REQUEST FOR PROPOSALS (RFP)

Implementing a Smart Sewer System to Optimize Capacity to Reduce Surface Flooding and Sewer Overflows (RFP 5297)

Date Posted
Monday, September 9, 2024

Due Date
Proposals must be received by 3:00 pm Mountain Time on Thursday, November 14, 2024.

WRF Project Contact
Harry Zhang, PhD, PE, hzhang@waterrf.org

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

Project Objectives
- Establish a methodology to assess and optimize the use of existing storage and conveyance elements within the system.
- Provide a utility-facing guidance on:
  a. Best practices for identifying problem areas in the system.
  b. Recommendations on the location and type of sensors required, data communication strategies, and physical infrastructure/assets based on drainage area.
  c. Recommendations on the type of data and information collected (e.g., depth, velocity, rain gauge, weather radar).
  d. Identifying the areas where the flow can be diverted to in a gravity-fed system and where to avoid.
  e. Controlling Infiltration and Inflow (I/I) into systems through alternative stormwater management practices and discharges/contributions to sanitary sewer.
  f. Determining the minimum requirements when selecting a Real-Time Control (RTC) logic and SCADA integration for stormwater and wastewater management.

Budget
Applicants may request up to $200,000 in WRF funds for this project.

Background and Project Rationale
Municipal sewer systems, especially in cities with older infrastructure, potentially have large portions that were designed to capture what is now considered a 2- or 5-year return period

storm event. This can lead to hazardous, even fatal, levels of surface flooding and large volumes of sewer overflows, including combined sewer overflows (CSOs) in the municipalities with combined sewer systems. A significant number of investments (e.g., in the order of tens of billions of dollars) have been spent to reduce and separate CSOs in the U.S. The time, funding, and resources needed to upsize and/or separate all the sewers would take decades to complete with significant capital investments.

One approach to mitigating this issue is to implement a "Smart Sewer" network to improve the efficiency, longevity, and reliability of physical assets through improved measuring, collecting, analyzing, and acting upon a wide range of events. This includes using real time monitoring and automated controls to divert flow from areas experiencing heavy rainfall to less impacted parts of the system or storage structures. A smart sewer system can also proactively hold water in areas that are not hit by precipitation to free up capacity in the trunk sewers by proactively drawing down storages based on forecasts. Results can help utilities maximize the capacity of the existing system, allowing for quicker drainage of the impacted area and reduction of peak flows within the collection system so that it can be stored and treated, rather than discharged. Various smart stormwater management and collection systems solutions and associated technologies are emerging on the market. However, this research must address the management aspect as well. Strategies and tactics that employ selected technologies are the key to success.

There are several case studies currently available that demonstrate utilities' success with implementing smart sewer systems. That said, no two collection systems are the same. The scope, costs, and scale of implementing a smart sewer system are specific to each municipality or utility. For utilities that want to implement a type of smart sewer system, especially with in-house resources, reviewing case studies is helpful to understand the big picture, but it does not necessarily aid the utility with knowing where to start with their system.

The desired outcome of this research is for industry experts to review existing case studies and collection system management technologies on the market and provide guidance and recommendations on how to identify opportunities and implement smart sewer techniques in their systems. Through this project, utilities and municipalities will have information, strategies, and tactics to scope their capital and operations’ programs related to smart sewer systems, tailor their control strategies for sewer overflows, and meet regulatory requirements. These related efforts are expected to reduce treatment costs and protect human health and the environment.

By focusing on smart sewer systems, this project can apply to utilities of any size. Both separate and combined systems can benefit from the outcome of this research. Geographic applicability is anywhere with a collection system that is experiencing problems in a sewershed such as sewer overflows, chronic flooding, and water quality issues.

Research Approach

The research team will conduct a comprehensive literature review, including WRF's research efforts to date (please see the section of 'References and Resources').

The project will build from completed and ongoing applications including case studies of smart sewer systems, including WRF research projects on this topic. The research team will conduct a broad survey and targeted interviews with selected utilities and municipalities, with a goal of synthesizing state-of-the-practice and case studies across geographic/climate regions and different sizes of utilities. Case studies with diverse management goals will be synthesized, including real-world applications of predictive modeling/digital twin and automated or manual controls. This should also include case studies where the smart-sewer system did not generate the intended benefit/outcome and, more importantly, why. When applicable, applications researched should include a forward-looking perspective of artificial intelligence (AI)/machine learning (ML). This would help inform a wide range of collection system managers and operators as technology advances in the future.

In addition, a utility-focused invitation-only virtual workshop (e.g., in two separate three-hour sessions) will be held with multiple utilities and municipalities across geographic regions. The objectives of this utility workshop are to share what has or hasn't worked for smart sewer systems, discuss pros and cons of different approaches, and identify knowledge gaps along with future research needs. The virtual workshop invitees will include WRF, WRF's Project Advisory Committee (PAC) members, representatives from participating utilities, WRF's collaborators and partners, and other invitees recommended by WRF.

The research team will develop a utility-facing state-of-the-practice guidance document, which includes a synthesis of case studies across different geographic regions and utility sizes, with a focus on utilities and municipalities in North America. In addition, the guidance document will include a separate chapter on emerging smart sewer technologies and AL/ML related applications, including from beyond the water sector but have a potential to be used in the water sector. Furthermore, a separate chapter in the guidance document will summarize the knowledge gaps, research needs, and preliminary research concepts for recommended future projects.

The research team will conduct one webcast hosted by WRF and collaborating organizations on the overall findings of this project. The research team is also encouraged to submit one open access peer-reviewed journal paper after the project's completion. In addition, the research team will conduct additional outreach activities, such as presenting project findings at national and regional conferences.

Expected Deliverables

- A stand-alone literature review on smart sewer systems and related practices, including annotations for the list of publications and resources used.

- User-friendly utility-facing searchable, electronic guidance along with a supporting document that includes recommendations for sensing management platforms and pilot testing, with recommendations for pre-requisites to a pilot test and/or smart-sewer program, based on a summary of case studies.
    - The guidance document will include a separate chapter on emerging smart sewer technologies and AI/ML related applications, with cross reference to WRF publications.
    - The guidance document will include a separate chapter and supporting technical appendix that summarizes knowledge gaps, research needs, and preliminary research concepts for recommended future projects.
- A utility-focused invitation-only virtual workshop (with two sessions offered at different times) for peer-to-peer information exchange and identification of future research needs, along with workshop planning and all supporting materials (e.g., agenda, presentations, meeting notes, and workshop summary).
- Broader outreach:
    - Webcast and public outreach materials.
    - Conference presentations including at a WEF-sponsored conference.
    - Submitting one open access peer-reviewed journal paper is encouraged and can be completed beyond project end date.

Communication Plan

Please review WRF's *Project Deliverable Guidelines* for information on preparing a communication plan. Conference presentations, webcasts, peer-reviewed publication submissions, and other forms of project information dissemination are typically encouraged.

Project Duration

The anticipated period of performance for this project is 24 months from the 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.

- Kadiyala, R. and C. Macintosh. 2018. *Leveraging Other Industries - Big Data Management (Phase I).* Project 4836. Denver, CO: The Water Research Foundation. https://www.waterrf.org/research/projects/leveraging-other-industries-big-data-management-phase-i
- Liggett, J., C. Macintosh, and K. Thompson. 2018. *Designing Sensor Networks and Locations on an Urban Sewershed Scale (Phase I)*. Project 4835. Denver, CO: The Water Research Foundation. https://www.waterrf.org/research/projects/designing-sensor-networks-and-locations-urban-sewershed-scale-phase-i
- Salveson, A. 2023. *Integrating Real-Time Collection System Monitoring Approaches into Enhanced Source Control Programs for Potable Reuse.* Project 5048. Denver, CO: The Water Research Foundation. https://www.waterrf.org/research/projects/integrating-real-time-collection-system-monitoring-approaches-enhanced-source

- Thompson, K., S. Sinha, R. Dadiala, A. Vishwakarma, and C. Dermody. Forthcoming. *Designing Sensor Networks and Locations on an Urban Sewershed Scale with Big Data Management and Analytics.* Project 4797. Denver, CO: The Water Research Foundation. https://www.waterrf.org/research/projects/designing-sensor-networks-and-locations-urban-sewershed-scale-big-data-management
- U.S. Environmental Protection Agency (USEPA). 2024. Storm Sewers (including Smart Sewer Case Studies.) https://www.epa.gov/npdes/smart-sewers

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 15 points)
- Communication Plan, Deliverables, and Applicability (maximum 20 points)
- Budget and Schedule (maximum 15 points)

PROPOSAL PREPARATION INSTRUCTIONS

Proposals submitted in response to this RFP must be prepared in accordance with WRF's *Guidelines for Research Priority Program Proposals* and *Instructions for Budget Preparation*. These 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 *Technology Deliverables Guidance*.

Eligibility to Submit Proposals
Proposals will be accepted from both U.S.-based and non-U.S.-based 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. 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.*

Budget and Funding Information
The maximum funding available from WRF for this project is $200,000. The applicant must contribute additional resources equivalent to at least 33% 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% to the project, but the maximum WRF funding

available remains fixed at $200,000. Proposals that do not meet the minimum 33% of the project award will not be accepted. Consult the *Instructions for Budget Preparation* 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.

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 Thursday, November 14, 2024.

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. Submit your proposal at https://forms.waterrf.org/cbruck/rfp-5297.

Questions to clarify the intent of this RFP and WRF's administrative, cost, and financial requirements may be addressed to the WRF project contact, Harry Zhang, PhD, PE; hzhang@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 on your settings, you may need to click refresh on your browser to load the latest file.)**

Andrea Suarez Abastida
Director
NMB Water
17050 NW 19 Avenue, 2nd floor
North Miami Beach, FL 33143
(305) 948-2983
andrea.suarez@citynmb.com

Matthew Jalbert, P.E.
Executive Manager, Northern Region
Trinity River Authority of Texas
5300 S. Collins Street
Arlington, TX 76018
(817) 372-0303
Jalbertm@trinityra.org

Bina Nayak
Water Research Project Manager
Pinellas County Utilities
6730 142nd Avenue N
Largo, FL 33771
(727) 582-2306
bnayak@pinellas.gov

Caroline Nguyen
Principal Scientist
WSSC Water
14501 Sweitzer Lane
Laurel, MD 20707
(301) 206-8141
caroline.nguyen@wsscwater.com