City of Austin

AUDIT REPORT

Water Loss Management Audit

August 2015

A Report to the Austin City Council

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REPORT SUMMARY

The Austin Water Utility has implemented several water loss mitigation activities that include replacing pipeline through the Renewing Austin program and reducing leak response time. However, it has not adequately addressed costly losses resulting from inaccurate meters. Additionally, Austin Water could improve the process for collecting and reporting water loss information.

AUDIT NUMBER: AU14114

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GOVERNMENT AUDITING STANDARDS COMPLIANCE

We conducted this performance audit in accordance with Generally Accepted Government Auditing Standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

AUDIT TEAM

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August 2015

WATER LOSS MANAGEMENT AUDIT

Report Highlights

Why We Did This Audit

This audit was conducted, in part, due to the risks presented by water loss during the area's widespread drought.

What We Recommend

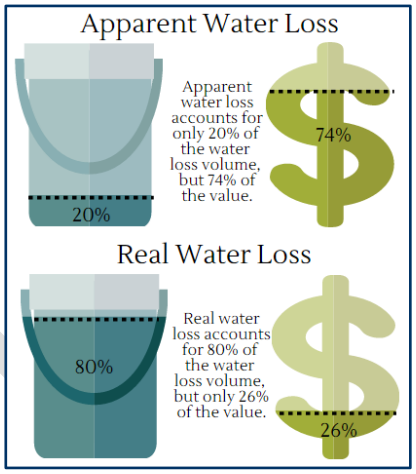
The Austin Water Utility Director should implement a proactive small meter replacement program and prioritize recommendations to improve water meter operations.

Further, the Austin Water Utility Director should improve the process for preparing the water loss report.

For more information on this or any of our reports, email oca_auditor@austintexas.gov

BACKGROUND

- Austin Water completes a water loss report to help determine the quantity and value of water lost from the City's water system each year. These reports classify water loss as:
  - Apparent loss, which is water used by customers but not recorded (e.g., inaccurate water meters); and
  - Real loss, which is water lost due to leaks.
- In 2013, Austin Water reported losing 10.7% (5 billion gallons) of the total water input to the distribution system, which had a value of $6.2 million. This was one of the lowest loss percentages compared to other large Texas cities.
- The value of lost water depends on the type of loss, and differences in those valuations lead to an inverse relationship between volume and value.



OBJECTIVE AND SCOPE

The objective of the audit was to evaluate Austin Water's efforts to mitigate and report water loss. The audit scope included actions taken by Austin Water to mitigate water loss in FY 2013 and FY 2014 and the water loss audit reports submitted to the Texas Water Development Board in 2010, 2012, and 2013.

WHAT WE FOUND

Austin Water measures the success of its water loss management program through an industry benchmark called the Infrastructure Leak Index. Based on that self-reported measure, Austin Water had one of the best water loss management programs compared to other large Texas cities.

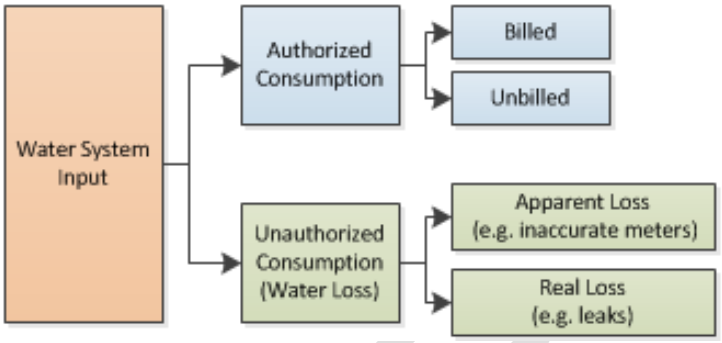
The Austin Water Utility has implemented several water loss mitigation activities that include replacing pipeline through the Renewing Austin program and reducing leak response time. However, it has not adequately addressed loss resulting from inaccurate water meters. This loss represents approximately $4 million in lost revenue for Austin Water, since customers' water use is not accurately recorded.

Additionally, Austin Water's processes for preparing and supporting the water loss report are not efficient. Austin Water uses hundreds of documents that are not clearly organized to support approximately 20 data fields on the water loss report. This takes Austin Water personnel several months to collect and makes preparing and replicating the water loss report difficult.

BACKGROUND

The Texas Water Development Board requires that all large retail water suppliers submit an annual water loss audit[1]. This process helps utilities determine the quantity and value of water that is lost. The water loss report method is represented by the water balance model (Exhibit 1), developed by the International Water Association and the American Water Works Association.

Exhibit 1
Water Balance Model

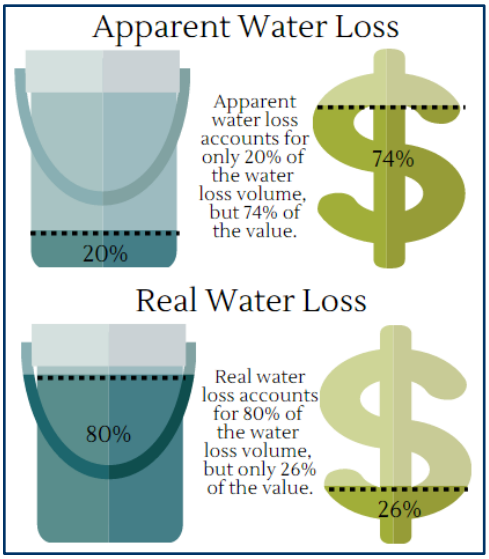


SOURCE: OCA summary of IWA/AWWA Water Balance, 2015

Authorized consumption includes both billed and unbilled use, while water loss is categorized as apparent or real loss. Apparent loss occurs when water used by customers is not recorded and therefore not billed to customers, leading to lost revenue. Inaccurate water meters and water theft are components of apparent loss. Real loss is the result of leaks in the system. The American Water Works Association specifies that real losses are valued at the production cost[2] of the water, while apparent losses are valued at the retail cost[3] of water. Due to the differences between these valuations, the dollar value of apparent water loss is significantly higher for the City than the dollar value of real loss.

In its 2013 water loss report, Austin Water reported losing 10.7% of water input to the water distribution system. While this is a smaller percentage than most other large Texas cities[4], this represented over 5 billion gallons of water valued at $6.2 million.

Austin Water classified approximately 80% of its total water loss as real loss, but this volume only represented approximately 26% of the value of the total water lost, due to the difference between production costs and retail costs. This inverse relationship was noted in water loss reports prepared by other large Texas cities.



[1] The industry term for these documents is "water loss audits." However, "audit" in this context does not denote work done following auditing standards recognized by the auditing profession or the Office of the City Auditor. This report will refer to these documents as "water loss reports."
[2] The production cost of water is based on the cost to produce and treat (e.g., energy and chemicals) water.
[3] The retail cost of water is based on a composite rate for all customer classes.
[4] Auditors reviewed self-reported water loss data from Houston, San Antonio, Dallas, Fort Worth, and El Paso.

OBJECTIVE, SCOPE, AND METHODOLOGY

The audit was included on the Office of the City Auditor's Fiscal Year (FY) 2014 Strategic Audit Plan, as presented to the City Council Audit and Finance Committee. The Water Loss Management Audit was conducted, in part, due to the risks presented by water loss during the area's widespread drought.

Objective

The objective of the audit was to evaluate the Austin Water Utility's efforts to mitigate and report water loss.

Scope

The audit scope included actions taken by Austin Water to mitigate water loss in FY 2013 and FY 2014 and the water loss reports submitted to the Texas Water Development Board in 2010, 2012, and 2013.[5]

Methodology

To accomplish our audit objectives, we performed the following steps:

- interviewed Austin Water personnel responsible for preparing the water loss report and water loss mitigation activities;
- selected a judgmental sample of water loss report fields and recreated report using source data;
- evaluated Austin Water's reported water loss data in 2010, 2012, and 2013;
- evaluated water loss data reported by other large Texas cities in 2012 and 2013;
- interviewed San Antonio Water System personnel about its water loss reports and water loss mitigation efforts;
- interviewed Texas Water Development Board personnel about water loss report procedures and requirements;
- reviewed water loss report manuals from the American Water Works Association and the Texas Water Development Board;
- evaluated internal controls related to the preparation of the water loss report;
- evaluated risk of fraud, waste, and abuse relevant to water loss mitigation and reporting; and
- evaluated information technology risks relevant to water loss mitigation and reporting.

[5] Austin Water was not required to submit a water loss report in 2011.

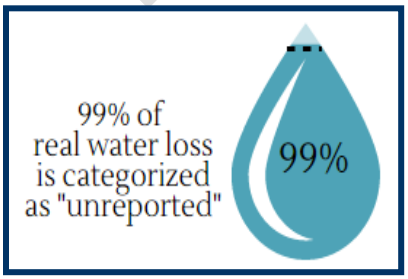
AUDIT RESULTS

The two largest contributing factors to the City's water loss are inaccurate water meters and "unreported loss[6] ." While Austin Water has several programs to mitigate water loss that include replacing pipeline through the Renewing Austin program and reducing leak response time, it has not adequately addressed recommendations to improve water meter accuracy. Since inaccurate water meters lead to water usage that is not properly billed to customers, the value of this water represents lost revenue for the City. However, the full amount of this loss may not be recoverable, as it would require 100% accuracy on every water meter in the system at all times.

Additionally, the process for preparing Austin Water's water loss report is not efficient and makes replicating and validating the water loss report difficult. Improving this process may give Austin Water more accurate water loss data, leading to more effective water loss mitigation efforts.

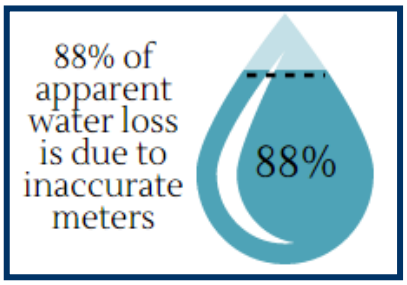
Finding 1: While Austin Water has implemented several water loss mitigation activities, costly losses related to inaccurate meters have not been adequately addressed.

The two largest components of water loss for Austin Water are inaccurate meters (classified as apparent loss) and unreported loss (classified as real loss). On the 2013 water loss report, Austin Water categorized the loss of nearly 4 billion gallons of water, valued at $1.6 million as unreported loss. This type of loss accounts for over 79% of the total water loss *volume* (and 99% of the total real loss volume), but only approximately 26% of the *value* of total water loss because it is measured at the production cost of water.



To address unreported loss, Austin Water contracts with two vendors to perform leak detection services for both large and small water lines.[7] Unreported loss can also be addressed by decreasing calculation errors in the water loss report. Issues relating to calculations in the water loss reports are addressed in Finding 2.

In the same year, Austin Water reported that inaccurate meters resulted in the loss of nearly 900 million gallons of water, valued at over $4 million. This type of loss accounted for nearly 18% of the total water loss *volume* (and 88% of the total apparent loss volume), but approximately 74% of the *value* of total water loss. Since inaccurate water meters lead to water usage that is not properly billed to customers, the value of this water represents lost revenue for the City. However, the full amount of this loss may not be recoverable, as it would require 100% accuracy on every water meter in the system at all times. Both the American Water Works Association and Austin Water's meter purchase contract acknowledge that meter accuracy between 98.5% and 101.5% is acceptable.



[6] According to the Texas Water Development Board, "unreported loss" is a category on the water loss report used for undetected leaks and any errors in calculating the water loss elements.

[7] New contracts for leak detection services were executed in April (small lines) and June (large lines) of 2015.

To address meter inaccuracy, oversight agencies and industry groups[8] recommend a proactive water meter testing and replacement program. Austin Water proactively tests the accuracy of large water meters and has a pilot program[9] to test the accuracy of small water meters with the highest risk for inaccuracy.

The vendor's recommendations include:
- changing policies related to meter charges,
- ensuring customers had the appropriate size and type of meter,
- reviewing parameters used to identify potentially inaccurate meter reads, and
- developing a proactive small meter replacement program.

Additionally, Austin Water contracted with a vendor to evaluate its water meter operations[10], and the vendor made several recommendations in a report delivered to Austin Water in April 2015. Austin Water management asserted that it is currently determing how and when the recommendations can be implemented.

Austin Water has also taken action to address water loss in several other ways. For example, Austin Water has:
- replaced approximately 50 miles of pipeline since 2012 through the Renewing Austin program;
- reduced leak response time; and
- identified the management of water system pressure as a key loss management area[11].

Austin Water measures the success of its water loss management program through the Infrastructure Leak Index, which is an industry benchmark that compares real losses to unavoidable real losses[12]. On the water loss reports submitted by Austin Water between 2010 and 2013, this ratio remained relatively constant, and Austin Water had one of the lowest reported Infrastructure Leak Index values among other large Texas cities.

Oversight agencies and industry groups recommend both preventative and reactive water loss mitigation activities.

Finding 2: Current methods to create and support the water loss report are not efficient.

There are approximately 20 unique data fields on the water loss report, and Austin Water obtains this data from within its department, from employees in other City departments, and from external sources. Currently, the Austin Water employee responsible for preparing the water loss report spends several months each year collecting this data.

Austin Water maintains this data and supported the 2013 report with more than 50 electronic documents, more than 120 emails, and an assortment of paper records. However, these source documents sometimes provide conflicting information, making it difficult to validate the water loss report. As an example, a spreadsheet used to calculate the amount of water used by a certain type

[8] The United States Environmental Protection Agency, American Water Works Association, and the Texas Water Development Board all identify improvements to water meter operations as a method to reduce apparent water loss.
[9] A test of 48 high-risk meters found that 85% were outside the acceptable accuracy limits established by Austin Water and the American Water Works Association.
[10] Two previous audits conducted by The Office of the City Auditor (the 2014 Water Meter Billing Audit and the 2009 Austin Water Utility Water Loss Audit) also identified the need to improve water meter operations.
[11] An Austin Water business plan identifies pressure management, but does not identify how it is to be managed, likely due to the complexity of such an undertaking.
[12] Unavoidable real loss represents the lowest amount of real loss volume that could be achieved in a system and is calculated using a formula developed by the American Water Works Association.

of customer does not match the totals listed on invoices sent to those customers. In another instance, two Austin Water employees provided data about the same component of the water loss audit, but the data did not match. Although Austin Water provided explanations for these discrepancies, this information was not included in the source documentation.

Additionally, the organization of the source documents makes it difficult to validate the water loss report. As an example, 11 emails have a similar, generic file name ("FY13 Water Loss") with no reference to whom the email is from or what water loss data the email contains. Two of these emails had the exact same title, but referred to different elements of water loss data.

Improving Austin Water's process for preparing the water loss report may provide more time for staff to conduct a more thorough analysis of the report elements and potential strategies to further mitigate water loss. Additionally, streamlining the process for gathering water loss data and improving the record keeping of supporting documentation may enhance Austin Water's ability to validate data contained in the water loss report.

According to the Texas Water Development Board, a more detailed analysis of water loss data can lead to improved accuracy and more effective water loss control strategies.

RECOMMENDATION

1. **The Austin Water Utility Director should:**
   - **A. develop and implement a plan to proactively replace small water meters, and**
   - **B. prioritize and implement additional recommendations made in the Meter Maintenance Evaluation Report (JBS Inc., 2015) that are most impactful to water meter operations.**

MANAGEMENT RESPONSE: **Concur.** Refer to Appendix A for action plan.

2. **The Austin Water Utility Director should, where feasible, develop and implement a more efficient process for preparing the water loss report, such as automating the data collection process and improving records management.**

MANAGEMENT RESPONSE: **Concur.** Refer to Appendix A for action plan

APPENDIX A

ACTION PLAN

Water Loss Management Audit

Recommendation	Concurrence and Proposed Strategies for Implementation	Status of Strategies	Proposed Implementation Date
1. The Austin Water Utility Director should: A. develop and implement a plan to proactively replace small water meters, and B. prioritize and implement additional recommendations made in the Meter Maintenance Evaluation Report (JBS Inc., 2015) that are most impactful to water meter operations.	**Concur.**[13] The Director will ensure that Austin Water: A. Develop and implement a small meter replacement program, based on analysis performed on accuracy testing of replaced meters; B. Continue to research new meter types to replace meters at high volume accounts and obsolete compound meters. Also continues to evaluate improving the testing frequency scheduling of high volume meters.	Planned/underway. A. Austin Water has already begun accuracy testing of old or high volume small meters that are presumed to be the least accurate and have the greatest payback. Analysis of this and additional testing will be used to develop a replacement strategy. B. Austin Water is also currently piloting several new meter types, including magnetic and ultrasonic meters, to evaluate their use for installation in place of compound meters. The goal is to designate a new meter type for installation through a purchasing contract. Finally, Austin Water is in the process of putting a new large meter testing system in place that prioritizes high volume meter testing.	A: Strategy development, October 1, 2016; Strategy implementation, October 1, 2017. B: Meter types: Investigation of meter types, October 1, 2016; Bidding for new contract, January 1, 2017. Large meter testing frequency, Development, October 1, 2016, Implementation, October 1, 2017.

[13] Austin Water Management indicated they considered and prioritized the recommendations made in the Meter Maintenance Evaluation Report (JBS Inc., 2015) and this management action plan reflects that prioritization.

APPENDIX A

Recommendation	Concurrence and Proposed Strategies for Implementation	Status of Strategies	Proposed Implementation Date
2. The Austin Water Utility Director should, where feasible, develop and implement a more efficient process for preparing the water loss report, such as automating the data collection process and improving records management	**Concur.** The Director will ensure that Austin Water automates those areas where there is the highest opportunity to do so while maintaining access to source data to ensure accuracy and validity, focusing on opportunities offered by the SharePoint and Cognos systems. It will also implement policies to ensure that any investigations into data discrepancies are fully documented and that water loss emails have unique titles to allow easier third party tracking.	Planned.	Automation: Investigation, May 1, 2016; Implementation, May 1, 2017. Documentation: Implementation, May 1, 2016.