RFTC Release: June 2023

Open Innovation Challenge:
Detecting Lead Service Lines without Breaking Ground
Request for Technology Concepts (RFTC)

Grant Opportunity:	US $75,000 total (individual grants anticipated between US $3,000 and US $25,000 each).
Letters of Intent (LOI) Due:	Wednesday, June 28, 2023 at 3p ET
Proposals Due:	Wednesday, July 26, 2023 at 3p ET

Whenever there is a market gap – a true absence of effective solutions to a challenge – there is also an opportunity to accelerate solutions to the market that yield significant potential profit. Understanding the scope and nuances that comprise the challenge is critical to equipping innovators to inspire ideas, develop prototypes, and evolve solutions that can make a transformational – and potentially very profitable -- impact.

This Request for Technology Concepts (RFTC) is a call for technologies and innovative concepts around a significant market gap: the physical detection of the material(s) comprising drinking water utility service lines without having to dig down to the service-line pipes for identification. Participants in this RFTC may be eligible to receive grant dollars to assist in bringing their solutions to market. The following sections provide an overview of this RFTC, including a description of the challenge, and information on how you can participate.

Established in 2014, Cleveland Water Alliance (CWA) is a global leader in facilitating innovation for the water economy. Supported by a robust testbed infrastructure and world-class industry expertise, CWA leverages collaborative research and multi-sector partnerships to support market-driven innovation and sustainable solutions for regional and global water challenges. Since our founding, CWA has invested over $500,000 directly into early-stage innovations.

I. Critical Industry Challenge: Detecting Lead Service Lines without Breaking Ground

This RFTC seeks technologies and innovative concepts regardless of development stage, but specifically anticipates early-stage ideation due to the true "market-gap" nature of the Challenge described in this document.

This RFTC is a call for technologies and innovative concepts that would enable the physical detection of the material(s) comprising drinking water utility service lines without having to dig down to the service-line pipes for identification, which is the current state of physical material detection. These service lines carry water between utility water mains and the commercial and residential properties which the utility services, and may be buried beneath a range of "substrates," such as dirt, gravel, or concrete. Service lines may be comprised of lead (Pb), copper (Cu) and/or galvanized steel, and the priority focus for this challenge is technologies and innovative technology concepts which would be

able to differentiate lead service lines from those comprised of other materials. Background on this Industry Challenge, as well as some of the technical and market considerations necessary to formulating a viable solution, are provided in the following sections.

A. Background:

Environmental exposure to lead is of great concern, especially to the most vulnerable populations, including children through age 6 and pregnant women. Starting in the 1950s, a phased approach has been used in federal regulations to significantly reduce or eliminate the use of lead in products like gasoline, household paint, lead solder in food cans and toys. As a result of these policies, overall blood lead levels in children have dramatically decreased. The U.S. Environmental Protection Agency (US EPA) also enacted rules to ban the use of lead water pipes and limit the amount of lead used in drinking fountains and potable water faucets and solder used to join pipes. Events like the water crisis in Flint, Michigan, have brought lead issues in water to the forefront. When water sits inside lead pipes or faucets and fixtures that contain lead, the metal can slowly dissolve into the water. The U.S. EPA is evaluating and supporting the implementation of stricter regulations surrounding the elimination of water service lines made from lead to further mitigate the issue of potential exposure to lead through drinking water. In January 2021, the Federal Lead and Copper Rule Revisions (FLCRR) were published in the Federal Register. While the U.S. EPA has stated they are going to propose updates to this rule, a new requirement likely to be retained is for all water utilities across the country to map their service line materials and provide that inventory to the EPA by Oct. 16, 2024. While historical records may document what was originally put in the ground and replacement records exist, for many PWS, these records are incomplete or do not exist. Rather than relying on probability algorithms, the only way to accurately verify the service line material type requires at least basic excavation to enable visual inspection.[1] The manual inspection approach represents a significant expense well beyond utilities' budgets. As an essentially unfunded mandate while a solution for detecting lead pipes without breaking ground remains elusive, public water systems (PWS) are still required to create a system-wide plan that denotes funding sources for removal of all lead service lines as well as galvanized steel services that are downstream of lead. Pipes that are of an "unknown" type must be so noted and treated as lead for planning purposes.

This federal requirement on PWS represents a pivotal market driver for innovations in the detection of lead service lines in the very near future. While utilities may use historical records, plan documents, and other qualified sources of data to apply a "rules" approach for modeling the likely material composition of a service line, this approach has proven to be only 70-80% effective in determining the likelihood of material composition, and utility records and supporting data may often be incomplete. As a result, currently the only guaranteed method to confirm the service line material is through a visual examination after excavation of a service line, and for most utilities, excavation of every service line to confirm materials is an expensive and impractical approach. Therefore, the need arises for a technology to detect service line materials in situ, without the need for excavation. A tool, process or technology is needed that can detect service-line materials with

[1] One estimate within the US Midwest puts basic excavation just for visual inspection of a service line to $1,800.00 per line. A mid-size PWS may have a quarter to a half-million service lines that may or may not be comprised of lead, translating to a visual-inspection cost of $450M - $900M simply to provide an accurate materials map, without even starting on removal and/or replacement of lines.

the priority of identifying lines comprised of lead as differentiated from copper, and galvanized steel, to an efficiency of 90% or greater without excavation.

This challenge is the focus of this RFTC. Innovative concepts for tools, technologies, and/or processes that can viably address this need, in mind of the technical and market considerations outlined below, may be selected to received grants to create prototypes or support other aspects of product development and commercialization. Solutions that can be proven to be both pragmatic and effective are likely to receive significant market and investor interest as well as accelerated market adoption.

B. Key Technical and Market Considerations

The priority focus of this RFTC is for solutions that can identify service lines comprised of lead, copper and galvanized steel, and be able to differentiate between materials.

The following key technical and market considerations should guide ideation around solution concepts and potential products and/or approaches:

- The proposed innovation should viably provide a 90% accuracy or greater for the detection and differentiation of service line materials with the following composition-detection priority: lead, galvanized steel, and copper. Technologies or devices that can detect more than one material will be of particular interest.
- The proposed innovation must physically detect the material(s) comprising service lines without “breaking ground” (digging down to or disturbing the pipe itself).
- The proposed innovation must be able to achieve the desired accuracy *without* the use of broader data inputs such as may be applied through statistical or AI-prediction methods.
- Residential service lines are typically up to 2 inches in diameter (up to 1 inch in diameter for lead service lines).
- Service lines are buried 3 to 10 feet below ground, depending on the frost-depth threshold of different geographies.
- Service lines are buried under a range of substrates, such as soil, sand, clay, gravel, and concrete.
- Detection cannot occur by way of physically breaching the pipe itself due to the environmental and health risks associated with disturbing lead materials.
- Detection approaches cannot require access to the inside of residential homes and buildings.
- Detection results are ideally provided in real-time (e.g., a visual indicator on the device itself), or at minimum should be available by way of a detailed report within two weeks of detection activities.
- Device(s) used for detection must be usable moving from one property to the next, without need for significant calibration between properties (imagine a utility worker moving from one house to the next in succession, covering multiple blocks of homes within a single day).

- The envisioned technology or device would ultimately be used by utility contractors during service-line replacement seasons in the field. As such, the innovation should be as portable as possible, and as self-contained for power as possible (e.g., a power source either within the device itself, rechargeable at the end of the day, or potentially connected to or rechargeable by way of a power source within a utility truck).

II. Letter of Intent, Proposal Requirements & Selection of Grant Recipients

A. Letter of Intent (LOI)

An LOI is due no later than 3pm ET on Wednesday, June 28, 2023, to OpenInnovation@clewa.org. Respondent's Letter of Intent (LOI) may be submitted as a simple e-mail, and should include the following information:

1. Full Name
2. Contact E-mail Address
3. Contact Phone Number
4. 2-3 sentences describing general concept(s) that respondent is exploring for a fuller proposal submission.

Please note that an LOI is a prerequisite for participation in the proposal stage of this Challenge.

B. Proposal

Proposals are due no later than 3pm ET on Wednesday, July 26, 2023, to OpenInnovation@clewa.org. Proposals should be submitted in PDF format, and should include the following components:

1. Cover Sheet with Identifier Information (1 page maximum), including:
   - Name of respondent(s) / inventor(s)
   - Name of associated company/ies, university/ies or organization(s) if applicable
   - Phone and e-mail contact information
2. Main Proposal (15 pages maximum), including:
   - Description of the technology and/or methods you propose as a solution to the challenge described in this document (please do not include IP-protected or proprietary aspects). Summarize any current uses, applications, or deployments of the technology in other settings, if applicable.
   - Description of the key scientific principles that support your theory of applicability.
   - Description of the state of the technology or concept you propose for application to the specific challenge described in this document **as it currently exists *within your sphere of influence, experimentation, IP-process, invention, prototype and/or control*.** Is this still in a concept-only phase in so far as you are directly involved? Does a prototype exist? If a prototype or device already exists, describe performance as currently known under lab and/or other described real-world conditions. Describe any

known limitations and/or anticipated evolutions for the device relevant to the device's accuracy or usability as described in this RFTC.

- Overview of anticipated tasks, milestones and timelines needed to develop a prototype for proof of concept.
- A brief summary of qualifications and relevant experience of the innovator / innovation team (1 page maximum).
- A hyperlinked bibliography of key articles that support your hypothesis of applicability, as applicable (1 page maximum). *Please, no article attachments!*

3. Budget Request Summary (not to exceed 2 pages):

   Provide a proposed budget between US $3,000 and US $25,000, outlining how you would use potential grant dollars to evolve your proposed technology or concept into a working prototype capable of at least a basic proof of concept in response to the challenge described in this document.[2]

C. Selection of Grant Recipients

A judging panel of industry experts will review and score proposal submissions to determine grantee selection. In addition to meeting the proposal specifications outlined in this RFTC, the following criteria may be applied to the selection of grant recipients:

- Alignment of technology/innovation with the challenge described in this RFTC
- Perceived viability of the solution
- Perceived likelihood of prototype development within a 4- to 8-month timeframe
- Perceived potential of a commercial-ready product within a 2-4 year timeframe
- Any already-known performance indicators as described within respondent proposals
- Any already-deployed uses/applications of the technology/innovation, if applicable
- Practicality and/or creativity of approach
- Potential scalability of device for deployment (demonstrable or considered)

NOTE: Any respondent attempting to make direct contact with the utilities, presenters, judges, testing assistants, CWA staff and/or other stakeholders associated with this program outside of the e-mail address specified in this RFTC may face disqualification.

[2] Proposed budgets should not exceed $25,000. However, please note that CWA reserves the right to provide grants greater than $25,000 under advisement of the Challenge's judging panel and/or as may be informed by insights from industry expertise.

III. Ideation and Concept-Refinement Support

The following supports will be available to respondents that submit a Letter of Intent (LOI) prior to submission of a full proposal:

- A webinar about this Challenge provided by industry expert(s), with the opportunity for Q&A (see schedule, Section IV).
- A recording of the webinar for easy access and review following the scheduled event.
- A downloadable FAQ as developed based upon Webinar questions and feedback.
- Up to weekly responses by industry experts to general questions submitted by way of OpenInnovation@clewa.org. The question period will run from June 1 to July 24, 2023.

IV. Schedule of Key Milestones

Please see below for an overview of key milestones associated with this Challenge:

Milestone	Date / Time
Q&A Period	June 1 through July 24, 2023
Industry Expert Webinar with Q&A	Tuesday, June 20, 2023, 10a ET
Letter of Intent (LOI) DUE	**Wednesday, June 28, 2023, 3p ET**
Proposal DUE	**Wednesday, July 26, 2023, 3p ET**
Grantees Announced	Wednesday, August 16 – Friday August 25, 2023