# The State-Led Response to the PFAS Crisis: California's Precedent in an Era of Federal Ambiguity

### **Executive Summary**

The proliferation of per- and polyfluoroalkyl substances (PFAS) in the nation's water supplies has precipitated a complex and fragmented regulatory crisis, characterized by a deliberate yet protracted federal response and the emergence of proactive, state-level leadership. This report provides an exhaustive analysis of this dynamic, with a primary focus on the State of California, which has established itself as a regulatory vanguard. The analysis reveals a profound divergence between California's approach—anchored in health-exclusive Public Health Goals (PHGs) that are orders of magnitude stricter than federal standards—and the U.S. Environmental Protection Agency's (EPA) feasibility-inclusive Maximum Contaminant Levels (MCLs). This divergence is not merely a matter of scientific interpretation but is rooted in fundamentally different legal mandates, positioning California's actions as a crucial case study in a new era of "environmental federalism."

The report quantifies the immense financial and operational burdens that California's leadership imposes on its water utilities. Facing compliance costs estimated in the billions of dollars, these utilities are undergoing a fundamental transformation. They are moving beyond their traditional roles as water purveyors to become sophisticated environmental risk managers, compelled to invest in advanced treatment technologies, develop in-house scientific capabilities, engage in robust public communication, and pursue aggressive litigation against polluters to recoup costs.

This analysis contextualizes California's model by comparing it with the federal timeline and with alternative collaborative approaches, such as the research- and advocacy-focused consortia in the Great Lakes region. The emerging national patchwork of regulations, with some states following the federal lead and others enacting legislative "backstops" against federal political volatility, creates significant operational complexity for multi-state utilities and national industries. California's stringent standards, however, are creating a "California Effect"—a de facto national benchmark for treatment technology and compliance that influences markets and utility planning far beyond the state's borders. This report concludes with strategic recommendations for water utilities and policymakers navigating this evolving landscape, emphasizing the critical need for regulatory stability, sustainable funding mechanisms, and enhanced technical capacity to address the persistent challenge of PFAS and future emerging contaminants.

## Section 1: The Federal Context and the Impetus for State Action

The regulatory landscape for PFAS in the United States is defined by the tension between a methodical, yet often slow, federal rulemaking process and the urgent need for action perceived by individual states. The EPA's journey toward a national standard has been a multi-year effort marked by extensive scientific review, public input, and significant political and bureaucratic headwinds. In this context of federal deliberation and uncertainty, states like California have chosen to forge their own path, driven by a history of environmental leadership and specific legislative mandates designed to protect public health decisively and preemptively.

### The EPA's Protracted Path to a National Standard

The federal government's response to the growing awareness of PFAS contamination has been a deliberate, multi-stage process, culminating in the first-ever national drinking water standard nearly a decade after the issue gained widespread public attention.

#### Initial Actions and Monitoring

The groundwork for federal regulation was laid through early monitoring programs and voluntary industry actions. The EPA's Third Unregulated Contaminant Monitoring Rule (UCMR3), conducted between 2013 and 2015, required large water systems to test for six specific PFAS compounds. This program provided the first nationwide dataset on the prevalence of these chemicals in drinking water, revealing the scope of the contamination problem.1 Concurrently, a voluntary phase-out of the production of two of the most notorious PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), was undertaken by major U.S. manufacturers after 2015, though these chemicals continued to be imported in consumer products and persist in the environment from legacy use.3

#### The PFAS Strategic Roadmap (2021)

In October 2021, the EPA signaled a more formal and comprehensive regulatory intent with the release of its *PFAS Strategic Roadmap*. This document outlined a whole-of-agency approach built on three pillars: Research, to invest in understanding PFAS; Restrict, to pursue a range of regulatory actions to prevent PFAS from entering the environment; and Remediate, to broaden and accelerate the cleanup of PFAS contamination.3 The Roadmap committed the agency to specific timelines, including the establishment of a national drinking water regulation for PFOA and PFOS, setting the stage for the formal rulemaking process that would follow.3

#### The National Primary Drinking Water Regulation (NPDWR)

After a formal determination to regulate PFOA and PFOS in March 2021 and a proposed rule in March 2023, the EPA announced the final National Primary Drinking Water Regulation (NPDWR) on April 10, 2024.8 This landmark rule established legally enforceable Maximum Contaminant Levels (MCLs) for six PFAS:

* PFOA: 4.0 parts per trillion (ppt)
* PFOS: 4.0 ppt
* Perfluorohexane sulfonic acid (PFHxS): 10 ppt
* Perfluorononanoic acid (PFNA): 10 ppt
* Hexafluoropropylene oxide dimer acid (HFPO-DA or "GenX"): 10 ppt
* A Hazard Index (HI) of 1.0 for mixtures containing two or more of PFHxS, PFNA, PFBS, and GenX.4

The rule established a clear compliance timeline for public water systems: initial monitoring for the regulated PFAS must be completed within three years (by 2027), and systems exceeding the MCLs must implement solutions to achieve compliance within five years (by 2029).8

#### Political and Bureaucratic Headwinds

The federal process, governed by statutes like the Safe Drinking Water Act (SDWA), is inherently deliberate, requiring extensive data collection, peer-reviewed science, and formal public comment periods that can span years.16 This methodical pace is further complicated by shifts in political administrations, which can alter regulatory priorities and timelines.

A stark example of this volatility occurred in May 2025, when the EPA announced its intention to modify the final rule it had issued just over a year earlier. While affirming the 4.0 ppt MCLs for PFOA and PFOS, the agency stated it would extend the compliance deadline for these two chemicals to 2031. Furthermore, it announced plans to rescind and reconsider the MCLs for the other four PFAS (PFHxS, PFNA, PFBS, and GenX).8 This decision, coming after industry and utility groups filed legal challenges arguing the rules were scientifically flawed and overly burdensome, highlights the political and legal pressures that can delay and reshape federal environmental regulations.19 This inherent uncertainty in the federal process creates a significant challenge for states and utilities that must engage in long-term financial and infrastructure planning.

### California's Proactive Stance: The Rationale for Independent Action

In the face of a slow-moving and politically sensitive federal process, California chose to act independently, leveraging its institutional capacity and a strong state-level policy framework to address the PFAS threat on its own terms.

#### A History of Environmental Leadership

California's decision to lead on PFAS is consistent with its long-established role as a national and global trendsetter in environmental policy. The state has a well-documented history of establishing regulations that are more stringent than federal standards, most famously through its authority under the Clean Air Act to set its own vehicle emission standards via a federal waiver.22 This history has cultivated a deep institutional expertise within its state agencies and a political culture that supports proactive environmental protection, creating a fertile ground for independent action on emerging contaminants like PFAS.

#### Legislative Mandates and Policy Drivers

The state's actions are underpinned by a robust legal and policy framework. Foundational to this is the state's declaration that "every human being has the right to safe, clean, affordable, and accessible water," a policy that elevates the protection of drinking water to a fundamental right and provides a powerful moral and legal impetus for stringent regulation.23 This principle is reinforced by specific legislative mandates, such as Assembly Bill 756, which went into effect in 2020 and requires municipalities to notify consumers when PFAS are detected above state-established notification levels.2 These laws created both the authority and the public expectation for the state's water agencies to act decisively.

#### The "Backstop" Strategy

The most direct legislative response to federal regulatory uncertainty has been the introduction of Assembly Bill 794 in February 2025 by Assemblymember Jesse Gabriel.25 This bill is a strategic maneuver designed to insulate California from the vagaries of federal politics. It would mandate the State Water Resources Control Board (SWB) to adopt, via emergency regulation, drinking water standards for PFAS that are

*at least as protective* as the federal NPDWR that was in effect on January 19, 2025—the day before the presidential inauguration.23

This "backstop" legislation serves a critical purpose. It is not merely about setting a stricter standard; it is about establishing a stable, predictable, and legally durable regulatory floor. For water utilities facing the need to plan, finance, and construct multi-billion-dollar infrastructure projects with timelines stretching over a decade, this regulatory certainty is paramount.28 By locking in a protective standard at the state level, AB 794 aims to provide the stability required for utilities to make long-term capital investment decisions with confidence, effectively managing the risk posed by potential federal rollbacks or delays.24 This approach demonstrates a sophisticated understanding that for capital-intensive environmental compliance, regulatory stability can be as important as regulatory stringency.

## Section 2: The Scientific Foundation of California's Leadership

California's regulatory leadership on PFAS is built upon a foundation of independent scientific assessment conducted by its own state agencies. This capacity to perform rigorous, in-house toxicological reviews allows the state to develop health-protective goals tailored to its specific legal mandates, which differ fundamentally from those governing federal agencies. The result is a set of standards for PFOA and PFOS that are among the most stringent in the world, derived from a transparent, multi-year process that prioritized public health above all other considerations.

### The OEHHA Public Health Goals (PHGs): A Health-First Mandate

At the heart of California's scientific process are the Public Health Goals (PHGs) developed by the Office of Environmental Health Hazard Assessment (OEHHA), a branch of the California Environmental Protection Agency.

#### Statutory Mandate

The legal basis for the PHGs is the California Safe Drinking Water Act of 1996. This statute explicitly requires OEHHA to establish PHGs for drinking water contaminants based *exclusively on public health considerations*, without any regard for technological or economic feasibility.31 This singular focus on health is the crucial legal distinction that separates California's PHG process from the EPA's MCL-setting process, which must balance health protection with what is achievable and affordable for water systems. The PHG is not an enforceable regulatory limit itself; rather, it is a purely health-based goal that the State Water Resources Control Board (SWB) must then use as the benchmark for setting the final, enforceable MCL.32

#### The PHG Process Timeline

The development of the PFOA and PFOS PHGs was a deliberate and public process spanning nearly five years, demonstrating a commitment to scientific rigor and stakeholder engagement. The SWB formally requested OEHHA to begin the process, which was initiated with a public webinar and data call-in in November 2019.33 OEHHA released its first draft technical support document for public review in July 2021, followed by a public workshop and an extended public comment period that closed in October 2021.33

A critical step was the external scientific peer review, conducted as required by state law, with comments received in February 2022.33 This external validation ensures the scientific integrity of OEHHA's methodology and conclusions. Following this review, OEHHA released a second public review draft in July 2023 for another round of public comment.33 After considering all public and peer-review feedback, OEHHA officially adopted the final PHGs on April 5, 2024.31

#### The Final PHGs

The final PHGs established by OEHHA are exceptionally stringent, reflecting the agency's assessment of the chemicals' potency at very low levels of exposure. The final goals are:

* **PFOA: 0.007 parts per trillion (ppt)**, or 7 parts per quadrillion. This goal is based on the risk of kidney cancer in humans.9
* **PFOS: 1 part per trillion (ppt)**. This goal is based on the risk of liver and pancreatic tumors observed in laboratory animals.31

These goals are set at a de minimis cancer risk level of one additional cancer case per one million people exposed over a lifetime.31 OEHHA also calculated non-cancer health-protective concentrations of 3 ppt for PFOA (based on liver damage in humans) and 2 ppt for PFOS (based on increased total cholesterol in humans), but the lower, cancer-based values were adopted as the final PHGs.31

### Divergent Science: A Comparative Analysis of OEHHA and EPA Methodologies

The significant difference between California's PHGs and the EPA's MCLs stems not from a disagreement over basic scientific facts, but from different risk assessment methodologies shaped by their distinct legal mandates.

#### OEHHA's Risk Assessment Methodology

OEHHA's approach to developing the PHGs was a comprehensive, four-part scientific process.32 It began with a systematic literature search to identify all relevant toxicological studies. These studies were then critically evaluated for quality using stringent, predefined criteria for both animal and human epidemiological research. For human studies, OEHHA employed an updated version of the Hill criteria for causal inference, assessing factors like study design, potential for bias and confounding, dose-response relationships, and biological plausibility.32 From this body of evidence, the agency identified the key health hazards and selected the most sensitive health endpoint—the adverse effect that occurs at the lowest dose—to serve as the basis for the final PHG calculation.32

#### PFOA - The Human Data Distinction

A critical element of OEHHA's analysis for PFOA was its decision to base the cancer dose-response assessment directly on human data, a more direct and often preferred approach when high-quality human studies are available.34 OEHHA identified two large case-control studies—Shearer et al. (2021) and Vieira et al. (2013)—as being of sufficient quality to quantify the link between PFOA exposure and kidney cancer in human populations.32 This reliance on direct human evidence for cancer risk is a key factor behind the extremely low PFOA PHG.

#### PFOS - The Animal Data Basis

For PFOS, OEHHA concluded that the available human epidemiological studies were insufficient for quantifying cancer risk due to mixed results or small sample sizes.34 Therefore, the agency turned to animal data, using evidence of liver and pancreatic tumors in male rats from a National Toxicology Program study as the basis for its cancer risk calculation. OEHHA applied a standard linearized multistage (LMS) cancer model to these animal tumor data to derive the cancer slope factor used to calculate the 1 ppt PHG.32

#### EPA's Approach

The EPA's scientific process, as mandated by the SDWA, also relies on a systematic review of the "best available, peer-reviewed science".36 However, its ultimate goal is to set an MCL, not a PHG. The SDWA requires the MCL to be set as close to the health goal (known as the Maximum Contaminant Level Goal, or MCLG) as is "feasible," explicitly taking into account treatment technology efficacy and compliance costs.17 The EPA set its MCLG for PFOA and PFOS at zero, reflecting their carcinogenicity, but the final, enforceable MCL of 4.0 ppt for each represents the agency's determination of the lowest level that is practically and economically achievable for water systems nationwide.3 Additionally, the EPA's use of a Hazard Index to regulate mixtures of four other PFAS is a different risk management strategy than California's individual PHG approach, reflecting a choice to address the cumulative risk of co-occurring contaminants.9

This comparison reveals that the regulatory divergence is not a simple matter of one agency's science being "right" and the other's "wrong." It is a direct consequence of their different legal instructions. OEHHA is tasked with answering a purely scientific question: "At what level does this chemical pose no significant health risk?" The EPA is tasked with answering a broader policy question: "What is the most health-protective level that is also technologically and economically achievable on a national scale?" These different questions inevitably lead to different answers.

### Building the Capacity for Independent Science

California's ability to undertake such a rigorous and independent scientific assessment is not accidental; it is the result of decades of investment in its state-level scientific and regulatory institutions.

#### Institutional Expertise

The primary asset is OEHHA itself, an agency with a specific mandate and dedicated staff of toxicologists, epidemiologists, and risk assessors focused on evaluating environmental health risks for the state.37 This in-house expertise allows California to conduct its own literature reviews, critique existing studies, and perform independent dose-response modeling, rather than relying solely on federal assessments.

#### Funding and Collaboration

While the specific budget for the PFAS PHG development is not detailed, California has demonstrated a broader commitment to funding PFAS-related activities through legislative appropriations from the state's General Fund and the creation of dedicated funding programs within the SWB.38 Furthermore, California's agencies do not operate in a vacuum. OEHHA maintains a Memorandum of Understanding with the EPA's Office of Research and Development (ORD), allowing it to leverage federal data and tools, such as the CompTox Chemicals Dashboard and other high-throughput screening data, to inform its own state-level risk assessments for drinking water contaminants and Proposition 65 listings.40

#### Academic Partnerships

California's environmental agencies have a history of collaborating with the state's world-class academic institutions. For instance, OEHHA has partnered with researchers at the University of California, Berkeley, and the University of Arizona on other exposure studies.41 This pattern of leveraging external academic expertise complements the state's in-house capabilities and ensures its scientific assessments remain at the cutting edge. This combination of dedicated institutional capacity, targeted funding, and strategic collaborations provides the robust foundation necessary for California to act as a scientific leader on emerging environmental health threats.

## Section 3: Implementation, Industry Reaction, and Economic Reality

The translation of California's stringent, health-based scientific goals into tangible, on-the-ground action is a complex process managed by the State Water Resources Control Board (SWB). This process involves a phased approach to investigation and the use of interim advisory levels to compel early action from water utilities. The state's aggressive regulatory posture has elicited a strong reaction from the water industry, with significant concerns raised about technical feasibility, analytical limitations, and, most critically, the staggering financial costs of compliance. These costs, estimated to be in the billions for California alone, are driving a multi-pronged financial strategy among utilities that includes seeking state and federal aid, pursuing litigation against polluters, and ultimately, passing costs on to ratepayers.

### From Health Goal to Enforceable Mandate: The State Water Board's Role

The SWB is the state entity responsible for turning OEHHA's scientific recommendations into enforceable drinking water standards. Its approach has been systematic and incremental, building a comprehensive understanding of the contamination problem while progressively tightening requirements for water systems.

#### A Phased Investigative Approach

Long before the final PHGs were established, the SWB initiated a sweeping, phased investigation to identify the sources and extent of PFAS contamination across the state. This effort began in March 2019 with investigative orders directed at facilities considered high-risk for historical PFAS use, such as airports (due to firefighting foam) and landfills.2 The investigation was subsequently expanded to include chrome plating facilities in October 2019 and publicly owned treatment works (POTWs) in July 2020, recognizing them as potential conduits for PFAS into the environment.2 This methodical, source-targeted approach allowed the state to build a detailed map of contamination hotspots, which in turn informed orders for nearby public water systems to begin monitoring their wells.1

#### Iterative Advisory Levels

In parallel with its investigations, the SWB established a series of non-enforceable advisory levels to guide utility actions. These included Notification Levels (NLs), which trigger a requirement to notify governing bodies, and Response Levels (RLs), at which the SWB recommends taking a water source out of service, treating the water, or notifying the public.11 These levels were not static; the SWB lowered them over time as OEHHA provided updated toxicological data. For example, the initial interim NL for PFOA was 14 ppt in 2018, which was lowered to 5.1 ppt in August 2019. Similarly, the RL for PFOA was set at 10 ppt in February 2020.39 While not legally binding in the same way as an MCL, these RLs effectively forced early action, compelling many utilities to shut down contaminated wells years before a final state or federal standard was in place.28

#### The Path to an MCL

With the final PHGs adopted by OEHHA in April 2024, the SWB now has the scientific foundation required to proceed with the formal rulemaking process to establish a primary drinking water standard, or Maximum Contaminant Level (MCL), for PFOA and PFOS. State law mandates that this MCL be set as close to the PHG as is technologically and economically feasible, with a primary emphasis on the protection of public health.9 This process will involve a detailed analysis of treatment technology effectiveness, costs, and analytical detection limits. All documents and updates related to this effort are being compiled on the SWB's dedicated PFAS MCL rulemaking record webpage.9

### The Water Utility and Industry Perspective

The water utility sector and broader industry groups have been active participants in the state's regulatory process, consistently raising significant concerns about the practical implications of California's uniquely stringent approach.

#### Formal Public Comments

The public comment periods for the draft PHGs provided a formal venue for stakeholders to articulate their positions. The feedback from major associations was largely critical of the proposed goals' stringency and feasibility:

* The **PFAS Regulatory Coalition**, representing a broad group of industries, argued that the proposed PHGs were "orders of magnitude lower" than any other state or federal guidelines. They raised concerns about the scientific methodology, particularly the control of confounding factors in the human studies used for the PFOA goal, and urged California to work with the EPA to avoid creating a confusing "patchwork set of state-specific goals and standards" that would create overwhelming compliance challenges for companies operating nationwide.45
* The **California-Nevada Section of the American Water Works Association (AWWA)**, representing drinking water providers, focused on the operational and financial fallout. They highlighted the immense cost burden that would ultimately fall on ratepayers, the current lack of widespread laboratory capacity to reliably detect and quantify PFAS at the sub-ppt levels of the PFOA PHG, and the profound public communication challenge of explaining a risk based on a standard that is, for all practical purposes, analytically indistinguishable from zero.46
* The **California Association of Sanitation Agencies (CASA)** brought the perspective of the wastewater sector, emphasizing that their member agencies are passive receivers of PFAS discharged into the sewer system, not the producers. They expressed deep concern that extremely low drinking water MCLs would create cascading regulatory pressures on recycled water programs and the management of biosolids, potentially disrupting critical resource recovery efforts.47

#### Legal Challenges

While the provided materials do not indicate direct legal challenges against California's PHGs (which are non-enforceable goals), the groundwork for future litigation is evident. Utilities and municipalities are already filing lawsuits against PFAS manufacturers to recover cleanup costs, framing the issue as a matter of holding polluters financially responsible.28 Concurrently, national industry groups are challenging the federal NPDWR in court.21 Given the industry's strong objections during the comment period, it is highly probable that any final MCL established by California that approaches the stringency of the PHGs will face legal challenges from the regulated community.

### The Economics of Compliance

The financial implications of meeting California's stringent PFAS standards are monumental, with local cost estimates revealing a reality far more expensive than aggregated national projections suggest. This has forced utilities to develop sophisticated, multi-faceted strategies to fund the necessary infrastructure upgrades.

#### Staggering Local Costs

The cost estimates from California utilities with significant PFAS contamination are staggering. The Orange County Water District (OCWD), which serves 2.5 million people, and its retail agencies project spending approximately $1.8 billion on capital costs, operations, and interim replacement water over the next 30 years.28 Santa Clarita Valley (SCV) Water estimates its capital costs could reach $200 million, with an additional $10 million or more in annual operating and maintenance (O&M) expenses.28 Even smaller-scale contamination can be costly; a single water agency in the Sacramento area estimated it will need $45 million to treat its affected groundwater wells, at a cost of roughly $3 million per well.50 One 2021 estimate placed the total cost for Orange County at nearly $1 billion, underscoring the scale of the financial challenge.51

#### The National Cost-Perception Gap

These granular, local figures stand in stark contrast to broader national estimates. The EPA's economic analysis for its NPDWR projected a total national compliance cost of approximately $1.5 billion annually.53 However, national water industry associations have produced far higher estimates, with the AWWA projecting annual costs exceeding $3.8 billion and total capital costs potentially surpassing $50 billion.54 This vast discrepancy highlights a critical dynamic: while the national cost may be spread across thousands of water systems, the financial burden is acutely concentrated in communities with significant contamination, like those in California. The table below illustrates this gap.

**Table 1: Comparative Cost Projections for PFAS Compliance**

| Source of Estimate | Scope | Estimated Capital Cost | Estimated Annual O&M/Total Cost | Key Assumptions/Notes |
| --- | --- | --- | --- | --- |
| U.S. EPA 55 | National | Not specified as separate capital | $1.5 billion (total annualized) | Based on compliance with federal MCLs (e.g., 4 ppt for PFOA/PFOS). |
| AWWA 54 | National | $37.1 billion - $48.3 billion+ | $2.7 billion - $3.8 billion+ | Industry trade group estimate; assumes broader impact and higher costs than EPA. |
| NACWA 57 | National | At least $50 billion (drinking water) | Not specified | Wastewater association estimate, highlighting vast underestimation by federal agencies. |
| OCWD 28 | Local (Orange County, CA) | Part of total cost | $1.8 billion (total over 30 years) | Covers capital, O&M, and replacement water for a basin serving 2.5 million people. |
| SCV Water 28 | Local (Santa Clarita, CA) | Up to $200 million | $10+ million | Covers treatment for a utility where 20 of 42 wells were impacted. |
| Sacramento Agency 50 | Local (Sacramento, CA) | $45 million | Not specified | Cost to treat a subset of contaminated wells within one utility's service area. |

#### The Search for Funding

Faced with these immense costs, California utilities are pursuing an all-of-the-above funding strategy:

* **Federal and State Aid:** Utilities are actively seeking grants and low-interest loans. The federal Bipartisan Infrastructure Law allocated over $700 million to California for addressing emerging contaminants, a significant source of funding.38 The state has also appropriated its own funds, with the SWB administering tens of millions of dollars from the General Fund for technical and financial assistance to drinking water systems.39
* **State Legislative Solutions:** Recognizing the scale of the problem, state legislators have proposed bills like SB 454, which would create a dedicated PFAS Mitigation Fund. This fund would be administered by the SWB and could accept state, federal, and private funds to provide grants and loans for treatment projects, thereby reducing the direct burden on local ratepayers.26
* **Litigation as a Funding Strategy:** A key component of the financial strategy for many utilities is to sue the chemical companies that manufactured and profited from PFAS. Major utilities, including OCWD and California Water Service Company, have filed lawsuits seeking to recover the massive costs of investigation, treatment, and remediation, operating on the "polluter pays" principle.10 Recent national settlements with manufacturers like 3M, valued at over $10 billion, provide a potential source of recovery for public water systems.61
* **Ratemaking and Ratepayer Impact:** Ultimately, costs not covered by grants or litigation settlements must be borne by customers. Large, investor-owned utilities like California Water Service Company are using the formal ratemaking process overseen by the California Public Utilities Commission (CPUC) to gain approval for dedicated PFAS compliance programs and the associated capital budgets, which are then recovered through water rates.30 This ensures financial viability for the utility but translates to higher water bills for residents and businesses in contaminated areas.

## Section 4: Operational Adaptation: California Utilities on the Front Lines

The imposition of stringent PFAS standards has catalyzed a significant operational and technological shift among California's water utilities. Forced to move beyond conventional treatment methods, these agencies are now at the forefront of deploying advanced purification technologies. This transition is not merely a technical exercise; it represents a fundamental evolution in the role of a modern water utility. Proactive agencies are transforming themselves into sophisticated environmental risk managers, developing new in-house capabilities, and pioneering strategies for public engagement and regional collaboration. The case studies of Santa Clarita Valley Water and the Orange County Water District provide powerful examples of this adaptation in practice.

### Deploying a Technological Arsenal

To meet the challenge of removing PFAS compounds to near-zero levels, California utilities are investing heavily in a suite of advanced treatment technologies. These methods, recognized by the EPA as Best Available Technologies (BATs), represent a significant upgrade from the filtration and disinfection processes that form the backbone of traditional water treatment.

#### Best Available Technologies

The primary technologies being permitted and installed across California fall into three main categories 54:

1. **Granular Activated Carbon (GAC):** This is the most established and widely studied method for PFAS removal. Water is passed through large vessels containing GAC, a highly porous material made from wood, coal, or other carbonaceous sources. The vast internal surface area of the carbon granules adsorbs the PFAS molecules, effectively trapping them. GAC is particularly effective at removing long-chain PFAS like PFOA and PFOS, though its performance can be less efficient for some of the shorter-chain PFAS compounds.62
2. **Ion Exchange (IX):** This technology uses synthetic resins that are specifically designed to have an electrostatic attraction to charged molecules. As PFAS-contaminated water flows through beds of these tiny, porous resin beads, the negatively charged PFAS molecules are attracted to and bind with the positively charged sites on the resin, removing them from the water. IX can be highly effective for a broad range of PFAS and often has a smaller physical footprint than GAC systems designed for the same flow rate.
3. **High-Pressure Membranes:** Technologies like Reverse Osmosis (RO) and Nanofiltration (NF) use semi-permeable membranes to physically separate contaminants from water. Water is forced through the membrane at high pressure, while the larger PFAS molecules are rejected and retained in a concentrated waste stream. These technologies are extremely effective at removing nearly all PFAS compounds, but they are also the most energy-intensive and produce a brine concentrate that requires careful management and disposal.54

The SWB's Division of Drinking Water has been actively permitting these types of advanced treatment facilities. As of early 2022, the division had already issued approximately twenty permits for PFAS treatment, with thirty more in progress, indicating a rapid and widespread adoption of these technologies by utilities across the state, often driven by the need to comply with the state's interim Response Levels even before final MCLs are set.42

### Case Study in Proactive Response: Santa Clarita Valley (SCV) Water

SCV Water, serving a community of 300,000 people north of Los Angeles, provides a compelling model of how a single utility can mount a comprehensive and rapid response to widespread PFAS contamination.

#### The Challenge

The agency faced a severe threat to its water supply reliability when testing revealed PFAS contamination that forced it to take 20 of its 42 active groundwater wells offline during a drought.63 Unlike many contaminated sites, SCV Water's service area lacked an obvious industrial source, with testing suggesting the contamination was pervasive, likely originating from consumer products entering the wastewater stream and subsequently impacting groundwater—a testament to the ubiquitous nature of the chemicals.63

#### The Strategy

In 2019, SCV Water initiated an aggressive, multi-pronged strategy that has positioned it as a national leader in PFAS response 63:

1. **Treatment:** The agency moved quickly to design and build treatment facilities. It fast-tracked California's first plant to use synthetic ion adsorption, a form of ion exchange, and brought its Valley Center Well Groundwater Treatment Facility online. Originally taken offline in 2019, the facility now produces 1,200 gallons of clean water per minute. This was the second of what may ultimately be up to fifteen treatment facilities needed to restore the agency's full groundwater production capacity.63
2. **Technology:** Recognizing the bottleneck and high cost of external laboratory analysis, SCV Water made a strategic investment to build its own in-house testing capabilities. It became one of the first three public agency labs in California to achieve state certification for PFAS analysis. This vertical integration of a critical technical function gives the agency faster results, greater control over its monitoring programs, and reduced long-term costs.28
3. **Transparency:** From the outset, SCV Water prioritized open communication with its customers. The agency developed a robust public outreach program featuring a dedicated PFAS webpage, e-newsletters, direct mailings, and engagement with media. This approach was designed to keep the community fully informed of the problem and the agency's response, building public trust and preventing alarm.63

This proactive approach—combining rapid infrastructure deployment, strategic investment in in-house technical capacity, and a commitment to public transparency—demonstrates a paradigm shift in utility management. It reflects an evolution from simply supplying water to actively managing complex environmental health risks.

### Case Study in Regional Collaboration: Orange County Water District (OCWD)

The Orange County Water District offers a different but equally innovative model, focused on regional collaboration and financial burden-sharing to tackle a problem that spans multiple jurisdictions.

#### The Scale of the Problem

The Orange County Groundwater Basin is a critical water source for 2.5 million people served by 19 separate retail water agencies. The discovery of widespread PFAS contamination was a regional crisis, with projections indicating that more than 100 wells across the basin would ultimately require treatment.28

#### The Financial Model

Recognizing that the immense cost of treatment could overwhelm some of its smaller retail member agencies, the OCWD Board of Directors adopted a landmark policy: OCWD would fund 100% of the capital costs for designing and constructing the necessary PFAS treatment facilities for all its retailers. Once a facility is built, ownership is transferred to the local retailer, with the ongoing operations and maintenance (O&M) costs split equally between OCWD and the retailer.28 This regional cost-sharing model ensures that every community in the basin, regardless of its individual financial capacity, has access to the capital needed to build treatment, ensuring a consistent level of public health protection across the region.

#### Holding Polluters Accountable

A central pillar of OCWD's financial strategy is its pursuit of litigation against the manufacturers of PFAS. OCWD is a lead plaintiff in a major lawsuit seeking to recover the full costs of remediation from the chemical companies.28 By taking on the legal battle at a regional level, OCWD leverages its greater resources and provides a unified front, relieving individual retailers of the burden of pursuing separate, costly lawsuits. This "polluter pays" approach is viewed not only as a mechanism for cost recovery but also as a matter of principle, ensuring that the financial burden of cleanup does not fall solely on the public and ratepayers who played no role in creating the contamination.28

These case studies reveal that California utilities are not passive recipients of regulation. They are active agents of change, developing sophisticated operational, technical, and financial strategies. The necessity of dealing with PFAS is forcing an evolution in the sector, demanding a new level of expertise in environmental chemistry, advanced engineering, public health communication, and complex litigation. This transformation signifies a move toward a more resilient and risk-aware model of water utility management.

## Section 5: A National Mosaic: Comparative State and Regional Models

While California's top-down, state-agency-driven regulatory model represents one powerful approach to the PFAS crisis, it is not the only one. Across the country, a diverse mosaic of state and regional strategies is emerging. In the Great Lakes region, a more collaborative, research-oriented model has taken shape, focused on building scientific consensus and community advocacy. Meanwhile, other states are charting their own courses, creating a complex and fragmented national regulatory landscape that ranges from proactive leadership to cautious adherence to federal minimums, with a growing number adopting legislative safeguards against federal policy shifts.

### The Great Lakes Collaborative Approach

The response to PFAS contamination in the Great Lakes region is characterized by a network of collaborative consortia, each with a distinct focus, rather than a single, centralized regulatory authority like California's SWB.

#### Distinguishing the Consortia

It is crucial to differentiate between the various entities operating in the region, as they serve different functions:

* **Great Lakes Consortium for Fish Consumption Advisories:** This is a formal, long-standing interstate and international body composed of government health, water quality, and fisheries agencies from the eight Great Lakes states and Ontario.64 Its primary function is to share data and develop consistent, science-based guidelines for safe consumption of fish from shared waters, including advice based on PFOS contamination levels.66 This consortium is a model of cross-jurisdictional scientific collaboration for public health messaging.
* **Great Lakes PFAS Action Network (GLPAN):** In contrast, GLPAN is a grassroots coalition driven by impacted community members and supported by environmental advocacy organizations like the National Wildlife Federation.69 Its mission is not regulatory but political and educational: to unify affected communities, educate policymakers at the state and federal levels, and advocate for funding and cleanup actions that hold corporate polluters accountable.69 It functions as an advocacy and support network for those on the front lines of the contamination crisis.
* **Great Lakes ReNEW (Water Innovation Engine):** This is the newest entity, a research and development consortium funded by the U.S. National Science Foundation (NSF) with a potential investment of up to $160 million over 10 years.71 Led by the Chicago-based nonprofit Current, ReNEW brings together over 50 partners, including universities, industry, and government agencies from six Great Lakes states.72 Its goal is to accelerate the transition to a "circular blue economy" by developing and commercializing innovative technologies, with a specific focus on methods to selectively remove and potentially recover valuable materials and dangerous chemicals, including PFAS, from wastewater.72

#### Research and Outputs

The outputs of the Great Lakes collaborations are primarily scientific and informational, aimed at filling knowledge gaps and developing new solutions. This contrasts with California's focus on developing legally enforceable standards. Key research areas include:

* **Innovative Treatment Technology:** Projects funded through the Great Lakes Research Consortium, such as a collaboration with the University at Buffalo, are exploring novel approaches like nanotechnology-assisted advanced wastewater treatment processes to achieve complete degradation of PFAS compounds.74
* **Fish Contamination and Human Exposure:** Extensive research has focused on the high levels of PFAS in Great Lakes fish and the resulting human exposure, particularly in subsistence fishing communities. Studies have found that eating a single freshwater fish can be equivalent to drinking PFOS-contaminated water for a month, with the highest levels observed in the Great Lakes.76
* **Social and Economic Impacts:** Recognizing that the PFAS crisis extends beyond toxicology, the Illinois-Indiana Sea Grant is leading a regional research initiative to investigate the social and economic challenges related to PFAS risk, exposure, and remediation. Funded projects are examining topics such as the comparative analysis of state regulations and effective risk communication strategies.77

### A Spectrum of State Strategies

Outside of California and the Great Lakes region, states have adopted a wide range of policies, creating a complex national patchwork of regulations that presents significant challenges for compliance, particularly for multi-state industries and utilities.78

#### Proactive Leaders

A number of states, primarily in the Northeast, have joined California in acting ahead of the EPA to establish their own legally enforceable standards or stringent advisory levels. States such as New Jersey, Delaware, Connecticut, Massachusetts, Michigan, New Hampshire, New York, Pennsylvania, Rhode Island, and Vermont have all established their own drinking water standards for various PFAS compounds.78 These standards often differ from one another and from the federal MCLs in terms of the specific PFAS regulated and the concentration limits, as illustrated in the table below.

#### Federal Followers

Many other states have chosen to wait for the EPA's NPDWR to be finalized before taking regulatory action. Under the Safe Drinking Water Act, states that have been granted primary enforcement authority ("primacy") are required to adopt drinking water regulations that are no less stringent than the federal standards within two years of the final EPA rule.12 This group of states will now be in the process of incorporating the EPA's 4.0 ppt MCLs for PFOA and PFOS into their own state codes.

#### Legislative "Backstops"

A notable and growing trend is the adoption of "backstop" legislation designed to protect state residents from a potential weakening of federal standards. Spurred by concerns over federal political shifts and the potential for regulatory rollbacks, states are moving to codify the protective federal standards into their own state laws. In addition to California's AB 794, lawmakers in Pennsylvania, Maine, and Connecticut have introduced or are developing similar bills.27 This strategy ensures that even if a future federal administration were to weaken or repeal the NPDWR, the more protective standards would remain in effect at the state level.

#### States Resisting or Scaling Back

The movement toward stricter regulation is not universal. While no state has explicitly rejected the need to address PFAS, some have demonstrated a more cautious approach or have even scaled back initial, more aggressive proposals. For example, in 2024, Maine passed a new law (LD 1537) that significantly amended its groundbreaking 2021 "first-in-the-nation" PFAS law. The new law eliminated a broad and challenging requirement for manufacturers to report all intentionally added PFAS in all products sold in the state, replacing it with a more limited reporting requirement for uses that are deemed "currently unavoidable".80 This demonstrates that even in leading states, the practical challenges and economic impacts of broad PFAS regulation can lead to legislative adjustments.

The following table provides a snapshot of the resulting regulatory patchwork, comparing the standards in several leading states to the final federal MCLs.

**Table 2: State-by-State PFAS Drinking Water Standards vs. Federal MCLs**

| State | Regulated PFAS Compound | State Standard (ppt) | Type of Standard | Federal MCL (ppt) |
| --- | --- | --- | --- | --- |
| **California** 78 | PFOA | 0.007 | Public Health Goal (PHG) | 4.0 |
|  | PFOS | 1 | Public Health Goal (PHG) | 4.0 |
|  | PFOA | 5.1 | Notification Level (NL) | 4.0 |
|  | PFOS | 6.5 | Notification Level (NL) | 4.0 |
|  | PFHxS | 3 | Notification Level (NL) | 10 |
| **Connecticut** 78 | PFOS | 10 | Action Level | 4.0 |
|  | PFOA | 16 | Action Level | 4.0 |
|  | PFNA | 12 | Action Level | 10 |
|  | PFHxS | 49 | Action Level | 10 |
| **Delaware** 78 | PFOA | 4 | Proposed MCL | 4.0 |
|  | PFOS | 4 | Proposed MCL | 4.0 |
|  | PFHxS | 10 | Proposed MCL | 10 |
|  | PFNA | 10 | Proposed MCL | 10 |
|  | GenX | 10 | Proposed MCL | 10 |
| **New Jersey** 79 | PFOA | 14 | MCL | 4.0 |
|  | PFOS | 13 | MCL | 4.0 |
|  | PFNA | 13 | MCL | 10 |
| **New York** 79 | PFOA | 10 | MCL | 4.0 |
|  | PFOS | 10 | MCL | 4.0 |
| **Vermont** 79 | PFOA+PFOS+PFHxS+PFNA+PFHpA | 20 (sum of 5) | MCL | Varies |

*Note: This table is illustrative and not exhaustive. State regulations are subject to change. PHGs and NLs are non-enforceable advisory levels, while MCLs are legally enforceable standards.*

## Section 6: Broader Implications and the Future of Environmental Federalism

The multifaceted state-led response to the PFAS crisis, spearheaded by California, carries profound implications that extend far beyond the regulation of a single class of chemicals. It challenges the traditional model of environmental federalism, tests the scientific and financial capacity of state governments, and sets powerful precedents for how the nation will confront future emerging contaminants. The actions taken by states today are reshaping the legal, technical, and economic landscape of environmental protection for decades to come.

### The Legal Framework for State Leadership

The ability of states like California to enact environmental standards more stringent than those set by the federal government is a long-established principle of U.S. environmental law, but the PFAS crisis is testing and reinforcing this framework in new ways.

#### "Floor, Not a Ceiling"

Most major federal environmental statutes, including the Clean Air Act (CAA), the Clean Water Act (CWA), and the Safe Drinking Water Act (SDWA), were designed to establish a national minimum level of protection—a regulatory "floor".17 These laws generally preserve the right of states to enact their own, more protective standards, creating a system of cooperative federalism where states can tailor regulations to their specific environmental challenges and public health priorities.82 California's establishment of PHGs and its subsequent move toward state-specific MCLs is a direct exercise of this authority under the SDWA.

#### Precedent and Sovereignty

The legal and political precedent for this type of state leadership is robust. California's authority to seek a waiver from the EPA under the Clean Air Act to enforce its own stricter vehicle emission standards is the most prominent example.22 This authority, repeatedly affirmed by Congress and the courts, has allowed California to serve as a "laboratory of innovation" for the nation.22 Similarly, the U.S. Supreme Court's landmark 2007 decision in

*Massachusetts v. EPA* was a pivotal moment for state environmental authority. The Court affirmed that states had standing to sue the federal government for its failure to regulate greenhouse gases under the CAA, cementing the role of states as critical actors in compelling federal environmental action and protecting their sovereign interests against harms like climate change-induced sea-level rise.83 These precedents provide a strong legal foundation for states to act on PFAS in the absence of what they deem a sufficiently protective or timely federal response.

#### A Precedent for Other Contaminants

The comprehensive scientific and regulatory process that California has built to address PFAS is highly significant because it creates a replicable template for future environmental challenges. The state has demonstrated that it possesses the institutional capacity to move from contaminant identification to independent toxicological review, health goal setting, and finally to enforceable regulation. This model could readily be applied to other emerging contaminants of concern, such as microplastics, endocrine disruptors, or novel pharmaceuticals in drinking water.84 By successfully navigating the PFAS crisis, California is not just solving one problem; it is stress-testing and refining a state-led regulatory machine that can be deployed to address the next generation of environmental threats.

### The Replicability of the California Model

While California's approach provides a powerful model for state leadership, its replicability in other states is constrained by significant technical and financial hurdles.

#### Technical Capacity Requirements

To follow California's path requires a substantial investment in state-level institutional capacity. A state agency must possess a deep bench of in-house scientific expertise, including toxicologists, epidemiologists, and risk assessors capable of conducting independent literature reviews and dose-response modeling. It also requires skilled legal and policy staff to navigate the complex administrative procedures of formal rulemaking.85 The EPA provides guidance and partnership opportunities to help states build this capacity, such as through the Environmental Council of the States (ECOS) research needs assessments, but developing this level of expertise from the ground up is a long-term and resource-intensive endeavor.86

#### Cost of Independent Science

Conducting independent, state-of-the-art scientific research and risk assessment is expensive. It involves staff time, access to scientific databases, and often, contracts with academic institutions or external consultants. For many states with smaller budgets and competing priorities, the cost of duplicating the scientific work already being performed by federal agencies like the EPA, the National Institutes of Health (NIH), and the Centers for Disease Control and Prevention (CDC) is a significant barrier.87 This financial reality makes it more practical for most states to adopt or adapt federal scientific assessments rather than creating their own from scratch.

#### Sustainability of State-Led Programs

The prospect of 50 states each running parallel, resource-intensive scientific assessment programs for every new contaminant is likely unsustainable and inefficient. This raises the question of alternative models for states that wish to be proactive but lack California's resources. Regional collaborations, such as the research-focused consortia in the Great Lakes, may offer a more efficient path. By pooling resources, sharing data, and funding joint research projects, a coalition of states can build collective technical capacity and develop regional scientific consensus at a lower cost per state than going it alone.

### Concluding Analysis and Strategic Recommendations

The state-led response to PFAS contamination, with California at its epicenter, is fundamentally reshaping the landscape of environmental regulation in the United States. The state's actions have created what can be termed the "California Effect": due to the sheer size of its economy and population, California's stringent standards create a de facto national benchmark that drives innovation and influences behavior across the country. Treatment technology vendors must now engineer systems capable of meeting California's near-zero targets, and multi-state utilities may find it operationally and financially prudent to standardize their compliance efforts to the most stringent regulation in any of their service territories rather than managing a complex patchwork of varying rules.78 This dynamic positions California not just as a regulator, but as a powerful market force.

#### Recommendations for Water Utilities

1. **Financial Planning:** Utilities, particularly those in states with proactive environmental agencies, should budget for compliance based on the most stringent plausible standards, such as California's PHGs or forthcoming MCLs, not just the current federal floor. This conservative approach to long-term capital planning will prevent costly retrofits in the future. An aggressive, multi-pronged funding strategy should be developed that includes applying for all available state and federal grants (e.g., SRF loans, BIL funding), exploring participation in class-action lawsuits against polluters to recover costs, and engaging in transparent, forward-looking ratemaking processes to ensure financial stability.
2. **Operational Strategy:** Utilities in contaminated areas must embrace the shift from being water purveyors to becoming environmental risk managers. This involves investing in technical capacity, whether through hiring new expertise or, for larger agencies, developing in-house capabilities like certified monitoring laboratories, as demonstrated by SCV Water. Proactive and continuous public communication is essential to build ratepayer trust and support for the necessary investments and rate increases.
3. **Regulatory Engagement:** The experience of California's utilities shows the importance of active and substantive participation in the regulatory process. By providing detailed comments on the technical feasibility, analytical limitations, and cost implications of proposed rules, utilities can help shape final regulations that are both protective and achievable.45

#### Recommendations for Policymakers

1. **Prioritize Regulatory Stability:** State and federal policymakers must recognize that for capital-intensive infrastructure projects, regulatory certainty is as crucial as the standard itself. "Backstop" legislation at the state level can provide this stability, insulating long-term planning from the volatility of federal politics.
2. **Ensure Sustainable Funding:** The cost of PFAS remediation is beyond the capacity of many local communities to bear alone. State and federal governments must continue to support robust funding mechanisms, including the State Revolving Funds (SRFs), dedicated grant programs for emerging contaminants, and policies that firmly uphold the "polluter pays" principle to reduce the burden on the public.
3. **Foster Interstate Collaboration:** To avoid the inefficiency of 50 separate scientific efforts, federal agencies and state coalitions should foster and fund interstate and regional collaborations for research, data sharing, and the development of technical expertise. This will enable more states to make informed, science-based regulatory decisions in a more cost-effective manner, ensuring that all Americans, regardless of which state they live in, are protected from the threat of PFAS and the emerging contaminants of tomorrow.

#### Works cited

1. Perfluoroalkyl And Polyfluoroalkyl Substances (PFAS) - Tracking California, accessed August 23, 2025, <https://trackingcalifornia.org/topics/pfas>
2. CA PFAS Timeline | California State Water Resources Control Board, accessed August 23, 2025, <https://www.waterboards.ca.gov/pfas/ca_pfas_timeline.html>
3. PFAS and the EPA Strategic Roadmap: Progress and Challenges, accessed August 23, 2025, <https://eelp.law.harvard.edu/pfas-and-the-epa-strategic-roadmap-progress-and-challenges/>
4. Report Per- and Polyfluoroalkyl Substances (PFAS) | State Legislation and Federal Action, accessed August 23, 2025, <https://www.ncsl.org/environment-and-natural-resources/per-and-polyfluoroalkyl-substances>
5. EPA's Latest PFAS Guidance Signals Source-based Permitting and Monitoring Strategy, accessed August 23, 2025, <https://www.harrisbeachmurtha.com/insights/epas-latest-pfas-guidance-signals-source-based-permitting-and-monitoring-strategy/>
6. EPA's PFAS Strategic Roadmap: Three Years of Progress, accessed August 23, 2025, <https://www.epa.gov/system/files/documents/2024-11/epas-pfas-strategic-roadmap-2024_508.pdf>
7. Inside EPA's Roadmap on Regulating PFAS Chemicals - Earthjustice, accessed August 23, 2025, <https://earthjustice.org/feature/pfas-chemicals-epa-roadmap>
8. Per- and Polyfluoroalkyl Substances (PFAS) | US EPA, accessed August 23, 2025, <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>
9. PFAS: Per- and Polyfluoroalkyl Substances Drinking Water Systems, accessed August 23, 2025, <https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/pfas.html>
10. California Water Service Group Utilities Prepared to Comply with New PFAS Regulations, accessed August 23, 2025, <https://www.calwatergroup.com/news/press-releases/detail/601/california-water-service-group-utilities-prepared-to-comply-with-new-pfas-regulations>
11. PFAS | Riverside Public Utilities - RiversideCA.gov, accessed August 23, 2025, <https://www.riversideca.gov/utilities/residents/our-water/pfas>
12. USEPA Announces Final PFAS Drinking Water Rule, Extends Compliance Timeline - Vorys, accessed August 23, 2025, <https://www.vorys.com/publication-usepa-announces-final-pfas-drinking-water-rule-extends-compliance-timeline>
13. States' Growing Efforts to Eliminate PFAS - ASTHO, accessed August 23, 2025, <https://www.astho.org/communications/blog/states-growing-efforts-to-eliminate-pfas/>
14. Key EPA Actions to Address PFAS | US EPA, accessed August 23, 2025, <https://www.epa.gov/pfas/key-epa-actions-address-pfas>
15. EPA Sets First-Time Limits for Six PFAS in Drinking Water - Stinson LLP, accessed August 23, 2025, <https://www.stinson.com/newsroom-publications-epa-sets-first-time-limits-for-six-pfas-in-drinking-water>
16. Understanding the factors that impact federal rulemaking: a survey of former EPA regulators, accessed August 23, 2025, <https://pmc.ncbi.nlm.nih.gov/articles/PMC11488514/>
17. Regulating Contaminants Under the Safe Drinking Water Act (SDWA) | Congress.gov, accessed August 23, 2025, <https://www.congress.gov/crs-product/R46652>
18. EPA Announces It Will Keep Maximum Contaminant Levels for PFOA, PFOS, accessed August 23, 2025, <https://www.epa.gov/newsreleases/epa-announces-it-will-keep-maximum-contaminant-levels-pfoa-pfos>
19. EPA Announces Illegal Plan to Eliminate Restrictions for Toxic PFAS in Drinking Water, accessed August 23, 2025, <https://earthjustice.org/press/2025/epa-announces-illegal-plan-to-eliminate-restrictions-for-toxic-pfas-in-drinking-water>
20. EPA Announces Plan to Modify PFAS Drinking Water Rule and Extend Compliance Deadline, accessed August 23, 2025, <https://bbklaw.com/resources/la-051525-epa-announces-plan-to-modify-pfas-drinking-water-rule-and-extend-compliance-deadline>
21. EPA Signals Potential PFAS Policy Pivot Under New Administrator, accessed August 23, 2025, <https://pfas.pillsburylaw.com/epa-pfas-policy-pivot-trump/>
22. California & the waiver: The facts - California Air Resources Board - CA.gov, accessed August 23, 2025, <https://ww2.arb.ca.gov/resources/fact-sheets/california-waiver-facts>
23. AB 794 - Assembly Bill Policy Committee Analysis, accessed August 23, 2025, <https://aesm.assembly.ca.gov/system/files/2025-04/ab-794.pdf>
24. Key California Assembly committee advances bill to limit 'forever chemicals' in drinking water - Environmental Working Group, accessed August 23, 2025, <https://www.ewg.org/news-insights/news-release/2025/04/key-california-assembly-committee-advances-bill-limit-forever>
25. Lawmakers, Advocates Introduce Legislation to Protect Californians from Dangerous “Forever Chemicals” in Drinking Water - Jesse Gabriel, accessed August 23, 2025, <https://a46.asmdc.org/press-releases/20250219-lawmakers-advocates-introduce-legislation-protect-californians-dangerous>
26. California Strengthens PFAS Regulations and Funding with SB 454 and AB 794, accessed August 23, 2025, <https://www.mgmlaw.com/news-insights/california-strengthens-pfas-regulations-and-funding-with-sb-454-and-ab-794>
27. States Take Up 'Forever Chemicals' Restrictions as EPA Shifts - Bloomberg Law News, accessed August 23, 2025, <https://news.bloomberglaw.com/us-law-week/states-take-up-forever-chemicals-restrictions-as-epa-shifts>
28. The PFAS Challenge: How Two California Water Agencies Are Responding, accessed August 23, 2025, <https://www.csda.net/blogs/kristin-withrow1/2024/06/20/the-pfas-challenge-how-two-california-water-agenci>
29. States move to cement PFAS protections amid fears of federal rollbacks - EHN.org, accessed August 23, 2025, <https://www.ehn.org/pfas-regulations-trump>
30. BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA In the Matter of the Application of CALIFORNIA WATER SERVICE C, accessed August 23, 2025, <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M567/K540/567540359.PDF>
31. NOTICE OF ADOPTION OF PUBLIC HEALTH GOALS FOR PERFLUOROOCTANOIC ACID AND PERFLUOROOCTANE SULFONIC ACID IN DRINKING WATER - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/media/downloads/water/public-health-goal/pfoapfosnotice040524.pdf>
32. Public Health Goals for Perfluorooctanoic Acid ... - OEHHA - CA.gov, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/2024-10/pfoapfosphgfinaldraft040524.pdf>
33. Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/water/public-health-goal-report/perfluorooctanoic-acid-pfoa-and-perfluorooctane-sulfonic-acid-pfos-drinking-water>
34. PFOA PFOS Peer Review Comments - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/downloads/water/peer/pfoapfospeerreviewcomments.pdf>
35. California adopts health-protective goals for forever chemicals in drinking water - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/water/public-health-goal-press-release-water/california-adopts-health-protective-goals-forever-chemicals-drinking-water>
36. Maximum Contaminant Level Goals for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS) in Drinking Water - Environmental Protection Agency (EPA), accessed August 23, 2025, <https://www.epa.gov/system/files/documents/2024-04/mclg-doc-for-pfoa-pfos_final-508.pdf>
37. California's PFAS Journey | News & Events | Clark Hill PLC, accessed August 23, 2025, <https://www.clarkhill.com/news-events/news/californias-pfas-journey/>
38. Emerging Contaminants (EC) and Per- and Polyfluoroalkyl Substances (PFAS) Funding | California State Water Resources Control Board, accessed August 23, 2025, <https://www.waterboards.ca.gov/water_issues/programs/grants_loans/pfas.html>
39. PFAS Drinking Water | California State Water Resources Control Board - CA.gov, accessed August 23, 2025, <https://www.waterboards.ca.gov/pfas/drinking_water.html>
40. EPA Research Partner Support Story: Evaluating chemicals for health effects, accessed August 23, 2025, <https://www.epa.gov/research-states/epa-research-partner-support-story-evaluating-chemicals-health-effects>
41. OEHHA Synthetic Turf Study Public Review Draft, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/2025-03/DraftTurfReport031325.pdf>
42. California Steps Up Its Investigations and Permitting of PFAS | Downey Brand LLP, accessed August 23, 2025, <https://www.downeybrand.com/legal-alerts/california-steps-up-its-investigations-and-permitting-of-pfas/>
43. California PFAS Push Now Includes POTWs as State Water Board Rolls Out New Testing Order | Downey Brand LLP, accessed August 23, 2025, <https://www.downeybrand.com/legal-alerts/california-pfas-push-now-includes-potws-as-state-water-board-rolls-out-new-testing-order/>
44. Drinking Water Notification Levels | California State Water Resources Control Board, accessed August 23, 2025, <https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.html>
45. Comment by Comments of the PFAS Regulatory Coalition on California OEHHA￢ﾀﾙs Proposed Public Health Goals for Perfluorooct, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/dockets/20426/20530-comments_of_the_pfas_regulatory_coalition_on_california_oehhas_proposed_public_health_goals_for_perfluorooctanoic_acid_and_perfluorooctane_sulfonic_acid_in_drinking_water/2021-10-28_oehha_proposed_phgs_for_pfoa_and_pfos_0.pdf>
46. Comment by California-Nevada Section, American Water Works Association on Comment Submissions - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/dockets/20491/20510-california-nevada_section_american_water_works_association/ca-nv_awwa_-_phg_comment_letter_pfoa_-pfas.pdf>
47. Comment by California Association of Sanitation Agencies on Comment Submissions - Announcement of Availability of a Draft Techni - OEHHA, accessed August 23, 2025, <https://oehha.ca.gov/sites/default/files/media/dockets/20426/20537-california_association_of_sanitation_agencies/10-28-21_casa_cover_ltr_to_oehha_phg.pdf>
48. Fifteen California Cities and Water Districts File a Lawsuit on the Heels of EPA's Announcement of MCLs for PFAS in Drinking Water - Farella Braun + Martel LLP, accessed August 23, 2025, <https://www.fbm.com/publications/fifteen-california-cities-and-water-districts-file-a-lawsuit-on-the-heels-of-epas-announcement-of-mcls-for-pfas-in-drinking-water/>
49. Regulatory and Litigation Developments | Per- and Polyfluoroalkyl Substances (PFAS), accessed August 23, 2025, <https://www.fbm.com/per-and-polyfluoroalkyl-substances-pfas/regulatory-and-litigation-developments/>
50. Sacramento water providers plan to meet new federal limits for 'forever chemicals', accessed August 23, 2025, <https://www.capradio.org/articles/2024/04/17/sacramento-water-providers-plan-to-meet-new-federal-limits-for-forever-chemicals/>
51. California water agencies remove wells following new PFAS requirements, accessed August 23, 2025, <https://waterfm.com/california-water-agencies-remove-wells-following-new-pfas-requirements/>
52. The True Cost of PFAS and the Benefits of Acting Now - PMC, accessed August 23, 2025, <https://pmc.ncbi.nlm.nih.gov/articles/PMC8296683/>
53. Breaking down PFAS water treatment cost to remove forever chemicals - Fehr Graham, accessed August 23, 2025, <https://www.fehrgraham.com/about-us/blog/breaking-down-pfas-water-treatment-cost-to-remove-forever-chemicals-fg>
54. EPA Takes Sweeping Actions to Regulate PFAS, California Makes Targeted Moves | 2024 LUENR Update - Allen Matkins, accessed August 23, 2025, <https://www.allenmatkins.com/real-ideas/luenr-update-2024-PFAS.html>
55. Benefits and Costs of Reducing PFAS in Drinking Water - Environmental Protection Agency (EPA), accessed August 23, 2025, <https://www.epa.gov/system/files/documents/2024-04/pfas-npdwr_fact-sheet_cost-and-benefits_4.8.24.pdf>
56. The Cost of Freeing Drinking Water from 'Forever Chemicals' - Undark Magazine, accessed August 23, 2025, <https://undark.org/2024/01/15/drinking-water-pfas-cost/>
57. Feds Vastly Underestimate Forever Chemical Clean-Up Costs for Water Sector; PFAS Myths Report Shows Operational Costs for Wastewater Utilities to go up 60%, Drinking Water Utilities Require at Least $50 Billion for New Treatment Technology, accessed August 23, 2025, <https://www.nacwa.org/news-publications/news-detail/2023/07/18/feds-vastly-underestimate-forever-chemical-clean-up-costs-for-water-sector-pfas-myths-report-shows-operational-costs-for-wastewater-utilities-to-go-up-60-drinking-water-utilities-require-at-least-$50-billion-for-new-treatment-technology>
58. Biden-Harris Administration Announces $169 Million in Bipartisan Infrastructure Law Funding for California to Address Emerging Contaminants like PFAS in Drinking Water - Environmental Protection Agency (EPA), accessed August 23, 2025, <https://www.epa.gov/newsreleases/biden-harris-administration-announces-169-million-bipartisan-infrastructure-law>
59. Padilla Announces Funds from Bipartisan Infrastructure Law to Clean up PFAS in California Drinking Water, accessed August 23, 2025, <https://www.padilla.senate.gov/newsroom/press-releases/padilla-announces-funds-from-bipartisan-infrastructure-law-to-clean-up-pfas-in-california-drinking-water%EF%BF%BC/>
60. California Water Policy Update: SB 454, accessed August 23, 2025, <https://calruralwater.org/california-water-policy-update-sb-454/>
61. The Cost of PFAS Clean Up in Waterways: Who Pays and How?, accessed August 23, 2025, <https://lawreview.colorado.edu/print/volume-96/the-cost-of-pfas-clean-up-in-waterways-who-pays-and-how-sarah-e-mische/>
62. Reducing PFAS in Drinking Water with Treatment Technologies | US EPA, accessed August 23, 2025, <https://www.epa.gov/sciencematters/reducing-pfas-drinking-water-treatment-technologies>
63. Case Study June 2023: SCV Water Leads Way on PFAS Response, accessed August 23, 2025, <https://www.acwa.com/news/case-study-june-2023-scv-water-leads-way-on-pfas-response/>
64. Consortium Member Fish Consumption Advisory Guidelines - MN ..., accessed August 23, 2025, <https://www.health.state.mn.us/communities/environment/fish/consortium/members.html>
65. Great Lakes Consortium for Fish Consumption Advisories - MN Dept. of Health, accessed August 23, 2025, <https://www.health.state.mn.us/communities/environment/fish/consortium/index.html>
66. Great Lakes Consortium for Fish Consumption Advisories Best Practice for Perfluorooctane Sulfonate (PFOS) Guidelines - Minnesota Department of Health, accessed August 23, 2025, <https://www.health.state.mn.us/communities/environment/fish/docs/consortium/bestpracticepfos.pdf>
67. Consumption Advisories and PFAS - Wisconsin DNR, accessed August 23, 2025, <https://dnr.wisconsin.gov/topic/PFAS/Advisories.html>
68. Scientists found PFAS in Ohio fish. Are they safe to eat?, accessed August 23, 2025, <https://indepth.ideastream.org/scientists-found-pfas-in-ohio-fish-are-they-safe-to-eat/index.html>
69. About — Great Lakes PFAS Action Network, accessed August 23, 2025, <https://www.glpan.org/about>
70. Great Lakes PFAS Action Network, accessed August 23, 2025, <https://www.glpan.org/>
71. Gov. Pritzker Announces $160 Million In Federal Funding for Great Lakes Water Innovation Engine, accessed August 23, 2025, <https://gov.illinois.gov/news/press-release.29570.html>
72. Great Lakes project selected to receive up to $160 million from NSF - Northwestern Now, accessed August 23, 2025, <https://news.northwestern.edu/stories/2024/01/great-lakes-project-selected-to-receive-up-to-160-million-from-nsf/>
73. Great Lakes ReNEW: Home, accessed August 23, 2025, <https://greatlakesrenew.org/>
74. New York Great Lakes Research Consortium Small Grants - SUNY ESF, accessed August 23, 2025, <https://www.esf.edu/glrc/nyglpf.php>
75. Great Lakes Research Consortium funds innovative wastewater treatment project at UB, accessed August 23, 2025, <https://www.buffalo.edu/great-lakes-program.host.html/content/shared/engineering/civil-structural-environmental/articles/2019/07/great-lakes-research-consotium-funds-innovative-wastewater-treatment-project-at-ub.detail.html>
76. New study finds extremely high levels of 'forever chemicals' in Great Lakes fish - WPR, accessed August 23, 2025, <https://www.wpr.org/animals/study-finds-extremely-high-levels-forever-chemical-pfas-great-lakes-fish>
77. Great Lakes Region PFAS Scoping and Competitive Research ..., accessed August 23, 2025, <https://iiseagrant.org/work/healthy-waters/programs-initiatives/gl-pfas-scoping-research/>
78. PFAS drinking water standards: state-by-state regulations | BCLP, accessed August 23, 2025, <https://www.bclplaw.com/en-US/events-insights-news/pfas-drinking-water-standards-state-by-state-regulations.html>
79. EPA Finalizes PFAS Drinking Water Regulation | Insights - Holland & Knight, accessed August 23, 2025, <https://www.hklaw.com/en/insights/publications/2024/04/epa-finalizes-pfas-drinking-water-regulation>
80. The Summer Heats Up With Five States Enacting New Laws Prohibiting PFAS in Consumer Products - Hunton Andrews Kurth LLP, accessed August 23, 2025, <https://www.hunton.com/the-nickel-report/the-summer-heats-up-with-five-states-enacting-new-laws-prohibiting-pfas-in-consumer-products>
81. Regulatory and Guidance Information by Topic: Air | US EPA, accessed August 23, 2025, <https://www.epa.gov/regulatory-information-topic/regulatory-and-guidance-information-topic-air>
82. Other Regulators: Response to Environmental Compliance Violations at Federal Facilities, accessed August 23, 2025, <https://www.epa.gov/enforcement/other-regulators-response-environmental-compliance-violations-federal-facilities>
83. Massachusetts v. EPA | 549 U.S. 497 (2007) | Justia U.S. Supreme Court Center, accessed August 23, 2025, <https://supreme.justia.com/cases/federal/us/549/497/>
84. Litigation Minute: Tough to Swallow: Increased State Regulation of and Attention on Contaminants in Food - K&L Gates, accessed August 23, 2025, <https://www.klgates.com/Litigation-Minute-Tough-to-Swallow-Increased-State-Regulation-of-and-Attention-on-Contaminants-in-Food-5-8-2025>
85. Financing for Environmental Compliance | US EPA, accessed August 23, 2025, <https://www.epa.gov/compliance/financing-environmental-compliance>
86. State Environmental Agencies' Research Needs | US EPA, accessed August 23, 2025, <https://www.epa.gov/research-states/state-environmental-agencies-research-needs>
87. Basic Research Needs for Environmental Management - DOE Office of Science, accessed August 23, 2025, <https://science.osti.gov/-/media/bes/pdf/reports/2016/Basic_Research_Needs_for_Environmental_Management_rpt.pdf>
88. Expired PAR-22-210: Research to Action: Assessing and Addressing Community Exposures to Environmental Contaminants (R01 Clinical Trial Optional) - NIH Grants & Funding, accessed August 23, 2025, <https://grants.nih.gov/grants/guide/pa-files/PAR-22-210.html>