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REQUEST FOR PROPOSALS (RFP)

Technologies and Approaches to Minimize Brominated and Iodinated DBPs in Distribution Systems (RFP 5122)

Due Date: Proposals must be received by **3:00 pm Mountain Time** on **Tuesday, September 28, 2021**

WRF Project Contact: Katie Spahr, PhD, PE, kspahr@waterrf.org

Project Sponsors

This project is funded by The Water Research Foundation (WRF) as part of WRF's Research Priority Program.

Project Objectives

This project aims to develop creative and novel techniques and approaches to minimize the formation of currently unregulated brominated and iodinated disinfection byproducts (DBPs) in the distribution system considering practical applicability and economic feasibility in the operation of existing treatment systems.

Budget

Applicants may request up to \$250,000 in WRF funds for this project. WRF funds requested and total project value are evaluation criteria considered in the proposal selection process.

Background and Project Rationale

Bromide is ubiquitous in natural waters. Elevated bromide concentrations are commonly associated with coastal seawater intrusion and source geological formations. In recent years, higher bromide concentrations have been observed in inland surface waters as a result of anthropogenic activity, including (i) treated and untreated wastewater and other industrial discharges into rivers, streams, and lakes; (ii) residues from process/flowback waters from hydraulic fracturing operations; and (iii) wastewater from wet scrubbers in coal-fired power plants. Iodide occurrence in raw water is also naturally linked to seawater intrusion and contact with geological formations. Anthropogenic sources of iodide include commercial and household products that can persist through municipal wastewater treatment and produced water from oil and gas operations. WRF Project 4711 recently reported iodide concentrations in over 700 samples co-analyzed with bromide ion during UCMR4 sampling of raw waters and found that 46% of surface waters and 64% of groundwaters contained iodide above the detection

limit of 1 µg/L. Overall, the range of iodide concentrations was below the detection limit to 252 µg/L (50th percentile < 1 µg/L; 75th percentile = 5 µg/L; 95th percentile = 26 µg/L). Using all the raw water data reported in UCMR4, the median bromide concentration is 39 µg/L (n=2405 samples) and 64 µg/L (n=9447 samples) in surface and ground waters, respectively.

Bromide and iodide in drinking water supplies may increase health risks to consumers by promoting the formation of unregulated brominated and/or iodinated DBPs, which are generally more cyto- and genotoxic in *in vitro* assays than their chlorinated counterparts (i.e., trihalomethanes [THMs] and haloacetic acids [HAAs]). As these unregulated HAAs are considered probable human carcinogens, the U.S. Environmental Protection Agency is considering regulating these additional HAAs, whether with enforceable standards or treatment techniques. Overall, increases in bromide and iodide levels increase and shift the total organic halogen (TOX) speciation in treated waters. However, total organic bromine (TOBr) and total organic iodine (TOI) levels have been neither widely reported nor measured in distribution systems. There is a need to understand better the speciation of TOX in distribution systems and closer to the point of human exposure. Most prior studies on emerging DBPs have focused on formation and levels within water treatment plants instead of the inclusion of distribution systems where different disinfectants, biofilms, and storage conditions may influence DBP formation.

Unit processes designed to remove organic matter (e.g., enhanced coagulation, granular activated carbon [GAC] adsorption) result in lower total organic carbon (TOC) concentrations but do not remove bromide or iodide. Thus, these processes can increase the Br/TOC or I/TOC ratios, shifting DBP speciation towards brominated or iodinated DBP species (although overall DBP levels may be lower due to TOC removal). The particular composition of the organic carbon mixture in raw waters may further influence halogen incorporation patterns. Raw waters present a unique set of treatment and management tradeoffs for water utilities to consider, and the presence of bromide and iodide can add additional complexity due to the increased public health threat associated with their resulting DBPs.

Developing new and cost-effective treatment processes or practices and/or modifying distribution system management approaches offer opportunities to minimize the formation of brominated and iodinated DBPs. These approaches could reduce public health risks independent of whether additional brominated or iodinated DBPs are ultimately regulated.

Research Approach

1. Propose treatment techniques or management approaches for water treatment plants and/or water systems based upon existing literature and current practices to minimize the formation of unregulated brominated and iodinated DBPs in drinking water supplies (including distribution system techniques/approaches). The cost and technology readiness level of the proposed approaches should be considered.
2. Quantify occurrence of unregulated brominated and iodinated DBPs beyond water treatment plants and into distribution systems.
3. Conduct bench-, pilot-, and/or full-scale studies, as appropriate, to test the proposed approaches to control unregulated brominated and iodinated DBPs exposures to consumers.

4. Based on the study results, provide an analysis of feasibility and practical applicability of the various evaluated approaches for implementation, considering differences in water sources and distribution system residual disinfectants.
5. Prepare guidance for water utilities for the adoption of the selected approaches.

Expected Deliverables

Prepare a final report that will summarize feasible, cost-effective, and practical solutions for minimizing the formation of unregulated brominated and iodinated DBPs in treated waters that will significantly reduce the public exposure to these compounds with known adverse health effects.

Communication Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communication plan. The guidelines are available at <https://www.waterrf.org/project-report-guidelines>. Conference presentations, webcasts, peer review publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 18 to 24 months from the contract start date.

Proposal Evaluation Criteria

The following criteria will be used to evaluate proposals:

- Understanding the Problem and Responsiveness to RFP (maximum 20 points)
- Technical and Scientific Merit (maximum 30 points)
- Qualifications, Capabilities, and Management (maximum 20 points)
- Communication Plan, Deliverables, and Applicability (maximum 15 points)
- Budget and Schedule (maximum 15 points)

Proposal Preparation Instructions

Proposals submitted in response to this RFP must be prepared in accordance with the WRF document *Guidelines for Research Priority Program Proposals*. The current version of these guidelines is available at <https://www.waterrf.org/proposal-guidelines>, along with *Instructions for Budget Preparation*. The guidelines contain instructions for the technical aspects, financial statements, indirect costs, and administrative requirements that the applicant must follow when preparing a proposal.

Proposals that include the production of web- or software-based tools, such as websites, Excel spreadsheets, Access databases, etc., must follow the criteria outlined for web tools presented in the Web Tool Criteria and Feasibility Study for The Water Research Foundation Project Deliverables at <https://www.waterrf.org/sites/default/files/file/2021-07/WebToolCriteria.pdf>.

Eligibility to Submit Proposals

Proposals will be accepted from domestic or international entities, including educational institutions, research organizations, governmental agencies, and consultants or other for-profit entities.

WRF's Board of Directors has established a Timeliness Policy that addresses researcher adherence to the project schedule. The policy can be reviewed at <https://www.waterrf.org/policies>. Researchers who are late on any ongoing WRF-sponsored studies without approved no-cost extensions are not eligible to be named participants in any proposals. Direct any questions about eligibility to the WRF project contact listed at the top of this RFP.

Administrative, Cost, and Audit Standards

WRF's research program standards for administrative, cost, and audit compliance are based upon, and comply with, Office of Management and Budget (OMB) Uniform Grants Guidance (UGG), 2 CFR Part 200 Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, and 48 CFR 31.2 Contracts with Commercial Organizations. These standards are referenced in WRF's *Guidelines for Research Priority Program Proposals*, and include specific guidelines outlining the requirements for indirect cost negotiation agreements, financial statements, and the Statement of Direct Labor, Fringe Benefits, and General Overhead. Inclusion of indirect costs must be substantiated by a negotiated agreement or appropriate Statement of Direct Labor, Fringe Benefits, and General Overhead. Well in advance of preparing the proposal, your research and financial staff should review the detailed instructions included in WRF's *Guidelines for Research Priority Program Proposals* and consult the *Instructions for Budget Preparation*, both available at <https://www.waterrf.org/proposal-guidelines>.

Budget and Funding Information

The maximum funding available from WRF for this project is \$250,000. The applicant must contribute additional resources equivalent to at least 33 percent of the project award. For example, if an applicant requests \$100,000 from WRF, an additional \$33,000 or more must be contributed by the applicant. Acceptable forms of applicant contribution include cost-share, applicant in-kind, or third-party in-kind that comply with 2 CFR Part 200.306 cost sharing or matching. The applicant may elect to contribute more than 33 percent to the project, but the maximum WRF funding available remains fixed at \$250,000. **Proposals that do not meet the minimum 33 percent of the project award will not be accepted.** Consult the *Instructions for Budget Preparation* available at <https://www.waterrf.org/proposal-guidelines> for more information and definitions of terms.

Period of Performance

It is WRF's policy to negotiate a reasonable schedule for each research project. Once this schedule is established, WRF and its sub-recipients have a contractual obligation to adhere to the agreed-upon schedule. Under WRF's No-Cost Extension Policy, a project schedule cannot be extended more than nine months beyond the original contracted schedule, regardless of the number of extensions granted. The policy can be reviewed at <https://www.waterrf.org/policies>.

Utility and Organization Participation

WRF encourages participation from water utilities and other organizations in WRF research. Participation can occur in a variety of ways, including direct participation, in-kind contributions, or in-kind services. To facilitate their participation, WRF has provided contact information, on the last page of this RFP, of utilities and other organizations that have indicated an interest in this research. Proposers are responsible for negotiating utility and organization participation in their particular proposals. The listed utilities and organizations are under no obligation to participate, and the proposer is not obligated to include them in their particular proposal.

Application Procedure and Deadline

Proposals are accepted exclusively online in PDF format, and they must be fully submitted before 3:00 pm Mountain Time on Tuesday, September 28, 2021.

The online proposal system allows submission of your documents until the date and time stated in this RFP. Submit your proposal at <https://forms.waterrf.org/212005647211846>

Please ensure you upload the required documents before the deadline. **Proposals submitted after the deadline will not be accepted.**

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Katie Spahr, PhD, PE at (303) 734-3478 or kspahr@waterrf.org. Questions related to proposal submittal through the online system may be addressed to Caroline Bruck at (303) 347-6118 or cbruck@waterrf.org.

Utility and Organization Participants

The following utilities have indicated an interest in possible participation in this research. This information is updated within 24 business hours after a utility or an interested organization submits a volunteer form, and this RFP will be re-posted with the new information. **(Depending upon your settings, you may need to click refresh on your browser to load the latest file.)**

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