



Smart Management for
Small Water Systems



Webinar 4 for Small Systems in Connecticut: Managing Your Water System Under Pressure: New Requirements for Hydropneumatic Tanks and Water Loss

Presented By: Heather Himmelberger

www.southwestefc.unm.edu

www.efcnetwork.org



This program is made possible under a cooperative agreement with the U.S. EPA.



New Fiscal and Asset Management Plan Requirements – Highlights of PA 18-168 § 61

- Applicable only to Small CWS serving between 25-1000 people.
- The Plan is **due Jan. 1, 2021** and must be updated annually.
- The Plan covers all capital assets and includes:
 - A list of all capital assets,
 - The useful life of assets based on current conditions,
 - Maintenance/service history,
 - Manufacturer’s recommendations,
 - A Plan for reconditioning, refurbishing, or replacement.



New Fiscal and Asset Management Plan Requirements – Highlights of PA 18-168 § 61 Cont'd

- Includes a provision to evaluate unaccounted for water loss including;
 - Estimates on volume of water loss,
 - Causes for unaccounted for water loss,
 - Measures taken to reduce losses.
- Prioritizes the fiscal and asset assessment of hydropneumatic tanks.

DWS is developing additional guidance and resources that will be available on our website – Capacity Development Page.



**Why the interest in
Hydropneumatic
Tanks?**

Hydropneumatic Tank Fiscal and Asset Assessment

Due by May 2, 2019





DPH Has Created a Form to Assist

Fillable PDF

DPH STATE OF CONNECTICUT DEPARTMENT OF PUBLIC HEALTH
 Drinking Water Section
Hydroponic Task Asset and Fiscal Assessment Form

Permitted to Public Use: No. 18-000 (All phone numbers on this form are a small community Public Water System (PWS) that serves at least 1000 year-round residents and connects it to the office by May 1, 2018.

Public Water System Information

PWS ID: [] PWS Name: [] Town: []

| Hydroponic Task Information and Asset Assessment | | Hydroponic Task(s) | | | |
|--|---|--------------------------|--------------------------|--------------------------|--------------------------|
| | | Task 1 | | Task 2 | |
| 1.1 | Date Assessment was Completed | | | | |
| 1.2 | Task Volume (in gallons) | | | | |
| 1.3 | Water System Facility ID | | | | |
| 1.4 | Task Name | | | | |
| 1.5 | Year Task Constructed | | | | |
| 1.6 | Current Age of Task (Indicate Year Task Constructed from Current year) <small>Example: (Current year) - (Year)</small> | | | | |
| 1.7 | What is the world service lifespan of the task as specified by the manufacturer? <small>If there are no manufacturer specifications, enter 10 years or provide the source of your source here.</small> | | | | |
| 1.8 | <small>If warranty from manufacturer is < 10 years, note that and attach the proof of manufacturer warranty to this form.</small> | | | | |
| 1.9 | <small>If the task has not exceeded its world service lifespan, what is its adjusted remaining world service life (in years)?</small> | | | | |
| 1.10 | <small>If the task has exceeded the world service lifespan, how many years have passed since the manufacturer (indicate year assessed to 1.7 from year assessed to 1.6)?</small> | | | | |
| 1.11 | <small>Select the current condition of the task (e.g. Good (G), Needs maintenance (NM) or Needs replacement (NR)).</small> | | | | |
| 2.1 | Has the task been inspected within the past 1 year? <small>If yes, indicate the name, credentials, and contact information of the inspector here.</small> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.2 | Has the volume of task been maintained within the past 1 year? <small>If yes, indicate the name and contact information of the person who did the maintenance here.</small> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.3 | Has the pressure of the task been maintained within the past 1 year? <small>If yes, indicate the name and contact information of the person who did the maintenance here.</small> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.4 | Were both volume and pressure of task maintained to manufacturer's recommendations over the past 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.5 | Is the task free of exterior damage and / or corrosion? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.6 | Is the task free of interior damage and / or corrosion? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.7 | Was task painted to prevent rust corrosion in the past 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.8 | Has this task always operated below the maximum operating pressure? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.9 | Does the task have a working pressure relief valve? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.10 | Is the pressure relief valve set to open at the manufacturer's specified pressure? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.11 | Has the pressure relief valve been tested or replaced during the last 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.12 | Does the task have a functioning pressure gauge? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.13 | Is the task properly secured to the foundation or bulk head(s)? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.14 | Are sight levels, levers, and valves in good working condition? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.15 | Has the task ever been repaired? <small>If yes, indicate when and for what reason here.</small> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1/2018 Page 1 of 1 Hydroponic Task Asset and Fiscal Assessment Form



The Form Comes with a Set of Instructions

Most is self-explanatory. We'll Cover Some of the Items in a Little More Detail

DPH STATE OF CONNECTICUT DEPARTMENT OF PUBLIC HEALTH
Drinking Water Section
Hydrostatic Task Asset and Fiscal Assessment Form

Personnel in Public Act No. 22-108 (2022) please complete this form if you are a small community Public Water System (PWS) that serves at least 2000 year-round residents and covers it to the office by May 1, 2024.

Public Water System Information

PWS ID: [] PWS Name: [] Town: []

| Hydrostatic Task Information and Asset Assessment | | Hydrostatic Task(s) | | | |
|---|---|--------------------------|--------------------------|--------------------------|--------------------------|
| | | Task 1 | Task 2 | | |
| 1.1 | Date Assessment was Completed | | | | |
| 1.2 | Task Volume (in gallons) | | | | |
| 1.3 | Water System Facility ID | | | | |
| 1.4 | Task Name | | | | |
| 1.5 | Year Task Constructed | | | | |
| 1.6 | Current Age of Task (Indicate Year Task Constructed from Current year) If you are unsure of the age, indicate the year of the world service lifespan of the task as specified by the manufacturer. If there are no manufacturer specifications, enter 10 years or provide the source of your source here. | | | | |
| 1.7 | If warranty from manufacturer is >10 years, enter that and attach the proof of manufacturer warranty to this form. If the task has not exceeded its world service lifespan, what is its adjusted remaining world service life (in years)? | | | | |
| 1.8 | If the task has exceeded the world service lifespan, how many years have passed since the manufacturer (indicate year assessed to 1.7) from year assessed to 1.6? | 0 | 0 | | |
| 1.9 | Select the current condition of the task (e.g. Good (G), Needs maintenance (NM) or Needs replacement (NR)) | | | | |
| | | Yes | No | Yes | No |
| 2.1 | Has the task been inspected within the past 1 year? If yes, indicate the name, credentials, and contact information of the inspector here. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.2 | Has the volume of task been maintained within the past 1 year? If yes, indicate the name and contact information of the person who did the maintenance here. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.3 | Has the pressure of the task been maintained within the past 1 year? If yes, indicate the name and contact information of the person who did the maintenance here. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.4 | Were both volume and pressure of task maintained to manufacturer's recommendations over the past 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.5 | Is the task free of exterior damage and / or corrosion? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.6 | Is the task free of interior damage and / or corrosion? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.7 | Was task provided to prevent rust corrosion in the past 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.8 | Has this task always operated below the maximum operating pressure? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.9 | Does the task have a working pressure relief valve? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.10 | Is the pressure relief valve set to open at the manufacturer's specified pressure? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.11 | Has the pressure relief valve been tested or replaced during the last 1 year? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.12 | Does the task have a functioning pressure gauge? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.13 | Is the task properly secured to the foundation or bulk headed? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.14 | Are sight levels, levers, and valves in good working condition? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2.15 | Has the task ever been repaired? If yes, indicate when and for what reason here. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1/2024 Page 1 of 1 Hydrostatic Task Asset and Fiscal Assessment Form



| | |
|-----|---|
| 1.7 | <p><i>If your tank construction is unknown enter 10 years.</i></p> <p>What is the useful service lifespan of the tank as specified by the manufacturer? If there are no manufacturer specifications, enter 10 years or provide the source of your answer here: _____</p> <p>If warranty from manufacturer is >10 years, enter that and attach the proof of manufacturer warranty to this form.</p> |
|-----|---|

The Useful Life is An Important Consideration

Refers to how long the tank can be used effectively without concern.



| | |
|-----|---|
| 1.7 | <p><i>If your tank construction is unknown enter 10 years.</i></p> <p>What is the useful service lifespan of the tank as specified by the manufacturer? If there are no manufacturer specifications, enter 10 years or provide the source of your answer here: _____</p> <p>If warranty from manufacturer is >10 years, enter that and attach the proof of manufacturer warranty to this form.</p> |
|-----|---|

Option 1: 10 years

Option 2: Manufacturer's

Recommendation or Specification

Option 3: Utility specific information that indicates different amount of time

Choice should be conservative, given the potential consequences



1.10

Select the current condition of the tank (e.g. Good (G), Needs maintenance (NM) or Needs replacement (NR)).

Based on all of the information you know about the tank from visual inspections, knowledge of maintenance, past history of problems, provide a rating of the tank. Be as realistic as possible. Understanding the actual condition of the tank will benefit the utility.



| | |
|-----|---|
| 2.1 | Has the tank been inspected within the past 5 years? If yes, indicate the name, credentials and contact information of the Inspector here: <input type="text"/> |
| 2.2 | Has the exterior of tank been maintained within the past 5 years? If yes, indicate the name and contact information of the person who did the maintenance here: <input type="text"/> |
| 2.3 | Has the interior of the tank been maintained within the past 5 years? If yes, indicate the name and contact information of the person who did the maintenance here: <input type="text"/> |
| 2.4 | Were both exterior and interior of tank maintained to manufacturer's recommendation over the past 5 years? |
| 2.5 | Is the tank free of exterior damage and / or corrosion? |
| 2.6 | Is the tank free of interior damage and / or corrosion? |
| 2.7 | Was tank painted to prevent rust/corrosion in the past 5 years? |

This section regards inspections and maintenance you have done of your tanks.



| | |
|------|--|
| 2.8 | Has this tank always operated below the maximum operating pressure? |
| 2.9 | Does the tank have a working pressure relief valve? |
| 2.10 | Is the pressure relief valve set to open at the manufacturer's specified pressure? |
| 2.11 | Has the pressure relief valve been overhauled or replaced during the last 5 years? |
| 2.12 | Does the tank have a functioning pressure gauge? |

This section regards pressure related items.



| | |
|------|---|
| 2.13 | Is the tank properly secured to the foundation or bulk-headed? |
| 2.14 | Are sight levels, hoses, and valves in good working condition? |
| 2.15 | Has the tank ever been repaired? If yes, indicate when and for what reason here: _____ |

This section regards functionality and repair issues related to the tank. One major consideration, if the tank has had repairs that includes welding, the integrity of the tank may be compromised or the overall life of the tank may be shortened.



| | |
|------|--|
| 3.1 | Estimated cost to rehabilitate this tank? |
| 3.2 | Estimated cost to replace this tank with a new one? |
| 3.3 | Estimated cost to install variable frequency drive (VFD) pumps and floor mounted bladder tanks (as an alternative to rehabilitating or replacing tank)? |
| | |
| 3.9 | Have you evaluated the need for rehabilitation or replacement of this tank? |
| 3.10 | If replacement or rehabilitation is needed could the tank(s) be eliminated with the installation* of variable frequency drive (VFD) pumps and bladder tanks as a more cost-effective option? <i>(If you answered yes to this question and if you are interested in DWSRF financing, visit http://www.ct.gov/dph/dwsrf)</i> |
| 3.11 | For VFD pumps and floor mounted bladder tanks installation did you or do you plan to apply to the DWSRF program for financing? |
| 3.12 | If you have chosen to eliminate the tank by installing VFD pumps and bladder tanks, what is your estimated date of VFD project commencement? |

It is important to consider the replacement of the tank, the cost and the cost of alternatives. It is also includes a question regarding whether SRF funding is desired for this purpose.



| | |
|-----|--|
| 3.4 | Do you currently bill customers for water usage? |
| 3.5 | Beyond funds used to cover standard operation and maintenance costs, do you have a <i>reserve fund</i> (funds set aside) in place for rehabilitating and/or replacing all your assets including your tank(s)? |
| 3.6 | Will your reserve fund allocated for hydropneumatic tank(s) be enough to cover the cost of replacement of the tank(s) by the end of its remaining useful service life? |
| 3.7 | If you selected "No" to 3.2 or 3.3, are you willing to increase your customer billing rates and/or form consolidation partnerships to meet the tank and overall infrastructure improvement to meet your reserve funding needs? |
| 3.8 | Do you review the reserve funding needs of your assets, including this tank, on an annual basis? |

This section discusses financial components of your water system.

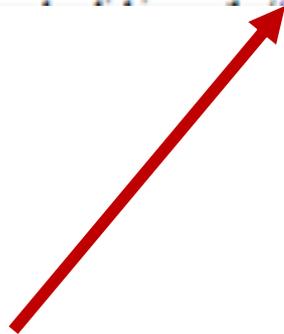


Important Information on the Form

Important Notes:

Average useful service lifespan of a hydropneumatic tank is 10 years or as warranted by the manufacturer. If the age of tank (in 1.6 above) is 10 years or greater than that specified by the manufacturer, then the tank has reached or exceeded its useful service life. If you are considering replacement, we strongly recommend you consider VFDs as a possible alternative to replacement, if feasible.

*Any alternative configuration must be able to meet peak demands and separation distance requirements. Such changes and works of sanitary significance require review and approval by the DWS prior to construction, in accordance with RCSEA Section 19-13 B102(d)2; A *general application* can be found on DWS website.



One consideration is to consider alternatives to hydropneumatics tanks



Hydropneumatic Tank Fiscal and Asset Assessment Requirement - Highlights

- The Assessment Form, Instructions, and a Fact Sheet are available on our Capacity Development Webpage.
- Must use the “e-form” and follow the instructions provided. **Please remember to download the form prior to completion.**
- **Not Applicable** to bladder tanks.
- This Fiscal & Asset Assessment **does not** require an internal inspection of the tank(s) unless you choose to do so.
- Assessment can be performed by system owners/operators.
- This part of the overall Fiscal & Asset Management Plan takes priority and has a deadline of **May 02, 2019.**



Hydropneumatic Tank Fiscal and Asset Assessment Requirement - Highlights

- This assessment is more than a tank “inspection” and is intended to assist sCWS achieve long-term sustainability and includes a physical and fiscal assessment of this critical infrastructure.
- Systems with hydropneumatic storage tanks beyond their useful life are encouraged to consider design modifications to eliminate or repurpose the old tank and incorporate VFD pumps as a possible alternative.
- Provides options for a pathway to sustainability including potential opportunities for financial assistance.
 - DWSRF Small Loan Program- Projects <\$100k, no construction, subsidization available
 - DWSRF Base Program – Projects any size



Switching Gears...

Water Loss and Water Loss Control



What the Statutes Say....

“Such fiscal and asset management plan shall also provide information regarding whether the small community water system **has any unaccounted for water loss**, the **amount** of such unaccounted for water loss, what is **causing** such unaccounted for water loss and the **measures** the small community water system is taking to reduce such unaccounted for water loss.”

House Bill No. 5183, Public Act 18-168

<https://www.cga.ct.gov/2018/ACT/pa/pdf/2018PA-00168-R00HB-05163-PA.pdf>



The Answer to the First Part

....whether the small community water system has any unaccounted for water loss...

Is YES!



How Do We Know That?

Because every water utility has unaccounted for water (or water losses).

Some amount of water loss is a necessary part of running a utility and some is unavoidable



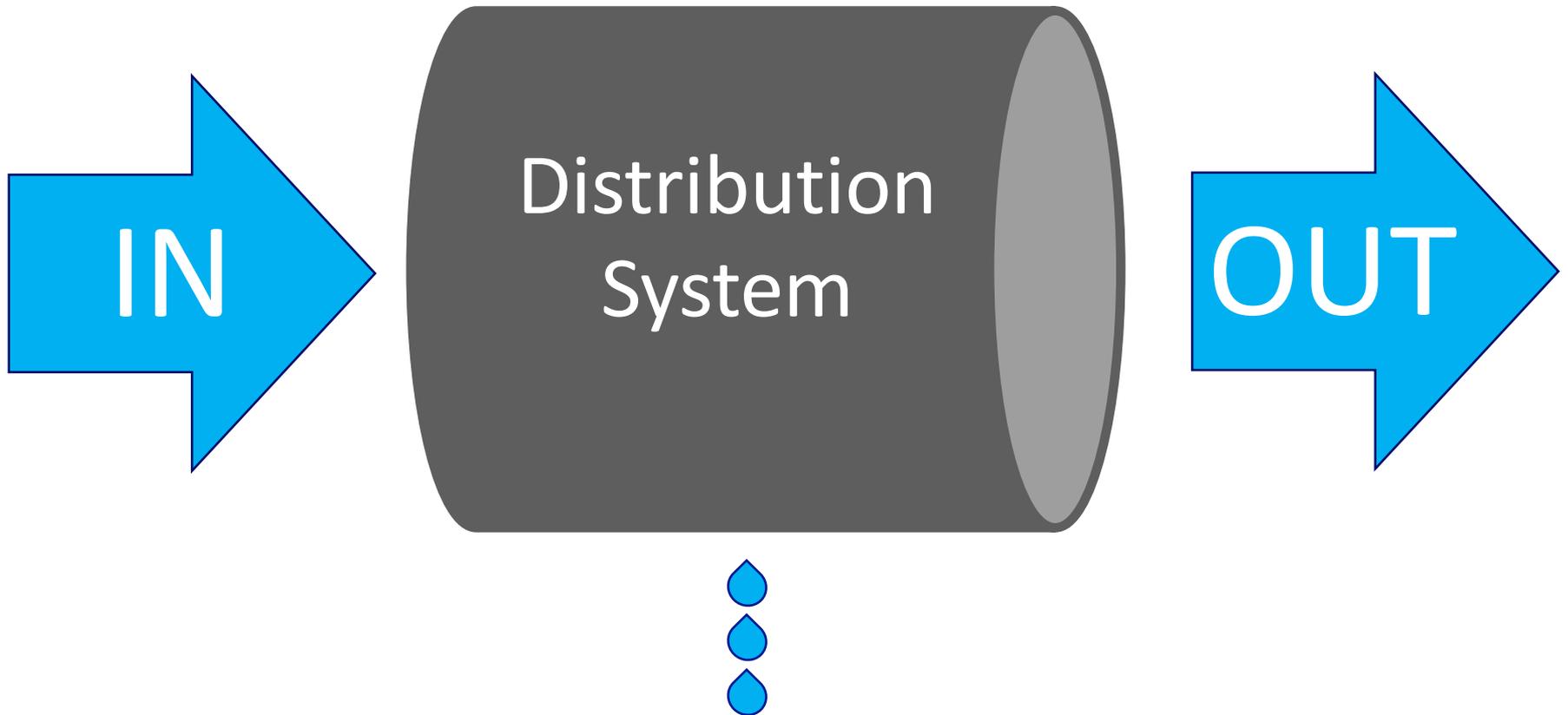
The Answer to the Second Part

the amount of such unaccounted for
water loss

Is More Complicated;
Let's Take a Closer Look

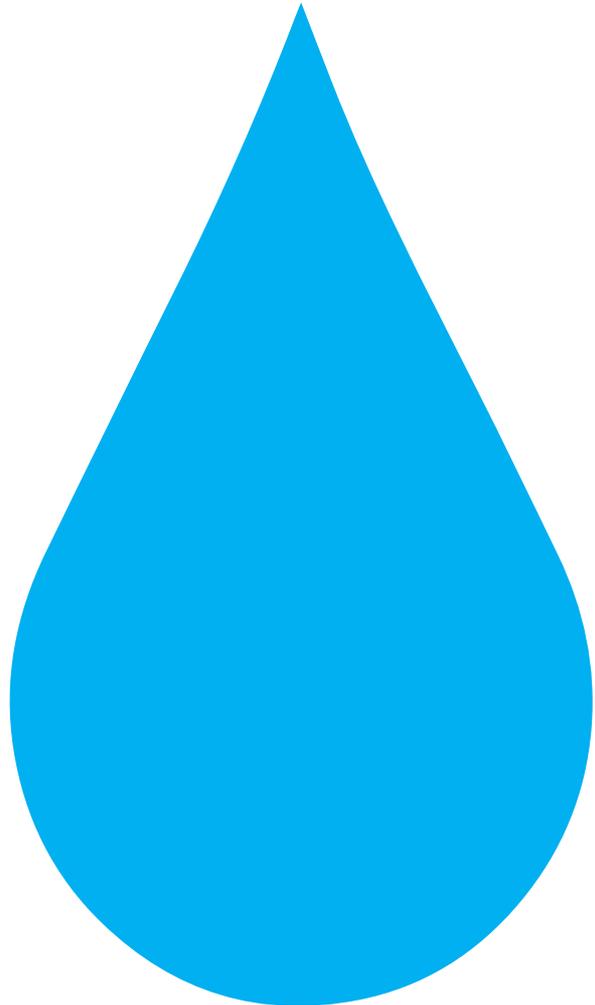


What goes in, comes out ... somewhere





You're either getting paid ...

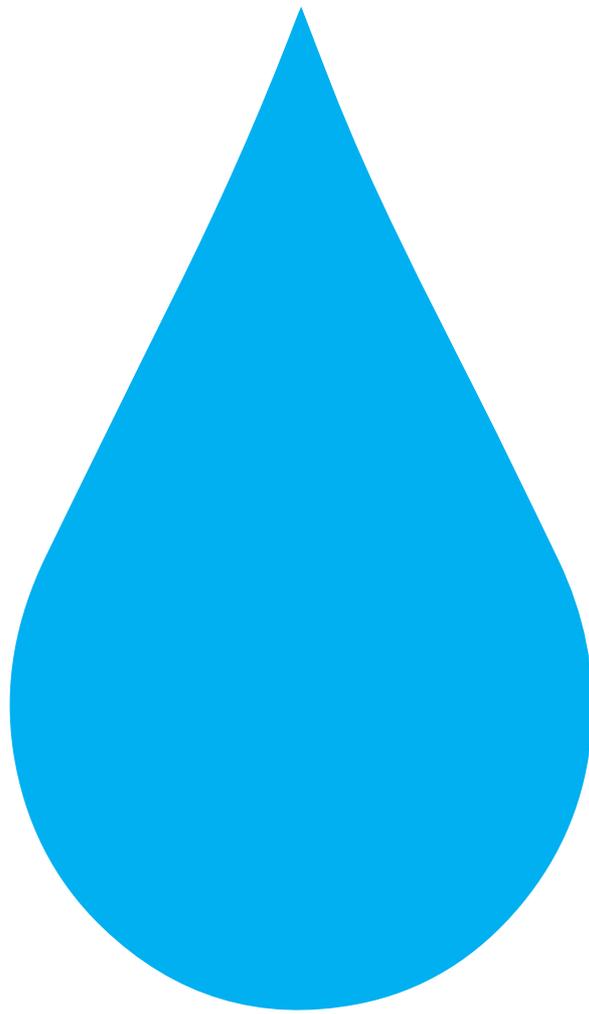


=





Or you're not.



≠



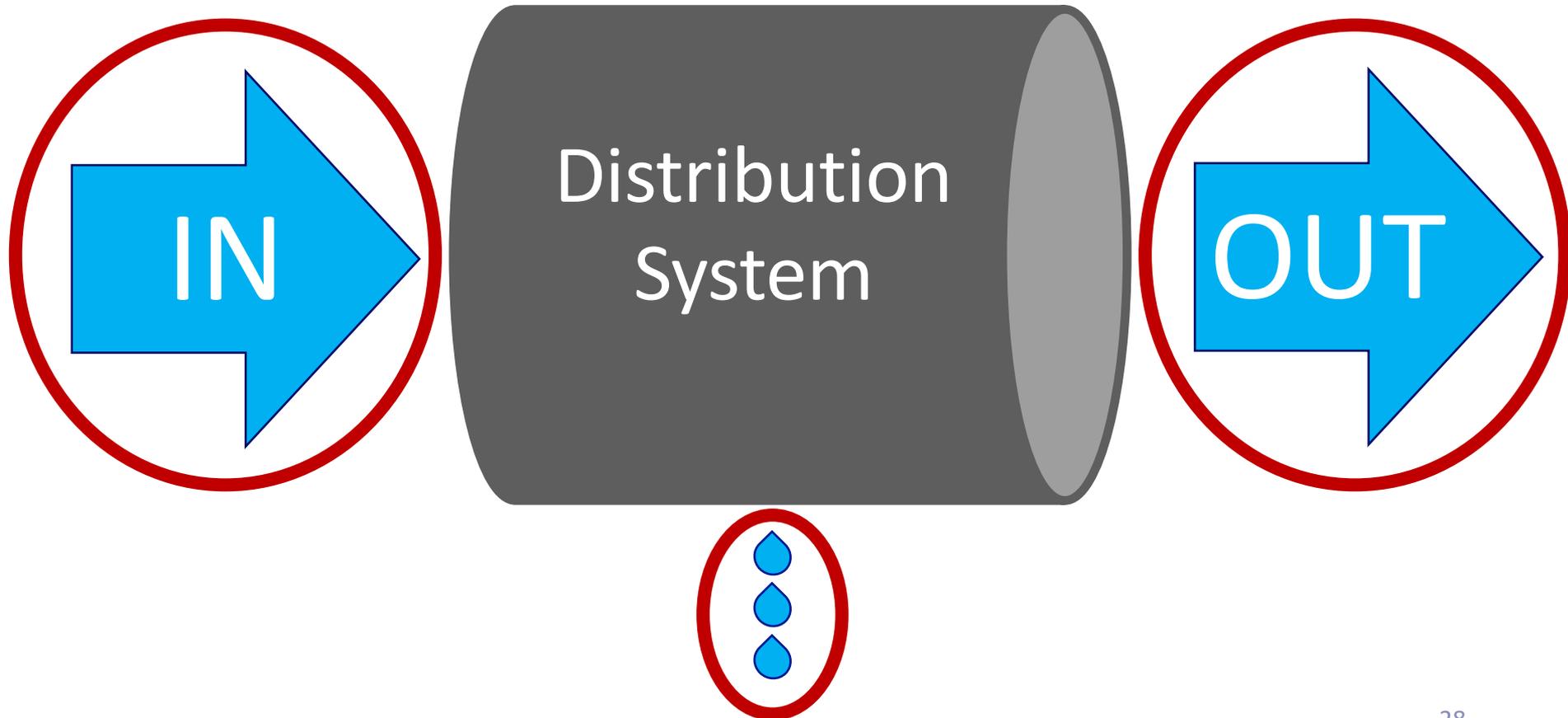


It's a BLUE and GREEN problem ...



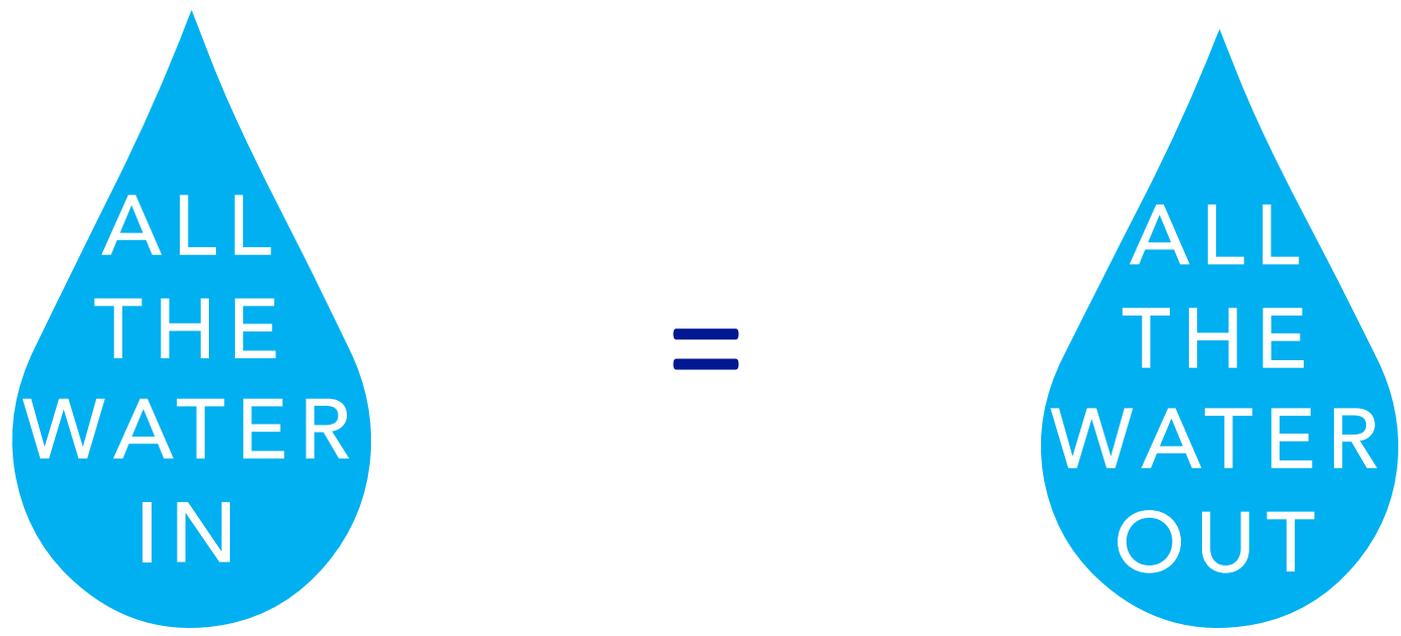


We need a way to estimate water that isn't being used the way we want and the amount of money we're not getting:





The Water Balance Is Our Estimating Technique





The Water Balance:

ALL
THE
WATER
IN

=

We can measure these

+

Water from your
own sources

Water you purchase



Water sold



Water given away



Water used by utility



Water not accurately metered or billed



Water stolen



Water leaking

*We can measure
or estimate all
but one of these*

=





The Water Balance:



ALL THE
WATER IN



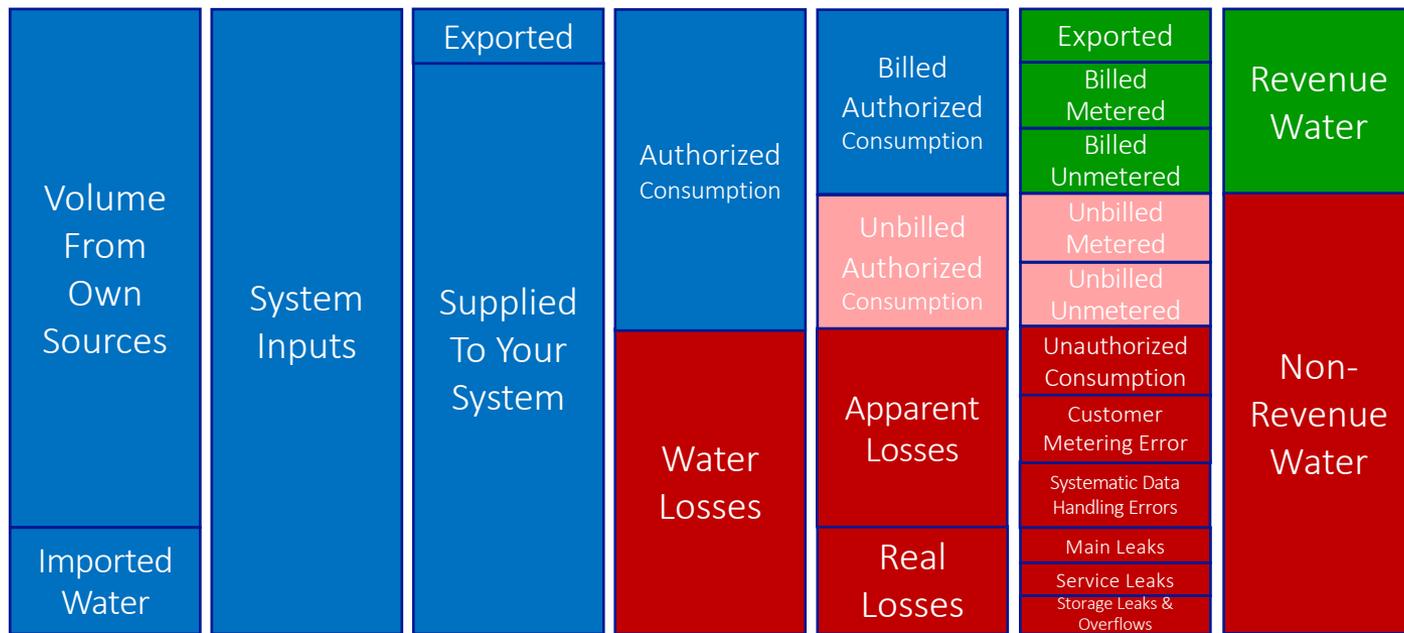
ALL THE
WATER OUT
(EXCEPT
WATER
LOSSES)



*Real
Water
Losses*

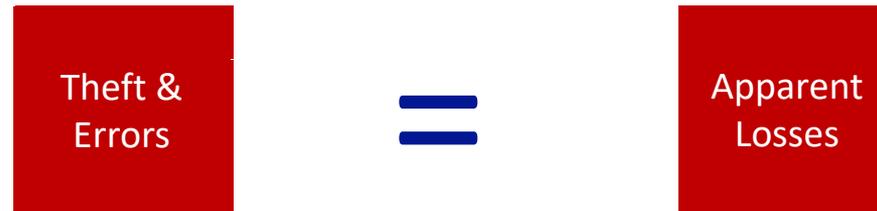


We Use That Theory to Create the Water Balance





A bit about terminology...



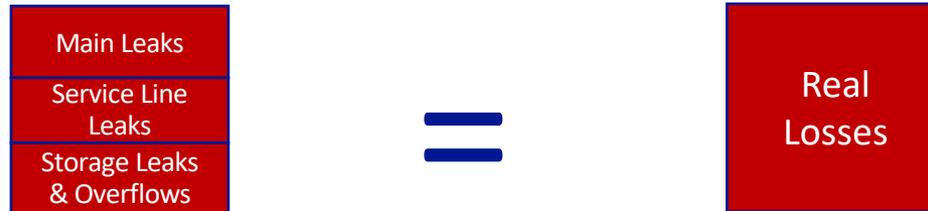
NOT PHYSICAL LOSSES

- Water reaches a user
- Volumes are not counted
- Water does not generate revenue

VALUED AT THE PRICE YOU CHARGE CUSTOMERS



And a bit more ...



ARE PHYSICAL LOSSES

- Water did not reach a customer
- Difficult if not impossible to measure
- Water does not generate revenue

VALUED AT THE PRICE OF PRODUCTION

You CAN'T directly charge for losses, but all customers pay indirectly



American Water Works Association

An Industry Standard: The AWWA M36 Methodology and the AWWA Water Audit Software

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association. Copyright © 2014. All Rights Reserved.

Water Audit Report for: **Northern San Leandro Combined Water Sewer Storm Utility District (0007900)**
Reporting Year: **2013** 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter Error Adjustments

| Enter grading in column 'E' and 'J' -----> | Pcnt | Value: |
|--|-------|---------------|
| Volume from own sources: + ? 5 1,000.000 MG/Yr | + ? 1 | 100.000 MG/Yr |
| Water imported: + ? 7 100.000 MG/Yr | + ? 9 | 25.000 MG/Yr |
| Water exported: + ? 7 100.000 MG/Yr | + ? 9 | 25.000 MG/Yr |

WATER SUPPLIED: 825.000 MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

| | |
|--|---|
| Billed metered: + ? 8 700.000 MG/Yr | Click here: ? for help using option buttons below |
| Billed unmetered: + ? 9 50.000 MG/Yr | |
| Unbilled metered: + ? 7 10.313 MG/Yr | |
| Unbilled unmetered: + ? 7 10.313 MG/Yr | |

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

AUTHORIZED CONSUMPTION: 760.313 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 64.688 MG/Yr

Apparent Losses

| | |
|--|---|
| Unauthorized consumption: + ? 10 3.000 MG/Yr | Pcnt: 1.25% Value: 3.000 MG/Yr |
| Customer metering inaccuracies: + ? 5 7.071 MG/Yr | Use buttons to select percentage of water supplied OR value |
| Systematic data handling errors: + ? 4 5.000 MG/Yr | Pcnt: 1.00% Value: 5.000 MG/Yr |

Apparent Losses: 15.071 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? **49.617 MG/Yr**

WATER LOSSES: 64.688 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: ? **75.000 MG/Yr**

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

| |
|--|
| Length of mains: + ? 7 100.0 miles |
| Number of active AND inactive service connections: + ? 8 1,000 |
| Service connection density: ? 10 conn./mile main |

Are customer meters typically located at the curbstop or property line? Yes (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line: + ? 7

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 6 60.0 psi

COST DATA

| | |
|---|----|
| Total annual cost of operating water system: + ? 5 \$1,000.000 \$/Year | 36 |
| Customer retail unit cost (applied to Apparent Losses): + ? 7 \$3.50 \$/1000 gallons (US) | |
| Variable production cost (applied to Real Losses): + ? 7 \$3,000.000 \$/Million gallons | |

Use Customer Retail Unit Cost to value real losses



Data Needed

Water supplied to your system



Water supplied to customers



System characteristics



Financial information





Once the data is entered, the software calculates Non-Revenue Water, Real Water Loss, & Apparent Losses



Asbestos cement water main leak.

What Might Be Some Concerns for Small Systems?



Lack of customer meters
Customer meters not being read regularly
No knowledge regarding accuracy of customer meters

Lack of master meters
Lack of master meter readings
Improper master meters
Improperly installed master meters
Lack of information regarding the accuracy of master meters

No specific charge to customers for water (part of rent or other payment)
Flat charge rather than based on volumetric usage





Without Data, More Difficult to Know NRW and Water Loss & to Use Water Audit Approach



But it's okay to use what you have and at least get as far as you can



What else can we do?





Can watch production quantities over time



Do the values go up unexpectedly?
Do the values go up suddenly and stay up?
What are the trends day to day month to month?



Can look at night flows



Usage at night above an expected low level (about 1.5 gal/connection/hour) is most likely leakage

Can you monitor night usage?

Can put in temporary flow meters, can check tank levels at say midnight and 5 am to see total usage



If there are no customer meters...



Why not?

Is there an ability to add meters on a per customer basis?

Without meters, all leaks are system leaks (including household leaks)



Without customer meters, usage must be estimated



Based on data regarding # of fixtures or
number of people, per household, per person
Can use meters that contain multiple units
Can install some test meters
Can use industry standard usage (4,208
g/conn/month)



If there are customer meters



Are they read regularly?
Is the accuracy ever checked?



The Answer to The Third Part

what is causing such unaccounted for water loss

Is A Combination of Things As We Talked About Before



Let's Review the List

Authorized
Unbilled

Water you authorize someone to use, but don't charge for

Theft &
Errors

Theft of water from your system – either illegal connections or stealing from hydrants

Inaccurate meter readings

Data handling errors

Real
Losses

Water physically leaking from water mains, service lines, or water leaking or overflowing from storage tanks



Based on All the Information You Know About Your System and Any Information from the Water Audit, Which of these Are Likely in Your System?

| |
|---------------------|
| Authorized Unbilled |
| Theft & Errors |
| Real Losses |

Water you authorize someone to use, but don't charge for

Theft of water from your system – either illegal connections or stealing from hydrants
Inaccurate meter readings

Data handling errors

Water physically leaking from water mains, service lines, or water leaking or overflowing from storage tanks



Which is Most Important?



Water you authorize someone to use, but don't charge for

Theft of water from your system – either illegal connections or stealing from hydrants
Inaccurate meter readings

Data handling errors

Water physically leaking from water mains, service lines, or water leaking or overflowing from storage tanks



The Answer to The Fourth Part

the measures the small community water system is taking to reduce such unaccounted for water loss.

The Actions Need to Match the Reason for the Water Loss



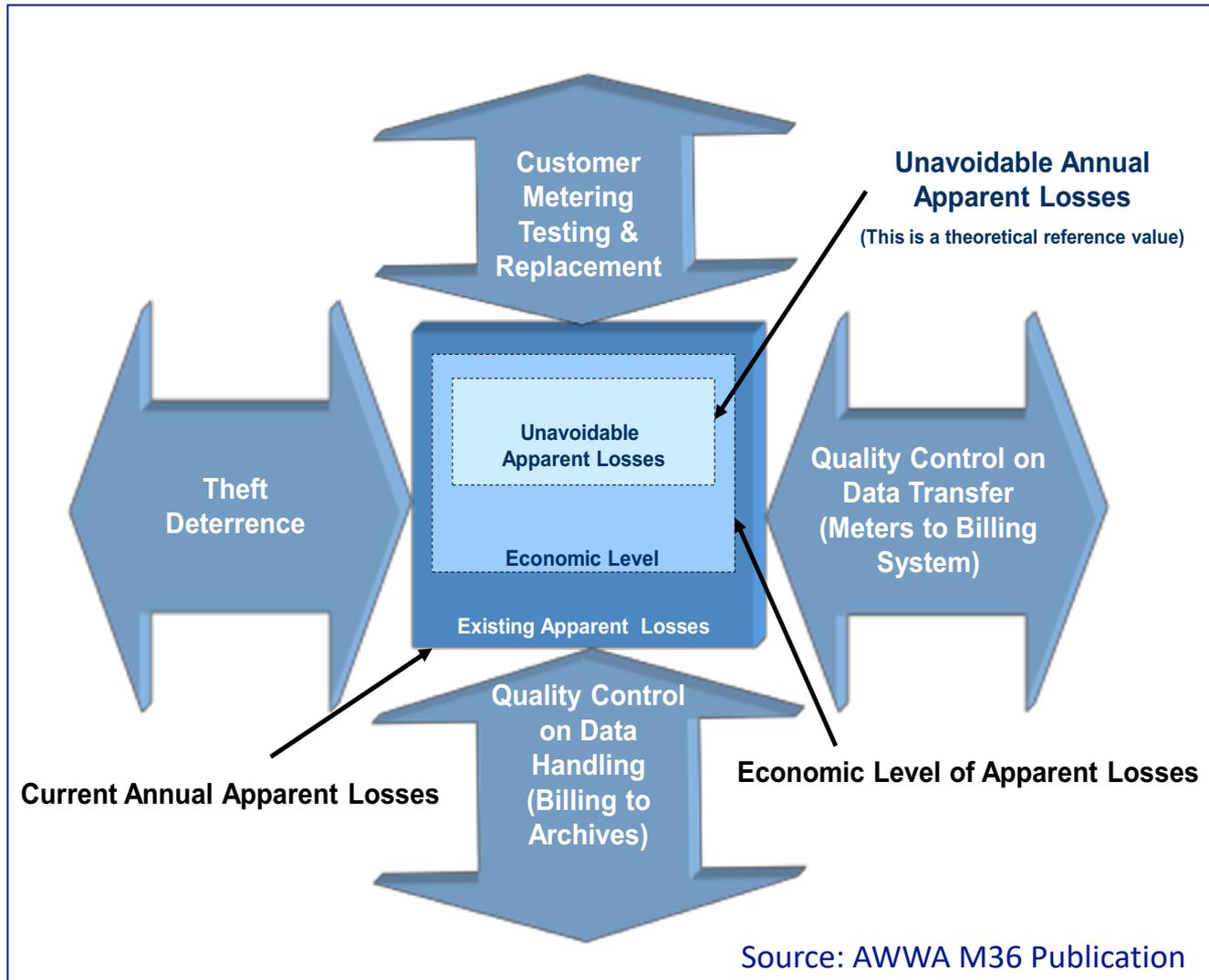
Words of Wisdom



There is no single ‘silver bullet’ to leakage control. Water utilities need to have an ample ‘toolbox’ of leakage control tools and know when to use each tool in the right amount.”

George Kunkel, AWWA M36 Manual Chair

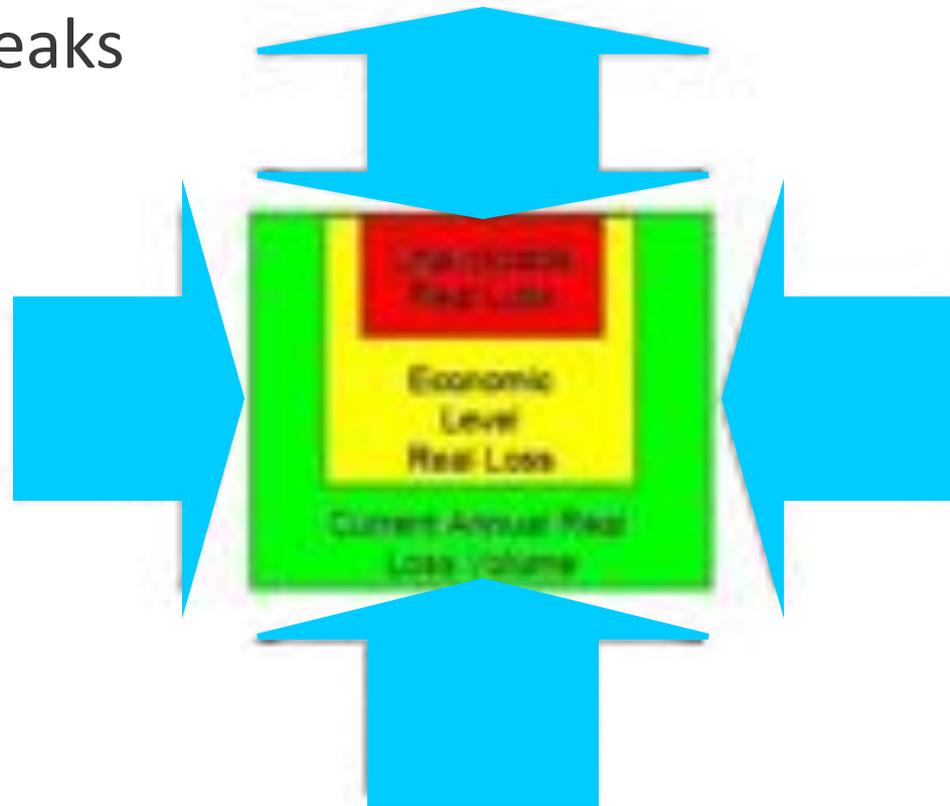
Measures to Address Losses Related to Revenue and Not Related to Leaks



Addressing Real Losses

Ways to reduce real losses

1. Respond faster to known leaks
2. Asset Management
3. Reduce pressure
4. Find hidden leaks



| Helps to Address | The Toolbox (Basic) | Cost Range |
|--|--|------------|
| Data Validity, Data Results Out of Range | 1 - Validation of supply & consumption volumes; Look for Data Grade Improvements | Low-Mid |
| Validity, Billed Unmetered Use, Unbilled Unmetered Use | 2 - Estimating and tracking unmetered use | Low |
| Validity | 3 – Master Meter Annual Testing Program | Low - Mid |
| Validity; Other Benefits Related to Asset Inventory & Management | 4 – Mapping the System | Low - Mid |
| Authorized, Unbilled usage | 5 – Review Policies & Procedures for unbilled customers | Low |
| Unbilled unmetered | 6 - Unidirectional flushing program | Low |
| Unbilled Unmetered Use | 7 - Installing meters on unmetered connections | Mid |
| Customer metering inaccuracy | 8 - Meter testing & replacement | Mid-High |
| Unauthorized Use | 9 - Theft Deterrence | Low - Mid |
| Systematic Data Handling Errors | 10 - Billing system audit | Low-Mid |
| Real Losses | 11 – Collecting & Analyzing Break Data | Low |
| Real Losses | 12 - Improve speed/quality of repairs | Low |
| Real Losses | 13 - Locate & eliminate pressure transients (surges, water hammer) | Low-Mid |
| Real Losses | 14 – Night Flow Analysis | Mid |
| Real Losses | 15 - Reduce peak and overall pressure | Mid-High |
| Real Losses: Leakage on Mains | 16 – Main Replacement | High |
| Real Losses: Leakage on Services | 17 – Service Replacement | Mid - High |
| Real Losses: Unreported Leaks | 18 - Acoustic leak survey | Mid |
| Real Losses: Overflows and Leakage on Storage Tanks | 19 – Tank Management, Data Collection, & Inspection | Low |



CT's Unaccounted For Water Requirement

RCSA Section 19-13-B102(s)

- Each CWS shall have a program to reduce the amount of water which cannot be accounted for which has been submitted to the Department for review and approval.
- The program shall include an implementation schedule and consider the following elements:
 - 1) Calibration of supply and main line meters
 - 2) Calibration of consumers' meters
 - 3) Pipeline flow measurements
 - 4) Leakage surveys
 - 5) Inspection of bleeders



Small CWS Unaccounted For Water Perspective

Many Small CWS have a sole source of supply
A Large Percentage of Small CWS are unmetered
Incorrect or Missing Distribution system Mapping
Raw Water Quality in CT varies

Small CWS examples:

Water outages due to:

- one or more running toilets can drain a tank
- tenants running water all night to prevent freezing lines
- single main break bringing down entire system because you can't find where the leak is.

Water outages can introduce potential contamination due to back siphonage during low or no pressure events.

Small CWS not wanting to pursue interconnections due to amount of leakage in distribution system – fear of high water bills





SOUTHWEST
ENVIRONMENTAL
FINANCE CENTER

Heather Himmelberger: heatherh@unm.edu

Dawn Nall: dnall@unm.edu

James Markham: jmarkham@unm.edu

Department of Civil Engineering MSC01 1070
1 University of New Mexico, Albuquerque, NM 87131
505-277-0644
swefc@unm.edu
<http://southwestefc.unm.edu>