

MEMORANDUM

TO: Shannon Pociu, Environmental Analyst, CTDEEP

FROM: Steven LaRosa, Team Leader, Weston & Sampson Engineers, Inc

DATE: June 16, 2021

SUBJECT: Summary of Research into PFAS Use in Consumer Products

Weston & Sampson Engineers, Inc. (Weston & Sampson) has conducted research regarding the presence and use of per and polyfluorinated alkyl substances (PFAS) in consumer products. Specific product manufacture and use focus areas were outlined by CT DEEP. These included:

- 1) Food Packaging
- 2) Carpet and fabrics
- 3) Composting/Biosolids
- 4) Car Washes
- 5) School/Commercial Cleaning
- 6) Metal Plating
- 7) Artificial Turf
- 8) Solar Panels

The review also prioritized documentation of the use or presence of the five PFAS of CTDEEP concern (PFOA, PFOS, PFHxS, PFNA, and PFHpA).

Weston & Sampson utilized research by the Environmental Protection Agency (EPA) and Juliane Gluge, (Institute of Biogeochemistry and Pollutant Dynamics) an expert on PFAS and PFAS uses as primary sources of consumer product information. Their documents (referenced below) were review and the references cited utilized to provide more detailed information regarding PFAS uses in target manufacturing and product sectors. Between the uses CT DEEP requested to be researched and those identified uses from Gluge and the EPA, our team prioritized research into food packaging, commercial washes and waxes, biosolids, cosmetic products, metal and electroplating, and building materials.

From these main sources, targeted internet searches, primarily from research databases, was performed to collect additional compound specific information, if available. Identification of specific uses within broad categories, including building materials, cosmetic products, food packaging, and textiles was performed, as well as some of the specific PFAS contaminants used in production and as a part of the final product. All of the documentation reviewed has been summarized in a database format using Microsoft Excel. The completed file has been presented under separate cover. The format of the database allows

for filtering using the column attributes including author, subject and “key words”. When available, links to the source information are provided. This initial database can be easily expanded and act as a warehouse for PFAS related information CT DEEP finds pertinent to their management of potential PFAS impacts.

The information collected was utilized to create a non-exhaustive list of PFAS containing products that may be impacting Connecticut. Specific PFAS, when able to be identified, in relation to their specific uses are outlined in **Table 1** and **Table 2**. The tables include a brief description of the broad categories of use and the purpose PFAS serves in the manufacture of the product, if identified. References to sources where our team was able to gather information can also be found in both tables. **Table 1** defines consumer products Weston & Sampson identified as containing PFAS in the final result of production, which is the product consumers use. **Table 2** defines the products that use PFAS in the manufacturing of the product.

Table 1: Consumer Products that contain PFAS in the Final Products as Identified Through Research by Weston & Sampson

Product Category	PFAS Identified (if applicable)	Specific Products and Reasoning for Use	Sources of Information
Baking/ Cook ware	PFOA, Teflon	Found in the outer liner of some baking sheets, pots and pans to give them non-stick properties.	Gluge, Juliane, et al, 2020
Textiles	PFHxA, PFOA, PFOS, PTFE	Used as waterproofing agent in textiles, such as rain jackets.	Gluge, Juliane, et al, 2020; Josh Silverman, ND; Minnesota Pollution Control Agency, ND; Rockwell, Cheryl, et al., 2013; EPA, 2017; Ginty, M, 2020; Janousek, R, et al, 2019; Becanova, J. et al., 2016
Floor and Carpet protection	PFOS, PFHpA, PFHxS, PFOA	Floor waxes, linoleum and washes, protective carpet sprays and shampoos	Gluge, Juliane, et al, 2020; EPA, 2017; FDA, 2021
Boating use	PFHxA, PFOA	Sails, seat covers, other fabric parts inside for waterproof protection	Gluge, Juliane, et al, 2020
Cosmetic Products	PFHpA, PFOA, PFNA, PTFE	Foundations, Powders, eyeshadows, Dental floss (specifically Oral-B Glide)	Boronow, Katherine, et al., 2019; Schultes, Lara, et al., 2018
Plastics and Rubber	PFOA, PFOS	PFAS identified in the final product of Tupperware and other food storage containers	Gluge, Juliane, et al, 2020; Josh Silverman, ND; Minnesota Pollution Control Agency, ND.
Food Packaging	PFHxS, PFOA, PFNA, PFDA, PFHxS, PFOS	Food wrappings and packaging, particularly in the fast-food industry, use PFAs for grease and water repellency. Common in Microwave popcorn bags	Minnesota Pollution Control Agency, ND.; Rockwell, Cheryl, et al., 2013; Susmann Herbert P., Schaidler Laurel A., Rodgers Kathryn M., & Rudel Ruthann A. (n.d.)
Fire-Fighting Foams	PFOA	Used in AFFFs for heat and alcohol resistance	Gluge, Juliane, et al, 2020; Rockwell, Cheryl, et al., 2013

Product Category	PFAS Identified (if applicable)	Specific Products and Reasoning for Use	Sources of Information
Automobile waxes and washes	PTFE (Teflon), PFHxA, PFOA	A carwash in New Hampshire was found to be the source of PFAS in groundwater. Since then, other carwashes and the products they use have been tested for PFAS. In 2019, The Vermont Department of Environmental Conservation performed a study and found 79 carwashes to be contaminated with PFAS. According to the International Carwash Association in 2020, there are 62,668 carwashes in the United States. PFAS in automotive waxes are used for their oleophobic and hydrophobic properties and ability to repel dirt and debris. PTFE in oil and grease are used to improve lubrication and cleanliness.	Gluge, Juliane, et al, 2020; Goldenman, Gretta, et al., 2019; The International Carwash Association, 2020; Gluge, Juliane, et al. 2020; AGC, ND; EBI Consulting, 2019; VT DEC, 2019; Nordic Council of Ministers, 2017; Treatment Products, LTD, 2021
Biosolids		Fertilizers and biosolids shown to be contaminated with PFAS. MWRA sells fertilizer that tested in March 2021 to contain more than 18,000 ppt of PFAS contaminants. Since 2006, MWRA has sold more than 100,000 tons of New England Fertilizer and 1,3000 tons of Bay State Fertilizer.	Wilkinson, K, Biala, J, Schliebs, D, Hazell, L, 2019; Abel, David, 2019;
Paints and coatings		PFAS have been used to make paints and coatings due to its ability to repel water and oil. The American Coatings Association suggests for facilities to investigate their current and historic uses of PFAS in paints and coatings to avoid future groundwater cleanup.	ACA, 2019; FDA, 2021; Green Science Policy Institute, 2021
Building and Roofing Materials	ETFE	Roofing materials, including metal, asphalt, waterproof, and tensile, have all shown to be made with PFAS. Use is identified for solar reflection, protection against mildew and staining, and for decorative purposes. Windows and doors also have been shown to contain PFAS to improve durability.	Green Science Policy Institute, 2021; Robinson-Gayle, S, et al, 2001; Janousek, R, et al, 2019; Becanova, J. et al., 2016

Table 2: Consumer Products that Use PFAS in Production as Identified Through Research by Weston & Sampson

Product Category	PFAS Identified (if applicable)	Specific Products and Reasoning for Use	Sources of Information
Electroplating/ Metal plating	PFESA (F-35B), PFOS, 6:2 FTS, 6:2 F-53B, PFTE; PFBS, PFNA, PFHxS	PFAS are used in the production of metal plating as a fume suppressant. The use is identified for health of the workers to not inhale chromium and other metal fumes. Use of PFOS in metal plating is one of the few non-restricted uses, due to claims of need for the substances. PFTE is used in electroless nickel plating for better suited properties. The reason for use of other PFASs has not been identified. Surface water and sediment testing near metal plating facilities showed identified them as sources.	Lin, Y, et al, 2017; Liu, Y, 2018; Huang, Q, 2021; Clara, M, et al, 2008; Department of Toxic Substances, 2019; KEMI Swedish Chemicals Agency, 2015; National Association for Surface Finishing, 2019; EPA 2009
Chemical Manufacture and Production	PTFE, PVDF	PFAS used as a reaction media, organic molecule synthesis, metals manufacture,	Gluge, Juliane, et al, 2020
Plastic and Rubber Manufacture	PTFE, PVDF,	Mould release agent, curing agent, foaming/blowing agent, increase in processing efficiency.	Gluge, Juliane, et al, 2020

All products listed have been shown to possess PFAS, however, not all products in the broader categories do. Out of the outlined products, Weston & Sampson defines the primary products of concern as posing a risk to human and environmental health, including products that more frequently possess PFAS. These product groups include waterproof textiles, floor and carpet protection and shampoos, baking and cookware, food packaging, fire fighting foams, automobile waxes and washes, biosolids, building materials, and metal plating facilities. These products and facilities are of higher concern of PFAS impacting human health and the environment due to their frequency of use and likely discharge/disposal methods from the product or facility. The most common PFAS's present across all uses researched include PFOA, PFOS, PTFE, and PFNA.

We would like to acknowledge again that this is a non-exhaustive list of uses, as well as their associated PFAS compounds.

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