

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

National Primary Drinking Water Regulation for Perchlorate

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Comments of Natural Resources Defense Council

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I. Executive Summary

EPA's proposed national drinking water standard will threaten the health of millions of Americans by failing to ensure protection against perchlorate, a highly toxic contaminant found in tap water of hundreds of water systems across the nation. The agency's Maximum Contaminant Level Goal (MCLG or health goal) for perchlorate falls far short of EPA's statutory mandate to set such a target at "the level at which no known or anticipated adverse effects on the health of persons occurs and which allows an adequate margin of safety," 42 U.S.C. § 300g-1(b)(4)(A). The agency's proposal also fails to set a Maximum Contaminant Level (MCL) as close to a scientifically sound and protective health goal as feasible, *id.* § 300g-1(b)(4)(B). To put it bluntly, according to the agency's own technical support documents, children drinking water at EPA's proposed standard are at risk of suffering harm to their brains and decreased IQs. Many children would be harmed; some will be at risk of suffering a "mild intellectual disability" and others "shifting from a gifted IQ level [of over 135] into a lower IQ category."¹ Yet EPA says this would not be an "adverse effect" on health under the law.

More technically, as discussed in detail in these comments, EPA's analysis shows that drinking water at EPA's proposed health goal is associated with an average (mean) one-point population-level IQ decrement—indisputably, an adverse health effect. Moreover, EPA arbitrarily chose its MCLG based on IQ loss alone, neglecting the other documented health harms from low levels of perchlorate exposure. Because there is no threshold for safe exposure, EPA should set an MCLG of zero. And EPA should set an MCL of 2 parts per billion (ppb), which EPA's own analysis of treatment technologies demonstrates is feasible.

EPA's proposed MCLG health goal and MCL of 20 ppb are completely out of step with the careful scientific analyses and standards set by state health authorities. The health goals recommended by states are 10 to 100 times stricter than what EPA has proposed—for example, 0.2 to 2 ppb (New Jersey), 1 ppb (California), and 0.49 ppb (Massachusetts). The states that have established enforceable perchlorate tap water standards set MCLs at 2 ppb (Massachusetts) and 6 ppb (California)—more than three to 10 times more protective than EPA's proposal.

EPA's occurrence analysis, too, is fundamentally flawed and likely understates the true extent of the perchlorate tap water contamination problem. EPA relies on quarter century-old Unregulated Contaminant Monitoring Rule 1 (UCMR1—collected in 2000-2005) and highly limited data, and heavily biases its "updated" dataset towards water systems with low perchlorate levels by adding data *only* from the two states that regulate perchlorate in drinking water. Indeed, 82.5 percent of the data EPA relies upon to evaluate perchlorate occurrence is from the only two states (California and Massachusetts) that have regulated perchlorate, and most of that data was

¹ EPA, Draft Health Effects Technical Support Document: Deriving a Reference Dose and Maximum Contaminant Level Goal for Perchlorate in Drinking Water at 5-18, EPA-HQ-OW-2024-0592-0755, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0755>.

collected *after* those states adopted strict perchlorate standards. Yet even EPA's deeply flawed occurrence dataset shows that perchlorate was present in 40,656—or 20.7%—of samples taken by water systems.

EPA also refused to include in its analysis many available data sources showing widespread perchlorate contamination. Buried in appendices to EPA's technical documents are data the agency strangely ignored in its analysis. For example, the U.S. Geological Survey (USGS) found perchlorate in more than 72% of drinking water samples, with a median detection level of 16 parts per billion. Nearly 55% of USGS groundwater samples and over 93% of surface water samples found perchlorate. EPA appendices also show that perchlorate was detected in 508 public water systems serving more than 17 million people, and a Centers for Disease Control and Prevention (CDC) survey that found perchlorate in 83% of tap water samples. While many of these detections were below EPA's extraordinarily unprotective proposed standard, if the agency were to establish a perchlorate standard that protected the public, comprehensive and updated monitoring clearly would show widespread and problematic tap water contamination.

The agency also ignored evidence that there has likely been ongoing perchlorate contamination from Department of Defense (DoD) and other sources in the decades since UCMR1. EPA has been under sustained pressure from the DoD and its allies not to strictly regulate perchlorate. Perhaps not surprisingly, EPA has chosen to be willfully blind to the likelihood of spreading perchlorate contamination from hundreds of DoD and other federal facilities, as well as industrial and Superfund sites. The EPA collected data in 2005 showing over 100 such sites spread across the country, and the Government Accountability Office flagged hundreds of these perchlorate-contaminated sites in a 2010 report. But since then, EPA has shown no discernable interest in collecting updated information on whether perchlorate contamination has spread from these and other sites. Moreover, even though it has been documented that the use of fireworks can cause perchlorate water contamination, EPA ignored the more than doubling of fireworks use in the country since UCMR1 decades ago. The agency abruptly canceled a study in 2025 of the impacts of expanding fireworks use on perchlorate contamination without providing any advanced notice to the researchers. But the preliminary data collected “strongly suggested that fireworks do impact drinking water sources across the US and that their use leads to elevated surface and groundwater concentrations as well as increased deposition.” Nor has EPA sought updated data on the inappropriate storage and use of hypochlorite, which EPA admits can cause perchlorate contamination. There has been a significant increase in the use of this disinfectant by water systems since UCMR1.

EPA's proposed monitoring—which would likely allow the vast majority of systems to go nine years at a time without any monitoring—would fail to detect harmful levels of perchlorate contamination. And EPA's cost-benefit analysis fails to consider the full health benefits of reducing perchlorate in drinking water and overestimated the costs of monitoring. In sum, EPA's proposal fails to consider the best available science and will not adequately protect public health.

II. EPA must set a national primary drinking water standard for perchlorate

“[T]he Safe Drinking Water Act requires that the agency ‘shall’ regulate [a contaminant] after making a regulatory determination” to regulate that contaminant. *NRDC v. Regan*, 67 F.4th 397 (D.C. Cir. 2023). EPA determined that the statutory criteria to regulate perchlorate under SDWA were met in 2011. 76 Fed. Reg. 7762, 7762 (Feb. 11, 2011). EPA thus must set a national primary drinking water standard for perchlorate. *See NRDC*, 67 F.4th at 404-05.²

Even if this were not the case, the statutory criteria for regulation are still met. EPA “shall” regulate a contaminant if it determines, based upon the “best available public health information,” 42 U.S.C. § 300g-1(b)(1)(B)(ii)(II), that: (i) the contaminant may have an adverse effect on the health of persons; (ii) the contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and (iii) in the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems, *id.* § 300g-1(b)(1)(A)(i)–(iii). As EPA recognizes, perchlorate has serious adverse effects on human health. It also appears in public water systems “with a frequency and at levels of public health concern.” *Id.* § 300g-1(b)(1)(A)(ii). Despite its previous finding that perchlorate meets these criteria, EPA now contends otherwise, 91 Fed. Reg. at 400-01. But the agency’s position is based on both (1) the agency’s mistaken conclusion that exposure to perchlorate levels below 20 parts per billion (ppb) does not have adverse health effects, *see infra* Section III, and (ii) its reliance on outdated and limited sampling data and willful blindness to other evidence that perchlorate contamination is more widespread than EPA acknowledges, *see infra* Section V. As explained further below, even low levels of perchlorate exposure well below the EPA’s proposed 20 ppb Maximum Contaminant Level (MCL) have significant adverse health effects. In addition, there is substantial evidence—that EPA declined to consider—that dangerous levels of perchlorate in drinking water are widespread. Even EPA’s flawed occurrence dataset shows that perchlorate was present in 40,656—or 20.7%—of samples taken by water systems.³ Regulating perchlorate thus presents a “meaningful opportunity for health risk reduction for persons served by public water systems.” *Id.* § 300g-1(b)(1)(A)(iii). At a minimum, and as explained further below, EPA’s conclusion to the contrary is arbitrary and not supported by the best public health information available. *See id.* § 300g-1(b)(1)(B)(ii)(II); *NRDC*, 67 F.4th at 410-13 (Pan, J., concurring).

² After the D.C. Circuit issued its decision in *NRDC v. Regan*, American Water Works Association petitioned for rehearing en banc. The D.C. Circuit denied that petition. *See Order, NRDC v. Regan*, No. 20-1335 (D.C. Cir. Sept. 7, 2023), Dkt. No. 2015727.

³ EPA, Perchlorate Occurrence and Monitoring Report for the Perchlorate National Primary Drinking Water Regulation 40-41 (2025), EPA-HQ-OW-2024-0592-0737, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0737> (“2025 Occurrence Report”); EPA, Perchlorate NPDWR Occurrence Combined Dataset 2025, EPA-HQ-OW-2024-0592-0733, <http://regulations.gov/document/EPA-HQ-OW-2024-0592-0733>.

III. EPA’s proposed MCLG is not set at the level at which no known adverse health effects occur, and should instead be set at zero, or in the alternative at no more than 0.2 ppb to 1 ppb.

SDWA requires EPA to set a Maximum Contaminant Level Goal (MCLG) at “the level at which no known or anticipated adverse effects on the health of persons occurs and which allows an adequate margin of safety,” 42 U.S.C. § 300g-1(b)(4)(A), and to consider “the effects of the contaminant on the general population and on groups within the general population such as infants, children, pregnant women, the elderly, individuals with a history of serious illness, or other subpopulations that are identified as likely to be at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population.” *Id.* § 300g-1(b)(3)(C)(i)(V). As explained further below and in the attached Veles Group Report,⁴ EPA’s proposed MCLG does not meet this standard. The proposal does not account for the best public health information available indicating that there are known or anticipated adverse effects on health at levels at and below the proposed MCLG, and fails to adequately consider the wide variety of health effects that perchlorate exposure can cause at low levels of exposure. While EPA acknowledges that perchlorate exposure may result in other serious health harms, EPA looked to only a single harm—IQ loss—to derive its MCLG and MCL, and relied on data from only a single paper, the Korevaar study. But the SDWA requires EPA to set MCLG at the level at which *no* adverse health effects will occur. EPA must consider whether its MCLG will avoid *all* known or anticipated adverse health effects of perchlorate, not merely IQ loss.

Even taking IQ loss alone, EPA’s MCLG does not meet the statutory standard: exposure to drinking water at 20 ppb will not avoid IQ loss, *contra* 91 Fed. Reg. at 413, but rather is associated with an average (mean) one-point population-level IQ decrement. Of course, since this is an *average* IQ decrement for the affected population, many children will suffer more IQ loss than the mean. And as discussed below and recognized by EPA, this population-average IQ loss means that there will be more children with low IQs that require remedial education and special services, as well as fewer very high IQ “gifted” children. Indeed, as shown below in EPA’s Table 5-5, the agency found that a 1-point national shift in IQ would result in 1,631,035 more individuals with learning disabilities (IQs between 75 and 85) and 760,528 fewer gifted individuals (IQs between 125 and 135).⁵

⁴ See The Veles Group, LLC, Response to EPA’s Request for Comments: National Primary Drinking Water Regulation for Perchlorate (February 27, 2026) (“Veles Group Report”).

⁵ EPA, Draft Health Effects Technical Support Document: Deriving a Reference Dose and Maximum Contaminant Level Goal for Perchlorate in Drinking Water at 5-18, EPA-HQ-OW-2024-0592-0755, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0755>.

Table 5-5. Number of Individuals Shifting^a Between Categories of IQ per One- and Two-Point IQ Decrements Based on the United States Population^b

IQ Range	Average IQ		
	100	99 (-1)	98 (-2)
IQ ≤ 65	3,288,135	3,921,275 (+328,698)	4,657,655 (+736,380)
65 < IQ ≤ 75 (Mild Intellectual Disability)	12,721,633	14,436,488 (+877,247)	16,312,297 (+1,875,810)
75 < IQ ≤ 85	37,139,742	40,375,759 (+1,631,035)	43,705,931 (+3,330,172)
85 < IQ ≤ 95	70,613,339	73,545,553 (+1,442,421)	76,272,114 (+2,726,561)
95 < IQ ≤ 105	87,474,302	87,287,208 (-140,283)	86,728,324 (-558,885)
105 < IQ ≤ 115	70,613,339	67,508,217 (-1,572,089)	64,263,734 (-3,244,483)
115 < IQ ≤ 125	37,139,742	34,016,896 (-1,546,203)	31,023,288 (-2,993,608)
125 < IQ ≤ 135	12,721,633	11,162,429 (-760,528)	9,752,338 (-1,410,091)
IQ > 135	3,288,135	2,746,175 (-260,298)	2,284,319 (-461,856)

IQ = intelligence quotient.

^a IQ category population increases are indicated by a + and blue text; IQ category population decreases are indicated by a - and red text.

^b United States population data obtained from Census Bureau projected estimates (<https://www.census.gov/popclock/>) for July 2023.

As EPA explained in its technical support document,

[A] 1-point decrement in average population IQ can result in a substantial number of individuals ($n = 877,247$) shifting from the lower bound of the normal range (IQ = 75–85) to the IQ range *considered as mild intellectually disabled* (IQ = 65–75) (Table 5-5). A 1% decrease in average population IQ would not only impact individuals considered intellectually disabled, but it *would also have a considerable impact in the number of individuals shifting into a lower IQ category across the entire spectrum of IQ* (Figure 5-2). At the United States population level, a 1% decrease in average population IQ would correspond to *a similarly large portion of individuals ($n = 760,528$) shifting from a gifted IQ level into a lower IQ category* (Table 5-5). The available scientific information (see above) indicates that *a decreased IQ in early life is a severe and irreversible health endpoint*.⁶

It is impossible to say that “decreased IQ in early life [that] is a severe and irreversible health endpoint” is not a “known or anticipated adverse effect” on health under the statute. 42 U.S.C. § 300g-1(b)(4)(A). Having more children “considered as mild[ly] intellectually disabled”

⁶ *Id.* at 5-18 (emphasis added).

and children “shifting a gifted IQ level into a lower IQ category” is manifestly a major public health concern. While the number of individuals who would suffer these fates from perchlorate in tap water of course would not be as large as the numbers cited above, since not the entire national population is so exposed, in establishing its standard EPA must consider any such adverse effects on “groups within the general population such as infants, children, pregnant women...or other subpopulations that are identified as likely to be at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population” *Id.* § 300g-1(b)(3)(C)(i)(V).

Because there is no established threshold below which perchlorate has no adverse effects, EPA must set an MCLG of zero. EPA’s analysis and model, and the best available public health information, do not establish a threshold below which no IQ loss or certain other adverse effects may occur. In light of these facts, EPA clearly has failed to comply with the statutory mandate that the MCLG provide an “adequate margin of safety” to ensure that these adverse effects will not occur. *Id.* §300g-1(b)(4)(A). Therefore, **EPA should instead set an MCLG of zero because there is no identifiable threshold below which there are no adverse effects.**

There are numerous precedents for EPA to establish an MCLG at zero when it cannot establish a safe level of exposure to a contaminant. It has long been the agency’s policy to set MCLGs at zero for carcinogens.⁷ And we need to look no further that the agency’s recent Lead and Copper Rule Improvements for a summary of the agency’s policy:

[T]he EPA established a maximum contaminant level goal (MCLG) for lead of zero. The Safe Drinking Water Act (SDWA) requires the EPA to set MCLGs at the level at which no known or anticipated adverse effects on the health of persons would occur, allowing for a margin of safety. The EPA established the MCLG of zero in part due to lead being a probable carcinogen and due to there being no clear threshold below which there are no risks of some non-carcinogenic health effects.⁸

In the case of perchlorate as with lead, EPA has determined that IQ impacts occur, as well as other non-carcinogenic health effects. And as with lead, EPA cannot and has not established with the best available public health science that there is “clear threshold below which there are no risks of some non-carcinogenic health effects.” Therefore, it is incumbent upon the agency, as required by the SDWA, to set an MCLG at zero for perchlorate.

Assuming arguendo that EPA were to establish that there is a threshold for perchlorate’s adverse health effects, the agency should set an MCLG consistent with the

⁷ EPA, PFAS National Primary Drinking Water Regulation, 89 Fed. Reg. 32,532, at 23,563 (April 26, 2024).

⁸ EPA, National Primary Drinking Water Regulation for Lead and Copper: Improvements, 89 Fed.Reg. 86418, 86,429-30 (Oct. 30, 2024).

most recent published, peer-reviewed recommendations from state experts, at 0.2 ppb (NJDEP SAB) to 1 ppb (CA OEHHA). EPA’s MCLG is out-of-step with other jurisdictions that have considered the health harms of perchlorate. Both California and Massachusetts, and at least 8 other states, set advisory or guidance levels below 20 ppb.

Table 1: Summary of State Perchlorate Health Goals & Standards

State	Level (ppb)
Enforceable limits	
California	6
Massachusetts	2
Guidance, advisory levels or health goals	
Arizona	1
California (public health goal)	1
Hawaii	15
Maryland	1
Massachusetts (health-based safe level)	0.49 (adults) 0.44 (bottle-fed infants)
Nevada	18
New Jersey Drinking Water Quality Institute	5
New Jersey DEP Science Advisory Board	0.2 to 2
New Mexico	13.8
New York	18
Vermont	2.2

Source: 2025 Occurrence Report at 16-17; [California PHG \(2015\)](#); [Mass. DEP \(2006\)](#); [NJDEP SAB \(2020\)](#); [NJDWQI \(2005\)](#).

Many of these states grappled with the same available scientific evidence as EPA and concluded that a much lower limit on perchlorate was necessary to avoid health harms. In 2015, California’s Office of Environmental Health Hazard Assessment, for example, set a scientifically robust and

peer-reviewed public health goal for perchlorate of 1 ppb.⁹ EPA fails to even mention this in its proposal or MCLG technical support document. In 2020, the New Jersey Department of Environmental Protection Science Advisory Board recommended a scientifically rigorous and peer-reviewed MCL of 0.2 to 2 ppb, expressly disagreeing with EPA’s 2019 analysis of the health effects literature and concluding that a limit of 15 ppb—EPA’s previous health advisory for perchlorate—was not health protective.¹⁰ Despite this, again, EPA did not even mention the New Jersey analysis in its proposal. The Massachusetts Department of Environmental Protection also published a rigorous scientific evaluation of perchlorate and recommended a safe level based upon the “scientific review and deliberation of MassDEP scientists, as well as distinguished members of the MADEP/DPH Advisory Committee on Health Effects” and received the input from “two local members of the NAS committee.”¹¹ The Massachusetts scientific review recommended a safe level for drinking water, using its recommended reference dose, of 0.49 ppb for adults and 0.44 ppb for bottle-fed infants.¹² Again, EPA does not even mention this published analysis.

As explained further in the attached Veles Group Report, EPA’s analysis differed in significant ways from these analyses, failed to consider numerous key findings and recommendations of these august scientific bodies, and is not based upon the best available peer-reviewed public health science. EPA has entirely failed to explain in full detail, nor to scientifically justify, why it so radically departs from the carefully established and documented, peer-reviewed scientific findings published by experts from these other august bodies.

A. EPA’s proposed MCLG will not protect against adverse health effects

The Safe Drinking Water Act requires that an MCLG reflect “the level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety.” 42 U.S.C. § 300g-1(b)(4)(A). As explained further in the attached Veles Group Report, EPA’s proposed MCLG violates that statutory mandate in several respects.

Loss of an average of one point in IQ in an affected population is an adverse health effect. A decrease in average IQ of one point is an “adverse effect[] on the health of persons.” *NRDC*, 67 F.4th at 411 (Pan, J., concurring). The Veles Group Report explains that “the evidence indicates that 20 ppb corresponds to an exposure level associated with approximately a one-point population-level IQ decrement, rather than a no-effect level.” Veles Group Report 3. In other

⁹ California Office of Environmental Health Hazard Assessment, Public Health Goal: Perchlorate in Drinking Water (Feb. 2015), EPA-HQ-OW-2024-0592-0618, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0618>.

¹⁰ New Jersey Department of Environmental Protection Science Advisory Board, Final Report: Review of Proposed EPA Maximum Contaminant Level for Perchlorate (Aug. 2020), <https://dep.nj.gov/wp-content/uploads/sab/sab-perchlorate.pdf>.

¹¹ Massachusetts Department of Environmental Protection, Update to ‘Perchlorate Toxicological Profile and Health Assessment,’ (June 2006), <https://www.mass.gov/doc/perchlorate-toxicological-profile-health-assessment-june-2006/download>.

¹² *Ibid.*

words, EPA's proposed MCLG is *associated with*, rather than *avoids*, the one-point IQ decrease. *Accord NRDC*, 67 F.4th at 411 (Pan, J., concurring). EPA's reliance on a one-point IQ decrement as an acceptable benchmark response is statutorily invalid.

EPA's proposal does not account for population level effects. As the attached report explains, “[t]he EPA’s 2025 derivation of a 20 ppb MCLG is fundamentally flawed because it relies on an individual-specific threshold model that ignores the population impact of low-level perchlorate exposure. By focusing on a 1-point IQ decrement as a manageable individual risk, the EPA obscures the large impact on population-wide health outcome.” Veles Group Report 26. A *mean* IQ loss of less than 1 point yields cumulative population-level effects that present serious public health concerns. *Id.* at 26-27. The report details the “significant societal impacts” of such a “systemic public health failure” at the population level. *Id.* at 26. These population-wide adverse effects also mean EPA’s proposed MCLG violates the statute: SDWA requires EPA to set its MCLG at the level that avoids adverse effects on the health of “*persons*,” plural. 42 U.S.C. § 300g-1(b)(4)(A) (emphasis added). EPA therefore must account for the population-level effects of its MCLG.

EPA's proposal does not account for key sensitive populations. EPA’s approach relies on a model based on “healthy but iodine-deficient” pregnant woman. Veles Group Report 27. However, this model “ignores individuals with pre-existing clinical conditions that further impair the thyroid’s ability to handle perchlorate.” *Id.* The Veles Group Report identifies studies on specific clinical populations that are “significantly more vulnerable than the modeled individual” and which EPA omits from its consideration, including women with medication-induced vulnerability, NIS gene variants, and suboptimal thyroid function. *Id.* at 27-28. EPA also does not account for “individuals subject to synergistic co-exposures from other environmental goitrogens such as thiocyanate or nitrates.” *Id.* at 29. A 20 ppb MCLG is not protective of these sensitive groups, for whom “even minor perturbations in thyroid hormone levels can result in significant neurodevelopmental effects.” *Id.* The Veles Group Report explains why EPA’s assumption of a “safe lower bound,” or threshold, for neurodevelopmental effects from perchlorate exposure “ignores the physiological vulnerability of the most at-risk populations.” *Id.* at 29-31.

EPA also places disproportionate consideration on fetuses and healthy adults while discounting infants, who may be particularly susceptible to the effects of perchlorate “during a critical window of neurodevelopment.” *Id.* at 28-29. Data from California and elsewhere indicates that an MCLG of 20 ppb is “not protective for newborns and children exposed to low levels of perchlorate.” *Id.* at 11.

The agency’s failure to consider these especially vulnerable subpopulations runs directly contrary to the statute, which requires that in establishing a drinking water standard EPA must consider “the effects of the contaminant on the general population and on groups within the general population *such as infants, children, pregnant women, the elderly, individuals with a*

history of serious illness, or other subpopulations that are identified as likely to be at greater risk of adverse health effects due to exposure to contaminants in drinking water than the general population.” *Id.* § 300g-1(b)(3)(C)(i)(V)(emphasis added). This, EPA did not do.

EPA’s proposal is based on flawed assumptions. The Veles Group Report demonstrates why EPA’s assumption of a safe threshold is incorrect, and no such safe threshold has been demonstrated. Veles Group Report at 26-27. Additionally, EPA used incorrect assumptions in deriving a relative source contribution (RSC) value, errors which are passed on in calculating the MCLG value. *Id.* at 31. And as detailed below, EPA’s uncertainty factors do not adequately account for population variability or database uncertainties. *See id.* at 20-23, 27-28, 31. As a result, EPA’s proposed MCLG will not protect against adverse health effects.

EPA’s model does not account for other health effects that may occur at lower levels of perchlorate exposure. EPA’s proposed maximum contaminant level goal does not account for the wide variety of health effects that low-level exposure to perchlorate may cause. While EPA acknowledges that perchlorate exposure may result in other serious health harms, EPA looked to only a single neurodevelopmental outcome—IQ loss—to derive its MCLG and relied on an opaque reanalysis of data from only a single paper, the Korevaar study. But SDWA requires EPA to set MCLG at the level at which *no* adverse health effects will occur. The Veles Group Report cites several studies linking perchlorate with numerous adverse health effects beyond neurodevelopmental outcomes, “including child growth, cardiovascular effects, diabetes, renal dysfunction in adolescents, and cancer.” *Id.* at 32. The EPA’s 2025 MCLG determination excluded these studies and does not account for the adverse health effects. Moreover, EPA’s focus on IQ “obscures other endpoints that are sensitive to thyroid disruption,” such as ADHD and autism. *Id.* at 29. EPA must establish that its MCLG will avoid *all* the adverse health effects of perchlorate, not just IQ loss. By relying exclusively on the Korevaar model, EPA arbitrarily fails to account for health effects other than IQ loss that may occur as a result of low levels of perchlorate exposure.

B. EPA deploys a flawed model and analysis that is not scientifically rigorous as compared to the robust, peer-reviewed analyses by New Jersey, California, and Massachusetts

The Safe Drinking Water Act requires that EPA use “the best available, peer-reviewed science and supporting studies conducted in accordance with sound and objective scientific practices” in every action under the Safe Drinking Water Act that “is based on science.” 42 U.S.C. § 300g-1(b)(3)(A)(i). As explained further in the attached Veles Group Report, comparing EPA’s analysis to those of New Jersey, Massachusetts, and California illuminates how EPA failed to meet this statutory requirement in several significant ways.

EPA based its MCLG solely on an altered model from a single paper—the 2016 Korevaar study. In doing so, the agency prioritized a less scientifically rigorous approach than other peer-

reviewed analyses that thoroughly examined the same evidence, and did not consider several important factors described below. EPA had access to peer-reviewed analyses and studies conducted and cited by New Jersey, Massachusetts, and California agencies that deploy a more rigorous methodology and constitute the best available peer-reviewed science. EPA's proposed MCLG runs counter to this evidence. EPA also did not adequately explain its choice of model or account for a significant disparity in results derived from the original model.

EPA's proposal fails to address key evidence and considerations available to state agencies. The New Jersey Department of Environmental Protection Scientific Advisory Board (NJDEP¹³), the California Office of Environmental Health Hazard Assessment (OEHHA), and Massachusetts Department of Environmental Protection (MADEP) conducted and published robust, peer-reviewed scientific analyses that set perchlorate health goals 10–100 times lower than EPA's proposed MCLG. As the Veles Group Report details, the New Jersey, California, and Massachusetts agencies based their limits on more scientifically defensible approaches. Unlike EPA's proposal, those analyses account for (1) susceptible populations and inter-individual variability; (2) evidence of adverse thyroid and neurodevelopmental effects at lower exposure levels; (3) cumulative and co-exposures; and (4) numerous sources of scientific uncertainty. Veles Group Report 7. The report explains how the EPA falls short in each of those categories:

- (1) OEHHA, NJDEP, and MADEP account for both vulnerable subpopulations and inter-individual variability in health effects associated with perchlorate exposure. *Id.* at 8-9. EPA does not, instead relying on a model that assumes an average physiological response. *Id.* at 8. Only the state agencies' method adequately accounts for individuals at sensitive life stages, including key subpopulations of pregnant women and infants. *Id.* at 8-9. EPA also ignores populations with specific genetic, dietary, and clinical vulnerabilities, such as an acute iodine deficiency that now affects a significant portion of pregnant women. *Id.* at 8.¹⁴ Moreover, EPA did not consider published, peer-reviewed scientific studies addressing risks for individuals with pre-existing conditions who are significantly more vulnerable than the EPA's modeled individual. *Id.* at 9-10.
- (2) OEHHA considered evidence that perchlorate exposure adversely affects levels of the thyroid hormones TSH and/or T4 in infants at exposure levels much lower than those deemed safe for healthy adults. *Id.* at 11-13. The studies noted adverse neurologic effects

¹³ New Jersey Department of Environmental Protection Science Advisory Board, Final Report: Review of Proposed EPA Maximum Contaminant Level for Perchlorate (August 2020), <https://dep.nj.gov/wp-content/uploads/sab/sab-perchlorate.pdf> (hereafter cited for shorthand as NJDEP).

¹⁴ As noted in the Veles Group Report, while EPA purports to consider iodine-deficient women in its model, a far higher percentage of pregnant women (46 percent) are now iodine deficient than a decade ago. Veles Group Report 8 (citing Lieberman et al. 2025). EPA only considered the 10th percentile of iodine deficiency based on old data. Thus, as explained in the Report, EPA failed to consider the best available published peer-reviewed data indicating that there is a highly at-risk subpopulation: pregnant women now at less than 10th percentile iodine consumption using current data and their fetuses. *Id.*

at small changes in thyroid hormones. *Id.* at 11; *see also id.* at 23 (describing the chain of causation by which perchlorate impacts thyroid hormones, which in turn leads to decreased neuronal network function and impaired learning and memory). EPA does not consider these studies.

- (3) OEHHA, but not EPA, accounted for data indicating that perchlorate can interact with other contaminants to produce a greater adverse effect on thyroid function than that caused by perchlorate alone. *Id.* at 13-15. NJDEP and OEHHA considered “additive and synergistic effects from co-exposure to other goitrogens (e.g., thiocyanate and nitrate),” and “emerging high-throughput evidence” identifying new sodium iodide (Na⁺/I⁻) symporter (NIS) inhibitors that may interact with perchlorate. *Id.* at 5, 13-15. EPA does not consider these interactions with other contaminants. Although EPA “acknowledged that co-exposure with other goitrogens are potential sources of uncertainty and confounding, they did not account for other exposures when deriving [uncertainty factors (UFs)] and only considered other exposures as potential confounders that might exacerbate the measured effect.” *Id.* at 13. EPA also failed to consider numerous studies identifying other chemicals that interact with NIS to disrupt thyroid function, which could “contribute to susceptibility of sensitive populations to perchlorate.” *See id.* at 14.
- (4) NJDEP, OEHHA and MADEP appropriately accounted for scientific uncertainty in deriving their MCLG values. NJDEP, OEHHA, and MADEP, but not the EPA, “derived UFs to adequately account for susceptible and vulnerable populations, variability within the target population, and deficiencies in the database informing perchlorate toxicity.” *Id.* at 16. Accordingly, NJDEP, OEHHA, and MADEP “applied a 10x Intraspecies UF to account for the inherent biological differences within the human population. This factor is specifically designed to protect sensitive life stages, including pregnancy, gestation, and the perinatal period and to account for uncertainty in interindividual differences in fetuses, infants and young children, people with thyroid diseases, and subjects exposed to high levels of other NIS inhibitors.” *Id.* at 8. Thus the 10x Intraspecies UF represents the most scientifically justified exposure values at which no known or anticipated adverse effects on the health of persons occur. By contrast, EPA’s UFs are far lower than scientifically justified. *Id.* at 16, 18. And thus, EPA’s MCLG also utterly fails to include “an adequate margin of safety” as mandated by the SDWA.

The Veles Group Report details how EPA made several scientific and logical errors in assigning UFs for human variability. *Id.* at 16-18. And EPA’s uncertainty factor fails to account for several variabilities, including:

- a. genetic variability in relevant genes, *id.* at 18-20;
- b. differences in vulnerability by race, ethnicity, diet (e.g., veganism), and sex, *id.* at 20-22;

- c. uncertainties in perchlorate toxicokinetics (TK) and toxicodynamics (TD) of the NIS transporter, *id.* at 22;
- d. uncertainty regarding perchlorate effects on the fetal thyroid, *id.* at 22-23; and
- e. uncertainty in the available database informing perchlorate's toxicity, *id.* at 23-25.

Similar to other published, peer-reviewed state analyses, the Massachusetts DEP used UFs to account for substantial scientific uncertainty. The MADEP used a UF of 100.¹⁵ This was based upon the standard full human variability factor (10x), its conclusion that the Greer study relied upon may not be a true No Observable Adverse Effect Level (NOAEL), but rather should be considered “a minimal Lowest Observed Adverse Effect Level” (3x), and MADEP's finding that there are significant database deficiencies including a lack of chronic data and emerging data indicating potentially widespread contamination of breast milk with perchlorate and uncertainties about how perchlorate may interfere with iodine transport into breast milk, and uncertainties about the interactive effects of perchlorate with other goitrogens such as nitrate (3x).

In short, EPA's selected uncertainty factors are “insufficient to ensure protection of the full range of human variability.” Veles Group Report 18. And thus, the MCLG fails to establish a “level at which no known or anticipated adverse effects on the health of persons occur and which allows an adequate margin of safety.” 42 U.S.C. §300g-1(b)(4)(A).

Unexplained shift in methodology. As the Veles Group Report explains, “the EPA's 2026 proposed MCLG of 20 ppb represents a significant departure from more protective state standards,” (e.g., Massachusetts safe level of 0.49 ppb and California PHG at 1 ppb), and from state MCLs (California at 6 ppb and Massachusetts at 2 ppb). *Id.* at 28. “This divergence is not due to new data, but rather a shift in methodology from a 10x UF approach to a 3x BBDR model.” *Id.* EPA previously established an Interim Drinking Water Health Advisory and Health Reference Level (HRL) for perchlorate of 15 ppb based on a clinical study from 2002 of perchlorate effects on healthy adults (“Greer et al. study”) and the application of a 10x uncertainty factor to accommodate more sensitive populations. *Id.* at 10. EPA does not explain why its prior calculations and uncertainty factor are no longer justified. Moreover, California and Massachusetts found that the Greer et al. study required lower limits for perchlorate to protect neonates and pregnant women. *Id.* at 9-10. “California and Massachusetts have set lower [enforceable] limits (1–6 ppb) with more robust UFs precisely to protect the most sensitive populations with an adequate margin of safety.” *Id.* at 27. EPA does not adequately justify its

¹⁵ Mass. DEP, Update to ‘Perchlorate Toxicological Profile and Health Assessment,’ (2006). <https://www.mass.gov/doc/perchlorate-toxicological-profile-health-assessment-june-2006/download>.

shift in methodology away from the 10x uncertainty factor approach that mandates more protective standards.

Transparency gaps in EPA’s model. EPA must use “the best available, peer-reviewed science and supporting studies conducted in accordance with sound and objective scientific practices,” 42 U.S.C. § 300g-1(b)(3)(A)(i). But EPA’s final model has not been peer-reviewed. EPA altered the original Korevaar et al. (2016) dose-response model. In doing so, it “introduces additional uncertainty and bias that was not transparently justified, further undermining confidence in the resulting reference dose and MCLG.” *Id.* at 5. By comparison, NJDEP used the *original* Korevaar model and recommended a perchlorate drinking water goal of only 0.2 to 2.0 ppb. *Id.* at 6-7 (chart). EPA does not adequately explain how or why it altered the Korevaar dose-response model nor account for the disparity when using the original model. *See id.* at 39-41. The disparity between results from the original Korevaar et al. equation and the EPA’s altered model requires justification. *Id.* at 38. Moreover, NJDEP identified several issues with EPA’s revised model in 2017 that EPA did not address in its 2025 MCLG derivation, as summarized in the Veles Group Report. *Id.* at 40-41. The report also describes several additional transparency gaps and potential limitations of EPA’s model. *Id.* at 32-39, 41. It cautions, for example, that EPA’s approach may have yielded an inappropriately low reference dose (RfD). *Id.* at 41. The report concludes that “EPA’s failure to justify changes introduced into the Korevaar equations, along with other missing information, raises the question as to whether EPA’s model is sufficiently transparent and reliable to derive a MCLG for perchlorate.” *Id.* at 39. Without such justification, EPA cannot be said to have met its statutory requirement to use “the best available, peer-reviewed science.”

In sum, EPA’s scientific approach does not pass muster compared to that of state agencies, and does not constitute best available, peer-reviewed science.

IV. A lower MCL is feasible

EPA contends that because it has determined the health benefits of its proposed MCLs do not justify the cost, it may set an MCL at the level where the cost is justified by the benefits. 91 Fed. Reg. at 401 (citing 42 U.S.C. § 300g-1(b)(6)). EPA is incorrect that the health benefits here do not justify the costs. Because EPA failed to consider an appropriate MCLG, *see supra* Section III, it arbitrarily failed to consider any MCL below 20 ppb. But a lower MCL would result in substantially higher health benefits. And even as to the MCLs it has considered, EPA’s cost-benefit analysis is flawed: it disregarded known health harms from perchlorate and certain benefits of controlling perchlorate in tap water; wrongly concluded that those harms do not occur at low levels of exposure; and overestimated the cost of monitoring. *See infra* Section VII.

EPA thus must set the MCL as close to a scientifically sound and protective MCLG as feasible. 42 U.S.C. § 300g-1(b)(4)(B). Feasible, in this context, means “technically possible and affordable,” *City of Portland v. EPA*, 507 F.3d 706, 712 (D.C. Cir. 2007), by large metropolitan or regional public water systems. 91 Fed. Reg. at 406 (citing H.R. Rep. No. 93-1185, at 6454,

6471(1974)). As explained further below in the attached technical report from Elin Betanzo of Safe Water Engineering (“Betanzo report”), an MCL of 2 ppb is feasible.

California and Massachusetts—the only two states to set an enforceable limit on perchlorate—have set limits considerably below EPA’s MCL: 6 ppb and 2 ppb, respectively. And both these states have achieved widespread compliance with their MCLs. Massachusetts reported only seven water systems with perchlorate levels above 2 ppb in 2024 and 2025 combined. Of those, only two systems detected perchlorate above 3 ppb, and the highest detected level statewide was 3.6 ppb.¹⁶ California reported just two MCL violations in 2018 and 2019; two in 2022; one in 2023, and zero in 2024.¹⁷ This is ample evidence that an MCL of 2 ppb is feasible.

As EPA acknowledges, multiple “cost-affordable” perchlorate treatment options—ion exchange, biological treatment, and reverse osmosis—are available to water systems.¹⁸ These same treatment options can also achieve an MCL of 2 ppb. Ion exchange, for example, can reduce perchlorate to <4 ug/L and lower, and multiple studies cited by EPA demonstrate reductions to 2 ug/L perchlorate.¹⁹ Indeed, EPA acknowledged this in 2019, concluding that, with ion exchange, “levels below 1 to 2 µg/L are achievable.”²⁰ Biological treatment, too, consistently achieves perchlorate removal to levels typically below EPA’s previous detection limit of 4 ug/L or lower.²¹ Nontreatment options to meet an MCL of 2 ppb also exist, including source water blending, well rehabilitation, contaminant source elimination, new well construction, and interconnection with another water system to purchase water.²² And treatment to achieve an MCL of 2 ppb would not cost substantially more than treatment to achieve an MCL of 20 ppb. For example, EPA’s cost analysis assumes large systems will use ion exchange, which “can achieve very high perchlorate removal efficiencies (e.g., 95 percent or greater).”²³ Because this same technology could achieve an MCL of 2 ppb, the capital costs for water systems to achieve and MCL of 20 or 2 ppb would remain the same.

Even the American Water Works Association (AWWA) has opined that a perchlorate standard is readily achievable. As a detailed AWWA study of the costs of a perchlorate rule published in 2013 concluded, “National compliance costs for a perchlorate MCL ranging from 2 to 24 [ppb] is smaller than estimated compliance costs for other drinking water regulations — e.g., \$120 million per year for a 4 [ppb] perchlorate MCL compared to \$320 million per year (2013 dollars) for the Arsenic Rule at 10 [ppb].”²⁴

¹⁶ See Massachusetts Executive Office of Energy and Environmental Affairs, Drinking Water Data Portal, <https://eeaonline.eea.state.ma.us/Portal/#!/search/drinking-water> (search criteria: perchlorate, collected between January 1, 2024 and December 31, 2025), last accessed March 6, 2026.

¹⁷ Betanzo Report 5 (citing California State Water Resources Control Board data from 2018-2024).

¹⁸ 91 Fed. Reg. at 41; *see also generally* EPA, Technologies and Costs for Treating Perchlorate-Contaminated Waters for the Perchlorate National Primary Drinking Water Regulation (2025), EPA-HQ-OW-2024-0592-0740, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0740> (“2025 Technologies and Costs Report”)

¹⁹ Betanzo Report 1-2; 2025 Technologies and Costs Report Ex. 2-5.

²⁰ EPA, Best Available Technologies and Small System Compliance Technologies for Perchlorate in Drinking Water (2019), EPA-HQ-OW-2018-0780-0111, <https://www.regulations.gov/document/EPA-HQ-OW-2018-0780-0111>

²¹ Betanzo Report 2-3; 2025 Technologies and Costs Report Ex. 3-5.

²² Betanzo report at 4; *see also* 2025 Technologies and Costs Report at 53.

²³ 2025 Technologies and Costs Report at 60.

²⁴ AWWA, National Perchlorate Cost Update, W TAF #316, October 2013.

A minimum reporting level of 1 ppb—as opposed to 4 ppb—is also feasible. As EPA acknowledges, “more recently approved analytical methods for perchlorate have lower MRLs.” 91 Fed. Reg. 413. Indeed, five of the six labs consulted by EPA reported a minimum reporting level of 1 ppb.²⁵ And both Massachusetts²⁶ and California²⁷ use a minimum reporting level of 1 ppb.

Water systems thus have a variety of feasible options to meet an MCL of 2 ppb. EPA should set an MCL of 2 ppb. If it declines to do so, it should, at a minimum explain in its final rule why that MCL is not feasible, especially considering it can be achieved with the same technologies EPA already identified as cost-affordable.

If EPA finalizes any of its proposed MCLs—which it should not—it should finalize an MCL of no higher than 20 ppb. As EPA appropriately concludes in the proposal, an MCL of 20 ppb is feasible, albeit not as close as is feasible to a scientifically sound, much lower MCLG.

V. EPA’s occurrence analysis is flawed and does not accurately reflect nationwide perchlorate occurrence

A. EPA’s continued reliance on outdated UCMR 1, plus data from Massachusetts and California, skews its dataset

EPA’s occurrence dataset does not provide a nationally representative figure of current perchlorate contamination in drinking water. Between 2001 and 2005, EPA required all large community water systems nationwide, as well as a statistically representative selection of small community water systems, to test for perchlorate and report detections at or above 4 ppb. 84 Fed. Reg. 30,524, 30,541 (2019).²⁸ This program is referred to as the Unregulated Contaminant Monitoring Rule 1 (UCMR 1). It ultimately included monitoring results from 3,073 large systems and 797 small systems.²⁹ This no longer reflects the distribution of public water systems in the United States: there are now 4,559 large systems—an 48% increase from UCMR—and 61,721 small systems.³⁰ EPA’s reliance on outdated occurrence data has similarly been criticized in the past as lacking “transparency, clarity, and consistency.”³¹ EPA has not explained why the

²⁵ The Cadmus Group, Perchlorate Laboratory Cost Estimates 2025, EPA-HQ-OW-2024-0592-0730, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0730>

²⁶ 2025 Occurrence Report at 51.

²⁷ California lowered the detection limit for perchlorate to 2 ug/L in 2021 and further to 1 ug/L in 2024. California State Water Resources Control Board, Perchlorate in Drinking Water, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Perchlorate.html (last accessed March 4, 2026).

²⁸ *See also* 2025 Occurrence Report at 33-34.

²⁹ *Id.*

³⁰ EPA, (2025) Economic Analysis for the Proposed EPA National Primary Drinking Water Regulation, at 3-23, EPA-HQ-OW-2024-0592-0752, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0752> (“EPA 2025 Economic Analysis”).

³¹ GAO, SDWA: Improvements in Implementation Are Needed to Better Assure the Public of Safe Drinking Water, Statement of David C. Trimble, (July 12, 2011).

UCMR 1 sampling, designed and executed back in early 2000's, continues to be a nationally representative sample.

Regardless of whether UCMR 1 remains a nationally representative dataset, EPA's reliance on more recent occurrence data exclusively from California and Massachusetts—the only two states that have adopted enforceable perchlorate limits—introduces a systematic bias toward lower perchlorate concentrations. The revised UCMR 1 dataset contains 196,376 perchlorate samples, comprising 34,192 samples (17.4%) from the original UCMR 1, *plus* 155,735 post-UCMR1 samples from California (79.3%), and 6,449 post UCMR-1 samples from Massachusetts (3.2%).³² In total, 82.5% of the dataset now comes from California and Massachusetts.

This heavy concentration of samples from just two states raises several concerns. Most significantly, it overrepresents data from jurisdictions with existing regulatory limits, thereby biasing analytic results toward conditions shaped by regulation—an issue that EPA's Bayesian model does not adequately address, as discussed further below. *See infra* Section V.F. Although EPA is no longer proposing to replace UCMR 1 data with newer state data as it did in 2019, its present approach produces a similar, if not more significant, effect. EPA's decision to add new data from states that regulate perchlorate, but not any data from states that do *not* regulate perchlorate, resulted in a dataset that overwhelmingly consists of samples from systems subject to legal limits on perchlorate, and thus were much more likely to have detected and treated for perchlorate contamination than other systems. *Accord NRDC*, 67 F.4th at 412 (Pan, J., concurring) (EPA's failure to consider that “clean water could . . . become contaminated” was arbitrary).

Moreover, even for California and Massachusetts, EPA includes only data from water systems originally participating in UCMR 1, meaning the updated dataset is not representative of those states.³³ The sheer volume of post-regulation samples—over 80% of the updated dataset—effectively overwhelms the original UCMR 1 data from California and Massachusetts. This problem is compounded by EPA's decision to pool pre- and post-regulation samples from these states in its model. *See infra* Section V.F.

B. EPA should include other available information in its occurrence analysis.

EPA should have incorporated additional state monitoring data into its modeling but arbitrarily chose not to do so. Although several states have conducted perchlorate monitoring since UCMR 1, EPA relies solely on data from the two states with enforceable perchlorate standards.³⁴ EPA has not explained why it is unable to include data from states that conducted

³² 2025 Occurrence Report at 39-40

³³ 2025 Occurrence Report at 38.

³⁴ *Id.* at 28.

monitoring targeted at suspected perchlorate sources yet is able to include data from states with enforceable limits. If, as EPA suggests, the characteristics of the California and Massachusetts datasets can be accounted for within its proposed Bayesian model for estimating national perchlorate occurrence, the same should be true for data collected by other states and entities.

The data EPA did not include shows widespread perchlorate contamination in drinking water. Many examples of these data are summarized in an appendix to EPA's Perchlorate Occurrence and Monitoring technical support document but inexplicably are not integrated into EPA's model and analysis. Examples of additional data showing widespread perchlorate occurrence and buried in EPA's technical appendix are legion. Data collected in 2017 from the USGS's National Water Information System detected perchlorate in more than 72% of drinking water samples, with a median detection level of 16 ppb. Nearly 55% of groundwater samples and over 93% of surface water samples detected perchlorate.³⁵ More recent USGS data reflected perchlorate in 94.4% of surface water samples.³⁶ Separate data collected in 2018 from EPA's STORET data warehouse reveal perchlorate contamination in 88% of water samples.³⁷ According to the EPA appendix, between 2021 and 2023, Environmental Working Group's (EWG) National Drinking Water Database detected perchlorate in 508 public water systems serving more than 17 million people in 5 states and the District of Columbia.³⁸ A 2005-2006 survey collected by the Centers for Disease Control and Prevention's (CDC's) National Center for Health Statistics detected perchlorate in 83% of tap water samples.³⁹ Numerous other sources of data reflect widespread perchlorate contamination at harmful levels.⁴⁰ EPA's decision not to

³⁵ EPA, (2019) Perchlorate Occurrence and Monitoring Report, at A-4, A-5 EPA-HQ-OW-2024-0592-0570, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0570> ("2019 Occurrence Report").

³⁶ *Id.* at A-3

³⁷ *Id.* at A-6. (EPA now reports that this data revealed perchlorate contamination in 75% of sites, but does not explain why it reaches a different conclusion, based on the same data, than it did in 2019.)

³⁸ 2025 Occurrence Report at A-6.

³⁹ *Id.* at 27.

⁴⁰ See Brandhuber et al., A review of Perchlorate Occurrence in Public drinking water systems, AWWA (2009) (This review analyzed and mapped the national occurrence of perchlorate in drinking water by compiling data from existing perchlorate occurrence surveys. The existing surveys included studies conducted by utilities for UCMR 1 and by the states of Arizona, California, Massachusetts, and Texas.); W. Andrew Jackson et al., Distribution and Potential Sources of Perchlorate in the High Plains Region of Texas (Final Report), (Texas Tech Univ. Water Res. Ctr., Aug. 31, 2004), at ii ("Among the 560 PWS wells sampled in the 54 Texas counties, 256 (46%) contained perchlorate (>0.5 ppb), of which 102 (18%) contained perchlorate equal to or greater than 4 ppb."); Brandhuber et al., Perchlorate Occurrence Mapping, AWWA, (Jan. 2005); Association of State and Territorial Solid Waste Management Officials, Perchlorate Policy Update: Final (Federal Facilities Research Center, April 2011) ("As of October 2009, perchlorate has been detected at private and federal facilities in 45 states, three territories, and the District of Columbia."); GAO, Perchlorate: A system to Track Sampling and Cleanup Results is Needed, GAO-05-462 (May 2005) ("Perchlorate contamination has been found in water and soil at almost 400 sites in the United States where concentration levels ranged from a minimum reporting level of 4 parts per billion to millions of parts per billion."); Jennifer Sass, *Science Experts Tell EPA to Regulate Toxic Perchlorate*, Water Online (April 10, 2018), <https://www.wateronline.com/doc/science-experts-tell-epa-to-regulate-toxic-perchlorate-0001>; EPA, Perchlorate: Environmental Occurrence, CLU-IN, (last updated on November 19, 2015); DENIX, Perchlorate Summaries, <https://www.denix.osd.mil/perchloratesummaries/>, <https://web.archive.org/web/20120916022559/https://www.denix.osd.mil/perchloratesummaries/>, (last visited Mar. 3, 2026).

include data in its modeling and analysis that reports a contrary finding of the pervasiveness of perchlorate contamination raises serious concerns. *See Sorenson Commc'ns Inc. v. FCC*, 755 F.3d 702, 709-10 (D.C. Cir. 2014) (Where “contrary evidence” in the record raises questions about the appropriateness of an agency’s conclusion, it is arbitrary to leave such “serious concerns unaddressed.”)

C. EPA has failed to consider that conditions have changed since the UCMR 1 data was collected from 2001 to 2005 and that perchlorate contamination may have increased in many locations

EPA concluded in 2020 that perchlorate contamination nationwide had decreased.⁴¹ But this report relied primarily upon evidence from the two states that regulate perchlorate and from water systems that previously detected high levels of perchlorate. That water systems aware of high perchlorate levels reduced those levels says nothing about the presence of perchlorate in water systems that previously detected lower levels or never sampled for perchlorate at all. EPA also failed to consider that, since UCMR-1 data was collected a quarter of a century ago, there has been growth in private space industry, largely outside Massachusetts and California, as well as a documented huge increase in fireworks use. And EPA has apparently done little to nothing to determine whether contamination has spread or monitoring has been done around the scores of known perchlorate-contaminated Department of Defense, NASA, and Superfund sites. Perchlorate contamination has likely increased as a result of these ongoing events. Nor has EPA considered that there has been a massive increase in hypochlorite use, with the majority of water systems now having switched in the 15 years to this disinfectant that can cause significant perchlorate contamination when improperly stored or handled. EPA’s failure to consider these sources of increased contamination is arbitrary.

EPA has failed to consider the impacts of a 100% increase in fireworks use. EPA is aware of ammonium perchlorate’s use in the fireworks industry⁴² but failed to consider post-UCMR 1 monitoring data from states other than California and Massachusetts. Yet the fireworks industry has changed significantly in the last two decades. According to the American Pyrotechnics Association, the total fireworks consumption figure was 161.6 million lbs. in 2001 and was 322.7 million lbs. in 2024.⁴³ This means that fireworks consumption has increased by nearly 100%. Also, the consumer fireworks industry has seen its annual revenue grow from \$407 million in 2000 to 2.3 billion in 2022.⁴⁴ That is a 465% increase in annual revenue growth.

⁴¹ See EPA, (2020) Reductions of Perchlorate in Drinking Water, EPA-HQ-OW-2024-0592-0243, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0243>.

⁴² 91 Fed. Reg. at 399; See also 2025 Occurrence Report at 22, 27

⁴³ Am. Pyrotechnics Ass’n, *U.S. Fireworks Consumption Figures 2000-2024*, <https://www.americanpyro.com/assets/docs/FactsandFigures/2025/APA%20Facts%20and%20FiguresConsumption2024.pdf> (last visited Mar. 5, 2026).

⁴⁴ Greg Rosalsky, Darian Woods & Julia Ritchey, *The Explosive Growth of the Fireworks Market*, NPR (July 4, 2023, at 6:30 ET), <https://www.npr.org/sections/money/2023/07/04/1184798951/the-explosive-growth-of-the->

Display fireworks accounted for an additional \$400 million in revenue. Contamination may have increased particularly in the 19 states that have relaxed their fireworks laws since 2000.⁴⁵ By comparison to these 19 states, California has relatively strict fireworks laws,⁴⁶ and Massachusetts is the only state that maintains a total prohibition on all consumer fireworks.⁴⁷

This increased fireworks usage has likely led to increased perchlorate contamination in drinking water. For example, a 2021 case study shows that fireworks in one city resulted in “annual leaching of about 4 kg of perchlorate to groundwater each year or about 2% of the initial perchlorate mass which contaminated the City’s water supply wells.”⁴⁸ Perchlorate contamination was found in six out of the city’s ten wells with concentrations ranging from 2.8 to 36 µg/L.⁴⁹ Using this example, it is estimated that “approximately 0.9 million kilograms of residual perchlorate is environmentally dispersed and available to potentially leach to groundwater each year from fireworks.”⁵⁰

In the past, EPA has acknowledged that it needs to allocate resources to studying firework’s impact on perchlorate contamination. In 2022, EPA announced a funding opportunity for a study to fill the gaps in understanding the magnitude and extent of perchlorate contamination when fireworks discharge around water sources.⁵¹ A group of researchers began conducting the study in 2023, but, in 2025, EPA abruptly terminated the study’s funding without providing any advanced notice to the researchers.⁵² Due to the sudden grant cancellation the

fireworks-market; *see also* Am. Pyrotechnics Ass’n, *U.S. Fireworks Industry Revenue Figures Breakdown by Industry Segment 2000 – 2022*,

<https://www.americanpyro.com/assets/docs/FactsandFigures/2023/Fireworks%20Revenue%20by%20Industry%20Segment%202000-22.pdf> (last visited Mar. 5, 2023)

⁴⁵ Greg Rosalsky, Darian Woods & Julia Ritchey, *The Explosive Growth of the Fireworks Market*, NPR (July 4, 2023, at 6:30 ET), <https://www.npr.org/sections/money/2023/07/04/1184798951/the-explosive-growth-of-the-fireworks-market>,

see also Am. Pyrotechnics Ass’n, *Fireworks-Related Injury Rates Continue to Decline as States Liberalize Laws*, <https://www.americanpyro.com/assets/docs/FactsandFigures/2023/ConsumpVinjuriesLiberalizationgraph5.8.23.pdf> (last visited Mar. 5, 2026).

⁴⁶ NBC LA, *Are fireworks legal in my state? See how laws differ across the U.S.*, (July 1, 2025, 7:36 AM) <https://www.nbclosangeles.com/news/national-international/fireworks-state-rules-regulations-fourth-of-july/3735890/>.

⁴⁷ Am. Pyrotechnics Ass’n, *Fireworks-Related Injury Rates Continue to Decline as States Liberalize Laws*, <https://www.americanpyro.com/assets/docs/FactsandFigures/2023/ConsumpVinjuriesLiberalizationgraph5.8.23.pdf> (last visited Mar. 5, 2026).

⁴⁸ Andrews et al., *Rapid Cleanup of a Perchlorate Plume from Fireworks*, at 619 (2021), EPA-HQ-OW-2024-0592-0562, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0562>.

⁴⁹ *Id.* at 615.

⁵⁰ *Id.* at 619.

⁵¹ EPA, Office of Science Advisor, Science to Achieve Results Program, *Assessing Perchlorate Occurrence in Ambient Waters Following the Usage of Fireworks*, Funding Opportunity Number EPA-G2022-STAR-II (July 29, 2022).

⁵² EPA, *Quantification and Modeling of Perchlorate Impacts from Fireworks on Drinking Water Sources*, Abstract, <https://perma.cc/6GBW-GBJK>; (“Texas Tech Fireworks Study Abstract”); *see also* EPA, Final Report: *Quantification and Modeling of Perchlorate Impacts from Fireworks on Drinking Water Sources*, EPA Grant No. R840554, (May 2, 2025) <https://perma.cc/MS3E-5XN3> (“Texas Tech Fireworks Study Final Report”); EPA, 2023

study’s findings were ultimately inconclusive, however, the data collected “strongly suggested that fireworks do impact drinking water sources across the US and that their use leads to elevated surface and groundwater concentrations as well as increased deposition.”⁵³ EPA’s grant cancellation is particularly egregious because the study would have created a tool for public water systems to estimate the risk of perchlorate contamination based on specific fireworks events.⁵⁴ Additionally, this research would have: “resulted in a robust data set and expanded models that would have directly addressed [perchlorate] concentrations in drinking water supplies due to fireworks usage;” “allowed direct assessment of the impact of fireworks on drinking water sources;” and “produced a predictive screening model to evaluate impact based on site specific hydraulic, hydrologic, and ecological conditions as well as fireworks use.”⁵⁵ Unfortunately, EPA cut this valuable research short and fails adequately address this issue in its proposed rule.

EPA has failed to evaluate the impact of the growth in the space industry. Another primary user of perchlorate, the space industry, has significantly increased in the last 20 years and is expected to surpass \$1 Trillion by 2030.⁵⁶ In 2005, the global space economy was about \$186 billion,⁵⁷ by 2024 the global space economy had reached \$613 billion.⁵⁸ This is roughly a 229% increase in the total industry value. In the early 2000’s, the U.S. only had about 3 licensed commercial spaceports.⁵⁹ As of 2025, the FAA lists 14 licensed commercial spaceports.⁶⁰

Solid rocket fuel used by NASA, DoD and some private entities is made primarily with perchlorate. Historically, according to NASA, space programs used perchlorate in large rocket motor propellants (such as the Space Shuttle), and current use includes propellants in smaller solid motors used in applications unsuitable for liquid propellants; in small explosives used

Progress Report: Quantification and Modeling of Perchlorate Impacts from Fireworks on Drinking Water Sources, EPA Grant No. R840554, (last updated Apr. 28, 2023) <https://perma.cc/JP7B-KC8C> (“Texas Tech Fireworks Study 2023 Progress Report”).

⁵³ Texas Tech Fireworks Study Final Report

⁵⁴ *Id.*

⁵⁵ *Id.*

⁵⁶ Bao Tran, *The Growth of Private Space Companies: Investment & Funding Trends (2020-2030)*, PatentPC (Feb. 8, 2026) <https://patentpc.com/blog/the-growth-of-private-space-companies-investment-funding-trends-2020-2030>

⁵⁷ Space Foundation, *Space Foundation Report Pegs 2006 Global Space Economy at \$220 Billion and Growing* (Oct. 10, 2007) <https://www.spacefoundation.org/2007/10/10/space-foundation-report-pegs-2006-global-space-economy-at-220-billion-and-growing/>.

⁵⁸ Space Foundation, *The Space Report 2025 Q2 Highlights Record \$613 Billion Global Space Economy for 2024, Driven by Strong Commercial Sector Growth* (July 22, 2025) <https://www.spacefoundation.org/2025/07/22/the-space-report-2025-q2/>

⁵⁹ New Space Economy, *FAA Licensed Spaceports*, https://newspaceeconomy.ca/2025/08/13/faa-licensed-spaceports/#google_vignette (last visited Mar. 5, 2026); see also FAA, *Frequently Asked Questions (FAQs)*, https://www.faa.gov/space/additional_information/faq#sites1 (last updated May 2, 2025).

⁶⁰ FAA, *Spaceports by State*, https://www.faa.gov/space/spaceports_by_state#:~:text=Spaceports%20by%20State%20Site%20Navigation%20State%20License,Port%20FAA%20Orbital%20Reentry%20ALASKA%20Pacific%20Space (last updated Dec. 10, 2025)

during launch; and in oxygen candles used in emergencies on the International Space Station.⁶¹ While reportedly many private space launches use liquid propellant rather than solid perchlorate-based fuels, perchlorate continues to be used heavily by the Department of Defense. The increase in commercial spaceports and ongoing DoD use of perchlorate further establishes the need for EPA to complete an updated assessment of perchlorate contamination from the aerospace industry.

D. EPA failed to consider perchlorate contamination from DoD and NASA sites.

EPA's failure to assess current contamination at DoD and NASA facilities constitutes what appears to be willful, arbitrary and capricious ignorance. EPA is well aware that the defense and space industry are the primary sources of perchlorate contamination in groundwater.⁶² EPA also is aware that perchlorate is "widely used" by the DoD and NASA and that significant contamination has been found at hundreds of federal sites in the past.⁶³ Indeed, according to the Interstate Technology and Regulatory Council (ITRC), perchlorate is used in "[s]olid rocket products... [including] jet-assisted take-off motors; tactical rockets such as Falcon, Hawk, Harpoon, Sidewinder, Maverick, Bullpup, Genie, Sparrow, AMRAAM, Tartar, and Navy Standard Missile; ballistic missiles Minuteman I, II, and III, Polaris, Midgetman, Peacekeeper, and space boosters; and sounding rockets."⁶⁴ DOD's use of perchlorate in weapon systems from 2003-2008 years was 6–8 million pounds per year.⁶⁵ While DoD has claimed that much of this is recycled, there is no indication in the record that EPA has sought to verify this, nor to follow up on the likely ongoing spread of contamination of hundreds of documented DoD and other federal perchlorate-contaminated sites.

⁶¹ NASA, Perchlorate Past & Present: 2020 Update.

<https://jplwater.nasa.gov/Docs/JPL%20PERCHLORATE%20PAST%20&%20PRESENT%20update%20-%20final%20draft.7.8.20.pdf>

⁶² DOD, *Demonstration of a Full-Scale Fluidized Bed Bioreactor for the Treatment of Perchlorate at Low Concentrations in Groundwater* (Environmental Security Technology Certification Program (ESTCP) Final Report (ER-0543), at xi, (2009) EPA-HQ-OW-2018-0780-0084, <https://www.regulations.gov/document/EPA-HQ-OW-2018-0780-0084>

⁶³ Trumpolt et al., *Perchlorate: Sources, Uses, and Occurrences in the Environment*, at 6, (2005), EPA-HQ-OW-2024-0592-0645, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0645>; see also 2025 Occurrence Report at 26-27, 28; EPA, *Known Perchlorate Releases in the U.S.*, FFRRO (March 25, 2005), https://www.fredsakademiet.dk/ordbog/pord/pdf/Known_Perchlorate_Releases_in_the_U.S..pdf; Sass, J. (2004), *U.S. Department of Defense and White House Working Together to Avoid Cleanup and Liability for Perchlorate Pollution*. International Journal of Occupational and Environmental Health, 10(3), 330–334. <https://doi.org/10.1179/oeh.2004.10.3.330>; GAO, *Perchlorate Occurrence Is Widespread but at Varying Levels; Federal Agencies Have Taken Some Actions to Respond to and Lessen Releases*, (2010), EPA-HQ-OW-2024-0592-0679, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0679>

⁶⁴ Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Perchlorates*, at 157-58 (2008). EPA-HQ-OW-2024-0592-0031

⁶⁵ *Id.*

EPA produced a report in 2005 that assessed perchlorate contamination at over 100 DoD, Department of Energy (DOE), NASA and other sites.⁶⁶ That study noted scores of DoD perchlorate contamination sites in at least 25 states, with sometimes shockingly high contamination levels of water in excess of 200,000 ppb. In addition, the study found dozens of other DOE, NASA, and private sites, many of which also had extraordinarily high perchlorate water contamination. In 2020, NRDC submitted a Freedom of Information Act (FOIA) for updated information about perchlorate contamination at DoD sites, yet the agency produced nothing responsive. Nor does the administrative record reflect any recent attempt by EPA to update this information.

The most recent report on perchlorate occurrence data at DoD and NASA sites in the record was compiled by the Government Accountability Office (GAO) in 2010.⁶⁷ GAO's analysis of DOD data showed that perchlorate was detected at almost 70 percent of the 407 installations sampled from fiscal years 1997 through 2009, with detections ranging from less than 1 part per billion to 2.6 million parts per billion.⁶⁸ NASA found perchlorate at 4 of the 7 facilities tested.⁶⁹

Recent databases also report active perchlorate contamination. For example, the Superfund database currently lists perchlorate as an active contaminant at 29 sites, 12 of which are maintained by NASA, DoD and the Department of Energy.⁷⁰

There is every reason to believe that many of these DoD, NASA, DOE, Superfund and private sites are significant contributors of perchlorate in drinking water. It is arbitrary for EPA to ignore these sources of contamination. The agency has had more than 20 years to collect and analyze information about these sites across the country since UCMR1 monitoring was completed. The record does not reflect any significant effort by the agency to collect and analyze such information. The agency could and should have collected data on perchlorate contamination from its sister federal agencies. At a minimum, EPA could and should have conducted additional monitoring from in and around known or suspected past perchlorate contamination sites listed in the record, by GAO, or otherwise known to the agency.

⁶⁶ EPA, Known Perchlorate Releases in the U.S., March 25, 2005; *see also* EPA, Occurrence and Potential Sources of Perchlorate Releases to the Environment as of April, 2003

⁶⁷ GAO, Perchlorate Occurrence Is Widespread but at Varying Levels; Federal Agencies Have Taken Some Actions to Respond to and Lessen Releases, (2010), EPA-HQ-OW-2024-0592-0679, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0679>

⁶⁸ *Id.*

⁶⁹ *Id.*

⁷⁰ EPA, Superfund Site Search Results, <https://cumulis.epa.gov/supercpad/CurSites/srchrslt.cfm?start=1> (last visited Mar. 5, 2026) (Search Criteria: Active, Contaminant Name: *PERCHLORIC ACID (7601-90-3) [SYNONYMS : PERCHLORIC ACID] (OR) PERCHLORATE (14797-73-0) [SYNONYMS : PERCHLORATE] (OR) AMMONIUM PERCHLORATE (7790-98-9) [SYNONYMS : AMMONIUM PERCHLORATE]*).

We are well aware of the significant political pressure that has been exerted for many years upon EPA by the Department of Defense, its contractors and allies, and often the White House not to set a perchlorate drinking water standard.⁷¹ This is due to their concerns about the impact of such a standard on their cleanup responsibilities and costs. However, the agency's willful blindness to the ongoing and likely spreading impacts of these sites, well documented in the record and from past EPA, GAO, DoD and other studies, highlights how arbitrary and capricious EPA's evaluation of perchlorate occurrence has been.

E. EPA failed to consider the huge increase in use of hypochlorite since UCMR1, which may be responsible for significant perchlorate contamination, and failed to consider that many water UCMR 1 systems tested source water *prior* to hypochlorite disinfection, so they may have missed perchlorate contamination from this source.

EPA acknowledges, "perchlorate concentrations increase over time as perchlorate degrades."⁷² There has been a major switch in the water utility industry from chlorine gas to hypochlorite since UCMR 1 data were collected. A 2021 survey by AWWA found,

⁷¹ See, for example, Jennifer Sass, Science Experts Tell EPA to Regulate Toxic Perchlorate, Water Online (April 10, 2018), <https://www.wateronline.com/doc/science-experts-tell-epa-to-regulate-toxic-perchlorate-0001>; NRDC, White House, Pentagon, Industry Secretly Colluded to Skew National Academy of Sciences Perchlorate Report, Documents Show (2005), <https://www.nrdc.org/press-releases/white-house-pentagon-industry-secretly-colluded-skew-national-academy-sciences>; Erik D. Olson & Dr. Jennifer Sass, White House and Pentagon Bias National Academy Perchlorate Report (2005), <https://www.nrdc.org/resources/white-house-and-pentagon-bias-national-academy-perchlorate-report>; Public Employees for Environmental Responsibility, PERCHLORATE CONTAMINATION WORSENS ON CAPE COD (May 19, 2003), <https://peer.org/perchlorate-contamination-worsens-on-cape-cod/>; Juliet Eilprin, EPA Unlikely to Limit Perchlorate in Tap Water, Washington Post (September 21, 2008), <https://www.washingtonpost.com/archive/national/2008/09/22/epa-unlikely-to-limit-perchlorate-in-tap-water/b91638e5-da27-431d-a68b-b87e1db67b4a/>; Juliet Eilprin, EPA Makes No Rule On Chemical in Water, Washington Post, (Oct. 3, 2008), <https://www.washingtonpost.com/archive/national/2008/10/04/epa-makes-no-rule-on-chemical-in-water/3fe15fac-dda3-45d9-8fd6-475e0565327d/?>; Lisa Friedman, E.P.A. Opts Against Limits on Water Contaminant Tied to Fetal Damage, New York Times (May 14, 2020), <https://www.nytimes.com/2020/05/14/climate/trump-drinking-water-perchlorate.html>; James Goodwin, Pentagon Continues to Press Its Case for Behind-the-Scenes Interference at OMB, Center for Progressive Reform (July 1, 2009), <https://progressivereform.org/cpr-blog/pentagon-continues-to-press-its-case-for-behind-the-scenes-interference-at-omb/>; Enid Sisskin PhD, Pentagon relies on antiquated, dangerous methods for hazardous waste disposal, Gulf Coast Environmental Defense, https://downloads.regulations.gov/EPA-HQ-OA-2022-0050-0021/attachment_2.pdf; Peter Waldman, Bush Seeks Liability Shield On Perchlorate Pollution: Administration Looks to Protect Military, Contractors From Environmental Laws, The Wall Street Journal (March 14, 2003); U.S. Senate Committee on Environment and Public Works, Hearing: Perchlorate and TCE in Water, S. Hrg. 110-1255, 110th Cong., 2d Sess., May 6, 2008, <https://www.congress.gov/event/110th-congress/senate-event/LC28763/text>; Annie Snider, What broke the Safe Drinking Water Act? There's perchlorate in this reservoir. Here's why Washington isn't doing anything about it. May 10, 2017, <https://www.politico.com/agenda/story/2017/05/10/safe-drinking-water-perchlorate-000434/>.

⁷² 2025 Occurrence Report at 22; see also 91 Fed. Reg. at 404. EPA has been aware of this source of perchlorate contamination for years. See, e.g., Letter from Tom Neltner, Senior Attorney, Env't Def. Fund and Maricel Maffini, Ph.D., Senior Scientist, NRDC, to Lance Wormell, Office of Pesticide Programs, U.S. EPA (July 31, 2014); Letter from Steve Knizer, Office of Pesticide Programs, EPA, to Tom Neltner, EDF, and Maricel Maffini, NRDC (Jan. 18,

Chlorine is still by far the most commonly used disinfectant in drinking water treatment plants in the United States (70% of the responding systems). ***More than half these systems use bulk liquid sodium hypochlorite, making it the most prevalent form used.*** Less than half of the systems (48%) use chlorine gas and approximately 12% use onsite generation of sodium hypochlorite.

In the past 10 years, more than 35% of the systems have switched from using chlorine gas to sodium hypochlorite, primarily for safety reasons. For the systems using bulk sodium hypochlorite, 90% of respondents purchase it at a concentration between 10% and 15% trade strength, and more than half (55%) store bulk sodium hypochlorite for between seven and 30 days.⁷³

This means that many water systems, even according to their self-reporting, may be storing higher concentrate hypochlorite for weeks to a month or more. Indeed, 45 percent of respondents may be storing it for more than 30 days.

Mishandling of hypochlorite can lead to significant spikes in perchlorate contamination. EPA points to unenforceable guidance from EPA and the American Water Works Association to suggest that perchlorate formation from hypochlorite is not a significant problem.⁷⁴ However, this guidance is just that—an unenforceable recommendation that may or may not be complied with. This is particularly a concern for the roughly 60,000 small and very small community and non-transient non-community water systems, which often lack a full-time operator and constitute the bulk of violations even of mandatory EPA drinking water standards.⁷⁵ It is unclear how many of the tens of thousands of water systems, including those that have switched in recent years to hypochlorite, are aware of much less complying with EPA's and AWWA's non-binding recommendations that water systems reduce perchlorate contamination from hypochlorite. These recommendations urge water systems to: (1) dilute their hypochlorite upon delivery; (2) store hypochlorite solution at lower temperatures (every 5°C reduction reduces perchlorate formation rate by about 2); (3) control hypochlorite solution within the pH range of 11 to 13.4; and (4) avoid extended storage times (hypochlorite degrades over time into oxygen, chlorate, and perchlorate.)⁷⁶ EPA has presented no data to show that the tens of thousands of water systems

2017); EPA, Sodium Hypochlorite, Calcium Hypochlorite, and Potassium Hypochlorite Interim Registration Review Decision (March 27, 2018), <https://www.regulations.gov/document/EPA-HQ-OPP-2012-0004-0018>.

⁷³ AWWA Disinfection Committee, Emerging Trends in Disinfection: Lessons From AWWA's Disinfection Survey, *J Am Water Works Assoc.* 2021 January 19; 113(1): 20–28. doi:10.1002/awwa.1648, <https://pmc.ncbi.nlm.nih.gov/articles/PMC9351709/pdf/nihms-1815422.pdf>.

⁷⁴ See EPA, Reductions of Perchlorate in Drinking Water (May 2020) 11-12 (EPA-815-F-20-002)

⁷⁵ EPA, Providing Safe Drinking Water in America: National Public Water Systems Compliance Report. Last updated 2025, <https://www.epa.gov/compliance/providing-safe-drinking-water-america-national-public-water-systems-compliance-report#:~:text=The%20violation%20points%20for%20each,to%20generate%20each%20annual%20report>.

⁷⁶ See EPA, Sodium Hypochlorite Registration Review Decision, *supra* n.72; EPA, Reductions of Perchlorate in Drinking Water, *supra* n.41.

now using hypochlorite are aware of these recommendations much less complying with them. As the survey cited above indicates, the *majority* of the 70 percent of U.S. water systems that disinfect their water are using hypochlorite, and many have only switched over recently and may not be conversant with or feel compelled to comply with these non-binding recommendations.

Additionally, EPA has noted that while most UCMR 1 samples were collected at entry point to the distribution system locations, many “samples from source water (untreated water) (SR) locations are also included in the UCMR 1 dataset.”⁷⁷ In other words, many of the water samples tested for perchlorate in UCMR1 were taken at locations *prior to* the introduction of hypochlorite disinfection. Again, there is no evidence that EPA has undertaken any effort since UCMR 1 to determine whether perchlorate contamination may be occurring in thousands of systems as a result to the inappropriate use and storage of hypochlorite, which would not have been detected in any event at many systems in UCMR1 testing their water prior to disinfection.

Thus, the issue of hypochlorite-related perchlorate contamination could be a much more widespread issue than it was 25 years ago when the UCMR1 monitoring was done. The lack of meaningful and up-to-date nationwide sampling data for perchlorate, and the lack of any EPA program to verify whether water systems are actually complying with its hypochlorite guidance, means that neither EPA nor the public has any way of knowing if EPA’s wishful thinking that all water systems are complying with this unenforceable guidance is true.

In sum, EPA’s occurrence estimate is based upon outdated data on the use of hypochlorite, a lack of comprehensive testing of post-disinfection water, and wishful thinking that thousands of utilities are voluntarily complying with its non-binding guidance. EPA has failed to provide any meaningful assurance that water systems are not mishandling hypochlorite. EPA’s proposal also is insufficient to ensure compliance with its proposed MCL, let alone to detect lower, but still harmful, levels of perchlorate.

F. EPA’s Bayesian model does not cure the defects in its occurrence dataset

As explained further in the attached technical report by Professor Frank Curriero, PhD, MA, (“Curriero Report”), EPA’s Bayesian model is also flawed. Among other issues

- EPA’s “regulating state” factor fails to address distinctions between pre- and post-regulation data from California and Massachusetts, effectively largely washing out the impact of any pre-state regulation data from California and Massachusetts in the original UCMR 1. As noted earlier, this biases the results toward lower anticipated perchlorate levels.

⁷⁷ EPA, First Unregulated Contaminant Monitoring Rule, last updated August 7, 2025, <https://www.epa.gov/dwucmr/first-unregulated-contaminant-monitoring-rule> (visited March 8, 2026).

- EPA’s model did not account for geographical clustering of water system locations and the principle that observations from water systems closer to each other are more similar than observations further away from each other. This source of variation, if unchecked and overlooked, can lead to underestimation of the uncertainty in regression model results.
- EPA’s model includes a remarkably large, and unexplained, measure of uncertainty. For example, EPA’s model predicts that “an estimated number of 103 PWSs (90% CI [credible interval], 12 – 266) are estimated to have sampling results that exceed 20 µg/L of perchlorate per sampling event.”⁷⁸ In other words, the model suggests that from 12 to 266 water systems may be contaminated with perchlorate above the 20 ppb MCL. EPA must explain why its model includes such high levels of uncertainty and why its results are reliable despite it.

EPA also failed to adequately respond to comments from its peer reviewers about, among other key issues, whether the limited data used by EPA allows inferences to non-sampled regions; whether it was appropriate for EPA to pool pre- and post-regulation data from California and Massachusetts; and whether EPA could have considered tweaks or alternatives to its model to make it more accurate. Curriero Report 3-4. Nor does it appear, based on the record, that the peer reviewers had the opportunity to read EPA’s responses and revisions based on their comments and the comments of their colleagues and to provide any further rebuttals (whether in agreement or disagreement). Given the importance of this model, the effort put forth by the reviewers and their detailed comments and suggestions for further analysis, and that, according to one reviewer EPA apparently gave only an “incomplete presentation” of parts of its model, that process is particularly important here.⁷⁹ Moreover, EPA’s refusal to adjust the model to consider non-UCMR data from states other than Massachusetts and California that show widespread contamination is scientifically indefensible. *See supra* Section V. EPA’s model is thus not based on “the best available, peer-reviewed science.” 42 U.S.C. § 300g-1(b)(3)(A)(i).

VI. EPA should require more frequent monitoring

EPA’s proposed monitoring requirement will fail to adequately detect harmful levels of perchlorate in drinking water and thus violates SDWA’s requirement that every national primary drinking water regulation include “testing procedures to insure compliance with” the MCL. 42 U.S.C. § 300f(1)(D). Unlike many other inorganic contaminants subject to that framework, which are generally naturally occurring, perchlorate contamination is linked to specific sporadic events, such as fireworks displays, use of rockets or munitions, or precipitation events that may mobilize perchlorate-contaminated runoff into surface waters, or mishandling of hypochlorite,

⁷⁸ 2025 Occurrence Report at ii.

⁷⁹ EPA, Peer Review of the Bayesian Hierarchical Model to Describe Perchlorate Occurrence in Public Drinking Water Systems at 6 (2025), EPA-HQ-OW-2024-0592-0735, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0735>.

and thus may vary widely over the course of a year. More frequent monitoring is thus necessary to detect harmful spikes in perchlorate levels. EPA should require all water systems to monitor for perchlorate quarterly and, as explained below, conduct additional monitoring during peak events.

At a minimum, EPA should require monitoring consistent with EPA's Standard Monitoring Framework for inorganic contaminants. *See* 56 Fed. Reg. 3526 (1991). Under either its proposed reduced monitoring or the standard framework, EPA should require water systems to complete new monitoring to qualify for reduced monitoring or a waiver, and should not allow water systems to qualify based on preexisting sampling data. Finally, EPA should set a minimum reporting level of 1 ppb, as California and Massachusetts have done.

A. EPA should require systems to, at a minimum, follow the Standard Monitoring Framework for perchlorate

In 1991, EPA set a Standard Monitoring Framework for all inorganic contaminants regulated under SDWA. *See* 56 Fed. Reg. 3526, 3560 (“EPA intends to apply this framework to future requirements for source-related contamination,” including “inorganics”). In crafting this framework, EPA carefully balanced the need to minimize monitoring burdens and allow for regulatory flexibility while still ensuring that MCL exceedances will be detected. *Id.* Under this framework, monitoring takes place on nine-year cycles, with each cycle split into three compliance periods. If a system is reliably and consistently below the MCL, as determined by the State, it must sample annually (for surface water) or once every three years (for groundwater); if a system exceeds the MCL, it must sample quarterly for a minimum of two quarters (groundwater) or four quarters (surface water). 40 C.F.R. § 141.23(c)(1), (7), (8). The standard framework also provides for further reduced monitoring—once every nine years—but only if a system requests and receives an explicit waiver in writing from the state. *Id.* § 141.23(c)(4). Importantly, this reduced monitoring is not automatic: primacy States must affirmatively grant a waiver, and only after the water system has completed three rounds of monitoring, and the state makes several substantive findings that may influence the likelihood of future contamination. *Id.* § 141.23(c)(4)-(6). Indeed, in the standard framework rule, EPA expressly declined to allow automatic waivers because “State approval is crucial in certain circumstances such as where the system is adjacent to a toxic waste site or other anthropogenic sources of contamination.” 56 Fed. Reg. at 3565.

EPA's monitoring proposal for perchlorate flips this framework on its head: instead of requiring States to grant waivers, after taking into account specific characteristics of a given water system, it creates automatic reduced monitoring for any water system that—after either a single year of monitoring or based on stale, years-old data—has perchlorate levels below 4 ppb, permitting those systems to monitor only once every nine years. EPA offers no explanation why State approval for waivers is crucial for other inorganic contaminants, but not this one. But state

approval for reduced monitoring is just as critical, if not more so, here. Unlike many other inorganic contaminants, which are primarily naturally occurring, perchlorate contamination is caused by discrete events, such as fireworks displays, rocket or munitions launches, or improper storage and handling of hypochlorite. If water systems were required to affirmatively seek monitoring waivers, primacy states could consider these well-known sources of perchlorate contamination in deciding whether to grant waivers. But under EPA's proposal, all water systems—even those with specific and knowable risk factors—automatically qualify for reduced monitoring.

EPA claims that this automatic reduced monitoring is necessary because it is burdensome for states to determine whether systems qualify for reduced monitoring, and because EPA believes its rule will require so few systems to actually reduce perchlorate levels that monitoring for perchlorate will have little benefit. EPA presumed that since, in its view, “virtually all systems would have initial perchlorate sample concentrations below any of the proposed MCLs . . . for most systems, rule implementation will only require monitoring and no other action, imposing costs and burden with limited public health benefit.” 91 Fed. Reg. at 415. This rationale is incorrect. As explained above, EPA is incorrect that perchlorate concentrations below 20 ppb do not have adverse health effects. More frequent monitoring would thus have a substantial public health benefit by detecting harmful levels of perchlorate and giving notice to water system customers of perchlorate in their drinking water. And had EPA set an appropriate MCL, most systems would be required to not just monitor, but actually reduce perchlorate levels. Finally, even with an MCL of 20 ppb, EPA's willful blindness to perchlorate contamination means that EPA does not in fact know whether “all systems” will have initial perchlorate concentrations below 20 ppb. *See supra* Section V. EPA's rationale for reduced monitoring is thus arbitrary.

EPA's proposed automatic reduced monitoring will also miss unsafe levels of perchlorate in drinking water. As explained above, *see supra* Section III, perchlorate levels below 4 ppb may result in adverse health impacts and are feasible to detect and report. EPA's proposal means those levels will go entirely undetected for nine years at a time. Monitoring only once every nine years would also miss increases in perchlorate contamination due to changed circumstances. Consider, for example, a new annual fireworks display that begins near a water source in year two of a nine-year monitoring cycle, causing perchlorate levels in the drinking water to spike as high as the MCL.⁸⁰ That contamination would go undetected for *eight years*, if it is ever detected.

This reduced monitoring could also miss variable spikes in perchlorate from inappropriate storage and handling of the widely used disinfectant hypochlorite. Neither EPA nor states have any way of ensuring that thousands of water systems are storing and handling hypochlorite in a manner that avoids perchlorate spikes. As noted earlier, EPA acknowledges that

⁸⁰ *See* Andrews et al., *Rapid Cleanup of a Perchlorate Plume from Fireworks*, 59 *Groundwater* 614 (2021) (annual fireworks display led to perchlorate concentrations as high as 20 ppb in wells).

“perchlorate concentrations increase over time as hypochlorite degrades.”⁸¹ And there has been a major switch in the water utility industry from chlorine gas to hypochlorite, with 35 percent of water systems surveyed making this switch in the 10 years from 2011-2021.⁸² This means that the issue of hypochlorite-related perchlorate contamination could be a much more widespread issue than it was 25 years ago when the UCMR1 monitoring was done.

As discussed earlier in these comments, mishandling of hypochlorite could lead to multiple spikes or ongoing elevated levels of perchlorate contamination during the nine-year monitoring period, and these would go undetected. EPA points to unenforceable guidance from EPA and the American Water Works Association to suggest that perchlorate formation from hypochlorite is not a significant problem.⁸³ However, this guidance is just that—an unenforceable recommendation that may or may not be complied with. This non-binding guidance is not a sufficient assurance that water systems will not mishandle hypochlorite. EPA’s proposal is thus insufficient to ensure compliance with its proposed MCL, let alone to detect lower, but still harmful, levels of perchlorate.

If EPA does permit automatic reduced monitoring, it should not set a trigger value higher than 1 ppb. 91 Fed. Reg. at 415. As explained below, a 4 ppb trigger level is irrational and will not detect harmful levels of perchlorate. A higher trigger level would result in even greater health harms. To the extent EPA finalizes its proposal for automatic reduced monitoring (which, as explained above, it should not) it should set a trigger level of 1ppb.

B. EPA should not permit reduced monitoring based on preexisting sampling data

EPA should not permit water systems to use perchlorate data collected after January 1, 2021 to satisfy the initial monitoring requirements, and should instead require all water systems to complete initial quarterly monitoring in the year before the rule’s compliance date (anticipated to be in 2030). As explained above, sampling only once in a nine-year period will miss harmful changes in perchlorate levels that could occur during that time due to changes in fireworks usage, mishandling of hypochlorite, or other changed circumstances. And EPA’s proposal, by allowing systems to use nine-year-old data to qualify for an automatic waiver lasting another nine years, would in fact allow water systems to go *eighteen years* without sampling for perchlorate. This is irrational. As EPA acknowledges, “older data [from before 2021] may not capture current

⁸¹ 2025 Occurrence Report at 22; *see also* 91 Fed. Reg. at 404. EPA has been aware of this source of perchlorate contamination for years. *See, e.g.*, Letter from Tom Neltner, Senior Attorney, Env’t Def. Fund and Maricel Maffini, Ph.D., Senior Scientist, NRDC, to Lance Wormell, Office of Pesticide Programs, U.S. EPA (July 31, 2014); Letter from Steve Knizer, Office of Pesticide Programs, EPA, to Tom Neltner, EDF, and Maricel Maffini, NRDC (Jan. 18, 2017); EPA, Sodium Hypochlorite, Calcium Hypochlorite, and Potassium Hypochlorite Interim Registration Review Decision (March 27, 2018), <https://www.regulations.gov/document/EPA-HQ-OPP-2012-0004-0018>.

⁸² AWWA Disinfection Committee, Emerging Trends in Disinfection: Lessons From AWWA’s Disinfection Survey AWWA Disinfection Committee, J Am Water Works Assoc. 2021 January 19; 113(1): 20–28. doi:10.1002/awwa.1648, <https://pmc.ncbi.nlm.nih.gov/articles/PMC9351709/pdf/nihms-1815422.pdf>.

⁸³ *See* EPA, Reductions of Perchlorate in Drinking Water (May 2020) 11-12 (EPA-815-F-20-002)

conditions.” 91 Fed. Reg. at 416. But EPA offers no explanation as to why data collected since 2021 captures current conditions, but older data does not.

EPA’s rationale for this is to account for states that already monitor for perchlorate on a different schedule, yet it proposes to extend this requirement to all states. To the extent EPA permits the use of preexisting data to satisfy initial monitoring requirements, it should only do so for states that require perchlorate monitoring at least as frequently as the standard monitoring framework and for water systems that have been in compliance with those requirements for at least three years.

C. EPA should require water systems to perform additional monitoring when recurring infrequent events present an elevated risk of contamination

EPA should require water systems to determine whether recurring infrequent events, such as fireworks displays, present an elevated risk of perchlorate contamination and require sampling events to take place within 48 hours of the event. Perchlorate, unlike most other inorganic contaminants regulated under SDWA, may enter drinking water as a result of discrete, infrequent high-risk events, such as fireworks displays. Without this requirement, some water systems that actually have perchlorate in their source water will never find it. Additionally, at a minimum EPA should require a written certification by each PWS operator subject to the perchlorate rule, that the system operators are trained upon and are fully complying with the EPA and AWWA recommendations for storage and handling of hypochlorite. This should be verified when sanitary surveys are completed.

D. EPA’s monitoring proposal fails to meet the statutory standard of ensuring the MCL is complied with

As noted, the SDWA requires EPA to establish “testing procedures to insure compliance with” the MCL. 42 U.S.C. § 300f(1)(D). For the reasons noted above, EPA’s proposal fails to meet this statutory mandate.

VII. EPA underestimates benefits and overestimates costs

A. EPA should not be using a discount rate for future benefits

The use of a discount rate is wholly inappropriate in the case of perchlorate. Discounting future benefits—such as projected IQ losses—effectively treats long-term harms as negligible just a few years down the line. It also reduces the value of IQ loss or other adverse impacts experienced by children born in the future to nearly nothing. A potential loss in IQ points has lifetime and intergenerational consequences. A discount rate as high as EPA’s proposed 3% and 7% fails to take these lifetime effects into account. For instance, “over the course of 80 years, a 7% rate discounts away 99.5% of a future effect’s value.”⁸⁴

⁸⁴ Peter Howard & Jason A. Schwartz, Valuing the Future: Legal and Economic Considerations for Updating Discount Rates, 39 Yale J. Regul. 595, 599 (2022) (“Howard & Schwartz (2022)”).

The use of a discount rate runs contrary to the preventative statutory goals espoused in the legislative history including the 1974 House Report, and provisions of the SDWA. The Act includes numerous specific requirements for the cost-benefit analysis in section 1412(b). If Congress believed a discount rate was appropriate, it could have explicitly required or authorized it, and did not do so. Moreover, as discussed below, by largely failing to base any of its standard on non-monetized benefits or benefits other than IQ loss, the agency has ignored the provisions of SDWA section 1412(b).⁸⁵

B. Alternatively, EPA should not use a discount rate higher than 1.7%.

EPA's Economic Analyses Guidelines (EPA 2010) note that, "OMB Circular A-4 (2003) requires the use of constant 3% and 7% for both intra- and intergenerational discounting for benefit cost estimation of economically significant rules but allows for lower, positive consumption discount rates, perhaps in the 1 percent to 3 percent range, if there are important intergenerational values."⁸⁶ First, it must be noted that those guidelines are not legally binding and cannot contravene statutory requirements such as those in the SDWA. Second, the 2003 OMB guidance is outdated. These rates were derived from data on financial returns for U.S. Treasury notes and private capital investments collected between 1973 and 2003, which in 2003 were estimated at approximately 3% and 7%, respectively.⁸⁷ However, in 2017 the U.S. Council of Economic Advisers reviewed OMB's 2003 discount rates and decided to revisit and reduce the 3% and 7% rates based on more recent data and trends.⁸⁸ Moreover, the 2003 A-4 Circular recognizes that discount rates lower than 3% are appropriate when significant intergenerational effects are present: "If your rule will have important intergenerational benefits or costs you might consider a further sensitivity analysis using a lower but positive discount rate."⁸⁹ In 2023, OMB proposed revisions to the 2003 guidance and recommended a discount rate of 1.7%.⁹⁰ This rate more accurately reflects the best available economic data and literature.⁹¹

⁸⁵ 42 U.S.C. § 300g-1(b)

⁸⁶ EPA 2010. Guidelines for Preparing Economic Analyses. Page 6-15, Footnote 22.

<https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-06.pdf>

⁸⁷ Howard & Schwartz (2022) at 597.

⁸⁸ CEA, *Discounting for Public Policy: Theory and Recent Evidence on the Merits of Updating the Discount Rate* (Jan. 2017),

https://obamawhitehouse.archives.gov/sites/default/files/page/files/201701_cea_discounting_issue_brief.pdf.

⁸⁹ White House Off. of Mgmt. and Budget, Circular A-4, at 35-36 (Sept. 17, 2003) <https://www.whitehouse.gov/wp-content/uploads/2025/08/CircularA-4.pdf> ("Circular A-4"); see also CEA, *Discounting for Public Policy* ("Intergenerational ethical considerations and greater uncertainty about the investment environment and economic growth in the far future would tend to support lower discount rates in this context. This point is partially addressed in the current discounting guidance in A-4, but is worthy of additional study and public comment should the guidance be revisited—with plausible estimates based on past data and current market- and survey-based forecasts of at most 2 percent.").

⁹⁰ White House Off. of Mgmt. and Budget, *Circular A-4 (Public Review Draft)*, at 76 (Apr. 6, 2023) (proposing consumption-based discount rate of 1.7%), <https://bidenwhitehouse.archives.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf>

⁹¹ Howard & Schwartz (2022) at 595-96, 599, 610-11, 617-19; see also White House Off. of Mgmt. and Budget, *Circular A-4 (Public Review Draft)*, at 76 (Apr. 6, 2023) (proposing consumption-based discount rate of 1.7%), <https://bidenwhitehouse.archives.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf>

C. EPA underestimates benefits

1. EPA failed to consider the costs and benefits of a lower MCL

EPA should provide the cost and benefit values for a wider distribution range of MCL values, including at 1ppb (California PHG), 2 ppb, (the MA regulatory limit), and 4 ppb (EPA's past reporting limit). By failing to provide these additional relevant analyses, EPA leaves the public with too little information to provide informed comments on EPA's analysis and proposed MCL.

EPA's flawed occurrence analysis and failure to consider a lower MCLG and MCL means it underestimated benefits. EPA assumed that only 100 water systems would be required to take action to reduce perchlorate with an MCL of 20 ppb.⁹² Though as noted earlier, EPA's own model found that as many as 266 water systems may exceed the 20 ppb level.⁹³ Moreover, a lower MCL would require more water systems to reduce perchlorate, resulting in greater health benefits. And even at an MCL of 20 ppb, EPA's flawed occurrence analysis means EPA is incorrect about how many systems will be required to treat perchlorate: perchlorate may very well be present at levels of 20 ppb or higher at far more systems than EPA presumes. In contrast to the much greater benefits of a lower MCL, the costs would not be significantly higher. Because the same technology EPA already deemed affordable can achieve a lower MCL, *see supra* Section IV, treatment costs would likely not be much higher. And monitoring costs would stay the same.⁹⁴

2. EPA failed to consider non-quantified benefits.

EPA's Economic Analysis recognizes that published scientific literature identifies "other health effects for a broader population that are associated with consequences of perchlorate exposure." EPA also admits that its quantitative analysis fails to consider the substantial benefits for vulnerable children and others such as "cardiovascular disease, hypothyroidism, additional neurodevelopmental endpoints such as ADHD, reduced iodine uptake or benefits accruing from removal of co-occurring contaminants and the value of information."⁹⁵ 91 Fed. Reg. at 420. EPA claims that it was not able to quantify or monetize these benefits because "sufficient evidence is not available in the literature to quantify the relationships between perchlorate exposure and these additional adverse health effects."⁹⁶ Although it is noteworthy that EPA acknowledges it has not quantified many of these significant and troubling adverse effects, the agency cannot simply note their existence and then neglect to make any meaningful effort to quantify or genuinely evaluate these unmeasured benefits. In its weighing of costs and benefits, EPA offers only minimal attention to these substantial harms.

⁹² 2025 Economic Analysis at 6-3.

⁹³ 2025 Occurrence Report Ex. 5-3; *supra* Section V.F.

⁹⁴ *See* 2025 Economic Analysis at 4-24 ("[M]onitoring costs are generally unaffected by the MCL selection.").

⁹⁵ 2025 Economic Analysis at 5-21

⁹⁶ *Id.*

EPA should give more weight to these additional adverse health effects. For example, cardiovascular disease is the number one killer of Americans. According to the CDC, in 2023, over 900,000 people died from cardiovascular disease.⁹⁷ That is the equivalent of 1 in every 3 deaths.⁹⁸ The societal cost of cardiovascular disease is extremely high. According to the American Heart Association:

In 2016, total spending on cardiovascular care in US adults was \$320.1 billion (95% CI, \$299.2–\$345.6 billion). More than half of cardiovascular spending was paid by public payers at \$180.1 billion (95% CI, \$167.2–\$194.3 billion), followed by private payers at \$118.8 billion (95% CI, \$106.0–\$135.1 billion) and out-of-pocket spending at \$21.2 billion (95% CI, \$17.0–\$25.7 billion). Services for adults ≥65 years led to more than half of cardiovascular spending at \$185.3 billion (95% CI, \$171.9–\$199.9 billion), followed by spending on adults aged 45 to 64 years at \$113.3 billion (95% CI, \$104.3–\$125.9 billion) and adults aged 20 to 44 years at \$21.4 billion (95% CI, \$20.0–\$22.8 billion).⁹⁹

Even a small reduction in cardiovascular disease would have significant economic and societal benefits.

Also, it is possible to quantify additional health benefits. Researchers in other countries have published studies that quantify the costs of ADHD¹⁰⁰ and hypothyroidism.¹⁰¹ Additionally, EPA’s water treatment for perchlorate could remove other harmful contaminants such as nitrate, arsenic and uranium.¹⁰² In accordance with White House guidance, the agency is required to quantify important effects “to the fullest extent that the[y] can be usefully estimated.”¹⁰³

The SDWA requires EPA to weigh all “Quantifiable and nonquantifiable health risk reduction benefits for which there is a factual basis in the rulemaking record to conclude that such benefits are likely to occur from reductions in co-occurring contaminants that may be attributed solely to compliance with the maximum contaminant level, excluding benefits resulting from compliance with other proposed or promulgated regulations.”¹⁰⁴ Courts do not allow agencies to use uncertainty as an excuse for failing

⁹⁷ CDC, Heart Disease Facts, <https://www.cdc.gov/heart-disease/data-research/facts-stats/index.html> (last update Oct. 24, 2024).

⁹⁸ *Id.*

⁹⁹ Maxwell Birger, et al., Spending on Cardiovascular Disease and Cardiovascular Risk Factors in the United States: 1996 to 2016, *AHA J.* 144, 4 (Apr. 30, 2021) <https://www.ahajournals.org/doi/10.1161/CIRCULATIONAHA.120.053216>

¹⁰⁰ Kotsopoulos N, Connolly MP, Sobanski E, Postma MJ. Assessing the Economic Burden and Benefit-cost of Treating Attention-deficit Hyperactivity Disorder in Germany. *J Health Econ Outcomes Res.* 2013 Nov 12;1(3):212-223. PMID: 37662879; PMCID: PMC10471420.

¹⁰¹ Nadeesha Karunaratna, Manjula Hettiarachchi, Cost-Effective Analysis of the Congenital Hypothyroidism Screening Program in Sri Lanka, *Value in Health Regional Issues*, Vol. 24, 181-186, ISSN 2212-1099, (2021) <https://doi.org/10.1016/j.vhri.2021.01.001>.

¹⁰² 2025 Economic Analysis at 5-25

¹⁰³ Exec. Order No. 12,866 § 1(a).

¹⁰⁴ 42 U.S.C. § 300g-1(b)(3)(C)(i)(II).

to monetize key categories of benefits, especially when the benefit's monetized value "is certainly not zero."¹⁰⁵

In addition, where quantification is not possible, EPA should utilize available monetary cost-of-illness or willingness to pay estimates to illustrate the potential magnitude of benefits discussed qualitatively. The Act expressly provides that EPA "identify valid approaches for the measurement and valuation of benefits...including approaches to identify consumer willingness to pay for reductions in health risks from drinking water contaminants."¹⁰⁶ There is significant scientific support in the literature documenting the public's willingness to pay for higher quality drinking water, even if it is not required by a drinking water standard.¹⁰⁷

Accordingly, EPA should reevaluate whether any major categories of non-monetized benefits could, in fact, be monetized using a reasonable range of estimates that appropriately reflects any uncertainty. And even if the agency determines that some or all of these additional benefits are non-quantifiable, they must be considered as a matter of law under the SDWA. 42 U.S.C. § 300g-1(b)(3)(C)(i)(I)-(II) (EPA must consider "Quantifiable and nonquantifiable health risk reduction benefits").

D. EPA overestimates the cost of monitoring

EPA justifies its reduced monitoring based on the following costs per sample: \$105.896 for systems with 20 or fewer entry points, \$79 per sample for systems with more than 20 entry points, and \$105 per confirmation sample when an initial sample exceeds the MCL.¹⁰⁸ EPA based these cost estimates on quotes from eight labs.¹⁰⁹ Based on these costs, EPA estimates that its proposed monitoring approach would result in annual monitoring costs of \$1.7 million.¹¹⁰ Even assuming that 50,000 community water systems would have to test four times a year to do initial monitoring, at EPA's \$79/sample estimate, monitoring analytical costs would be about \$16 million per year; even a doubling or tripling of these costs due for example to additional points of entry into distribution systems would still mean reasonable national costs. These costs are

¹⁰⁵ *Center for Biological Diversity v. NHTSA*, 538 F.3d 1172, 1200 (9th Cir. 2008).

¹⁰⁶ 42 U.S.C. § 300g-1(b)(3)(C)(iii).

¹⁰⁷ See, e.g. Chiradip Chatterjee, Russell Triplett, Christopher K. Johnson, Parvez Ahmed, Willingness to pay for safe drinking water: A contingent valuation study in Jacksonville, FL, *Journal of Environmental Management*, Volume 203, Part 1, 2017, Pages 413-421, ISSN 0301-4797, <https://doi.org/10.1016/j.jenvman.2017.08.008>. (<https://www.sciencedirect.com/science/article/pii/S0301479717307855>); Pintus FJ. Valuing drinking water quality after a PFAS contamination event: Results from a meta-analysis benefit transfer. *J Environ Manage.* 2024 Jun;360:121143. doi: 10.1016/j.jenvman.2024.121143. Epub 2024 May 20. PMID: 38772240; William F. Vásquez, Pallab Mozumder, Jesús Hernández-Arce, Robert P. Berrens, Willingness to pay for safe drinking water: Evidence from Parral, Mexico, *Journal of Environmental Management*, Volume 90, Issue 11, 2009, Pages 3391-3400, ISSN 0301-4797, <https://doi.org/10.1016/j.jenvman.2009.05.009>. (<https://www.sciencedirect.com/science/article/pii/S0301479709001704>).

¹⁰⁸ EPA Economic Analysis at 4-20, Ex. 4-10

¹⁰⁹ The Cadmus Group, Perchlorate Laboratory Cost Estimates 2025, EPA-HQ-OW-2024-0592-0730, <https://www.regulations.gov/document/EPA-HQ-OW-2024-0592-0730>.

¹¹⁰ *Id.* at 4-2, Ex. 4-1 (mean cost at a 3% interest rate).

extremely modest (less than 1/100th of 1 percent) compared to capital and other expenses of water systems—the total EPA-estimated capital needs for drinking water systems of \$625 billion.

Moreover, EPA apparently only reviewed cost estimates for assessing perchlorate assuming perchlorate would be the only contaminant at issue. But for water systems that are already sampling for other inorganic contaminants—as all are, unless they have been granted a reduced monitoring waiver—monitoring costs are substantially lower. EPA also overestimated the labor burden and cost for sample collection and analysis: for water systems already monitoring for other inorganic contaminants, there will be no additional labor cost to collect a perchlorate sample, since the system would already be collecting that sample to comply with other monitoring requirements. Given that monitoring costs comprise a particularly high proportion of the total rule costs, *see* 91 Fed. Reg. at 422, these errors are significant.

VIII. Conclusion

EPA's proposed national drinking water standard will fail to protect the health of millions of Americans from toxic perchlorate, which is found in tap water of hundreds of water systems across the nation. The proposed health goal for perchlorate violates EPA's statutory mandate to set an MCLG at "the level at which no known or anticipated adverse effects on the health of persons occurs and which allows an adequate margin of safety," 42 U.S.C. § 300g-1(b)(4)(A). The agency's proposal also fails to set an MCL as close to a scientifically sound and protective health goal as feasible. *Id.* § 300g-1(b)(4)(B).

As these comments have detailed, the agency's technical support document shows that children drinking water at EPA's MCLG and proposed standard are at risk of suffering harm to their brains and decreased IQs. Numerous studies also establish other adverse effects of perchlorate at low levels of exposure that EPA has ignored or swept aside. Many children will be harmed: some will be at risk of suffering what EPA describes as a "mild intellectual disability"; children at the other end of the spectrum will shift "from a gifted IQ level [of over 135] into a lower IQ category." EPA's conclusion that this would not be an "adverse effect" on health is contrary to the best available public health science and the law.

The agency also has stacked the deck in evaluating the occurrence of perchlorate by relying upon a biased set of data that uses a one-way ratchet. Fully 82.5% of the samples evaluated were from the only two states—California and Massachusetts—that have established drinking water standards for perchlorate which are far more stringent than EPA's proposed level. Moreover, EPA has ignored extensive evidence, including testing by USGS and many others, indicating that perchlorate contamination is more widespread than EPA supposes. And the agency has been willfully blind to the likelihood that perchlorate contamination has spread since it collected its national sampling a quarter of a century ago. EPA has ignored that perchlorate contamination that was documented decades ago at many of the hundreds of DoD and other

federal, private and Superfund sites likely spread since its last national monitoring conducted. And the agency has failed to grapple with the doubling of the use of fireworks since its last national monitoring. Nor has EPA collected evidence to assess the impact of the major expansion in use of hypochlorite over the past decade, which the majority of disinfecting water systems now use, and which can cause significant perchlorate contamination.

EPA should acknowledge that the science does not show a safe level or threshold below which perchlorate is safe, so it should establish an MCLG of zero. In the alternative, if EPA concludes that there is a safe level, the agency should follow the lead of the three states that have conducted rigorous peer-reviewed scientific evaluations of perchlorate and established far more stringent MCLGs and MCLs. We recommend, based on the evidence, an MCLG of 0.2 ppb to 1 ppb, and an enforceable MCL of 2 ppb.

Respectfully Submitted,

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Technical Review of EPA's Bayesian Modeling Approach to Describe Nationwide Perchlorate Occurrence

March 2, 2026

Prepared by Professor Frank Curriero, PhD, MA, Johns Hopkins School of Public Health

I. EPA's Bayesian model does not cure the defects in its occurrence dataset

A. EPA's "Regulating State" factor fails to address distinctions between pre- and post-regulation California and Massachusetts data. EPA explained that it "selected a final Bayesian model that included factors for "Regulating State" (which addresses potential impacts on perchlorate occurrence due to whether or not the system is located in a state that has existing regulations for perchlorate in drinking water, i.e., California and Massachusetts) and "water source" of the PWS (which addresses potential impacts on perchlorate occurrence due to known differences in hydrologic regimes between ground water and surface water). These factors address plausible distinctions, which can be used to group data, thereby reducing the chance that data are grouped by artifacts in the dataset that do not represent the reality of perchlorate occurrence." 2025 Occurrence Report at 44. EPA defined the "Regulating State" model factors in such way that grouped the original UCMR 1 data from California and Massachusetts with their respective post-regulation data, essentially considering these as homogenous strata for modeling the data. But they are not homogeneous: one set of data was collected in the original UCMR 1, before those states regulated perchlorate in drinking water, while the other set was collected after perchlorate regulations were in place. Given the sheer volume of post compared to pre regulation data for California and Massachusetts, pooling pre- and post-regulation data together essentially zeros out the impact of any data from California and Massachusetts in the original UCMR 1. EPA's approach thus fails to address the most important plausible distinction between these datasets.

EPA could have defined the Regulating States model factor in a way that distinguishes between pre- and post-regulation data (rather than grouping them together) for each state. In such a model variant, it would have also been possible to then test how results differ from applying this modeling approach to just the original UCMR 1 data versus the revised UCMR 1 data. EPA should apply this type of sensitivity analysis given the sheer volume of post-regulation data in EPA's occurrence dataset.

B. EPA's Bayesian hierarchical model approach for describing perchlorate occurrence also did not account for or adjust in any way the geographic clustering of PWS locations. Irrespective of whether UCMR 1 or revised UCMR 1 can still be considered nationally representative, the data themselves likely exhibit spatial dependence – e.g.,

observations closer to each other are more similar than observations further away from each other. This source of variation, if unchecked and overlooked, can lead to underestimation of the uncertainty in regression model results. Because EPA did not adjust for spatial dependence, its Bayesian credible intervals may be reported inaccurately as being more narrow (more confident) than if the model adequately accounted for geographic clustering.

C. EPA's model includes a large measure of uncertainty, which undermines the reliability of its results and raises concerns about what factors in EPA's modeling approach are driving this level of uncertainty. EPA's model predicts that "an estimated number of 103 PWSs (90% CI [credible interval], 12 – 266) are estimated to have sampling results that exceed 20 µg/L of perchlorate per sampling event." This means there is a 90% probability that the true number of water systems with results of 20 ppb is somewhere between 12 and 266—a remarkably wide range. EPA's model produced similarly wide ranges for systems above 40 ppb (47 systems, with a 90% credible interval between 0 and 160 systems) and above 80 ppb (20 systems, with a 90% credible interval between 0 and 92). EPA must explain why its model includes such high levels of uncertainty and why its results are reliable in spite of it.

II. EPA did not adequately respond to comments from its peer reviewers

Although a Bayesian modeling approach is an acceptable statistical approach, and one generally supported by the reviewers, reviewer comments raised some critical issues and criticisms that were not all adequately addressed by EPA. It is also unclear if the reviewers had the opportunity to further assess EPA's responses/revisions based on their review comments. For example, when submitting a paper to a scientific journal for publication with the scientific peer review process, reviewers and journal editors have a chance to review the author's responses and revisions based on all review comments. If responses/revisions are not deemed adequate that could cause the paper to be rejected for publication by the journal. Given the importance of this model, the effort put forth by the reviewers and their detailed comments and suggestions for further analysis, and that, according to one reviewer EPA apparently gave only an "incomplete presentation" of parts of its model (Reviewer 3 Overall Comments, Peer Review at 6), the reviewers should have had the opportunity to read EPA's responses and revisions based on their comments and the comments of their colleagues and to provide any further rebuttals (whether in agreement or disagreement). The reviewers do not appear to have had this opportunity given the documents in the record.

Reviewer 2, Comment #1 pointed out that "*it is not clear that the limited data allow[s] inferences to non-sampled regions,*" particularly as to small systems, because the small

systems in UCMR-1 and the many small unsampled small systems could differ in meaningful ways. In response EPA acknowledged that “[i]ndividual contaminants, such as perchlorate, may have specific relationships to spatial and other features of water systems that were not accounted for in sampling.” This may be so, but such spatial relationships would likely impart spatial structure into the regression model residuals, which—as noted above—can and should have been checked and accounted for in the analysis.

Reviewer 3, Comment #6, stated, among several other comments, “.....*I am skeptical about their decision to pool the three datasets (UCMR 1, post-rule compliance samples from CA and MA) together without maintaining their identity or assessing the average differences between pre- and post-ruling in the two states.....*” In response, EPA explained that it used this approach to improve estimation of perchlorate contamination below 4 ppb, its minimum reporting level. But this does not explain why EPA did not define the Regulating States model factor in a way that distinguishes between pre and post regulating data (rather than grouping them together) for each state California and Massachusetts. If there is no variant of EPA’s model that can be formulated to distinguish California and Massachusetts data from pre- and post- regulation, then the proposed modeling approach is severely inadequate with respect to this crucial issue.

Reviewers also suggested other tweaks or alternatives to EPA’s model that may have made it more accurate. EPA did not explain why it did not adopt these suggestions.

- a. Reviewer 3, Comment #1 provided several alternative model structures to the lognormal distribution with compelling justification as to why their consideration would be beneficial. Reviewer 3 did not suggest a replacement of EPA’s use of the lognormal distribution but rather as a complement. EPA responded to this part of Reviewer 3’s comment by explaining that the lognormal distribution model was “more appropriate in light of the potential need to update the model and resulting simulations quickly in response to new data.” EPA may prefer an easier-to-update model, but that justification does not address the reviewer’s point that incorporating additional model structures would result in a more accurate assessment of their final model.
- b. Reviewer 1, Comment #6 states “*Within the framework of a Bayesian model, the sensitivity of the model to the prior distributions assigned to model parameters assumes paramount importance. In this context, the selection of $N(-2,2)$ as the prior distribution for the overall mean (M) warrants careful scrutiny. It is advisable to conduct a sensitivity analysis by refitting the model using alternative prior distributions, such as $M \sim N(0,5)$, and comparing the resulting posterior distributions and model inferences.*” EPA responded by clarifying its description

- of parts of its model. However, EPA did not respond to the part of the reviewer's comment suggesting additional sensitivity analysis.
- c. Reviewer 1, Comment #8 talks about alternative models EPA could have employed in their model selection process. The reviewer accurately argues that simple variants on an existing model (such as whether to include a covariate) is not model selection and EPA should consider other more true alternative models, not just variants on an existing model. EPA's response was to disagree with part of the reviewer's comment on the model's primary objective. EPA did not adequately address the reviewer's more substantive criticism on how model selection should be performed.