

ORDINANCE NO. _____

BILL NO. _____ (2024)

A BILL FOR AN ORDINANCE AUTHORIZING THE MAYOR OF THE COUNTY OF MAUI, TO ENTER INTO AN INTERGOVERNMENTAL AGREEMENT WITH PURDUE UNIVERSITY

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

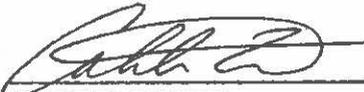
SECTION 1. Purpose. Pursuant to the County of Maui, Department of Water Supply's ("County") letter of support and collaboration ("Letter of Support") to Purdue University ("Agency"), the County expressed its intent to commit \$20,000 to be used for the purchase of experimental supplies, labor and travel, as well as unspecified in-kind contributions of staff time and expertise, as more fully described in the Letter of Support attached hereto and incorporated herein as Exhibit "1".

Section 2.20.020, Maui County Code, provides that, unless authorized by ordinance, the Mayor shall not enter into any intergovernmental agreement or any amendment thereto which places a financial obligation upon the County or any department or agency thereof.

SECTION 2. Authorization. Pursuant to Section 2.20.020, Maui County Code, the Council of the County of Maui hereby authorizes the Mayor to execute any agreement with the Agency to fulfill the Letter of Support, as well as all other necessary documents relating to any agreement with the Agency, and any amendments thereto.

SECTION 3. Effective date. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:



CALEB ROWE
Deputy Corporation Counsel
County of Maui

LF2022-1636

2024-01-25 Ord Auth DWS IGA-Water Research Foundation Project.docx

RICHARD T. BISSEN, JR.
Mayor

JOSIAH K. NISHITA
Managing Director

JOHN STUFFLEBEAN, P.E.
Director

JAMES A. LANDGRAF
Deputy Director



DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793
<http://www.mauicounty.gov/water>

February 26, 2024

Purdue University
610 Purdue Mall
West Lafayette, Indiana 47907-2040
Attn: Andrew Whelton

Dear Andrew,

This letter confirms the County of Maui, Department of Water Supply's Agreement to participate in the Project as set forth in the "Emergency Opportunities and Project Concept" document dated February 1, 2024, and attached hereto as Exhibit "A". This Agreement supports the collaboration for the Water Research Foundation fire project you are submitting in February 2024. We appreciate being considered in its development. As you know our organization is an enterprise fund with approximately 200 employees that service approximately 164,221 residents.

To support this project, we commit to providing \$20,000.00 to be used for the purchase of experimental supplies, labor, and travel. We recognize there will be structures manufactured by the Fire Research Safety Institute and inside and outside these structures will be water system components. We recognize that samples will be collected and transported to Purdue University for forensic analysis.

Separately, we recognize that as part of the project you have asked that we provide our own time and expertise periodically in the review of the experimental plan, design/configuration of field experiments, and even share experiences responding to and recovering from wildfires (or connections to communities that we know have had such experiences). We estimate an IN-KIND contribution of personnel labor that will be determine at a later date.

Please do not hesitate to contact us if there are any questions. My contact information is (808) 270-6193.

Sincerely,

JOHN STUFFLEBEAN, P.E.
Director

"By Water All Things Find Life"

Purdue University
610 Purdue Mall
West Lafayette, Indiana 47907-2040
Attn: Andrew Whelton
Page 2

AFFIRMED:

RICHARD T. BISSEN, JR.
Mayor, County of Maui

APPROVED AS TO FORM:

ANDREW J. WHELTON, PH.D.
PURDUE UNIVERSITY

APPROVED AS TO FORM
AND LEGALITY:

CALEB ROWE
Deputy Corporation Counsel

EXHIBIT "A"

EMERGING OPPORTUNITIES PROJECT CONCEPT

WRF Staff Sponsor: Jian Zhang

Date Submitted: Feb. 1, 2024

Project Title: Towards more resilient water systems in the face of fire: Solutions to understanding and preventing infrastructure damage

EO Type (EO, Add-on, Partnership): EO with co-funding to be sole-sourced to Purdue University

Objective(s): We will determine the conditions that cause physical and chemical damage to utility assets by fires and mitigation actions to lessen this damage. With partner feedback already received, and our own lab and post-fire field observations in Oregon, Colorado, Hawaii, and California, we identified four key questions that we will address in the proposed efforts:

- How do plastic, concrete, and insulated cover (concrete vs. iron) water meter boxes compare at protecting the enclosed water meter from heat damage?
- To what degree do single and double check valve water meters prevent backflow into the utility service line when exposed to heat?
- What is the minimum amount of negative pressure needed to draw pollutants (vapors and/or particulates) from structure fires into a service line?
- What structure-fire pollutants condense and sorb inside the metal and plastic service lines, and how does that vary based on distance from the structure fire?

Background/Rationale: Since 2017, 16+ widespread volatile organic compound (VOC) drinking water chemical contamination events have been caused by wildfires in Hawaii, Oregon, Colorado, and California. Sometimes 9+ months of pipe replacement were needed to remove the contamination coupled with *Do Not Use* orders. Several utility partners have experienced these disasters, and others have been working to improve sector understanding. This contamination comes from (1) VOC entry from depressurized water distribution system assets (i.e., hydrants, tanks, pipes), (2) back siphonage of contamination from destroyed and damaged structure plumbing, and (3) direct plastic water system damage and leaching¹. Thermal damage to water system plastics (pipes, gaskets, etc.) can be responsible for contamination^{2,3,4}. Our WRF 5106 project⁵ revealed that temperatures as low as 150 °C (much lower than what others had previously reported) can prompt water system plastics to generate VOC contamination. For comparison, wildfires can reach 300-800 °C^{6,7,8}. Recent work by others theorized that utility assets ≥ 1.5 ft below ground surface may be insulated from thermal damage⁹. But, shallow service lines, meter boxes/meters, valves, and other infrastructure are vulnerable. A new 2023 study¹⁰ (by our collaborator on this EO project) has confirmed our theory: structure fires generate chemical contamination and this can be sucked into building plumbing during depressurization¹¹. This discovery is transformational for the utilities as it pertains to not just wildfires, but structure fire events too. To help rapidly advance water utility understanding and response to a growing number of fires, we will test water utility research questions into planned structure burns. Separately, there are more than 340,000 structure fires in the U.S./year¹² and sometimes localized distribution system depressurization occurs. Structure fires and pressure loss can also occur due to post-earthquake fires^{13,14,15}.

Approach: Three series of structure "burns" are planned at the FSRI facility in Pennsylvania and acquired structures throughout the US, including compartment fire scenarios, single-family, room-and-contents fire scenarios and multi-story, multi-family structure fire scenarios. Fires will be conducted with conditions similar

¹ Proctor et al. 2021. *AWWA Wat. Sci.* <https://awwa.onlinelibrary.wiley.com/doi/full/10.1002/aws2.1183>

² Isaacson et al. 2020. *Environ. Sci.: Wat. Res. & Technol.* <https://pubs.rsc.org/en/content/articlehtml/2021/ew/d0ew00636b>

³ Draper et al. 2022. *Environ. Sci. & Technol.* <https://pubs.acs.org/doi/full/10.1021/acestwater.1c00401>

⁴ Metz et al. 2023. *ACS EST Wat.* <https://pubs.acs.org/doi/full/10.1021/acestwater.2c00248>

⁵ Isaacson et al. In prep. WRF. <https://www.waterrf.org/research/projects/post-wildfire-distribution-system-water-quality-impacts-and-potential-responses>

⁶ Haase and Sackett. 1998. *Proc. Tall Timbers Fire Ecology Conference Proceedings*. Tallahassee, Florida.

⁷ Neary et al. 1999. *Forest Ecol. Mgmt.* [https://doi.org/10.1016/S0378-1127\(99\)00032-8](https://doi.org/10.1016/S0378-1127(99)00032-8)

⁸ Busse et al. 2005. *Int'l J Wildland Fire.* <https://doi.org/10.1071/WF04062>

⁹ Richter et al. 2022. *Fire Technol.* <https://link.springer.com/article/10.1007/s10694-022-01232-3>

¹⁰ Horn et al. 2023. *Fire Technol.* <https://doi.org/10.1007/s10694-023-01487-4>

¹¹ Whelton et al. 2023. *AWWA Wat. Sci.* <https://awwa.onlinelibrary.wiley.com/doi/10.1002/aws2.1318>

¹² NFPA. 2023. *Home Structure Fires*. Quincy, MA.

¹³ Chung et al. July 1996. Gaithersburg, MD. <https://doi.org/10.6028/NIST.SP.901>

¹⁴ Todd et al. 1994 *Northridge earthquake: performance of structures, lifelines and fire protection systems*. NIST Special Publication 862. Gaithersburg, MD.

¹⁵ Scauthorth et al. *Fire Following Earthquake*; ASCE; NFPA. 2005.

to prior burns¹⁶, *but our design will integrate utility assets*. Single compartment and single-family ranch building fire experiments have been planned by FSRI in 2024. We have three experiments:

Experiment 1: How does chemical contamination change down copper, HDPE, and PVC service lines?

Experiment 2: How can meter boxes lessen water meter and service line damage?

Experiment 3: What is the role of pipe orientation on contamination entering distribution systems?

At the field site, we will identify the influence of distance from the fire, temperature, and progression of fire on various types on the resulting damage and contamination of assets (meters, pipes, valves). We will also assess the impact of the orientation of the asset relative to the fire (vertical, horizontal) and the impact of materials like concrete or soil that are often between the fire and the asset. We will measure heat flux at specific locations as a function of the fire progression timeline. We believe that accurately quantifying the heat flux will enable more accurate predictions of the thermal response of assets beyond those tested experimentally. To understand the degree structure fires can contaminate drinking water service lines, liquid condensate and organic vapor will be collected during the experiment. Thermocouples will be used to assess temperature and this data source will help us interpret physical damage and water contamination results.

Additionally, water utility recovery lessons where wildfires have damaged water distribution systems will be formally documented. Specifically, lessons about post-fire contamination testing, flushing, operations, material procurement, and asset replacement will be considered. The review will also focus on utility approaches to improving post-recovery fire defense (i.e., some utilities have required backflow prevention devices on every service line, switched from natural gas to diesel generators). Factors that influenced asset and material type selection decisions, contractor experiences, and government reimbursements may be described.

Benefit to Subscribers: Full-scale structure burns and thermal monitoring will help utilities understand potential threats to existing assets. Recovery lessons will also help utilities improve system designs and recoveries.

Possible Outcomes/Deliverables: A training session at AWWA ACE 2024 (submitted), and a final report and training session at the AWWA ACE 2025 (planned). Recommendations on utility design and post-fire response and recovery will be described.

Estimated Duration: 1.75 years with major report outs during the project period, Apr 2024-Dec 2025

Estimated Budget: \$157,000 is requested from the WRF EO Program because of the project's significance and scope. The total budget of this critically emergent project will be \$390,500. At present, confirmed cash contributions from the utilities are \$137,000, with \$20,000 verbally committed by two other utilities. Such cash contributions are expected to be provided to WRF first, and then provided to Purdue University as part of the project budget. Purdue University will lead the project working with the FSRI and Utility Partners. In-kind support of \$76,500 includes input to material section, design, and data feedback underscoring the collaborative work. Funds will be used for supplies such as piping, meters, shipping, travel, supply chemical, and measurement costs for water analysis. The majority of budgeted expenses will be personnel (graduate students, some faculty time) to design, oversee, conduct, interpret results, and prepare the final report. Some travel funding is necessary. FSRI is constructing structures for ongoing projects and supplies will be provided for the pipes to be installed, etc. We expect one structure burn to occur in Summer, and Fall 2024, and multistory burns are to start in Spring 2025.

Potential, Interested Participants: Please see the appendix. 7 confirmed utilities, 2 other utilities, FSRI.

What is the source of the idea? This idea is based on recent discoveries from WRF 5106, utility partner experience, our own experience, and the FSRI.

Volunteer Experts (who developed/reviewed the Project Concept): Dr. Andrew Whelton, Purdue University

¹⁶ Horn et al. 2023. *Fire Technol.* <https://doi.org/10.1007/s10694-023-01487-4>

WASSP Committee

From: Michelle Santos <Michelle.Santos@co.maui.hi.us>
Sent: Wednesday, February 28, 2024 2:00 PM
To: WASSP Committee
Cc: Cynthia Sasada; James Landgraf; John Stufflebean; Josiah Nishita; Keanu LauHee; Leo Caires; Linda Kimura; Louise Batoon; Pili Nahooikaika
Subject: MT#10529 Bill 26
Attachments: MT#10529-WASSP Committee.pdf

You don't often get email from michelle.santos@co.maui.hi.us. [Learn why this is important](#)

NOTE: PLEASE DO NOT FORWARD MY EMAIL TO ANYONE OUTSIDE OF THE COUNTY OF MAUI. YOU MAY CLICK ON THE ATTACHMENT ITSELF AND CREATE YOUR OWN EMAIL TO FORWARD THE DOCUMENT TO ANOTHER PERSON OUTSIDE OF THE COUNTY.

Michelle L. Santos

Office Operations Assistant

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County of Maui
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