75% Progress Report

2013 Water Loss Control Audit for Security Water and Sanitation District

September 15, 2014

Funding Provided by Colorado Water Conservation Board

Water Efficiency Grant PO OE PDA 14000000074

Prepared by:

Introduction

The goal of this project was to use the IWA/AWWA Water Audit Method published in the AWWA Manual of Practice M36 to conduct the first "top down approach" desktop water audit

for the Security Water and Sanitation Districts (District). The preliminary audit was developed ty District staff in conjunction with WaterDM and Water Matters!. The results of the desktop audit were reviewed by international water loss expert Reinhard Sturm of WSO.

This summary report and the completed water audit spreadsheet constitute the 75% progress report deliverable for this project.

Security Water District

Security Water District was established in 1954 as a quasi-municipal corporation and political subdivision of the State of Colorado for the purpose of providing water improvements and services for its residents, which currently number about 18,500. The District is located in an area of unincorporated El Paso County bordered on the north by Drennan Blvd., on the west by I-25, on the east by Grinnel Road and on the south by Fontaine Blvd. The District comprises approximately five square miles.

Security obtains its water supply from the Frying Pan-Arkansas Project by way of the Fountain Valley Authority and from 20 groundwater wells located in the Widefield and Windmill Gulch aquifers. About 2/3 of the current supply comes from groundwater, the remaining 1/3 from Project surface water. Its groundwater is alluvial, therefore subject to various augmentation agreements. This mix is expected to change in the future, ultimately increasing dependence on surface water.

Although the District enjoys an adequate supply of water, sufficient to meet the needs of its current growth well into the future, it experiences an average of 10 to 12 percent "non-revenue" water loss, and is anxious to determine the cause of this loss.

Working with Linda Firth of Water Matters! and Peter Mayer, P.E. of WaterDM, the District obtained a water efficiency implementation grant from the Colorado Water Conservation Board (CWCB) for conducting the water loss control audit and expert review.

Water Loss Audit

Peter Mayer and Linda Firth met with Security Water District on February 7, 2014 to learn more about their non-revenue water concerns; to establish project goals and timelines; and to begin the data gathering process. We gave Security a list of data needed to begin our analysis, using the AWWA M36 method.

The audit team met again with Security Water District on February 12. The water loss control audit data input process was completed, and few gaps and uncertainties were identified. Using the AWWA M36 methodology, the team identified three areas for further investigation and analysis. These were imported water (inability to verify Southeastern Colorado Water

Conservancy District's measurement accuracy without further investigation); volume from own sources; and systematic data handling errors.

Next the audit team held a phone discussion with Reinhard Sturm of Water System Optimization (WSO) to discuss the audit results, clarify issues, and revise the reporting worksheet responses. A revised audit spreadsheet was provided to the District and the project was put on hiatus for several months to allow the Town of Monument to catch up so that the in-person visit from Reinhard Sturm could be coordinated at a convenient time.

On September 4, Reinhard Sturm, Peter Mayer, and Linda Firth met again with Roy Heald and District staff to review and finalize the water loss control audit. On September 5, the Team conducted a water loss control workshop at the Water Research Foundation facility at 6666 West Quincy Ave. in Denver. The workshop was led by Reinhard Sturm and Kate Gasner of WSO, assisted by Peter Mayer and Linda Firth.

Findings from 2013 Water Audit

The 2013 water loss control audit for the Security Water and Sanitation Districts found that approximately 110 million gallons of water are lost from the system each year. About 12 million gallons are apparent losses and 98 million gallons are real losses. It is estimated that in Security's water system about 46 million gallons per year of loss is unavoidable suggesting that about 66 million gallons of loss could be addressed through future action.

Real water losses in the district amount to 36.5 gallons per connection to day. This could probably be brought down to 20 gallons per connection per day over time through a systematic water loss control program. It is calculated that in 2013, the annual cost of the Apparent Losses in the system was $36,030 and the annual cost of Real losses to the system was $169,995.

2013 Water Loss Control Performance Indicators

Financial Indicators

- $35,030 – Annual cost of Apparent losses
- $169,965 – Annual cost of Real losses (valued at the variable production cost - $1,731.60 per MG)
- 12.5% - Non-revenue water as percent by volume of water supplied.
- 6.5% - Non revenue water as percent by cost of operating water system

Operational Efficiency

- Apparent losses per service connection – 4.4 gal/connect/day
- Real losses per service connection per day – 36.5 gal/connect/day
- Current Real Annual Losses – 98.15 million gallons/year
- Infrastructure Leakage Index (ILI) – 2.14

The ILI is a performance indicator for comparing utilities operational management of real losses. An ILI score of in the range of 1-3 is a general indication that water is expensive to deliver and there is limited ability to increase revenue through rates. Supplies are limited and difficult or environmentally unsound to develop. Because of this, operating with a system leakage level above 2013 levels is not recommended. A path of steady water accountability and improvement is recommended.

Water Audit Data Validity Score

Security received a 76 out of 100 Water Audit Data Validity Score for their first Water Audit. A score of 76 is quite a good level of overall water accountability, particularly for a first audit. This score can be improved by implementing as many of the recommendations described below

as possible and by reviewing the data validating requirements in the AWWA software (v5.0) provided.

Recommendations from 2013 Water Audit

Based on discussions with Roy Heald and District staff, it appears that water loss and system leaks have been fairly consistent through the years. This suggests that leak detection could be carried out in phases up to the annual economic level of water loss discussed above.

The following recommendations for Security were made by Reinhard Sturm of WSO during the September 4, 2014 meeting:

- Consider independent calibration of Security's well meters and the meters supplying Security that belong to the Fountain Valley Authority (FVA). This calibration will improve understanding of the accuracy of these source water meters and will improve accountability.
    - Work to obtain better information and accuracy reports from the Fountain Valley Authority regarding their supply meters. One of these supply meters is currently a differential pressure (i.e. Venturi) type of meter of unknown age, accuracy. The testing history of all FVA meters is unknown.
    - Request addition of an insertion meter or a permanently installed water meter to provide independent measurements of FVA meters.
- To improve the data validity score of the "Billed metered" category of future water audits, an independent verification of the customer billing data is recommend. This "audit" of the database searches for inconsistencies and verifies volume measurements for the water audit.
- Meters will deteriorate over time and with use. Within 2 years, Security should pull a small random sample of 20 – 30 meters and test them for accuracy at low, medium, and high flow regimes. Based on the results on those tests the City should develop a rational meter replacement program.
- Think long term. Reducing system operating pressure will help extend the life of the infrastructure and reduce water loss over time.

2013 Water Loss Control Audit Summary

A summary of the data input and outputs from the 2013 Security Water and Sanitation Districts water loss control audit is presented here.

WATER SUPPLIED		
Volume from own sources:	623.326	MG/Yr
Water imported:	331.480	MG/Yr
Water exported:		MG/Yr
WATER SUPPLIED:	**954.806**	MG/Yr
AUTHORIZED CONSUMPTION		
Billed metered:	835.140	MG/Yr
Billed unmetered:		MG/Yr
Unbilled metered:	1.142	MG/Yr
Unbilled unmetered:	8.535	MG/Yr
AUTHORIZED CONSUMPTION:	**844.817**	MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)	**109.989**	MG/Yr
Apparent Losses		
Unauthorized consumption:	2.387	MG/Yr
Customer metering inaccuracies:	8.447	MG/Yr
Systematic data handling errors:	1.000	MG/Yr
Apparent Losses:	**11.834**	MG/Yr
Real Losses = Water Losses - Apparent Losses:	**98.155**	MG/Yr
WATER LOSSES:	**109.989**	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **119.666** MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	101.0	miles
Number of active AND inactive service connections:	7,368	
Service connection density:	73	conn./mile main
Average length of customer service line:	60.0	ft
Average operating pressure:	55.0	psi

COST DATA

Total annual cost of operating water system:	$3,430,431	$/Year
Customer retail unit cost (applied to Apparent Losses):	$2.96	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	$1,731.60	$/Million gallons

2013 Water Balance

AWWA Free Water Audit Software: Water Balance

WAS v5.0

Water Audit Report for:	Security Water Districts	
Reporting Year:	2013	12/2012 - 12/2013
Data Validity Score:	76	

Own Sources (Adjusted for known errors) 623.326	Water Exported 0.000	Billed Water Exported			
		Authorized Consumption 844.817	Billed Authorized Consumption 835.140	Billed Metered Consumption (water exported is removed) 835.140	Revenue Water 835.140
				Billed Unmetered Consumption 0.000	
			Unbilled Authorized Consumption 9.677	Unbilled Metered Consumption 1.142	Non-Revenue Water (NRW) 119.666
				Unbilled Unmetered Consumption 8.535	
	Water Supplied 954.806	Water Losses 109.989	Apparent Losses 11.834	Unauthorized Consumption 2.387	
				Customer Metering Inaccuracies 8.447	
				Systematic Data Handling Errors 1.000	
Water Imported 331.480			Real Losses 98.155	Leakage on Transmission and/or Distribution Mains Not broken down	
				Leakage and Overflows at Utility's Storage Tanks Not broken down	
				Leakage on Service Connections Not broken down	

2013 Performance Indicators

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.

Water Audit Report for: Security Water Districts
Reporting Year: 2013 | 12/2012 - 12/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 76 out of 100 ***

System Attributes:

	Apparent Losses:	11.834	MG/Yr
+	Real Losses:	98.155	MG/Yr
=	**Water Losses:**	**109.989**	MG/Yr
	? Unavoidable Annual Real Losses (UARL):	45.76	MG/Yr
	Annual cost of Apparent Losses:	$35,030	
	Annual cost of Real Losses:	$169,965	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	12.5%	
	Non-revenue water as percent by cost of operating system:	6.5%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	4.40	gallons/connection/day
	Real Losses per service connection per day:	36.50	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.66	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	98.15	million gallons/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.14	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Contact Information

Peter Mayer, P.E.
720-318-4232
peter.mayer@waterdm.com
www.waterdm.com

Water Matters!

Linda Firth
719.213.0446
ljfirth@comcast.net

Reinhard Sturm
(415) 538 8641
reinhard.sturm@wso.us