IS YOUR TOILET RUNNING? YOU'D BETTER GO CATCH IT!
LEAK NOTIFICATION PROGRAMS IN ACTION

AWWA ACE – June 2023

Liesel Hans, Director of Programs, Alliance for Water Efficiency | Liesel@a4we.org

Alliance *for* Water Efficiency

Alliance for Water Efficiency

The Alliance for Water Efficiency is a stakeholder-based nonprofit organization dedicated to the efficient and sustainable use of water.

Collaboration: Network of colleagues across water providers, governments, business and industry, researchers, nonprofits and other partners.

Knowledge: Creating and sharing resources, tools, trainings, expertise and research.

Change: Advocacy for funding, policies, and partnerships that advance water efficiency.

Learn more:
www.a4we.org

Alliance for Water Efficiency

THANK YOU!

Funding:

- This work was funded by the participating agencies and the Innovative Conservation Program sponsored by the Metropolitan Water District of Southern California.

Participating Agencies:

- City of Fort Worth, TX
- City of Sacramento, CA
- Sacramento Suburban Water District, CA
- San Francisco Public Utilities Commission, CA

Consultants:

- David Mitchell, MSc | M.Cubed
- Don Schlenger, PhD | Don Schlenger & Associates

AMI-ENABLED PROACTIVE LEAK NOTIFICATION PROGRAMS

- Customer-side leaks are perceived to be very common, and the ability to deliver timely leak notifications are celebrated as a key benefit of adopting Advanced Metering Infrastructure.

- **AMI** = Advanced Metering Infrastructure
- **Leak** = continuous water consumption as defined by:
  - a minimum time threshold and,
  - a minimum flow threshold
- **Proactive** = before the bill is delivered, the sooner the better

SMART PRACTICES TO SAVE WATER

- Use an opt-out approach, where all customers are automatically eligible for a notification and do not need to take action to enroll in the program.
- Analyze use and notify customers 24-hours a day, 7-days a week to avoid missing leaks.
- Leverage multiple communication channels.
- Notify customers as quickly as possible after the leak is identified.
- Include the “next step” with the notification, such as a guide to search for leaks, leak detection kit, leak inspection service, or leak repair service.

Image by rawpixel.com on Freepik

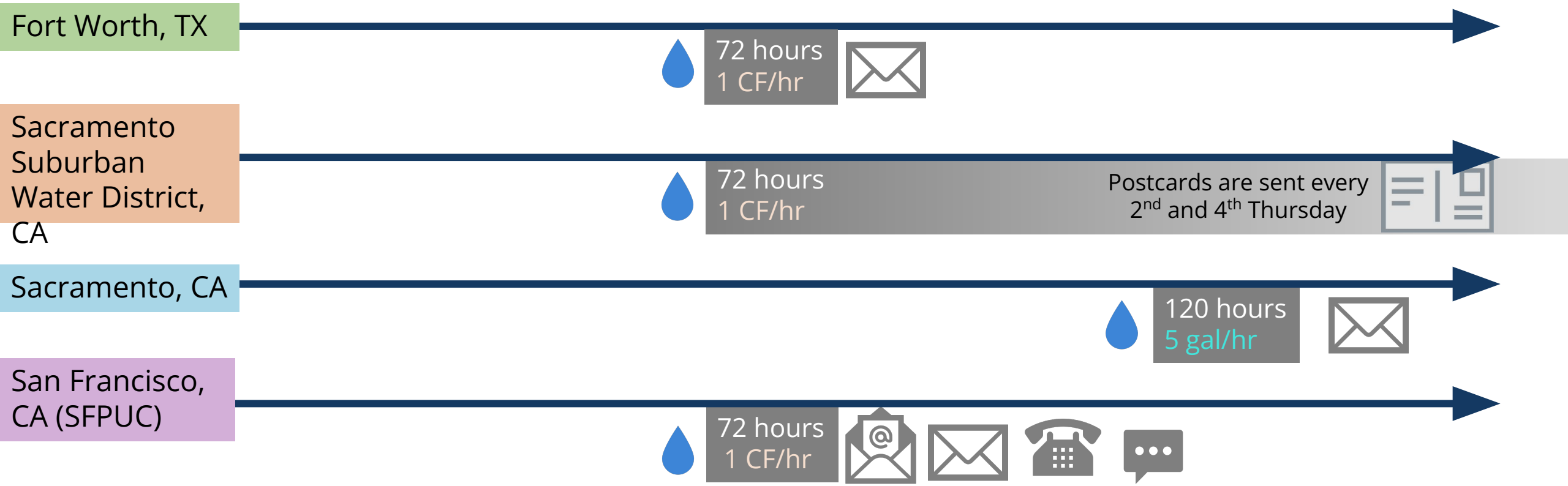
CASE STUDIES

Some leak alert programs are called “continuous consumption” programs because they are based on the idea that most homes do not use water every hour. When water is being continuously used every hourly meter read, it is likely abnormal water use that could be avoided.

Utility	Customer Category	Minimum Flow Threshold (volume per hour)	Minimum Time Threshold	Initial Notification Timing and Method
City of Fort Worth, TX (FWTX)	Single-Family	1 cubic foot (7.48 gallons)	72 hours	Automated letter
City of Sacramento, CA (SAC)	Single-Family	5 gallons	120 hours	Automated letter
	Multi-Family (2-4 units)	7.5 gallons		
Sacramento Suburban Water District, CA (SSWD)	Single-Family	1 cubic foot (7.48 gallons)	72 hours	Account added to list, postcards mailed every 2nd and 4th Thursday of the month
	Multi-Family (2-4 units)			
San Francisco Public Utilities Commission, CA (SFPUC)	Single-Family	1 cubic foot (7.48 gallons)	72 hours	Automated mails, mailed letter, interactive voice response (IVR), and SMS text. Manual notifications are sent to municipal dedicated irrigation meter accounts only
	Multi-Family (2-5 units)			
	Dedicated Irrigation Meters: Municipal & Non-Municipal			

Utility leak criteria, notification timing, and notification method(s) for single-family residential programs

1 cubic foot (CF) = ~7.48 gallons



= when continuous consumption is considered a leak; continuous consumption = water use registered every hour for the minimum duration set

Some leak alert programs are called “continuous consumption” programs because they are based on the idea that most homes do not use water every hour. When water is being continuously used every hourly meter read, it is likely abnormal water use that could be avoided.

FORT WORTH.

Continuous Usage Water Alert

March 6, 2023

<<NAME>>
<<ADDRESS>>
<<CITY>> <<STATE>> <<ZIP CODE>>

Water Account: <<WATER ACCOUNT>>
Meter Location: <<Meter LOCATION>>

This is a City of Fort Worth Water utility courtesy alert letting you know our remote meter reading shows the meter at the above location is registering continuous water use. This means water usage was detected every hour for at least 72 continuous hours in the previous week. This could indicate a possible leak. Continuous usage is unusual and can result in higher than normal monthly utility bills.

What you should do
Sign up for Fort Worth Water's customer portal MyH2O so you can see your water usage. You may be able to identify what caused your continuous usage. Visit fortworthtexas.gov/water. Review the conservation webpage on how to check for leaks or download our leak detection checklist at savefortworthwater.org. Financial assistance may be available for low-income homeowners through Fort Worth Water's SmartRepair program. Call customer service at 817-392-4477. Call Center hours are 7 a.m. to 7 p.m. Monday through Friday, excluding city holidays.

Este es un aviso de cortesía de la Compañía de Agua de Fort Worth. Se le comunica que las lecturas del medidor a distancia muestran que el medidor en la dirección mencionada arriba está registrando un uso continuo de agua. La semana pasada se detectó un consumo de agua de por lo menos 72 horas seguidas. Esto pudiera tratarse de una fuga. El uso continuo es algo inusual y puede resultar en una factura mensual más alta de lo normal.

Qué pudiera hacer
Inscribirse en el portal MyH2O para revisar su consumo de agua. Quizás pueda identificar la causa del uso continuo. Visite fortworthtexas.gov/water. Revise la página en línea de conservación dónde encontrará detalles sobre cómo identificar las fugas o descargue la lista de recomendaciones de savefortworthwater.org. Ayuda financiera pudiera proporcionarse a personas de escasos recursos que califiquen a través del programa SmartRepair. Llame a nuestra oficina de servicio al cliente al 817-392-4477. El horario del centro de llamadas es de 7 a.m. – 7 p.m. de lunes a viernes, excluyendo los días festivos.

WATER DEPARTMENT
The City of Fort Worth · 200 Texas Street · Fort Worth, TX 76102
817-392-4477

SACRAMENTO SUBURBAN WATER DISTRICT

3701 Marconi Ave
Sacramento, CA 95821

LEAKS CAN ACCOUNT FOR UP TO 13.7% OF HOUSEHOLD WATER USE PER DAY.

Please check for leaks right away and make repairs as soon as possible:

- Visually inspect faucets, showerheads, and sprinkler system
- Look for signs around the house such as a soggy yard or a dripping faucet
- Test your toilet by dropping food coloring into the tank. If after 20 minutes color seeps into the bowl, you have a leak

This notice has been sent as a courtesy. Customers are responsible for resolving leaks on their property in a timely manner.

COURTESY NOTICE
from Sacramento Suburban Water District

Looks Like You've Got a Leak

SSWD's automated leak detection system was created to help our customers detect leaks that might otherwise go unnoticed. Our system has flagged the water use at your property as having a non-stop flow of water, indicating that your home has a leak.

Many leaks are easy and inexpensive to fix. Turn over to learn what to do.

You can also contact SSWD for help. Call 916.972.7171 or visit sswd.org to schedule a complimentary Water-Wise House Call. We'll review your water use indoors and outside to help find that pesky leak.

City of SACRAMENTO
Department of Utilities

5730 24TH ST, BUILDING 22
SACRAMENTO CA 95822-3634

PH 916-264-5011
FAX 916-808-5655

December 2, 2016

«Name»
«Address1»
«Address2»
«Address3»
«City» «State» «Postal»

URGENT! YOU MAY HAVE A LEAK!

Dear Customer:

The Department of Utilities automated water meter read system indicates nonstop water use at **«Address1_Prem»**. We estimate that you may be losing approximately **«Gals_Lost»** gallons per day.

Irregular use can often indicate an indoor leak (such as a leaky toilet) or outdoor irrigation system leak (such as a leaky valve). We would like to assist you further in identifying the reason for the irregular water usage and encourage you to call us to schedule a free site visit. Once scheduled, a Water Conservation Representative will visit your home or business and will help evaluate your system and water use. Recommendations for using water wisely, indoors and out, and details on our rebate programs may also be provided.

In addition, the City is excited to announce the launch of a free web-based portal that will allow you to track and be notified of any abnormal usage and set leak alerts in the future. To create your own account, please visit mywater.cityofsacramento.org.

The table below provides a conversion of gallons to cubic feet for the estimated water loss:

Gallons/day Loss	Gallons/month Loss	Cubic Foot (CF) conversion
100	*3,000*	401
250	*7,500*	1,003
500	*15,000*	2,005
1,000	*30,000*	4,010

We are here to assist you in identifying ways to save money by saving water. To schedule a free site visit, please call 311 or 916-264-5011.

Sincerely,

Water Conservation Office

SMS Text Message

** SFPUC LEAK ALERT – NOTICE #2 ** Our data shows nonstop water use of at least 60 gal/hr at 555 Main St. This may mean you have a plumbing leak. Log onto MyAccount.sfwater.org to check for unusual increases in water use and visit sfpuc.org/fixleaks for tips. For questions call (415) 551-3000 weekdays 8-5 or email customerservice@sfwater.org. Thank you.

Email (English; also sent in Spanish and Chinese)

Subject Line: URGENT: Potential Water Leak at 555 Main St. Courtesy Notice # 2

Dear #RecipientFullName#,
California is in a severe drought. The SFPUC asks everyone to reduce outdoor water use and eliminate water waste from leaks.

Our data shows nonstop water usage at your property that started as early as **9/18/2022**. During our most recent review period from **10/18 - 10/19/2022**, the minimum usage was **60** gallons per hour, which may mean you have a plumbing leak. As a courtesy, we provide three leak alert notices over a ten-week period if nonstop usage continues. We advise that you check all indoor and outdoor plumbing fixtures and equipment as soon as possible, or call a plumber. You do not need to contact us in response to this notice unless you have specific questions that aren't addressed in the resources described below.

It is your responsibility to resolve plumbing leaks at your property in a timely manner. Tenants receiving this notice may want to contact the property owner for more direction on leak repairs. If you received this notice for a multi-family property, please share it with other occupants. While leaks at most properties are usually ongoing, some may be intermittent. For multi-family properties, leaks may occur in a particular dwelling unit or in a common area.

For tips on how to detect and fix a leak or for free assistance available through the SFPUC, please visit **sfpuc.org/fixleaks**. Printed copies of our Leak Guide are also available at the first floor Customer Service Center at 525 Golden Gate Avenue.

We also encourage you to use **MyAccount.sfwater.org** to review your property's daily water use and check for unusual increases. If you are not currently registered for My Account it only takes a few minutes to register. Hourly usage that never goes to zero in a day reflects nonstop water use.

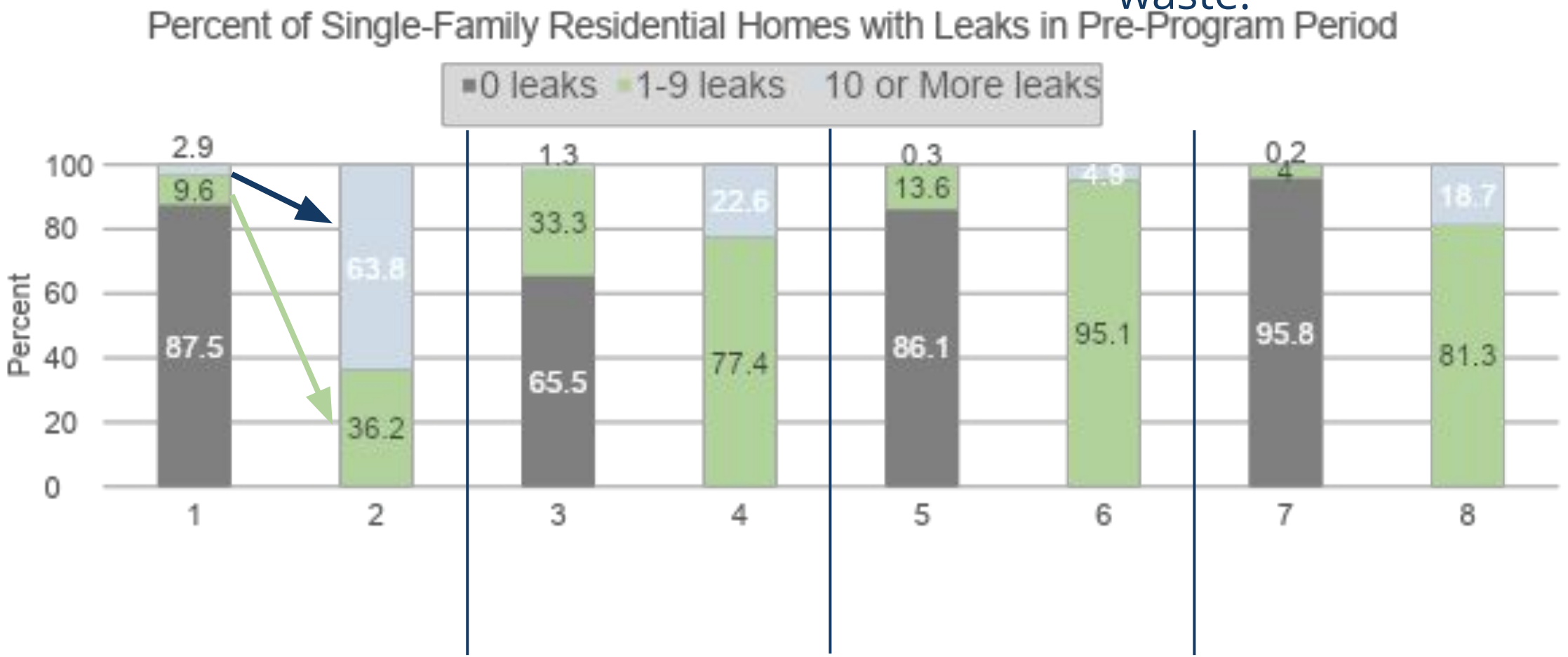
For further questions, call (**415**) **551-3000** 8AM-5PM, Monday to Friday or email **customerservice@sfwater.org**.

4 CASE STUDIES: SINGLE-FAMILY RESIDENTIAL PROGRAMS

Utility Case Study	Avg Daily Use (gal/day)	Summer to Winter Ratio of Water Use	Study Pre-Program Period	Study Program Period
City of Fort Worth, TX (FWTX)	247	1.7	April 2020-Dec 2020	Apr 2021 – Dec 2021
City of Sacramento, CA (SAC)	312	2.7	Oct 2015 – Aug 2016	Oct 2017 – Oct 2018
Sacramento Suburban Water District, CA (SSWD)	321	1.9	Mar 2015 – Jan 2016	Mar 2016 – Jan 2017
City of San Francisco, CA (SFPUC)	132	1.1	Jul 2014 – Mar 2015	Jul 2018 – Mar 2019

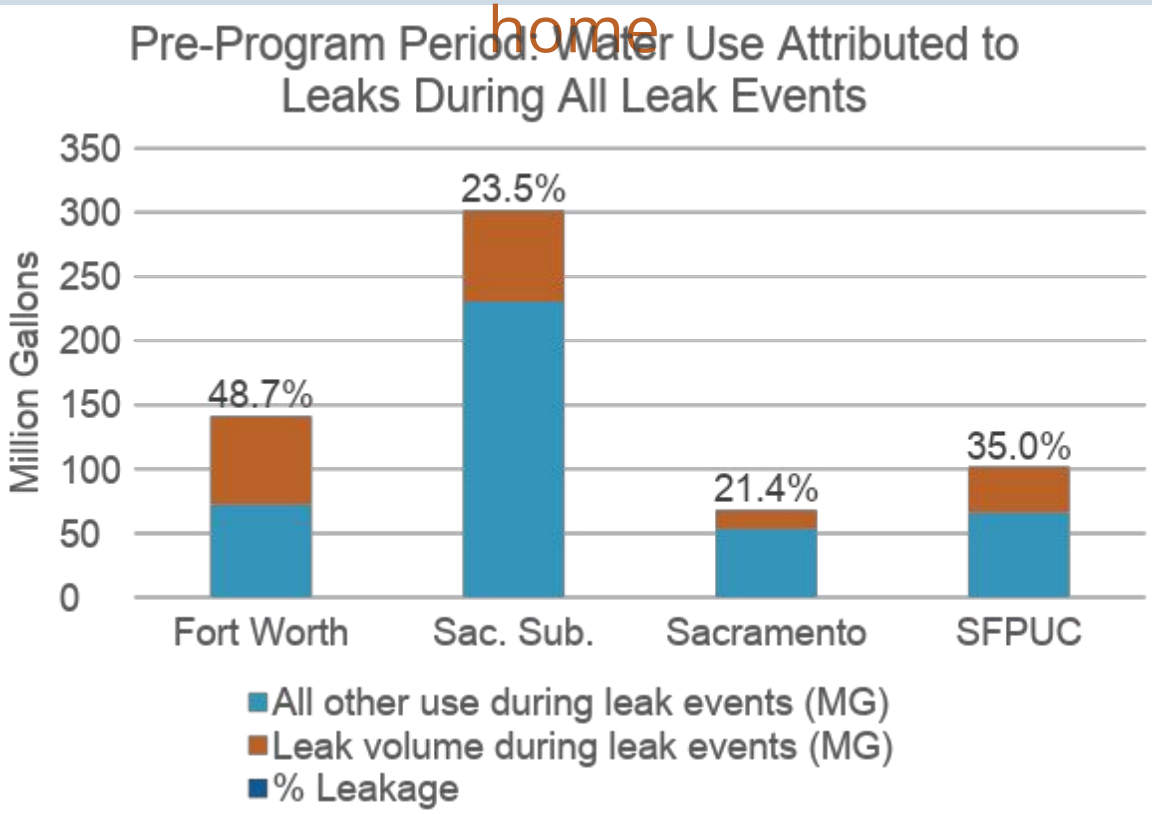
HOW MANY HOMES HAVE LEAKS?

A small portion of homes are responsible for a big portion of water waste.



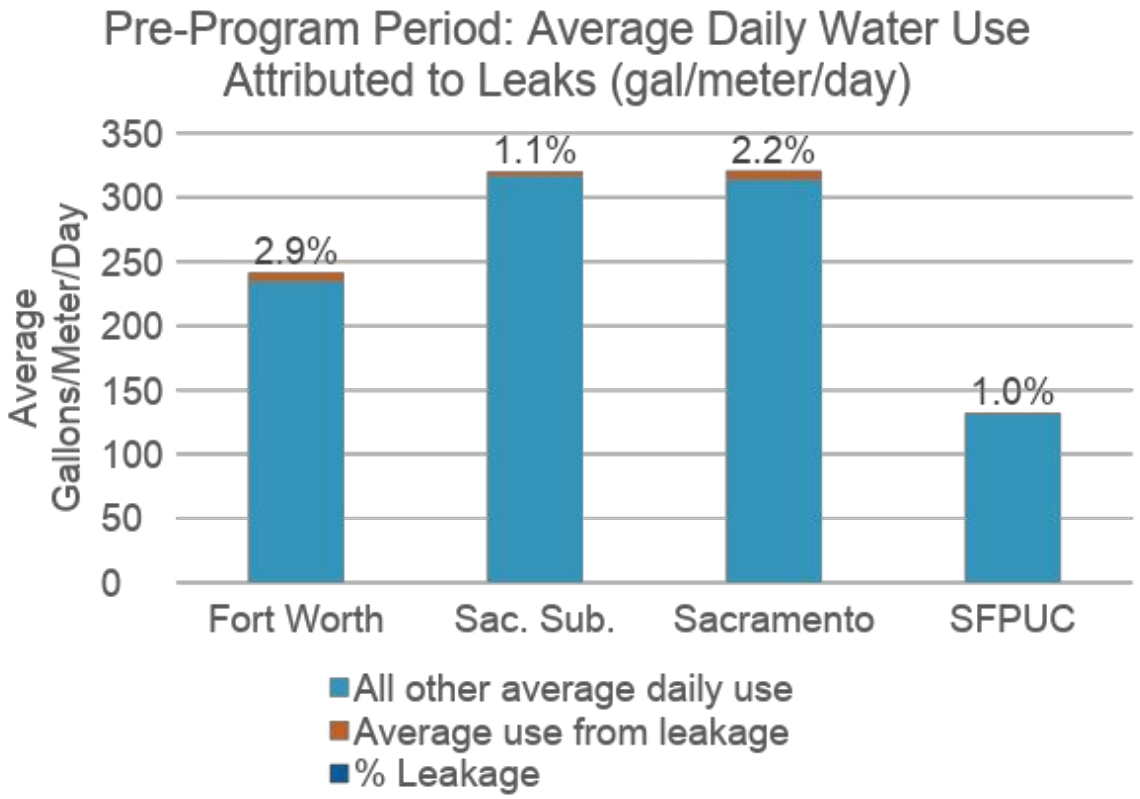
During a leak, the leak accounts for a large portion of water use

» Leaks matter a lot to the individual home



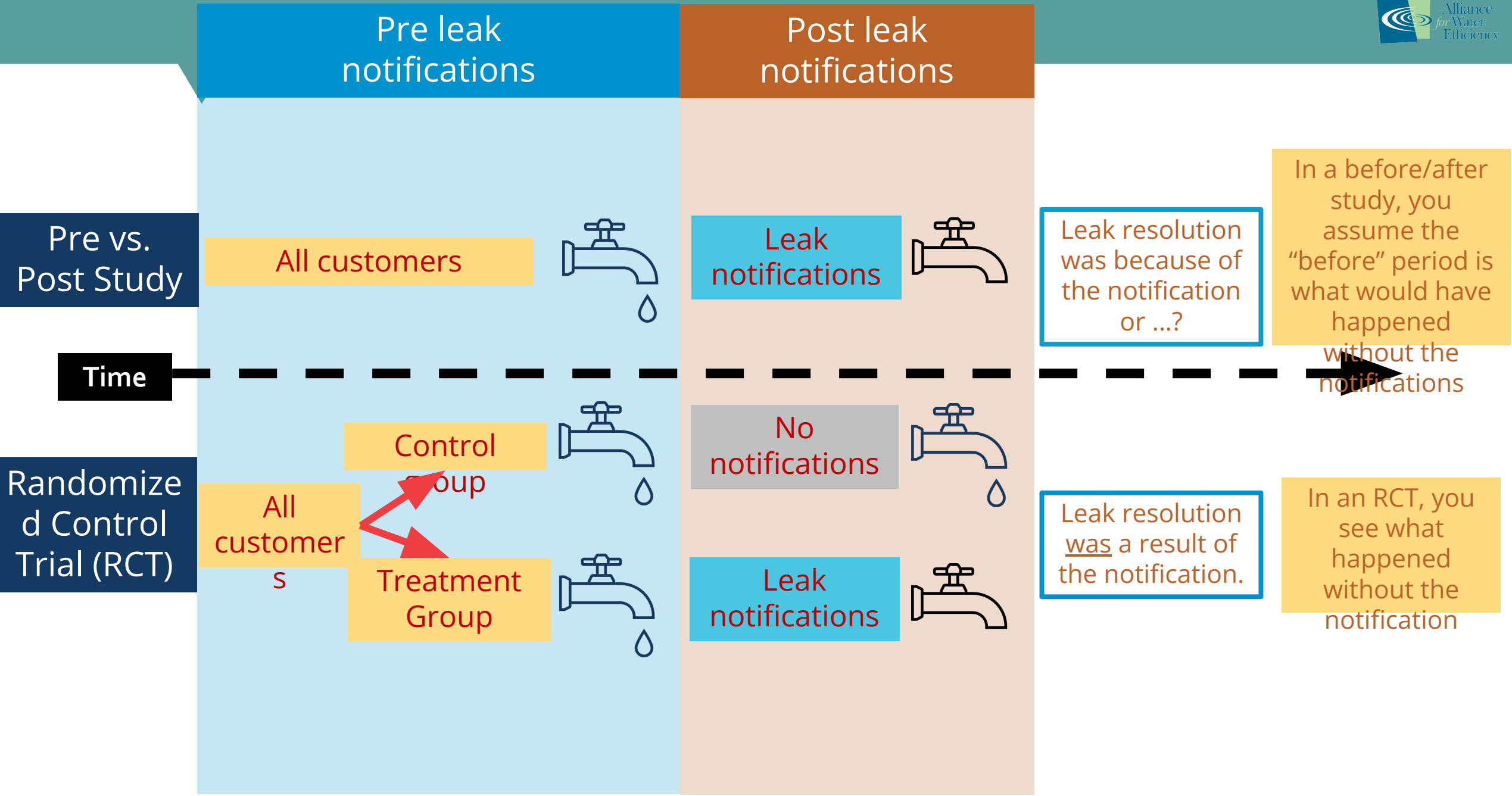
Leaks account for a small portion of *average* daily water use

» Small impact to *overall* water use



IMPACT EVALUATION APPROACH

- **Methodology used: Difference in Means**
- Calculate leak metrics pre- and post-program implementation periods
  - **Leak formation rate, leak duration, leak flow rate, leak volume**
- Regression analysis to determine the differences between the two periods
  - Note: There are likely other non-observed factors at play, differences may be attributable to more than just the notification program
- **The ideal methodology is to launch with a randomly selected control and treatment groups (RCT).**
  - Allows you to fully attribute causality to the program evaluated
  - Many organizations outside of utilities employ this method – sometimes called “A/B testing”
  - Launch of AMI is an ideal time to employ this approach, but can be used at any point in the journey.


Pre leak notifications
Post leak notifications
Pre vs. Post Study
All customers
Leak notifications
Leak resolution was because of the notification or …?
In a before/after study, you assume the "before" period is what would have happened without the notifications
Time
Randomized Control Trial (RCT)
All customers
Control group
No notifications
Treatment Group
Leak notifications
Leak resolution was a result of the notification.
In an RCT, you see what happened without the notification

EXPERIMENTS GIVE

- Control of factors not under your control
- Systematic identification what works and what doesn't
- Greater confidence in the results
- Easier analysis (seriously)
- Reduced risk + a lower bar for success
- Results others can learn from
- Opportunity to maximize your savings

Is the word "***experiment***" a non-starter?

Try: study, pilot, assessment, trial, evaluation, test, first phase/phase one, establishment phase, business case evaluation, etc.

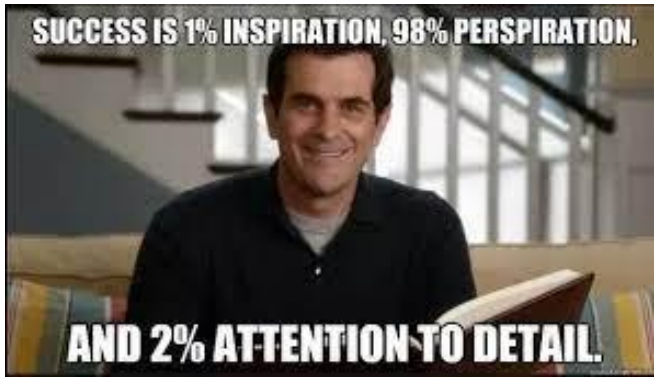
Avoid These Pitfalls

Launching program as soon as technically possible

- Comparing apples (old meter data) to oranges (AMI meter data) is bad
- Loss of baseline condition knowledge
- **Solution: Make yourself wait**
- How long? One year

Launching program for all customers at the same time

- Without a control group, you won't know *how much of the change* is from the program
- **Solution: Make some people wait**
- Utility program FOMO isn't real

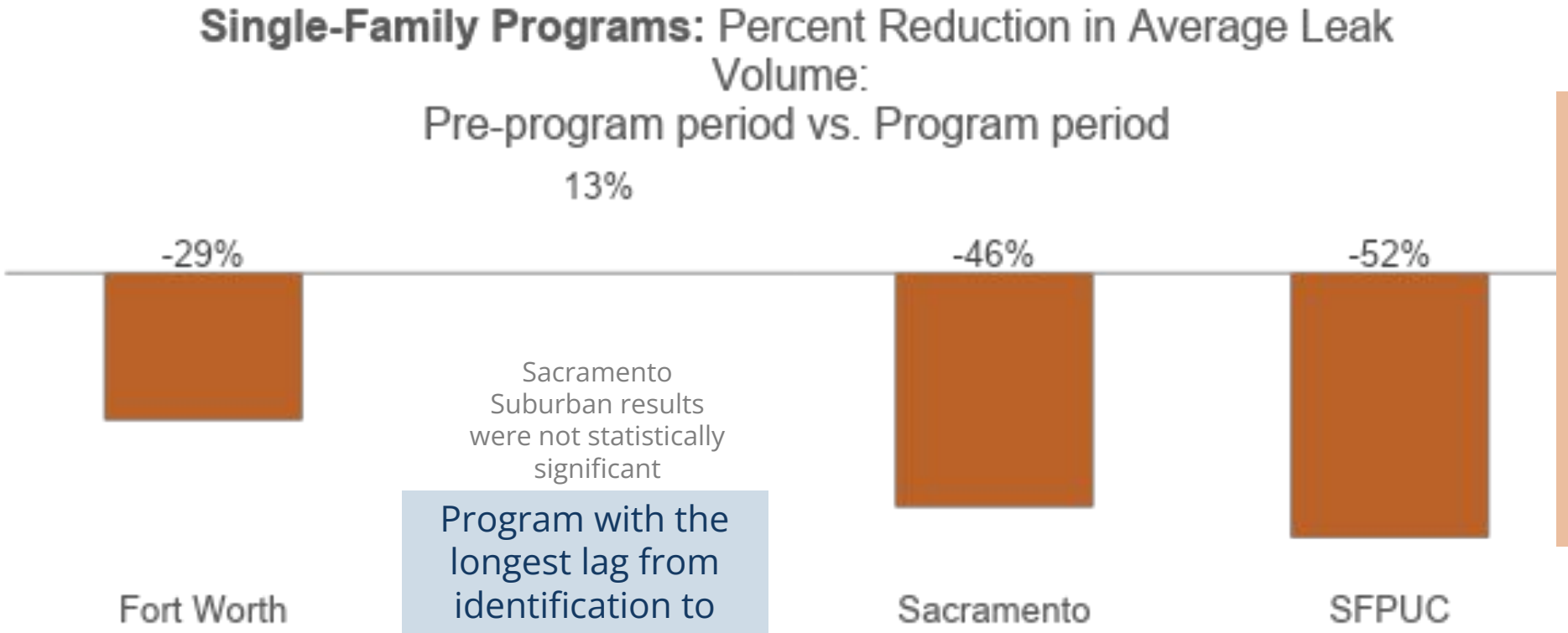


Poor planning & documentation

- Can't assess what happened if not documented and tracked
- **Solution: Get organized**
- Especially important if multiple people and departments have a role in the program

SO, WHAT HAPPENED?

» Programs with timely notifications have a big impact on water use from leaks



Sacramento Suburban results were not statistically significant

Program with the longest lag from identification to notification

Offered a free leak repair service in the notification

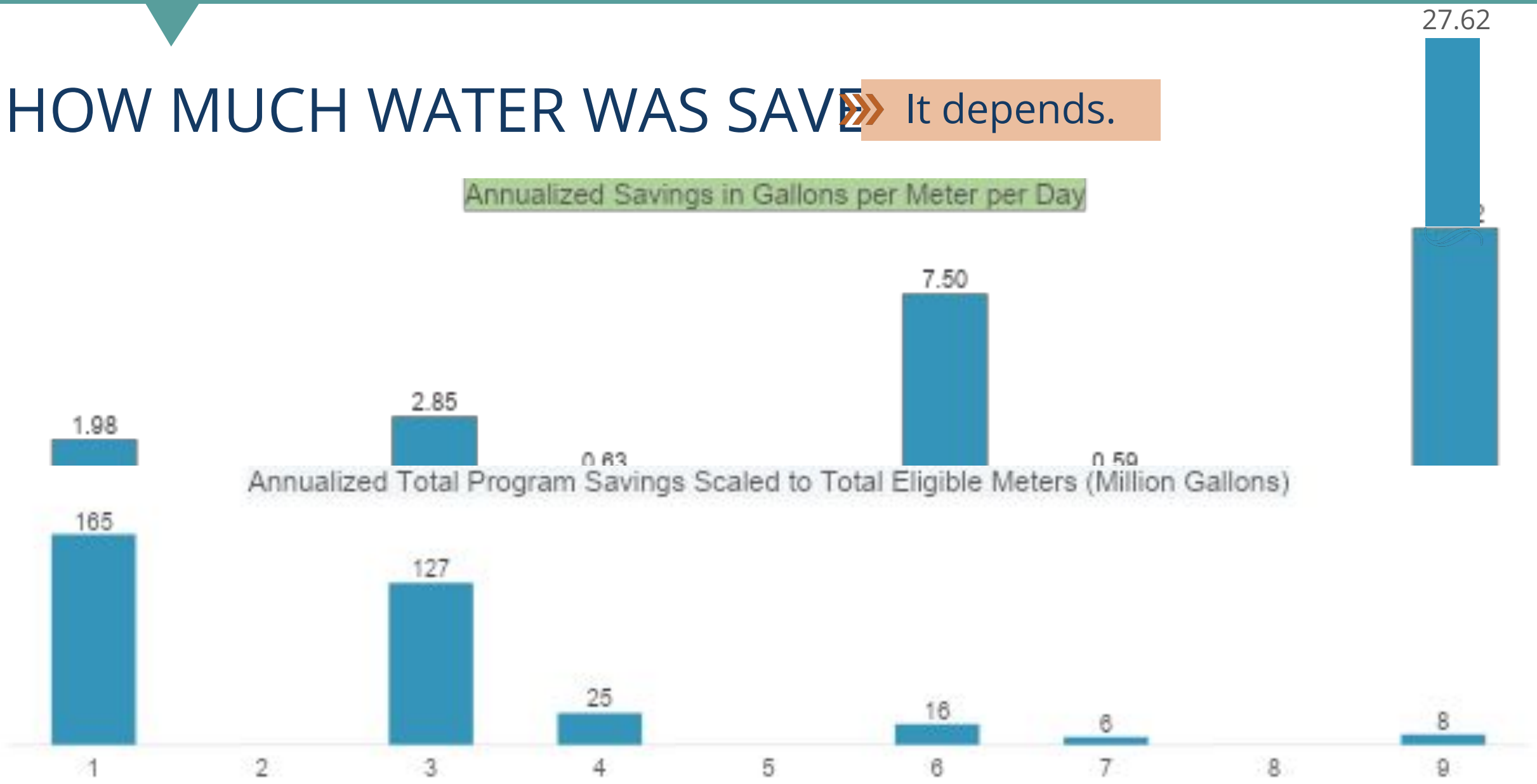
Only program to use email, text and phone contact methods

Leak volume is a combination of duration and flow rate.

Reductions may stem from addressing high flow leaks, shortening leak duration, or a combination of both.

HOW MUCH WATER WAS SAVED

» It depends.



HOW DO NOTIFICATIONS SAVE WATER?

	Change in Mean Leak Volume (gal/meter-day)	**Reduce how long leaks last** Change in Mean Leak Duration (hours/leak)	**Stop leaks from starting** Change in Mean Leak Formation Rate (leaks per meter per day)
Single-Family			
Fort Worth	-29%	102%	-55%
Sac. Sub.	13%	26%	3%
Sacramento	-46%	-29%	-16%
SFPUC	-50%	-26%	-41%
Multi-Family			
Sac. Sub.	-10%	23%	-15%
Sacramento	-48%	-24%	-9%
SFPUC	-18%	-6%	-24%
Dedicated Irrigation Meters			
SFPUC Municipal	7%	41%	-26%
SFPUC Non-Municipal	-51%	-4%	-37%

WHAT DID WE LEARN ABOUT LEAKS?

Across the four case studies:

- Water waste during a **leak can be ~20-50% of total water household use**
- **~500 gallons to nearly 2,500 gallons per household** are lost to leaks per year.
- **0.2 to 2.9 percent of households experience more than 10 leaks per year** and represent between 5 to 64% of the total gallons lost to leaks.
- Average leak rate was ~8.5 to 16.4 gallons per hour.
- Average leak duration was ~5 days to nearly 28 days.

WHAT DID WE LEARN ABOUT NOTIFICATION PROGRAMS?

- Automated leak notification **programs reduced average leak duration by ~24-29 percent**.
- **Notifications must be delivered quickly to save water.**
- SFPUC survey found **77 percent of customers were unaware of usage before notification.**
- Annualized single-family program savings ranged from **25 to 165 million gallons per year;** normalizing by number of accounts yields about **230 to 1,040 gallons saved per household per year.**
  - Multi-family savings were 220 and 2,700 gallons per eligible account per year.
  - The DIM program generated nearly 11,500 gallons saved per eligible account per year.

THANK YOU! QUESTIONS?

Liesel Hans

Contact: liesel@a4we.org

Smart Practices to Save Water: An Evaluation of AMI-enabled Proactive Leak Notifications. Access the Full Report: www.a4we.org/impact/our-work/smart-practices-save-water-evaluation-ami-enabled-proactive-leak-notification

Forthcoming: A Companion Utility Guide.

- Components of an effective notification program, bringing a team together, policy considerations, example metrics, program set up and evaluation, CII customer considerations, and more!

Join the ongoing AMI conservation with our **CAMI (Conservation + AMI) group. Quarterly virtual meetings with others in the AMI trenches.**

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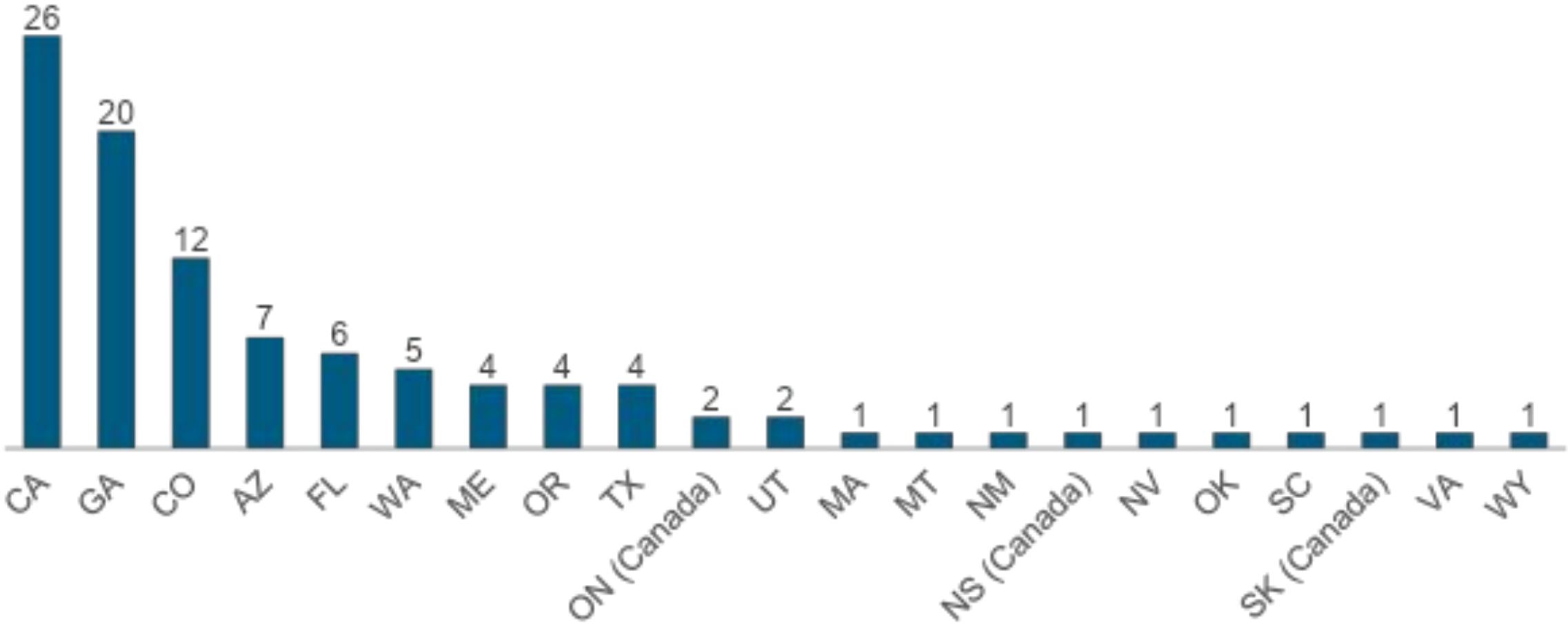
WHAT'S HAPPENING BEYOND THE CASE STUDIES?

Survey says....

Alliance for Water Efficiency

Number of Survey Responses by U.S. State or Canadian Province



NOTIFICATION THRESHOLDS

- 56 utilities reported proactively contacting customers regarding leaks (continuous consumption).
- 41, or nearly 75 percent of these, said they also offer high flow notifications.
- **Thresholds for notifications vary. A lot.**

Single-family Residential:

Minimum time thresholds:
How long before it's a "leak"?

41% flag after 24 hours
33% flag after 72 hours

OPT-IN VS. OPT-OUT

Leak Notification Outreach Methods & Customer Opt-in Requirement

Method (Total Responses = 50)	No. Used	No. Customer Must Opt-in	% of Utilities Requiring Opt-in
Letter	28	1	4%
Email	38	10	26%
Text (SMS)	27	19	70%
IVR robocall	19	9	47%
Call by staff	40	0	0%
Notification within portal	26	8	31%
Door hanger or other physical notification	37	1	3%

ADD'L SURVEY TAKEAWAYS

- Most utilities felt the notification program had lowered or reduced high bill complaints
- 64 utilities have a courtesy bill adjustment policy for customers with leaks
- 43 utilities offer free or subsidized leak inspections or audits
- 70 utilities have a code, regulation or policy that prohibits water waste from leaks
- 79 utilities complete an annual water loss audit

84% of those have conservation staff on the water loss audit team!

The survey asked utilities to reflect on their biggest challenges related to their notification programs. The top responses were:

48 percent insufficient staff for follow-up, inspections and/or audits.
41 percent maintaining current contact information for customers.
36 percent developing appropriate criteria for large residential and CII customers.
35 percent educating customers.
30 percent no customer-facing portal.

- High use resolution
- Leak and high use notifications
- AMI + weather data to flag irrigation during rain events
- Benchmarking multi-family and commercial properties.

HOW ELSE ARE AGENCIES USING AMI? HOW ARE YOU USING AMI?

- Indoor and outdoor audits.
- Water loss/revenue recovery efforts like tracking use on inactive accounts.
- Optimizing marketing of programs and services to customers who may benefit the most.
- Enhanced messaging and reporting for customers.
- Water use restrictions monitoring and enforcement.
- Demand modeling and forecasting; analysis.
- Education programs (K-12 and adult).
- Troubleshooting during a big freeze/pressure loss event
- Rates, water budgets
- Verification of savings
- Distribution system leak management

WHAT OTHER RESOURCE ARE OUT THERE?

Advanced Metering Infrastructure: A Guidance Manual for Water Utilities

Don Schlenger, PhD

Covers foundational information about AMI technology, feasibility studies, procurement, implementation, project management.

Advanced Metering Infrastructure System Template Request for Proposals

A group of AWE and CalWEP members created an RFP for utilities to use/customize.

The Behavioralist & AWWA released a study and guidebook on AMI customer p on c

engagement and use of portals.

Water Research Foundation Project #4741: AMI-Meter Data Analytics.

This project focused on foundational interactions with customers (high bills, ur
for water loss audits, and meter management practices.

Improving Water Management Using Advanced Metering Infrastructure Data: A Guide for Fac

EPA WaterSense