



## Alliance for Telomer Chemistry Stewardship

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January 22, 2021

Ms. Irina Makarow  
Washington State Department of Ecology  
Hazardous Waste & Toxics Reduction Program  
300 Desmond Drive SE  
Lacey, WA 98503  
*Submitted via:* <http://hwtr.ecology.commentinput.com/?id=j4eJD>

Dear Ms. Makarow:

The Alliance for Telomer Chemistry Stewardship (ATCS) appreciates this opportunity to provide comments on Washington State's draft Per- and Polyfluoroalkyl Substances (PFAS) Chemical Action Plan (CAP). ATCS is a global organization that advocates on behalf of C6 fluorotelomer-based products. Our members are leading manufacturers of fluorotelomers in North America, Europe and Japan. Our mission is to promote the responsible production, use and management of fluorotelomers, while also advocating for a sound science- and risk-based approach to regulation.

We understand the important issues facing Washington regarding elevated levels of certain PFAS found in multiple locations in the state. Further, we appreciate the significant efforts the departments of Ecology and Health have put into drafting CAP. As Washington continues with these efforts, it is crucial that the state pursue a science- and risk-based approach grounded in a thorough understanding of the broad family of PFAS in order to develop a set of final recommendations that will address these issues in an appropriate and effective manner.

As drafted, however, both the Draft CAP Recommendations and the updated Appendices remain technically inaccurate and fail to identify and focus on the true sources of concern that should be addressed under the CAP. The document attempts to characterize the extremely broad and diverse group of chemicals referred to as "PFAS," which includes products and substances that are not PBT's and are not relevant to the contamination issue in Washington. We again recommend that Ecology and Health refine their focus to a more narrow and appropriate scope addressing long-chain PFAS and related salts only.

Below are ATCS' specific comments on the draft CAP, which are offered to provide technical accuracy and a more appropriate, focused scope that would support actions to address the PFAS-related issues in Washington.

Thank you for your consideration and please let me know if we can provide any additional information or answer any questions regarding comments.

Sincerely,

Shawn Swearingen  
Director, Alliance for Telomer Chemistry Stewardship

## **WA CAP Comments for Consideration**

### Executive Summary and Front End of Document

Page 9.

The section titled “Why are we concerned about PFAS” repeats the common misconception that “little is known” about the specific PFAS substances used in products. In fact, a relatively small number of PFAS substances are in active commerce in the US. For many of these substances EPA has required manufacturers to generate a considerable amount of scientific data as a condition of being allowed on the market.

PFAS used too broadly in this paragraph. Please be clear, specific and descriptive throughout the document

PFAS can withstand high temperatures and survive highly corrosive environments. They are used in the manufacture of coatings, surface treatments, and specialty chemicals in cookware, carpets, food packaging, clothing, cosmetics, and other common consumer products. PFAS also have many industrial applications and are an active ingredient in certain types of firefighting foams (aqueous film-forming foams, or AFFF). PFAS coatings resist oil, grease, and water.

Page 10.

Please clarify this sentence and provide reference(s): “Animals do not need to be near sources of PFAS to show bioaccumulation”

It is incorrect to state that “replacement products are still poorly understood.” While new data is continually being generated, a robust body of scientific data has already been developed on some of the most common replacement products. These data can, and should, be used to assess the risks, if any, posed by products made with those alternatives.

Pages 14; 49

Biomonitoring data can be a valuable tool, but only if the studies used to collect and interpret the data are well-designed and only if the limitations of the collected data are clearly explained. In addition, exposure data, by itself, is not helpful for exposed communities unless those data are presented in the context of a quantitative risk assessment. Any biomonitoring efforts undertaken by the State should conform with these principles.

Pages 15, 53

Ecology should clarify that cleanup levels established by the agency will be risk-based and compound-specific (i.e., designed to avoid unreasonable risk from exposure to specific PFAS compounds or groups of PFAS compounds with similar hazard profiles).

Pages 20-22; 60-64

If Ecology acts to regulate the use of PFAS compounds in certain categories of priority products, the agency should focus on those specific PFAS compounds (or groups of PFAS compounds) that (i) are used in the particular applications under consideration; (ii) present an unreasonable risk when used in those

applications (considering both hazard and exposure); and (iii) for which safer alternatives are available at comparable cost, that perform at least as well as the substance or group of substances to be regulated.

In addition to considering whether certain communities are “overburdened” with PFAS-containing products, Ecology should also consider whether certain vulnerable or underserved communities uniquely or disproportionately benefit from the unique properties and protections provided by PFAS chemistries.

Page 23.

Please correct this sentence from “with eight” to “with seven” or more..... It is incorrect as written: “Long-chain PFAAs include perfluorinated carboxylates (PFCAs) with eight or more fully fluorinated carbons (for example, PFOA)”

Pages 24, 65

In evaluating the presence and sources of PFAS compounds in wastewater treatment facilities, Ecology should consider collaborating with, and leveraging work already conducted by, the US Environmental Protection Agency’s (EPA’s) Office of Water. Ecology should also utilize EPA’s multi-laboratory validated wastewater analytical methods, referenced in EPA’s *Interim Strategy for Per- and Polyfluoroalkyl Substances in Federally Issued National Pollutant Discharge Elimination System Permits*, (November 22, 2020).

Pages 25, 67

It is important for Ecology to acknowledge the limitations of the TOP assay and the likelihood that use of the assay will overestimate PFAS presence and the resulting formation of PFAAs. For example, TOP can be used to determine whether there is a significant amount, or molar mass, of precursors present. These precursors may transform into PFAA’s under the aggressive oxidative conditions of the assay but not transform under normal environmental conditions.

#### Assessment Summaries

Page 34.

Please provide reference for this statement – OECD Survey/Publication  
More than 4,730 PFAS are registered in the Chemical Abstract Service.

Page 34.

We do know that PFAS compounds do degrade since they are functionalized. This statement needs to be clarified.

One of the important chemical characteristics of PFAS is their resistance to extreme environments. This characteristic makes many PFAS compounds resistant to natural degradation.

Page 34.

Please consider changing Surfactants to Fluorinated additives  
Surfactants to impart water, oil, and dirt resistance to painted walls, sealed grout, or polished floors.

Page 36.

Please correct spelling to fluorotelomer:  
fluorotelemer alcohol [FTOH]

Page 38.

Please provide references for this broad statement around high levels in fish tissues  
Though short-chain PFAS are less bioaccumulative, high mobility and bioavailability lead to relatively high levels in fish tissues.

#### Appendix 1. Chemistry

Page 77.

As noted before, use of PFAS here is too broad and does not reflect the huge diversity of compounds and properties. Need OECD reference for 4730. And reference for EPA citation.  
PFAS are a class of fluorine-containing chemicals with broad application in commercial products. More than 4,730 PFAS have been registered in the Chemical Abstract Service. EPA's Master List of PFAS Substances includes 7,866 compounds.

Page 77.

The ECF process produces branched and linear and it should be noted.  
The ECF process produces mixtures of various structural shapes (branched chains) and lengths (odd and even).

Page 77.

Shifted to shorter-chain PFAS by year-end 2015, shifted manufacture primarily to shorter-chain PFAS.

Page 77.

May want to consider giving notice to those countries that are still manufacturing long chains.

Page 82.

If the fluorinated material contains a CH<sub>2</sub> then it is polyfluorinated not perfluorinated. Please consider revising sentence to clarify. Perfluoroalkane substances have a fully fluorinated carbon chain tail, but they also contain one or more CH<sub>2</sub> groups in the head of the molecule

Page 83.

This figure needs to be corrected as it shows 8:2 FTSA and not 6:2 FTSA  
Figure 6. Schematic structure of a polyfluorinated surfactant, the 6:2 fluorotelomer sulfonic acid.

Page 84.

Please change Polymer Processing Aid to Polymer Polymerization Aid in this Table and in the balance of the CAP document.

Also COF and PFOF – PFOctanoyl Fluoride has been converted to PFOA and salts. Historically this has not been a major raw material for either fluorosurfactants or other derivatives like surface protection products.

Table 4 and line items

Page 87.

6:2 FTSCI is indeed an intermediate but it is generally not regarded as an environmental transformation product.

Table 5 line item

Page 89.

It is well recognized that all (not most) US manufacturers have discontinued long chain usage. Most U.S. manufacturers have discontinued the use of PFOA (see Appendix 9: Regulations, Section 9.2.1 Environmental Protection Agency) and PFNA salts.

Page 92.

For consideration is the fact that the spacer has been in place since the early 1970's and has nothing to do with the short chain introduction as reported by Renner.

The spacer allows for broader functionalization of the telomer chain.

Some reports suggest that the use of a spacer helps to balance function and toxicity as manufacturers have moved to shorter perfluorinated chains (Renner, 2006)

Page 93.

We would suggest a couple items be clarified in Fig 8. One should identify the hydrocarbon backbone as well as note that in the fluorinated sidechain that the fluorinated part is black and the spacer is gray. Figure 8. Fluorinated side-chain polymer, typical of stain-resistant surface treatments for textiles.

Page 95.

This sentence may be somewhat misleading as it insinuates that fluorotelomerization is a relatively new process. In fact, fluorotelomerization was invented in the 60's and became fully commercial in the early 1970's. Following the phase-out of PFOS and PFOA production by ECF, telomerization has become a dominant process for producing perfluorinated alkyl chain raw materials.

Page 96.

FTACs are indeed made from FTOH monomers but that is not the only currently used commercial process for making FTACs., such as the fluorotelomer acrylates (FTACs), which are made from FTOH monomers.

Page 98.

It is widely known that the primary surfactant for polymer polymerization was the ammonium salt of PFOA - APFO, not PFOA itself. Please consider correcting.

PFOA was widely used as a polymerization aid in fluoropolymer manufacture

Page 99.

This is generally an untrue statement. In most applications, larger quantities are not needed to attain similar performance, larger quantities are being used to attain similar performance to long-chain PFAS

Page 101.

There a couple items that need to be addressed in this table. First <C6 should be ≤C6 translating to less than or equal to, not less than as written and current use product Ammonium salt of PFOA is not correct. Current use products are generally Perfluoroalkyl ether carboxylates (PFECA's)

Table 7. Typical examples of legacy and current-use products for selected use categories (Danish Environmental Protection Agency (DEPA), 2015; United Nations Environmental Programme (UNEP), 2013).

Page 103.

This paragraph needs to be clarified. Acrylates and methacrylates are on the FCN list while the PAP's are no longer permitted.

Fluorotelomer acrylate and methacrylate side-chain polymers made with short-chain fluorotelomer intermediates. It should be noted that although these are discussed in literature, none of these types of products (fluorotelomer-based PAPs) are approved products on the U.S. Food and Drug Administration's (FDA) current Food Contact Notification (FCN) listing.

Page 103.

As noted we are dealing with polymer polymerization aids that are currently characterized by using PFECA's – perfluoroalkyl ether carboxylates, not just plain ethers as noted. Perfluoroethers or polyethers can also be used (as illustrated in Section 1.4.5 below) as polymer processing aids.

Page 104.

The sentence below gives the impression that the current 6:2 FS are new and the current generation. In fact, the 6:2 FS have been used commercially since the 1970's. This is captured in many publications. What has changed since 2006 is the move to very high purity 6:2 FS – the so-called modern AFFF products.

The current generation fluorotelomer-based AFFF products are shorter perfluorinated chains, such as the 6:2 fluorotelomer sulfonamide alkylbetaine (6:2 FTAB, Figure 20) (Wang et al., 2013).

Page 105.

Please change to Polymer Polymerization Aids  
1.4.5 Polymer processing aids

Page 105.

This statement is an overstatement of the OECD List publication that notes 4730 compounds compiled in a list. Nowhere in that publication, or anywhere else, is it substantiated that there are thousands of compounds in commerce and in use. Please revise accordingly, there are thousands of different PFAS in use.

### Appendix 3 Sources & Uses

Pages 159-160.

For the reader and general audience, it would be helpful to reflect more current data in Tables 28 and 29 which would reflect current products in commerce versus all historical legacy products.

CAP draft: Using the process developed by EPA, recent product testing study data are added to the 2009 data (Guo et al., 2009; Fujii, 2013; Herzke et al., 2012; Kotthoff, 2015; Liu et al., 2015). Tables 28 and 29 list the top ten products for the sum of PFCA and FTOH/fluorotelomer sulfonate (FTS).

Supplement 1 to this appendix provides estimates for more product testing data. The amount of PFAS in the typical home from each product will not directly correlate with exposure. Some PFAS such as fluoropolymers in non-stick cookware have been shown to be stable

### Appendix 4 Fate & Transport

Page 203.

Monomer is a broad term and can have many meanings. Please define here so that the reader clearly understands what the CAP document means. It is not usually used in the context shown here in the document. All PFAS monomers are either perfluoroalkyl acids (PFAAs) or perfluoroalkyl acid (PFAA) precursors.

Page 203.

It should be noted that there is both published work as well as work presented at scientific conferences that do indicate the  $t_{1/2}$  for precursor transformation to vary from hours/days to months to hundreds of years to thousands of years.

It is believed that all PFAA precursors will transform to PFAAs, with a timeframe that could range from hours to hundreds of years.

Page 205.

The structure for 8:2 FTOH is incorrect as it shows a ketonic structure. Please correct.

Figure 26. Examples of precursor aerobic biotransformation to PFAAs with half-lives (as described in Section 4.1).

Page 209.

We would ask the CAP authors to please check the reference citing 15000 years as a  $t_{1/2}$  for biodegradation. What is often cited is 1200-1400 years in the Russell et al publications.

However, this finding is still unsettled, due to alternate reports using different methods, which show a half-life of approximately 15,000 years for fluorotelomer-based polymers (Russell, Berti, Szostek & Buck, 2008; Russell, Wang, Berti, Szostek & Buck, 2010).

Page 212.

It may be helpful to the reader to qualify what is meant by “large source” as AFFF use is very localized and is currently only used to fight high hazard Class B fires. In addition, almost all testing and training with AFFF has been discontinued in the US and elsewhere.

Firefighting using AFFF represents a large source of release of water-based PFAS mixtures into the environment through runoff into surface and migration to groundwater, as discussed in Appendix 3: Sources and uses, Section 3.2.

## Appendix 7. Health

Page 293.

We ask Ecology to consider noting that potential exposure sources vary greatly. Food and/or drinking water may be the primary sources depending on location in the US and elsewhere. This can vary greatly depending on the locale.

“People can be exposed to PFAS from contaminated drinking water, other dietary sources, indoor dust and air that contain PFAS from consumer products, and use of consumer products that contain PFAS. Although it has been difficult to assess which sources contribute the most to human exposure, studies identify food and drinking water as the likely main routes of non-occupational exposure.”

Page 302.

As has been noted before we ask Ecology to recognize that there are not thousands of PFAS in commerce as implied here but likely hundreds of compounds. We believe this is an overstatement and an unneeded exaggeration. Please remember that the OECD list of 4730 compounds is just that – a list of compounds with no commercial relevance noted. Sources of uncertainty in assessing hazard. We still know very little about the potential toxicity of thousands of individual PFAS.

Page 303.

We do agree about the uncertainty of how animal studies translate to humans. While they may guide us, absolute translations of effects for risk assessments are often not possible.

Toxicokinetic models of internal dose help us extrapolate from animal results to humans, but some of the inputs—like human clearance rates for different life stages, gender, and level of exposure—are

uncertain. The mechanisms of action underlying adverse effects observed are only partly understood. This adds to uncertainty about which outcomes in test animals are most relevant to human risk assessment and which animal models are best suited to investigating outcomes observed in human studies.

Page 305.

Same comments as made earlier on the “thousands of PFAS”.

It is important to acknowledge that we have limited ability to measure and identify human exposures to PFAS. There are thousands of PFAS compounds, but only about a dozen have been regularly measured in blood serum of people (CDC – NHANES, 2019; Olsen et al., 2017).

Page 306.

Thank you for including the  $t_{1/2}$  values for comparison purposes. A couple points should be noted. First, the  $t_{1/2}$  for PFOA is usually cited in the 3-4 year period by most all literature accounts. It is puzzling to see the citation here, especially the 0.3 year  $t_{1/2}$ .

On PFHxA - while we do acknowledge the Russell et al work as one of the few literature studies on PFHxA, this work was not a formal  $t_{1/2}$  study. Most citations note a 28-32 day range.

Mean and median estimates that are most relevant to environmental exposures are provided below. •

**PFOA: 0.3 to 3.9 years** (Li et al., 2018). • PFOS: 3.3 to 4.6 years (Li et al., 2018; Olsen et al., 2007). • PFNA: 2.5 to 4.3 years (Zhang et al., 2013). • PFHxS: 5.3 to 7.1 years (Li et al., 2018). • PFHxA: 32 days (Russell et al., 2013). • PFBS: 27 days (Olsen et al., 2009). • PFBA: 72 hours (Chang et al., 2008)

Page 342.

It would be helpful for Ecology to call out what testing they do believe is needed for each of these compounds. PFHxA for example has a significant body of published testing literature available. Further toxicity testing on other PFAS that occur in drinking water and human serum (especially PFHpA, PFHxA, PFBA, 6:2 FTS, and PFDA)

Page 352.

It is unclear why this PFBA reference is included in the PFHxA section of comments. The TABLE from the SAW report is included here and shows PFHxA is 400,000 ppt. Please correct paragraph.

The health-based value for subchronic or chronic intake of PFBA from Michigan Science Advisory Workgroup (SAW) is 83,000 ng/kg-day (SAW, 2019).

#### Summary Table of Drinking Water Health-Based Values

Specific

PFAS

Drinking Water Health based Value

Chemical Abstract

Services Registry

Number (CASRN)

PFNA 6 ng/L (ppt) 375-95-1

PFOA 8 ng/L (ppt) 335-67-1

PFHxA 400,000 ng/L (ppt) 307-24-4

PFOS 16 ng/L (ppt) 1763-23-1

PFHxS 51 ng/L (ppt) 355-46-4

PFBS 420 ng/L (ppt) 375-73-5

GenX 370 ng/L (ppt) 13252-13-6



Page 352.

For completeness it might be helpful for the reader if Ecology included the conclusions from this Luz work and the companion Anderson et al paper which provides a genuine RfD for PFHxA. Limited human evidence has been reported (Luz et al., 2019).

#### Appendix 9 – Regulation

Page 429

In June of 2020, EPA revised its regulations to add the 172 PFAS substances subject to TRI reporting by virtue of the 2020 NDAA. See (85 Fed Reg 37354). Separately, in 2019, EPA also issued an advance notice of proposed rulemaking to add further to the list of PFAS substances subject to reporting for TRI (See 84 Fed Reg 66369).

Page 431

On July 31, 2020, FDA announced a voluntary agreement with manufacturers to phase out the distribution in commerce of several short-chain PFAS compounds for use in food packaging by the end of 2023. (See <https://www.fda.gov/food/cfsan-constituent-updates/fda-announces-voluntary-phase-out-industry-certain-pfas-used-food-packaging>)

#### Appendix 10 – Economic Analysis

Page 452

The Draft CAP correctly notes that facilities will incur significant capital costs to replace AFFF, since application and mixing equipment and infrastructure designed for use with AFFF are generally not suitable for non-fluorine firefighting agents and will have to be replaced or retrofitted

Page 453

When assessing the economic impact of replacing PFAS-containing carpeting with non-PFAS carpeting, Ecology should consider the increased durability provided by PFAS treatments. Because of their superior stain resistance and soil release properties, PFAS treatments prolong the useful life of carpeting – and other, similar, articles -- thereby allowing for less frequent replacement (and the generation of less waste) and concomitant cost savings.