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**PERFORMANCE AUDIT OF  
THE PUBLIC UTILITIES  
DEPARTMENT'S WATER BILLING  
OPERATIONS**

**Office of the City  
Auditor**

**City of San Diego**



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## THE CITY OF SAN DIEGO

July 26, 2018

Honorable Mayor, City Council, and Audit Committee Members  
City of San Diego, California

Transmitted herewith is an audit report on the Public Utilities Department's Water Billing Operations. This report was conducted in accordance with the City Auditor's Fiscal Year 2018 Audit Work Plan, and the report is presented in accordance with City Charter Section 39.2. The Results in Brief is presented on page 1. Audit Objectives, Scope, and Methodology are presented in Appendix B. Management's comments on our audit can be found after page 50.

We would like to thank the Public Utilities Department (PUD), Department of Information Technology - SAP support, and their staff for their assistance and cooperation during this audit. All their valuable time and efforts spent on providing us information are greatly appreciated. The audit staff responsible for this audit report are Joe Picek, Greg Cleary, Stephanie Chernau, Jenny Song, Nathan Otto, Megan Garth, Rod Greek, Luis Briseño, Kevin Christensen, Andy Horita, Steve Gomez, Andy Hanau, Shawneé Pickney, Danielle Knighten, and Kyle Elser.

Respectfully submitted,

Eduardo Luna  
City Auditor

cc: Kris Michell, Chief Operating Officer  
Stacey LoMedico, Assistant Chief Operating Officer  
Rolando Charvel, Chief Financial Officer  
Vic BIANES, Director, Public Utilities Department  
Paz Gomez, Deputy Chief Operating Officer, Infrastructure and Public Works  
Johnnie Perkins Jr., Incoming Deputy Chief Operating Officer, Infrastructure and Public Works  
Lee Ann Jones-Santos, Assistant Director, Public Utilities Department  
Tracy McCraner, Director, Department of Finance  
Scott Clark, Assistant Director, Department of Finance  
Mara Elliott, City Attorney  
Andrea Tevlin, Independent Budget Analyst  
Jessica Lawrence, Policy Advisor, Mayor's Office

OFFICE OF THE CITY AUDITOR  
600 B STREET, SUITE 1350, • SAN DIEGO, CA 92101  
PHONE (619) 533-3165 • FAX (619) 533-3036

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## Results in Brief

A basic tenet of customer service is to accurately bill for goods and services purchased. More so in government, residents expect and deserve that the water bills they receive are accurate and reflect actual water consumption. In late 2017, City of San Diego Public Utilities Department (PUD) customers started reporting higher than average water bills. In January 2018, news reports began covering stories of PUD water customers complaining of high water bills. Some PUD customer charges exceeded \$1,000 and other charges more than doubled average costs. Complaints spanned various neighborhoods including La Jolla, Scripps Ranch, Normal Heights, Pacific Beach, and Talmadge.

Due to heightened complaints, in February 2018, City Council President Pro Tem Barbara Bry and the Mayor requested the Office of the City Auditor (OCA) to investigate the reported increase in residents' water bills. Based on these requests, we set out to answer the following questions:

### 1. In calendar year (CY) 2017, what contributed to higher water bills?

In 2017, PUD issued 1.3 million water bills and we found that approximately 21,000 bills (1.6 percent) showed double or more than double of the previous billing period's usage. This does not mean that these customers were incorrectly billed. The increases could be a result of actual water consumption. This number simply reflects the number of customers with significant billing increases in calendar year (CY) 2017.

There were multi-causal factors that contributed to bill increases. These include:

- A one-time extended billing cycle from 60 to 70 days;
- A water rate increase of 6.4 percent effective August 2017; <sup>1</sup>
- Warmer winter months;
- Unidentified water leaks in homes and irrigation systems; and
- Meter reading inconsistencies.

We found that installation of smart meters did not contribute to bill increases. According to PUD, one meter reader intentionally entered inaccurate meter readings, and they believe that any other meter reader errors were inadvertent and unintentional. However, we found that human error, whether intentional or not, was a factor for meter readers as a whole. Ten meter readers accounted for over half of the readings corrected before billings and 71 percent of rebillings for the year. This issue is addressed further in **Question 3**.

To investigate whether any additional factors contributed to the billing increases, we randomly sampled and conducted field review of 455 meters that saw significant spikes in CY 2017. We also

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<sup>1</sup> The City approved an increase of 6.4 percent for FY 2017. According to PUD, San Diego County Water Authority rates were approved late. This meant that the City could not calculate the increase in time to implement the rate increase on July 1, 2017. The delayed implementation resulted in the actual increase being 6.9 percent effective August 1, 2017.

found that while PUD appears to identify and correct most meter reading and billing errors; a relatively small number of errors likely go unnoticed and uncorrected.

## **2. How often are meter reads inaccurate?**

Obtaining accurate meter readings is a critical first step in PUD's revenue collection process. Meter reading errors are caused by a variety of factors and can lead to incorrect bills, delayed bills, and/or customer dissatisfaction, which can damage residents' trust in the City's ability to deliver essential services correctly. Minimizing meter reading errors and implementing a well-designed quality assurance process to identify and correct inaccurate readings are both essential to ensure PUD bills customers correctly. We found that generally PUD obtains accurate meter readings and bills customers correctly. However, there are exceptions for a small proportion of customer billings. For example, some bills are corrected after PUD misbills the customer; these errors may be identified because of a customer complaint.

Based on our review of single-family residential customer billings in CY 2017, PUD read 1.3 million meters and issued a corresponding number of water bills. Our analysis found that PUD's quality assurance process flagged 57,117 potentially anomalous meter readings (4.3 percent) for additional review. PUD adjusted 18,728 (1.4 percent) meter reads prior to sending bills to customers, while the remaining 2,750 (less than 1 percent) bills were adjusted after customers received an incorrect bill.

We found that errors may have occurred in 2017 as a result of meter readers bypassing preventative controls when entering an out-of-range meter reading in handheld devices. Also, PUD did not have any mechanisms in place to monitor when supervisor codes were used to circumvent controls in the handheld devices. We recommended PUD monitor the use of supervisor codes to prohibit the circumvention of controls in handheld devices that detect out-of-range meter readings, and periodically assess the strength and effectiveness of their billing control environment.

## **3. What factors potentially cause inaccurate meter readings?**

As indicated in **Question 2**, the percentage of inaccurate readings that pass through the PUD billing system is low. During our review, we examined potential causes for inaccurate meter readings during CY 2017 and found that human error and estimations caused the highest number of inaccurate readings. We found that human error was not isolated to one specific individual. In CY 2017, we found that ten meter readers accounted for over half of readings corrected before billing and 71 percent of rebillings for that year. We found that management oversight of meter readers has been an issue in previous years. Meter reader errors can directly impact customer bills and can lead to over- or under-billing and customer complaints.

We also found that PUD does not have metrics for evaluating meter reader performance. By not evaluating meter reader performance, PUD cannot sufficiently manage staff capacity and ensure accurate meter reads, which can lead to meter reading errors and customer complaints. We recommended PUD develop, track, and analyze employee performance metrics to increase the effectiveness of the meter reading program and reduce potential billing errors before they impact customers, and re-evaluate its meter reading routes based on the performance metrics identified.

Additionally, we found the readers do not always enter trouble codes to help identify issues that need resolution, such as a broken, obstructed, or unreadable meter. Entering trouble codes inconsistently may result in unresolved meter issues that can lead to skipped meter reads and billing estimates that may result in water bills being based on higher-than-actual usage. We made recommendations for the improvement of the use of trouble codes, coordination, and supervisor review.

**4. Did customers pay more due to the extended billing cycle?**

Yes, because of the extra days in the billing cycle, customers averaged higher water use during the billing period. However, PUD prorated the charges based on per day use. By prorating the charges, customers paid earlier for what they would have used in the next billing cycle.<sup>2</sup> A typical billing cycle for PUD is approximately 60 days. According to PUD, it extended the billing cycle to 70 days for bills issued between October 2017 and December 2017 to coordinate maintenance work (such as replacing meters) in meter reading routes that are read in even or odd months.

Also, according to PUD, it does not intend to extend billing cycles in the future. Nevertheless, customers may have been able to plan for the added expense if PUD had communicated the anticipated billing cycle extension in prior correspondence to customers.

**5. Did PUD's methods of communication exacerbate public discontent with the increase in water bills?**

Yes, because increased communication with customers in advance of anticipated activities that might impact bill charges would have allowed customers to plan for bill increases and lessened some of the confusion regarding billing concerns. Moreover, timely access to customer service representatives with a customer-first approach could also help mitigate public outcries over unaddressed concerns in the future.

While the Office of the City Auditor is scheduled to conduct a customer service audit in FY 2019, in this report we made one customer service recommendation to improve PUD's communications with customers. We recommended PUD communicate with customers in advance of anticipated bill-impacting activities.

In total, we made 10 recommendations and PUD management agreed to implement all recommendations.

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<sup>2</sup> Assumes the customer continued their normal usage (e.g., did not vacation, shut off water, etc.). It is also based on an analysis of how bills are calculated and the assumption that the meter reading is correct.



# Background

## *Introduction*

In accordance with the Office of the City Auditor's Fiscal Year (FY) 2018 Audit Work Plan, in December 2017, we commenced an audit of the Public Utilities Department's (PUD) Customer Support Division. The objective of the audit was to determine the efficiency and effectiveness of the Customer Support Division call center—call wait times and customer service. However, in February 2018, we shifted the focus of our audit to customer billing in response to resident concerns and requests by Councilmember Bry and the Mayor concerning increased water bills despite customer efforts to conserve water and/or despite having consistent water usage patterns. Specifically, with a focus on single-family residential accounts, our new objectives were to:

- Assess whether PUD has internal controls that detect errors in the billing system;
- Evaluate how the meter reading and meter install processes impact customer billing; and
- Evaluate if PUD's response to the Citywide billing issue was timely and appropriate.<sup>3</sup>

We addressed these objectives by answering the following five questions:

1. In calendar year (CY) 2017, what contributed to higher water bills?
2. How often are meter reads inaccurate?
3. What factors potentially cause inaccurate meter readings?
4. Did customers pay more due to the extended billing cycle?
5. Did PUD's methods of communication exacerbate public discontent with the increase in water bills?

**Appendix B** provides a detailed Objectives, Scope, and Methodology statement.

## *Magnitude of Public Complaints About Increased Water Bills*

Customer complaints about increases in water bills garnered public attention in January 2018. In news reports, customers complained of high water bills with some customer charges exceeding \$1,000 and other charges more than doubling average costs. Complaints spanned various areas including Scripps Ranch, Normal Heights, Pacific Beach, and Talmadge. In addition to the increased bills, customers, as well as Councilmembers, expressed dissatisfaction with customer service pertaining to call wait times, customer interactions, and an inability to resolve issues. Moreover, customers expressed skepticism about whether meter readers conduct visual readings.

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<sup>3</sup> In addition to this billing audit, our office is conducting subsequent audits on PUD operations including: 1) a review of Customer Service Operations; and 2) a review of the Advanced Metering Infrastructure (AMI) installation process. Moreover, an audit of PUD's meter boxes and lids replacement process is in progress.

*PUD's Response to Customer Complaints*

In March 2018, PUD released a Water Billing Frequently Asked Questions (FAQ) document to provide customers with the most recent updates regarding the high water bills and to describe the corrective actions PUD developed to improve oversight of its billing practices.

In public statements, as well as the FAQ, PUD cited the following factors as contributors to increased water bills:

- A one-time longer billing period to normalize the statement schedule, extending the 60-day billing period to 70 days between October and December 2017;
- A water rate increase of 6.9 percent effective August 2017;<sup>4</sup>
- Unidentified leaks in homes and irrigation systems;
- Warmer winter months; and
- Human error, specifically blaming one meter reader for customer billing errors in the Rancho Bernardo, Carmel Valley, Rancho Peñasquitos, and Mira Mesa areas.

PUD, has also indicated in news reports that the installation of the smart meters was not a contributor to the billing increases. To address the factors outlined above, PUD stated that it implemented the following oversight procedures to monitor the accuracy of customer bills:

- Requiring PUD Supervisors to personally sign-off on daily reports from meter readers;
- Adding security protocols to ensure that only designated staff can input data;
- Improving automated alerts that flag unusual spikes in water usage;
- Adding a second review of meter reads to ensure accuracy; and
- Including an informational insert in water bills on how customers can read their own meters and track their water usage.

*The Public Utilities Department*

The City of San Diego's Public Utilities Department (PUD) purchases and imports approximately 85 percent of its water from the San Diego County Water Authority (CWA); the remaining water comes from local water sources. PUD delivers treated water to more than 1.3 million customers in the cities of San Diego, Del Mar, and the California American Water Company, which serves the cities of Coronado and Imperial Beach.

To meet the costs associated with providing water service to its customers, PUD generates revenue primarily from water sales to customers. It derives revenue from other sources including

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<sup>4</sup> The City approved an increase of 6.4 percent for FY 2017. According to PUD, San Diego County Water Authority rates were approved late. This meant that the City could not calculate the increase in time to implement the rate increase on July 1, 2017. The delayed implementation resulted in the actual increase being 6.9 percent effective August 1, 2017.

water user charges, other water sales, rental income, capacity fees, interest earned from the investment of available funds, meter installation fees, and other miscellaneous revenues. To capture this revenue, customers pay a base fee in addition to individual usage as captured by water meters, as discussed later in this section.

According to PUD's FY 2018 Adopted Budget, PUD was budgeted to expend approximately \$876 million. It also budgeted approximately 1,650 full-time equivalents (FTEs).

#### *Customer Support Division*

Properly functioning meters, accurate meter reading, and an internal quality assurance process are essential components to ensure that customers pay for actual use and for PUD to meet its revenue needs. PUD has two divisions that play key roles in water meter installation, maintenance, meter reading, and customer billing: the Customer Support Division (CSD) and the Water Construction and Maintenance Division (WCMD).

CSD responds to customer phone calls and emails including account/billing inquiries and general water/sewer utility information. In addition, CSD is responsible for customer billing and payment processing, meter reading and code enforcement, ensuring customer compliance with State backflow device requirements, and providing public information.

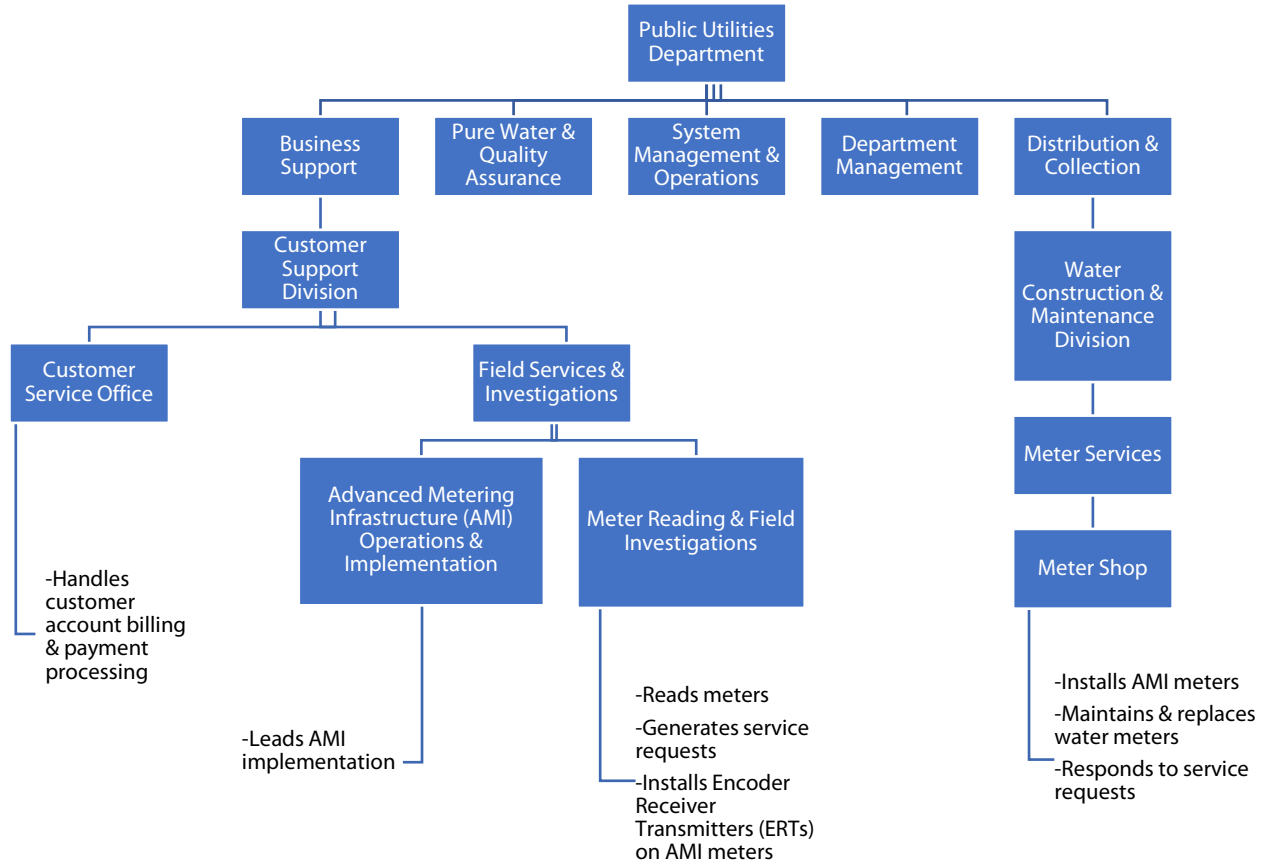
Furthermore, CSD leads the implementation of Advanced Metering Infrastructure (AMI) meters that transmit water usage data wirelessly to the City's billing system. Meter readers assist with the AMI implementation by installing AMI's transmitting devices, called an Encoder Receiver Transmitter (ERT), on the AMI meters.

#### *Water Construction and Maintenance Division*

While CSD coordinates the implementation of AMI meters, staff within the WCMD's Meter Shop (Meter Shop) are responsible for installing AMI meters. Additionally, this group maintains, installs, and replaces old analog water meters with AMI meters. Lastly, the Meter Shop responds to service requests generated by meter readers in the field. **Exhibit 1** shows the organizational makeup of PUD and its key divisions.

**Exhibit 1:**

**The Public Utilities Department Has Five Branches**



Source: OCA generated based on a review of the Public Utilities Department’s organizational chart and budget documents.

*A Breakdown of Water Bills*

To protect the long-term interests of water customers with respect to rate pricing, service quality, and the reliability of essential services, PUD must consider the need for water to remain financially viable and be able to provide reliable, safe, and secure water services to its consumers in the long run. These considerations are therefore built into PUD’s water rates that are passed onto customers in the form of a monthly base fee and a commodity charge. As shown in **Exhibit 2**, the water rates, requested by PUD and approved by City Council, will increase each year until 2020.

**Exhibit 2:**

**In December 2015, City Council Approved Increased Water Rates for Fiscal Years 2016 to 2020**

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
<b>Effective Date</b>	January 2016	July 2016	July 2017 <sup>†</sup>	July 2018	July 2019
<b>Percent</b>	9.8%	6.4%	6.4%	5.0%	7.0%

<sup>†</sup> The increase for July 2017 took effect on August 1, 2017 due to delays in the rate approval process. As a result, the effective rate for August 1, 2017 was 6.9 percent to make up for the delay in time (i.e., 11 months vs 12 months).

Source: City of San Diego Resolution Number R-310097.

The monthly base fee is determined by water meter size while the commodity charge is based on the amount of water consumed during the billing cycle. The commodity charge is divided into four usage tiers (measured by the number of hundred cubic feet (HCF) of water consumed), each with an associated fee that is based on the water rate for the year.<sup>5</sup> Customers’ commodity charge is based on the amount of water consumed during the billing cycle multiplied by the fee associated with each tier. **Exhibit 3** below shows the monthly base fee and commodity fees for FY 2018.

**Exhibit 3:**

**Fiscal Year 2018 Monthly Water Base Fee and Tiered Fees for a Typical Single-Family Domestic Customer**

<b>Base Fee</b>	<b>\$ 24.22</b>
<b>Tier 1 (0-4 HCF)</b>	\$ 4.84 per HCF
<b>Tier 2 (5-12 HCF)</b>	\$ 5.42 per HCF
<b>Tier 3 (13-18 HCF)</b>	\$ 7.75 per HCF
<b>Tier 4 (18+)</b>	\$ 10.90 per HCF

Source: OCA generated based on the Public Utilities Department’s website.

According to PUD’s cost of service study (COSS), the tier breakpoints (tiers 1–4) reflect general usage patterns of single-family residential (SFR) customers, rate setting industry standards, and American Water Works Association (AWWA) household usage survey data. The COSS assumes that a typical SFR household includes 2–3 people, that typically consume 50–60 gallons of water per person per day, equating to approximately 3,000–5,000 gallons per month per household. Moreover, since the COSS notes that water resource supply in the City is limited and expensive, it assumes that 0–4 HCF of usage per month represents customer efficiency, 12 HCF reflects typical SFR water use, and 18 or more HCF indicates the existence of outdoor irrigation or landscaping.

<sup>5</sup> The mathematical conversion of gallons of water used to hundred cubic feet: 1 HCF = 748 gallons.

With PUD's need to provide economically viable services combined with the limited supply of water, customers' water bills will continue to increase regardless of usage.

### *Other Water-Related Fees*

In addition to paying for water, customers also pay a storm drain fee, a sewer base fee, and an individualized sewer fee. Both the storm drain and sewer base fees are set monthly fees which pay for the storm water and wastewater systems, respectively. However, the City calculates the sewer fee based on each customer's amount of water used during the winter (primarily December to March of each year) because according to PUD, the highest percentage of water used is returned to the sewage system during this time. The City uses the least amount of water consumed during this period to calculate each customer's sewer rate. Sewer fee revenues pay for collection and transport of sewage to the Point Loma Sewage Treatment Plant, treatment and safe disposal of waste, and the maintenance, repair, and replacement of the sewage system.

### *Meter Readers Record a Large Portion of Household Water Usage Amounts*

Reading water meters is labor-intensive and critical to PUD's revenue generating process. Meter readers are responsible for manually reading most of the City's 281,000 meters every other month, based on the City's two-month billing cycle. They walk or drive to each location and record readings on a handheld device. The device is pre-programmed with the meter route and address information and allows each meter reader to easily input readings. Meter readers perform additional duties, which include field investigations and generating work orders for meter replacement or repair. As of FY 2018, PUD employed 36 meter readers with 2 supervisors.

To reduce manual reading, in FY 2013, the City began installing AMI meters that transmit meter readings wirelessly. As of June 2017, PUD reported that it had installed and activated 11,500 AMI meters. As a result, meter readers still manually read approximately 270,000 meters throughout the City. As mentioned previously, meter readers also install the AMI's wireless transmitting devices, ERTs, on the AMI meters. The ERT transmits the water consumption data wirelessly to PUD.

### *PUD Has Processes to Ensure Accurate Meter Readings Prior to Billing Customers*

Ensuring correct readings prior to billing customers is important so that customers receive accurate bills that reflect their true water consumption. Meter readers' handheld devices provide the first line of defense to ensure accurate readings. For example, the handheld device will alert meter readers in the field when a reading falls outside of the meter's projected range, such as when a customer increases their water use beyond their normal use. When this occurs, the device prompts the meter reader to re-enter the reading and the last four digits of the water meter's serial number. If rejected, the meter reader can accept the reading, re-enter it, or enter a skip code specifying why the meter was left unread. If the reading is rejected three times, the device will lock requiring a supervising meter reader to unlock it. **Exhibit 4** shows the meter reading and quality assurance process.

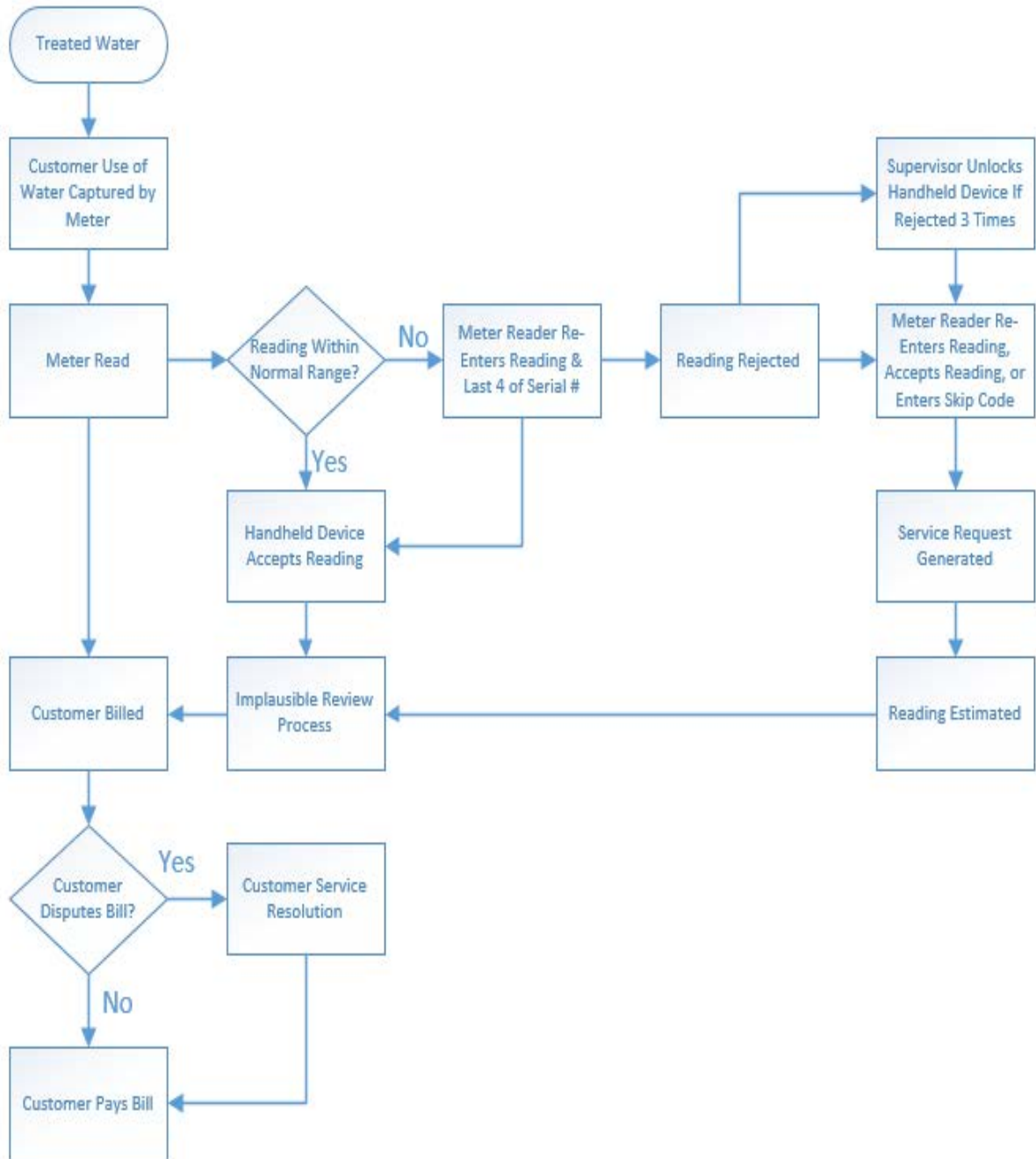
When a meter reader skips a reading, they note the skip in their handheld device and PUD's billing system, known as SAP Customer Care Solutions (CCS), generates an estimated reading.

Meter readers may skip readings for a variety of reasons, including when a meter is broken, inaccessible, or when the meter reader is unable to physically locate the meter. In cases like these, entering a trouble code into the handheld device will generate a work order for other PUD work crews to address the problem. Prompt fulfillment of the work order prevents the ongoing need for estimated reads.

Additionally, PUD's second line of defense includes a quality assurance process in CCS that identifies implausible readings, which are readings that fall outside a range projected by the system. This process controls for numerous factors. Most importantly, it flags accounts with more than three consecutive estimated readings because consecutively estimated readings do not reflect a customer's actual usage.

**Exhibit 4:**

**Meter Reading and Billing Process**



Source: OCA generated based on a review of the Public Utilities Department's procedures, website information, and interviews with staff.



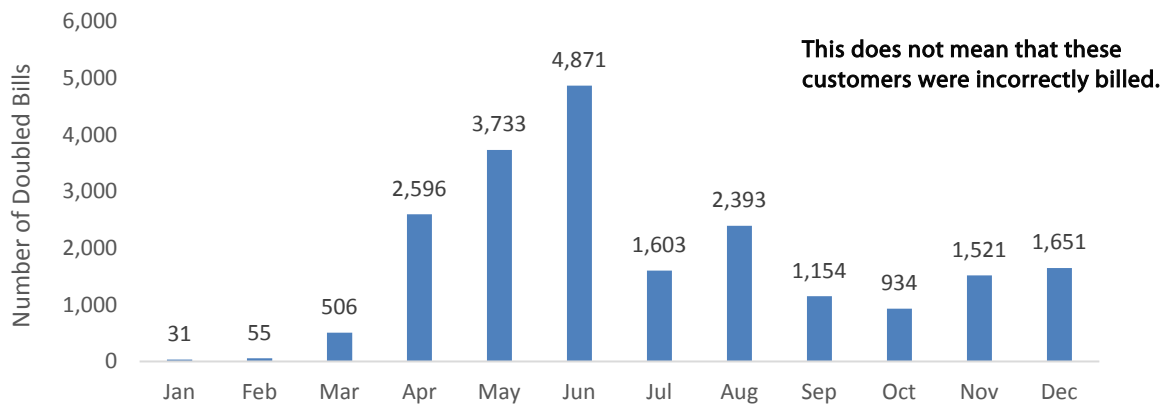
# Audit Results

## ***Question 1: In Calendar Year (CY) 2017, What Contributed to Higher Water Bills?***

We found that approximately 21,000 bills (1.6 percent) of the 1.3 million water bills Public Utilities Department (PUD) issued in 2017 showed water usage that was double or more than double the previous usage. This does not mean that these customers were incorrectly billed. The increases could be a result of actual water consumption. The 21,000 bills simply reflect the number of customers with significant billing increases in calendar year (CY) 2017. As shown in **Exhibit 5**, these increases varied throughout the year.

### ***Exhibit 5:***

#### **Total Number of Bills with Double or More than Double Previous Consumption in CY 2017**



Source: OCA generated based on Cost of Service Study 2017 data.

To investigate whether any additional factors contributed to the billing increases, we randomly sampled and conducted field review of 455 meters that saw significant spikes in CY 2017. We also found that PUD appears to identify and correct most meter reading and billing errors, a relatively small number of errors likely go unnoticed and uncorrected.

### ***Single-Family Residential Water Bills Fluctuated in CY 2017***

Customer complaints about increases in water bills garnered public attention in January 2018. In news reports, customers complained of high water bills, with some customer charges exceeding \$1,000 and other charges more than doubling average costs.

To understand the magnitude of the billing increases, we analyzed CY 2017 single-family residence bills. Specifically, we identified customer accounts that more than doubled their water usage from the previous billing period and that doubled by at least 20 hundred cubic feet (HCF).<sup>6</sup>

As shown in **Exhibit 6**, we examined PUD's explanations for increased water bills, which provide some context for possible causes. There were multi-causal factors that contributed to bill increases, including an extended billing cycle and a water rate increase.

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<sup>6</sup> Our data is based on increases from the previous billing period, where a customer may have had unusually low water consumption in one month followed by slightly higher than normal consumption in the next. For example, a rainy billing period followed by a dry one could mean a customer used more water for landscaping during the dry billing period. Hundred Cubic Feet (HCF) is the unit of measurement for water consumption. To prevent including cases where changes were small in volume, we included a minimum bill-to-bill increased consumption of 20 hundred cubic feet (HCF), which is PUD's internal threshold per implausible review.

**Exhibit 6:**

**Review of the Public Utilities Department's Explanations for Increased Water Bills**

PUD's Explanation for Increased Water Bills	Auditor Observations	Conclusion
<b>Extended Billing Cycle – the Billing Period was extended from 60 to 70 days in November 2017</b>	<ul style="list-style-type: none"> <li>A review of sample data shows extended billing cycles between October and December 2017.</li> </ul>	<ul style="list-style-type: none"> <li>PUD prorated charges based on per day usage. By prorating, customers paid earlier for what they would have used in the next billing cycle.</li> <li>PUD did not communicate with customers in advance that an extended billing cycle was forthcoming.</li> <li>Discussed in <b>Questions 4 and 5</b> of the report.</li> </ul>
<b>Water Rate Increase Effective August 2017</b>	<ul style="list-style-type: none"> <li>Water rates did increase by 6.4 percent in July 2016 and by 6.4 percent in July 2017.<sup>7</sup></li> </ul>	<ul style="list-style-type: none"> <li>The rate increase resulted in higher dollar amounts in each usage tier.</li> <li>PUD did not communicate with customers in advance that a rate increase was forthcoming.</li> <li>Discussed in <b>Question 5</b> of the report.</li> </ul>
<b>Warmer Winter Months</b>	<ul style="list-style-type: none"> <li>Weather records show average temperatures were higher than normal between October 2017 and March 2018.</li> </ul>	<ul style="list-style-type: none"> <li>PUD's annual winter monitoring period falls between December and March.</li> <li>PUD uses the month in the monitoring period with the lowest water usage for its assessment of sewer charges.</li> </ul>
<b>Unidentified Water Leaks in Homes and Irrigation Systems</b>	<ul style="list-style-type: none"> <li>In March 2018, PUD implemented the use of new water meter testing equipment. According to an expert, the old testing equipment was obsolete and had inadequacies.</li> </ul>	<ul style="list-style-type: none"> <li>PUD publicly stated that it would refund customers who paid for tests dating back to July 1, 2017, and would also waive the meter controversy test fee moving forward. A date to resume the fee has not been determined.</li> </ul>
<b>Meter Reading Inconsistencies</b>	<ul style="list-style-type: none"> <li>One meter reader created approximately 330 billing corrections in December 2017.</li> <li>Human error was not specific to one meter reader.</li> </ul>	<ul style="list-style-type: none"> <li>Meter readers as a group had the highest correction rate and accounted for a large percentage of corrections after customers already received a bill.</li> <li>Discussed in <b>Question 3</b> of the report.</li> </ul>
<b>Installation of Smart Meters Not a Contributor of Bill Increases</b>	<ul style="list-style-type: none"> <li>PUD made pre-bill corrections for approximately 26 percent of AMI-Network readings flagged for review. The readings were corrected before customers received a bill.</li> <li>Identified three AMI meter models that generated a higher percentage of errors.</li> </ul>	<ul style="list-style-type: none"> <li>Errors related to new meter installs are common during smart meter installations.</li> <li>PUD should actively monitor and manage smart meter implementation to avoid billing errors.</li> <li>Discussed in <b>Question 3</b> of the report.</li> </ul>

Source: OCA generated based on our review.

<sup>7</sup> The City approved an increase of 6.4 percent for FY 2017. According to PUD, San Diego County Water Authority rates were approved late. This meant that the City could not calculate the increase in time to implement the rate increase on July 1, 2017. The delayed implementation resulted in the actual increase being 6.9 percent effective August 1, 2017.

*Field Investigations of 455 Meters with High Bills Did Not Reveal Additional Causes of Billing Errors*

To investigate whether any additional factors contributed to the billing increases, we randomly sampled and conducted field review of 455 meters that saw significant spikes in CY 2017. We investigated whether certain issues may have affected metering and billing, including whether the meter and register sizes matched, and whether the meter serial number and residence in PUD's billing system matched our observations in the field. Based on our observations, we did not find mismatched parts for the sites where we were able to document both the register and the meter size.<sup>8</sup> In instances where we found anomalous occurrences, we referred the accounts to PUD for follow-up.

*PUD Appears to Identify and Correct Most Meter Reading and Billing Errors, a Relatively Small Number of Errors Likely Go Unnoticed and Uncorrected*

We reviewed SAP Customer Care Solutions (CCS) service notes for the 455 meters in our sample. Our review found that there were multiple issues that contributed to bill increases, such as the extended billing cycle and spikes during the summer months. In some customer accounts, multiple issues occurred around a particular time period, such as a new meter install during the summer months, making it difficult to identify the main driver of the bill increase.

We also judgmentally selected a subset of approximately 40 bills in this sample and performed more extensive review in CCS and SWIM (PUD's prior database) to identify any other billing problems that may have occurred. While no systematic problems were revealed (other than those identified by PUD), we do note that it is extremely difficult to identify reading errors that occurred several months prior, and several of these spikes in usage appeared unusual.

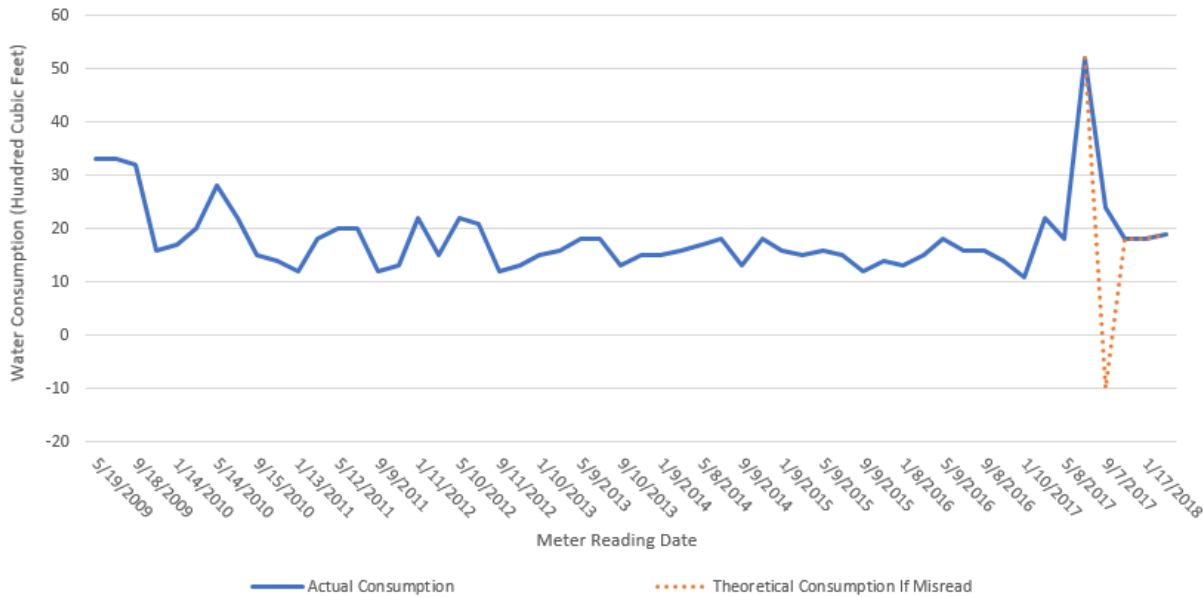
For example, **Exhibit 7** shows the water usage pattern for a home in Point Loma. In the billing period associated with the meter reading taken on September 7, 2017, PUD billed this customer for 52 HCF of water use—more than three times the home's typical use in the last five years. This represents an increase in use of over 25,000 gallons over the prior billing period. However, the billing is likely accurate due to the fact that the following water meter reading does not reflect a corresponding drop and negative consumption. As shown by the dotted line in **Exhibit 7** if the reading was incorrect it would have gone below zero on the following read indicating negative consumption.

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<sup>8</sup> In our sample of 455 sites, we were able to document meter and register sizes for 233 sites. For the remaining 222 sites, we could not record both the meter and register due to reasons such as the site being inaccessible and the register size not being visible. These observations are based on a snapshot in time and reflective of our observations during field review.

**Exhibit 7:**

**Water Consumption for a PUD Customer Shows a Spike in Water Usage in September 2017**



Source: OCA generated based on SAP Customer Care Services Data.

While PUD appears to catch and correct most billing errors, and this bill was most likely accurate, this usage spike was not flagged for further review by PUD’s quality assurance process, nor should it have been based on PUD’s internal review procedures.

If the September 7, 2017 meter reading had been inaccurate, the following reading would probably indicate negative consumption, because meters show cumulative use. As a result, it would be flagged by PUD’s internal review, corrected, and rebilled to correct the overbilling. This unfortunately would result in an initial incorrect bill if the customer did not call to notify PUD.

If the meter reader over-read the usage by a smaller amount, there would still be a corresponding dip in the following bill, but it may not be flagged by the process. The customer would pay for the same amount of water; however, more of their usage would be billed at a higher tier. These types of incorrect billings are not easily quantified and are difficult to identify as more time passes. However, once PUD performs a reconciliation of identified errors, customers pay for actual water used.

We found that PUD generally obtains accurate meter reads and bills customers correctly, with some exceptions in a small proportion of billings. For example, some bills are corrected and rebilled after customers have already received an incorrect bill. Since these bills are corrected after customers receive the bills, it is highly likely that PUD is notified of these instances via customer complaints. When reviewing corrected bills, we found that human error and meter read estimates were the leading causes of billing errors.

Given that some increased bills may go undetected in PUD's review process, and that human error and estimating meter reads are contributors to billing increases, it is imperative for PUD to ensure the accuracy of the initial read and to identify and correct billing errors through a robust quality review process. We discuss our findings in greater detail in subsequent sections of this report.

## ***Question 2: How Often Are Meter Reads Inaccurate?***

Obtaining accurate meter readings is a critical first step in Public Utilities Department's (PUD) revenue collection process. Meter reading errors are caused by a variety of factors and can lead to incorrect bills, delayed bills, and/or customer dissatisfaction. Minimizing meter reading errors and implementing a well-designed quality assurance process to identify and correct inaccurate readings are both essential to ensure PUD bills customers correctly.

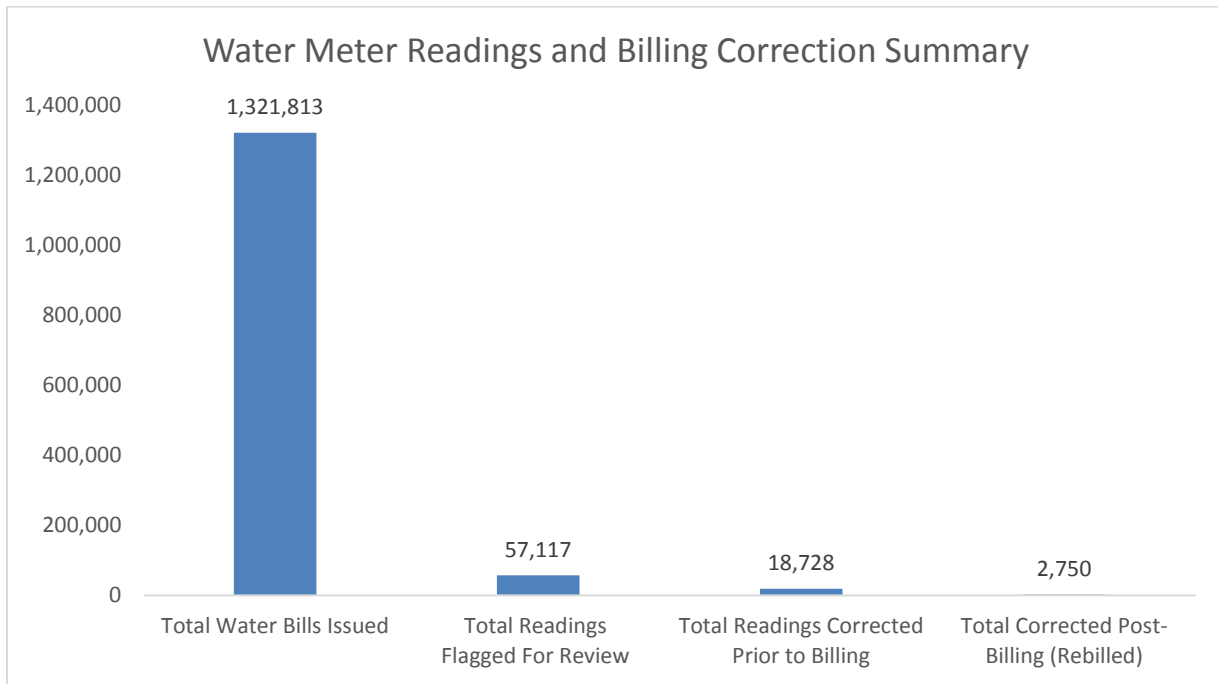
### *Most Single-Family Residential Water Bills are Accurate*

We found that generally PUD obtains accurate meter readings and bills customers correctly. However, there are exceptions for a small proportion of customer billings. For example, some bills are corrected after PUD misbills the customer; these errors may be identified because of a customer complaint.

Based on our review of single-family residential customer billings in calendar year (CY) 2017, PUD read 1.3 million meters and issued a corresponding number of water bills. As shown in Exhibit 8, our analysis found that PUD's quality assurance process flagged 57,117 potential anomalous meter readings (4.3 percent) for additional review and that PUD adjusted 18,728 meter reads (1.4 percent) prior to sending them to customers, while the remaining 2,750 bills (less than 1 percent) were adjusted after customers received an incorrect bill.

**Exhibit 8:**

**In CY 2017, PUD Corrected 2,750 Water Bills of 1.3 Million Bills Issued**



Source: OCA generated based on CY 2017 SAP Customer Support Solutions (CCS) data.

While 2,750 rebills out of 1.3 million is a very low percentage (equivalent to approximately 1 in every 500), incorrect bills, when they do occur, can cause a significant increase in the expected bill payment. For example, as shown in **Exhibit 9**, if a single-family residential customer uses on average about 18 hundred cubic feet (HCF) of water per billing period, the water charges and fees portion of the bill (not including sewer charges and fees), would be approximately \$141.

**Exhibit 9:**

**Example of Single-Family Customer Bill if Average Water Use Per Billing Period is 18 Hundred Cubic Feet**

Correct Read:	18		
<b>Billing Category</b>	<b>Rate</b>	<b>HCF - Correct Read</b>	<b>Amount - Correct Read</b>
Base Water Fee	\$48.44	N/A	\$48.44
0-8 HCF	\$4.84	8	\$38.74
9-24 HCF	\$5.42	10	\$54.23
25-36 HCF	\$7.75	0	
37+	\$10.90	0	
<b>TOTAL</b>		<b>18</b>	<b>\$141.41</b>

Note: For illustration purposes, we used two decimal places for the rate amount whereas the system generates three

Source: OCA generated based on review of billing structure.



However, as shown in **Exhibit 10**, if the same customer’s usage was incorrectly captured, the increase to the water portion of the bill can significantly increase. In **Exhibit 10**, for illustration purposes, we used the CY 2017 median error correction of 31 HCF. If this customer was overbilled by 31 HCF, this would show water use of 49 HCF, resulting in a bill of \$408.56. The customer would have been overbilled by approximately \$267.

**Exhibit 10:**

**Example of Single-Family Customer Bill if Water Usage is Incorrectly Captured Using the Median Error Correction of 31 HCF**

Incorrect Read	49		
<b>Billing Category</b>	<b>Rate</b>	<b>HCF - High Read</b>	<b>Amount - High Read</b>
Base Water Fee	\$48.44	N/A	\$48.44
0–8 HCF	\$4.84	8	\$38.74
9–24 HCF	\$5.42	16	\$86.77
25–36 HCF	\$7.75	12	\$92.98
37+	\$10.90	13	\$141.64
<b>TOTAL</b>		<b>49</b>	<b>\$408.56</b>

*Note: For illustration purposes, we used two decimal places for the rate amount whereas the system generates three*

Source: OCA generated based on review of billing structure.

*Meter Readers May Have Circumvented Controls in Handheld Devices that Detect Out-of-Range Readings*

We found that errors may have occurred in 2017 as a result of meter readers bypassing preventative controls when entering an out-of-range meter reading. Specifically, handheld devices are programmed to alert meter readers when they enter a reading that falls outside of a pre-determined range of expected water consumption. The device is supposed to lock after three unsuccessful attempts to enter different meter read values, which would then require a supervisor to unlock the device. We learned through interviews with meter reader staff that there appear to be methods to bypass the device lockout control.

In response to a complaint regarding a cluster of high water bills from December 2017, PUD conducted an investigation and determined that a meter reader entered false meter read data, which increased the number of misbilled customers during that period. Of the approximately 2,750 bills that were reissued in 2017, of which 625 were by this meter reader, with 366 of those in the month of December 2017 alone. Based on our interviews with meter readers and meter reader supervisors, we found that meter readers were aware of ways to circumvent the controls to prevent errors. So, while PUD only identified one meter reader, the controls may have been circumvented by other meter readers as well.

*PUD Did Not Consistently Monitor Quality Assurance Controls*

PUD did not have any mechanisms in place to monitor when supervisor codes were used to circumvent controls in the handheld devices. According to PUD—to address internal control

weaknesses around the use of supervisor codes—in situations where a meter reader's handheld device needs to be unlocked, a supervisor may be sent out to the field to enter the unlock code. In unusual circumstances in which a supervisor must share the code with an employee instead of going into the field, the supervisor is required to notify their chain-of-command and ensure the code is changed within 24 hours. This information is to be captured in a data log that includes the date, time, location, names of employees, and the supervisor unlocking the device. Also, PUD now requires that the supervisor codes be changed every 30 days.

To test this internal control, we requested a copy of the April 2018 supervisor log. PUD did not provide the log because it could not find it. We then inquired about the March 2018 log and PUD stated that supervisor activities for March 2018 were not available because the log was cumulative—one document for all months. In addition, the log was not stored in a secure location. We also found that the Information Systems Analyst changes the passwords, but not at the same time each month per the directive. There were a few requests from supervisors to change the codes after use in the field. However, the supervisor's log could not be located and we could not verify that the code was changed every time it was used. These internal control weaknesses create risks that hinder PUD's ability to safeguard records and monitor whether supervisors are using their codes appropriately. For example, if meter readers have access to the unlock code in the field they would be able to enter multiple incorrect reads that could result in incorrect billings.

According to PUD, to address these identified weaknesses, it will require supervisors to maintain monthly logs which will be securely stored. PUD stated that the logs will be reviewed and approved monthly by the Program Manager and Deputy Director. PUD also stated that during the review, the Program Manager will conduct a quality control assessment.

When meter readers circumvent controls in the handheld devices, PUD relies on the implausible review process to catch any associated errors. Although the implausible review process catches most incorrect meter reads, a small portion of customers still receive incorrect bills. PUD does not evaluate the number of implausible readings created and changed. Moreover, PUD does not communicate the reasons for bill corrections with customers. We describe PUD's communication issues in greater detail in **Question 5** of this report.

*Internal Controls Guidance Requires Periodic Evaluation of Operational Activities to Assess Whether Controls on Bill Accuracy are Working*

A review of the American Institute of Certified Public Accountants (AICPAs) auditing standards and the 2015 Internal Control Guidelines for California Local Agencies, published by the California State Controller's Office (State Controller's Guidelines), suggests that management should continuously monitor operational activities over time to assess the effectiveness of existing internal controls and take remedial actions when necessary. Ongoing monitoring activities, such as PUD's implausible review process, are often built into normal recurring activities and include regular management and supervisory activities. These can include identifying and reviewing performance metrics that assess key controls.

According to the State Controller's Guidelines, an example of government monitoring is when local governments respond to information from customers about the accuracy of utility billings in order to give the local government information about the quality of internal controls associated with the utility billing system. Overall, the internal controls should, at minimum, ensure that customers receive accurate and timely utility bills.

*Customers May Receive Incorrect Bills When Quality Assurance Procedures Fail*

Customers who are billed inaccurately are inconvenienced in terms of time and money. For example, customers must wait for bill credits when applicable or must take time out of their schedule to call PUD's Customer Service Division and seek resolution for a disputed bill.

Throughout a portion of fiscal year (FY) 2018, PUD's customer service lines were heavily impacted by customer calls resulting in higher call volume and a higher number of customers terminating calls before connecting with a representative. This situation, in turn, made it less likely for some customers to learn why their bill had increased and may have damaged the public's trust in PUD to competently bill its customers.

**Recommendation #1**

The Public Utilities Department (PUD) should monitor the use of supervisor codes to prohibit the circumvention of controls in handheld devices that detect out-of-range meter readings. Specifically, PUD should develop and enforce a policy that:

- a) Specifies the mechanism for monthly documentation of supervisor requests to change codes and safeguard the logs for use by authorized personnel;
- b) Requires the supervisors to complete the log whenever a code is used in the field;
- c) Specifies a consistent timeframe for the monthly change of passwords by the Information Systems Analyst; and
- d) Requires the monthly review and quality control check of the monthly logs by the Program Manager and Deputy Director. (Priority 2)

## Recommendation #2

The Public Utilities Department (PUD) should periodically assess the strength and effectiveness of their billing control environment. Specifically, to determine the effectiveness of current controls at a macro level, PUD should, at least twice a year, evaluate the number of implausible readings created and changed, in addition to the number of customers rebilled and the number of customer complaints. PUD could then assess if these numbers are high, identify causes, and adjust controls to address root causes, such as poor meter reader performance. Additionally, PUD should:

- a) Post these metrics and the results of its assessment on its public website as soon as they become available, along with any actions taken to improve the control environment;
- b) Add key performance indicators relating to billing accuracy to its annual budget; and
- c) Report the results of this assessment and billing accuracy performance in its annual budget and to relevant committees and oversight bodies. (Priority 2)

### ***Question 3: What Factors Potentially Cause Inaccurate Meter Readings?***

As discussed earlier, the percentage of inaccurate readings that pass through the Public Utilities Department (PUD) billing system is low. During our review, we examined potential causes for inaccurate meter readings during calendar year (CY) 2017 and found that human error and estimations caused the highest number of inaccurate readings. According to PUD, one meter reader intentionally entered incorrect meter readings, and they believe that other meter reader errors were inadvertent and unintentional. However, we found that human error, whether intentional or not, was not isolated to one specific individual. In CY 2017, we found that ten meter readers accounted for over half of readings corrected before billing and 71 percent of rebillings for that year. **Pages 25–29** detail the causes of inaccurate bills related to human error. **Pages 30–34** detail how estimated readings cause inaccurate bills.

#### *PUD Adjusted Meter Readings Due to Several Factors*

PUD’s internal control processes reduce meter misreads through preventive controls embedded in the meter readers’ handheld devices. These controls are designed to catch errors when meter readers enter readings into the system. PUD also uses detective controls in its implausible review process to catch errors as well. These controls are designed to flag anomalous readings that may have passed the screenings in the handheld device. Both sets of controls work in tandem to lessen the number of incorrect bills issued to customers. Even with these controls in place, however, a customer may still receive an incorrect bill that is later adjusted and rebilled. In CY 2017, PUD corrected approximately 2,750 single-family residential bills.

As shown in **Exhibit 11**, in-person and system estimated readings together made up over 98 percent of the readings flagged for review. Meters read remotely by the Advanced Metering Infrastructure (AMI) network accounted for approximately 2 percent of the readings flagged as implausible for additional review in 2017. Readings flagged for review are not always indicative of an error; instead, they indicate that water usage may be outside the range of historical and/or expected usage.

#### ***Exhibit 11:***

#### **In-Person Readings Generated Most Implausible Reviews in CY 2017**

Original Meter Reading Type	Number of Readings Flagged as Implausible	Percent of Total Readings Flagged Implausible
In-Person Read	52,039	91%
System Estimated	4,139	7%
AMI Network Read	894	2%
AMI Radio Read	45	<1%
<b>Total Implausible Readings</b>	<b>57,117</b>	

Source: OCA generated based on analysis of PUD Quality Assurance Implausible Meter Reading Reports.

*AMI Network Meters and Newly Installed Meters Did Not Appear to Significantly Impact the Accuracy of Customer Water Billing for Single-Family Residential Accounts*

Meters read automatically over the AMI network accounted for a small number of reading adjustments. PUD made pre-bill corrections for approximately 26 percent of AMI network reads flagged for review, which is equal to the average correction rate of reads flagged for review. However, none of the AMI readings, including those flagged for review, resulted in a rebilling. This indicates that PUD corrected these read errors prior to customers receiving a bill. Additionally, 4,500 of the approximately 31,000 new meters that PUD installed in CY 2017 were flagged for review during the first reading after installation. However, only 89 of these readings required adjustments.

As a result, we conclude that the meters read automatically over the AMI network and the newly installed meters in CY 2017 did not significantly impact the accuracy of customer water billing. We did find that three meter models caused a disproportionate amount of AMI network read errors. PUD stated the errors were related to known causes, such as the meter transmitting the wrong number of digits to the system. However, PUD stated that it has identified the issue, sent staff out to reprogram meter components, and corrected these readings prior to billing. We should note that similar issues will likely continue as PUD moves forward with implementation of its AMI program. To that end, PUD should ensure that these issues are continuously monitored and quickly resolved to reduce billing impacts to customers.

*Human Error Was Not an Isolated Event Specific to One Meter Reader*

PUD stated that one meter reader contributed to the bill increases that resulted from human error. To test this assertion, for CY 2017, we looked at the total number of corrected bills relative to the total number of readings flagged for review for each meter reader.

Although the percentage of corrected readings for the identified meter reader (OCA Reference 34) was the highest, the ten meter readers with the highest number of corrections account for the majority of bills (1,966 of 2,750) that PUD had to correct after customers received their bill (rebill). **Exhibit 12** provides a breakdown.

**Exhibit 12:**

**In CY 2017, 10 Meter Readers had the Highest Correction Rate and Accounted for Most Rebills**

Count	OCA Reference	Total Meters Read	Flagged for Review	Total Readings Corrected	Corrected Before Billing	Corrected After Billing (Rebill)	Percent Corrected
1	34	63,802	3,263	2,686	2,061	625	4.21%
2	30	69,666	2,991	1,714	1,346	368	2.46%
3	32	79,319	3,435	1,442	1,216	226	1.82%
4	5	71,321	3,429	1,399	1,265	134	1.96%
5	28	76,100	3,287	1,316	1,140	176	1.73%
6	36	53,226	2,162	1,113	939	174	2.09%
7	17	56,869	2,803	1,073	904	169	1.89%
8	10	22,396	1,277	506	460	46	2.26%
9	13	13,295	817	278	253	25	2.09%
10	1	4,496	196	121	98	23	2.69%

Source: OCA generated based on CY 2017 data from SAP-Customer Care Solutions (CCS).

Further, **Exhibit 13** shows that, while these meter readers account for only 39 percent of all meters read, they created 52 percent of the readings requiring corrections before billing and 71 percent of rebillings.

**Exhibit 13:**

**High-Error Meter Readers Compared to Others**

	Meters Read	Flagged for Review	Readings Corrected	Corrected Before Billing	Corrected After Billing (Rebill)
<b>10 Highest-Error Reader Totals</b>	510,490	23,660	11,648	9,682	1,966
<b>Population Totals</b>	1,321,813	57,117	21,478	18,728	2,750
<b>High-Error Reader Percentages:</b>	39%	41%	54%	52%	71%

Source: OCA generated based on CY 2017 data from SAP Customer Care Solutions (CCS).

*Meter Reader Performance Problems Were Identified 15 Years Ago*

PUD's management oversight of meter readers has been an issue in previous years. In 2003, a confidential audit report of meter reader performance documented falsified overtime payments totaling \$15,500 for work performed in a 97-day period where no corresponding meter reading activity was recorded. During a 10-month review period, the audit found that meter readers

documented performing work on Saturday and Sunday, but the meter reading data had actually been recorded during the week. Fifteen meter readers were found to have submitted fraudulent time cards, mileage cards, and overtime authorization reports, which had all been approved by the supervisor.

The 2003 audit also found that meter readers were able to read two routes in an average of 8 hours and 12 minutes but had received pay for 8 hours of regular pay and 8 hours of overtime pay. Each meter reading route was to be paid for a full 8 hours. The meter readers in the 2003 report appeared to have taken advantage of an incentive program with unclear guidelines regarding overtime pay. According to PUD, the incentive program was discontinued after the audit. In addition, the 2003 audit found that meter readers appeared to have been using each other's identification numbers when reading routes that were assigned to another employee. This appears to be an internal control weakness that prevented management from providing meaningful oversight of employee performance.

The audit recommended that management take the appropriate corrective action with respect to the identified employees and the supervisor who approved the falsified documents. The supervisor in question is no longer employed by the City, but there are at least two meter readers identified in the 2003 audit report who were still employed by the City reading meters as of CY 2017.

One meter reader identification number that was assigned to an employee identified in the 2003 report was used extensively in CY 2017. However, the employee in question did not work for the City in 2017. This indicates that one or more meter readers used a unique identification number that was not assigned to them. The improper use of another meter reader's identification number was identified as a problem in the 2003 report, and we identified the same practice in CY 2017. According to PUD, upon further review, PUD determined that there was a transposition error when the meter reader entered a similar identification number. PUD has stated that they will work with the handheld vendor to discuss the addition of meter reader passwords. However, the meter reader was still able to use an identification number that was not assigned to them. Using a different meter reader's identification number prevents a meaningful evaluation of an individual's performance and complicates disciplinary investigations. We found no written PUD policy requiring meter readers to only use the unique identification number assigned to them.

*Meter Reader Errors Can Directly Impact Customer Bills and Can Lead to Over- or Under-Billing and Customer Complaints*

Meter reading is the critical first step in the utility revenue collection process. Errors or delays in the meter reading process delays billing or cause a bill to be estimated—both of which negatively impact customer satisfaction.

According to the Ascent Group, the best performing companies clearly and concisely measure and report employee performance. These companies review organization, work tasks, route standards, and systems periodically to identify opportunities for improvement. To improve



performance, the Ascent Group states that companies should measure and track individual employee and department-wide measures.<sup>9</sup>

*Errors Should Be Reduced to a Minimum Through Process Improvements that Reduce Reliance on Quality Assurance Modifications*

With over 281,000 water meters divided into 637 meter reading routes, it is critical for PUD to analyze performance to maximize employee efficiency and accuracy. According to the Ascent Group, most utilities (water, gas, and electric) use three popular performance measures to individually evaluate meter readers:

- Completion rate (i.e., the number of meters read per assigned route);
- Read accuracy (i.e., the error rate); and
- Read time (i.e., the number of hours spent on the meter reading route excluding breaks, lunch, and travel time).

Other measures cited include customer complaints, attendance, amount of other work assigned, and conduct. The Ascent Group also notes that from a department perspective, companies emphasize read rate and accuracy, with additional focus on cost, safety, estimated reads, theft, and time to read.

*PUD Management Does Not Sufficiently Evaluate Employee Performance*

PUD does not have metrics for evaluating meter reader performance and does not capture performance data in a central database. Although our review of employee performance evaluations showed that some meter readers were advised by their supervisors to reduce the number of skipped and missed meter reads, PUD does not capture this information on an aggregate scale. As such, it does not evaluate certain aspects of meter readers' collective performance, such as read time, accuracy, or completion rate.

PUD does not have performance metrics for meter readers, and management and supervisors disagree about how to evaluate performance and how to assign meter reader routes. Interviews with PUD indicated that differences of opinion included whether management should:

- Assign meters readers a regular route or rotate them;
- Keep existing route lengths or split routes into smaller groups;
- Evaluate meter readers based on read time; and
- Make overtime available for route scheduling when necessary.

Management and supervisors also disagreed on how to best maximize existing staff given that vacancies limited staff capacity. For example, aside from meter reading, meter readers assist with AMI implementation. However, due to recent public concern regarding increased water bills,

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<sup>9</sup> *Meter Reading Profiles and Best Practices*, published by the Ascent Group, Inc. in December 2016.

management has increased meter readers' responsibility by promising to re-read all meters by April 2018. Additionally, PUD management required meter readers to leave door hangers that inform customers when meter readers visited the premises. This added more time and walking to meter readers' existing routes.

By not evaluating meter reader performance, PUD cannot sufficiently manage staff capacity and consistently ensure accurate meter reads, which can lead to meter reading errors and customer complaints.

### **Recommendation #3**

The Public Utilities Department (PUD) should develop, track, and analyze employee performance metrics to increase the effectiveness of the meter reading program and reduce potential billing errors before they impact customers. Specifically, PUD should annually:

- a) Develop performance metrics based on the time taken to complete each route and the average number of errors and estimations for that route;
- b) Identify methods to reduce the number of errors and skipped readings per route;
- c) Track specific meter reader performance against route averages and incorporate this into annual performance evaluations;
- d) Define acceptable boundaries of performance for each route and adjust them as necessary; and
- e) Track metrics for each route over time, such as route difficulty, ease of meter access, which routes take longer, why they take longer, etc., and adjust as necessary for maximum efficiency. (Priority 2)

### **Recommendation #4**

The Public Utilities Department (PUD) should re-evaluate its meter reading routes based on the metrics identified in Recommendation 3 and determine if routes should be split, assigned to specific meter readers, or reallocated based on more or less time needed. (Priority 2)

### **Recommendation #5**

The Public Utilities Department (PUD) should develop a written policy requiring meter readers to exclusively use the meter reader identification number assigned to them. (Priority 2)

*Meter Readers Inconsistently Enter Trouble Codes Which Leads to Unresolved Meter Issues that Prohibit Actual Meter Reads*

As discussed in the previous section, human error is one major contributor to implausible reads. However, we found that consecutive estimated reads are a second contributor to a high volume of implausible reads. When meter readers skip reads, it can generate an estimated read in the system. The system is designed to flag accounts for review after three consecutive estimated readings.

Meter readers may skip reads for a variety of reasons, including: broken meter, obstructed meter (e.g., covered by a car), or inability to physically locate the meter. In fact, our review confirmed these issues in the field. We inspected a sample of 455 water meters throughout the City but were unable to record a meter reading for approximately 20 percent of the sample for reasons listed in **Exhibit 14**.

**Exhibit 14:**

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**The Office of the City Auditor Could Not Record Readings for Approximately 20 Percent of Sample Water Meters**

Meter Issue	Count
Could Not Locate	18
Inaccessible	36
Obstructed	4
Physical Meter Issues (e.g., Scratched, Foggy, In Water)	27
Other (No Meter, Could Not Remove Lid, Construction)	6
<b>Total</b>	<b>91</b>

*Note: These observations are based on a snapshot in time and reflective of our observations during field review.*

Source: OCA generated based on a field review of 455 water meters throughout the City of San Diego.

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*City Standards State that Meter Readers Can Enter Trouble Codes for Broken or Tampered with Meters*

When meter readers enter the skip code into their handheld device, they can also enter a trouble code which can prompt the generation of a work order to address the identified problem. PUD management has stated that meter readers have been verbally instructed to enter both skip codes and trouble codes into their handheld device when a meter needs to be replaced. For example, if a meter reader enters a skip code for “improper install,” based on management’s direction, they should also enter the trouble code “improper install” which would generate a work order and initiate the meter repair process. In another example, if a meter reader enters a skip code for “register or meter damaged,” they should also enter a trouble code for “replace meter.” However, in our review of meter reading data for CY 2017, we found that meter readers did not enter a trouble code for at least 80 percent of skip codes that should generate a work order.

Moreover, as shown in **Exhibit 15**, we found repeat entries of the “replace meter” trouble code, indicating that meters remain broken for multiple billing cycles. As a result, affected customers

cannot receive an accurate reading of their water usage; instead when reads are not available, PUD estimates the read.

***Exhibit 15:***

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**Multiple Trouble Code Entries for Meter Replacement Indicate Meter Issues Remain Unresolved for Multiple Billing Cycles**

Number of Unique Accounts with Trouble Code Entry of “Replace Meter” for Skip Code “Register or Meter Damaged”	
1 Entry	354
2 Entries	210
3 Entries	170
4 Entries	119
5 Entries	68
6 Entries	33
7 Entries	2
<b>Total</b>	<b>956</b>

Source: OCA generated based on CY 2017 MVRs Skipped Reads Report.

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***Meter Readers Received Conflicting Instructions Regarding Use of Trouble Codes***

Based on our conversations with PUD’s Meter Reading and Field Investigations Unit staff, there has been mixed messaging regarding the use of trouble codes. On the one hand, management advised meter readers to not enter trouble codes due to a backlog of duplicate service requests at the Meter Shop. On the other hand, management within the unit expected meter readers to identify malfunctioning meters by entering a trouble code when appropriate; this would allow malfunctioning meters to be replaced by the Meter Shop.

Furthermore, management indicated that unit management and supervisors disagree on the use of performance metrics to evaluate skipped and missed reads; management supports the use of misread and skipped read reports as part of the meter readers’ performance evaluation, but said supervisors do not. As a result, meter readers continue to operate under conflicting internal directives.

***Supervisor Review Form Does Not Include Information for Assessing Trouble Code Entry***

PUD told us that beginning in February 2018, it requires supervisors to review and sign-off on daily reading reports as an oversight measure for meter reader accuracy. As shown in **Exhibit 16**, the supervisor review form includes several fields for assessing meter reading performance. However, the form does not include the supervisor’s review to ensure that meter readers enter trouble codes when meters are damaged, unreadable, or otherwise need to be replaced. Therefore, this review does not adequately address the risk that a meter reader does not enter a trouble code when skipping a meter. Generally, without the trouble code entry, a work order would not be generated, and the problem regarding the meter would potentially not be addressed.

**Exhibit 16:**

**The Supervisor Review Form Does Not Include Information on Trouble Code Entries**

Date of Supv. Review: 4/30/2018  
 Date of Meter Read: 4/28/2018  
 DETERE Report Number: 175

Employee Name	Meter Reader ID	Route #	Route Completed	Route begun within 30 min of start time	Audit Counts Reviewed	reads/skips entered after leaving area	duplicate reads noticed	# of Skipped Reads	Comments	
[REDACTED]	[REDACTED]	Out								
		460	Yes	7:35	Yes	No	Yes	0		
		Out								
		Out								
		670	Yes	7:34	Yes	No	Yes	2		
		413	Yes	7:03	Yes	No	Yes	1		
		Out								
		Out								
		673	Yes	7:33	Yes	No	Yes	2		
		668	Yes	7:13	Yes	No	Yes	0		
		675	Yes	7:26	Yes	No	No	0		

First Line Supervisor Signature

Second Line Supervisor Signature

[REDACTED SIGNATURE] 4/30/18  
 [REDACTED SIGNATURE] 5/2/18

Source: The Public Utilities Department.

We found discrepancies during our limited review of the accuracy and completeness of the supervisor review forms for the data listed in **Exhibit 16**. For instance, we found meter reading data for five meter readers that were not included on a supervisor's review form. We also found that 4 of the 18 routes that were read on the date in question, Saturday, April 28, 2018, were missing (either entirely or in part) from the review. Those missing routes accounted for approximately 1,000 meter readings. Therefore, data from approximately 1,000 meter readings were not reviewed by the supervisor. We also found that one meter reader was listed on the form as both having completed a meter reading route and as being off that day. We confirmed that he did not work on the date in question, but the route was completed by two other meter readers, one of whom was not clearly identified on the form as having completed the route.

The data also showed that there were 67 instances in which meter readers entered three or more different readings for the same meter. This could indicate that meter readers are overriding the control in the handheld devices that should lock the system after three attempts to enter a different reading for the same meter. In our interviews with meter reader staff, we learned that meter readers may be aware of a way to circumvent the device lockout process.

*The Meter Shop is Encountering Unanticipated Obstacles with the Transition to the New Citywide IAM Work Order System*

We found that the recent implementation of the City's new Infrastructure Asset Management (IAM) database system potentially impacts customer billing. As previously explained, when meter readers skip a reading, PUD estimates the reading. Since consecutive estimated readings result in higher numbers of implausible reads and potentially inaccurate water bills, it is imperative for PUD to address broken meters immediately. However, we found that the City's new infrastructure management system, IAM San Diego, is delaying the processing of work orders to repair or replace broken meters for several reasons.

First, the rollout of IAM San Diego to PUD's Meter Shop was not well coordinated. During the transition period, PUD staff indicated there was a misunderstanding about whether work orders in SWIM (PUD's prior database) would be transferred to IAM San Diego. According to PUD, after subsequent meetings to resolve the misunderstanding, the work orders were transferred to IAM San Diego. These delayed work orders may have resulted in delayed repairs to water meters and therefore impacted customer bills. Furthermore, PUD indicated that staff are still learning how to use the system creating the potential for errors.

Second, manually creating work orders in IAM creates the potential for inaccurate bills. Meter Shop staff stated that work orders must be manually created and reviewed in IAM San Diego, even when meter readers generate a work order through their handheld devices. With a manual process, work orders may be delayed. Furthermore, once work orders are completed, only one supervisor is responsible for conducting quality assurance to ensure that the new meter was properly installed. As recently as March 2018, the Customer Service Division (CSD) observed that new meter installs were causing spikes in implausible reads. Without quality verification of proper installation, potential inaccurate water bills may result.

Lastly, limited full-time staff delay work order processing for meter replacement. The Meter Shop reported it is currently filling 22 full-time positions, mainly with existing hourly staff. Eventually, newly-hired employees will require AMI-specific and standard Citywide training, which will likely limit their ability to be immediately productive.

*Unreported Broken, Obstructed, or Tampered Meters Cannot be Corrected Resulting in Potentially Inaccurate Water Bills*

As discussed, we found that meter readers do not always enter trouble codes when they skip a meter read. This can lead to some meter issues such as a broken meter, obstructed meter, or otherwise unreadable meters to be skipped for up to three cycles. Entering trouble codes inconsistently, thus leaving some meter issues unresolved, can lead to billing estimates that may not reflect actual customer usage. Estimated bills may reflect higher-than-actual water usage, thus resulting in a higher water bill.

**Recommendation #6**

The Public Utilities Department's (PUD) Customer Support Division should identify all skip codes that require a trouble code entry and those that require immediate supervisory attention (such as locating meter). To that end, meter readers should enter a trouble code for every skip code that requires it. Also, PUD should update their Process Narrative (PN-0326) to align with revisions. (Priority 2)

**Recommendation #7**

The Public Utilities Department (PUD) should facilitate stronger coordination between the Customer Support Division and the Meter Shop to prioritize repairs and reduce the backlog of unrepaired meters that impact accurate and timely customer billing. Additionally, the Customer Support Division should communicate high priority trouble code entries to the Meter Shop to expedite critical maintenance. (Priority 2)

**Recommendation #8**

The Public Utilities Department's Customer Support Division (CSD) should strengthen its supervisory review of meter reader accuracy. Specifically, to facilitate a determination about whether skipping the meters was appropriate, and to facilitate remedial action for affected meters, CSD should revise the supervisor review form to include trouble code information in addition to skip code information. (Priority 2).

**Recommendation #9**

The Public Utilities Department's Customer Support Division (CSD) should review the discrepancies between the supervisor's review forms and the underlying data for a sample of dates, including April 28, 2018, and take appropriate corrective action with respect to the identified employees. (Priority 2).

### ***Question 4: Did Customers Pay More Due to the Extended Billing Cycle?***

Yes, because of the extra days in the billing cycle, customers averaged higher water use during the billing period. However, Public Utilities Department (PUD) prorated the charges based on per day use. By prorating the charges, customers paid earlier for what they would have used in the next billing cycle.<sup>10</sup>

As shown in the examples in **Appendix C and D**, by having their charges prorated, customers may have seen a higher amount of water billed in the more expensive tiers, but they also may have seen a higher amount of water billed in the lower, less expensive tiers as well. For the examples in **Appendix C and D**, the difference between the prorated bill and what the bill would have been if PUD had not prorated charges was less than a dollar (meaning the customer paid slightly less using the prorated method). However, that does not negate the fact that the extended billing cycle may have been costlier for some customers since water billed during the cycle was greater (due to more days of use in the cycle) than if the billing cycle had been shorter.

A typical billing cycle for PUD is approximately 60 days. According to PUD, it extended the billing cycle to 70 days for bills issued between October 2017 and December 2017 to coordinate maintenance work (such as replacing meters) in meter reading routes that are read in even or odd months.<sup>11</sup> According to PUD, this ensures maintenance and other construction work—such as meter and box replacement—does not conflict with the meter reading schedules or the meter readers themselves.

Additionally, PUD wanted to avoid meter replacement near the time of a scheduled reading to ensure the meter serial number and expected read match the meter in the ground at the time of the meter reading.

According to PUD, it does not intend to extend billing cycles in the future. Nevertheless, customers may have been able to plan for the added expense if PUD had communicated the anticipated billing cycle extension in prior correspondence to customers. We make a recommendation to PUD for improving customer notifications as it relates to bill-impacting activities in **Question 5** of this report.

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<sup>10</sup> Assumes the customer continued their normal usage (e.g., did not vacation, shut off water, etc.). It is also based on an analysis of how bills are calculated and the assumption that the meter reading is correct.

<sup>11</sup> Some customers experienced billing cycle extensions past 70 days.



***Question 5: Did PUD's Methods of Communication Exacerbate Public Discontent with the Increase in Water Bills?***

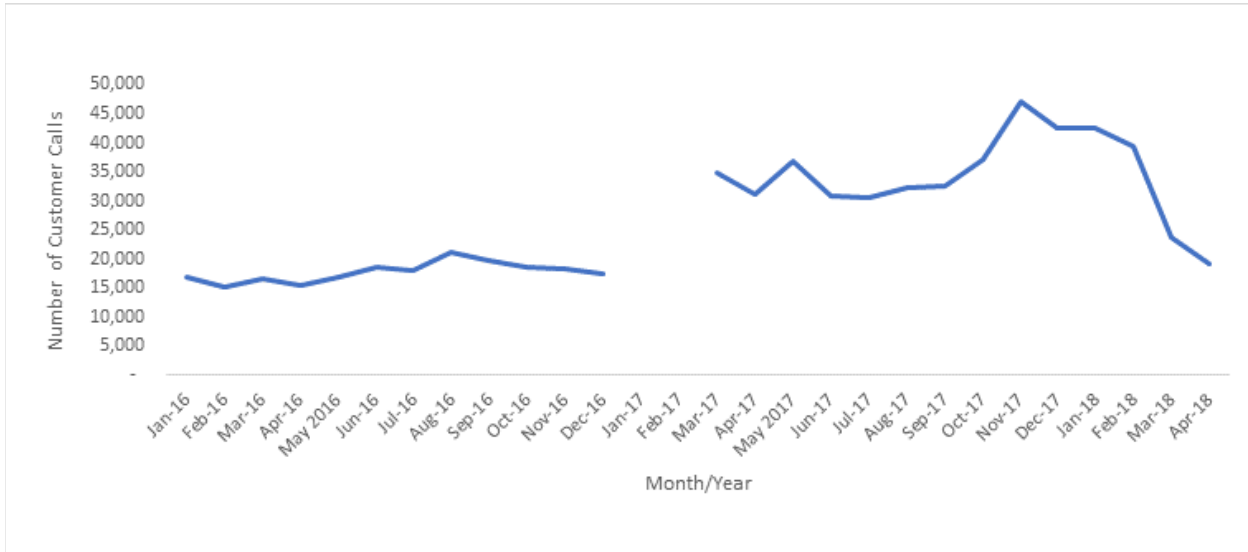
Yes, because increased communication with customers in advance of anticipated activities that might impact bill charges would have allowed customers to plan for bill increases and lessened some of the confusion regarding billing concerns. Moreover, timely access to customer service representatives with a customer-first approach could have also helped to mitigate public concerns. The City of San Diego's Strategic Plan cites a mission to effectively serve and support our communities. It states that the City's goal is to provide high quality public service through promoting a customer-focused culture that values accessible, consistent, and predictable delivery of services. During our review, we identified areas where PUD should improve its communications with customers to enhance customer satisfaction, increase transparency, and regain public trust.

***As More Calls Came into PUD's Call Center, More Customers Terminated Calls Before Issues Were Resolved***

PUD identifies errors via its implausible review process (before the customer receives the bill). In addition, PUD may also learn of incorrect billings from customers contacting the Customer Service Division's call center to dispute charges. In these cases, it is imperative for customers to reach a customer service representative in a timely manner for appropriate resolution. As shown in **Exhibit 17**, in reviewing call center data for the period between January 2016 and April 2018, we found that the call center experienced a higher volume of customer calls between November 2017 and February 2018 (the height of public attention on water billings).

**Exhibit 17:**

**The Public Utilities Department Experienced a Substantial Increase in Calls between November 2017 and February 2018—the Height of Public Attention on Water Billing**



*Note: January and February 2017 data was not available.*

Source: OCA generated based on Public Utilities Department Call Center data.

We also found that, when PUD experienced its largest increases in call volume, it had a higher than average percentage of abandoned calls from December 2017 to February 2018. PUD defines *abandoned* calls as calls that were terminated before being connected to an appropriate call center resource. Terminated calls may have resulted from wrong numbers, long wait times, etc. For December 2017, January 2018, and February 2018, the percentage of abandoned calls were 15 percent, 21 percent, and 23 percent, respectively.

To make matters worse, we heard anecdotal complaints expressing dissatisfaction about PUD’s customer service when customers did reach a representative. For example, customers stated:

- They were placed on hold;
- They received no resolution to their issue (e.g. because the supervisors were unavailable);
- They never received a call back; and
- They were given reasons that placed the blame on the customer, including that others may have used the property’s water without permission and unbeknownst to the owner.

We heard similar sentiments in some of our discussions with Councilmembers and/or their staff. Moreover, the complaints from the public were not always just in reference to customer service representatives, but to PUD management at large with the sentiment being that PUD should have taken ownership of the issue much sooner than it did.

According to PUD, between December 2017 and February 2018, it shifted staff from other units and doubled staffing in the call center to try and address the increase in calls. However, despite

PUD's efforts to provide more resources, due to the sheer volume of incoming calls, the increased staff capacity was still not enough. However, PUD staff stated that the addition of staff did lead to a reduction in call wait times starting in March 2018.

*PUD Has Opportunities to Communicate Bill-Impacting Activities in Advance*

According to the Government Accountability Office's (GAO) Standards for Internal Control in the Federal Government, open two-way communication between management and the public is necessary to exchange quality information to achieve the entity's objectives and address related risks. Moreover, according to the Government Finance Officers Association (GFOA), public participation can help governments be more accountable and responsive, and improve the public's perception of governmental performance and the value the public receives from the government.

Therefore, communication between PUD and its customers is essential for accountable and responsive service. We found areas where PUD can make improvements. Specifically, when PUD anticipates bill increases due to planned activities, notifying the customers in advance will allow customers time to make the appropriate budgetary adjustments for their households. For example, in FY 2018, PUD informed customers of a City Council approved rate increase on the same bill where the rate took effect, instead of providing prior notice on preceding bills.<sup>12</sup> We also saw that PUD did not provide advanced notice to customers regarding the anticipated extended billing cycle. Again, customers were notified that changes to the billing cycle may have impacted their bill on the same bill that included increased charges.

Furthermore, PUD can communicate ongoing internal activities associated with customers' accounts, including notifying customers when their bills are under review or delayed; when customers might receive multiple bills simultaneously; and when a bill dispute is resolved.

Lastly, listening to customer input from calls received through the call center can help PUD assess the quality of the processes it uses to ensure billing accuracy. However, without improvements in PUD's communications with its customers, customer frustration and dissatisfaction may continue.

While our office is scheduled to conduct a customer service audit in FY 2019, in this report, we make one customer service recommendation to improve PUD's communications with customers.

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<sup>12</sup> For FY 2019, another rate increase is scheduled to take effect July 2018. This will increase billing rates in water usage tiers. Yearly water rate increases are scheduled through FY 2020. See the Background page 2 for discussion.

**Recommendation #10**

To improve customer satisfaction, the Public Utilities Department (PUD) should communicate with customers *in advance of* anticipated bill-impacting activities. Specifically, PUD should

- a) Notify a customer when their meter reading is under review for a prolonged period that may impact their billing schedule or result in receiving multiple bills at the same time; and
- b) Inform customers of forthcoming changes or bill-impacting activities, such as rate increases or prolonged billing periods, with sufficient notice to prepare for the additional expenses. (Priority 2)

## Conclusion

A basic tenet of customer service is to accurately bill for goods and services purchased. More so in government, residents expect that water bills received are accurate and reflect actual water consumption. In late 2017, City of San Diego Public Utilities Department (PUD) customers started reporting higher than average water bills. In January 2018, news reports began covering stories of PUD water customers complaining of high water bills. Some PUD customer charges exceeded \$1,000 and other charges more than doubled average costs. The high water bills caused some residents to lose trust in PUD's ability to issue accurate water bills.

Based on our audit of water bills issued in calendar year (CY) 2017, we uncovered that by and large most water bills are accurate. PUD appears to identify and correct most meter reading and billing errors before customers receive a bill. However, in CY 2017, a small number of bills (2,750 of 1.3 million issued) were incorrect when customers received them. Moreover, a relatively small number of errors likely go unnoticed and uncorrected.

There were multi-causal factors that contributed to bill increases, including an extended billing cycle and a water rate increase. The percentage of inaccurate readings that pass through the PUD billing system is low. During our review, we examined potential causes for inaccurate meter readings during CY 2017 and found that human error and estimations caused the highest number of inaccurate readings. While according to PUD, one meter reader intentionally entered inaccurate meter readings, we found that human error was a factor for meter readers as a whole. Ten meter readers accounted for over half of the readings corrected before billings and 71 percent of rebillings for the year.

To regain the public trust, PUD executives will need to strengthen their oversight of the meter readers. Specifically, PUD needs to take steps to minimize meter reading errors. The lack of management oversight of meter readers has been an issue in previous years and currently continues. PUD should also implement a well-designed quality assurance process to identify and correct inaccurate readings and improve its communications with customers to enhance customer satisfaction.

# Recommendations

## Recommendation #1

The Public Utilities Department (PUD) should monitor the use of supervisor codes to prohibit the circumvention of controls in handheld devices that detect out-of-range meter readings. Specifically, PUD should develop and enforce a policy that:

- a) Specifies the mechanism for monthly documentation of supervisor requests to change codes and safeguard the logs for use by authorized personnel;
- b) Requires the supervisors to complete the log whenever a code is used in the field;
- c) Specifies a consistent timeframe for the monthly change of passwords by the Information Systems Analyst; and
- d) Requires the monthly review and quality control check of the monthly logs by the Program Manager and Deputy Director. (Priority 2)

## Recommendation #2

The Public Utilities Department (PUD) should periodically assess the strength and effectiveness of their billing control environment. Specifically, to determine the effectiveness of current controls at a macro level, PUD should at least twice a year evaluate the number of implausible readings created and changed, in addition to the number of customers rebilled and the number of customer complaints. PUD could then assess if these numbers are high, identify causes, and adjust controls to address root causes, such as poor meter reader performance. Additionally, PUD should:

- a) Post these metrics and the results of its assessment on its public website as soon as they become available, along with any actions taken to improve the control environment;
- b) Add key performance indicators relating to billing accuracy to its annual budget; and
- c) Report the results of this assessment and billing accuracy performance in its annual budget and to relevant committees and oversight bodies. (Priority 2)

## Recommendation #3

The Public Utilities Department (PUD) should develop, track, and analyze employee performance metrics to increase the effectiveness of the meter reading program and reduce potential billing errors before they impact customers. Specifically, PUD should annually:

- a) Develop performance metrics based on the time taken to complete each route and the average number of errors and estimations for that route;
- b) Identify methods to reduce the number of errors and skipped readings per route;
- c) Track specific meter reader performance against route averages and incorporate this into annual performance evaluations;

- d) Define acceptable boundaries of performance for each route and adjust them as necessary; and
- e) Track metrics for each route over time, such as route difficulty, ease of meter access, which routes take longer, why they take longer, etc. and adjust as necessary for maximum efficiency. (Priority 2)

**Recommendation #4**

The Public Utilities Department (PUD) should re-evaluate its meter reading routes based on the metrics identified in Recommendation 3 and determine if routes should be split, assigned to specific meter readers, or reallocated based on more or less time needed. (Priority 2)

**Recommendation #5**

The Public Utilities Department (PUD) should develop a written policy requiring meter readers to exclusively use the meter reader identification number assigned to them. (Priority 2)

**Recommendation #6**

The Public Utilities Department's (PUD) Customer Support Division should identify all skip codes that require a trouble code entry and those that require immediate supervisory attention (such as locating meter). To that end, meter readers should enter a trouble code for every skip code that requires it. Also, PUD should update their Process Narrative (PN-0326) to align with revisions. (Priority 2)

**Recommendation #7**

The Public Utilities Department (PUD) should facilitate stronger coordination between the Customer Support Division and the Meter Shop to prioritize repairs and reduce the backlog of unrepaired meters that impact accurate and timely customer billing. Additionally, the Customer Support Division should communicate high priority trouble code entries to the Meter Shop to expedite critical maintenance. (Priority 2)

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**Recommendation #9**

The Public Utilities Department's Customer Support Division (CSD) should review the discrepancies between the supervisor's review forms and the underlying data for a sample of dates, including April 28, 2018, and take appropriate corrective action with respect to the identified employees. (Priority 2).

**Recommendation #10**

To improve customer satisfaction, the Public Utilities Department (PUD) should communicate with customers *in advance of* anticipated bill-impacting activities. Specifically, PUD should:

- a) Notify a customer when their meter reading is under review for a prolonged period that may impact their billing schedule or result in receiving multiple bills at the same time.
- b) Inform customers of forthcoming changes or bill-impacting activities, such as rate increases or prolonged billing periods, with sufficient notice to prepare for the additional expenses. (Priority 2)



# Appendix A: Definition of Audit Recommendation Priorities

## DEFINITIONS OF PRIORITY 1, 2, AND 3 AUDIT RECOMMENDATIONS

The Office of the City Auditor maintains a priority classification scheme for audit recommendations based on the importance of each recommendation to the City, as described in the table below. While the City Auditor is responsible for providing a priority classification for recommendations, it is the City Administration’s responsibility to establish a target date to implement each recommendation taking into consideration its priority. The City Auditor requests that target dates be included in the Administration’s official response to the audit findings and recommendations.

Priority Class <sup>13</sup>	Description
1	Fraud or serious violations are being committed. Significant fiscal and/or equivalent non-fiscal losses are occurring. Costly and/or detrimental operational inefficiencies are taking place. A significant internal control weakness has been identified.
2	The potential for incurring significant fiscal and/or equivalent non-fiscal losses exists. The potential for costly and/or detrimental operational inefficiencies exists. The potential for strengthening or improving internal controls exists.
3	Operation or administrative process will be improved.

<sup>13</sup> The City Auditor is responsible for assigning audit recommendation priority class numbers. A recommendation which clearly fits the description for more than one priority class shall be assigned the higher priority.

# Appendix B: Objectives, Scope, and Methodology

## Objectives

As part of the Office of the City Auditor's FY 2018 Audit Work Plan, we commenced an audit of the Public Utilities Department's (PUD) Customer Support Division (CSD). The tentative objective of the audit was to determine the efficiency and effectiveness of the Customer Support Division call center—call wait times and customer service. However, in February 2018, we shifted the focus of our audit to customer billing in response to resident concerns and requests by Councilmember Bry and the Mayor concerning increased water bills despite customer efforts to conserve water and/or despite having consistent water usage patterns. Specifically, with a focus on single-family residential accounts, our new objectives were to:

- Assess whether PUD has internal control that detect errors in the billing system;
- Evaluate how the meter reading and meter install processes impact customer billing; and
- Evaluate if PUD's response to the Citywide billing issue was timely and appropriate.<sup>14</sup>

We addressed these objectives by answering the following five questions:

1. In CY 2017, what contributed to higher bills?
2. How often are meter reads inaccurate?
3. What factors potentially cause inaccurate meter readings?
4. Did customers pay more due to the extended billing cycle?
5. Did PUD's methods of communication exacerbate public discontent with the increase in water bills?

## Scope and Methodology

To assess the effectiveness of PUD's billing process controls, and their impact on meter reading accuracy, we reviewed data on single-family residential (SFR) routine meter reads for CY 2017. Due to the complexity of SAP's treatment of historical data, this required a custom data report prepared by the City's IT Department in coordination with PUD. PUD provided 2.3 million customer reading records from December 2016 through December 2017. From this data, we analyzed the SFR population from CY 2017, which constituted approximately 1.3 million of the 2.3 million records. This data included customer information, meter reader IDs, original read information, modified read information, and the system-generated implausible code, which flags meter readings based on specified criteria for further review by PUD. We further requested meter information, including size, model, and an indicator for meters identified by PUD as active AMI

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<sup>14</sup> In addition to this billing audit, our office is conducting subsequent audits on PUD operations including: 1) a review of Customer Service Operations; and 2) a review of the Advanced Metering Infrastructure (AMI) installation process. Moreover, an audit of PUD's meter boxes and lids replacement process is in progress.

meters, which we merged with the customer data report for our analysis. We then created an indicator to identify when new meters were installed by isolating and flagging changes in the meter IDs for SFRs from one bill to the next.

Using this data, we then analyzed factors that may have caused more implausible readings, meter read adjustments, and rebills, such as AMI network meters, newly installed meters, and individual meter readers.

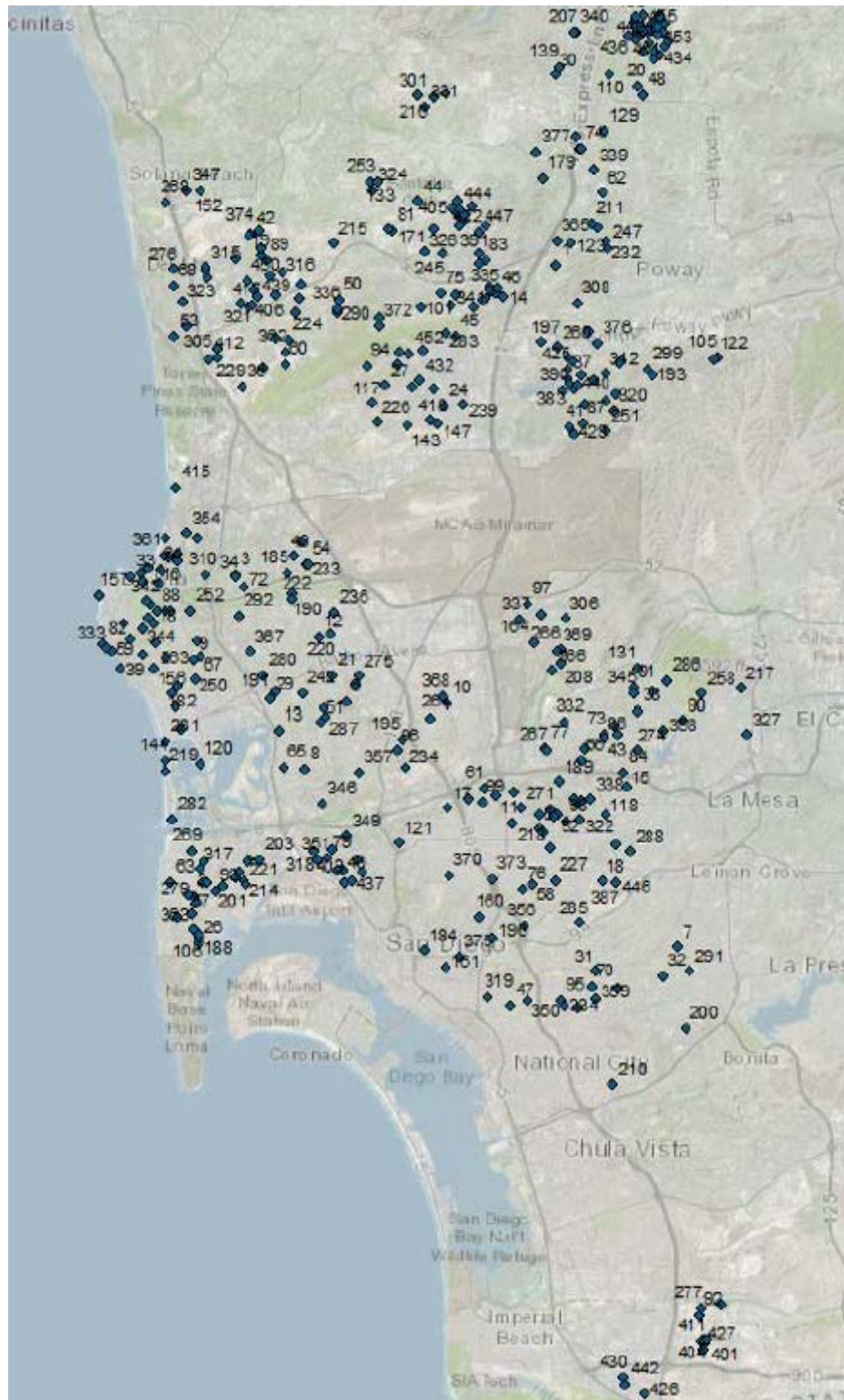
### *Meter Reading and Meter Install Processes*

To evaluate the meter reading and meter install processes, we reviewed PUD policies and procedures that included meter reading guidance, downloaded meter route information, and reported meter issues identified in the field. We reviewed daily read reports and supervisor review logs used by PUD to monitor meter reader productivity. We interviewed meter readers, meter reader supervisors, and management to understand how PUD assigns routes, the typical issues encountered on a route, protocols related to entering data into the handheld devices, and other operational issues. We also reviewed meter reading best practice guidance to identify strategies used within the industry to measure individual, team, and organizational performance. We reviewed PUD's personnel files to compare its performance standards against industry guidance.

Moreover, in April and May 2018, we conducted field reviews of 455 water meters throughout the City of San Diego. To create our sample, we leveraged PUD's CY 2017 Cost of Service Study, comprised of water billing data to San Diego residents consisting of approximately 1.3 million records. We isolated the single-family residents (SFR) customers with more than zero consumption from this population, and calculated the percent of change for each customer from one billing period to the next, isolating increases of 100 percent or more and at least 20 hundred cubic feet (HCF), resulting in a population of 21,115 observations of the original 1.3 million records. We randomly selected 455 meter reads from this population to conduct our quality assurance review. The map in **Exhibit 18** shows the geographic regions of our review.

**Exhibit 18:**

Sample of Residences Reviewed by the Office of the City Auditor



Source: OCA generated based on PUD Data.

During our field review, we recorded: 1) meter and register sizes; 2) serial numbers; 3) the existence of an encoder receiver transmitter (ERT) and antennas; 4) the meter vendor; 5) the reading on the meter; and 6) general observations about the conditions of the meters (e.g., scratched, foggy, in water, etc.). To inform customers that we visited their homes, we left a letter on the premises explaining the purpose of our visit and that the personal information associated with their account would remain confidential. The information collected allowed us to evaluate issues such as the compatibility of parts, whether customer information in the billing system was tied to the correct addresses in the field, and the conditions of the meters Citywide. We also reviewed SAP Customer Care Support (CCS) data to review customer usage history and service request notes. We interviewed management and staff within PUD's Meter Shop to understand how new meters are installed and how meter-related service requests are addressed.

#### *PUD's Response to Increased Customer Bills*

To evaluate PUD's response to the billing issue, we attended the February 2015 Mira Mesa Townhall meeting. In addition to the field reviews, we made home visits to a few customers and reviewed customer account inquiries that came to our office and forwarded those cases to PUD. We met with each Councilmember and/or their staff to understand the nature of the customer complaints received in each Council District. We interviewed PUD management and key City officials to get their perspective. We also reviewed PUD's correspondence section on customer bills to assess the timeliness of notifications to customers regarding bill-impacting activities such as the extended billing cycle and anticipated rate increases. We reviewed PUD's customer call center data to assess the volume of calls received and addressed. We also tested PUD's methodology used to prorate charges during the 70 day extended billing cycle.

#### **Internal Controls Statement**

To assess whether PUD has internal control controls that detect errors in the billing system, we reviewed and tested PUD's methodology for billing customers, including a review of the methodology used to calculate the fees and charges on customer bills related to the water usage tiers.

#### **Compliance Statement**

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 the audit objectives.

# Appendix C: Example of a Customer Bill if the Public Utilities Department (PUD) Had Not Prorated Charges to Account for the Extended Billing Cycle

## Hypothetical Example Bill: September 2017 to December 2017 Charges If PUD Had Not Prorated Charges

Days in Typical Billing Cycle:	60
Days in Extended Billing Cycle:	73
Average Hundred Cubic Feet (HCF) Used by Customer:	57 HCF
HCF Used During Extended Billing Cycle:	80 HCF

### Water Usage Calculation

Tier Level	HCF Breakpoints	Water Rate	Charges
1	8.00	4.842	\$ 38.74
2	16.00	5.423	\$ 86.77
3	12.00	7.748	\$ 92.98
4	44.00	10.895	\$ 479.38
<b>Total HCF</b>	<b>80.00</b>		<b>\$ 697.86</b>

### Total Bill Calculation

Single-Family Residential Base Fee:	\$ 48.44
Water Charges:	\$ 697.86
Sewer Base Fee:	\$ 30.66
Sewer Service Charge:	\$ 92.02
Storm Drain Fee:	\$ 2.31
<b>Total</b>	<b>\$ 871.29</b>

*Note: The number of extended days and the calculation of the charges and fees will vary by customer.*

Source: OCA generated based on a series of a customer's bills between April 2017 and December 2017.

# Appendix D: Example of Customer Bill Where the Public Utilities Department (PUD) Prorated the Charges to Account for the Extended Billing Cycle

**Example Bill: September 2017 to December 2017  
Actual Charges for this Customer Resulting from PUD Proration**

Days in Typical Billing Cycle: 60  
Days in Extended Billing Cycle: 73

Average HCF Used by Customer: 57 HCF  
HCF Used During Extended Billing Cycle: 80 HCF

**Water Usage Calculation**

Tier Level	HCF Breakpoints (Prorated)	Water Rate	Charges
1	9.73	4.842	\$ 47.13
2	19.47	5.423	\$ 105.57
3	14.60	7.748	\$ 113.12
4	36.20	10.895	\$ 394.40
<b>Total HCF</b>	<b>80.00</b>		<b>\$ 660.22</b>

**Total Bill Calculation**

Single-Family Residential Base Fee:	\$ 58.94
Water Charges:	\$ 660.22
Sewer Base Fee:	\$ 37.30
Sewer Service Charge:	\$ 111.96
Storm Drain Fee:	\$ 2.31
<b>Total</b>	<b>\$ 870.72</b>

Source: OCA generated based on a series of a customer's bills between April 2017 and December 2017.

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THE CITY OF SAN DIEGO

M E M O R A N D U M

DATE: July 26, 2018

TO: Eduardo Luna, City Auditor, Office of the City Auditor

FROM: Vic Bienes, Director, Public Utilities Department  
via Stacey LoMedico, Assistant Chief Operating Officer

SUBJECT: Management's Response to the Public Utilities Department's Water Billing Operations

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The purpose of this memorandum is to provide Management's responses to the recommendations contained in the Office of the City Auditor's Public Utilities Department's Water Billing Operations.

**RECOMMENDATION#1:** The Public Utilities Department (PUD) should monitor the use of supervisor codes to prohibit the circumvention of controls in handheld devices that detect out-of-range meter readings. Specifically, PUD should develop and enforce a policy that:

- a) Specifies the mechanism for monthly documentation of supervisor requests to change codes and safeguard the logs for use by authorized personnel;
- b) Requires the supervisors to complete the log whenever a code is used in the field;
- c) Specifies a consistent timeframe for the monthly change of passwords by the Information Systems Analyst; and
- d) Requires the monthly review and quality control check of the monthly logs by the Program Manager and Deputy Director. (Priority 2)

**MANAGEMENT RESPONSE:** Management agrees with the recommendation. PUD will create Standard Operating Procedures (SOPs), review with staff, monitor use and documentation, target implementation date August 2018.

**RECOMMENDATION#2:** The Public Utilities Department (PUD) should periodically assess the strength and effectiveness of their billing control environment. Specifically, to determine the effectiveness of current controls at a macro level, PUD should at least twice a year evaluate the number of implausible readings created and changed, in addition to the number of customers rebilled and the number of customer complaints. PUD could then assess if these numbers are high, identify causes, and adjust controls to address root causes, such as poor meter reader performance.

Additionally, PUD should:

- a) Post these metrics and the results of its assessment on its public website as soon as they become available, along with any actions taken to improve the control environment;



- b) Add key performance indicators relating to billing accuracy to its annual budget; and
- c) Report the results of this assessment and billing accuracy performance in its annual budget and to relevant committees and oversight bodies. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will:

- 1. Evaluate the number of implausibles, develop and implement the plan, target implementation date January 2019.
- 2. Develop and implement the plan to review the number of rebillings, target implementation date September 2018.
- 3. Develop a methodology to track customer complaints for record-keeping purposes, target implementation date October 2018.
- 4. Monthly reports will be generated and provided to City Council for their review, target implementation date September 2018.
- 5. Documented metrics will be posted on PUD's public website for transparency, target implementation date June 2019.
- 6. Add KPIs, target implementation date June 2019.
- 7. Report assessment and billing accuracy in the annual budget, target implementation date April 2019.

**RECOMMENDATION #3:** The Public Utilities Department (PUD) should develop, track, and analyze employee performance metrics to increase the effectiveness of the meter reading program and reduce potential billing errors before they impact customers. Specifically, PUD should annually:

- a) Develop performance metrics based on the time taken to complete each route and the average number of errors and estimations for that route;
- b) Identify methods to reduce the number of errors and skipped readings per route;
- c) Track specific meter reader performance against route averages and incorporate this into annual performance evaluations;
- d) Define acceptable boundaries of performance for each route and adjust them as necessary; and
- e) Track metrics for each route over time, such as route difficulty, ease of meter access, which routes take longer, why they take longer, etc. and adjust as necessary for maximum efficiency. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will create new SOPs to develop metrics for the meter reading program staff, target implementation date January 2019.

**RECOMMENDATION #4:** The Public Utilities Department (PUD) should re-evaluate meter reading routes based on the metrics identified in Recommendation 3 and determine if routes should be split, assigned to specific meter readers or reallocated based on more or less time needed. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will prepare analysis to re-evaluate meter reading routes and implement the recommendations, target implementation date January 2019.

**RECOMMENDATION #5:** The Public Utilities Department (PUD) should develop a written policy requiring meter readers to exclusively use the meter reader identification number assigned to them. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will develop a written policy and have meter readers sign off on this policy annually, target implementation date August 2018.

**RECOMMENDATION #6:** The Public Utilities Department's Customer Support Division should identify all skip codes that require a trouble code entry and those that require immediate supervisory attention (such as locating a meter). To that end, meter readers should enter a trouble code for every skip code that requires it. Also, PUD should update their Process Narrative (PN-0326) to align with revisions. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will:

1. Prepare analysis to evaluate skip codes, target implementation date September 2018.
2. Conduct a trial run, target implementation date November 2018.
3. Fully implement skip codes, target implementation date January 2019.

**RECOMMENDATION #7:** The Public Utilities Department should facilitate stronger coordination between the Customer Support Division and the Meter Shop to prioritize repairs and reduce the backlog of unrepaired meters that impact accurate and timely customer billing. Additionally, the Customer Support Division should communicate high priority trouble code entries to the Meter Shop to expedite critical maintenance. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will:

1. Create SOPs and flow charts, target implementation date August 2018.
2. Provide quarterly updates to the Deputy Chief Operating Officer and Director of PUD, target implementation date August 2018.
3. Develop a plan to document the list of high priority trouble codes and work order status, assessment completed in October 2018 and target implementation date January 2019.

**RECOMMENDATION #8:** The Public Utilities Department's Customer Support Division (CSD) should strengthen supervisory review of meter reader accuracy. Specifically, to facilitate a determination about whether skipping the meters was appropriate, and to facilitate remedial action for affected meters, CSD should revise the supervisor review form to include trouble code information in addition to skip code information. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will:

1. Develop meter reader SOPs, target implementation date September 2018.
2. Document the list of high priority trouble codes and work orders, target implementation date September 2018.
3. Supervisors will continue to review daily reports and sign off on the review form, target implementation date October 2018.
4. Create improved daily reports; develop plan, conduct assessments and fully implement, target implementation date April 2019.

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Eduardo Luna, City Auditor, Office of the City Auditor

July 26, 2018

**RECOMMENDATION #9:** The Public Utilities Department's Customer Support Division (CSD) should review the discrepancies between the supervisor's review forms and the underlying data for a sample of the dates, including April 28, 2018, and take appropriate corrective action with respect to the identified employees. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will review the current process regarding supervisorial review of documents and the database and implement appropriate corrective action, target implementation date October 2018.

**RECOMMENDATION #10:** To improve customer satisfaction, the Public Utilities Department (PUD) should communicate with customers *in advance* of any anticipated bill-impacting activities. Specifically, PUD should:

- a) Notify a customer when their meter reading is under review for a prolonged period that may impact their billing schedule or result in receiving multiple bills at the same time.
- b) Inform customers of forthcoming changes or bill-impacting activities, such as rate increases or prolonged billing periods, with sufficient notice to prepare for the additional expenses. (Priority 2)

**MANAGEMENT RESPONSE: Management agrees with the recommendation.** PUD will:

1. Create SOPs to help manage issues related to water bills, target implementation date September 2018.
2. PUD supervisors will ensure that the newly created SOPs are implemented by all staff members, target implementation date October 2018.

Sincerely,



Vic Bienes, P.E.  
Director, Public Utilities Department

LAJS/esm

cc: Kris Michell, Chief Operating Officer  
Rolando Charvel, Chief Financial Officer  
Johnnie Perkins, Deputy Chief Operating Officer, Infrastructure/Public Works  
Jonathan Behnke, Director, Information Technology  
Julio Canizal, Director, Risk Management Department  
Bahija Humphrey, Director, Performance and Analytics  
Katie Keach, Director, Communications Department  
Judy von Kalinowski, Director, Human Resources Department  
Kyle Elser, Assistant City Auditor, Office of the City Auditor  
Stan Griffith, Assistant Director, Public Utilities Department  
Lee Ann Jones-Santos, Assistant Director, Public Utilities Department