AGENDA SUMMARY
EUREKA CITY COUNCIL

TITLE: Water Meter Update Project

DEPARTMENT: Public Works

PREPARED BY: Brian Issa, Deputy Public Works Director

PRESENTED FOR: ☐Action ☒Information only ☐Discussion

RECOMMENDATION

1. Receive report

FISCAL IMPACT

☐No Fiscal Impact ☒Included in Budget ☐Additional Appropriation

COUNCIL GOALS/STRATEGIC VISION

- Effective governance
- Fiscal responsibility

DISCUSSION

System Overview

With over 10,000 accounts, the City's water metering system is composed of a chain of components that measure, translate and relay usage information from the field to the City's billing system. These components include:

- The meter box. Most meters are located in meter boxes made of concrete, plastic, metal or, in some cases, wood. The box has a removable lid which also be made of a variety of materials.
- The water meter. Typically located in a meter box in the sidewalk, the meter measures the volume of water that moves through the water service over time. The City uses Badger Recordall nutating disk meters. A short video of how the meter measures usage can be found here.
- The register sits on top of the meter and translates the internal movement of the meter into a measurement of volume based on the meter size. The register is replaceable independent of the meter body and provides both a visible read of usage and a leak indicator dial. The register also stores read data every hour which is useful in tracking down leaks or unusual usage patterns. Currently,

hourly data is stored but is not transmitted as part of the monthly read cycle (conserves battery life). Obtaining the stored data requires physically coupling to the register with a laptop.

- Endpoint (ERT). The endpoint is essentially an antenna that is hard-wired to the register with a cable and is used to transmit the read data via a low-wattage radio signal. The current ERTs are able to transmit through all lid types including concrete or metal. Surface mounting of the transmitter is not required to obtain a read and almost all of our current endpoints are located under the meter lid.
- The read computer. The City has a van equipped with an antenna and computer that drives set routes on a monthly basis and collects the read data from the meters. The difference between monthly reads is the billable volume. The read software/hardware have ongoing maintenance costs specific to those systems.
- The billing system. The City used Tyler Incode to record usage and create bills based on the current rate schedule.

The City installed new meter bodies, registers and ERTs in 2006-07, moving from a manual-read system to the current radio read system. When installed, the current equipment had an estimated 20 year battery life.

The Problem

Beginning in 2020, we started to see equipment dropping out due to battery failure. At first, we were seeing just a couple of meters dying per month. However, this number began to climb drastically in 2022 and we are currently losing 250, or 2%, of our meter population each read cycle with the rate increasing logarithmically. Without acting, we were on track to read a full 25% of our system manually each month by June of this year. We went from one person reading meters for eight hours a month, to four people reading meters full time.

In response, starting in March of this year, finance staff switched to billing every other month with interim months based on an average use. This move freed up staff from manually reading meters so we could focus on replacing dead equipment.

Questions to Answer

Knowing that equipment replacement was necessary, the following questions became relevant:

1. Will we replace the meter bodies or just the registers/ERTs?
2. What type of equipment will we replace with?
3. What is the potential total cost of the project?
4. Are there ways to reduce the cost of the project?

Approach

Meter Bodies

To answer question one the City selected a random sample of our meter population for testing by Badger. Sample size was determined by the total meter population and a confidence interval of 98%. Those test results indicate that the meter bodies themselves are well within the accuracy limits recommended by the manufacturer. This is largely due to our water chemistry and the lack of mineral buildup. The cost of replacing all of

the meters exceeds $700,000 just in the purchase cost of the meter. Replacing the meter also involves a significant amount of labor, especially when you consider the number of service lines and house plumbing connections that are likely to break when the meters are removed and replaced. Choosing not to replace the meter bodies will save the City well over $1M.

With a more robust tracking of meter performance over time, and a policy of not reusing meters that are pulled from the field, it will be possible to just replace meter bodies on an as-needed basis.

New Technology

As was the case 20 years ago, technology has moved forward in the meter reading world. The current radio-read technology is outdated and while the manufacturer will continue to support the current system as it's phased out, a wholesale changeover to new technology has many advantages. The City has two options both of which are real-time monitoring systems that do away with the need to read meters entirely. Both systems utilize endpoints that transmit continuously.

A. Move to a "fixed base" system. This system includes a network of fixed collectors distributed throughout the City. This system would be owned and maintained by the City similar to our existing SCADA network.
B. Move to a "cellular" system. This utilizes the existing/future cellular network to collect and transmit the read data via the internet to our accounting software

These options are very similar in the way they work and their advantages over the current system. Both options make the need for a dedicated vehicle, staff, hardware, and software to read meters obsolete. Both provide opportunities for greater transparency and control of water use both at the customer level and by the City.

Both options also have drawbacks. Due to the topography of Eureka, getting network coverage could be challenging in areas of heavy tree cover and down in the gulches. The City completed a propagation study which indicated that at least two collectors would be needed but that number is likely higher. It's possible we could install multiple collectors and not get 100% coverage. Likewise, coverage with the existing cellular network is likely less than 100%. The benefit of the cellular system is existing coverage is very good and market forces are constantly moving towards better coverage. As cell coverage is improved, our meter network will automatically benefit. The City purchased several cellular meters and installed them in areas we thought might be problematic. So far, we haven't found a location where the cellular solution doesn't work.

The costs of a fixed base network are in the equipment purchase (roughly $100K) and the yearly fees (roughly $30K or $3/meter/year). There are also costs associated with ongoing maintenance of the network collectors that are difficult to anticipate.

The costs of the cellular option are currently $.95/meter/month for cellular service (approximately $116,000/year total).

The idea of owning and maintaining our own network presented unknown future costs and provides no benefits over the cellular option. Coupled with the meter manufacturers

recommendation and prediction that the industry is moving away from fixed networks, the City chose to adopt the cellular option.

The Lid Issue

Both the cellular and fixed network transmitters differ considerably from our current system. The current endpoints only transmit data every few seconds and at a power low enough to be read when the reader van is in close proximity. The current endpoints only transmit and no two-way communication is occurring.

Both the cellular and fixed network endpoints transmit on a different frequency, with higher power (they have to talk to a tower that isn't close by) and provide for two-way communications. These transmitters will talk to the tower and if the tower doesn't talk back, the endpoint will increase signal power until it does. This can drastically shorten battery life.

Due to these properties, the manufacturer recommends that these units be surface mounted. In many instances, this is solved by simply replacing the existing lid with a new lid which has a recessed hole for surface mounting the endpoint. However, based on a meter survey conducted in 2020, we have approximately 3600 meters located within boxes that have metal lids. These lids vary widely with respect to dimensions and materials and typically sit in a shallow metal ring for which no replacement lid is available.

Replacing the meter boxes themselves presents multiple issues, not least of which is the cost. Replacing the box typically means jackhammering out the concrete, replacing the box and pouring new concrete around the new box. The estimated parts and labor cost of replacing 3600 boxes is over $5M for this task alone, not including the cost of replacing the meter equipment. This would more than double the cost of the project and have significantly more impact on our residents, especially in areas like Old Town, which predominantly have metal lids.

As a work-around, we have sourced retrofit kits that require an 8-inch diameter hole to be cut into the lid. The transmitter is them mounted in a plastic insert that does not interfere with signal propagation. The total estimated cost of the kits and installation is approximately $500K.

Availability of Equipment

Both the cost of equipment and the lead time to delivery have increased significantly since COVID. The microchip shortage has resulted in lead times of up to 120 working days on endpoints. The current estimated lead time is 95 working days. This makes purchasing and coordinating delivery of equipment more difficult. We no longer have the option of buying equipment as needed and have to place larger orders and store more equipment on hand. This is true of the replacement lids as well as registers and endpoints.

Project Coordination and Automation

Given the following points, we decided to explore the idea of completing the project with the Water Distribution crew as opposed to hiring a contractor.

- Meters only replaced as needed
- No widespread meter box replacement
- Significantly reduced labor costs (even assuming significant overtime and temp employee costs)
- Our crew will provide the greatest standard of care and the closest communication and coordination with Incode, the City's finance department, and the various equipment vendors to provide an end result that is as free from errors and cost effective as possible
- Improvements in GIS and mobile tech allow us to perform functions previously limited to specialty contractors

To this end, we developed a way to largely automate the equipment swap process to reduce points where errors creep into the process. Previously, staff would write down relevant data (new and old 9-digit meter numbers, reads, etc.) on a paper form which when then transferred to finance where the information was hand entered into Incode. This resulted in large error rates do to transposing of numbers etc. We purchased iPads and bar code scanners and working with a data gathering tool developed by our GIS specialist, gather all of the information directly from the tags on the equipment in a way that allows multiple points for quality control. This data is then fed to Incode staff who upload the data directly, updating the billing system.

Using this process, we believe we have a robust, efficient, and cost-effective system to replace the equipment in house. Beta testing of this system indicates an average replacement rate of 50-70 meters per day. This rate will vary depending on a number of factors but an average replacement rate of 50 units per day is likely. This would allow us to complete the changeover in approximately one year.

Purchase History and Budgeting

The total cost of the project not including staff time is approximately $4.5M in 2023 dollars.

As Council is aware, we have come forward with two large purchases recently that were not originally planned for in the FY23 budget. The first purchase for $363K for registers, endpoints and 2400 lids was approved as an additional appropriation. The second for $778K included 3500 registers and endpoints was done though a mid-year adjustment.

Based on current pricing, we have approximately $3M worth of equipment (registers, endpoints, lids, and metal lid retrofit kits) to purchase to complete the project. Based on the estimated install rate of the equipment already purchased and the current estimated lead time on delivery, it is necessary to place orders for the remaining equipment as soon as possible to avoid delays in project completion. Most of these deliveries will not arrive until after the start of FY24.

Project Funding

The City applied for a grant in 2021 which was denied due to the project not fitting the programs focus which is increasingly on water conservation due to successive years of drought. Currently there are no grant programs available for this type of project and the City has applied for low-interest loan funds through the State Clean Water Revolving Loan Fund. That application is still in review.

Cellular Advantages

The move to a real-time read system has several advantages. These include:

- A customer side portal that allows users to see their water use in near real-time. This allows customers to manage their water use and their bill with much more control and transparency than the current monthly read system. Through the portal called EyeOnWater, customers can set customized leak parameters and be notified by text or email if leaks occur. They can also compare usage over time down to the minute. This will lead to greater water conservation (a current state priority), less staff time spent answering billing questions and handling leak adjustments, and ultimately a more efficient and cost-effective system.
- Reduced staff time dedicated to reading meters, performing re-reads when errors occur, and pulling data from meters for leaks.
- No need for a dedicated vehicle. A “meter reader” vehicle becomes unnecessary reducing fleet lease and fuel costs
- Reduced emissions. Less driving means less fuel use and emissions.
- Easier for billing staff to respond to questions as they will have the data in front of them and the customer will be able to see it as the same time.
- Tracking meters and usage outside of the billing software. Incode is less than stellar at providing access to water usage and meter data. This information is increasingly required for state reporting. Beacon provides a much more user-friendly way to access this data.
- The option of utilizing remote actuated meter valves in situations where tenant turnover or inconsistent payment history results in multiple staff callouts to start/stop service at the meter. We currently don’t have any of these specialty meters in our system but expect to beta test them in the coming year.

Upcoming Tasks

1. Beta test the first upload of swap data to Incode
2. QA/QC of the process to ensure low error rate
3. Start swapping equipment on an ongoing basis to refine project timeline and cost estimates
4. Place orders for equipment so that we have units on hand when the current supply runs out
5. Complete state SRF loan application process
6. Rollout EyeOnWater customer portal

REVIEWED AND APPROVED BY:

☐City Attorney
☒City Clerk/Information Technology
☐Community Services
☐Development Services
☒Finance
☐Fire
☐Human Resources
☐Police
☒Public Works