THE Water Research FOUNDATION

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REQUEST FOR PROPOSALS (RFP)

Successful Implementation of Decentralized Reuse and Treatment Systems (RFP 5040)

Due Date: Proposals must be received by 2:00 pm Mountain Time
on **Thursday, September 12, 2019**

WRF Project Contact: Katie Henderson, khenderson@waterrf.org

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

Project Objective
To evaluate the experiences of water utilities that have or are currently integrating decentralized reuse and treatment systems into their portfolios through answering the following questions:

- What are the key drivers, decision factors, and costs?
- How do successfully implemented decentralized systems balance impacts to water quality and quantity, internal operations, relationships with other water agencies and the local government, business community, and general community so as to provide social equity?

Budget
Proposals may request up to **$150,000** in WRF funds for this project. WRF funds requested and total project value will be an evaluation criteria considered in the proposal selection process.

Background and Project Rationale
This project was developed through the *IWM: Planning for Future Water Supplies* Research Area, which was formed in 2015 to provide research to support reliable and sustainable water supplies through water supply diversification, and is supervised by an Advisory Committee of experts from across the water sector.

More utilities are developing diversified water supply portfolios through treatment and use of gray water, stormwater, rainwater, black water, and wastewater. Potable and non-potable reuse began in the United States in the 1990s with centralized wastewater treatment systems (Asano et al., 2008). Decentralized water reuse options have been explored and practiced in the United States by individual utilities and developers, and they are becoming more common. Utilities may consider decentralized treatment systems when determining how best to provide service to a new community without an expensive capital expansion, or in response to a developer who wants to or is required to recycle water

onsite for a new project. Decentralized wastewater treatment and reuse may be an appropriate way to meet a community's future water supply needs or sustainability goals.

Decentralized options exist along a scale, from onsite individual systems to larger cluster systems, and can include engineered treatment systems or natural processes (Novotny et al., 2010; Xue et al., 2016). Decentralization is considered key to the new management framework proposed by many thought leaders, but its implementation will carry challenges, from planning, design, and operation to policy and community engagement (Humphreys et al., 2006; Hering et al., 2013; Xue et al., 2015; Goodwin et al., 2019).

Overall, deciding which type and how to integrate decentralized options into an existing water supply portfolio is a challenging decision-making process. Fortunately, many water utilities are incorporating reclamation and reuse into their supply portfolios and are using WRF research to do so. There has been considerable WRF investment in this research area, including the robust decision-making analysis of alternative supplies (4615), understanding their treatment requirements (4665), planning for the inevitable trade-offs that these supplies introduce (4715), integrating supply planning with land use planning (4623), applying these approaches at smaller utilities (4970), and overall planning (4008) and management of reuse systems (SIWM10C15). The next step is compiling real world data from, and examples of, utilities that have or are currently exploring or actively incorporating decentralized reuse into their portfolios.

While evaluating their options, utilities must consider the optimal design and configuration of these reuse systems: should they be centralized (where wastewater is treated at a centralized location and then distributed), or decentralized (where there are points along the collection and distribution systems where water is treated and reused more than once before reaching a wastewater treatment plant)? Decentralized treatment systems are increasingly implemented for their cost savings compared to centralized reuse and distribution systems (e.g., Wood et al., 2015), and can include sewer mining, onsite non-potable or potable reuse systems, constructed wetlands, and several other options (Hering et al., 2013).

Decentralized systems are designed based on local needs and contexts and vary in terms of drivers, costs, governance models, outcomes, and configuration. With so many options, it is a challenge for those managing urban water utilities to select an optimal system to fit their specific needs (Daigger and Crawford, 2007). Due to the variability of utility geographies, contexts, challenges, and drivers, one-size-fits-all frameworks and tools only get them so far, and then the water planner must apply a site-specific approach. There are existing resources that can help, including the materials published by the Blue Ribbon Commission for On-Site Non-Potable Reuse Systems and the forthcoming guide on anticipating trade-offs of alternative supplies (WRF 4715).

The full array of management decisions facing a utility contemplating decentralized options has not yet been researched. Hence the need for a compendium of data analysis, examples, and case studies on decentralized systems.

Case studies and analysis should review decentralized systems *currently in use* or planned, including general system design and configuration, performance, and cost. A review of the tools or methods used to select the system, including community engagement or educational efforts, its governance structure (public/private), and any community benefits or risks that the system poses, is also needed.

Research Approach

The advisory committee recommends a robust exploratory case study approach that captures the real-life complexities of the implementation phase of decentralized water supply planning, and an in-depth analysis of the number, variety, and characteristics of these types of systems, to determine what factors are predictive of successful implementation and long-term sustainability. **Proposers are encouraged to propose other approaches and tasks if they will help meet or exceed the project objectives**. The following elements are recommended:

- How many of these systems are there in North America? A typology of these types of systems may be needed in order to determine how many of them there are.

- An analysis of current and planned decentralized treatment systems that reflect a wide range of design configurations, public/private governance structures (including Public-Private-Partnership configurations) and local considerations, both in the collection and distribution systems.

    - What are the drivers, analysis, and decision-making, (including regulatory issues, like CSOs), **associated costs**, and demonstrated outcomes from the system after it was installed?
    - What are the factors that lead to successful implementation and long-term sustainability of these systems? An analysis of unsuccessful projects may be needed for comparison.

- To the extent possible, analysis should include utilities of different sizes, with different governance structures and regulatory approaches (performance-based versus prescriptive standards), and across a range of geographic and climate zones (wet/dry/etc.).

- The extent and nature of community engagement utilized to aid in the selection process for the reuse system is of particular interest, as are any potential social changes that occurred along with its implementation. For example, how did the utility interact with building architects and developers?

- Case studies can come from both U.S. and international projects, but analysis that can provide useful data for decentralized system implementation in North America is a priority.

Expected Deliverables

- Final Report
- Compendium of Case Studies. The compendium should be organized so that readers can search for certain drivers and/or themes.
- **Other Deliverables** (Proposers are encouraged to identify other supporting deliverables that would help support the objectives of this RFP)
    - Video tours or interviews
    - Infographics or schematics of different decentralized system configurations.
    - Case study data added to the WateReuse 101 Map.
    - Webpages or databases.

Communications Plan
Please review WRF's *Project Deliverable Guidelines* for information on preparing a communications plan. The guidelines are available at http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx. 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 12-18 months from contract start date.

References and Resources
The following list includes examples of research reports, tools, and other resources that may be helpful to proposers. It is not intended to be comprehensive, nor is it a required list for consideration.

Cashman, S., J. Mosley, C. Ma, J. Garland, J. Cashdollar, D. Bless. Life Cycle Assessment and Cost Analysis of Water and Wastewater Treatment Options for Sustainability: Influence of Scale on Membrane Bioreactor Systems. Eastern Research Group, Inc. EPA Contract No. EP-C-12-021; U.S. Environmental Protection Agency: 2016; p 171.

Clark, M., S. Johnstone, A. Macrellis, D. Sarno, C. Sarno, K. Bergeron-Hale. 2007. Long-Range Planning for Decentralized Wastewater and Stormwater Treatment Research: Workshop Summary. The Water Environment & Reuse Foundation. Alexandria, VA.

Daigger, G.T and G.V. Crawford. 2007. Enhancing Water System Security and Sustainability by Incorporating Centralized and Decentralized Water Reclamation and Reuse into Urban Water Management Systems. Journal of Environmental Engineering & Management Vol. 17(1): 1-10.

Fedak, R., S. Sommer, D. Hannon, D. Beckwith, A. Nuding, L. Stitzer. 2018. Integrating Land Use and Water Resources: Planning to Support Water Supply Diversification. The Water Research Foundation. Denver, CO (WRF 4623).

Hering, J.G., et al. 2013. A Changing Framework for Urban Water Systems. Environmental Science & Technology. Vol. 47, 10721−10726.

Hill, C., D. Owen, S. Trussell, A. Evans, E. Houtz., S. Sriboonlue, S. Triolo, K. Thompson. 2018. Alternative Water Source Requirements for Conventional Drinking Water Treatment. The Water Research Foundation. Denver, CO (WRF 4665).

Howe, C., P. Mukheibir. 2015. Pathways to One Water: A Guide for Institutional Innovation. Water Environment Research Foundation. Alexandria, VA (WERF SIWM 2T12).

Huber-Lee, A., C. Swartz, J. Sieber, J. Goldstein, D. Purkey, C. Young, E. Soderstrom, J. Henderson, R. Roucher. 2006. Decision Support System for Sustainable Water Supply Planning. The Water Research Foundation. Denver, CO.

Humphreys, L.; TRG & Associates Marketing Nonpotable Recycled Water. A Guidebook for Successful Public Outreach & Customer Marketing; WateReuse Foundation: Alexandria, VA, 2006.

Goodwin, D., M. Raffin, P. Jeffrey, H.M. Smith. Stakeholder evaluations of risk interventions for non-potable recycled water schemes: A case study. Sci Total Environ 2019, 674, 439-450.Maheepala, S., J. Blackmore, C. Diaper, M. Moglia, A. Sharma, S. Kenway. 2010. Integrated Urban Water Management Planning Manual. The Water Research Foundation. Denver, CO (WRF 4008).

Makropoulos, C.K. and D. Butler. 2010. Distributed Water Infrastructure for Sustainable Communities. Water Resources Management 24: 2795.

Novotny, V., J. Ahern, P. Brown. 2010. Water Centric Sustainable Communities: Planning, Retrofitting, and Building the Next Urban Environment. John Wiley & Sons, Inc. Hoboken, NJ.

Paulson, E.G., M. Badruzzaman, E. Triana, C. Cherchi, N. Stewart, Y. Hsin. 2018. Framework for Evaluating Water Supplies: Balancing Cost with Reliability, Resilience, and Sustainability. The Water Research Foundation. Denver, CO (WRF 4615).

Prieto, A.L., D. Vuono, R. Holloway, J. Benecke, J. Henkel, T.Y. Cath, L. Johnson, J.E. Drewes, 2013. Decentralized Wastewater Treatment for Distributed Water Reclamation and Reuse: The Good, The Bad, and The Ugly—Experience from a Case Study.

Schoen, M. . XD. Xue, A. Wood, T.R. Hawkins, J. Garland, N.J. Ashbolt. Cost, energy, global warming, eutrophication and local human health impacts of community water and sanitation service options. Water Res 2017, 109, (1), 186-195.

Sharvelle, S.N. Ashbolt, E. Clerico, R. Hultquist, H. Leverenz, H., A. Olivieri. 2017. Risk-Based Framework for the Development of Public Health Guidance for Decentralized Non-Potable Water Systems. Water Environment & Reuse Foundation. Alexandria, VA. WE&RF Project No. SIWM10C15.

Stanford, B., A. Luck, R. Cisterna, P. Knowles, L. Shuler, Y. Liu, M. LeChevallier. 2013. Guidance for Implementing Reuse in New Buildings and Developments to Achieve LEED/Sustainability Goals. The WateReuse Foundation. Alexandria, VA. (WRRF 10-08).

Wood, A., M. Blackhurst, T. Hawkins, X. Xue, N. Ashbolt, J. Garland. Cost-effectiveness of nitrogen mitigation by alternative household wastewater management technologies. J Environ Manage 2015, 150, 344-54.

Xue, X., T.R. Hawkins, M.E. Schoen, J. Garland, N.J. Ashbolt. Comparing the life cycle energy consumption, global warming and eutrophication potentials of several water and waste service options. Water 2016, 8, (4), w8040154.

Xue, X., M.E. Schoen, X.C. Ma, T.R. Hawkins, N. Ashbolt, J. Cashdollar, J. Garland. Critical insights for a sustainability framework to address integrated community water services: Technical metrics and approaches. Water Res 2015, 77, 155-169.

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 http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx, 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.

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 http://www.waterrf.org/funding/Pages/policies.aspx. 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 http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx.

Budget and Funding Information
The maximum funding available from WRF for this project is **$150,000**. 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 **$150,000**. **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 http://www.waterrf.org/funding/Pages/proposal-guidelines.aspx 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 http://www.waterrf.org/funding/Pages/policies.aspx.

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 2:00 pm Mountain Time on Thursday, September 12, 2019. All proposal documents must be compiled into two (2) PDF files consisting of your technical review documents and your financial review documents. All forms and components of the proposal are available in the *Proposal Component Packet* zip file on the proposal website at https://proposals.waterrf.org/Pages/RFPs.aspx. An FAQ and a tutorial are also available. A login is required to access the proposal website and download the packet. Proposers are encouraged to create logins and verify the validity and compatibility of the system well in advance in order to avoid last-minute errors or delays.

The online proposal system allows submission of your documents until the date and time stated in this RFP. To avoid the risk of the system closing before you press the submit button, do not wait until the last minute to complete your submission.

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 Henderson at 303-347-6108 or khenderson@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 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.)**

N/A