The Water Audit Handbook for Small Drinking Water Systems

Based on the

AWWA/IWA

Water Audit Method

Smart Management for Small Water Systems

2013

EFCN
environmental finance center network

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Acknowledgement

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1 – Introduction

According to the 2011 Drinking Water Infrastructure Needs Survey & Assessment, more than $247.5 billion is needed over the next 20 years for the replacement or refurbishment of deteriorating transmission and distribution mains at public water systems (PWS) in the United States. This aging infrastructure can be a significant source of water loss in a system. Since water is considered a commodity that is produced by a PWS, the loss of this water is directly connected to a loss of revenue for the system. As water system infrastructure continues to age and as drought throughout the United States continues to stretch water resources, a water loss control program becomes critical. Water loss control programs have the possibility of deferring, reducing, or eliminating the need for a PWS to spend resources on repairs. In addition, a water loss control program can protect public health through a reduction in leaks that can compromise the distribution barrier by allowing the entry of pathogens into a water system.

The first step in establishing an effective water loss control program is performing a water audit. The idea of tracking water loss as a percentage of estimated losses over the volume of water supplied was first introduced by the American Water Works Association (AWWA) in 1957. The terms unaccounted-for-water or unaccounted-for-percentage were widely adopted by water utilities in response to this. However, due to differences in how these terms were interpreted and because there was not a verifiable reduction in losses by those that adopted these terms, it has been recommended that they no longer be employed. Instead, it is now recommended to use the term "non-revenue" water and to employ the AWWA/International Water Association (IWA) Water Audit Method. The AWWA/IWA Water Audit Method is based on the Water Balance Table shown in Figure 1. By using this table along with the AWWA/IWA methodology, all water loss is accounted for through both apparent losses and real losses and therefore there is no unaccounted-for-water.

This handbook was developed primarily for use by small drinking water systems that serve 10,000 people or less. Its purpose is to simplify the process of using the AWWA/IWA Water Audit by grouping information and data entry into separate sections for System Input Volume, Authorized Consumption and Water Losses. In addition, cost data and the performance indicators that are present in the AWWA/IWA Water Audit are left out to further simplify the process. The grading matrices that are present in the AWWA/IWA Water Audit that allow a Water Audit Data Validity Score to be calculated are instead included in each section as discussions on ways to improve data along with bottom up tools that can be used to improve data quality in each section. Overall, the intended use of this handbook is to start as a top down or paper water audit that allows a system to identify what sorts of bottom up activities should be

done in order to verify and improve the accuracy of water loss data associated with their water system. The intent of this handbook is not to replace the complete AWWA/IWA method. In simplifying the AWWA/IWA Water Audit Method, this handbook makes it easier for small systems to begin getting used to Water Audit Method terminology and allows these systems to start the Water Audit process to begin seeing benefits in understanding what happens to the water in their system.
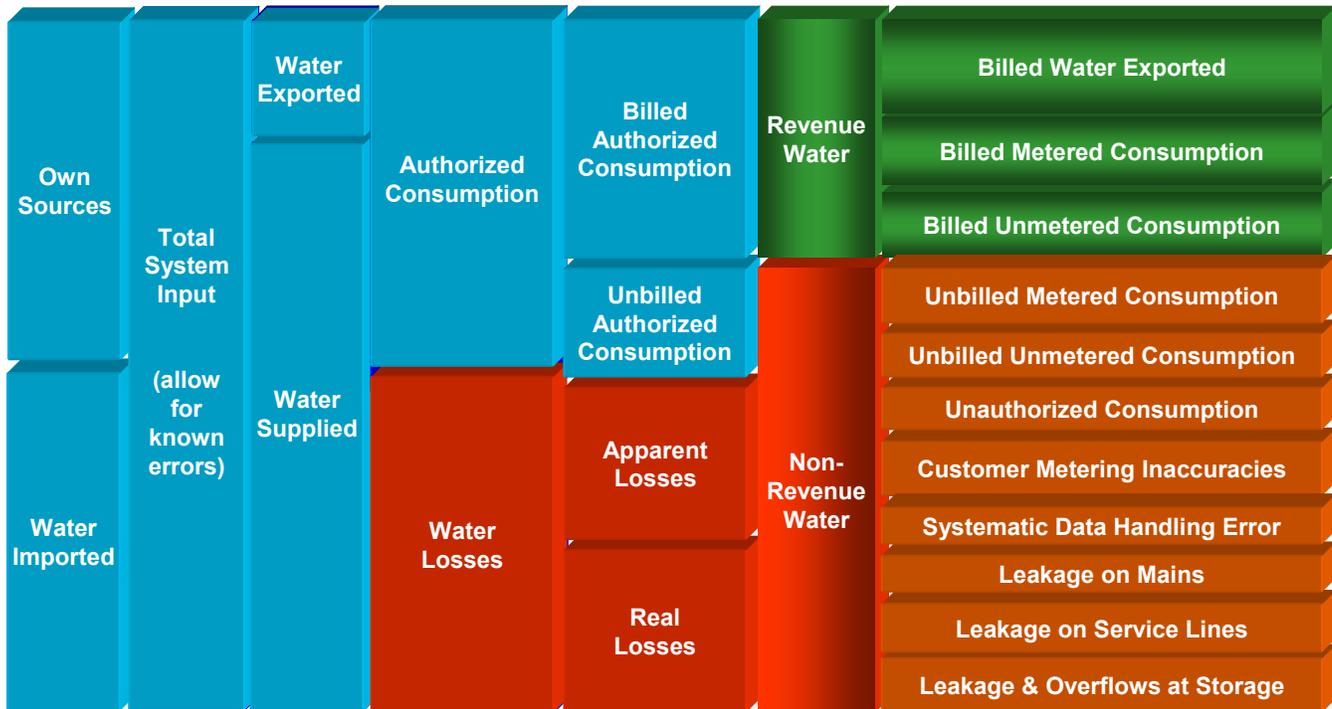

Figure 1   the AWWA/IWA Water Balance Table

2 – Instructions for Using this Handbook

This handbook can be used in two different ways. It can be printed and the paper copy can be filled out by hand or it can be used as an Adobe Form and completed electronically. The sections following these instructions require the input of data by the water utility. If the user is doing the data entry using the Adobe Form and a calculation is required, it will be done automatically, and if filling in a paper copy; the user should utilize the formulas given in each section and do the calculations by hand. The user can input data section by section or if it is preferred, all of the water audit data can be input into the Water Audit Data Summary Table on page 29. All volumes should be entered in millions of gallons per year (MG/Yr).

3 – Drinking Water System Information

This section includes general information about the water system. While this information is not required in order to use this handbook, it is information that should be collected and maintained in order to have an effective water loss management program. Further, this information is required in order to calculate some of the Performance Indicators included in the AWWA/IWA Water Audit method.

WATER SYSTEM NAME:	
PWSID:	
WATER SYSTEM ADDRESS:	
AUDIT START DATE:	
AUDIT END DATE:	
CONTACT PERSON NAME:	
TELEPHONE NUMBER:	
E-MAIL:	

LENGTH OF MAINS (miles):	
NUMBER OF ACTIVE & INACTIVE SERVICE CONNECTIONS:	
AVERAGE LENGTH OF CUSTOMER SERVICE LINE (feet):	
AVERAGE OPERATING PRESSURE (PSI):	

4 – System Input Volume

The system input volume is the total amount of water that is supplied to the distribution system. This value can include water produced from the system's own sources as well as water imported from a water wholesaler. The system input volume should be validated and should include an adjustment for master meter errors. The system input volume is the first, and largest value included in a water audit. Enter the system input volume for your system below in millions of gallons per year (MG/Yr).
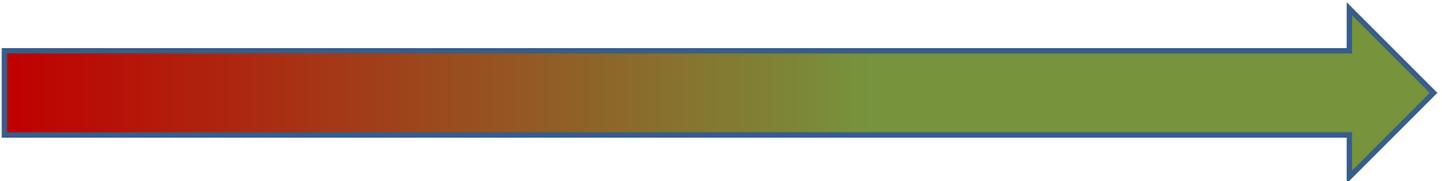
SYSTEM INPUT VOLUME

(MG/Yr)

	Water Produced from Own Sources
+	Water Imported
+/-	Meter Error Adjustment
=	**System Input Volume**

System Input Volume – *Where is your data coming from?*

As part of doing a water audit it is important to understand where your information is coming from. Are you just taking a best guess at how much water you are producing and adding into your distribution system because you do not meter? Do you meter the water you produce but your meters are old and you don't know how accurate they are? Or, do you know exactly how much water you produce because your meters are new and you test them regularly to ensure accuracy? Included below is a portion of the Grading Matrix from the Texas Water Development Board's (TWDB) "Water Loss Audit Manual for Texas Utilities". This matrix allows you to determine how reliable the data is that's coming from your system. Data that is acquired using methods on the left side of the table is questionable. Data acquired using methods on the right side of the table is much more valid. Where in the table best describes the data from your system?

No meters; volume quantified by estimates only	Partially metered; several supply sources metered but not all	Fully metered; no regular testing or calibration of meters	Fully metered; partial testing or electronic calibration; no meters greater than 15 years old	Fully metered; annual electronic calibration and flow testing; no meters greater than 15 years old

From TWBD's "Water Loss Audit Manual for Texas Utilities"

System Input Volume – *What can you do to improve your data?*

Are you happy with the data that makes up your System Input Volume? If you're not, the table below describes activities that can be done at your system to improve the reliability of your data. Activities are arranged from left to right with the activities on the right giving you the best data

Install meters	Complete 100% metering	Initiate testing of meters	Reduce age of meters unless able to prove accuracy of all old meters through flow testing	No new work; standardize calibration, testing, and replacement to ensure this high level of service continues

From TWBD's "Water Loss Audit Manual for Texas Utilities"

System Input Volume – *Tools to help improve data collection*

Included on the following pages are some basic tools to help you begin to collect the information you need for a water audit. These tools can either serve as examples, or they can be printed and used directly. The tools to help collect System Input Volume include:

Water System Name:		PWSID:	

Water Supplied Log Sheet

Month: _____ **Year:** _____

Facility Information

Facility Name:		Facility Type:	
Master Meter Manufacturer		Master Meter Model#:	
Date Meter Installed:		Date/s Meter Tested:	

Date	Time	By (initial)	Meter Reading	Gallons	Comments

Water System Name:		PWSID:	

Master Meter Tracking Form

Master Meter Location:	
Manufacturer:	
Model #:	
Serial #:	
Size:	
Date Installed:	

Date Tested	Testing Method	Tested By	Result

Master Meter Location:	
Manufacturer:	
Model #:	
Serial #:	
Size:	
Date Installed:	

Date Tested	Testing Method	Tested By	Result

5 – Authorized Consumption

Authorized consumption is the water that is used by customers that are known to the water system. It is the sum of billed authorized consumption and unbilled authorized consumption. It also includes water exported and supplied to other water systems. Authorized consumption is a known quantity and includes:

Billed Meter Consumption – Authorized consumption of water that is directly metered and billed to the customer and generates revenue.

Billed Unmetered Consumption – Authorized consumption of water that is not directly metered. Consumption is still billed to the customer based on either an estimate or a flat fee and generates revenue.

Unbilled Metered Consumption – Authorized consumption of water that is metered but is not billed and does not generate revenue. Because this water use is metered, it is accounted for and is not lost from the system. Examples of this type of authorized consumption include water used at municipal facilities including buildings and parks.

Unbilled Unmetered Consumption – Authorized consumption of water that is not metered and is not billed and does not generate revenue. Examples of this type of authorized consumption include water used for flushing and for firefighting.

Enter the data for authorized consumption at your water system in MG/Yr.

AUTHORIZED CONSUMPTION		
Billed Metered	*(MG/Yr)*	Billed Metered
Billed Unmetered	*(MG/Yr)*	+ Billed Unmetered
Unbilled Metered	*(MG/Yr)*	+ Unbilled Metered
Unbilled Unmetered	*(MG/Yr)*	+ Unbilled Unmetered
Total Authorized Consumption		= **Authorized Consumption**
(MG/Yr)		

Authorized Consumption – *Where is your data coming from?*

As before with your System Input Volume, you have to understand where your information on Authorized Consumption is coming from. How much of your system is metered? How old are your meters? Have meters ever been tested? Do you utilize automated meter reading? Do you estimate volumes used for flushing or firefighting? Data that is acquired using methods on the left side of the table is questionable. Data acquired using methods on the right side of the table is much more valid. Where in the table best describes the data from your system?

Billed Metered	No consumption data gathered; flat or fixed rate in use only	Manual meter reads and billings; no regular audits of customer billing data	Automated billing system; no annual checks of data	Automated meter reading and billing system; internally checked or checked by third party on less than annual basis	Automated meter reading and billing system audited by third party on annual basis
Billed Unmetered	Estimates of consumption used	Source production meters used to determine consumption; all areas not monitored	Source production meters used to determine consumption; all areas monitored	District meters (each 3,000 or fewer connections) used to determine consumption; No total coverage; rest use production meters	District meters (each covers 3,000 connections or less) throughout system used to determine consumption
Unbilled Metered	No testing; estimates only	Testing only where problems suspected	Systematic testing of all meters; underperforming meters not always replaced	Systematic testing of all meters within at least a five-year cycle; all meters over standards replaced or repaired and retested	Testing of all production meters conducted in year of audit; replacement of all meters outside standard accuracy range
Unbilled Unmetered	Overall estimates throughout system	Partial estimates for some of variables; basic estimates for others	Estimates using formulae (for example, time x gallons per flush) for known events	Partial estimates using test data; other estimates using formulae from known number of events	Estimates using previous metered testing to determine overall estimated values

From TWBD's "Water Loss Audit Manual for Texas Utilities"

Authorized Consumption – *What can you do to improve your data?*
Are you happy with the data that makes up your Authorized Consumption? If you're not, the table below describes activities that can be done at your system to improve the reliability of your data. Activities are arranged from left to right with the activities on the right giving you the best data

Improvements in quantifying volume of billed metered consumption	Start meter reading and volume-based billing; plan computerized billing system	Develop computerized billing system; consider automatic meter reading	Conduct internal checks of billing data; install automatic meter reading	Conduct third-party audit of billed data	Continue and standardize program
Improvements in quantifying volume of billed unmetered consumption	Develop methods to meter at a higher level (production or district level)	Improve level of monitoring to all areas or consider metering any unmetered accounts	Reduce size of monitored areas or meter unmetered accounts	Reduce size of monitored areas and standardize system analysis, or meter unmetered accounts	Continue and standardize program; all customers who can feasibly be metered are metered
Improvements in quantifying volume of unbilled metered consumption	Start testing program and regular meter readings	Develop systematic testing program; consider automatic meter reading	Replace or repair all non-standard meters; install automatic meter reading	Test all meters annually; repair or replace all underperforming meters	No new work; standardize calibration, testing, and replacement to ensure this high level of service continues
Improvements in quantifying volume of unbilled unmetered consumption	Develop estimates for various unbilled metered events; use default of 1.25% of input volume; change to metered values	Record number of events and develop standard formula for calculating volume, or change to metered values	Conduct test studies of defined duration to determine actual versus estimated volumes, or change to metered values	Conduct test studies on all variables to determine actual versus estimated volumes, or change to metered values	Change to metered values; use of diffuser to accurately determine flushing volume

From TWBD's "Water Loss Audit Manual for Texas Utilities"
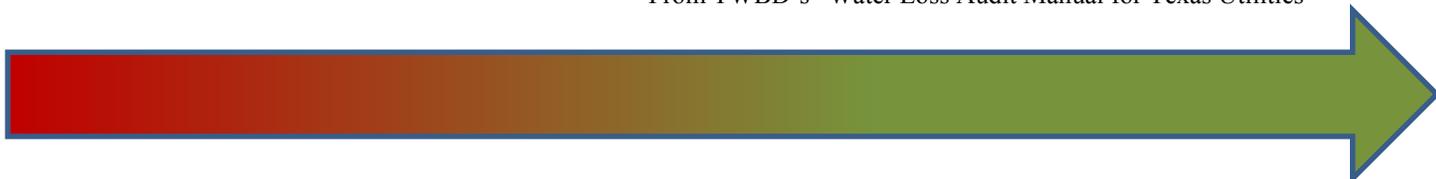
Authorized Consumption – *Tools to help improve data collection*

Included on the following pages are some basic tools to help you begin to collect the information you need for a water audit. These tools can either serve as examples, or they can be printed and used directly. The tools for collecting Authorized Consumption data include:

➢ Line Flushing Report – page 14
➢ Water Usage for Fire Fighting – page 15

Water System Name:		PWSID:	

Line Flushing Report
Adapted from TWDB's "Water Loss Audit Manual for Texas Utilities"

Date	Location	GPM		Time (minutes)	Gallons
			X		
			X		
			X		
			X		
			X		
			X		
			X		
			X		
			X		
			X		
			X		
			X		
		Total Gallons			

Remarks:_____

_____

_____

_____

_____

Signature: _____ Date: _____

Water System Name:		PWSID:	

Water Usage for Fire Fighting

Fire Department Name: _____

Date	Description of Use	Gallons Used	Documented By (initial)	Comments

6 – Water Losses

Water losses are losses in the distribution system that are not due to authorized consumption. Water losses can be categorized as either apparent losses or real losses.

The following box requires a calculation. If you are using this handbook electronically as an Adobe Form the value should calculate automatically. If you are using this handbook as a paper copy, you need to perform the calculation using the formula provided.

WATER LOSSES

(MG/Yr)
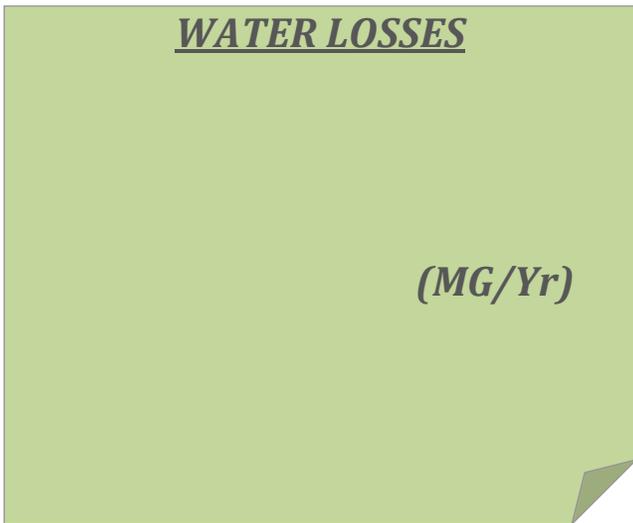
System Input Volume
−   Authorized Consumption
=   **Water Losses**

6.1 – Apparent Losses

Apparent losses are also referred to as commercial losses. This is because water that is lost in this way is water that could have been sold. Because of this, when doing financial calculations, this water should be priced at the retail rate. Examples of apparent losses include water theft, slow meters and billing issues. Specifically, apparent losses are comprised of:

Unauthorized Consumption – Typically, unauthorized consumption is considered to be water theft. Examples include taking water illegally from fire hydrants, customer meter tampering, meter bypasses and illegal line taps. This value is low for most water systems. Unless the user has well validated data on unauthorized consumption, a value of 0.25% of the water produced from the users own sources can be used as a starting point for the audit.

Customer Meter Inaccuracies – Customer meters are quite accurate when they are new but as they age and they start to wear they begin to under-register. Meter inaccuracy can be further increased by water that is chemically aggressive. Customer meter inaccuracies are the apparent loss due to the collective under-registration of customer meters. Data should be entered as the percentage under-registration of billed & unbilled metered consumption. This percentage is often estimated. A value of 2.0% under-registration of billed metered consumption can be used as a starting point for the audit.

Systematic Data Handling Errors – These are errors that occur between when a meter is read and when a bill for that reading is sent to the customer. They are due to data handling and billing errors.

	Unauthorized Consumption
+	Customer Meter Inaccuracies
+	Systematic Data handling Errors
=	**Apparent Losses**

Enter your apparent water losses for unauthorized consumption, customer meter inaccuracies and systematic data handling errors.

APPARENT WATER LOSSES

Unauthorized Consumption	(MG/Yr)
Customer Meter Inaccuracies	(Mg/Yr)
Systematic Data Handling Errors	(MG/Yr)
Total Apparent Losses	(MG/Yr)

Apparent Losses – *Where is your data coming from?*

Again, you have to understand where your information for Apparent Losses is coming from. Are you guessing at how much is lost? Do you have to use the default values for unauthorized consumption and customer meter inaccuracies? Do you have clear policy in regards to data handling and billing? Data that is acquired using methods on the left side of the table is questionable. Data acquired using methods on the right side of the table is much more valid. Where in the table best describes the data from your system?

Unauthorized Consumption	Arbitrary volume estimates	Default of 0.25% of input volume	Number of events of each type evaluated; multiply by estimated gallons lost per event	Number of occurrences evaluated; monitoring and enforcement program started	Monitoring and enforcement program well established with analyzed losses less than 0.25% and declining from previous years
Average Customer Meter Inaccuracies	No testing or replacement; estimates only	Testing or replacement of 1 to 5% of meters in year of audit	Analysis of test data finds meters meeting specs, or testing or replacement of 5 to 10% of meters per year	Previous test data analyzed and all meters in specifications, or testing or replacement of 10 to 50% of meters in year of audit	Previous test data analyzed and all meters in specifications, or testing or replacement of over 50% of meters in year of audit
Systematic Data Handling Errors	No review of billing system	Automated system but no checks of data validity	Automated system; less than annual checks of data	Automated system; internally checked on at least annual basis	Assessment of data handling errors conducted internally and audited by third party on annual basis

From TWBD's "Water Loss Audit Manual for Texas Utilities
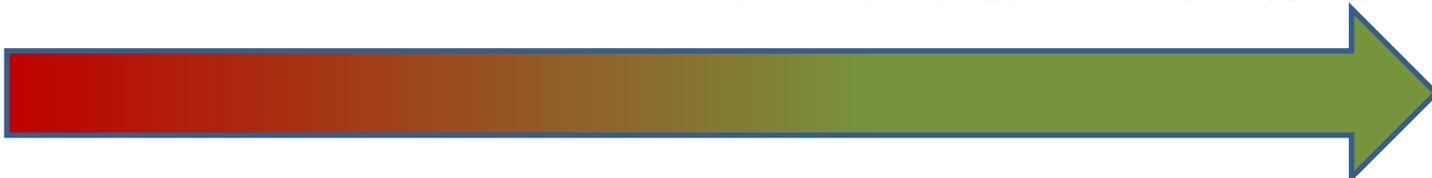
Apparent Losses – *What can you do to improve your data?*

Are you happy with the data that makes up your Apparent Losses? If you're not, the table below describes activities that can be done at your system to improve the reliability of your data. Activities are arranged from left to right with the activities on the right giving you the best data

Improvements in quantifying volume of unauthorized consumption	Develop estimates for likely major incidents of unauthorized consumption; use default of 0.25% of input volume	Evaluate number of occurrences of each of major incidents of unauthorized consumption	Identify losses and aim to reduce; audit areas of suspected losses; examine policy and procedures for gaps allowing fraud	Put in place a monitoring and enforcement plan to show reductions in water lost; implement improved policy and procedures for better policing	Continue with monitoring and enforcement program; review at least annually; consider new regulations to thwart specific incidents of unauthorized consumption
Improvements in quantifying loss due to customer meter inaccuracies	Conduct testing regime on small number of meters targeted to suspected problem areas such as meter age or type	Standardize testing and test or replace 5 to 10% of meters; consider increasing number of meters tested or replaced after review of test data	Consider increasing number of meters tested or replaced after review of test data	Consider increasing number of meters tested or replaced after review of test data	Consider increasing number of meters tested or replaced after review of test data
Improvements in quantifying losses due to systematic data handling error	Conduct internal review of meter reading and billing systems	Conduct internal checks on data validity and meter reading procedures	Conduct annual internal checks of billing data	Conduct third party audit of billed data with specific review of possible data handling and meter reading errors	Continue and standardize program

From TWBD's "Water Loss Audit Manual for Texas Utilities
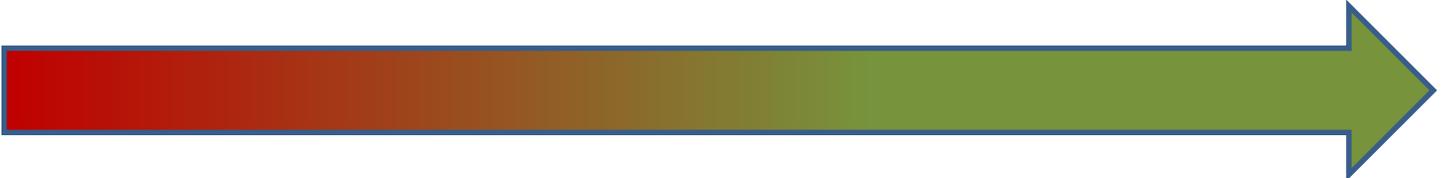
## Apparent Losses – *Tools to help improve data collection*

Included on the following pages are some basic tools to help you begin to collect the information you need for a water audit. These tools can either serve as examples, or they can be printed and used directly. The tools for collecting Apparent Losses data include:

➢ Service Meter Tracking Form – page 22

| Water System Name: | | PWSID: | |

Service Meter Tracking Form

Location/Address	Manufacturer	Model #	Serial #	Size (in.)	Date Installed	Comments

6.2 – Real Losses

Real losses are the water that is actually lost due to leaks. This leakage can occur as distribution and transmission leaks, storage leaks including overflow at water storage tanks and service connection piping leaks. All water systems have loss due to leakage. Preventing or repairing these leaks typically requires a water system to invest in a utility loss control program for the water system infrastructure.

Again, the following box requires a calculation. If you are using this handbook electronically as an Adobe Form the value should calculate automatically. If you are using this handbook as a paper copy, you need to perform the calculation using the formula provided.
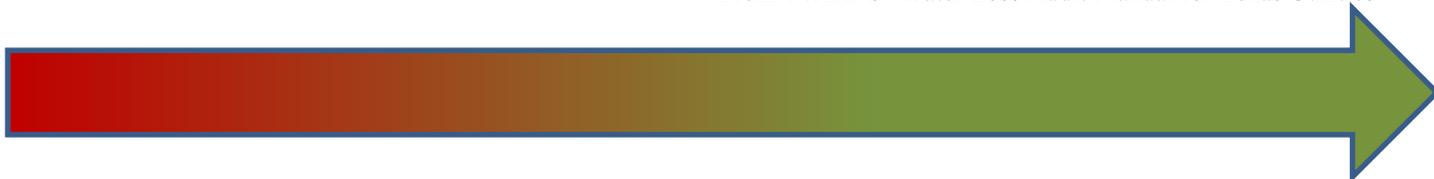
REAL LOSSES

(MG/Yr)
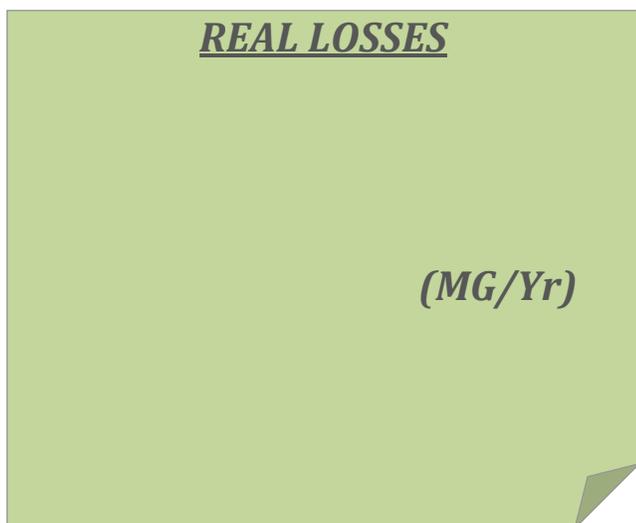
$$\begin{array}{rl} & \text{Water Losses} \\ - & \text{Apparent Losses} \\ \hline = & \textbf{Real Losses} \end{array}$$

Real Losses – *Does your system have an active leak control program?*

Real losses are water that is lost due to leakage. Do you have any data regarding leakage for your system? How often do you get leaks in your system? How quickly do you fix the leaks? Do you actively go out and look for leaks or do you wait for them to surface? Where in the table best describes the data from your system? If you are on the left side of the table then you do not have an active leak control program. If you are on the right side of the table then you are proactive in finding and fixing leaks.

Reported Leaks	Arbitrary estimates; repairs of reported leaks and breaks not documented	Only visual leaks and breaks from customer calls fixed; no known duration before fixing; cursory records	Visual leaks and breaks reported by customers and city staff; call-to-repair times known (greater than one week average); good records	Visual leaks and breaks reported by customers and city staff; call-to-repair times average less than one week; computerized maintenance management system used to document leak repair trends	Visual leaks and breaks reported by customers and city staff; call-to-repair times average less than two days; outstanding computer maintenance records track system deficiencies and repair crew performance
Unreported Loss	If no active leakage control activities exist, unreported leaks are undetected and quantity is zero	Limited leak detection using basic sounding performed for a portion of the distribution system; no detailed records/ database	Proactive leak detection using basic sounding, correlation, and detailed leak detection records; one or more District Metered Areas in use	Proactive leak detection using basic sounding, correlation, flow monitoring, and detailed leak detection and asset condition records; detailed component analysis results	Fully integrated flow monitoring and leak detection program with continuous reporting and analysis of system leakage; integration with asset management, GIS, and economic level of leakage

From TWBD's "Water Loss Audit Manual for Texas Utilities

Real Losses – *What can you do to start a leak control program?*

Are you happy with the leakage control program for your system? If you're not, the table below describes activities that can be done at your system to start a leak control program. Activities are arranged from left to right with the activities on the right being the most proactive.

Improvements in quantifying reported leaks	Report leaks and breaks and develop standards to find, repair, and document leaks and breaks	Standardize recording of leak location and repair data	Continue to standardize recordkeeping process; plan computerized maintenance management system; cut average leak run time to less than one week	Implement computerized maintenance management system to document repairs; reduce leak run time average to less than two days; plan proactive leak detection	Use capabilities of computerized maintenance management system to track failure trends in distribution system and repair crew activity costs; conduct proactive leak detection
Improvements in quantifying unreported loss	Plan proactive leak detection, and/or evaluate the feasibility of continuous flow monitoring in one or more District Metered Areas	Upgrade leak detection capabilities using electronic correlation; set structured leak survey schedule; improve detail of records/database	Improve sonic leak detection and flow monitoring capabilities; improve records to include analysis of asset condition; conduct a component analysis by estimating leak run times and repair times	Fully integrate all leak detection and asset management functions; continue to install District Metered Areas as economically feasible; start to analyze economic level of leakage	Continue to standardize and audit on regular basis

From TWBD's "Water Loss Audit Manual for Texas Utilities

Real Losses – *Tools to help start a leak detection program*

Included on the following pages are some basic tools to help you begin to collect the information you need for a water audit. These tools can either serve as examples, or they can be printed and used directly. The tools for starting a leak detection program include:

➢ Leak Detection Survey Log – page 27

Leak Detection Survey Log
Adapted from TWDB's "Water Loss Audit Manual for Texas Utilities"

Survey Date: _____ Crew: _____ Total Survey Time: _____

Area: _____ Vehicle: _____

Weather: _____

Starting Address: _____

Ending Address: _____

Route: _____

Miles Surveyed: _____

Give a brief description of each leak discovered/suspected (size and location):

1.)

2.)

3.)

4.)

5.)

6.)

Additional Notes:

Signed: _____

7 – Non-Revenue Water

Non-revenue water is water that is not billed and for which no payment is received. Non-revenue water can be the result of authorized consumption and from water losses, both apparent and real.

The following box requires a calculation. If you are using this handbook electronically as an Adobe Form the value should calculate automatically. If you are using this handbook as a paper copy, you need to perform the calculation using the formula provided.
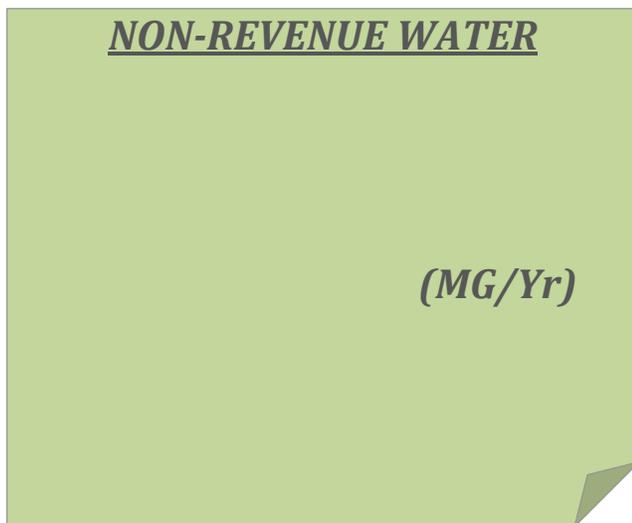
NON-REVENUE WATER

(MG/Yr)

	Water Losses
+	Unbilled Metered
+	Unbilled Unmetered
=	**Non-Revenue Water**

8 – Water Audit Data Summary Table

WATER SYSTEM NAME:	PWSID:
WATER SYSTEM ADDRESS:	
AUDIT START DATE:	AUDIT END DATE:
CONTACT PERSON NAME:	
TELEPHONE #:	E-MAIL:

LENGTH OF MAINS (miles):	
NUMBER OF ACTIVE & INACTIVE SERVICE CONNECTIONS:	
AVERAGE LENGTH OF CUSTOMER SERVICE LINE (feet):	
AVERAGE OPERATING PRESSURE (PSI):	

SYSTEM INPUT VOLUME	
SYSTEM INPUT VOLUME (MG/Yr):	
AUTHORIZED CONSUMPTION	
BILLED METERED (MG/Yr):	
BILLED UNMETERED (MG/Yr):	
UNBILLED METERED (MG/Yr):	
UNBILLED UNMETERED (MG/Yr):	
TOTAL AUTHORIZED CONSUMPTIONS (MG/Yr):	
APPARENT LOSSES	
UNAUTHORIZED CONSUMPTION (MG/Yr):	
CUSTOMER METER INACCURACIES (MG/Yr):	
SYSTEMATIC DATA HANDLING ERRORS (MG/Yr):	
TOTAL APPARENT LOSSES (MG/Yr):	
REAL LOSSES	
TOTAL REAL LOSSES (MG/Yr):	
NON-REVENUE WATER	
NON-REVENUE WATER (MG/Yr):	

Audit performed by: _____ Date: _____

Signature: _____

9 – Next Steps

While this handbook is an excellent starting point for performing a water audit at a small drinking water system it does not replace the AWWA/IWA Water Audit Method. If you feel that you have a good understanding of the water audit process and that you have representative data for your system, performing a full top down Water Audit using the AWWA/IWA software could be your next step.

The benefits of using the AWWA/IWA software include being able to look at cost data to determine how much that lost water is costing your system. The software also includes a series of rational performance indicators that allow you to evaluate system specific attributes such as average distribution system pressure. In addition, you are able to grade your data so that a Water Audit Data Validity Score can be calculated. This tells you just how good the data that you input into the audit really is and if you can rely on the audit to make sound managerial and financial decisions. Overall the AWWA/IWA Water Audit Method and software allow for a comparison of results from year to year and even between water systems.

The water audit software can be obtained on the AWWA website at awwa.org. Search for "water loss control". You may have to register in order to download the spreadsheet based software.

Even if you decide that your system is not quite ready to use the AWWA/IWA water audit software, just remember that water loss and performing a water audit isn't something that you can do just once and check it off your list. It is a process that needs to be repeated and the results compared from year to year.

10 – References

AWWA (American Water Works Association). 2010. AWWA Free Water Audit Software©, Version 4.2. Denver, CO: AWWA.

EPA (Environmental Protection Agency) November 2010. Control and Mitigation of Drinking Water Samples in Distribution Systems, EPA 816-R-10-019.

TWDB (Texas Water Development Board) 2008. Water Loss Audit Manual. Austin, Texas: Texas Water Development Board.