

# Seattle airport's legacy of PFAS chemicals: 'Foam showers,' sick firefighters and contaminated water

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In the 1980s, rookie firefighters at Seattle-Tacoma International Airport endured a hazing ritual known as the "foam shower."

Recruits stood some 150 feet down the tarmac with 5-gallon buckets and were told to catch firefighting foam shot out of a crash-response truck's water cannon.

They would wear the usual helmet and heat-resistant gear, but still ended up drenched as the bubbly white liquid rained down on them.

"It was a rite of passage," said Thomas Sanchez, a retired Port of Seattle firefighter who first went to work at the airport in 1980.

The foam contained per- and polyfluoroalkyl substances, or PFAS, and was long considered essential at airports for quickly smothering blazes.

It was marketed as "environmentally benign."

Today, the PFAS in these foams are known as "forever chemicals" and have contaminated aquifers across the country, including under Sea-Tac. Regulators are trying to figure out the best approach to a cleanup that is likely to stretch on for decades. The foam also poses risks to firefighters, three of whom at the Port of Seattle developed pancreatic cancer, which in [animal tests](#) has been associated with exposure to small amounts of PFAS.

One of these firefighters, Gilbert Smith Jr., a 31-year retired veteran of the Sea-Tac crew, died of the disease in 2015.

Sea-Tac firefighting crews, through the 1980s and most of the 1990s, spread white blankets of PFAS foam in training exercises, dousing fires that raged in a pit filled with burning fuels.

Stark details about the scope of crew exposure to the foam emerged from a precedent-setting survivor's benefits case at the state Board of Industrial Insurance Appeals that was filed by Smith's widow and included testimony from five of his fellow firefighters. An appeals judge ruled Smith's death was linked to PFAS, as well as the pollution caused by hydrocarbon fuels, such as diesel and jet fuel.

The Federal Aviation Administration, as well as the Defense Department, still requires airports to have PFAS products on hand even as some airports in Europe, Canada and all of Australia have moved to alternative foams without these chemicals.

Today at Sea-Tac, five Port tanker trucks hold more than 2,000 gallons of a newer formulation of PFAS foam.

Port of Seattle Fire Chief Randy Krause, who took the job in 2010, is eager to get rid of every last drop. "We want to be the first airport in this transition—if we can," Krause said.

That could happen later this year.

In January, the Defense Department, in an action required by Congress, published the first-ever performance specifications for PFAS-free foams, which the FAA also has accepted.

In the months ahead, as products are certified for meeting these standards, airports can finally start to dispose of PFAS foams and buy safer products.

Krause, eager to get a head start on the transition, has purchased a PFAS-free alternative that Sea-Tac crews tested in 2019. The concentrate, National Foam's Avio Green, went through a certification program to screen for hazardous chemicals and was used to douse flames from a

simulated airplane crash at a fire training center at Dallas Fort Worth International Airport.

"My firefighters cannot tell the difference," Krause said.

## **Hidden risks**

Gilbert Smith Jr. first went to work at Sea-Tac in 1982.

A native of Spokane, Smith was a buff weightlifter who loved the outdoors, fishing, kayaking and snowmobiling.

His firefighting job involved 24-hour shifts at the station as part of a specialized crew that would be first to respond to aviation accidents.

When liquid fuel feeds a fire, water will typically not extinguish the flames. So the crews practiced mixing and spraying the PFAS foam, and often ended up getting covered with it. Their saturated gear would be brought inside and hung up to dry in their sleeping quarters. They would bring it back to their families, according to Sanchez, the retired firefighter who worked with Smith. Sanchez said the training sometimes happened without the crew donning self-contained breathing apparatus.

"We were taking those contaminants home with us. Nobody realized that. Nobody knew about it. It was a badge of honor to smell ... like you've just been at a raging, you know, bonfire," Sanchez testified.

PFAS foam manufacturer 3M called for crews to wear protective breathing apparatus when using the foam, but also promoted the safety of the product.

A 1978 marketing pamphlet by manufacturer 3M assured customers the "light water" foam was "biodegradable" and low in toxicity and that tests

indicated it would not harm animals and aquatic life, according to a copy of the document filed in U.S. District Court as part of a lawsuit.

Yet 3M's internal studies found something different.

The strongly bonded fluorocarbons were "completely resistant to biodegradation," according to a Jan. 9, 1978, internal 3M memo written by chemist Eric Reiner. Other 3M studies documented the firefighting foam's toxicity to fish, plant life and at high levels to laboratory animals that included Rhesus monkeys. And 3M later confirmed the findings of independent researchers who in the 1970s found PFAS to be widespread in blood-bank samples, according to documents made public in federal court. By 1998, a company researcher had recommended a "safe" level of PFOS in the blood that was lower than that found in 3M population studies, court documents show.

In 2000, 3M announced it would phase out production of its firefighting foam formulation even as it maintained—in a 2005 production information sheet—that "there are no known health effects from anticipated exposure ... when used as intended and instructed."

Other companies developed a new generation of PFAS foams that an industry lobbying group—the Fire Fighting Foam Coalition, where National Foam is a member—portrayed as environmentally benign alternatives. Through the years, these PFAS also have been found in human blood samples as researchers found that some of them can pose health risks, and may be even more difficult to filter out of drinking water.

Less than a year after his 2014 retirement from Sea-Tac firefighting, Smith was diagnosed with pancreatic cancer. Initially, there was hope he could survive the disease.

"Gilbert was the most positive person I think I have ever met. He didn't blame anybody," Sanchez recalled in an interview with The Seattle Times.

By then, Sanchez had learned a lot more about PFAS and its risks.

Sanchez said he counseled Smith to file a Labor & Industries claim with the Port for his cancer. Smith did but was rejected. After he died, Sanchez urged Smith's widow, Cheryl Smith, to refile a claim. It was also denied.

By then a third Sea-Tac firefighter, Alvin Vaughn, had been diagnosed with pancreatic cancer. And his plight strengthened Cheryl Smith's resolve to pursue an appeal.

The ruling in Smith's case came down in 2017.

It followed extensive testimony from firefighters and doctors, some called by the Port who noted that Smith smoked cigarettes and who argued there was not enough evidence from epidemiological studies to tie his pancreatic cancer to his workplace.

Board of Industrial Insurance Appeals Judge Dominique L. Jinhong noted the exposure described in the testimony of firefighters and ruled Smith's death "arose from the distinctive conditions of his employment" that included regular and unprotected exposure to PFOA, as well as hydrocarbons from fires and other sources. Jinhong reversed the Port's decision and ordered that death benefits be paid.

In recent years, even though Sea-Tac fire crews no longer trained with PFAS foams, they still would spray the foam each year to check the calibration of equipment. Those tests ended in 2018, when a new system was installed that does not require the foam to be discharged.

Krause was called to testify by the Port during the Board of Industrial Insurance Appeals case. He said the experience helped boost his determination to move Sea-Tac firefighters off PFAS foams.

"I have sent some pretty poignant emails to a lot of different people out of frustration," Krause said. "I wanted the FAA to lead more."

Krause said Port firefighters have had their blood tested, and many of the results, including his own, show elevated levels of different kinds of PFAS.

Smith, who also left behind four children and eight grandchildren, is now considered to be one of the Port firefighters who have died in the line of duty. His name is engraved on the International Association of Fire Fighters memorial in Colorado.

## **Destroying PFAS**

In 2018, Washington state leaped into the front lines of the efforts to curb the use of PFAS firefighting foams. The Legislature passed a law that restricted most in-state sales, and also required fire departments to stop training with the concentrate already on hand.

By then, there was increasing concern about groundwater contamination and health threats to firefighters, who joined with Seattle-based Toxic-Free Future, to lobby for the legislation in Olympia.

The bill was opposed by the Firefighting Foam Coalition and another industry group, the FluoroCouncil, formed by the American Chemistry Council. FluoroCouncil representative Jessica Bowman testified that new formulations of PFAS foams can be used safely and provide "life-saving benefits."

After the legislation became law, Washington airports were still bound by federal regulation to use PFAS foams, so they continue to purchase them.

But many local fire departments were buying alternatives and wanted to get rid of stockpiled PFAS. That created a new challenge: safely disposing of 25,000 to 60,000 gallons of these concentrates.

The state Ecology Department initially called for burning the foam at a Utah incinerator. This plan was put on hold after the Sierra Club objected, noting some incinerators had failed to fully destroy the PFAS, which had then spread through stacks to pollute surrounding areas.

This year, the Ecology Department still is trying to figure out what to do with the foam. Options include incineration, injecting it through a deep well to a depth below aquifers, or disposal in a hazardous waste landfill where they would be stowed in containers that would have to be watched into the distant future.

There also are new technologies, such as "supercritical water oxidation" that involves high temperatures and immense pressure to destroy PFAS.

"There isn't a silver bullet. There are positives and negatives for each option," said Sean Smith, manager of Ecology's product replacement program.

## **Scope of contamination unknown**

At Sea-Tac, once the PFAS firefighting foams are finally drained from all the tanks, airport environmental officials will still face a much bigger cleanup of groundwater.

Port environmental officials have put in 15 wells to monitor PFAS



contamination that seeped into the ground during the many years of training exercises. Tests have found the presence of more than a dozen types of PFAS.

PFOA was found in concentrations ranging up to 2,800 parts per trillion, according to sampling results obtained under a public disclosure request. That is 280 times above the level that the state considers protective of public health in drinking water. PFNA, another "forever chemical," was found at quantities more than 500 times the protective level established by the state.

"We know we have impacted the environment. ... We don't know the extent of it," said Meagan King, senior environmental program manager at the Port of Seattle.

The airport's [groundwater contamination](#) has raised concerns at the nearby Highline Water District, which uses four wells to supplement drinking water purchased from Seattle Public Utilities. One of those wells, located on airport property, has tested slightly above the state action level for one PFAS compound, and has been shut down.

"You can imagine where it is coming from. But there is no conclusive evidence yet," said Jeremy DelMar, Highline Water District's general manager.

Currently, the main line of attack involves costly filtration that sends contaminated water through large tanks packed with thousands of pounds of carbon—such as specially treated coal—that can absorb the PFAS.

Federal and state environmental officials are searching for better ways to remove PFAS or limit their spread.

In Minnesota, the state's Pollution Control Agency purchased equipment that injects air into contaminated water, which causes PFAS to coalesce into foam that then can be removed. The technology is being used east of Minneapolis along with an oxidation process to break down the PFAS once it's recovered.

In Washington, the Ecology Department has invested some \$300,000 in an experimental effort to curb the spread of PFAS in groundwater beneath Eastside Fire and Rescue in Issaquah, where firefighters once spread [foam](#). There, 21 holes have been dug 55 feet deep and filled with carbon filter material that can capture PFAS and prevent it from flowing farther into the aquifer.

This is far less expensive than erecting above-ground filters. And preliminary results are promising.

"It's dropping the concentrations by a couple of orders of magnitude," said Priscilla Tomlinson, a state Ecology Department toxicologist.

Still, Tomlinson does not know how long this approach will fend off the PFAS. The carbon could eventually become saturated with the compounds and the chemicals could leach farther into the groundwater.

"This is not a permanent remedy," Tomlinson said. "We would prefer to actually dig up the contaminated soil and remove it. But it's super expensive."

At Sea-Tac, PFAS cleanup is expected to take at least 10 years. The Port is in an initial testing phase to figure out the scope of the pollution.

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