January 12, 2026

Washington State Department of Ecology
Southwest Region Office
PO Box 47775
Olympia, WA 98504-7775

Submitted via: swrowqpermits@ecy.wa.gov

Re: Comments on Draft State Waste Discharge Permit No. ST0006154 (Analog Devices)

Dear Agency,

On behalf of CHIPS Communities United (CCU), the Center for Public Environmental Oversight (CPEO), Bend the Curve, Clean Water Action, and the undersigned organizations, we respectfully submit the following comments to the Washington State Department of Ecology on the Draft State Waste Discharge Permit No. ST0006154 for Analog Devices, Inc. located at 4200 Northwest Pacific Rim Boulevard, Camas, Washington.

CCU is a national coalition organizing for an equitable and sustainable semiconductor manufacturing industry. CCU includes labor, environmental, social justice, civil rights, and community organizations representing millions of workers and community members nationwide. Based in Silicon Valley, CPEO experts have been working to clean up the semiconductor industry since the 1970s. Bend the Curve is a nonprofit research institute that promotes safer alternatives to petrochemicals and plastics. Clean Water Action is a national nonprofit that has worked to win strong health and environmental protections by bringing issue expertise, solution-oriented thinking, and people power to the table.

The semiconductor industry is known to use and discharge a wide range of harmful chemicals, including per- and polyfluoroalkyl substances (PFAS). We are particularly concerned about the monitoring, treatment, and prevention of PFAS discharges, especially given their potential to impact the Columbia River. The Columbia River is a critical source of drinking water; the host to Chinook, Coho, and Sockeye salmon runs; and home to numerous indigenous nations.

Given the well-documented risks these chemicals pose to human health and the environment, it is imperative that the Department of Ecology thoroughly plan for and address PFAS discharges from Analog Devices, as well as from the semiconductor industry as a whole. As currently drafted, this permit falls short of addressing PFAS discharges from Analog Devices. The permit's lack of pollution limits and minimal monitoring requirements for PFAS are inadequate to protect water quality, the environment, and the health of workers as well as surrounding communities.

In this comment, we call on the Department of Ecology to:

- Significantly expand requirements to monitor, identify, quantify, and characterize all PFAS discharged by Analog Devices.
- Expand the locations and frequency of PFAS monitoring.
- Expand the universe of PFAS being regulated and establish a goal of complete elimination of PFAS discharges.
- Require Analog Devices to implement a robust PFAS minimization and management plan.
- Ensure the permit remains flexible for the rapidly evolving industry.
- Ensure adequate tribal consultation.

The Department of Ecology has been a leader in addressing PFAS contamination, and improving this permit provides an opportunity to extend that leadership to the semiconductor industry. Strengthening this permit would not only address a significant source of harmful discharge but would also position the State of Washington at the forefront of regulating PFAS discharges.

By strengthening PFAS monitoring, treatment, and minimization requirements in the State Waste Discharge Permit for Analog Devices, the Department of Ecology can ensure this industry is held accountable for their PFAS discharges and help prevent further contamination of the Columbia River, drinking water sources, and nearby communities.

I. Background

Analog Devices

Analog Devices, Inc. is a semiconductor integrated circuit fabrication facility, Standard Industrial Classification (SIC) Code number for the facility is 3674. Analog Devices manufactures 6-inch diameter wafers for semiconductor devices. According to the permit's fact sheet, their current production estimates are approximately 5,000 wafers per week by end of 2025.

Analog Devices uses the following processing steps: diffusion, oxidation, photolithography, deposition, etching, cleaning, and grinding. Supporting operations include air handling, fume wet scrubbers, cooling water, and reverse osmosis to produce de-ionized water. Wastewater sources are neutralized acid wastewater, treated hydrofluoric acid wastewater, process rinse water, gray water, reverse osmosis reject waste, condensate, fume control scrubber blowdown, cooling water, boiler blowdown, and cooling tower blowdown. Gray water, RO reject water, and 2 condensate streams are recycled into the fume control system.

Analog Devices has two main treatment processes: acid wastewater neutralization (AWN) using sodium hydroxide, and the fluoride treatment system (FTS), which precipitates fluoride as calcium fluoride using calcium chloride. FTS discharge, scrubber blowdown, and excess gray water are treated in the AWN system, then discharged through Compliance Point 002.

All waste streams from Analog Devices discharge to the City of Camas sewer at Outfall 001. The City of Camas Publicly Owned Treatment Works (POTW) ultimately discharges into the Columbia River.

The Columbia River

The Columbia River is a vital tributary and the lifeblood of the Pacific Northwest. It serves as a critical drinking water source and supports rich biological diversity, including Chinook, Coho, and Sockeye salmon. The river is widely used for fishing, swimming, and other recreational uses. Columbia River tribes have depended on native fish species, such as salmon, for thousands of years.[1] The Columbia River's designated beneficial uses include drinking water, aquatic life (including salmonid spawning, rearing and migration), as well as recreation.[2]

Significant Adverse Effects Associated with PFAS

According to the Environmental Protection Agency (EPA), PFAS are "an urgent public health and environmental issue facing communities across the United States."[3] PFAS are a class of thousands of different human-made chemicals that contain one or more fully-

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[1] EPA, Columbia and Lower Snake Rivers Temperature Total Maximum Daily Load (August 13, 2021) https://www.epa.gov/system/files/documents/2022-06/tmdl-columbia-snake-temperature-errata-update-05102022.pdf

[2] EPA, Columbia River Water Body Report, https://mywaterway.epa.gov/waterbody-report/WA_ECOLOGY/WA170800030200_02_02 (Accessed January 8, 2026).

[3] EPA, PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021), https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

fluorinated carbon atoms. Since their introduction in the 1940s, PFAS compounds have been widely used in many manufacturing processes as well as countless consumer products. PFAS chemicals are notable because their carbon-fluorine bonds are very resistant to degradation, resulting in extremely long lifetimes. Known as "forever chemicals," PFAS are highly persistent and mobile in the environment, easily traveling through streams, rivers, and other water bodies, including drinking water sources.[4] This persistence acts as a force-multiplier for toxicity.

Because they break down very slowly, PFAS can easily bioaccumulate in human beings, wildlife, and the environment over time.[5] PFAS are highly toxic and linked to serious health problems, including damage to liver, thyroid, and pancreatic function; increased risk of high blood pressure or pre-eclampsia in pregnant women; developmental delays; immune system harm; hormone disruption; increased cholesterol levels; and increased risk of kidney or testicular cancer.[6,7]

PFAS have already been a major concern in the region. The City of Camas has reported multiple drinking water violations for PFAS, including over the Summer of 2025 when PFAS levels reached nearly ten times the EPA's action level of 4 parts per trillion.[8, 9,10] Of particular concern in this region is the bioaccumulation in aquatic life, especially fish. The Columbia River supports important Chinook, Coho, and Sockeye salmon runs. Yet fish in the river have been found to be so contaminated with PFAS that the state of Oregon has issued a health advisory warning people not to consume fish from the Columbia Slough.[11,12]

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[4] Ian T. Cousins et al., Why is High Persistence Alone a Major Cause of Concern?, 21 Env't Sci. Process Impacts 781, 785 (2019), https://pubs.rsc.org/en/content/articlelanding/2019/em/c8em00515j
[5] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks
[6] EPA, *Our Current Understanding of the Human Health and Environmental Risks of PFAS*, https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks
[7] CDC, *How PFAS Impacts Your Health*, https://www.atsdr.cdc.gov/pfas/about/health-effects.html?CDC_AAref_Val=https://www.atsdr.cdc.gov/pfas/health-effects/index.html
[8] City of Camas, "PFAS and the Camas Water System" https://engagecamas.com/pfas-and-the-camas-water-system (Accessed January 7, 2026).
[9] The Columbian, "Camas residents concerned about safety of city's water supply; some eye area's microchip makers" (September 12, 2024) https://www.columbian.com/news/2024/sep/12/camas-residents-concerned-about-safety-of-citys-water-supply-some-eye-areas-microchip-makers/ (Accessed January 7, 2026).
[10] Camas Post Record, "PFAS at Camas' Well 13 the 'highest we've seen' says utilities manager" (July 24, 2025) https://www.camaspostrecord.com/news/2025/jul/24/pfas-at-camas-well-13-the-highest-weve-seen/ (Accessed January 7, 2026).
[11] Nilsen, E. et al, Target and suspect per- and polyfluoroalkyl substances in fish from an AFFF-impacted waterway (January 1, 2024). https://pubmed.ncbi.nlm.nih.gov/37838049/
[12] City of Portland, "Columbia Slough Fish Advisory"

PFAS Usage in the Semiconductor Industry

The Semiconductor Industry Association (SIA) acknowledges the use of many PFAS compounds in semiconductor fabrication-related processes, including photolithography, wet chemical processing, plasma etch and deposition, assembly and packaging materials, among others.[13] As described above, several of these PFAS-intensive processes take place at the Analog Devices facility, including photolithography and etching.

Semiconductor manufacturers are known to use and discharge a wide array of PFAS, posing a "substantial risk for PFAS contamination of the environment."[14] One investigation at a semiconductor manufacturing facility detected 78,000 parts per trillion (ppt) of PFAS in wastewater from some samples, compared to EPA's proposed limit of 4 ppt for some PFAS in drinking water.[15]

In addition, semiconductor production is an innovative and constantly evolving industry. Over the past two decades, semiconductor manufacturers have reduced or replaced the use of certain PFAS. For example, long-chain PFAS compounds such as PFOS (perfluorooctane sulfonic acid) have been replaced by short-chain PFAS, and the use of PFOA (perfluorooctanoic acid) has been phased out.[16] Therefore, it is critical the permit remains flexible to account for ongoing changes in the semiconductor industry.

Overall, it is imperative that the Department of Ecology adequately plan for and address PFAS discharges, especially as they relate to Analog Devices, to ensure that surrounding communities do not suffer any further burdens.

II. Regulatory Context

Clean Water Act Effluent Limitation Guidelines (ELGs) and the National Pretreatment Program

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https://www.portland.gov/bes/protecting-rivers-streams/columbia-slough-fish-advisory

[13] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

[14] National Institute of Standards and Technology, Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program (June 28, 2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf (C-15)

[15] Tom Perkins, "Industry acts to head off regulation on PFAS pollution from semiconductors"The Guardian (August 24, 2024) https://www.theguardian.com/environment/article/2024/aug/24/pfas-toxic-waste-pollution-regulation-lobbying

[16] Semiconductor Industry Association. Background on Semiconductor Manufacturing and PFAS (May 17, 2023) https://www.semiconductors.org/wp-content/uploads/2023/05/FINAL-PFAS-Consortium-Background-Paper.pdf

EPA promulgated the Electrical and Electronic Components (E&EC) Effluent Guidelines and Standards (40 CFR Part 469) in 1983. Subpart A regulates the semiconductor subcategory. In 2022, EPA conducted a detailed study of the E&EC category and concluded there was no need to revise the regulation at that time, but the study acknowledges that: "The PFAS data the EPA reviewed are limited; however, the EPA intends to continue to monitor discharges of PFAS from this category and expects to review additional data in the coming years to help identify any significant sources of these chemicals in future reviews."[17]

The Clean Water Act also establishes the National Pretreatment Program (40 CFR Part 403). The objectives of general pretreatment regulations[18] are to:

a. Prevent the introduction of pollutants into a POTW that will interfere with the operation of the POTW, including interference with its use or disposal of municipal sludge;
b. Prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works; and
c. Improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.

Under this program, any POTW with a total design flow greater than 5 million gallons per day (mgd) must implement a local pretreatment program to prevent pass-through and interference. Therefore, most of the responsibility of the pretreatment program falls on the local states or municipalities to establish pretreatment standards, local limits, and oversee compliance.

Safe Drinking Water Act Maximum Contaminant Levels (MCLs)

In 2024, EPA finalized enforceable Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) for PFOA and PFOS at 4 ppt, the lowest level that can be reliably measured in drinking water (40 CFR Part 141.61(c)(2)). Because research indicates that PFAS chemicals can cause health risks at lower levels and in mixtures, EPA has also finalized a hazard index approach to regulating four chemicals - PFHxS, HFPO-DA (GenX), PFNA, and PFBS -

[17] EPA, "Electrical and Electronic Components Effluent Guidelines" https://www.epa.gov/eg/electrical-and-electronic-components-effluent-guidelines (November 2022).
[18] 40 CFR Part 403.2

when they occur in mixtures. However, the Trump administration's EPA is currently working to eliminate the drinking water standards for those PFAS.[19]

EPA has Directed All Levels of Government to Limit PFAS Discharges

EPA's *PFAS Strategic Roadmap* stresses that all levels of government (federal, Tribal, state and local) must "exercise increased and sustained leadership to accelerate progress to clean up PFAS contamination, prevent new contamination and make game-changing breakthroughs in the scientific understanding of PFAS."[20]

States do not have to wait for EPA to finalize additional PFAS ELGs to address PFAS in water pollution permits. Nor are states limited to addressing pollutants and contaminants with preexisting effluent limitations or guidance values. To the contrary, the Clean Water Act requires permits to include "technology based effluent limitations and standards," including "case-by-case effluent limitations" when other values are not available.[21] As a state designated to implement the National Pollutant Discharge Elimination System (NPDES) program, Washington must adhere to these authorities.[22]

In December 2022, EPA issued a guidance memo directing states to use NPDES permits to limit discharges of PFAS to surface waters.[23] That memo affirms that "[s]ite-specific technology-based effluent limits (TBELs) for PFAS discharges developed on a best

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[19] Earthjustice, EPA Seeks to Eliminate Critical PFAS Drinking Water Protections, (September 12, 2025), https://earthjustice.org/press/2025/epa-seeks-to-roll-back-pfas-drinking-water-rules-keeping-millions-exposed-to-toxic-forever-chemicals-in-tap-water

[20] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

[21] 40 C.F.R. § 122.44(a)(1); *see also* 33 U.S.C. § 1342(a)(1)(B) (a discharge permit should include "such conditions as the Administrator determines are necessary to carry out the provisions of this chapter); *see also* EPA, *Technology-based Effluent Limits Flue Gas Desulfurization (FGD) Wastewater at Steam Electric Facilities*, attach. A *in National Pollutant Discharge Elimination System (NPDES) Permitting of Wastewater Discharges from Flue Gas Desulfurization (FGD) and Coal Combustion Residuals (CCR) Impoundments at Steam Electric Power Plants* at 2 (June 7, 2010), https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-1564.pdf) ("[A]n authorized state must include technology-based effluent limitations in its permits for pollutants not addressed by the effluent guidelines for that industry ... In the absence of an effluent guideline for those pollutants, the CWA requires permitting authorities to conduct the [best professional judgment] analysis discussed above on a case-by-case basis for those pollutants in each permit.").

[22] 40 C.F.R. § 123.25

[23] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

professional judgment (BPJ) basis may be appropriate for facilities for which there are no applicable effluent guidelines (see 40 CFR 122.44(a), 125.3)."[24] In addition, the memo makes specific recommendations for permit conditions (like monitoring requirements, Best Management Practices [BMPs], effluent limits, etc.), which states should require for industrial permittees known or suspected of discharging PFAS.

For example, for monitoring, the memo recommends using EPA Method 1633 at least quarterly to assess the presence and concentration of PFAS in discharges. In addition, if appropriate, the memo recommends the use of the adsorbable organic fluorine wastewater method (EPA Method 1621) in conjunction with EPA Method 1633. EPA's memo makes it clear that states and POTWs can use their existing water program authorities to address PFAS in wastewater discharges immediately.

Given recent high detections of PFAS in local groundwater, the Department of Ecology and the City of Camas should remain on high alert and exercise all authority to identify sources and limit the discharge of PFAS wherever those sources are known.[25,26,27]

III. The Department of Ecology Should Significantly Expand Requirements to Monitor, Identify, Quantify, and Characterize All PFAS Discharged by Analog Devices

Background. The draft permit would only require quarterly monitoring for PFAS compounds using EPA Method 1633/1633A, which provides a targeted analysis for approximately 40 PFAS. The permit proposes monitoring of the final wastewater effluent - Compliance Point 002 (Final Industrial Effluent to City of Camas POTW).

The proposed monitoring requirements cannot ensure adequate protection of water quality, human health, and the environment from the industrial use of PFAS by Analog Devices because they fail to determine:

- The chemical identity of most PFAS compounds in the wastewater discharge;
- The efficacy of PFAS removal by proposed treatment; and

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[24] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[25] City of Camas, "PFAS and the Camas Water System" https://engagecamas.com/pfas-and-the-camas-water-system (Accessed January 7, 2026).

[26] The Columbian, "Camas residents concerned about safety of city's water supply; some eye area's microchip makers" (September 12, 2024) https://www.columbian.com/news/2024/sep/12/camas-residents-concerned-about-safety-of-citys-water-supply-some-eye-areas-microchip-makers/ (Accessed January 7, 2026).

[27] Camas Post Record, "PFAS at Camas' Well 13 the 'highest we've seen' says utilities manager" (July 24, 2025) https://www.camaspostrecord.com/news/2025/jul/24/pfas-at-camas-well-13-the-highest-weve-seen/ (Accessed January 7, 2026).

- The impact of PFAS compounds on beneficial uses of all receiving waters.

PFAS and their breakdown products are extremely persistent, mobile, and toxic. Therefore, monitoring requirements should be designed to detect and quantify a broad spectrum of PFAS, such that a mass balance accounting of the fate and transport of all PFAS can be constructed. Only a comprehensive approach to monitoring using a variety of analytical methods can assist in virtually eliminating all PFAS releases to waterways.

Recommendations:

1. The permit should require Analog Devices to fully characterize and identify all PFAS present in its wastewater. This aim should be accomplished through the application of all the following methods, in addition to monitoring wastewater using Method 1633:
    a. Expanded targeted analysis enabled by requiring Analog Devices to provide high quality analytical reference standards and stable isotope-labeled standards for all unique PFAS used in its manufacturing process;
    b. Identification and quantification of ultra short-chain PFAS, through a method conducted by a qualified contract laboratory;
    c. Nuclear magnetic resonance spectroscopy (^{19}F NMR) to determine total organic fluorine, total polymeric fluorine, and total inorganic fluorine as a percent of total fluorine, in addition to providing information on chemical structure;
    d. EPA Method 1621 to determine total Adsorbable Organic Fluorine (AOF);
    e. Extractable Organic Fluorine (EOF), through a method conducted by a qualified contract laboratory;
    f. Total Organic Precursors (TOP) assay, conducted by a qualified contract laboratory;
    g. A non-targeted analysis using high-resolution mass spectrometry (HRMS) to characterize, semi-quantify, and identify PFAS compounds not detected by targeted analysis or measures of total organic fluorine; and
    h. The above data shall be submitted with a report that analyzes and interprets the monitoring results and computes and closes a mass balance of all fluorinated compounds present in the influent and effluent of the industrial wastewater treatment plant.

Rationale:

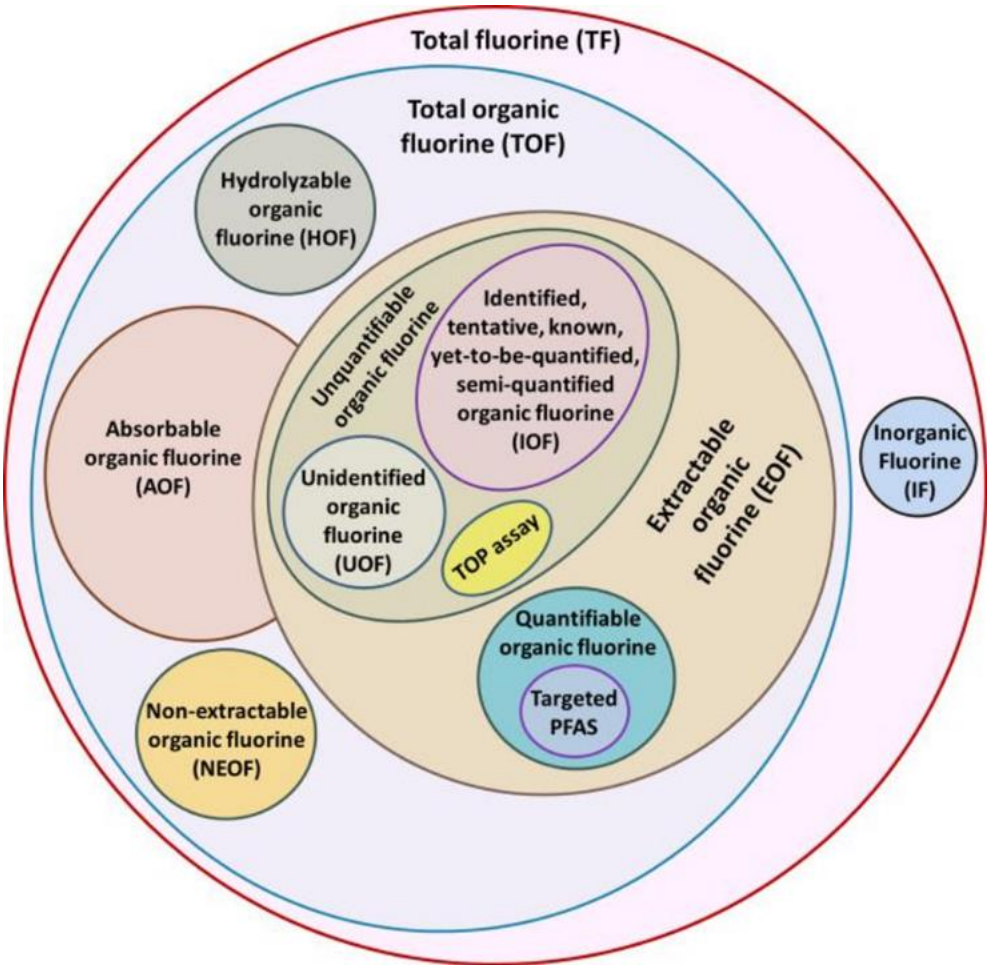
The draft permit would fail to detect the vast majority of PFAS that are present in Analog Devices' wastewater including many chemical compounds and breakdown products that are uniquely used in semiconductor manufacturing. Without more rigorous monitoring and ongoing efforts to identify the chemical identity of the specific PFAS present in Analog Devices' wastewater, it will be impossible to determine the effectiveness of wastewater treatment or the impact of the treated industrial effluent on the City of Camas POTW, biosolids, and the beneficial uses of the receiving waters.

Given that there are thousands of types of PFAS, of which over one hundred PFAS are known to be used by the semiconductor industry, and new PFAS are constantly being introduced, EPA Method 1633 is completely inadequate for identifying the full suite of PFAS in semiconductor wastewater discharge.

Method 1633 is a targeted analysis that identifies and quantifies only 40 chemical compounds in the PFAS class. **The peer-reviewed literature reports that targeted analysis often detects less than 10% of the total organic fluorine of environmental concern.**[28,29,30]

The figure below is a Venn diagram that illustrates how targeted analysis (small circle labeled "Targeted PFAS") such as Method 1633 captures only a small portion of PFAS compounds and how several other analytical methods that are routinely offered by contract laboratories enable a much broader characterization of PFAS in wastewater.

[28] Shelor, C. P.; Warren, C.; Odinaka, C. V.; Dumre, K. Comprehensive review of combustion ion chromatography for the analysis of total, adsorbable, and extractable organic fluorine. *J. Sep.Sci.* 2024, 47 (15), 2400235.
[29] Ersan, M. S.; WangWongWesterhoff, B. M. S. P.; Westerhoff, P. Advanced oxidation processes may transform unknown PFAS in groundwater into known products. *Chemosphere* 2024, 349, 140865.
[30] Schultes, L.; Vestergren, R.; Volkova, K.; Westberg, E.; Jacobson, T.; Benskin, J. P. Per- and polyfluoroalkyl substances and fluorine mass balance in cosmetic products from the Swedish market: implications for environmental emissions and human exposure. *Environ. Sci. Process. Impacts* 2018, 20 (12), 1680–1690.



Source: Ifeoluwa Grace Idowu, et al, A systematic review of methods for the analysis of total per- and polyfluoroalkyl substances (PFAS), Science of The Total Environment, Vol 967 (2025), https://doi.org/10.1016/j.scitotenv.2025.178644.

A recent journal article that reviewed analytical methods to characterize PFAS in the wastewater of semiconductor manufacturing facilities supports our recommendation: "The choice of the method used to cover a range of PFAS generally requires more than one analytical method, with some overlap between methods."[31]

Targeted analysis. For targeted analysis, this study concluded that "[T]o increase confidence in novel PFAS identified in semiconductor wastewater, high quality analytical standards and stable isotope-labeled standards will be needed."

Ultra short-chain PFAS. Regarding the need to measure for ultra short-chain PFAS, this study advised: "[T]he shift to short-chain PFAS by the semiconductor industry indicates

[31] Droz B, Heron CG, Kim-Fu ML, Reardon PN, Roig-Paul M, Field JA. Practical Guidance on Selecting Analytical Methods for PFAS in Semiconductor Manufacturing Wastewater. *ACS Meas. Sci. Au.* 2025, 5, 399-423.

that monitoring only for > [or equal to] C4 PFCAs or greater may miss many C1-C3 short-chain precursors, unless methods for ultra short-chain PFCAs are utilized."

Total organic fluorine. Further, these same scientists concluded: "[U]ntil analytical standards become available for all relevant PFAS present in semiconductor wastewater, investigations will require suspect and nontarget PFAS analysis that require sophisticated identification and data techniques." And: "[T]his review also stresses the need for advanced techniques, including high-resolution mass spectrometry for suspect and nontarget analysis as well as nonspecific methods for total organic and inorganic fluorine."

PFAS nuclear magnetic resonance (^{19}F NMR). The Semiconductor PFAS Consortium of the Semiconductor Industry Association (SIA) commissioned a study by chemists at the University of Toronto that successfully adapted an analytical method known as PFAS nuclear magnetic resonance **(**^{19}F NMR) spectroscopy to characterize PFAS in semiconductor industry wastewater.[32]

The method distinguishes total organic fluorine from total polymeric fluorine, indicators of PFAS that pose high environmental concern, from total inorganic fluorine, which presents a relatively low hazard. The results are expressed as a percentage of total fluorine. The method also provides data-driven clues that can help characterize the chemical structure of as-yet unidentified PFAS.

The study concluded that "[B]ased on these promising results, multiple member companies of the Semiconductor PFAS Consortium are moving forward with acquiring the necessary equipment to begin this type of analysis in-house to assist in identifying and quantifying PFAS constituents in semiconductor manufacturing process wastewater."

Given that this study has been published on the SIA website, and Analog Devices is a member of the Semiconductor PFAS Consortium, and the method provides invaluable data, Analog Devices should be required to apply these monitoring methods to its proposed wastewater discharge a recommended above.

Method 1621. As described above, the EPA's December 2022 memo recommends supplementing EPA Method 1633 with the Adsorbable Organic Fluorine (AOF) analysis

[32] Gauthier JR, Mabury SA (2025). ^{19}F NMR analysis of semiconductor manufacturing facility wastewater samples for the Semiconductor PFAS Consortium, University of Toronto, Department of Chemistry, July 22. Available from https://www.semiconductors.org/19f-nmr-analysis-of-semiconductor-manufacturing-facility-wastewater-samples/.

using EPA Method 1621, the only other EPA-approved standard analytical method for PFAS in wastewater.[33]

Non-targeted analysis. Non-target analysis is needed to identify more PFAS including novel PFAS from semiconductor processes that end up in the wastewater. This will help the Department of Ecology anticipate the introduction of new PFAS in semiconductor manufacturing and ensure that the permit remains protective.

Peer-reviewed literature demonstrates that targeted analysis of PFAS can only identify a fraction of the PFAS present in the wastewater of typical semiconductor fabrication facilities. For example, in a study of wastewater effluent from three semiconductor manufacturing plants, researchers found that the total PFAS concentration in wastewater determined through non-targeted analysis significantly exceeded the PFAS concentration indicated by a targeted analysis of 25 PFAS (all of which are included in EPA Method 1633).[38] In that study, Jacob et al. (2021) measured PFAS using the two different methods and found the following concentrations expressed as nanograms per liter (ng/L):

Semiconductor Facility	Targeted analytes (25 PFAS)	Non-targeted analytes (133 PFAS)	TOTAL PFAS (sum of two methods)	Percent of PFAS (mass) missed by targeted analysis
Fab 1	623	867	1,490	58%
Fab 2	394	78,006	78,400	99.5%
Fab 3	376	1,794	2,170	83%
Source: Jacob et al., Target and Nontarget Analysis of Per- and Polyfluoroalkyl Substances in Wastewater from Electronics Fabrication Facilities, 55 Env't Sci. & Tech. 2346 (2021), https://pubs.acs.org/doi/10.1021/acs.est.0c06690.				

The non-targeted analysis above revealed 41 homologous series of PFAS, which included 133 individual PFAS compounds. Chemical structures were proposed for 15 compounds, six of which were reported for the first time ever. None of these PFAS are detectable using EPA Method 1633.

[33] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

Other peer-reviewed non-targeted analyses have also characterized many PFAS in semiconductor industry wastewater that cannot be detected by targeted analysis,[34,35] such as through the use of Method 1633.

IV. The Department of Ecology Should Expand the Locations and Frequency of PFAS Monitoring

PFAS monitoring must be comprehensive in order to capture any variability of PFAS discharges. In addition to the need for robust identification and measurement of PFAS, the draft permit does not provide adequate monitoring for PFAS in terms of location and frequency.

Recommendations:

The draft permit should be amended to:

1. Expand the monitoring points from effluent at Outfall 001 to include sampling prior to any pretreatment, as well as effluent sampling at Outfall 001;
2. Increase the monitoring frequency from quarterly to, at minimum, monthly using the methods described above; and
3. Extend PFAS monitoring beyond 2026 and 2027, so that monitoring is required for the entire duration of the permit.

Rationale:

The draft permit's current monitoring requirements are insufficient to track the variability of PFAS discharges and the effectiveness of treatment. Monitoring prior to pretreatment is essential to better understand PFAS usage and sources within the facility, while effluent monitoring is necessary to assess the effectiveness of any treatment. Such monitoring is also needed to ascertain how much PFAS may be transferred to solid waste as treatment residues. Whether those solid residues are subject to PFAS destruction, which should be

[34] Chen, Y.-J.; Yang, J. S.; Lin, A. Y.-C. Comprehensive nontargeted analysis of fluorosurfactant byproducts and reaction products in wastewater from semiconductor manufacturing. *Sustain. Environ. Res.* 2024, 34, 14.

[35] Chen, Y. J.; Wang, R. D.; Shih, Y. L.; Chin, H. Y.; Lin, A. Y. Emerging perfluorobutane sulfonamido derivatives as a new trend of surfactants used in the semiconductor industry. *Environ. Sci. Technol*. 2024, 58 (3), 1648−1658.

required, or simply transferred to another environmental media, such as landfill leachate, is an important consideration.

In addition, limiting monitoring to quarterly sampling at a single effluent location (Outfall 001) will fail to provide sufficient data to assess the types, amounts, and the potential for pass-through of PFAS. Quarterly monitoring would provide a very limited snapshot of PFAS discharges. Increasing the frequency of monitoring from quarterly to at least monthly is necessary to capture variability in PFAS discharges, given known fluctuations in the manufacturing processes.

As currently drafted, the permit only requires PFAS monitoring in 2026 and 2027, without providing any clear explanation for this limitation. Given that Analog Devices is known to be a significant discharger of PFAS, monitoring should be required for the entire duration of the permit.

Therefore, the draft permit must be updated to expand the monitoring points for PFAS, monitoring frequency, and monitoring duration.

V. The Department of Ecology Should Expand the Universe of PFAS Being Regulated and Establish a Goal of Complete Elimination of PFAS Discharges

Recommendations:

The permit should be amended to ensure that no PFAS are discharged into surface waters. To achieve this, the draft permit should be amended to:

1. Expand the universe of PFAS being regulated;
2. Establish a zero-discharge goal for PFAS; and
3. Require the use of treatment technologies that destroy PFAS.

Rationale:

The draft permit does not establish any specific effluent limits for PFAS. In addition, it appears that the NPDES permit for the Camas Wastewater Treatment Plant and the technology-based local limits for the Camas Wastewater Treatment Plant do not identify PFAS as pollutants of concern and do not set any limits or treatment requirements for

PFAS.[36,37] Nonetheless, as described above, EPA affirms that "[s]ite-specific technology-based effluent limits (TBELs) for PFAS discharges developed on a best professional judgment (BPJ) basis may be appropriate for facilities for which there are no applicable effluent guidelines (see 40 CFR 122.44(a), 125.3)."[38]

The CHIPS Program Office (2024) *Final Programmatic Environmental Assessment for the Modernization and Expansion of Existing Semiconductor Fabrication Facilities* contains considerable detail about the use of PFAS in wafer fabrication.[39] Appendix C of that document includes a 10-page table describing the over one hundred types of PFAS used by the semiconductor industry. Furthermore, these compounds undergo transformations during semiconductor production. Consequently, one can expect thousands of different PFAS chemicals to exist in semiconductor plant wastewater.

Managing PFAS through limits for one chemical at a time will take years, delay critical protections, and may encourage the creation of alternatives that are just as harmful to skirt around protections. Given the persistent, bioaccumulative, and toxic nature of PFAS, the Department of Ecology should require a zero-discharge goal for PFAS from all industrial uses. Every additional release of PFAS builds up in the local, regional and global environment, leading to contamination of drinking water supplies, fish, wildlife, livestock, and in humans. It is especially important to control PFAS at point sources such as Analog Devices.

The permit described that Analog Devices has two main treatment processes: acid wastewater neutralization (AWN) using sodium hydroxide, and the fluoride treatment system (FTS), which precipitates fluoride as calcium fluoride using calcium chloride. Although reverse osmosis is mentioned briefly on page 9 of the fact sheet, it is unclear at what point it takes place and whether it is used prior to discharging to the City of Camas POTW. Nonetheless, reverse osmosis does not destroy PFAS, and instead generates a concentrate containing high levels of PFAS that must be transported off-site for disposal.

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[36] Department of Ecology, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT WA0020249 (Camas Wastewater Treatment Plant) Issuance Date: July 1, 2025.

[37] Jacobs, "Technically Based Local Limits for the Camas Wastewater Treatment Plant" (September 2019) https://www.cityofcamas.us/sites/default/files/fileattachments/public_works/page/9212/technicallybasedlocallimits.pdf

[38] EPA, Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs (Dec. 5, 2022), https://www.epa.gov/system/files/documents/2022-12/NPDES_PFAS_State%20Memo_December_2022.pdf

[39] National Institute of Standards and Technology, *Final Programmatic Environmental Assessment for Modernization and Expansion of Existing Semiconductor Fabrication Facilities under the CHIPS Incentives Program* (June 28,2024), https://www.nist.gov/system/files/documents/2024/06/28/Final%20PEA%20for%20Modernization%20and%20Expansion%20of%20Semiconductor%20Fabs%206-28-2024%20-%20OGC-508C.pdf

This concentrated waste stream poses numerous environmental and public health concerns, including:

- Exposure for workers who handle these wastes
- Potential exposure during transport of wastes through local communities
- Likely exposure in the vicinity of waste disposal sites, often sited near communities of color and low-income communities

Industrial dischargers of PFAS-containing wastewater, such as Analog Devices, should therefore be required to use treatment methods that destroy PFAS.

A growing variety of technologies exist which are capable of destroying PFAS (breaking the C-F bond). (See for example https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/) These include:

- Supercritical water oxidation (SCWO)
- Hydrothermal alkaline Treatment (HALT)
- Electrochemical oxidation
- Surface Plasma

For further information see:

1) U.S. Department of Defense-funded PFAS demo projects show promise for remediation and destruction (A. Reese, Waste Dive, Dec. 1, 2025) https://www.wastedive.com/news/dod-pfas-destruction-disposal-demos-waste/805991/
2) Competition to destroy 'forever chemicals' heats up (B. Erikson, Chem & Eng, News, Mar. 4, 2024) https://cen.acs.org/environment/persistent-pollutants/Competition-destroy-forever-chemicals-heats/102/i7

Because Analog Devices is a significant source of PFAS and the complete elimination of PFAS is both technically feasible and available, the Department of Ecology should not permit the discharge of any PFAS into surface waters.

VI. Analog Devices Should Be Required to Implement a Robust PFAS Minimization and Management Plan, Updated Annually

Recommendations:

The Department of Ecology should require that Analog Devices develop and implement a PFAS Minimization and Management Plan. The Department of Ecology must ensure that the PFAS Minimization and Management Plan:

1. Identifies the ways the facility uses, generates, or releases PFAS.
2. Requires a comprehensive PFAS inventory with known or suspected PFAS compounds present, final deposition, and purpose of use.
3. Requires that Analog Devices obtain and provide analytical reference standards for every PFAS used in their facility, so those PFAS can be detected in wastewater effluent and in the environment.
4. Establishes a monthly PFAS monitoring plan that includes sampling before and after any pretreatment, using the methods described above. The results should be made publicly available online promptly after the results are available.
5. Requires the use of safer, non-PFAS alternatives, wherever feasible.
6. Prohibits the discharge to surface waters or groundwater of any wastewater containing PFAS at concentrations exceeding background levels, using best management practices and optimized treatment.
7. Establishes reporting requirements and requires receipt of all data within 30 days of sampling.

Rationale:

In EPA's *PFAS Strategic Roadmap*, EPA identifies the need to prevent "PFAS from entering the environment in the first place—a foundational step to reducing the exposure and potential risks of future PFAS contamination."[40] The industrial pretreatment program is an integral part of the Clean Water Act, requiring indirect industrial dischargers to reduce or eliminate the discharge of harmful pollutants to POTWs.

Under the Clean Water Act, industrial facilities are prohibited from sending any pollutant or wastewater to a POTW if the wastewater contains pollutants that will "pass through" the facility if inadequately treated prior to discharge into receiving water. Without PFAS-specific requirements, the City of Camas POTW may be held accountable for pass-through releases of toxic PFAS compounds. In addition, accountability for pass-through releases of PFAS into the environment might add to the cost of operating the POTW. Therefore, the permit should institute a PFAS Minimization and Management Plan.

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[40] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024 (Oct. 2021)*, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf

Through the development of a PFAS Minimization and Management Plan, the Department of Ecology would better understand the types and quantities of PFAS present in the effluent being sent to the POTW. A robust PFAS Minimization and Management Plan would also help inform the monitoring requirements and treatment technologies necessary to effectively monitor, manage, and eliminate PFAS. Without these improvements, the Department of Ecology and the City of Camas will lack the information necessary and be unable to prevent the pass-through of toxic PFAS discharges.

VII. The Department of Ecology Should Require All Data be Made Publicly Available Online

Recommendations:

1. All influent, effluent, and biosolids monitoring and sampling data should be made publicly available online and updated regularly.

Rationale:

Public access to monitoring data ensures transparency, accountability, and public trust. The Department of Ecology should require data be reported and posted to an easily accessible public website within 30 days of collection. Timely posting will build public trust in the effectiveness of minimization and treatment efforts and allow for the early detection of emerging issues.

VIII. The Department of Ecology Should Ensure the Permit Remains Flexible for the Rapidly Evolving Industry

Recommendations:

1. The Department of Ecology must ensure the permit includes mechanisms to account for changes in effluent limits, monitoring requirements, or PFAS treatment technologies that may evolve over time.

Rationale:

Given the evolving nature of the semiconductor industry, the wastewater discharge permit must remain robust and flexible to prevent harmful environmental releases. Although semiconductor manufacturers have proven themselves willing to engineer solutions once regulations are in place, they also have a history of failing to share information with the affected public.

Since the permit is anticipated to remain effective until 2031, new chemicals (including additional PFAS) may be used and discharged. At the same time, treatment technologies for PFAS continue to rapidly advance. Since the landscape for this facility is expected to change significantly over the coming years, the Department of Ecology should include a condition in the permit allowing modification of effluent limitations outside the permit renewal cycle based on new information, if appropriate, to protect human health and the environment.

IX. The Department of Ecology Should Ensure Adequate Tribal Consultation

Recommendation:

1. The Department of Ecology should consult all affected tribal nations.

Rationale:

The United States federal government is obligated to consult with sovereign tribal nations as part of the government-to-government relationship established by treaties and memorialized by Congress and Indian law.[41] Although this applies to federal policy initiatives and federally-funded projects, as a best practice and since states like Washington are delegated authority by the federal government to issue wastewater discharge permits under the federal Clean Water Act, state and local governments should proactively consult with all affected tribal nations. Because this permit has the potential to affect subsistence resources, such as PFAS impacts on salmon and other fisheries, the Department of Ecology should consult all affected tribal nations.

X. Conclusion

As currently drafted, the Draft State Waste Discharge Permit for Analog Devices (No. ST0006154) fails to protect the Columbia River, a critical drinking water source and ecological haven, from harmful PFAS discharges.

The draft permit does not address the well-documented persistence, bioaccumulation, and harmful risks associated with PFAS. The absence of effluent limits and minimal monitoring requirements for PFAS are inadequate to protect water quality, the environment, workers, and surrounding communities that rely on the Columbia River.

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[41] Administrative Conference of the United States, "Consultation with State, Local, and Tribal Governments in Regulatory Policymaking" (June 20, 2025) https://www.acus.gov/document/consultation-state-local-and-tribal-governments-regulatory-policymaking

We therefore urge the Department of Ecology to carefully and deliberately review the draft permit and address PFAS pollution by strengthening PFAS monitoring, treatment, and minimization requirements based on the recommendations outlined above.

Please specifically respond to each requested change in the Response-to-Comments issued in the final permit. Please provide the final permit and response to comments to the emails provided below.

Sincerely,

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Additional signatories:

Climate Jobs PDX
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Washington County Citizen Action Network