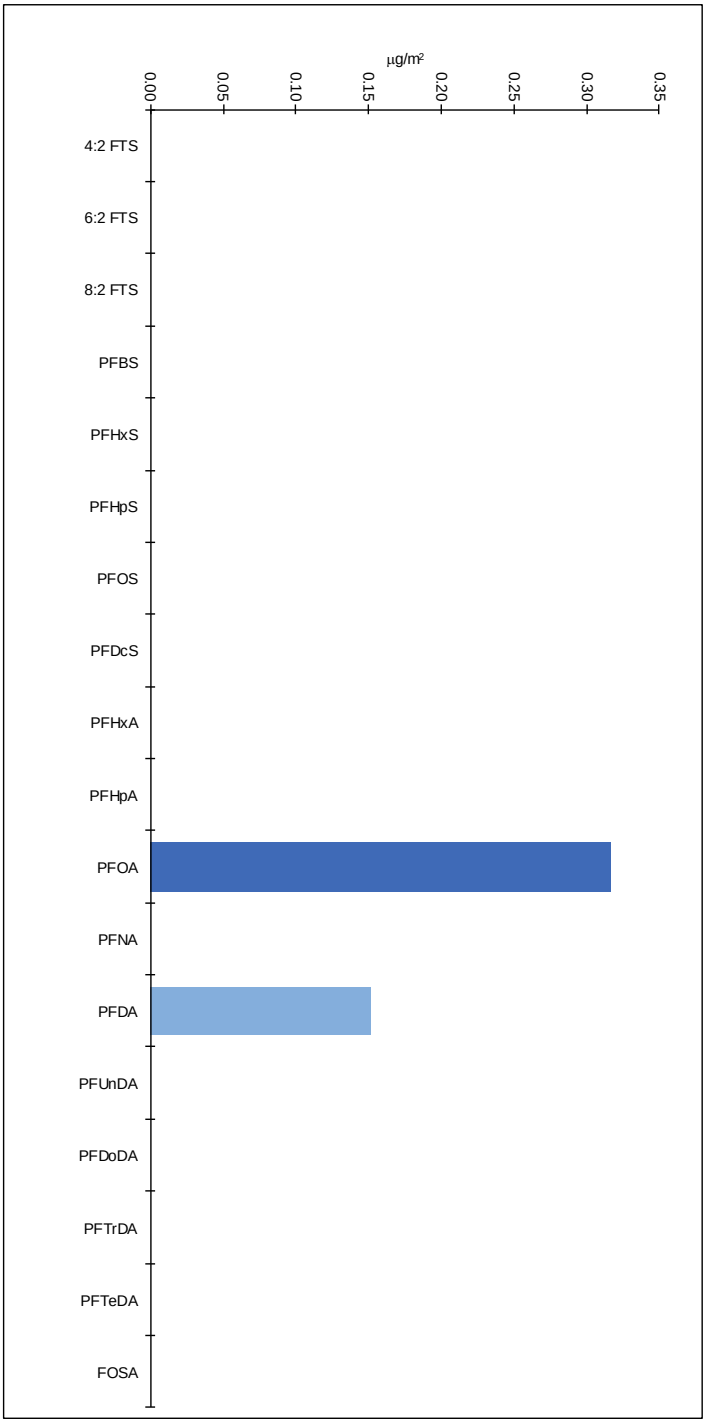
Type of sample: Telt
Sample amount (g): 0.79
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**0.316**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**0.151**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.5***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 17



PFASs analysis results

Appendix to report: T-281

NILU sample number: 18
Customer: Miljødirektoratet

Customers sample ID: R

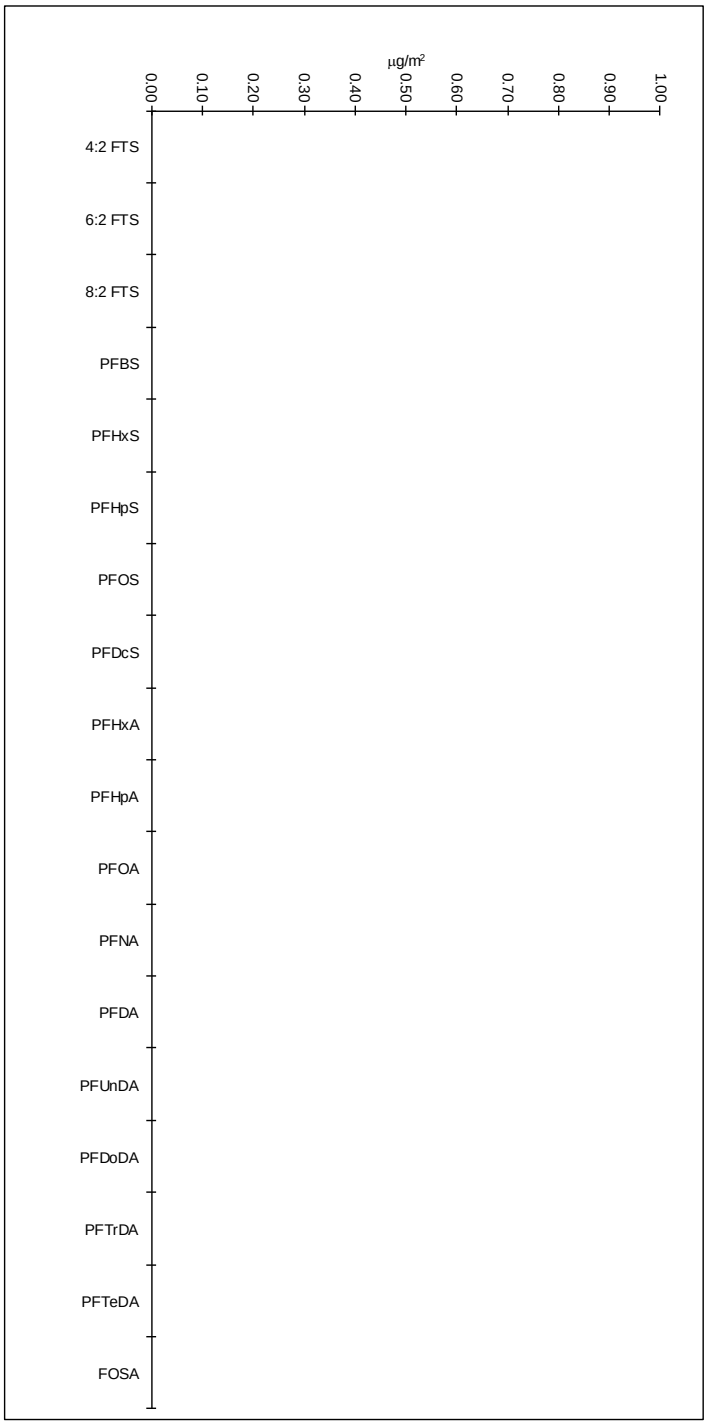
Type of sample: Hengekøye (tak)
Sample amount (g): 0.71
Measuring unit: µg/m^2

Compound		Concentration
Full name	Abbreviation	µg/m^2
4:2 Fluorotelomer sulfonic acid	**4:2 FTS**	**<0.03**
6:2 Fluorotelomer sulfonic acid	**6:2 FTS**	**<0.03**
8:2 Fluorotelomer sulfonic acid	**8:2 FTS**	**<0.15**
Sum-FTS and FTCAs		***0.00***
Perfluorobutane sulfonate	**PFBS**	**<0.03**
Perfluorohexane sulfonate	**PFHxS**	**<0.15**
Perfluoroheptane sulfonate	**PFHpS**	**<0.15**
Perfluorooctane sulfonate	**PFOS**	**<0.15**
Perfluorodecane sulfonate	**PFDcS**	**<0.30**
Sum-PFSA		***0.00***
Perfluorohexanoate	**PFHxA**	**<0.60**
Perfluoroheptanoate	**PFHpA**	**<0.06**
Perfluorooctanoate	**PFOA**	**<0.06**
Perfluorononanoate	**PFNA**	**<0.15**
Perfluorodecanoate	**PFDA**	**<0.15**
Perfluoroundecanoate	**PFUnDA**	**<0.15**
Perfluorododecanoate	**PFDoDA**	**<0.09**
Perfluorotridecanoate	**PFTrDA**	**<0.05**
Perfluorotetradecanoate	**PFTeDA**	**<0.09**
Sum-PFCA		***0.0***
Perfluorooctane sulfonamide	**FOSA**	**<0.15**

<: Lower than indicated method detection limit (signal:noise 3:1)

PFAS analysis results

Appendix to report: T-281
NILU sample number: 18



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REPORT SERIES Oppdragsrapport	REPORT NO. OR 4/2015	ISBN: 978-82-425-2750-9 (print) 978-82-425-2797-4 (electronic)	
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TITLE Investigation of outdoor textiles and gear with respect to determine the content of ionic perfluorinated substances (PFAS) Evaluation of results		PROJECT LEADER Linda Hanssen NILU PROJECT NO. O-114087	
AUTHOR(S) Linda Hanssen, Dorte Herzke		CLASSIFICATION * A CONTRACT REF.	
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REPORT PREPARED FOR Norwegian Environment Agency			

ABSTRACT.
NILU has on behalf of the Norwegian Environment Agency determined the concentration of ionic perfluorinated substances (PFASs), including PFOA, in outdoor gear.

Of the investigated 18 items, no PFAS could be detected at all in nine of them. Two samples contained PFOA exceeding the limit of 1 µg/m². The quality assurance where three replicates of one sample were extracted had a relative standard deviation (RSD) less than 10% for all detected substances except one (PFTrDA). Other quality measures such as recovery calculations and blanks shows that the method used for extraction is suitable for these types of matrices and substances. PFOS was not present in the items investigated, indicating that the textile industry manages to effectively avoid PFOS in their production processes.

NORWEGIAN TITLE

Undersøkelse av innholdet av ioniske perfluorerte forbindelser i utstyr til utendørsbruk. Evaluering av resultater

KEYWORDS		
PFOA	Outdoor gear	Quality Assurance

ABSTRACT (in Norwegian)

** Classification*
- *A Unclassified (can be ordered from NILU)*
- *B Restricted distribution*
- *C Classified (not to be distributed)*

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