City of Cincinnati contract 25x2217

THE Water Research FOUNDATION

6666 W. Quincy Ave.
Denver, CO 80235-3098

1199 N. Fairfax St., Ste. 900
Alexandria, VA 22314-1445

February 1, 2022

John Curp City Manager City of Cincinnati 801 Plum Street Cincinnati, OH 45202	Verna Arnette Deputy Director Greater Cincinnati Water Works 4747 Spring Grove Avenue Cincinnati, OH 45232

Re: Letter of Agreement for Co-Funding by the City of Cincinnati's Greater Cincinnati Water Works for The Water Research Foundation Project #5152 titled, "**Identifying Service Line Materials without Excavation Distinguishing LSLs from Non-LSLs**."

Dear Ms. Arnette:

This Letter of Agreement ("LOA") is entered between **The Water Research Foundation** ("WRF") a Colorado non-profit corporation, whose principal place of business is located at 6666 W. Quincy Ave., Denver, Colorado 80235 and the **City of Cincinnati** on behalf of its **Greater Cincinnati Water Works** ("**GCWW**" or "Co-Funder"), whose address for the purposes of this LOA is 4747 Spring Grove Avenue, Cincinnati, Ohio 45232, in furtherance of their common interest to support research on behalf of the water community.

Project #5152 (the "Project" as described in the Attachments) is a co-funded research project being funded by WRF, **GCWW** and other co-funding water utilities. The work for the Project has been awarded to **Cornwell Engineering**, the chosen awardee (hereafter "Sub-recipient"). WRF and the Sub-recipient will enter into and execute a separate contract a called Project Funding Agreement (hereafter "PFA"). The Sub-recipient will perform the tasks and activities outlined in the PFA to meet the Project objectives. Upon request, a copy of the executed PFA can be provided.

GCWW Duties. **GCWW** will provide Sixteen Thousand US dollars ($16,000.00) to WRF in support of WRF's Project #5152. **GCWW** will also provide in-kind services for this project as described in the Attachments of an estimated value of $12,000. Funding from **GCWW** will be paid in full to WRF upon full execution of this LOA and upon invoicing **GCWW** as provided below under Contacts. If a purchase order number is required for payment of an invoice, please provide.

WRF Duties. Upon execution of this LOA, WRF will invoice **GCWW** for the funding that is to be paid in full. WRF will enter into similar LOAs with the other co-funding utilities for their contribution to the Project. WRF will provide One Hundred Thousand US dollars ($100,000) in co-funding toward the

Project to match the $100,000 total to be provided by GCWW and other co-funding utilities, for a total Project funding amount of $200,000.

Sub-recipient costs will be recognized proportionally as costs are incurred. In the event Sub-recipient's costs incurred are less than the total funding received from WRF, the funding will be returned on a proportional basis to the Co-Funder.

WRF will reasonably monitor the Project with consideration to **GCWW**'s input and needs for this Project. A Project Advisory Committee (PAC) has been formed for Project #5152 that consists of independent volunteers selected by WRF and Co-funder to provide technical review, assistance, and/or expertise related to the Project. The number of volunteers to serve on the PAC will be determined by WRF. WRF and the PAC will make mutually agreed management decisions regarding this Project. In the event of any disagreement, however, WRF shall have final decision-making authority regarding the Project.

Copyright. If the Project is satisfactorily completed in WRFs sole discretion, WRF may publish the results of the Project. WRF will own all U.S. and world-wide copyright in the reports created as a result of the research deliverables for the Project as defined in the PFA. WRF will provide an electronic PDF of any Final Report published to **GCWW** for placement on **GCWW**'s website for internal use and for public viewing. **GCWW** agrees that they will not make any other use of the WRF's copyrighted materials without WRF's prior written permission. Approval for use of such materials for educational, noncommercial purposes, however, will not be unreasonably withheld. Further, any requests **GCWW** receives for a printed copy of any printed Final Report should be forwarded to WRF to fulfill the order.

Nonexclusive license. WRF grants **GCWW**, a non-exclusive, non-transferrable, royalty free, nonterminable, without any requirement of accounting, the right to use Intellectual Property developed through this research Project.

Acknowledgement. WRF and **GCWW** will be recognized as a Co-funder of the Project in the Final Report publication.

Amendments. This Agreement may not be modified or amended, nor may any term or provision be waived or discharged, including this Paragraph, except in writing, signed by all parties.

Project Termination. In the event the Project is not progressing as required by the PFA, WRF may terminate that Project and, in such event, will reimburse **GCWW** for the portion of their contribution allocated to the Project which has not already been distributed or earmarked by WRF but not yet invoiced by the Sub-recipient.

Liability/Construction/Headings. In no event, shall any judgment/order against WRF and/or **GCWW** exceed the amount of funds provided by WRF (for claims against WRF) or **GCWW** (for claims against **GCWW**) relating in any manner to this Agreement. Further, this Agreement shall not be construed against the drafter; headings are for convenience only.

Dispute Resolution/Mediation. In the event, any co-funder has a disagreement with another co-funder, each agrees to submit such dispute to a mediator chosen by both parties, with each party shall be responsible for their own costs of mediation.

Independent Contractors. The parties are independent contractors to each other. Nothing in this Agreement shall be construed to create an agency, partnership, joint venture, employment, or franchise relationship between the parties. No party shall have any right or authority to assume or create any obligation, commitment or responsibility for or on behalf of the others except as the other may expressly authorize in writing.

Contacts. Co-funder contacts for this Project are:

Organization	Contact	Contribution
Greater Cincinnati Water Works (**GCWW**)	Verna Arnette Deputy Director Phone: 513.591.6898 Email: verna.arnette@cincinnati-oh.gov Jeff Swertfeger Water Quality Superintendent Phone: 513.624.5068 Email: Jeff.Swertfeger@gcww.cincinnati-oh.gov John Ridder Supervising Accountant Phone: 513.591.5065 Email: john.ridder@cincinnati-oh.gov	$16,000.00 USD $12,000.00 in-kind

The Water Research Foundation (WRF)	Jonathan Cuppett Research Program Manager Phone: 303.347.6122 Email: jcuppett@WaterRF.org Valerie Roundy Project Coordinator Phone: 303.347.6124 Email: vroundy@WaterRF.org Christine Conville Contracts Manager Phone: 303.734.3424 Email: cconville@WaterRF.org Connie Schonlau Contracts Assistant Phone: 303.347.6211 Email: cschonlau@WaterRF.org	$100,000

This Agreement may be executed on separate originals or copies and shall be valid as if all parties had executed the same document. Facsimile or electronic signatures shall be valid as written signatures.

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Project 5152

IN WITNESS, WHEREOF, the parties have caused this LOA to be signed and dated as shown below.

The Water Research Foundation

_____
By: Peter C. Grevatt, PhD
Title: Chief Executive Officer

Date: _____

City of Cincinnati

By:_____
John P. Curp, Interim City Manager
Date: _____

Recommended by GCWW:

_____
Verna Arnette, Deputy Director

Approved by City Purchasing:

_____
Bobbi Hageman, Chief Procurement Officer

Approved by Department of Economic Inclusion:

_____
Edgar DeVeyra, Interim Director

Approved as to form by:

_____
Assistant City Solicitor

CERTIFICATION OF FUNDS:
Date: _____
Funding: _____
Amount:_____

_____
Karen Alder, Finance Director

Project 5152

ATTACHMENT A

(Commitment Letter)

A Service of The City of Cincinnati
GREATER CINCINNATI WATER WORKS
Cathy Bernardino Bailey, *Director*

September 10, 2021

Richard Brown
Cornwell Engineering Group
712 Gum Rock Ct
Newport News, VA 23606

RE: Water Research Foundation (WRF) Tailored Collaboration Proposal
Identifying Service Line Materials without Excavation: Distinguishing LSLs from non-LSLs

Dear Mr. Brown,

The Greater Cincinnati Water Works (GCWW) is pleased to participate as a member of the research team submitting the tailored collaboration proposal listed above. Our water system has currently identified almost 40,000 complete or partial lead service lines (LSLs) and around 700 unknown or unidentified service lines. Consequently, we are very interested in working with the research team to develop suitable methods for identification of service line material and determine the advantages and disadvantages of each approach. We feel this research will not only benefit our system and our customers, but water systems throughout the US.

The project objectives as we understand them are to compare different methods to identify service line material composition (e.g., at minimum lead versus non-lead, and perhaps breaking down non-lead into copper, galvanized, plastic, etc.) by as many of the following means as possible:

1. Water system records (e.g., tap cards)
2. Profile sampling (collected before any other activities at the study location)
3. Potholing (i.e., local excavation at curb stop or meter) plus inspection of pipe entering house
4. Up to two non-destructive identification technologies, such as acoustic or stress wave propagation techniques
5. Excavation and visual inspection of the entire service line, when possible.

We will participate in all of these tasks, except items 3 (potholing) and 5 (excavation). However, we will gather information about lines in which we are otherwise partially uncovering to replace.

We anticipate participation in these tasks will involve our water system contributing staff time, equipment, materials, analytical services, and contractors hired by the water system to perform the following:

- Review water system records, identify candidate study locations, recruit customers at these locations to volunteer for the study, and coordinate activities with customers during the study (i.e., allowing access to site, working within the project schedule, collecting samples, etc.)
- Work with the project team and vendors from item 4 above to schedule work at study locations, and provide support as needed
- Collect and analyze water samples as defined in item 2 above

- Conduct site work as needed (surveying, service line replacement, etc.)
- After completion of activities at each study location:
    - Provide water filters certified for lead removal (pitcher), replacement filters, and instructions for filter use and maintenance to customers who have lead service lines who participate in the project
    - Provide instructions and training support (as needed) for customer who have lead service lines to conduct whole-house, high velocity flushing (HVF) as outlined in Brown et al. (2021 - WRF 4713) and AWWA Standard C810-17 (or latest version when updated)
- Review and comment on the project Final Report.

GCWW will provide a direct cash contribution to the Foundation (WRF) in the amount of $16,000 to cover costs of the research team. In addition, GCWW anticipates total in-kind/cost-share contribution towards this project $12,000 to cover analytical costs, labor, expenses, and materials. We will work with the research team to conduct the above described study efforts at 10 to 16 locations in our system.

We look forward to participating in this important project. If you have any questions regarding our involvement in the project, please contact Jeff Swertfeger at (513) 624-5608.

Sincerely,

Cathy B. Bailey
Executive Director,
Greater Cincinnati Water Works

ATTACHMENT B

(Project Summary)

RESEARCH OBJECTIVE

Lead service line replacements (LSLRs) are a pressing need for drinking water utilities to safeguard consumer health. However, lead service lines (LSLs) cannot be removed until their locations are identified. Unfortunately, no rapid, user-friendly and cost-effective technologies are commercially available to accurately identify LSLs, without excavation (and consequent potential disturbance of pipe protective scales). This tailored collaboration project will test three innovative and non-invasive detection platforms (acoustic monitoring, x-ray diffraction/fluorescence and stress wave propagation/attenuation) to perform buried service line characterization in blind trials using a pipe farm testing facility followed by extensive field testing in collaboration with six large geographically dispersed water utilities.

The specific test objectives will be to:

- Conduct blind trials with multiple rapid, non-invasive detection technology platforms to assess accuracy of service line characterization
- Assess performance of promising technologies (up to three) in extensive field application studies with SLs from up to 6 geographically dispersed utilities
- Examine impact of technology deployment on changes in baseline water quality
- Compare performance of test technologies to each other and to conventional physical inspection methods (e.g., potholing, profile water sampling, excavation, etc.) to validate performance
- Provide recommendations to the water industry, regulators, and WRF on approaches that can expedite LSL inventory development

BACKGROUND/UNDERSTANDING OF THE PROBLEM

Presently "15 to 22 million Americans nationally are served drinking water by lead lines" according to Cornwell et al. (2016). Given the recent attention from the public health community related to the potential impacts from lead in drinking water, it is understandable that USEPA is promoting Lead Service Line Replacements (LSLRs). Many drinking water systems are struggling to accurately develop inventories that can be used to both educate consumers and efficiently deploy a LSL replacement strategy. The traditional indirect methods (e.g., institutional knowledge, water quality data, information captured from tap cards, date of service line installation, records of recent repairs, etc.) presently available to utilities tend to be unreliable. The revisions to the LCR require identification of all unknown service lines to the greatest extent possible. Most utilities have limited records and therefore need industry accepted identification tools. This complex and challenging situation is unlikely to be solved through indirect methods. While direct methods (e.g., potholing or full excavation) can identify service line pipe materials, these approaches are time consuming and costly. Furthermore, vibrations from these activities may indirectly do harm to pipe protective scales and potentially expose customers to contaminants.

In WRF 4693, literature reviews and industry practices were explored to search for detection technologies that are fast, portable, economical, user-friendly, minimally invasive, and sufficiently sensitive to identify lead pipes buried in soils of various types (Bukhari et al. 2020).

That study concluded that there was a significant absence of convenient and/or cost-effective methodologies while utilities urgently needed practical solutions that could accurately identify buried LSLs.

Recognizing this urgent need (for rapid tools to improve the speed, efficiency, and reduce the costs of finding LSLs) was the impetus for this tailored collaboration. This tailored collaboration will examine three promising technology platforms in both blind trials and field studies. Having such tools will allow utilities to focus their efforts on premises that actually have LSLs which can then be replaced. Another need for this project is to provide utilities with multiple tools to use., Some tools can be used in conjunction with other tools, while some tools perhaps may be more suitable for certain situations over others. Therefore, this project will look not only at these alternative technological tools, but also develop a collection of tools for water systems to pick and choose. This menu will provide utilities options depending on budget, speed/urgency, and difficulty in finding the LSLs using conventional tools.

TECHNICAL APPROACH

Evaluation of the proposed technologies will be conducted in two distinct phases. In the first phase, performance of all three technologies will be tested in parallel in blind trials. This phase will use a pipe farm which has pipes of known composition (lead, copper, galvanized steel, brass and/or other materials) buried at depths of 4-5 feet. The pipe farm will have various interconnections (e.g., lead and galvanized) and be overlayed with materials including soil, sand, clay, gravel, or a combination of the four. The pipe farm testing will provide comparative testing of the different technologies and serve for prioritization of technologies for field testing. It will also provide the opportunity for participants to refine and calibrate their methodologies before these technologies advance to the extensive field during the 2nd Phase of the test plan.

In the 2nd phase, testing will evaluate material composition of at least 50 service lines from up to six participating water systems (DC Water, Aquarion, Pittsburgh Water and Sewer, Greater Cincinnati, American Water, Aqua). Comparisons of the three innovative detection technologies (acoustic monitoring, x-ray diffraction/fluorescence and stress wave propagation/attenuation) will be made relative to traditional methods, which include:

- Water system record reviews (i.e., tap cards, historic records, plans, tax records, etc.)
- Sequential Profile sampling (collected before any other activities at the study location) using techniques from Lytle, Deshommes, and others)
- Potholing (i.e., local excavation at curbstop or meter) plus inspection of pipe entering house
- Excavation

Based on these evaluations, it is anticipated that the research team will be able to capture data for each property to define the specific material (i.e., “material count”) and by the length of that specific pipe (i.e., “ft. of each material”). The ability to differentiate lead from non-lead materials and the ability to characterize non-lead materials successfully will be key success criteria for each technology.

ORIGINALITY AND INNOVATION OF THE RESEARCH

Recent and extensive literature reviews by our team as well as outreach to various industry partners and technology developers have indicated an urgent need for better tools to identify

lead pipes buried in soils of various types. Tools need to be faster, portable, economical, user-friendly, minimally invasive, and sufficiently sensitive. . Additionally, it isn't adequate just to identify lead service lines, but it is also necessary for non-lead service lines to be characterized. This requires a unique strategy in which a signal can be transmitted from a device, penetrate through the soil profile, reflect off the buried pipe, and then be retrieved and analyzed to generate a unique fingerprint for the material under interrogation. In this proposed research, three different technology platforms will be tested to evaluate their performance. By examining acoustic waves, XRF and stress waves individually, it is anticipated that the performance of these technology platforms will be tested in a controlled environment (pipe farm) and in expanded field analyses in geographically dispersed water systems. Both will be performed under blind conditions to the technology providers. As the field testing will be corroborated through a variety of validation methods ranging from historic records to excavation, the robustness of each technology for accurately determining presence of specific materials will be ascertained.

To the best of the authors' knowledge, no previous attempts have been made to conduct such comprehensive tests for user-friendly/non-invasive options to identify the material of water service lines. While NDE approaches (for instance Ground Penetrating Radar) exist to identify the location of buried pipelines, no effective tools exist to characterize the material of underground service lines.

ANTICIPATED RESULTS AND BENEFITS

Based on the data generated from this study, we anticipate identifying one or more user-friendly service line characterization technology platforms that can yield practical solutions for service line inventory development. The data from both phases of the study will specifically help:

- Vendors to refine their detection methodologies to improve sensitivity/specificity of materials analyses (if needed).
- The field comparisons will identify existing technology limitations (if any) and help define additional criteria to be considered for the technologies to be deemed successful.
- As six large utility partners will be participating in the project, the field studies will provide an opportunity to directly capture feedback from water utility practitioners on the useability and likely adoption rate (or possible impediments) of each technology.
- Importantly, data generated in this study will inform the water industry, regulators, consultants, academics, and technology manufacturers whether rapid, user-friendly and cost-effective service line characterization tools are viable.

STATEMENT OF QUALIFICATIONS

Members of the research team from Cornwell, DC Water, and American Water have cooperated on various lead projects before, including several WRF studies (4713, 4639, etc.) and can produce useful interpretation of results and guidance to WRF subscribers and other water systems. The project team will seek advice from the following technical advisors: Dr. Charles Haas, Drexel University, Elizabeth Holst, Cleveland Water Alliance and Dr. David Cornwell, Cornwell Engineering.