Human Health Risk Assessment for 1,4-Dioxane in Drinking Water Briefing and Request

NC Secretaries' Science Advisory Board – Dec 4, 2024

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Human Health Risk Assessment for 1,4-Dioxane in Drinking Water Briefing and Request

BRIEFING:

SHORT SUMMARY OF REPORT AND PREVIOUS PRESENTATION GIVEN TO SAB DURING AUG 2024 MEETING

REQUEST:

FORMALLY REVIEW THE REPORT AS AN EXTERNAL ENTITY FROM DEQ; PROVIDE OFFICIAL RECOMMENDATION TO DEQ

Legislative Report Details and Timeline

Sept 2023:

NC General Assembly directed DEQ to *prepare a human health risk assessment of 1,4-dioxane in drinking water supported by peer-reviewed scientific studies.*

Dec 2023:

NC SSAB discussed the difficulty in meeting the legislative timeline and recommended a strategy to meet the requirements in the time given

Jan 2024:

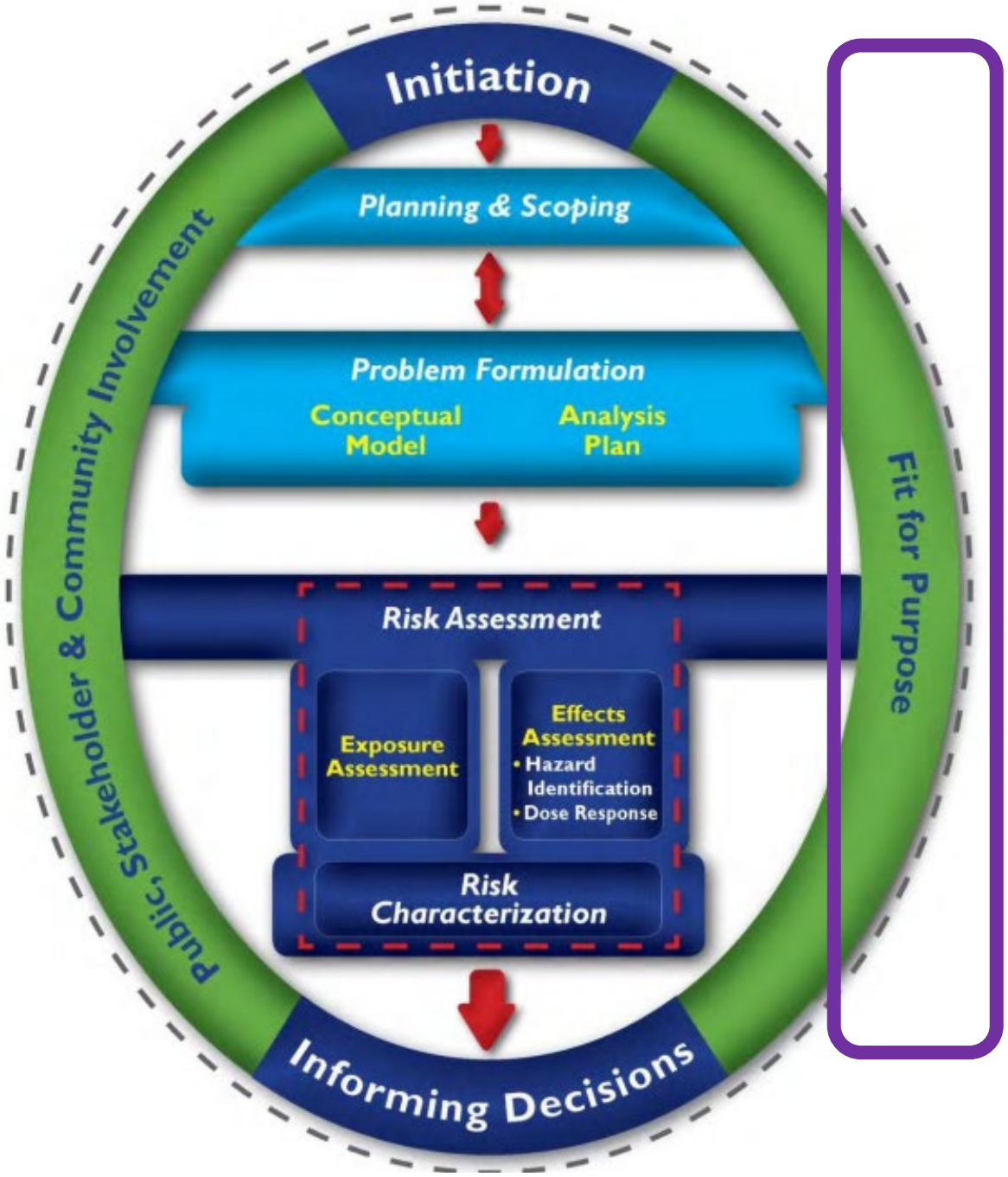
DEQ followed the strategy the SSAB suggested and convened a group of experts to begin the directive activities.

May 1, 2024:

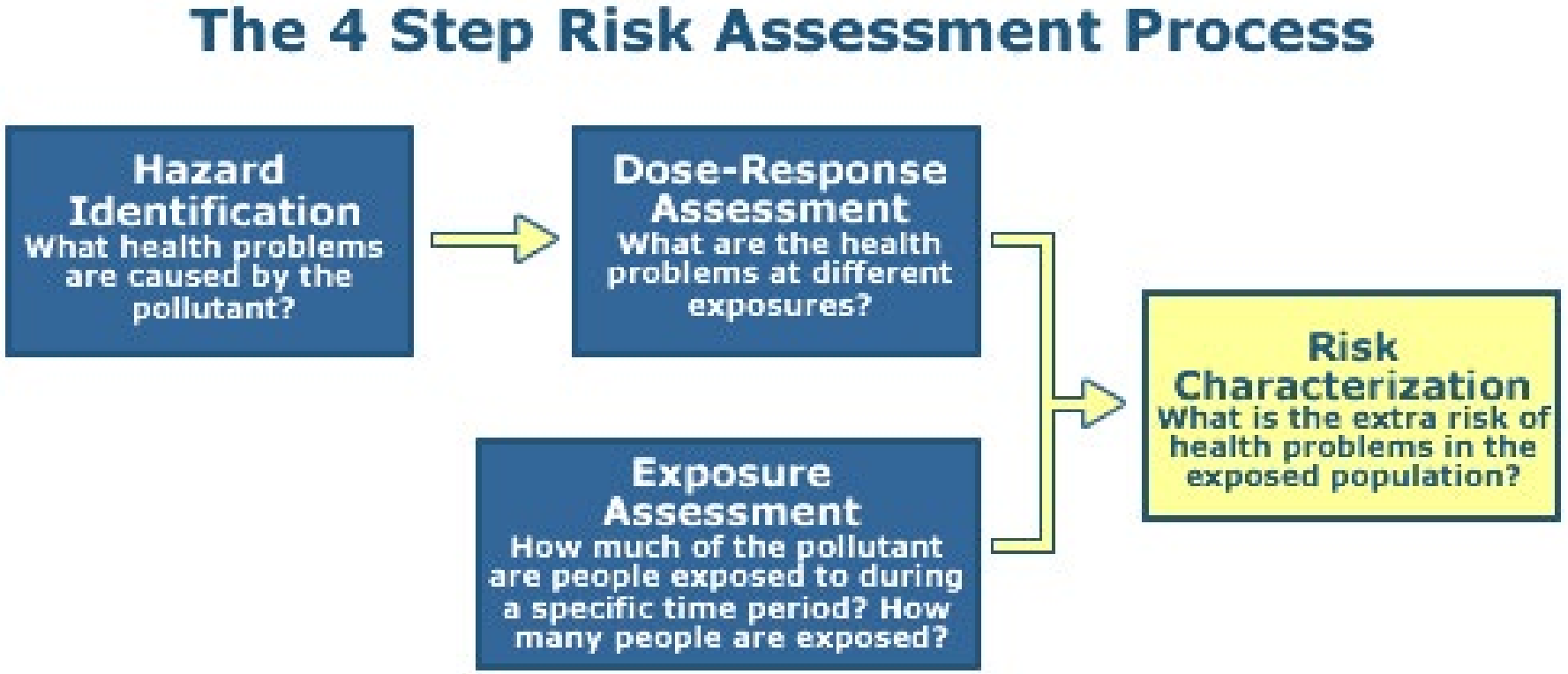
DEQ delivered the assessment to the Joint Legislative Commission on Governmental Operations.

Overall Approach

EPA's HHRA for Decision Making Framework



Risk Assessment Components



Exposure Assessmen Data Analysis

- Environmental Occurrence: DEQ surface water (SW), DEQ wastewater (WW), drinking water utility raw/intake water (*i.e.,* surface or ground water) from 2013 through 2023,
- Pre-Regulatory Efforts – Drinking water utility finished water from 2014 through Dec 2021.
- Post-Regulatory Efforts – Drinking water utility finished water from Jan 2022 through present (most recent data retrieved January 2024).

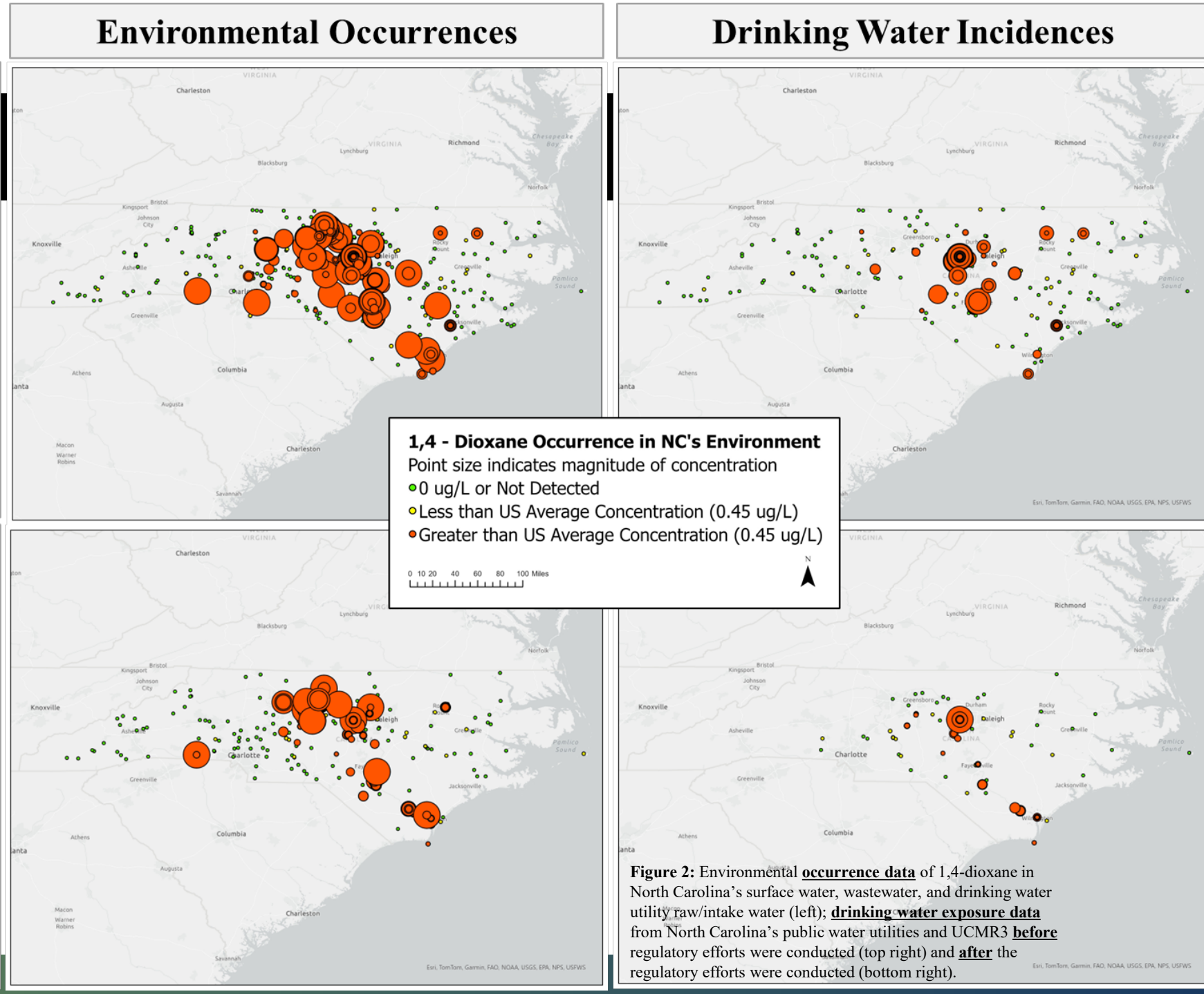


Figure 2: Environmental **occurrence data** of 1,4-dioxane in North Carolina's surface water, wastewater, and drinking water utility raw/intake water (left); **drinking water exposure data** from North Carolina's public water utilities and UCMR3 **before** regulatory efforts were conducted (top right) and **after** the regulatory efforts were conducted (bottom right).

Exposure Assessment – Summary

The data examined in this report indicate the following:

1. Most North Carolinians outside of the Cape Fear River Basin are not exposed to 1,4-dioxane at concentrations above the UCMR3 national average.
2. Some of those who are exposed within the Cape Fear River Basin are exposed to the third highest drinking water concentrations in the nation (UCMR3 Data).
3. Regulatory attention focused to reduce concentrations led to decreased 1,4-dioxane environmental and drinking water exposure in the Cape Fear River Basin in NC.
4. The public outreach efforts regarding 1,4-dioxane exposure in drinking water resulted in many locations in NC decreasing 1,4-dioxane exposure outside of the Cape Fear River Basin due to voluntary and/or other actions.

NORTH CAROLINA
Department of Environmental Quality

Effects Assessment – Summary

The Effects Analysis sections highlighted,

1. The EPA and Health Canada assessments agree that oral exposure to 1,4-dioxane causes carcinogenic effects in the liver, and that the carcinogenic liver effects MOA are the most well-understood.
2. The EPA IRIS assessment provides the most consistent value across regulated chemicals, and with federal and other state regulatory programs.
    1. There have been a few peer-reviewed scientific publications since both assessments were produced, but there are not enough additional data to support non-linear low-dose extrapolation approach for all target organs.
3. The CSF provided by the EPA IRIS assessment of 0.1 mg/kg-day was derived using the most health protective modeling approach and will provide science-based protection to North Carolinians from exposure to 1,4-dioxane in their drinking water.

Risk Characterization– Data Analysis

While the drinking water in NC is a source of 1,4-dioxane exposure at higher concentrations than the national values, the entire country is exposed to 1,4-dioxane in concentrations above the value that is predicted to cause one case of cancer in a million people (0.35 µg/L)

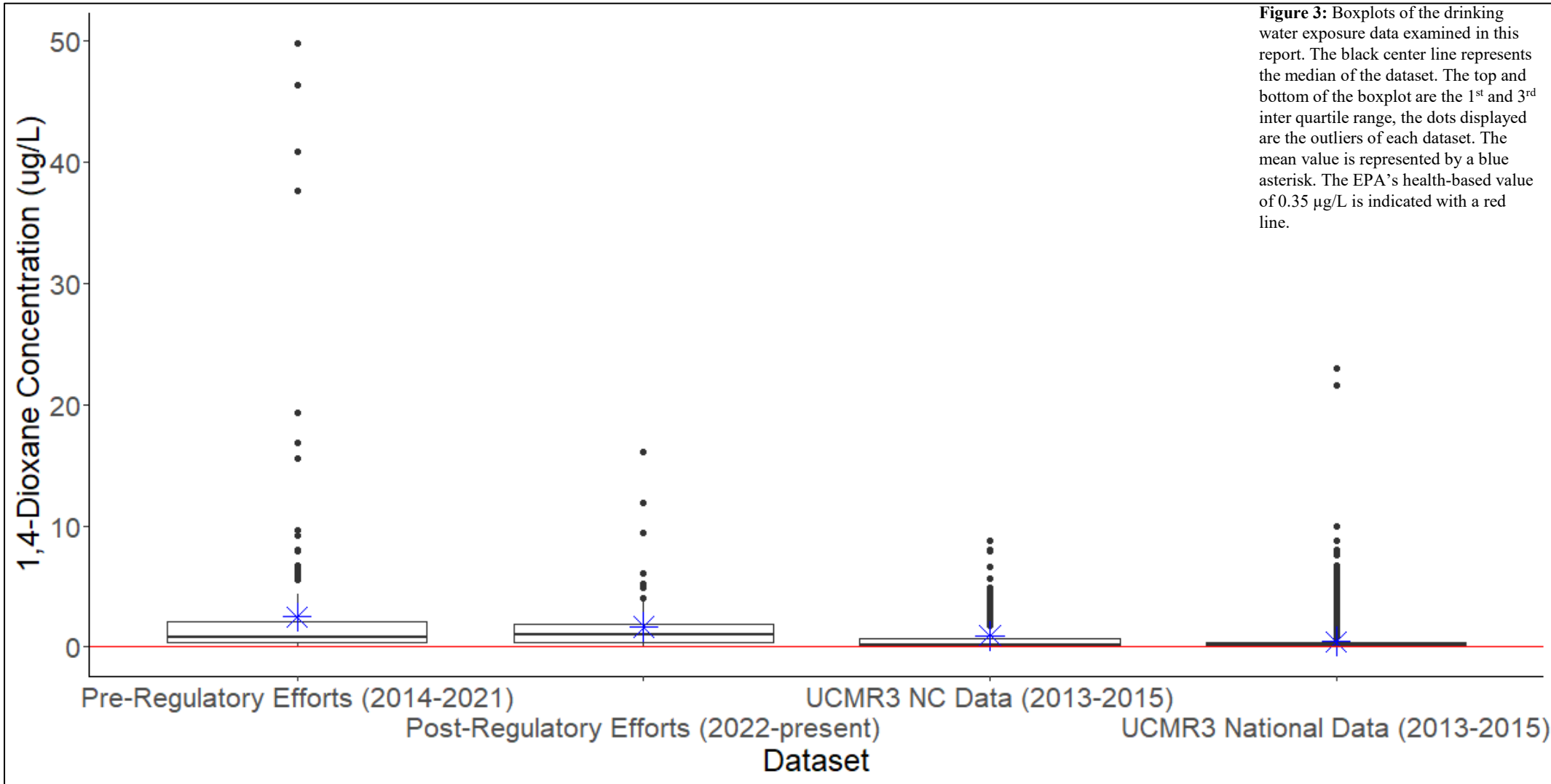


Figure 3: Boxplots of the drinking water exposure data examined in this report. The black center line represents the median of the dataset. The top and bottom of the boxplot are the 1st and 3rd inter quartile range, the dots displayed are the outliers of each dataset. The mean value is represented by a blue asterisk. The EPA's health-based value of 0.35 µg/L is indicated with a red line.

Risk Characterization – Summary

This report uses the exposure data and health-based values for cancer endpoint dose response information to determine how the risk in NC compares to the national risk.

Based on the risk assessment, it is concluded that NC's residents are exposed to 1,4-dioxane concentrations that may be two times the national average in drinking water and as much as 4 times national averages in surface and groundwater.

Based on the UCMR3 data, North Carolinians experienced approximately half the protection than the rest of the nation received from 1,4-dioxane in drinking water from 2013-2015 (NC UCMR3 = 38%; US UCMR3 = 78%).

Request to the Board

Request:
DEQ is asking the NC SSAB to review the 1,4-Dioxane HHRA Report and provide formal feedback regarding the study approach and conclusions that were in response to the Legislative Directive to assess the human cancer risk to 1,4-Dioxane in drinking water in North Carolina.

Charge Question (draft):
Are the approach of the HHRA report and are the findings of the report ~~scientifically defensible?~~

Suggested Revision:
Is approach reasonable- literature search, quality assessment

Human Health Risk Assessment Report is Available

Report is available here:

https://www.deq.nc.gov/legislative-reports/14-dioxane-drinking-water-human-health-risk-assessment/open