Albuquerque Bernalillo County
Water Utility Authority

Analysis of Small Meter Maintenance within ABCWUA

Presented by

UtiliWorks™
Building Smart Utility Solutions

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Albuquerque Bernalillo County
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Executive Summary

The Albuquerque Bernalillo County Water Utility Authority is presented with the challenge of conducting business with thousands of inoperable meters within its service territory. The utility is currently estimating all customer bills with inoperable meters. For the last 3 months, over 3,000 bills have been estimated. These inoperable meters remain in pits due to an inability of the utility to service all broken meters in a timely manner. Of those estimated bills in the past 3 months, over 1,200 have produced estimations of zero, resulting in significant revenue losses for the utility. Meters estimated for prolonged periods eventually estimate zero reads due to the current estimating algorithm in place. If unaddressed, the picture appears bleak, as depicted in figure 1 and table 1:

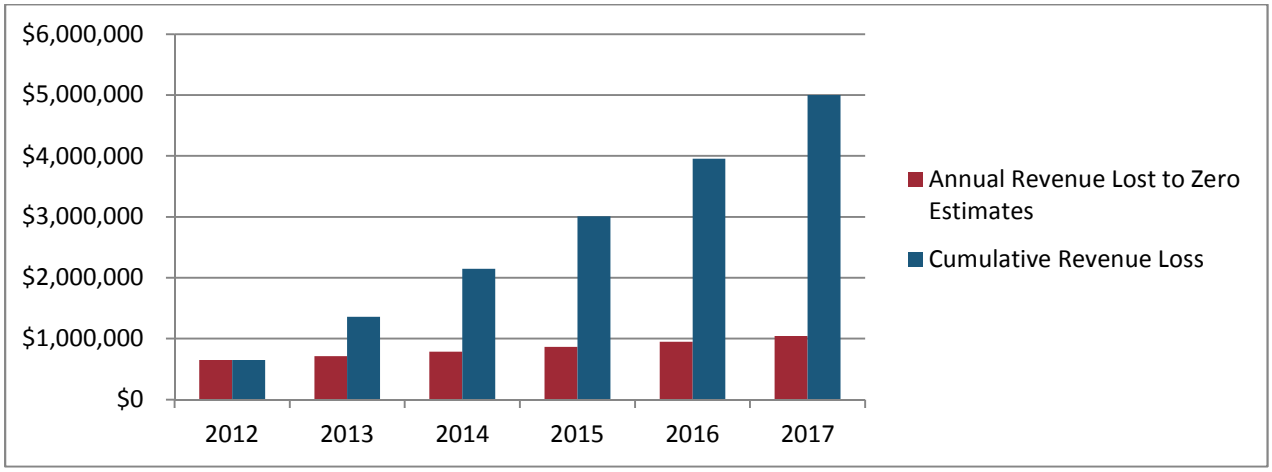

Figure 1 - Revenue Lost to Zero Bill Estimation

Year	2012	2013	2014	2015	2016	2017
Estimated Meters	3000	3000	3000	3000	3000	3000
Zero Estimated Meters	1200	1320	1452	1597	1757	1933
Annual Revenue Lost to Zero Estimates	$648,000	$712,800	$784,080	$862,488	$948,737	$1,043,610
Cumulative Revenue Loss	$648,000	$1,360,800	$2,144,880	$3,007,368	$3,956,105	$4,999,715
Monthly Avg. Bill	$45.00					
Estimated Annual Growth Rate of Zero Estimates	10%					

Table 1 - Five Year Projected Revenue Loss Data Table

The future outlook becomes even bleaker when consideration is paid to the fact that this model assumes no growth in the number of inoperable meters on a forward basis.

As ABCWUA pursues its AMI implementation, meter field maintenance will become increasingly important to ensure a positive return on the AMI investment. Deferring meter maintenance will not be a viable option to achieve the benefits set out by the AMI project. To address the inoperable meter issue, ABCWUA has requested a study to evaluate the feasibility of shifting small meter maintenance responsibilities from Field Services to the Customer Service Division.

This study evaluates ABCWUA current state processes and identifies the causes driving the inoperable meter issue. The causes found are as follows:

- Large backlogs of work orders
- Lack of system integration with IBM Maximo
- Manual data processes
- Poor data integrity
- Business process issues
- Use of multiple systems for work order tracking

These causes have also put strain on resources within ABCWUA and produced large costs for the utility.

Lack of system integration around the Maximo platform has required significant manual intervention to communicate data for various service processes. The high-level of manual data transfers creates two problems for the utility:

- Poor data integrity due to human error
- Major labor costs

In addition, the level of effort is so high; maintenance of small meters is deprioritized due to data management and backlogged work orders. Operational inefficiencies such as zero estimations and unnecessary manual intervention are incurring a significant loss to ABCWUA.

The solution to these issues is to create a future state of fully integrated systems, increased automation, clear business processes, and a shift in small meter maintenance responsibility. This will transform the operational nature of ABCWUA, reduce costs and achieve efficient meter maintenance. Such changes will reduce inoperable meters significantly and create a more streamlined operational environment.

UtiliWorks Consulting recommends that inoperable meters be replaced as quickly as possible, with priority on those meters that have been estimated for three or more consecutive billing periods. In addition, the business process of small meter maintenance must change.

In contrast, the NWSA currently maintains a closure time of less than 48 hours and currently has no inoperable meters. Additionally, NWSA has in place a “No Estimation” policy. In fairness, NWSA has significant advantages in their meter maintenance processes than the utility at large. The most significant of these advantages is the subcontracting of responsibility for infrastructure repair and maintenance. This resolves one of the major factors of small meter work order closure rate, that being the overhead burden of higher priority work orders.

To achieve the solution, a paradigm shift is needed within ABCWUA: Shift the responsibility of small meter maintenance to the Customer Service vertical, with NWSA serving as the pilot location. This shift represents a change in philosophy, to one where the business unit responsible for billing is also responsible for the billing data collection mechanism. Responsibility for distribution and infrastructure remains within its current structure. The proposed realignment of responsibility is demonstrated in Figures 2 and 3, with responsibilities not relevant to the studied problem abridged.

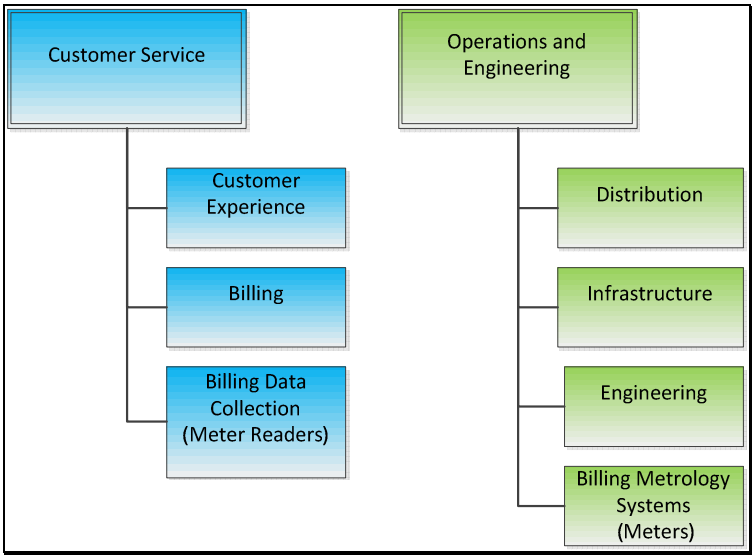

Figure 2 - Current Organizational Responsibilities (Abridged)

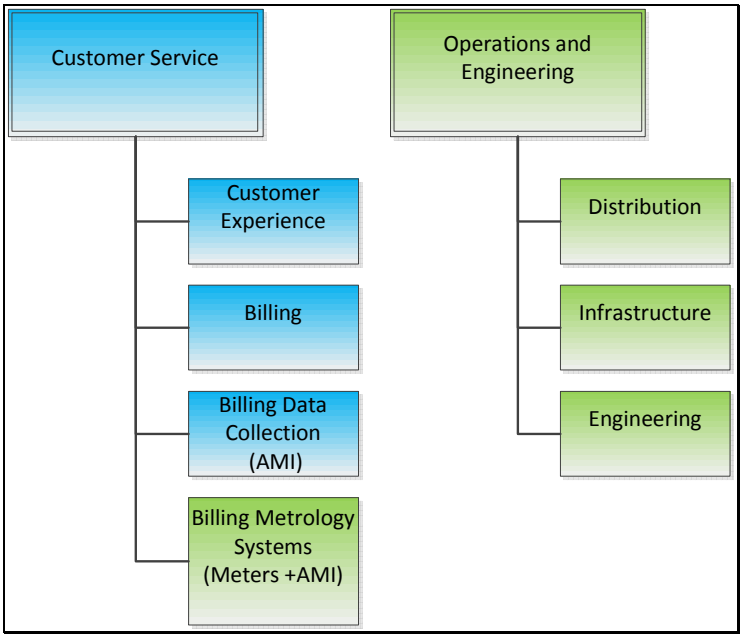

Figure 3 - Future Organizational Responsibilities (Abridged)

NWSA is being nominated as the pilot organization for this transition for several reasons:

- Highly efficient meter service processes provide an excellent starting point
- First functional area to receive AMI meters on a large scale
- Relative autonomy provides a "test" environment allowing fine-tuning of processes on a small scale prior to roll-out
- Smaller staff size reduces implementation complexities

Organizationally, we further recommend that NWSA either assimilate the newly created Utility Technician roles into a single meter maintenance group or provide training and mentorship in deploying the processes and standards in the remainder of the service area. Upon completion of change implementation, Field Services will be relieved of small meter maintenance due to its current workload.

NWSA will be the first area to receive AMI meters, and should assume responsibility for all AMI meters deployed in phase 2 of that project due to the geographical proximity of the first two areas to be implemented. As implementation of the AMI project proceeds, NWSA will develop the expertise to take the lead in small meter maintenance. CSD has 25 Meter Readers who will be offered the opportunity to train in the UT 1 program to manage small meter maintenance as the AMI deployment phases out meter reading functions. This program will provide staff to assume the small meter maintenance role.

UtiliWorks also recommends that systems must be fully integrated, directing all possible vectors for Work Order creation to Maximo, which will serve as the sole work order management system and as the system of record for metering asset maintenance data. The process of small meter maintenance will include Utility Technicians closing out work orders with remote terminals in the field which will automatically update information in all associated systems.

The current costs of Business-As-Usual at ABCWUA far exceed the implementation cost of the recommendations outlined in this document. Indeed, the revenue loss alone provides a substantial business case for the proposed recommendations. To ensure the success and stability of future operations, UWC strongly recommends immediate action, regardless of the course taken.

Introduction

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) currently faces the challenge of conducting its operations with a significant number of inoperable small meters. The high penetration level of inoperable meters within the ABCWUA service territory has led to routinely estimated reads of customer accounts. This practice has resulted in regular complaints by customers, negatively impacting customer service. The management of small meter maintenance data has also experienced issues regarding its data integrity, which has created additional manual work steps for staff.

These issues have caused ABCWUA to reevaluate its operational processes and to determine if alternative options are available to eliminate these challenges. According to the ABCWUA fiscal year objectives for 2012, the company shall "complete and close 80% of all inoperable meter work orders within 3 months of notification through the end of the 4th Quarter of FY12" and "evaluate shifting small meter replacement to the Customer Services Division based on best practices by the end of the 2nd Quarter of FY12". Such objectives illustrate ABCWUA's initiative to resolve what it sees as significant operational issues surrounding meter maintenance.

As the deployment of AMI technology begins on a large scale within ABCWUA it will become increasingly important meters are serviced in a timely and effective manner. If small meter maintenance operational issues continue to exist, it will significantly impact the return on the AMI investment.

UtiliWorks Consulting has conducted an analysis to determine the best path forward for small meter maintenance within ABCWUA. After interviewing various stakeholders within the organization, analyzing departmental processes and data, UtiliWorks Consulting has identified the extent, depth and root causes of the small meter maintenance issue. This understanding has developed its recommendation for next steps on ABCWUA small meter maintenance.

Definition of Small Meter Maintenance

In the context of this study, small meter maintenance is defined as service supporting meters size 1, 2, 3 and 4 (collectively 2" and below) and related infrastructure. Specifically, this includes the meter and any part or component that is directly connected to the meter. For clarity, the line of responsibility is drawn on the immediate system side of the curb stop. The majority of these activities can be performed by a single Utility Technician (UT) with a select few activities that require two UTs at most. The majority of the following activities require hand tools. In some cases, a jackhammer may be required to break up concrete.

For purposes of this study, small meter service activities include the following:

- Meter change out
- Replacement of meter or meter related parts such as register, bolts, tailpiece, Endpoint, AMI Device, etc.
- Turn meter on/off
- Rotate backward meters
- Realign offset meter plates
- Investigate theft of meter
- Raise a meter
- Meter recheck
- Tag and test
- AMI repair

The final three are small meter activities that may require more than one UT to perform the work:

- Replace meter setter/resetter
- Change out a curb stop
- Replace meter can or meter box
- Meter set

All other meter maintenance activities for meters larger than 2" are outside the scope and abilities of small meter maintenance and should continue to be serviced by Field Services or WUA contractors.

Current State Assessment

The primary challenge facing ABCWUA is the large backlog of field activities and work orders within both the Maximo and CC&B systems which has allowed thousands of field activities to go unaddressed. One asset strongly impacted by the backlog is meters. Below are two charts illustrating meter work orders of type BILMTR11 and BILMTR12 that account for most non-functional meter issues. As indicated below, those work orders are mostly pending within the system. Of those completed, many are completed months after they are reported.

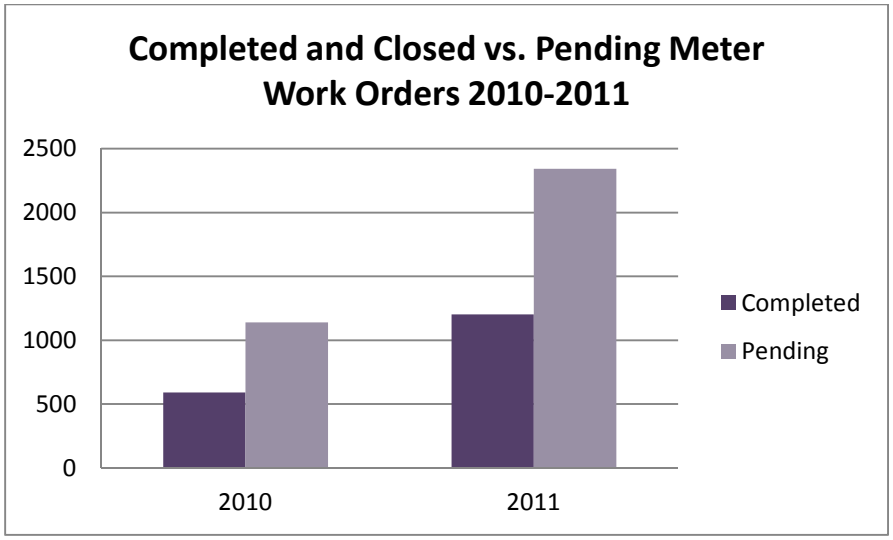

Figure 4 - Completed and Closed vs Pending Meter Work Orders

Figure 5 - Completed or Closed Work Orders 2010-2011

Estimated Meter Reads

There are over 3,000 inoperable meters in the field. This large number of non-functional meters has resulted in the regular estimation of thousands of customer accounts. Of those 3,000 meters, 1,209 meters have estimated zero reads for the last 3 months (between 03-05/2012). Accounts estimated for extended periods of time have shown to eventually trend towards estimations of zero; essentially providing free water to active accounts and resulting in a significant revenue loss for ABCWUA. Currently, there is no specific plan to meter and bill these customers with actual reads in the near-term.

ACCT_ID	READER REMARK	DATE REQUESTED	MAXIMO W/O	W/O STATUS	VACANT	START EST	ZERO EST	AVERAGE UNIT MONTHLY CONSUMPTOIN
8811749560	BRKN/SCRCH GLASS - EST-HIGH	8/13/2010	COULD NOT FIND	N/A	UNKNOWN	8/2010	8/2011	9
7184669560	INOPERABLE METER - EST HIGH	11/17/2010	COULD NOT FIND	N/A	UNKNOWN	11/2010	8/2011	6
7084639560	INOPERABLE METER - EST HIGH	8/5/2010	10180530	WAPPR	NEW OWNER ~ 6/30/10	8/2010	7/2011	9
4045479560	INOPERABLE METER - EST HIGH	8/24/2010	10183610	WAPPR	NO	8/2010	3/2011	12
4678149560	INOPERABLE METER - EST HIGH	6/8/2011	10261873	WAPPR	UNKNOWN	6/2011	1/2012	14
8560869560	INOPERABLE METER - EST HIGH	7/22/2011	COULD NOT FIND	N/A	NO	7/2011	11/2011	30
4154759560	INOPERABLE METER - EST HIGH	12/16/2010	10213015	WAPPR	UNKNOWN	12/2010	11/2011	6

Table 2 - Zero Estimated Meter Reads

The above table illustrates a selection of seven small meter accounts currently experiencing zero estimated reads. On the right, the table outlines the time estimations began, and when the account started receiving estimations of zero. The average monthly consumption is provided in units based on actual reads since January 2009. In the data displayed above, estimated reads extended to 05/2012. Therefore, all accounts were experiencing zero estimated reads up until 05/2012, but possibly continue to experience them. The average consumption identifies likely losses incurred to the utility on a monthly basis. In a report by KOB Channel 4 News on 04/19/2012, Water Utility Authority chief executive Mark Sanchez said the typical residential customer's bill is $45 per month. With over 1,200 inoperable meters estimating zero, the resultant revenue loss is $648,000 a year. This number will grow as more meters reach the zero point, but that growth is difficult to predict reliably due to poor data integrity. For the purpose of this study, we assumed a conservative growth rate of 10% per year.

In addition, the table indicates why the accounts were estimated, the Maximo work order, the work order's status (which are N/A or waiting approval), and vacancy status.

This table not only provides evidence of instances in which customers are receiving unbilled water, but it also demonstrates the primary causes of issues discussed above. Of the seven estimated accounts, only four have work orders in Maximo, highlighting a drop in data transfer from CC&B to Maximo. For those accounts with Maximo work orders, most have been pending for over a year and are likely a low priority for Field Services. The unknown vacancy status also flags a possible lack of data management or data transfer, considering that these accounts are all likely active.

As demonstrated in figure 6 and table 3, estimated meter reads of zero present a major revenue loss problem to ABCWUA. It should be emphasized the data issues ABCWUA is experiencing is resulting in a direct loss to the organization in terms of lost revenue and labor costs.

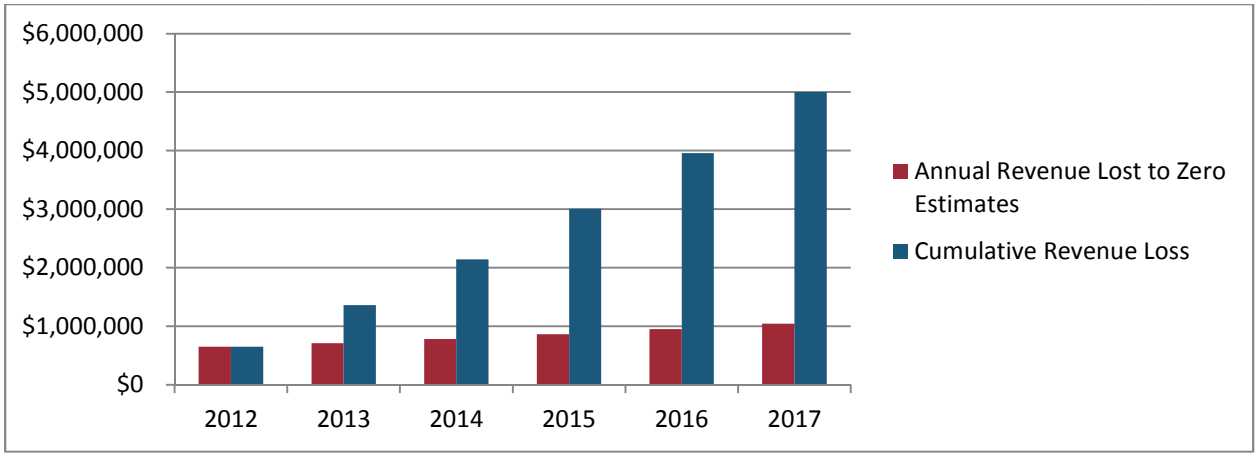

Figure 6 - Revenue Lost to Zero Bill Estimation

Year	2012	2013	2014	2015	2016	2017
Estimated Meters	3000	3000	3000	3000	3000	3000
Zero Estimated Meters	1200	1320	1452	1597	1757	1933
Annual Revenue Lost to Zero Estimates	$648,000	$712,800	$784,080	$862,488	$948,737	$1,043,610
Cumulative Revenue Loss	$648,000	$1,360,800	$2,144,880	$3,007,368	$3,956,105	$4,999,715
Monthly Avg. Bill	$45.00					
Estimated Annual Growth Rate of Zero Estimates	10%					

Table 3 - Five Year Projected Revenue Loss Data Table

Systems

The lack of system integration between CC&B and Maximo causes various problems. Multiple sources can report a single issue, creating a CC&B field activity or a Maximo work order. This can include a customer call, a meter reader report via ITRON notifications, or a Customer Care Representative (CCR) reporting an issue to Field Services. Today, each field activity is created independently without consolidating corresponding activities associated with the same location. Consequently, the current situation regularly creates duplicate data in CC&B and Maximo because there is no mechanism to consolidate activities before or after they are reported. Additionally, no automated process exists to transfer data between CC&B and Maximo. Therefore, users must regularly check and update systems to avoid duplications and unnecessary work orders.

Discussions with Field Services reveal that Dispatch receives a printout of field activities from Cognos 2-3 days after they are identified in CC&B. Due to this delay, Dispatch may have received a call and fixed the issue before receiving the report from Cognos, resulting in field activity duplication. Dispatchers typically try to manually identify duplications, but some duplicates go undetected and result in unnecessary truck rolls. This lack of data consolidation and integration is driving much of the problems today.

Data Integrity

The lack of systems integration has also demanded a large number of manual touches to maintain system data. Manual maintenance has contributed to a significant level of poor data integrity within both CC&B and Maximo. Such errors have eroded user confidence in field activity data and consequently, demand regular corrective maintenance in both systems. Field Services claims that Maximo corrective maintenance consumes 90-95% of the work day for the following resources:

- Dispatch Supervisor
- Assistant Superintendent
- Planner Scheduler
- 4.5 Temps

Temps were hired specifically to support Field Services to perform corrective maintenance in Maximo. The 8 Dispatchers who work for Field Services also spend significant time correcting and manipulating Maximo data in addition to their other dispatch duties.

CSD has also experienced issues with manually inputted data. For example, currently, one CCR allocates the majority of their time updating meter change out information in both Maximo and CC&B. In addition, CSD has one resource dedicated to cross-checking and correcting mismatching data of large meters in CC&B in support of the AMI project. Considering the number of small meters is far greater than large meters, it is likely a much larger volume of mismatching data exists for small meters. Such manual processes to maintain system data have demanded large allocations of labor and still result in poor data integrity.

Business Process

Work Order management does not have a clearly defined business process with explicit roles and duties. In many cases, various individuals are responsible for a single process step, blurring the lines of responsibility which often results in activities going unworked. Further, no identifiable Service Level Agreement is in place to escalate pending issues and identify how to resolve them. Monitoring a KPI tracking the Mean Time to Repair (MTTR) will also help identify work order delays or problems, while tracking performance of staff relative to established norms. The relatively informal nature of the work order management process, combined with a lack of system integration, data management and resource issues, creates an environment which increases opportunities for error.

Current State Service Order Process

For most of ABCWUA, field service is conducted by the Field Services group which ranges from main line breaks to fire hydrant maintenance to meter service. Currently, there are multiple ways issues are reported to Field Services, where they then dispatch them as work orders. Prior to work order dispatch the information undergoes various manual validations. Upon resolution of the issue, the information is then channeled back through the Field Service office where it is manually entered into the system and manually validated prior to closing it out.

The following diagram outlines the current Meter Service process.

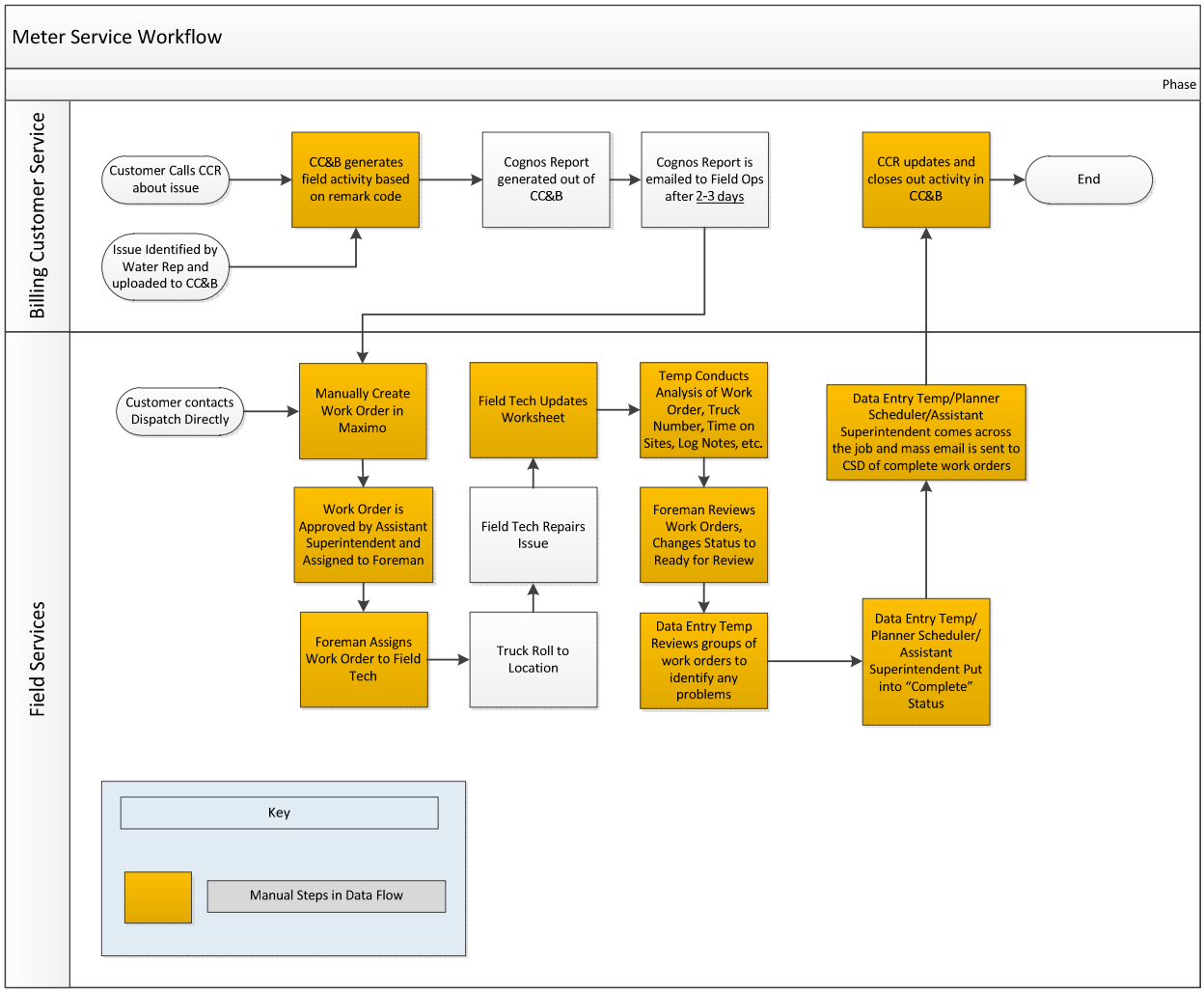

Figure 7 - Meter Service by Field Services

Within **Error! Reference source not found.** above, if a customer contacts dispatch directly, the same field activity could be pending in the Cognos report which will arrive to Field Services 2-3 days later. Also, the final steps performed by Field Services have multiple process owners. Such division of process steps can lead to errors, or information falling through the cracks.

After work orders are put into "Complete" status, Field Services waits to compile multiple orders until they are sent to CSD. Upon their arrival, they are manually closed out in CC&B. It is believed that many of the pending work orders in CC&B exist because they are not closed out by CSD or have not been sent by Field Services.

The flow diagram below illustrates the steps for a "New Service Request". This process includes all the steps from when a customer requests service to the account's activation. Like the diagram above, those process steps in orange are instances of manual touches to communicate data.

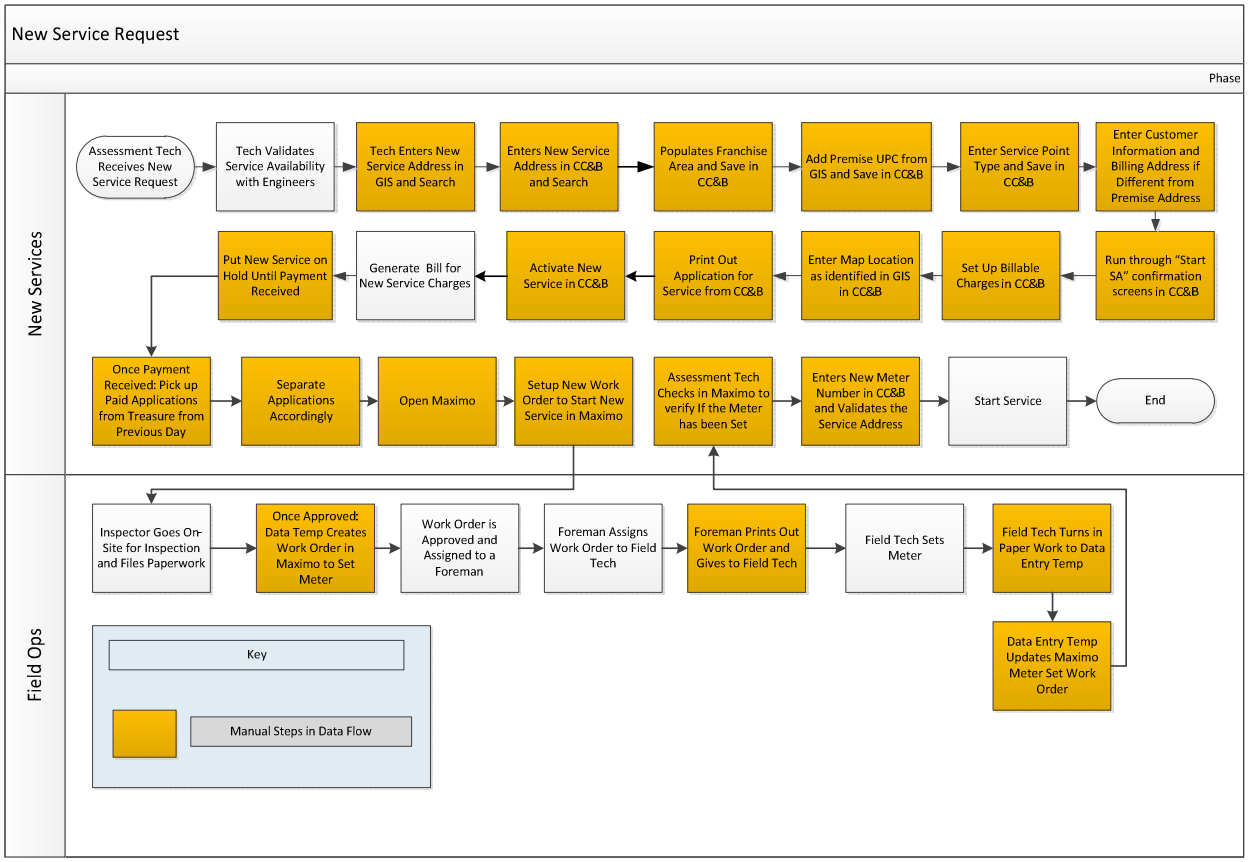

Figure 8 - New Service Request

Of all the processes documented, maintaining meter change out data in CC&B and Maximo is the most telling of system manual intervention. A CCR dedicates approximately 25 hours a week managing meter change out data; thus, utilizing most of their time on this activity. The step-by-step process can be seen below.

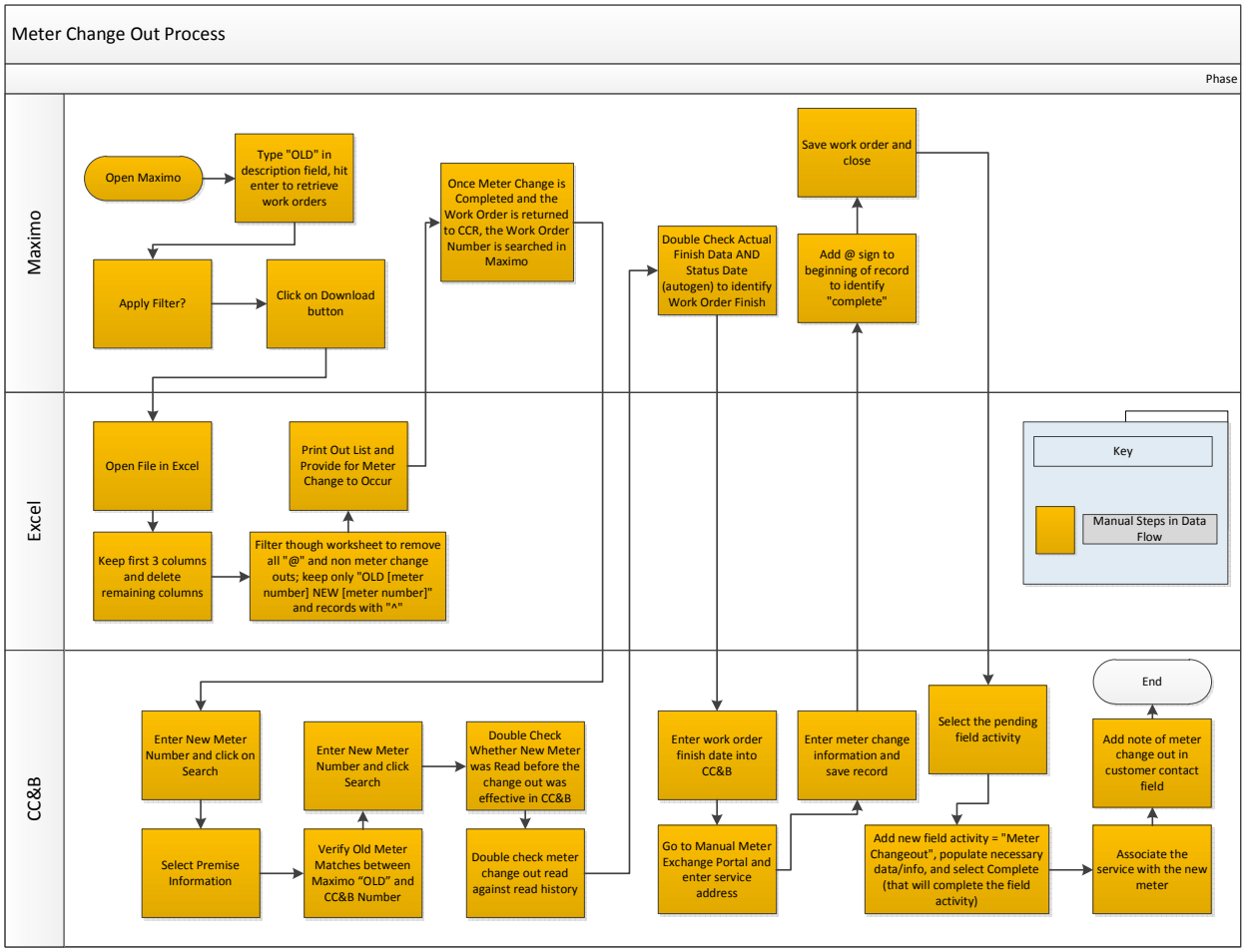

Figure 9 - Meter Change Out Process

The significant level of manual steps required to use CC&B and Maximo at ABCWUA has resulted in large labor efforts. Further, system automation and integration can significantly lower the amount of labor and resource allocation to fulfill routine tasks. The reduction of manual processes through increased automation and integration will result in improved data integrity and limit the number of backlog activities.

Field Services

During interviews with Field Services personnel, it was claimed that 90-95% of various resources' time was dedicated to corrective maintenance in Maximo. Not all activities monitored and corrected dealt with small meter maintenance. However, because such large levels of corrections must be made; small meter maintenance must often be deferred in favor of higher priority activities.

To cope with regular corrective maintenance, Field Services was able to hire temps to support the effort. Of the 6 temps working in the Field Services office, 4.5 temps dedicate their time to corrective maintenance in Maximo. It was stated that the 6 temps cost the company $5,000 a week, resulting in $833 per person per week. If 4.5 temps must work 50 weeks a year, the annual cost to the company is $187,500.

Staff Augmentation for Maximo Corrective Maintenance	Annual Cost
4.5 Temps	$187,500

Table 4 - Staff Augmentation Corrective Maintenance in Maximo

This cost does not include the time spent by the Dispatch Supervisor, Assistant Superintendent, and Planner Scheduler who also spend 90-95% of their time conducting corrective maintenance in Maximo. Because there are so many resources who dedicate their time to corrective maintenance, small meter maintenance is deprioritized to attend to more urgent work orders.

As discussed earlier, field activity duplications are a common occurrence within Maximo as a result of no automated process to consolidate field activities. The table below shows multiple work orders created for the same address at relatively the same time. Both examples show 4 or more work orders for the same location.

Work Order	Description	Address	Work	Status	Status Date	Priority	Reported Date	MaxGIS ID
11204732	bp 2/28	3121 SYLVIA RD SW	BILMTR12	COMP	2/28/12 1:34 PM	3	2/27/12 6:03 AM	SRVPREM754331
11201328	CONCRETE METER COLLAR 4X4X4	3121 SYLVIA RD SW	BILMTR12	COMP	2/27/12 6:03 AM	3	2/16/12 9:20 AM	SRVPREM754331
11200928	PICKUP/REFILL CONCRETE METER COLLAR 4X4X4	3121 SYLVIA RD SW	BILMTR12	COMP	3/12/12 1:25 PM	3	2/15/12 11:22 AM	SRVPREM754331
11200904	bd 4 and flag (lines 821)	3121 SYLVIA RD SW	BILMTR12	COMP	2/15/12 10:01 AM	5	2/15/12 9:04 AM	SRVPREM754331
11199117	els nmoc 2012062524 clr 551pm ed	3121 SYLVIA RD SW	BILMTR12	COMP	2/9/12 3:52 PM	2	2/9/12 3:51 PM	SRVPREM754331
11201581	bp 2/19	2012 BLAKE RD SW	BILMTR11	COMP	2/19/12 8:18 PM	3	2/17/12 5:48 AM	SRVPREM554788
11198666	4x3x4 conc s-walk	2012 BLAKE RD SW	BILMTR11	COMP	2/17/12 5:52 AM	3	2/8/12 6:08 PM	SRVPREM554788
11197214	pickup/refill concrete meter collar 4x3x4	2012 BLAKE RD SW	BILMTR11	COMP	3/12/12 11:12 AM	3	2/3/12 11:19 AM	SRVPREM554788
11197185	barr dlvry	2012 BLAKE RD SW	BILMTR11	COMP	2/3/12 10:48 AM	4	2/3/12 10:00 AM	SRVPREM554788

Table 5 - Maximo Duplicate Work Orders

Some fields have been eliminated for illustrative purposes. It was stated by Field Services that Maximo does not have data fields which could assist in the consolidation of field activities and overall efficiency.

Greater information from the above fields can equip dispatch and service workers with better understanding of issues in the field. Further, they could serve as the necessary fields to integrated both CC&B and Maximo.

Although the effort of corrective maintenance and manual data entry has been addressed, duplications also create unnecessary truck rolls to locations where issues were previously resolved. Unnecessary truck rolls consume Utility Tech time, as well as expend truck costs which are approximately $275 per truck roll according to NARUC. This analysis does not quantify unnecessary truck rolls due to an inability to track such metrics. Nonetheless, it serves as another example in which poor data integrity impacts ABCWUA costs.

Customer Service Division

The Customer Service Division at ABCWUA also experiences significant levels of effort to maintain functionality of the service order process. As indicated in Figure 7: Meter Service by Field Services, Figure 8: New Service Request and Figure 9: Meter Change Out Process, the CSD also must manually process and verify data to conduct day-to-day activities, particularly in CC&B. The Meter Change Out Process as noted above is a very heavily manual process which requires a large amount of effort by Customer Care Representatives (CCR). Currently, one CCR spends approximately 25 hours a week manually updating and closing out meter change orders. If the CCR works 50 weeks a year, the annual cost to conduct this activity is $25,429.

CCR Time Spent Manually Updating Meter Change Outs	Annual Cost
25 hours a week	$25,429

Table 6 - CCR Time Meter Change Outs

Other service activities demand significant manual intervention by CSD staff, including any manual processes involving CC&B in the above flow diagrams. The large levels of manual steps required to manipulate data in CC&B and Maximo encumbers CCRs to a degree in which a significant portion of their time is allocated to manually manipulating data in the system.

Due to the uncertainty of data provided by ABCWUA, true cost impact of the current state may be much higher.

Desired Future State

The desired future state of small meter maintenance will be to complete and close 100% of all inoperable meter work orders within 48 hours of notification. This proposed Service Level Agreement meets the new requirement to restore an AMI meter to service in time to prevent data loss.

NWSA Processes

After evaluating current processes within ABCWUA, it was noted that NWSA has very fast closure rates of meter maintenance orders, especially when compared to Field Services. According to NWSA, a verbal policy exists to close out all meter issues within 48 hours. In addition, NWSA does not estimate meter reads.

When compared to Field Services, it is clear NWSA is able to prioritize inoperable meters much higher repairing meters in less than 48 hours. Field Services currently experiences approximately 3,000 broken meters in the field and must deal will a huge backlog of other, more highly prioritized field activities.

The table below provides characteristics of both operations.

Field Services	NWSA
190,000 meters	18,000 meters
225 square miles of service territory	34 square miles of service territory
Approximately 70 Drinking Water Utility Techs	7 Utility Techs on staff
Thousands of pending meter orders currently existing in the system	No pending meter orders existing more than 2 days.

Table 7 - Field Services and NWSA Comparison

Future State Service Order Process

The future state service order process should be based upon NWSA's considering how highly efficient and effective it is. The NWSA process manages issues in both CC&B and Maximo and requires its UTs to manage much of the data entry themselves, assigning ownership to processes.

NWSA UTs have the capability to close out Maximo work orders in the field using iPads without returning to the utility to provide an update. In the case of CC&B work orders, the UT must return to the utility and provide a printout of accomplished work orders which are later closed out in CC&B by a CCR. When contrasted with Field Services, the UT must control all data entry prior to delivery to the CCR for closeout, without Temps or management involvement in the process.

Creating a clear process for UTs to take greater ownership of work order data increases the likelihood of good data integrity. With this process, incorrect data or issues can be easily tracked back to UTs who were responsible for the work order, improving accountability for errors. By pushing clear business processes and ownership on personnel, troubleshooting issues and maintaining data integrity should improve.

CCRs in NWSA also have a different role than their counterparts in ABCWUA. If personnel within NWSA identify a meter issue, a work order is created within Maximo and then provided to a Planner/Scheduler who delegates the work accordingly.

This process differentiates from CSD downtown, where CCRs enter field activities in CC&B exclusively, which are sent to Field Services 2-3 days later and must be entered manually in Maximo. NWSA also receives CC&B field activities in the same manner from CSD downtown, but the batch from Cognos arrives the next day instead of 2-3 days later. Once the batch file arrives, the designated UT fulfills the work and sends the update directly to the CCR in NWSA who updates data directly into CC&B.

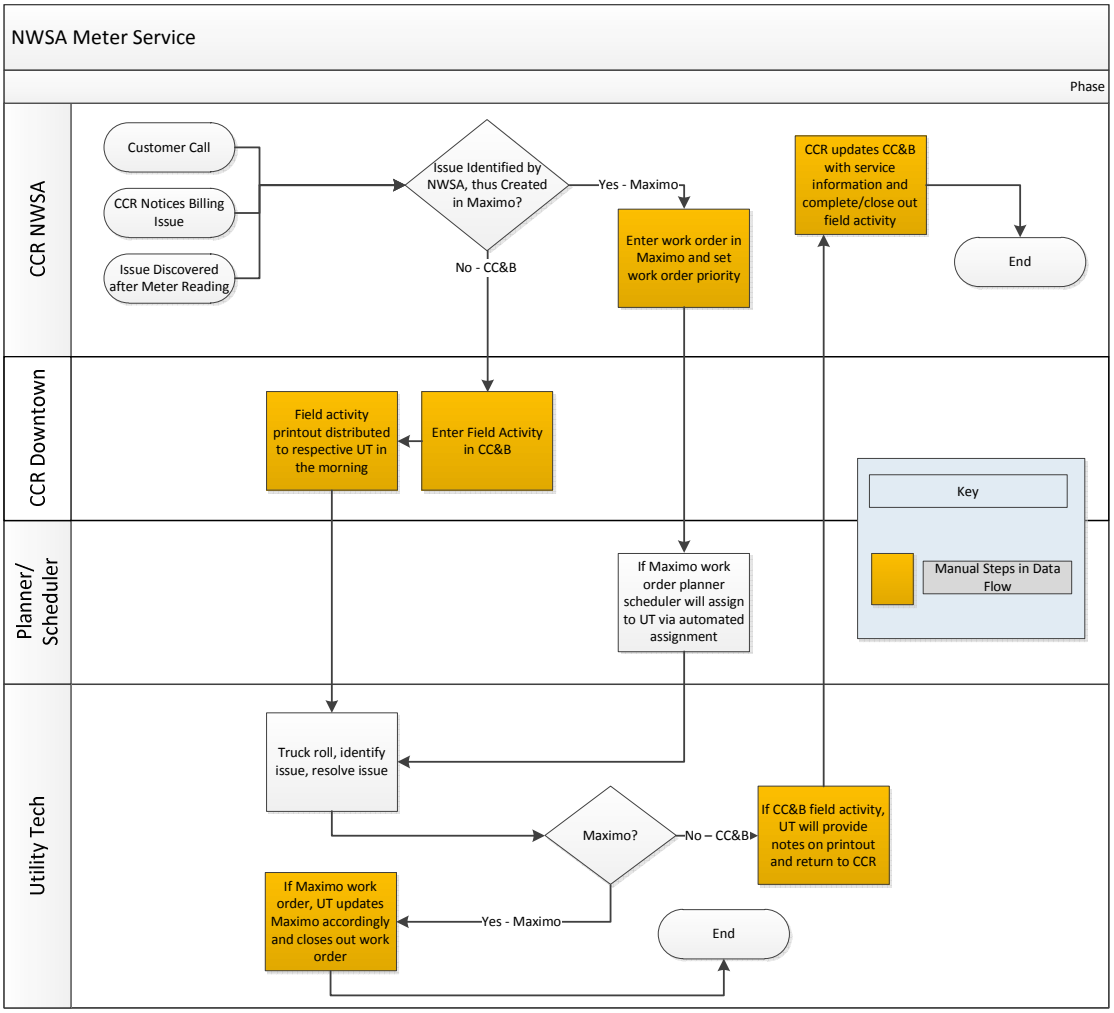

Figure 10 - NWSA Meter Service Process

In an ideal future state with proper systems integration, the current NWSA steps will be further reduced. If a field activity is identified and inputted in CC&B, that activity will be transferred automatically to Maximo and prioritized automatically. Therefore, the Planner Scheduler may assign work orders to UTs without managing two separate systems. In addition, if Maximo is the system utilized by UTs, all work orders should be closed out in Maximo, and automatically updated in CC&B.

Integration of both systems eliminates the need for manual data entry, improving data integrity and reducing resource effort in maintaining the systems.

A future state Meter Service process would resemble the following diagram.

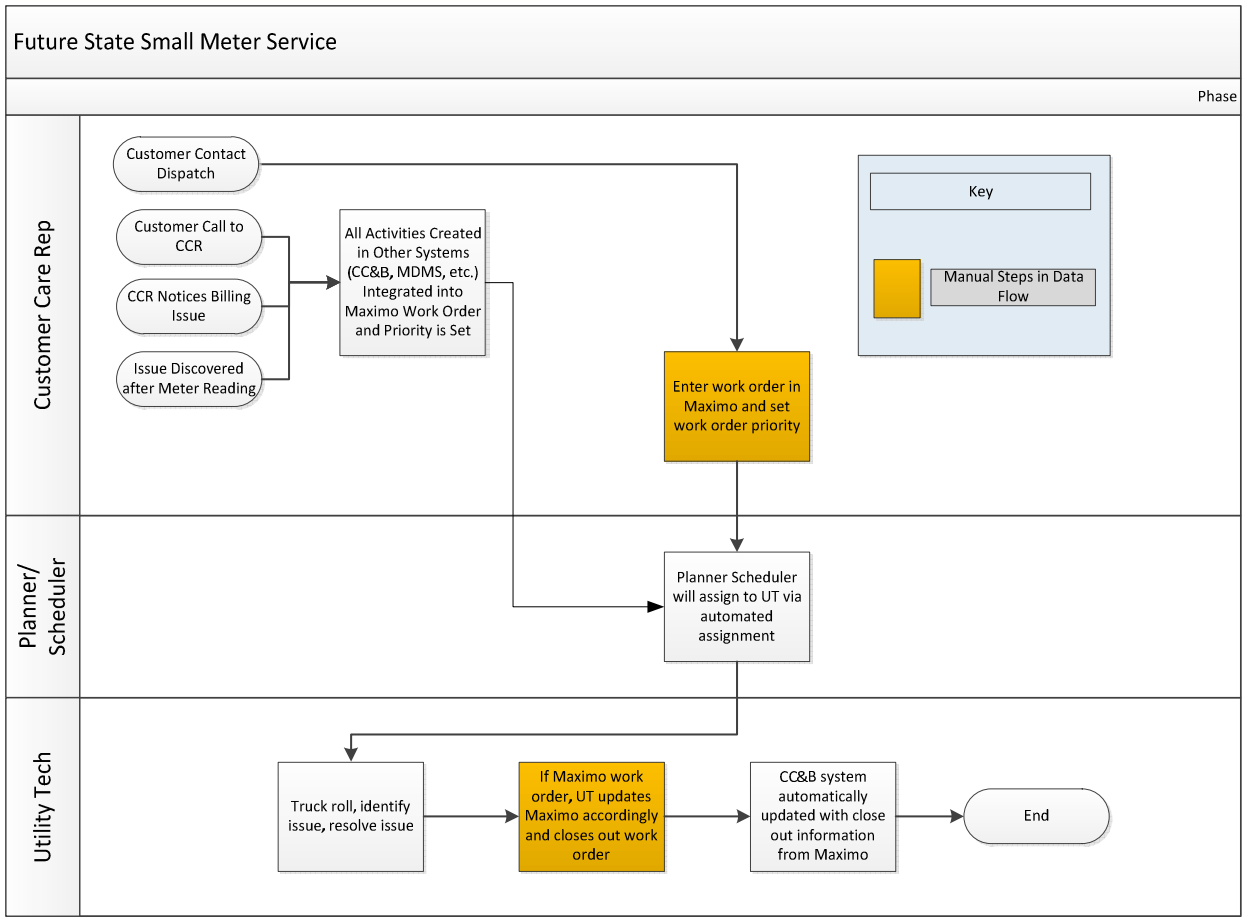

Figure 11 - Future State Small Meter Service

It is assumed that meter issues will continue to be reported through various channels (customer calls, meter reading notifications, CCR reports, etc.) but if requests are reported in CC&B, they must be automatically populated in Maximo to undergo the work order process. Once the UT closes the work order in Maximo, the information should be automatically transferred in CC&B where the activities are closed out.

Service Level Agreement

A clearly defined Service Level Agreement must be implemented to escalate issues when they arise and address them in a timely fashion. Additionally, Mean Time To Repair (MTTR) must be monitored to measure whether service orders are closed in the agreed timeframes.

Utility Technician Position

If a team were to dedicate their time exclusively to small meter maintenance, UT 1 and UT 2 positions would be the most adequate staff. The level of experience and certification required to accomplish the majority of small meter maintenance could be done by UT 1s only. Within Field Services today, Runners who are typically UT 1s or 2s are those expected to complete small meter maintenance when possible.

According to NWSA, the equipment required to service small meters consists of a ½ ton truck and a list of tools for each Utility Technician.

Asset Group	Cost
½ Ton Truck	$25,000
Utility Technician Tools and Consumables	$1,600

Table 8 - Utility Technician Capital Costs

Meter Readers at ABCWUA do not currently have a defined career path. As their positions become obsolete from the implementation of AMI, they may elect to commence training as UT 1s to manage small meter maintenance. The training should occur in advance to allow Meter Readers to smoothly transition into UT 1 positions.

CCRs and Dispatch

In the future state, CCRs will conduct their daily activities inputting information into CC&B which would automatically create work orders in Maximo.

Dispatch will also conduct their typical daily activities. Once they enter data into Maximo, a work order is created and distributed to the Planner Scheduler. If there is an issue with a particular closed work order, CCRs or Dispatch is notified and will follow up with the UT assigned to the work orders to correct the issue.

System Integration

The future state will need CC&B and upcoming systems to funnel all issues to Maximo, which will serve as the system of record for all Meter Work Orders. It is critical that data flows from CC&B in an integrated fashion to Maximo, where work orders can be created and closed out. Once data is closed out in Maximo, the system will automatically update within CC&B.

The fields utilized in both systems will match and include additional fields such as the examples provided below.

- Meter ID
- Meter Size
- Meter Type
- Location in the Field
- Number of Field Activities for particular location and badge number
- Resolution Code

This will eliminate much of the data integrity issues, backlog, and manual processes which have bogged down Field Services and caused small meter maintenance to be largely deprioritized.

The following provide the costs of system integration required:

Anticipated System integration Costs
$150,000-$250,000

Table 9 - System Integration Costs

Change management

Depending on the recommended path forward, change management efforts will be required to accomplish the transition of small meter maintenance to another entity. Project management, communication to employees and regular monitoring of the transition will be addressed during planning and implementation.

Gap Analysis

Technological gaps

Remote Terminals

Current State	Future State	Potential Issues
UTs in Field Services write finished work orders on worksheets. Worksheets must undergo validations by multiple resources prior to being added into Maximo and later CC&B.	UTs are equipped with a remote terminal, which is used to receive and update work orders.	Field Services has expressed concern over network coverage throughout the entire ABCWUA service territory to support remote terminals. Those assertions should be considered when selecting technology for remote terminals.

Slower Web-Based Maximo

Current State	Future State	Potential Issues
ABCWUA has upgraded from Maximo 4.1 to the web-based Maximo 6.2.5. Field Services uses the web-based Maximo to create and close work orders.	UTs in the field will use the web-based Maximo 6.2.5 from remote terminals to receive and close work orders.	Field Services has expressed concerns that the Maximo web client is very slow and will be further inhibited with additional data. They claim the current ABCWUA network infrastructure has difficulty supporting the application. Such claims should be investigated and addressed prior to selecting remote terminal technology and integrating systems.

System Integration

Current State	Future State	Potential Issues
CC&B and Maximo are not integrated. Information in Maximo must be manually updated in CC&B and vice versa. The current state requires a significant amount of labor and causes data errors.	Maximo will be the system of record for work orders. CC&B will be integrated with Maximo resulting in automated updates between systems.	System integration will require approximately $250,000 in cost allocation. Business processes must alter to accommodate a sole system of record for work orders. Remote terminals will be important to maintain a streamlined work order system in Maximo. The above issues must be considered in integration planning.

Equipment

Current State	Future State	Potential Issues
No small meter maintenance group exists at this time, nor does additional equipment to support small meter maintenance.	Approximately 25 Utility Techs will be assigned to small meter maintenance. Equipment to support each UTs will include a ½ ton truck and a set of UT tools.	Necessary budget must be allocated to procure the required equipment.

Operational gaps

Current State	Future State	Potential Issues
Field Services is highly resource constrained and must defer small meter maintenance to address higher priority issues. Consequently, small meter problems often go unaddressed.	All small meter maintenance issues will be addressed and closed out within 2 days.	A new group must be created to manage small meter maintenance. Sufficient budgetary allocations must be made to support staff and equipment.

Organizational gaps

Current State	Future State	Potential Issues
CSD does not currently have the organizational structure to manage all small meter maintenance responsibilities. NWSA currently has the organizational structure to manage small meter maintenance, but only within its service territory.	A small meter maintenance group must have an organizational structure of management and staff to address small meter work orders in a timely and consistent fashion.	If CSD assumes the role of small meter maintenance, its organizational structure must be adjusted to maintain small meters. If NWSA assumes the role, the organization must expand personnel and possibly create a new group within NWSA.

Personnel gaps

Meter Reading Career Path to UT

Current State	Future State	Potential Issues
Meter Readers are working in an environment in which they understand their positions will become obsolete with the expansion of the AMI system. Based on experience, this results in poor morale and occasionally sabotage of AMI projects.	Meter Readers will have the opportunity to train and become UTs focusing on small meter maintenance.	Meter Readers must complete training to become UT 1s. Sufficient time and funds must be allocated to transition Meter Readers into the UT position. Meter Reader pay rates are higher than those of UT 1s and should be grandfathered. These points must be considered in any transition planning.

Maximo Use

Current State	Future State	Potential Issues
NWSA UTs currently utilize remote terminals in the field to update Maximo work orders. UTs in Field Services do not work with remote terminals and do not work directly with Maximo.	Small meter UTs will all utilize remote terminals and have proficient understanding of Maximo to manage work orders.	Training on utilizing Maximo must be incorporated into the UT training program to ensure proper use of remote terminals and maintain data integrity.

Recommendations

Reassign Small Meter Maintenance as a Customer Service Function

The responsibility of small meter maintenance will fall under Customer Service, with NWSA serving as the pilot location. UtiliWorks Consulting further recommends that NWSA either assimilate the newly created Utility Technician roles into a single meter maintenance group or provide training and mentorship in deploying the processes and standards in the remainder of the service area.

Consequently, Field Services should discontinue their responsibility of small meter maintenance in an orderly transition as routes are upgraded to AMI. UTs focusing on small meters will be assigned to quadrants throughout the city, thus dividing resources along geographical lines. The deployment of AMI meters will demand regular maintenance and cannot tolerate prolonged outages without severe data loss. If AMI meter maintenance is neglected, it will significantly reduce or eliminate benefits derived from the system, thus impacting the return on the AMI investment.

NWSA currently supports the AMI deployment and will maintain all AMI meters upgraded in the course of phase 2 of the AMI project. As the deployment expands, NWSA will develop the expertise to lead small meter maintenance. Upon commencement of phase 3, Customer Service will take responsibility of small meter maintenance and receive training and guidance from NWSA. Customer Service will adjust its organization accordingly to accommodate new managerial roles, which will also receive guidance from NWSA.

During this AMI expansion, all meters experiencing estimated reads of three consecutive months or more will be replaced with AMI meters. Those meters will be connected to the AMI system and be eliminated from meter reading routes. Newly replaced AMI meters will fall under the responsibility of NWSA despite geographic location. This process will eliminate inoperable meters while expediting the deployment of the AMI system. The meter change out will be conducted by a contractor or internally. In this way, this meter exchange can be funded and capitalized as part of the AMI project budget.

Convert Meter Readers to UT1 as Manual Reading Declines

As Meter Reader positions gradually become obsolete from the AMI implementation, Meter Readers will have the opportunity to manage AMI small meter maintenance by becoming UT 1s. UT 1 training and certification programs will be offered and provided to qualifying Meter Readers during their tenure.

Once Meter Reader routes are eliminated, they will be reassigned to the area as a UT 1 while maintaining their original Meter Reader pay rates. Small meter UT 1s will work generally alone and be provided their own tools and truck to carry tools, meters, and possibly jackhammers. Small Meter UT 1s will have the opportunity to grow within the UT position and develop a career path.

Meter Reading managers in CSD will also transition into managing small meter maintenance. Because they will have less training in the position of the UT, it will be critical management demands that UTs are fulfilling particular process steps and managing staff statistics to ensure proper performance.

Declare Maximo as System of Record for Work Orders, and integrate with other systems

It is essential systems are integrated with Maximo to perform small meter maintenance work orders. CC&B will be integrated with Maximo to ensure all work orders are produced, communicated, and closed via Maximo. UTs will be provided remote terminals to close out work orders in Maximo, which will automatically update in critical systems such as CC&B and the MDM. Declaring Maximo the system of record of work orders and integrating it with other systems will be critical in achieving the above recommendations.

Business Case

Benefit Opportunities

The driving factors to pursue the recommendation above are:

- Revenue loss
- Labor costs
- Data integrity issues

Revenue Loss

Revenue Loss Due to Estimations

Currently over 1,200 meters are estimating at zero. Based on the stated $45/month average, the current annualized cost in revenue loss to the utility is $648,000. We expect this number to rise as demonstrated in the final analysis. Based upon the existing data set, it is difficult to reliably predict when a meter will reach the zero point, but the evidence points to all inoperable meters reaching it.

Labor Costs

The large number of manual touches required in the ABCWUA service order process demands significant labor to accomplish system tasks. To determine the labor costs in the business case, only the 4.5 Temps in Field Services and the CCR updating meter change out data was quantified.

4.5 Temps for Maximo Corrective Maintenance

Annual Cost: $187,500

CCR Time Spent Manually Updating Meter Change Outs

Annual Cost: $25,429

The labor time other CCRs and Field Service personnel dedicate to manual processes was not included in the analysis. Unnecessary truck rolls from duplicate data was also not included. Therefore, there may be additional ROI that we were unable to quantify for this analysis.

Data Integrity Issues

The massive data integrity issues for small meters within ABCWUA should disappear with comprehensive system integration and the deployment of the AMI system. By improving data integrity, it is likely additional operational efficiencies will emerge and promote confidence in users of the systems. For example, customer satisfaction is likely to improve because reductions in estimated meter reads will significantly decrease customer complaints.

Due to the uncertainty of data provided by ABCWUA, true cost impact of the current state may be much higher.

Costs for Implementation

The costs for this analysis included the following:

- CAPEX
  - Capital Assets
  - Staffing Requirements
  - Business Process Engineering
- OPEX
  - Vehicle Operational Costs
  - Technology
  - Staffing

The offsets from Meter Reading reductions to AMI were also included. These included staffing costs, and vehicle costs.

Capital Assets

Small meter maintenance will require ½ ton trucks at about $25,000 each. As Meter Readers transition out of their positions, Meter Reading trucks will be auctioned at an estimated $10,000 each. This will offset the vehicle cost to about $15,000 each. UT equipment will total approximately $1,600 per person and iPads to serve as remote terminals at $700 each.

Staffing Requirements

The training required for 25 Meter Readers to become UT 1s will require 2 trainers. Training UT 1s will require 101 hours of in-class training and 80 hours of On-the-Job training. Trainers will need to allocate 101 in-class training hours.

Business Process Engineering

This includes costs for System Integration of $250,000 and Change Management costs of $100,000. Change management will be critical in achieving effective transitioning of small meter maintenance responsibilities.

OPEX

The OPEX for small meter maintenance will consist of ongoing vehicle costs which are offset by similar costs from Meter Reading trucks. In addition, the labor costs will be offset by eliminated Meter Reading positions. The ongoing costs for network subscriptions to support iPads are included.

Findings

When comparing costs over time, it becomes evident the costs to maintain business as usual exceed the costs of changing responsibility of small meter maintenance and performing systems integration. This cost analysis assumes capital costs for the project will be spent by 2016. When compared, ongoing costs incurred by ABCWUA significantly outweigh those of implementing the recommended solution. By 2016, business-as-usual costs will result in a projected loss of $5 million dollars, whereas the projected cost to implement the project by 2016 will be $978,632.

Continued inaction by ABCWUA will cost the utility greatly.

Conclusion

When AMI systems are implemented, it becomes critical that small meter maintenance is regularly and adequately accomplished. The current operating losses in revenue, labor, customer satisfaction and data integrity should be addressed by integrating systems and switching small meter responsibility to CSD, or NWSA, or both groups.

The costs to pursue such recommendations are heavily outweighed by the current costs incurred by revenue loss, data integrity issues and manual processes. UWC strongly recommends it take immediate action to implement all recommendations provided to avoid further losses to the authority.

Albuquerque Bernalillo County Water Utility Authority

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Table 10: Project Reallocation Costs vs. Current State Costs at ABCWUA

Reallocation Costs							
CAPEX		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
CAPITAL ASSETS REQUIRED		0	$112,582.85	$112,582.85	$112,582.85	$112,582.85	0
STAFFING REQUIREMENTS		0	$32,575.11	$32,575.11	$32,575.11	$32,575.11	0
BUSINESS PROCESS ENGINEERING		0	$300,000.00	$50,000.00	0	0	0
Total		0	$445,157.96	$195,157.96	$145,157.96	$145,157.96	0
Aggregated Total		0	$445,157.96	$640,315.93	$785,473.89	$930,631.85	0

OPEX		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
VEHICLES		0	0	0	0	0	0
STAFFING		0	0	0	0	0	0
Technology		$0.00	$12,000.00	$12,000.00	$12,000.00	$12,000.00	$12,000.00
Total		0	12000	12000	12000	12000	12000
Aggregated Total		0	12000	24000	36000	48000	60000

Total Costs		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Total		$0.00	$457,158	$207,158	$157,158	$157,158	$12,000
Aggregated Total		0	$457,158	$664,316	$821,474	$978,632	$1,038,632

Current State Costs						
Ongoing Costs	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Field Ops 4.5 Temps	$187,500	$187,500	$187,500	$187,500	$187,500	$187,500
CCR Updating Meter Change Outs	$25,429	$25,429	$25,429	$25,429	$25,429	$25,429
Revenue Loss Due to Estimations	$648,000	$712,800	$784,080	$862,488	$948,737	$1,043,610
Total	$860,929	$1,184,929	$1,444,129	$1,651,489	$1,817,377	$1,950,087
Aggregated Total	$860,929	$1,786,658	$2,783,667	$3,859,084	$5,020,750	$6,277,289