

Component	SYSTEM DATA	Assessment Table									
		1	1.5	2	2.5	3	3.5	4	4.5	5	
	n/a										
Length of main lines, miles		Estimates only	Conditions between 1 and 2	Paper records in poor condition (no totals from year to year)	Conditions between 2 and 3	Good annual paper records	Conditions between 3 and 4	Electronic records and asset management system in good condition; includes system backup	Conditions between 4 and 5	GIS data and asset management database in agreement; random field checks validate databases	
Improvements in quantifying the length of mains		Research and collect paper records for a number of years prior to audit year		Improve to include all totals for at least five years prior to audit year		Convert to electronic databases with backup		Link GIS and asset management databases; conduct field verification of data		Continue with standardization and random field validation to improve knowledge of system	
Number of retail connections, active and inactive		Poor paper records of number of active and inactive service connections	Conditions between 1 and 2	Paper billing/connection information records in poor condition (no totals from year to year)	Conditions between 2 and 3	Good annual paper records, with reasonably accurate tracking of number of active and inactive connections; few or limited field verifications and audits	Conditions between 3 and 4	Electronic records in good condition and reviewed periodically; routine field verifications and audits allow more accurate active/inactive connection count	Conditions between 4 and 5	Well managed policies and procedures for active/inactive connection information in place; GIS data and asset management database in agreement; field verifications and audits prove database accuracy	
Improvements in quantifying connection information		Research and collect paper records for a number of years prior to audit year		Improve to include all totals for at least five years prior to audit year		Convert to electronic databases with backup; increase review and audits		Link GIS and asset management databases; conduct field verification of data at least biannually		Continue with standardization and random field validation to improve knowledge of system	
Average yearly system operating pressure		Estimates only	Conditions between 1 and 2	Random pressure testing and averaging	Conditions between 2 and 3	Pressure testing through system standardized on annual basis	Conditions between 3 and 4	Combine pressure testing to calibrate hydraulic model to develop average system pressure	Conditions between 4 and 5	District testing and averaging matching data from hydraulic model	
Improvements in quantifying the average operating pressure		Develop total system pressure by averaging known pressure from hydrant and random pressure tests		Improve standardization of pressure testing and recording		Analyze SCADA pressure data and assess average pressure through hydraulic network modeling		Conduct standard pressure testing as part of calibration process for developing hydraulic model		Continue with standardization and random field validation to improve knowledge of system; refine hydraulic model	
System Data											
WATER SUPPLIED											
Produced water (volume entering distribution system)	This option should be selected only if the water utility has no water sources of its own - all water resources are purchased	No Meters; volume quantified by estimates only	Conditions between 1 and 2	Partially metered; several supply sources metered but not all	Conditions between 2 and 3	Fully metered; no regular testing or calibration of meters	Conditions between 3 and 4	Fully metered; partial testing or electronic calibration; no meters greater than 15 years old	Conditions between 4 and 5	Fully metered; annual electronic calibration and flow testing; no meters greater than 15 years old	
Improvements in quantifying produced water volume		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	
Production meter accuracy		No testing of production meters; estimated adjustment used only as needed	Conditions between 1 and 2	Testing of production meters only where problems suspected	Conditions between 2 and 3	Systematic testing of meters; underperforming meters not always replaced	Conditions between 3 and 4	Systematic testing of all meters at least within a five-year cycle; all meters over standards replaced or repaired and retested	Conditions between 4 and 5	Testing of all production meters conducted in year of audit; replacement of all meters outside standard accuracy range	
Improvements to production meter error adjustment		Start testing program		Develop systematic testing program		Replace or repair all non-standard meters		Test all production meters annually; repair or replace all underperforming meters		No new work; standardize calibration, testing and replacement to ensure this high level of service continues	
Total treated water purchased	Select this option if the utility's water supply is all self-supplied; no self-wholesale water to other water suppliers	No Meters; volume quantified by estimates only	Conditions between 1 and 2	Partially metered; several supply sources metered but not all	Conditions between 2 and 3	Fully metered; no regular testing or calibration of meters	Conditions between 3 and 4	Fully metered; partial testing or electronic calibration; no meters greater than 15 years old	Conditions between 4 and 5	Fully metered; annual electronic calibration and flow testing; no meters greater than 15 years old	
Improvements in quantifying volume of treated water purchased		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	
Treated water purchased meter accuracy		No testing of production meters; estimated adjustment used only as needed	Conditions between 1 and 2	Testing of production meters only where problems suspected	Conditions between 2 and 3	Systematic testing of meters; underperforming meters not always replaced	Conditions between 3 and 4	Systematic testing of all meters at least within a five-year cycle; all meters over standards replaced or repaired and retested	Conditions between 4 and 5	Testing of all production meters conducted in year of audit; replacement of all meters outside standard accuracy range	
Improvements to treated water purchased meter error adjustment		Start testing program		Develop systematic testing program		Replace or repair all non-standard meters		Test all production meters annually; repair or replace all underperforming meters		No new work; standardize calibration, testing and replacement to ensure this high level of service continues	
Total treated wholesale water sales	Select this option if the utility does not self-wholesale water to other water suppliers	No Meters; volume quantified by estimates only	Conditions between 1 and 2	Partially metered; several supply sources metered but not all	Conditions between 2 and 3	Fully metered; no regular testing or calibration of meters	Conditions between 3 and 4	Fully metered; partial testing or electronic calibration; no meters greater than 15 years old	Conditions between 4 and 5	Fully metered; annual electronic calibration and flow testing; no meters greater than 15 years old	
Improvements in quantifying volume of treated wholesale water sales		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	
Treated wholesale water meter accuracy		No testing of production meters; estimated adjustment used only as needed	Conditions between 1 and 2	Testing of production meters only where problems suspected	Conditions between 2 and 3	Systematic testing of meters; underperforming meters not always replaced	Conditions between 3 and 4	Systematic testing of all meters at least within a five-year cycle; all meters over standards replaced or repaired and retested	Conditions between 4 and 5	Testing of all production meters conducted in year of audit; replacement of all meters outside standard accuracy range	
Improvements to treated wholesale water meter error adjustment		Start testing program		Develop systematic testing program		Replace or repair all non-standard meters		Test all production meters annually; repair or replace all underperforming meters		No new work; standardize calibration, testing and replacement to ensure this high level of service continues	
Water Supplied											
AUTHORIZED CONSUMPTION											
Billed Metered		No consumption data gathered; flat or fixed rate in use only	Conditions between 1 and 2	Manual meter reads and billings; no regular audits of customer billing data	Conditions between 2 and 3	Automated billing system; no annual checks of data	Conditions between 3 and 4	Automated meter reading and billing system; internally checked or checked by third party on less than annual basis	Conditions between 4 and 5	Automated meter reading and billing system audited by third party on annual basis	
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	
Billed Unmetered		Estimates of consumption used	Conditions between 1 and 2	Production meters used to determine consumption; all areas not monitored	Conditions between 2 and 3	Production meters used to determine consumption; all areas monitored	Conditions between 3 and 4	Estimates using formulae (for example time x gallons per flush) for known events	Conditions between 4 and 5	Estimates using previous metered testing to determine overall estimated values	
Improvements in quantifying volume of billed unmetered consumption		Develop methods to meter at a higher level (production or district)		Improve level of monitoring to all areas or consider metering any unmetered accounts		Reduce size of monitored areas or meter unmetered accounts		Standardize system analysis, or meter any unmetered accounts		Change to metered values; use of diffuser to accurately determine flushing volume	
Unbilled metered		No testing; estimates only	Conditions between 1 and 2	Testing only where problems suspected	Conditions between 2 and 3	Systematic testing of meters; underperforming meters not always replaced	Conditions between 3 and 4	Systematic testing of all meters at least within a five-year cycle; all meters over standards replaced or repaired and retested	Conditions between 4 and 5	Testing of all production meters conducted in year of audit; replacement of all meters outside standard accuracy range	
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 production meters annually; repair or replace all underperforming meters		No new work; standardize calibration, testing and replacement to ensure this high level of service continues	
Unbilled unmetered		Overall estimates throughout system	Conditions between 1 and 2	Partial estimates for some of variables; basic estimates for others	Conditions between 2 and 3	Estimates using formulae (for example time x gallons per flush) for known events	Conditions between 3 and 4	Partial estimates using test data; other estimates using formulae from known number of events	Conditions between 4 and 5	Estimates using previous metered testing to determine overall estimated values	
Improvements in quantifying volume of unbilled unmetered consumption		Develop estimates for various unbilled metered events; use default of 1.2% 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 to determine actual versus estimated volumes, or change to metered values		Conduct 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	
Authorized Consumption											
APPARENT LOSSES											
Average customer meter accuracy		No testing or replacement; estimates only	Conditions between 1 and 2	Testing or replacement of 1 to 5% of meters in year of audit	Conditions between 2 and 3	Analysis of test data finds meters meeting specs, or testing or replacement of 5 to 10% of meters per year	Conditions between 3 and 4	Previous test data analyzed and all meters in spec, or testing or replacement of 10 to 50% of meters in year of audit	Conditions between 4 and 5	Previous test data analyzed and all meters in spec, or testing or replacement of over 50% of meters in year of audit	
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		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	
Systematic data handling discrepancy		No review of billing system	Conditions between 1 and 2	Automated system but no checks of data validity	Conditions between 2 and 3	Automated system; less than annual checks of data	Conditions between 3 and 4	Automated system; internally checked on at least annual basis	Conditions between 4 and 5	Assessment of data handling errors conducted internally and audited by third party on annual basis	
Improvements in quantifying loss 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	
Unauthorized consumption		Arbitrary volume estimates	Conditions between 1 and 2	Default of 0.25% of input volume	Conditions between 2 and 3	Number of events of each type evaluated; multiply by estimated gallons lost per event	Conditions between 3 and 4	Number of occurrences evaluated; monitoring and enforcement program started	Conditions between 4 and 5	Monitoring and enforcement program well established with analyzed losses less than 0.25% and declining from previous years	
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	
Apparent Losses											
REAL LOSSES											
Reported Leaks and breaks		Arbitrary estimates; repairs of reported leaks and breaks not documented	Conditions between 1 and 2	Only visual leaks and breaks from customer calls fixed; no known duration before fixing; cursory records	Conditions between 2 and 3	Visual leaks and breaks reported by customers and city staff; call-to-repair times known (greater than one week average); good records	Conditions between 3 and 4	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	Conditions between 4 and 5	Visual leaks and breaks reported by customers and city staff; call-to-repair times average less than two days; outstanding computerized maintenance records track system deficiencies and repair crew performance	
Improvements in quantifying reported leaks and breaks		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 to document repairs; reduce leak run time to less than one week		Implement computerized maintenance management system to document repairs; reduce leak run time 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	
Unreported loss		If no active leakage control activities exist, unreported leaks are undetected and quantity is zero	Conditions between 1 and 2	Limited leak detection using basic sounding performed for a portion of the distribution system; no detailed records/database	Conditions between 2 and 3	Proactive leak detection using basic sounding; correlation and detailed leak detection records; one or more District Metered Areas in use	Conditions between 3 and 4	Proactive leak detection using basic sounding, correlation, flow monitoring and detailed leak detection and asset condition records; detailed component analysis results	Conditions between 4 and 5	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	
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 a regular basis	
Real Losses											
COST DATA											
Customer retail unit cost (applied to apparent losses)		Estimates only	Conditions between 1 and 2	Residential rate only	Conditions between 2 and 3	Weighted average residential rate using volumes in each rate book	Conditions between 3 and 4	Weighted average combination usage rate (includes residential, commercial and industrial)	Conditions between 4 and 5	Third-party reviewed; weighted average combination usage rate (includes residential, commercial and industrial)	
Improvements in quantifying the annual retail unit costs		Evaluate volume of water used in each usage block by residential users; multiply volumes by full rate structure		Conduct structured audit		Evaluate volume of water used in each usage block by all classifications of users; multiply volumes by full rate structure		Conduct a third-party audit of water used in each usage block by all classifications of users; multiply volumes by full rate structure		Continue with this program	
Variable production cost (applied to real losses)		Estimates only	Conditions between 1 and 2	Extrapolated from evaluation of partial system electric and chemical costs	Conditions between 2 and 3	Non-audited evaluation of total system electric and chemical costs	Conditions between 3 and 4	Internally audited wholesale, electric and chemical costs	Conditions between 4 and 5	Third-party audited wholesale, electric and chemical costs	
Improvements in quantifying the variable production costs		Conduct cost evaluation of total system electric and chemical costs		Conduct structured audit		Conduct an annual internal audit		Conduct a third-party audit		Continue with this program	
Cost Data											
Total Score										100	