November 25, 2025

Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency
Sacramento, CA

Subject: Comments on OEHHA's First Public Review Draft Proposed Public Health Goal for 1,4-Dioxane in Drinking Water

Dear Ms. Jimenez,

The undersigned organizations represent public agencies and private companies that provide safe, affordable, and reliable drinking water and wastewater services to millions of Californians. We are committed to achieving the Human Right to Water,[1] protecting public health and the environment, and to the beneficial reuse of California's limited and increasingly uncertain water resources through wastewater recycling and groundwater replenishment projects.

We appreciate this opportunity to comment on the Office of Environmental Health Hazard Assessment's (OEHHA) First Public Review Draft Public Health Goal (PHG) for 1,4-Dioxane in Drinking Water ("Draft PHG"). This chemical is found in the environment both from industrial uses and from the use of everyday personal care and cleaning products like

[1] Assembly Bill 685 (Chapter 524, Statutes of 2021). Water Code Section 106.3 establishes as state policy the right of "every human being [] to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes."

shampoos, soaps, and detergents. Because the sources of 1,4-Dioxane are so widespread, and the chemical is so hard to remove from water, any future regulatory standards targeting small concentrations would require advanced water treatment systems. [2]

Our water systems must meet strict standards set by the State Water Resources Control Board (SWRCB), and these standards are often based on PHGs developed by OEHHA. While PHGs themselves aren't enforceable, they play a major role in shaping the rules we follow and the information we share with the public.

State law also requires OEHHA focus on public health when setting PHGS *and* requires OEHHA to use the latest science and methods and to set PHGs at levels that truly reflect what is safe for people.[3] Recent research, including studies published since 2020, shows that using the default methodology for estimating cancer risk from exposure to 1,4-Dioxane is likely to overstate the potential harm, especially at the low levels found in drinking water. The best available science now demonstrates that there is a threshold below which 1,4-Dioxane does not pose a significant cancer risk. OEHHA did not consider many of these studies in its draft technical document. We urge OEHHA to more carefully consider this evidence.

Key Technical Points for OEHHA to Consider in Revising the Draft PHG:

- OEHHA should use the most up-to-date science: OEHHA should use the latest research and risk assessment methods to ensure the PHG truly reflects what is safe for people, without driving a future drinking water standard to a level that would create unnecessary additional barriers to water access and affordability.
- Recent science shows a threshold for cancer risk: New studies suggest that 1,4-Dioxane does not cause cancer at the low levels found in many sources of drinking water, meaning there is a "safe" level below which risk is negligible.

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[2] "Advanced oxidation processes, which use peroxide and ultraviolet light (UV) or ozone, have been shown to destroy 1,4 Dioxane. Chlorination has also been found to be effective for the removal of 1,4 Dioxane. However, the byproducts that result from chlorination of 1,4 Dioxane are significantly more toxic than 1,4 Dioxane itself. Standard wastewater treatment methods and conventional activated sludge methods have proven to be ineffective. Air-stripping and granular activated charcoal do not remove 1,4 Dioxane from water." SWRCB, Groundwater Fact Sheet for 1,4 Dioxane (rev. Nov. 2019), p. 3, available at https://www.waterboards.ca.gov/gama/docs/coc_1_4_dioxane.pdf.

[3] Health and Safety Code §116365(c) requires OEHHA to prepare PHG risk assessments "using the most current principles, practices, and methods used by public health professionals who are experienced practitioners in the fields of epidemiology, risk assessment, and toxicology," and to set PHGs at a "safe dose response threshold" if "adequate scientific evidence" demonstrates that such as threshold exists for the subject contaminant.

- Default cancer risk assessment methods are likely to overstate cancer risk: The traditional way of calculating cancer risk – using a linear model to extrapolate from high dose animal data – is likely to exaggerate cancer risk from exposure to 1,4-Dioxane, especially at very low concentrations.
- Need to use realistic worst-case assumptions in the PHG calculation: OEHHA's reliance on multiple exposure adjustments in the PHG calculation overstates potential impacts to sensitive populations.
- Need to improve transparency and public confidence in the PHG development process: OEHHA should at least calculate a threshold-based PHG to allow for a direct comparison between this approach and the default approach, including an evaluation of the relative weight of evidence and uncertainty of each approach.

Beyond the science, there are important policy issues to consider. For example, because 1,4-Dioxane is so common in consumer products and so hard to treat, setting a very low PHG may cause SWRCB to set a very low MCL, which could prevent communities from relying on recycled water—an essential resource as California faces ongoing drought and water shortages. Similarly, the advanced treatment needed to remove very small concentrations of 1,4-Dioxane is extremely expensive and may be out of reach for smaller or disadvantaged communities, putting them at greater risk of not meeting the Human Right to Water.

We are not asking OEHHA to ignore its mandate to protect public health. Instead, we ask that you take into account the latest scientific findings and employ the most relevant risk assessment methods to establish a PHG that better reflects real-world health risks. More accurate risk estimates will help the SWRCB set standards that protect human health without creating unnecessary barriers to water access and affordability.

We look forward to continuing this conversation and working with OEHHA as the PHG development process moves forward. For more detailed technical comments and references, please see Attachments 1 and 2.

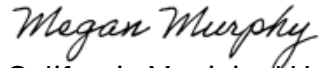
If you have any questions or would like to discuss these comments further, please feel free to contact me at (949) 632-2074 or cwilson@socalwater.org.

Sincerely,

Charley Wilson

Executive Director
Southern California Water Coalition

Community Water Systems Alliance



California Municipal Utilities Association

Kelly Gardner
San Gabriel Valley Water Association

Nick Blair
Association of California Water Agencies

California Association of Sanitation Agencies

CA-NV AWWA

California Association of Mutual Water Companies

WateReuse California

Enclosures:
Attachment 1 – Technical Comments
Attachment 2 – Recent Studies on 1,4-Dioxane

CC:

Dr. Kristine Thayer, Director, OEHHA
Dr. David Edwards, Chief Deputy Director, OEHHA
Dr. Kimberly Gettmann, Deputy Director for Scientific Programs
Dr. Amy Gilson, Deputy Director for External and Legislative Affairs, OEHHA
Yana Garcia, Secretary for Environmental Protection, CalEPA
Scott Lichtig, Deputy Secretary for Environmental Policy, CalEPA
Anna Naimark, Deputy Secretary and Special Counsel for Water Policy, CalEPA

Joaquin Esquivel, Chair, SWRCB
Dorene D'Adamo, Vice Chair, SWRCB
Laurel Firestone, Member, SWRCB
Nichole Morgan, Member, SWRCB
Sean Maguire, Member, SWRCB
Eric Oppenheimer, Executive Officer, SWRCB
Darrin Polhemus, Deputy Director, Division of Drinking Water, SWRCB

Attachment 1

Technical Comments on the First Public Review Draft PHG for 1,4-Dioxane in Drinking Water

November 25, 2025

1. OEHHA's literature review should include additional critical publications.

OEHHA states that it conducted a "systematic review" of the available health effects literature. However, OEHHA's systematic review methodology, which is summarized in three pages in Appendix A, appears to be missing elements that are identified in authoritative papers and guidance as being critical to proper selection of key studies for health risk assessment, such as risk of bias analysis.[1] Moreover, neither the draft Technical Support Document (TSD), nor Appendix A, show how OEHHA applied the Appendix A methodology to individual studies, or the results of that analysis, which might help explain why certain studies were selected while others were rejected.

The draft Technical Support Document (draft TSD) states that OEHHA's literature review was updated through August 2023 (Appendix A, page 81), but the references listed on pages 71-80 only include four of nine papers relevant to the mode of action (MOA) for cancer effects from exposure to 1,4-Dioxane in drinking water, published between January 2020 and August 2023 (Lafranconi et al., 2021, Health Canada, 2021, Charkoftoki et al., 2022, and Chen et al., 2022). All nine papers were provided to OEHHA by SCWC in a letter to former OEHHA Director Dr. Loren Zeise, dated July 17, 2023 (see Attachment 2). Another paper missing from OEHHA's literature review is Lafranconi et al., 2023, which synthesizes the literature demonstrating a threshold MOA for liver tumors.[2] OEHHA's list of references also excludes other authoritative assessments that have identified a threshold MOA for cancer effects from exposure to 1,4-Dioxane, including the European Chemicals Authority (2022), the World Health Organization (2005), and the European Chemicals Bureau (2002). And although it does

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[1] See for example, National Academies of Sciences, Engineering, and Medicine, The Use of Systematic Review in EPA's Toxic Substances Control Act Risk Evaluations, 2021: https://nap.nationalacademies.org/catalog/25952/the-use-of-systematic-review-in-epas-toxic-substances-control-act-risk-evaluations.

[2] Lafranconi, M., Anderson, J., Budinsky, R., Corey, L., Forsberg, N., Klapacz, J., & LeBaron, M. J. (2023). An integrated assessment of the 1,4-dioxane cancer mode of action and threshold response in rodents. *Regulatory Toxicology and Pharmacology*, *142*(142), 105428. https://doi.org/https://doi.org/10.1016/j.yrtph.2023.105428

reference the Health Canada assessment, the draft TSD provides no direct analysis of that assessment, which demonstrates the lack of scientific basis for the genotoxic MOA and the scientific evidence supporting a clearly defined threshold MOA.

Attachment 2 also cites a new publication by Kirman et al., (2026) that is now available online at the Journal of Regulatory Toxicology and Pharmacology.[3] This publication reports the findings of a six-member panel of subject matter experts charged with evaluating the scientific literature on the cancer MOA. The panel evaluated multiple alternative MOAs, including the genotoxic MOA OEHHA proposes in the draft TSD, and concluded that the most likely MOA begins with a threshold event (metabolic saturation), followed by cytotoxicity, proliferative repair processes (regenerative hyperplasia), promotion of cells with DNA damage, and tumor formation in susceptible tissues.

Request: OEHHA should include an analysis of these additional studies in a revised draft TSD, and discuss how they relate to the weight of evidence for alternative, non-linear MOAs.

2. The weight of evidence supports a threshold MOA over a linear MOA.

OEHHA has not established the scientific basis for using the default linear extrapolation approach for cancer dose response assessment. OEHHA states in the "Risk Characterization" section of the draft TSD, that because the evidence of genotoxicity is mixed, "a genotoxic MOA for 1,4-Dioxane cannot be ruled out."[4] However, OEHHA's analysis here, and elsewhere in the TSD, does not address the relative weight of evidence for a genotoxic MOA compared to alternative, non-linear MOAs, despite the availability of methods to conduct quantitative weight of evidence comparisons to discern the most likely MOA.[5] The SCWC addressed the lack of evidence supporting a genotoxic MOA in its July 2023 letter to Dr. Zeise:

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[3] Kirman, C. R., Bus, J. S., Gupta, S., Klaunig, J. E., Meek, M. E., & Hays, S. M. (2026). Expert panel evaluation of the tumor modes of action for 1,4-dioxane and their implications for human risk assessment. *Regulatory Toxicology and Pharmacology*, *164*, 105950. https://doi.org/https://doi.org/10.1016/j.yrtph.2025.105950 https://www.sciencedirect.com/science/article/pii/S0273230025001825?via%3Dihub

[4] Office of Environmental Health Hazard Assessment, First Public Review Draft, 1,4-Dioxane in Drinking Water, September 2025, p. 67.

[5] See for example, Becker, R. A., Dellarco, V., Seed, J., Kronenberg, J. M., Meek, B., Foreman, J., Palermo, C., Kirman, C., Linkov, I., Schoeny, R., Dourson, M., Pottenger, L. H., & Manibusan, M. K. (2017). Quantitative weight of evidence to assess confidence in potential modes of action. *Regulatory Toxicology and Pharmacology*, *86*, 205–220. https://doi.org/https://doi.org/10.1016/j.yrtph.2017.02.017

> 1,4-dioxane is not mutagenic and there is no evidence that the dose response curve is linear at low doses. In its TSCA Risk Assessment, USEPA concluded "Based on the weight of scientific evidence, … there is some evidence for genotoxicity in vivo at high doses, but there is insufficient evidence to conclude that 1,4-dioxane is mutagenic or induces cancer through a mutagenic mode of action."[6] Reviews by all other authoritative bodies have also concluded that 1,4-dioxane is not likely mutagenic and only weakly genotoxic.[7] Genotoxicity has only been detected at high levels of exposure, typically greater than 1,000 parts per million (ppm) in drinking water used in animal studies. Based on available occurrence data, drinking water concentrations in North America rarely exceed the current USEPA health advisory reference concentration of 0.00035 ppm (0.35 µg/L).[8]

OEHHA's statements in the draft TSD regarding the scientific support for a genotoxic MOA suggests that ***any*** evidence of genotoxicity justifies the default policy to use a non-threshold approach and a linearized multistage (LMS) cancer model to calculate cancer potency, even if that evidence is weak and the weight of evidence supports a different mode of action. This is an untenable and unscientific position. The practical outcome of OEHHA's position is that, unless genotoxicity can be completely "ruled out," which would require evaluation of every conceivable theoretical genotoxic mechanism and definitive proof of the absence of genotoxicity in each case, all of OEHHA's cancer risk assessments will be based on a default methodology that ignores new scientific information and improved risk assessment methods. As we will discuss in the next section, this science policy position is also at odds with USEPA's cancer risk assessment guidelines.

In its TSCA (2020) Risk Evaluation, USEPA considered, but ultimately rejected, a threshold MOA for assessment of cancer risks from exposure to 1,4-Dioxane based on data gaps that raised questions about whether the MOA had been adequately

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[6] Office of Chemical Safety and Pollution Prevention, USEPA, Final Risk Evaluation for 1,4-Dioxane, EPA-740-R1-8007 (Dec. 2020), p. 170.

[7] Health Canada 2021; ECHA 2021, 2002; USEPA 2013; Agency for Toxic Substances and Disease Registry (ATSDR) 2012; World Health Organization (WHO) 2005; IARC 1999, National Industrial Chemicals Notification and Assessment Scheme (NICNAS) 1998. See Appendix B for complete citations.

[8] See USEPA, Occurrence Data from the Unregulated Contaminant Monitoring Rule, UCMR 3 (2013–2015) Occurrence Data (Jan. 2017). https://www.epa.gov/dwucmr/occurrence-data-unregulated-contaminant-monitoring-rule#3. Only 2.9% of municipal water systems reported exceeding the 0.00035 ppm reference concentration.

established. USEPA did not change approach in the 2024 revised Risk Evaluation. [8] OEHHA now has the benefit of additional scientific data from more recently published studies, including the just-published Kirman et al. paper that directly compares the level of confidence in a genotoxic MOA to a defined threshold MOA, and concludes that there is much greater confidence in the threshold MOA. This additional body of evidence reduces uncertainty in establishing a threshold MOA for cancer effects, enabling a more scientifically justified approach for risk assessment and for development of a more accurate PHG for 1,4-Dioxane.

It would also allow OEHHA to set a PHG for 1,4-Dioxane that conforms to the direction in the CSDWA to set the PHG at a safe dose response threshold if, as has been demonstrated in multiple government assessments and affirmed in recent scientific publications, "adequate scientific evidence" demonstrates that a safe dose response threshold exists (for 1,4-Dioxane). OEHHA's assertion that use of a non-threshold LMS model is the appropriate approach to calculate cancer potency "unless there is sufficiently compelling evidence" to justify an alternative approach[9] arbitrarily establishes a higher burden to justify departures from the default approach than the statute requires.

Request: OEHHA should reconsider its assumptions regarding genotoxicity and application of the LMS model and more thoroughly evaluate the weight of evidence supporting a threshold MOA for cancer effects.

3. OEHHA's proposed approach for the cancer PHG conflicts with USEPA's Cancer Risk Assessment Guidance.

OEHHA's choice of the default linear low-dose extrapolation for cancer dose-response analysis follows from its assertion that "the available evidence for a singular predominant mechanism for 1,4-Dioxane carcinogenesis is not conclusive."[10] However, this assertion overstates the weight of evidence supporting the default linear approach and understates the weight of evidence supporting the probable non-linear threshold MOA defined in the above noted publications. It also conflicts with USEPA's

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[8] See 2024 Final Revised Risk Determination for 1,4-Dioxane, available at https://www.epa.gov/system/files/documents/2024-11/2.-1-4-dioxane-.-revised-risk-determination-.-public-release-.-hero-.-nov-2024.pdf; 2024 Supplement to the 2020 Risk Evaluation for 2,4-Dioxane, available at https://www.epa.gov/system/files/documents/2024-11/1.-1-4-dioxane-.-supplement-to-the-risk-evaluation-.-public-release-.-hero.-nov-2024.pdf.

[9] Office of Environmental Health Hazard Assessment, First Public Review Draft, 1,4-Dioxane in Drinking Water, September 2025, p. 12.

[10] Id., p. 51.

Guidelines for Carcinogen Risk Assessment (EPA Guidelines), [11] the most comprehensive and authoritative cancer risk assessment guidance currently available, regarding selection of a dose-response approach.

Section 3.3.1 of the EPA Guidelines recommends linear extrapolation "when there are MOA data to indicate that the dose-response curve is expected to have a linear component below the [Point of Departure]." The EPA Guidelines offer as an example "agents that are DNA-reactive and have direct mutagenic activity," or where human exposures or body burdens are "near doses associated with key precursor events in the carcinogenic process." Neither of these conditions have been established for 1,4-Dioxane. The EPA Guidelines further stipulate that linear extrapolation is appropriate when the weight of evidence is inconclusive with respect to mode of action for a tumor site, and ***"when scientifically plausible based on the available data"*** (emphasis added). While OEHHA asserts that the weight of evidence supporting one MOA over another is inconclusive, it certainly has not established based on the available data that a genotoxic MOA is biologically plausible at typical human exposure levels. The consequence of choosing the default approach over a more scientifically plausible threshold MOA is a lower point of departure for calculating a PHG, which results in a PHG that may be substantially lower than necessary to meet the statutory requirement to "set the PHG at the level of the contaminant in drinking water that does not pose any significant risk to (public) health."

OEHHA also disregards USEPA's recommendation to present results based on more than one approach when "alternative approaches ***with significant biological support are available for the same tumor response and no scientific consensus favors a single approach,"*** (emphasis added). The lack of a comparative analysis of the above noted threshold PHG and OEHHA's proposed genotoxic MOA-based PHG in the draft TSD fundamentally undermines the transparency of OEHHA's cancer risk assessment for 1,4-Dioxane.

Request: OEHHA should follow the recommendations in USEPA's Guidelines for Carcinogen Risk Assessment and evaluate a threshold MOA for comparison to the default linear MOA in the draft PHG.

4. OEHHA's cancer risk assessment would be more reliabile with increased transparency.

The fact that several other jurisdictions have developed and approved health assessments based on threshold MOAs for liver cancer helps to establish the likelihood

[11] US EPA, Guidelines for Carcinogen Risk Assessment, March 2005.

of this MOA. USEPA's decision to disregard its own Guidance in its 2013 IRIS assessment, and again in its 2020 and 2024 (revised) TSCA Risk Evaluation, is not sufficient justification for OEHHA to follow USEPA's approach in developing a PHG for 1,4-Dioxane, especially in light of the several additional studies that have been published since USEPA completed its 2020 TSCA Risk Evaluation that add to the weight of evidence supporting a threshold MOA for liver cancer. Evaluating this approach alongside OEHHA's proposed linear extrapolation would at least allow for a direct comparison of the two approaches, including an evaluation of the relative weight of evidence and uncertainty of each approach. This step would greatly improve the transparency of OEHHA's draft TSD, and public confidence in the proposed PHG.

OEHHA's failure to conduct a comparative analysis of alternative cancer PHGs is also a barrier to determining which methodology best achieves OEHHA's statutory mandate to "set the PHG at a level that does not pose any ***significant*** risk to [public] health" (emphasis added). The CSDWA does not define what level of cancer risk constitutes a "significant risk." For purposes of developing PHGs, OEHHA has interpreted this term to mean an increase of one theoretical cancer case per million people exposed to the subject contaminant in drinking water. This default cancer risk benchmark is an order of magnitude lower than the "no significant risk" threshold established in the Safe Drinking Water and Toxic Enforcement Act (Proposition 65) to warn the public about potential exposures to chemicals "known to the State of California to cause cancer." It is also much more conservative than the plain meaning of the word "significant" would suggest in this context. The Cambridge Dictionary defines "significant" as "important, large, or great, especially in leading to a different result or to an important change." OEHHA's approach yields a PHG that is likely well below a level that corresponds to an "important, large, or great" cancer risk, and as noted in our cover letter, an overreaching PHG based on a scientifically implausible genotoxic MOA is likely to have negative real-world consequences.

Request: OEHHA should separately calculate an alternative PHG based on a threshold MOA and compare it to the linear extrapolation in the draft PHG to evaluate the relative weight of evidence and uncertainty of each approach.

5. **OEHHA's proposed cancer PHG does not reflect a complete evaluation of the available evidence and leads to incorrect conclusions.**

In addition to the above-noted gaps in OEHHA's literature review and the scientific basis for its proposed approach to dose-response assessment, there are several anomalies

in OEHHA's interpretation of the studies it used in developing the draft cancer PHG that lead to the wrong conclusions, including but not limited to those identified in the following examples.

Among the critical errors in the draft TSD is OEHHA's decision to use the female mouse data from Kano et al. (2009) as the point of departure for cancer risk assessment, despite the long-standing controversy regarding the tumor response observed in this study. OEHHA acknowledges on page 58 of the draft TSD that there was significant mortality among female mice early in the study. Kano et al. (2009) also reported a high incidence of background tumors in the control group and an exceptionally high incidence of combined tumors in female mice at the lowest tested dose, which conflicts with the findings of earlier studies showing lower tumor incidence at comparable exposures (e.g., NCI, 1978). Health Canada also rejected Kano et al. (2009) as a basis for cancer risk assessment because other studies did not corroborate the low dose tumor findings. Moreover, since the data upon which the Kano et al. (2009) findings are based is not available, it is not possible for other scientists to replicate this study or to validate these incongruous results. For these reasons, Kano et al. (2009) should not be selected as a key study, much less used to establish the point of departure for the PHG calculation.

OEHHA also draws incorrect conclusions based on inadequate analysis of the available evidence. In Appendix F, on page 148, OEHHA states that "there are no specific mechanistic data to suggest deviation from the standard assumptions, including low dose linearity." However, the growing weight of evidence for 1,4-Dioxane, including the most recent publication by Kirman et al. (2025), demonstrates that metabolic clearance in animals is overwhelmed at high exposure levels, which leads to a cascade of events resulting in tumor formation. Recent research (Charkoftaki et al., 2021; Chen et al., 2022) has identified oxidative stress as a key downstream event, followed by cell damage and a repair process that leads to increased cell proliferation. These latter events in the cancer MOA are demonstrated in some of the studies included in OEHHA's list of references (e.g., Dourson et al., 2014, 2017; Kano et al., 2008; Kasai et al., 2009; Kociba et al., 1974; Stott et al., 1981; Lafranconi et al., 2021; Miyagawa et al., 1999), but OEHHA's analysis of these studies appears to be incomplete. For example, OEHHA's analysis of Lafranconi (2021) is limited to an evaluation of sub-chronic effects and does not consider the additional data this study provides on 1,4-Dioxane's cancer MOA.

OEHHA acknowledges on page 28 that "The majority of in vitro studies indicate that 1,4-Dioxane is not genotoxic," and that USEPA concluded in its 2013 risk evaluation that

"1,4-Dioxane is nongenotoxic or weakly genotoxic based on results from in vitro studies." These findings are consistent with those of every other regulatory agency that has evaluated the carcinogenic potential of 1,4-Dioxane. However, OEHHA disregards these findings in favor of a conclusion it attributes to USEPA's 2020 TSCA risk evaluation that "1,4-dioxane is genotoxic in vivo at high doses based on bone marrow micronucleus assays." This statement misrepresents the actual conclusion in USEPA's 2020 risk evaluation, which focuses on the lack of evidence indicating that 1,4-Dioxane induces cancer through a mutagenic MOA:

> "[b]ased on the weight of scientific evidence, EPA concluded that there is some evidence for genotoxicity *in vivo* at high doses, but there is insufficient evidence to conclude that 1,4 -dioxane is mutagenic or induces cancer through a mutagenic mode of action."[12]

OEHHA offers other hypotheses regarding how 1,4-Dioxane might induce a genotoxic response, such as the possibility that metabolites of 1,4-dioxane are mutagenic,[13] DNA strand breaks,[14] and deficiencies in experimental systems,[15] but it does not provide scientific evidence demonstrating that these hypotheses are relevant to the 1,4-Dioxane cancer MOA. OEHHA also fails to acknowledge studies demonstrating that 1,4-Dioxane does not cause direct DNA damage (e.g., Scott et al., 1981).

Request: These and other needs underscore the importance of a comprehensive revision of the draft TSD and the PHG calculation.

6. OEHHA's reliance on multiple improbable default assumptions results in a PHG that is likely to overstate cancer risk.

To calculate a point of departure for 1,4-Dioxane risk assessment, OEHHA starts with a one in 1 million cancer risk benchmark, then employs the conventional default assumption that 1,4-Dioxane is a direct-acting mutagen and uses a linear extrapolation to predict human cancer risk at low doses from high dose animal data. In this case, reliance on the default linear approach, which conflicts with the weight of evidence, results in a lower point of departure for the PHG calculation.

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[12] Office of Chemical Safety and Pollution Prevention, USEPA, Final Risk Evaluation for 1,4-Dioxane, EPA-740-R1-8007 (Dec. 2020), page 170.
[13] Office of Environmental Health Hazard Assessment, First Public Review Draft, 1,4-Dioxane in Drinking Water, September 2025, page 45.
[14] Id., page 45.
[15] Id., page 46.

OEHHA then uses default Age Sensitivity Factors (ASF) to account for the possibility that early life stages (e.g., fetus, infant, child) may be more susceptible to adverse health effects from exposures to 1,4-Dioxane. OEHHA does not cite any scientific evidence supporting this adjustment, even though the law that directs OEHHA to consider differential susceptibility for infants and children expressly indicates that such adjustments are required "where data permit."[16] Rather, OEHHA states that default ASFs "are applied regardless of the mechanism of action, unless chemical-specific data exist to better guide the risk assessment."[17] This policy decision also conflicts with the language in the CSDWA requiring OEHHA to consider disproportionate effects on infants, children and other sensitive subgroups "to the extent information is available."[18] The default ASFs magnify the effect of OEHHA's default drinking water intake rates, which already account for differences in exposures during early life stages. OEHHA's default drinking water intake rates are also improbably high for early life stages. For example, OEHHA assumes a third trimester fetus drinks 0.047 liters per kilogram of body weight per day (L/kg-d). For an average 3.4 kg fetus (US EPA 2011), that assumption corresponds to a ***tap water*** intake of 0.16 liters per day (L/d). For a 0-2 year old child, OEHHA assumes a rate of 0.196 L/kg-d, which for the average 11.4 kg-child translates to 2.2 liters, or more than half a gallon of tap water per day.

The result of relying on these extremely conservative and scientifically unsupported policy decisions in the PHG calculation is an estimate that may substantially overpredict cancer risk even for the most sensitive populations.

Request: OEHHA should utilize more realistic worst-case assumptions for early life stage exposures and avoid double counting exposure parameters in the PHG calculation.

Attachment 2

[16] The Age Sensitivity Factor (ASF) was introduced by OEHHA in 2009 in the *Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures*. The ASF was developed in response to SB 25 (Escutia, 1999). OEHHA states "Under SB 25, OEHHA is mandated to consider infants and children specifically, ***where data permit***, in evaluating the health effects of Toxic Air Contaminants (TACs)" (emphasis added).

[17] Office of Environmental Health Hazard Assessment, First Public Review Draft, 1,4-Dioxane in Drinking Water, September 2025, p. 65.

[18] Health and Safety Code § 116365(c)(1)(C)(ii).

1,4-Dioxane Studies Published Since USEPA's TSCA Risk Assessment (2020)

November XX, 2025

1. Kirman, C.R. Bus, J.S., Gupta S., Klaunig, J.E., Meek, M.E., Hays, S.M. (2026). Expert panel evaluation of the tumor modes of action for 1,4-Dioxane and their implications to human risk assessment. Regulatory Toxicology and Pharmacology. https://www.sciencedirect.com/science/article/pii/S0273230025001825?via%3Dihub

2. Chappell, G. A., Heintz, M. M., & Haws, L. C. (2021). Transcriptomic analyses of livers from mice exposed to 1,4-dioxane for up to 90 days to assess potential mode(s) of action underlying liver tumor development. Current Research in Toxicology, 2, 30–41. https://www.sciencedirect.com/science/article/pii/S2666027X21000037?via%3Dihub

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