Austin Water, Austin Texas

Water Meter Reading & Testing Accuracy Audit Report

Publication Date: January 19, 2016

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Introduction

UtiliWorks Consulting, LLC (UWC, www.utiliworks.com) was hired by Austin Water to conduct a water meter read accuracy audit and to complete water meter accuracy tests per Solicitation #DCR16009 - Water Meter Reader Testing Accuracy Audit Services. The audit was in response to thousands of calls received by Austin Water from customers concerned their water usage reflected on their bills was abnormally high. UtiliWorks Consulting subcontracted National Metering Services, Inc. (NMS, www.nmsnj.com) to perform the independent meter reads and water meter accuracy tests.

Austin Water serves the City of Austin, Texas and has approximately 200,000 residential water meters. Austin Water (AW) through Austin Energy (AE) hires a reading subcontractor to obtain water meter reads and to bill customers for water usage through AE's Oracle based Utilities Customer Care and Billing (CC&B) system. The objective of the meter reading portion of the audit is to determine if the current water meter reading process results in accurate water meter reads.

Water meter reading accounts are divided into 20 billing cycle groups across 10 districts and the reading subcontractor reads each water meter once per month.

A subset of water service accounts within its service territory were identified by AW for the purpose of the meter reading audit. AW provided 2240 meters, approximately 200 addresses per cycle with the intent of accomplishing approximately 100 meter reads for each District area.

Objective

The objective of the meter reading audit was to determine if the current water meter reading process results in accurate water meter reads.

The objective of the water meter accuracy testing was to review related procedures for the removal of water meters, associated testing and to compare the flow test results of AW to the results from an independent testing facility.

Requirements

1. Austin Water required UWC/NMS to conduct a water meter read audit for approximately one thousand (1,000) residential water meters at locations designated by Austin Water. The following details were required to be collected:

   i. Water Meter identification number
   ii. Water Meter reading data
   iii. Water Meter reading date and time
   iv. Water Meter and meter box condition
   v. Water Meter location (showing by address or on GIS map)
   vi. Photo of each water meter lid evidencing the water meter number (water meter identification)
   vii. Photo of the meter register indicating the read (read dial)
   viii. Photo of the water meter box condition

   UWC was required to report on the findings of the comparison of the readings and to make summary conclusions based on the statistical analysis.

2. Austin Water required UWC/NMS to conduct a water meter accuracy audit for thirty (30) residential water meters. This included:

   i. Witnessing the City's removal of identified water meter, preparation and arrangement of delivery of the removed water meter to the City's testing facility
   ii. Witness water meter accuracy test at City's testing facility
   iii. Ship the removed water meters to NMS testing facility for an independent accuracy testing
   iv. Reporting of the findings including comparison to AW testing of the same meters

   UWC/NMS was then required to provide AW with a Water Meter accuracy report of the results comparing the AW test results to the independent test results.

Methodology

1. Water Meter Reading Audit

   Austin Water provided UWC/NMS with a list of potential water meters to be read for the meter reading accuracy audit. The list of potential water meters covered Cycle 06 through 16 which included accounts in all 10 districts (ultimately reads were audited by NMS in cycles 6-13 and all 10 Districts were represented). Austin Water provided approximately 200 addresses for each of the cycles with the intent of completing approximately 100 audits for each District and a total of approximately 1000 meters. Austin Water worked with UWC and NMS so that readings included multiple streets within each cycle to ensure that a representative sample of each cycle was provided. The potential water meter audit sites were from the same cycle route data that Austin Water's reading subcontractor read on the same day.

   To minimize any customer concerns, Austin Water provided NMS auditing personnel with a letter on AW letterhead to be used in explanation in the event that any customer had a questions about the reason for a second party being involved in the reading process.

   The list of potential water meters to be read from Austin Water included:
   a. Customer Address
   b. Premise ID
   c. Meter ID
   d. Location Notes
   e. Meter Type
   f. MR ID
   g. Cycle/Route

   The reading audits were planned to allow NMS to complete the read audits between December 04 and December 18, 2015 and based on the normal cycle reading schedule as the reading subcontractor. The readings were planned so that NMS and the reading subcontractor were reading the same meters on the same day. The NMS auditors completed reading for cycles 7-13 between 12/7-12/15/15. Due to the cycle read schedule and the availability of NMS resources, 80 addresses in Cycle 06 were audited on January 07, 2016. The table below details the total list of meters by cycle and district that were provided by AW to NMS.

Table 1. Total of all meters provided to NMS by AW

AS PROPOSED BY AUSTIN WATER

Meter Route	Read Date	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9	District 10	Total
Cycle 6	12/04/15 or 01/07/16	0	0	0	0	0	80	0	0	0	0	80
Cycle 7	12/07/15	30	40	0	20	40	0	0	40	10	20	200
Cycle 8	12/08/15	10	40	10	0	40	0	20	20	20	50	210
Cycle 9	12/09/15	0	0	0	60	0	0	40	40	30	30	200
Cycle 10	12/10/15	0	60	40	20	0	100	20	0	20	0	260
Cycle 11	12/11/15	0	60	20	30	60	0	20	30	40	20	280
Cycle 12	12/14/15	60	0	20	50	30	0	30	0	20	0	210
Cycle 13	12/15/15	0	0	50	20	30	0	20	80	20	0	220
Cycle 14	12/16/15	60	0	40	20	0	0	30	0	0	50	200
Cycle 15	12/17/15	40	0	20	0	0	60	20	0	30	40	210
Cycle 16	12/18/15	20	0	40	0	0	30	20	0	40	20	170
Total		220	200	240	220	200	270	220	210	230	230	2240

Two (2) NMS auditors were assigned to be on-site to complete the water meter audits between December 07 and December 15, 2015 and one was assigned to return on January 07, 2016 to complete the Cycle 06 readings. The total number of meter audit/reads attempted was 1163. The below Map, Figure 1, Map shows the total of the 1163.

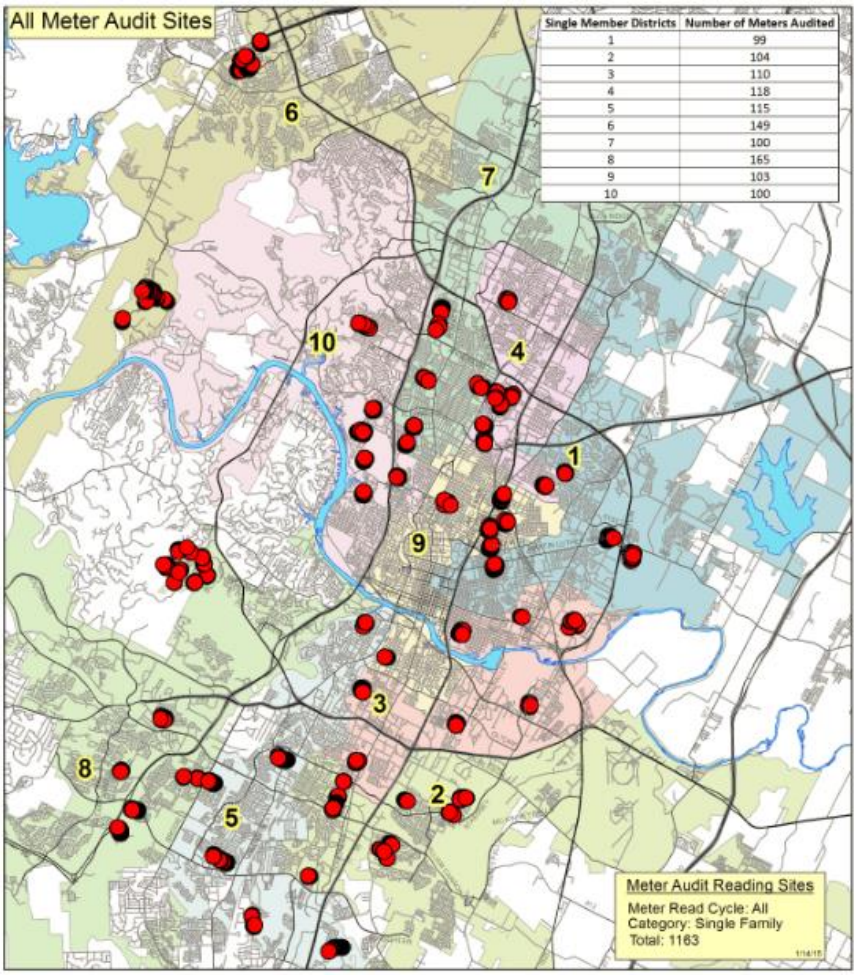

Figure 1. Map of the water meters location audited and/or unable to find/read

NMS personnel were unable to obtain reads for 19 meters, due to several reasons, i.e., cannot locate meter pit, meter lens cloudy and unable to read. AW's reading subcontractor did obtain reads from these 19 locations. Since there was no NMS read

obtained these 19 were removed from overall analysis. In addition, 6 of the meters had circumstances where both NMS and AW's reading subcontractor obtained reads that did not match. Photos of the NMS reads were reviewed but they were not of high enough resolution to confirm the read. These 6 along with the 19 unable to locate/unable to read were removed from the overall comparative data analysis. The resulting total of 1138 verifiable reads were used in the data analysis comparison of meter reads. The following table presents the NMS reads that were used for comparison.

Table 2. Water meter audits by Cycle & District used for analysis

COMPLETED BY NATIONAL METERING SERVICES

Meter Route	Read Date	District 1	District 2	District 3	District 4	District 5	District 6	District 7	District 8	District 9	District 10	Total
Cycle 6	01/07/16						80					80
Cycle 7	12/07/15	30	17		11	34			17	9	20	138
Cycle 8	12/08/15	9	27	10		33		19	20	20	50	188
Cycle 9	12/09/15				59			40	37	29	29	194
Cycle 10	12/10/15		39	39	20		69	20		20		207
Cycle 11	12/11/15		18	20	27	45		19	25	17		171
Cycle 12	12/14/15	53		20						7		80
Cycle 13	12/15/15			20					60			80
Total		92	101	109	117	112	149	98	159	102	99	1138

The NMS auditors recorded the water meter data as required, which included:

a. Read Date
b. Premise ID
c. Cycle
d. District
e. Customer Address
f. Meter ID
g. Out Read
h. Timestamp
i. Remarks (Location Notes)
j. Section ID
k. Sequence Number
l. Tech ID (Reader ID)
m. Map of Meter Location
n. Multiple photos: (1) Water meter location general surroundings, (2) Water meter box condition, (3) Water meter lid, (4) Meter register indicating the read dial

An excel workbook listing the water meter data above (minus Tech ID, map of meter location and multiple photos) was submitted daily by NMS to Austin Water and UWC. The same information (with the additional data; Tech ID, map of meter location and multiple photos) was uploaded to NMS' designated web portal (https://austintx.nmsnj.com/) to assist with the review and analysis.

Austin Water provided the meter read data for the same meters as completed by the reading subcontractor. An Excel workbook including the reading data from NMS and the reading subcontractor was combined for comparison and analysis. UWC compared and analyzed the reads taken by NMS and the reading subcontractor. Readings were compared for any differences.

UWC compared the read data as recorded by NMS and the meter reading as recorded for the same meter on the same day by the reading subcontractor. All readings with a read difference of more than 500 gallons were set aside for additional research. To verify accuracy of the NMS recorded read, UWC compared the NMS reading for the meters with more than a 500 gallon difference against the recorded register dial photo of the respective meter.

To be noted, NMS auditors recorded all digits displayed on the water meter dial and submitted that data. AW provided the reading subcontractor data which omits the last two (2) digits displayed (Austin Water bills the customers in the hundred gallons unit). To compare the reads, UWC omitted the last two (2) digits of NMS readings to be consistent with the data provided by AW's reading subcontractor.

Findings and analysis of the water meter reading comparisons in summary and in detail for the discrepant meter readings is presented in the Findings and Analysis section of this document.

2. Water Meter Accuracy

Austin Water selected thirty (30) residential water meters for water meter accuracy testing. The meters were selected by AW and located throughout the AW service territory.

On January 5, 2016 NMS personnel witnessed two Austin Water department employees remove water meters under the Audit Services Contract. NMS personnel witnessed the removal process of approximately 15 of the total 30 water meters that were removed by the AW technicians. These meters were tagged with the customer's address, meter number and final reading. They were placed in a box for transport back to the AW testing facility for accuracy testing. A new meter was installed in place of the removed meter.

On January 6, 2016, NMS personnel were present at the Austin Water's meter testing facility, located at 2600 Webberville Road, Austin, TX 78702. Austin Water utilizes a MARS Company 20 station test bench with 1-100 gallons & 1-10 gallons prover tank. All the tags were taken off the meters before the meters were placed on the bench. The tags were then used to fill in the Austin Water meter form MTR48A. Once complete the technician had to find and match the work order with the meter on the bench and verify what position the meter was in. Testing rings with 1/10 of a gallon were placed on each meter face and utilized in place of the meters internal markings. The first test performed was the high flow, at 15 gallons per minute (GPM) for 100 gallons. The second test performed was at 2 GPM for 10 gallons. The third test performed was at ¼ GPM for 10 gallons.

After Austin Water's testing, the meters were then shipped to NMS testing facility in Kearny, Jersey. NMS also utilizes a MARS Company 20 station test bench with 1-100 gallons & 1-10 gallons prover tank. NMS tanks are certified yearly by the State of New Jersey Division of Weights and Measures, and NMS also has a yearly certification completed by the New York Public Service commission. The meters were tested at NMS facility at the recommended flow rates prescribed by the AWWA M-6 manual. The tests were started with the low flow through high flow. NMS independent testing was completed on January 14, 2016.

Findings and Analysis

1. Water Meter Reading Audit

As noted above, 1163 meter audits were attempted. 19 were meters that were unable to be audited due to not found/unable to read. 6 meter reads were deleted from the analysis because the NMS read was unable to be supported by a high enough resolution register photo to be certain of the read. 1138 meters were included in the analysis of meter reads to be compared. The overall findings are based on the 1138 meters.

Of the 1138 reads, 981 (86.20%) were exactly the same. 142 reads (12.48%) had a small difference in gallons that seemed consistent with the difference in time between the reads.

15 of the 1138 meter reads (1.32%) were identified as having a read difference of more than 500 gallons and were included in the category considered to be "discrepant" readings. The discrepant reads were further researched and the NMS read was compared to the photo of the register read. For these 15, the NMS read was found to match the register photo.

The tables and graph presented below provide details of the "unable to obtain read" meters, discrepant readings from each Cycle/District and a summary of overall results by Cycle.

Table 3. Water Meter Read Analysis for Cycle 7

Cycle 7 (Read Date: 12/07/2015)					
Unable to obtain Reads: 1					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
9000076	0	29006	Cannot locate pit		
Discrepant Reads: 3 out of 138. Accuracy: 97.83%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
214558	806990	8069	8060	(09)	Under bill
860343	975750	9757	9767	10	Over bill
862286	2693860	26938	11025	(15913)	Under bill

Table 4. Water Meter Read Analysis for Cycle 8

Cycle 8 (Read Date: 12/08/2015)					
Unable to obtain Reads: 2					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
82568	0	6503	Glass cloudy - hard to read		
126498	---240	9382	N/A (Dual with 8507 Dalview Dr)		
Discrepant Reads: 2 out of 188. Accuracy: 98.94%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
19124	419350	4193	4173	(20)	Under bill

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112576	704310	7043	6574	(469)	Under bill

Table 5. Water Meter Read Analysis for Cycle 9

Cycle 9 (Read Date: 12/09/2015)					
Unable to obtain Reads: 3					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
67224	0	5992	Glass cloudy - cannot read meter		
144631	0	8680	Glass cloudy - hard to read		
682414	0	14286	Glass cloudy - hard to read		
Discrepant Reads: 3 out of 194. Accuracy: 98.45%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
12085	1041080	10410	10419	9	Over bill
91688	960920	9609	6909	(2700)	Under bill
144385	061340	613	643	30	Over bill

Table 6. Water Meter Read Analysis for Cycle 10

Cycle 10 (Read Date: 12/10/2015)					
Unable to obtain Reads: 2					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
200041	0	20799	Cannot locate meter pit		
59464	0	14022	Cannot locate meter pit		
Discrepant Reads: 4 out of 207. Accuracy: 98.07%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
900315	721370	7213	7273	60	Over bill
90311	959750	9597	9697	100	Over bill
90445V	578860	5788	5288	(500)	Under bill
941075	1439090	14390	14399	9	Over bill

Table 7. Water Meter Read Analysis for Cycle 11

Cycle 11 (Read Date: 12/11/2015)					
Unable to obtain Reads: 0					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
N/A					
Discrepant Reads: 2 out of 171. Accuracy: 98.83%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
14264	3067890	30678	30878	200	Over bill
196202	1563840	15638	15688	50	Over bill

Table 8. Water Meter Read Analysis for Cycle 12

Cycle 12 (Read Date: 12/12/2015)					
Unable to obtain Reads: 7					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
121176	0	5456	Pit full of water/dirt		
60140	0	9672	Foggy glass - unable to get reading		
40519	0	123	Foggy glass - unable to get reading		
39761	0	1276	Foggy glass - unable to get reading		
77259	0	9594	Foggy glass - unable to get reading		
69240	0	8447	Foggy glass - unable to get reading		
124318	0	886	Pit full of water/dirt		
Discrepant Reads: 0 out of 80. Accuracy: 100.00%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
N/A					

Table 9. Water Meter Read Analysis for Cycle 13

Cycle 13 (Read Date: 12/13/2015)					
Unable to obtain Reads: 4					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
107621	0	5400	Foggy glass - unable to get complete reading		
672765	0	10571	Unable to locate meter pit		
672799	0	9816	Unable to locate meter pit		
673327	0	34882	Unable to locate meter pit		
Discrepant Reads: 0 out of 80. Accuracy: 100.00%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
N/A					

Table 9. Water Meter Read Analysis for Cycle 6

Cycle 06 (Read Date: 01/07/2016)					
Unable to obtain Reads: 0					
Meter ID	Complete NMS Read	AW's Subcontractor Read	Remarks		
N/A					
Discrepant Reads: 1 out of 80. Accuracy: 98.75%					
Meter ID	Complete NMS Read	NMS Read, minus the last 2 digits	AW's Subcontractor Read	Difference (hundred gallons)	Impact
77627557	3834250	38342	38353	11	Over bill

Summary for the water meter reading accuracy by Cycle is presented in the following table and graph.

Table 10. Summary of Water Meter Read Accuracy by Cycle

Cycle	Reading Date	Discrepant Readings	Total Readings in Cycle	Accuracy % by Cycle
Cycle 06	01/07/2016	1	80	98.75%
Cycle 07	12/07/2015	3	138	97.83%
Cycle 08	12/08/2015	2	188	98.94%
Cycle 09	12/09/2015	3	194	98.45%
Cycle 10	12/10/2015	4	207	98.07%
Cycle 11	12/11/2015	2	171	98.83%
Cycle 12	12/14/2015	0	80	100.00%
Cycle 13	12/15/2015	0	80	100.00%
	Total	**15**	**1138**	**Overall Average Accuracy: 98.86%**

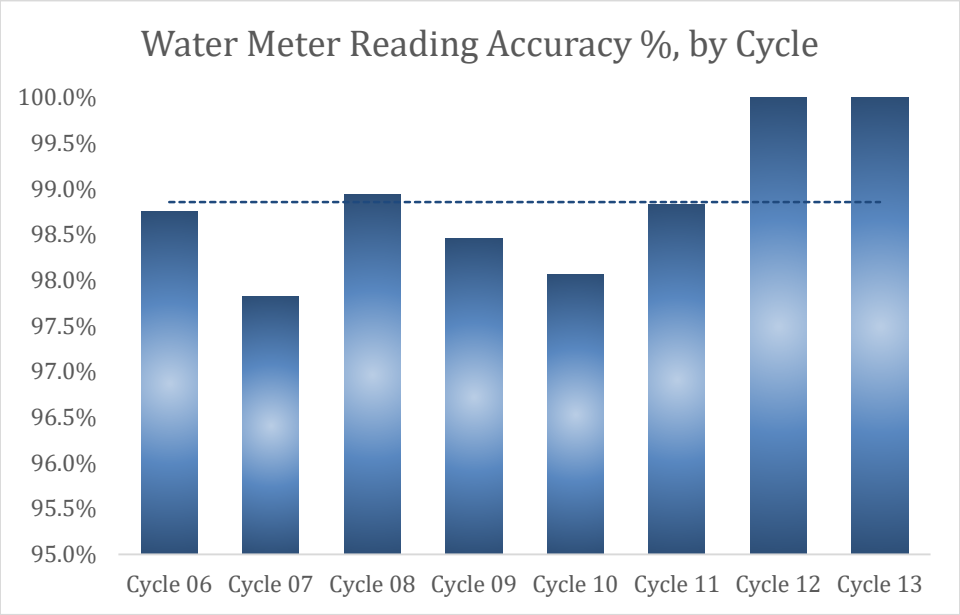

Figure 2. Graphic Representation of Water Meter Reading Accuracy by Cycle

2. Water Meter Removal and Accuracy Testing

As noted above, NMS personnel witnessed AW technicians in the removal of approximately ½ of the 30 water meters that were tested at AW's meter accuracy testing facility. AW personnel also witnessed the meter accuracy testing of all 30 meters that were tested at the AW meter accuracy testing facility. The following is NMS assessment of both activities.

Austin Water Meter Removal

The actual meter removal process was inconsistent between the two Austin Water personnel. One technician knocked on the customer's door to inform the customer of the water being turned off. The same technician also flushed the waterline at the hose bib after the meter replacement. The second technician did not attempt

customer contact and did not flush the waterline at a hose bib. It was also noted that neither technician left a door notice at the customer's property after the installation. It's recommended that all meter replacements to be performed using the same SOP. A door hanger notice should also be left informing your customer that the meter was replaced that day and to run a small amount of water to release any trapped air or dirt. This practice can help reduce after hour calls to customer service inquiring if any work was done on their water line. It also could help avoid an after hour service call by an Austin Water technician because low or no pressure in a fixture due to debris. The first fixture used is where any possible debris broken loose during meter replacement is going to go, which is typically the toilet supply.

Austin Water Meter Accuracy Testing

Upon inspection of the two meter prover tanks, no State calibration seals were visible. In discussion with the meter testers, NMS was informed that the bench was calibrated by the meter manufacture. Test tanks should be calibrated yearly by the State division of weights and measures. The meter test flow rates used by the tester were at the proper flow rates for 5/8 x ¾" meters per the AWWA M-6 manual, however the order used starting with the high flow is for new water meter standards. The 5th edition of the American Water Works Association M6 manual (Manual of Water Supply Practices), page 77 paragraph 11, suggest meters being removed from service to determine the condition of the meter should be tested from low flow to high flow. The reasoning is if the meter is first tested at high flow, it is possible that it could free a stuck disc - thereby obtaining a false impression of the meter's condition at lower rates. After each test the meter reading and % result should be written on the work order. The reading after each test is used for supporting data of the results.

Meter Accuracy Testing at NMS Facility

NMS accuracy test results were fairly consistent with Austin Water's results. In summary, Austin Water found 12 meters (out of 30) "failed" the accuracy test while NMS found 11 meters (out of 30) that "failed" the accuracy testing. Please see the testing result comparison table in the following page.

Table 12. Water Meter Accuracy Testing Details and Comparison

					NMS RESULTS					AUSTIN WATER RESULTS					
SEQ	Date Tested	METER #	NOTES	SIZE	TEST READ	High Result%	Inter Result%	Low Result%	NMS Result Notes	Start Read	End Read	High Result%	Inter Result%	Low Result%	Austin Result Notes
1	2016-01-11	29325	BADGER	5/8X3/4	129926290	100.0	100.3	99.7		129902	12991	100.9	99.1	100.0	
2	2016-01-11	55559	ROCKWELL	5/8X3/4	15732343	96.5	100.0	79.7	Fail - Under	15709	1572	97.3	101.0	75.0	Fail - Under
3	2016-01-11	58684	ROCKWELL	5/8X3/4	055809730	100.3	100.0	93.9	Fail - Under	055785	05579	100.4	101.0	94.0	Fail - Under
4	2016-01-11	62053	ROCKWELL	5/8X3/4	72114139	98.2	99.7	82.4	Fail - Under	72090	7210	97.7	100.0	93.0	Fail - Under
5	2016-01-11	65493	ROCKWELL	5/8X3/4	34684171	100.1	99.1	97.0		34660	3467	101.5	101.0	97.0	
6	2016-01-11	77786	ROCKWELL	5/8X3/4	29957132	99.9	99.8	0.0	Fail - Under	29934	2	100.2	100.0	0.0	Fail - Under
7	2016-01-11	83144	BADGER	5/8X3/4	142015540	100.1	99.1	99.0		141991	14200	101.1	101.0	101.0	
8	2016-01-11	99464	ROCKWELL	5/8X3/4	185863923	98.0	100.1	90.7	Fail - Under	185840	18585	97.7	101.0	90.0	Fail - Under
9	2016-01-11	103757	ROCKWELL	5/8X3/4	29059450	99.8	100.0	100.0		29035	2904	100.0	101.0	98.0	
10	2016-01-11	108526	ROCKWELL	5/8X3/4	10813400	99.2	95.7	92.3	Fail - Under	17989	1800	99.7	98.0	90.0	Fail - Under
11	2016-01-11	129913	ROCKWELL	5/8X3/4	62003640	98.4	100.0	93.0	Fail - Under	61980	61999	99.1	100.0	92.0	Fail - Under
12	2016-01-11	164197	ROCKWELL	5/8X3/4	94159961	91.6	67.8	0.0	Fail - Under	94140	9415	92.0	74.0	0.0	Fail - Under
13	2016-01-11	196024	NEPTUNE	5/8X3/4	098689300	99.2	99.1	0.0	Fail - Under	098666	09867	99.5	100.0	0.0	Fail - Under
14	2016-01-11	196006	NEPTUNE	5/8X3/4	234936021	99.0	99.6	99.0		234912	23492	98.9	100.0	99.0	
15	2016-01-11	206206	NEPTUNE	5/8X3/4	101923950	99.8	100.2	100.0		101899	10190	98.9	100.0	99.0	
16	2016-01-11	238293	HERSEY	5/8X3/4	103162960	99.9	100.3	100.0		103138	10315	100.2	100.0	100.0	
17	2016-01-11	238296	HERSEY	5/8X3/4	071017463	99.0	99.9	99.7		070993	07100	98.7	101.0	100.0	
18	2016-01-11	244153	HERSEY	5/8X3/4	021148898	100.0	100.1	100.2		021124	02113	100.5	101.0	100.0	
19	2016-01-11	244173	HERSEY	5/8X3/4	102940450	98.6	98.6	99.3		102916	10292	99.0	96.0	100.0	Fail - Under
20	2016-01-11	253435	HERSEY	5/8X3/4	025490000	100.0	100.2	100.1		025465	025	100.5	101.0	100.0	
21	2016-01-11	259016	HERSEY	5/8X3/4	092473762	98.4	99.9	0.0	Fail - Under	092450	09246	97.8	100.0	0.0	Fail - Under
22	2016-01-11	275051	HERSEY	5/8X3/4	010702142	100.2	99.9	99.8		010690	01070	99.3	101.0	100.0	
23	2016-01-11	275052	HERSEY	5/8X3/4	025322441	99.7	100.1	100.0		025298	02530	99.5	100.0	100.0	
24	2016-01-11	277935	HERSEY	5/8X3/4	033879200	99.9	100.0	99.0		033855	03386	99.5	100.0	100.0	
25	2016-01-11	10000392	HERSEY	5/8X3/4	019265812	100.0	100.0	0.0	Fail - Under	019242	01925	99.1	100.0	0.0	Fail - Under
26	2016-01-11	10023644	BADGER	5/8X3/4	012473492	99.6	100.0	98.9		012449	01246	99.3	100.0	100.0	
27	2016-01-11	10024873	BADGER	5/8X3/4	003247459	98.9	99.9	100.1		003223	00323	98.9	100.0	101.0	
28	2016-01-11	10025193	BADGER	5/8X3/4	012516003	99.7	100.0	99.8		012491	01250	99.5	100.0	101.0	
29	2016-01-11	10025204	BADGER	5/8X3/4	009996734	99.7	100.1	99.7		009972	00998	99.8	101.0	100.0	
30	2016-01-11	10028785	BADGER	5/8X3/4	000343999	99.7	100.0	100.0		000320	00033	99.5	100.0	100.0	
					Total NMS recorded fail, under-recording:				11	Total Austin Water recorded fail, under-recording:					12

Notes:

High test performed at 15 gpm	Acceptable high test result for new meters	98.5% - 101.5%
Intermediate test performed at 2 gpm	Acceptable intermediate test result for new meters:	98.5% - 101.5%
Low test performed at 1/4 gpm	Acceptable low test result for new meters:	95% - 101.0%

Summary and Conclusions

Water meter read audit

For the 1,138 meter reads that were compared and based on this data analysis, the meter reading subcontractor's reading subcontractor meter reading accuracy is an average of 98.86% by cycle.

Cycle 6, 7, 9, 10 and 11 were found to be below the average meter reading accuracy by cycle. Cycles 8, 12 and 13 are above the average meter read accuracy.

The current water meter reading contract with the current meter reading service provider requires the Read Error to be no more than 1 error per 1,000 reads and the Skipped Reads to be no more than 5 skipped reads per 500 meters.

UWC's subcontractor, NMS, was unable to find a number of meter pits during the audit. Based on familiarity of the service territory and previous reading experience within the AW service territory, it is understandable that the current service provider would be able to locate the meter pit sites that NMS was unable to locate. In the case of not being able to read a "foggy" lens, it is possible for moisture to be evident in a lens/register at one part of the day and for that moisture to dry at another part of the day allowing for a read to be obtained. This could account for the current service provider being able to read meters that the auditor noted as foggy lens and was not able to read.

UWC recommends that the data analysis be provided to the current meter reading subcontractor.

The current meter reading service provider should consider deeper analysis of its meter readers in the areas where read accuracy rates were found to be lower than the average of other cycles. Re-training of some personnel may be needed.

AW may consider assigning its own staff to observe the contracted meter reading service provider on a random basis.

UWC recommends that AW consider plans for automating its metering infrastructure.

Water Meter removal and accuracy testing

Based on comparing the accuracy data from the AW testing to the NM testing it is determined that the results are fairly consistent between AW and the independent water meter accuracy testing.

Based on the results of the testing where approximately 30% of the meters being tested "failed", it is recommended that AW consider a more comprehensive meter test to take place to include a larger population of residential meters, intermediate and large meters.

UWC recommends that AW meter accuracy testing equipment be properly certified on an annual basis.

UWC recommends that AW document, train and require all meter exchange technicians to follow the same approved standard procedures for meter exchanges to include: customer contact, flushing debris from the waterline via hose bib upon meter exchanges and use of leave behind door tags to notify customers.