PERSISTENT CHEMICALS

Additional EPA Actions Could Help Public Water Systems Address PFAS in Drinking Water

Report to Congressional Requesters

September 2024
GAO-24-106523
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Accessible Version

GAO Highlights

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Highlights of GAO-24-106523, a report to congressional requesters
September 2024

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Why GAO Did This Study

PFAS are a large group of chemicals developed in the 1940s that can persist in the environment and cause adverse health effects. They are used in a wide range of products, such as carpet and some nonstick cookware. Studies show that most people in the U.S. have been exposed to PFAS, likely from contaminated water, food, or air.

In 2029, EPA will require certain public water systems to comply with maximum contaminant levels for specific PFAS in drinking water. But there are concerns about whether systems have sufficient information to implement treatment methods and safely manage the resulting waste.

GAO was asked to examine PFAS-related challenges for public water systems. This report examines how systems in selected states have (1) treated PFAS in drinking water and (2) managed the resulting PFAS-contaminated waste, and challenges the systems faced in doing so. GAO conducted a generalizable survey of systems with PFAS in six states and interviewed representatives from water associations and engineering firms, as well as state and federal officials.

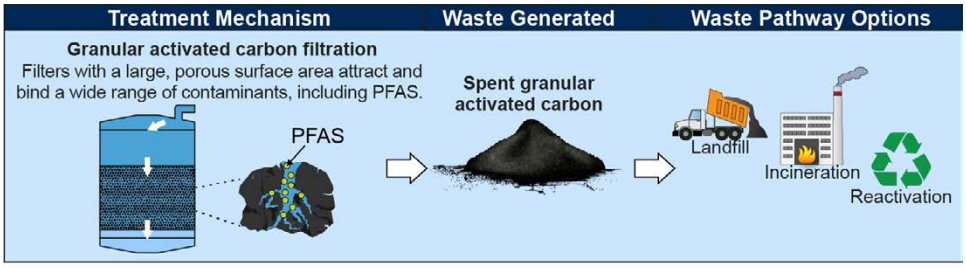
What GAO Recommends

GAO is making four recommendations, including that EPA (1) establish a time frame for issuing additional resources to help systems communicate PFAS health risks to customers and (2) create a straightforward resource relevant to systems' disposal of PFAS-contaminated waste. EPA agreed with three recommendations and said the fourth could be addressed in the next iteration of EPA's disposal guidance.

What GAO Found

The Environmental Protection Agency (EPA) established maximum contaminant levels applicable to six types of per- and polyfluoroalkyl substances (PFAS) in drinking water. For perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)—two of the most common PFAS—EPA set maximum contaminant levels at 4 parts per trillion. GAO surveyed public water systems in six selected states that had PFOA or PFOS at or above these levels. Most public water systems—an estimated 77 percent—have not yet fully implemented a PFAS treatment method, according to GAO's survey. Among the systems that have implemented treatment, granular activated carbon was used most often. This and other treatment methods generate PFAS-contaminated waste that must be safely managed (e.g., disposed of in a landfill, incinerated, or reactivated and reused).

Possible Waste Pathways for Granular Activated Carbon Contaminated with Per- and Polyfluoroalkyl Substances (PFAS)



Sources: GAO; GAO (icons); PikePicture/stock.adobe.com (spent granular activated carbon image). | GAO-24-106523

GAO found that public water systems face challenges as they implement PFAS treatment methods. For example, in the six selected states, an estimated 86 percent of large systems that were treating drinking water for PFAS found it challenging to communicate effectively with customers about PFAS health risks. Beginning in 2029, if there is a violation of a PFAS maximum contaminant level, systems will be required to notify the public about relevant health risks. EPA released a PFAS Communication Toolkit to help water systems communicate with the public, and officials said the agency plans to issue additional resources. However, according to agency officials, EPA has not established a time frame for issuing such resources. By promptly establishing a time frame, EPA can ensure these additional resources are available to systems in a timely manner.

In the six selected states, GAO estimates that 41 percent of public water systems treating for PFAS have managed the resulting PFAS-contaminated waste using various methods, such as disposal in landfills, incineration, and reactivation. Most systems—both those that have and have not begun managing waste—would find additional guidance on appropriate methods for managing waste helpful. Most systems were unfamiliar with EPA's 2020 PFAS destruction and disposal guidance and were confused about the regulatory requirements—or lack thereof—for PFAS disposal. EPA has developed multiple documents about these issues and updated its 2020 guidance in 2024. EPA could further address public water systems' confusion and desire for guidance by creating a straightforward resource for public water systems that summarizes existing regulations, policies, and guidance relevant to the disposal of PFAS-contaminated waste.

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Abbreviations

CWS	community water system
EPA	Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended

GenX chemicals	hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt
GAC	granular activated carbon
IIJA	Infrastructure Investment and Jobs Act
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
NTNCWS	non-transient non-community water system
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonic acid
PFHxS	perfluorohexane sulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
RCRA	Resource Conservation and Recovery Act of 1976
UCMR	Unregulated Contaminant Monitoring Rule

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Congressional Requesters

Per- and polyfluoroalkyl substances, known as PFAS, are a group of thousands of synthetic chemicals that have been used in a wide range of commercial and consumer products since the 1940s. PFAS have entered and spread throughout the natural environment and can be persistent, as they are resistant to degradation and can bioaccumulate in humans, animals, and plants. According to the Centers for Disease Control and Prevention, most Americans have PFAS in their blood.[1] Certain PFAS have been associated with a variety of negative health effects, including cancer.

The Safe Drinking Water Act, as amended, authorizes the Environmental Protection Agency (EPA) to regulate contaminants in our nation's drinking water. Under the act, EPA is authorized to set National Primary Drinking Water Regulations that establish legally enforceable standards—known as maximum contaminant levels (MCL)—to protect public health by limiting the level of contaminants in drinking water.

In April 2024, EPA finalized a drinking water regulation that established MCLs for six PFAS. That is, EPA set individual MCLs for five PFAS and an MCL for mixtures, which includes a sixth PFAS.[2] As a result, public water systems will be required to monitor drinking water for those PFAS, and systems with any of the regulated PFAS above allowable levels will be required to take actions to reduce their levels of those PFAS, such as by implementing a treatment method, by April 2029, when all systems are required to comply with the MCLs.[3]

In recent years, federal legislation has been enacted to help public water systems address PFAS and other emerging contaminants. For example, the 2021 Infrastructure Investment and Jobs Act (IIJA) appropriated $9 billion for programs that provide funds for certain public water systems to address emerging contaminants in

[1]Since 1999, the Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey, also known as NHANES, has measured some PFAS in the blood of a representative sample of Americans.

[2]The rule sets individual MCLs for the following five PFAS: perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), and hexafluoropropylene oxide dimer acid (HFPO-DA) and its ammonium salt (also known as GenX chemicals), as well as an MCL for mixtures containing two or more of the following PFAS: PFHxS, PFNA, GenX chemicals, and a sixth PFAS—perfluorobutane sulfonic acid (PFBS). The rule covers all salts, isomers, and derivatives of the chemicals listed. See *PFAS National Primary Drinking Water Regulations*, 89 Fed. Reg. 32532 (Apr. 26, 2024).

[3]There are over 148,000 public water systems in the U.S. that provide drinking water to 90 percent of Americans. EPA regulations define a "public water system" as "a system for the provision to the public of water for human consumption through pipes or . . . other constructed conveyances, if such system has at least [15] service connections or regularly serves an average of at least [25] individuals daily at least 60 days out of the year." 40 C.F.R. § 142.2. According to EPA documentation, there are three types of public water systems: (1) community water systems that supply water to the same population year-round; (2) non-transient non-community water systems that regularly supply water to at least 25 of the same people at least 6 months per year, such as those at schools, factories, office buildings, and hospitals; and (3) transient non-community water systems that provide water in a place such as a gas station or campground where people do not remain for long periods of time. EPA's PFAS National Primary Drinking Water Regulation applies to community water systems and non-transient non-community water systems.

drinking water, including PFAS.[4] However, concerns have been raised about whether public water systems have sufficient information and expertise to implement PFAS treatment methods and safely manage (i.e., destroy, dispose of, or store) the resulting PFAS-contaminated waste.

You asked us to examine public water systems' ability to implement PFAS treatment methods and safely manage the PFAS-contaminated waste generated during the water treatment process. This report examines (1) how public water systems in selected states have treated PFAS in drinking water and challenges they face in doing so and (2) the extent to which public water systems in selected states have managed PFAS-contaminated waste from treating water and challenges they face in doing so.

For both objectives, we conducted a web-based, generalizable survey of public water systems in selected states with certain PFAS at or above EPA's MCLs from 2019 through 2022.[5] For the survey we took the following steps:

- Drew a stratified, random sample of public water systems from our September 2022 report that described the occurrence of PFAS in drinking water in six states (Illinois, Massachusetts, New Hampshire, New Jersey, Ohio, and Vermont).[6] At the time, these states had established PFAS regulations or guidance, and had comprehensive data from most or all public water systems in the state.[7]
- Queried public water system officials about PFAS treatment and management of the resulting PFAS-contaminated waste.

In our 2022 report, we found that at least 18 percent of the 5,300 total public water systems in the six states—978 systems serving 9.5 million people—had perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS)[8] at levels exceeding 4 parts per trillion, the MCL established in April 2024 by EPA for these PFAS.[9] For

[4]This amount includes appropriations for two programs. First, the IIJA appropriated $5 billion for grants addressing emerging contaminants, such as PFAS, through EPA's Emerging Contaminants in Small or Disadvantaged Communities grant program. Through this program, EPA awards grants to states and territories to assist public water systems that serve certain small or disadvantaged communities with addressing emerging contaminants in drinking water. Second, the IIJA appropriated $4 billion for capitalization grants to states for their Drinking Water State Revolving Funds to address emerging contaminants, including PFAS. States use Drinking Water State Revolving Funds to, among other things, make loans to local communities and utilities for various drinking water infrastructure projects, such as for replacing water treatment systems, repairing and replacing distribution pipelines, and taking other actions needed to achieve or maintain compliance with EPA's National Primary Drinking Water Regulations. This funding is in addition to other appropriations made in the IIJA for drinking water and wastewater programs, such as the $23.4 billion appropriated in the law to EPA for capitalization grants for the Drinking Water and Clean Water State Revolving Funds programs.

[5]We surveyed community water systems and non-transient non-community water systems, which we collectively refer to as "public water systems" in this report. We conducted the survey after the MCLs for six PFAS were proposed, but before EPA finalized the regulation. We surveyed public water systems with PFOA or PFOS at or above 4 parts per trillion—the MCL that has now been established for these two PFAS.

[6]GAO, *Persistent Chemicals: EPA Should Use New Data to Analyze the Demographics of Communities with PFAS in Their Drinking Water*, GAO-22-105135 (Washington, D.C.: Sept. 30, 2022).

[7]We assessed the reliability of each state's dataset and found all six datasets to be sufficiently reliable for describing the occurrence of certain PFAS in drinking water in the six states, and for our purposes of identifying specific public water systems with PFOA or PFOS at or above 4 parts per trillion—the MCLs eventually established for these PFAS in EPA's drinking water regulation, although these were not proposed or in place when we collected these data.

[8]An alternate name for perfluorooctane sulfonate is perfluorooctanesulfonic acid; both refer to the same chemical, which is abbreviated as PFOS.

[9]One part per trillion is equivalent to a single drop of water in 20 Olympic-sized swimming pools.

this report, we selected a stratified random sample from among those systems because they were likely to have had some experience with PFAS treatment methods for drinking water and with managing PFAS-contaminated waste, as their states were already addressing PFAS. Our survey had a 51 percent response rate based on 283 respondents from a sample size of 560 eligible, in-scope public water systems.[10]

For both objectives, we also conducted semi-structured interviews with representatives from water associations, state drinking water officials, manufacturers and suppliers of PFAS treatment products, engineering firms, EPA officials, and Department of Defense officials. We asked them about challenges public water systems face as they implement PFAS treatment methods and manage PFAS-contaminated waste, and about the helpfulness of available treatment, disposal, and destruction guidance. Finally, we also reviewed relevant laws, proposed and final rules, and agency guidance. In appendix I, we provide a more complete explanation of our objectives, scope, and methodology. In appendix II, we provide a copy of our full survey instrument.

We conducted this performance audit from January 2023 to September 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

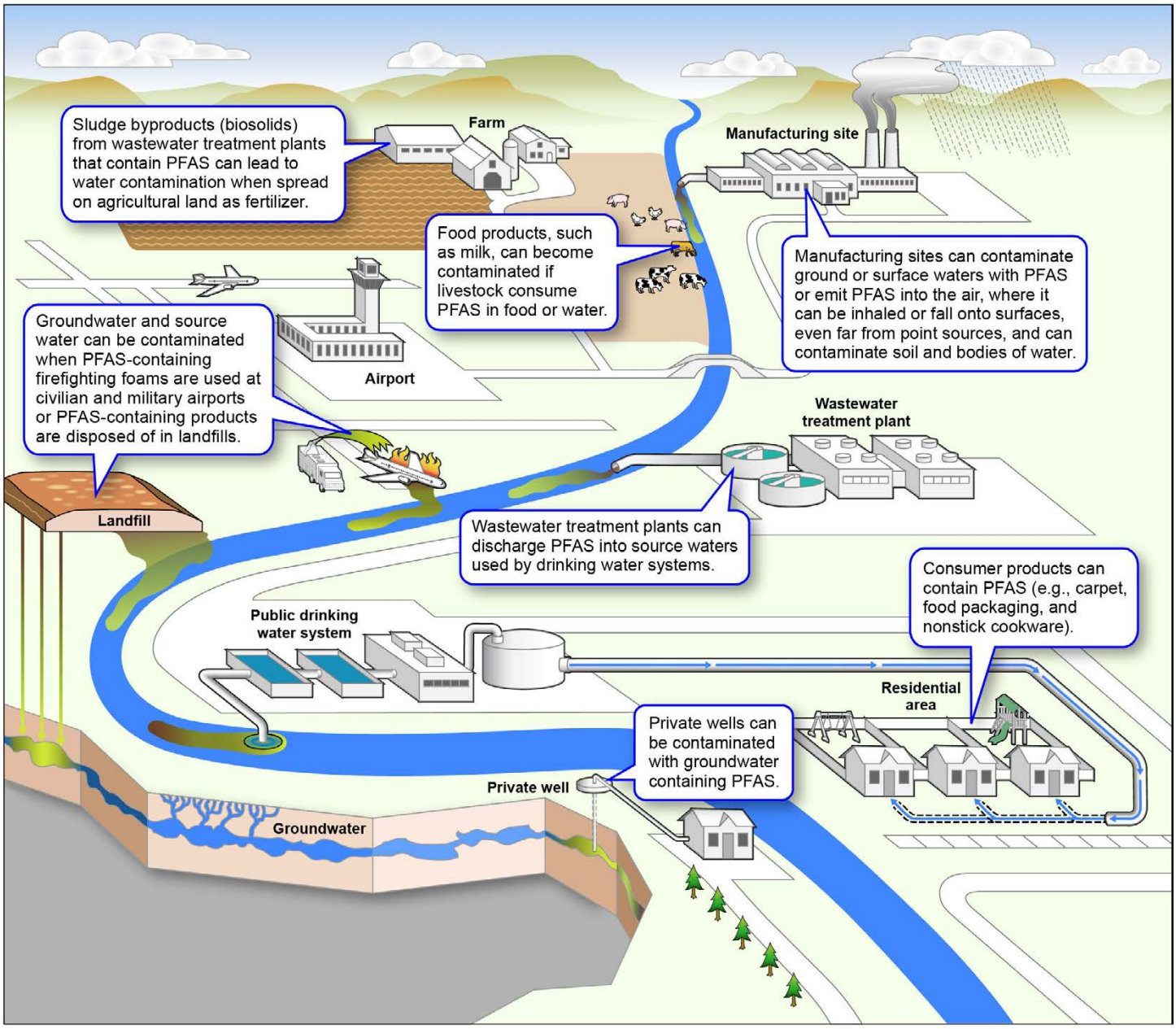
Background

PFAS Uses and Pathways into the Environment

PFAS are used in consumer products (e.g., carpet, food packaging, some nonstick cookware, and certain clothing) and at manufacturing facilities, airports, and military installations (e.g., in firefighting foam). According to scientific literature, some PFAS are pervasive in the environment and bioaccumulate in humans, animals, and plants. PFAS can enter the environment through numerous pathways (see fig. 1). For example, firefighting foam containing PFAS can seep into groundwater, as can water (i.e., leachate) that drains from landfills where PFAS-containing materials are disposed.

[10]We conducted a nonresponse bias analysis to ensure nonrespondents did not differ significantly from respondents. We found evidence of potential bias based on water system size and type. Therefore, we adjusted the sample weights to get to unbiased estimates based on respondents, which allows us to generalize survey responses to our entire population of public water systems.

Figure 1: Examples of How Per- and Polyfluoroalkyl Substances (PFAS) Enter the Environment



Source: GAO. | GAO-24-106523

Note: For more information on the Department of Defense's efforts to transition to PFAS-free firefighting foams, see GAO-24-107322.

Some companies in the U.S. have voluntarily phased out certain PFAS from their production processes and replaced them with chemicals that are generally less bioaccumulative and potentially less toxic; however, legacy uses and a lack of commercially viable alternatives for certain products have resulted in widespread PFAS contamination across the U.S.

PFAS Risks to Human Health

Most people in the U.S. have been exposed to two PFAS—PFOA or PFOS—according to biomonitoring data collected by the Centers for Disease Control and Prevention. According to the National Institute of Environmental Health Sciences, people are most likely exposed to PFAS by consuming PFAS-contaminated water or food, using products made with PFAS, or breathing air containing PFAS.[11] According to EPA, exposure to certain PFAS may have adverse effects on human health, including effects on fetal development, the immune system, and the thyroid, and may cause liver damage and cancer. GAO has previously identified actions that could be taken to better detect PFAS occurrence in drinking water, limit human exposure to PFAS, and treat PFAS contamination.[12]

Federal Regulation of PFAS in Drinking Water

The Safe Drinking Water Act authorizes EPA to establish legally enforceable standards for public water systems—called National Primary Drinking Water Regulations—that generally limit the maximum levels of specific contaminants in drinking water.[13]

In March 2023, EPA proposed establishing MCLs for six PFAS known to occur in drinking water. EPA finalized the regulation on April 26, 2024, after considering public comments. In the final rule, EPA established individual MCLs for five PFAS as well as an MCL for mixtures of certain PFAS. The final rule covers a total of six types of PFAS and sets the MCL for PFOA and PFOS at 4 parts per trillion. The rule requires public water systems to:

1. monitor for the regulated PFAS;[14]
2. ensure those PFAS in drinking water fall at or below the MCLs by April 2029; [15] and
3. notify the public if the levels of those PFAS violate the MCLs, starting in April 2029.

According to EPA documentation, the rule will reduce PFAS exposure for approximately 100 million people, prevent thousands of deaths, and reduce tens of thousands of serious illnesses.

[11]National Institute of Environmental Health Sciences, “Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).” Accessed April 25, 2024, https://www.niehs.nih.gov/health/topics/agents/pfc.

[12]GAO. *Persistent Chemicals: Detecting, Limiting Exposure to, and Treating PFAS Contamination,* GAO-23-106970 (Washington, D.C.: Sept. 2023).

[13]Under the Safe Drinking Water Act, EPA can delegate primary enforcement responsibility for water systems to states and federally recognized Tribes if they meet certain requirements.

[14]Public water systems have 3 years to complete initial monitoring (by 2027), followed by ongoing compliance monitoring.

[15]Public water systems with levels of PFAS above the applicable MCLs can take various actions to reduce their levels of PFAS, such as implementing a treatment method, changing the ratios with which water is blended, and switching sources, according to EPA officials.

Extent of Nationwide PFAS Contamination in Drinking Water

Information about the nationwide extent of PFAS contamination in drinking water and the related number of public water systems with PFAS contamination that exceed EPA's MCLs is limited, but EPA is currently in the process of gathering such data.

Through its fifth Unregulated Contaminant Monitoring Rule (UCMR 5), EPA has been requiring certain public water systems to monitor their drinking water for 29 PFAS—including the six PFAS addressed by the PFAS National Primary Drinking Water Regulation.[16] Specifically, according to EPA documentation, public water systems subject to UCMR 5 must collect data on the occurrence of the 29 PFAS in drinking water from January 2023 through December 2025 and submit those data to EPA.[17]

EPA released a fifth set of UCMR 5 data in August 2024. These data represent approximately 46 percent of the total results that EPA expects to collect through UCMR 5.[18] According to these data, 11 percent of the public water systems that have reported a full set of UCMR 5 results for at least one location,[19] had one or more of the newly regulated PFAS at levels that exceeded an MCL.[20] These systems will not be required to comply with the MCLs until April 2029.

EPA estimates that from 4,100 to 6,700 water systems, serving from 83 to 105 million people, may exceed the MCLs promulgated in the PFAS National Primary Drinking Water Regulation and may have to take action to reduce levels of PFAS. EPA will finalize its data collection under UCMR 5 in 2026, at which point the agency will have more complete information on the nationwide extent of PFAS contamination in drinking water.[21]

Treatment of PFAS in Drinking Water and the Resulting Waste

Public water systems can use various technologies to remove PFAS from drinking water. In July 2022, we examined technologies for PFAS treatment in various media, including drinking water, and found that current

[16]Under its UCMR program, EPA requires certain water systems to monitor for specific unregulated contaminants that EPA identifies.

[17]According to EPA documentation, the following public water systems are expected to participate in UCMR 5 monitoring: (1) a nationally representative sample of 800 systems serving 25–3,299 people; (2) all systems serving 3,300–10,000 people, subject to the availability of appropriations; and (3) all systems serving more than 10,000 people. EPA pays for the sample kit preparation, sample shipping fees, and sample analysis for small systems (those serving 25–10,000 people) subject to UCMR 5. UCMR 5 applies only to community water systems and non-transient non-community water systems. It does not apply to transient non-community water systems.

[18]EPA randomly assigns each system a year during which to collect data, according to EPA officials.

[19]According to EPA officials, this percentage is based on unweighted data and does not constitute a nationwide rate, since data collection is still in process. Unweighted estimates may differ from weighted estimates that appropriately incorporate selection probabilities to generalize the estimated quantity to the entire population from which the sample was selected (i.e., all public water systems subject to UCMR 5).

[20]Exceedances were based on an average concentration. According to EPA officials, for UCMR 5 purposes, a full set of results is defined as four sample results from a surface water location or two sample results from a groundwater location.

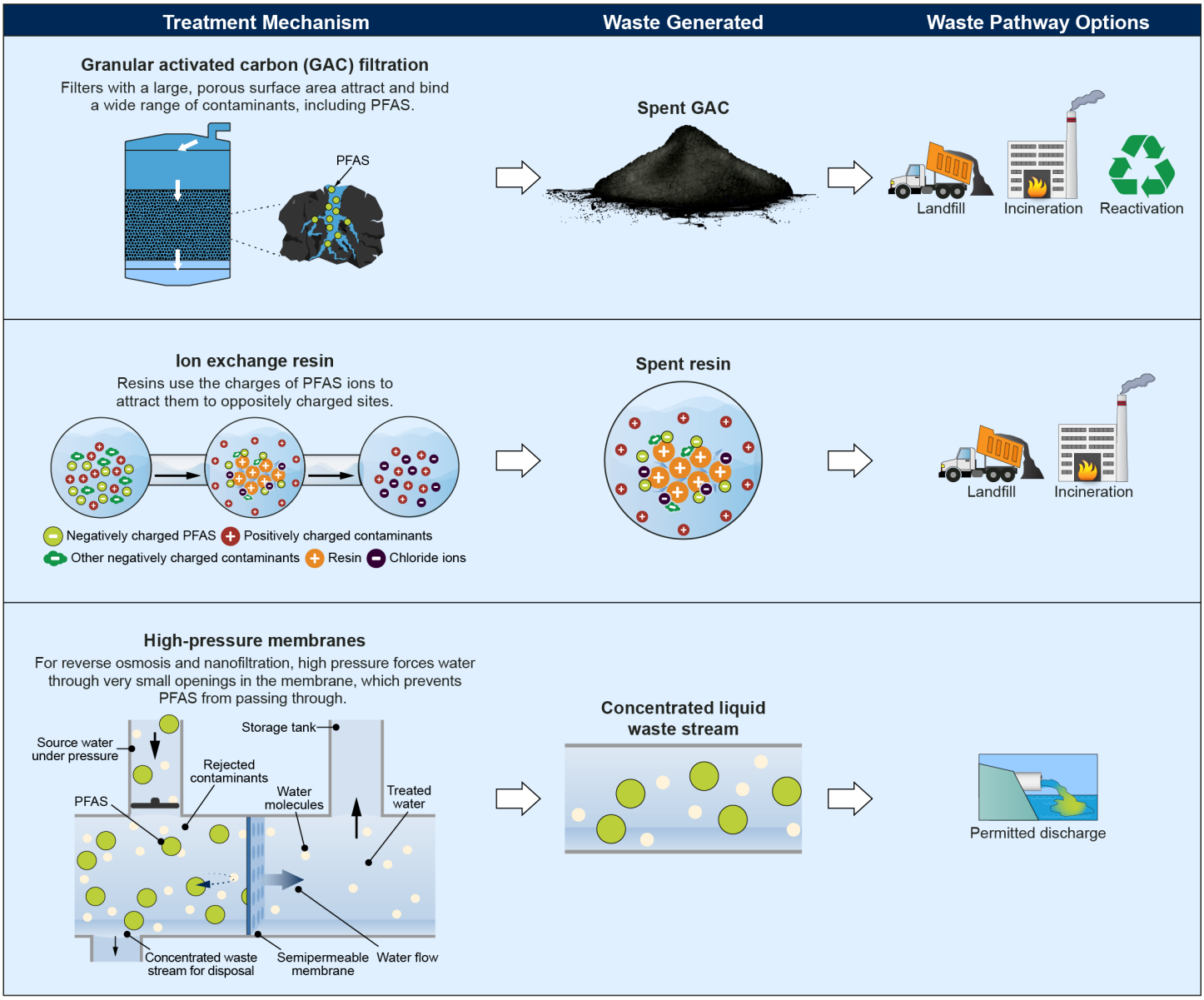
[21]In 2022, we recommended that EPA use comprehensive data, such as the UCMR 5 data, to conduct a nationwide analysis to determine the demographic characteristics of communities with PFAS in their drinking water. EPA agreed with our recommendation. See GAO-22-105135.

technologies can remove up to 90 percent or more of 30 different PFAS from drinking water.[22] However, as of July 2024, EPA's Drinking Water Treatability Database showed that three treatment technologies—granular activated carbon (GAC), ion exchange resin, and high-pressure membranes (e.g., reverse osmosis or nanofiltration)—generally removed up to 99 percent or more of the six PFAS for which EPA has promulgated MCLs.[23] According to EPA officials, current technologies can remove more than 30 different PFAS to non-measurable concentrations, often resulting in removal efficiencies that exceed 99 percent. However, treating PFAS in drinking water can create PFAS-contaminated waste materials as byproducts that then need to be properly managed—for example, disposed of in a landfill, incinerated, or reactivated (see fig. 2).

[22]GAO, *Persistent Chemicals: Technologies for PFAS Assessment, Detection, and Treatment*, GAO-22-105088 (Washington, D.C.: July 28, 2022).

[23]For GenX chemicals, GAC has been found to be up to 95 percent effective.

Figure 2: Examples of Treatment Methods to Remove Per- and Polyfluoroalkyl Substances (PFAS) from Drinking Water and of Pathways for Resulting PFAS-Contaminated Waste



Sources: GAO analysis of information from the Environmental Protection Agency (EPA); GAO (icons); PikePicture/stock.adobe.com (spent GAC image). | GAO-24-106523

Notes: According to EPA documents, GAC should be sent to landfills that are properly lined. If not properly controlled, landfilled PFAS can leach into the environment.

Incinerators burn waste at high temperatures to destroy contaminants. Incinerators operating under certain conditions may be more effective at adequately destroying (mineralizing) PFAS and minimizing products of incomplete combustion. EPA recommends testing with a range of methods at thermal treatment facilities before accepting large quantities of PFAS-containing materials.

Reactivation uses high temperatures to remove contaminants from GAC so that it can be reused.

Permitted discharge could take several forms. For example, the Clean Water Act prohibits the discharge of pollutants into navigable waters unless the discharge occurs in accordance with a National Pollutant Discharge Elimination System permit, which generally specifies the amount of a pollutant that

can be discharged into a receiving water. In 2022, EPA issued guidance regarding steps that could be taken to reduce discharges of PFAS through such permits.

Through the IIJA, Congress appropriated $9 billion for programs that provide funds for certain public water systems to address emerging contaminants, including PFAS, in drinking water.[24] Public water systems granted such funds can use them for various activities that will facilitate compliance with National Primary Drinking Water Regulations or other requirements of the Safe Drinking Water Act. However, since operations and maintenance activities are generally not eligible for such funding, public water systems are limited in their ability to use the funds for those activities, which might include activities like those associated with managing PFAS-contaminated waste.

Recent Federal Activity Related to Managing PFAS-Contaminated Waste and Releases to the Environment

Currently, there are no specific federal regulatory requirements for the disposal of PFAS. Therefore, the presence of PFAS in waste— such as the waste generated as part of the drinking water treatment process— does not impose any additional federal waste management or disposal requirements on public water systems. However, EPA has issued some guidance pertaining to the destruction and disposal of PFAS-containing materials. Specifically, in April 2024, EPA released an updated version of its *Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances*.[25] The guidance identifies various methods for PFAS destruction and disposal, as well as a framework for evaluating emerging technologies.

In addition, EPA finalized rules that will help to facilitate the cleanup of PFAS in the environment. For example, in May 2024, EPA finalized a rule designating two PFAS—PFOA and PFOS—as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA).[26] CERCLA gives EPA the authority to respond to actual and threatened releases to the environment of (1) hazardous substances and (2) pollutants and contaminants that may pose an imminent and substantial danger to public health or the environment. CERCLA authorizes EPA to compel parties potentially responsible for those releases to clean up contaminated sites; allows EPA to pay for cleanups and seek reimbursement from potentially responsible parties;[27] and establishes a Hazardous Substance Superfund (trust fund) to help EPA pay for cleanups and related program activities.

According to EPA, the new rule is expected to strengthen EPA's ability to clean up sites contaminated with certain PFAS and to hold responsible parties accountable for addressing significant contamination and cleanup

[24]As noted above, the IIJA also appropriated billions of dollars for other EPA drinking water and wastewater programs, including $23.4 billion for capitalization grants for states' Clean Water State Revolving Funds and Drinking Water State Revolving Funds.

[25]The first version of this document was released in December of 2020, as mandated by section 7361 of the National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, 133 Stat. 1198 (2019). The act directed EPA to publish interim guidance on the destruction and disposal of PFAS substances and materials containing PFAS, including for spent filters, membranes, resins, granular carbon, and other waste from water treatment, among other PFAS-containing materials. EPA was directed to publish revised interim guidance at least once every 3 years.

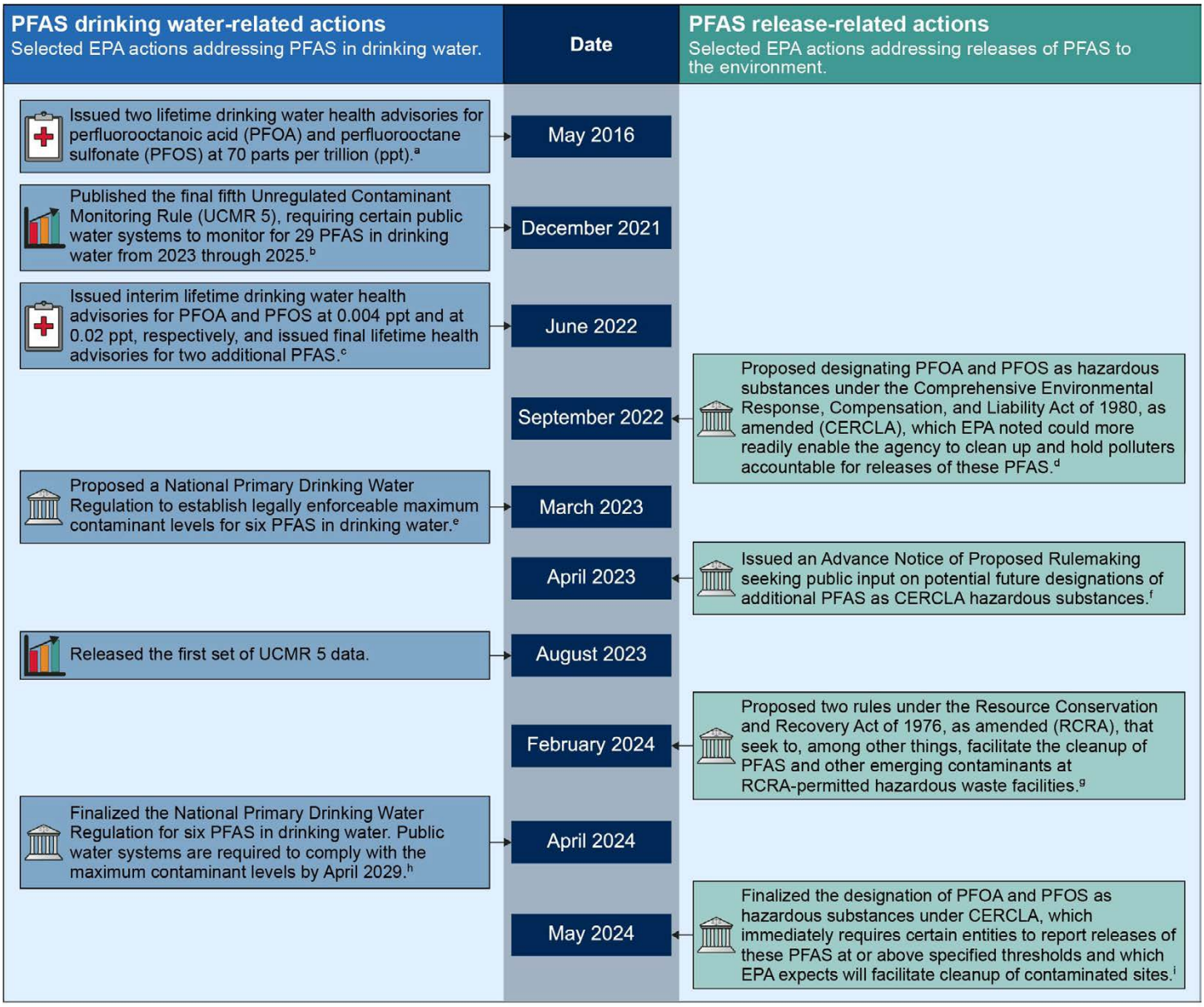
[26]*Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances*, 89 Fed. Reg. 39124 (May 8, 2024).

[27]Potentially responsible parties encompass a range of entities, including the current owner and operator of a vessel or a facility as defined by CERCLA; past owners and operators at the time of disposal of a hazardous substance; and parties that arranged for the disposal, treatment, or transport of a hazardous substance. 42 U.S.C. § 9607.

costs.[28] For example, assuming certain conditions are met, CERCLA can impose liability for cleanup costs on parties responsible in whole, or in part, for releases of hazardous substances into the environment. Courts have held that CERCLA liability is retroactive, joint and several, and strict, meaning that a potentially responsible party may be held liable for cleanup costs and damages to natural resources, regardless of fault, and regardless of whether the release occurred before CERCLA was enacted or after. A party that has incurred cleanup costs or been held liable for such costs under CERCLA may seek to recover those costs from other potentially responsible parties. In addition to the CERCLA designation, EPA has taken various other actions to address PFAS in drinking water and releases of PFAS to the environment (see fig. 3).

[28]The direct effects of the CERCLA designation include requiring certain entities to report releases of PFOA or PFOS above a specified threshold. Anticipated indirect effects include that the rule will allow the federal government to more readily require responsible private parties to address releases of PFOS and PFOA, and allow the government and private parties to recover cleanup costs from potentially responsible parties, assuming relevant criteria are met.

Figure 3: Certain Environmental Protection Agency (EPA) Actions Addressing Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water and Releases of PFAS to the Environment Since 2016



Source: GAO analysis of EPA actions, laws, and regulations; GAO (icons). | GAO-24-106523

Note: EPA also took other actions prior to 2016. For example, EPA issued its first provisional health advisory for PFOA and PFOS in 2009, and the first UCMR containing PFAS was UCMR 3—which required certain public water systems to monitor for six PFAS from 2013 through 2015.

[a]*Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate*, 81 Fed. Reg. 33250 (May 25, 2016). Drinking water health advisories are nonenforceable and nonregulatory, but rather provide information on the health risk of identified but unregulated contaminants.

[b]*Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems and Announcement of Public Meetings*, 86 Fed. Reg. 73131 (Dec. 27, 2021). Under its UCMR program, EPA requires certain water systems to monitor for specific unregulated contaminants that EPA identifies. Under the third UCMR cycle (UCMR 3), EPA required monitoring from 2013 through 2015 for six PFAS, including five for which EPA set legally enforceable maximum levels in drinking water in April 2024.

[c]*Lifetime Drinking Water Health Advisories for Four Perfluoroalkyl Substances*, 87 Fed. Reg. 36848 (June 21, 2022).

[d]*Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances*, 87 Fed. Reg. 54415 (Sept. 6, 2022). An alternate name for perfluorooctanesulfonic acid is perfluorooctane sulfonate; both refer to the same chemical, which is abbreviated as PFOS.

[e]PFAS *National Primary Drinking Water Regulation Rulemaking*, 88 Fed. Reg. 18638 (Mar. 29, 2023). EPA proposed establishing individual maximum contaminant levels for PFOA and PFOS, and proposed establishing a maximum contaminant level for any mixture containing one or more of four other PFAS using a Hazard Index.

[f]*Addressing PFAS in the Environment*, 88 Fed. Reg. 22399 (Apr. 23, 2023).

[g]*Listing of Specific PFAS as Hazardous Constituents*, 89 Fed. Reg. 8606 (Feb. 8, 2024); Definition of Hazardous Waste Applicable to Corrective Action for Releases From Solid Waste Management Units, 89 Fed. Reg. 8958 (Feb. 8, 2024).The first rule would add nine PFAS, their salts, and structural isomers to the list of RCRA hazardous constituents; the second would amend the definition of hazardous waste as it applies to cleanups at permitted hazardous waste facilities. According to EPA officials, the second proposed rule would more clearly provide EPA authority to address releases from permitted hazardous waste facilities, not only of hazardous waste and constituents listed or identified in EPA regulations, but also of all substances that meet RCRA's statutory definition of hazardous waste.

[h]*PFAS National Primary Drinking Water Regulation*, 89 Fed. Reg. 32532 (Apr. 26, 2024). In the final rule, EPA set individual maximum contaminant levels for five PFAS and a maximum contaminant level for any mixtures containing two or more of certain PFAS. In total, the rule covers six types of PFAS.

[i]*Designation of Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) as CERCLA Hazardous Substances*, 89 Fed. Reg. 39124 (May 8, 2024).

Most Public Water Systems Do Not Know the Source of PFAS Contamination in Their Drinking Water and Face Challenges Implementing Treatment Methods

In our survey of public water systems in selected states with PFAS at or above EPA's MCLs, we found that most public water systems did not know the source(s) of PFAS contamination in their drinking water. In addition, we estimate that most public water systems with PFAS have not yet fully implemented a treatment method.[29] However, as they implement PFAS treatment methods, public water systems face or expect to face technical, financial, and other challenges. While EPA is working to address these challenges, the agency could further help public water systems through various actions.

To what extent do public water systems in selected states know the source(s) of PFAS contamination in their drinking water?

We estimate that most public water systems (90 percent) in selected states do not know the source(s) of PFAS contamination in their drinking water, but those public water systems that do know the entity responsible for the

[29]Our sample was designed to produce reliable percentage estimates but was not designed to estimate the total number of people served, due to uncertainties around those estimates. Though we cannot reliably estimate the population served by all public water systems that have not yet implemented a treatment method in our selected states, at least 3.6 million people in our sample are served by systems that have not yet implemented a PFAS treatment method.

contamination cited several sources.[30] These include airports, fire stations/training facilities, industry (e.g., effluent from a factory), military facilities, and wastewater treatment plants, among other sources.[31]

Officials at public water systems identified the source of PFAS contamination by either conducting source water investigations or being informed by others, such as a responsible party or a state or federal agency. Some systems reported that once they identified the source of PFAS contamination, they were able to get the responsible party to pay for treatment. For example, officials from one water system stated that they identified the party responsible for PFAS contamination in their water and, "after a long negotiation process," received compensation from that party for the construction, operation, and maintenance costs for a PFAS treatment system.

According to EPA officials, the agency plays a role in PFAS source identification by providing funding, technical assistance, and conducting research. For example, the IIJA appropriated $5 billion across fiscal years 2022 through 2026 for grants addressing emerging contaminants through EPA's Emerging Contaminants in Small or Disadvantaged Communities grant program. According to EPA documentation, this funding can be used for an array of activities, including research and investigations to identify the presence, source, or extent of PFAS contamination in source water.

Additionally, EPA's Office of Research and Development provides technical assistance to Tribes, states, and territories to help characterize the PFAS found in their communities. In some cases, this work can include efforts to identify sources of PFAS detected in the environment. For example, in a 2020 study, EPA traced PFAS contamination in New Jersey water samples to an industrial PFAS user.[32]

According to EPA officials, the agency is also working to expand the scientific foundation for understanding and addressing risks from PFAS contamination through its research. As part of these efforts, EPA is studying sources of PFAS in the environment, how PFAS move and transform in the environment, and approaches for removing PFAS from drinking water.

How, if at all, have water systems in selected states implemented PFAS treatment methods?

We estimate that most water systems with PFAS contamination (77 percent) had not yet fully implemented a PFAS treatment method at the time of the survey, according to our generalizable survey of water systems in

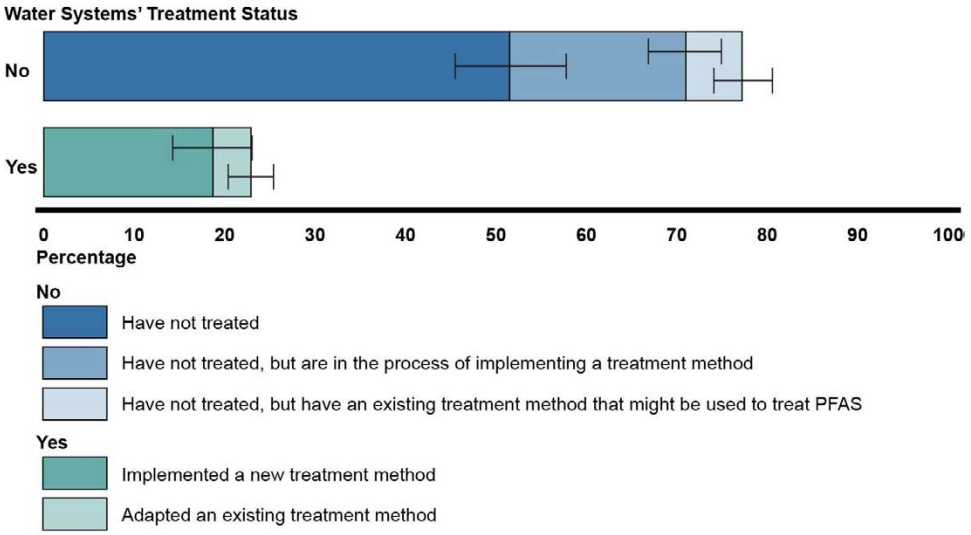
[30]We surveyed community water systems and non-transient non-community water systems, which we collectively refer to as "public water systems" in this report. Because we followed a probability procedure based on random selections, our sample is only one of a large number of samples that we might have drawn. Since each sample could have provided different estimates, we express our confidence in the precision of our particular sample's result as a 95 percent confidence interval or margins of error (the half-width of this interval). This is the interval that would contain the actual population value for 95 percent of the samples we could have drawn. All reported survey results have a 95 percent margin of error from 3.7 to 8.9 percent, unless otherwise noted.

[31]In our survey, the responses to the questions about sources of PFAS and the ways water systems identified the sources of PFAS were presented in lists that included an "Other" category, and respondents were instructed to check all that apply. Some respondents selected "Other."

[32]James P. McCord, Mark J. Strynar, John W Washington, Erica L. Bergman, and Sandra M. Goodrow, "Emerging Chlorinated Polyfluorinated Polyether Compounds Impacting the Waters of Southwestern New Jersey Identified by Use of Nontargeted Analysis," *Environmental Science and Technology Letters*, vol. 7, no. 12 (2020): 903-908.

six selected states (see fig. 4).[33] Of those systems that were in the process of implementing a PFAS treatment method, approximately half are in the early phases of implementation (research, planning, and design), with a similar percentage in the later phases (procurement, construction, installation, and testing).[34]

Figure 4: Extent to Which Public Drinking Water Systems in Selected States Have Treated for Per- and Polyfluoroalkyl Substances (PFAS)



Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Accessible Data for Figure 4: Extent to Which Public Drinking Water Systems in Selected States Have Treated for Per- and Polyfluoroalkyl Substances (PFAS)

Water Systems' Treatment Status	Percent	Lower Bound	Upper Bound
Have not treated	51.5	45.8	57.1
Have not treated, but are in the process of implementing a treatment method	19.5	15.3	23.6
Have not treated, but have an existing treatment method that might be used to treat PFAS	6.2	3.5	9.9
Implemented a new treatment method	18.7	14.2	23.2
Adapted an existing treatment method	4.2	2.2	7.3

Source: GAO analysis of data from survey of public water systems in selected states. I GAO-24-106523

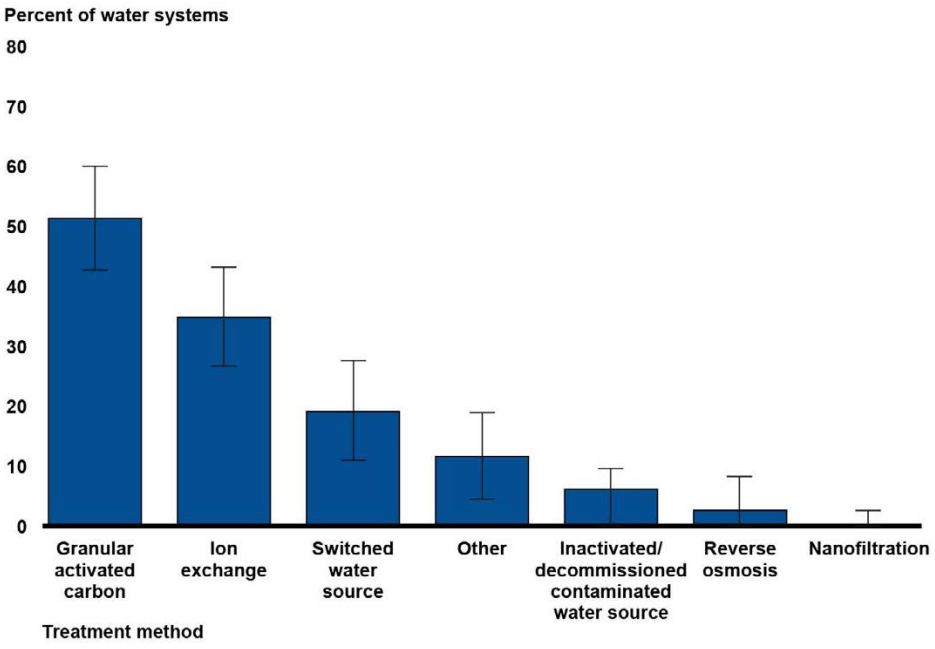
[33]The 77 percent includes water systems that have not treated (see fig. 4, dark blue bar); have not treated, but are in the process of implementing a treatment method (medium blue bar); and have not treated, but have an existing treatment method that might be used to treat PFAS (light blue bar). As noted previously, although our sample was designed to produce reliable percentage estimates and not to estimate the total number of people served, at least 3.6 million people are served by systems in our sample that have not yet implemented a PFAS treatment method.

[34]While not statistically different, an estimated 49.5 percent (95 percent confidence interval of 37.8 to 61.2 percent) are in the early phases, compared with an estimated 37.1 percent (95 percent confidence interval of 25.5 to 48.6 percent) that are in the later phases of implementation.

Notes: GAO administered the survey from October 2023 to January 2024. The whiskers display the 95 percent confidence interval for each estimate. Any estimates with nonoverlapping intervals are statistically different at the 95 percent confidence level.

Large and small public water systems that have partially or fully implemented a PFAS treatment method (an estimated 23 percent, see fig. 4) used several methods, with GAC being the method used most often (see figs. 5 and 6).[35] Similarly, among the systems not yet treating for PFAS, GAC was the method they were most likely to use.

Figure 5: Drinking Water Treatment Methods Used by Large and Small Public Water Systems for Per- and Polyfluoroalkyl Substances (PFAS)



Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Accessible Data for Figure 5: Drinking Water Treatment Methods Used by Large and Small Public Water Systems for Per- and Polyfluoroalkyl Substances (PFAS)

Treatment Method	Percent	Margin of Error
Granular activated carbon	51.3	8.7
Ion exchange	34.8	8.2
Switched water source	19.1	8.4
Other	11.6	7.3
Inactivated/decommissioned contaminated water source	6.1	3.5
Reverse osmosis	2.6	5.6
Nanofiltration	0	2.4

[35]For the purposes of this report, large public water systems are those that serve more than 10,000 people and small public water systems are those that serve 10,000 or fewer people. More than 93 percent of the public water systems required to implement the PFAS drinking water regulation are small, according to EPA officials. Examples of small public water systems include small towns, homeowners' associations, schools, restaurants, and campgrounds.

Source: GAO analysis of data from survey of public water systems in selected states. I GAO-24-106523

Notes: GAO administered the survey from October 2023 to January 2024. The whiskers display the 95 percent confidence interval for each estimate. Any estimates with nonoverlapping intervals are statistically different at the 95 percent confidence level. The estimate for granular activated carbon is significantly different than that for ion exchange. The percent of public water systems using the treatment methods might not sum to 100 percent, as some public water systems used more than one treatment method.

Figure 6: Examples of Granular Activated Carbon (GAC) Filtration in Large and Small Public Water Systems

Source: © February 2024/Sudbury Water District (left); Cirtronics Corporation (right). | GAO-24-106523

Notes: The image on the left is of per- and polyfluoroalkyl substances (PFAS) GAC treatment under construction for a municipal public water system in Massachusetts, serving about 18,000 people. This is a 40-foot by 50-foot treatment system with four 12-foot diameter filter vessels, each equipped with 30,000 pounds of GAC. It is designed to treat 2 million gallons of water per day. The image on the right is of PFAS GAC treatment for an office building in New Hampshire, serving about 250 people. This system is approximately 4 feet wide, 12 inches deep, and 7 feet high and treats about 100 gallons per week.

What are the challenges that public water systems in selected states face, or expect to face, as they implement PFAS treatment methods, and how can EPA help address these challenges?

Public water systems in selected states face challenges implementing PFAS treatment methods, including technical capacity, financial, and communication challenges (see table 1). While EPA is working to address these challenges, EPA could further help public water systems through various actions, such as tailoring treatment implementation guidance to the needs of small systems, working with partners to improve access to funding, and developing resources to help systems communicate with customers about PFAS health risks.

Table 1: Selected Challenges Public Water Systems Face Implementing Treatment Methods for Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Technical Capacity
1. Selecting the best treatment method
2. Understanding how existing source water quality could affect treatment method options
3. Identifying available treatment methods
4. Determining the ongoing operations and maintenance needs of treatment methods
Financial
1. Obtaining federal or state funding
2. Raising customer water rates to help pay for the costs of implementing a treatment method
3. Obtaining loan or bond funding
4. Developing a capital cost estimate
5. Paying for ongoing operations and maintenance costs
Communication
1. Communicating effectively with customers and the public about PFAS health risks
2. Communicating effectively with representatives of local governments or advisory boards about treatment method costs and benefits

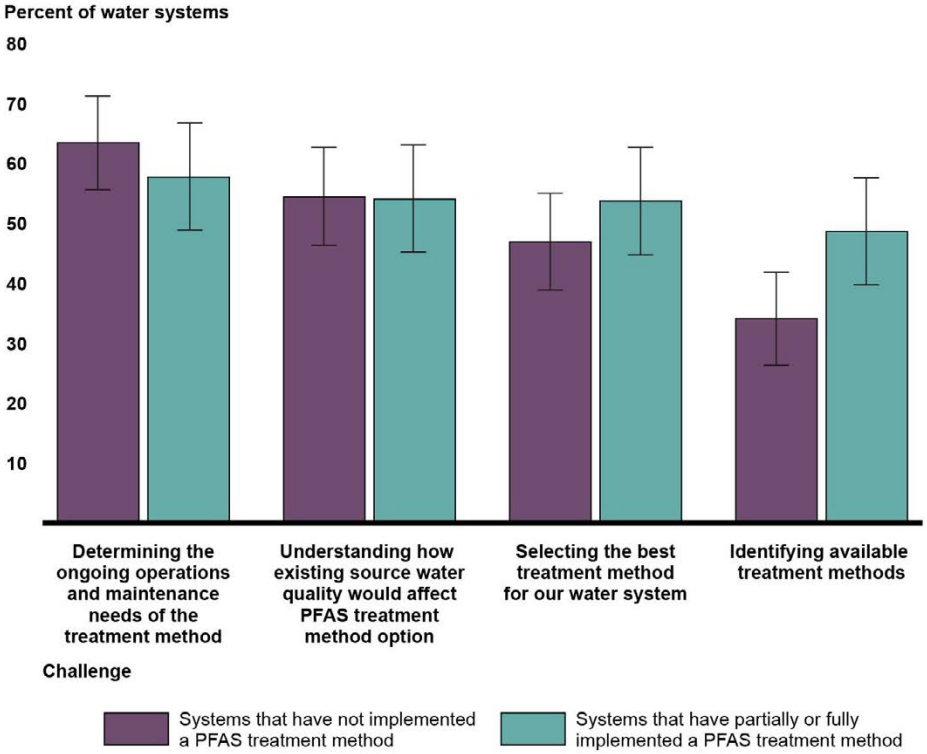
Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Notes: Public water systems also face or expect to face other challenges in treating for PFAS in drinking water, including regulatory compliance, workforce, and market supply challenges. For more information about these challenges, see appendix III.

Technical Capacity Challenges Related to Implementing Treatment

In our survey of public water systems in selected states with PFAS at or above EPA's MCLs, we found that systems faced technical capacity challenges implementing a PFAS treatment method. These challenges included determining ongoing operations and maintenance needs of the treatment method, understanding how source water quality would affect treatment method options, and identifying available treatment methods for their water system. Additionally, we estimate approximately half of all systems—both those that have partially or fully implemented a PFAS treatment method and those that have not—faced or expected to face challenges related to selecting the best PFAS treatment method for their water system (see fig. 7).

Figure 7: Technical Capacity Challenges Faced by Public Water Systems in Treating Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water



Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Accessible Data for Figure 7: Technical Capacity Challenges Faced by Public Water Systems in Treating Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Challenge	Percent (Systems that have not treated)	Margin of Error (Systems that have not treated)	Percent (Systems that have treated)	Margin of Error (Systems that have treated)
Determining the ongoing operations and maintenance needs of the treatment method	63.4	7.8	57.7	8.9
Understanding how existing source water quality would affect PFAS treatment method option	54.4	8.1	54	8.9
Selecting the best treatment method for our water system	46.9	8	53.7	8.9
Identifying available treatment methods	34.1	7.6	48.6	8.9

Source: GAO analysis of data from survey of public water systems in selected states. I GAO-24-106523

Notes: GAO administered the survey from October 2023 to January 2024. The whiskers display the 95 percent confidence interval for each estimate. Any estimates with nonoverlapping intervals are statistically different at the 95- percent confidence level.

For public water systems that have not implemented a PFAS treatment method, an estimated 90 percent would find it helpful to have guidance to help evaluate and select the best treatment method for their system. For example, one water system official said it would be beneficial to have “a recommendation from the federal

government on how to treat or remove PFAS from drinking water based on the treatment process." Another said it would be helpful to have "guidance on selecting the best treatment method."

When looking for guidance to help them implement a PFAS treatment method, systems were likely to turn to several types of organizations, such as engineering firms, state agencies, and water associations. Representatives we interviewed from some of these organizations said that small systems might especially benefit from having clear PFAS treatment guidance from EPA. For example, one official from an engineering firm said that while they help larger systems that can afford engineering services to understand their treatment options, clear guidance from EPA could be important for smaller systems that may not have access to an engineering firm's expertise. Similarly, an official from a water association that works with small public water systems said a major hurdle for rural utilities is the lack of expertise needed for implementation. That is, PFAS treatment implementation is consultant- and engineer-driven, and small systems may not have resources to hire consultants or engineers. Further, state officials we interviewed said that EPA should develop guidance that is specific to small public water systems, as these systems are in greatest need of assistance. State officials also said that while EPA has provided helpful information, the information would be more valuable if it were easier for public water systems to find.

Section 212 of the Small Business Regulatory Enforcement Fairness Act of 1996, as amended, requires federal agencies to publish small entity compliance guides for certain rules.[36] According to EPA officials, the PFAS National Primary Drinking Water Regulation qualifies as such a rule. Accordingly, EPA is required to prepare a Small Entity Compliance Guide to explain what actions small entities—such as certain small public water systems—are required to take to comply with the rule. The act states that the agency must ensure that small entity compliance guides are written with sufficiently plain language likely to be understood by affected small entities. Further, the act requires agencies to publish the guide on the same date as the date of publication of the final rule, or as soon as possible after that date, and no later than the date on which the requirements of the rule become effective. The PFAS National Primary Drinking Water Regulation was published on April 26, 2024, and public water systems must comply with the MCLs by April 26, 2029.

EPA officials we interviewed told us they are aware that small public water systems will need help implementing a PFAS treatment method. EPA has developed some guidance and resources on PFAS treatment, such as fact sheets on monitoring and treatment options. (See app. IV for EPA resources related to addressing PFAS in drinking water, including specific technical capacity resources.) Officials say the agency also plans to issue a Small Entity Compliance Guide for the PFAS National Primary Drinking Water Regulation. Officials do not have a target date for issuing the guide but are aiming to do so in sufficient time for it to be practical for helping small entities evaluate and implement compliance options before the April 2029 deadline, when public water systems must comply with the PFAS MCLs.

[36]Small Business Regulatory Enforcement Fairness Act of 1996, Pub. L. No. 104-121, § 212, 110 Stat. 847, 858 (1996), as amended by Pub. L. No. 110-28, § 8302, 121 Stat. 112, 204-05 (2007). Section 212 requires agencies to publish one or more small entity compliance guides for each rule or group of related rules for which the agency is required to prepare a final regulatory flexibility analysis under the Regulatory Flexibility Act. The relevant sections of the Regulatory Flexibility Act (codified at 5 U.S.C. §§ 604-605) generally require agencies to prepare a final regulatory flexibility analysis for every final rule for which a general notice of proposed rulemaking is required unless the head of the agency certifies that the rule will not have a "significant economic impact on a substantial number of small entities." 5 U.S.C. § 605(b).

More than 93 percent of the nation's public water systems are small systems.[37] By releasing a Small Entity Compliance Guide for the PFAS National Primary Drinking Water Regulation as soon as feasible—written with sufficiently plain language to be readily understood—EPA could help small systems better plan and prepare to comply with the rule, thus addressing challenges faced by small, rural, and often disadvantaged communities. Doing so would align with one of EPA's stated approaches in the *PFAS Strategic Roadmap*—the agency's plan to address PFAS—to ensure that disadvantaged communities have equitable access to solutions.[38]

Financial Challenges Related to Treatment

In our survey of public water systems in selected states with PFAS at or above EPA's MCLs, we found that the systems face or expect to face various financial challenges related to treating for PFAS. For example, respondents said the following:

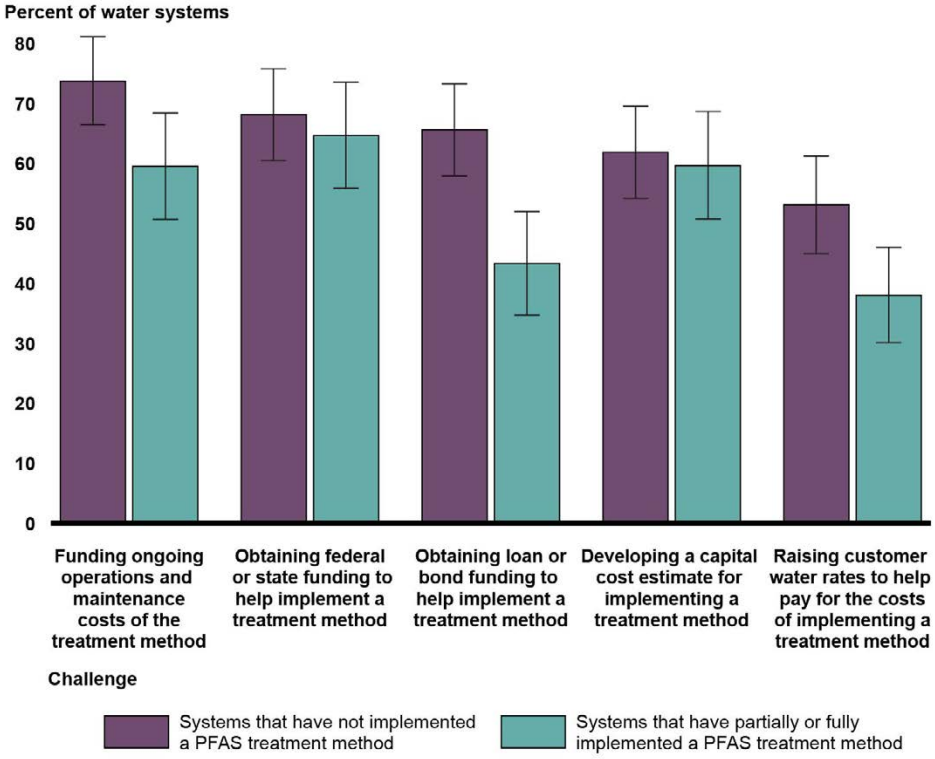
- "Funding is the largest hurdle for [our city] to implement treatment of PFAS."
- "We are a small homeowner's association with a community well/water system. We have minimal excess capital funds, some of which are being depleted just to pay for state EPA-required and expensive PFAS testing. Our system is also over 30 years old and will most likely be needing major infrastructure repairs and improvements in the relatively-near [sic] future, for which our capital reserve is likely not remotely sufficient to cover those costs. In short, our resources are extremely finite as it is. Adding testing and mitigation requirements relative to PFAS is going to most likely be financially crippling for us."
- "We have budgets to work through, as we are neither a small or a disadvantaged community, but at the end of the day we are held to the same standards as everyone else, just with little or no funding. We are not able to print more dollars to stay in business and keep the water pumping. We must come up with reasonable solutions to a very large problem in a short amount of time, with little to no help. We have discussed even staying in business with city council. [Chemical companies] will still be in business at the end of the day though."

Additionally, public water systems found it challenging to access federal funding. Specifically, we estimate 65 percent of public water systems that have partially or fully implemented treatment method, and 68 percent of systems that have not, faced or expected to face challenges related to obtaining federal or state funding to help implement a treatment method (see fig. 8).

[37]This percentage is specific to public water systems subject to EPA's PFAS National Primary Drinking Water Regulation, and thus omits transient non-community water systems.

[38]EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021–2024* (October 2021).

Figure 8: Financial Challenges Faced by Public Water Systems in Treating Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water



Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Accessible Data for Figure 8: Financial Challenges Faced by Public Water Systems in Treating Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Challenge	Percent (Systems that have not treated)	Margin of Error (Systems that have not treated)	Percent (Systems that have treated)	Margin of Error (Systems that have treated)
Funding ongoing operations and maintenance costs of the treatment method	73.7	7.4	59.5	8.9
Obtaining federal or state funding to help implement a treatment method (e.g., via State	68.1	7.6	64.6	8.8
Obtaining loan or bond funding to help implement a treatment method	65.6	7.7	43.3	8.6
Developing a capital cost estimate for implementing a treatment method	61.8	7.7	59.6	8.9
Raising customer water rates to help pay for the costs of implementing a treatment metho	53.1	8.1	38	7.9

Source: GAO analysis of data from survey of public water systems in selected states. I GAO-24-106523

Notes: GAO administered the survey from October 2023 to January 2024. The whiskers display the 95 percent confidence interval for each estimate. Any estimates with nonoverlapping intervals are statistically different at the 95 percent confidence level.

To provide information about available federal funding for implementing PFAS treatment methods (e.g., Drinking Water State Revolving Funds and the Emerging Contaminants in Small or Disadvantaged Communities grant program), EPA has developed resources, such as implementation memorandums and frequently asked questions documents. EPA also developed Water Technical Assistance programs to support communities in identifying water challenges; developing plans; building technical, managerial, and financial capacity; and developing application materials to access water infrastructure funding. According to EPA officials, resources about funding opportunities are published on EPA's website, shared with EPA regional staff, and shared through outside organizations and networks, such as the Council of Infrastructure Financing Authorities and the Association of State Drinking Water Administrators. (See app. IV for EPA funding resources.) EPA officials told us the agency intends to develop additional resources to support the implementation of the PFAS National Primary Drinking Water Regulation and newly available federal funding for private wells.[39]

However, according to our survey, most public water systems in selected states are generally not familiar with existing EPA guidance, technical documents, and related funding information.[40] According to EPA officials we interviewed, the primary distribution channels for these resources are EPA regional officials and managers of Drinking Water State Revolving Funds, since the funding programs are administered largely at the state level.

Standards for Internal Control in the Federal Government state that management should externally communicate the necessary quality information to achieve the entity's objectives.[41] In its PFAS Strategic Roadmap, one of EPA's objectives is to ensure that communities affected by PFAS contamination receive resources and assistance to address the contamination, regardless of income, race, or language barriers. EPA could better support communities treating PFAS in drinking water by working with partners (e.g., Tribes, states, regional offices, and outside organizations) to (1) identify barriers public water systems experience obtaining funding and (2) assess how best to disseminate funding information.

Communication Challenges about PFAS Health Risks

In our survey of public water systems in selected states with PFAS at or above EPA's MCLs, we found that approximately half of the systems faced or expected to face challenges related to communicating effectively with customers and the public about PFAS health risks (see fig. 9).[42] In particular, an estimated 86 percent of large public water systems that have partially or fully implemented a PFAS treatment found communicating health risks to be challenging. We also found that approximately half of all public water systems in selected

[39]The Consolidated Appropriations Act, 2024, and an accompanying Senate Report, specified that owners of drinking water wells that are not public water systems or connected to a public water system are eligible for fiscal year 2024 funds awarded to states through certain Safe Drinking Water Act grant programs for small and disadvantaged communities. This act was enacted after we completed our survey of public water systems.

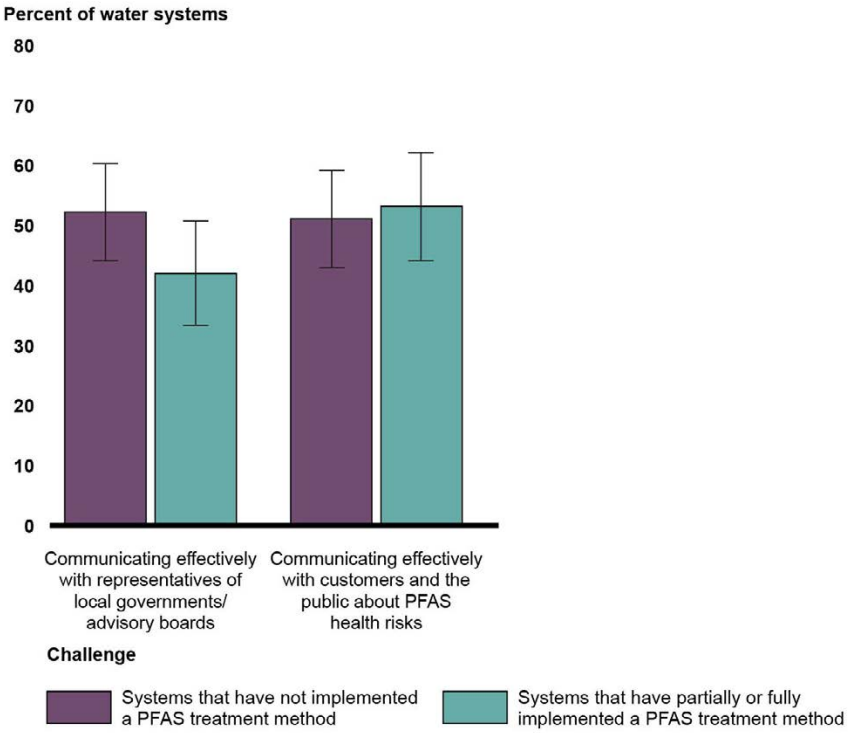
[40]GAO's survey of public water systems presented several existing EPA resources to respondents, along with the option to select whether each resource was helpful, not helpful, or not familiar to the respondent. "Not familiar" responses ranged from an estimated 46.3 percent to 60.4 percent for the various EPA resources. Our survey concluded in January 2024, which was before EPA released some of its technical documents and information about available funding.

[41]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: Sept.10, 2014).

[42]The 95 percent confidence interval is 44 percent to 62 percent for systems that have partially or fully implemented a PFAS treatment method and 43 percent to 59 percent for those systems that had not implemented a treatment method.

states were unfamiliar with EPA's various PFAS health advisories that identified the concentration of these chemicals in drinking water at or below which adverse health effects were not anticipated to occur.[43]

Figure 9: Communication Challenges Faced by Public Water Systems in Treating Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water



Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Notes: GAO administered the survey from October 2023 to January 2024. The whiskers display the 95 percent confidence interval for each estimate. Any estimates with nonoverlapping intervals are statistically different at the 95 percent confidence level.

Additionally, for an estimated 84 percent of public water systems—both those that have partially or fully implemented a PFAS treatment method and those that have not—it would be helpful to have tools to communicate with stakeholders about the health risks associated with PFAS, according to our survey.[44] However, public water systems were generally unaware of EPA's existing risk communication resources.

Public water systems will be required to communicate with stakeholders about the health risks associated with regulated PFAS detected at certain levels in drinking water. For example, Safe Drinking Water Act regulations

[43]An estimated 49 percent of public water systems were unfamiliar with EPA's health advisory for PFOA; 50 percent with EPA's PFOS health advisory; 54 percent with EPA's PFBS health advisory; and 55 percent with EPA's GenX chemicals health advisory. The Safe Drinking Water Act authorizes EPA to issue health advisories for contaminants that are not subject to a National Primary Drinking Water Regulation. Each of the health advisories referenced here was issued before EPA promulgated the PFAS National Primary Drinking Water Regulation in 2024. Health advisory documents provide technical information on chemical and microbial contaminants that can cause human health effects and are known or anticipated to occur in drinking water.

[44]For systems that have partially or fully implemented a PFAS treatment method, tools and templates to improve communication with stakeholders about the health risks associated with not treating for PFAS would be helpful for an estimated 84 percent. For those systems that had not yet treated, such tools would be helpful for an estimated 88 percent.

require community water systems to provide their customers with an annual Consumer Confidence Report that includes information on the quality of the water delivered by the system and characterizes the risks, if any, from exposure to contaminants detected in the drinking water in an accurate and understandable manner. Under the PFAS National Primary Drinking Water Regulation, community water systems will be required to report PFAS detections above a specified trigger level in their Consumer Confidence Reports starting in 2027. Beginning in 2029, these systems will be required to include information about potential health effects in the reports when there are PFAS MCL violations. Further, in the case of a violation of a PFAS MCL, all public water systems will need to provide the public notice of the violation as soon as practical, but no later than 30 days after the system learns of the violation. These notices will also need to include health effects language. The final rule includes mandatory health effects language that relevant public water systems will need to include in their public notices and annual reports in the case of an MCL violation for each of the regulated PFAS.

Effectively communicating with communities about the health risks associated with PFAS is a key action identified in EPA's PFAS Strategic Roadmap. Upon finalizing the PFAS National Primary Drinking Water Regulation in April 2024, EPA posted a PFAS Communication Toolkit on its website with some information public water systems can share with customers. (See app. IV for EPA health effects and risk communication resources.) According to EPA officials, the agency is planning to develop additional resources that systems can choose to use when communicating about PFAS health effects to customers in case of PFAS detections or MCL violations. This will include fact sheets and optional templates that affected public water systems can modify and then share with their customers. EPA officials we interviewed told us that providing public water systems with additional resources during the initial implementation of the PFAS drinking water rule is a priority but could not specify a time frame for completing these resources. EPA has taken important steps toward helping public water systems communicate with customers about PFAS health risks and could continue to do so by promptly establishing a time frame for issuing these additional resources so that they are available to systems in a timely manner.

Finally, public water systems also face or expect to face other challenges in treating for PFAS in drinking water, including regulatory compliance, workforce, and market supply challenges. We provide information about these challenges in appendix III.

Most Public Water Systems Have Not Managed PFAS-Contaminated Waste and Want Guidance on Appropriate Methods for Doing So

Most public water systems in selected states have not yet treated drinking water for PFAS, and therefore have not managed the resulting PFAS-contaminated waste. However, some of those that have implemented treatment have also managed the resulting PFAS-contaminated waste, using various methods to do so. Public water systems have faced challenges managing PFAS-contaminated waste, and most said that having guidance on the methods available for managing waste would be helpful.

How, if at all, have public water systems in selected states managed the PFAS-contaminated waste generated from the drinking water treatment process?

An estimated 41 percent of public water systems treating drinking water for PFAS have managed the resulting waste, using various methods to do so.[45] Significantly higher percentages of large systems than small water systems have managed PFAS-contaminated waste.[46] These systems used various methods to manage the waste, including reactivation of GAC, incineration, and disposal in hazardous and nonhazardous waste landfills.[47]

Most public water systems have not yet treated drinking water for PFAS, and therefore have not managed PFAS-contaminated waste. Most of these systems (an estimated 68 percent) have not yet considered how they would manage PFAS-contaminated waste. An official from one system stated, “It seems like no one knows what to do with the waste and what the effects of creating super concentrated sites will do.” Another stated, “It is unclear as to where the spent GAC is going to go as more PWS [public water systems] start using GAC for PFAS treatment, disposal and costs will become a big concern.”

Public water systems that had not yet managed PFAS-contaminated waste, but had considered how they would do so, were unsure about which waste management methods they might use. For example, an estimated 37 percent were likely to use incineration, but another estimated 34 percent did not know whether they would use incineration.[48]

What challenges do public water systems in selected states face, or expect to face, as they manage PFAS-contaminated waste, and how can EPA help address these challenges?

Public water systems face or expect to face challenges managing PFAS-contaminated waste, due to technical capacity challenges and legal uncertainty, as well as communication, financial, workforce, and storage capacity challenges.

For example, in our survey of public water systems with PFAS at or above EPA’s MCLs, we found that systems lacked the technical capacity to manage waste. Specifically, while few were already managing PFAS-

[45]The margin of error is approximately 12 percent.

[46]Although results were significantly different between large and small systems, because of the small sample size and resulting imprecise estimates for these subgroups, we do not report the estimates of these small and large water systems that have managed the resulting waste.

[47]Due to overlapping margins of error, we could not determine which waste management methods were used most frequently. See appendix I for more information on our survey methodology.

[48]The margin of error is approximately 10 percent for public water systems likely to use incineration and for systems that did not know whether they would use incineration.

contaminated waste (32 total systems), most (23 systems) found it challenging to identify feasible management methods for their PFAS-contaminated waste.[49]

Relatedly, we found that legal uncertainty around potential liability from disposing of PFAS-contaminated waste posed challenges for systems. This may be, in part, because CERCLA liability is legally complex and the PFAS regulatory landscape is evolving. Specifically, among public water systems that had not yet managed PFAS-contaminated waste, most (29 of 43) found regulatory requirements related to managing waste uncertain, and therefore did not know how to best manage the waste. As we note above, there are no specific federal regulatory requirements for the disposal of PFAS—meaning that public water systems do not currently have to dispose of the PFAS-contaminated waste in a specific way under federal rules.[50] Nonetheless, recent regulatory developments, like the designation of PFOA and PFOS as CERCLA hazardous substances, are expected to affect public water systems' disposal decisions for PFAS-contaminated waste, even though these regulations do not specify a particular disposal method.

Respondents provided comments about the challenges legal uncertainty presents for managing waste, including the following:

- "The ongoing ever-changing regulations have made it very difficult to plan for waste [management]…."
- "Landfill/disposal regulations are in flux and we still have many unknows [sic] related to managing the waste…."
- "Regulations are still being developed while we are trying to determine solutions. Not having a complete regulatory landscape…is challenging in that we do not know what may be expected after we choose and implement [drinking water treatment] solutions."

These comments indicate that while public water systems may not fully understand that there currently are no federal PFAS-specific disposal regulations, the systems are concerned about the evolving regulatory landscape surrounding PFAS. This may be in part due to concerns articulated by water associations about the PFAS CERCLA designation and potential associated liability. Specifically, water association officials we interviewed expressed concerns that the CERCLA hazardous substances designation of PFOA and PFOS—which would allow EPA to hold responsible parties accountable for cleanup costs—might negatively affect public water systems that disposed of PFAS-contaminated waste. For example, water association officials noted that public water systems might be pulled into CERCLA litigation concerning PFAS contamination in a particular location because there is a perception that the method the water system used to dispose of PFAS-contaminated waste contributed to the contamination in question.

EPA officials we interviewed said they were aware of public water systems' concerns about CERCLA liability and uncertainty around proper waste management methods. The officials said that because the agency has

[49]Due to the small number of systems that were both treating for PFAS in drinking water and managing the associated waste, and thus able to answer this question, we are not able to report statistically reliable and generalizable results to all public water systems in the scope of our review. Consequently, we report the number of systems providing a response out of the number that were both treating PFAS and managing waste.

[50]According to EPA officials, in part because no PFAS are listed as regulatory hazardous wastes under RCRA, there are currently no specific federal regulatory requirements for PFAS disposal. EPA officials further clarified that they do not expect the February 2024 proposed rule to list certain PFAS as hazardous constituents under RCRA to have any significant impact on public water systems. That rule, if finalized, would apply to cleanups taking place at RCRA-permitted hazardous waste treatment, storage, and disposal facilities, and EPA officials indicated that they are not aware of any public water systems that qualify as such facilities.

not thought of public water systems as being the target of the CERCLA designation, EPA had not developed specific guidance for public water systems on disposal methods that addresses CERCLA liability. Further, EPA officials noted that CERCLA liability is complex and fact-specific, and because EPA cannot provide legal counsel to outside entities, EPA would not be able to tell public water systems how to avoid CERCLA liability altogether.

However, EPA did issue the *PFAS Enforcement Discretion and Settlement Policy Under CERCLA* in April 2024, which states EPA's intention to focus its CERCLA enforcement efforts on entities that significantly contribute to the release of PFAS contamination into the environment (e.g., parties that manufactured PFAS or used PFAS in the manufacturing process, federal facilities, and other industrial parties).[51] The policy states that EPA does not intend to pursue entities where equitable factors do not support seeking response actions or costs under CERCLA, including, but not limited to, community water systems and publicly owned treatment works. The policy also outlines circumstances where EPA may enter into settlements with these parties, which would provide certain protection from contribution claims by other liable parties.[52]

EPA officials said that while this policy is a good resource for understanding EPA's intentions on CERCLA PFAS enforcement, they recognized that public water systems may need additional communication from EPA in more accessible and straightforward formats. The officials said they have not developed such guidance, because, until recently, their focus had been on finalizing various PFAS regulations.

Most systems—both those that have and have not managed waste—said having guidance on the appropriate methods available for managing waste would be helpful (25 out of 31 systems that have managed waste; 76 out of 86 systems that have not managed waste). Respondents provided a number of comments about the need for guidance, including the following:

- "Water systems need definitive guidance not only on the treatment alternatives but the disposal options and requirements for backwash water and disposal of filter wastes."
- "PFAS treatment extends beyond the water system and its customers. Clear guidance for the disposal of the backwash water and filter wastes are needed."
- "We will need specific guidance on how to handle and dispose of this type of waste stream."

Officials we interviewed from drinking water associations, engineering firms, and water regulators from nine states also told us that they, and public water systems, need guidance from EPA on how to properly dispose of or destroy the PFAS-contaminated waste generated during the drinking water treatment process.[53]

[51]EPA, Memorandum, *PFAS Enforcement Discretion and Settlement Policy Under CERCLA* (Apr. 19, 2024).

[52]In CERCLA settlements, EPA has the discretion to provide parties with a "covenant not to sue," in which the federal government promises not to pursue additional enforcement actions against the parties for matters addressed by the settlement. CERCLA also provides "contribution protection" to parties that settle with EPA. That is, other parties cannot sue the settling parties for the costs affiliated with the matters addressed by the settlement.

[53]During an interview with the association that represents state drinking water administrators, officials from nine states provided their perspectives on guidance EPA could provide to assist public water systems with managing PFAS-contaminated waste. The nine states were Alaska, Arizona, Connecticut, Idaho, Kentucky, Missouri, Oklahoma, Tennessee, and Texas. We also held follow-up interviews with states that volunteered to provide us with additional input.

EPA has developed some guidance related to the disposal and destruction of PFAS. For example, as mandated by the National Defense Authorization Act for Fiscal Year 2020, EPA published its first *Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances* in December 2020. However, most systems that responded to our survey were unfamiliar with the document.[54]

EPA updated the guidance in April 2024—after public water systems responded to our survey.[55] In the updated guidance, EPA stated that the purpose of an effective destruction and disposal technology is to prevent or minimize environmental releases. The guidance outlined multiple approaches for public water systems to manage PFAS-contaminated waste while minimizing environmental exposures and releases, to the extent feasible.[56] The guidance also highlighted that, as of December 2023, there were no specific federal regulatory requirements for PFAS disposal, and stated that the presence of PFAS in treatment residuals does not impose any additional federal requirements, while also noting that they may be subject to regulatory attention. However, the guidance does not specify what the nature of that regulatory attention may be.

Water association officials we interviewed told us that while the updated guidance does provide information on different PFAS destruction and disposal options, it does not provide clarity for public water systems about expectations for managing PFAS-contaminated waste. Given the absence of federal disposal requirements for PFAS, EPA officials stated that they cannot instruct public water systems on how to dispose of PFAS-contaminated materials, but they can provide the PFAS destruction and disposal guidance that has been required by Congress. EPA officials we interviewed also stated that, for the next update to the PFAS destruction and disposal guidance, the agency is considering developing shorter, more user-friendly guidance for public water systems that could include the latest science on the proper disposal of PFAS-contaminated waste.[57]

Standards for Internal Control in the Federal Government state that management should externally communicate the necessary quality information to achieve the entity's objectives.[58] For example, this could include EPA communicating quality information to public water systems about agency guidance and policies relevant to managing PFAS-contaminated waste, so that EPA achieves its objective of minimizing PFAS environmental exposures and releases.

As we have noted above, EPA has developed some quality information about methods public water systems can use to manage PFAS-contaminated waste; however, at the time of our survey, most public water systems were unfamiliar with EPA's 2020 PFAS destruction and disposal guidance and were confused about the

[54]At the time of our survey, the April 2024 update to the guidance had not yet been released, so we asked respondents if they were familiar with the December 2020 version of the guidance. Due to the small number of survey respondents that responded to this question (118 out of 283), we do not generalize. Of these respondents, 81 indicated that they were not familiar with the 2020 guidance, 28 indicated it was somewhat or very helpful, and 9 indicated it was not helpful.

[55]EPA, *Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances—Version 2 (2024)* (April 2024). EPA is required to update this guidance at least once every 3 years.

[56]The approaches include (1) thermal treatment (i.e., incineration or reactivation of GAC), (2) landfilling, and (3) underground injection.

[57]EPA is also supporting ongoing research to address significant scientific uncertainties about the proper management of PFAS-contaminated waste, and scientific understanding of the issue is evolving, according to EPA officials.

[58]GAO-14-704G.

regulatory requirements—or lack thereof—for PFAS disposal. Further, while EPA's updated PFAS destruction and disposal guidance references the absence of federal regulatory requirements for PFAS disposal, it does not discuss the designation of certain PFAS as hazardous substances under CERCLA, which is expected to affect how public water systems handle PFAS-contaminated waste.[59] Thus, public water systems do not currently have a single, readily understandable resource for understanding EPA's guidance on the disposal of PFAS-contaminated waste, in the context of both the designation of certain PFAS as hazardous substances under CERCLA and the absence of federal disposal requirements for PFAS.

EPA could help address public water systems' confusion and desire for guidance by creating a single, straightforward, and easily accessible resource that summarizes existing regulations, policies, and guidance relevant to the disposal of PFAS-contaminated waste. For example, EPA could consolidate, into one document, information for public water systems from its (1) designation of PFOA and PFOS as CERCLA hazardous substances, (2) *PFAS Enforcement Discretion and Settlement Policy Under CERCLA*, and (3) 2024 *Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances*. By doing so, EPA could reduce confusion and help public water system officials make informed decisions about managing PFAS-contaminated waste.

Public water systems also face or expect to face other challenges to managing PFAS-contaminated waste, including communication, financial, workforce, and storage capacity challenges. We provide information about these challenges in appendix V.

Conclusions

Aside from lead, public water systems have not previously dealt with a contaminant as pervasive and potentially as costly as PFAS. In April 2024, in response to the occurrence of some PFAS in drinking water and the negative health effects from exposure to them above certain concentrations, EPA finalized a regulation that will require public water systems to limit the amount of these PFAS in the nation's drinking water. However, there are concerns about whether public water systems have sufficient information and expertise to implement PFAS treatment methods and safely manage (i.e., destroy, dispose of, or store) the resulting PFAS-contaminated waste.

From our generalizable survey of public water systems in selected states with certain PFAS at or above EPA's regulatory levels, we learned that most systems with PFAS contamination have not yet fully implemented a drinking water treatment method. Further, these systems are generally not familiar with existing EPA guidance and technical documents and need more guidance related to PFAS contamination, including information about water treatment methods, available federal funding, and appropriate methods for managing the PFAS-contaminated waste generated during the drinking water treatment process.

EPA has already developed some resources and guidance to help public water systems implement PFAS treatment methods and safely manage the resulting PFAS-contaminated waste. However, EPA can do more to support public water systems addressing PFAS, by, for example, identifying barriers these systems face in obtaining federal funding to address PFAS contamination and releasing a compliance guide to help small entities implementing the PFAS National Primary Drinking Water Regulation. EPA could also establish a time

[59]EPA updated this guidance prior to finalizing the designation of certain PFAS as hazardous substances under CERCLA.

frame for releasing additional resources to help water systems communicate with customers about the health risks of certain PFAS and develop more straightforward and targeted information to aid water systems in managing PFAS-contaminated waste. By doing so, EPA can, among other things, help public water systems comply with the PFAS National Primary Drinking Water Regulation and avoid inadvertently creating future contamination as systems dispose of PFAS-contaminated waste.

Recommendations for Executive Action

We are making the following four recommendations to EPA:

The Administrator of EPA should publish a Small Entity Compliance Guide for the PFAS National Primary Drinking Water Regulation as soon as is feasible, to best support small public water systems preparing to comply with the PFAS maximum contaminant levels by April 2029. (Recommendation 1)

The Assistant Administrator of EPA's Office of Water should, in consultation with partners from Tribes, states, regional offices, and outside organizations, identify barriers public water systems experience obtaining federal funding to address PFAS contamination and assess how best to disseminate information on such funding potentially available to these systems. (Recommendation 2)

The Assistant Administrator of EPA's Office of Water should establish a time frame for issuing additional planned resources—such as fact sheets and templates—to help public water systems communicate with customers about PFAS health risks. (Recommendation 3)

The Assistant Administrators of EPA's Office of Water and Office of Land and Emergency Management should summarize and consolidate existing regulations, policy, and guidance relevant to the disposal of PFAS-contaminated waste into a straightforward resource for public water systems. (Recommendation 4)

Agency Comments and Our Evaluation

We provided a draft of this report to EPA for review and comment. EPA provided technical comments, which we incorporated as appropriate. In written comments reproduced in appendix VI, EPA agreed with our findings and concurred with our first three recommendations. EPA neither agreed nor disagreed with Recommendation 4.

Our fourth recommendation is that EPA should summarize and consolidate existing regulations, policy, and guidance relevant to disposal of PFAS-contaminated waste into a straightforward resource for public water systems. EPA stated that such guidance may be unnecessary in light of existing resources available to public water systems. Further, EPA stated that "attempting to consolidate all existing regulations, policy, and guidance may result in redundancy and not an efficient use of agency resources." However, EPA acknowledged that "future material to support public water systems may be needed and that material could be developed as part of overview fact sheets, within the context of the next iteration of [the PFAS destruction and disposal guidance]." EPA is required under the National Defense Authorization Act for Fiscal Year 2020 to update the PFAS destruction and disposal guidance every 3 years.

Because most public water systems were unfamiliar with EPA's 2020 PFAS destruction and disposal guidance and were confused about the regulatory requirements, or lack thereof, for PFAS disposal, we continue to believe that a single, straightforward, and easily accessible resource that summarizes and consolidates existing information would be beneficial for public water systems. We agree that EPA could develop such a resource as it fulfills its obligation to update the existing PFAS destruction and disposal guidance. This resource need not cover all existing regulations, policy, and guidance, but rather could focus on the information that is particularly relevant to decisions by public water system officials about managing PFAS-contaminated waste. For example, the resource could explain the absence of federal disposal requirements for PFAS and EPA's planned CERCLA enforcement discretion policy, as it relates to public water systems. Finally, we agree with EPA's intention to ensure that water systems and primacy agencies know what information is available and where to find it.

We are sending copies of this report to the appropriate congressional committees and the Administrator of the Environmental Protection Agency. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix VII.

J. Alfredo Gómez
Director
Natural Resources and Environment

List of Requesters

The Honorable Tom Carper
Chairman
Committee on Environment and Public Works
United States Senate

The Honorable Gary C. Peters
Chairman
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Ron Johnson
Ranking Member
Permanent Subcommittee on Investigations
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Haley Stevens
Ranking Member
Subcommittee on Research and Technology
Committee on Science, Space, and Technology
House of Representatives

The Honorable Mikie Sherrill
House of Representatives

The Honorable Lizzie Fletcher
House of Representatives

Appendix I: Objectives, Scope, and Methodology

In this report, we examine (1) how public water systems in selected states have treated per- and polyfluoroalkyl substances (PFAS) in drinking water and challenges they face in doing so and (2) the extent to which public water systems in selected states have managed PFAS-contaminated waste from treating water and challenges they face in doing so.

For both objectives, we conducted a web-based, generalizable survey of certain public water systems in selected states with certain PFAS occurring at or above the Environmental Protection Agency's (EPA) maximum contaminant levels (MCL) from 2019 through 2022.[1]

Our target survey population from which we drew the sample consists of public water systems identified in our September 2022 report as having concentrations of perfluorooctanoic acid (PFOA) or perfluorooctane sulfonate (PFOS) at or above 4 parts per trillion—which EPA has now established as the MCLs for these two PFAS.[2] That report included public water systems in six states: Illinois, Massachusetts, New Hampshire, New Jersey, Ohio, and Vermont. At the time, these states had established PFAS regulations or guidance and had comprehensive data from most or all public water systems in the state.[3] We assessed the reliability of each state's dataset and found all six datasets to be sufficiently reliable for describing the occurrence of PFAS in drinking water in the six states, and for our purposes of identifying public water systems with PFAS at or above the MCLs established in EPA's drinking water regulation.

To select our survey sample, we stratified the population into five strata, based on system size (large, medium, and small) and type of system (community water system and non-transient non-community water system).[4] We designed our sample to produce generalizable percentage estimates for key population attributes, such as the percentage of in-scope public water systems that faced a particular challenge, with a 95 percent confidence interval that is within plus or minus 5 percentage points. The sample design controlled for water system type and size. Because we could not guarantee estimates in these groups had a specific margin of error, we proportionally allocated our sample across groups defined by water system type and size, and then observed the resulting margin of error for various reporting groups. We assumed a 60- percent response rate, based on the response rate that GAO received on a previous survey of public water systems. Our sampling design

[1]EPA's PFAS National Primary Drinking Water Regulation applies to community water systems (which supply water to the same population year-round) and non-transient non-community water systems (which regularly supply water to at least 25 of the same people at least 6 months per year). We surveyed these two types of systems, which we collectively refer to as "public water systems" in this report. We conducted the survey after the MCLs for six PFAS were proposed, but before EPA finalized the regulation.

[2]GAO, *Persistent Chemicals: EPA Should Use New Data to Analyze the Demographics of Communities with PFAS in Their Drinking Water*, GAO-22-105135 (Washington, D.C.: Sept. 30, 2022). An alternate name for perfluorooctane sulfonate is perfluorooctanesulfonic acid; both refer to the same chemical, which is abbreviated as PFOS.

[3]Water association officials representing public water systems told us that, although our survey would only represent water systems in six states, the challenges those water systems face are likely to be the same as challenges water systems in other states face.

[4]For the purposes of stratifying our sample, we defined "large" systems as those serving more than 10,000 people; "medium" as systems serving from 3,301 to10,000 people; and "small" as systems serving 3,300 or fewer people. In general, we report combined survey results for small and medium systems as "small systems."

resulted in a sample size of 560 in-scope public water systems from the original population of 972 total eligible in-scope public water systems.

To design our survey instrument, we interviewed representatives from water associations, state drinking water officials, manufacturers and suppliers of PFAS treatment products, engineering firms, EPA officials, and Department of Defense officials to obtain information about topics such as how public water systems were treating drinking water for PFAS and managing the resulting PFAS-contaminated waste, challenges public water systems faced, and ways EPA could help address these challenges. We used this information to develop survey questions, which we pre-tested with nine volunteer public water systems. We conducted pretests of the survey instrument to ensure that the questions were relevant, clearly stated, and easy to understand. We identified pre-test candidates from recommendations provided to us by water associations and state drinking water officials. We used feedback from the pre-testers to revise the survey instrument, as appropriate. See appendix II for the full survey instrument.

We fielded the web survey on October 16 and 30, 2023.[5] We conducted email and phone follow-up with survey nonrespondents to increase our response rate. We closed the survey on January 8, 2024. The final response rates were 51 percent (unweighted) and 48 percent (weighted). This is based upon 283 respondents to our sample size of 560 eligible in-scope public water systems. We conducted a nonresponse bias analysis to ensure nonrespondents did not differ significantly from respondents and found size and type of water system, which are components of strata, are significantly associated with nonresponse status.[6] Therefore, we calculated final analysis weights, which are nonresponse adjusted sampling weights, to produce generalizable estimates for our target survey population overall, and where sample sizes permit, for various subgroups. We assume the data are missing at random given the weighting class adjustments based on our strata. See table 2 for the final sample size and number of completed surveys.

Table 2: Population, Sample, Expected Respondent, and Final Respondent Counts for Eligible In-Scope Public Water Systems

Stratification variable	Population size	Sample size	Expected respondents	Final respondent count
Large community water system (CWS)* (serving >10,000 people)	187	187	113	115
Medium CWS* (serving 3,301–10,000 people)	95	47	28	32
Small CWS (serving <=3,300 people)	308	146	88	68
Small non-transient non-community water system (NTNCWS) (serving <=3,300 people)	382	180	109	68
Total	972	560	338	283

Source: GAO analysis of data from survey of public water systems in selected states. | GAO-24-106523

Note: The label for CWS includes an asterisk for strata one and two to signify we included from one to three NTNCWS within each respective stratum.

[5]Some emails bounced back after we sent out predeployment survey notification emails on October 4, 2023, so we had to locate correct contact information for water system officials. This resulted in about 28 water public systems receiving their survey activation emails 2 weeks after the main group.

[6]Our strata variable was also significantly associated with nonresponse status.

Because we followed a probability procedure based on random selections, our sample is only one of a large number of samples that we might have drawn. Since each sample could have provided different estimates, we express our confidence in the precision of our sample's results with a 95 percent confidence interval. This is the interval that would contain the actual population value for 95 percent of the samples we could have drawn. Confidence intervals (margins of error) are provided for all sample estimates in the report. Estimates and confidence intervals are obtained using methods that account for the sample design and final analysis weights. Because we knew how many public water systems exceeded EPA's MCLs but not whether they had implemented treatment or managed the related PFAS-contaminated waste, we were unable to control the margin of error for various questions in our survey. As a result, our sample included a small number of public water systems that were already managing waste, and therefore had small sample sizes or large confidence intervals for survey responses pertaining to waste management.

In general, we report combined survey results for all sizes of public water systems. However, in some instances, such as cases where the responses were both different and statistically significant by system size, we report the differences by system size. Additionally, while we asked respondents about the difficulty of various factors as they treated for PFAS or managed PFAS-contaminated waste, we did not ask them about "challenges," because using such language in the question could bias their responses. We defined a "challenge" as any factor that is a barrier or that impedes the entity (i.e., the public water system) from achieving its objective (i.e., either treating for PFAS or managing PFAS-contaminated waste). We report as "challenges," the factors that water systems rated to be difficult. Finally, all survey results presented in the body of this report are generalizable to water systems in the six states, except where otherwise noted.

For all objectives, we also

- reviewed relevant laws, EPA's proposed and final rules, and agency guidance and
- conducted semi-structured interviews with representatives from three water associations, drinking water officials from nine states, two manufacturers and suppliers of PFAS treatment products, two engineering firms, EPA officials, and Department of Defense officials.

We conducted this performance audit from January 2023 to September 2024 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: GAO's Survey of Public Water Systems

Detailed methodology for this survey and analysis can be found in appendix I.

Survey of Public Water Systems about PFAS Treatment and Waste Management in Drinking Water

Background

The U.S. Government Accountability Office (GAO) is a non-partisan agency that provides the U.S. Congress with objective, fact-based information to help the federal government save money and operate more effectively and efficiently. Congress has asked us to provide information about the challenges public water systems face as they work to (1) implement treatment methods for per- and polyfluoroalkyl substances (PFAS) in drinking water and (2) manage the resulting PFAS-contaminated waste. As part of our review, we are collecting information from public water systems that have certain PFAS in their water that exceed the maximum levels proposed by the U.S. Environmental Protection Agency.

Your participation in this short survey is critical for us to be able to provide Congress with meaningful information about the challenges the proposed regulatory limits for PFAS in drinking water pose to public water systems and the ways in which the federal government could better support systems like yours.

Instructions

This survey should be completed by knowledgeable public water system operators or managers for the [**name of water system**]. When responding, you may want to consult with others in your organization, such as governing boards, who are knowledgeable about the challenges your water system faces. If you are not able to answer the questions in this survey, please forward it to the person or people who are in a position to answer them. *(Note: Only one person may fill out the survey online. If multiple people need to provide input, please coordinate responses in advance of filling out the survey. Click here for an offline, printable copy of the survey to help facilitate coordination, if needed.)*

Depending on the particular circumstances for your water system, we estimate that it will take 15-30 minutes to complete this survey. Your responses will be automatically saved as you navigate through the survey. You can return to it as many times as needed before submitting the completed survey. The questions are generally short and may be answered by checking a box next to the appropriate response. Some questions also allow you to provide additional comments. We designed the survey so that you should not have to conduct significant research to answer questions—much of this information should be readily known by you. If you are not sure about the answers, respond with "Don't know/Not sure."

Please complete all questions and submit the survey electronically. If you are unsure of how to respond to a question, please contact Bruna Oliveira (at *PFAS_Survey@gao.gov* or 617-788-0543). Thank you very much for your assistance.

Disclaimer: Our public report will not attribute responses to you or your specific institution. Comments you provide may be used as anonymous examples or attributed by water system size (e.g., small, medium, large). GAO provides substantial statutory and regulatory protection

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to information we obtain during our audits. Your personal or institutional identifiable information will not be released outside GAO, unless compelled by law or requested by Congress.

Section 1: Implementing a treatment method for PFAS in drinking water

Section 1 asks questions related to treating PFAS in drinking water. Section 2 asks questions related to managing the PFAS-contaminated waste that occurs as a result of treatment.

Definitions *(Click here for a downloadable copy of the definitions to refer to throughout the survey.)*

- **PFAS**: Per- and polyfluoroalkyl substances, known as PFAS, are a large group of more than 4,000 synthetic chemicals that have been in use since 1940s. For this survey, we are interested in the six PFAS that the U.S. Environmental Protection Agency (U.S. EPA) has proposed regulating in drinking water: perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), perfluorobutane sulfonic acid (PFBS), and hexafluoropropylene oxide dimer acid and its ammonium salt (HFPO-DA [commonly referred to as GenX chemicals]).
- **PFAS National Primary Drinking Water Regulation (NPDWR)**: Regulation proposed by U.S. EPA on March 14, 2023, to establish legally enforceable standards for six PFAS in drinking water.
- **PFAS treatment**: The process by which public water systems remove PFAS from drinking water, such as through the use of granular activated carbon, anion exchange, reverse osmosis, or nanofiltration. For the purposes of this survey, we also consider methods to mitigate (e.g., avoid) PFAS, such as switching water sources, as a type of PFAS treatment.
- **Public water system**: Per U.S. EPA, a public water system provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections, or serves an average of at least 25 people for at least 60 days a year. A public water system may be publicly or privately owned.
- **Stakeholders**: Water system customers, representatives of local government, advisory boards, members of environmental organizations, community advocacy groups, tribal entities or other citizens' groups that deal with environmental issues, or a concerned individual who is not a member of any organization or group.
- **Treatment implementation:** For this survey, implementation includes the steps necessary to prepare for operation of the treatment, such as selecting a method, design and planning, construction, installation, and testing. For the purposes of this survey, this also includes steps to mitigate (e.g., avoid) PFAS, such as switching water sources (e.g., closing a contaminated well and drilling a new one).

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Questions

1. [For all systems]

   a. How many treatment plants does your water system have? *[Insert number]*

   b. How many untreated wells does your water system have? *[Insert number]*

   c. How many of these plants or wells have or had PFAS contamination? *[Insert number]*

   [Proceed to Q. 2]

2. [For all systems] Do you know the primary source(s) of PFAS contamination in your finished drinking water?

   Yes *[Proceed to Q. 2a and 2b]*
   No *[Proceed to Q. 3]*

   2a. If yes, what is the source(s) of PFAS contamination? (*Check all that apply*)

   Airport (civilian or military)
   Fire station/training facility
   Military facility
   Industry (e.g. effluent from a factory)
   Wastewater treatment plant
   Other: Please explain [*Text box to describe*].

   2b. How do you know the source(s) of PFAS contamination? (*Check all that apply*)

   We or others conducted a source water investigation.
   We were informed by the responsible party.
   We were informed by a state agency.
   We were informed by a federal agency. > What agency? *[Text box to describe].*
   Other: Please explain [*Text box to describe*].

   [Proceed to Q. 3]

3. [For all systems] As of October 2023, have any of your water system's treatment plants implemented a treatment method (e.g. granular activated carbon, anion exchange, reverse osmosis, nanofiltration, or switched water sources) for any of the six PFAS that U.S. EPA proposed regulating through the NPDWR (proposed on March 14, 2023)?

If you have multiple treatment plants, for this question only, please select the response that applies to the plant that is in the most advanced stage of PFAS treatment method implementation.

Yes, we implemented a new treatment method (which can include switching water sources). [*Proceed to Q. 4a, p4]*
Yes, we adapted a treatment method we already had but that was not being used to treat PFAS. [*Proceed to Q. 4a, p4]*
No, but we are in the process of implementing a treatment method. [*Proceed to Q. 3a, p4]*

3

No, but we have an existing treatment method that might be used to treat PFAS. [*proceed to Q. 4b, p9*]
No [*proceed to Q. 4b, p9]*

3a. What phase of the PFAS treatment implementation process is your water system currently in?

Preliminary Research
Planning
Design
Procurement
Construction/Installation
Treatment Testing
Other: Please explain [*Text box to describe*]

[*Proceed to Q. 4a*]

4a. [For systems that have already installed treatment] What treatment method(s) did your water system select to address PFAS contamination at any of your plants? (*Check all that apply*)

Granular Activated Carbon (GAC)
Anion Exchange (AIX)
Nanofiltration (NF)
Reverse Osmosis (RO)
Switched water source
Inactivated/decommissioned contaminated water source
Other: Please explain [*Text box to describe*].

[*Proceed to Q. 5a*]

5a. [For systems that have already installed treatment method] How difficult, if at all, did your water system find each of the following factors when implementing a treatment method to remove PFAS? *(Select one response per row)*

	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Identifying available treatment methods				
Selecting the best treatment method for our water system				
Understanding how existing source water quality would affect PFAS treatment method options				

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	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Hiring or contracting qualified engineering staff to plan and design a treatment method				
Developing a capital cost estimate for implementing a treatment method				
Having enough qualified staff to implement a treatment method				
Obtaining federal or state funding to help implement a treatment method (e.g., via State Revolving Funds)				
Obtaining loan or bond funding to help implement a treatment method				
Raising customer water rates to help pay for the costs of implementing a treatment method				
Determining the ongoing operations and maintenance needs of the treatment method				
Funding ongoing operations and maintenance costs of the treatment method				
Obtaining sufficient treatment materials in a timely fashion due to supply chain issues				
Implementing the treatment fully by 2026, in order to comply with U.S. EPA's proposed drinking water regulation				
Communicating effectively with customers and the public about PFAS health risks				

5

	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Communicating effectively with representatives of local governments/advisory boards about treatment method costs and benefits				

Other factor(s) not listed above.

[*Proceed to Q. 5c*]

5c. (Optional) Please provide an example of how one or more of the factors above made implementing a treatment method to remove PFAS difficult for your water system?

[*Proceed to Q. 6a*]

6a. [For systems that have already installed treatment] In general, how difficult, if at all, was it for your water system to implement a treatment method for removing PFAS?

Not difficult
Somewhat difficult
Very difficult
Don't know/Not sure

[*Proceed to Q. 7a*]

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7a. [For systems that have already installed treatment] When looking for guidance to help you implement a treatment method for PFAS, how likely or unlikely were you to turn to the following organizations? (*Select one response per row*)

	Very unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat Likely	Very likely	Don't know/Not sure
Engineering firm						
Other water systems						
State agency						
Treatment manufacturer						
Universities						
U.S. EPA						
Water associations (e.g., AMWA, AWWA, NRWA)						

Other organization(s) not listed above:

[*Proceed to Q. 8a*]

8a. [For systems that have already installed treatment] How helpful, if at all, would each of the following resources or actions have been for your water system when implementing a treatment method? *(Select one response per row)*

	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Having guidance to help us evaluate and select the best treatment method option for our water system				
Having tools and templates to improve communication with stakeholders (e.g., customers and representatives of local government) about the health risks associated with not treating for PFAS				
Having guidance to help our water system develop application materials to obtain funding, such as through State Revolving Funds (SRF), the Assistance for Small and Disadvantaged Communities Drinking Water				

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	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Grant Program, or other federally-supported funding opportunities				
Having a centralized resource (e.g., website or handbook) where we can access guidance and information about treatment methods				
Having accessible labs (sufficient numbers of labs and near to our water system) that can analyze PFAS samples				
Having reliable access to the materials we will need for treatment (e.g., electrical components, carbon)				
Having assistance identifying source(s) of PFAS contamination				
Having laws or regulations developed to reduce sources of PFAS contamination				
Having qualified operators who can run treatment methods (e.g., workforce development)				

Other resource(s) or action(s) not listed above:
[*Proceed to Q. 8c*]

8c. (Optional) Please provide an example of how one or more of the resources or actions above would make implementing a treatment method easier for your water system.

[*Proceed to* Q. 9, p13]

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4b. [For systems not yet treating PFAS] How likely or unlikely is your water system to select the following methods to address PFAS contamination? *(Select one response per row)*

	Very unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat Likely	Very likely	Don't know/Not sure
Granular Activated Carbon (GAC)						
Anion Exchange (AIX)						
Nanofiltration (NF)						
Reverse Osmosis (RO)						
Switching water source						
Inactivating/decommissioning contaminated water source						

Other method(s):

[*Proceed to Q. 5b*]

5b. [For systems not yet treating PFAS] How difficult, if at all, does your water system expect to find each of the following factors when implementing a treatment method to remove PFAS? *(Select one response per row)*

	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Identifying available treatment methods				
Selecting the best treatment method for our water system				

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	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Understanding how existing source water quality would affect PFAS treatment method options				
Hiring or contracting qualified engineering staff to plan and design a treatment method				
Developing a capital cost estimate for implementing a treatment method				
Having enough qualified staff to implement a treatment method				
Implementing the treatment fully by 2026, in order to comply with U.S. EPA's proposed drinking water regulation				
Obtaining federal or state funding to help implement a treatment method (e.g., via State Revolving Funds)				
Obtaining loan or bond funding to help implement a treatment method				
Raising customer water rates to help pay for the costs of implementing a treatment method				
Determining the ongoing operations and maintenance needs of the treatment method				
Funding ongoing operations and maintenance costs of the treatment method				
Obtaining sufficient treatment materials in a timely fashion due to supply chain issues				

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	Not difficult	Somewhat difficult	Very difficult	Don't know/Not sure
Implementing the treatment fully by 2026, in order to comply with U.S. EPA's proposed drinking water regulation				
Communicating effectively with customers and the public about PFAS health risks				
Communicating effectively with representatives of local governments/advisory boards about treatment method costs and benefits				

Other factor(s):

[*Proceed to Q. 5c]*

5c. [Optional] Please provide an example of how one or more of the above factors would make implementing a treatment method to remove PFAS difficult for your water system.

[*Proceed to Q. 6b]*

6b. [For systems not yet treating] In general, how difficult, if at all, will it be for your water system to implement a treatment method to remove PFAS?

Not difficult
Somewhat difficult
Very difficult
Don't know/Not sure

[*Proceed to Q. 7b*]

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7b. [For systems that not yet treating] When looking for guidance to help you implement a treatment method for PFAS, how likely or unlikely are you to turn to the following organizations? (*Select one response per row*)

	Very unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat Likely	Very likely	Don't know/Not sure
Engineering firm						
Other water systems						
State agency						
Treatment manufacturer						
Universities						
U.S. EPA						
Water associations (e.g., AMWA, AWWA, NRWA)						

Other organization:

[*Proceed to Q. 8b]*

8b. [For systems not yet treating] How helpful, if at all, would each of the following resources or actions be for your water system when implementing a treatment method? *(Select one response per row)*

	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Having guidance to help us evaluate and select the best treatment method option for our water system				
Having tools and templates to improve communication with stakeholders (e.g., customers and representatives of local government) about the health risks associated with not treating for PFAS				
Having guidance to help our water system develop application materials to obtain funding, such as through State Revolving Funds (SRF), the Assistance for Small and Disadvantaged Communities Drinking Water				

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	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Grant Program, or other federally-supported funding opportunities				
Having a centralized resource (e.g., website or handbook) where we can access guidance and information about treatment methods				
Having accessible labs (sufficient numbers of labs and near to our water system) that can analyze PFAS samples				
Having reliable access to the materials we will need for treatment (e.g., electrical components, carbon)				
Having assistance identifying source(s) of PFAS contamination				
Having laws or regulations developed to reduce sources of PFAS contamination				
Having qualified operators who can run treatment methods (e.g., workforce development)				

Other resource(s) action(s):

[*Proceed to Q. 8c]*

8c. [Optional] Please provide an example of how one or more of the actions above would make implementing a treatment method easier for your water system.

[*Proceed to Q. 9]*

9. [For all systems] Below is a list of U.S. EPA's existing PFAS treatment method guidance, technical documents, and related information. If you are familiar with any of the material, how helpful, if at all, would you say it is to your water system's implementation of a treatment method

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for PFAS? (*We are providing links to the documents as a resource, reviewing them is not necessary to answer the question).*

	Not familiar with this guidance	Not helpful	Somewhat helpful	Very helpful
Drinking Water Treatability Database: provides access to scientific literature on the effectiveness of various treatment methods for specific contaminants in drinking water, including some PFAS.				
Drinking Water Treatment Technology Unit Cost Models: offers tools to help estimate costs for implementing treatment methods, including GAC, anion exchange, and membrane (RO/Nano) treatments.				
Best Available Technologies and Small System Compliance Technologies for Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water (EPA-HQ-OW-2022-0114-0946): Document included in the proposed NPDWR docket that addresses treatment technologies drinking water systems could use to meet the requirements of the NPDWR (i.e., proposed drinking water regulation).				
Economic Analysis for the Proposed PFAS NPWDR (EPA-HQ-OW-2022-0114-0952): Document included in the proposed NPDWR docket that addresses the economic costs and benefits to the proposed regulation, including treatment costs.				
Interim PFOA Health Advisory: Primarily provides information on				

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	Not familiar with this guidance	Not helpful	Somewhat helpful	Very helpful
PFOA health effects, but includes treatment information.				
Interim PFOS Health Advisory: Primarily provides information on PFOS health effects, but includes treatment information.				
PFBS Health Advisory: Primarily provides information on PFBS health effects, but includes treatment information.				
HFPO-DA (GenX Chemicals) Health Advisory: Primarily provides information on HFPO-DA health effects, but includes treatment information.				
Other Information on U.S. EPA's website: Information other than the resources listed above, such as information on U.S. EPA's proposed regulations, PFAS resources, and data, among other topics.				

Other U.S. EPA, state-developed, or association-developed guidance:

[*Proceed to Q. 10]*

10. [Optional] Do you have any additional comments that you would like to share about your experience with or concerns about implementing a treatment method for PFAS? *[Text box to describe*]

[*Proceed to Section 2*]

Section 2: Managing PFAS-contaminated waste after drinking water treatment

Section 2 asks questions related to managing (via disposal, incineration, storage, or regeneration) the waste resulting from treating drinking water containing PFAS.

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Definitions *(Click here for a downloadable copy of the definitions to refer to throughout the survey.)*

- **PFAS-contaminated waste**: Materials and byproducts generated at public water systems from treating drinking water containing PFAS. May include spent filters, membranes, resins, granular activated carbon, brines, backwash water, and waste water, among others.
- **PFAS disposal**: Transferring PFAS-contaminated waste from a public water system to a final location, such as a landfill, hazardous waste landfill, underground injection well, wastewater treatment plant, or a facility for incineration.
- **PFAS storage:** Maintaining PFAS-contaminated waste at a non-final location (for an estimated period between two- and five-years). This may occur when the immediate destruction or disposal of PFAS-contaminated waste is not possible. Does not include short-term storage while awaiting transportation by disposal contractors.
- **PFAS treatment media regeneration:** The act of restoring some of the sorption capacity of a treatment media (such as activated carbon or ion exchange) by removing the adsorbed matter (PFAS).

Questions

11a. [For systems that are treating] As of October 2023, has your drinking water system (or your contractor) managed—via disposal, incineration, storage, or regeneration—PFAS-contaminated waste generated through the drinking water treatment process?

Yes, we have managed PFAS-contaminated waste. [*Proceed to Q. 12a, p16*] No, we have not managed PFAS-contaminated waste. [*Proceed to Q. 12b, p20*] No, we have not managed PFAS-contaminated waste because we switched water sources and therefore have no waste to manage. *[Proceed to Q. 18, p25]*

11b. [For systems that are not treating] As of October 2023, has your drinking water system (or your contractor) considered how you will manage PFAS-contaminated waste generated through the drinking water treatment process?

Yes [*Proceed to Q. 12b, p20*]
No *[Proceed to Q. 18, p25]*

12a. [For systems that are already treating and managing the related waste] What method(s) is your drinking water system using to manage PFAS-contaminated waste? *(Check all that apply)*

A. **Non-Hazardous Waste Landfill Disposal:** We send spent GAC filter media, spent ion exchange resins, or other solid PFAS-contaminated waste to a non-hazardous waste landfill.

B. **Hazardous Waste Landfill Disposal:** We send spent GAC filter media, spent ion exchange resins, or other solid PFAS-contaminated waste to a hazardous waste landfill.

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C. **Deep Well Injection Disposal:** We send waste brines or other liquid PFAS-contaminated waste to a deep well injection site.

D. **Regeneration:** We send spent GAC filter media to be regenerated and returned to be used again, at our plant or another plant.

E. **Incineration:** We send spent GAC filter media, spent ion exchange resins or other PFAS-contaminated waste to be incinerated at municipal or specialized facilities.

F. **Storage:** We, or a vendor we contract, store the PFAS-contaminated waste.

G. **Wastewater treatment plant:** We send brines, backwash water, wastewater, or other liquid PFAS-contaminated waste to a local wastewater treatment plant.

H. **Other method:** Please explain [*Text box to describe*]

I. **Don't know/Not sure**

[*Proceed to Q. 13a]*

13a. [For systems that are already treating and managing the related waste] How difficult, if at all, does your drinking water system find each of the following factors when managing PFAS-contaminated waste? *(Select one response per row)*

	Not difficult	Somewhat difficult	Very difficult	Not applicable	Don't know/Not sure
Understanding the legal requirements for managing PFAS-contaminated waste					
Identifying management methods for PFAS-contaminated waste that are feasible for our system					
Having enough qualified staff to manage PFAS-contaminated waste					
Raising sufficient revenue to manage PFAS-contaminated waste					

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	Not difficult	Somewhat difficult	Very difficult	Not applicable	Don't know/Not sure
Identifying contractors to transport PFAS-contaminated waste					
Identifying contractors to dispose of PFAS-contaminated waste					
Determining liabilities related to managing PFAS-contaminated waste for our system's or our contractor's actions					
Having the capacity to store PFAS-contaminated waste onsite					
Communicating effectively with stakeholders (e.g., customers and representatives of local government) about our management of PFAS-contaminated waste					
Obtaining stakeholder support for our management of PFAS-contaminated waste					

Other factor(s):

[*Proceed to Q. 13c]*

13c. [Optional] Please provide an example of how one or more of the factors above would make managing PFAS-contaminated waste easy or difficult for your water system. [*Text box to describe*]

[*Proceed to Q. 14a]*

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14a. [For systems that are already treating and managing the related waste] How difficult, if at all, has it been for your drinking water system to manage PFAS-contaminated waste?

Not difficult
Somewhat difficult
Very difficult
Don't know/Not sure

[*Proceed to Q. 15a]*

15a. [For systems that have already managed waste] When looking for guidance to help you manage PFAS-contaminated waste, how likely or unlikely were you to turn to the following organizations? (*Select one response per row*)

	Very unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat Likely	Very likely	Don't know/Not sure
Engineering firm						
Other water systems						
State agency						
Treatment manufacturer						
Universities						
U.S. EPA						
Water associations (e.g., AMWA, AWWA, NRWA)						

Other organization:

[*Proceed to Q. 16a]*

16a. [For systems that are already treating and managing the related waste] How helpful, if at all, would each of the following resources or actions be to your drinking water system when managing PFAS-contaminated waste? *(Select one response per row)*

	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Having information about the legal requirements and our water system's liability when managing PFAS-contaminated waste				

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	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Having guidance on the appropriate methods available for managing PFAS-contaminated waste				
Having tools and templates to improve communication with stakeholders (e.g., customers and representatives of local government) about PFAS-contaminated waste management, such as its efficacy, costs, and benefits				
Having a centralized resource (e.g., website or handbook) where we can access guidance and information about managing PFAS-contaminated waste				
The advancement of research on PFAS destruction				

Other resource(s) or action(s):

[*Proceed to Q. 16c]*

16c. [Optional] Please provide an example of how one or more of the resources or actions above would make it easier for your water system to manage PFAS-contaminated waste. [*Text box to describe*]

[*Proceed to Q. 17, p23*]

12b. [For systems that are not yet managing the related waste] How likely or unlikely is your drinking water system to use the following methods to manage PFAS-contaminated waste? *(Select one response per row)*

	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't know/Not sure
Non-Hazardous Waste Landfill: Send spent GAC filter media, spent ion exchange						

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	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't know/Not sure
resins, or other solid PFAS-contaminated waste to non-hazardous waste landfill						
Hazardous Waste Landfill: Send spent GAC filter media, spent ion exchange resins, or other solid PFAS-contaminated waste to hazardous waste landfill						
Deep Well Injection: Send waste brines or other liquid PFAS-contaminated waste to deep well injection site						
Regeneration: Send spent GAC filter media to be regenerated and returned to be used again, either at our facility or at another						
Incineration: Send spent GAC filter media, spent ion exchange resins or other PFAS-contaminated waste to be incinerated at municipal or specialized facilities						
Storage: Store the PFAS-contaminated waste ourselves, or through a vendor we contract						
Wastewater Treatment Plant: Send brines, backwash water, wastewater, or other liquid PFAS-contaminated waste to a local wastewater treatment plant						

Other method(s):

[Proceed to Q. 13b]

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13b. [For systems that are not yet managing the related waste] In general, how difficult, if at all, will it be for your drinking water system to manage PFAS-contaminated waste?

Not difficult [*Proceed to Q. 15b, p22*]
Somewhat difficult [*Proceed to Q. 14b]* Very difficult [*Proceed to Q. 14b]*
Don't know/Not sure [*Proceed to Q. 15b, p22*]

14b. Why do you expect managing PFAS-contaminated waste to be somewhat/very difficult? (*Check all that apply*)

The regulatory requirements are uncertain, therefore I don't know how best to manage PFAS-contaminated waste.

There is no U.S. EPA-approved method for fully destroying PFAS (as of Oct. 2023).

I don't know the management options for PFAS-contaminated waste.

I don't know the costs to manage PFAS-contaminated waste.

Other: please explain *[Text box to describe]*

[*Proceed to Q. 15b]*

15b. [For systems that not yet managing waste] When looking for guidance about managing PFAS-contaminated waste, how likely or unlikely are you to turn to the following organizations? (*Select one response per row*)

	Very unlikely	Somewhat Unlikely	Neither likely nor unlikely	Somewhat Likely	Very likely	Don't know/Not sure
Engineering firm						
Other water systems						
State agency						
Treatment manufacturer						
Universities						
U.S. EPA						
Water associations (e.g., AMWA, AWWA, NRWA)						

Other organization:

[*Proceed to Q. 16b]*

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16b. [For systems that are not managing the related waste] How helpful, if at all, would each of the following resources or actions be for your drinking water system when managing PFAS-contaminated waste? *(Select one response per row)*

	Not helpful	Somewhat helpful	Very helpful	Don't know/Not sure
Having information about the legal requirements and our water system's liability when managing PFAS-contaminated waste				
Having guidance on the appropriate methods available for managing PFAS-contaminated waste				
Having tools and templates to improve communication with stakeholders (e.g., customers and representatives of local government) about PFAS-contaminated waste management, such as its efficacy, costs, and benefits				
Having a centralized resource (e.g., website or handbook) where we can access guidance and information about managing PFAS-contaminated waste				
The advancement of research on PFAS destruction				

Other resources (s) or action(s):

[Proceed to 16c]

16c. [Optional] Please provide an example of how one or more of the resources or actions above would make it easier for your water system to manage PFAS-contaminated waste. [*Text box to describe*]

[Proceed to Q. 17]

17. [For all systems] Below is a list of U.S. EPA's existing guidance, technical documents, and other information related to PFAS waste management. If you are familiar with any of the material, how helpful is it to your drinking water system's understanding of how to manage

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PFAS-contaminated waste? (*We are providing links to the documents as a resource, reviewing them is not necessary to answer the question)*

	Not familiar with this guidance	Not helpful	Somewhat helpful	Helpful
Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances (2020): Includes information on PFAS destruction and disposal, uncertainties for current commercially available disposal or destruction technologies, and options to manage PFAS waste that may destroy or control its migration, among other topics.				
Per- and Polyfluoroalkyl Substances (PFAS): Incineration to Manage PFAS Waste Streams (Feb. 2020): This technical brief outlines options and considerations for the disposal of PFAS waste via incineration.				
Best Available Technologies and Small System Compliance Technologies for Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water (EPA-HQ-OW-2022-0114-0946): Document included in the proposed NPDWR docket that addresses treatment technologies and potential disposal options.				
PFAS Innovative Treatment Team Briefs: Overviews and assessments on four technologies (electrochemical oxidation, mechanochemical degradation, pyrolysis and gasification, and super critical water oxidation) for potential PFAS destruction and disposal				

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I'm familiar with other U.S. EPA, state-developed, or association-developed guidance: *text box to describe*

[Proceed to Q. 18]

18. [Optional] Do you have any additional comments that you would like to share about your experience with or concerns about managing PFAS-contaminated waste resulting from treating drinking water containing PFAS? *[Text box to describe].*

[Proceed to Q. 19]

19. May we contact you with follow-up questions or requests for additional information?

Yes *[please provide name and contact information]*
No

Thank you for completing the survey!

We are interested in seeing examples of public drinking water systems' PFAS treatment methods and operations. If you would like to share photo(s) of your treatment methods, please send them to PFAS_Survey@gao.gov.

Please send your photo(s) in JPEG format. We may use these photos in a report that will be publicly available. If one of your photos is chosen, we will contact you for permission to use it. Please provide the contact information for the person we should contact to obtain permission.

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Appendix III: Additional Challenges Related to Treatment of Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Public water systems in selected states face, or expect to face, various challenges as they implement PFAS treatment methods. In addition to technical capacity, financial, and communication challenges, which were described in the body of this report, public water systems also reported regulatory compliance, workforce, and market supply challenges (see table 3).[1]

Table 3: Additional Challenges Public Water Systems Face Implementing Treatment Methods for Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Regulatory Compliance
1. Implementing a treatment method fully by 2026 to comply with the Environmental Protection Agency's (EPA) National Primary Drinking Water Regulation[a]
Workforce
1. Hiring or contracting qualified engineering staff to plan and design a treatment method
2. Having enough qualified staff to implement a treatment method
Market Supply
1. Obtaining sufficient treatment materials in a timely fashion due to supply issues

Source: GAO analysis of data from a survey of public water systems in selected states.. | GAO-24-106523

[a]At the time respondents completed our survey, it was thought that EPA's PFAS National Primary Drinking Water Regulation would go into effect in December 2026. EPA finalized the regulation later than expected and extended the deadline for public water systems to comply with the PFAS maximum contaminant levels to April 2029, not 2026, which was the date we used in our survey.

Regulatory Compliance Challenges

In our survey of public water systems with PFAS at or above the Environmental Protection Agency's (EPA) proposed maximum contaminant levels (MCL), respondents viewed meeting the expected deadline for complying with the new PFAS National Primary Drinking Water Regulation as challenging. Specifically, an estimated 68 percent of the systems not treating for PFAS expected to find it challenging to fully implement a treatment method by 2026 to comply with EPA's PFAS National Primary Drinking Water Regulation.[2] For example, one respondent said, "A grace period of three years to comply seems very short, when everyone is scrambling to find millions to construct, supplies, manpower and engineers." At the time of our survey, we estimated that half of the systems not treating for PFAS were in the early phases of developing a treatment method—such as in the preliminary research, planning, and design phases.[3]

[1]All reported survey results in this appendix have a margin of error from 7.7 to 8.7 percent, unless otherwise noted.

[2]At the time respondents completed our survey, it was thought that EPA's PFAS National Primary Drinking Water Regulation would go into effect in December 2026.

[3]The margin of error is approximately 12 percent.

Recognizing the challenges implementing treatment poses, when EPA finalized the PFAS National Primary Drinking Water Regulation in April 2024, the agency announced that public water systems have 5 years—until April 2029—to comply with the PFAS MCLs.

Workforce Challenges

We found that an estimated 61 percent of public water systems that have not treated drinking water for PFAS expected to face challenges related to having enough qualified staff to implement a treatment method. For public water systems that have partially or fully implemented a PFAS treatment method, an estimated 46 percent faced challenges related to having sufficient staff to implement their treatment method. Further, an estimated 43 percent of public water systems that have not treated PFAS in drinking water expected to find it challenging to hire or contract qualified engineering staff to plan and design a treatment method.

According to EPA officials, the agency helps public water systems build workforce capacity generally through its operator certification program and by providing guidance and support for water operator certification and workforce development. For example, EPA regional offices have coordinators that oversee operator certification programs. In addition, EPA developed national-level resources, such as the EPA Water Operator Hiring and Contracting Guide, that can help public water system decision-makers hire or contract with a licensed or certified water operator.[4]

Market Supply Challenges

An estimated 40 percent of public water systems that have partially or fully implemented a PFAS treatment method faced challenges related to obtaining sufficient treatment materials in a timely fashion due to supply chain issues. Similarly, an estimated 54 percent of public water systems that have not treated PFAS in drinking water also expected to find this challenging.

According to EPA officials, EPA helps build market supply capacity generally by developing resources, including guides, and by conducting supply chain resilience assessments. For example, EPA developed the *Supply Chain Resilience: Guide for Water and Wastewater Utilities*, which provides actions systems can take to prepare for, or respond to, equipment and water treatment chemical supply chain challenges.[5] EPA also developed the Chemical Suppliers and Manufacturers Locator Tool, which public water systems can use to search for suppliers and manufacturers across the U.S. that may be able to fulfill their chemical supply needs and increase resilience to supply chain disruptions, according to EPA's website.[6]

EPA officials we interviewed told us the agency is also conducting supply chain resilience assessments with individual systems to evaluate their practices with respect to chemical delivery, storage, inventory, and usage

[4]EPA, *Water Operator Hiring and Contracting Guide*, EPA 810-B-19-001 (September 2019).

[5]EPA, *Supply Chain Resilience: Guide for Water and Wastewater Utilities*, EPA 810-F-22-007 (August 2022).

[6]The tool is accessible via the following link: https://www.epa.gov/waterutilityresponse/chemical-suppliers-and-manufacturers-locator-tool.

and to make recommendations for improving their resilience to supply disruptions. (See app. IV for EPA supply chain resources.)

Appendix IV: Selected Environmental Protection Agency Resources for Public Water Systems

Table 4: Environmental Protection Agency (EPA) Resources for Public Water Systems Related to Addressing Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water

Funding

Title	Description	Access link
Addressing PFAS in Drinking Water with the Drinking Water State Revolving Fund	Provides information on how communities may use the Drinking Water State Revolving Fund to address PFAS in their drinking water systems, including a link to apply for funding and case study examples on how others have used the fund to address PFAS.	EPA file
Memorandum: Implementation of the Clean Water and Drinking Water State Revolving Fund Provisions of the Infrastructure Investment and Jobs Act/Bipartisan Infrastructure Law	Provides information and guidelines on how EPA will award and administer State Revolving Fund capitalization grants appropriated to the State and Tribal Assistance Grants account by the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law.	EPA file
Frequent Questions about Bipartisan Infrastructure Law State Revolving Funds	Provides link to website containing questions and answers about the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law.	EPA website
Fact Sheet: Bipartisan Infrastructure Law: State Revolving Funds Implementation Memorandum	Provides information and guidelines on how EPA will administer the State Revolving Fund capitalization grants appropriated to states under the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law.	EPA file
Frequently Asked Questions about the Emerging Contaminants in Small or Disadvantaged Communities Grant Program	Provides answers to frequently asked questions about the Emerging Contaminants in Small or Disadvantaged Communities Grant Program, which provides states and territories with grants to assist public water systems that serve certain small or disadvantaged communities with addressing emerging contaminants in drinking water, including PFAS. EPA's website provides answers to frequently asked questions about the program.	EPA website
Tribal Drinking Water Funding Programs	Provides information on tribal grant programs administered by EPA's regional offices and other funding opportunities for tribal water infrastructure support.	EPA website
Water Technical Assistance	EPA's free Water Technical Assistance, known as WaterTA, helps communities identify water challenges, develop plans, build capacity, and develop application materials to access water infrastructure funding. EPA's website includes more information about the program, including how to request technical assistance.	EPA website

Health Effects and Risk Communication

Title	Description	Access link
Fact Sheet: Benefits and Costs of Reducing PFAS in Drinking Water	Provides a summary of annual costs and benefits of the PFAS National Primary Drinking Water Regulation and information on available funding to support the implementation of the rule.	EPA file
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA) and its ammonium salt (GenX Chemicals) Health Advisory	Provides information on HFPO-DA health effects.	EPA file
Human Health Toxicity Assessment for Perfluorooctanoic Acid (PFOA)	Provides hazard identification, dose-response information, and derives toxicity values for PFOA.	EPA website
Human Health Toxicity Assessment for Perfluorooctane Sulfonic Acid (PFOS)	Provides hazard identification, dose-response information, and derives toxicity values for PFOS.	EPA website
Maximum Contaminant Level Goals (MCLG) for PFOA and PFOS in Drinking Water	Provides a summary of relevant health effects information and describes the derivation of the EPA's final individual MCLGs for PFOA and PFOS used in the PFAS National Primary Drinking Water Regulation.	EPA file
MCLGs for Three Individual PFAS and a Mixture of Four PFAS	Provides a summary of the health effects, exposure information, and analyses and describes the derivation of the EPA's final MCLGs for three PFAS—HFPO-DA, perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS)—and for mixtures of four PFAS—HFPO-DA, PFNA, PFHxS, and perfluorobutane sulfonic acid (PFBS).	EPA file
PFAS Communications Toolkit	Provides materials for public water systems, local officials, and other entities that need to communicate about PFAS as well as about EPA's new drinking water limits on certain PFAS.	EPA website
PFBS Health Advisory	Provides information on PFBS health effects.	EPA file

Technical Capacity

Title	Description	Access link
Best Available Technologies and Small System Compliance Technologies for PFAS in Drinking Water	Addresses treatment technologies drinking water systems could use to meet the requirements of the PFAS National Primary Drinking Water Regulation.	EPA file
Building the Capacity of Drinking Water Systems	Provides links to information about available resources for capacity development, including a guide to contracting water operators and information about workforce development.	EPA website
Drinking Water Treatment Technology Unit Cost Models	Offers tools to help estimate costs for implementing treatment methods, including granular activated carbon, ion exchange, and membrane (reverse osmosis/nanofiltration) treatments.	EPA website
EPA's Website on the Final PFAS National Primary Drinking Water Regulation	Includes fact sheets that provide general information about the rule; information for Tribes, states, and water systems; regulatory information; and webinars.	EPA website
EPA's Website on Additional Supporting Materials for the Final PFAS National Primary Drinking Water Regulation	Provides links to technical support documents related to the PFAS National Primary Drinking Water Regulation, such as information on technologies and costs for removing PFAS from drinking water.	EPA website
Fact Sheet: Benefits and Costs of Reducing PFAS in Drinking Water	Provides a summary of annual costs and benefits of the PFAS National Primary Drinking Water Regulation and information on available funding to support the implementation of the rule.	EPA file
Fact Sheet: EPA's Final Rule to Limit PFAS in Drinking Water	Provides information about EPA's national PFAS standards, as established by the PFAS National Primary Drinking Water Regulation; impacts and costs of the rule; implementation and funding; and additional resources.	EPA file
Fact Sheet: Small and Rural Water Systems	Provides information about the PFAS National Primary Drinking Water Regulation; its impacts and costs; available resources, including implementation, funding, and technical assistance; available support for small systems; and information for communities served by privately owned wells.	EPA file

Title	Description	Access link
Fact Sheet: Treatment Options for Removing PFAS from Drinking Water	Provides information on topics such as treatment options, treatment technologies that are appropriate for small water systems, disposal, and helpful resources related to drinking water treatment and compliance with EPA's PFAS maximum contaminant levels.	EPA file
Drinking Water Treatability Database	Provides access to information on the effectiveness of various treatment methods for specific contaminants in drinking water, including some PFAS.	EPA website
Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances	This update identifies methods to remediate, dispose of, and destroy certain PFAS-containing materials. It provides information on the current state of science and associated uncertainties for three large-scale capacity technologies that can destroy PFAS or control the release of PFAS into the environment: landfills, thermal destruction, and underground injection.	EPA website
Small Drinking Water Systems Webinar Series	Provides access to EPA's past and upcoming free webinar series, which communicates current research, regulatory information, and solutions for challenges facing small drinking water systems.	EPA website
Water Technical Assistance	EPA's free Water Technical Assistance, known as WaterTA, supports communities to identify water challenges, develop plans, build capacity, and develop application materials to access water infrastructure funding. EPA's website includes more information about the program, including how to request technical assistance.	EPA website

Supply Chain

Title	Description	Access link
Water Treatment Chemical Supply Chain Profiles	Outlines the supply chain for chemicals directly used in water treatment or in manufacturing water treatment chemicals. Each profile provides information about water treatment applications, competing uses, manufacturing methods, trade, history of supply disruptions, and an assessment of the risk of future supply disruptions.	EPA website
Chemical Suppliers and Manufacturers Locator Tool	Tool that allows water utilities to search for suppliers and manufacturers across the U.S. that may be able to fulfill their chemical supply needs and increase resilience to supply chain disruptions, such as by helping to identify alternative chemical suppliers in the case of supply chain shortages.	EPA website
Safe Drinking Water Act Section 1441	Identifies steps public water systems experiencing critical shortages of treatment chemicals can take to request direct assistance from EPA as provided for in the Safe Drinking Water Act.	EPA website
Defense Production Act	Identifies steps public water systems experiencing critical shortages of treatment products (other than water treatment chemicals) can take to request direct assistance from EPA as provided for in the Defense Production Act.	EPA website

Source: GAO icons and analysis of EPA information. | GAO-24-106523

Note: EPA also developed a fact sheet for those considering installing a home filter to reduce PFAS levels. The fact sheet provides information on the types of filters that address PFAS, among other things. To access the fact sheet, visit Reducing PFAS in Your Drinking Water with a Home Filter.

Appendix V: Additional Challenges Related to Managing Per- and Polyfluoroalkyl Substances (PFAS) Contaminated Waste

Public water systems face, or expect to face, a variety of challenges as they manage PFAS contaminated waste—in addition to the technical capacity and legal uncertainty challenges described in the body of this report. Specifically, systems reported the following additional challenges: communication, financial, workforce, and storage capacity (see table 4).

Table 5: Additional Challenges Public Water Systems Face Managing Per- and Polyfluoroalkyl Substances (PFAS) Contaminated Waste

Communication
1. Communicating effectively with stakeholders (e.g., customers and local government officials) about managing PFAS-contaminated waste
2. Obtaining stakeholder support for managing PFAS-contaminated waste
Financial
1. Raising sufficient revenue to manage PFAS-contaminated waste
Workforce
1. Having enough qualified staff to manage PFAS-contaminated waste
2. Identifying contractors to transport PFAS-contaminated waste
3. Identifying contractors to dispose of PFAS-contaminated waste
Storage Capacity
1. Having the capacity to store PFAS-contaminated waste onsite

Source: GAO analysis of data from survey of public water systems in selected states. GAO administered the survey from October 2023 to January 2024. | GAO-24-106523

Communication Challenges

Public water systems already managing PFAS-contaminated waste identified challenges communicating about waste with stakeholders—for example, tribal entities or citizens' groups that deal with environmental issues, customers, representatives of local government, advisory boards, members of environmental organizations, and community advocacy groups. Specifically, 18 out of 32 systems that were already managing waste and responded to our survey found it challenging to obtain stakeholder support for managing PFAS-contaminated waste and 17 found it challenging to communicate effectively with external stakeholders about their management of PFAS-contaminated waste.

Environmental Protection Agency (EPA) officials we interviewed said they have not considered developing guidance focused on communications regarding the management of PFAS-contaminated waste, partially due to competing agency priorities and remaining scientific uncertainties. According to agency officials, EPA has been focusing its resources on finalizing recent regulations—including the PFAS National Primary Drinking Water Regulation and designation of certain PFAS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA)—and proposing

others, including the proposals to list several PFAS as hazardous constituents under the Resource Conservation and Recovery Act of 1976, as amended (RCRA) and clarifying the definition of hazardous waste applicable to certain RCRA cleanups. Further, officials said they were focusing their attention on implementation of the rules and determining what public water systems need to successfully implement the drinking water rule, including communication.

Financial Challenges

Public water systems already managing PFAS-contaminated waste experienced financial challenges. Specifically, 20 out of 32 systems that responded to our survey found it challenging to raise sufficient revenue to manage PFAS-contaminated waste. One survey respondent stated, “With the…levels proposed by EPA, discharge of PFAS waste will be increasingly difficult and costly.”

This challenge may arise, in part, because available federal funding, such as that available through the Drinking Water State Revolving Funds, generally cannot be used for ongoing operations and maintenance activities—including for managing the waste generated as part of the drinking water treatment process. Officials we interviewed from a water association that represents small and rural communities said that the ongoing operations and maintenance costs, including those incurred disposing of PFAS-contaminated waste, pose a significant challenge to rural utilities and that increased costs will either result in service cutbacks or rate increases passed on to customers.

EPA officials we interviewed said they expect that the recent designation of certain PFAS as hazardous substances under CERCLA may help systems address financial challenges posed by addressing PFAS contamination generated by other parties. Specifically, according to these officials, the central tenet of CERCLA is that the polluter pays, and therefore, entities that significantly contributed to the release of PFAS into the environment will be held responsible for both treatment and ongoing operations and maintenance costs—including managing PFAS-contaminated waste.

Workforce Challenges

Public water systems already managing PFAS-contaminated waste experienced workforce challenges affecting their ability to handle the waste. For example, 19 of 32 public water systems that responded to our survey faced challenges related to having enough qualified staff to manage PFAS-contaminated waste. Further, half (16 of 32 systems) found it challenging to identify contractors to dispose of PFAS-contaminated waste.

EPA officials we interviewed told us that the Interstate Technology and Regulatory Council and other organizations offer workforce resources to address PFAS, such as trainings for public water system workers. For example, the Interstate Technology and Regulatory Council partners with the EPA Clean Up Information Network to present free training webinars. Additionally, since public water systems have 5 years to comply with the PFAS maximum contaminant levels, the agency believes there is enough time for the market to meet workforce demand.

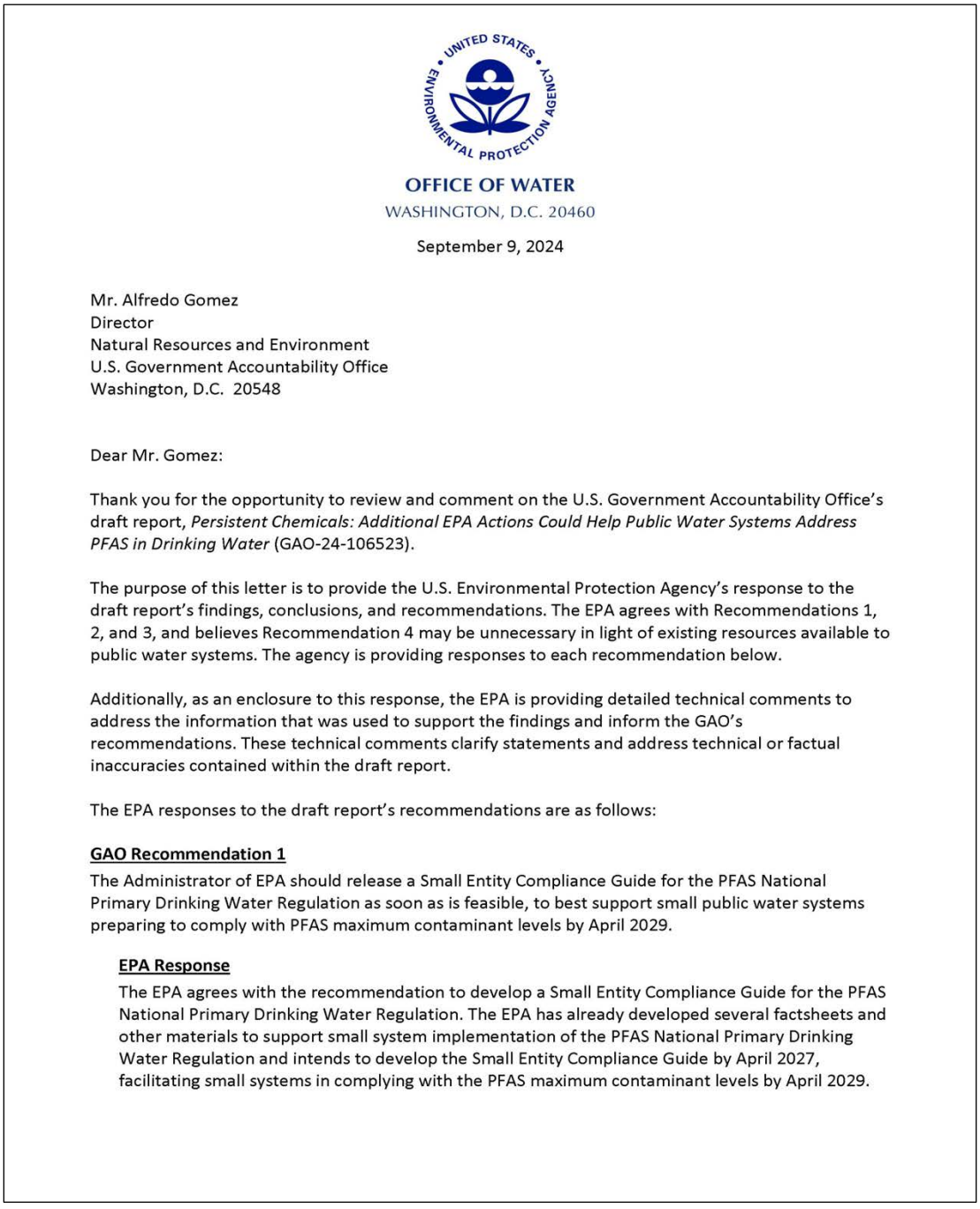
Storage Capacity Challenges

Most public water systems that were already managing PFAS-contaminated waste experienced challenges related to storage capacity. Specifically, 17 out of 32 systems that responded to our survey found it challenging to store the waste onsite. Water association officials we interviewed stated that most public water systems, particularly small ones, might not have the space or expertise to store waste onsite.

According to EPA officials, in its latest update to the interim guidance on PFAS disposal and destruction, EPA has moved away from recommending public water systems use interim storage for PFAS-contaminated waste. Specifically, according to these officials, storage might make sense in situations where the volume of materials is low and the concentration of PFAS is high, but most public water systems will be continuously generating large amounts of granular activated carbon, with relatively low volumes of PFAS, which they will choose to reactivate rather than store.

Appendix VI: Comments from the Environmental Protection Agency

The following letter references appendix V. We reordered the appendixes after we provided a draft of this report to the Environmental Protection Agency for review and comment. Therefore, the referenced appendix can be found in appendix IV.



OFFICE OF WATER
WASHINGTON, D.C. 20460

September 9, 2024

Mr. Alfredo Gomez
Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, D.C. 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on the U.S. Government Accountability Office's draft report, *Persistent Chemicals: Additional EPA Actions Could Help Public Water Systems Address PFAS in Drinking Water* (GAO-24-106523).

The purpose of this letter is to provide the U.S. Environmental Protection Agency's response to the draft report's findings, conclusions, and recommendations. The EPA agrees with Recommendations 1, 2, and 3, and believes Recommendation 4 may be unnecessary in light of existing resources available to public water systems. The agency is providing responses to each recommendation below.

Additionally, as an enclosure to this response, the EPA is providing detailed technical comments to address the information that was used to support the findings and inform the GAO's recommendations. These technical comments clarify statements and address technical or factual inaccuracies contained within the draft report.

The EPA responses to the draft report's recommendations are as follows:

GAO Recommendation 1

The Administrator of EPA should release a Small Entity Compliance Guide for the PFAS National Primary Drinking Water Regulation as soon as is feasible, to best support small public water systems preparing to comply with PFAS maximum contaminant levels by April 2029.

EPA Response

The EPA agrees with the recommendation to develop a Small Entity Compliance Guide for the PFAS National Primary Drinking Water Regulation. The EPA has already developed several factsheets and other materials to support small system implementation of the PFAS National Primary Drinking Water Regulation and intends to develop the Small Entity Compliance Guide by April 2027, facilitating small systems in complying with the PFAS maximum contaminant levels by April 2029.

GAO Recommendation 2

The Assistant Administrator of EPA's Office of Water should, in consultation with partners from regional offices, states, Tribes and outside organizations, identify barriers public water systems experience obtaining federal funding to address PFAS contamination and assess how best to disseminate information on such funding potentially available to these systems.

EPA Response

The EPA agrees with this recommendation. The agency is currently addressing it through its WaterTA effort, and one of its primary purposes is to identify and address barriers communities may encounter when trying to access federal funding. The EPA's Office of Water is also working toward launching a WaterTA initiative specific to PFAS and emerging contaminants that will help identify barriers, disseminate information, and provide support to communities, through consultation with regional offices, states, Tribes, and outside organizations. Goals of WaterTA include to meet communities where they are at and to help improve access to funding, which helps the agency learn how to better break through barriers and then to share that knowledge nationally. The EPA also continues to participate in many stakeholder meetings and events which provide opportunities for states, Tribes, and communities to identify barriers. The agency will continue to solicit feedback regarding challenges public waters systems experience obtaining federal funding to address PFAS.

GAO Recommendation 3

The Assistant Administrator of EPA's Office of Water should establish a time frame for issuing additional planned resources such as factsheets and templates to help public water systems communicate with customers about PFAS health risks.

EPA Response

The EPA agrees with this recommendation, and recognizes the importance of having PFAS risk communication materials for water systems. The EPA has already prioritized the materials that will be most important to water systems at this time. As is documented in Appendix V of the draft report, the EPA has already developed an extensive package of communication and risk communication materials, including many fact sheets and a communication toolkit to help public water systems communicate with customers. Additionally, to support risk communication, the EPA also published health effects language that systems must use when there are MCL violations, as the GAO notes, as well as a list of typical major sources of the regulated PFAS in drinking water. As documented to the GAO, the EPA has prioritized developing additional resources, such as factsheets, to help water systems implement the regulations, and other information that can inform systems' communication with the public. Setting additional specific timeframes is not necessary, and we note that the EPA intends to release these products before compliance monitoring begins in April of 2027, prioritizing those resources the EPA believes will most help states, Tribes, and the regulated community effectively implement the rule and communicate with the public.

GAO Recommendation 4

The Assistant Administrator of EPA's Office of Water and Office of Land and Emergency Management should summarize and consolidate existing regulations, policy, and guidance relevant to disposal of PFAS-contaminated waste into an accessible resource for public water systems.

EPA Response

This recommendation may be unnecessary, in light of existing resources available to public water systems. The EPA has already produced extensive and accessible information about both treatment systems and disposal of PFAS-contaminated waste. Additional targeted information about treatment and residual disposal for public water systems may be useful, however, attempting to consolidate all existing regulations, policy, and guidance may result in redundancy and not an efficient use of agency resources. Developing future material to support public water systems may be needed and that material could be developed as part of overview fact sheets, within the context of the next iteration of the Interim Guidance on the Destruction and Disposal of PFAS and Materials Containing PFAS, which the agency is mandated by Congress under the *National Defense Authorization Act* of 2020 to update every three years. After further evaluation of stakeholder need, the EPA will continue supporting public water systems' need for treatment and/or waste disposal information, as well as ensuring water systems and primacy agencies are aware of all the available information and where to find it.

Again, thank you for the opportunity to review and provide input on the GAO's draft report. If you have any questions, please contact Colin Jones, the Office of Water's GAO Audit Follow-up Coordinator, at (202) 564-2959 or at Jones.Colin@epa.gov.

Sincerely,

For: Best-Wong, Benita
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Date: 2024.09.09 18:36:29 -04'00'

Bruno Pigott
Acting Assistant Administrator

ENCLOSURE

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Nancy Grantham, OW/IO
Matt Klasen, OW/IO - PFAS Council
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Accessible Text for Appendix VI: Comments from the Environmental Protection Agency

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Acting Assistant Administrator

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Appendix VII: GAO Contact and Staff Acknowledgments

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Staff Acknowledgments

In addition to the individual named above, Diane Raynes (Assistant Director), Tanya Doriss (Analyst in Charge), Adrian Apodaca, Mark Braza, John Delicath, Claudia Hadjigeorgiou, Jill Lacey, Mark Luth, Bruna Oliveira, and Sonya Vartivarian made key contributions to this report.

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