Validation Impact & Data Insights

The California Water Loss Technical Assistance Program
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*Impact & Insights*

- **Context** – *water loss and validation*
- **Water Loss TAP** – *goals & approach*
- **Level 1 Validated Dataset** –
  - *progress*
  - *the data!*
  - *qualifications*
- **Considerations for Water Loss Regulation**
SB555 & Level 1 Validation

Goals: quality and consistency

1. Review audit methodology and input determinations
2. Verify Data Validity Grade selections

Guidance manual: Water Research Foundation 4639
Water Loss TAP

1. **Teach** water auditing and water loss control best-practice methods

2. **Level 1 validate** retail urban water supplier water audits submitted from across the state to DWR in 2017 submittal cycle

*Standardize Data Validity Grade criteria application in CA*
## Water Loss TAP Phases

<table>
<thead>
<tr>
<th>WAVE 1</th>
<th>WAVE 2</th>
<th>WAVE 3</th>
<th>WAVE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 2016</td>
<td></td>
<td></td>
<td>Oct 2017</td>
</tr>
<tr>
<td>in-person work</td>
<td>teleconference</td>
<td>in-person work</td>
<td>teleconference</td>
</tr>
<tr>
<td>session</td>
<td>work session</td>
<td>session</td>
<td>validation session</td>
</tr>
</tbody>
</table>

- progressive learning model
- value of practice rounds in Wave 2
- two tracks to accommodate different experiences
Water Audit Progress

1. **Largest number** of water audits compiled to date
2. More water loss **education**... than ever before!?
3. **Consistency** across submissions
4. **Most scrutiny** on water audit inputs and results
Largest CA Dataset to Date

291 water audits previously submitted with UWMP 2016

385 Urban Retail Water Suppliers equipped to submit to DWR 2017

405 Level 1 Validations Complete
Varying Experience to Start

Count of Wave 4 Audit Validations by Stated Experience

- Unfamiliar: 109
- Beginner: 154
- Intermediate: 108
- Advanced: 14
Participation in the TAP

1,500+ people participated
73 workshops taught

“We not only achieved our goal of completing a water audit, we learned a lot along the way and the experience was enjoyable.”

“The whole process brought to light the areas in which our District could improve and how the interaction between departments affects the water loss analysis.”

“Very comprehensive and surprisingly high level of person-to-person communication.”
Consistency

- recent reporting timeframe: either CY2016 or FY16-17
- data validity grade interpretation and assignment
  - eliminated arbitrary adjustments
  - updated unbilled unmetered authorized consumption estimates
  - insisted on some level of customer meter inaccuracy
Scrutiny

- supporting documentation
- each input and data validity grade verified
- discussion!
The Data – All Results

<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Median</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumetric</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Losses per Service Connection per Day (gal)</td>
<td>34.1</td>
<td>42.7</td>
<td>-43.0</td>
<td>507.0</td>
</tr>
<tr>
<td>Apparent Losses per Service Connection per Day (gal)</td>
<td>8.1</td>
<td>10.9</td>
<td>0.5</td>
<td>193.0</td>
</tr>
<tr>
<td>Real Losses per Service Connection per Day (gal)</td>
<td>24.9</td>
<td>33.1</td>
<td>-49.5</td>
<td>505.3</td>
</tr>
<tr>
<td>Real Losses per Service Connection per Day per PSI</td>
<td>0.3</td>
<td>0.5</td>
<td>-0.8</td>
<td>10.1</td>
</tr>
<tr>
<td>Infrastructure Leakage Index (ILI)</td>
<td>1.4</td>
<td>2.1</td>
<td>-3.6</td>
<td>42.2</td>
</tr>
<tr>
<td>Financial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Cost of Apparent Losses</td>
<td>$148,968</td>
<td>$450,012</td>
<td>$1,824</td>
<td>$21,609,19</td>
</tr>
<tr>
<td>Annual Cost of Real Losses</td>
<td>$152,432</td>
<td>$520,918</td>
<td>- $165,244</td>
<td>$38,936,07</td>
</tr>
<tr>
<td>Non-Revenue Water as a % of Total Operating Cost</td>
<td>3.4%</td>
<td>4.2%</td>
<td>-0.8%</td>
<td>68.2%</td>
</tr>
<tr>
<td>Data Validity Score</td>
<td>60</td>
<td>61</td>
<td>36</td>
<td>89</td>
</tr>
</tbody>
</table>
Distribution of Results

Real Losses per Conn. per Day

Count

0  25  50  75  100  125  150  175
“Typical” California Utility!?

Leakage depends on pressure and infrastructure.
Cost-effective leakage management incorporates the value of water.

**California Ranges for Leakage Management Parameters:**

- **Mains:** 21 miles to 7,372 miles
- **Serv. conns:** 210 conns to 737,583 conns
- **Pressure:** 42 PSI to 158 PSI
- **Prod. cost:** $18 / AF to $3,756 / AF
Water Audit Results - Qualifications

1. Common Data Challenges and persistence of error
2. DVG do not communicate accuracy
3. Low leakage results – impressive or suspicious?
4. Replicability of audit results
Common Data Challenges

*CA water suppliers are still refining water audit data*

**Source meter accuracy**
- Meters aren’t accessible
- Meters are owned by another agency
- Volumetric testing feasibility isn’t known

**Billing data pro-rating** (supply and sales volumes not aligned)

**Customer meter inaccuracy** (test data not available)

**Pressure** (field data not available and/or representative; many inputs are guesses)

12 audits still reported negative leakage after L1 validation
Data Validity Grade Qualifications

Billed Metered Authorized Consumption

4
- Manual meter reading
- Customer meter replacement upon failure
- Period internal auditing of billing data

8
- AMR or AMI piloting
- Proactive customer meter testing
- Informed meter replacement
- Routine auditing of billing data with third party review

higher grade = adoption of best practices (but no guarantee of data input accuracy)
resist the temptation that a high Data Validity grade always means better audit information!
Low Leakage Results

Do very low leakage audits indicate impressive performance or suspicious data?

- fewer audits with ILI<1 after validation
- acknowledge non-zero leakage for all systems
- acknowledge CA is special?
- difficulty in distinction between performance and inaccuracy
Replicability of Results

- 305 suppliers participated in W2 and W4, providing consecutive water audits
- 43 (14%) showed a change in the real loss performance indicator greater than 15 gal/conn/day
Water Loss Regulation Considerations
given Year 1 Data

• Year to year consistency

• Low leakage performance handling

• Role of Data Validity Grades?

• Allocation of total Water Loss into Apparent and Real Loss

• Transition from improvement to maintenance?
Thank you!

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