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COMMISSIONER

Memorandum

To: Jeff Crawford, Director, Bureau of Air Quality

From: Stacy Knapp, Director, Division of Air Quality Assessment

Date: January 16, 2025

Re: Brunswick PFAS ambient air sample results

Summary:

In response to community concerns about the potential for ongoing air exposures following the aqueous film-forming foam (AFFF) spill at the former Brunswick Naval Air Station, Maine DEP investigated potential ambient air sampling methods for the per-and polyfluoroalkyl substances (PFAS) compounds found in AFFF. This type of sampling had not been previously conducted by Maine DEP. A method used by Minnesota was selected for use in our study. Maine DEP staff collected three 72-hour ambient air samples for PFAS analysis, along with two blank samples used for quality control checks. Using high-volume air samplers, over 390,000 liters of air were sampled by each instrument during the sampling period. Laboratory analysis results indicated low ambient air concentrations of many PFAS compounds found in AFFF. Nearly all PFAS compounds detected in the samples were found at concentrations well below provisional health-based air screening levels. One compound, PFOA, was detected at concentrations above the provisional cancer screening level. However, this screening level only indicates an increased risk from long-term exposure to PFOA in ambient air above the threshold and does not necessarily indicate increased risk from short-term exposure. Based on separate calculations, analysis of PFOA data suggests that exposure at the level found in ambient air at BNAS is not likely to result in any measurable increase in blood levels over expected current background blood levels in the U.S. population. To better understand the results of this first round of sampling, specifically whether levels are increasing, decreasing, or remaining constant, additional sampling is planned in Brunswick. In addition, sampling will be performed at an identified location in Acadia National Park to better understand background levels of PFAS in ambient air without a known PFAS source.

Methods:

There are no official methods for ambient air PFAS monitoring; however, a few states, organizations, and analytical laboratories have investigated and conducted ambient air PFAS sampling and analyses. Of the methods researched, the method used by the Minnesota Pollution Control Agency (MPCA) was found to be able to reliably sample for the largest number of

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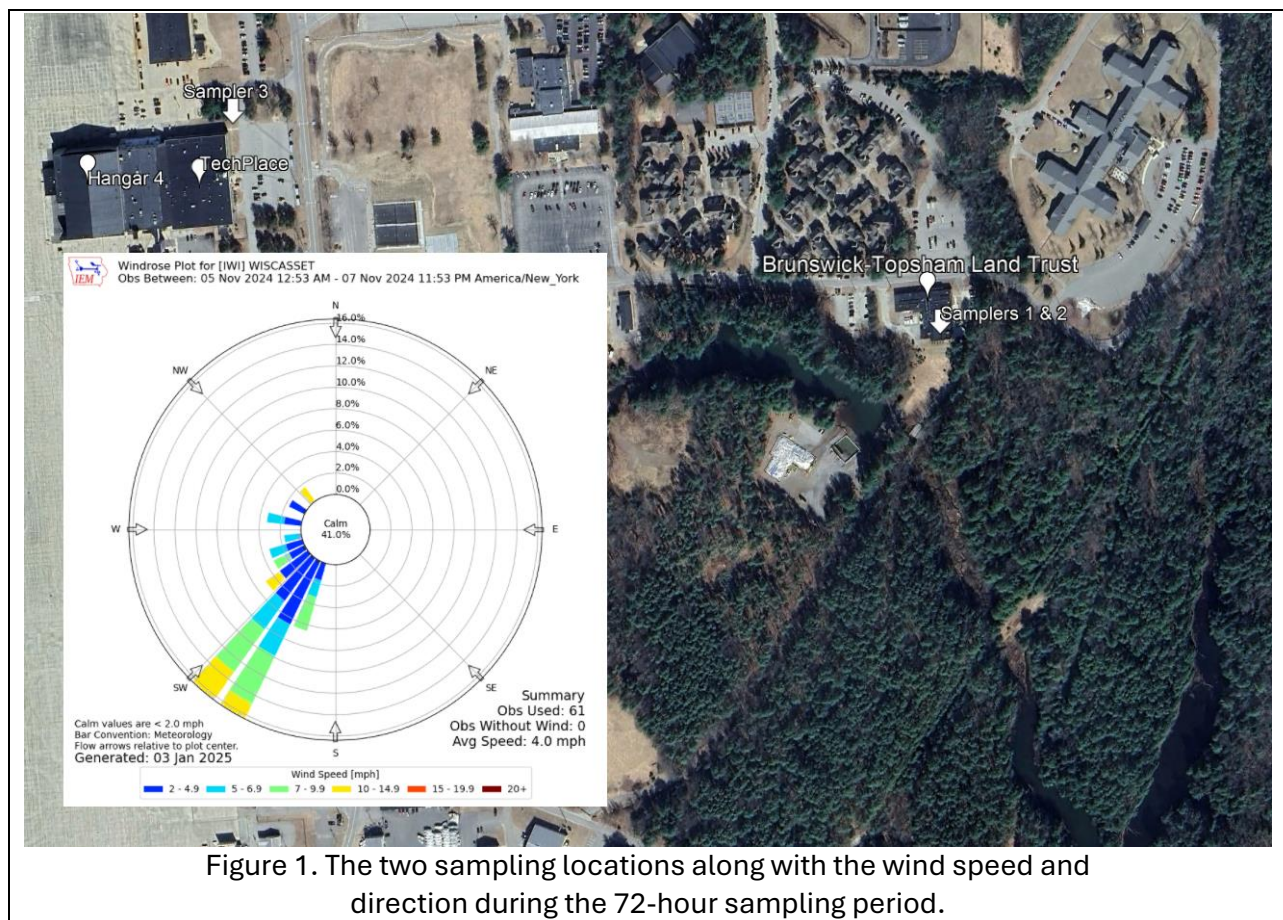
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targeted PFAS compounds. The MPCA utilized a modified version of Environmental Protection Agency (EPA) Method TO-4A for sample collection. Method TO-4A uses Polyurethane Foam High Volume (HiVol PUF) air samplers that sample ambient air at a rate in-excess of 100 liters per minute. Three HiVol PUF samplers were lent to Maine DEP by EPA to conduct ambient air sampling for PFAS.

Two locations in Brunswick were identified as initial sampling locations. The first location was just outside on the grass at the northeast corner of TechPlace, the facility adjacent to Hangar 4, which was the origin of the AFFF spill. The second location identified was the roof of the Brunswick-Topsham Land Trust building, northeast of the retention pond and adjacent to where soil samples with elevated levels of PFAS were discovered. Figure 1 shows these two sampling locations on a map along with the wind speed and direction during the 72-hour sampling period.



The air sampling media for this type of sampling consists of a quartz fiber pre-filter and a glass sample cartridge filled with a polyurethane foam (PUF) and XAD adsorbent resin “sandwich” (PUF/XAD/PUF). The quartz fiber pre-filter collects particulate matter within the air sample up to 50-100 μm in size. Most particulate bound PFAS will be collected on the filter. The rest of the air sample then passes through the PUF/XAD/PUF “sandwich” where smaller particulate matter ($< 0.1 \mu\text{m}$) that was able to pass through the filter is collected. Volatile PFAS

compounds adsorb to the XAD resin. Air sampling media was spiked with field standards by the laboratory prior to deployment. (Recovery of the field spiked standards is used to monitor sampling efficiency.)

Air sampling media were provided to ME DEP by SGS AXYS Analytical Services Ltd.¹ on October 30, 2024. Monitoring staff identified a 72-hour period with projected west and southwest winds without rain, which were the meteorological conditions expected to lead to the highest detection of ambient air PFAS in the identified sampling locations. Following the procedure developed by the MPCA, samples were collected over a continuous 72-hour duration, starting at midnight, the morning of November 5th. Following standard quality control practices, blank samples were included for each of the two sampling locations, and two of the three HiVol PUF samplers were collocated together. One of the collocated samples on top of the Brunswick-Topsham Land Trust building stopped sampling at 59 hours due to an instrument electrical issue. Over 390,000 liters of air were sampled by each instrument during the sampling period.

After sample collection, the sampling media were returned to SGS AXYS and analyzed by SGS AXYS Method MLA-076 for PFAS in ambient air, a proprietary method similar to EPA Method 1633.² Following this method, each air sampling media unit was separated into three sections for independent extraction and analysis: the quartz fiber pre-filter, the front portion of the “sandwich” containing the first layer of PUF and the XAD resin, and the back portion of the “sandwich” containing the second layer of PUF. The instrumental analysis was performed by ultra high-performance liquid chromatography/mass spectrometry (UPLC-MS/MS). Results were reported in nanograms (ng) per sample and concentration calculations were completed by Maine DEP based on the total volume of air sampled. (Note: While one of the collocated samples on top of the Brunswick-Topsham Land Trust Building stopped sampling at 59 hours, the concentration calculation included only the volume of air sampled by this instrument, so these results are still comparable to the other two samples.)

Results:

Laboratory analysis results indicated low ambient air concentrations of many PFAS compounds found in AFFF in each of the three samples. Sample results for each of the three Brunswick samples are listed in Table 1. Results are reported in ng/m³ to be consistent with the mass units reported for sampling results in other media. Because this effort is the first time Maine DEP has conducted ambient air sampling for PFAS, the Department does not currently have an ambient air background value for PFAS to use as a comparison. Planned follow-up sampling includes a background value assessment.

¹ <https://www.sgsaxys.com/>

² Mills, M. Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. US Environmental Protection Agency, Cincinnati, OH, 2022
https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=CESER&dirEntryId=356428

Table 1. Brunswick PFAS ambient air sample results

PFAS	Brunswick-Topsham Land Trust Building #1 (ng/m3)	Brunswick-Topsham Land Trust Building #2 (ng/m3)	TechPlace (ng/m3)
PFBS	0.002	0.004	0.003
PFBA	0.072	0.066	0.064
PFDA	<DL ³	<DL	0.001
PFDaA	<DL	<DL	0.000
PFHxS	0.005	0.005	0.003
PFHxA	0.025	0.021	0.021
PFOS	0.016	0.014	0.018
PFOA	0.007	0.012	0.008
PFTeDA	<DL	<DL	<DL
PFUnDA	<DL	<DL	0.001
6:2 FTS	0.051	0.043	0.026

To better understand the results, Maine DEP consulted with the Maine Center for Disease Control (CDC). Because there are no ambient air guidelines for PFAS compounds, Maine CDC developed provisional health-based screening levels based on the most recent toxicity data available from EPA. The lowest values available were used in order to be most conservative. It is important to note that these provisional screening levels are not true ambient air guidelines because they are estimated based on oral toxicity values adjusted for inhalation exposure in the absence of toxicity values that are based on inhalation studies. Also, the cancer-based guidelines assume exposure over many years and there is uncertainty in estimating long-term exposure from a single measurement.

Brunswick sample results compared to the provisional health-based screening levels are listed in Table 2. Nearly all PFAS compounds detected in the samples were found at concentrations well below provisional health-based air screening levels. One compound, PFOA, was detected at concentrations above the provisional cancer screening level. However, this screening level only indicates an increased risk from long-term exposure to PFOA in ambient air above the threshold and does not necessarily indicate increased risk from short-term exposure. Given the PFOA concentrations found above the screening level, Maine CDC conducted an analysis of PFOA from a toxicity perspective, comparing the ambient air concentrations found in Brunswick to estimated mean serum (blood) level of PFOA in adults. Based on this assessment, exposure to the PFOA concentrations detected in Brunswick is not believed likely to result in any measurable increase in blood levels over expected current background blood levels in the U.S. population.

³ DL = detection limit.

Table 2. Brunswick median sample results compared to provisional air screening levels

PFAS	Non-Cancer Air Screening Level (ng/m3)	Cancer* Air Screening Level (ng/m3)	Brunswick Median (ng/m3)
PFBS	1050	--	0.003
PFBA	3500	--	0.066
PFDA	0.007	--	0.001
PFD _o A	175	--	0.000
PFH _x S	70.0	--	0.005
PFH _x A	1750	--	0.021
PFOS	0.350	0.886	0.016
PFOA	0.105	0.001	0.008
PFT _e DA	3500	--	<DL
PFU _n DA	1050	--	0.001
6:2 FTS	700	--	0.043

* 1/100,000 risk level

Next steps:

Maine DEP plans to conduct additional sampling to better understand the results of this pilot study. Two additional samples on top of the Brunswick-Topsham Land Trust Building are planned to assess whether PFAS concentrations are increasing, decreasing, or remaining constant over time and at different ambient temperatures. These samples will also help Maine DEP to better understand variability between collocated samples. In addition to the repeated samples at the Brunswick location, an additional sample will be collected at McFarland Hill in Acadia National Park. This location was selected as a background site to help Maine DEP better understand ambient air levels of PFAS in ambient air without a known PFAS source. Blank samples will also be included at each of these two locations for quality control. For the next round of sampling, sample media are expected to arrive to Maine DEP in late January/early February, sampling is expected to take place in mid-February, and results are expected back from the analytical lab in June.