BUILDING A WORLD OF DIFFERENCE

Making System Improvements Through Tracking and Validating Non-Revenue Water

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BUILDING A WORLD OF DIFFERENCE®

Work Conducted

- Water Audits in 2014 and 2017
- Reviews of Datasets and Validation
- Interaction with all Departments and Crews
- Updated Recommendations from 2017 Audit
- Development and Trending of Performance Indicators

City of Spokane

Sole Source Aquifer

- 7 well stations, 23 pumps, 261 MGD total capacity

23 Active Booster Stations

- 22 pressure zones
- 1,683 feet to 2,999 feet MSL elevation range
- 70 booster pumps, 200 MGD capacity

32 Active Water Storage Reservoirs

- 106 MG total storage
- 14 feet to 134 feet nominal height range
- 14-foot diameter to 2-1/2 acre footprint

Water Mains

- > 1,000 miles transmission and distribution mains
- ~ 85,000 service connections
- 1892 to 2019 installation

Water exported to 7 Purveyors

- 10 Interties

1,000s of Appurtenances

- Hydrants, valves, meters, bends, fittings

2019 Water Rates

- Single-family Residential, within City limits:
  - Basic monthly service charge, $16.73
  - Consumption Charge, block structure

Consumption Charge		
First 4,500 gal	1-6 units	$0.32/unit
Next 3,000 gal	7-10 units	$0.68/unit
Next 26,100 gal	11-45 units	$0.91/unit
Over 33,600 gal	Over 45 units	$1.17/unit

City of Spokane

- **Distribution System Leakage (DSL) Standard per WAC 246-290-820**

	2014	2015	2016	2017
Volume, billion gallons	4.0	3.2	2.6	2.9
Annual Loss	17.8%	13.4%	11.7%	12.6%
3-Yr Running Average	18.5%	16.4%	14.3%	12.6%

City Conducted AWWA Water Audit to more accurately assess and target water losses

Tracking and Validating

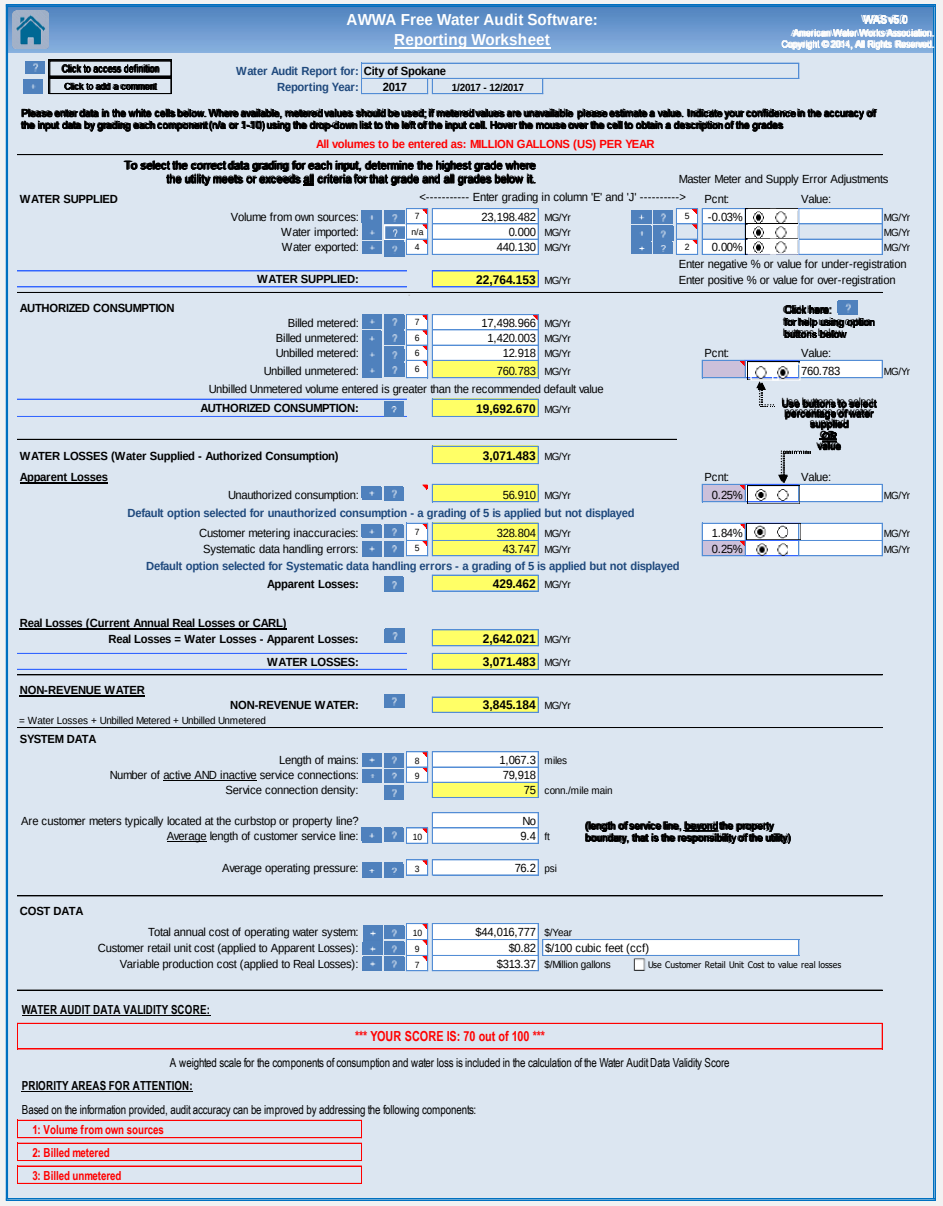
Category	CY 2014 Grading	CY 2017 Grading	Comments
Volume from own sources (MG/Yr.)	5	7	Electronic calibration was conducted in the audit year.
Water exported (MG/Yr.)	5	4	Wholesale meters are present however regular meter accuracy testing does not occur.
Number of active & inactive service connections	6	9	More accurate analysis using GIS in 2017
Average operating pressure (psi)	4	3	The model was not set up for the 2017 demands and no physical hydrant flow tests were conducted in 2017.

Water Audit 2017

- **Not mandatory reporting**
- **DoH does recommend this method**
- **Completing a (DoH) water loss control action plan**

"At a minimum, include the following in your water loss control action plan:

Water loss control methods you will implement to strive for the 10% standard. - Such as leak detection, meter replacement, attending water loss management educational courses, or performing a **water audit**."



AWWA Free Water Audit Software: Reporting Worksheet

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

Click to access definition
Click to add a comment

Water Audit Report for: City of Spokane
Reporting Year: 2017 1/2017 - 12/2017

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.

<---------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED				Pcnt:	Value:
Volume from own sources:	7	23,198.482	MG/Yr	-0.03%	MG/Yr
Water imported:	n/a	0.000	MG/Yr		MG/Yr
Water exported:	4	440.130	MG/Yr	0.00%	MG/Yr
WATER SUPPLIED:		22,764.153	MG/Yr		

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

AUTHORIZED CONSUMPTION				Pcnt:	Value:
Billed metered:	7	17,498.966	MG/Yr		
Billed unmetered:	6	1,420.003	MG/Yr		
Unbilled metered:	6	12.918	MG/Yr		
Unbilled unmetered:	6	760.783	MG/Yr		760.783 MG/Yr
AUTHORIZED CONSUMPTION:		19,692.670	MG/Yr		

Unbilled Unmetered volume entered is greater than the recommended default value

Click here: for help using option buttons below

Use buttons to select percentage of water supplied OR value

WATER LOSSES (Water Supplied - Authorized Consumption)				Pcnt:	Value:
		3,071.483	MG/Yr		
Apparent Losses					
Unauthorized consumption:		56.910	MG/Yr	0.25%	MG/Yr
Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed					
Customer metering inaccuracies:	7	328.804	MG/Yr	1.84%	MG/Yr
Systematic data handling errors:	5	43.747	MG/Yr	0.25%	MG/Yr
Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed					
Apparent Losses:		429.462	MG/Yr		
Real Losses (Current Annual Real Losses or CARL)					
Real Losses = Water Losses - Apparent Losses:		2,642.021	MG/Yr		
WATER LOSSES:		3,071.483	MG/Yr		

NON-REVENUE WATER		
NON-REVENUE WATER:	3,845.184	MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA			
Length of mains:	8	1,067.3	miles
Number of active AND inactive service connections:	9	79,918	
Service connection density:		75	conn./mile main
Are customer meters typically located at the curbstop or property line?		No	
Average length of customer service line:	10	9.4	ft
Average operating pressure:	3	76.2	psi

(length of service line, beyond the property boundary, that is the responsibility of the utility)

COST DATA			
Total annual cost of operating water system:	10	$44,016,777	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$0.82	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	7	$313.37	$/Million gallons

Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 70 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

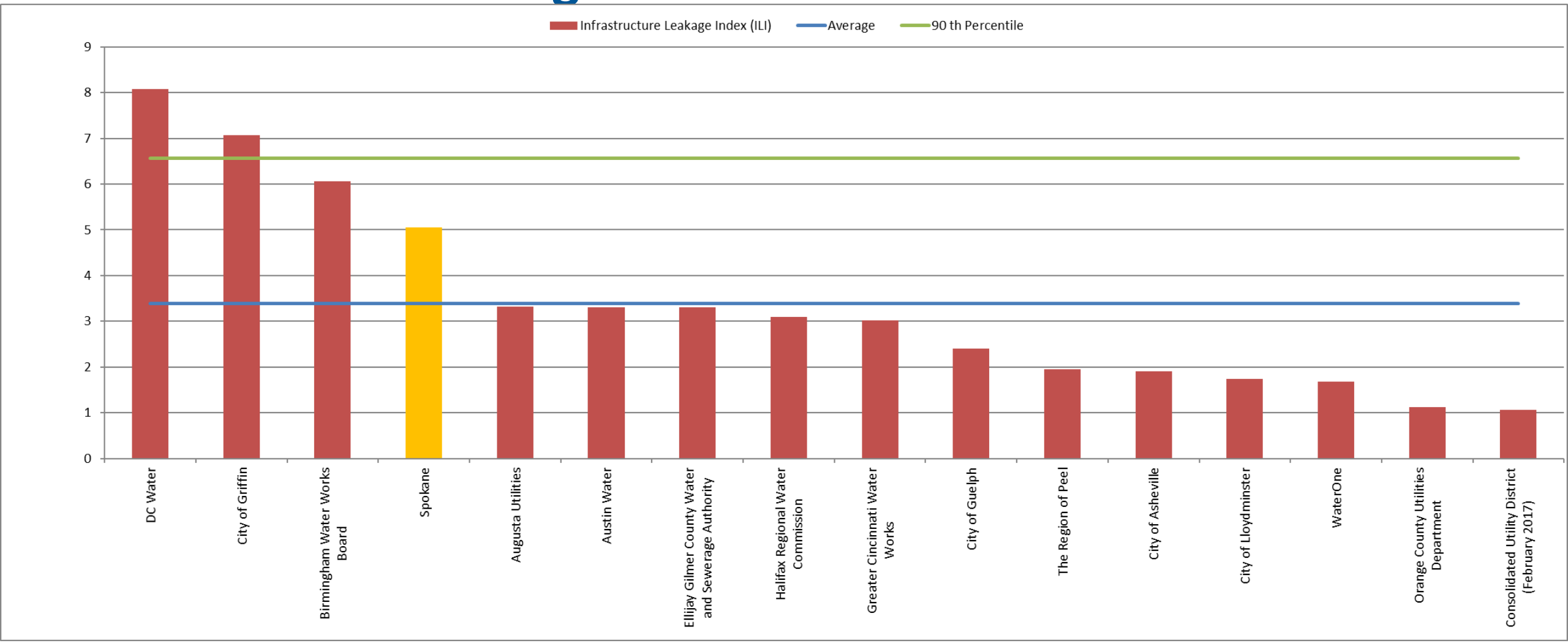
Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Billed metered
3: Billed unmetered

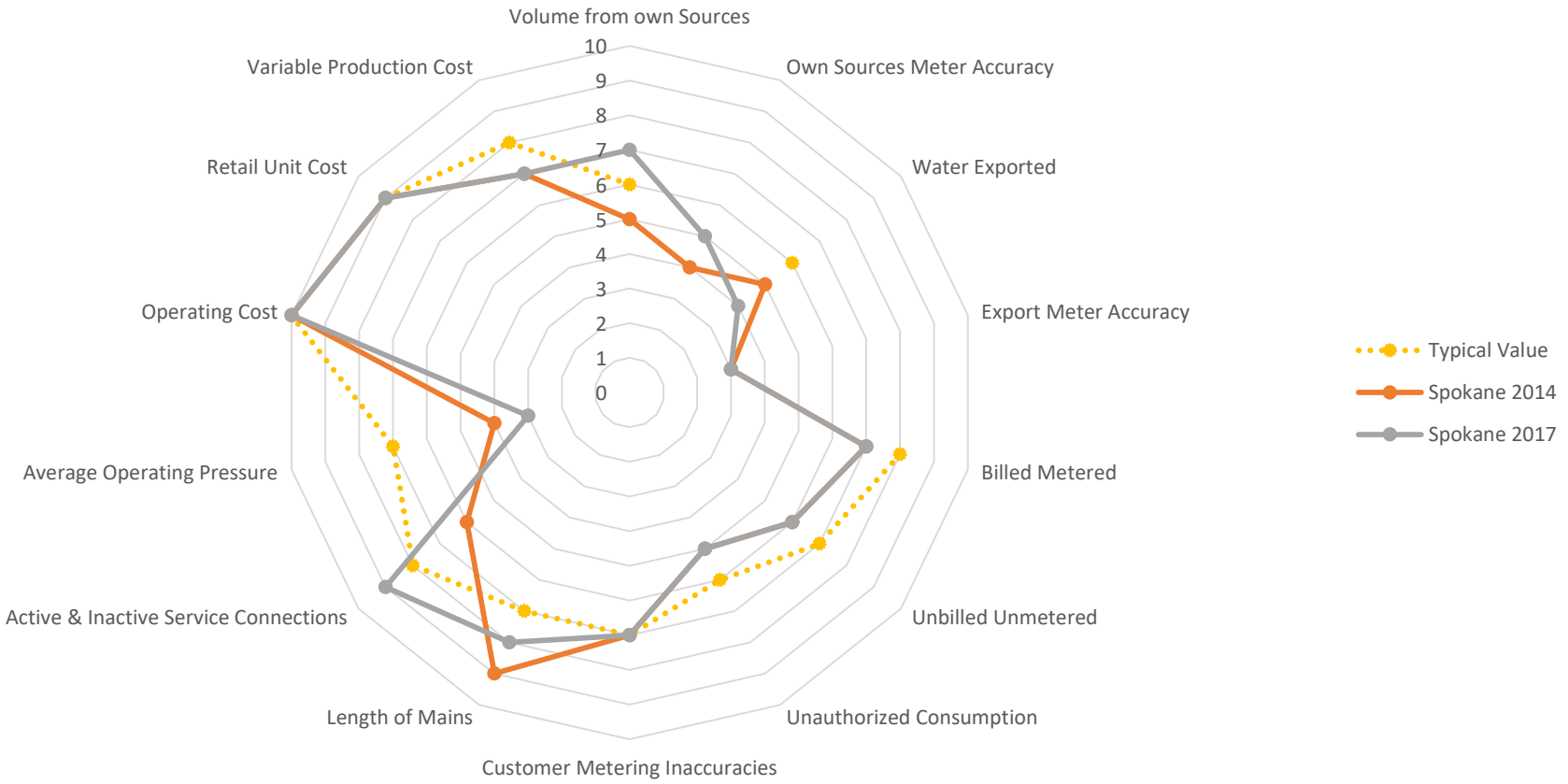
Performance Indicators

INDICATORS	CY 2014	CY 2017	AWWA TYPICAL VALUE*
Validation Score	60	**70**	60-70
Apparent Losses (gals/conn/day)	9.6	**14.72**	11
Real Losses (gals/conn/day)	147.65	**90.57**	67
Infrastructure Leakage Index (ILI)	7.32	**5.05**	3.13
Annual Cost of Water Losses	$1,072,789	**$1,298,698**	n/a
Total Annual Cost of Operating Water System	$39,077,086	**$44,016,777**	n/a

Infrastructure Leakage Index



Data Validation 2014 to 2017



Improvements that came out of the audit in 2014

- Improving calibration of production meters
- Additional retail meter testing
- Moved a large proportion of unmetered accounts to metered
- Side-by-side evaluation of billing data and GIS to improve confidence on number of active service connections
- Seeds planted to improve leakage detection and involve vendors and service contractors/trainers

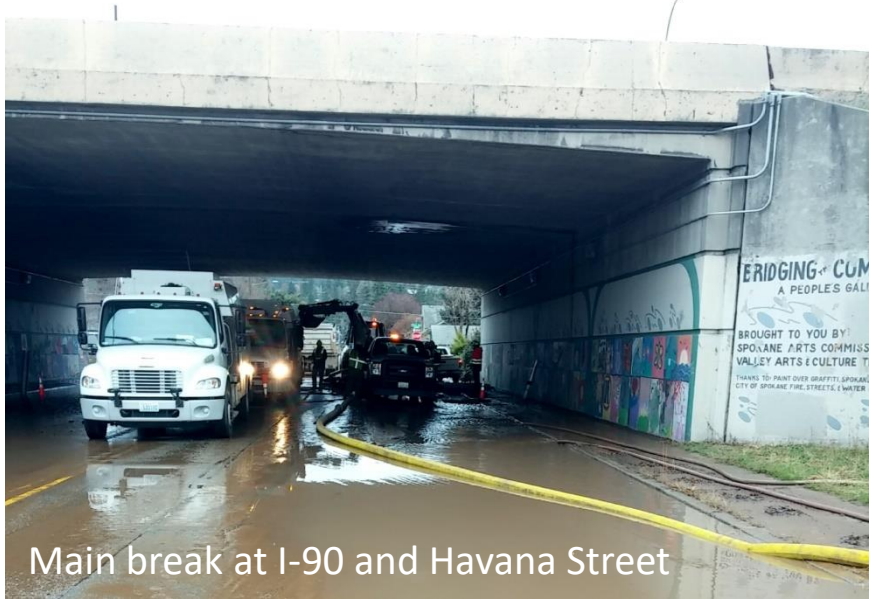
Nevada
Flow Meters

- Electronic Calibration
- Review of sites for secondary physical flow testing

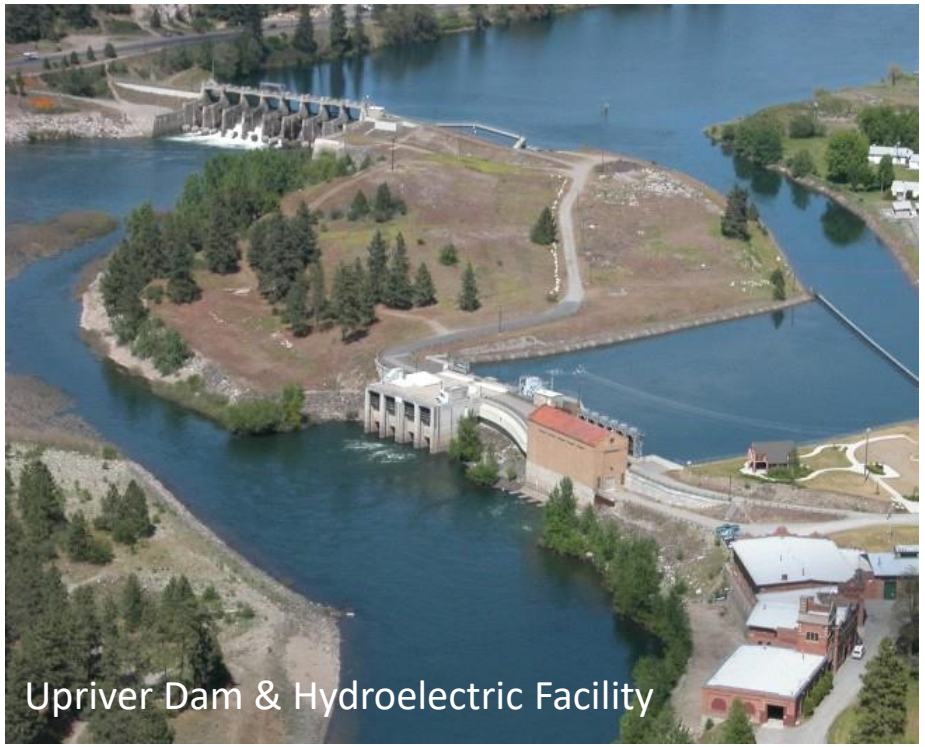
Improvements that came out of the audit 2017

- Annual audit going forward
- Additional leakage detection training
- Validation of data needs to be “continuously” reviewed
- Updated data management
- Initiation of use of innovative technologies
  - Satellite Leak Detection
  - Active Leakage Control

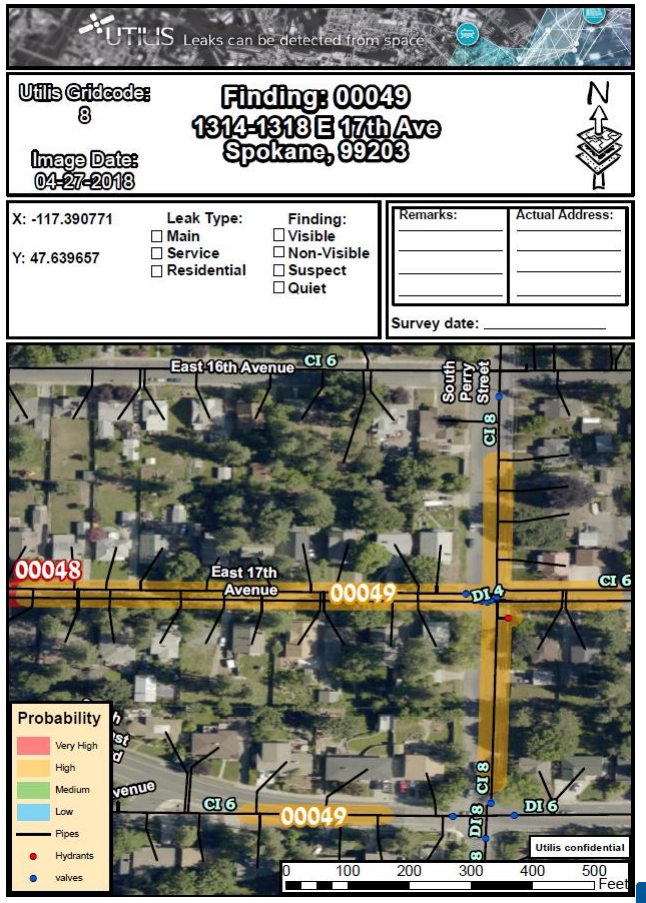

Meter Shop


Main break at I-90 and Havana Street


Leak survey


Upriver Dam & Hydroelectric Facility


Main break close up
12/01/2017 09:42


UTILIS Leaks can be detected from space
Utilis Gridcode: 8
Image Date: 04-27-2018
Finding: 00049
1314-1318 E 17th Ave
Spokane, 99203
N
X: -117.390771
Y: 47.639657
Leak Type:
Main
Service
Residential
Finding:
Visible
Non-Visible
Suspect
Quiet
Remarks:
Actual Address:
Survey date:
East 16th Avenue
CI 6
South Perry Street
CI 8
00048
East 17th Avenue
00049
DI 4
CI 6
Probability
Very High
High
Medium
Low
Pipes
Hydrants
valves
CI 6
00049
DI 8
CI 8
DI 6
Utilis confidential
0 100 200 300 400 500
Feet

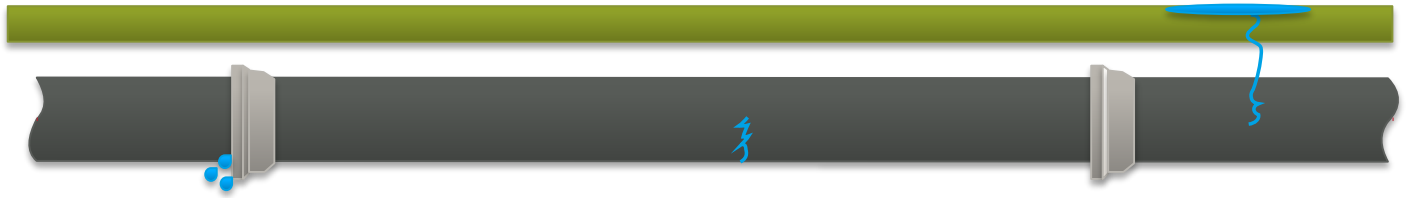
Ongoing Work

- Updated Water Audit for 2018
  - Annual updates into the future
- Update on Trending of Performance Indicators
- Component Analysis of Leakage
- Pressure Management Evaluation
- Data Management of Metered Data

Review Of Real Losses (Component Analysis of Leakage)

- **Conducted Reviews with Leakage Detection crews**

Background Leakage | **Un-Reported Leakage** | **Reported Leakage**



Tools
- Pressure reduction
- Main and service replacement
- Reduction in number of joints and fittings

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- Pressure reduction
- Main and service replacement
- Reduction in number of joints and fittings
- Proactive leak detection

Tools
- Pressure reduction
- Main and service replacement
- Optimized repair time

Selected System Improvements due to this Program

- Proactive Leakage Detection Program
  - Previously only reported leak location, now finding un-reported leaks
- Improvements in CMMS utilization and inputs to the required outputs
- Measured improvements in leakage surveying accuracy
- Meter replacements modified to account for test data and degradation metrics
- Source meter calibrations improved accuracy of volume from own sources