This presentation premiered at WaterSmart Innovations

watersmartinnovations.com
San Antonio Tackles Water Loss

5 years of water loss work

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Making San Antonio Waterful
San Antonio Water System - Intro

- Municipally Owned
- Population 1.8M
- 500,000+ Water Customers
- 7,000 Miles of Water Main
- ~60 Pressure Zones
- 1,700 Employees
SAWS’s Interest in Water Loss

- Efficiency Measure
- Executive Management Goal
- State Requirement
- Canary in Coalmine!
- Public Perceptions
- Saving Water & Money
SAWS Water Loss Program

Data Management
Across most all departments for the water audit!

Leak Detection
For 4+ consecutive years.

Meter Testing
Random small meter testing, large meter testing, right-sizing analysis

Leak Repairs
Work order data analysis, increased capacity

Supply Meter Tests
Completed two rounds of reservoir drop tests and ongoing side by side meter comparisons

Pressure Surveying
Field verified hydraulic model, revised estimate of average pressure
# Water Loss Activities & Investments

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Loss Data &amp; Strategy</strong></td>
<td>• Full water audit data source review</td>
<td>• Pressure data collection</td>
<td>• Pressure data collection and hydraulic model verification</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Initial plan development</td>
<td></td>
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<tr>
<td><strong>Supply Meter Testing</strong></td>
<td>• 13 critical supply meter tests</td>
<td>• 8 supply meter re-tests</td>
<td></td>
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</tr>
<tr>
<td><strong>Customer Meter Testing</strong></td>
<td>• 430 random small meter tests</td>
<td>• 243 random small meter tests</td>
<td>• 15 large meter flow profiling</td>
<td>• Large meter testing program frequency review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 30 large meter flow profiling</td>
<td></td>
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## Water Loss Activities & Investment

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</thead>
<tbody>
<tr>
<td><strong>Leakage Recovery &amp; Analysis</strong></td>
<td>• Leakage Component Analysis (work order data review)</td>
<td>• 3,480 miles surveyed</td>
<td>• 3,283 miles surveyed</td>
<td>• 3,721 miles surveyed</td>
<td>• 2,500+ miles surveyed</td>
</tr>
</tbody>
</table>
Highlights

Customer Meter Accuracy Testing

Proactive Leakage Recovery

Repair Record Improvement
Customer Meter Accuracy Testing

Example of a data improvement effort for water audit input

Small meter testing effort – 2015, 2017

<table>
<thead>
<tr>
<th>Meter Size</th>
<th>Number of Tests</th>
<th>Average Accuracy</th>
<th>95% Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8”</td>
<td>741</td>
<td>98.2%</td>
<td>+/- 0.4%</td>
</tr>
<tr>
<td>3/4”</td>
<td>174</td>
<td>96.0%</td>
<td>+/- 2.1%</td>
</tr>
<tr>
<td>1”</td>
<td>79</td>
<td>97.8%</td>
<td>+/- 2.2%</td>
</tr>
<tr>
<td>1 1/2”</td>
<td>67</td>
<td>100.0%</td>
<td>+/- 0.6%</td>
</tr>
<tr>
<td>2”</td>
<td>133</td>
<td>98.7%</td>
<td>+/- 1.1%</td>
</tr>
<tr>
<td>ALL</td>
<td>1194</td>
<td>98.0%</td>
<td>+/- 0.5%</td>
</tr>
<tr>
<td>stuck meters</td>
<td>32</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

- Critical for insight into Apparent Losses
- Directly impacts Real Loss estimation
- Currently evaluating the continuation of program:
  - Frequency
  - Scale
Proactive Leakage Recovery

~ 13,000 miles of leak detection between 2015 and 2018

3,500+ unsurfaced leaks identified

Two rounds of surveying on the same mileage allow for an investigation of the recurrence of leakage
### Proactive Leakage Recovery – Rate of Rise

<table>
<thead>
<tr>
<th>Infrastructure Type</th>
<th>Leaks Discovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>valve</td>
<td></td>
</tr>
<tr>
<td>service</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td></td>
</tr>
<tr>
<td>meter</td>
<td></td>
</tr>
<tr>
<td>main</td>
<td></td>
</tr>
<tr>
<td>joint</td>
<td></td>
</tr>
<tr>
<td>hydrant</td>
<td></td>
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**Unreported Leak Findings by Survey Round**

- **1.5 kgal leakage**
  - Developed per mile per day

**Survey Round**
- round 2
- round 1

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**Unreported Leak Findings by Survey Round**

- **1.5 kgal leakage**
  - Developed per mile per day

**Survey Round**
- round 2
- round 1
Repair Record Improvement

• 31,000+ reported repairs (2018)
Repair Record Improvement

Reported Work Order Durations: 2015

Count of Work Orders

Work Order Duration (days)
from INITDTTM to FirstWORprLbr
Repair Record Improvement

Reported Work Order Durations: 2018

Work Order Duration (days) from INITDDTM to FirstWORPrLbr

Count of Work Orders

-10 -5 0 5 10 15 20 25 30 35 40 45 50

0 250 500 750 1000 1250 1500 1750 2000 2250 2500 2750

Count of Work Orders
Performance Indicators

**Progress:**
- Streamlining process so that it is well documented and repeatable
- Holding losses steady still indicates *savings in avoided leakage*
- Investing in better data collection
- Reducing authorized unbilled volumes

**Concerns**
- System wide leak detection not showing up in water audit results
- Adjustments on supply need refinement

~ 60 gallons / connection / day of leakage
Current Activities

Water Loss Control Team

- Quarterly Meetings
- Updates on "Leading Indicators"
- Irregular Sub-Committee Meetings

- Production Metering
- Customer Meter Inaccuracy
- Repair Capacity / Documentation
- Pressure
- Proactive Leak Detection

Water Loss Control Plan

2020 - 2024

Water Audit Handbook

2019

Non-Revenue Water Calculation Handbook

SAWS Procedures and Supporting Documentation for the Texas Water Development Board Non-Revenue Water Calculations
Thank You!

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