

Internal Quarterly Report

Date of Report: 4th Quarterly Report – September 30, 2025

Contract Number: 693JK32410005POTA

Prepared for: DOT-PHMSA, D'Shante Lucas dshante.lucas@dot.gov; Andrea Ceartin,
andrea.ceartin @ dot.gov, 406-577-6818

Project Title: P4: Partnership to Advance Pipeline Leak Detection Methods

Prepared by: Colorado State University

Contact Information: Dan Zimmerle, PI/ dan.zimmerle@colostate.edu/ 970-581-9945/ Bryan
Rainwater, Research Scientist / bryan.rainwater@colostate.edu / 970-459-0179; Wendy Hartzell
/ wendy.hartzell@colostate.edu / 970-491-8058

For quarterly period ending: September 30, 2025

1: Items Completed During this Quarterly Period:

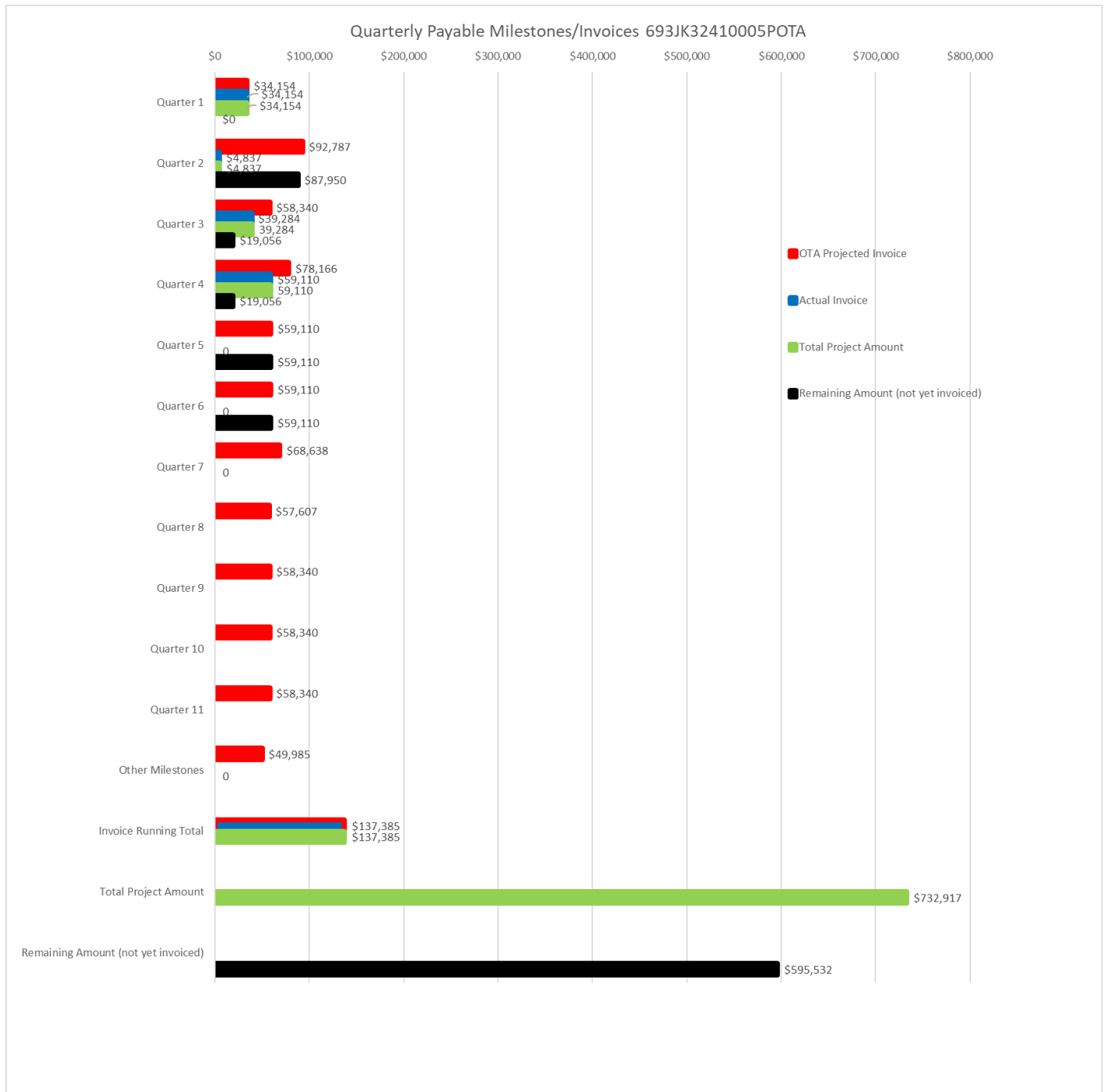
<i>Item #</i>	<i>Task #</i>	<i>Activity/Deliverable</i>	<i>Title</i>	<i>Federal Cost</i>	<i>Cost Share</i>
4	3.1	Test Program – Year 1		\$ 53,503	\$ 0
10	5	Protocol Documentation		770	\$ 0
11	7	4th Quarterly Status Report		\$ 4,837	\$ 0
		<i>Fourth Payable Milestone</i>		<i>\$ 59,110</i>	<i>\$ 0</i>

2: Items Not Completed During this Quarterly Period:

<i>Item #</i>	<i>Task #</i>	<i>Activity/Deliverable</i>	<i>Title</i>	<i>Federal Cost</i>	<i>Cost Share</i>
6	3.1	Test Program – Year 1		\$ 53,503	\$ 0
8	3.1	Test Program – Year 1		\$ 53,503	\$ 0
9	4.1	Showcase 1		\$ 19,056	\$ 0

Testing began in July 2025, so we are invoicing Item #4 for the first quarter of testing activity now. The first Showcase is scheduled for October 7, 2025, and we will include this item for invoicing with the next quarterly report. We expect cost share to start accruing with more testing weeks scheduled.

3: Project Financial Tracking During this Quarterly Period:



4: Project Technical Status –

Task 1: Assemble an advisory group

The SMU team supported the assembly of the advisory group by contacting solution providers (13), utility companies (2) and regulatory agencies (3). Further SMU organized and secured two academic tech advisors for the TAP: Professor Aaron Cahill, Heriot Watt university and Professor. Bo Guo, The University of Arizona.

Task 2. Literature Review

SMU team engaged directly with leak detection and quantification (LDAQ) solution providers and utility companies to understand current practices in underground natural gas (NG) pipeline leak detection through industrial interviews. These industrial interviews highlighted how solution developers and operators approach deployment, testing, and validation under field conditions. Insights from these discussions inform the broader effort to advance leak detection practices by linking technology development with realistic testing environments, standardized deployment protocols, and opportunities for knowledge exchange among operators, regulators, and stakeholders. The first deliverable draft report on general literature and stakeholder review attached in Appendix A (*redacted in public report*).

Task 3. Test Program

Many solution developers are small companies or small divisions of larger service providers, both with limited cash on hand. In the current uncertain regulatory environment, recruiting companies to test under this program has proven more challenging than originally anticipated. Recently, however, interest has accelerated. Two companies completed a week of testing each on the new underground testbed. Observational notes were taken, by CSU staff, on their deployment strategies as well as challenges and successes that were faced while testing. CSU and the companies met several times to discuss idea test plans and how CSU could best support their testing needs. Two more companies are scheduled to conduct week-long testing on the testbed next quarter.

Task 4. Showcase Event

The upcoming showcase event on Tuesday, October 7, 2025, aims to foster collaboration between pipeline operators and solution developers to address underground leak detection challenges. It provides an opportunity for developers to present recent testing results and innovations in pipeline leak detection, while operators and stakeholders can explore state-of-the-art solutions on METEC's underground testbed. The event will feature panels on advanced detection methods, leak quantification, and current industry challenges, alongside hands-on demonstrations of leak detection technologies. Participants will gain insights into new practices, network with industry experts, and discuss evolving needs in leak detection and pipeline infrastructure. The day will be split between sessions at

Government	2
Government	2
Industry	25
Association	1
Distribution	14
Midstream	6
Production	4
Other	8
Our Team	8
Services	32
Engineering	6
Solution	22
Unknown	4

Figure 1 Workshop attendees by category

CSU's Powerhouse and METEC Research Site, with a backup plan in case of inclement weather. Currently the Showcase has 7 solution developers signed up to provide live demonstrations and over 65 attendees that will participate in the morning session at the Energy Institute Powerhouse, and then move to engage with the live demos. Figure 1 is a general breakdown of the attendees. The workshop agenda is attached as Appendix B.

Task 5: Document protocols

The project team prepared a questionnaire for the pre- and post-participation for the testing round. CSU is collecting responses to the questionnaire before and after companies test and are using the feedback to refine the experimental testing plan and data collection. SMU is currently using the collected data and reviewing it for completeness. Pre- and post- surveys are attached in Appendix C.

5: Project Schedule –

Project is on schedule. For the next quarter, the project team will focus on continuing to update the literature review, summarize findings from the Pipeline Solutions Showcase, and operate the testing round for additional study participants. The teams will determine whether a Fall TAP meeting is needed.

6. Attachments

Appendix A – Task 2 General Literature and Stakeholder Review (*redacted in public report*)

Appendix B – October 7 Pipelines Solutions Showcase Agenda

Appendix C – P4 Entry and Exit Questionnaires



Solution Showcase Agenda – Tuesday ~ October 7, 2025

Note: This Solution Showcase is free for participants and is a pre-conference event prior to the annual [CH4 Connections Conference](#), October 8 & 9 in Fort Collins, CO.

Locations:	Morning: CSU Energy Institute Powerhouse 430 N College Avenue, Classroom #104, Fort Collins, CO 80524 Afternoon: CSU METEC Research Site 3401 W Vine Dr, Fort Collins, CO 80521
1. 8:00 am 2. 8:30 am 3. 8:40 am	1. Coffee and Networking 2. Welcome and opening remarks: Dan Z. 3. Update on recent pipeline regulations
9:00-9:45 am 9:45 – 10:00 am 10:00 – 10:30 am 10:35 – 11:20 am	4. Sessions a. Panel 1: Advance leak detection survey methods. (45-60 min) Operators share methods used, promising practices, challenges, current state of the field and perceived needs. Break b. Presentation: Cracking the Code on Underground Methane: What 30 Controlled Natural Gas Leak Tests Reveal About Detection in Diverse Operating Conditions (30 min). c. Panel 2: Topic: Pipeline Leak Quantification – Successes, Challenges, Opportunities (45 min).
11:20 – 12:30 pm	5. Review Agenda & Process for afternoon Solution Showcase 6. Lunch, Networking, and Travel to METEC, and 7. Travel time
12:30 – 4:30 pm	8. Solution Developer (SD) Showcase at METEC a. SDs display and demonstrate solution products on active underground leaks at the METEC Research Site
2:00 pm	Mid-Afternoon Refreshments (afternoon snack & beverages)
4:30 pm	Closing and End of Demonstrations

***Inclement Weather Back-up Plan:** Companies would showcase their solutions in the lobby of the Powerhouse (there would not be any methane releases in this situation).

P4 Partnerships to Advanced Leak Detection

Task 3. Test Program, Solution Provider Entry Survey

W. Hartzell, G. V. Rao, K.M. Smits

v. 7/23/2025

Company Name: _____

Dates of Testing: _____

1. Do you have a written protocol or procedure for your survey method(s)? If so, can you provide METEC with a copy? If not, please briefly describe the usual procedure taken in the field:

2. Are you willing to provide METEC with a sample output from your solution, so the study team has an example of what is typically provided to customers? Preferably from data collected during testing at METEC.

3. Please provide, via email, the instrument(s) make and model used in your solution. If available, attach spec sheets. If applicable and not included in your protocol, also include:
 - a. Height(s) of inlet above ground
 - b. Intake flow rate or sampling rate
 - c. Additional inline equipment

4. How do you define a detection or an indication of a leak?

5. What is the *minimum detection limit (MDL)* of your solution? Please specify the leak rate and associated units (e.g., g/hr, SLPM, kg/day).

6. What is your *detection threshold*? If it is different from the MDL, please define the threshold and explain how it is determined and applied.

7. What type(s) of survey will you complete? (Provide speed range for each applicable method)
 - a. Walking: ____ Speed Range: _____
 - b. Driving: ____ Speed Range: _____
 - c. UAV: ____ Speed Range: _____
 - d. Other (please specify): _____

8. How many passes are required to complete a survey? If it varies by method, please specify.

9. On average, how much distance can your team cover per hour during a survey? (Provide for walking, driving, or UAV if applicable. e.g., miles per hour or km/hour.)

10. What is the typical downwind distance from right of way (ROW) during the survey?

11. Under what conditions is the survey terminated early? e.g., Is there a concentration or confidence threshold where the survey is stopped, a detection is logged, and/or a notification is sent?

12. What are the environmental limits for your solution? Please provide the valid envelope for:
 - a. Wind speed (min & max): _____

- b. Precipitation (acceptable types and intensities): _____
 - c. Temperature range (if applicable): _____
 - d. Other limiting conditions: _____
13. Localization: If your solution locates an emitter, then:
- a. Do you provide a map or spatial limits of surface expression? ____ Yes ____ No
 - b. Do you provide a point location that is indicative of leak location? ____ Yes ____ No
 - c. Other (please describe): _____
14. Quantification – Emitter Level:
- a. If a leak is detected, does your solution estimate emission rate? ____ Yes ____ No
 - If yes, how many passes are required to make an estimate? _____
 - b. Does your solution estimate leak duration? ____ Yes ____ No
 - If yes, describe the method used: _____
 - c. Please describe your quantification methodology in your own words:
15. Quantification – Area Level: Can your solution estimate total emissions from all emitters in a defined area over a specified time? ____ Yes ____ No
- a. If yes, please describe assumptions and estimation approach:
16. What are your solution's target market sectors? (e.g., Distribution, Midstream, Upstream/Production, Storage, Refineries, etc.)
17. Are there market sectors or facility types where your solution is not applicable? If yes, please describe:



18. If you deploy your solution in different sectors (e.g., production vs. distribution), do you make changes to your procedures or technology setup? ____ Yes ____ No
If yes, please describe how and why procedures differ:



Company Name: _____

Dates of Testing: _____

- 1

