

**Performance Audit:  
Water Meter Reading, Estimates,  
and Adjusted Billings**

May 2013

City Auditor's Office  
City of Atlanta

File #12.03





## CITY OF ATLANTA

City Auditor's Office  
Leslie Ward, City Auditor  
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May 2013

### ***Why We Did This Audit***

We undertook this audit because the Department of Watershed Management's reliance on estimated consumption to bill customers for water and sewer service has been a long-standing problem, resulting in billing disputes and adjustments.

The installation of automated meter reading technology, which began in 2006, was intended to reduce estimated readings; however, estimated readings accounted for 10% of total billings in 2009. Customers continue to complain of unusually high bills.

### ***What We Recommended***

The Commissioner of the Department of Watershed Management should:

- Develop a method to track the number of adjustments for leaks or billing errors.
- Complete and implement the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology.
- Set the threshold in enQuesta to flag accounts with high use for review to 50% higher than the 12-month average, consistent with current billing procedures.
- Complete bill priority inspections before billing or notify customers on the bill that they might have a leak and a work order is pending.
- Update billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process. The revised procedures should include supervisory review of suspended bills.
- Use enQuesta to estimate bills or revise procedures to include a specific method for estimating usage.

For more information regarding this report, please contact Stephanie Jackson at 404.330.6678 or [sjackson@atlantaga.gov](mailto:sjackson@atlantaga.gov).

## ***Performance Audit:***

### ***Water Meter Reading, Estimates and Adjusted Billings***

#### ***What We Found***

While automation has significantly reduced the incidence of water and sewer bills that are based on estimated consumption, the number of customers who disputed water and sewer bills and/or requested to have meters checked for accuracy has remained fairly stable. Automated meter readings accounted for 96% of bills in the first six months of 2012; manual readings accounted for 3% and estimated and forced reads were 1%, down from 10% in 2008 and 2009. Automated reads should improve billing accuracy, but between 9% and 18% of accounts had at least one disputed bill or customer-initiated meter investigation each year between 2007 and 2011.

The number of disputes and investigations dropped in the first six months of 2012 to an annualized rate of about 11.6%. The number of monthly account adjustments has decreased since 2007, while the number of appeals to the Water and Sewer Board has increased, perhaps reflecting the streamlined dispute and appeals processes that were prompted by customer lawsuits. Although the number of account adjustments also appears to be trending downward slightly, the department lacks a specific code in enQuesta to identify the number of adjustments that the department makes to accounts because of leaks or billing errors. The Department of Watershed Management's small meter evaluation found that only one-third of meters met all standards. The department's internal findings are similar to our assessment of newly installed meters in a previous audit. We recommended in our 2007 audit, Department of Watershed Management *Automated Meter Reading Program*, that the department develop a maintenance plan for small meters to include periodic site surveys or similar ways to identify operational problems - such as leaks and broken lids - that AMR technology could not detect. The department has recently begun preparing a small meter maintenance plan to identify and address ongoing meter problems.

Undetected leaks appear to explain many of the unusually high bills that have led to customer dissatisfaction. Under the department's existing technology and processes, many customers will not know they have a leak until they have received at least one high bill. In two extreme cases reported in the media, customers complaining of high bills were later found to have leaks on their properties. We concur with the department's assessment that ruled out systematic hardware or software problems.

## Management Responses to Audit Recommendations

<b>Summary of Management Responses</b>		
<b>Recommendation #1:</b>	The Commissioner of the Department of Watershed Management should develop a method to track the number of adjustments for leaks or billing errors.	
<b>Response &amp; Proposed Action:</b>	DWM will have a work order created with resolution codes that will enable the department to better track the number of adjustments for leaks or billing errors as well as the rationale for adjustments, and train staff on the new process.	<b>Agree</b>
<b>Timeframe:</b>	December 2013	
<b>Recommendation #2:</b>	The Commissioner of the Department of Watershed Management should complete and implement the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology.	
<b>Response &amp; Proposed Action:</b>	DWM is developing the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology.	<b>Agree</b>
<b>Timeframe:</b>	June 2013	
<b>Recommendation #3:</b>	The Commissioner of the Department of Watershed Management should set the threshold in enQuesta to flag accounts with high use for review to 50% higher than the 12-month average, consistent with current billing procedures.	
<b>Response &amp; Proposed Action:</b>	DWM is currently using enQuesta to flag accounts with high use for review at 100% higher than the 12-month average and plans to evolve to 50% over the course of the next two years. The billing department will also investigate conducting alternative analyses on high-consumption accounts.	<b>Agree</b>
<b>Timeframe:</b>	FY2015	
<b>Recommendation #4:</b>	The Commissioner of the Department of Watershed Management should complete bill priority inspections before billing or notify customers on the bill that they might have a leak and a work order is pending.	
<b>Response &amp; Proposed Action:</b>	DWM would like to investigate how the department can leverage technology to notify customers regarding leaks and/or pending work orders, and the feasibility of providing notification on the bills. DWM currently completes bill priority inspections before billing customers and uses bill priority inspection work orders to track this information. Customers are notified with door hangers regarding potential leaks\pending work orders.	<b>Agree</b>
<b>Timeframe:</b>	FY2014	
<b>Recommendation #5:</b>	The Commissioner of the Department of Watershed Management should update billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process. The revised procedures should include supervisory review of suspended bills.	
<b>Response &amp; Proposed Action:</b>	DWM is updating billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process.	<b>Agree</b>
<b>Timeframe:</b>	Q4FY2013	
<b>Recommendation #6:</b>	The Commissioner of the Department of Watershed Management should update billing procedures to require that when staff places an account in suspense status, in addition to leaving door hangers, staff notify the customer in writing and by telephone and document those contacts in enQuesta.	
<b>Response &amp; Proposed Action:</b>	DWM will update billing procedures to require that staff notify customers when placing an account in suspense status and investigate alternative ways to communicate with customers and document the contact.	<b>Agree</b>
<b>Timeframe:</b>	FY2014	
<b>Recommendation #7:</b>	The Commissioner of the Department of Watershed Management should use enQuesta to estimate bills or revise procedures to include a specific method for estimating usage.	
<b>Response &amp; Proposed Action:</b>	DWM will revise procedures to identify a specific method to estimate usage.	<b>Agree</b>
<b>Timeframe:</b>	FY2014	



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**Ex-Officio:** Mayor Kasim Reed

May 1, 2013

Honorable Mayor and Members of the City Council:

We undertook this audit of the Department of Watershed Management's water meter reading, billing and estimated usage because the department's reliance on estimated consumption to bill customers for water and sewer service has been a long-standing problem, resulting in billing disputes and adjustments. The installation of automated meter reading technology, which began in 2006, was intended to reduce estimated readings; however, estimated readings accounted for 10% of total billings in 2009. Customers continue to complain of unusually high bills.

As of October 2012, 99% of the department's meters had been converted to automated meter reading technology. The majority of the readings were automated meter readings in the first six months of 2012; as a result, manual and estimated readings have significantly decreased. Although the increase in automated readings should improve bill accuracy, between 9% and 18% of accounts had at least one disputed bill or customer-initiated meter investigation each year between 2007 and 2011. We found that meter installation errors, data entry errors, and undetected leaks contribute to high or inaccurate bills that have led to customer dissatisfaction. Although the department has processes in place to identify bills that are out of customers' normal ranges prior to billing, it has not been able to resolve those billing issues and/or communicate with customers prior to billing customers.

The department is completing an evaluation of its small meter population and preliminary results have been consistent with the findings in our 2007 audit, *Automated Meter Reading Program*, conducted during the installation of the automated meter reading technology. The department identified problems with meters, such as leaks, broken meter lids, and damaged registers, that could not be detected with AMR technology. At the time of the audit, we recommended that the department develop a small meter maintenance plan to identify and address ongoing meter problems; we continue to emphasize this recommendation. We concur with the department's assessment that ruled out systematic hardware or software problems as a cause of high bills.

Our recommendations to the watershed management commissioner focus on systematically identifying leaks and other billing issues, as well as providing customers with proactive, timely information regarding potential meter issues, including water leaks.

The Department of Watershed Management agrees with all recommendations and commits to implementing them by the end of fiscal year 2015. The specific responses to our recommendations are included in Appendix A. The Audit Committee has reviewed this report and is releasing it in accordance with Article 2, Chapter 6 of the City Charter. We appreciate the courtesy and cooperation of city staff throughout the audit. The team for this project was Kwasi Obeng and Stephanie Jackson.



Leslie Ward  
City Auditor



Fred Williams  
Audit Committee Chair

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# Water Meter Reading, Estimates and Adjusted Billings

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## Introduction

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We conducted this performance audit of the Department of Watershed Management's water meter reading, estimates, and adjusted billings pursuant to Chapter 6 of the Atlanta City Charter, which establishes the City of Atlanta Audit Committee and the City Auditor's Office and outlines their primary duties. The Audit Committee reviewed our audit scope in October 2012.

A performance audit is an objective analysis of sufficient, appropriate evidence to assess the performance of an organization, program, activity, or function. Performance audits provide assurance or conclusions to help management and those charged with governance improve program performance and operations, reduce costs, facilitate decision-making and contribute to public accountability. Performance audits encompass a wide variety of objectives, including those related to assessing program effectiveness and results; economy and efficiency; internal controls; compliance with legal or other requirements; and objectives related to providing prospective analyses, guidance, or summary information.<sup>1</sup>

We undertook this audit because the Department of Watershed Management's reliance on estimated consumption to bill customers for water and sewer service has been a long-standing problem, resulting in billing disputes and adjustments. The installation of automated meter reading (AMR) technology, which began in 2006, was intended to reduce estimated readings; however, estimated readings accounted for 10% of total billings in 2009. Customers continue to complain of unusually high bills.

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## Background

The Department of Watershed Management maintains more than 166,000 water meters throughout its service area. The department supplies drinking and wastewater services to five cities and counties within the metropolitan area, including the cities of Sandy Springs and East Point, and Coweta, Clayton and Fayette counties. The department maintains the drinking water distribution system, including customer service lines and meters, and manages meter reading, billing, and collection.

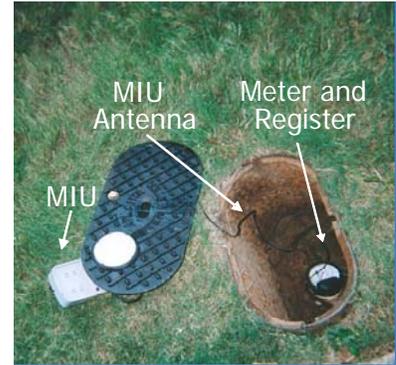
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<sup>1</sup>Comptroller General of the United States, *Government Auditing Standards*, Washington, DC: U.S. Government Accountability Office, 2011, p. 17-18.

Information captured during meter reading provides the basis for the department's water and sewer billing collection.

The department began installing AMR meters in 2006 to streamline meter reading, reduce reliance on estimated readings, and improve accuracy.

The water meter measures the volume of water that customers use. That use is recorded on the attached register - a device like an odometer. A meter interface unit (MIU) is attached to the water meter and collects water use data from the register (see figure 1). Using radio frequency signals, the MIU electronically transmits the data to either a handheld or mobile data collector (see figure 2). The antenna attached to the MIU enables the data collectors to receive the radio signals. This information is then transferred to the department's billing system.



**Figure 1 AMR Components**



**Figure 2 Mobile and Handheld Data Collectors**

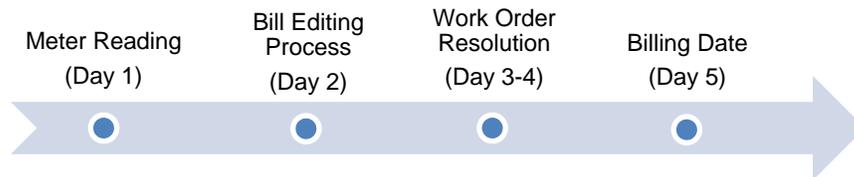
Source: Department of Watershed Management *Meter and Billing Accuracy Assessment Phase One*, March 2011

### **Billing Cycle Allows About Five Days to Read Meters and Prepare Bills**

Watershed management staff has approximately five days to read meters and bill customers for each of its 43 monthly billing cycles. Staff reads meters for assigned routes each day. Billing staff reviews the data the following day to identify anomalies and issues work orders for meter

inspectors to re-read and/or repair meters. Billing staff prepares the bills and a third party prints and mails bills to customers. Although stages may overlap, the process from meter reading to billing should take about five days (see Exhibit 1).

### Exhibit 1 Meter Reading, Editing and Billing Timeline



**Source:** Prepared by audit staff from interviews with watershed management staff

**Meter Reading:** Meter readers drive scheduled routes to obtain radio reads that are automatically uploaded into mobile data collectors. If a meter does not transmit a radio read, the meter reader reads the register, manually types the read into the mobile data collector, and assesses why the signal did not transmit. When a meter reader is unable to access the meter for a manual reading, the meter reader logs the meter number and billing staff issues a work order to have the meter checked by a meter inspector. The meter reading supervisor uploads readings from the mobile data collectors into enQuesta, the department's billing system.

**Bill Editing:** Billing staff reviews abnormal usage to correct errors prior to billing the customer. According to the billing supervisor, about 28% of the department's active accounts are flagged for review each month. Accounts are automatically flagged in enQuesta when meter readings show:

- negative consumption
- zero consumption
- no meter reading
- duplicate reading
- out of range readings, which the department defines as either 100% higher or 67% lower than the 12-month average for the account
- readings that represent billing periods of less than 20 or more than 40 days (the average billing cycle is between 29-30 days)

Bill editors also run reports using a different tool to identify accounts with:

- negative consumption
- zero consumption

- high consumption, which the department defines as usage above 20 CCFs
- 39 or more days since the last read

Staff reviews each identified account to decide whether to:

- approve the read - accept as is and bill it
- change or estimate read - change an existing reading or if there is none, estimate the reading
- issue a work order to schedule the meter to be read again
- delete read - only if there is a duplicate read on the same account

Watershed management's policy is for bill editors to accept all high AMR readings and issue a work order for a meter inspector to re-read the meter. If the high reading is not an AMR reading and a work order is pending, bill editors estimate consumption until the inspector completes the work order and provides an actual reading. Staff generates a work order if none is pending. Work orders generated during bill editing are called *bill priority reads*.

Billing staff may suspend billing for an account until the issue is resolved. When an account is placed in suspense status, it is billed at a later date, separately from the ordinary billing cycle. The billing supervisor said that their goal is to resolve suspended accounts within 30 days, although it could take longer.

**Work Order Resolution:** Inspectors check the meters to identify whether the:

- meter, register or any other components are damaged
- meter and register are the same size
- meter and MIU serial numbers match the MIU and meter numbers listed in enQuesta
- meter is registering water flow
- meter or area around it shows any signs of a leak

The inspector also reads the meter to determine if it is consistent with the reading flagged during editing and logs the consumption into enQuesta as an *interim* reading, which means that it occurred between billing cycles for information purposes only. Inspectors perform routine repairs if needed, including replacing broken meter registers and wires, and create work orders for distribution staff to do other repairs, such as replacing meter lids and repairing meter leaks. Inspectors record notes in enQuesta, about the meter and site and whether there were indications of a leak.

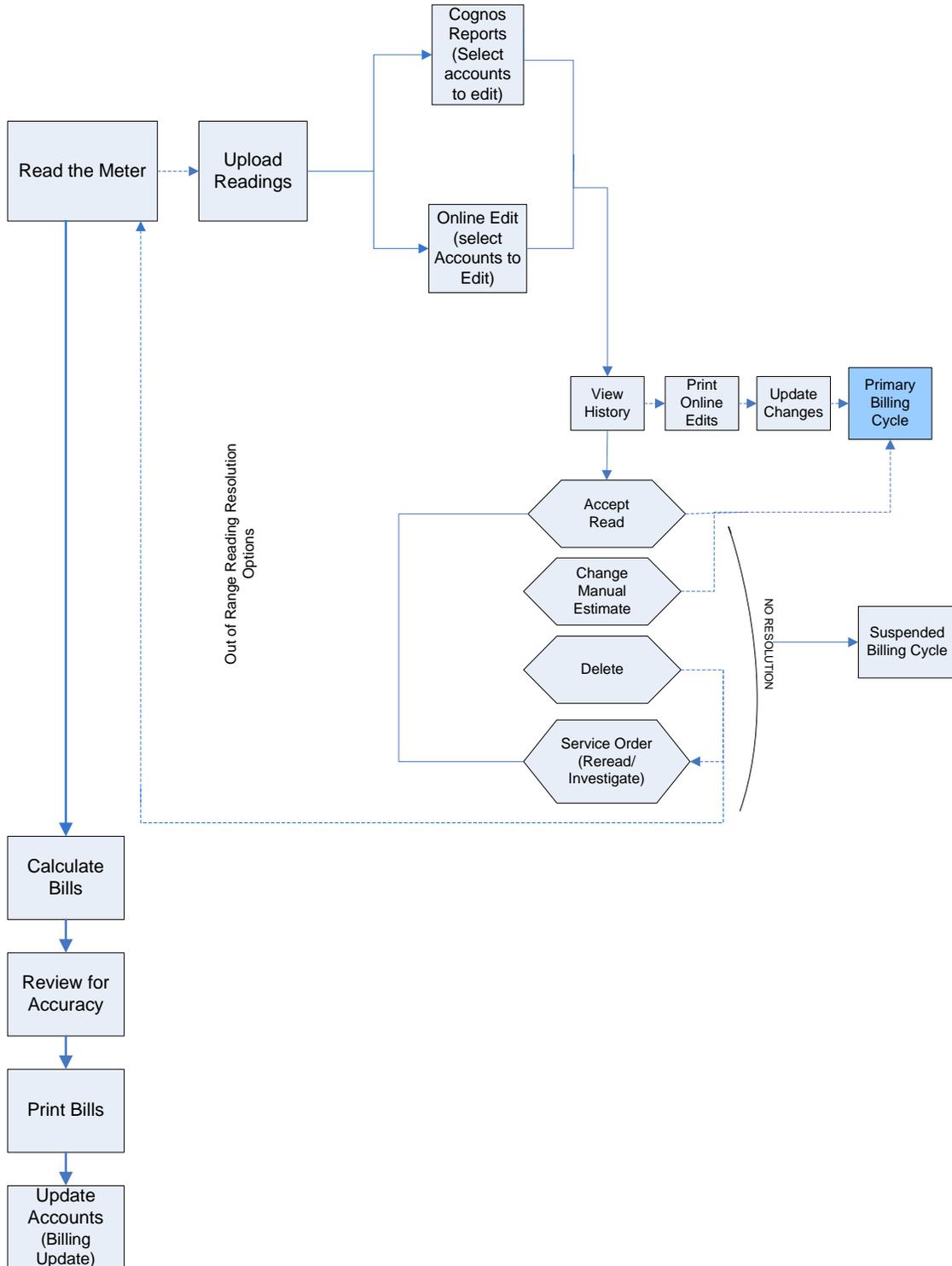
**Billing:** Customers are billed monthly based on water consumption, which is measured in CCFs, or 100 cubic feet. Each CCF is equal to 748 gallons. The department uses a tiered rate structure in which the rate per CCF is higher as the usage increases. The tiered rates are as follows:

1-3 CCFs		4-6 CCFs		7 CCFs and above	
Water	Sewer	Water	Sewer	Water	Sewer
\$2.58	\$9.74	\$5.34	\$13.64	\$6.16	\$15.69

All watershed management’s customers also pay a base water charge of \$6.56 and a base sewer charge of \$6.56 each month.

Staff prepares accounts for billing after bill editing and transfers the billing files to a third party vendor for printing and mailing. Exhibit 2 shows a flow chart of the billing process.

**Exhibit 2 Flowchart of Meter Reading, Editing, and Billing Processes**



**Source:** Developed by audit staff using Systems & Software Billing Process Guide and interviews with watershed billing staff

## **In-house Small Meter Evaluation Ruled Out System-wide Transmission and Programming Errors**

Watershed management hired contractors to review all of its small residential meters to assess meter location, installation, condition, and accuracy. The department first assessed a random sample of 9,193 small meters to respond to customer complaints regarding what customers perceived as unexplained increases in water consumption from 2008 to 2010. The preliminary sample identified meter problems, but ruled out AMR transmission and billing calculation errors.

Contractors evaluated the condition of all of the city's small residential meters. The department hired two contractors at a total cost of \$2.2 million to assess the condition of the city's small water meters, which includes residential meters one inch in size and less. The scope of the work required the contractors to dig out the area around each meter and gather the following information:

- meter size, type, manufacturer and serial number
- register size and complete reading
- MIU number
- whether water valves are on or off
- meter box lid and condition
- whether antenna is installed in lid
- meter location
- global positioning system coordinates of meter

The contractors inspected 158,128 small residential meters during five months starting in September 2011. The department reported preliminary results of the small meter assessment to the City Utilities Committee in October 2012, and stated that 86% of the needed repairs had been completed.

## **Previous Audit Identified Need for Ongoing Meter Maintenance**

We recommended in our December 2007 audit, *Department of Watershed Management Automated Meter Reading Program*, the department develop a maintenance plan for small meters to include periodic site surveys or similar ways to identify operational problems — such as leaks and broken lids — that AMR technology could not detect. AMR reduces operating expenses by collecting meter data remotely but eliminates a visual site inspection that would inform the department of problems, such as broken lids or leaks that are wasteful or potentially hazardous. Industry best practices recommend that water utilities revisit meters periodically to ensure proper operation and to protect its

assets, even after automation. Periodic site surveys prompt identification of problems sooner and reduce the number of customer service calls the department receives about defective water meters. Automated meter installation was still under way when we conducted the 2007 audit. We reported that recently installed meters had problems that needed to be resolved by either the department or the installation contractor, including:

- register damage
- unlocked meter lids
- plastic or damaged meter boxes
- lids that did not fit the meter box
- meter interface units (MIUs) that were not tied to the meter lids

We were unable to verify electronic readings for 13% of the meters we sampled; 9% of those reads could not be verified due to broken or malfunctioning equipment.

The department had not yet implemented the recommendation to develop a small meter maintenance plan when we last followed up in October 2010.

### **Consent Orders Revised Dispute and Appeal Processes**

Customers filed a lawsuit in 2011 against the city that alleged they were overcharged for water and sewer use and the city failed to timely process disputes and appeals. As part of the settlement, the parties agreed to a consent order that defined a three-tiered process for watershed management to identify and resolve pending disputes and appeals. The process provides customers with an opportunity to speak with watershed management staff to resolve disputes by telephone, in-person, or if still not resolved, by appealing directly to the Water and Sewer Appeals Board. Watershed management agreed to refrain from terminating service for any customer with a pending dispute or appeal, but customers were required to pay the undisputed portion of the bill to avoid termination. The consent order applies to both large and small meter customers. A lawsuit filed in 2009 by small meter customers resulted in a similar consent order. The department has incorporated the general guidelines of the consent orders into their procedures governing disputes.

If a customer files a dispute, the department must log the dispute amount and the associated bill or bills into the billing system. While in dispute, the department cannot terminate service or charge late fees on the disputed portion of the bill. A customer will have an opportunity to discuss the dispute and negotiate an account adjustment with watershed

management staff by telephone, in person, or if no agreement is reached, by appealing directly to the Water Sewer Appeals Board. The department must maintain a dedicated phone number for customers to call to discuss billing disputes.

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## Audit Objectives

This report addresses the following objectives:

- What is the magnitude of billing errors?
  - What factors could explain perceived billing errors?
  - Is the bill editing process effective in identifying anomalies prior to billing?
- 

## Scope and Methodology

We reviewed the Department of Watershed Management's meter reading data from January 2008 through June 2012.

Our audit methods included:

- assessing the number of estimated reads, disputes, appeals and adjustments over time and examining the correlations between them
- reviewing policies and procedures for meter reading, bill editing, disputes, and appeals and interviewing staff in those areas
- reviewing city code provisions governing account adjustments
- observing the bill editing process and reviewing a sample of accounts flagged during bill editing to examine the department's handling of readings outside of normal use
- reviewing policies and procedures and observing meter inspections to understand how the procedures are implemented
- reviewing industry literature to understand AMR technology and functioning
- reviewing literature to understand AMR implementation and subsequent billing problems in other jurisdictions, and to identify the magnitude and potential causes of errors

Generally accepted government auditing 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.

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## Findings and Analysis

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### Customer Complaints Continue After Automation

While automation has significantly reduced the incidence of water and sewer bills that are based on estimated consumption, the number of customers who disputed water and sewer bills and/or requested to have meters checked for accuracy has remained fairly stable. Automated meter readings accounted for 96% of bills in the first six months of 2012; manual readings accounted for 3% and estimated and forced reads were 1%, down from 10% in 2008 and 2009. Automated reads should improve billing accuracy, but between 9% and 18% of accounts had at least one disputed bill or customer-initiated meter investigation each year between 2007 and 2011. The number of disputes and investigations dropped in the first six months of 2012 to an annualized rate of about 11.6%. The number of monthly account adjustments has decreased since 2007, while the number of appeals to the Water and Sewer Board has increased, perhaps reflecting the streamlined dispute and appeals processes that were prompted by customer lawsuits. Although the number of account adjustments also appears to be trending downward slightly, the department lacks a specific code in enQuesta to identify the number of adjustments that the department makes to accounts because of leaks or billing errors. *We recommend* the department develop a method to track the number of adjustments for leaks or billing errors.

### AMR Functionality Has Improved Significantly Since 2008

The number of meter readings captured electronically has increased significantly since 2008, resulting in fewer readings that are manually input into the department's billing system and fewer bills based on estimated consumption. As of October 2012, 99% of the department's meters had been converted to automated meter reading (AMR) technology. Automated reads should be more accurate than manual entries or estimates — either estimated based on prior consumption or *forced*, which refers to manual entries to correct prior errors.

Automated reads increased from 38% of billed readings in 2008 to 96% in the first six months of July 2012. The increase in automated readings shows that most of the department's meters have been equipped with AMR technology and nearly all meters are transmitting electronic readings (see Exhibit 3). The Department of Watershed Management's inventory of active meters showed that 99% of its meters

had been converted to AMR technology as of October 2012. According to industry information, automated meters have a success rate greater than 99% in transmitting electronic readings under proper conditions and when installed properly.

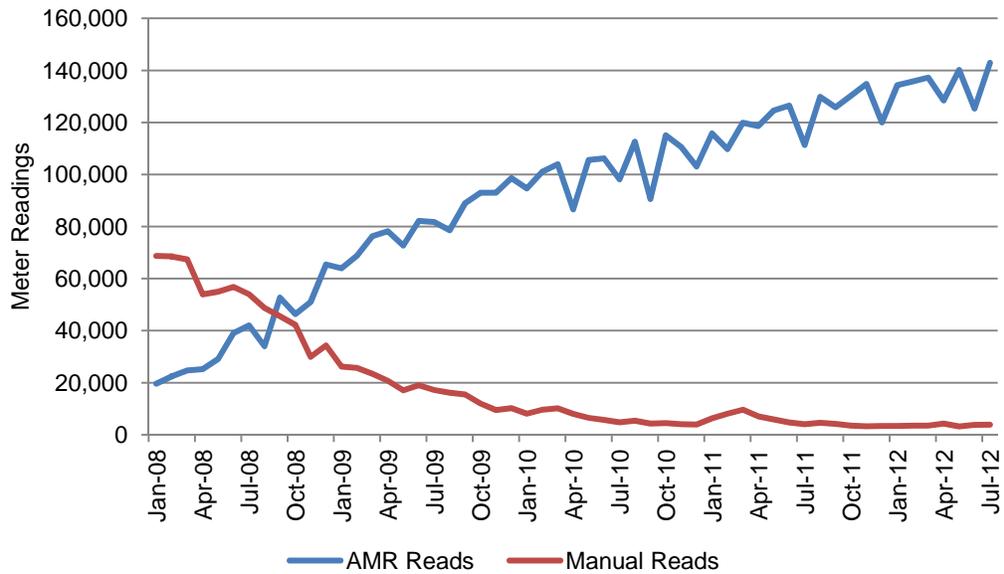
**Exhibit 3 Meter Readings, January 2008 through July 2012**

	Number of Readings by Type				
	CY2008	CY2009	CY2010	CY2011	CY2012 (Jan - July)
Automated	451,693	976,014	1,227,893	1,467,187	944,128
Manual	625,075	212,783	75,218	64,813	25,643
Estimated	99,444	121,056	69,903	23,850	6,130
Forced	15,878	15,506	15,799	12,567	3,341
<b>Total Billed</b>	<b>1,192,090</b>	<b>1,325,359</b>	<b>1,388,813</b>	<b>1,568,417</b>	<b>979,242</b>
	Reading Types As Percent of Total Billed Reads:				
Automated	38%	74%	88%	94%	96%
Manual	52%	16%	5%	4%	3%
Estimated	8%	9%	5%	2%	1%
Forced	1%	1%	1%	1%	0%
Forced + Estimated	10%	10%	6%	2%	1%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Source:** Meter reading data from watershed management's enQuesta Customer Information System, January 1, 2008, through July 31, 2012.

Manual reads dropped from 52% in 2008 to 3% in the first six months of 2012. As shown in Exhibits 3 and 4, the number of manual readings decreased as automated reads increased. Meter readers use handheld data collectors to input manual meter readings directly into the billing system for meters that have not been converted to AMR technology, or for non-functioning AMR meters. Manual readings are more prone to error than automated readings.

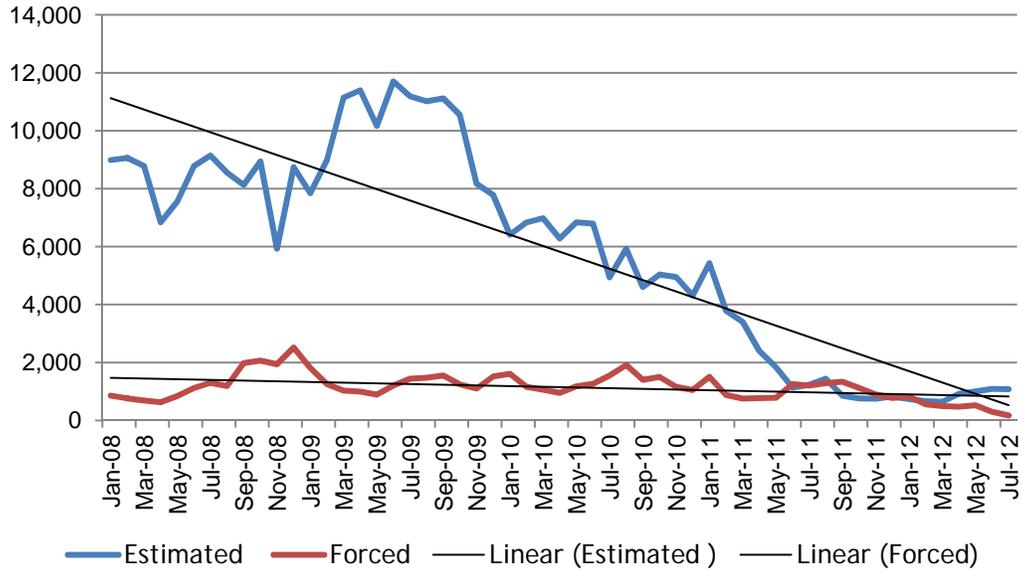
Exhibit 4 AMR and Manual Readings, January 2008 through July 2012



**Source:** Meter reading data from watershed management's enQuesta Customer Information System, January 1, 2008, through July 31, 2012

Estimated and forced reads decreased from 10% of billed reads in 2008 to 1% in the first six months of 2012. Bills based on either system- or staff-generated estimates of consumption accounted for 1% of total billed reads and forced usage was 0% as of July 2012 (see Exhibits 3 and 5). An *estimated reading* is an estimate of water consumption for the billing period that the billing system generates or that billing staff calculates based on historic consumption. A *forced reading* is an estimate of water consumption that billing staff manually inputs into the billing system to correct a prior billing error or adjust for a leak. Billing staff estimates customer usage if meter readers are unable to read the meter prior to billing or the read captured is outside of the customer's normal range. Staff also estimates customer usage pending work order resolution when a manual read is flagged during bill editing. Department policy is to accept and bill based on automated reads regardless of whether a work order is pending.

**Exhibit 5 Estimated and Forced Readings, January 2008 through July 2012**

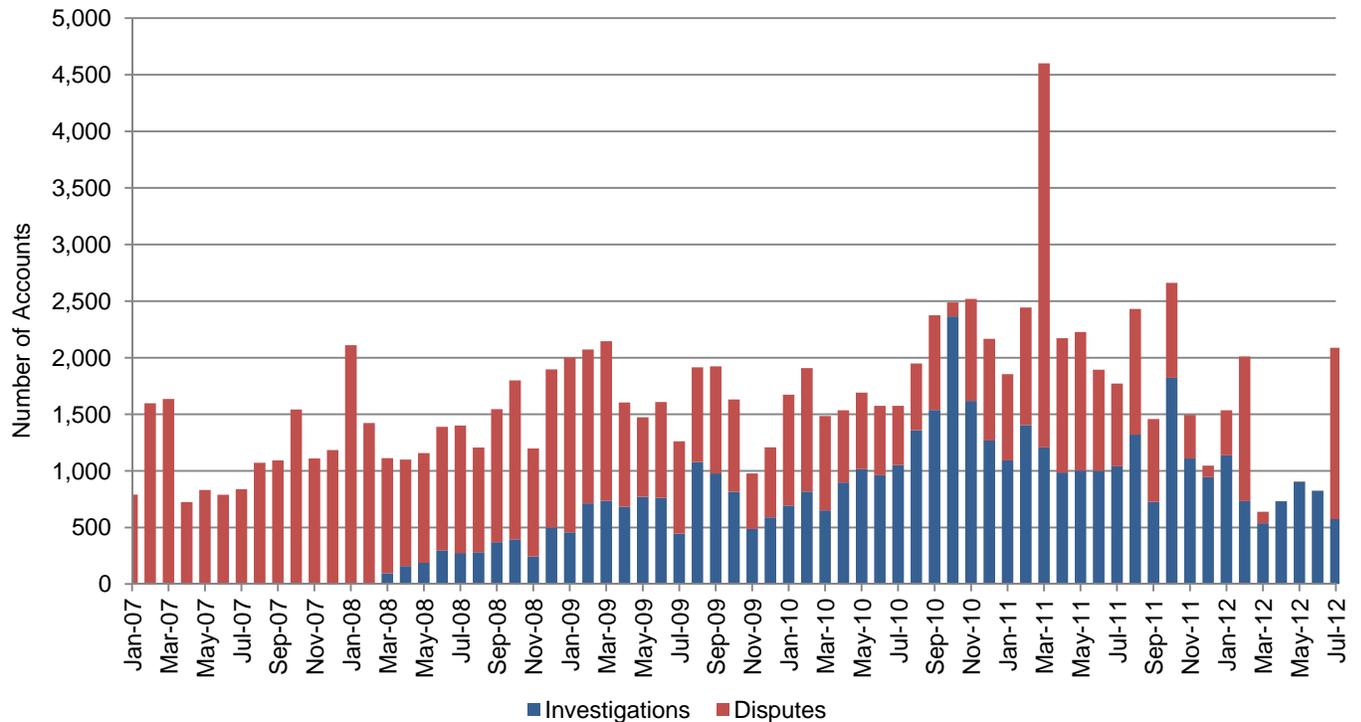


**Source:** Meter read data from enQuesta Customer Information System, January 1, 2008, through July 31, 2012.

### Customer Complaints Continue

The number of customers who disputed water and sewer bills and/or requested to have meters checked for accuracy has remained fairly stable since 2007. Exhibit 6 shows the number of accounts with at least one dispute and/or one customer-initiated investigation during the calendar year, captured in the earliest month of the year in which it occurred. Between 9% and 18% of accounts had at least one disputed bill or meter investigation request each year between 2007 and 2011. The number of disputes and investigations dropped in the first six months of 2012 to an annualized rate of about 11.6%, perhaps reflecting the department's efforts to repair problems found in its assessment of small meters conducted at the end of 2011.

Exhibit 6 Number of Accounts with Disputes and Meter Investigations, January 2007 through July 2012



	2007	2008	2009	2010	2011	Jan-Jul 2012
<b>Disputes</b>	13,206	14,531	11,304	8,703	12,396	3,297
<b>Investigations</b>	1	2,808	8,519	14,239	13,660	5,443
<b>Total</b>	<b>13,207</b>	<b>17,339</b>	<b>19,823</b>	<b>22,942</b>	<b>26,056</b>	<b>8,740</b>
<b>Average Active Accounts</b>	140,898	144,952	146,112	146,773	147,840	149,452
<b>Percent with Complaint</b>	9.4%	12.0%	13.6%	15.6%	17.6%	5.8%

**Source:** Watershed management’s enQuesta Customer Information System, January 1, 2007, through July 31, 2012 (work order numbers 1001, 2001, 6345, and 2002). Shows the number of accounts with at least one dispute and/or one investigation during the calendar year, captured in the earliest month of the year in which it occurs. The department began using meter investigation codes in enQuesta in late 2007.

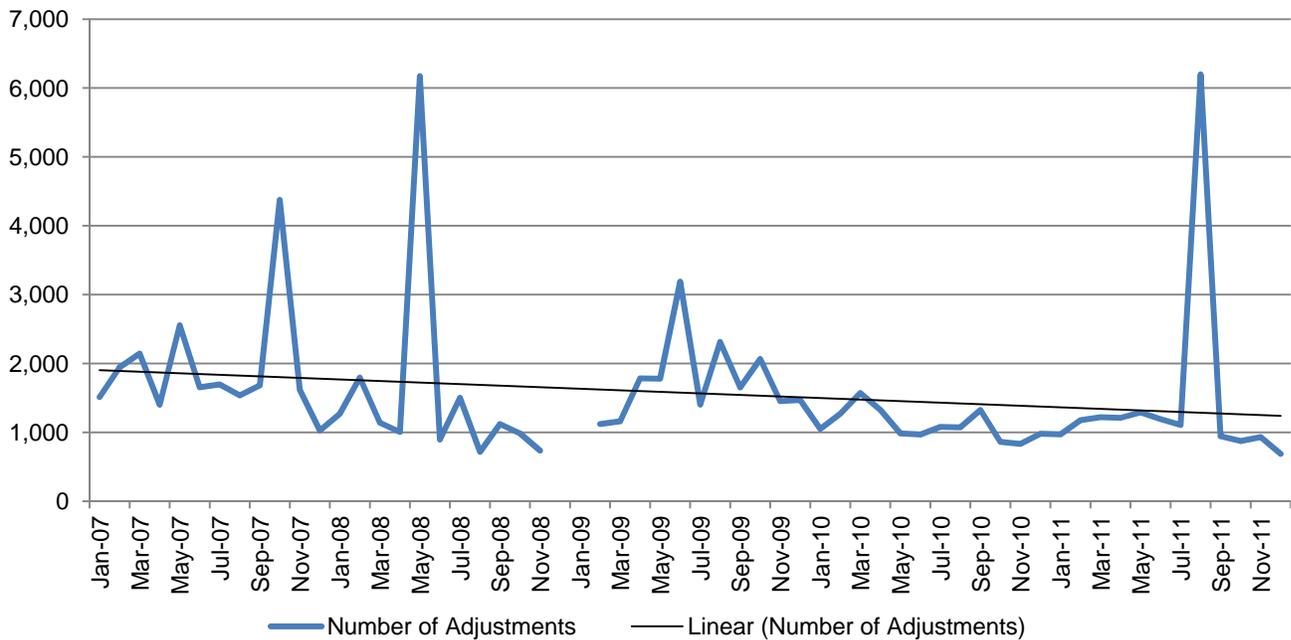
Customers can dispute bills they think are inaccurate by contacting watershed management’s customer service or by submitting a dispute form to the department. Customers can request a meter investigation if they think their bill is inaccurate and/or their meter is not functioning properly by contacting customer service. In both instances, an inspector will check the meter equipment, examine the area for leaks, and take a reading of the meter to determine whether it appears to be operating

correctly. Inspectors record the investigation results in the notes on the account. Watershed management uses work order codes in enQuesta to track disputes and meter investigations. The department began using meter investigation codes at the end of 2007.

**Account Adjustments Are Trending Down; Adjustments for Leaks or Errors Not Identified**

City code authorizes the Department of Watershed Management to adjust water and sewer bills for meter and other leaks, meter reading errors, and billing errors. The number of monthly adjustments fluctuated from January 2007 through December 2011, and appears to be trending downward. The department has no specific codes to identify when bills are adjusted due to leaks or billing errors.

**Exhibit 7 Number of Account Adjustments by Month, January 2007-December 2012**



**Source:** Adjustment data on all dwelling codes from enQuesta Customer Information System, January 1, 2007, through December 31, 2011. The data may include multiple adjustments on the same account. Removed adjustment totals for December 2008 (206,269) and January 2009 (16,032) to normalize data. The department posted the July 2008 rate increase to accounts as adjustments during these two months.

Adjustments have fluctuated since 2007 but appear to be going down. The number of adjustments fluctuated from 2007 through the end of 2011, as shown in Exhibit 7. The number of adjustments appears to be decreasing. Monthly adjustments ranged from a low of 687 to a high of 6,198, with a median of 1,270 adjustments per month over the period.

We excluded adjustments applied in December 2008 and January 2009 from the analysis because the department posted the July 2008 rate increase to these bills as adjustments.

Section 154-27 of the city code authorizes watershed management to adjust water and sewer bills for meter and other leaks, meter reading errors, or billing errors. Adjustments are listed on the bill.

Customers must call or write to the department to dispute a bill and request an adjustment. If the customer requests an adjustment for a leak, the customer must provide written proof that a leak existed and was repaired. Watershed management will adjust a maximum of two bills for underground leaks, which are the customer's responsibility. The department does not adjust accounts for toilet or faucet leaks unless the customer is deaf, and in those cases, will adjust up to two bills. When watershed management adjusts accounts for leaks, it makes adjustments for up to 100% of the excess bill; the customer is responsible for paying the portion of the bill that represents normal usage. After a customer repairs a leak, watershed management allows at least two billing periods to elapse before making an adjustment to ensure that the leak has been repaired and water usage has returned to normal. Because the department is responsible for repairing leaks at the meter, adjustments for excess consumption recorded because of meter leaks are not limited to two months.

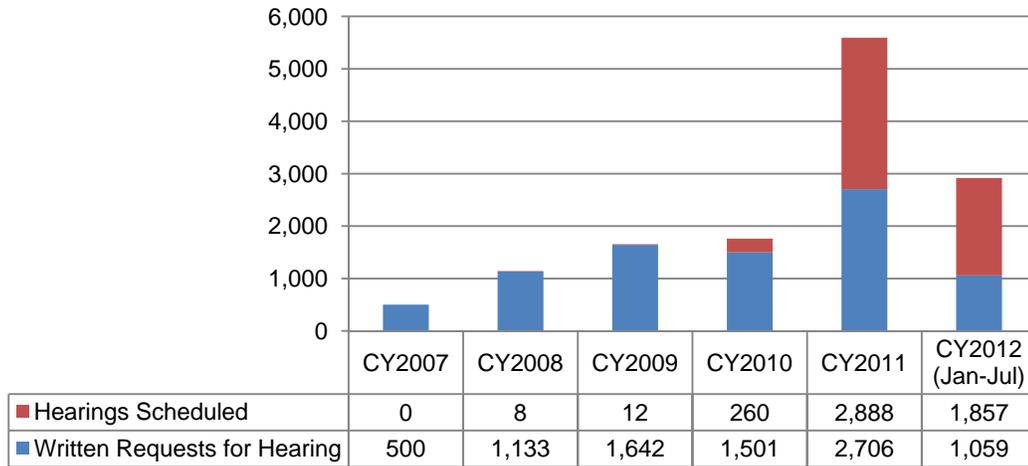
Data capture limitations prevent watershed management from identifying the number of adjustments due to leaks or billing errors. Although adjustments are recorded in enQuesta, the department has no specific codes to identify adjustments for billing errors or leaks. Adjustment codes categorize certain types of adjustments, such as late fee reversals or payment reversals for payments with insufficient funds (NSFs). It is only possible to determine whether adjustments were made to accounts because of leaks or billing errors by reviewing the notes recorded for each account.

### **Appeals to the Water and Sewer Board Have Increased**

Customers have appealed more decisions regarding billing disputes since 2007, and the department is scheduling more of those requested appeals, as shown in Exhibit 8. If a customer disputes a bill and is unable to reach an agreement with watershed management staff regarding whether there is a valid dispute or amount that should be adjusted, the customer can appeal to the Water and Sewer Appeals Board, which will review the customer's case and render a decision. The Board will also determine an amount if members decide that an

adjustment is due to the customer. Watershed management tracks customer appeals in enQuesta, the department’s customer information system, using work order codes.

**Exhibit 8 Number of Appeals Requested and Scheduled, Calendar Years 2007 through July 2012**



**Source:** Watershed management’s enQuesta Customer Information System, January 1, 2007, through July 31, 2012 (work order numbers 6355 and 6370)

The increased number of appeals is likely because the department streamlined dispute and appeals processes as part of the settlement of two customer lawsuits. The resulting consent orders required watershed management to identify customers with pending disputes, investigate the dispute, and negotiate a resolution within a specific time. Staff is required to inform customers of their right to appeal to the Water and Sewer Appeals Board when the customer and department are unable to reach an agreement.

The Water and Sewer Appeals Board is made up of seven citizens appointed by the City Council. Board members serve three-year terms and meet three times a week. The Board is authorized to address administrative matters and cannot make policy decisions. Members review facts presented by watershed management staff and can order the department to refund, credit or adjust the portion of the bill that is in dispute. According to an employee responsible for managing the appeals process, the department provides the Board with related account information for each case, including the dispute and appeals forms, consumption history, and invoices from plumbers showing that leaks were repaired, if applicable.

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## Meter Installation Errors, Data Entry Errors, and Undetected Leaks Contribute to High or Inaccurate Bills

The Department of Watershed Management's small meter evaluation found that only one-third of meters met all standards. Of the remaining meters requiring repair or follow-up, about 6% were installed incorrectly, which would generate an inaccurate bill, 24% posed a potential safety hazard, and 35% had other problems. Some of these other problems, such as damage to the register or antenna wire, could also contribute to inaccurate billing if reads are not transmitted because manual reads and data entry are more prone to error.

The department's internal findings are similar to our assessment of newly installed meters in a previous audit. We recommended in our 2007 audit, *Department of Watershed Management Automated Meter Reading Program*, that the department develop a maintenance plan for small meters to include periodic site surveys or similar ways to identify operational problems — such as leaks and broken lids — that AMR technology could not detect. The department has recently begun preparing a small meter maintenance plan to identify and address ongoing meter problems. We continue to recommend that watershed management complete and implement the maintenance program.

Undetected leaks also appear to explain many of the unusually high bills that have led to customer dissatisfaction. Under the department's existing technology and processes, many customers will not know they have a leak until they have received at least one high bill—and for the average customer that bill is more than twice as high as normal. In two extreme cases reported in the media, customers complaining of high bills were later found to have leaks on their properties. We concur with the department's assessment that ruled out systematic hardware or software problems.

We recommend the department lower the threshold for identifying potential leaks to help identify leaks more quickly. We also recommend the department communicate the results of bill priority inspections to customers and notify customers when their accounts are placed in suspense status.

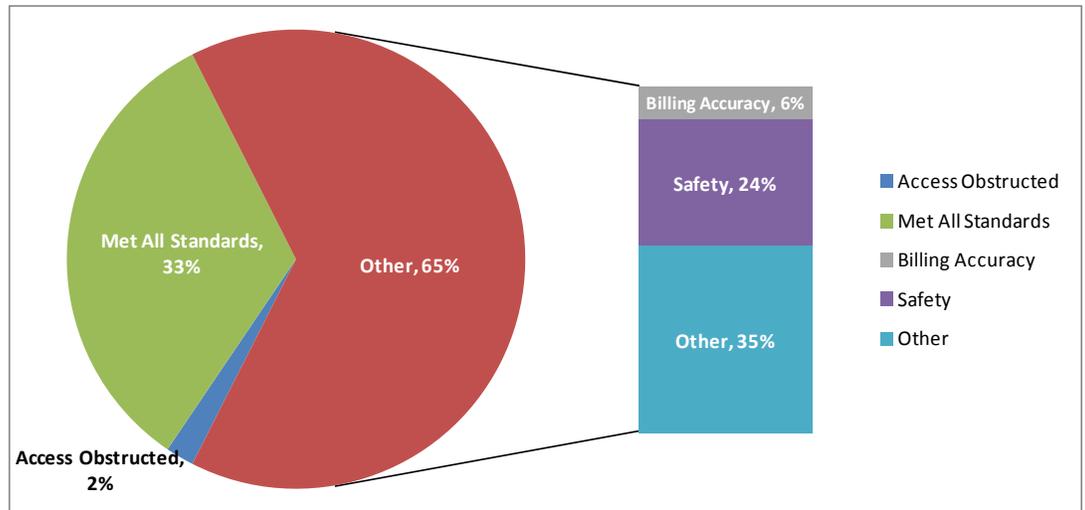
### Meter Installation Errors Continue to Pose Risk

Watershed management's evaluation of the condition of the city's 158,128 small residential water meters identified about 105,000 meters

(65%) that needed some type of repair. Of those, about 10,000 (6%), had installation problems that would affect billing. Other problems that impede electronic transmission of readings could also result in billing errors. The department is now developing an ongoing meter maintenance plan, as we recommended in our 2007 audit.

Six percent of small meters had installation errors that would directly affect billing. Department contractors inspected 158,128 small residential meters starting in September. Of those, 33% met the department’s standards, 2% could not be accessed, and 65% needed some type of follow-up, as shown in Exhibit 9. Of the 65% (about 105,000) of meters needing follow-up, the department reported that 6% (about 10,000 meters) had installation errors that would affect billing, 24% had safety issues, and 35% had “other” types of problems. The department created work orders to repair meters.

**Exhibit 9 Watershed Management’s Small Meter Evaluation Results**



**Source:** Department of Watershed Management

Installation errors can occur when meters and their components are newly installed or when staff members replace broken components. Installation problems that affect billing include:

- **Meter number mismatch.** The meter number on the equipment is different from the number listed on the account in enQuesta. If the serial numbers are different, the meter reader will not be able to obtain an electronic meter reading because the data does not match in the billing system.
- **Incorrect MIU number mismatch.** The (MIU) meter interface unit is different from the number listed on the account in the billing

system. If the MIU numbers are different, the meter reader will not be able to obtain an electronic meter reading.

- **Meter/register mismatch.** The meter and register are different sizes. A one-inch meter must be connected to a one-inch register. If a larger meter is connected to a smaller register, the water pressure will reflect a higher meter reading than actual water usage. A smaller meter connected to a larger register will create a lower water flow, causing a lower reading than actual water usage.

Assessment identified 59% of meters as needing repairs unrelated to installation. The department's assessment identified 24% of meters that required repairs to address safety concerns and 35% that required repairs categorized as "other." The safety concerns included broken meter lids, and "other" included MIU and antenna wire damage, register damage, and improperly placed antennas.

- **Broken meter lid.** If the meter lid is broken, the meter will likely still transmit an electronic read, but an uncovered meter presents a safety hazard. Broken meter lids could also expose the equipment to water damage and debris. Although the equipment is designed to function submerged in water, both circumstances could ultimately impair meter functionality.
- **MIU wire damage.** If the wire that connects the meter interface unit to the antenna is cut or disconnected, the register cannot transmit a reading. If there is no read or an invalid read, the meter reader has to stand directly over the meter box to manually read the meter or estimate consumption.
- **Antenna position.** The AMR radio frequency transmits up to a one mile range. If the antenna is not installed in the meter lid, the register may not transmit a reading, and the meter reader may need to get in close proximity to the meter to pick up a radio read.
- **Antenna wire damage.** If the antenna is cut, it will not transmit a reading.
- **Register damage.** If the register is cracked or damaged, depending on the extent of the damage, the register may not transmit a reading.

Problems that affect transmission can also lead to billing errors. Although the department concluded that 6% of meters that had problems that would generate inaccurate bills, any issue that prevents the meter from transmitting an electronic reading could affect billing if a meter reader manually inputs data or billing staff estimates consumption.

Watershed management's meter assessment recommended staff limit manual entry into the billing system. In its preliminary evaluation of a random sample of 127,000 meters, 20% of the 154 discrepancies between automated and electronic reads were due to manual data entry errors. Our review of two instances of monthly bills that were reported in the media found that manual data entry errors compounded the original problem in one of the examples.

Proper installation and ongoing maintenance are essential to benefit from AMR technology. According to watershed management and industry experts, AMR technology is over 99% accurate when installed correctly. The department implemented the technology partly to replace aging, non-functioning meters and to obtain more accurate meter readings. In order to gain the benefits of the automated meters, the department must ensure that the meters and their components are installed properly.

We recommended in our 2007 audit, *Department of Watershed Management Automated Meter Reading Program*, that the department develop a maintenance plan for small meters to include periodic site surveys or similar ways to identify operational problems – such as leaks and broken lids – that AMR technology could not detect. When we conducted a follow-up of the report recommendations in October 2010, the department had not yet implemented the recommendation.

### **Undetected Leaks Create Perception of Billing Errors**

Undetected leaks can also lead to unusually high bills and create the perception of billing errors. In two extreme cases reported in the media, customers complaining of high bills were later found to have leaks on their properties. Aging infrastructure contributes to leaks; almost half of homes in Atlanta were built before 1970 compared with 23% statewide and 41% nationwide.

Undetected leaks contribute to high water bills. Watershed staff told us that most of the account adjustments they make are because of leaks. During our observation of meter inspections the inspector identified leaks in two of three bill priority read inspections that were triggered by high water consumption. Also, two of the department's customers reported unexplained high bills to the media; both customers were later found to have a water leaks on their properties. One customer's monthly usage spiked to 555 CCFs, from a normal range averaging 4 CCFs. Watershed management documented in enQuesta that the customer had a leak. The second customer's usage spiked to 26 CCFs from a previous 12-month average of 12 CCFs. Although watershed

management staff told us the customer had a leak, staff did not document the leak in enQuesta. After the customer's bill spiked, the department installed a data logger, which showed that the customer had an intermittent leak. Industry information supports that under proper conditions and when installed properly, the automated meters have success rate of over 99% in transmitting electronic readings.

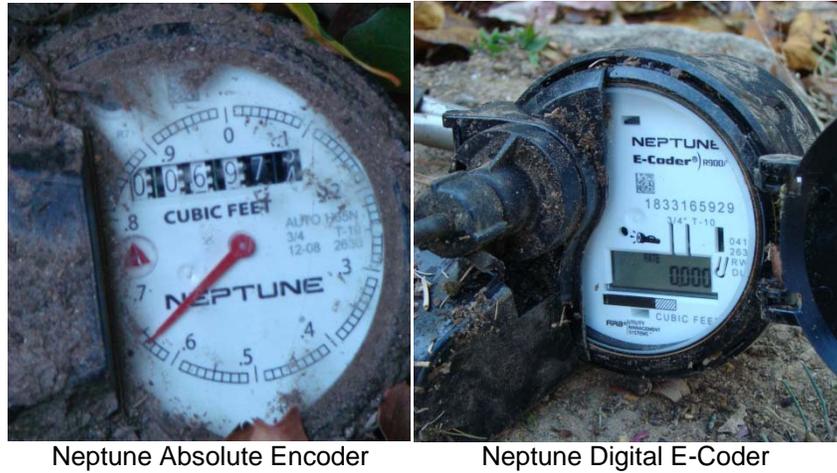
The city's aging infrastructure is likely to be prone to leaks. The age of components is a factor contributing to leaks. According to 2010 United States census data, 46% of Atlanta's homes were built in 1969 or earlier, compared to 23% of homes statewide and 41% of homes nationwide. This means that in addition to an aging city infrastructure, private homes and other buildings are also prone to leaks due to aging plumbing.

### **Many Customers Are Unaware of Leaks Until They Have Received at Least One High Bill**

Although the department has begun installing digital registers with greater capacity to detect leaks, the department cannot obtain the information remotely with its existing technology. The department relies on customer complaints or on the bill edit process to flag potential leaks. The threshold for identifying potential leaks may be too high to flag small or intermittent leaks. Further, the department may not complete meter inspections on the flagged accounts before sending the bills. Therefore many customers are unaware that they have a leak until they have received at least one bill that is more than double their usual monthly bill. In some cases, customers' bills are held pending resolution of meter issues, but staff does not communicate with customers that billing has been temporarily suspended and the ultimate bill, which could cover multiple billing cycles, could be quite high.

Watershed management's policies required inspectors to communicate the outcome of customer-initiated meter investigations to customers, but did not require an inspector to communicate with customers during bill priority (department-initiated) inspections unless results indicated a leak that was the customer's responsibility to fix. Staff told us they recently changed procedures to require inspectors to communicate with customers the results of all high usage inspections.

Data loggers are better at detecting leaks but require inspectors to collect the usage information at the meter site. The city initially installed Neptune's Absolute Encoder single dial registers and has begun replacing them with Neptune's digital E-coder register, as shown in figure 3.



Neptune Absolute Encoder

Neptune Digital E-Coder

**Figure 3 Neptune Registers**

Digital E-Coders, also called “data loggers,” identify leaks by recording water flow through the meter in 15-minute intervals over a 24-hour period; consistent water flow indicates a leak. This information is captured by the digital register and uploaded into an inspector’s handheld when he reads the meter at the site - the data cannot be obtained remotely. In addition to leak detection, data loggers can also indicate when the register has been tampered with and when the water is flowing in reverse. Exhibit 11 shows the capabilities of the department’s two register types. The department began installing data loggers for customers who report high bills and for accounts that billing employees flag as having high readings during the bill editing process. The department plans to eventually replace all existing registers with data loggers. The existing registers, Absolute Encoders, offer some leak indication on the face of the meter, but do not capture usage data over a time interval.

**Exhibit 10 Capabilities of Watershed Management’s Register Types**

<b>Register Capability</b>	<b>Neptune Absolute Encoder</b>	<b>Neptune E-Coder R900i/DL Data Logger</b>
<b>How Meter Is Read</b>	Manual display - read first 4 digits	Digital display -read first 4 digits
<b>Leak Detection</b>	Yes, by spinning red triangle; but not “true” leak detection	Yes - “True” leak detection <ul style="list-style-type: none"> <li>• blinking flashlight indicates that water used during at least 50 of the 15-minute intervals in the last 24 hours</li> <li>• continuous on flashlight indicates water used during all 15 minute intervals in 24-hour period; records consumption up to 35 days</li> <li>• no flashlight indicates water is not running</li> </ul>
<b>Reverse Flow Detection</b>	No	Yes - icons show the direction of the water flow
<b>Tamper Detection</b>	No	Yes - logs the number of days of zero consumption over the previous 35 days

Source: Neptune Product Catalog

The threshold for identifying potential leaks may be too high to flag small or intermittent leaks. The department flags accounts in its bill edit process with readings 100% higher than the 12-month average and accounts that used at least 20 CCFs or more in the billing period. These thresholds are higher than stated in the billing procedures and may be too high to catch relatively small leaks. The department’s billing procedures state, “If you edit an account that has a drastic increase (50%, 100% or higher) do the following...,” but accounts with a 50% increase are not identified in bill editing. Average monthly water consumption is 9 CCF, about 6,400 gallons. Under current procedures, the bill edit process would not identify an average account as having a potential leak until monthly consumption was 6,400-8,500 gallons more than usual. An intermittent or dripping leak consumes an estimated 450 gallons per month while a 1/32 inch leak consumes an estimated 7,900 gallons per month. Depending on when in the billing cycle the leak started, it could be one to two billing cycles before a small leak is flagged in the bill edit process.

Meter inspections to investigate high readings may not be completed prior to billing. The average turnaround time for bill priority read work orders dropped from an average of 14 days in 2007 to 2 days in 2011, then increased to 6 days in the first six months of 2012 (see Exhibit 14). The turnaround time for processing work orders has likely increased because inspection staff was assigned to handle the work orders issued for the department’s small meter audit. The department’s billing cycle allows about two days to complete work orders generated during bill editing. The short timeframe combined with the shift in resources to complete work orders associated with the small meter audit make it likely that many bills are sent before the investigation is completed.

During our observations of inspections and bill editing in October 2012, the department completed none of 9 bill priority read work orders prior to billing the customer.

**Exhibit 11 Processing Times for Completed Bill Priority Read Work Orders**

	CY2007	CY2008	CY2009	CY2010	CY2011	CY2012 Jan-Jul
<b>Min. no. of days</b>	0	0	0	0	0	0
<b>Max no. of days</b>	270	155	237	142	49	83
<b>Average</b>	14	10	12	7	2	6
<b>Total work orders</b>	<b>1,066</b>	<b>9,528</b>	<b>17,199</b>	<b>31,872</b>	<b>8,075</b>	<b>5,056</b>

**Source:** enQuesta work order data, January 1, 2007 through July 31, 2012, includes active and final accounts only; the number of days is calculated using business days - excludes weekends and city holidays. Priority read work orders are identified by work order code 4130.

Many customers are unaware that they have a leak until they have received at least one bill that is more than double their usual monthly bill. Based on average water use, a monthly bill would have to reach \$370 before the account is flagged for review. The department charges different rates using a tiered structure; the rate per CCF increases as usage increases. This rate structure is commonly referred to as conservation pricing because customers who use less water pay lower rates. A bill based on average use of 9 CCFs is \$172.57. Use would have to double for the average account to be flagged during bill editing. Monthly use of 18 CCFs would result in a bill of \$369.22, an increase of \$196.65.

We recommend the department set the threshold in enQuesta to flag accounts with high use for review to 50% higher than the 12-month average. Staff should complete bill priority inspections before billing or notify customers on the bill that they might have a leak and a work order is pending.

Until recently, the department did not communicate with customers the results of bill priority inspections unless the inspector found evidence of a leak. The department's policies required inspectors to inform the customer or leave a note if a bill priority inspection showed evidence of any leaks. If there was no evidence of a leak, the inspector recorded notes in enQuesta without communicating inspection results to the customer. Procedures required inspectors to communicate with the customer the results of customer-initiated meter investigations.

During our observations of meter inspections in October 2012, the inspector left a door hanger at one of seven locations where he conducted bill priority read inspections. The door hanger lists the date of the inspection, inspector's name, meter reading, whether the inspector found a leak, and a

Exhibit 12 New Door Hanger

**BILL PRIORITY WORK ORDER  
COMPLETION PROCESS**



- Upon receipt of Bill Priority Work Orders each inspector is required to post his/her daily assignment.
- Make certain you have e-coder registers, plus, meter sticks, city issued cellular phone and/or camera, etc. before leaving the office.
- Pictures are to be taken of the address, reading, and the notice. Once the notice is completed, place the notice on the door knob or handle and take image.
- Please label all pictures as prescribed.
- Information to capture and record in enQuesta on each account:
  1. Type of Property
    - Residential: \_\_\_\_\_ (Y/N)
    - Commercial: \_\_\_\_\_ (Y/N)
    - Number of Units: \_\_\_\_\_
  2. Reading \_\_\_\_\_
  3. Meter Number \_\_\_\_\_
  4. Meter Size \_\_\_\_\_
  5. MIU/E-Coder Number \_\_\_\_\_
  6. Register Size \_\_\_\_\_
  7. Meter and Register Condition
    - Glass Broken: \_\_\_\_\_ (Y/N)
    - Wires Cut: \_\_\_\_\_ (Y/N)
    - Water in Meter Box: \_\_\_\_\_ (Y/N)
    - Meter Leaks: \_\_\_\_\_ (Y/N)
      - Inlet: \_\_\_\_\_ (Y/N)
      - Outlet: \_\_\_\_\_ (Y/N)
    - Other Damages: \_\_\_\_\_ (Y/N)

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- All work orders are to be completed in enQuesta daily.
- All pictures are to be downloaded each day, prior to the end your work day.

City of Atlanta  
 Department of Watershed Management  
 Inspections Division  
 651 14th Street, N.W.  
 Atlanta, GA 30318

contact number for the department. In contrast, in all five customer-initiated meter investigations, the inspector either left a door hanger or spoke with the customer on the premises to let them know whether he found any problems with the meter or leak indications. Watershed management told us that, effective November 2012, inspectors are required to leave door hangers for customers after all bill priority inspections. The new door hanger that inspectors said they will begin using is shown in Exhibit 13.

**Billing staff hold bills without notifying customers.** Bill editing staff told us they may place an account in suspense status if a meter reading is outside of the customer's normal range or if an automated meter is not transmitting an electronic reading. When the account is in suspense status, a monthly bill is not generated and mailed to the customer. While billing procedures state that staff should suspend an account if an account has a pending work order and there is a crossed meter interface unit (the meter usage reported is connected to another account), different staff members described different circumstances under which they would suspend an account. The billing supervisor told us that staff suspends accounts when meter readers input a manual reading for an automated meter so that staff can determine why the meter didn't transmit an electronic read. Another billing employee said she would suspend an account if a reading was a "high" manual reading, and not bill the account until the issue is resolved. The employee said she makes a judgment call about when to put accounts in suspense status - usually for "extremely" high usage, even if it is a radio read. She said there is no specific threshold for determining whether to suspend an account for high usage. Staff told us they do not notify customers when the account is suspended, but add a note to the bill when it is sent, which could cover multiple billing cycles.

One of the department's accounts showed a meter reading of 555 CCFs in June 2012; the customer's normal usage ranged from 3 to 5 CCFs during the preceding 12 months. Because this reading was extraordinarily high, bill editing staff said they held the bill until they were able to determine the cause of the high reading and issued a bill priority read work order to have an inspector check the meter. Watershed management billed the customer in May 2012 with usage of 5 CCFs in April 2012, but did not bill him again until September. Instead of a 31 day billing period, the customer was billed for 154 days of usage.

When the customer's usage spiked in June, billing staff issued a bill priority read work order to have the meter inspected. The customer's account shows that an inspector checked the meter on June 22<sup>nd</sup>. The inspector's notes in enQuesta state that the register dial was constantly

spinning, which indicated a leak and that he left a note (door hanger) on the customer's door. EnQuesta shows that an inspection was conducted at the property on July 30<sup>th</sup>, but no inspection notes were recorded. A billing employee said she later called the customer and left a message; however, she said she did not document the call in enQuesta. Between June and July, the customer's meter recorded almost 2,000 CCFs (1.5 million gallons) of water usage at the property.

The customer contacted the department in August to report that he had not received a bill and customer service employee told him he would be billed soon. Watershed management sent the customer a bill in September for \$62,823, which covered usage for May, June, July, and August; each month the usage increased. Because the September bill double-counted two months of usage, staff later corrected the bill to \$38,477. In November 2012, watershed management adjusted the account because of an underground leak. Other than the initial door hanger in June, there is no record in enQuesta that indicates that the department contacted the customer.

We recommend that when the department places an account in suspense status, in addition to leaving door hangers, staff should notify the customer in writing and by telephone and document those contacts in enQuesta. The department should update the billing procedures to include criteria for staff to use to suspend accounts. The billing supervisor should review all suspended accounts and ensure that staff notify customers that their bills have been suspended and record the customer contacts in enQuesta.

The method for calculating estimated usage varies among billing staff and is not addressed in billing procedures. During our observations, two bill editors estimated a bill differently. In one instance, an account had a leak, which was documented in enQuesta. The employee estimated the bill based on an average of consumption for the previous six months. In another instance, a different employee estimated consumption by viewing previous usage and "eyeballing" average usage. According to the billing supervisor, consumption is manually estimated based on an average of the previous three months' usage. Although enQuesta is capable of estimating usage, the supervisor said they haven't used the system to estimate usage since late 2010. We recommend the department either use enQuesta to estimate bills or revise procedures to specify a method for estimating usage.

## Technological Incompatibility Is Unlikely Explanation for Inaccurate Bills

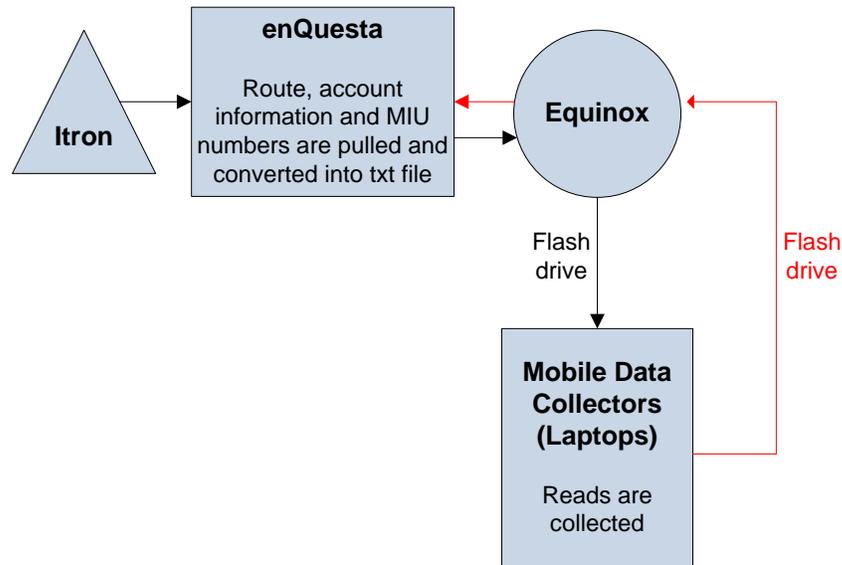
We identified no meter hardware and software incompatibilities that would cause systematic billing errors. Almost all of the department's meters and components are Neptune brand, and the meter reading and billing software is either a Neptune product or Neptune compatible.

We ruled out hardware and software incompatibility as a potential cause of incorrect water bills. We assessed whether interface issues between watershed management's water meter components or issues with data transfer through the department's software system could result in high water bills. Information from a local water industry official suggested that a possible explanation for customers' high meter reads might be due to incompatible meter hardware or software components, which could cause transmission inaccuracies.

The official explained that in order to function properly, meter components should be the same or compatible brands. We reviewed meter inventory data and interviewed watershed management's meter personnel as well as the department's information technology staff and confirmed that meter hardware and related software components were compatible. According to the department's inventory of all active meters as of October 2012, 99% of the meters are the Neptune brand, which is compatible with the billing software.

Watershed management's in-house meter assessment stated that there were no indications of mathematical or computational errors in the billing system. Watershed's information technology staff told us they have not identified any software issues that would cause high meter readings and that a software malfunction in enQuesta would result in a more widespread billing problem that would affect a larger number of accounts than have been reported. Exhibit 14 illustrates how data is transferred through the software system.

### Exhibit 13 Watershed's Meter Reading Data Transfer Process



**Source:** Watershed meter reading and information technology staff

Meter reading employees download meter and route information from enQuesta in a text format, based on Neptune's requirements. They then upload the route information into Equinox, a Neptune product. Equinox assigns routes that meter readers will read, and they download this information onto a flash drive, and insert the drive into their mobile data collectors (laptops). The meter readers capture readings into the mobile data collectors while driving the meter routes, and then upload the readings back into Equinox using flash drives. Meter reading staff then transfer the readings into enQuesta. Meter reading staff uses Itron to read meters that have not been converted to AMR technology.



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## Recommendations

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In order to more systematically identify leaks and other billing issues, the Commissioner of the Department of Watershed Management should:

1. Develop a method to track the number of adjustments for leaks or billing errors.
2. Complete and implement the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology.
3. Set the threshold in enQuesta to flag accounts with high use for review to 50% higher than the 12-month average, consistent with current billing procedures.

To provide customers with proactive, timely information regarding potential meter issues, including water leaks, the commissioner should:

4. Complete bill priority inspections before billing or notify customers on the bill that they might have a leak and a work order is pending.
5. Update billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process. The revised procedures should include supervisory review of suspended bills.
6. Update billing procedures to require that when staff places an account in suspense status, in addition to leaving door hangers, staff notify the customer in writing and by telephone and document those contacts in enQuesta.
7. Use enQuesta to estimate bills or revise procedures to include a specific method for estimating usage.



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# Appendices

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Appendix A  
Management Review and Response to Audit Recommendations

<b>Report # 12.03</b>	<b>Report Title: Water Meter Reading, Estimates and Adjusted Billings</b>	<b>Date: 4/11/13</b>
<b>Recommendation Responses</b>		
<b>Rec. #1</b>	The Commissioner of the Department of Watershed Management should develop a method to track the number of adjustments for leaks or billing errors.	Agree
	<p><b><u>Proposed Action:</u></b> The DWM will submit a request to the Customer Information System Committee to have a work order created with resolution codes that will enable the department to better track the number of adjustments for leaks or billing errors as well as the rationale for adjustments (e.g., overestimates, vandalism). It is proposed that the work order will be in the 6000 series so that all adjustments would be associated with this series. The department would also work with the enQuesta vendor to create the adjustment codes. The department will develop and implement training on the new process for staff.</p> <p><b><u>Implementation Timeframe:</u></b> December 2013</p> <p><b><u>Responsible Person:</u></b> Daphne Rackley, Deputy Commissioner of IT (or IT designee) &amp; Yolanda Clayton-Moses, Manager of Billing</p>	
<b>Rec. #2</b>	The Commissioner of the Department of Watershed Management should complete and implement the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology.	Agree
	<p><b><u>Proposed Action:</u></b> The DWM is in the process of developing the small meter maintenance program to identify operational problems, such as leaks, that cannot be detected with AMR technology. The results of this effort will meet the recommendation of the audit.</p> <p><b><u>Implementation Timeframe:</u></b> June 2013</p> <p><b><u>Responsible Person:</u></b> Mohamed Balla, Director of Finance &amp; Jaunius Simokaitis, Director of Customer Service/Billing</p>	

<b>Rec. #3</b>	The Commissioner of the Department of Watershed Management should set the threshold in enQuesta to flag accounts with high use for review to 50% higher than the 12-month average, consistent with current billing procedures.	Agree		
<table border="1"> <tr> <td data-bbox="65 386 560 862"> <p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p> </td> <td data-bbox="560 386 2032 862"> <p>The DWM is currently utilizing enQuesta to flag accounts with high use for review at 100% higher than the 12-month average and plans to evolve to 50% over the course of the next two years. The billing department will also investigate conducting alternative analyses on high-consumption accounts, such as utilizing Cognos reports which are pulled from enQuesta. Additionally the DWM is investigating moving towards measuring on a CCF basis due to the current 3-tier rate structure which distorts the dollar value.</p> <p>FY2015</p> <p>Michael Geisler, Deputy Commissioner of Financial Administration\CFO, Daphne Rackley, Deputy Commissioner of IT (or IT designee), &amp; Yolanda Clayton-Moses, Manager of Billing</p> </td> </tr> </table>			<p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p>	<p>The DWM is currently utilizing enQuesta to flag accounts with high use for review at 100% higher than the 12-month average and plans to evolve to 50% over the course of the next two years. The billing department will also investigate conducting alternative analyses on high-consumption accounts, such as utilizing Cognos reports which are pulled from enQuesta. Additionally the DWM is investigating moving towards measuring on a CCF basis due to the current 3-tier rate structure which distorts the dollar value.</p> <p>FY2015</p> <p>Michael Geisler, Deputy Commissioner of Financial Administration\CFO, Daphne Rackley, Deputy Commissioner of IT (or IT designee), &amp; Yolanda Clayton-Moses, Manager of Billing</p>
<p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p>	<p>The DWM is currently utilizing enQuesta to flag accounts with high use for review at 100% higher than the 12-month average and plans to evolve to 50% over the course of the next two years. The billing department will also investigate conducting alternative analyses on high-consumption accounts, such as utilizing Cognos reports which are pulled from enQuesta. Additionally the DWM is investigating moving towards measuring on a CCF basis due to the current 3-tier rate structure which distorts the dollar value.</p> <p>FY2015</p> <p>Michael Geisler, Deputy Commissioner of Financial Administration\CFO, Daphne Rackley, Deputy Commissioner of IT (or IT designee), &amp; Yolanda Clayton-Moses, Manager of Billing</p>			
<b>Rec. #4</b>	The Commissioner of the Department of Watershed Management should complete bill priority inspections before billing or notify customers on the bill that they might have a leak and a work order is pending.	Agree		
<table border="1"> <tr> <td data-bbox="65 984 560 1403"> <p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p> </td> <td data-bbox="560 984 2032 1403"> <p>The DWM would like to further evaluate this recommendation to investigate how the department can leverage technology to notify customers regarding leaks and/or pending work orders. The DWM currently completes bill priority inspections before billing customers and utilizes the bill priority inspection work orders to track this information. Customers are notified with door hangers regarding potential leaks\pending work orders. The department will also work with the appropriate vendor to investigate the feasibility of providing notification on the customer bill.</p> <p>FY2014</p> <p>Daphne Rackley, Deputy Commissioner of IT (or IT designee), Scheree Rawles, Director of Communications, &amp; Jaunius Simokaitis, Director of Customer Service/Billing</p> </td> </tr> </table>			<p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p>	<p>The DWM would like to further evaluate this recommendation to investigate how the department can leverage technology to notify customers regarding leaks and/or pending work orders. The DWM currently completes bill priority inspections before billing customers and utilizes the bill priority inspection work orders to track this information. Customers are notified with door hangers regarding potential leaks\pending work orders. The department will also work with the appropriate vendor to investigate the feasibility of providing notification on the customer bill.</p> <p>FY2014</p> <p>Daphne Rackley, Deputy Commissioner of IT (or IT designee), Scheree Rawles, Director of Communications, &amp; Jaunius Simokaitis, Director of Customer Service/Billing</p>
<p><b><u>Proposed Action:</u></b></p> <p><b><u>Implementation Timeframe:</u></b></p> <p><b><u>Responsible Person:</u></b></p>	<p>The DWM would like to further evaluate this recommendation to investigate how the department can leverage technology to notify customers regarding leaks and/or pending work orders. The DWM currently completes bill priority inspections before billing customers and utilizes the bill priority inspection work orders to track this information. Customers are notified with door hangers regarding potential leaks\pending work orders. The department will also work with the appropriate vendor to investigate the feasibility of providing notification on the customer bill.</p> <p>FY2014</p> <p>Daphne Rackley, Deputy Commissioner of IT (or IT designee), Scheree Rawles, Director of Communications, &amp; Jaunius Simokaitis, Director of Customer Service/Billing</p>			

<b>Rec. #5</b>	The Commissioner of the Department of Watershed Management should update billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process. The revised procedures should include supervisory review of suspended bills.	Agree
	<p><b><u>Proposed Action:</u></b> The DWM is currently in the process of updating billing procedures to identify specific criteria for suspending bills that are flagged for further review during the editing process. The DWM is also investigating moving towards measuring on a CCF basis due to the current 3-tier rate structure which distorts the dollar value. If adopted, this will also be updated in the billing procedures. The results of this effort will meet the recommendation of the audit.</p> <p><b><u>Implementation Timeframe:</u></b> Q4FY2013</p> <p><b><u>Responsible Person:</u></b> Michael Geisler, Deputy Commissioner of Financial Administration\CFO &amp; Jaunius Simokaitis, Director of Customer Service/Billing</p>	
<b>Rec. #6</b>	The Commissioner of the Department of Watershed Management should update billing procedures to require that when staff places an account in suspense status, in addition to leaving door hangers, staff notify the customer in writing and by telephone and document those contacts in enQuesta.	Agree
	<p><b><u>Proposed Action:</u></b> The DWM will update billing procedures to require that when staff places an account in suspense status, they will notify the customer utilizing methods in addition to leaving door hangers. The DWM would like to further evaluate this recommendation to investigate alternative ways of communicating with customers regarding suspended accounts and documenting the contact.</p> <p><b><u>Implementation Timeframe:</u></b> FY2014</p> <p><b><u>Responsible Person:</u></b> Scheree Rawles, Director of Communications, Jaunius Simokaitis, Director of Customer Service/Billing, &amp; Daphne Rackley, Deputy Commissioner of IT (or IT designee)</p>	

<b>Rec. #7</b>	The Commissioner of the Department of Watershed Management should use enQuesta to estimate bills or revise procedures to include a specific method for estimating usage.	Agree
<p data-bbox="323 378 548 407"><b><u>Proposed Action:</u></b></p> <p data-bbox="197 509 548 539"><b><u>Implementation Timeframe:</u></b></p> <p data-bbox="281 610 548 639"><b><u>Responsible Person:</u></b></p>	<p data-bbox="571 378 1961 475">The DWM will make revisions to current procedures including identifying a specific method for estimating usage. At this time the use of enQuesta is not workable. The results of this effort will meet the recommendation of the audit.</p> <p data-bbox="571 509 667 539">FY2014</p> <p data-bbox="571 610 1955 639">Daphne Rackley, Deputy Commissioner of IT (or IT designee) &amp; Yolanda Clayton-Moses, Manager of Billing</p>	