

Washington State Department of Ecology
PFAS in Food Packaging
Alternatives Assessment Project Summary
November 6, 2018

Summary

In 2018, Washington State passed a new law to prohibit all per- and polyfluorinated substances (PFAS) in paper food packaging. The ban takes effect following the identification of safer alternatives (not limited to paper) as specified in the toxics in packaging law (RCW 70.95G).

The assessment of alternative products must follow the Interstate Chemicals Clearinghouse (IC2) Alternatives Assessment Guide (v 1.1) and consider chemical hazard, performance, cost and availability, and exposure. The Washington State Department of Ecology (Ecology) is particularly interested in food packaging intended for direct food contact, including applications used in the food service industry.

Ecology will be requesting bids from a pre-approved list of contractors to support Ecology's work to identify safer alternatives (chemical and non-chemical) to PFAS in food packaging.

In conducting the alternatives assessment (AA), Ecology will seek information and data from institutional and government purchasers, users of food packaging, producers of food packaging, producers of PFAS-free alternatives, researchers, chemical manufacturers, product testing laboratory services, and other interested parties.

Ecology is required to conduct an external peer review process of the AA and publish its findings in the Washington State Register. Ecology will make the final decision on whether safer alternatives to PFAS food packaging are available and will report the findings to the legislature in late 2019. The ban will take effect on January 1, 2022.

Background

Ecology and the Washington State Department of Health (Health) have identified concerns related to PFAS as a class of chemicals given the potentially broad and long-term impacts to human health and the environment.

Ecology, Health and the CAP Advisory Committee identified concerns including:

- PFAS released from products or manufacturing sources can change into substances of concern that are extremely persistent in the environment.
- PFAS are soluble in water and can easily move in water and soil. It can be difficult and expensive to filter these chemicals out of drinking water.
- Ongoing concerns related to potential exposures to PFAS from both regional and global sources that will continue into the future.

Safer Alternatives for PFAS

PFAS-free alternatives must meet the following criteria:

- Improve hazard and exposure considerations relative to PFAS-containing products [RCW 70.95G.010 (6)].
- Practicably and economically substituted for PFAS-containing products [RCW 70.95G.010 (6)].
- Readily available in sufficient quantity and at a comparable cost [RCW 70.95G.070 (3)].
- Perform as well as or better than PFAS chemicals in a specific food packaging application [RCW 70.95G.070 (3)].

One or more contractors under the direction of Ecology will develop the data needed to address these assessment criteria. The contractor(s) will conduct research and convene meetings with interested parties and experts to gather data on hazard, performance, cost, and other criteria.

What Products Are Covered by the Law?

Food package means “a package or packaging component that is intended for direct food contact and is comprised, in substantial part, of paper, paperboard, or other materials originally derived from plant fibers.”

Based on direction and funding from the legislature, Ecology is required to conduct the AA based on the functional requirements of the food packaging (e.g. grease and oil resistance). The alternatives that serve these functions and the appropriate products or product categories will be selected by Ecology with input from the consultant.

Scope of Work Proposal

This proposal follows the steps and assessment modules in the order described in the IC2 AA Guide.

Chemicals of Concern

RCW 70.95G.010 (5) identifies the chemicals of concern as “Perfluoroalkyl and polyfluoroalkyl substances” or “PFAS Chemicals.” These are further defined as “a class of fluorinated organic chemicals containing at least one fully fluorinated carbon atom.”

The AA will include a narrative description of the concerns associated with PFAS chemicals. Ecology will identify at least one PFAS formulation as an example of a chemical of concern.

Decision Rules

Ecology is responsible for the decision rules developed for conducting the AA. Ecology will direct the contractor to interview experts and knowledgeable parties, and engage interested parties (see Interested Parties Outreach and Engagement below) to develop data on cost,

performance, and other assessment criteria (Table 1). The contractor will use follow the decision rule assumptions established by Ecology.

The PFAS prohibition will not take effect until Ecology identifies that safer alternatives exist and the assessment is supported by feedback from an external peer review. Ecology will publish the findings in the Washington Register.

IC2 Alternatives Assessment Framework

Ecology's preferred approach is to use the sequential framework based on experience with the IC2 guide. Ecology will use adaptive management strategies as provided under the IC2 guidance. Ecology will use the IC2 guide to determine the appropriate evaluation levels for each module that meets the criteria under the packaging law.

Table 1. Development of Decision Rules (the AA module sections of this document contain additional detail)

| Criterion | Decision Rule Assumptions | |
|--|---|---|
| | Contractor Role | Ecology Role |
| RCW 70.95G.010 (6) defines “safer alternative” as a substance or chemical that: | | |
| <ul style="list-style-type: none"> meets improved hazard considerations | Evaluate PFAS-free food contact substances via GreenScreen® assessments. Identify improved hazard considerations using the GreenScreen® methodology. For chemicals with the same GreenScreen® score, develop a narrative evaluation to identify improved hazard based on individual hazard endpoints. | Specify any narrative evaluation criteria. Determine if the alternative has an improved hazard profile. A chemical with a GreenScreen® benchmark of 2 or higher is considered improved. |
| <ul style="list-style-type: none"> meets improved exposure considerations | Provide narrative description of the exposure considerations for each alternative. | Determine if exposure considerations of alternatives are improved. |
| <ul style="list-style-type: none"> can be practicably and economically substituted | Conduct surveys, internet and literature reviews, contact users and manufacturers of alternative products to determine whether safer alternatives are being practicably and economically substituted. Obtain publically available cost information where possible. | Determine if the alternatives can be practicably and economically substituted. |
| RCW 70.95G.070 (3) specifies additional requirements that a safer alternative must: | | |
| <ul style="list-style-type: none"> be readily available in sufficient quantity and at comparable cost | Conduct surveys, internet and literature reviews, contact purchasers, users and manufacturers of alternative products to determine whether they available at a comparable cost. | Determine if alternative meets the requirement. |
| <ul style="list-style-type: none"> perform as well as or better than PFAS chemicals in a specific application | Conduct surveys, internet and literature reviews to determine performance in a specific application. Document the findings, performance information or data that the alternative performs as well or better to a specific application. | Determine if alternative meets the requirement. |
| <ul style="list-style-type: none"> if the alternative is a chemical | Verify that use of the food contact substances in any proposed packaging alternative comply with FDA regulations. | Determine if alternative meets the requirement. |

Chemical Action Plan Advisory Committee & Interested Parties Outreach and Engagement

Ecology will coordinate the AA outreach and engagement as part of the PFAS CAP Advisory Committee. Ecology will: 1) provide regular updates to the PFAS CAP Advisory Committee and list serve, 2) implement the Peer Review process; and 3) provide subject matter expert opportunities to provide input, as needed.

Ecology will utilize the contractor to engage interested parties to gather information from the food packaging industry, manufacturers, food service business professionals, consumers, purchasers and other interested parties to:

- **Identify Safer Alternatives to Evaluate.** The contractor will identify potential alternatives (chemical and non-chemical) and conduct one or more GreenScreen® evaluations for the AA.
- **Collect Performance Information.** The contractor will conduct research and engage interested parties to identify whether alternative products/solutions can be practicably substituted. Interested parties may also provide information on performance through standard industry test methods and/or product-specific performance tests, information or other methods.
- **Availability and Cost.** The contractor will develop information and data on availability and cost for competitive products, including market or sales information where available.

Confidential Business Information (CBI)

In many cases, the lack of publicly available information and data related to PFAS and PFAS-free chemicals creates data gaps for conducting an AA. As part of this process, Ecology will be seeking the use of protected CBI that can support the successful outcomes of determining the availability of safer alternatives.

Ecology has statutory authority to protect CBI. Businesses have the option to submit CBI requests for confidentiality under RCW 43.21A.060. Ecology staff will provide technical assistance and help process the requests.

PFAS Food Packaging and Identifying Alternatives

Based on Ecology's AA budget and legislative deadlines, the agency will identify and prioritize the types of packaging and assess alternatives that are applicable to a wide ranges of products. Table 2 provides examples of food packaging where PFAS may be used. This list is not exhaustive and should not be interpreted as limiting the range of products considered for the AA.

Table 2. Example Food Packages or Packaging Components Related to Paper, Paperboard, or Other Materials Originally Derived from Plant Fibers

| MARKET SEGMENT | PACKAGE TYPE | PAPER BASE MATERIAL | |
|--|---------------------------------|----------------------------|---------------------|
| Quick Service Restaurants (QSR): such as national brands or local chains | Wraps/Liners | Paper | |
| | Pinch Bottom Bags | Paper | |
| | Flat Bottom Bags | Paper | |
| | Clam Shells | | Corrugated |
| | | | Board |
| | | | Molded Fiber |
| | Cartons | | Board |
| | | | Molded Fiber |
| | Bowls/Soup Containers | Board | |
| | Pizza Boxes | Corrugated | |
| Food Service (FS): such as private restaurants, hospitals, institutions, or groceries | | Board | |
| | Trays | Molded Fiber | |
| | | Corrugated | |
| | Cartons | Board | |
| | | Board | |
| | Take Out Packages | Molded Fiber | |
| | | Corrugated | |
| | Pizza Boxes | Corrugated | |
| | Boxes | Board | |
| | | Corrugated | |
| Bowls/Soup Containers | Board | | |
| Bakery Packaging (bags/liners) | Paper | | |
| Deli Packaging (wraps/liners/interleaves) | Paper | | |
| Bread Bags | Paper | | |
| Prepared/Ready-to-eat Food Containers | Board | | |
| Consumer Packaged Goods (CPG): such as items sold in retail stores | Confectionary/Candy Wrap | Paper | |
| | Snack Bags | Paper | |
| | Microwave Popcorn Bags | Paper | |
| | Pet food bags | Paper | |

Published research suggests that PFAS-containing and PFAS-free food packaging products serve some of the same or identical markets (Andrews & Walker, 2017; Schaider, et al., 2017). Several recent investigations identified a variety of PFAS-free food packaging for many applications, as well as alternative coatings and treatment approaches (Center for Environmental Health, 2018; Clean Production Action, 2018).

The contractor will conduct research to identify PFAS-free products that are currently available on the U.S. market.¹

Functional substitution or non-chemical alternatives (e.g., mechanical densification approaches) should be considered for relevant applications (Trier, Taxvig, Rosenmai, & Pedersen, 2018). Chemical or coating treatments may involve treatments introduced at the wet-end of the papermaking process or surface treatments, such as size press applications or off-machine coaters.

Suitable alternatives may not contain intentionally added PFAS in any amount. Given their widespread use in manufacturing operations, food packaging components may be contaminated with PFAS during manufacturing or downstream converting processes. There is no budget for such confirmatory testing.

Food packaging does not generally identify food contact substances. Ecology and the contractor will ensure that the manufacturer/supplier of a proposed alternative will disclose the food contact substances and formulation adjuvants, so that hazard and exposure assessments can be completed. Ecology will provide manufacturers and suppliers the opportunity to obtain confidential treatment under RCW 43.21A.060. The manufacturer/supplier should provide information on food types and conditions of use that would be consistent with FDA requirements for the application.²

The contractor must efficiently address the largest possible range of products (specific applications) in the PFAS food packaging market within the budget and duration of the contract. The contractor will identify potential alternatives for assessment and Ecology will make the final selection of products and application areas to assess.

Interested Parties Outreach and Engagement on Alternatives and Applications

The contractor will hold at least one webinar to share information on the proposed food packaging applications and alternative products identified by Ecology. Interested parties may provide input on:

- Prioritization of specific products for assessment.
- Other alternatives that should be considered for evaluation and valid groupings of products.
- Performance, cost, and availability of proposed alternatives.

¹ RCW 70.95G.070 (3) specifies that a safer alternative must "...be readily available in sufficient quantity..." Given the two-year transition period that would occur prior to any potential product ban, the contractor may consider packaging products that are available in foreign markets and could be successfully introduced to the U.S. market.

² The FDA provides guidance on determining the regulatory status of food contact substances: <https://www.fda.gov/food/ingredientspackaginglabeling/packagingfcs/regulatorystatusfoodcontactmaterial/default.htm>.

- Whether the proposed alternatives can be practicably substituted [RCW 70.95G.010(6)].
- Whether the proposed alternatives are or could be readily available in sufficient quantity by 2022 [RCW 70.95G.070(3)].

Hazard Module

The contractor (or Ecology may separately contract) will use the GreenScreen® for Safer Chemicals to perform a hazard assessment³ of formulation components. Ecology will publish completed GreenScreen® assessments in the IC2 Chemical Hazard Assessment Database. GreenScreen® assessments may be redacted so long as they permit endpoint hazard score (vH, H, M, L, vL) comparisons and alternative formulation components.

The contractor may perform an initial hazard screen using the GreenScreen® List Translator or other hazard screening method approved by Ecology before selecting chemicals for the minimum assessment.

GreenScreen® assessments must address all feasible and relevant transformation products. Transformation products are usually evaluated using the GreenScreen® List Translator. Some chemistries are likely to give rise to persistent or very persistent dead-end degradates. Persistent product chemicals or degradates should be evaluated with full GreenScreen® assessments. Ecology will approve the final list of chemicals for assessment.

Performance Assessment Module

The contractor will develop data to assess at least one alternative for each application. RCW 70.95G.070 (3) states that safer alternatives must “perform as well as or better than PFAS chemicals. . .” but does not further define performance. The contractor will consult with interested parties to identify appropriate performance criteria for each specific application. These may include qualitative or quantitative measures of performance.

Given the widespread use of PFAS-free food packaging, actual performance data from specific alternative products should also be available (Andrews & Walker, 2017; Schaider, et al., 2017). Interested parties can also help identify whether alternative products and solutions can be “practicably substituted” [RCW 70.95G.010 (6)].

The contractor may collect standardized test data as available and use the data to guide performance evaluations.

The contractor will propose decision rules to determine whether PFAS-free alternatives perform as well or better than PFAS chemicals. There may be cases where PFAS-based products

³ The IC2 Guide identifies levels of effort for each of the assessment modules. Ecology is will determine the appropriate levels for this AA. The contractor can perform work beyond the requirements of the assigned level, as needed.

perform beyond levels required for an application. Alternatives do not need to achieve levels beyond application requirements in order to meet the law’s criteria for safer alternatives.

Cost and Availability Module

The contractor will perform an assessment of cost and availability. RCW 70.95G.010 (6) defines “safer alternative” as a substance or chemical that “. . . can be . . .economically substituted . . .” RCW 70.95G.070 (3) specifies that a safer alternative must “. . . be readily available in sufficient quantity and at a comparable cost.” The IC2 Guide Cost and Availability Module uses similar cost comparison language.

Given the apparent widespread use of PFAS-free food packaging, food service businesses are clearly willing to purchase PFAS-free products in the same markets where PFAS-containing products are used (Andrews & Walker, 2017; Schaidler, et al., 2017). The contractor will engage interested parties and experts to develop data on the costs of PFAS-free alternative products relative to PFAS-based products in specific applications.

The contractor will propose decision rules to address the cost and availability criteria that meet the provisions in the law. Cost and availability should be addressed in an order (and in time) to benefit the prioritization of chemicals for hazard assessment. Ecology must approve the decision rules regarding cost and availability.

Exposure Assessment Module

The contractor will perform an assessment of exposure. This includes a narrative explanation of primary exposure from food contact packaging to food, other use-phase exposures, and end-of-life exposures.

Local jurisdictions in Washington State, such as Seattle/King County, may send food packaging waste from households and businesses to composting facilities. Packaging chemicals or degradates can re-enter the food cycle when this compost is applied in commercial agriculture or home gardens (Bräunig, Baduel, Barnes, & Mueller, 2019; Bizkarguenaga, Zabaleta, Prieto, Fernández, & Zuloaga, 2016). Stormwater runoff associated with compost applications leads to further environmental exposures. Ecology will approve any decision rules for the exposure module.

Safer Alternative Determination

Ecology will make a determination of whether the assessed food packaging products meet the law’s definition of safer alternatives. Tables 1 (above) and 3 (below) identify key decision authorities for the AA process. Ecology will report safer alternative determinations for external peer review. Ecology’s findings and feedback from the peer review will be reported to the legislature and published in the Washington State Register.

Ecology Decision Authority

Table 3. Key decisions and the roles for contractor(s) and Ecology.

| DECISION POINT | CONTRACTOR ROLE | ECOLOGY ROLE |
|--|---|--|
| DECISION RULES <ul style="list-style-type: none"> • DETAILS DESCRIBED IN TABLE 1. | Develop decision rules. | Approve decision rules. |
| SELECTION OF ALTERNATIVE TREATMENT (NON-PFAS) CHEMICALS, AS APPLICABLE | Identify candidate food contact substance formulations and recommends ingredients for hazard and exposure evaluation. | Select the alternative chemical formulation(s) prioritized for evaluation. Approve the specific list of substances for hazard and exposure evaluations. Substances may include and are not necessarily limited to ingredients, manufacturing intermediates, transformation products, and impurities. |
| SELECTION OF PRODUCT OR PRODUCT GROUPS | Recommend product or product groups. | Select product or product groups. |
| EVALUATE ALTERNATIVE PRODUCT OR PRODUCT GROUPS | Recommend product or product group for evaluation. | Select product or products for evaluation. |
| PEER REVIEW | No role. | Select peer review group and submit findings for their review. |
| FINAL REPORT ALTERNATIVE RECOMMENDATIONS | No role. | Prepare final report to legislature and publish in the Washington State Register. |

Appendix

Timeline and Deliverables (in process)

References

- Andrews, D., & Walker, B. (2017, February 1). *Many Fast Food Wrappers Still Coated in PFCs, Kin to Carcinogenic Teflon Chemical*. Retrieved from Environmental Working Group: <https://www.ewg.org/research/many-fast-food-wrappers-still-coated-pfcs-kin-carcinogenic-teflon-chemical#.W18wfNVKj0N>
- Begley, T., White, K., Honigfort, P., Twaroski, M., Neches, R., & Walker, R. (2005). Perfluorochemicals: potential sources of and migration from food packaging. *Food additives and contaminants*, 22(10), 1023-1031.
- Bizkarguenaga, E., Zabaleta, I., Prieto, A., Fernández, L., & Zuloaga, O. (2016). Uptake of 8:2 perfluoroalkyl phosphate diester and its degradation products by carrot and lettuce from compost-amended soil. *Chemosphere*, 152, 309-317.
- Bräunig, J., Baduel, C., Barnes, C., & Mueller, J. (2019, 1 1). Leaching and bioavailability of selected perfluoroalkyl acids (PFAAs) from soil contaminated by firefighting activities. *Science of The Total Environment*, 646, 471-479.
- Cedar Grove. (n.d.). *Stormwater Solutions - Cedar Grove | Organic Compost*. Retrieved from <https://cedar-grove.com/commercial/stormwater-solutions>
- Center for Environmental Health. (2018). *CEH Report: A Purchaser's Guide to Safer Foodware - Center for Environmental Health | Center for Environmental Health*. Retrieved from <https://www.ceh.org/ceh-report-avoiding-hidden-hazards-purchasers-guide-safer-foodware/>
- Clean Production Action. (2018). *How to purchase PFAS-free food service ware*. Retrieved from <https://www.cleanproduction.org/resources/entry/avoid-pfas-new-fact-resources>
- Interstate Chemicals Clearinghouse (IC2). (2017). *Interstate Chemicals Clearinghouse Alternatives Assessment Guide Version 1.1*. Retrieved from http://theic2.org/article/download-pdf/file_name/IC2_AA_Guide_Version_1.1.pdf
- Rice, P. (2015). C6-Perfluorinated Compounds: The New Greaseproofing Agents in Food Packaging. *Current environmental health reports*, 2(1), 33-40.
- Schaider, L., Balan, S., Blum, A., Andrews, D., Strynar, M., Dickinson, M., . . . Peaslee, G. (2017, 3 14). Fluorinated Compounds in U.S. Fast Food Packaging. *Environmental Science and Technology Letters*, 4(3), 105-111.
- TAPPI. (n.d.). *TAPPI Test Methods*. Retrieved from <https://www.tappi.org/standards-and-methods/test-methods/>
- Trier, D., Taxvig, C., Rosenmai, A., & Pedersen, G. (2018). *PFAS in Paper and Board for Food Contact*. Nordic Council of Ministers.