



March 2, 2023

Washington State Department of Ecology
Toxics Cleanup Program
PO Box 47600
Olympia, WA 98504-7600
Centralia, Washington

Re: Comments on Draft Guidance for Investigating and Remediating PFAS Contamination in Washington State, Draft for Public Comment
December 2022
Publication 22-09-058

To Whom it May Concern:

Thank you for providing a public comment period for the Draft Guidance for Investigating and Remediating PFAS Contamination in Washington State (Guidance), dated December 2022. A team of 7 TRC professionals have each reviewed one to two sections of the document and have prepared written comments for review and consideration by the Washington State Department of Ecology (Ecology) Toxics Cleanup Program for inclusion in the final Guidance. Our overall impression is that the draft Guidance is a well-written and comprehensive document that presents a significant amount of technical and regulatory information in a logical and orderly format. We are hopeful that our review comments and questions will be a valuable and respectful addition to the public comment process.

CHAPTER 3. ADVISORY, ACTION, AND CLEANUP LEVELS, AND HISTORICAL INVESTIGATORY LEVELS

1. Section 3.0 Paragraph 2: We suggest that the document clarify why MTCA CULs would include RSCs. It is our understanding that RSCs are not incorporated into standard MTCA CULs. This would make PLPs for an environmental release liable for background conditions. MTCA normally takes background conditions into account.
2. Section 3.1.1 Paragraph 1: Estimation of RSCs from drinking water is appropriate for DOH, but similar to our comment above, we suggest that the document clarify how RSCs are appropriate for MTCA.
3. Section 3.1.1 Paragraph 3: Please clarify the duration of breast- or bottle-feed.
4. Section 3.2 Paragraph 1: It is our understanding that presence of COC above a CUL does not in itself trigger a cleanup. To our understanding, there must be actual or potential exposure. "Cleanup" is different from remediation or remedial action. Remedial action can include monitoring. It may be appropriate to modify to "may warrant."
5. Section 3.2 Paragraphs 3 and 4: Please clarify why non-carcinogenic effects are not included.
6. Section 3.2.1 Title: Section 3.2.1 does not discuss CUL equations. Consider rewording.
7. Section 3.2.1 Paragraph 4: Please differentiate oral RfD (RfDo) from inhalation RfD, as this is important under MTCA.

8. Section 3.2.3 Paragraph 4: Change “hazard index” to “hazard quotient” per regulation.
9. Section 3.2.3 Paragraph 4: Please clarify if data indicate the target organ or toxic endpoint for the individual compounds, or whether the reader should assume they affect the same organ.
10. Section 3.2.3 Paragraph 6: The statement “Until Ecology determines that the DOH SALs are an ARAR for a site” appears to conflict with the earlier discussion that SALs likely will be ARARs. SALs are listed in CLARC.
11. Section 3.2.3 Paragraph 6: Please clarify whether SALs or MTCA B/C CULs are to be used and when.
12. Please clarify if adjustments to soil cleanup levels will be allowed based on site-specific exposure and site-specific soil characteristics per WAC 173-340-740(3) or 173-340-740 (5).
13. Section 3.4 Paragraph 1: We suggest changing “contamination” to “identified in a drinking water supply well.”
14. Section 3.4 Paragraph 1: Please clarify the term “Investigatory Levels (ILs).”

CHAPTER 4. SAMPLING FOR PFAS

1. Section 4.2, Paragraph 1: The text references EPA Method 537 being published in 2009. According to the EPA website, it was published in 2008.
2. The link to Method 537.1 is currently connected to EPA Method 533, not EPA Method 537.1.
3. The text states the document was updated in November 2018 to Method 537.1. However, it was also updated in March 2020 to EPA 537.1, revision 2.
4. Section 4.3.3: This section should reference Table B-24 in the DoD QSM in relation to EPA method 1633 instead of Table B-15. This is consistent with the intent of Table B-24.
5. Section 4.4.3: Call-out box: Correct acronym to read “PTFE”.
6. It might be helpful to provide guidance on the state’s expectation for how laboratories should handle aqueous samples with elevated levels of total suspended solids. Some laboratories centrifuge and decant the aqueous layer off for extraction only. However, some laboratories centrifuge and decant the aqueous layer off for extraction and also perform a separate extraction of the remaining particulate phase and combine both extracts for a “total” measurement. TRC has observed differences in results using these techniques due to the higher likelihood of longer-chain PFAS and sulfonate PFAS to adhere to the particulate.
7. Please clarify if there are preferences to how groundwater is sampled (e.g., low-flow, bailer, Hydrasleeve, etc.)

CHAPTER 5. PROTECTIVE CONCENTRATIONS FOR ECOLOGICAL RECEPTORS

1. Section 5.1: We suggest that the *Draft Recommended Aquatic Life Ambient Water Quality Criteria for PFOA and PFOS* (<https://www.federalregister.gov/documents/2022/05/03/2022-09441/draft-recommended-aquatic-life-ambient-water-quality-criteria-for-perfluorooctanoic-acid-pfoa-and-pfos>) be referenced/included here.

CHAPTER 6. TREATMENT TECHNOLOGIES

1. Section 6.0, Paragraph 2, Sentence 2: “ongling” should be “ongoing”.

2. Section 6.0: Paragraph 4: We recommend including a discussion about the importance of PFAS that are not included in approved analytical method lists, like precursor compounds. These compounds can affect mass removal calculations and can be transformed to PFAA end products depending on treatment conditions.
3. Section 6.1, Paragraph 1: We suggest clarifying that for complex waste streams such as municipal and industrial wastewater and landfill leachate, pre-treatment for co-contaminants is typically required prior to PFAS removal.
4. Section 6.1.1.3: When discussing pre-treatment to remove particulates, it is unclear what particulates are being referenced. We suggest clarifying that pre-treatment may be required to control bacterial growth on the membrane. Also, in the final sentence, we suggest adding “treatment or disposal” of reject water, as the reject may be too concentrated to treat.
5. Section 6.2.2: For clarity, we suggest that the sentence: *To minimize further leaching of PFAS compounds from source materials, strong consideration should be given to stabilization or thermal treatment of the media prior to final management.* be modified slightly to: *To minimize further leaching of PFAS compounds from source materials, strong consideration should be given to stabilization of the media prior to landfill disposal.*
6. Section 6.2.2: Due to the long-term stability of PFAS, how a landfill or disposal facility manages leachate should be considered when evaluating off-site management and disposal options. For example, is the leachate treated and discharged to a local wastewater treatment plant, managed on-site through evaporation ponds (e.g., US Ecology Beatty), etc.
7. Section 6.2.3: We recommend that Ecology consider referencing the following reports in this section:
 - a. *EA Engineering and Montrose Environmental Group. 2021. Final Report on PFAS Destruction Testing Results at Clean Harbors’ Aragonite, Utah Hazardous Waste Incinerator. November 2021.* This will help substantiate the statement regarding field-scale testing.
 - b. *Incineration to Manage PFAS Waste Streams, EPA 2019.* A statement could also be added noting that per EPA, PFAS thermal destruction technologies are not well-understood, and research is ongoing. https://www.epa.gov/sites/default/files/2019-9/documents/technical_brief_pfes_incineration_ioaa_approved_final_july_2019.pdf
8. Section 6.2.4: We recommend that Ecology consider removing the subject of soil washing from the discussion. To our knowledge, soil washing for PFAS is not yet at the field-demonstrated level.

APPENDIX A. TABLES WITH SUPPORTING CALCULATIONS FOR HUMAN HEALTH PROTECTIVE CLEANUP LEVELS

1. Table A-1, Parameter: Potable water ingestion for PNFA. “PNFA” should be “PFNA”.
2. Table A-2, Parameter: Soil contact for PFOS+PFOA+PNFA. “+PNFA” should be removed.
3. Table A-2, Parameter: Soil contact for PNFA. “PNFA” should be “PFNA”.
4. As noted in the January 2023 DOE CLARC master data table, soil to groundwater cleanup level calculations should use Henry’s law constants at 13 degrees Celsius, whenever available. Table A-3a uses Henry’s law constant at 25 degrees Celsius. The following comments are based on the observed differences in the DOE CLARC master data table and Table A-3a:

- a. The value “nm” in Table A-3a of PFOS, parameter: Henry’s law constant Hcp may be incorrect based on the value of 4.43E-07 published in the DOE CLARC master data table.
- b. The value “4.0E-06” in Table A-3a of PFOA, parameter: Henry’s law constant Hcp may be high based on the value of 3.57E-06 published in the DOE CLARC master data table.
- c. The value “0.0E+00” in Table A-3a of PFOS, parameter: Henry’s law constant Hcc may be low based on the value of 1.81E-05 published in the DOE CLARC master data table.
- d. The value “1.2E-04” in Table A-3b of Vadose Zone, parameter: Soil leaching SL for PFNA may be high based on the value of 8.00E-05 published in the DOE CLARC master data table.
- e. The value “7.5E-06” in Table A-3b of Saturated Zone, parameter: Soil leaching SL for PFNA may be high based on the value of 4.80E-06 published in the DOE CLARC master data table.
- f. The value “4.4E-04” in Table A-3b of Vadose Zone, parameter: Soil leaching SL for PFHxS may be high based on the value of 4.10E-04 published in the DOE CLARC master data table.
- g. The value “2.8E-05” in Table A-3b of Saturated Zone, parameter: Soil leaching SL for PFHxS may be high based on the value of 2.60E-05 published in the DOE CLARC master data table.
- h. The value “6.8E-03” in Table A-3b of Vadose Zone, parameter: Soil leaching SL for PFBS may be high based on the value of 1.80E-03 published in the DOE CLARC master data table.
- i. The value “4.5E-04” in Table A-3b of Saturated Zone, parameter: Soil leaching SL for PFBS may be high based on the value of 1.20E-04 published in the DOE CLARC master data table.

The authors wish to thank Ecology for the opportunity to provide comments on this important draft document.

Sincerely,



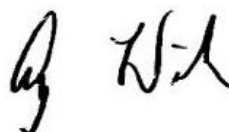
Clint Miller, PhD, LG
Senior Project Manager



Thomas Morin, LG
Principal Geologist



Elizabeth Denly
PFAS Initiative Leader / Chemistry Director



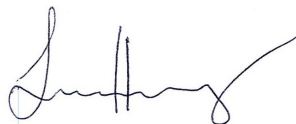
Amy Wilson, PhD, PE
Principal Engineer



Ruth Otteman, LG
Senior Geologist



Faith Morse
Environmental Intern



Lee Hovey
Senior Engineer