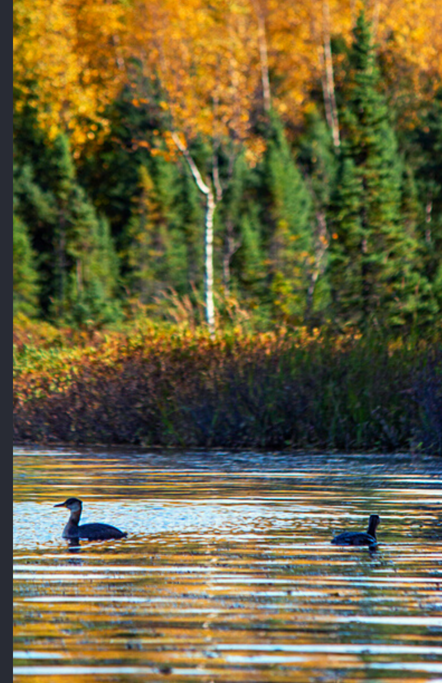

ALASKA COMMUNITY WATER QUALITY REPORT: PFAS CONTAMINATION OF MUNICIPALITY OF ANCHORAGE AND FAIRBANKS NORTH STAR BOROUGH WATERS

February 2023

ACAT
Alaska Community Action on Toxics

Alaska Community Water Quality Report:

PFAS Contamination of Municipality of Anchorage and Fairbanks North Star Borough Waters

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Introduction

PFAS (per- and polyfluoroalkyl substances) are a complex class of more than 12,000[1] chemicals used in consumer products and industrial applications. PFAS-based firefighting foams, also known as aqueous film forming foams (AFFF), are used to extinguish class B petroleum and chemical fires at airports, military bases, and training areas. PFAS are used in many consumer products such as food packaging, non-stick cookware, textiles, and apparel because of their stain, grease, and water resistance. PFAS are known as "forever chemicals" because they are extremely persistent in the environment. PFAS are also highly mobile, and some are bioaccumulative. Exposures to PFAS are associated with adverse health effects such as kidney and testicular cancer, ulcerative colitis, adverse reproductive health outcomes, low birth weight, liver disease, thyroid disease, elevated cholesterol levels, and immune system impairment.[2]

In June 2022, the EPA drastically revised the lifetime health advisories (LHAs) for four PFAS to reflect evolving science, affirming that PFAS are toxic at exquisitely low levels. The LHAs for two common PFAS, PFOA and PFOS, are 0.004 parts per trillion (ppt) and 0.02 ppt respectively. The LHAs for GenX chemicals and PFBS are 10 ppt and 2,000 ppt respectively.[3] In 2016, the EPA set an LHA for PFOA and PFOS of 70 ppt, orders of magnitude less protective than the current LHAs.

In Alaska, the dispersive use of PFAS-based firefighting foams known as aqueous film forming foams (AFFF) on military bases and airports has contaminated surface and groundwater sources of drinking water in communities throughout Alaska. Alaska Community Action on Toxics published an investigative report in 2019 (*Threats to Drinking Water and Public Health in Alaska)* that documented PFAS contamination at one hundred individual sites in nearly thirty locations. At that time, at least ten Alaska communities had PFAS in their drinking water at levels deemed unsafe by the U.S. Environmental Protection Agency according to their now outdated 2016 LHAs.[4] The state of Alaska has not revised guidance levels and lags behind other states that have established health protective drinking water standard and other measures to protect public health. The number of communities with unsafe levels of PFAS contamination in drinking water in Alaska is growing as more sampling is conducted throughout the state and as the EPA guidance levels for safe water are revised. PFAS contamination in Alaska has been confirmed at nearly every site that has been investigated in which aqueous film forming foam (AFFF) has been or is currently being used.

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1 U.S. Environmental Protection Agency CompTox Chemicals Dashboard: https://comptox.epa.gov/dashboard/chemical-lists/pfasmaster (accessed 29 January 2023)

2 Fenton SE et al. 2021. PFAS Toxicity and Human Health Review. Environmental Toxicology and Chemistry 40(3):606-630.

3 U.S. Environmental Protection Agency. June 2022. Drinking water health advisories for four per- and polyfluoroalkyl substances (PFAS): PFOA, PFOS, GenX chemicals, and PFBS. https://www.epa.gov/system/files/documents/2022-06/PFAS%20Health%20Advisories%20Public%20Webinar-%20FINAL%20FINAL.pdf

4 Threats to Drinking Water and Public Health in Alaska: The Scope of the PFAS Problem, Consequences of Regulatory Inaction, and Recommendations. An Investigative Report by Alaska Community Action on Toxics, September 2019: https://www.akaction.org/publications/threats-to-drinking-water-and-public-health-in-alaska-the-scope-of-the-pfas-problem-consequences-of-regulatory-inaction-and-recommendations-3/

Currently, there are 469 sites in Alaska where PFAS contamination has been identified in soil and water according to the Alaska Department of Environmental Conservation.[5]

As a result of PFAS contamination, several bodies of water in the Tanana River Management Area in the Fairbanks North Star Borough are only open to catch-and-release fishing. Kimberly Lake near the former North Pole Refinery is closed to fishing altogether. According to Alaska Department of Fish and Game (ADFG), rainbow trout caught in Kimberly Lake had nearly 2,000 times the concentrations of PFAS than levels measured in the lake water because PFAS are strongly bioaccumulative.[6] According to an ADFG advisory released in February 2022: "from 2019-2021, testing of water quality and fish from Polaris, Bear, and Moose Lakes, Bathing Beauty Pond, Moose Creek, and Piledriver Slough indicated that fish may be unsafe for human consumption due to PFAS contamination. These water bodies are connected to a plume of groundwater contaminated with PFAS associated with Eielson Air Force Base. Therefore, out of an abundance of caution, Bear, Moose, and Polaris Lakes, Bathing Beauty Pond, Piledriver Slough, and Moose Creek are being restricted to catch-and-release only fishing for all fish species."[7] Results from water quality testing at Bathing Beauty Pond in the summer of 2020 indicated that "PFAS levels were below EPA and DEC action levels (21–26 ppt) [Note: the EPA action levels are now outdated]. These concentrations can result in the bioaccumulation of PFAS in fish tissues to levels that may be unsafe for consumption."[8] The full extent of contamination in water bodies and fish throughout Alaska is unknown and new contaminated sites are likely to be identified in the future. Given the concentrations of PFAS found in water of lakes in the Fairbanks North Star Borough and Anchorage found in this study, additional fish advisories may be warranted to protect public health.

Background

In October 2021, Alaska Community Action on Toxics (ACAT) collected twelve lake water samples in Anchorage, Fairbanks, and North Pole, Alaska. These lakes are in areas with known or suspected PFAS contamination associated with the dispersive use of PFAS-containing firefighting foams known as aqueous film forming foams (AFFF) used to extinguish fuel or chemical fires in training facilities, airports, and military bases. We conducted water quality sampling in these lakes because people near the former Kulis Air National Guard Base, Anchorage International Airport, and in Fairbanks and North Pole expressed concern and contacted ACAT for assistance. The data concerning PFAS in our local lakes are of concern to environmental and public health. The information is a public right-to-know issue. Some of the lakes that have elevated levels of PFAS are used for fishing and may warrant fish consumption advisories. We need action now to protect fish, wildlife, pets, and people.

In 2022, ACAT conducted additional PFAS sampling in several Anchorage water bodies. These results supplement our 2021 results and show contamination in several additional lakes used for swimming and fishing.

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[5] Alaska Department of Environmental Conservation Inventory of PFAS Sites in Alaska: https://dec.alaska.gov/spar/csp/pfas/responses/ (accessed on February 6, 2023).

[6] Alaska Department of Fish and Game Advisory Announcement (January 25, 2021). https://www.adfg.alaska.gov/sf/EONR/index.cfm?ADFG=region.NR&Year=2021&NRID=3079

[7] Alaska Department of Fish and Game. Sport Fishing Emergency Order (February 9, 2022).

[8] Ibid.

The 2022 results also show contamination in Ship Creek downstream from Joint Base Elmendorf and Fort Richardson (JBER), an important urban ecosystem for fish, wildlife, as well as fishing. These data validate previous results and emphasize the need for immediate action to protect public health as well as fish and wildlife.

Sources of PFAS to Area Lakes, Other Surface Waters, and Groundwater Anchorage

- Former Kulis Air National Guard Base (now managed by Ted Stevens International Airport as the Kulis Business Park): PFAS-containing AFFF was stored, handled, released and /or used in at least ten areas. High levels of PFAS were found in stormwater ditches that drain to wetlands and area lakes.
- Anchorage International Airport: elevated levels of PFAS found in surface and groundwater downgradient of the Aircraft Rescue and Fire Training Facility.
- Joint Base Elmendorf and Fort Richardson (JBER): several source areas of AFFF are contaminating soils and groundwater on base and may contribute to contamination of Ship Creek and near shore environment of Knik Arm.

Fairbanks North Star Borough

PFAS source areas in the Fairbanks North Star Borough include at least eight locations and associated plumes: Eielson Air Force Base, Fairbanks International Airport, the Fairbanks Regional Fire Training Center, North Pole Refinery, Fort Wainwright, Alyeska Pipeline Services' Nordale Storage Yard, and two commercial properties where AFFF was used—Napa Auto Parts and Bloom Enterprises.

Summary of Results

Our sampling analyses revealed total PFAS levels in Anchorage lakes ranging from 10.2 ppt (Sundi Lake) to 952.2 ppt (Lake Spenard/Lake Hood)— (Table 3). In the Fairbanks North Star Borough, levels ranged from 2.8 ppt (Ballaine Lake) to 179.4 ppt in Airport Lake. A summary of our results can be found in Table 1.

Highest Levels (2021-2022):

Airport Lake (Fairbanks):	179.4 ppt total PFAS
Lake Spenard, Anchorage:	952.2 ppt total PFAS
Lake Hood, Anchorage:	698.7 ppt total PFAS

Anchorage Lakes (2021-2022, mean levels and number of samples)

DeLong Lake:	26.82 ± 3.67 ppt total PFAS (N = 5)
Lake Spenard:	763.30 ± 98.61 ppt total PFAS (N = 5)
Little Campbell Lake:	12.35 ± 1.17 ppt total PFAS (N = 4)
Sand Lake:	13.03 ± .93 ppt total PFAS (N = 4)
Sundi Lake:	10.2 ppt total PFAS (N = 1)
Lake Hood:	626.20 ± 51.55 ppt total PFAS (N = 3)
Connors Lake:	12.30 ± 2.04 ppt total PFAS (N = 4)
Jewel Lake:	20.90 ± 2.20 ppt total PFAS (N = 3)
Ship Creek:	22.60 ± 9.59 ppt total PFAS (N = 5)

Fairbanks North Star Borough (2021, N=1 sample per lake)

Airport Lake:	79.4 ppt total PFAS (Fairbanks)
Badger Slough:	27.8 ppt total PFAS (North Pole)
Ballaine Lake:	2.8 ppt total PFAS (Fairbanks)
Bathing Beauty Pond:	51.8 ppt total PFAS (Fairbanks North Star Borough)
Gravel Pit, Van Horn Road:	39.9 ppt total PFAS (Fairbanks)
Gravel Pit, 30th Avenue:	44.0 ppt total PFAS (Fairbanks)
Nordale Gravel Pit:	167.7 ppt total PFAS (North Pole)

Alaska has not yet established updated drinking water guidelines for PFAS and follows the outdated EPA health advisory level of 70 ppt for a combination of PFOA and PFOS. These guidance levels are not health protective. As indicated in the introduction to this report, the 2022 EPA health advisory guidelines for PFOA and PFOS were revised significantly to extremely low concentrations, indicating that there is virtually no safe level of exposure to these dangerous chemicals. There are no enforceable drinking water standards for PFAS either at the state or federal levels. For surface waters that support aquatic life, it is important to note that water concentrations found in this study can result in the bioaccumulation of PFAS in fish to levels that may be unsafe for consumption.

Conclusions and Recommendations

• Enact State Legislation During this Session to Protect Communities and Prevent Further Harm

Legislation is urgently needed to provide greater protections for communities by preventing and addressing PFAS contamination. In order prevent further harm to water quality, fish, wildlife, and public health, state legislators should pass strong legislation during this session. State legislatures around the country are taking the lead to address PFAS and protect the health of their residents because action at the federal level is too slow. State governments are taking more immediate legislative and regulatory action to phase out PFAS to prevent contamination in favor of safer alternatives. Thus far, 23 states have adopted 104 policies on PFAS, and another 114 policies are under consideration in 23 states.[9] Passing legislation to address PFAS in Alaska is the right thing to do and the time to do it is now. Effective legislation should:

1) Establish enforceable and health protective drinking water standards for PFAS as a class.
2) Phase out the use of PFAS in firefighting foams (AFFF) and other product categories. Safe and effective alternatives to the use of PFAS-based firefighting foams are readily available and in use at major airports, military installations, and oil and gas facilities throughout the world.
3) Provide safe, alternative drinking water sources to affected communities.
4) Provide medical monitoring for people who have been exposed to PFAS and allow for regular tests and procedures to detect latent diseases or other health impacts.
5) Prevent incineration of PFAS wastes and contaminated soils.
6) Regulate PFAS as a class and eliminate all non-essential uses of PFAS.
7) Require comprehensive monitoring.
8) Establish surface water action levels to protect aquatic life and public health.

[9] https://www.saferstates.com/toxic-chemicals/pfas/

- **Implement a Comprehensive Monitoring Program**

There are substantial gaps in the monitoring of PFAS in areas of known and suspected contamination. The State of Alaska must institute a comprehensive monitoring program of all potentially contaminated areas and media to assess the full extent of PFAS contamination in Alaska—this should include soils, ground- and surface waters, drinking water sources, fish and wildlife, traditional foods (including fish, terrestrial and marine mammals), garden produce, and wild plants used for food or medicine. Monitoring should include vulnerable receiving waters, lands, and communities in proximity to military bases, aviation facilities, fire training areas, oil and gas facilities, and mining operations. The State of Alaska and Department of Defense should require analyses of the full panel of PFAS and report these to the public.

- **Establish surface water action levels to protect aquatic life and public health**

Other states are taking the lead in protecting streams, rivers, wetlands, and lakes by setting enforceable standards to prevent PFAS contamination. For example, Massachusetts set a surface water action level of 23 ppt for five PFAS. PFAS must be regulated as a whole class of compounds rather than individually.

- **Address the Need for Additional Fish Consumption Advisories**

Additional restrictions on fish consumption for certain water bodies may be needed to protect public health depending on outcomes of systematic monitoring.

Table 1

Tables of Results:

Water Body Name	Average Total PFAS (ppt)	Average PFOS (ppt)	Average PFOA (ppt)	Range Min-Max Total PFAS (ppt)
Connors Lake (N=4)	12.30	1.80	3.05	10.1-15.2
DeLong Lake (N=5)	26.82	8.08	5.58	22.2-32.9
Jewel Lake (N=3)	20.90	2.67	6.70	18.2-23.6
Lake Hood (N=3)	626.20	154.20	67.57	583.3-698.7
Lake Spenard (N=5)	763.30	175.73	71.75	674.7-952.2
Little Campbell Lake (N=4)	12.35	1.47	2.70	10.5-13.7
Sand Lake (N=4)	13.03	2.73	3.93	11.5-14
Ship Creek (N=5)	22.60	9.14	3.48	4.3-32

Table 1 shows average concentrations (ppt) of PFOA, PFOS, and total PFAS from at least three samples from each water body. All the water bodies contain PFAS above the 2022 EPA interim health advisory levels. Lake Spenard and Lake Hood contain PFOA/PFOS concentrations above the 70 ppt Alaska DEC action level.

Table 2

Water Body Name	**Single Test PFAS-Measurement (ppt)**
Sundi Lake	10.2
Portage Lake	<1

Table 2 shows PFAS concentrations (ppt) from lakes (N=1).

Table 3

Table 3 shows individual test results from each water body in chronological order.

Water Body Name	Month/Year	PFAS (parts per trillion)
Connors Lake	Jun-22	15.2
Connors Lake	Aug-22	10.1
Connors Lake	Aug-22	10.7
Connors lake	Aug-22	13.2
DeLong Lake	Oct-21	22.2
DeLong Lake	Jun-22	32.9
DeLong Lake	Aug-22	24.7
DeLong Lake	Aug-22	25.7
DeLong Lake	Aug-22	28.6
Jewel Lake	Aug-22	18.2
Jewel Lake	Aug-22	20.9
Jewel Lake	Aug-22	23.6
Lake Hood	Aug-22	583.3
Lake Hood	Aug-22	596.6
Lake Hood	Aug-22	698.7
Lake Spenard	Oct-21	674.7
Lake Spenard	Jun-22	736.7
Lake Spenard	Aug-22	697.6
Lake Spenard	Aug-22	755.3
Lake Spenard	Aug-22	952.2
Little Campbell Lake	Oct-21	13.7
Little Campbell Lake	Aug-22	10.5
Little Campbell Lake	Aug-22	12.4
Little Campbell Lake	Aug-22	12.8
Sand Lake	Oct-21	11.5
Sand Lake	Aug-22	13.3
Sand Lake	Aug-22	13.3
Sand Lake	Aug-22	14
Ship Creek	Aug-22	4.3
Ship Creek	Aug-22	23.8
Ship Creek	Aug-22	24.8
Ship Creek	Aug-22	28.1
Ship Creek	Aug-22	32
Sundi Lake	Oct-21	10.2
Portage Lake	Aug-22	0

Figure 1

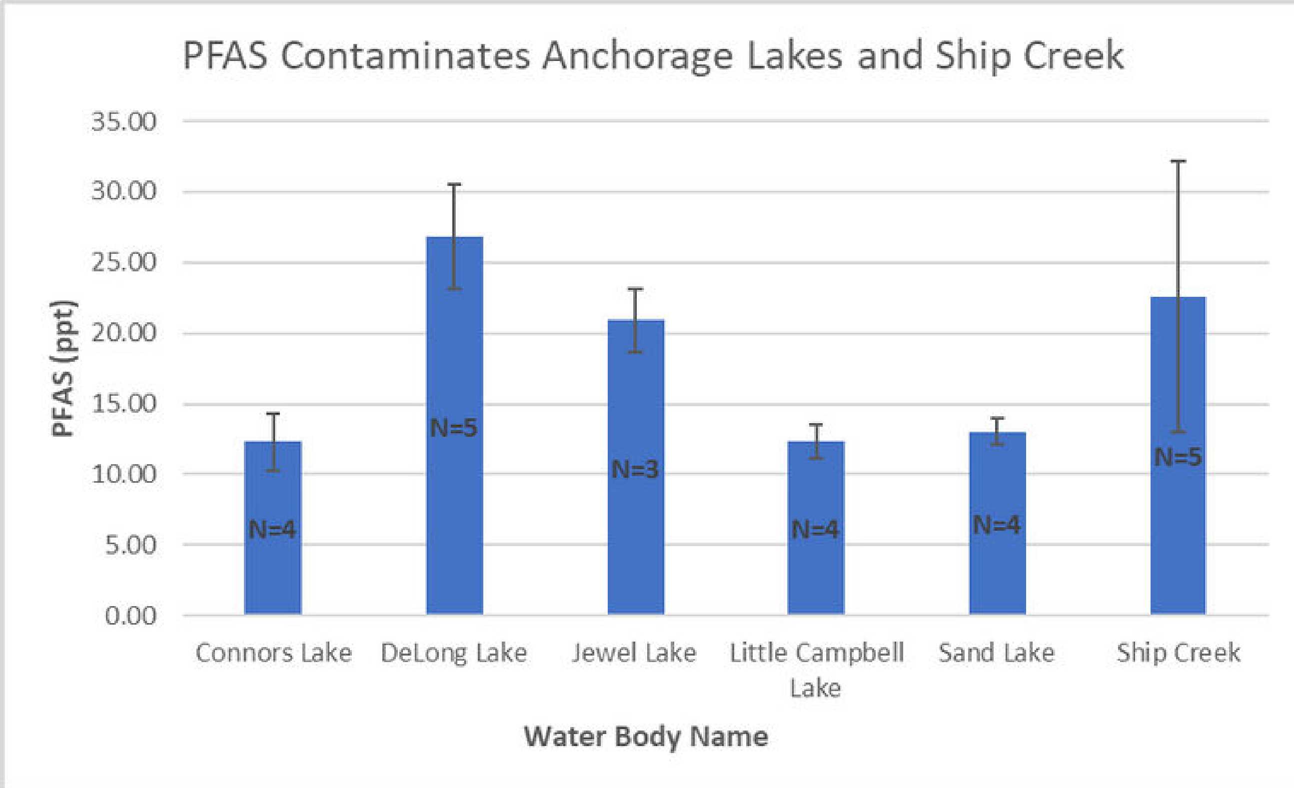

Figure 1 shows the mean PFAS concentrations (ppt) of five lakes in the vicinity of the Anchorage International Airport and former Kulis Air National Guard Base. It also includes Ship Creek which runs through the Joint-Base Elmendorf-Richardson and flows to Knik Arm. Ship Creek has the highest standard deviation at 9.59 ppt. This higher variability is likely a result of testing from five separate locations from the mouth to near Joint-Base Elmendorf Richardson.

Figure 2

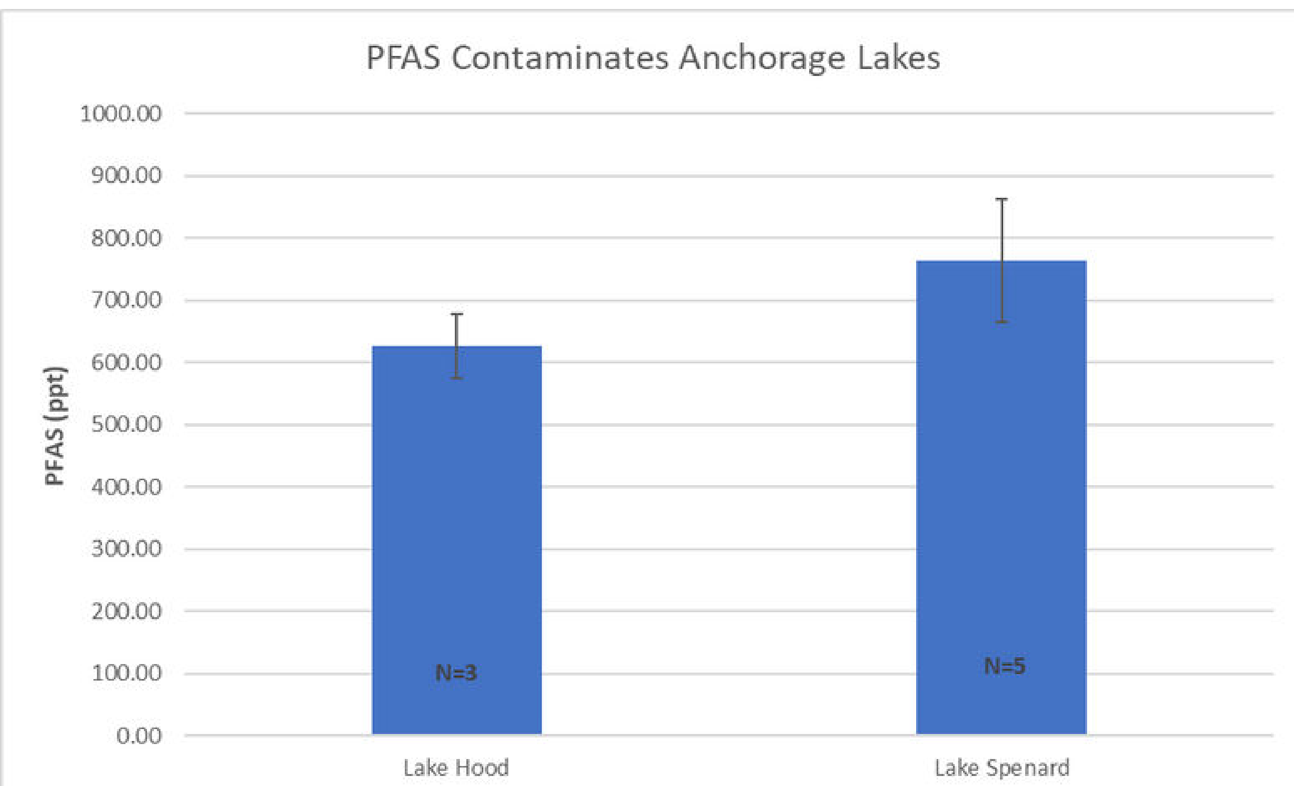

Figure 2 shows mean PFAS concentrations (ppt) in Lake Hood and Lake Spenard.

Methods:

Alaska Community Action on Toxics' scientific staff and volunteers collected surface water samples in 2021 and 2022 using PFAS analytical kits developed by Cyclopure, Inc. (www.cyclopure.com) and using passive sampling methods with DEXSORB loaded extraction discs in 250 mL collection cups. Cyclopure developed the PFAS water quality test kits through a grant from the National Institute of Environmental Health Sciences (NIEHS) to provide a convenient, affordable, and accurate method to detect PFAS compounds.

Sample analyses were performed in the Cyclopure laboratory using methanol amended with ammonia acetate as eluent to recover PFAS compounds by standard solid-phase extraction procedures from the DEXSORB disc. Eluted PFAS samples are then analyzed on a HPLC-MS/MS (QExactive hybrid quadrupole orbitrap, ThermoFisher) for target analyses of 40 compounds listed under EPA Methods 533, 537, and 1633. Analytical procedures used isotope dilution for PFAS measurement and quantification. The analysis of water samples has been validated to the requirements of EPA methods 533, 537, and 1633, and follow instrument procedures for internal standardization and calibration. The limit of quantification (LOQ) for all 40 PFAS tested under Cyclopure analytical methods is 1.0 ppt, other than GenX (HFPO-DA) and 3:3 FTCA which is 2.0 ppt. Reporting limits have been validated to the accuracy criteria of EPA methods, including Minimum Reporting Limit (MRL) confirmation.

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