Leaving Traces

The hidden hazardous chemicals in outdoor gear

Greenpeace product test 2016

GREENPEACE

www.greenpeace.de

S 0181 1

Imprint **Published January 2016** by Greenpeace e.V., Hongkongstraße 10, 20457 Hamburg, mail@greenpeace.de, www.greenpeace.de **Editor** Simone Miller
Authors Manfred Santen, Kevin Brigden, Madeleine Cobbing **Acknowledgements** Annekatrin Dreyer, Simon Gergely **Production** Birgit Matyssek **Print** Reset, Virchowstraße 8, 22767 Hamburg **Number of Copies** 1000 **Design** spiegel grafik_raum_konzept, Hamburg + Klasse 3b, Hamburg **Photos** Fred Dott, all ©Greenpeace, 100 % Recycled Paper

01/2016

Leaving Traces

Executive Summary

Content

1. Introduction

In this latest investigation Greenpeace tested a range of outdoor gear for hazardous per- and polyfluorinated chemicals (PFCs). The study reveals that not only outdoor clothing and footwear but also camping and hiking equipment such as backpacks, tents and sleeping bags contain chemicals that are hazardous to the environment and to human health. This follows an analysis conducted on items produced and sold by various outdoor brands, selected for testing by outdoor enthusiasts and Greenpeace supporters. This is the first time a Greenpeace product testing investigation has been designed with the participation of the public.

Out of the 40 products that were tested, only four were found to be free from the per- and polyfluorinated chemicals that were investigated, to the detection levels used. Greenpeace tested 11 jackets and 8 trousers, 7 pairs of shoes/footwear, 8 backpacks, 2 tents, 2 sleeping bags and 1 rope and 1 pair of gloves. PFCs were detected in all product categories, apart from gloves. Analysis was done on different parts of some samples and duplicates of some samples were also analysed. The results reported in this Summary are from one data set and are exemplary for each product; full details can be found in the Technical Report **http://www.greenpeace.org/international/en/publications/Campaign-reports/Toxics-reports/** [1]

Eleven product samples contained the very persistent ionic long chain PFC PFOA at levels above the 1µg/m² regulatory limit for products sold in Norway, with the highest concentrations by square metre found in shoes from Haglöfs and by weight in a sleeping bag by The North Face. PFOA is classified as substance of very high concern (SVHC) and is currently proposed for restriction under the EU's REACH regulation. [2]

Other persistent ionic PFCs such as short chained PFBS and PFHxA were detected in even higher concentrations, for example in jackets by Norrona and Patagonia but also in trousers and footwear.

Overall, the concentrations were dominated by volatile PFCs. Some of these compounds can break down to the corresponding acid. For example the long chain volatile PFC 8:2 FTOH, found at particularly high levels in footwear by Haglöfs. Jack Wolfskin and Mammut, can break down to PFOA.

The study shows that chemicals that are known to be hazardous, among them substances of very high concern such as PFOA and other long chain ionic PFCs, are still being widely used for products sold by outdoor brands. At the same time the tests show a shift in the type of PFCs being used towards short chain PFCs – chemicals that are also persistent but less well researched in some aspects. The investigation also shows that volatile PFCs such as long and short chain FTOHs (fluoro telomer alcohols) are used in high concentrations, leading to considerably higher extractable concentrations in many final products.

PFCs are used in many industrial processes and consumer products, and are well known for their use by the outdoor apparel industry in waterproof and dirt-repellent finishes. They are used for their unique chemical properties, especially their stability and their ability to repel both water and oil.

However, PFCs are environmentally hazardous substances and many of them are persistent in the environment. [3] Once released into the environment most PFCs break down very slowly; they can remain in the environment for many years after their release and are dispersed over the entire globe. [4]

[1] **Brigden K., Santillo D., Santen M.** Per- and poly-fluorinated chemicals in branded waterproof clothing, footwear, hiking and camping equipment. Greenpeace Research Laboratories Technical Report 01-2016, January 2016 **http://www.greenpeace.org/international/en/publications/Campaign-reports/Toxics-reports/**

[2] ECHA, Germany and Norway propose a restriction on Perfluorooctanoic acid (PFOA), its salts and PFOA -related substances; the proposal is for a restriction on the manufacturing, use and placing on the market of Perfluorooctanoic acid (PFOA) and its salts, including substances that may degrade to PFOA (PFOA-related substances), in concentrations equal to or greater than 2 ppb. **http://echa.europa.eu/documents/10162/3b6926a2-64cb-4849-b9be-c226b56ae7fe**

[3] **OECD (2013)** Synthesis Paper On Per- and Polyfluorinated Chemicals (PFCs). **http://www.oecd.org/env/ehs/risk-management/PFC_FINAL-Web.pdf**

[4] **OECD (2013)** Op.cit.

[5] **Greenpeace (2015)** Footprints in the snow, Hazardous PFCs in remote locations around the globe. **http://detox-outdoor.org/assets/uploads/Report%20RAE/RAE_report_08_2015_english_final.pdf**

[6] **OECD (2013)** op.cit.

[7] **Madrid Statement (2015)** **http://greensciencepolicy.org/madrid-statement/**
The Madrid Statement is based on: M. Scheringer, X. Trier, I. Cousins, P. de Voogt, T. Fletcher e, Z. Wang, T. Webster: Helsingør Statement on poly- and perfluorinated alkyl substances (PFASs), Chemosphere, Volume 114, November 2014, Pages 337–339. **http://www.sciencedirect.com/science/article/pii/S004565351400678X**

[8] **Greenpeace e.V. (2012)** Chemistry for any weather, Greenpeace tests outdoor clothes for perfluorianted toxins, October 2012. **http://www.greenpeace.org/romania/Global/romania/detox/Chemistry%20for%20any%20weather.pdf**

[9] **Greenpeace e.V. (2014)** A red card for sportswear brands, Greenpeace tests shoes in the prerun of World Champion Ship, May 2014. **http://www.greenpeace.org/international/Global/international/publications/toxics/2014/Detox-Football-Report.pdf**

[10] **Greenpeace e.V. (2013)** Chemistry for any weather, Part II, Executive Summary, December 2013. **http://www.greenpeace.org/russia/Global/russia/report/toxics/ExecSummary_Greenpeace%20Outdoor%20Report%202013_1.pdf**

[11] **Madrid Statement (2015)** op.cit.

PFCs – leaving their mark

A recent Greenpeace Germany report showed that these pollutants are found in secluded mountain lakes and snow from remote locations. [5] Studies show that PFCs can accumulate in living organisms such as the livers of polar bears in the Arctic and are also detected in human blood. [6] Animal studies provide evidence that some PFCs cause harm to reproduction, promote the growth of tumours and affect the hormone system. [7] In reports from 2012, 2013 and 2014, Greenpeace found that PFCs are routinely present in outdoor clothing [8] and shoes [9] and showed that volatile PFCs can evaporate from these products into the air. [10]

The demand for the outdoor industry to drastically reduce its use of PFCs resulting in their elimination is supported by many scientists. More than 200 scientists from 38 countries signed the 'Madrid statement', [11] which recommends avoiding the use of all PFCs (both long and short chain) for the production of consumer products, including textiles, in line with the precautionary principle.

In this new study Greenpeace revisited the status of jackets, shoes and trousers but also investigated other outdoor gear such as gloves, tents, sleeping bags and backpacks. Even a climbing rope was tested.

Greenpeace asked supporters, especially from the outdoor community, to decide which products from outdoor brands should be tested to find out if their favourite brand uses PFCs. Greenpeace pre-selected a wide range of products from the most important outdoor brands that are likely to contain PFCs according to our research and criteria, in particular those that use Durable Water Repellent (DWR) treatment and/or a fluorocarbon polymer membrane. We invited the outdoor community to choose either generic product categories (eg: jackets, tents, sleeping bags) or pre-selected specific products made by their favourite brands.

The results of more than 30,000 votes are published on the detox-outdoor website (http://detox-outdoor.org/). The most popular brands for products to be tested were The North Face, Columbia, Mammut, Jack Wolfskin and Patagonia. In October and November 2015 Greenpeace purchased the 40 most popular products in 19 different countries/regions and sent them to an independent lab where they were tested for PFCs in December 2015 (see table 1).

The products were purchased in Austria, Chile, China (mainland), Denmark, Finland, Germany, Hong Kong, Hungary, Italy, Korea, Norway, Russia, Slovakia, Slovenia, Sweden, Switzerland, Taiwan, Turkey and the United Kingdom.

According to the labels, 12 of the 40 products were made in China (mainland), 14 in Vietnam, 2 in Romania, 2 in Turkey, 2 in Philippines, 2 in Bangladesh, 1 in Switzerland, 1 in Columbia, 1 in Germany, for 3 items there are no information on country of manufacture. One jacket by Jack Wolfskin bought in Austria was labeled as PFC-free.

Per- and polyfluorinated chemicals (PFCs) [12]

There are different kinds of PFCs (long and short chain as well as ionic forms or volatile forms). Both ionic and volatile PFCs can be made up of **long chained** or **short chained** compounds.

Long chain PFCs refers to ionic PFCAs with carbon chain lengths C8 and higher, ionic PFSAs with carbon chain lengths C6 and higher, or volatile PFCs that have the potential to degrade to long-chain PFCAs or PFSAs, including long chain fluorotelomer compounds. Short chain PFCs refers to ionic PFCAs or PFSAs with shorter chain lengths than these, or volatile PFCs that have the potential to degrade to short chain PFCAs or PFSAs. [13]

Per- and polyfluorinated chemicals (PFCs) are used in many industrial processes and consumer products, including textile and leather products, due to their chemical properties such as their ability to repel both water and oil. A well-known example is the polymer PTFE, marketed as Teflon and widely used for "non-stick" cookware, but not for textiles.

Many PFCs, especially **ionic PFCs** such as the long chained PFOS and PFOA, are highly persistent and do not readily break down once released to the environment, which has led to their presence throughout the environment, even in remote regions. Ionic PFCs have been reported in a wide range of both aquatic and terrestrial biota, due to their ability to bioaccumulate, as well as in human blood and milk in the general population in many countries around the world. Studies show that PFCs such as PFOS and PFOA can cause adverse impacts both during development and during adulthood, in part due to their hormone disrupting properties, with impacts on the reproductive system and the immune system, as well as being potentially carcinogenic in animal tests.

Volatile PFCs such as FTOHs are generally used as precursors during manufacturing processes. However, volatile long chain FTOHs can be transformed into ionic PFCs (such as PFOA) in the body [14] or in the atmosphere [15] and can also be hazardous in their own right.

One of the ionic PFCs, PFOS, has been classified as a persistent organic pollutant (POP) under the Stockholm Convention, a global treaty that requires contracting parties to take measures to restrict the production and use of PFOS. The marketing and use of PFOS [16] within the EU has been prohibited for certain uses since 2008, with a maximum limit of 1 µg/m² set for PFOS in textiles. [17]

Norway is the first country to prohibit the sale of textiles containing the ionic long chain PFC above 1 µg/m² as from June 2014; certain PFCs have also recently been added to a list of priority chemicals, meaning that releases to the environment must be eliminated or substantially reduced by 2020. [18] Norway, and all other countries, should enforce the elimination of PFOA (and the PFC chemical group as a whole) at much lower levels, using the best current testing technology. In addition, PFOA and four other long chain PFCAs are also classified as substances of very high concern (SVHCs) within the EU under the REACH regulations. [19] There is currently a proposal for the marketing and use of PFOA to be restricted under REACH. [20] However, there are currently no limits set for any other PFCs, despite concerns about their hazardous nature and the fact that they can commonly be found at far higher concentrations in textiles.

Short chain alternatives to perfluorinated long chain C8 PFCs (such as 6:2 FTOH) can degrade into well-known perfluorinated short chain C6 compounds such as PFHxA. However PFHxA and other shorter-chained alternatives are also persistent in the environment. [21] Therefore, the increased global production and use of these chemicals and their potential precursors that is currently taking place, may lead to increasing widespread environmental and human exposure that will last for the foreseeable future. If additional risks associated with short-chain PFCs are discovered, the global environmental levels of these short-chain PFCs would remain in the environment for decades. Due in part to their persistence in the environment, short-chained PFCs are not a safe alternative. [22]

A recent Greenpeace report found traces of PFCs in snow samples from eight remote mountainous areas; they were present in the snow that fell in the winter of 2014/2015, as well as in water from mountain lakes where these substances have accumulated over several years, in all but one of the areas visited. Amongst the PFCs detected, samples from all sites contained short chain PFCs – used by many outdoor brands instead of long chain PFCs, though they are still hazardous.

[12] For more information on PFC see Chemistry for Any Weather, Greenpeace e.V. (2012) and Greenpeace e.V. (2013), op.cit.

[13]

	Short chain	Long chain
ionic		
PFCAs	C4 PFBA C5 PFPeA C6 PFHxA C7 PFHpA	C8 PFOA C9 PFNA C10 PFDA C11 PFUnA C12 PFDoA C13 PFTrA C14 PFTeA*
PFSAs	C4 – PFBS*	C6 PFHxS C7 PFHpS C8 PFOS C10 PFDS*
others	HPFHpA 6:2 FTS	PF-3,7-DMOA H2PFDA
volatile		
FTOHs	4:2 FTOH 6:2 FTOH*	8:2 FTOH 10:2 FTOH*
FTAs	6:2 FTA*	8:2 FTA 10:2 FTA*

*and others that are not included in this report

[14] **Frömel, T., & Knepper, T. P. (2010)** Biodegradation of fluorinated alkyl substances. Reviews of Environmental Contamination and Toxicology 208: 161–177 and Butt, C.M., Muir, D.C., Mabury, S.A. (2013) Biotransformation pathways of fluorotelomer-based polyfluoroalkyl substances:
A review. Environmental Toxicology & Chemistry, doi: 10.1002/etc.2407. [Epub ahead of print]

[15] **Young, C.J. & Mabury, S.A. (2010)** Atmospheric perfluorinated acid precursors: chemistry, occurrence, and impacts. Reviews of Environmental Contamination and Toxicology (208): 1–109

[16] Although a wide range of uses are currently exempted. UNEP (2009), Adoption of amendments to Annexes A, B and C of the Stockholm Convention on Persistent Organic Pollutants under the United Nations Environment Programme (UNEP). **http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/**

[17] **EU (2006)** 2006/122/EC of the European Parliament and of the Council of 12 December 2006 amending for the 30th time Council Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the member states relating to restrictions on the marketing and use of certain dangerous substances and preparations (perfluorooctane sulfonates). Official Journal L 372/32, 27.12.2006

[18] **NEA (2013)** Flere stoffer på verstinglista (additional substances added to the priority list), Norwegian Environment agency (NEA). **http://www.miljodirektoratet.no/no/Nyheter/Nyheter/2013/November-2013/Flere-stoffer-pa-verstinglista/**

[19] **ECHA (2013)** Candidate List of Substances of Very High Concern for authorization. European Chemicals Agency. **http://echa.europa.eu/candidate-list-table**

[20] **ECHA (2014)** op.cit.

[21] **Wang, Z., Ian T. Cousins, I.T., Scheringer, A. (2013)** Fluorinated alternatives to long-chain perfluoroalkyl carboxylic acids (PFCAs), perfluoroalkane sulfonic acids (PFSAs) and their potential precursors, Environment International 60 (2013) 242–248. **http://www.greensciencepolicy.org/wp-content/uploads/2014/10/Wang-et-al.-2013.pdf**

[22] for more information see Greenpeace 2012 op.cit.

2. Key Findings

Overall findings

PFCs were found in all but four of the 40 samples, though the PFC concentrations and the composition of the PFCs present varied greatly between individual articles.

The four products that did not contain PFCs were:

- two jackets – one by Vaude (J01) and one by Jack Wolfskin (J12,) which was the only item labelled as 'PFC free';
- one backpack by Haglöfs (BP14)
- and the one sample of gloves by the North Face (G01).

These results show that it is possible to produce jackets, backpacks and gloves with all the requirements without the use of PFCs investigated in this study.

PFCs were detected in all of the shoes, trousers, tents and sleeping bags, in 9 of the 11 jackets and in 7 of the 8 backpacks.

Volatile PFCs dominated the samples by concentration in jackets, trousers, footwear and sleeping bags and in a rope.

Ionic PFCs were detected in all of the footwear, sleeping bags, tents and rope samples, 9 out of the 11 jackets, 7 out of 8 trousers and 7 of the 8 tested backpacks.

Eleven product samples contained the Ionic PFC PFOA at levels above the 1µg/m² EU regulatory limit set for PFOS, which is taken as a comparative value for PFOA as it is closely related to PFOS (it has similar hazardous properties).[23] PFOA has also been restricted in Norway, at the same limit, since 2014 and currently PFOA is undergoing the restriction process according to the EU's-REACH regulation.[24], [25]

- Two **footwear** samples show the highest PFOA concentrations (by area, per square metre) found in this investigation: High concentrations of PFOA significantly above 1µg/m² were found in the shoes from Haglöfs (F02, 18.4 µg/m²) and also in shoes by Mammut (F05, 12.7 µg/m²), both products made with Gore-Tex material.
- In two **trouser** samples – the Jack Wolfskin and the Patagonia trousers – (TR04, 14.9 µg/m² and TR05, 2.47 µg/m²) the concentrations of PFOA also significantly exceed 1µg/m².
- The Mammut **backpack** (BP05) contained high concentrations of PFOA (4.24 µg/m²) and the **sleeping bag** by The North Face (SB02) also contained considerably high concentrations of PFOA at 7.10 µg/m². Because the weight of the sleeping bag fabric is very light in comparison to jackets or trousers, it makes more sense to compare results by weight. The outer fabric from The North Face sleeping bag contained the highest concentration of PFOA by weight (157,000 ng/kg) of all 40 products.

Jackets

- PFCs were detected in 9 of the 11 jackets tested
- **Volatile PFCs** dominated the samples by concentration and were found in 8 out of 11 jackets and the most commonly detected volatile PFC was 6:2 FTOH.
- The jacket by Norrona (J03) had by far the highest concentration of 6:2 FTOH, and of total volatile PFCs (630 µg/m²). 6:2 FTOH was also found in jackets from other brands, such as Mammut (J02) Patagonia (J10), Arc'teryx (J08) and Haglöfs (J07).
- The Blackyak jacket (J04) was the only sample which contained significant levels of long chain volatile PFCs like 8:2 and 10:2 FTOHs.
- **Ionic PFCs** were detected in all but 2 jackets, at lower concentrations but still significant due to the greater concern about these chemicals. The highest total ionic PFC concentrations were found in samples from the Patagonia jacket (J10 – two sections of fabric 97.4 & 684 µg/m²), the Norrona jacket (J03, 99.9 µg/m²) and the Salewa jacket (J11,

[23] The EU regulatory limit for PFOS in textiles is 1 µg/m², where its' marketing and use within the EU has been prohibited for certain uses since 2008. The EU regulatory limit for PFOS is taken as comparative value for PFOA which is closely related to PFOS (similar hazardous properties). In addition, the sale of textiles containing PFOA above 1 µg/m² was prohibited in Norway from June 2014. Three of the samples contained PFOA at concentrations above the 1 µg/m² limit in both sampling checks. Our investigations have shown that concentrations of ionic PFC can vary widely, not only between products but within different parts of the same product.

[24] The sale of textiles containing PFOA above 1 µg/m² was prohibited in Norway from June 2014.

[25] **ECHA (2014)** op.cit.

62.4 µg/m²), although the composition of ionic PFCs in these three jackets dif fered. For example in the Patagonia jacket (J10) C4 (PFBS and PFBA), C6 (PFHxA) and C7 (PFHpA) dominated, while in the Norrona jacket (J03) it was C5 (PFPeA) and C6 (PFHxA) and C7 (PFHpA). PFBS was also found in jackets from Mammut, Arc'teryx, Salewa and Blackyak.

Trousers

- PFCs were detected in all 8 trousers tested.
- **Volatile PFCs** also dominated PFCs by concentration in the trousers, with one or more volatile PFC detected in all trouser fabric samples. The highest total volatile PFCs concentrations were found in the Jack Wolfskin trousers (TR04, 540 µg/m²) followed by the Arc'teryx trousers (TR06, 270 µg/m²).
- The most commonly detected volatile PFC – 6:2 FTOH – was detected in all but one sample. The exception was the Patagonia trousers (TR05) which contained lower concentrations of the longer chained PFCs 8:2 FTOH, 10:2 FTOH, 8:2 FTA and 10:2 FTA.
- Concentrations of **ionic PFCs** were detected in all but 1 sample (Haglöfs, TR07).
- As well as the high concentrations of PFOA in two samples (the Patagonia and the Jack Wolfskin trousers – TR05 & TR04) mentioned above, three samples contained high concentrations of the C4 compound PFBS, the trousers from Mammut (TR02), Arc'teryx (TR06) and the aforementioned trousers from Jack Wolfskin.

Footwear

- PFCs were detected in all 7 shoes tested.
- In most shoe samples **Volatile PFCs** were found in higher concentration than in other product types.
- The highest total 6:2 FTOH concentrations above > 1,000 µg/m² were found in the Columbia footwear (F11) followed by shoes from Jack Wolfskin (F09), The North Face (F08), and Salewa (F04).
- High concentrations of a C8 volatile PFC 8:2 FTOH – above 1,000 µg/m² – were detected in the sample from Haglöfs (F02).
- Volatile PFCs were detected in all of the shoes/boots apart from the Patagonia sample (F10).
- Concentrations of **ionic PFCs** were detected in all footwear samples.
- Two footwear samples – Haglöfs and Mammut (F05) – show a wide range of PFCs, notably the highest PFOA-concentration by square metre (Haglöfs F02) found in this investigation, as mentioned above. The shoes by Columbia (F11) The North Face (F08) and Jack Wolfskin (F09B) contained high concentrations of PFBS.

Backpacks

- PFCs were detected in 7 out of 8 backpacks tested.
- Within the backpack samples, the highest total ionic PFC concentrations were found in backpacks from Mammut (BP05) and Patagonia (BP04). In particular the Mammut backpack contained high concentrations of long chain ionic PFCs such as PFOA (4.24 µg/m²) and PFDA (2.4 µg/m²). The Patagonia backpack contained even higher levels of PFBS (9.42 µg/m²) the highest concentration of any ionic PFC in the backpack samples.

Sleeping Bags

- PFCs were detected in both sleeping bags tested.
- **Volatile PFCs** were found in both bags. The sleeping bag by Mammut (SB01) contained high concentrations of a C6 volatile compound (6:2 FTOH at 41.0 µg/m²), whereas the bag from The North Face contained high concentration of a C8 PFC (SB02 – 8:2 FTOH 52 µg/m²).
- As well as the long chain **ionic PFC** PFOA (mentioned above), the sleeping bag from The North Face also contained PFDA at high concentrations (2.84 µg/m²) and considerably high concentrations of PFOA at 7.1 µg/m². Because the weight of the sleeping bag fabric is very light in comparison to jackets or trousers, it makes sense to also compare results by weight. The outer fabric from The North Face sleeping bag contained the highest concentrations of PFOA by weight (157,000 ng/kg) of all 40 products. It is possible that degradation of some 8:2 FTOH either during manufacture or within the product contributed to the PFOA concentration, as 8:2 FTOH can degrade to carboxylic acids such as PFOA. The sleeping bag also contained a wide range of ionic PFCs.

Tents

- PFCs were detected in both tents tested – Jack Wolfskin (TE05 – 07) and The North Face (TE01-04).
- Concentrations of volatile PFCs dominated over those of ionic PFCs, but generally at lower concentrations compared with volatile PFCs in other product categories.

Others

- **Volatile PFCs** (6:2 FTOH) were detected in the rope from Mammut (R01).

3. Sampling and Methodology

Table 1 The outdoor products that were tested

Jackets

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Arc'teryx	CPT-2015-28; J08	Alpha SL Jacket	GORE-TEX with Paclite Technology		Sweden
Blackyak	CPT-2015-11; J04/J05	U-Jade jacket # 1	YAK-TECH		Korea
Columbia	CPT-2015-25; J06	Alpine action jacket	OMNI-HEAT Thermal Reflektive, OMNI-TECH Breathable & Guaranteed Waterproof		Chile
Haglöfs	CPT-2015-27; J07	L.I.M III jacket	GORE-TEX	bluesign	Finland
Jack Wolfskin	CPT-2015-07; J12	Amply 3in1	Texapore, Nanuk 200	Fair Wear Foundation, PFC free	Austria
Mammut	CPT-2015-04; J02	Nordwand Pro HS Hooded Jacket	GORE-TEX		Switzerland
Norrona	CPT-2015-09; J03	Lofoten Gore-tex pro jacket	GORE-TEX		Norway
Patagonia	CPT-2015-30; J10	PATAGONIA MEN'S SUPER ALPINE JACKET	GORE-TEX		Taiwan
Salewa	CPT-2015-40; J11	Ultar GTX ACT M	GORE-TEX		Italy
The North Face	CPT-2015-29; J09	Women Stratos Jacket			Sweden
Vaude	CPT-2015-02; J01	Fjordan jacket men	Ceplex Advanced	Green Shape Guaranteed, Vaude Eco Product	Germany

Trousers

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Arc'teryx	CPT-2015-31; TR06	Beta AR Pant Men's	GORE-TEX		Taiwan
Columbia	CPT-2015-17; TR03	Jump Off Cargo Pants Men	OMNI-HEAT Thermal Reflektive, OMNI-TECH Breathable & Guaranteed Waterproof		Russia
Haglöfs	CPT-2015-36; TR07	Rugged II Mountain Pant		bluesign	Denmark
Jack Wolfskin	CPT-2015-18; TR04	Cloudburst Pants Women	Texapore	Fair Wear Foundation	Russia
Mammut	CPT-2015-15; TR02	Nordwand Pro Pants Man	GORE-TEX, Coolmax system		Slovenia
Patagonia	CPT-2015-23; TR05	M's TORRENTSHELL PANTS	H2NO waterproof, breathable, durable		Hong Kong
Salewa	CPT-2015-38; TR08	Kali GTX M PNT	GORE-TEX		Italy
The North Face	CPT-2015-14; TR01	Ravina Pants	HYVENT		United Kingdom

Shoes

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Columbia	CPT-2015-34; F11	WOMEN'S REDMOND™ LOW WATERPROOF	OMNI-TECH Breathable and Guaranteed Waterproof		Turkey
Haglöfs	CPT-2015-10; F01, F02, F03	Haglofs Grym HI GT men	GORE-TEX		Norway
Jack Wolfskin	CPT-2015-35; F09	ALL TERRAIN TEXAPORE MEN	Textapore, Vibram		Turkey
Mammut	CPT-2015-20; F05	Redburn Mid GTX Men	GORE-TEX		Slovakia
Patagonia	CPT-2015-39; F10	Foot Tractor Wading Boots	Clarino® Synthetic leather with Venergy Monofil mesh insert		Patagonia Online Shop
Salewa	CPT-2015-16; F04	Condor Evo GTX	GORE-TEX		Slovenia
The North Face	CPT-2015-24; F06, F07, F08	Men's HEDGEHOG HIKE MID GTX	GORE-TEX		Hong Kong

Backpack

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Arc'teryx	CPT-2015-22; BP09, BP10	Alpha FL 30 Backpack	AC2 Technology		Mainland China
Columbia	CPT-2015-33; BP12, BP13	Silver Ridge 25L	OMNI SHIELD Advanced Repellency		Columbia Online Store
Haglöfs	CPT-2015-37; BP14	Roc Rescue 40	Interact Suspension System	bluesign®, DWR PFOA FREE	Denmark
Jack Wolfskin	CPT-2015-03; BP01, BP02	EDS DYNAMIC 48 PACK		Fair Wear Foundation	Germany
Mammut	CPT-2015-19; BP05, BP06	Trion element 30 backpack		Fair Wear Foundation	Slovakia
Patagonia	CPT-2015-12; BP03, BP04	ascensionist pack 45L			Korea
The North Face	CPT-2015-32; BP11	The North Face Shadow 40+10			Hungary
Vaude	CPT-2015-21; BP07, BP08	Bulin 30		PVC-free, myclimate neutral product, Gold Winner 2013 ISPO Award	Mainland China

Sleeping Bag

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Mammut	CPT-2015-01 SB01	Alpine UL Winter	Filling: ajungilak MIT Endurance, Outer Fabric: prolight TX, Inner Fabric: lightTX		Germany
The North Face	CPT-2015-26 SB02, SB03	Snow Leopard sleeping bag	Heatseeker Pro		Chile

Tent

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Jack Wolfskin	CPT-2015-08 TE05, TE06, TE07	Gossamer Tent			Austria
The North Face	CPT-2015-05 TE01, TE02, TE03, TE04	Talus 2			Switzerland

Rope

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
Mammut	CPT-2015-06; R01	9.8 Eternity Dry		bluesign®; myclimate	Switzerland

Glove

Brand	Sample ID	Product description	Technology/coating or finish	Label	Store/country
The North Face	CPT-2015-13; G01	Men's Etip gloves	UR POWERED; Etip		United Kingdom

The products were bought either in flagship or specialized stores, or ordered online. While still in the store, purchased products were immediately sealed in individual identical clean polyethylene bags. Sealed bags containing the products were sent to an independent accredited laboratory for analysis.

The samples were tested for a wide range of per- and poly-fluorinated compounds, among them perfluorinated carboxylic acids such as PFOA and perfluorinated sulfonic acids such as PFOS. The list also includes, among other compounds, fluorotelomer alcohols (FTOHs); [26] FTOHs are the main starting product today in the synthesis of fluorinated polymers used in the waterproof inner membrane and can also be used in the DWR finish on the outer layer. [27]

The testing covered a range of PFCs that could be extracted using solvents. A sample was cut from each article where there was no printing or labelling. Two separate analyses were carried out on each sample. One portion was extracted with methanol using Soxhlet extraction, the extract purified using solid phase extraction (SPE), and a range of ionic PFCs were quantified using high performance liquid chromatography (HPLC) combined with tandem mass spectrometry (HPLC-MS/MS). A second portion was extracted with methyl tertiary butyl ether (MTBE) using ultrasonic extraction and a range of volatile neutral PFCs were quantified using gas chromatography-mass spectrometry (GC-MS).

For a number of articles, a separate section of the same material from the article was subsequently analysed to gain an understanding of the variability in PFC concentrations for different parts of a fabric. This was carried out for ionic PFCs (4 jacket, 3 trouser, 5 footwear, 1 backpack and 1 tent samples) and for volatile PFCs (5 jacket, 3 trouser, 6 footwear, 2 backpack, 2 sleeping bag and 1 tent samples).

For more details on testing methodology and additional quality control checks see the Technical Report. [28]

[26] X:Y-FTOH: Telomers are derived from alcohols (-OH). Figure X stands for the number of fluorinated carbon atoms, figure Y for the number of non-fluorinated carbon atoms. Because some carbons atoms in telomers are never fluorinated, these are called polyfluorinated and not perfluorinated. FTOHs are more volatile than ionic perfluorinated carboxylic acids (PFCAs).

[27] **Walters A, Santillo D.** Uses of Perfluorinated Substances, Greenpeace Research Laboratories Technical Note 06/2006. **http://www.greenpeace.to/greenpeace/wp-content/uploads/2011/05/uses-of-perfluorinated-chemicals.pdf**

[28] **Brigden et. al. (2016)** Op.cit.

4. Conclusion

[29] http://www.greenpeace.org/international/en/news/Blogs/makingwaves/detox-outdoors/blog/54178/

[30] Some details of brand statements are provided here https://medium.com/@DetoxOutdoor/pfc-quest-results-694e5f62902d#.7noxfkdnn

[31] http://detox-outdoor.org/en/quests/

[32] **Greenpeace e. V. (2013)** op.cit

[33] **Madrid Statement (2015)** op.cit

Significant concentrations of both ionic and volatile PFCs, long and short chain, were found in many of the products. At the same time, the fact that the investigated PFCs were not detected in four products shows that alternatives are possible – and that they are starting to be implemented.

Outdoor brands have assured Greenpeace and our supporters on many occasions that ionic long chain PFCs such as PFOS and PFOA are being eliminated from the production of outdoor clothing. For example, see the clear responses from the brands [29] to Greenpeace supporters on our PFC-quest in summer 2015, who asked their favourite brand directly if they use hazardous PFCs in the production of outdoor gear. Some brands state that they have already phased out long chain chemicals (including PFOS and PFOA) from their production. [30], [31]

This study shows that the toxic chemical PFOA is still widely present in products by brands such as Jack Wolfskin, the North Face, Patagonia, Mammut, Norrona and Salewa, especially in the production of footwear, trousers, sleeping bags and some jackets. Eleven products contained levels of PFOA higher than 1 µg/m², the regulatory limit in Norway.

The highest result for PFOA by weight was in the sleeping bag by The North Face. PFOA is a substance that is well-known for its hazardous properties and should not be used in materials that could be taken into the mouth by children when they go camping, for example. Other samples, such as the Mammut backpack and shoes, also contained these long chain substances of very high concern, which should not be present in outdoor and camping gear.

Nevertheless, it is equally concerning that the report finds that the use of short chain volatile PFCs as an alternative in some cases leads to concentrations of extractable PFCs that are considerably higher than concentrations we found for ionic PFCs. These volatile PFCs can evaporate into the air, as Greenpeace has shown in former reports [32] and degrade into ionic PFCs such as PFHxA or PFOA.

The avoidance of all PFCs, both long and short chain, is supported by more than 200 scientists from 38 countries who signed the 'Madrid statement' – which recommends avoiding the use of PFCs for the production of consumer products, including textiles, in line with the precautionary principle. [33] There can only be one conclusion – the elimination of ALL PFCs – and not only long chain ionic PFCs – from all outdoor products, is necessary.

It's time to act.
It's time to Detox!
www.greenpeace.de/detox

Committing to Detox

Since 2011, Greenpeace's Detox My Fashion campaign has been working to ensure that hazardous chemicals are removed from the final product and from the entire manufacturing supply chain of the textiles industry.

Clothing companies that commit to Detox, not only undertake to eliminate all hazardous chemicals – including all PFCs – from their production and products as soon as possible, and by the very latest 2020, but they do so through a paradigm changing chemical management approach. The approach is based on the necessary precaution, transparency and recognition that there are 'no-safe-levels' for hazardous chemicals, especially persistent ones. More than 30 international fashion brands, [34] sportswear brands and discount retailers [35] and even some suppliers have published credible Detox Commitments and action plans with Greenpeace, corresponding to about 15 percent of global textile production. Of the Detox commited brands, retailers and suppliers, 15 are already completely out of all PFCs, [36] and another 16 – many of whom also sell PFC treated outdoor wear – will eliminate all PFC use by the end of 2016 or during 2017.

Regrettably, there is not one outdoor brand among the companies that have committed to zero discharges of all hazardous chemicals by 2020 and are acknowledged Detox Leaders. As global players, outdoor companies such as The North Face, Mammut, Patagonia and other companies have an opportunity and the responsibility to take on a truly precautionary approach to improve manufacturing practices in their supply chains.

These companies are prominent users of PFCs and need to take the lead on the elimination of all PFCs; this will send an important signal to the chemical industry and other innovators to increase their efforts on the further development of non-hazardous alternatives. PFC-free materials are already available today that are suitable for most applications. [37] Phasing out PFCs by 2020, as some outdoor clothing brands aspire to do, is not ambitious enough. It is not acceptable that their products continue to release persistent and potentially hazardous chemicals into the environment for another 5 years.

Recognising the fact that once they are out there we cannot get them back outdoor companies must make a genuine and credible commitment to stop using all hazardous chemicals – with ambitious schedules and concrete measures that match the urgency of the situation. In particular, outdoor clothing brands must set short-term deadlines for completely phasing out the use of all PFCs in products and production processes.

[34] Greenpeace website, Detox Catwalk (2015) http://www.greenpeace.org/international/en/campaigns/detox/fashion/detox-catwalk

[35] Tchibo Detox commitment (2014) http://tchibo.com/cb/1053454/data/-/TchiboDETOXCommitment.pdf

[36] H&M Conscious Actions Sustainability Report (2012) http://sustainability.hm.com/content/dam/hm/about/documents/en/CSR/reports/Conscious%20Actions%20Sustainability%20Report%202012_en.pdf H&M reports that "From January 2013, PFCs were banned from all our products globally. This means that all orders placed from 1 January or later have been produced without PFCs". Also see H&M Conscious Actions Sustainability Report 2013. http://sustainability.hm.com/content/dam/hm/about/documents/en/CSR/reports/Conscious%20Actions%20Sustainability%20Report%202013_en.pdf p.75 "During the year we conducted about 30,000 tests to ensure compliance with our restrictions."

[37] Some smaller outdoor companies such as Paramo, Pyua, Rotauf, Fjällräven and R'ADYS already have entire collections of functional weatherproof clothing that are PFC-free.

5. Annex

5.1 Tested products

Jackets

Arc'teryx
Alpha SL Jacket
J08 | Sweden

Blackyak
U-Jade jacket # 1
J04/J05 | Korea

Columbia
Alpine action jacket
J06 | Chile

Haglöfs
L.I.M III jacket
J07 | Finland

Jack Wolfskin
Amply 3in1
J12 | Austria

Mammut
Nordwand Pro HS Hooded Jacket
J02 | Switzerland

Norrona
Lofoten Gore-tex pro jacket
J03 | Norway

Patagonia
Patagonia Men's Super Alpine Jacket
J10 | Taiwan

Salewa
Ultar GTX ACT M
J11 | Italy

The North Face
Women Stratos Jacket
J09 | Sweden

Vaude
Fjordan jacket men
J01 | German

Trousers

Arc'teryx
Beta AR Pant Men's
TR06 | Taiwan

Columbia
Jump Off Cargo Pants Men
TR03 | Russia

Haglöfs
Rugged II Mountain Pant
TR07 | Denmark

Jack Wolfskin
Cloudburst Pants Women
TR04 | Russia

Mammut
Nordwand Pro Pants Man
TR02 | Slovenia

Patagonia
M's Torrentshell Pants
TR05 | Hong Kong

Salewa
Kali GTX M PNT
TR08 | Italy

The North Face
Ravina Pants
TR01 | London

Shoes

Columbia
Women's Redmond™ Low Waterproof
F11 | Turkey

Haglöfs
Haglofs Grym HI GT men
F01, F02, F03 | Norway

Jack Wolfskin
All Terrain Texapore Men
F09 | Turkey

Mammut
Redburn Mid GTX Men
F05 | Slovakia

Patagonia
Foot Tractor Wading Boots
F10 | Patagonia Online Shop

Salewa
Condor Evo GTX
F04 | Slovenia

The North Face
Men's Hedgehog Hike Mid Gtx
F06, F07, F08 | Hong Kong

Backpack

Arc'teryx
Alpha FL 30 Backpack
BP09, BP10 | Mainland China

Columbia
Silver Ridge 25L
BP12, BP13 | Columbia Online Store

Haglöfs
Roc Rescue 40
BP14 | Denmark

Jack Wolfskin
EDS DYNAMIC 48 PACK
BP01, BP02 | Germany

Mammut
Trion element 30 backpack
BP05, BP06 | Slovakia

Patagonia
ascensionist pack 45L
BP03, BP04 | Korea

The North Face
The North Face Shadow 40+10
BP11 | Hungary

Vaude
Bulin 30
BP07, BP08 | Mainland China

Sleeping Bag

Mammut
Alpine UL Winter
SB01, SB02 | Germany

The North Face
Snow Leopard sleeping bag
SB02, SB03 | Chile

Tent

Jack Wolfskin
Gossamer Tent
TE05, TE06, TE07 | Austria

The North Face
Talus 2
TE01, TE02, TE03, TE04 | Switzerland

Rope

Mammut
9.8 Eternity Dry
R01 | Switzerland

Glove

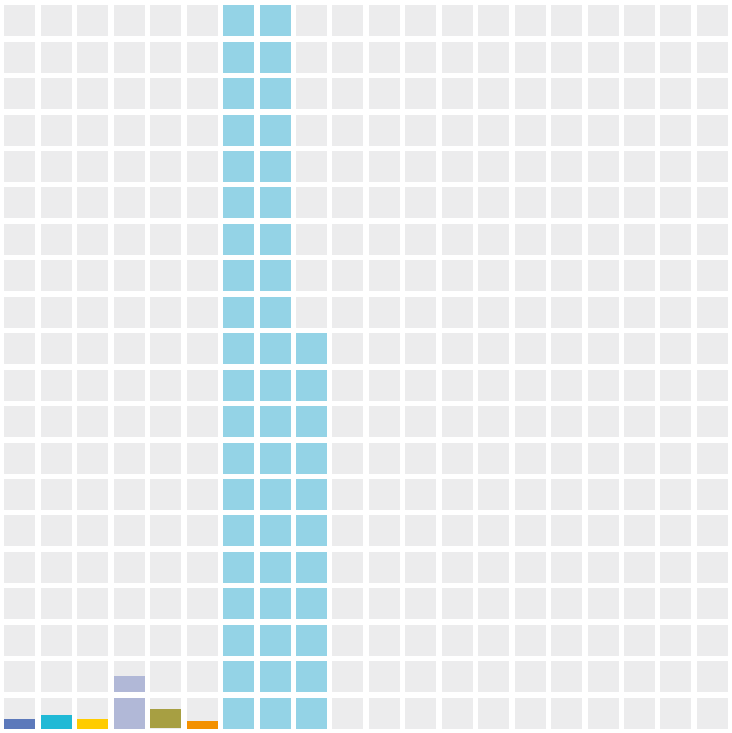
The North Face
Men's Etip gloves
G01 | London

5.2 Results

In cases where a number of different materials were analysed from the same product, results shown are for one of those materials only (in most cases, from the outer shell layer of the products), and should not therefore be seen as representative of all of the materials analysed from those items.

Jackets

Arc'teryx
Alpha SL Jacket (Sweden)

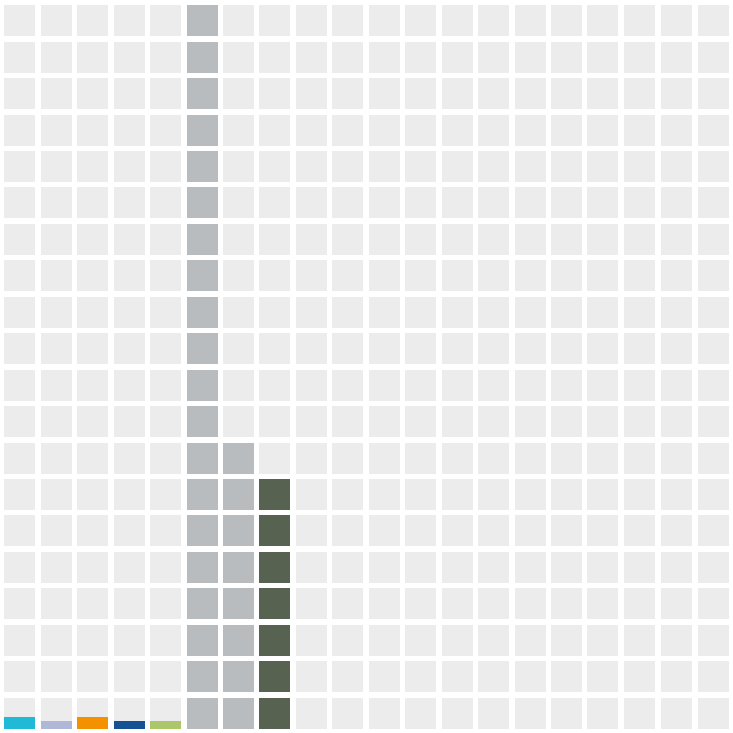


Sum PFC **106 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	0.53	0.5
PFBA	0.66	0.6
PFPA	0.40	0.4
PFHxA	2.90	2.7
PFHpA	1.42	1.3
PFOA	0.07	0.1
6:2 FTOH	100	94.5

Arc'teryx Alpha SL jacket **Sample Code** CPT-2015-28 **J08**

Blackyak
U-Jade jacket #1 (Korea)



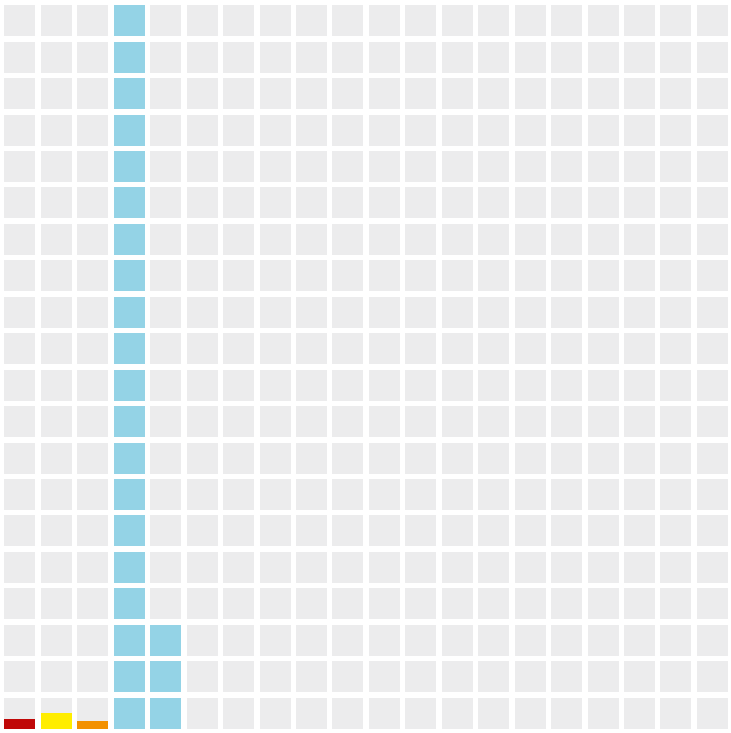
Sum PFC **71 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	0.28	0.39
PFHxA	0.12	0.17
PFOA	0.21	0.29
PFDA	0.17	0.24
PFDoA	0.11	0.15
8:2 FTOH	56	79
10:2 FTOH	15	21

Blackyak U-Jade jacket #1 **Sample Code** CPT-2015-11 **J04**

Jackets

Columbia
Alpine action jacket (Chile)

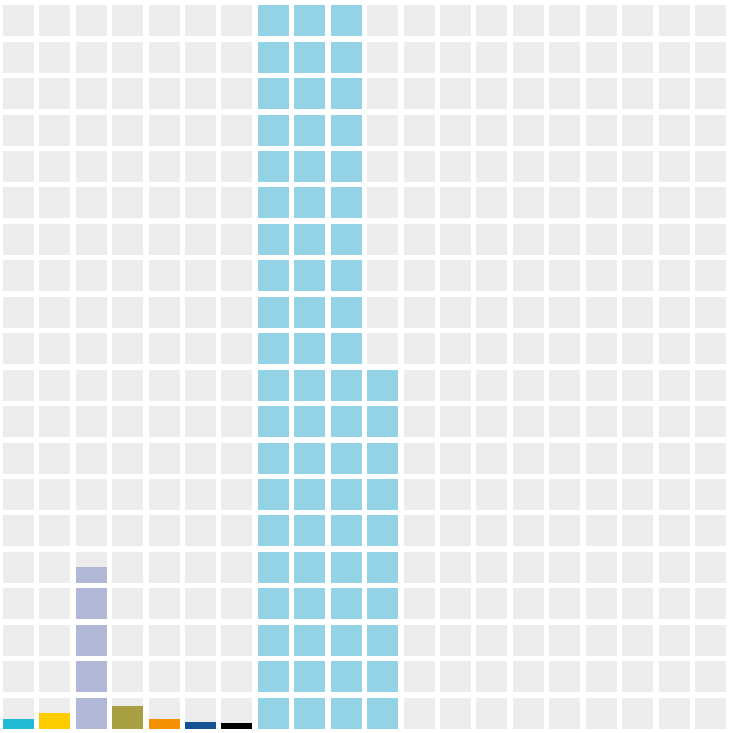


Sum PFC **46.7 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHxS	0.15	0.3
PFOS	0.43	0.9
PFOA	0.09	0.2
6:2 FTOH	46	98.6

Columbia Alpine action jacket **Sample Code** CPT-2015-25 **J06**

Haglöfs
L.I.M III jacket (Finland)



Sum PFC **143 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	0.11	0.1
PFBA	0.67	0.5
PFPA	0.84	0.6
PFHxA	9.15	6.4
PFHpA	1.50	1.0
PFOA	0.20	0.1
PFDA	0.10	0.1
H4PFOS 6:2 FTS	0.15	0.1
6:2 FTOH	130	91.1

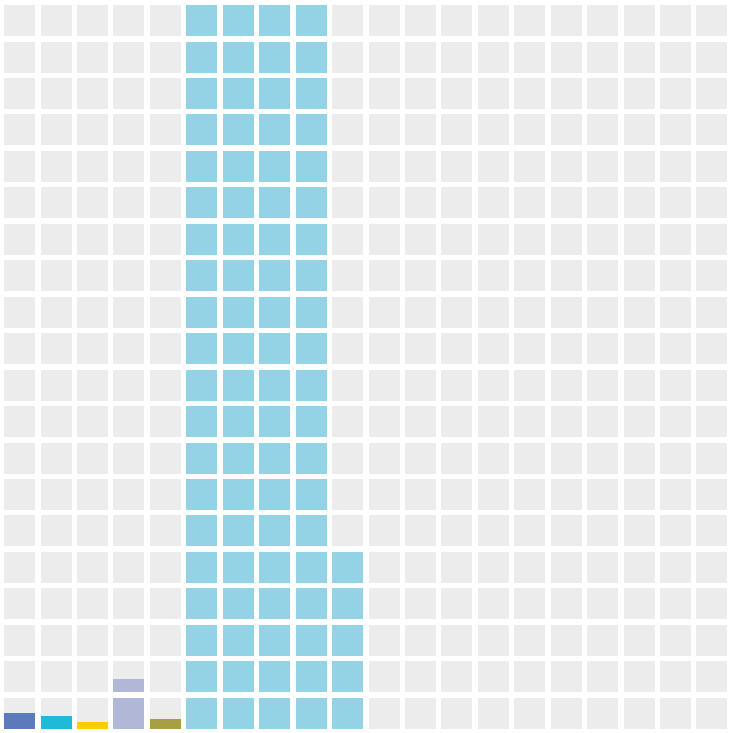
Haglöfs L.I.M III jacket **Sample Code** CPT-2015-27 **J07**

Jackets

Jack Wolfskin
Amply 3in1, Jacket (Austria)

Sum PFC **below Limit of Quantification (LOQ)**

Mammut
Nordwand Pro HS Hooded Jacket (Switzerland)



Sum PFC **175 µg/m²**

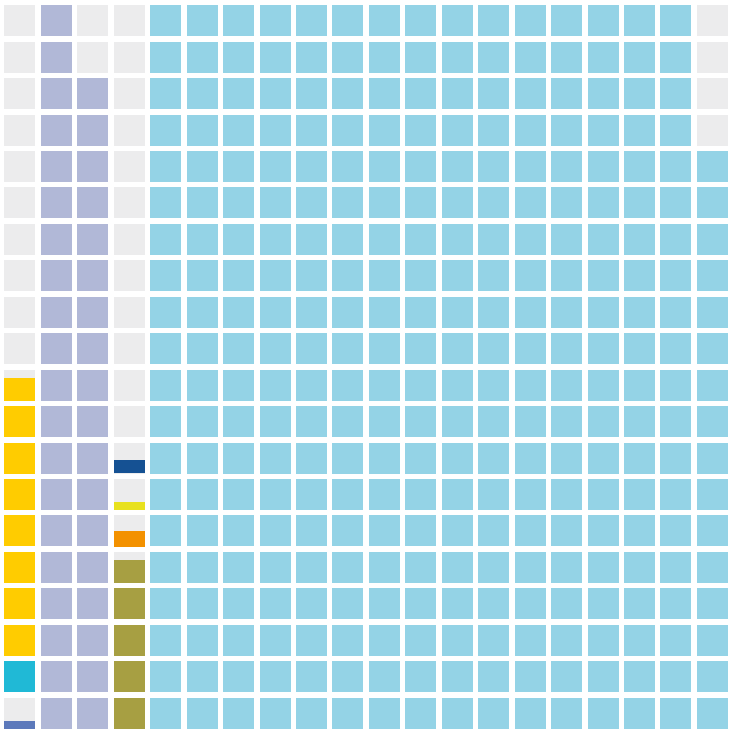
PFC	Concentration in µg/m²	Percentage
PFBS	0.97	0.6
PFBA	0.63	0.4
PFPA	0.28	0.2
PFHxA	2.67	1.5
PFHpA	0.33	0.2
6:2 FTOH	170	97.2

Jack Wolfskin Amply 3in1 Jacket **Sample Code** CPT-2015-07 **J12**

Mammut Nordwand Pro HS Hooded Jacket **Sample Code** CPT-2015-04 **J02**

Jackets

Norrona
Lofoten Gore-tex pro jacket (Norway)

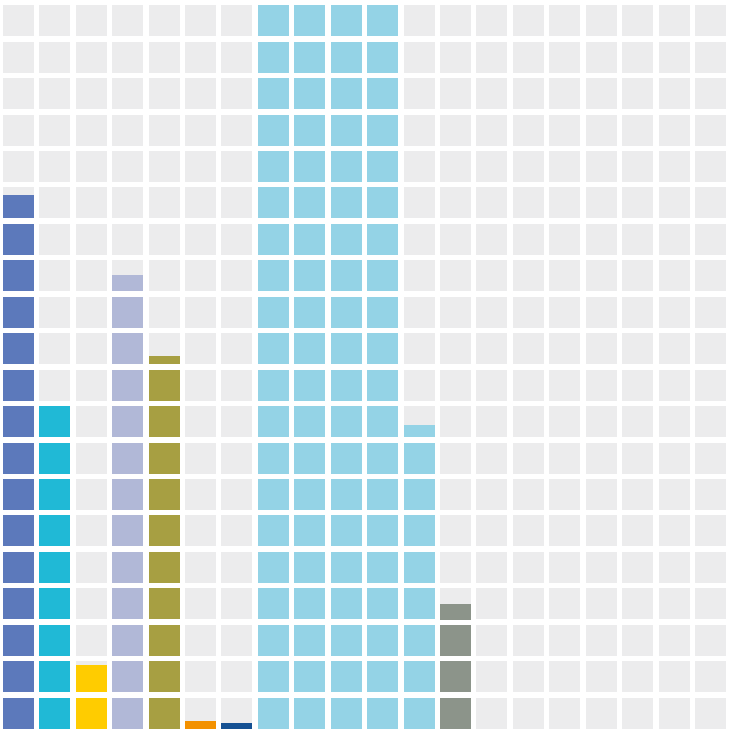


Sum PFC **730 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	0.21	0.03
PFBA	1.72	0.2
PFPA	10.6	1.8
PFHxA	76.4	10
PFHpA	9.97	1.20
PFOA	0.67	0.1
PFNA	0.11	0.02
PFDA	0.31	0.04
6:2 FTOH	630	86.40

Norrona Lofoten Gore-tex pro jacket **Sample Code** CPT-2015-09 **J03**

Patagonia
Men's Super Alpine Jacket (Taiwan)



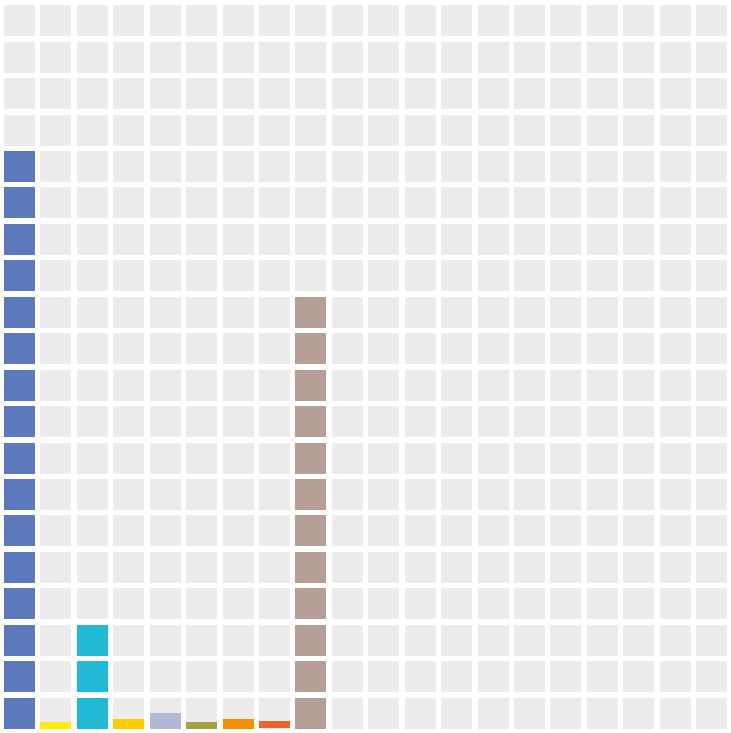
Sum PFC **284 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	28.9	10
PFBA	18.2	6.5
PFPA	3.79	1.4
PFHxA	25.1	8.9
PFHpA	21.3	7.5
PFOA	0.19	0.1
PFDA	0.07	0.02
6:2 FTOH	180	63
10:2 FTOH	6.7	2.4

Patagonia Men's Super Alpine Jacket **Sample Code** CPT-2015-30 **J10a**

Jackets

Salewa
Ultar GTX ACT M, Jacket (Italy)

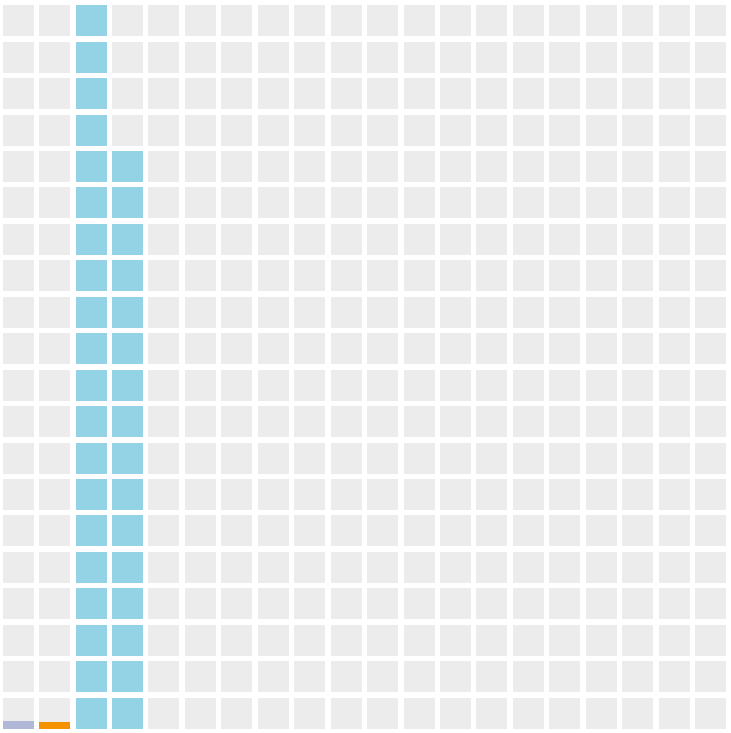


Sum PFC **62.1 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	31.6	51
PFOS	0.07	0.1
PFBA	5.82	9.4
PFPA	0.19	0.3
PFHxA	0.61	1.0
PFHpA	0.08	0.05
PFOA	0.16	0.3
PFUnA	0.07	0.1
H4PFOS; 6:2 FTS	23.6	38

Salewa Ultar GTX ACT M Jacket **Sample Code** CPT-2015-40 **J11**

The North Face
Women Stratos Jacket (Sweden)



Sum PFC **72.3 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHxA	0.18	0.3
PFOA	0.11	0.1
6:2 FTOH	72.0	99.6

The North Face Women Stratos Jacket **Sample Code** CPT-2015-29 **J09**

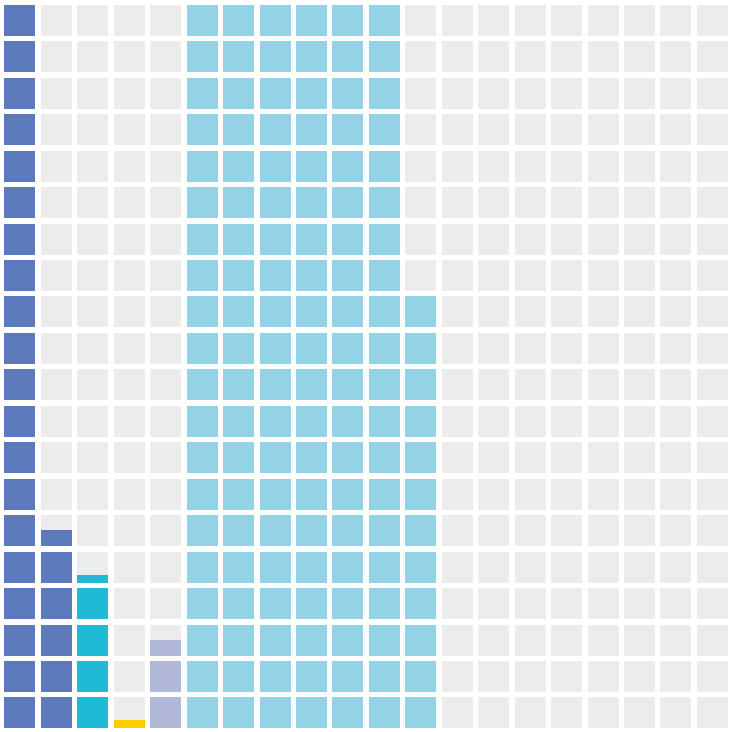
Jackets

Vaude
Fjordan jacket men (Germany)

Sum PFC **below Limit of Quantification (LOQ)**

Trousers

Arc'teryx
Beta AR Pant Men's (Taiwan)

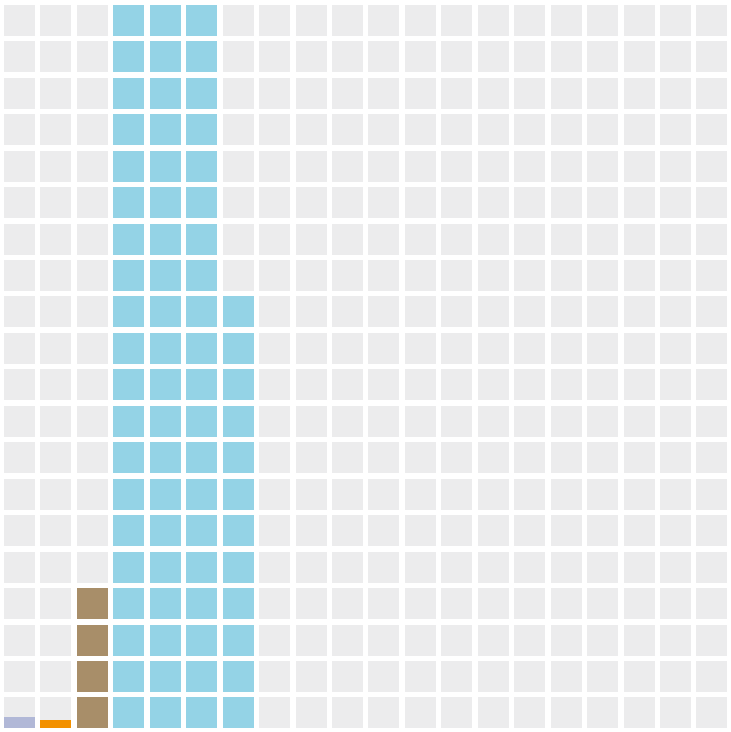


Sum PFC **336 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	51.4	15
PFBA	8.93	2.7
PFPA	0.42	0.1
PFHxA	4.91	1.5
6:2 FTOH	270	80.2

Arc'teryx Beta AR Pant Men's **Sample Code** CPT-2015-31 **TR06**

Columbia
Jump Off Cargo Pants Men (Russia)



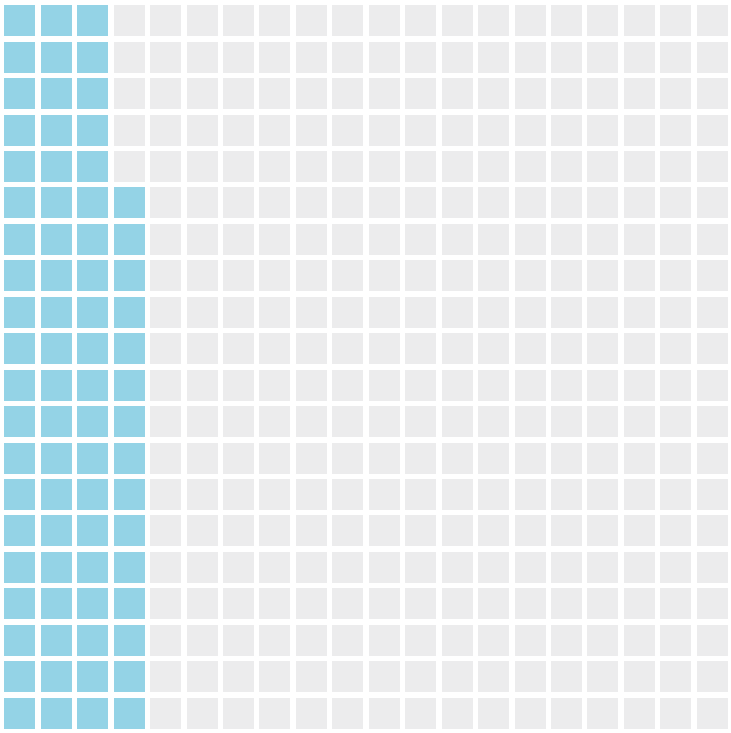
Sum PFC **151 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHxA	0.41	0.3
PFOA	0.20	0.1
8:2 FTA	7.8	5.0
6:2 FTOH	140	94.5

Columbia Jump Off Cargo Pants Men **Sample Code** CPT-2015-17 **TR03**

Trousers

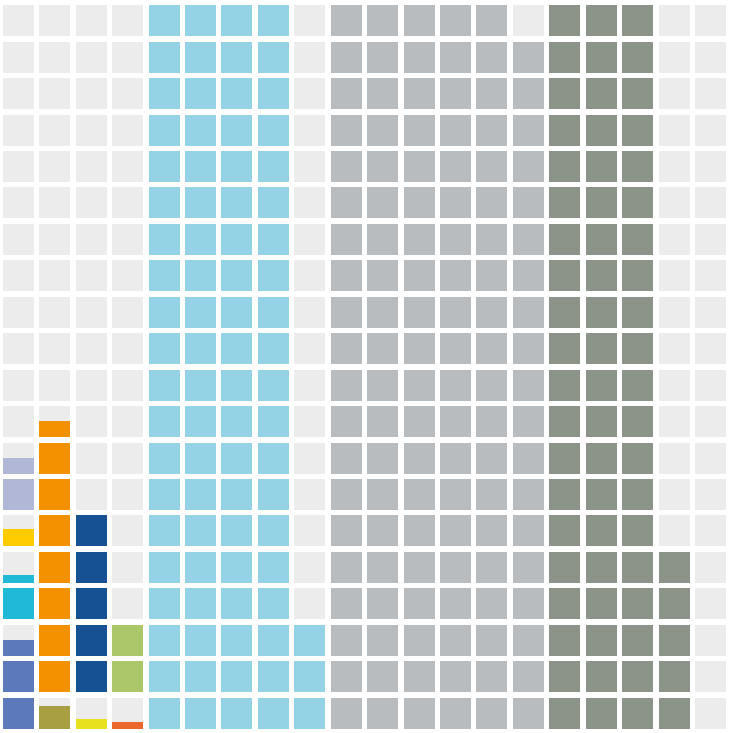
Haglöfs
Rugged II Mountain Pant (Danmark)



Sum PFC **150 µg/m²**

PFC	Concentration in µg/m²	Percentage
6:2 FTOH	150	100

Jack Wolfskin
Cloudburst Pants Women (Russia)



Sum PFC **584 µg/m²**

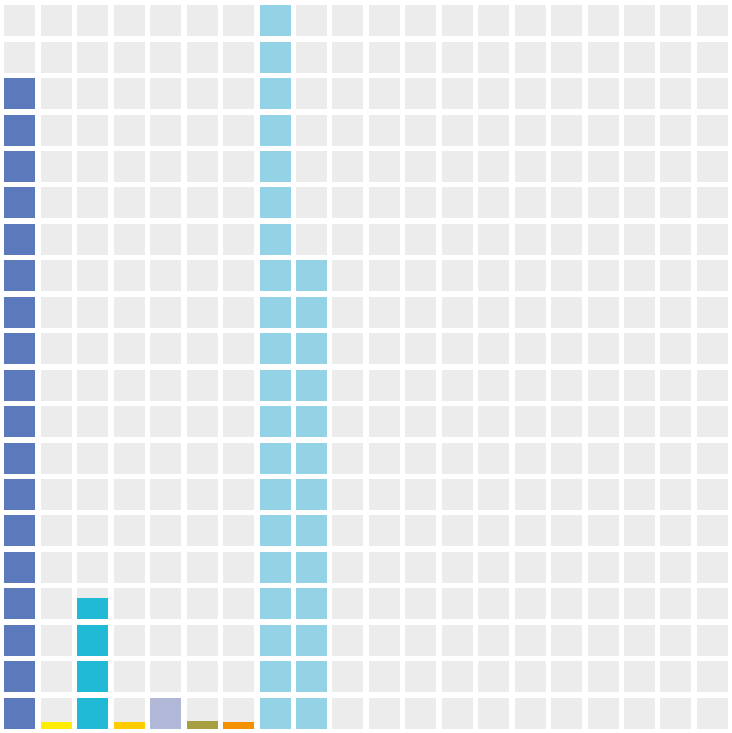
PFC	Concentration in µg/m²	Percentage
PFBS	5.04	0.9
PFBA	2.16	0.4
PFPA	1.29	0.2
PFHxA	3.14	0.5
PFHpA	1.79	0.3
PFOA	14.9	2.6
PFNA	0.74	0.1
PFDA	10.2	1.8
PFUnA	0.36	0.1
PFDoA	4.13	0.7
6:2 FTOH	170	29
8:2 FTOH	240	41
10:2 FTOH	130	22

Haglöfs Rugged II Mountain Pant **Sample Code** CPT-2015-36 **TR07**

Jack Wolfskin Cloudburst Pants Women **Sample Code** CPT-2015-18 **TR04b/c**

Trousers

Mammut
Nordwand Pro Pants Man (Slovenia)

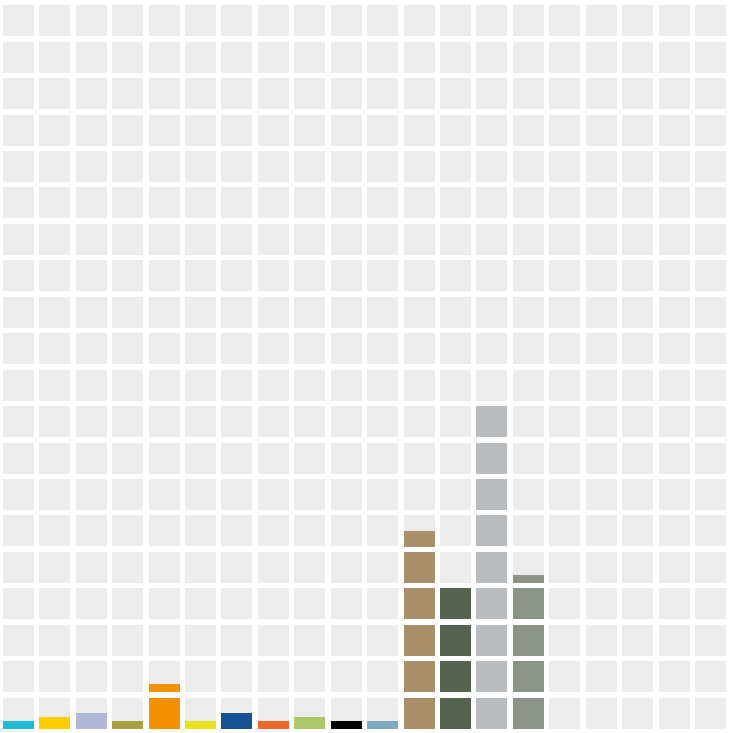


Sum PFC **112 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	35.7	32
PFOS	0.17	0.2
PFBA	7.38	6.6
PFPA	0.18	0.2
PFHxA	2.11	1.9
PFHpA	0.22	0.2
PFOA	0.11	0.1
6:2 FTOH	66	59

Mammut Nordwand Pro Pants Man **Sample Code** CPT-2015-15 **TR02**

Patagonia
M's Torrentshell Pants (Hong Kong)



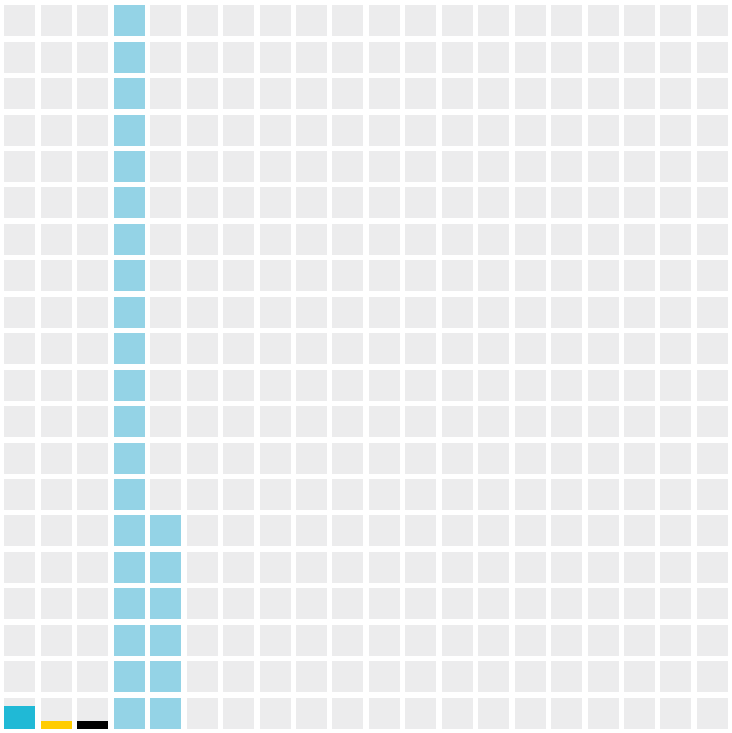
Sum PFC **50 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	0.13	0.3
PFPA	0.17	0.3
PFHxA	0.76	1.5
PFHpA	0.30	0.6
PFOA	2.47	4.9
PFNA	0.20	0.4
PFDA	0.86	1.7
PFUnA	0.08	0.2
PFDoA	0.29	0.6
PFTrA	0.08	0.2
PFTeA	0.10	0.2
8:2 FTA	11	22
10:2 FTA	7.8	15
8:2 FTOH	18	36
10:2 FTOH	8.6	17

Patagonia M's Torrentshell Pants **Sample Code** CPT-2015-23 **TR05**

Trousers

Salewa
Kali GTX M PNT, Pants (Italy)

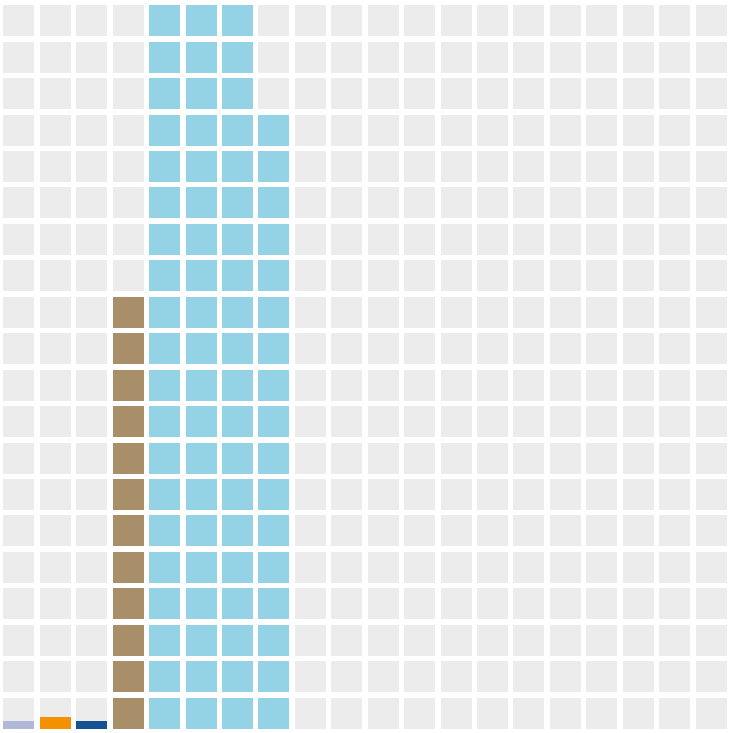


Sum PFC **58.1 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	1.63	2.8
PFPA	0.25	0.4
PFOSA	0.25	0.4
6:2 FTOH	56	96

Salewa Kali GTX M PNT Pants **Sample Code** CPT-2015-38 **TR08**

The North Face
Ravina Pants (United Kingdom)



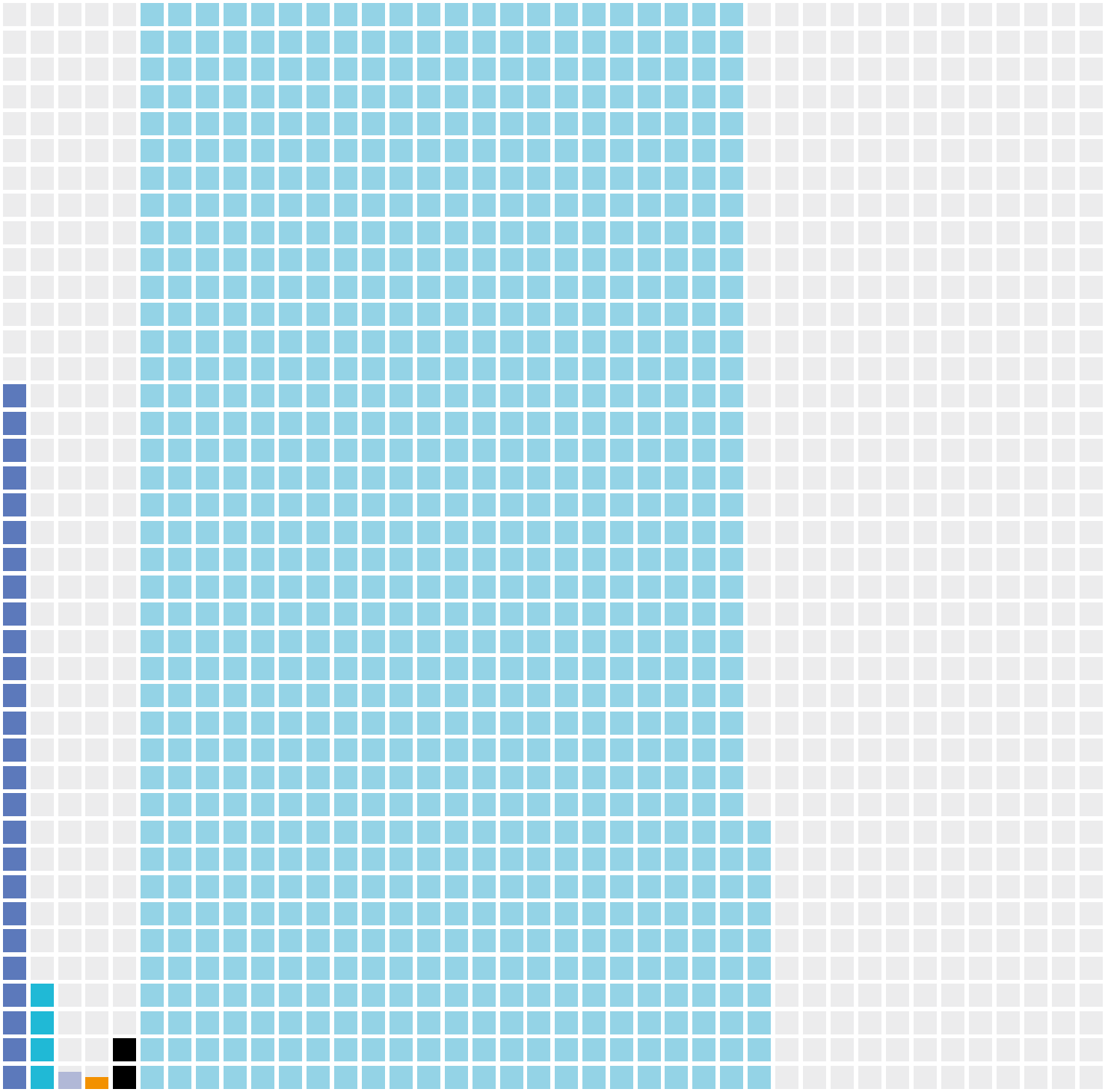
Sum PFC **175 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHxA	0.44	0.3
PFOA	0.58	0.3
PFDA	0.13	0.1
8:2 FTA	24	13
6:2 FTOH	150	86

The North Face Ravina Pants **Sample Code** CPT-2015-14 **TR01**

Shoes

Columbia
Women's Redmond Low Waterproof, Shoes (Turkey)

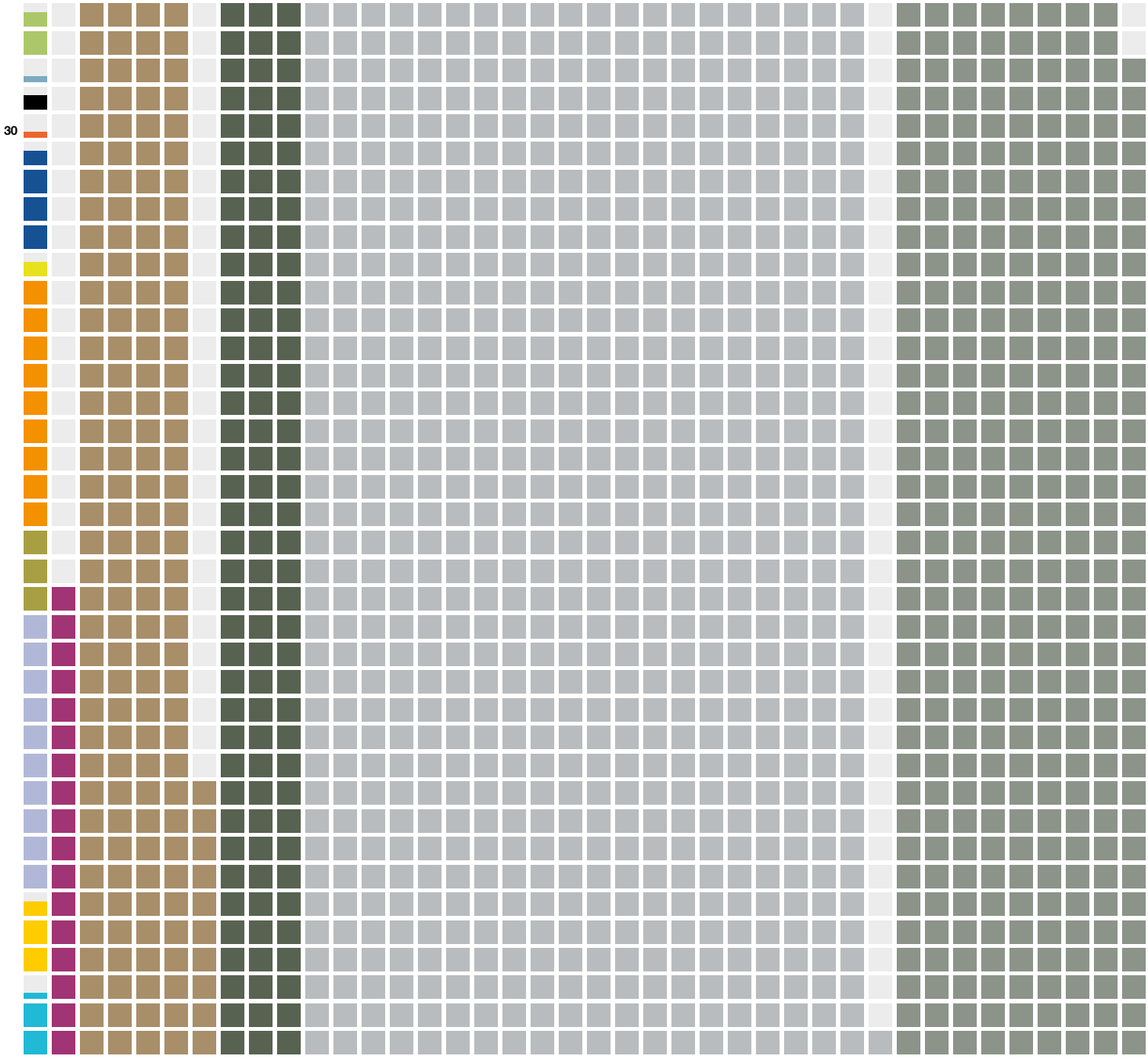


Sum PFC **1770 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	52.7	3.0
PFBA	8.02	0.5
PFHxA	1.57	0.1
PFOA	1.23	0.1
HPFHpA	3.73	0.2
6:2 FTOH	1700	95.2

Shoes

Haglöfs
Haglofs Grym HI GT men, Shoes (Norway)



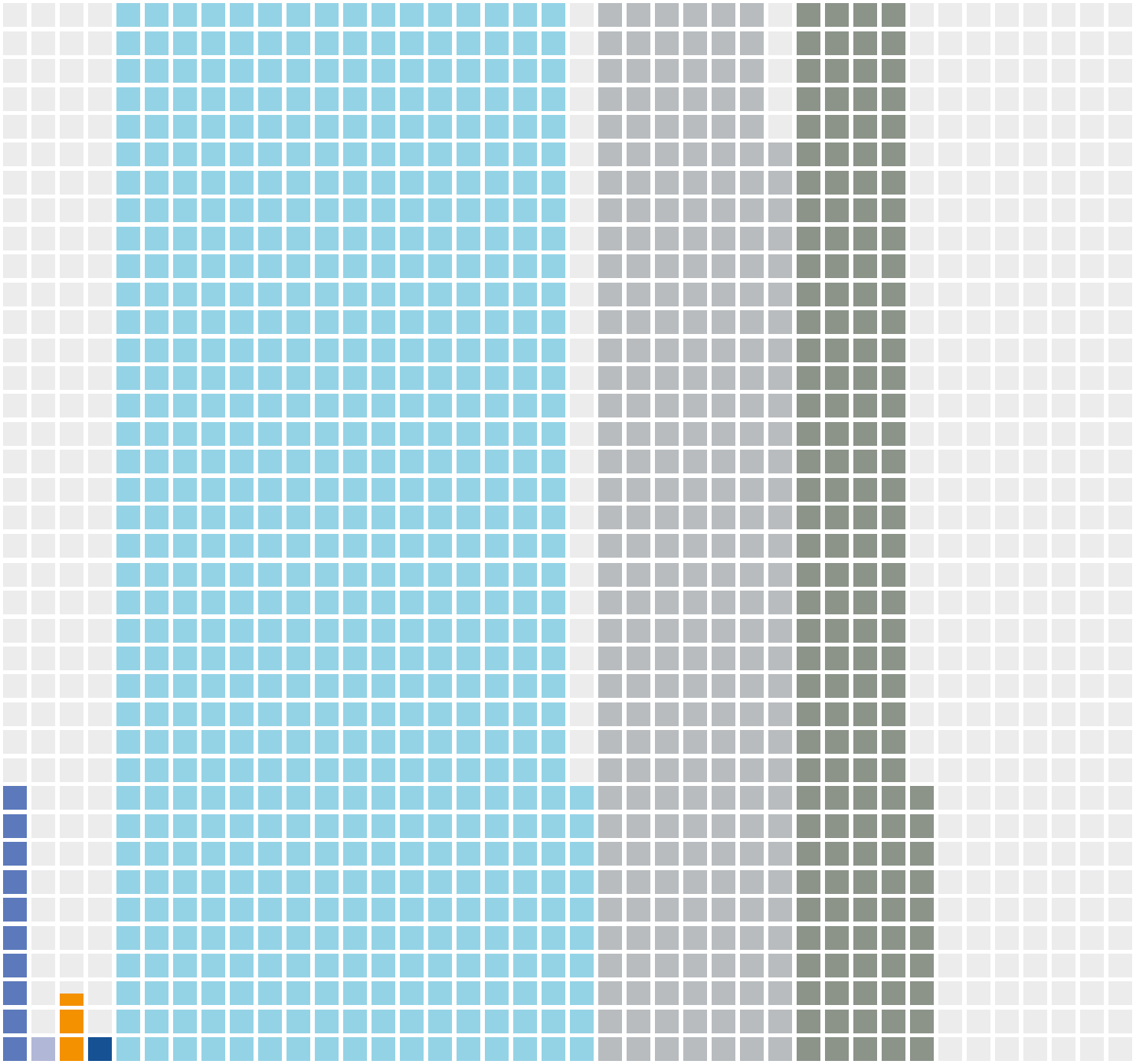
Sum PFC **3170 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	4.39	0.1
PFPA	4.91	0.2
PFHxA	19.7	0.6
PFHpA	5.59	0.2
PFOA	18.4	0.6
PFNA	1.73	0.1
PFDA	6.78	0.2
PFUnA	0.76	0.02

PFC	Concentration in µg/m²	Percentage
PFDoA	2.62	0.1
PFTrA	0.75	0.03
PFTeA	0.18	0.1
6:2 FTA	34	1.1
8:2 FTA	420	13
10:2 FTA	240	7.7
8:2 FTOH	1600	51
10:2 FTOH	770	24

Shoes

Jack Wolfskin
LL All Terrain Texapore Men, Shoes (Turkey)

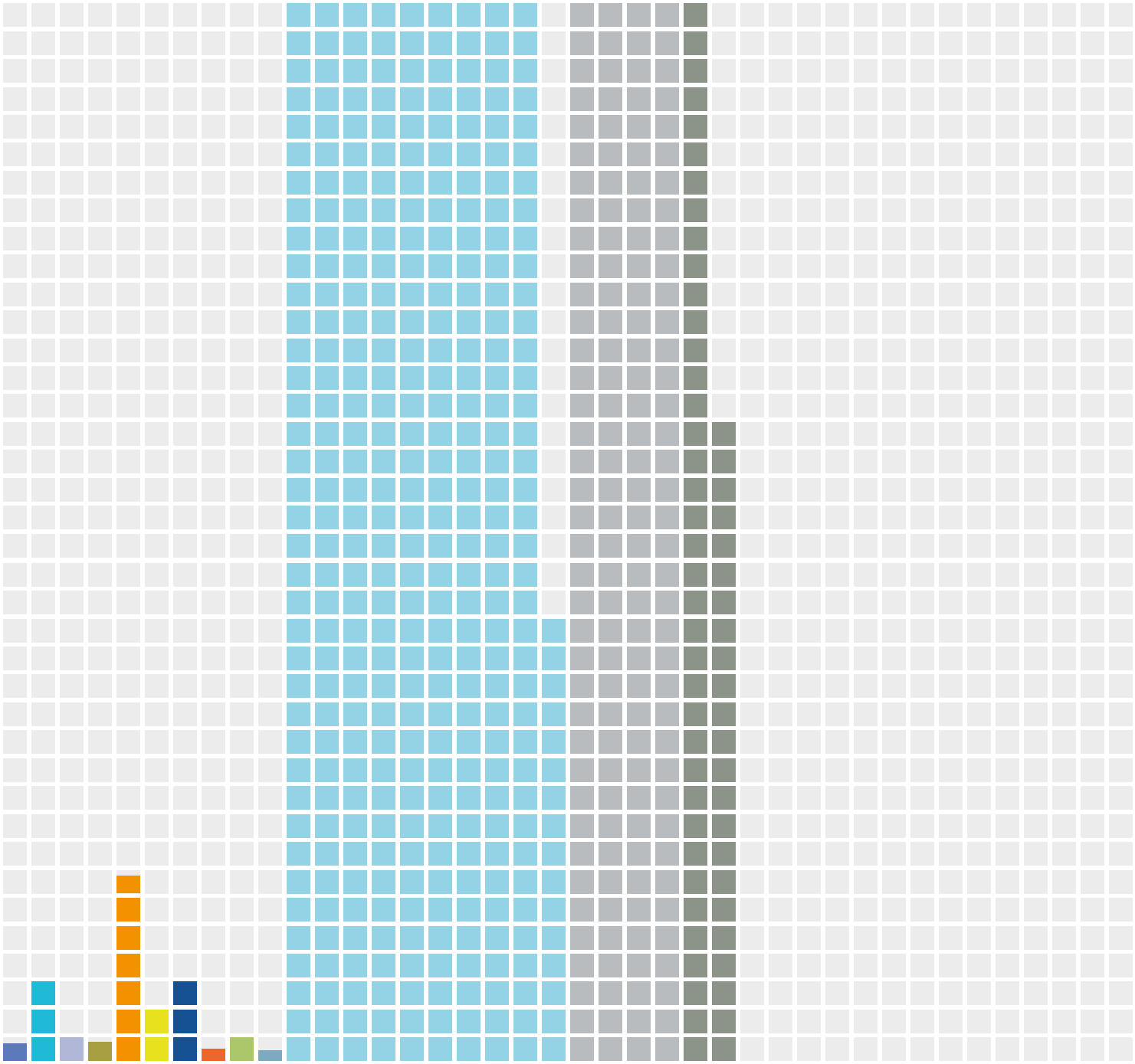


Sum PFC **2230 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	19.8	0.9
PFHxA	1.68	0.1
PFOA	4.99	0.2
PFDA	2.01	0.1
6:2 FTOH	1300	58
8:2 FTOH	550	25
10:2 FTOH	340	15

Shoes

Mammut
Redburn Mid GTX Men, Shoes (Slovakia)



Sum PFC **1240 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	1.50	0.2
PFBA	5.98	0.5
PFHxA	2.06	0.2
PFHpA	1.63	0.1
PFOA	12.7	1.0
PFNA	3.66	0.3
PFDA	5.98	0.5

PFC	Concentration in µg/m²	Percentage
PFUnA	1.26	0.1
PFDoA	2.06	0.2
PFTeA	1.15	0.1
6:2 FTOH	750	61
8:2 FTOH	320	26
10:2 FTOH	130	11

Shoes

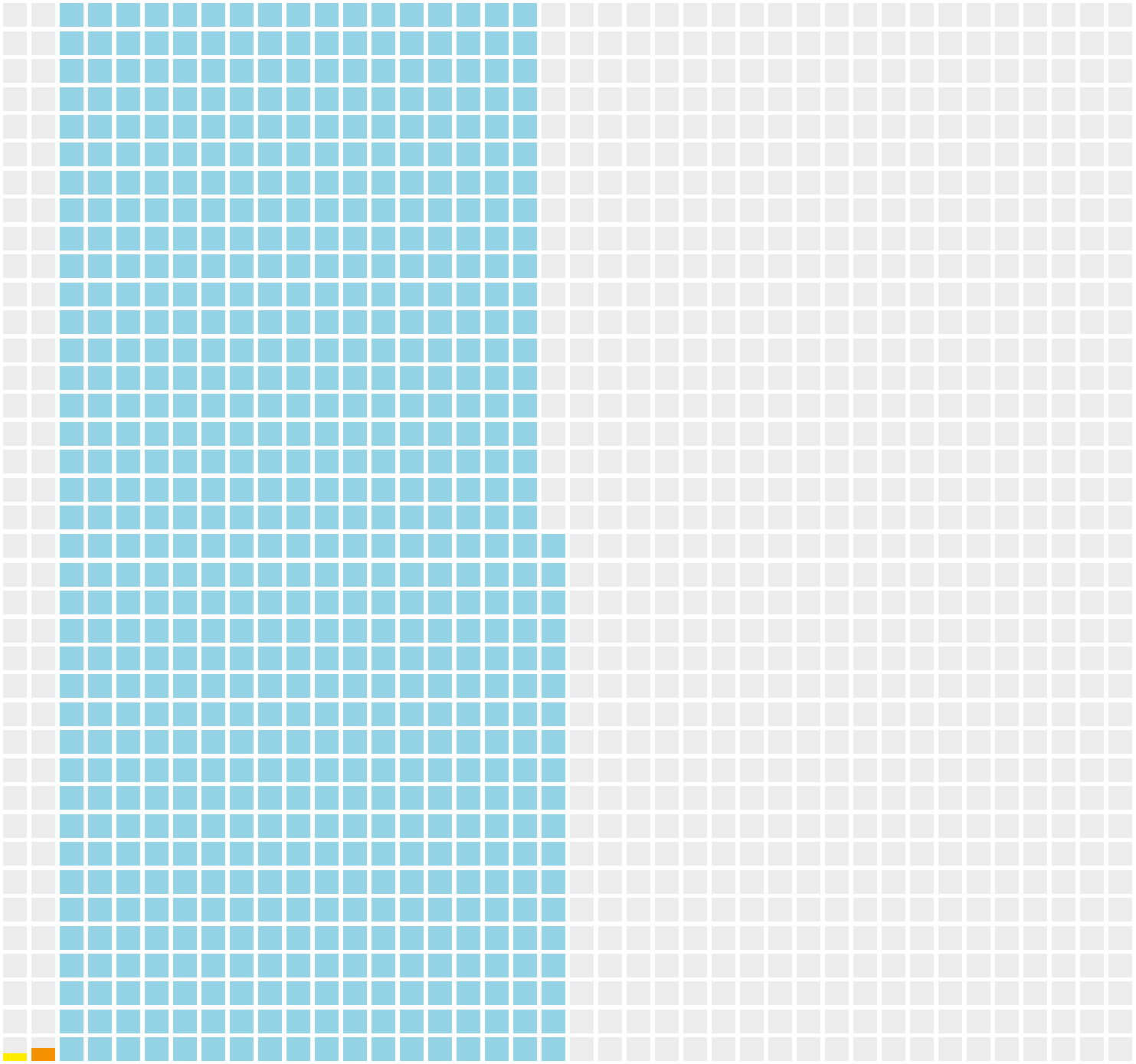
Patagonia
Foot Tractor Wading Boots (Patagonia Online Shop)

Sum PFC **3.78 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFOA	2.88	76
PFDA	0.90	24

Shoes

Salewa
Condor Evo GTX, Shoes (Slovenia)

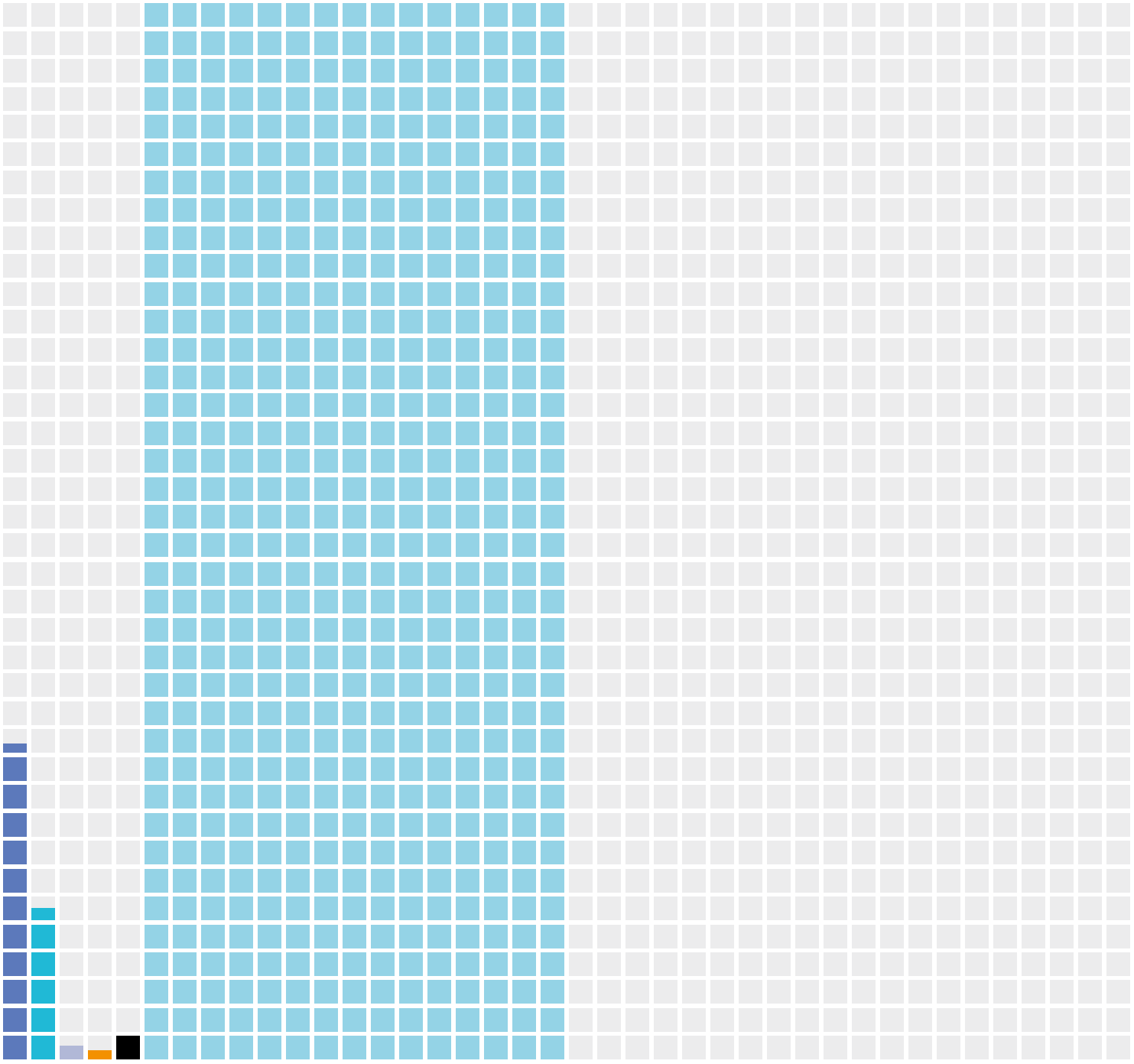


Sum PFC **1400 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFOS	1.07	0.1
PFOA	1.80	0.1
6:2 FTOH	1400	99.8

Shoes

The North Face
Men's Hedghog Hike Mid GTX, Shoes (Hong Kong)



Sum PFC **1240 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	22.5	1.8
PFBA	10.9	1.0
PFHxA	1.16	0.1
PFOA	0.81	0.1
H4PFOS 6:2 FTS	2. 03	0.2
6:2 FTOH	1200	96

Backpacks

Arc'teryx
Alpha FL 30 Backpack (Mainland China)

Sum PFC **0.14 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFOA	0.14	100

Columbia
Silver Ridge 25L, Backpack (Columbia Online Store)

Sum PFC **1.31 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFPA	0.09	7.1
PFHxA	0.34	26
PFOA	0.44	33
PFDA	0.15	11
HPFHpA	0.29	22

Arc'teryx Alpha FL 30 **Sample Code** CPT-2015-22 **BP09**

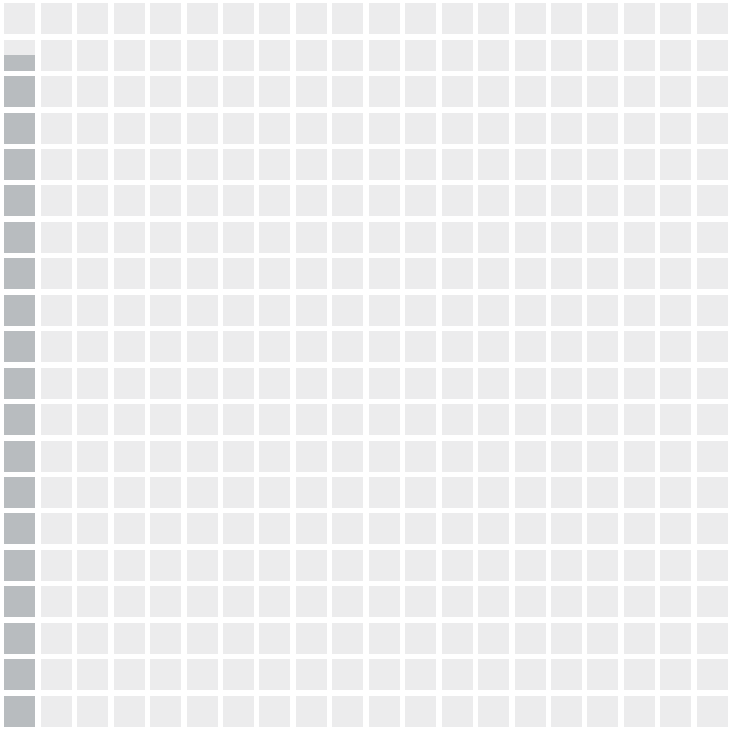
Columbia Silver Ridge 25L Backpack **Sample Code** CPT-2015-33 **BP12**

Backpacks

Haglöfs
Roc Rescue 40, Backpack (Danmark)

Sum PFC **below Limit of Quantification (LOQ)**

Jack Wolfskin
EDS DYNAMIC 48 PACK, Backpack (Germany)



Sum PFC **37 µg/m²**

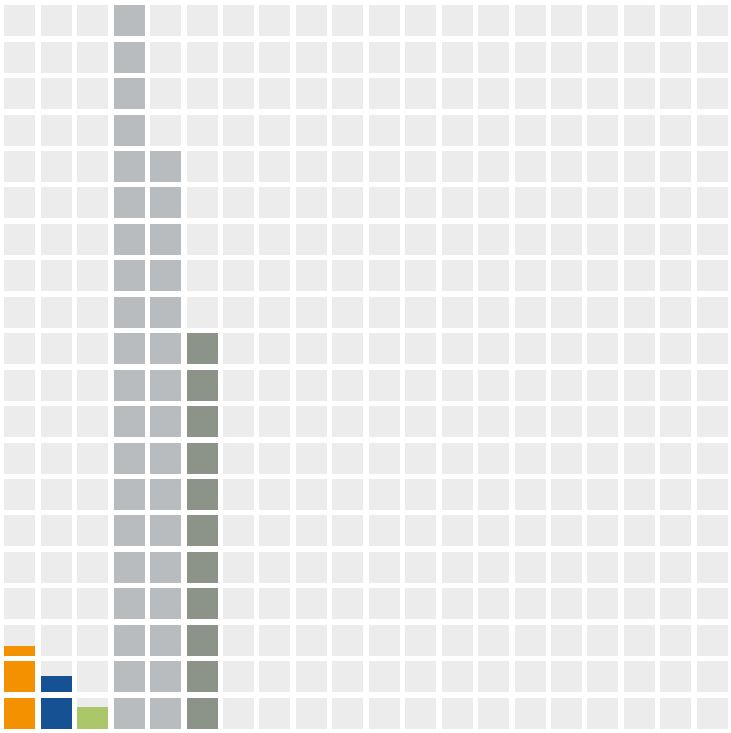
PFC	Concentration in µg/m²	Percentage
8:2 FTOH	37	100

Haglöfs Roc Rescue 40 Backpack **Sample Code** CPT-2015-37 **BP14**

Jack Wolfskin EDS DYNAMIC 48 PACK **Sample Code** CPT2015-03 **BP01**

Backpacks

Mammut
Trion element 30 backpack (Slovakia)

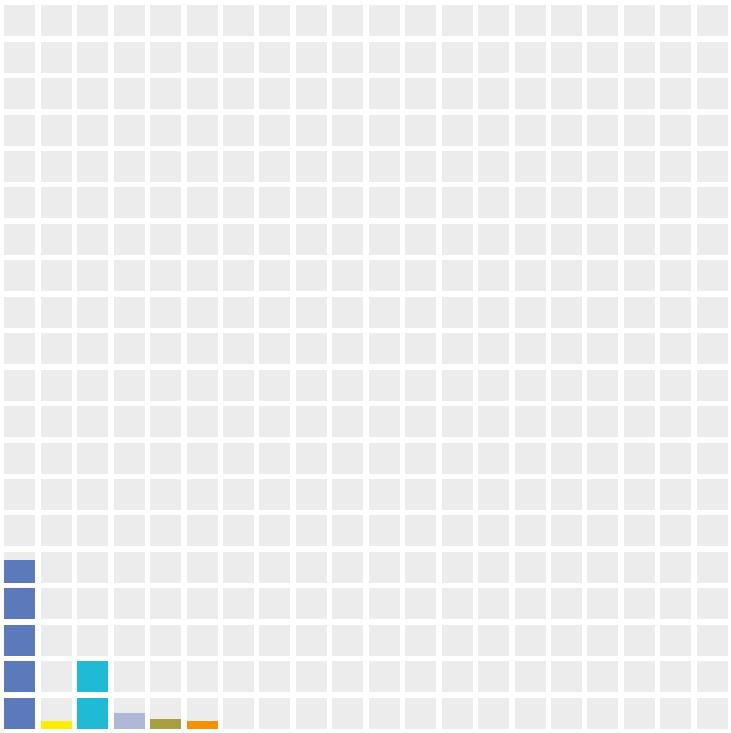


Sum PFC **102 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFOA	4.24	4.1
PFDA	2.40	2.3
PFDoA	1.43	1.4
8:2 FTOH	72	70
10:2 FTOH	22	22

Mammut Trion element 30 backpack **Sample Code** CPT-2015-19 **BP05**

Patagonia
Ascensionist pack 45L, Backpack (Korea)



Sum PFC **14.4 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBS	9.42	65
PFOS	0.09	0.6
PFBA	3.98	28
PFHxA	0.49	3.4
PFHpA	0.14	1.0
PFOA	0.29	2.0

Patagonia Ascensionist pack 45L **Sample Code** CPT-2015-12 **BP04a**

Backpacks

The North Face
Shadow 40+10, Backpack (Hungary)

Sum PFC **0.27 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHxA	0.18	66
PFOA	0.09	34

Vaude
Bulin 30, Backpack (Mainland China)

Sum PFC **1.22 µg/m²**

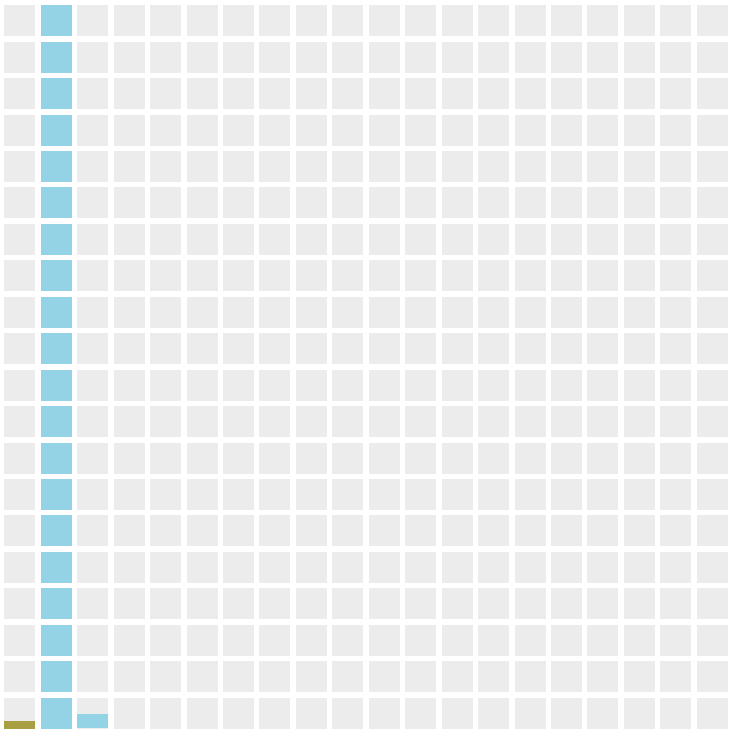
PFC	Concentration in µg/m²	Percentage
PFOA	1.22	100

The North Face Shadow 40+10 **Sample Code** CPT-2015-32 **BP11**

Vaude Bulin 30 **Sample Code** CPT-2015-21 **BP07**

Sleeping Bags

Mammut
Alpine UL Winter, Sleeping Bag (Germany)

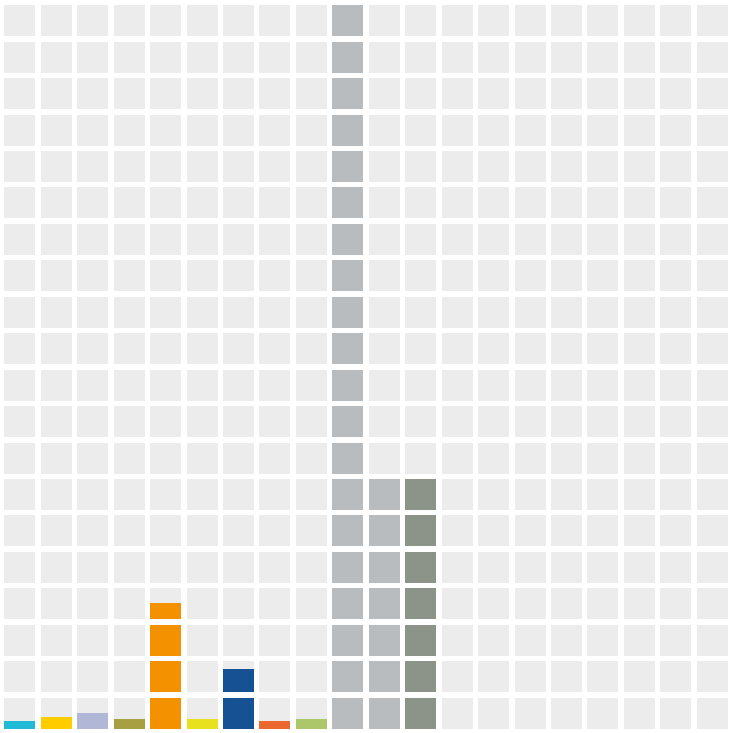


Sum PFC **41.2 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFHpA	0.17	0.4
6:2 FTOH	41	99.6

Mammut Alpine UL Winter **Sample Code** CPT2015-01 **SB01**

The North Face
Snow Leopard, Sleeping bag (Chile)



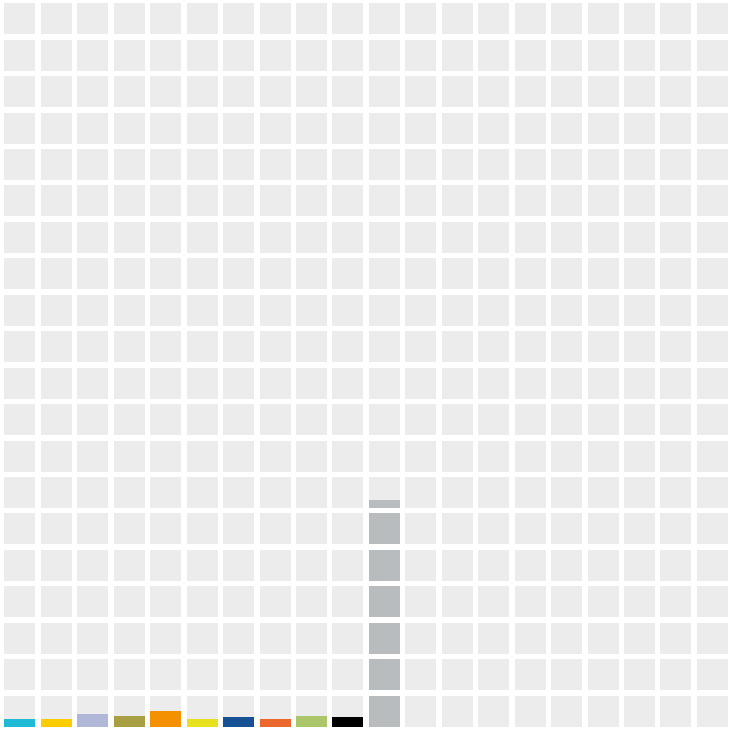
Sum PFC **79.0 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	0.09	0.1
PFPA	0.25	0.3
PFHxA	0.84	1.0
PFHpA	0.41	0.5
PFOA	7.10	9.0
PFNA	0.22	0.3
PFDA	2.84	3.6
PFUnA	0.09	0.1
PFDoA	0.20	0.3
8:2 FTOH	52	66
10:2 FTOH	15	19

The North Face Snow Leopard **Sample Code** CPT-2015-26 **SB02**

Tents

Jack Wolfskin
Gossamer Tent (Austria)



Sum PFC **14.1 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFBA	0.05	0.4
PFPA	0.06	0.4
PFHxA	0.19	1.3
PFHpA	0.12	0.8
PFOA	0.68	4.7
PFNA	0.08	0.6
PFDA	0.56	4.0
PFUnA	0.04	0.3
PFDoA	0.18	1.3
PFOSA	0.13	0.9
8:2 FTOH	12	85

Jack Wolfskin Gossamer Tent **Sample Code** CPT-2015-08 **TE05**

The North Face
Talus 2, Tent (Switzerland)

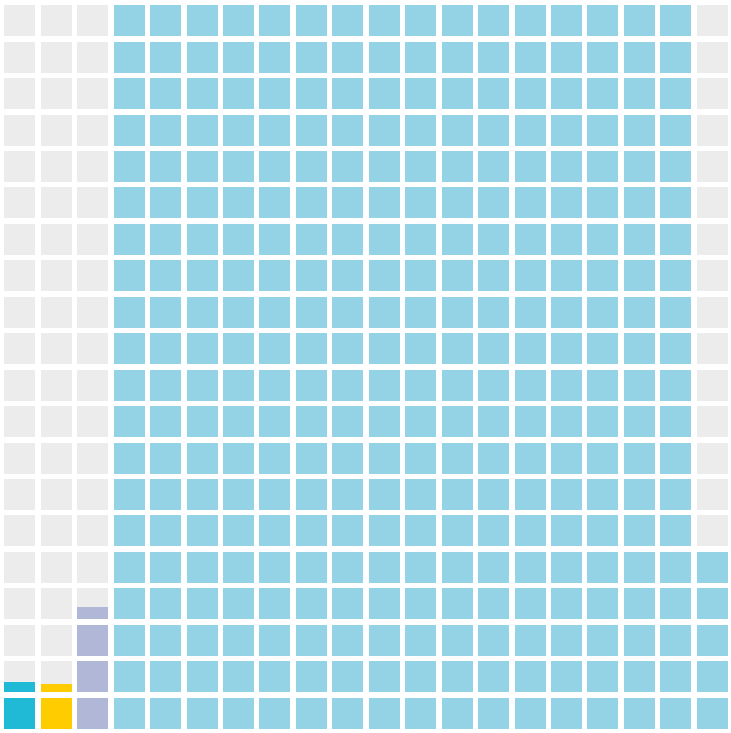
Sum PFC **0.04 µg/m²**

PFC	Concentration in µg/m²	Percentage
PFOA	0.04	100

The North Face Talus 2 **Sample Code** CPT-2015-05 **TE03**

Rope

Mammut
9.8 Eternity Dry, Rope (Switzerland)



Sum PFC **661 µg/kg**

PFC	Concentration in µg/kg	Percentage
PFBA	2.57	0.4
PFPA	2.35	0.4
PFHxA	6.51	1.0
6:2 FTOH	650	98

Note that the results for the rope sample are presented per kg material and not per m^2 and therefore cannot be compared directly with data for the other products presented here.

Mammut 9.8 Eternity Dry **Sample Code** CPT-2015-06 **R01**

Gloves

The North Face
Men's Etip gloves (Great Britain)

Sum PFC **below Limit of Quantification (LOQ)**

The North Face Men's Etip gloves **Sample Code** CPT-2015-13 **G01**


MAMMUT
ALPINE UL