

Water Demand Disaggregation for Non-Residential Users Using Smart Metering

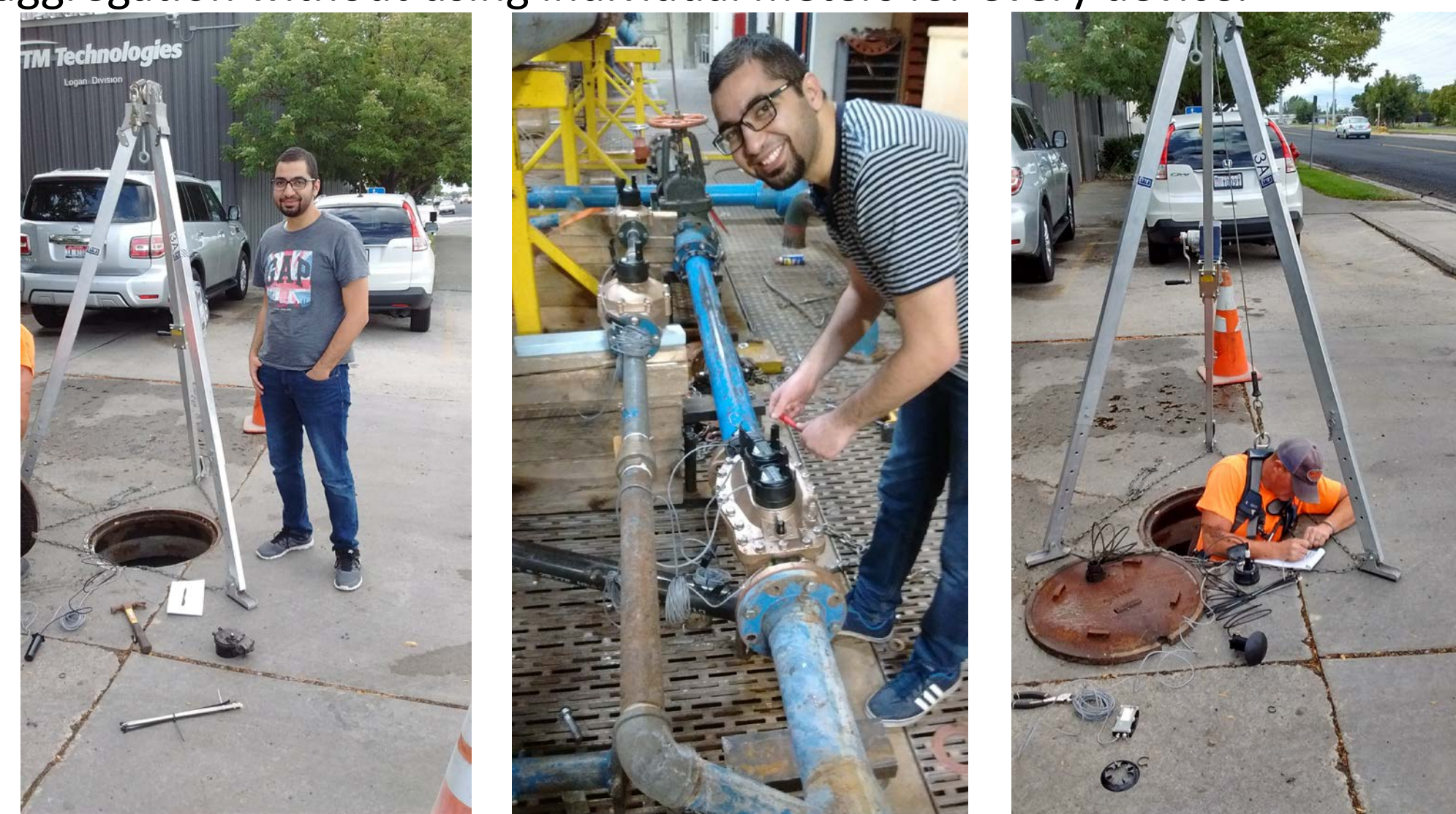
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ABSTRACT

- Water use disaggregation is the attempt of separating the consumption of individual appliances in a household. This is useful because having a breakdown of the consumption of all the devices encourages users to consume less water and gives them indications on how to do so. This project will focus on the problem of nonintrusive load monitoring, which attempts to perform water use disaggregation without using individual meters for every device.



STUDY AREA



Fig. 1. Location of the City of Logan – UT

- The Logan metropolitan area contained 125,442 people as of the 2010 census. Logan has a wide diversity of economic sectors including education, manufacturing and processing, medical services, agriculture, and retail businesses. Industry and commerce are growing rapidly in this city.

Business Type	# of meters	# of registers	Meter Size
Educational institution	2	2	24" Neptune
Medical Services	1	1	24" Compound Neptune
Medical Services	1	1	24" Compound Neptune
Manufacturing (circuit board)	4	4	44" Neptune & 2" Neptune
Manufacturing (circuit board)	1	1	12" Neptune
Manufacturing (Sensors)	1	1	12" Neptune
Manufacturing (commercial printing)	2	2	1.5" Neptune & 2" Neptune

Table 1. Participants

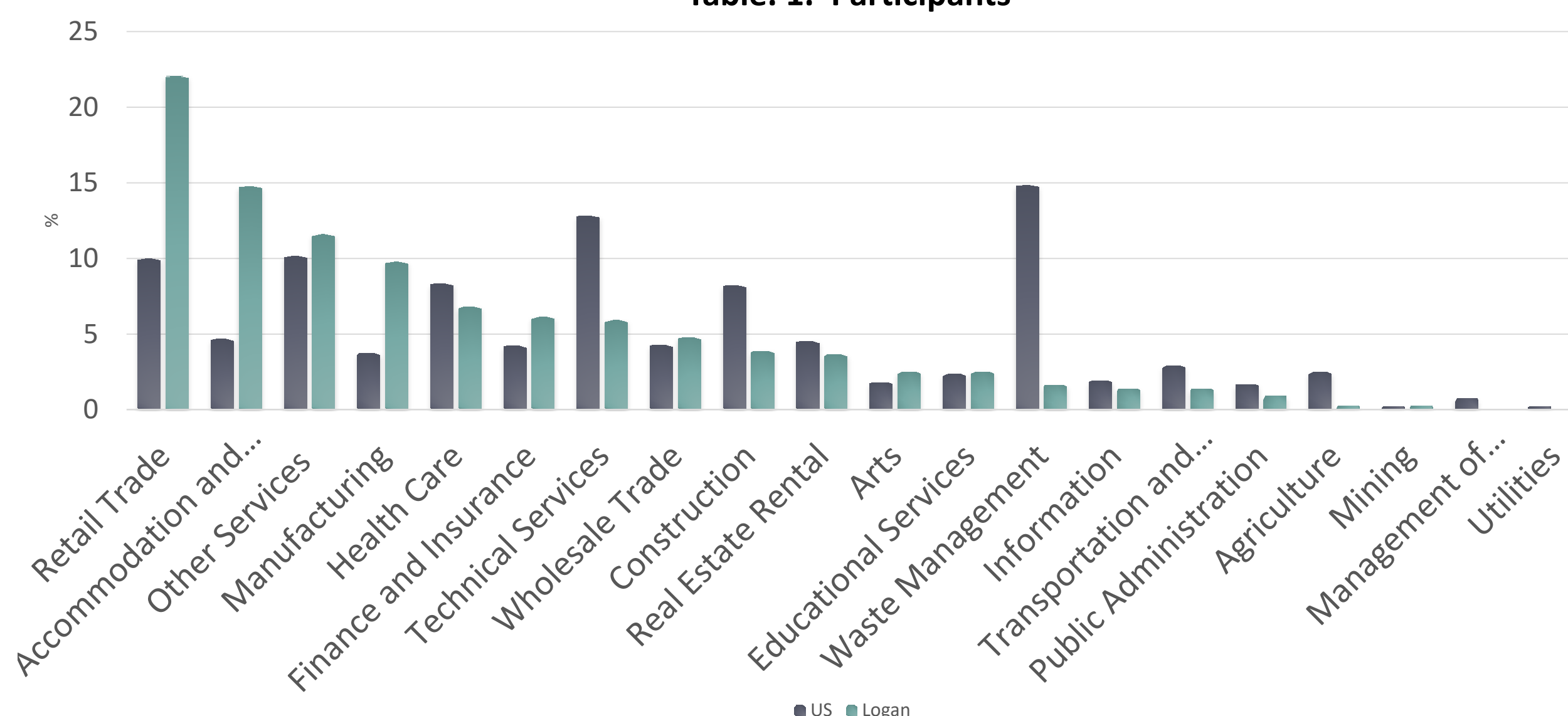


Fig. 2. NAICS Distribution in Logan VS US

RESEARCH APPROACH

- Customer level water billing data of CII users in the City of Logan for the period of 2014 – 2016 were provided by the City. Preliminary results obtained from the billing data were used to identify a subsample of approximately 10 customers to participate in high-frequency monitoring where for each participant a walk-through of the property was conducted to identify the types of water uses inside and outside the business.

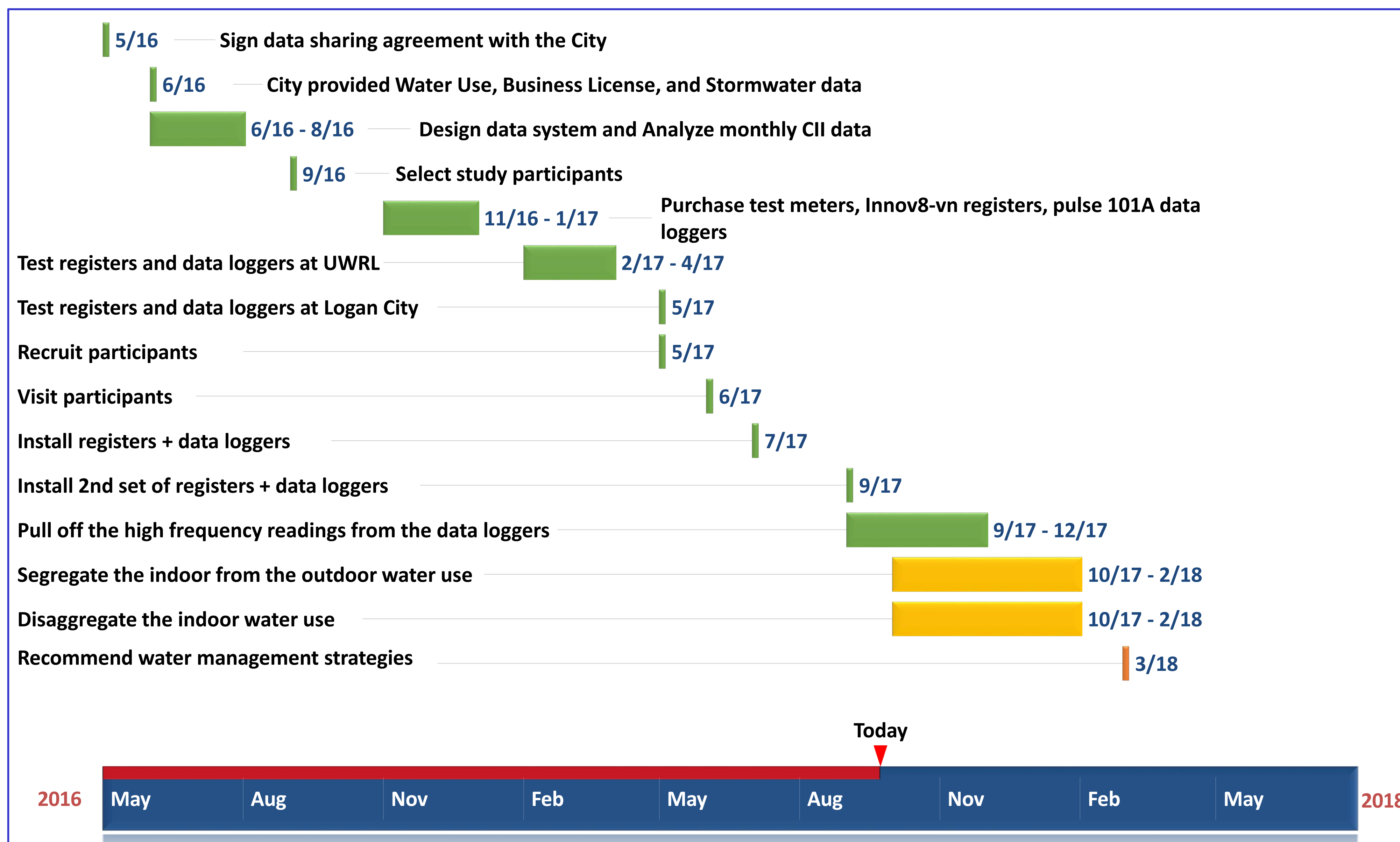


Fig. 3. Research Approach

Current System

- Reads once a month with a 1000 Gallon frequency.
- Used for billing purposes
- Cost ~ \$(100-200)



Fig. 4. Prior E-CODER register

New System

- Metron Innov8 VN registers
- VN: can log readings at a 5 min intervals
- A101 Data logger: dial down the reading frequency to 5 sec
- E-Coder - \$100
- Innov8-vn + antenna + pulse output - \$350
- Pulse 101A + water box - \$135

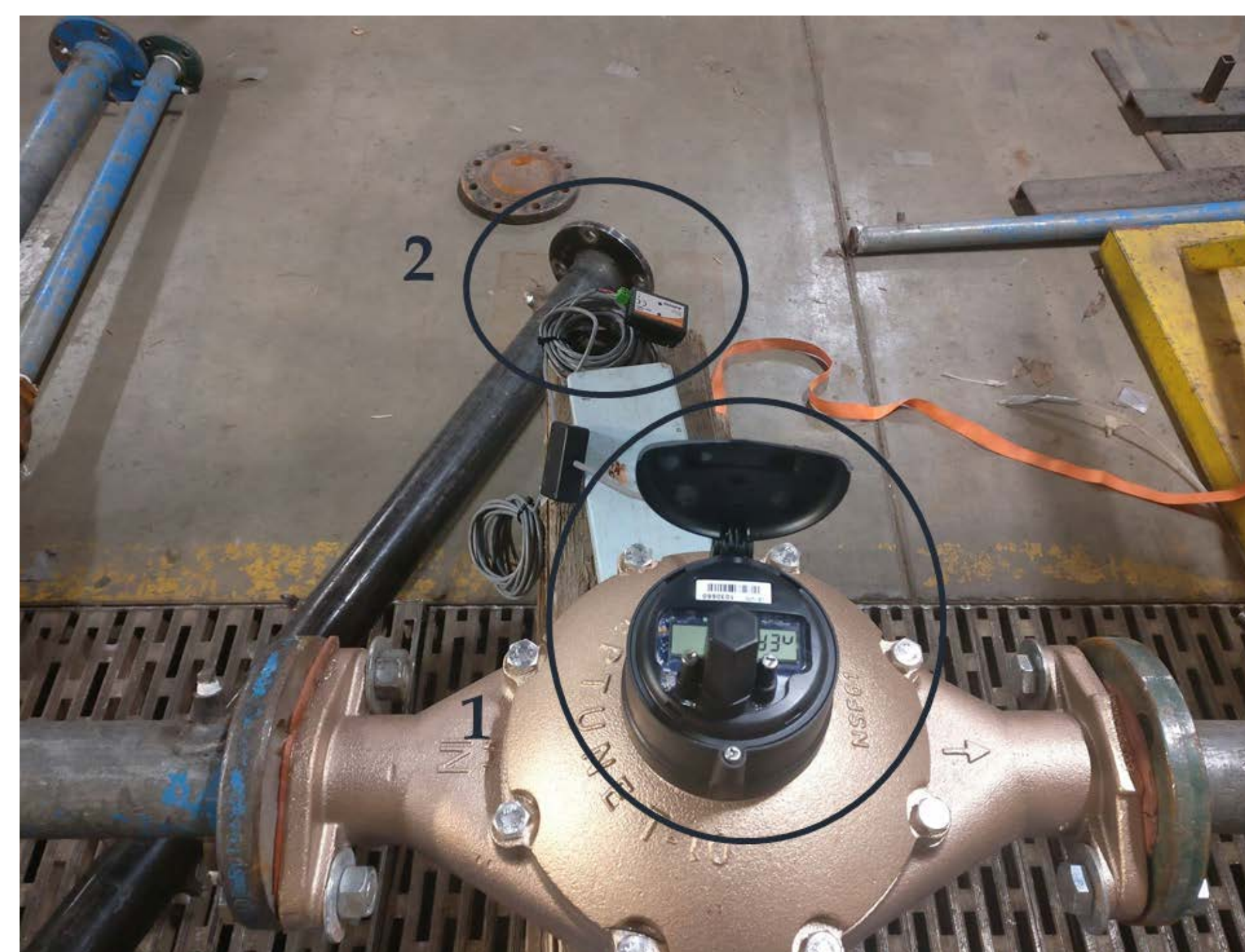


Fig. 5. High Frequency System

RESULTS & DISCUSSION

Fig. 6. Five-second data collected on 7/15/2017

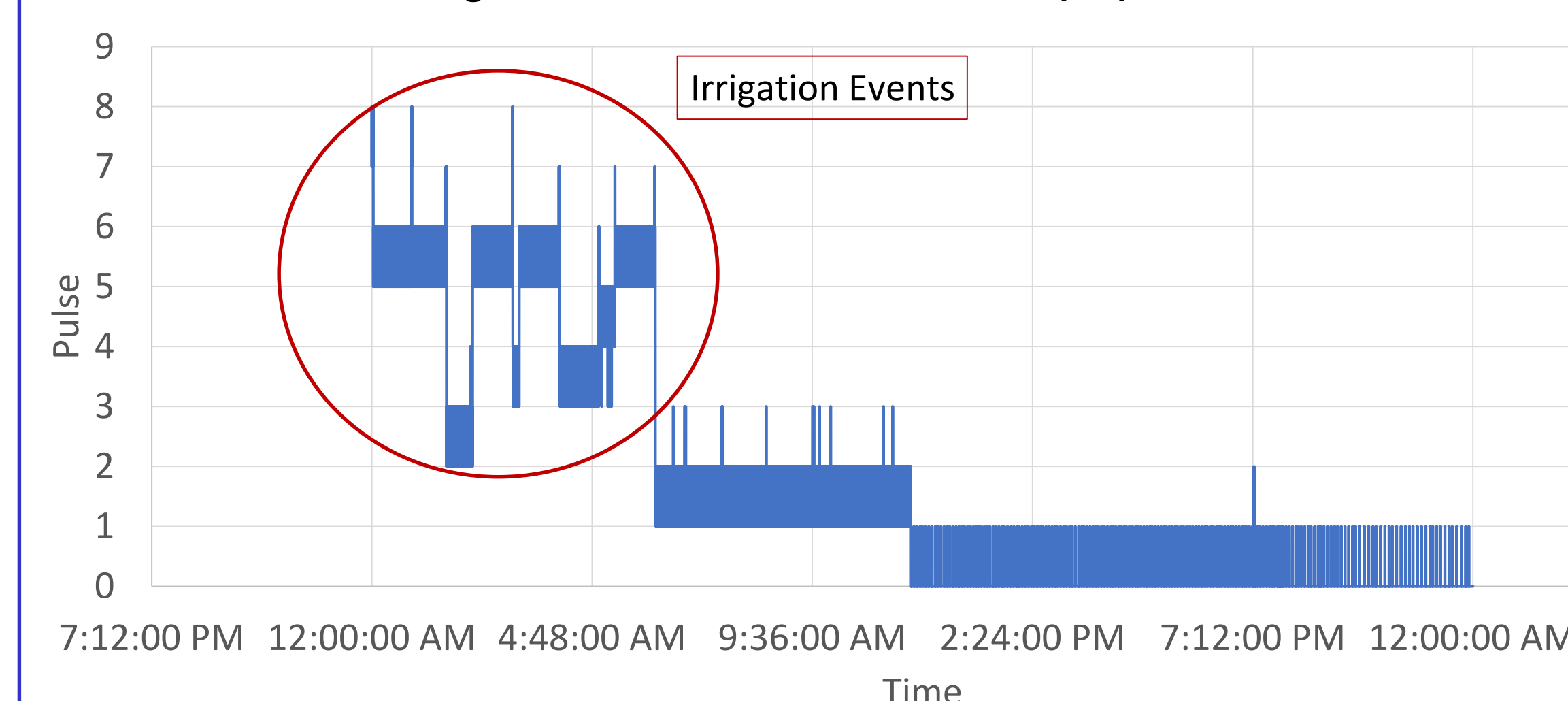


Fig. 7. Five-minute data collected on 7/15/2017

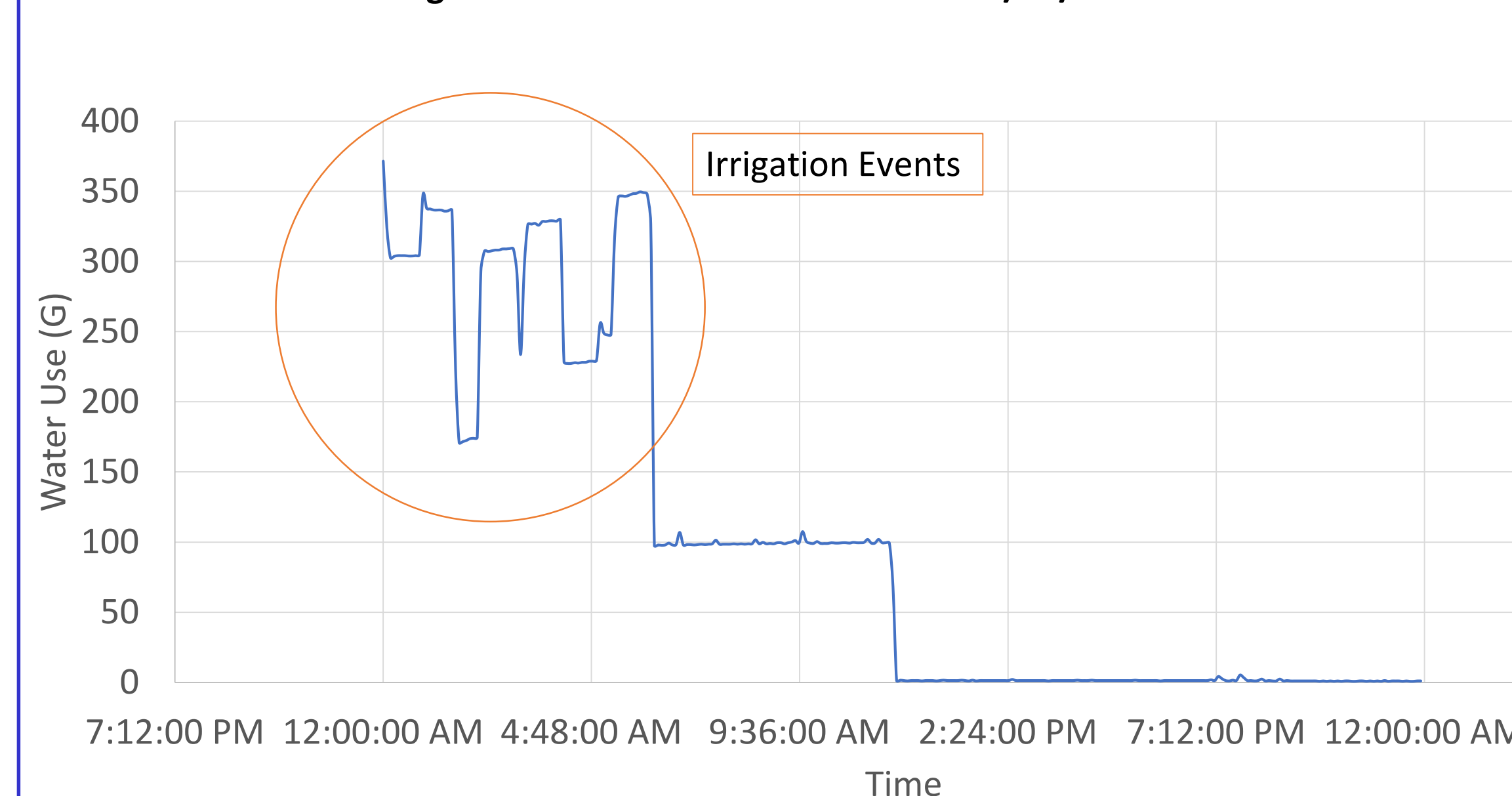
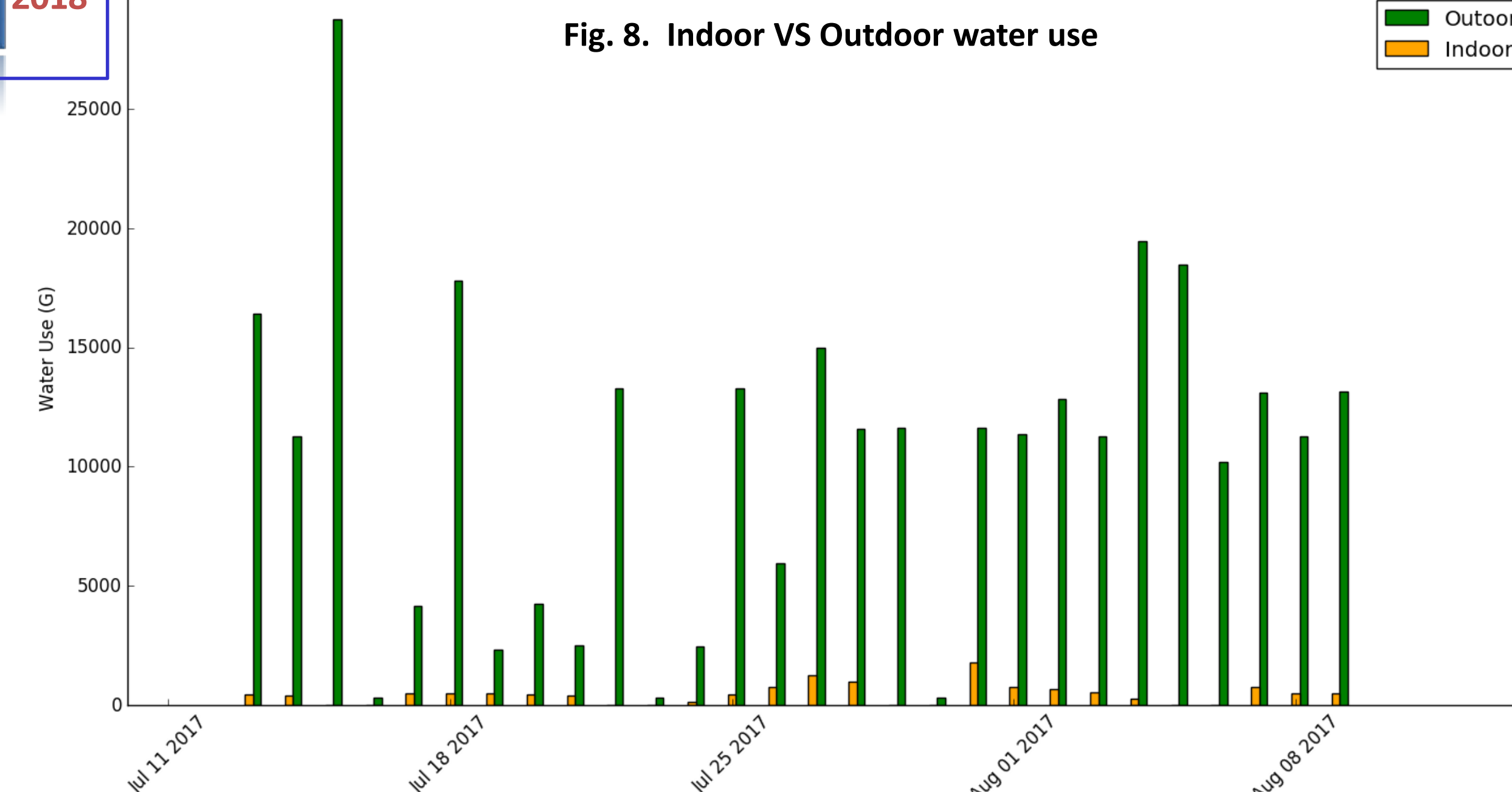


Fig. 8. Indoor VS Outdoor water use



CONCLUSION

- Non-intrusive water disaggregation is a valuable approach for estimating fixture-specific water consumption, while keeping installation costs affordable, and, at the same time, the underlying complexity of processing remains manageable.

- The field of water usage disaggregation is especially important in achieving water efficiency savings in CII properties. This enables consumers to see data relating to which of their appliances utilize the most water, which appliances they use the most, and when they utilize appliances across the day. The availability of this subsequently enables a more efficient optimization of the consumer's water usage by enabling them to reschedule usages at different times.