



City of Moose Jaw

COMMUNICATION # EC-2019-0249

TITLE: Smart Water Metering
TO: City Council
FROM: Department of Engineering Services
DATE: October 2, 2019
PUBLIC: PUBLIC DOCUMENT

RECOMMENDATION

THAT approval be granted to the Department of Engineering Services to issue an RFP for the purchase and installation of an Advanced Metering Infrastructure including the replacement of the City's water meters with smart meters.

Further, that the RFP Report to Council will include financing options as well as timelines to complete the project.

TOPIC AND PURPOSE

The purpose of this report is to outline the City's current water metering technology and engage in a discussion on alternatives to implement a new smart, customer service friendly, effective and efficient water metering network.

BACKGROUND

The City of Moose Jaw currently provides potable drinking water services to 12,416 active customers, not including seasonal accounts. Water meters measure the consumption of water for each customer and billing is comprised of two charges:

- 1) A base fee for water and sewer which is dependent on the size of the water meter.
- 2) A consumption charge for water and sewer recorded by the water meter.

Water meters are critical to the operation of the Water and Wastewater Utilities to recover the costs associated with providing water and wastewater services and to provide billings. Information on the City's water meters is included in Attachment i.

The reading of water meters is performed by the Treasury Department. The City is separated into quadrants and meters are to be read three times annually (37,248 total reads) plus one estimated read. The City is only able to attain 24,744 actual reads per year and estimate reads for the other two billing periods. When staff are unable to obtain a read for a property the City relies on the residents to read and report the meter consumption or the Water Meter Department is booked through an internal order system to obtain the read. An employee is then deployed to attempt to obtain the required read. In 2018 the Water Meter Department was deployed to obtain 2,329 reads.

Estimated quarterly billing can be problematic for the customer. Small leaks or running toilets can go unnoticed in a home and lead to very large bills when a possible six months could elapse between actual meter reads. The City regularly receives billing complaints and is unable to effectively resolve them due to the infrequency of meter readings. Regular meter reads are the best indicator for homeowners and City personnel to detect and trouble shoot for high water consumption. It should be noted that staff requiring access to thirty-four percent (34%) of customers' homes, twice annually, coupled with long estimating periods are not customer service-oriented procedures.

DISCUSSION

Smart Metering can be broken into two distinct discussion points, meter reading technology and meter design.

Meter Reading Technology

The most modern meter reading technology is called Advanced Metering Infrastructure (AMI). Meter reads are automatic and can be collected on demand remotely. There are many benefits that can be realized from an AMI network coupled with the right water meters:

- Hourly meter reads collected automatically eliminating the need for staff to physically attend the property or for the City to estimate bills.
- Elimination of safety concerns from staff entering homes alone.
- Any billing cycle can be chosen - quarterly, monthly, etc.
- More accurate data through the reduction/elimination of manual entry.
- Alarms can warn the customer or City personnel to abnormal usage which can immediately indicate water leaks in the home.
- Customers and City personnel have access to real time data, reducing billing concerns and greatly enhancing transparency.
- Water services can be turned on or off remotely for select accounts (move ins/outs, snowbirds, delinquent accounts).
- Temperature sensors can alert customers and City personnel to the risk of freezing service connection lines when a reduction in temperature is detected.
- Immediate detection of meters that have been damaged, stopped, or tampered with.

Non-mechanical (solid state) water meters are a newer technology of meter that have no internal moving parts. This technology measures water by analyzing signals in the flow of water with a series of electrodes. These meters can read low flow rates well and maintain their accuracy for their entire service life translating to no loss of revenue from degradation. The life expectancy of these meters is twenty (20) years due to battery life limitations and manufacturers do offer up to a fifteen-year full warranty plus an additional five-year prorated warranty.

FINANCIAL ANALYSIS

The City of Moose Jaw has had an average of 5,532.3 ML (megalitres) of treated water pumped annually from Buffalo Pound Water Treatment Plant over the last three (3) years. The City of Moose Jaw has billed customers for water usage and wastewater disposal and treatment at an annual average volume of 4,579.4 ML over the same time frame. This means that an average of 952.9 ML (17.2%) of water is unaccounted for annually. All water systems have loss and there are many causes for this discrepancy in water consumption:

- Water loss due to leaks and breaks
- Provision of temporary water due to system disruptions (water trailer, house to house connections for service leaks)
- Capital construction project consumption of water (water main replacement, water or sanitary main lining, paving, etc.)
- Operational programs (street sweeping, uni-directional flushing, sanitary main flushing, etc.)
- Metered service connections under read due to aged meters
- Undetected theft of water (unauthorized connections, meters that have been tampered with)

Through discussions with suppliers, industry studies and the City of Moose Jaw's own testing results from retired water meters, an estimate of 4% - 6% additional revenue gain has been used for this business case. This 4% - 6% increase in meter reading equates to an average of 183.2 ML - 274.8 ML or 19.2% - 28.8% of the water that is unaccounted for annually. The other would be from losses in the systems from leaks as well as preventative maintenance such as flushing.

In addition to a revenue increase, there will also be savings in annual operational costs (labour, materials, and equipment). Meter reading at every home or business in Moose Jaw will no longer be required as it will be automatically transmitted every hour. The number of water meters currently being replaced in the system will drop dramatically as the entire system is replaced through this program. Annual installs will consist of meters that have prematurely failed (warranty) or new home or business builds. With the reduction of reading required, the associated tools and vehicles can be repurposed or eliminated. The City anticipates a reduction of three (3) permanent positions which will be addressed through attrition.

COST ANALYSIS

The cost to install the AML infrastructure and replace the City's meter network is estimated at \$6,000,000. This estimate has come from high level discussions with several suppliers and other municipalities that have recently installed new systems. In order to install new

meters at every property in the City, water will need to be temporarily shut off for this installation. Internal water shut off valves at every property cannot be expected to work so the outside curb stop will need to be operated in those instances. Curb stops fail at a high rate over their lifetime and it has been estimated the number that will need to have some sort of repair (3 types, minor to major) during the project. All the costs, savings and revenue generation are shown in the following table:

AMI and smart meter system	Annually	20-year lifespan	Implementation Costs	One-time expenditures
Operational Savings	\$259,816	\$5,196,320	Additional Construction Work	\$570,965
Revenue Increase (4-6%)	\$495,342 - \$743,012	\$9,906,840 - \$14,860,240	AMI system and smart meter installation	\$6,000,000
Total	\$15,103,160 - \$20,056,560		Total	\$6,570,965
Net Benefit (20 years)	\$8,532,195 - \$13,485,595			

A simple payback model for this project would range from 6.6 to 8.7 years.

A request for proposal will be used to engage the contractor and the smart meter expertise required to complete the project. The project will be managed the same as a major capital project with a Technologist assigned as the Project Manager. The Project Manager will have an internal project team to support the project, including managers, technical, operational and communications support. The contractor will complete the required work and lead much of the communication when the work is underway.

Pending Council approval, the request for proposals would be drafted, issued and awarded. It is anticipated that the meter installation work would start in the summer of 2020. This would correspond well with the training and on-boarding of the additional construction crew which would be complete or nearly complete at this time.

SUMMARY

The AMI project will result in costs savings from operational requirements and additional revenues from accurate meter readings, it is anticipated that there will be a new stream of monies that will be available to provide funding to finance the project over a period of time.

The simple payback on the investment is estimated to be 8.7 years based upon the worse-case scenario of operational savings/revenue increase of just over \$ 755,000 annually. This investment would fit within the City's guiding budgeting principles and it is recommended that the City should seek to invest in infrastructure when productivity, efficiency and effectiveness increases are possible.

Options to finance the AMI program include vendor supplied financing, external borrowing, self-financing, reserves or a combination of these methods. Once the RFP proposals have been received, the Department of Financial Services will work with the

Department of Engineering Services to determine the best means of financing. The financing method will then be presented to City Council for the appropriate approvals.

Not only does this project generate revenue and savings for the City in a utility that requires significant funding for infrastructure replacement, it also greatly increases transparency and customer service for the City's water users.

OPTIONS TO RECOMMENDATION

- 1) That the City continue with the current practice of meter reading and meter replacement.

COMMUNICATION PLAN

This project involves the replacement of all water meters in the City. Every property that has a water connection will need to be entered in order to perform the meter installations. Significant communication will be required before and during the project implementation. The Communications Manager will be an integral part of this communication development.

FINANCIAL IMPLICATIONS

The estimated cost of this project is \$6,570,965 and is expected to be offset by cost savings and revenue generation. A separate report will be delivered by the Department of Financial Services once the RFP results have been received.

STRATEGIC PLAN

This fits the following major objectives of the Strategic Plan:

- Entrepreneurial Civic Administration and the subheading of Updated Information Technology Systems.

As well as the following values:

- We will have the courage to try new things and not be afraid action could lead to failure.
- We will be forward thinking and innovative in identifying problems and finding solutions.

PUBLIC NOTICE

Public Notice pursuant to the Public Notice Policy is not required.

PRESENTATION

VERBAL: Administration from the Department of Engineering Services will provide a brief overview of the report.

ATTACHMENTS

- i. Smart Metering – Water Meter History/Relevant Information

REPORT APPROVAL

Written by: Darrin Stephanson, Manager of Utilities
Reviewed by: Josh Mickleborough, Director of Engineering
Tracy Wittke, Assistant City Clerk
Approved by: Jim Puffalt, City Manager
Approved by: Fraser Tolmie, Mayor

To be completed by the Clerk's Department only.

Presented to Regular Council or Executive Committee on _____.

No. _____ Resolution No. _____

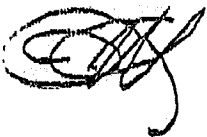
Report Approval Details

Document Title:	Smart Water Metering - CC-2019-0249.docx
Attachments:	- Smart Metering Attachment i.docx
Final Approval Date:	Nov 21, 2019

This report and all of its attachments were approved and signed as outlined below:



Tracy Wittke



Jim Puffalt



Fraser Tolmie

CITY OF MOOSE JAW Water Meter History/Relevant Information

The reading of water meters has changed significantly with the introduction of technology. The following table summarizes the major changes in meter reading methods and how municipalities around the province currently collect meter reads.

Introduction of Water Meter Reading Technology

Year	Mechanism	City
pre-1950	Manual Read of Meters (enter home to perform read)	Moose Jaw
1950	Visual/Dial Read Meter (register on exterior of home – prone to inaccuracy)	Moose Jaw
1970	Scan/Touchpad Read Remotes (wired pad on exterior of home)	Moose Jaw, North Battleford
1980	Radio Frequency Mobile Reading (no requirement to enter homeowner's property – first version of Smart Metering)	Regina, Swift Current
2000	Two -Way Communication (Advanced Metering Infrastructure (AMI) – evolution of Smart Metering)	Saskatoon, Weyburn, Prince Albert, North Battleford

Moose Jaw currently uses three different methods to collect meter reads:

- 1) Manual Read of Meters – 4,246 customers
- 2) Dial Read Remote – 982 customers
- 3) Touchpad Read Remotes – 7,188 customers

Water meters vary in size from 5/8-inch to 8-inch. The current standard for a residential meter is 3/4-inch. A size breakdown of the water meters in service are shown in the following table:

Meter Size	5/8"	3/4"	1"	1.5"	2"	3"	4"	6"	8"	Unknown
Quantity in Service	9,307	2,481	241	47	225	21	13	5	4	72

The inventory of water meters in use also vary in age, as illustrated in the following table:

Meter Age	1 year	2–5 years	6–10 years	11–15 years	+15 years	Unknown
Quantity in Service	326	1,389	2,038	2,399	5,674	590

Meter Design

Water meter design has historically consisted of a positive displacement meter with an internal nutating disc (mechanical meter). Mechanical meters are not effective at reading low flow rates and this can result in a significant amount of water consumption lost the larger the water meter gets. Mechanical meters begin losing accuracy once

installed. This loss of accuracy accelerates as the meter ages, more sharply as the meter passes ten years in service. Mechanical meters typically lose 3% – 8% accuracy, under reading water consumption, when they are ten to twenty years in age. Over 50% of the City of Moose Jaw's in-service water meters are over fifteen years old, 70% over ten years old. Current resources in the Meter Department put the City on a replacement cycle of water meters at thirty-six (36) years.