



FINANCE AND ADMINISTRATION COMMITTEE AGENDA

Finance and Administration Committee Meeting
Tuesday, April 17, 2018
Tom Davies Square

COUNCILLOR MIKE JAKUBO, CHAIR

Deb McIntosh, Vice-Chair

4:00 p.m. FINANCE AND ADMINISTRATION COMMITTEE MEETING
COUNCIL CHAMBER

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DECLARATIONS OF PECUNIARY INTEREST AND THE GENERAL NATURE THEREOF

PRESENTATIONS

1. Report dated April 3, 2018 from the General Manager of Growth and Infrastructure regarding Automated Water Meter Reading Feasibility Study. **5 - 123**
(ELECTRONIC PRESENTATION) (RESOLUTION PREPARED)
 - Joel Carty, Consultant, Diameter Services

(This report provides information regarding the Automated Meter Reading Feasibility Study and the staff recommendation to move forward with the RFP for procurement of the Advanced Metering Infrastructure system.)
2. Report dated March 26, 2018 from the General Manager of Corporate Services regarding 2019 Development Charges Background Study and By-Law. **124 - 131**
(ELECTRONIC PRESENTATION) (FOR INFORMATION ONLY)
 - Jason Bevan, Hemson Consulting Ltd.

(This report provides an overview of the 2019 Development Charges Background Study and By-Law.)
3. Report dated March 26, 2018 from the Director of Communications and Community Engagement regarding Customer Service Issues and Principles. **132 - 149**
(ELECTRONIC PRESENTATION) (FOR INFORMATION ONLY)
 - Eliza Bennett, Director of Communications and Community Engagement
 - Renee Higgins, Manager of 311 and Customer Service

(This report provides an overview of the high level customer service issues that the City of Greater Sudbury will seek to address and the principles that will be applied in the development of a corporate customer service strategy.)

CONSENT AGENDA

(For the purpose of convenience and for expediting meetings, matters of business of repetitive or routine nature are included in the Consent Agenda, and all such matters of business contained in the Consent Agenda are voted on collectively.

A particular matter of business may be singled out from the Consent Agenda for debate or for a separate vote upon the request of any Councillor. In the case of a separate vote, the excluded matter of business is severed from the Consent Agenda, and only the remaining matters of business contained in the Consent Agenda are voted on collectively.

Each and every matter of business contained in the Consent Agenda is recorded separately in the minutes of the meeting.)

CORRESPONDENCE FOR INFORMATION ONLY

- C-1. Report dated February 26, 2018 from the General Manager of Corporate Services regarding Section 391 Charges - Update of Existing Projects. **150 - 153**
(FOR INFORMATION ONLY)

(This report provides an update of existing projects where City of Greater Sudbury collects Section 391 charges as building permits are issued.)

- C-2. Report dated April 4, 2018 from the General Manager of Corporate Services regarding Asset Management Program. **154 - 169**
(FOR INFORMATION ONLY)

(The purpose of this report is to present the state of the City's Asset Management Program to Council by outlining the milestones to develop and implement the City's Asset Management Plan in accordance with the new provincial regulations. This report is a follow-up to the Asset Management Strategy report provided to Council in October 2017.)

- C-3. Report dated March 28, 2018 from the General Manager of Corporate Services regarding Election Compliance Audit Committee. **170 - 175**
(FOR INFORMATION ONLY)

(Every municipality is required to appoint an Election Compliance Audit Committee prior to October 1st of each municipal election year. The Terms of Reference for the Election Compliance Audit Committee were established by Council in 2010. This report updates Council on the changes made to the Municipal Elections Act since 2014 and the process for recruiting and appointing three citizens to the Election Compliance Audit Committee for the period December 1, 2018 to November 30, 2022.)

REGULAR AGENDA

MANAGERS' REPORTS

- R-1. Report dated April 4, 2018 from the General Manager of Corporate Services regarding Fleet - External Services Agreement. **176 - 180**
(RESOLUTION PREPARED)

(This report outlines general conditions and obtain authority for the General Manager of Corporate Services to enter into an Agreement to provide fleet services to Manitoulin - Sudbury District Services Board - Paramedic Services.)

- R-2. Report dated March 13, 2018 from the General Manager of Corporate Services regarding The Federation of Canadian Municipalities Funding: Municipal Asset Management Program. **181 - 183**
(RESOLUTION PREPARED)

(This report outlines information from the Federation of Canadian Municipalities Municipal Asset Management Program so that the City may submit an application for funding.)

ADDENDUM

CIVIC PETITIONS

QUESTION PERIOD AND ANNOUNCEMENTS

NOTICES OF MOTION

ADJOURNMENT

Request for Decision

Automated Water Meter Reading Feasibility Study

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Tuesday, Apr 03, 2018

Type: Presentations

Resolution

THAT the City of Greater Sudbury directs staff to take the next steps required to implement a fixed base Automated Meter Reading ("AMR")/Automated Meter Infrastructure ("AMI") system for the City of Greater Sudbury as outlined in the report entitled "Automated Water Meter Reading Feasibility Study", from the General Manager of Growth and Infrastructure, presented at the Finance and Administration Committee meeting on April 17, 2018, including the following steps:

- a) Issuing a Request for Proposals to select an implementation partner that will supply hardware, software and related expertise to establish an AMR/AMI solution;
- b) Establishing a municipally-owned Meter Data Management Software system; and
- c) Creating an on-line customer service portal to permit real-time access to personal consumption data, initiated or manage service requests and other features as may be determined following a review of the submitted proposals;

AND THAT the City of Greater Sudbury directs staff to report to the Finance and Administration Committee with recommendations before the end of Q2, 2019 with a detailed implementation plan including:

- a) A financing plan covering estimated capital costs, operating costs;
- b) Changes in customer service levels and processes to achieve the program's expected benefits;
- c) Changes in terms with Greater Sudbury Utilities;
- d) Communication strategies for informing customers about pending changes; and
- e) An implementation schedule

Signed By

Report Prepared By

Dave Brouse
Compliance Supervisor
Digitally Signed Apr 3, 18

Division Review

Mike Jensen
Acting Director of Water/Wastewater
Services
Digitally Signed Apr 3, 18

Financial Implications

Jim Lister
Manager of Financial Planning and
Budgeting
Digitally Signed Apr 3, 18

Recommended by the Department

Tony Cecutti
General Manager of Growth and
Infrastructure
Digitally Signed Apr 3, 18

Recommended by the C.A.O.

Ed Archer
Chief Administrative Officer
Digitally Signed Apr 3, 18

Relationship to the Strategic Plan / Health Impact Assessment

This report supports the 'Responsive, Fiscally Prudent, Open Governance' and Sustainable Infrastructure pillars of the Corporate Strategic Plan.

Report Summary

This report highlights the recommendations and benefits of upgrading the City's existing water metering infrastructure to an advanced metering infrastructure solution to enable operational, efficiencies, and customer service improvements.

Financial Implications

There are sufficient funds in the current budget to complete the estimated cost of \$138,300 for the next steps including the procurement and to update the business evaluation. The next report will include detailed financial implications for full implementation and operation of the AMR/AMI water meter system.

Advanced Metering Infrastructure System Report to Finance and Administration Committee April 17, 2018

BACKGROUND

The City of Greater Sudbury provides drinking water services to over 48, 000 customers. Funding to provide these services is primarily generated through user fees based largely on consumption through water meters measuring usage for each account.

The City's current metering technology is outdated when compared to industry norms and relies on 'touch pad' technology requiring manual readings to determine consumption. The resolution of the consumption data generated using touch pad technology also limits the range of business processes and customer friendly options. A contemporary water service provides real-time information to both system operators and customers about performance, consumption levels and trends. Currently, our service does not offer these features in a user-friendly or timely way. With a significant percentage of the City's meter inventory slated for replacement a review of the City's current water meter technology and metering related processes is underway.

In early 2017 the Water/Wastewater Services division procured consulting services from Diameter Services through a Request for Proposal process to review the City's current inventory of water meters, analyze current meter reading and billing processes and identify opportunities for improvements in functionality and efficiencies.

Diameter was also requested to provide an analysis of the feasibility and benefits of using improved metering technologies commonly referred to as smart meters for our customers. The City's Water/Wastewater Tactical Plan 2015-2018 recognized the need to review and possibly improve the current practice of water meter repair, replacement, and invoicing as a high priority project to enhance customer service and water meter efficiency. Platforms based on smart meter technology such as Automated Meter Reading (AMR), Advance Metering Infrastructure (AMI), Advanced Meter Reading Advanced Metering Analytics (AMA) are now widely used in many communities.

FEASIBILITY STUDY

The feasibility study conducted by Diameter Services is now complete and their recommendations are incorporated into the attached report. The report outlines the goals and approach used, recommendations and potential benefits, as well as anticipated implementation time lines and estimated project costs.

The following key recommendations and benefits were identified in the Diameter Services report:

KEY STUDY RECOMMENDATIONS

- The City of Greater Sudbury should implement a fixed base AMI system across the entire water meter population in the City of Greater Sudbury;
- The City of Greater Sudbury should procure, implement and operate their own Meter Data Management Software system;

- Customers should have access to an on-line customer service portal and should be available to Greater Sudbury water/wastewater customers to permit real-time access to personal consumption data and usage profile;
- The project should be fully implemented within a 36 month period where the first year of the project will be focused on procurement and start up, and the final 2 years concentrating on real data production and collection

IDENTIFIED BENEFITS OF AMR/AMI

Customer Improvements

- Enhanced Customer Service – improvements in customer service through the ability to provide accurate and instant consumption information to the customer
- customer on-line access to water account - observe water consumption while away from home on vacation – real time data access
- alerts to customers of abnormal water consumption - help avoid high water bills
- leak detection alert to customers - warnings for customers before severe property damage can occur
- reduction in customer estimated meter consumption readings – increase in accurate invoicing
- customer support to engage in water conservation and financial savings
- reduction in customer complaints and frustration – easy to read water consumption – real time data
- fast and efficient response to customers regarding water consumption and invoicing
- expedite customer requests for water service termination – final move in/ move out meter readings

Operational Improvements

- revenue protection – highlighted areas for revenue improvement such as elimination of estimated water bills
- reduced water meter damage
- use real time data to produce accurate and analytical reporting
- City staff will have full access and control of water meter asset data
- more efficient and rapid response to stopped meters
- operational efficiency – improvements in response time to maintenance issues, reduced water meter reading costs and exceptions
- water production and efficiencies accurately tracked improving water production and optimization
- potential opportunity to enhance collaboration with Greater Sudbury Utilities and efficiently share common resources
- improved Water Distribution System Operation – the data generated by the new system will enhance the City's ability to manage water losses from City water distribution systems by enabling district metering and leak detection programs, and dynamic water balance calculations
- the AMR/AMI system transmits real time information with no delays. City staff will be notified in a very short time frame of any water meter issues such as

damaged meters, stopped meters and irregular water consumption (high or low)

- the AMR/AMI technology will allow the City to review our present shared business practices and our contract arrangement with Greater Sudbury Utilities and allow us to examine the options to modify our relationship with GSU
- societal benefits – improvements in water conservation, lower carbon emissions associated with related City operations

Financial Benefits and Implications

The consultant has estimated revenue improvements from meter accuracy to be \$1.1 million. As meters get older, the parts begin to wear and the meter becomes less accurate with age. The replacement of older meters with new ones will reduce revenue loss.

Operating expenses are projected to decrease by a net amount ranging from approximately \$ 684,000 to \$764,000, summarized as follows:

- Elimination of meter reading costs - \$360,000
- Meter maintenance efficiencies - \$40,000
- Efficiencies in customer service and billing - \$182,000
- Reduction of unaccounted for water - \$428,000
- Increased IT support for new technology – (\$246,000 to \$326,000)

The consultant has projected that the combined impact of revenue improvements and cost savings will result in a pay back period of approximately 9 years for a fixed AMR/AMI solution.

The projected capital cost of a fixed AMR/AMI solution ranges from \$16.5 to \$17.4 million, inclusive of HST. There is approximately \$4.0 million in previously approved funds set aside for the acquisition and installation of an AMR/AMI solution. These funds would be available for a down payment towards the cost of the project. The amount that would have to be borrowed would be approximately \$12.5 to \$13.4 million. The annual repayment over a 20 year period at current borrowing rates would be approximately \$900,000 for \$12.5 million to be repaid and \$970,000 for \$13.4 million.

This repayment would be funded from future years' capital budgets, and would be partially offset by projected operating budget savings of \$684,000 to \$764,000 as identified in the consultant's report.

These amounts are based upon the Consultant's estimates at this time. A more detailed financial summary of the project capital and long term operating costs can only be completed following competitive procurement of the water meter system. The results of the RFP will be analyzed by City staff with the assistance of Diameter Services to determine the preferred system characteristics, the preferred business processes to manage information for water customers, and to determine the changes in business processes between City staff and services provided by Greater Sudbury Utilities.

The final analysis and recommendations including preferred vendor, capital financing, operational changes, and recommendations for changes to the GSU services agreement will be presented to Council in approximately one year's time.

PROCUREMENT RFP AND EVALUATION

The technical specifications involved with this type of procurement are relatively complex because the prospective bidders will be expected to complete the detailed design of the system that transmits data from the water meters to a centralized computer management system. Each vendor will have unique features and characteristics that will affect the City / GSU resources required to manage and operate the information and system. The reliability and quality of the electronic data is an important characteristic that will affect the system performance. City staff will be completing the specifications and RFP documents over the next few months with the assistance of Diameter Services.

The tender phase is anticipated to take approximately two to three months due to the extensive geographical area of our serviced community, and due to the fact that the proponents must complete enough design to adequately present their tender price for the proposed work. Following the tender phase, staff will be working with Diameter Services to complete the evaluation of the bids.

Similarly, Diameter Services will assist staff in the evaluation of the billing and meter reading services agreement with GSU, as it relates to the proposals submitted. Aside from the obvious costs savings from the reduction of manual meter reading services, staff will be evaluating all existing services and standard levels of those services. This process has to be performed in conjunction with the evaluation of the procurement RFP as there will be unique alternative changes to the service delivery model depending on which vendor is selected.

TIMETABLE OF NEXT STEPS

Subject to authorization, the next steps and timelines of the AMR/AMI Project are as follows:

| Step | Duration | Schedule |
|---|-----------------|--------------------|
| Prepare RFP, Specifications and Procurement Documents | 4 to 5 months | May to Sept, 2018 |
| Tender RFP and Response Period | 2 to 3 months | Sept to Nov, 2018 |
| Evaluate RFP, Financial Implications, City's Service Delivery and Business Relationship with GSU, | 4 to 5 months | Dec to April, 2019 |
| Report to Finance & Administration Committee | | April or May, 2019 |
| Installation Period | 24 to 30 months | 2019 to 2021 |

CONCLUSION

A feasibility study has concluded that a fixed based AMR/AMI water meter system should be used to replace the City's existing manual water meter reading system. An automated meter system would be consistent with best practice in the industry and would offer numerous benefits as identified in the study. Most notably an automated system would enhance the experience for customers of the City's water and wastewater services, while it is estimated that the City will realize a net reduction in operating costs.

The City is currently utilizing water meters that have reached their useful life expectancy and should be replaced at an estimated cost of \$8.1M. The net increase in capital costs to obtain an automated water meter system is estimated at approximately \$8.4 M to \$9.3M.

Following a tender for determining a preferred vendor for the AMR/AMI system, it will be possible for staff to complete the full business evaluation and provide recommendations to Council for changes in the City's service delivery model and the proposed service arrangements with Greater Sudbury Utilities. The next steps in the project would include a final report to Council tentatively in Q2 of 2019.

It is projected that a new AMR/AMI water meter system could be fully implemented and operational by the year 2021.



City of Greater Sudbury

**Automated Meter Reading / Advanced Metering Infrastructure /
Advanced Metering Analytics (AMR / AMI/ AMA) Feasibility Study**

February 17, 2017

Final Report

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City of Greater Sudbury

AMR / AMI / AMA Feasibility Study

Executive Summary

The City of Greater Sudbury (CGS) engaged Diameter Services earlier this year to review the organization's current water meter population, meter reading/billing processes and to provide an *Automated Meter Reading / Advanced Metering Infrastructure / Advanced Metering Analytics (AMR/AMI/AMA) Feasibility Study*. Working with the City's project team we reviewed the information provided, conducted educational workshops and evaluated technology alternatives that would best meet the needs and goals of the utility.

CGS has identified a number of goals that Council has mandated the utility to achieve. The City's Water & Wastewater Services tactical Plan 2015-2018 explicitly stated this study as a high priority project (project 6 – Complete the automated meter reading business plan). After reviewing the Utility's current situation, it was clear that AMR/AMI technology could assist CGS in achieving seven other high priority projects and one low priority project that were identified in the tactical plan. Although, the financials have to be considered this technology upgrade should be seen as tool to assist in achieving 32% of the tactical plan. This investment in technology will position CGS to improve operational efficiency, enhance customer service and will provide a positive financial return on investment.

This report is part one of two, the second report will address implementation strategies, timelines and resources to make the project successful. The alternatives we looked at assumed 100% of the approximately 48,000 water customers were converted to the selected technology. The scenarios we reviewed are illustrated in the diagram below:

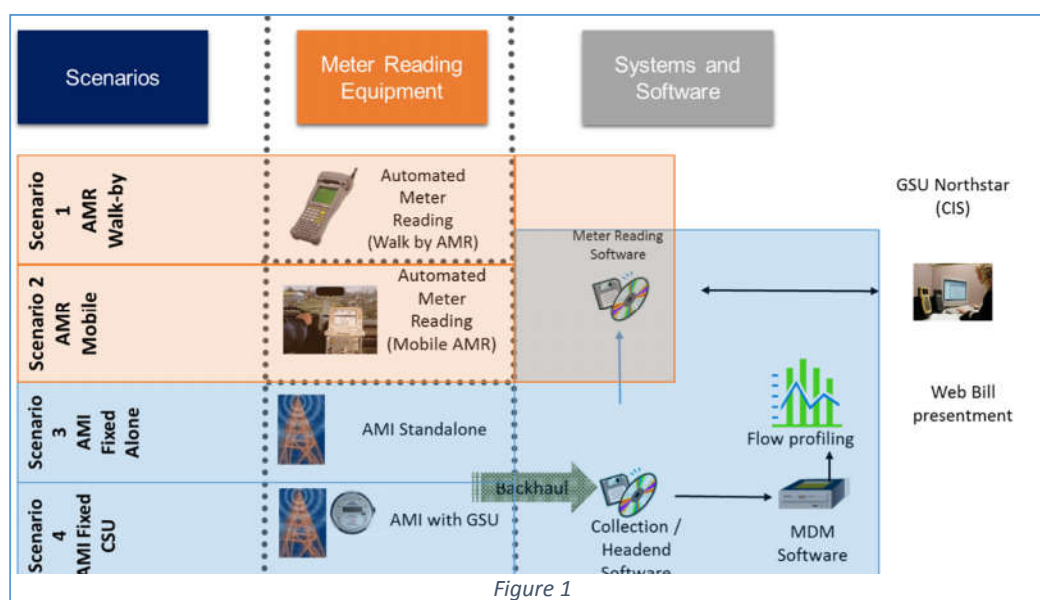


Figure 1

Scenarios 3 and 4 would provide the same technical benefits but had some cost implications when looking to partner with GSU. The three types of technologies (walk-by AMR, mobile AMR, fixed AMI) reviewed have different features and functionality that allows a water utility to perform a number of tasks. CGS project team reviewed 24 technology business drivers and identified 17 that were somewhat (8 drivers) or very important (9 drivers) to helping the utility achieve their tactical plan. These 17 business drivers were then compared to the three technologies to see how well they could support them. We found the following:

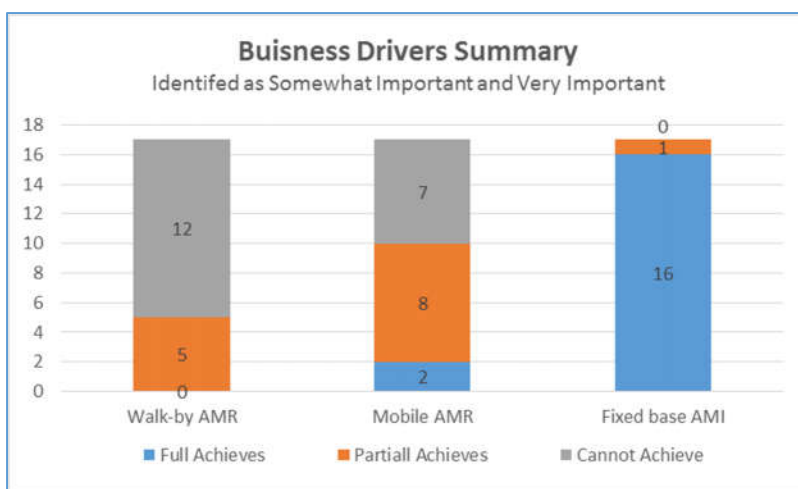


Figure 2

From a functional perspective, it is clear fixed based AMI technology is best suited to meet CGS business requirements. In addition to providing a tool to achieve the tactical plan, fixed base AMI technology will directly and indirectly help CGS address some of the long term water infrastructure challenges identified by WSP and presented to Council on November 22 2016. That study identified five current infrastructure challenges (1-Long Term Water Supply, 2-Water Storage, 3-System Pressure, 4-Fire Flow, 5-Leakage); fixed base AMI technology will provide the necessary data to optimize the significant infrastructure dollars that will be required over the next 20 years. In some cases, system-wide consumption data will require some infrastructure projects to be accelerated, in others, the data will allow CGS to push off some improvements allowing the infrastructure dollars to be prioritized to other systems or projects.

A project of this nature requires a significant investment, in addition to assessing the non-financial benefits CGS could expect, we reviewed financial implications. This report provides estimates of the total capital cost of the project, the cost of operating this system for its estimated 20 year life, as well as the financial impacts to meter reading, meter maintenance, customer service, water billing, distribution system management and IT support. Some of these estimates should lead to direct improvements in CGS financial budgeting, other financial benefits are considered efficiencies that will allow CGS to dedicate resources in other areas.

The table below summarizes the financial results including financial improvements, annual operational cost impacts, capital costs, the resulting payback and net present value calculations.

| | Scenarios | | | |
|--|------------------------------|-------------------------------|------------------------------------|--------------------------------|
| | Scenario 1 AMR Walk-by | Scenario 2 - AMR Mobile | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
| Year 1 Water & Wastewater Revenue | | | | |
| Cash Inflows (Annual, 1st) | | | | |
| Meter Accuracy Improvements | \$1.134M | \$1.134M | \$1.134M | \$1.134M |
| Cash OutFlows (Annual, 1st year) | | | | |
| Total Operational Costs | \$1.737M | \$1.426M | \$1.054M | \$1.134M |
| Operational Improvements | \$\$.081M | \$\$.392M | \$\$.764M | \$\$.684M |
| Capital Costs | | | | |
| Total Capital Cost | \$15.447M | \$15.68M | \$17.12M | \$16.18M |
| Results | | | | |
| Net Present Value of Cashflows (20 years) | \$6.191M | \$11.074M | \$15.873M | \$15.378M |
| Payback (in years) | 12.72 | 10.28 | 9.02 | 8.90 |

Table 1

Scenario 4 estimate has the best financial results. The cash inflows stem from the improved revenue by replacing the older less accurate water meters. The operational cost improvements relate to improvements in department costs. These are summarized for scenario 4 below:

| | Scenarios | | |
|--|---------------------------------|------------------------------------|--------------------------------|
| | Scenario 0 - Manual Touch | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
| Cash Out Flows (Annual, 1st year) | | | |
| Operational | | | |
| Operational - Meter Reading | \$.391M | \$.032M | \$.032M |
| Operational - Meter Maintenance | \$.088M | \$.048M | \$.048M |
| Operational - Customer Services | \$.307M | \$.125M | \$.125M |
| Operational - System Management Improvements | \$1.031M | \$.603M | \$.603M |
| Operational - IT Costs | \$0.M | \$.246M | \$.326M |
| Total Operational Costs | \$1.818M | \$1.054M | \$1.134M |
| Operational Improvements | \$\$.M | \$\$.764M | \$\$.684M |

Table 2

The \$750,146 financial improvement is the difference in expected costs with no AMI system \$1,805,907 per year and with a fixed base AMI system \$1,055,761. The additional cost of operating an AMI system is reflected in the increased IT costs, currently there are no IT costs related to meter reading and billing.

The capital cost of scenario 3 & 4 is summarized below:

| | Scenarios | |
|---------------------------|------------------------------------|--------------------------------|
| | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
| Capital Costs | | |
| Install | \$4.696M | \$4.696M |
| Meter Supply | \$3.695M | \$3.695M |
| AMR Supply | \$6.133M | \$5.225M |
| Consulting | \$.785M | \$.785M |
| Project Support | \$.759M | \$.759M |
| Non-Refundable HST | \$.291M | \$.275M |
| Contingency -0.1 | \$.761M | \$.745M |
| Total Capital Cost | \$17.12M | \$16.18M |

Table 3

The installation costs includes: installation management, meter replacement, installation of radio transmitters on the outside of the property, some valve replacements, plumbing, some carpentry to access the water meter and some wire replacements.

The water meter supply includes all high resolution water meters that are being recommended for replacement. Upgrading the water meter registers on those meters not being recommended for replacement would add approximately \$450,000 to the above costs. The benefit of this option would be all water customers would have the same level of service with respect to leak detection within the property.

AMR supply includes the radio transmitters, additional data collection equipment, initial software licensing, AMI vendor deployment management, and handheld equipment for the meter maintenance department. A standalone option (Scenario 3) may add up to \$908,310 in additional costs, but this amount is merely an estimate, the exact different should be determined through the procurement process.

Consulting assumes the procurement and full contract management is being conducted by a Water AMI consultant. Depending on the capabilities of the Vendor these costs could be significantly less. We have provided a worst case estimate for these costs.

Project support includes the internal CGS personnel who would need to be a part of the project. In some cases new resources may need to be added, it really depends on the expertise and how much time each person can dedicate to supporting the project.

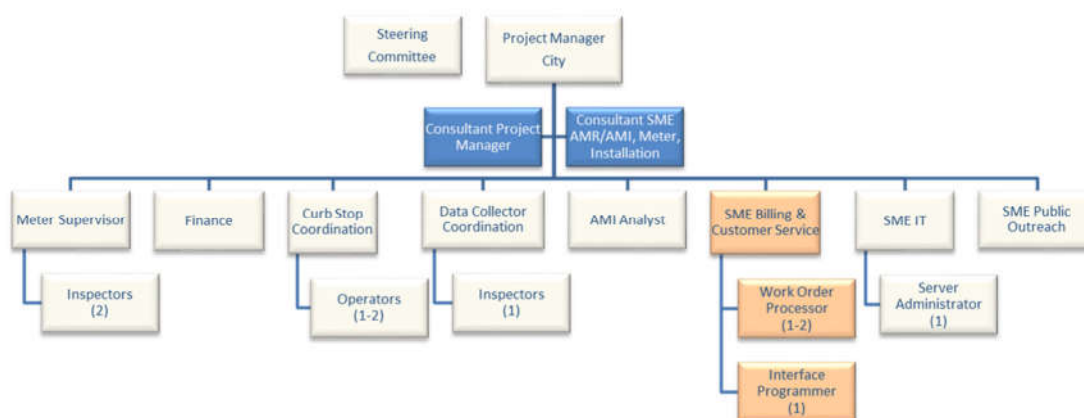
Contingency has been estimated base on some unknown risks of the installation and AMI supply. This contingency is really dependent on the quality of the procurement specifications. The installation costs have included most of the additional work that would be required so there is a good chance this contingency may not be required.

Project Schedule Summary:

| WBS | Task Name | Duration | Start | Finish |
|--------------|--|-----------------|---------------------|---------------------|
| 1 | City of Greater Sudbury AMI Implementation Schedule | 802 days | Mon 17-03-06 | Tue 20-03-31 |
| 1.1 | Project Management | 802 days | Mon 17-03-06 | Tue 20-03-31 |
| 1.1.1 | Project Start | 1 day | Mon 17-03-06 | Mon 17-03-06 |
| 1.2 | Pre-Procurement Task | 120 days | Tue 17-03-07 | Mon 17-08-21 |
| 1.2.1 | Develop and Award Consultant RFP | 80 days | Tue 17-03-07 | Mon 17-06-26 |
| 1.2.2 | Compile Potential Data Collector Locations | 60 days | Tue 17-03-07 | Mon 17-05-29 |
| 1.2.3 | GSU Engagement | 100 days | Tue 17-03-07 | Mon 17-07-24 |
| 1.2.4 | Secure Project Team | 20 days | Tue 17-07-25 | Mon 17-08-21 |
| 1.3 | Procurement Phase | 150 days | Tue 17-06-27 | Mon 18-01-22 |
| 1.3.1 | Water Meter Procurement | 75 days | Tue 17-06-27 | Mon 17-10-09 |
| 1.3.2 | AMR / AMI and Installation Vendor Procurement | 150 days | Tue 17-06-27 | Mon 18-01-22 |
| 1.4 | Startup Phase | 85 days | Mon 18-01-08 | Fri 18-05-04 |
| 1.5 | Installation / Deployment Phase | 497 days | Mon 18-05-07 | Tue 20-03-31 |
| 1.5.1 | Proof of Concept Phase (POC) | 110 days | Mon 18-05-07 | Fri 18-10-05 |
| 1.5.2 | Issue Notice to Proceed with Installation | 0 days | Fri 18-10-05 | Fri 18-10-05 |
| 1.5.5 | Substantial Completion | 0 days | Tue 20-03-31 | Tue 20-03-31 |

A detailed project plan is included in the implementation report.

The project Team necessary to support this project is as follows:



Recommendations

Based on the CGS current situation and financial results we are recommending CGS implement the following recommendations:

1. CGS should implement a fixed base AMI system across 100% of 48,000 water meter population.
2. Teaming with GSU may be a viable and cost effective solution, but this decision needs to be made once proposals have been received from all the different AMI vendors. Making this decision to team with GSU now, will mean a large part of the project (\$5M to \$6M) would need

- to be sole sourced. Without competitive pressure on the cost of the radio transmitter (85% of the AMI system cost) the cost may rise above a market proven prices.
3. CGS should procure, implement and operate their own Meter Data Management (MDM) software that will support the City's identified business drivers, although during the pre-procurement GSU meter sense should be reviewed in terms of functionality it is likely the restrictions to customize the MDM to meet CGS needs will be difficult.
 4. CGS should continue with GSU online customer portal, but as a part of the MDM implementation the consumption profiling functionality should be interfaced with real hourly consumption data.
 5. Regardless of the scenario approved by Council, CGS should contract the meter reading services directly from Olameter or another proven meter reading service provider. This contract should be administered by CGS meter maintenance department, this will ensure meter reading and meter maintenance are working together to keep meter reading costs low. Sign off of all meter reading invoices should be the responsibility of the meter maintenance department (currently this occurs in the finance department), ensuring there is more accountability to the money being spent.
 6. Water meter reading types (inside read, outside read, commercial read, special reads) should be controlled by the Northstar system. Currently the meter readers are the ones controlling the type of reads being charged. CGS will need to work with GSU to investigate why this is not being done and what changes to the system and contracts are required to put this data into the system.
 7. The project should be completed over an approximately 36 month period, with the first year focused on procurement and start up and the remaining 24 months left for the production phase.
 8. We are recommending the following water meter replacement criteria:
 - a. 15mm to 20mm sized water meters be replaced that are older than 5 years.
 - b. 25mm and greater sized water meters should only be replaced where a radio transmitter cannot be installed due to the age of the meter register technology. The City's existing commercial water meter program has done a good job of keeping these meters current. This program should continue and start to incorporate AMI data analysis to help prioritize the meters that should be tested and refurbished.
 - c. As an option, CGS should consider upgrading water meter registers (that are not being replaced) to a high resolution meter register. This will help the City maintain the same service levels across all customer for leak detection. The total optional cost of this upgrade is approximately: \$450,000 for new registers.
 9. CGS should plan for the design and contract management functions to be outsourced to a single water focused AMI consultant. The industry expert who designs the procurement specifications needs to be accountable to ensure the AMI vendor and installation contractor meet the functional requirements of the implemented AMI system.
 10. There are a number of procurements that will be required to support this project. Council should expect the following procurements as a part of this overall project:

| Component | Type of Procurement | Estimate Value |
|------------|---------------------|-------------------|
| AMI System | | \$9.9M to \$10.8M |

| | | |
|--------------------------------------|--|-----------------------|
| Installation | Supply and Install AMI System Request for Proposal | |
| Meter Supply | Request for Proposal | \$3.7M |
| AMI Subject Matter Expert Consultant | Request for Proposal | \$785K |
| Northstar Changes | Sole source | \$65K to \$100K |
| GSU poles rental & project support | Increase scope on existing contract | \$140K to \$200K |
| CGS Internal project staffing | Existing staff | \$375K |
| | New staff | \$375K |
| Cellular Providers | Increase scope on existing contract | \$25K to \$45K / year |
| Curb stop Locate and repairs | Using existing staff | None. |

11. To prepare for this project CGS should collect key information about the existing CGS owned facilities including: type of facility, contact information, height/stories of the building, access to AC and Intranet.

1. Introduction

1.1. Approach and Methodology

Information requests, technology education workshops, business requirements workshops and written reports were the tools that Diameter Services used to develop the AMR/AMI/AMA Feasibility Study for the City of Greater Sudbury. It was important that key stakeholders participated in these sessions to ensure that the needs of CGS were well represented. Core members of the team included: David Brouse, Nick Benkovich, Dion Dumontelle, Shawn Turner and Gilles Bonhomme.

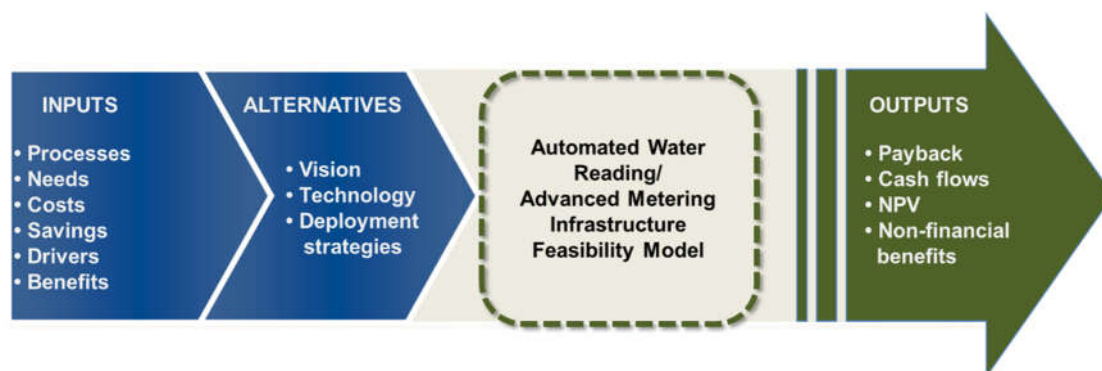


Figure 3

The above diagram shows how our approach led to our recommendations. The management team's contributions to our understanding of CGS business processes was critical in preparing this report so that the outputs were realistic and achievable. The steps that we followed were as follows:

Step 1 – Information Request

Diameter Services conducted an extensive survey at the onset of the project to collect data and information about CGS's current water meter population, organizational structure, meter reading equipment, current business practices related to meter reading, billing and maintenance, and existing software. The CGS management team gathered all the required information, often digging deeper than would normally be expected to ensure the information required to understand a process was accurate and clear. Collecting and analyzing this information prior to the business requirements workshops (see Step 3 below) ensured that Diameter Services arrived at the table with a solid understanding of CGS's existing program, which made for greater productivity in these initial meetings.

Step 2 - Educational Workshops

On a water meter and Automated Meter Reading (AMR) / Advanced Metering Infrastructure (AMI) project (See Glossary), the best decisions are made when each stakeholder has a reasonable level of industry and market knowledge. Educational workshops were used to ensure all team members (regardless of their existing level of expertise) were brought up to speed with respect to the products, systems, software and business processes that will be impacted by an AMR/AMI system.

Workshops Included:

- AMI/AMR Technology Review
- Water Meter Technology
- AMI/AMR Technology Drivers
- State of the Market

Step 3 – Business Requirements Workshops

Diameter Services conducted a series of business requirements workshops to validate and analyze the information that was provided during the information request. The workshops led the project team through discussions on critical issues that would have to be addressed for a water meter project of this size.

Workshops Included:

- Water Utility Challenges and Goals
- Existing Operations Assessment
- Meter Compatibility Requirements
- Small Water Meter Assessment
- Large Water Meter Assessment
- Meter Reading Equipment

Step 4 – Financial Analysis

Diameter Services worked with CGS to establish a financial model to derive a reasonable capital cost budget for all aspects of the project. Cost considerations included the AMR/AMI system, the meter data management system, water meters, installations, contract support, data collector location costs, backhaul and installation data management.

We reviewed four different financial scenarios:

Scenario 1 – Walk-by AMR Technology – this scenario assumes AMR radio transmitters would be installed on 100% of the water meter population. Meter reading would continue to be performed via a person walking by the property on a quarterly basis.

Scenario 2 – AMR Mobile technology – this scenario assumes AMR radio transmitters would be installed on 100% of the water meter population. Meter readings would be collected on a monthly basis by using a mobile driver by data collector.

Scenario 3 – Fixed base AMI (Standalone) – this scenario assumes AMI radio transmitters would be installed on 100% of the water meter population. Hourly meter readings would be collected daily using a CGS dedicated fixed base data collection network. This system would support monthly water billing.

Scenario 4 – Fixed base AMI (shared with GSU) – this scenario assumes a Sensus AMI radio transmitters would be installed on 100% of the water meter population. Hourly meter readings would be collected daily using the existing GSU fixed base data collection network and software. This system would support monthly water billing.

Step 5 – Recommendations

In this report Diameter Services has provides the conclusions and decisions reached as a result of Steps 1 through 4 above. The report includes clear recommendations on the type of technology that should be selected, the support it would need to be successfully implemented in the field, detailed descriptions of the preferred implementation strategy, and a roadmap from procurement to final completion.

Step 6 – Implementation Strategy

The implementation strategy really depends on the technology CGS decides to move forward with. The implementation strategy will discuss the resources, timelines and tasks required to implement the project.

2. Project Assessment

2.1. Water Utilities Challenges and Goals

The City of Greater Sudbury's (CGS) decision to carefully review the financial and operational benefits of AMR and AMI technologies was wise. Different meter reading technologies can improve the meter reading and billing process to reduce costs and improve billing accuracy. As a part of this exercise we looked beyond just meter reading and billing and tried to understand some of the challenges CGS experiencing as a utilities as a whole. It is important that water utilities take the time to really understand the full benefits of the more advanced technologies available. This engagement will provide the necessary information to ensure that CGS understands the available technologies and confidently selects the appropriate technology to meet their goals.

2.1.1. Challenges

Within the Challenges and Goals workshop and through our assessment of the CGS current practices, we have identified a number of challenges this study may face. The project team wanted to ensure this report addressed the following:

| Reference | Challenge | Description | Plan to Address |
|-----------|--|--|--|
| C1 | Full disclosure to Senior Management and Council | The project team wanted to make sure senior management and council were given enough summarized information to make the decision on moving forward, but still include all details for those who wanted more information. | The final report will include an executive summary with enough information to understand the financial and non-financial benefits of the different technologies. The full report will provide additional information to contributed to the final recommendations |
| C2 | Avoid surprises in cost of program / staffing | The project team wanted to make sure the project costs (as much as possible) reflect a conservative cost estimate that included all staffing required on the utility to ensure the project is a success. | The report will be based on the most up-to-date market costs and will detail the areas of cost that may be more risky. AMI Vendors will be engaged to ensure the fixed network implications and costs are fully understood. The implementation plan will include estimated staffing level required to manage the project. |
| C3 | Controlled message to the public | The team wanted to make sure the public is properly informed of the project (if approved) and promote the benefits of the program. | The installation cost estimate will include public outreach program to achieve this. |

| Reference | Challenge | Description | Plan to Address |
|-----------|---|--|---|
| C4 | Fairness of rates / Fair Share (true cost equitability) | There was a concern that some of the benefits may not be reflected in water rates. | The financial model included both direct financial improvements and anticipated improved efficiencies as the team felt these would realistic to help keep water rates down in the long term. |
| C5 | Vocal community relating to water conservation | The community is surrounded by fresh water, the importance of water conservation is more difficult to convince the public of. | Where possible the report should focus on the operational and customer service improvements, as the overall driving benefits of applying the technology to. |
| C6 | The cost of water continues to rise | Total water produced and total water consumed continues to drop, but the cost of delivery of the water continues to increase (Operational and Capital projects). | Within the implementation plan some consideration should be given to how the project will be paid for. It may be beneficial to include an additional cost for the project on the water bill so customers know once the project is paid for the extra cost is removed. |
| C7 | Balancing non-financial benefits of technology with the financial costs of implementing it. | Often capital projects are viewed strictly from a financial feasibility perspective but there are many non-financial benefits that need to be emphasized and considered. | The report will provide a quantitative measure of both the financial and non-financial benefits of the six technology options considered. |

Table 4

2.1.2. Business Goals

Throughout the workshop's CGS's management team provided detailed information and commentary about the utility's organization, business processes, challenges, and goals with the idea of looking beyond just the meter reading and billing functions. CGS has done an excellent job documenting the utility's vision, values and areas of focus within the *Water & Wastewater Services Tactical Plan 2015-2018*. It is safe to say that, AMR/AMI technology will further contribute to CGS's vision of:

"A growing, world-class community bringing talent, technology and a great northern lifestyle together."¹

AMR/AMI technology can improve the Utilities focus on Customers, Employees and Business. Within the tactical plan, there were 34 prioritized projects (22 High, 5 medium, 7 low), this feasibility study directly meets Project 6 - *Complete the automated meter reading business plan*. CGS should also be

¹ Water & Wastewater Services Tactical Plan 2015-2018.

aware that by implementing smart metering technology, it can contribute to a number of other projects that were identified in the plan, namely:

| Priority | Project Number | Project Description |
|----------|----------------|---|
| High | P2 | Implementation of community engagement program (improve information availability & transparency) |
| High | P5 | Data Management process improvement |
| High | P6 | Complete the automated meter reading business plan |
| High | P7 | Deliver Council report & implement backflow / cross connection bylaw and program by the end of 2015 |
| High | P11 | Use of previous reports and data to prioritize inflow & infiltration reduction target areas, water loss control / leakage reduction |
| High | P12 | Develop a framework & execute a plan to use existing data to reduce non-revenue water in the Vermillion distribution system |
| High | P14 | Presenting more operational KPI's; preventive maintenance, quarterly reporting by activity |
| Low | P31 | Energy savings with new monitoring / billing |

Table 5

The project team discussed and agreed to a number of goals they would want the AMR/AMI technology to achieve. The table below identifies these technology goals and links how they will help achieve the prioritized projects from the tactical plan:

| Reference | Goal | Description | Prioritized Projects reference |
|-----------|------------------------|---|--------------------------------|
| G1 | Leak Detection | The team wants to be able to identify two types of water leaks: <ul style="list-style-type: none"> Customer leaks – to avoid / minimize high water bill complaints. Distribution system leaks – to reduce the total unaccounted for water. | P2, P6 |
| G2 | High Bill complaints | Reduce the high bill complaints through: <ul style="list-style-type: none"> Provide all customer monthly non-estimated meter readings. Provide customer/billing staff with web access to hourly consumption information to allow them to better understand the reason for high bill complaints. | P2, P6 |
| G3 | Backflow detection | Use technology to identify backflow events. This would assist CGS in identifying those customers who need to be prioritized in installing backflow devices and customers that may require testing of the device. | P6, P7 |
| G4 | Reduce meter Tampering | Water meter maintenance has identified 10% of the meters removed from service had evidence of meter | P6, P11 |

| Reference | Goal | Description | Prioritized Projects reference |
|-----------|---|--|--------------------------------|
| | | tampering. CGS wants to use technology to identify tampering quickly to be able to respond accordingly. | |
| G5 | Client access to consumption information – customer portal | Giving customers hourly consumption information via web to improve customer service. Also give properties new tools to monitor their consumption – via e-mail alerts. | P6, P2 |
| G6 | Reduce / minimize billing estimates | Water billing estimates were at 7.2% in 2015. CGS wants the number of estimated to be reduced. | P6 |
| G7 | Reduce consumption credits due to high water bills | Water credits is quite involved and takes a number high level staff to review and approve. CGS wants the technology to allow GSU tools to avoid the need to perform credits. This can be achieved by improving meter reading data and the ability to view hourly consumption information. | P6, P11 |
| G10 | Reduce unaccounted for water | Unaccounted for water accounts for 26%. The team wants technology to reduce unaccounted for water. | P6, P5, P11, P12, P14, P31 |
| G8 | District metering | The project teams wants technology to implement district metering initiatives to understand what water systems/districts are contributing to unaccounted for water the most. This would allow capital infrastructure to prioritize money to go to the system with the highest need. | P6, P5, P11, P12, |
| G9 | Temperature flags from the meters to alert the Utility/customer of the potential of freezing water services | There are about 300 customers whose water services are a significant risk of freezing. To avoid the freezing, the City has these customer run water continuously. A temperature flag that is triggered when water temperature drops below zero may help reduce the amount of water being credited back to customers. | P6, P11 |
| G11 | Providing commercial customers with hourly consumption data in an efficient manner | Some commercial customers would find hourly consumption information very valuable in understanding when the water is used. | P6 |
| G12 | Maximize any synergies with GSU or Hydro one systems. | There is an existing electric based smart metering system already in place. CGS wants to understand the benefits and drawbacks of piggybacking on these existing deployments. | P6 |
| G13 | Improve financial reporting | Due to the two month billing and reading cycles the data used for financial reporting is always an estimate and often requires adjustments to | P6, P5, P14 |

| Reference | Goal | Description | Prioritized Projects reference |
|-----------|------|--|--------------------------------|
| | | forecasts. A Technology that allows for accurate reporting of revenues is important. | |

Table 6

As we move throughout the document, references back to the prioritized projects, challenges and goals discussed above may be used. In this way, we will be able to connect the recommendations with achieving the goals that the CGS team has identified as important.

2.2. Water Meter Population Assessment

At the onset of this study, Diameter Services requested that CGS provide a database with specific information pertaining to all of the active water accounts. In preparation for the initial workshops, an analysis of this information was conducted to identify: Account Type, Age and Size of Meter Population, Water Systems, Meter Type, Register Type, Number of Dials being Read and Read Frequency. During Workshop 1 – Project Assessment, the information outlined below was presented to the Project Team to validate for accuracy and minimize assumptions going forward.

Account Type

| Account Type | Total |
|--------------|---------------|
| Metered | 47,972 |
| Flat Rate | 217 |
| Total | 48,189 |

Table 7

- CGS is 99.5% metered with only a few Flat Rate accounts remaining.

Age and Size of Meter Population

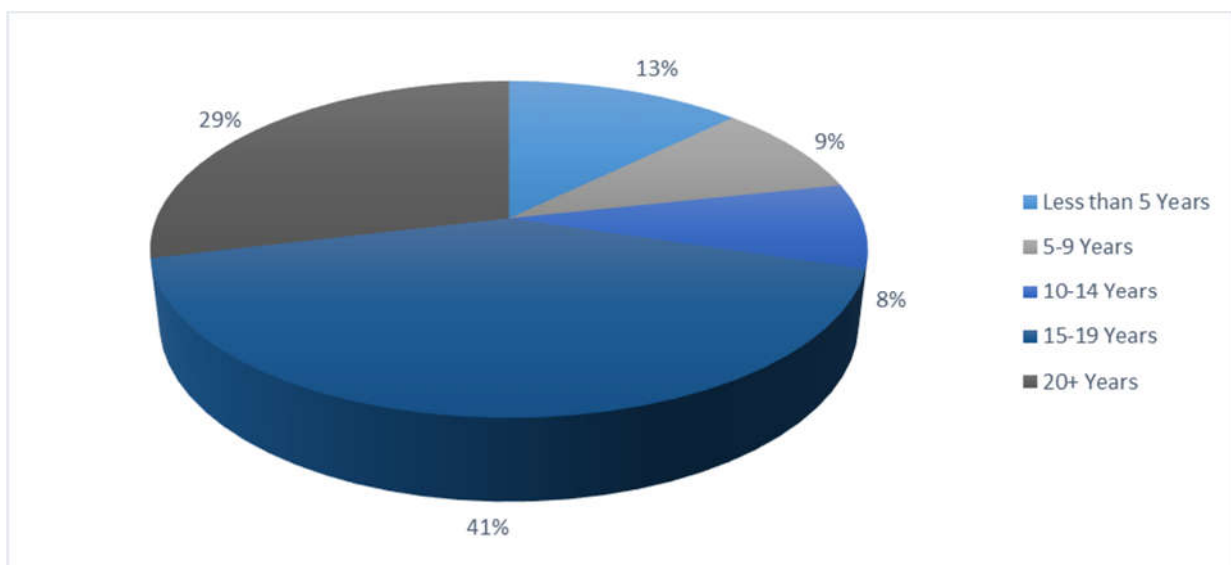


Figure 4

| Meter Age | Percentage | Total |
|-------------------|-------------|---------------|
| Less than 5 Years | 13% | 6,095 |
| 5 – 9 Years | 9% | 4,271 |
| 10 – 14 Years | 8% | 3,914 |
| 15 – 19 Years | 41% | 19,897 |
| 20 + Years | 29% | 13,795 |
| Total | 100% | 47,972 |

Table 8

- CGS meter population is aging, with 70% of the meters 15 years and older.
- 99% of the meters that are 15 years and older are residential small meters ranging in size (5/8" – 1").
- Intermediate and Large Meters (1.5" and greater) have benefited from an active meter maintenance program, with 75% of the meters being less than 5 years old.

Water Systems

Within the database 21 regions were identified across CGS. A breakdown of the number accounts per region is outlined below:

| Rank | Region | Totals |
|------|------------|--------|
| 1 | Sudbury | 25,036 |
| 2 | Hanmer | 3,693 |
| 3 | Chelmsford | 2,952 |
| 4 | Val Caron | 2,697 |
| 5 | Garson | 2,639 |
| 6 | Lively | 2,421 |
| 7 | Azilda | 1,714 |
| 8 | Capreol | 1,307 |

| Rank | Region | Totals |
|------|-----------------|--------|
| 9 | Coniston | 828 |
| 10 | Copper Cliff | 778 |
| 11 | Dowling | 633 |
| 12 | Val Therese | 628 |
| 13 | Levack | 563 |
| 14 | Wahnapiatae | 470 |
| 15 | New Sudbury | 414 |
| 16 | Naughton | 396 |
| 17 | Onaping Falls | 301 |
| 18 | Falconbridge | 284 |
| 19 | Bleazard Valley | 260 |
| 20 | Whitefish | 173 |
| 21 | Markstay | 2 |

Table 9

- During Workshop 1, the project team worked to identify the relationship between region and Water System so that account volume / system could be understood.

| Water System | Total |
|-------------------------------------|---------------|
| Sudbury / Wanapitei / Sudbury David | 26,750 |
| Valley / Capreol | 13,251 |
| Vermillion / Vale | 3,768 |
| Garson Wells | 2,639 |
| Levack / Onaping Wells | 864 |
| Dowling | 633 |
| Nickel Rim Well | 284 |
| Total | 48,189 |

Table 10

Meter Type

The analysis of Meter Type identified that Neptune Technology Group was the predominant meter manufacture across all sizes. In some cases, assumptions had to be made with respect to meter type using a combination of meter size, number of registers and any potential comments the database included.

| Meter Type | 5/8" | 3/4" | 1" | 1.5" | 2" | 3" | 4" | 6" | 8" | Unknown | Total |
|-----------------------|---------------|----------|--------------|------------|------------|-----------|-----------|-----------|----------|----------|---------------|
| Positive Displacement | 45,834 | 5 | 1,130 | 464 | 465 | | | | | | 47,898 |
| Turbine | | | | | | 11 | 3 | 1 | 1 | | 16 |
| Compound | | | | | 2 | 27 | 12 | 6 | | | 47 |
| Mag | | | | | | | | 1 | | | 1 |
| Fireline | | | | | | | | 3 | | | 3 |
| (blank) | | | | | | | 1 | 5 | | 218 | 224 |
| Total | 45,834 | 5 | 1,130 | 464 | 467 | 38 | 16 | 16 | 1 | 1 | 48,189 |

Table 11

- 99% of the Meter Population is Neptune.
- Large Meters
 - Turbine = HP Turbine
 - Compound = Tru-Flo
 - Fireline = HP Protectus
 - Mag = Endress & Hauser

Register Type / Unit of Measure

In line with a Meter Population of Neptune Meters, when looking at Register Type in CGS you see an evolution of the Neptune product line.

| Meter Size | ARB | Pro Read | E-Coder | Total |
|------------|-------|----------|---------|--------|
| 5/8" | 8,891 | 36,004 | 939 | 45,834 |
| 3/4" | | 5 | | 5 |
| 1" | 57 | 873 | 200 | 1,130 |
| 1.5" | 1 | 392 | 71 | 464 |
| 2" | 7 | 415 | 45 | 467 |
| 3" | | 31 | 7 | 38 |
| 4" | 1 | 13 | 2 | 16 |
| 6" | | 16 | | 16 |
| 8" | | 1 | | 1 |

| Meter Size | ARB | Pro Read | E-Coder | Total |
|--------------|--------------|---------------|--------------|---------------|
| (blank) | | 218 | | 218 |
| Total | 8,957 | 37,751 | 1,264 | 48,189 |

Table 12

- Majority of the Meter population contains Pro Read Registers.
- Within the last couple years, CGS upgraded to the E-Coder register on all new meters.
- 99.9% of the Registers are read in Cubic Meters M³.

Number of Dials

CGS water meter population is currently configured to be read down to the billable unit. A billable unit is equal to 1 cubic meter of consumption or as summarized in the chart below, 5 dials.

| Meter Size | 4 | 5 | 6 | 8 | 10 | (blank) | Total |
|--------------|--------------|---------------|------------|----------|----------|-----------|---------------|
| 5/8" | 8,871 | 36,942 | 3 | | 1 | 17 | 45,834 |
| 3/4" | | 5 | | | | | 5 |
| 1" | 35 | 1,090 | 4 | | | 1 | 1,130 |
| 1.5" | | 464 | | | | | 464 |
| 2" | | 10 | 457 | | | | 467 |
| 3" | | | 38 | | | | 38 |
| 4" | | | 16 | | | | 16 |
| 6" | | | 14 | 2 | | | 16 |
| 8" | | | | | | 1 | 1 |
| (blank) | | 1 | | | | 217 | 218 |
| Total | 8,906 | 38,512 | 532 | 2 | 1 | 19 | 48,189 |

Table 13

- In order to achieve meaningful leak detection across CGS customer base, it will be important to move to a higher resolution water meter registers.

Read Frequency

CGS currently has 3 different read frequencies across 66 Cycles, as can be seen in the chart below.

| Read Type | Cycle | Total |
|----------------|-----------|---------------|
| Monthly | 90 | 403 |
| Bi-Monthly | 1 - 63 | 47,444 |
| 3 Times / Year | 93 | 341 |
| Other | 95 | 1 |
| Total | 66 | 48,189 |

Table 14

- Mandated movement for GSU to move to monthly billing for Electric Meters, will see estimation occur every other month for 47,444 water customers.
- Accounts that are read 3 times / year are customers who have to run water throughout the winter months to avoid freezing.

2.3. Service Providers Assessments

CGS has a number of organizations, each with their own systems throughout the water meter reading, billing and maintenance business processes. The primary service provider is Greater Sudbury Utilities (GSU) who performs meter reading, billing and collections on behalf of CGS. The meter reading is actually sub-contracted to Olameter, whose costs are embedded in the monthly water billing cost GSU charges CGS. It should also be noted that GSU is solely owned subsidiary of CGS with Council members sitting on GSU's board.

2.3.1. Water Billing Systems

Each organization has different systems that support the various components of the business process. The diagram below depicts the pertinent software that was reviewed as a part of this project assessment.

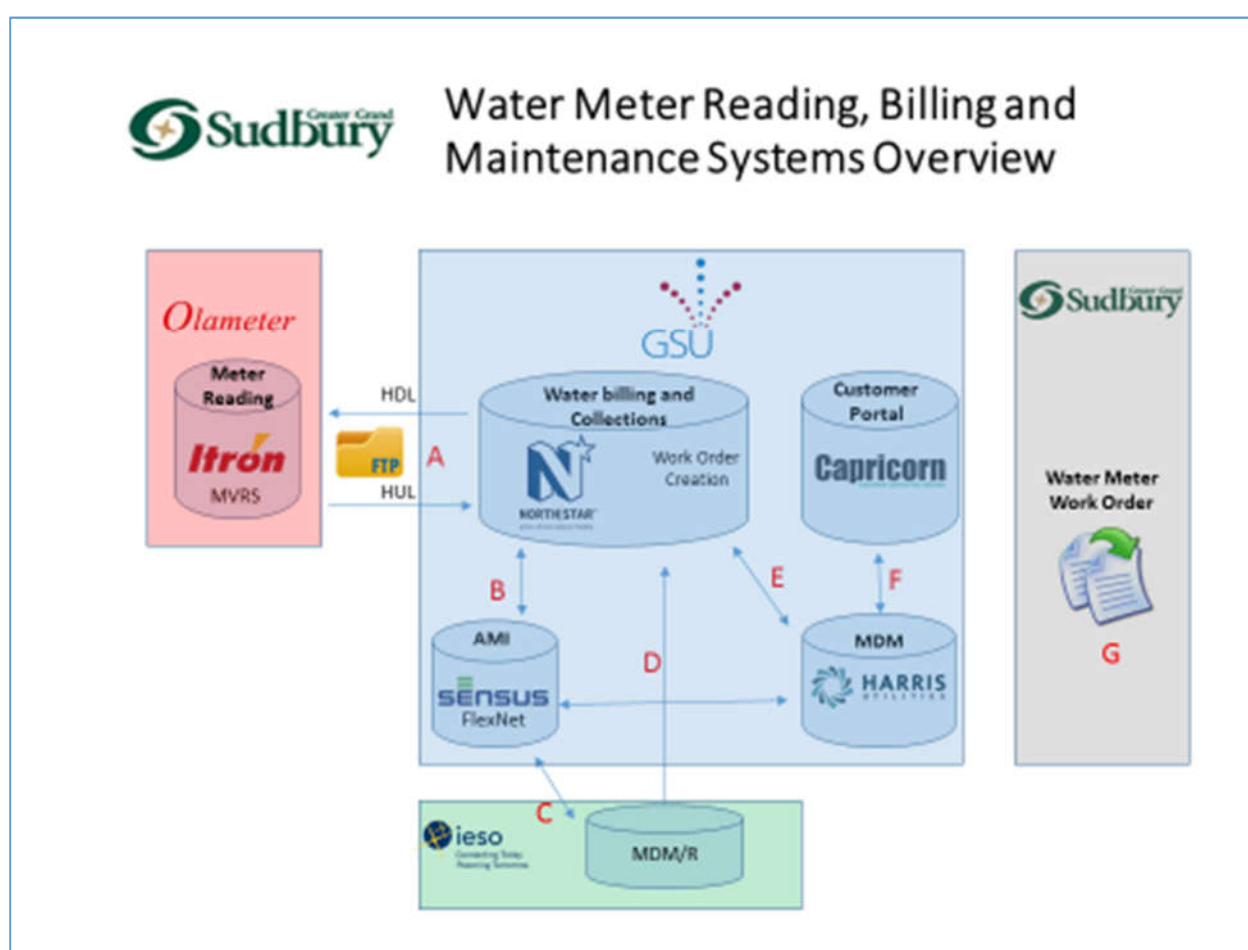


Figure 5

GSU Northstar billing system is interfaced with a number of different systems and depending on the type of technology that is implemented CGS could benefit from utilizing an existing system or interface. The table below shows what systems, interfaces and process that may be affected by the different scenarios being considered.

| System / Interface | Scenario 1 – Walk-by AMR 2 – Mobile AMR 3 – Fixed AMI (alone) 4 – Fixed AMI (with GSU) | Implications for CGS |
|---|--|--|
| Itron MVRs Interface A (HUL and HDL) | 1, 2, 3, 4 | This software would need to be replaced with the AMI/AMR vendor. The interfaces would need to be developed from scratch. |
| GSU Northstar | 1, 2, 3, 4 | The Northstar system can receive AMR and AMI data for billing purposes from all the major technology vendors. Some work will be required to setup and test the system. Business requirements will be required once a system has been selected. The capital cost has included some costs for Northstar to implement changes. |
| Sensus Flexnet Interface B Interface C Interface D | 1,2 | This system or interfaces would not be used. |
| | 3 | The Sensus Flexnet system would be replaced with the AMI vendor software. This would likely be installed with CGS's IT network or be hosted by the vendor. Interface B - would need to be developed from scratch with the assistance of the vendor. <i>Interface C</i> – would not be required. <i>Interface D</i> – would need to be developed and tested with the assistance of the vendors of the AMI (Sensus) and MDM systems. |
| | 4 | This system would be shared for both electric and water meter readings. GSU and Sensus has confirmed there is capacity to collect and store the meter readings with the existing software. Additional data collector infrastructure would need to be installed across the communities that are serviced by Hydro One. <i>Interface B</i> – it is likely the existing interfaces would be suitable for water purposes although some review and testing would be required. <i>Interface C</i> – would not be required. <i>Interface D</i> - would need to be developed and tested with the assistance of the vendors of the AMI (Sensus) and MDM systems. |
| Harris MDM (Meter Sense) Interface D Interface E Interface F | 1,2 | This system or interfaces would not be used. |
| | 3, 4 | It is unlikely this system would be utilized a fixed based AMI system. This system is setup for the electric utility, it is likely that there are limits to how water could be setup that would not allow CGS to fully meet the business |

| System / Interface | Scenario 1 – Walk-by AMR 2 – Mobile AMR 3 – Fixed AMI (alone) 4 – Fixed AMI (with GSU) | Implications for CGS |
|--|--|---|
| | | <p>requirements. It is recommended, once MDM specifications are developed, to allow Harris to propose how they could meet the needs of the software either through using GSU or having CGS stand up their own Meter Sense MDM software.</p> <p><i>Interface D</i> - would need to be developed and tested with the assistance of the vendors of the AMI (Sensus) and MDM systems.</p> <p><i>Interface E</i> - would need to be developed and tested with the assistance of the vendors of the Northstar and MDM systems.</p> <p><i>Interface F</i> - would need to be developed and tested with the assistance of the vendors of the Capricorn and MDM systems.</p> |
| ieso MDM/R | 1,2,3,4 | This system or interfaces would not be used. |
| Capricorn customer portal Interface F | 1,2,3,4 | <p>It is recommended CGS would use this customer portal system to provide customer access to their water consumption information. Unless CGS is planning a customer portal for other utility business, then an evaluation of the system should be conducted to determine the best location for customer to access water consumption information.</p> <p>Interface F - would need to be developed and tested with the assistance of the vendors of the AMI (Sensus) and MDM systems.</p> |
| CGS paper work order process | 1,2,3,4 | <p>Many of the AMR and AMI system require programming and testing of the radio transmitter at the time of installation. Best practices would recommend movement away from a paper based system to electronic data capture so that the same handheld equipment can be used to program and test the AMR / AMI radio transmitters.</p> |

Table 15

2.3.2. Meter Reading Processes

2.3.2.1. Organizational Structure

Water utilities in Ontario often have the electric distribution company provide water billing and reading services, even though they have already moved to smart electric meters. It is also very common for the billing service provider to control and contract out the meter reading services to a private company. In the case of CGS, GSU contracts these services out to Olameter.

This organizational structure was a necessity when the electric smart metering systems were being deployed. Today, there are some strong benefits that can be realized when reconsidering this structure.

The electric utility no longer requires manual meter readings and often the quality of the readings obtained is overlooked. This may be one of the contributing factors that has led to higher water billing estimates. In this historical structure, the water utility has limited ability to dictate terms, specifications and types of equipment that need to be used to collect the readings. For CGS, meter reading performance has been an issue and their ability to address is limited due to the contract being with GSU.

Regardless of the technology being selected, the following changes are recommended:

1. The Olameter contract be moved from GSU to CGS.
2. The meter reading contract should report into CGS meter maintenance department.
3. CGS remove meter reading equipment from the Olameter contract, instead CGS should procure their own meter reading handheld equipment, so targeted AMR / AMI radio transmitters can be deployed to high read cost meters.
4. CGS should own the meter reading software that would load the handheld equipment for Olameter meter readers.

2.3.2.2. Meter Reading Equipment and Software

The meter reading handheld equipment and software is owned and operated by the meter reading contractor, Olameter. They use 4 to 5 Itron FC200 handhelds with Itron's MVRs meter reading software, as well as a Neptune boomerang reading device.



Figure 6

Meter reads are obtained from a Neptune touchpad or ARB pin remote, the boomerang device displays the register ID and meter reading. The meter reader then manually enters the readings into the Itron FC200 handheld. This process is prone to manual key entry errors.

The current equipment is reaching the end of its useful life and would have limited ability to read water meters with an AMR radio transmitter installed. This is an opportunity for CGS to replace the equipment

themselves with a handheld and meter reading software that can collect readings from their preferred AMR provider.

It is recommended that this equipment be replaced with CGS selected meter reading equipment and software that would allow the use of even a limited number of AMR radio transmitter devices.

2.3.2.3. Detailed Meter Reading Costs

The of meter reading were broken in three components, direct meter reading costs that are conducted by Olameter, meter reading coordinator cost expect to be provided by GSU and CGS's meter reading department who are performing some re-reads as a result of billing estimates.

2.3.2.3.1. Direct Meter Reading Costs

Getting the right information to analyze the meter reading costs was difficult. The meter reading rates were easy to obtain, the 2015 rates are summarized in the table below. But we were not able to reference these rates to the database of meters we analyzed, so we initial made a number of assumptions about what fields of data drove the read rates.

| Meter Reading Rate Description | Rate (\$ per reading) | Understanding of when rate is applicable, and Northstar field we referenced |
|--|-----------------------|---|
| Residential Outside, Water Only | \$.545 | Residential properties with an outside touch pad. NS field "category" = R1 (46,044) |
| Residential Inside, Water Only | \$.93 | Residential properties with an no touch pad. NS field "category" = R1 (no inside indicated so we had to estimate) |
| Residential Outside-Freezing, Water Only | \$.635 | Residential properties with an outside touch pad that keep water running due to potential of freezing. NS field "category" = R1 & route 317-327 (340 accounts) |
| Residential Inside-Freezing, Water only | \$.982 | Residential properties with an no touch pad that keep water running due to potential of freezing. NS field "category" = R1 & route 317-327 (340 accounts), no inside indicated so we assumed none.) |
| Commercial Outside, Water Only | \$1.987 | Commercial or multi-unit residential properties (touch pad did not matter due to no difference in cost). NS field "category" = R2 (484), M1 (74), C1 (1,505), C2 (50), C3 (32), for a total of 2,145 |
| Commercial Inside, Water Only | \$1.987 | |
| Special Reading Service | \$7.990 | These readings were used for finals readings or a re-read (3,836 in 2015) |

| Meter Reading Rate Description | Rate (\$ per reading) | Understanding of when rate is applicable, and Northstar field we referenced |
|--------------------------------|-----------------------|--|
| | | where the meter reader was confirmed correct (no quantity provided). |
| Initial Calls | Unknown | This was to compensate the meter reader for traveling to the remote water systems. |
| Bi-monthly readings | See above | All readings were assumed to be read six times per year except very few monthly reads. |
| Monthly readings | See above | Meters with a category M1 (74) |

Table 16

When we attempted to use these assumptions to calculate the total annual meter reading cost, but we could not come up to the approximate \$235,050.35 approved in 2014. One issue that came up is no one in the meter department had reviewed or approved the meter reading invoices. So although the meter reading department was able to resolve issues (install an outside remote) to bring the cost of meter reading down, they did not know if the cost were actually decreasing.

To resolve the confusion we provided some additional resources to digitalize the 2015 Olameter invoices. The table below shows what the CGS was invoiced by the Olameter read rate description.

| Read Rates | Unit Prices | Invoiced Qty | Invoiced \$ |
|-------------------------------|--------------------|--------------|---------------------|
| Residential Inside | \$ 0.930 | 837 | \$ 781.76 |
| Residential Outside | \$0.5450 | 247,591 | \$134,937.10 |
| Residential Freezing | \$ 7.990 | 1,646 | \$13,151.54 |
| Commercial | \$1.987 | 23,778 | \$47,246.89 |
| Special Reading | \$ 3.060 | 4,397 | \$13,446.03 |
| Special Reading | \$ 7.990 | 3,656 | \$29,211.44 |
| Initial Call | \$22.49 to \$68.19 | 384 | \$12,832.64 |
| Turn-Off of Water Service | \$17.080 | 493 | \$ 8,421.43 |
| Turn-On of Water Service | \$17.080 | 74 | \$ 1,264.07 |
| Negotiation of Payment | \$11.81 to \$25.15 | 762 | \$ 9,025.90 |
| No. Customer Contact Required | \$2.84 to \$9.35 | 858 | \$ 2,457.95 |
| Total Invoiced | | | \$272,776.73 |

Table 17

This work allow us to compare reading costs and understand the quantity of each reading rate Olameter charged CGS (through GSU). There were a few things this highlighted:

- There was a lower special reading rate of \$3.060, after investigating where this rate was applied it was clear these were only related to special reads performed in the City of Sudbury water system.
- There were \$21,167 other services that were performed by Olameter that is unrelated to meter reading. We assumed this cost would be required moving forward. Total meter reading costs for 2015 were actually \$251,609.

The second step in the analysis was to compare the quantities invoiced in 2015 to what we would expect based on the analysis of the database. The table below provides this comparison and shows the delta between what was expected and what was invoiced.

| Read Rates | Expected (formula and qty) | Invoiced | Delta |
|---|--|----------------|-----------------|
| Residential Inside | 109 * 6 reads per year Total reads / year: 654 | 837 | 183 |
| Residential Outside | (46,044 R1 less 109 inside reads)*6 reads per year Total reads per year:275,610 | 247,591 | (28,019) |
| Residential Freezing Expected rate of \$.635- \$.982 / read Invoiced rate of \$7.99 / read | 340 reads * 3 reads per year Total reads per year: 1,020 | 1,646 | 626 |
| Commercial | 2,145 less 74 monthly *6 reads per year + 74 monthly*12 = Total reads per year:13,314 | 23,778 | 10464 |
| Special Reading at \$3.06 | 3836 final reads per year | 4,397 | 4,217 |
| Special Reading at \$7.99 | | 3,656 | |
| Total Readings | 294,434 | 281,905 | (12,529) |
| Initial Call | No information was given to provide an estimate | 384 | N/A |
| Turn-Off of Water Service | | 493 | |
| Turn-On of Water Service | | 74 | |
| Negotiation of Payment | | 762 | |
| No. Customer Contact Required | | 858 | |

Table 18

CGS will need to dig a little deeper in order to full understand why there are differences in the expected versus what was invoiced.

During the process of trying to obtain the critical Northstar field(s) that are used to drive meter read rates, Olameter indicated that GSU does not maintain a field that allows them to apply meter read rate using the MVRS reading file. Instead a few years ago they moved to relying on the meter reader to indicate what read rate would be used. So in essence, GSU has limited control over the rates are to be charged by Olameter. Meter readers are usually paid in a similar fashion as the meter reading contractor is paid (piece rate), this could provide a financial incentive to assess some properties in the

higher read rate categories. If a field was maintained within Northstar that drove meter read rates it would provide a lot more control to the meter department on the reads that are being charged.

Some other discrepancies that should be investigated by CGS:

- Residential freezing rate – it appears the read rate should be \$.635 per read, but they charged \$7.99 per read. There may have been an un-disclosed agreement to this rate change, this should be better understood.
- Residential freezing rate – the quantities were higher than expected and in 2015 it does not appear all meters were read three times. The May 31, 2015 reading in Sudbury was much higher than expected.

| Read Date | Capreol | Chelmsford | Dowling | Levack | Sudbury | Grand Total |
|--------------------|------------|------------|-----------|------------|---------------------------|--------------|
| 31-May-15 | No Reads | 3 | 87 | 43 | 812 More than expected | 945 |
| 14-Jun-15 | | | | | 7 | 7 |
| 27-Sep-15 | 69 | 3 | No Reads | 44 | 239 | 355 |
| 27-Dec-15 | 69 | 3 | No Reads | 26 | 241 | 339 |
| Grand Total | 138 | 9 | 87 | 113 | 1,299 | 1,646 |

Table 19

- The commercial readings – what was invoiced appears to be 10,464 more than what was expected based on what is in the Northstar system. A couple possible reasons for the discrepancies are 1) the category was not updated to the correct one, 2) meter readers and GSU have a difference of opinion on what is considered commercial. Having Northstar control what is considered a commercial read will give CGS back control of these costs. CGS may need to go out into the field with a meter reader to determine what they consider a commercial reads. This may lead to a cost savings or re-categorization within Northstar.
- Special readings – the quantity of special reads was higher than the total final reads. This may be due to re-read requests by GSU, but it would lead to the question of why are these re-reads required. CGS meter shop has already started to investigate these re-read requests and is finding about 72% may be preventable. Refer to the *Water Billing Estimate* section of this report. With CGS taking over the re-reading effort these extra costs may be better controlled.
- Lastly we reviewed the rates being charged to travel to the remote water systems we did not find any irregularities. See the table below that summarizes these costs:

| System | Rate | Qty / year | Extended | Estimated Km from GSU office |
|-----------|----------|------------|------------|------------------------------|
| Van Caron | \$ 22.49 | 33 | \$742.30 | 16.8Km |
| Garson | \$ 22.49 | 58 | \$1,304.65 | 14.8Km |

| System | Rate | Qty / year | Extended | Estimated Km from GSU office |
|--------------------|----------|------------|--------------------|------------------------------|
| Lively | \$ 22.49 | 40 | \$899.76 | 15.0Km |
| Chelmsford | \$ 28.63 | 62 | \$1,775.12 | 20.5Km |
| Naughton | \$ 28.63 | 11 | \$314.94 | 17.7Km |
| Val Therese | \$ 28.63 | 13 | \$372.20 | 23.8Km |
| Wahnapitae | \$ 28.63 | 25 | \$715.51 | 18.6Km |
| Hanmer | \$ 34.09 | 69 | \$2,352.00 | 26.6Km |
| Whitefish | \$ 51.14 | 6 | \$306.82 | 33.7Km |
| Dowling | \$ 51.14 | 27 | \$1,335.69 | 31.1Km |
| Onaping Falls | \$ 67.13 | 13 | \$872.65 | 37.4Km |
| Levack | \$ 68.19 | 27 | \$1,841.00 | 45.0Km |
| Grand Total | | 384 | \$12,832.64 | |

Table 20

The costs and quantities appear to be in line with the distance the meter reader needs to travel. As well we review the number of reads per day that were performed and there was a good correlation between the further the drive the few meters were read per day.

2.3.2.3.2. GSU Meter Reader Coordinator

The contract between CGS and GSU contemplated a meter reading coordinator position to manage the day to day activities of the Olameter contract. The contract allows for \$75,000 per year in additional budget to cover the cost of this position. Although GSU has not filled this position and therefore has not charged for this cost some of the issues highlighted in this report could be improved with more resources being dedicated to managing the meter reading contract and business practices.

We are recommending this position be filled with someone within CGS meter maintenance department so they can direct efforts relating to meter maintenance that will benefit the cost of meter reading and the service level the City's customers are receiving (fewer estimated bills). This would be done in conjunction with moving the meter reading contract from GSU to CGS.

2.3.2.3.3. CGS Re-read Costs

CGS meter staff have started to perform the re-reads to try and determine what is causing some of these issues. Between March and October of 2016, CGS staff found the following:

| Month | Customer Issue | Estimate | Inside Read | Maintenance | Re-read | Re-read Lockbox | (blank) | Total |
|---------|----------------|----------|-------------|-------------|---------|-----------------|---------|-------|
| (blank) | | | | 1 | 24 | | 5 | 30 |
| Mar | 5 | 2 | 8 | 9 | 68 | 21 | 4 | 117 |
| Apr | 6 | | 14 | 20 | 146 | 44 | 1 | 231 |
| May | 1 | | 4 | 16 | 38 | 34 | 1 | 94 |
| Jun | 1 | | 2 | 14 | 52 | 5 | | 74 |

| Month | Customer Issue | Estimate | Inside Read | Maintenance | Re-read | Re-read Lockbox | (blank) | Total |
|------------------------|----------------|----------|-------------|-------------|------------|-----------------|-----------|------------------|
| Jul | 10 | | 6 | 27 | 53 | 7 | | 103 |
| Aug | 14 | | 8 | 24 | 70 | 39 | 3 | 158 |
| Sep | 20 | | 3 | 21 | 55 | 6 | 2 | 107 |
| Oct | 3 | | 4 | 10 | 26 | 4 | | 47 |
| Grand Total | 60 | 2 | 49 | 142 | 532 | 160 | 16 | 961 |
| Non Preventable | 60 | 2 | 49 | 142 | 0 | 0 | 16 | 269 (28%) |
| Preventable | 0 | 0 | 0 | 0 | 532 | 160 | 0 | 692 (72%) |

Table 21

This would indicate that 72% of the re-reads that occur may be preventable through either better meter reading management or the use of AMR radio transmitters, to avoid the meter reader from being locked out. These finding support our recommendation for CGS to take over the Olameter contract and manage it directly.

Assuming no AMI/AMR technology is implemented we have assumed the cost of re-read meters due to weather or meter reading performance will continue. The cost are summarized below:

| Type of Reading | Quantity | Cost per occurrence | Extended |
|--------------------|----------|---------------------|--------------------|
| CGS staff re-reads | 1,260 | \$35.00 | \$44,100.00 |
| Total Cost | | | \$44,100.00 |

Table 22

2.3.2.4. Total Meter Reading costs and recommendations

The total meter reading costs used in the model are summarized below. It should be noted that the model does not match exactly the above findings due to formulas being used in the model.

| Meter Reading Cost | Extended |
|---------------------------|------------------|
| Olameter – Reading costs | \$ 250,983 |
| Olameter – Other Services | \$ 21,167 |
| Meter Reader Coordinator | \$ 75,000 |
| CGS re-read costs | \$ 44,100 |
| Total | \$391,251 |

Table 23

We are making the following recommendations:

1. Meter reading codes be setup in GSU Northstar system that will drive Olameter's meter reading costs. This would allow CGS to control the types of readings that are being performed.
2. Change the agreement with GSU to remove the meter reading portion from their contract and assign it to the meter maintenance department.

3. Purchase new meter reading equipment that would allow a CGS selected AMR capable meter reading handhelds. This would allow specific higher cost meter readings to be collected a lot cheaper.
4. Hire a meter reading coordinator to manage the meter reading contract. This position may change depending on what technology is approved.
5. Investigate the irregularities identified in the meter reading costs section of this report. Should be done at the same time as the switch of control of the meter reading contract.

2.3.3. Customer Service and Water Billing

GSU provides all water meter reading, billing and customer service functions for all CGS customers, including those customers who are serviced by Ontario Hydro (approximately 12,000 of the 48,000 customers).

2.3.3.1. Water Billing Estimates

GSU produces approximately 288,000 water bills per year. In 2015, 20,753 of these bills were estimated. This amounts to 7.2% of the bills produced. The current number of estimated bills would be higher than that of other water utilities of similar size and setup.

The reasons for these estimates are not tracked. It could be due to weather preventing the meter reader from obtaining a reading, it could be related to remote or wiring issues that require maintenance or it could be due to meter reader issues.

2.3.3.2. High/Low Customer Interactions

In 2015, GSU found approximately 1,080 High/Low complaints that resulted in a service call being issued to CGS meter department for investigation. High/Low complaints can be a result of a customer using more/less water than was expected, the meter readings being incorrect or theft/tampering occurring at the property. These types of complaints are costly to investigate and resolve given that all GSU and CGS staff have are the past bi-monthly readings (if they were actually collected).

From a customer service perspective both the GSU call center and billing staff currently have limited tools to help the customer explain the high bill complaint. This results in service orders being created for CGS staff to investigate and perform additional customer service to assist in explaining the high water complaint. If CGS staff are lucky, the problem can be found (continuous consumption occurring at the property) but often the issue may be very difficult to provide a reasonable explanation to the customer.

Although this level of customer service has been accepted over the years, advances in technology have raised the level of what is possible and more detailed consumption analysis tools are available. Customers have gotten used to this level of service being provided for their electric bills and it is expected that more requests for detailed hourly consumption will become the new standard of what customer service should be available to provide within the water industry.

2.3.3.3. Customer Service

In addition to the High/Low customer complaints, GSU receives calls about their water bills daily. Customer service staff spend time on the phone answering questions about their water bills, payments and maintenance that has occurred on their property. Providing a customer service online portal (which GSU currently does) can reduce these call volumes as more people change their expectations on using the internet instead of the phone for more information. The issue with the existing GSU on-line portal for water customers is there is no hourly consumption information available, although the Capricorn customer portal allows for it. The only information they can get is the total consumption for the last billing period. By providing better information on this portal it is likely this will be the first place customer turn to get water billing information. Overtime, if the information that the portal displays is of value to the customer there should be reduced call volumes.

2.4. Meter Maintenance processes

The CGS meter department has three water meter technicians that perform work on both commercial and residential properties. Their duties include: performing water meter replacements, investigation, wire and remote repair and replacement, new home installs, high water complaints, tamper and theft investigations and refurbishing water meters 25mm and greater. Some meter replacements are outsourced due to Ontario licensing requirements.

It was very apparent in our analysis that the department has been proactive with regards to their large consumers and large sized meters. This focus has resulted in the larger sized water meters (25mm and greater) being significantly newer than the smaller sized water meters.

| Meter Size | Average Age |
|------------|-------------|
| 5/8" | 16.8 |
| 3/4" | 6.0 |
| 1" | 6.1 |
| 1.5" | 4.1 |
| 2" | 4.6 |
| 3" | 3.9 |
| 4" | 4.8 |
| 6" | 5.0 |

Table 24

Compared to other water utilities of similar size, the proactive water meter program for commercial sized meter is much better than most. This focus will allow any type of large AMR/AMI project to focus on replacing the older residential (less than 25mm) sized meters and only having to upgrade or just install a radio transmitter on the commercial meters.

2.4.1. High/Low Customer Service Calls

As discussed in the Customer Service and billing section there were 1,080 High/Low water complaints that result in a service call to the customer's property. We have estimated that these take approximately 1 hour per service call to complete. This amount is equivalent to 50% of an FTE or approximately 17% of the department's effort. Often the technician customer service skills are key in explaining why their water consumption was higher than expected. Technology would see the number of these types of service calls reduced and would likely lead to a more positive customer service experience for CGS customers. There would also be a benefit for the technician, making the explanation or investigation of what caused the high or low consumption more efficient.

2.4.2. Meter Applications

CGS meter staff currently uses industry rule of thumb when it comes to water meter sizing and applications. Primarily install a water meter one sized smaller than the service size. Given it is difficult for a customer to show their consumption profiles with no water meter or data collection equipment being in place.

With AMI/AMR equipment CGS meter maintenance will be able to start to analyze hourly consumption profiles to ensure meters are the right type and size.

2.4.3. Frozen water meters

The cold winters CGS experience has led to a number of frozen water meter that require replacement and can lead to damage at the property. On average CGS experiences about 80 frozen water meters per year. This number could be much higher if they did not have the approximately 300 properties whose water service is too shallow to keep their water running through their winter months.

These emergency calls out and water being flushed down the drain could be reduced with the use of temperature gauges. Although these types of devices are still leading edge, depending the type of technology there may be some additional tools to help CGS reduce and control these types of costs.

3. AMR/AMI/AMA Requirements

3.1. AMR/AMI Technology Overview

3.1.1. Radio Frequency Considerations and Risks

Automated meter reading technology is based on readings sent wirelessly through radio frequency (RF) transmissions. All AMR/AMI manufacturers use RF technology, so by accepting the recommendation to implement AMR/AMI technology the utility must accept any perceived risks relating to the technology.

3.1.1.1. Proprietary RF Protocols

All water based radio transmitting products have a manufacturer specific, proprietary RF protocol. For a radio transmitter to be “heard” by a radio receiver (handheld RF receiver, mobile or fixed base collector) the manufacturers of those two products must have a formal agreement. The reality in the water AMR/AMI industry is that most manufacturers only allow their own products to work together.

Manufacturers keep tight control over their RF protocols to eliminate competition for future radio transmitters. Once a utility has purchased and started using a particular brand of data collection equipment, headend software, and interface for their water billing system, there can only be one future manufacturer of the radio transmitter. Any future procurement will either have to be sole sourced through the manufacturer or their distributor, or a competitive bid will have to be released that limits the products available for the project to that single manufacturer. Some of the manufacturers award exclusive territory to distributors in their network, so in some of these cases only one distributor might be able to respond to a RFP or tender. The risk here is that the manufacturer or distributor would be able to raise prices with minimal consequences, as the utility would be limited in their ability to find a more cost effective solution within some significant initial cost for new equipment.

Implications for CGS:

The best way for the utility to mitigate this risk is for any procurement to address 100% of the meters within the utility’s population. For the CGS, there would be approximately 48,000 water meters that require radio transmitters. Once AMR/AMI technology is approved, the procurement document should include 100% of the transmitters, even if the deployment of the radio transmitters is over a longer period of time.

3.1.1.2. Regulation Implications

All AMR/AMI products conform to both Industry Canada’s (IC) and the Federal Communication Commission’s (FCC) regulations. Both countries have very similar regulations that define the frequency bandwidths that wireless products are allowed to operate within. AMR/AMI products are designed to minimize conflicts with other common products such as cell phones, baby monitors, wireless phones, remote garage door openers, etc.

Implications for CGS:

Any AMR/AMI system would need to comply with Industry Canada's Safety Code 6, Radio Standards Specifications 102, and Radio Frequency (RF) exposure Compliance of Radio communication Apparatus (All Frequency Bands).

3.1.1.3. Licensed and Unlicensed Systems

When an AMR/AMI system operates on an unlicensed band, it means that there may be other products using the same frequency. Although, most manufacturers have designed their radio transmitters and receivers to filter out RF signals that are unrelated to the transmitter the receiver is looking for, in some cases there can still be conflicts with competing RF signals. If a conflict does occur it may prevent an RF transmission from reaching the data collector/receiver. To minimize this potential issue, most manufacturers have designed their products to use a process called frequency hopping: if there is an RF conflict on a specific frequency, then the next transmission is sent out on a slightly different frequency. We are not aware of any water utility that has run into a significant RF conflict of this kind.

Implications for CGS

The utility should require all RF licensing costs and responsibility be with the AMR/AMI vendor.

3.1.1.4. Radio Frequency Safety Considerations

In the water, gas, and electric industries, RF products are often referred to as "smart meters". There has been some push back from grassroots organizations that fear the RF transmissions pose risks to human health. To date there has been no credible studies produced that have proven that AMR/AMI RF technology is hazardous to peoples' health.

Industry Canada has regulations that ensure that RF technologies operating in Canada adhere to strict guidelines that comply with Health Canada's Safety Code 6 (SC6). This code defines the acceptable exposure limits to RF electromagnetic fields in the frequency range from 3 kHz to 300 GHz. Products approved by Industry Canada must not exceed this exposure limit. There are many products that are governed by this code, including cell phones, microwave ovens, and computers on wireless networks, cordless phones, baby monitors and AMR/AMI technologies. RF exposure is defined as an increase in tissue temperature of more than 1 degree Celsius after being exposed to the RF signal for a 6 minute period. The wording in the code is as follows:

- "[...] Temperature increases in living tissue due to RF energy absorption follow a well-defined pattern with a time constant of approximately 6 minutes (thermal time constant), where **63%** of the steady state temperature increases in living tissue within 6 minutes due to RF energy absorb
- Tissue temperature rises >1°C

The code defines how this test must be performed to be considered valid, including the frequency of the RF transmission, the strength of the transmission, and the distance from the source; all of which make worst case assumptions when evaluating a product.

Quebec Hydro performed a study showing typical household products and their measured emission levels. As you can see in the diagram below, a next generation electric meter is less than 120,000 times Industry Canada's allowable limit.

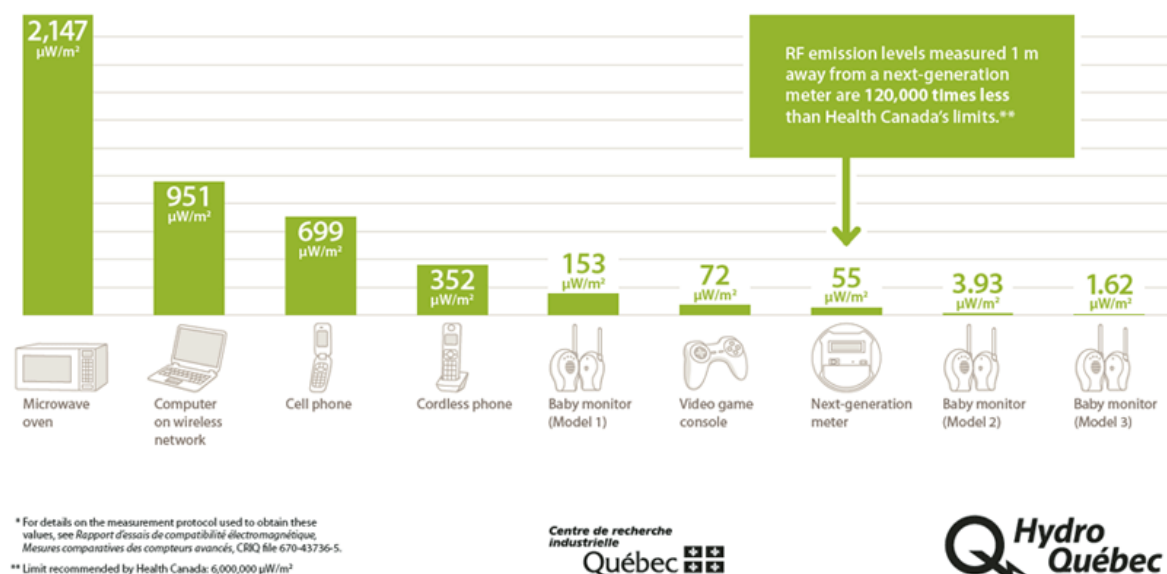


Figure 7

Even with substantiated evidence that supports the fact that AMR/AMI products are safe, people will still come forward voicing concerns about the safety of the products. A small percentage of the utility's customers will never be completely convinced that these products are safe to use. A very vocal minority can and have a major impact and have successfully stalled a few AMR/AMI projects.

Implications for CGS

To ensure the Utility is prepared to address these concerns the following steps should be taken:

1. Proof of the successful AMR/AMI product emission compared to Safety Code 6 should be readily available to customers on the utility or manufacturer websites.
2. During the procurement process, as a part of the evaluation, vendors should be required to show the testing and calculations done to prove that their products meet Industry Canada's emission limits.
3. Any public outreach program should include extensive information relating to the safety of the vendor's AMR/AMI products.

4. An opt-out program could be allowed. Typically this would come with additional charges to the customer for the additional labour and equipment the utility would need to perform a manual read process.
5. AMR/AMI products could be installed on the outside of the building in specific cases.

These are the tactics other utilities have used to successfully mitigate RF concerns and although they may not resolve all issues, they should help the utility avoid any major disruptions to the project.

3.1.1.5. High Resolution Water Meters

The resolution on the water meter register is defined as the lowest increment of water that a meter can register. Residential meters with six moving digits on the register typically read down to the 10th of a cubic meter (100 litres). The one exception to this rule is the Neptune Autodetect/ProRead meters where the digit furthest to the right only encodes a 0 or a 5, making the lowest increment of consumption 500 litres.

For AMR/AMI radio products that take hourly readings, the consumption for many hourly periods will be zero as the diagram below demonstrates.

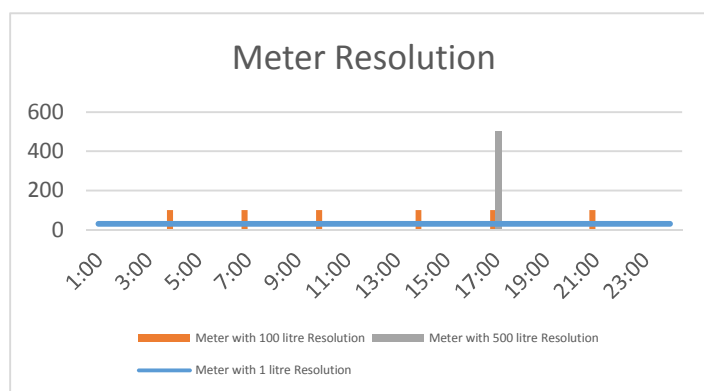


Figure 8

For a customer who has a significant leak of 30 litres per hour, a high resolution meter will flag the leak since all 24 hourly periods will show some consumption. Lower resolution meters (100 or 500 litre per hour resolution) with a leak of this size will never flag it because it will be impossible to differentiate the leak against normal consumption. The table below shows the number of hourly periods with zero consumption at each level of resolution, given the exact same rate of flow.

| 15mm Meter Resolution (based on a leak of 30l per hour) | Number of Hourly periods with Consumption | Number of Hourly periods with Zero Consumption | Would AMR / AMI Radio transmitter pick up leak |
|--|---|--|--|
| 8 digit meter - Meter with 1 litre resolution | 24 | 0 | Yes |
| 7 digit meter – meter with 10 litre resolution | 24 | 0 | Yes |
| 6 digit meter - Meter with 100 litre Resolution | 6 | 18 | No |

| 15mm Meter Resolution (based on a leak of 30l per hour) | Number of Hourly periods with Consumption | Number of Hourly periods with Zero Consumption | Would AMR / AMI Radio transmitter pick up leak |
|---|---|--|--|
| 6 digit meter (existing if Pro-read meters are re-programmed) - Meter with 500 litre Resolution | 1 or 2 | 22 or 23 | No |
| 5 digit meter (existing Pro-read meters without programming) meter with 1,000 litre resolution. | 0 or 1 (with only 720 litres per day, not every day will show consumption) | 23 or 24 | No |

Table 25

The table above shows that even if you have a radio transmitter that reads the meter on an hourly basis, it will only trigger the leak flags if the meter resolution is at least 7 digits reading down to the 10 litre. When reviewing some of the features (specifically leak and backflow flags) of an AMR/AMI system, the utility needs to consider the existing water meters' current resolution capability to ensure that the feature can be supported.

Implications for CGS

Currently the majority of the existing CGS water meter have Neptune ProRead and auto-detect 6-digit registers, but are programmed only to provide 5 digits to the billable unit (1 M3). A small % of the meters are considered high resolution. Those meters that require replacement will also get a higher resolution meter, but the remaining meters that have not yet reached the end of their useful life will either require a replacement or register upgrade in order for all customers to receive the benefits of the leak detection feature. The alternative would be to accept not all customers will get this feature until their water meter is replaced over time.

This is really a question of the service level that CGS wants to achieve and if all customers get the same features an AMR/AMI technology can deliver.

3.2. AMR/AMI Technology Types

3.2.1. Walk-by AMR

The diagram below shows the critical pieces of a walk-by system.

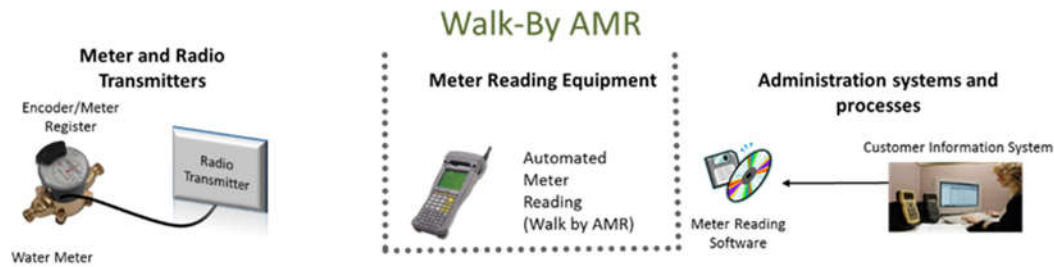


Figure 9

3.2.1.1. Functionality

At its core, AMR technology is comprised of a handheld computer that contains a database of property numbers along a meter reading route and the corresponding stored readings for each property. Efficiencies are created for the meter reader as the handheld computer logically directs him or her to each property that requires a reading.

Handheld meter reading equipment allows for three ways of capturing reading information. The first way is to manually type in the reading for each property. This is required for direct read and pulse generated meter registers. Properties with touchpad remotes may still require a manually entered reading, if the touchpad reading device does not communicate directly with the handheld. Readings that are keyed in are always prone to some human error.

The second way to get the reading information into the handheld is for the meter reading device (touch reader) to communicate directly to it. This method is available only with encoder technology. The meter reading device and handheld communicate through the wire or radio frequency connection. Readings are recorded in the handheld database according to the corresponding meter ID number. This method eliminates the need to key in each reading, thus improving the accuracy and efficiency of the meter readers. Although this method is an improvement to manually entering meter information, it still requires the meter reader to gain access to the remote receptacle at each property.

The third method of collection meter readings is for a radio transmitter to be attached to the water meter register and transmit the readings via RF to the handheld meter receiver. The readings will automatically associate with each property through the radio transmitter identification number. The meter reader would not have to touch the device on the building itself, likely all readings would be read by just walking by the property. This technology eliminates some of the inherent risks relating to meter reading on private property while increasing reading accuracy.

Regardless of how the readings make it into the handheld, at the end of each day, the handheld is downloaded to the utility's CIS via manufacturer-specific meter reading software. This software then transmits all readings within the book/route to the water billing CIS system.

3.2.1.2. AMR Radio Transmitter Features

Algorithms that are able to detect certain consumption patterns can be performed in either the meter register or the radio transmitters. For most walk-by, mobile, and some fixed base radio transmitters these calculations are able to determine leak, backflow, or zero consumption conditions. It is important to note that although some manufacturers provide this functionality within the register head, most have moved towards providing this same functionality within the radio transmitter.

A continuous leak detection flag checks for changes to readings on an hourly or 15-minute interval (depending on the product) and stores a 1 (if the read changed) or a 0 (if the read did not change) for 24 hours or 96 intervals every day. At the end of the day, if all periods hold a “1” then it assumes there was continuous (consumption in every time periods) consumption for that day. The algorithm will send a flag to the data collector once 30 to 45 days are registered as having had continuous consumption, indicating that there may be a leak occurring at that property. This will allow the utility to either warn the customer via water bill, a phone call from customer service, or web portal that a leak may be present at their property and that a higher water bill may be the result.



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the other hand if the resolution is very low (.001CCF, .0001M3, 1 gallon) then a large number of customers may experience this flag. Reacting to each one could become costly.

3.2.1.2.3. Backflow Detection Flag

Similar to leak detection technology, certain register heads have the ability to detect if backflow occurred or is occurring at a property. This information is sent through the meter reading equipment in the form of a flag. The water utility can then take corrective action to eliminate this risk to the water system. In order to be detected by the meter, the backflow event has to cause the meter to read negative volume. If the register is read every fifteen minutes, then the volume of backflow during this time must exceed the volume of water being consumed. Short, small volume backflow events will not normally be detected by these register heads.

3.2.1.2.4. Zero Consumption Flag

There are register heads that can determine if zero consumption has taken place for an extended period of time. Zero consumption is often a symptom of water theft. With this information the water utility can send a crew to investigate the situation.

3.2.1.2.5. Low Radio Transmitter Battery Flag

Most manufacturers' radio transmitters monitor the voltage level of their own battery and send an alarm six months before it's expected to die. This may provide some notice to the utility to get out and replace the radio transmitter before the battery failure, so that fewer readings are missed.

3.2.1.2.6. Tamper Flag

Radio transmitters often know if there is a communication error between the radio transmitter and the encoder register. Some systems can decipher between a cut wire, an incorrectly wired register, and a programming error/issue with the register. In some cases this flag may alert the utility to a legitimate customer tampering with their meter, but there will be other cases that are unintentional maintenance issues. These flags would initiate a response in the field to investigate and resolve the issue.

3.2.1.2.7. Data Logging

Certain manufacturers' radio transmitters store the daily and hourly readings for the last 30 to 40 days. This additional information can be used to resolve customer complaints. This data logging feature can provide the same type of hourly reading information a fixed base system produces for individual customers who may request this information.

Implications for CGS:

These benefits and feature of an AMR radio transmitter should help CGS meet the business drivers that are considered somewhat and very important that is identified later in this document.

3.2.2. Mobile AMR Technology

The diagram below shows the critical pieces of a Mobile AMR system.



Figure 11

All manufacturers of Mobile AMR systems ensure that their solution is also compatible with an AMR walk-by system. When a Mobile AMR solution is selected, often handhelds are purchased alongside the mobile unit, as a backup or for radio transmitter installation verification.

3.2.2.1. Functionality

Mobile meter reading systems are comprised of a laptop computer which is connected to a radio receiver that is in turn connected to an antenna mounted on the outside of a vehicle. This system has a more powerful radio receiver than the typical handheld and is capable of picking up multiple readings from several radio transmitters by driving past the metered properties. A mobile reading system often has multiple receiver channels that enables the system to do this very efficiently.

The laptop comes with mapping software that allows the meter reader to easily track his/her progress and shows him/her where to drive to collect any readings not yet captured. The map display often has different coloured dots to show if the meter at a property has been read, not read, or has an alert (leak, tamper, backflow, etc.).

Utilities can eliminate almost all the safety risks associated with having meter readers in the field by using the drive-by system. It also increases the speed at which the readings can be collected, far fewer human resources are required to conduct meter readings. Mobile AMR allows for a monthly billing cycle, due to the speed with which the meters can be read. The added consumption information can start to be used for other purposes beyond just water billing such as: water loss calculation, leak detection, district metering, and the ability to identify areas of peak demand.

3.2.2.2. Features

3.2.2.2.1. Radio Transmitter Alerts and Flags

The radio transmitter for a mobile AMR system is the same as the one provided for a walk-by system, so all the same alerts and flags are provided to the mobile data collector that were discussed in the walk-by AMR section.

3.2.2.2.2. Mobile Lite Device

Some manufacturers also market a product in-between a walk-by and mobile device. The product allows reading to be collected while driving but does not have the laptop with the mapping capabilities. Basically this solution uses a handheld connected to a vehicle-powered receiver with external antenna. This system is used sometimes by utilities that either want a more powerful back up system or want to reduce the initial capital cost.

3.2.2.2.3. Data Logging Collection During Regular Reading Route

As discussed in the walk-by AMR system, many radio transmitters are able to provide hourly reading information for the previous 30 to 45 days. This is usually performed outside the normal meter reading process, but some manufacturers have incorporated this feature into the normal reading process. The utility would indicate for a specific account if daily or hourly consumption information is required. When the meter reader passes the address the additional reading information is collected automatically. This would help the utility in a couple ways. First, if a customer complained of a high bill the utility could get hourly information the next time they were reading that address to help the customer understand their consumption pattern. Second, if a customer sells their house and it requires a reading on a specific day, the meter reading could collect the daily reads for the meter so the bill could be closed out properly. This would eliminate a meter reader from making a special trip.

Implications for CGS:

Greater Sudbury Utilities (GSU) is required to move to monthly reading and billing, with the water meters being read bi-monthly, GSU will have to start to estimate every other month (at a minimum). Mobile AMR technology will allow collection of monthly readings to eliminate the majority of these billing estimates. Many of the flags that are discussed in the Radio Transmitter features section of the report are dependent on reading the meters in the population every 30 days.

3.2.3. Fixed Base AMI Technology

Fixed Based AMI/AMR Meter Reading

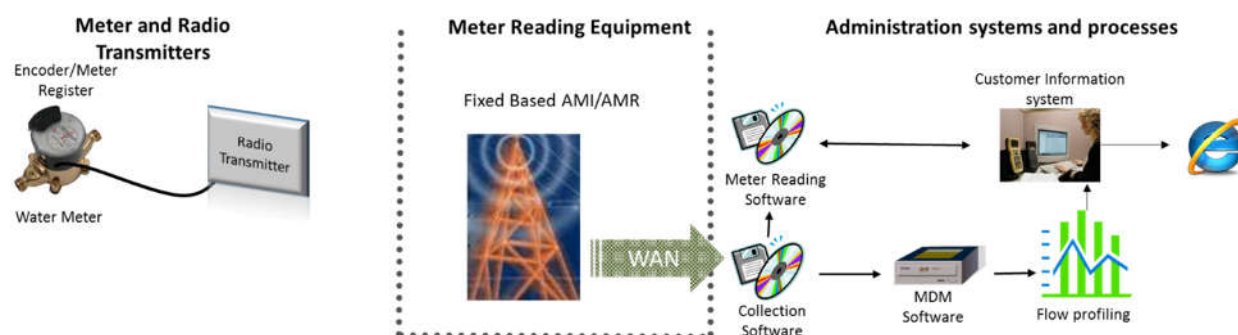


Figure 12

In a fixed area network (FAN) configuration, radio transmitters are installed on each water meter and are read by permanently installed radio collectors (receivers) or “data collectors”. These data collectors are strategically deployed around the geographic area by mounting them on poles, towers, or utility owned buildings. The data collectors are connected to the collection software using a wide area network (WAN). The type of WAN varies depending on what the data collector location has available: directly to the City network via a secured router or fiber optics network or cellular cards integrated within the collector itself. The collectors are constantly receiving data from the radio transmitters in the population and transmitting this back to the collection software.

3.2.3.1. Functionality

3.2.3.1.1. Collection Software

A fixed base network requires collection or headend software that receives all the reading information from the collection network. This software monitors the network devices (collectors and radio transmitters) and is able to display and report on the different components in the field and their status. The headend software passes the daily billable readings required to produce a water bill to either the CIS or the meter reading software (similar to walk-by or mobile AMR). Another function of the software is to pass all readings and alert information collected under the network to the Meter Data Management (MDM) software.

3.2.3.1.2. Meter Data Management Software

Meter Data Management software is required in a fixed base AMI system, due to the large amount of reading and consumption data that needs to be accessed and reported on. This separate piece of software can be procured with an AMI system or separately. Some manufacturers have their own MDM, and others rely on independent software companies to perform this role. The MDM has a number of functions:

1. **Data Repository** – The software is optimized to store the amount of data required from an AMI system. For an AMI system that provides hourly readings, the MDM will need to store 8,760

readings each year for every customer. Analyzing consumption patterns over a period of months or years necessitates the management of a large amount of data that needs to be accessed and reported on quickly. Most utilities store up to seven years of consumption data.

2. **Data Validations** – Depending on what the data is being used for, a utility may want the software to discharge and create estimates with certain types of bad data (non-numeric reading, unknown high readings, and missing readings). An MDM can often define the types of data validations that can be performed whereby a utility is able to create routines on how to handle the different situations. For example, if only 50% of the readings were received for a certain period, the validation will identify what is missing and then create estimates for the missing data. This will ensure when a customer graphs the data, it does not appear like there were large periods of no consumption. This functionality is often employed for electric smart meters, the need for this with a water utility may be limited.
3. **Reporting** – Another function of an MDM is the ability to produce different types of reports in an efficient manner. Given the amount of data that is accessible, report generation can be problematic and can take up significant IT resources. MDMs usually come with a standard set of reports in addition to a custom report builder which allows users to add fields of data or additional criteria and groupings.
4. **Utility Management** – MDM for water utilities should have modules that are capable of performing certain water utility functions such as: district metering, leak detection, misapplied meters, and water consumption program monitoring. Ideally the MDM will have a both reports and user interface application that will allow the user to easily use this functionality.
5. **Water Customer Web Portal** – In an effort to improve customer service, utilities are now providing online access to the consumption data of their rate payers. This can be achieved in a number of different ways, either by passing the consumption data to the CIS or web portal or in some cases, the MDM can allow customers to log in directly and view their consumption. The issue with the MDM providing customers with this type of access, is that there is a limit to what a customer can view. Utilities are moving towards more advanced customer engagement software that allows water customers to view the water bills, payment history, tax bill, service requests on their account, as well as consumption history. A standalone MDM does not have all these capabilities.

MDM and collection software can also be interfaced with other utility systems like GIS, Scada, 311 and works management software. These interfaced connections to other systems need to be well planned to make sure the costs and effort to make them possible is matched or exceeded by the benefits provided. For example, it may be very critical to be able to open a work order for field personnel to investigate a high water consumption event that the MDM has identified.

3.2.3.1.3. Data Collection Network

Establishing the data collection network of a fixed base system can be one of the more challenging parts of a deployment effort. This is not due to the fact that data collector installations are difficult. Finding and getting the appropriate approval for locations that meet all the right conditions to allow the AMI network to collect readings for the metered population, is often much more difficult than utilities anticipate.

Propagation and Redundancy - Planning the right amount and location of equipment is done through a propagation study performed by the manufacturer of a proposed solution. This “prop” study provides a theoretical performance of the system based on a number of factors including: the topography of the geographic area being covered, the strength and frequency of transmissions, location of the radio transmitter (inside or outside), the number and location of data collectors. Once a radio transmitter is installed, there are many factors that can block or redirect transmissions and prevent a data collector from hearing the signal. An AMI system requires redundancy in order to ensure that if one data collector misses a radio transmission, another is in a position where it can receive it. This is achieved by having overlapping coverage areas where every single radio transmitter can be heard by at least two different data collectors.

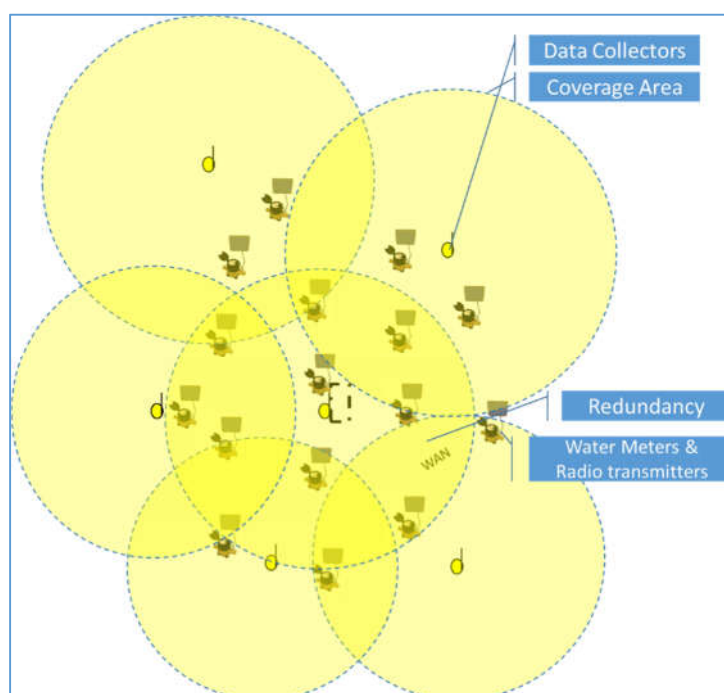


Figure 13

Data Collector Location and Approval – Most utilities prefer to mount the system’s data collectors on buildings, pump houses and water towers that the utility or municipality already owns. Installing data collectors on the roof of these locations (buildings, pump houses, water towers, schools, fire and police halls, etc.) often avoids rental fees when installing the device. AC power is also (usually) readily available and relatively easy to wire to the device. Another advantage to these locations is that the utility’s intranet may be available eliminating additional

data costs. In order to achieve the redundancy required, it is very likely that these locations will not allow for the propagation study to cover the entire area and more locations will need to be considered.

After considering its own buildings, most utilities try to install data collectors on existing power or light poles that the utility owns and has full control of. Depending on where they are located this infrastructure may be the next cheapest way of installing a collector. Installation on these types of poles may require additional costs for connection (including electric meter) to the electric grid. Some systems allow for optional solar panels to power the collector to avoid the need for a direct link to AC power.

After all previous locations have been exhausted the next option would be for the utility to install 25' to 30' poles (usually the higher the better) in the areas that have no other place to install a data collector. This option is often frowned upon because it's usually not popular with the public or politicians. No matter how unappealing this option may be for a utility, the reality is that a certain portion of the network will likely require newly installed poles to get full coverage. The utility should position this option as a reality when selling the concept of a fixed based system.

Drawing and Approvals – Understanding the approval process that must be taken to install data collection equipment is important. Often very specific engineering drawings are required for approval and some municipalities may not have a defined process for approving network locations. Some approval processes require extensive review or public notices and input. Ensuring the process for approval is clear and well documented, regardless of the type of data collector, is vital for a smooth deployment.

Wide Area Network/Backhaul – When planning for a fixed area network, consideration has to be given to the type of backhaul that will be required, in order to allow the collectors to pass data back to the collection software. Usually, the most cost efficient WAN process would be to connect to the utility's intranet through the use of a secured modem. This option would eliminate any additional data charges however it could also introduce some network security risks. A utility may also have an existing fiber optic network that can allow access to their intranet. If this is the case, then the access points would need to be identified, so preferred locations could be planned around them. Cellular is often the most popular way to backhaul a data collector, especially if the data collector is installed on poles or privately owned properties or if the headend software is hosted.

3.2.3.2. Features

There are a large number of manufacturers of fixed base AMI/AMR systems. Which in turn, creates variety with regard to the features and functionalities that are available. RFP specifications may reduce the number of systems that could compete during the procurement process. A list of necessary or preferred features would need to be discussed prior to procurement, when specification documents are being developed.

3.2.3.2.1. Radio Transmitter Alerts and Flags

Similar to walk-by and mobile AMR systems, fixed base radio transmitters may have algorithms within the radio transmitters that allow for various flags. Some fixed base systems have not added this feature to their radio transmitters because the same functionality can be achieved at the collection/headend or MDM software by analyzing hourly consumption.

3.2.3.2.2. Data Logging

With a fixed network AMR/AMI system, hourly read information is delivered to the collection software, so there is limited value to having the radio transmitter store reading information. Some systems have designed their radio transmitters to store readings for a day or two, which can act as another means of redundancy within the overall system. These radio transmitters will transmit past readings as well as new ones, so if a transmission was not heard by a data collector, the headend software can backfill these readings during a future transmission.

3.2.3.2.3. Software Hosting

Both Collection and MDM software are capable of being installed in-house on utility-provided server hardware or in a professionally managed/hosted environment (often by the AMR/AMI software manufacturer). The decision to host or not to host certain pieces of software depend on a number of factors that include the following considerations:

- Reliability
- Security
- System Support and utility expertise
- System maintenance
- Help desk
- Total life cycle
- Scalability
- Customization

These considerations and their level of importance to the utility should be reviewed prior to procurement documents being finalized. This will ensure that the utility gets all the information they require from the vendors in order to make the correct decision. This report provides details of the benefits and drawbacks of a hosted system vs. an in-house solution.

3.2.3.2.4. Time Synchronized Readings and Two-way Communication

A key specification for a fixed based AMI system is whether the system is considered a “two-way” system. Often manufacturers of a two-way system promote a number of benefits this specification allows and they use this to eliminate one-way fixed based AMR/AMI systems from procurement. Our recommendation is for the utility to consider the features and functionalities they are looking to achieve, then review how a one-way and two-way system achieve them (or not). In order to understand the nuances between the systems, we will explain the features of a two-way system and then compare how a one-way system operates. Radio transmitters in both systems communicate to a data collector (handheld, mobile or fixed based). It is important to note however, that only a two-way radio

transmitter is able to receive data and commands from the data collectors to the radio transceivers. Two-way communication has both benefits and drawbacks. The additional functionality of a two-way system are:

Time Synchronized Top of the Hour Readings - Meter readings can be time synchronized to allow all readings in the utility's network to be read at the same time. This feature requires a two-way radio transmitter, in order to receive the time stamp from the data collector. An AMI system schedules these readings at the top of the hour (12:00, 1:00, 2:00, etc.) which allows hourly consumption periods to be easily compared, as the diagram below demonstrates.

The diagram illustrates that a customer's consumption can be easily compared between the times 12:00 and 2:00.

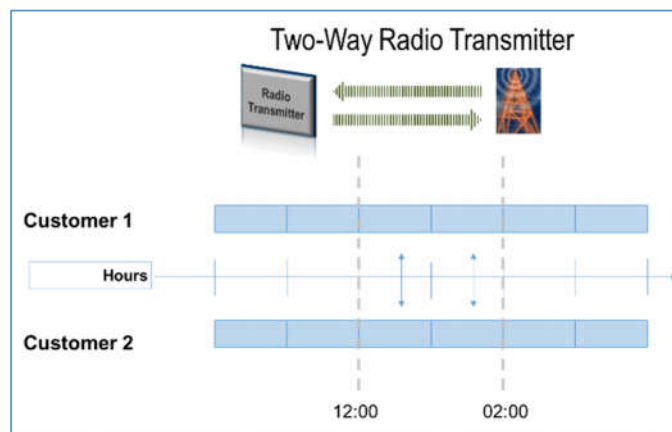


Figure 14

A one-way radio transmitter in a fixed base AMR system can lead to some confusion while comparing consumption as the diagram below shows.

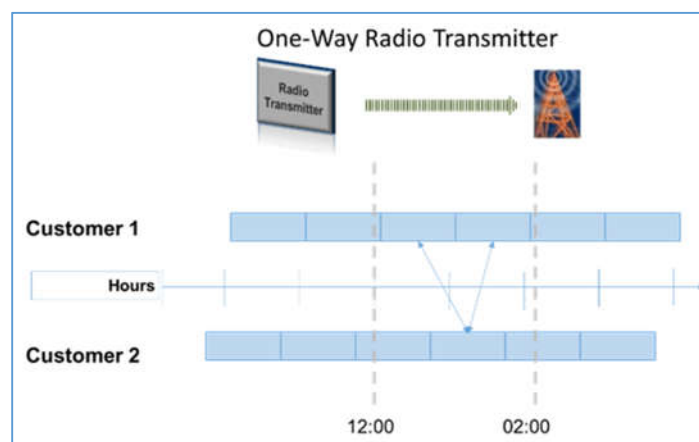


Figure 15

Given the same two customers, with the consumption over the same period being analyzed, a fixed base AMR system would suggest that Customer 1 had twice the consumption for the same one-hour period. This is due to the time readings were taken. The one thing a utility has to ask, is how often double the hourly consumption is actually going to change the analysis. Both types of systems will produce 24 hourly buckets. For a residential customer and an average daily consumption of 1,000 litres, this would mean approximately (1,000 liters / 24 hourly buckets) 41 liters in difference in some water buckets. Once you start to aggregate the number of customers you would want to do in district metering/dynamic water balancing, this difference does not really matter. If this is the only reason for requiring a two-way system, then it makes more sense to open up procurement to a fixed AMR/AMI system that collects hourly data and potentially give a few extra technical points for those systems that are two-way.

Remote Shut off Valves – Certain manufacturers are coming out with the ability to shut off water at a property from the office (eliminating truck rolls). A two-way system is required to perform this type of feature. If turning water off remotely is a business driver than a two-way AMI system should be specified.

Firmware Updates – Often one of the benefits that are promoted is the ability to push firmware updates to the radio transmitter. This is an important feature in the electric market due to some of the additional regulations and functionality an electric smart meter requires. Typically any additional functionality that is added to a water meter radio transmitter requires a new radio transmitter. It is very unlikely this functionality will benefit a water utility.

On-demand Read – A two-way AMI system will allow a utility to request a demand reading from the water meter anytime it is requested. This feature could be beneficial to a utility, if their billing agent is talking to a customer and wants to know the reading on the meter that very moment. That being said, most utilities are looking to obtain readings for final bills and a daily read pulled from the data collector would suffice. This can be accomplished by both a one-way and two-way system.

Future Abilities – Water utilities want to maximize their investment in the network by trying to expand what it is used for. Being able to send data from the office to a radio transmitter does appear to have a higher potential for other devices to be installed on them. AMR/AMI systems are not open, so innovation is limited to what the manufacturer develops or signs cross use agreements for. The other features that have been discussed include temperature and pressure gauges, scada system, remote hydrant flushing, and chlorine sampling. Some may require a two-way system, others could be achieved with a one-way system. These future abilities are still very much in development and differ by manufacturer. We would recommend during any procurement to provide additional technical points to systems that can perform these functions regardless of if it is a one-way or two-way system.

The biggest drawback of a fixed base AMI system is that there are fewer manufacturers that can provide it. Unless the benefits offered by an AMI system are critical to the utility's business case, then opening up the procurement specification to include either a fixed base AMR/AMI system will allow a larger

number of manufacturers and products to participate. By doing this, it will increase the competitiveness of the bids the municipality can expect to receive.

3.2.3.2.5. Remote Shut off Valves

A two-way fixed base AMI system can allow a utility to install remote shut off valves for certain customers who have a history of non-payment or other bylaw violations. These valves would be able to reduce flow to a site or turn off completely without the need for someone to attend the property.

Installation of these devices may be more challenging, as they will likely require changes to the meter setting. Also, once a utility moves to device management, it is usually necessary to add a higher level of encryption to the system's radio transmissions which adds complexity and cost to the solution. It is unlikely a water utility would want to install these devices on 100% of the population due to the costs involved.

Some water meters are coming out with remote shut off capability within the standard water meter lay length, which would address some of the increased cost of installing this feature.

3.2.3.2.6. Acoustic Leak Detection

An optional addition to a fixed base AMR/AMI system is the installation of acoustic leak detection (ALD) devices across part or all of the utility's water system.

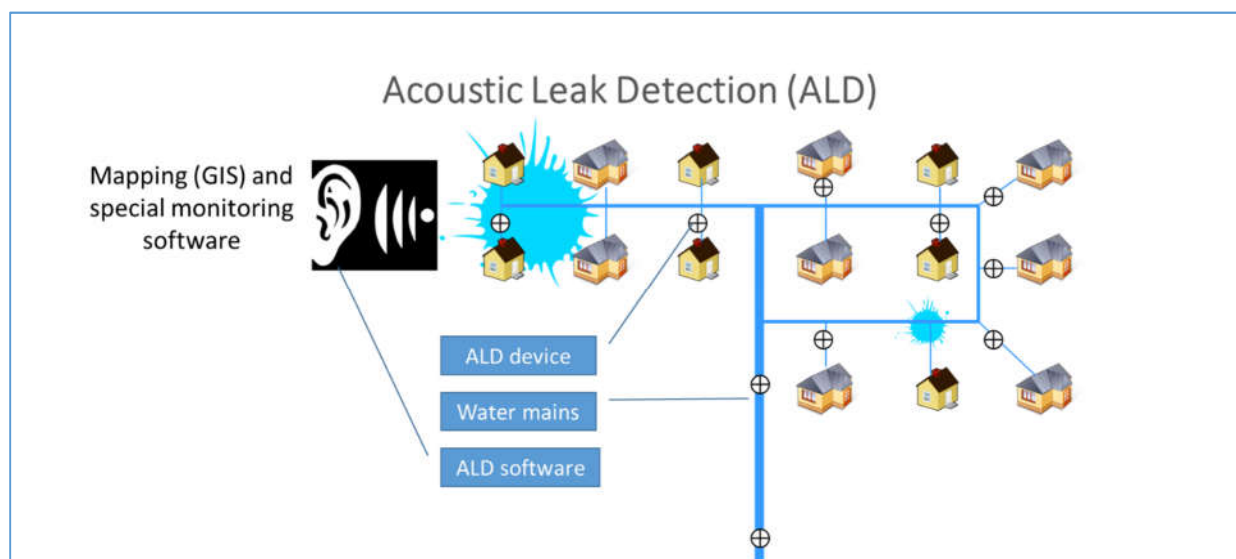


Figure 16

These devices measure the noise of the water flowing in the system and sends these acoustic readings through a number of radio transmitters in the network. It will then make its way back to a leak detection software that will place each device on a GIS map. Leaks in the system are detected by the pitch and change in acoustic readings from each reporting device. Typically, depending on the density of the

devices and the type of material used for the water mains, an ALD device would be installed for every 10 water meters in the system.

3.2.3.2.7. Temperature and Pressure Gauges

Some water utilities have expressed some interest in having temperature or pressure gauges in place that send readings back to the head end software. These readings could be used to better manage the overall system. For example, a temperature reading could allow a utility to respond to a frozen water meter before the freezing does damage to or destroys the meter main case.

These devices are not widely available on all AMI systems, although it's expected that they will become much more common in the future.

3.2.4. Hybrid AMI/AMR Technology

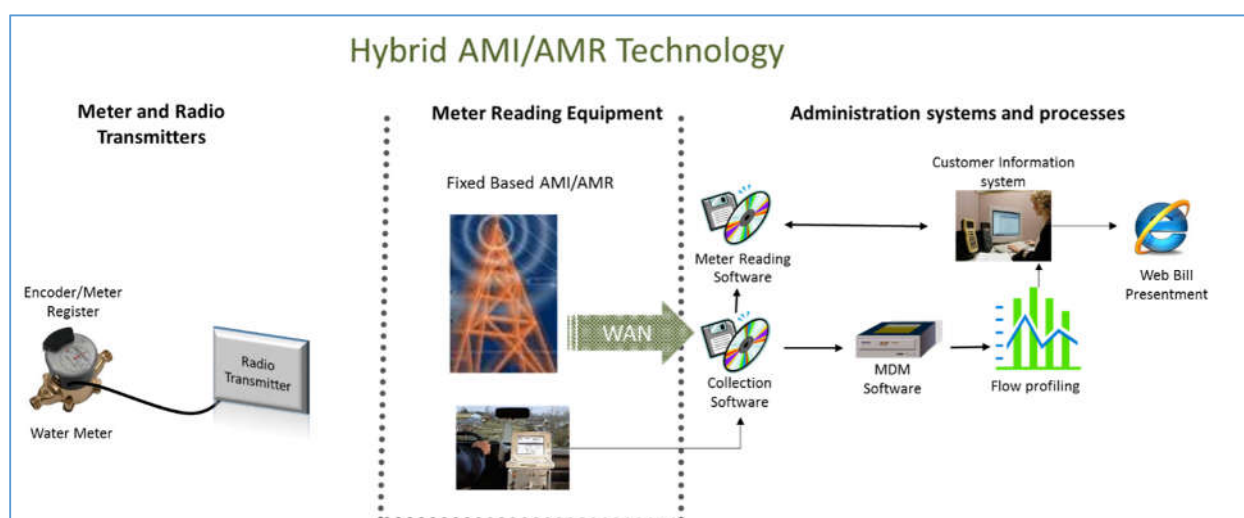


Figure 17

A Hybrid AMR/AMI technology solution would allow the utility to read radio transmitters using both fixed base collectors and mobile data collectors. This solution might work best for a utility where some parts of the system are too large and scarcely populated to justify the cost to install fixed area collectors. This hybrid solution would also allow the utility to gradually deploy an AMR/AMI network, only installing fixed network devices once all the meters in an area have been successfully converted.

It's important to know that not all AMR/AMI systems have the ability to support a hybrid solution, as some radio transmitters can only be read by either a mobile or fixed network collector.

3.2.4.1. Functionality

The key to a hybrid system is the radio transmitter's ability to be heard by the walk-by, mobile or fixed base methods of data collection. This functionality is usually referred to as a system's ability to "migrate" to more advanced technologies.

Some systems allow the radio transmitter to transmit to a variety of different collection devices right out of the box, others require that the radio transmitter be purposefully reprogrammed. This reprogramming process usually changes the read and transmission frequency to provide more hourly data, while maintaining the battery life of the product. Different manufacturers have different processes for reprogramming transmitters: some require an on-site visit for individual manual reprogramming; others can be performed over-the-air using the mobile data collector. Solutions that require little to no effort to reprogram a transmitter for this purpose should be valued more highly than those that require an on-site visit.

3.2.4.2. Features

A hybrid system would have the same features discussed in the mobile and fixed base system sections. In addition, some systems are designed to allow the mobile data collector to act as a back up to read the radio transmitters in the event that the fixed base data collector goes down, without the need to re-program the transmitter.

3.2.5. Cellular Radio Transmitters

An emerging fixed base AMI technology eliminates the need for new data collectors to be installed. The radio transmitters transmit directly to the existing cellular network. As long as the property has cellular coverage, the radio transmitter can be heard and backhauls automatically to the Vendor's hosted headend software.

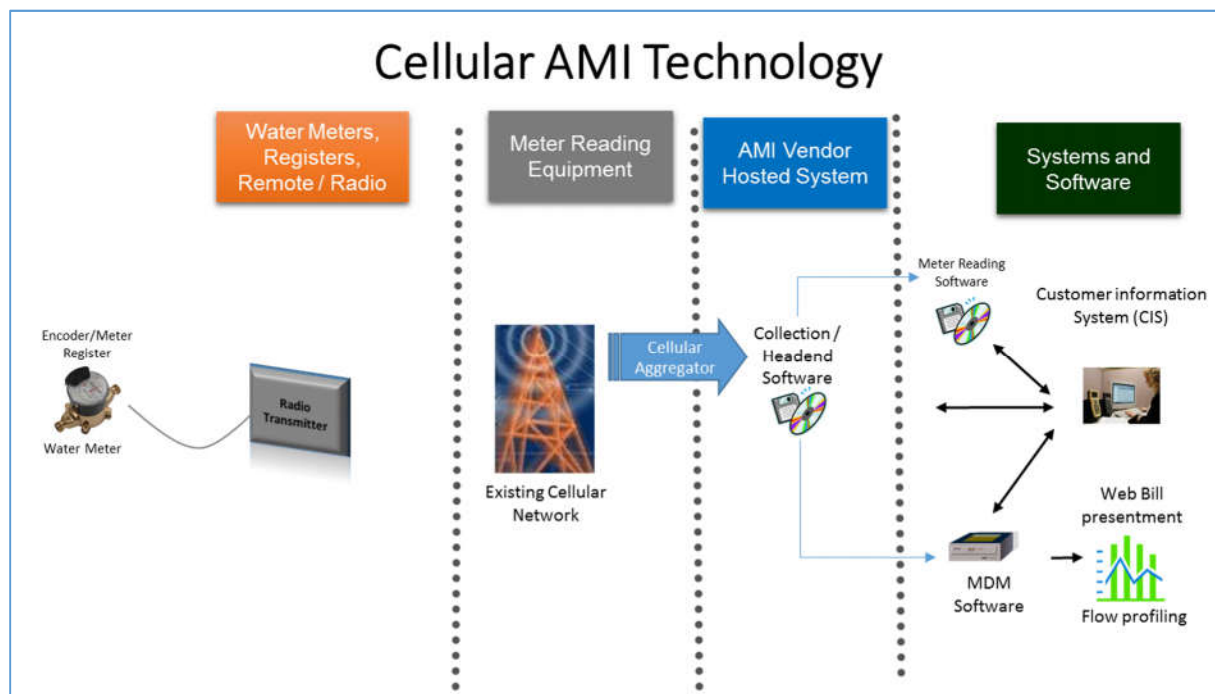


Figure 18

Not all AMR/AMI vendors have a cellular AMI system available for the water market. Most vendors are working on having cellular radio transmitter as an option in addition to a dedicated fixed network. There are some benefits to using a cellular network including not having to worry about maintaining a separate fixed network and no additional backhaul costs. There are some drawbacks that limit the applications you would want to use this technology for.

The main drawback of this technology is the radio transmitters have an expected life of about 10 to 12 years, with a limited warranty usually of about 10 years. This means the Utility would need to replace the radio transmitters well before the AMR or AMI radio transmitters discussed above. Also, the radio transmitter cost either includes the backhaul cost in the initial purchase or there is an on-going monthly fee based on the number of cellular radio transmitters a utility has deployed. If the backhaul costs are included in the initial purchase, the radio transmitter would likely cost more. With the cost of backhaul in the initial purchase, any radio transmitters replaced before the end of their useful life would not fully utilize the backhaul services included in the price resulting in higher maintenance cost for this type of system.

A risk with this technology depends on the type of cellular network the system is built around. Usually these radio transmitters transmit to an older type of cellular network (2 or 2.5G networks). Cellular providers are focusing on 4G and 5G type technologies and if they decided to not maintain the older cellular network in the future these radio transmitters may need to be replaced based on this decision that is outside the control of the utility.

3.2.5.1. Functionality

The AMI Vendor has an agreement in place with a cellular aggregator who provides cellular coverage across most major cellular networks. This allows for the ability that regardless of what cellular tower hears the radio transmitter, the data would be passed through the cellular aggregator to the AMI Vendors headend data collection software. The Utility would then need to access the software via a secured login and interface their CIS water billing system through a file transfer process. The utility would pay an on-going monthly software as a service fee to the AMI vendor that would include the backhaul costs.

3.2.5.2. Features

A cellular system would have the same features and functionality as the AMI radio transmitter. Utilizing cellular radio transmitters for 100% of the meters would not be economical. Strategically deploying a limited number of radio transmitters in areas that are not as densely populated, would allow the utility to have the same level of service across all their customers.

These radio transmitters could be deployed instead of having a portion of the meter population being read via mobile. This option should be explored during the procurement phase of the project.

3.3. State of the Market

The diagram below illustrates a number of Vendors products and systems that would likely show up within a procurement depending on the solution the utility is looking for.




| | Register | Radio / Endpoint | Collection Equipment | Software |
|---|--|---|---|--|
|  | <ul style="list-style-type: none"> 9 Digits on Register 8 Digits Encoded Digital Display Solar Powered Programmable (Field & Factory) | <ul style="list-style-type: none"> R900 – One Way R450 – Two Way Flags: Backflow / Leak / Days of No Flow / Tamper 96 Days of Data Logging | <ul style="list-style-type: none"> Trimble and Belt Clip – Walk by MRX920 – Mobile R900 Gateway – Fixed R450 Gateway – Fixed Cellular radio transmitters | <ul style="list-style-type: none"> N_Sight – Walk by or Mobile N_Sight Plus - Fixed Network N_Sight IQ - Hosted |
|  | <ul style="list-style-type: none"> 9 Digits on Register 9 Digits Encoded Digital Display Battery Powered Programmable (Field & Factory) | <ul style="list-style-type: none"> Orion CE / ME – One Way Orion SE – Two Way Flags: Backflow / Leak / Cut Wire / Reverse Flow / No Usage / Low Battery 90 Days of Data Logging | <ul style="list-style-type: none"> Trimble – Walk by Mobile Transceiver – Mobile Network Gateway – Fixed Cellular radio transmitters | <ul style="list-style-type: none"> Beacon AMA Field Application Suite - Hosted |
|  | <ul style="list-style-type: none"> 9 Digits on Register 8 Digits Encoded Digital Display Battery Powered Programmable (Field & Factory) | <ul style="list-style-type: none"> Smart Point – Two Way Flags: Leak / Reverse Flow / Broken Pipe / Low Battery 35 Days of Data Logging | <ul style="list-style-type: none"> Field Logic Handheld – Walk by Vehicle Gateway – Mobile Base Station – Fixed | <ul style="list-style-type: none"> Field Logic – Walk by or Mobile Sensus Logic - Hosted |
|  | <ul style="list-style-type: none"> N/A | <ul style="list-style-type: none"> ERT 100W – Two Way Flags: Leak / Reverse Flow / Tamper / Cut Cable / Low Battery 40 Days of Data Logging | <ul style="list-style-type: none"> FC300 – Walk by MC3 - Mobile Data Collector – Fixed | <ul style="list-style-type: none"> MVRS – Walk by or Mobile Choice Connect – Fixed Network |
|  | <ul style="list-style-type: none"> 10 Digits on Register 9 Digits Encoded Digital Display Battery Powered Programmable (Factory) | <ul style="list-style-type: none"> Hot Rod – One Way Mi Node – Two Way Flags: Leak / Reverse Flow / No Flow / Register Disconnect 170 Days of Data Logging | <ul style="list-style-type: none"> Psion Workabout Pro – Walk by Street Machine 2 – Mobile Mi. Hub - Fixed | <ul style="list-style-type: none"> EZ Reader – Walk by or Mobile Mi. Host - Hosted |

Table 26



3.4. AMR/AMI Business Drivers

AMR/AMI technology has a number of financial and non-financial benefits, depending on the water utility's situation and what is important to them. Often some benefits of implementing AMR/AMI technology have both non-financial and financial implications, some benefits are too theoretical to calculate accurately and are therefore considered a non-financial benefit.

AMR/AMI technology will improve a water utility's operations in a number of areas, some can be easily calculated, while the majority will show a qualitative improvement in the respective area. AMR/AMI technology should be seen as a tool the utility can use to improve on how the utility operates. The areas of improvement often do not have a direct financial improvement but are critical to the utility achieving the broader goals of the organization. We have identified five areas where AMR/AMI technology can show benefits, they are:

Revenue Protection – Ability to identify areas of revenue improvement, reduce theft and tampering, quicker response to stopped meters and an improved ability to apply the right meter technology to customer applications.

Operational Efficiency – Improvements in response time to maintenance issues, reduced meter reading cost and hazards and a reduction in exceptions that cause more effort to bill or additional trips into the field to collect data.

Enhanced Customer Service – Improvements in customer service through the ability to provide customer's consumption information, online access to consumption, alerts to avoid high water bills or damage and customer leak detection.

Improved Distribution System – Improvements in the utility's ability to manage their distribution system through district leak detection, dynamic water balance, system wide leak detection and more efficient by-law enforcement.

Societal Benefits – Improvements in water conservation and carbon emissions.

Within each area there are a number of very specific tasks the utility can perform, each of these tasks is considered a business driver. AMR/AMI technology functions differently and each provide different types of data allowing the utility to either fully achieve, partially achieve or in some cases cannot achieve specific business drivers. The table below describes the 24 business drivers and the technology's ability to achieve the goals of the driver.

| Water AMI/AMR Goals | | | | | |
|----------------------------|--|--|--------|------------|--|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| 1. Revenue Protection (RP) | | | | | |
| RP1 | Move to monthly billing | 0 | 2 | 2 | Mobile AMS –supports monthly billing, it would also reduce staffing levels in the meter reading department. |
| | | | | | Fixed-base AMS – supports monthly billing and it eliminates the requirement for meter readers. |
| RP2 | Detect meter tamper and water theft / Zero consumption | 1 | 1 | 2 | Walk-by AMS – Radio transmitters will have a stopped meter and cut wire tamper flag. These are <i>collected quarterly (some technology require monthly)</i> when meters are read, allowing staff to be alerted to an issue they need to attend to. |
| | Detect Stopped meters | | | | Mobile AMS – Radio transmitters will have a stopped meter and cut wire tamper flag. These are collected <i>monthly</i> when meters are read, allowing staff to be alerted to an issue they need to attend to much quicker. |
| | | | | | Fixed-base AMS - Radio transmitters will have a stopped meter and cut wire tamper flag. These are collected several times <i>daily</i> when the meter issue is first detected, allowing staff to be alerted very quickly, reducing possible theft and resolving issue prior to readings being required for billing. |
| RP3 | Detect mis-applied water meters | 0 | 0 | 1 | Fixed-base AMS – a customers water usage can be analyzed to determine high an low hourly flow rates helping a utility determine the best water meter for the applications. This will help detect some mis-applied meters. |
| RP4 | Reduce Consumption Usage on Inactive Accounts | 1 | 1 | 2 | Walk-by and Mobile AMR – consumption on inactive accounts can |

| Water AMI/AMR Goals | | | | | |
|------------------------|---------------------------------------|--|--------|------------|---|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| | | | | | be monitored with AMS technology on a quarterly or monthly frequency. |
| | | | | | Fixed-base AMS – this can be detected daily when the consumption starts. For detector check meters this can dramatically reduce water loss due to an un-authorized water use. |
| RP5 | Reduce Uncollected Revenue Write-offs | 0 | 0 | 2 | Fixed-base AMS – allows the utility to prove when water was used. This level of data will help billing agents to stand their ground on high water complaints. With an on-line tool the utility can offer customer high water alerts that would allow the customer to be notified pro-actively, again giving the customer another tool to avoid these high water bills. |
| Operational Efficiency | | | | | |
| OE1 | Improve meter reader reliability | 0 | 1 | 2 | Walk-by AMS – still require meter readers to walk the meter reading route. This will continue to create issues if a meter reader is sick of the weather prevents the readings to be collected. |
| | | | | | Mobile AMS – eliminates most of the risk of meter readers walking to obtain meter readings. There is still some risk due to traffic and weather, but it is much lower than walk-by or manual meter reading methods. |
| | | | | | Fixed-base AMS – This eliminates all readers in the field. There may still be maintenance personnel attending the site due to no reads, but meter reading safety is ensured. |

| Water AMI/AMR Goals | | | | | |
|---------------------|-------------------------------------|--|--------|------------|---|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| OE2 | Reduce billing exception Processing | 1 | 2 | 2 | Walk-by AMR - meter reading exceptions will be reduced reduced reliance on manual entered readings. But some will manual entry will still be required. Mobile AMR and Fixed Based AMR - With all AMS technologies there will be a reduction in re-read requests, meter readings being fat fingered, or other reading associated with manually reading the meter or odometer remotes and keying them into a handheld. |
| OE3 | Detect Register and wiring problems | 0 | 1 | 2 | Walk-by AMR and Mobile AMR – Wiring issues and flags will be picked up and repaired after the reading and billing process resulting in an estimated meter reading. |
| | | | | | Fixed Based AMS – Will allow register and wiring issues to be detected within 24 hours allows meter mainteance to performed right away, likely before the meter reader fails to pick up the reading. This will reduce the number of estimated readings. |
| OE5 | Same day final and special reading | 0 | 0 | 2 | Fixed-base AMI - will allow the utility to retrieve the daily readings for all customers, eliminating the need to send meter readers out to perform a final reading on a specific day. |
| OE6 | Remote Turn-off/Turn-on | 0 | 1 | 2 | Mobile AMS – need to drive past valve to operate. |
| | | | | | Fixed-base AMS – If a special valve/meter is installed in the customer properties, a two-way AMI or cellular AMI system will allow the utility to shut (or reduce flow) of the water from the office. |

| Water AMI/AMR Goals | | | | | |
|---------------------------|---|--|--------|------------|---|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| Enhanced Customer Service | | | | | |
| CS1 | Improve handling of high water bill complaints | 1 | 1 | 2 | Mobile AMS - will provide monthly readings |
| | Providing customers with information about their consumption will help them understand why their water bill was high. | | | | Fixed-base AMS – will provide hourly readings as well as allowing monthly billing and online consumption profiling. Hourly data allows users to track exactly when and likely why their bill was high. |
| CS2 | Customer Leak Detection Flags | 1 | 1 | 2 | Mobile AMS – the radio transmitter leak flags can be used to alert customers of <i>potential</i> leaks via a message on the water billing or customer web portal. These flags could be used by CSRs to resolve complaints. These flags require monthly reading which is why it would not be available on a walk-by AMS. |
| | | | | | Fixed-base AMS – potential leaks and irregular consumption patterns can be detected through the use of hourly consumption data. The utility and the customer can get access to these types of events through a reporting module within the MDM and customer portal. This can reduce high bill complaints can be reduced by sending alerts for consumption and leaks. |
| CS3 | Customer Consumption Information | 0 | 1 | 2 | Mobile AMR - some mobile AMR system allows hourly consumption to be downloaded from the radio transmitter for the last 35 to 90 days. For a specific complaint this data could be obtained to provide the customer, but it take more effort to obtain it. |

| Water AMI/AMR Goals | | | | | |
|---|-----------------------------------|--|--------|------------|--|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| | | | | | Fixed-base AMS – CSRs are able to give more informed communications; proactive communication (e-mail) can be sent to customers. |
| CS4 | On-line customer portal | 0 | 0 | 2 | Mobile AMS – only monthly reading information could be viewed online. There are some mobile AMSs that may be able to collect daily consumption information (not all systems allow this) |
| | Customer controlled e-mail alerts | 0 | 0 | 2 | Fixed-base AMS – will provide a customer with on-line hourly readings and customizable (high consumption warning, vacation consumption monitoring) alerts. These on-line tools allow the customer to better manage and monitor their consumption. There are also some additional features that may be available relating to temperature monitoring - where an alert would be sent if the temperature at the meter drops below zero allow the customer avoid a frozen service. |
| Improve Distribution System Performance | | | | | |
| DS1 | District Metering | 0 | 0 | 2 | Fixed-based AMI - this technology allows a utility to setup district meters, group all customers within the district and compare water going into the system and water being billed. This type of analysis will allow a utility to determine water loss and prioritize those systems where infrastructure improvement is needed the most. |

| Water AMI/AMR Goals | | | | | |
|---------------------|--|--|--------|------------|---|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| DS2 | Dynamic water balance monitoring | 0 | 0 | 2 | Fixed-based AMI - Dynamic water balancing allows a utility to monitor their water balance (water produced - consumed = unaccounted for water) on a daily or weekly basis. A utility would be able to respond to changes in the unaccounted for water and start their investigation within a certain system prior to complaints being received. the end result would be a reduction in unaccounted for water. |
| DS3 | Acoustic Leak Detection (ALD) - Hydrant monitoring | 0 | 0 | 2 | Fixed-base AMS – the utility could install accoustic listening devices on each fire hydrant in the distribution system raising an alert when someone is connected and using water from the hydrant. This will allow the utility to catch people stealing water from the hydrants. |
| DS4 | Acoustic Leak Detection (ALD) - Reactive to leaks | 0 | 0 | 2 | Fixed-base AMS – the utility could install accoustic listening devices across the distribution system and locate leaks as they occur. |
| DS5 | Acoustic Leak Detection (ALD) - Pro-active pipe replacement planning | 0 | 0 | 2 | Fixed-base AMS – The utility can use noise patters produced by the accoustic leak detection system to prioritize those parts of the distribution system where leakage is highest. This should allow the utility to focus infastructure dollars at system in the most need. |
| DS6 | Detect backflow | 0 | 1 | 2 | Mobile AMR - by reviewing the negative flow flag reports and cross referencing these properties with those where a backflow device a mobile AMR system may highlight those customers that have a defective backflow detector. This may |

| Water AMI/AMR Goals | | | | | |
|---------------------|--|--|--------|------------|---|
| Ref. | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| | | Walk-by | Mobile | Fixed-base | |
| | | | | | help monitoring the utility backflow program. |
| | | | | | Fixed-base AMR – by reviewing the negative flow reports and cross referencing these properties with those where a backflow device is installed the utility can flag those customers whose backflow device is faulty and exposing the water system to contamination risk. |
| DS7 | By-law enforcement | 0 | 0 | 2 | Fixed-base AMR – monitoring customer consumption during the summer may shows those customer who are violating any water bans that are in place. |
| | Societal Benefit | | | | |
| SB1 | Less Vehicle Miles | 0 | 1 | 2 | Fixed-base AMS - Reduced CO2 and Vehicles on the Road – The elimination of manual meter reading will reduce vehicles and vehicle mileage, thus reducing CO2 emissions. |
| SB2 | Water conservation – Peak Demand | 0 | 0 | 2 | Fixed-base AMS - water conservation programs has a positive impact on the enviroment. Being able to monitor how successfully a utilities conservation program is in reducing water consumption is a real benefit to a fixed base water system. |
| SB3 | Water Conservation – Events Management | 0 | 0 | 2 | Fixed-base AMS - Comparing changes in consumption after a specific event occurs (water meter is tested, mainteance performed, low flow devices are installed, tamper is detected, flushing is performed) can allow the utility to plan their resources to those events that may cause issues. Or |

| Water AMI/AMR Goals | | | | | |
|---------------------|---------------|--|--------|------------|---|
| | Goals/Drivers | AMS Technology | | | Explanation |
| | | Rating | | | |
| | | 0 - Not Achieves 1 - Partially Achieves 2 - Fully Achieves | | | |
| Ref. | | Walk-by | Mobile | Fixed-base | |
| | | | | | confirm that a certain event is resulting in increased consumption. |

Diameter Services reviewed each of the business drivers with CGS staff to determine which were important to them. We ranked each driver in the following manner:

0 – Not important, would not use the technology for this purpose.

1 – Somewhat important, may use the technology for this purpose.

3 – Very important, would use the technology for this purpose.

Just because a specific technology is able to perform a certain function does not mean the utility will get value out of it. In considering the type of technology that should be implemented, CGS focused on those drivers that were identified as *Somewhat Important* and *Very Important*.

The table below shows each business driver, how important each is to CGS and how the driver would benefit the utility. This table should influence the features and functionality specified in the future procurement document. It should also be used when implementing business process changes to ensure CGS uses the selected technology, as this business case has assumed.

| Reference | Business Driver | Importance Assessment | How the Business Driver would benefit CGS |
|-----------|-------------------------|-----------------------|---|
| RP1 | Move to monthly billing | Very Important | CGS billing service provider GSU is moving to monthly billing for electric. This is forcing CGS to also move to monthly billing, but moving to manually monthly readings was estimated to be \$418,000 or .7% ² increase to the customer. Implementation of both Mobile AMR and Fixed base AMI would |

² Laplate, Lorraine, presentation on: Changes to Water Wastewater Billing, August 19, 2016, Option 1 annual cost for 2017.

| Reference | Business Driver | Importance Assessment | How the Business Driver would benefit CGS |
|-----------|--|-----------------------|--|
| | | | allow monthly bills to be calculated based on actual readings. |
| RP2 | Detect meter tamper and water theft / Zero consumption | Very Important | <p>CGS has found approximately 10% of the meters they remove from service had signs of tampering, yet on average CGS meter staff have only been able to identify an average of 82 incidents per year of proven tamperers. This technology will help CGS staff:</p> <ul style="list-style-type: none"> • Reduce theft and tampering with the meter. • Respond quicker to zero consumption investigations. |
| RP3 | Detect incorrectly applied water meters | Somewhat Important | Using hourly consumption analysis CGS meter staff could identify customers with incorrectly applied meters (too large or not properly applied). This may lead to reduced meter cost and potentially increased revenues. |
| RP4 | Reduce Consumption Usage on Inactive Accounts | Somewhat Important | There were only a few situations in the last number of years where an inactive meter was found to be recording water. Technology may help catch these sooner. |
| RP5 | Reduce Uncollected Revenue Write-offs | Not Important | Unpaid amounts go to taxes so this is not a big issue. |
| OE1 | Improve meter reader reliability | Very Important | In 2015, there were 20,753 estimates (7.2% of all bills), most were due to meter readings not obtained for one reason or another. Technology would make meter reading and billing significantly more reliable. |
| OE2 | Reduce billing exception Processing | Very Important | |
| OE3 | Detect Register and wiring problems | Somewhat Important | |
| OE5 | Same day final and special reading | Very Important | In 2015, GSU processed 3,836 final bills at a cost of \$7.99 + the cost of travel to the far reaching systems. Technology would allow GSU to eliminate a manual reading for this purpose. |
| OE6 | Remote Turn-off/Turn-on | Not Important | Not feasible for CGS due to concerns of discriminating against lower income customers. |
| CS1 | Improve handling of high water bill complaints | Very Important | CGS and GSU staff would be able to better explain the reasons for the high |

| Reference | Business Driver | Importance Assessment | How the Business Driver would benefit CGS |
|-----------|--|-----------------------|---|
| CS2 | Customer Leak Detection Flags | Very Important | water bill complaints. Technology could also send alerts to the customer directly to avoid a high water bills altogether. |
| CS3 | Customer Consumption Information | Very Important | Providing customers with direct access to their consumption profile via an online web portal contributes to CGS tactical plan of providing more data and transparency to their customers. |
| CS4 | On-line customer portal | Very Important | Would allow GSU existing customer portal to display real hourly consumption information. |
| DS1 | District Metering | Very Important | With the ability to analyze hourly consumption, CGS would definitely start to move to district metering of some of the smaller and older parts of the distribution system. This will help reduce the unaccounted water. |
| DS2 | Dynamic water balance monitoring | Somewhat Important | This would help CGS respond to changes in unaccounted for water improving reaction time to main breaks. |
| DS3 | Acoustic Leak Detection (ALD) - Hydrant monitoring | Not Important | Not critical |
| DS4 | Acoustic Leak Detection (ALD) - Reactive to leaks | Somewhat Important | CGS does contract some acoustic leak detection to identify leaks in their system. Depending on the cost they may use AMR /AMI technology to perform these studies but also may decide not to. |
| DS5 | Acoustic Leak Detection (ALD) - Pro-active pipe replacement planning | Not Important | Not critical |
| DS6 | Detect backflow | Very Important | CGS is implementing a backflow program, a technology to monitor this program would definitely be used. |
| DS7 | By-law enforcement | Not Important | Not Critical |
| SB1 | Less Vehicle Miles | Somewhat Important | Elimination of meter readers may have a positive impact on the environment, but this is not something CGS tracks. |
| SB2 | Water conservation – Peak Demand | Not Important | Not critical due to the water systems have excess capacity and the year over year reduction in water demand. |
| SB3 | Water Conservation – Events Management | Somewhat Important | May cross reference data AMR/AMI technology can provide with events |

| Reference | Business Driver | Importance Assessment | How the Business Driver would benefit CGS |
|-----------|-----------------|-----------------------|---|
| | | | (meter testing, flushing) but it is not seen as critical. |

Table 27

Reviewing the CGS business drivers that are important and comparing them to how well the different types of AMR/AMI technology, shows a strong correlation to a specific technology meeting the needs of CGS.

Of the 24 business drivers discussed, there were 17 rated as Somewhat Important (8 drivers) or Very Important (9 drivers). The tables below illustrates how well each type of technology being considered will achieve the drivers.

| Walk-by AMR (Scenario 1) | | | |
|--------------------------|----------------|--------------------|----------------|
| CGS Important Rating | Fully Achieves | Partially Achieves | Cannot Achieve |
| Somewhat Important | 0 | 1 | 7 |
| Very Important | 0 | 4 | 5 |
| Total | 0 | 5 | 12 |
| % | 0% | 29% | 71% |

Table 28

Implementing scenario 1 (Walk-by AMR) would only partially achieve 29% of the business drivers that were identified as Somewhat or Very Important to CGS.

| Mobile AMR (Scenario 2) | | | |
|-------------------------|----------------|--------------------|----------------|
| CGS Important Rating | Fully Achieves | Partially Achieves | Cannot Achieve |
| Somewhat Important | 0 | 3 | 5 |
| Very Important | 2 | 5 | 2 |
| Total | 2 | 8 | 7 |
| % | 12% | 47% | 41% |

Table 29

Implementing scenario 2 (Mobile AMR) would fully achieve 12% of the business drivers, and would partially achieve 47% of the business drivers that CGS identified as somewhat or Very Important to CGS.

| Fixed Base AMI (Scenario 3 & 4) | | | |
|---------------------------------|----------------|--------------------|----------------|
| CGS Important Rating | Fully Achieves | Partially Achieves | Cannot Achieve |
| Somewhat Important | 7 | 1 | 0 |
| Very Important | 9 | 0 | 0 |
| Total | 16 | 1 | 0 |
| % | 94% | 6% | 0% |

Table 30

Implementing scenario 3 or 4 (fixed base AMI) would fully achieve 94% of the business drivers, and partially achieve the remaining 6% of the business drivers that CGS identified as Somewhat or Very Important to CGS.

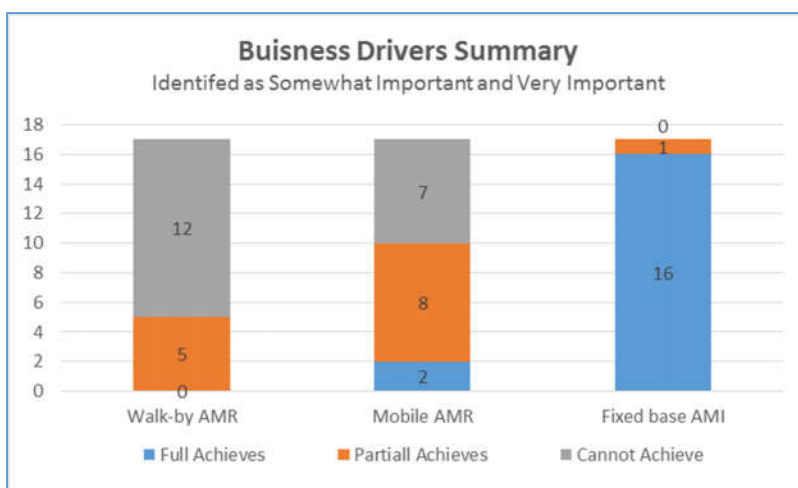
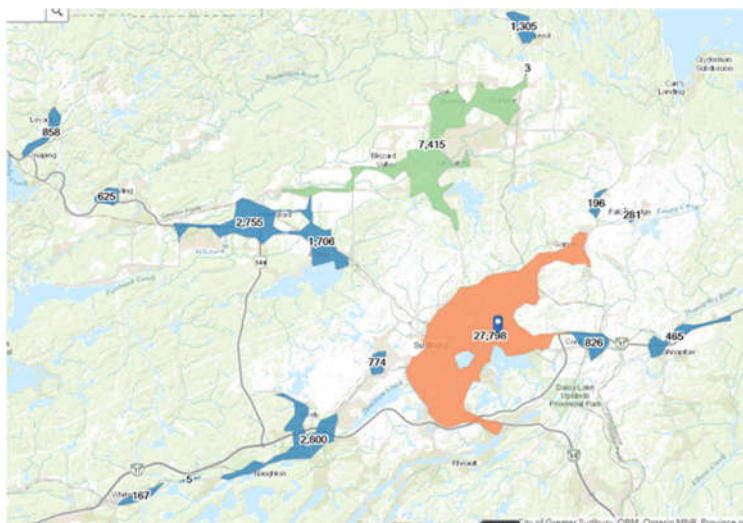


Figure 19

As a tool to help CGS improve Revenue protection, operational efficiency, customer service, distribution management and societal benefits, implementing a fixed AMI technology is strongly recommended.

3.5. AMI Vendor Network Coverage

The City of Greater Sudbury service area is quite large and spreads across both GSU and Hydro One's electric smart meter network. Working with CGS GIS group we established the total square of kilometers of the service area was 161.5km². The service areas with total estimate number of accounts is in the diagram below:



The number of water meters whose location corresponds to GSU and Hydro One is summarized in the table below.

| Area Number | System Name | # of Meters | Area (Sq Km) | Electricity Provider |
|-------------|-------------------------------|-------------|--------------|----------------------|
| 3 | City of Sudbury | 27798 | 73.79 | GSU |
| 6 | Capreol | 1305 | 2.90 | GSU |
| 11 | Falconbridge | 281 | 0.74 | GSU |
| 15 | Coniston | 826 | 3.57 | GSU |
| 1 | Levack | 858 | 2.79 | Hydro One |
| 2 | Mikkola | 2800 | 12.71 | Hydro One |
| 4 | Val Caron/Val Therese/ Hanmer | 7415 | 34.45 | Hydro One |
| 5 | Chelmsford | 2755 | 11.55 | Hydro One |
| 7 | Azilda | 1706 | 8.13 | Hydro One |
| 8 | Dowling | 625 | 1.94 | Hydro One |
| 9 | Whitefish | 167 | 1.71 | Hydro One |
| 10 | Copper Cliff | 774 | 1.81 | Hydro One |
| 12 | | 3 | 0.10 | Hydro One |
| 13 | Wahnapitae | 465 | 3.77 | Hydro One |
| 14 | Old Skead Road | 196 | 1.24 | Hydro One |
| 16 | | 5 | 0.30 | Hydro One |
| | Total | 47,979 | 161.50 | |

| Hydro Service Provider | # of Meters | % | Area (Sq Km) | % |
|----------------------------|-------------|-----|--------------|-----|
| Greater Sudbury Utilities: | 30,210 | 63% | 81.00 | 50% |
| Hydro One | 17,769 | 37% | 80.50 | 50% |

3.5.1. GSU Existing Smart Meter Network

GSU has indicated a willingness in working with CGS to share the network and collection software system. We would anticipate there would be some savings in capital costs and potentially operating costs. The Sensus Flexnet system that GSU has deployed is capable of adding water meter readings to the existing system and software. But the existing GSU network of data collectors only covers 50% of the service territory and 63% of the water customers. To collect the remaining customers (17,769) CGS would have to add additional equipment.

CGS has been working on getting information on existing facilities across their whole service territory where additional data equipment could be installed.

3.5.2. Hydro One Existing Smart Meter Network

Hydro One smart metering AMI technology is manufactured by Trilliant Networks and appears to be an electric only network. This network does not appear to be capable to collection water meter readings.

This statement is not definitive because Hydro One was not responsive to phone enquiries made to them to discuss the possibility of using the existing network.

Diameter Services followed up four times and was unable to get a response from them on whether they would be interesting in discussing sharing their AMI network. The customer service representative we worked with did confirm that Hydro One has not shared their network with any water utility across Ontario.

So based on this discussion we do not recommend pursuing this as an AMI option.

3.5.3. Other AMI Vendors

One part of this assessment was to determine how viable an AMI network was across the large CGS service territory. The capital cost of the network equipment was based on some broad based assumptions based on bids in City of Toronto and City of Baltimore. To get a better understanding of the viability we reached out to four AMI vendors and got responses on the number of data collectors and the estimated cost of the equipment. The below provides a summary of the responses we received. We left the name of each manufacturer off this report for confidentiality purposes.

| AMI Vendor | Estimated # of collectors | Estimated Cost Range | Comment |
|--------------------------------|--|--|--|
| Vendor 1 | 6 Existing collectors 2 to 4 New collectors | \$80,000 to \$160,000 | |
| Vendor 2 | 50 to 60 collectors | \$600,000 to \$900,000 | |
| Vendor 3 | 0 collectors (cellular) | \$0 | A cellular solution was offered but the radio transmitter only has a 10 year life. |
| Vendor 3 | 45 to 55 collectors | \$225,000 to \$275,000 | |
| Vendor 4 | 10 to 15 collectors | \$480,000 | |
| Assumption in the Model | 75 collectors | \$637,000 + cost of new poles | |

4. Financial Analysis

4.1. Key Assumptions and Variables

The financial model has a number of variables and assumptions. The scenarios may differ based on the type of technology being deployed. The variables and assumptions that were made in the financial model that remain constant are detailed in the table below:

| Reference | Assumption | Assumption |
|-----------|---|-----------------------|
| 3 | Interest | 2.000% |
| 4 | Inflation/Revenue Increases | 0.000% |
| 5 | Growth | 0.000% |
| 6 | Completion % | 100% |
| 9 | Contingency Rate (of installation) | 10% |
| 10 | Replacement Age - 15mm to 25mm | 5 to 9 years |
| 11 | Replacement Age - 37mm to 50mm | Greater than 20 years |
| 12 | Replacement Age - 75mm and greater | Greater than 20 years |
| 14 | Plumbing Minor S&I - 15 to 20mm | 0.00% |
| 15 | Plumbing Normal S&I - 15 to 20mm | 0.00% |
| 16 | Plumbing Minor S&I - 15 to 20mm (Change Outs) | 5.00% |
| 17 | Plumbing Normal S&I - 15 to 20mm (Change Outs) | 4.00% |
| 18 | Plumbing Minor S&I - 25mm | 0.00% |
| 19 | Plumbing Normal S&I - 25mm | 0.00% |
| 20 | Plumbing Minor S&I - 25mm (Change Outs) | 5.00% |
| 21 | Plumbing Normal S&I - 25mm (Change Outs) | 4.00% |
| 22 | Plumbing Major S&I (WMI) - 15 to 25mm | 2.00% |
| 23 | Plumbing Fitting S&I - 37mm | 5.00% |
| 24 | Plumbing Fitting S&I - 50mm | 5.00% |
| 25 | Plumbing Fitting S&I - 75mm | 5.00% |
| 26 | Plumbing Fitting S&I - 100mm | 5.00% |
| 27 | Plumbing Fitting S&I - 150mm | 5.00% |
| 28 | Plumbing Major S&I (plumber) - 37mm and greater | 10.00% |
| 29 | BCV Install S&I - 13 to 20mm | 6.00% |
| 30 | BCV Install S&I - 13 to 20mm | 6.00% |
| 31 | BCV Install S&I - 25mm | 6.00% |
| 32 | BCV Install S&I - 25mm | 6.00% |
| 33 | BCV Install S&I - 37mm | 4.00% |
| 34 | BCV Install S&I - 50mm | 4.00% |
| 35 | BCV Install S&I - 75mm | 4.00% |

| Reference | Assumption | Assumption |
|-----------|--|------------|
| 36 | BCV Install S&I - 100mm | 4.00% |
| 37 | BCV Install S&I - 150mm | 4.00% |
| 38 | Isolation Valve Install S&I - 13 to 20mm | 0.00% |
| 39 | Isolation Valve Install S&I - 25mm | 0.00% |
| 40 | Isolation Valve Install S&I - 37mm | 4.00% |
| 41 | Isolation Valve Install S&I - 50mm | 4.00% |
| 42 | Isolation Valve Install S&I - 75mm | 4.00% |
| 43 | Isolation Valve Install S&I - 100mm | 4.00% |
| 44 | Isolation Valve Install S&I - 150mm | 4.00% |
| 45 | Kornerhorn - KH2 S&I 15X20mm | 0.00% |
| 46 | Kornerhorn - KH3 S&I 20mm | 0.00% |
| 47 | Resetter - 15mm to 15X20mm | 0.50% |
| 48 | Resetter - 20mm | 0.50% |
| 49 | Resetter - 25mm | 0.50% |
| 50 | Small System Premium (total Number | - |
| 51 | Crawl Space | 1.00% |
| 52 | Confined Space | 2.00% |
| 53 | Residential Wire run to the Outside | 15.00% |
| 54 | Commercial Wire run to the Outside | 1000.00% |
| 55 | Carpentry Minor | 6.00% |
| 56 | Carpentry Normal with Box | 0.00% |
| 57 | Contingency | 10.00% |
| 58 | % of Compound | 65.00% |
| 59 | % Turbine | 35.00% |
| 101 | GSU Customer Service Hourly Rate | \$50.00 |
| 102 | GSU Billing Rate | \$50.00 |

Table 31

The following assumptions differed based on the scenario being reviewed.

| Reference | Assumption | Unit | Scenario 1 AMR Walk-by | Scenario 2 - AMR Mobile | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
|-----------|---------------------------|--------------|------------------------|-------------------------|------------------------------|--------------------------|
| 62 | Handhelds - Meter Reading | # of devices | 7.00 | 2.00 | - | - |
| 63 | Cradle - Meter Reading | # of devices | 7.00 | 2.00 | - | - |
| 64 | Handhelds - Maintenance | # of devices | 5.00 | 5.00 | 5.00 | 5.00 |
| 65 | Cradle - Maintenance | # of devices | 5.00 | 5.00 | 5.00 | 5.00 |
| 66 | Mobile lite | # of devices | - | - | - | - |

| Reference | Assumption | Unit | Scenario 1 AMR Walk-by | Scenario 2 - AMR Mobile | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
|-----------|---|--------------------------|------------------------|-------------------------|------------------------------|--------------------------|
| 67 | Full Mobile | # of devices | - | 2.00 | - | - |
| 68 | Multi-handheld cradle | # of devices | 2.00 | 1.00 | 1.00 | 1.00 |
| 69 | Data Collectors - Supply | # of devices | - | - | 75.00 | 4.00 |
| 70 | Data Collectors Deployment - Installation | # of devices | - | - | 75.00 | 4.00 |
| 71 | Data Collectors Deployment - Supply and Install Poles | # of devices | | | 20.00 | - |
| 72 | Data Collectors Deployment - Management/Approval | # of devices | | | 50.00 | 25.00 |
| 73 | Software Implementation and Daily Rate | Per Day \$ | \$1,600.00 | \$1,600.00 | \$1,600.00 | \$1,600.00 |
| 74 | Meter Reading Software - Initial License | # of Licenses | 1.00 | 1.00 | 1.00 | 1.00 |
| 75 | Meter Reading Software - Implementation (in days) | # of days | 6.00 | 6.00 | 6.00 | 6.00 |
| 76 | Meter Reading Software - User Training (in days) | # of days | 6.00 | 6.00 | 6.00 | 6.00 |
| 77 | Collection Software - Initial License | \$ of License | - | - | \$150,000.00 | |
| 78 | Collection Software - Implementation (in days) | # of days | - | - | 60.00 | 30.00 |
| 79 | Collection Software - User Training | # of days | | | 20.00 | 10.00 |
| 80 | Collection Software - Servers/Hardware | # of system environments | | | 1.00 | - |
| 81 | Collection Software - Operating & DB Licenses | # of Licenses | | | 1.00 | |
| 82 | MDM Software - Initial License | # of Licenses | | | 1.00 | 1.00 |

| Reference | Assumption | Unit | Scenario 1 AMR Walk-by | Scenario 2 - AMR Mobile | Scenario 3 - AMI Fixed Alone | Scenario 4 AMI Fixed GSU |
|-----------|--|--------------------------|------------------------|-------------------------|------------------------------|--------------------------|
| 83 | MDM Software - Implementation | # of days | | | 60.00 | 60.00 |
| 84 | MDM Software - User Training | # of days | | | 20.00 | 20.00 |
| 85 | MDM Software - Servers/Hardware | # of system environments | | | 1.00 | 1.00 |
| 86 | MDM Software - Operating & DB Licenses | # of Licenses | | | 1.00 | 1.00 |
| 87 | Interface Daily Rate | \$ per day | \$1,600.00 | \$1,600.00 | \$1,600.00 | \$1,600.00 |
| 88 | Interfaces (days of programming) | # of days | 20.00 | 20.00 | 60.00 | 40.00 |
| 89 | Contingency | | | | | |
| 90 | Procurement | Yes=1, No=0 | 1.00 | 1.00 | 1.00 | 1.00 |
| 91 | Project Support | Yes=1, No=0 | 1.00 | 1.00 | 1.00 | 1.00 |
| 92 | Disbursements | Yes=1, No=0 | 1.00 | 1.00 | 1.00 | 1.00 |
| 93 | Project Manager | % of FTE | 50% | 50 % | 50 % | 50% |
| 94 | IT Support - Hardware (days) | # of days | - | - | 20.00 | 10.00 |
| 95 | IT Support - AMS Champion | % of FTE | - | - | 50 % | 50 % |
| 96 | CIS Support - Validation Review (days per month) | # of days per month | 10.00 | 10.00 | 10.00 | 10.00 |
| 97 | Field Supervisors (days per month) | # of days per month | 10.00 | 10.00 | 10.00 | 10.00 |
| 98 | Inspector | # of days per month | 20.00 | 20.00 | 20.00 | 20.00 |

Table 32

4.2. Meter Accuracy Improvements

One of the ways to improve revenues is to replace aging meters. As meters become older, like any mechanical device, the parts begin to wear down and the meter becomes less accurate over time. Using the Neptune SEER® Program and the information provided from CGS database, the chart below was derived.

| Meter Accuracy | 5/8" | 3/4" | 1" | 1.5" | 2" | 3" | 4" | 6" | 8" |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Less than 5 Years | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| 5-9 Years | 98.5% | 98.5% | 98.5% | 98.0% | 96.0% | 97.0% | 96.0% | 96.0% | 96.0% |
| 10-14 Years | 96.5% | 96.5% | 97.0% | 96.5% | 94.0% | 95.0% | 94.0% | 94.0% | 94.0% |
| 15-19 Years | 95.0% | 95.0% | 95.0% | 95.0% | 92.0% | 93.5% | 92.0% | 92.0% | 92.0% |
| 20+ Years | 93.0% | 93.0% | 93.0% | 92.7% | 90.0% | 92.0% | 90.0% | 90.0% | 90.0% |

Table 33

The chart represents an average meter accuracy across age category and meter size.

Neptune's SEER® (Statistical Evaluation for the Enhancement of Revenue) analysis tool is specifically designed to identify Non-Revenue Water at the water meter level³. SEER Model can determine meter accuracy within a 95% confidence interval.

Within the information, CGS also provided 2015 consumption revenue for both Water and Sewer on a per account basis. The chart below represents the combined water and sewer consumption revenue of by age category and meter size. The revenues un-relating to consumption were not included below.

| Consumption Revenue - Water + Sewer | 15x20mm | 20mm | 25mm | 37mm | 50mm | 75mm | 100mm | 150mm | 200mm | (blank) | Grand Total |
|-------------------------------------|---------------|----------|--------------|--------------|--------------|------------|------------|--------------|-----------|------------|---------------|
| Less than 5 Years | \$ 2,349,653 | \$ - | \$ 1,193,185 | \$ 1,590,890 | \$ 3,367,889 | \$ 700,384 | \$ 510,703 | \$ 826,073 | \$ 26,644 | \$ 9,057 | \$ 10,574,478 |
| 5 to 9 Years | \$ 1,973,938 | \$ 8,309 | \$ 618,147 | \$ 481,368 | \$ 892,441 | \$ 131,562 | \$ 46,656 | \$ 231,508 | \$ - | \$ 12,861 | \$ 4,396,791 |
| 10 to 14 Years | \$ 2,016,273 | \$ - | \$ 273,538 | \$ 29,625 | \$ 126,418 | \$ 46,819 | \$ 42,226 | \$ 79,827 | \$ - | \$ 525,142 | \$ 3,139,868 |
| 15 to 19 years | \$ 10,296,740 | \$ - | \$ 18,675 | \$ - | \$ 6,679 | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 10,322,094 |
| Greater than 20 years | \$ 6,804,924 | \$ - | \$ 130,069 | \$ 5,723 | \$ 125,730 | \$ - | \$ 20,312 | \$ - | \$ - | \$ - | \$ 7,086,758 |
| (blank) | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 171,713 | \$ 171,713 |
| Grand Total | \$ 23,441,529 | \$ 8,309 | \$ 2,233,614 | \$ 2,107,606 | \$ 4,519,157 | \$ 878,765 | \$ 619,897 | \$ 1,137,408 | \$ 26,644 | \$ 718,773 | \$ 35,691,703 |

Table 34

Using the meter accuracy and the combined consumption revenue tables we can estimate the revenue loss for each age category and meter size as seen in the chart below. The formula we used for each cell within the matrix is as follows:

$$\text{Revenue Loss} = (100\% - \text{Meter Accuracy}) * \text{Consumption Revenue}$$

| Revenue Loss | 15x20mm | 20mm | 25mm | 37mm | 50mm | 75mm | 100mm | 150mm | 200mm | Total |
|-----------------------|-------------|--------|-----------|-----------|-----------|----------|----------|-----------|-------|--------------|
| Less than 5 Years | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| 5 to 9 Years | \$ 29,609 | \$ 125 | \$ 9,272 | \$ 9,627 | \$ 35,698 | \$ 3,947 | \$ 1,866 | \$ 9,260 | \$ - | \$ 99,404 |
| 10 to 14 Years | \$ 70,570 | \$ - | \$ 8,206 | \$ 1,037 | \$ 7,585 | \$ 2,341 | \$ 2,534 | \$ 4,790 | \$ - | \$ 97,062 |
| 15 to 19 years | \$ 514,837 | \$ - | \$ 934 | \$ - | \$ 534 | \$ - | \$ - | \$ - | \$ - | \$ 516,305 |
| Greater than 20 years | \$ 476,345 | \$ - | \$ 9,105 | \$ 418 | \$ 12,573 | \$ - | \$ 2,031 | \$ - | \$ - | \$ 500,472 |
| Grand Total | \$1,091,360 | \$ 125 | \$ 27,517 | \$ 11,082 | \$ 56,390 | \$ 6,288 | \$ 6,431 | \$ 14,050 | \$ - | \$ 1,213,243 |

Table 35

³ <https://www.neptunetg.com/products/water-meters/metering-system/seer/>

The estimated revenue lost shown in this table can only be realized if the water meters are going to be replaced. The City reviewed the best options and decided the following change out criteria would be used. This will adjust the revenue loss estimate to include only those meters that will be replaced.

| Reference | Assumption | Assumption |
|-----------|------------------------------------|-----------------------|
| 10 | Replacement Age - 15mm to 25mm | 5 to 9 Years |
| 11 | Replacement Age - 37mm to 50mm | Greater than 20 years |
| 12 | Replacement Age - 75mm and greater | Greater than 20 years |

Table 36

These assumptions reduced the total annual revenue loss to be \$1,119,000.

4.3. Operational Improvements

Some operational cost calculations can be easily determined. If these costs are eliminated, there is a direct impact to the utility's operational budget. Other costs can be difficult to estimate, especially when they are based on time estimates or a theoretical efficiency calculation.

The project team reviewed and calculated the savings each specific technology are expected to deliver. The assumed change and the overall financial impact of these changes are summarized by function: meter reading, customer service and water billing, and meter maintenance. These changes should be compared to the Project Assessment section of this report.

We also included the cost impact that the different technologies would have on distribution system management and IT Support costs. As well as provided some estimates on the financial improvements to the distribution system management.

4.3.1. Meter Reading

As discussed in the Project Assessment (2.3.2) the total meter reading costs are summarized below:

| Meter Reading Cost | Extended |
|---------------------------|------------------|
| Olameter – Reading costs | \$ 250,983 |
| Olameter – Other Services | \$ 21,167 |
| Meter Reader Coordinator | \$ 75,000 |
| CGS re-read costs | \$ 44,100 |
| Total | \$391,251 |

Table 37

The affect the different types of technology will have on the detailed meter read functions are detailed in the table below.

| Read Rates | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|---|---|--|---|--|
| Meter Reading Service Provider Costs | | | | |
| Residential Inside | Rate: reduced by 25% (\$.41/ read) Freq: no change | Rate: reduced by 75% (\$.136/ read) Freq: increased to 12 reads per year per customer | Rate: Reduced by 100% Frequency: Reduced by 100% (collecting hourly readings) | |
| Residential Outside | | | | |
| Residential Freezing | Rate: same as residential read Freq: no change | Rate: same as residential inside read Freq: read with residential meters 12 reads per year per customer | Rate: same as residential inside read Frequency: Reduced by 100% (collecting hourly readings) | |
| Commercial | Rate: reduced by 25% (\$1.48 / read) | | | |

| Read Rates | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly | |
|-------------------------------------|---|--|--|--|--|
| | Freq: no change | | | | |
| Special Reading at \$3.06 | No change | No change | Rate: reduced by 100% Frequency: reduced by 100% | | |
| Special Reading at \$7.99 | No change | No change | | | |
| Initial Call | Rate: No change Frequency: No change | | | | |
| Turn-Off of Water Service | | | | | |
| Turn-On of Water Service | | | | | |
| Negotiation of Payment | | | | | |
| No. Customer Contact Required | | | | | |
| Project Coordinator costs | | | | | |
| Coordination Costs | No change (\$75,000) | Rate: reduced by 50% (\$37,500) | Rate: reduced by 100% (%0) | | |
| CGS Meter Reading Maintenance costs | | | | | |
| Re-read Cost | Rate: No change (\$35/ re-read investigation) Frequency: Reduced by 75% | | | | |

Table 38

The above changes reduced the total expected meter reading costs from the current \$391,251 per year.

Table 39

| Meter Reading Cost | Existing | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|---------------------------|------------------|---|---|--|--|
| Olameter – Reading costs | \$ 250,983 | \$193,167 | \$127,192 | \$0 | \$0 |
| Olameter – Other Services | \$ 21,167 | \$ 21,167 | \$ 21,167 | \$ 21,167 | \$ 21,167 |
| Meter Reader Coordinator | \$ 75,000 | \$75,000 | \$37,500 | \$0 | \$0 |
| CGS re-read costs | \$ 44,100 | \$11,025 | \$11,025 | \$11,025 | \$11,025 |
| Total | \$391,251 | \$300,360 | \$196,885 | \$32,192 | \$32,192 |
| Annual Savings | \$0 | \$90,891 | \$194,366 | \$359,058 | \$359,058 |

4.3.2. Customer Service and Water Billing

As discussed in the project assessment section of the report there were three areas we felt could be positively affected by the application of AMI technology, improvement in water bill estimates, ability to better manage high/low consumption service calls and improved customer service to both residential and commercial customers.

| Improvement | Current Level | | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|------------------------------------|---|--|--|--|---|
| | Scenario 1 AMR Walk-by Readings bi-monthly | | | | |
| Water Bill Estimates | Qty = 20,753 Admin time = 10min / estimate | Qty = 15,564 (25% reduction) Admin time = 10 min / estimate | Qty = 10,375 50% reduction Admin time = 10 min / estimate | Qty = 5,188 75% reduction Admin time = 10 min / estimate | |
| High / Low Consumption Calls | | Reduction in customer interaction = No change | Reduction in customer interaction = 25% improvement* | Reduction in customer interaction = 35% improvement* | |
| Improved Customer Service | | On-line access reducing calls by = no change | On-line access reducing calls by = 25% ¹ | On-line access reducing calls by = 35% ¹ | |

Table 40

1 Improvements in complaints and call volumes comes from other water utilities and may not translate into reduced fees by GSU.

Some in GSU have concerns moving water customers to hourly reading will lead to increases in required customer service staffing. These improvements in customer service are estimated to create some efficiencies in the customer service and water billing and improve overall customer service.

| Meter Reading Cost | Existing | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|------------------------------|------------------|---|---|--|--|
| Water Bill Estimate | \$ 172,941 | \$129,706 | \$86,470 | \$43,235 | \$43,235 |
| High / Low Consumption Calls | \$ 120,472 | \$ 120,472 | \$ 90,354 | \$ 78,307 | \$ 78,307 |
| Improved Customer Service | \$ 13,553 | \$13,553 | \$9,035 | \$3,011 | \$3,011 |
| Total Expenses | \$306,967 | \$263,731 | \$185,860 | \$124,554 | \$124,554 |
| Annual Savings | \$ 0 | \$43,235 | \$121,106 | \$182,412 | \$182,412 |

Table 41

4.3.3. Water Meter Maintenance

Applying technology to the City's meter maintenance group affects a number of tasks the department is responsible for. First, there are a number of high/low consumption investigations that result in a field visit. The combination of hourly consumption history (with AMI technology) and being able to respond quickly to potential tamperers, will reduce the number of onsite visits required over time.

As a part of scenario 3 and 4 we have recommended testing some temperature gauges installed at properties whose water services are shallow and susceptible to freezing. Receiving these temperature flags will help CGS inform customers of the risk of pipes freezing. Due to this, we would expect to see a reduction in the number of total frozen meters and minimize the number of required replacements.

The third factor that we would expect to see improvements in relates to ensuring the correct application of the water meter type and size are installed. With hourly consumption information that an AMI system would provide the City would be able to determine mis-applied meters, resulting in increased meter accuracy.

Lastly, with the addition of a radio transmitter, the meter shop will need to perform additional maintenance. We have allowed for an increase in the amount of time servicing the radio transmitters as well as additional radio transmitters required due to lost or damaged devices.

| Improvement | Current Level | | Scenario 2 - AMR Mobile (per year) | Scenario 3 - AMI Fixed Alone (per year) | Scenario 4 AMI Fixed GSU (per year) |
|-------------------------------|--------------------|--------------------------------------|---------------------------------------|--|--|
| | | Scenario 1 AMR Walk-by (per year) | | | |
| Radio Transmitter Maintenance | None | Qty = 240 | Qty=240 | Qty 240 | |
| High / Low Consumption Calls | Qty= 1,084 | Qty 1,084 | Qty = 725 | Qty= 240 | |
| Frozen Meters | Qty = 80 | Qty=80 | Qty=80 | Qty=60 | |
| Misapplied meters | \$ improvement = 0 | \$ improvement = 0 | \$ improvement = 0 | \$ improvement = \$10,500 / year | |

Table 42

The financial impact each technology will have on the meter maintenance department is summarized below.

| Meter Reading Cost | Existing | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|-------------------------------|------------|---|--|---|---|
| Radio Transmitter Maintenance | \$ 0 | \$38,551 | \$38,551 | \$38,551 | \$38,551 |
| High / Low Consumption Calls | \$ 74,137 | \$ 74,137 | \$49,425 | \$16,475 | \$16,475 |
| Frozen Meters | \$14,270 | \$14,270 | \$10,700 | \$3,567 | \$3,567 |
| Expenses | 88,407 | \$126,958 | \$98,676 | \$58,593 | \$58,593 |
| Change in Expenses | \$0 | \$38,551 | \$10,269 | \$29,814 | \$(29,814) |
| Misapplied meters | \$ 0 | \$ 0 | \$ 0 | \$-10,500 | \$-10,500 |
| Annual Savings | \$0 | \$(38,551) | \$(10,269) | \$40,314 | \$40,314 |

Table 43

Negative savings are considered an increase in expenses.

4.3.4. Distribution System Management

Technology can be used in other parts of the CGS organization to improve the Utilities ability to manage the water distribution systems. Consumption data that an AMR/AMI system can provide will allow CGS to focus resources and capital improvement to the system that is in most need. We have provided a financial estimate of the improved system management, by comparing the affect each type of technology will have on unaccounted for water estimate (currently at 27%). We calculated the cost of this unaccounted for water by totaling the variable distribution and treatment costs. The table below provide a current estimate of unaccounted for water:

| 2015 Water Production Costs | | | | |
|-----------------------------|-------------|--------------|--------------------|---------------|
| | Treatment | Distribution | Total | Total |
| Costs | Actual | Actual | Actual | Variable Cost |
| Salaries | \$923,729 | \$1,156,819 | \$2,080,548 | |
| Materials | 1,283,026 | 486,210 | 1,769,236 | 1,769,236 |
| Purchased Services | 325,899 | 994,407 | 1,320,306 | |
| Energy | 1,895,152 | 658 | 1,895,810 | 1,895,810 |
| | \$4,427,806 | \$2,638,094 | \$7,065,900 | 3,665,046 |
| Unaccounted for Water | | | 27% | \$ 989,562.42 |

Table 44

Each technology will show different levels of improvement to the unaccounted for water percentage. AMR Mobile reducing this to an estimated 25%; we estimated AMI fixed network technology would improve this to 20%.

These improvements would be associated across the entire CGS system as well as the Vermillion water system. Improvements in unaccounted for water in Vermillion will have a direct improvement to

expenses due to CGS purchasing water for \$.416 per cubic meter rate. The cost of unaccounted for water and the savings produced for reducing it is detailed in the table below:

| Description | Extended |
|--|------------|
| Vermillion Flow (M3 in 2015) | 1,650,308 |
| Vermillion Flow (paid at \$.416) | \$ 0.416 |
| Total Cost of Water Vermillion | \$ 686,528 |
| Unaccounted for Water - Vermillion (%) | 20% |
| Unaccounted for Water - Vermillion (\$) at 20% | \$ 137,305 |
| Unaccounted for Water – Vermillion (\$) at 15% | \$102,979 |
| Savings per year | \$34,326 |

Table 45

The second area of distribution management improvement relates to reduction of water meter tampering. CGS meter shop consistently uncovers customers whose water meter has been damaged or tampered with, which has a direct impact on the total water consumption being recorded. These are usually uncovered due to dramatic changes in water consumption over a long period of time (60 days). CGS meter installers found approximately 10% of the meters they replaced in the last couple years had evidence of tampering, so it is likely CGS is not detecting all tampering that currently occurring. AMR and AMI technology can improve CGS ability to detect and monitor tampering and react quicker to changes in consumption behavior that may indicate that tampering is occurring.

The financial improvements CGS should expect are estimated in the table below:

| Meter Reading Cost | Existing | Scenario 1 AMR Walk- by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|--|-------------|---|--|---|---|
| Unaccounted for Water System-wide | \$ 989,560 | \$ 989,560 | \$ 916,260 | \$ 733,000 | \$ 733,000 |
| Unaccounted for Water Vermillion system | \$ 137,305 | \$ 137,305 | \$123,575 | \$102,980 | \$102,980 |
| Expenses | \$1,126,865 | \$1,126,865 | \$1,039,835 | \$835,980 | \$835,980 |
| Change | \$0 | \$0 | \$87,030 | \$290,885 | \$290,885 |
| Revenue Recovery from Tampering (Consumption + Admin fees) | \$95,437 | \$95,437 | \$ 116,386 | \$232,773 | \$232,773 |
| Change | \$0 | \$0 | \$20,949 | \$137,336 | \$137,336 |
| Annual savings | \$0 | \$0 | \$107,979 | \$428,221 | \$428,221 |

Table 46

4.3.5. IT Support Costs

Meter reading software and equipment currently in place require very little IT support to operate. The current contract with GSU and Olameter (through GSU) include all require IT support for the existing meter reading equipment and software. Introduction of AMI/AMR technology and having CGS directly manage the meter reading contract, will require and increase in IT support. Fixed network AMI technology requires significantly more IT support than a mobile AMR technology, due to the amount of data that would be collected.

The table below summarizes the IT support assumptions we made.

| Assumption | Current Level | Scenario 1 AMR Walk-by (per year) | Scenario 2 - AMR Mobile (per year) | Scenario 3 - AMI Fixed Alone (per year) | Scenario 4 AMI Fixed GSU (per year) |
|--|-------------------------------------|--|--|--|--|
| Meter Reading software | None, included in Olameter contract | 1 software license | 1 software license | 1 software license | 1 software license |
| Collection Software | Not required | Not required | Not required | 1 software license | Included in fees with GSU |
| Meter Data Management | Not required | Not required | Not required | 1 software license | 1 software license |
| RF license | Not required | Not required (or included in software cost) | Not required (or included in software cost) | Not required (or included in software cost) | Included in fees with GSU |
| Handheld Support (reading & Maintenance) | Not required | Handhelds= 12 Support \$=15% of capital cost | Handhelds= 7 Support \$=15% of capital cost | Handhelds= 5 Support \$=15% of capital cost | Handhelds= 5 Support \$=15% of capital cost |
| Mobile Data Collector Support | Not required | Not required | Mobile units= 2 Support \$=15% of capital cost | Not required | Not required |
| Fixed network Data collectors | Not required | Not required | Not required | Data collectors = 10 to 75 collectors (depends on manufacturer) Support \$=15% | Use of existing network + 3-4 data collectors Support \$=15% |
| Wide Area Network Costs | Not required | Not required | Not required | 75 cellular data plans @ \$600 / year | Included in fees with GSU |
| AMI Data Analyst | Not required | Not required | Not required | 50% of FTE | 50% FTE |
| IT Hardware support | Not required | Not required | Not required | Included in existing CGS IT infrastructure | Included in existing CGS IT infrastructure |

| Assumption | Current Level | Scenario 1 AMR Walk-by (per year) | Scenario 2 - AMR Mobile (per year) | Scenario 3 - AMI Fixed Alone (per year) | Scenario 4 AMI Fixed GSU (per year) |
|------------------------|---------------|-----------------------------------|------------------------------------|---|--|
| GSU System Sharing fee | Not required | Not required | Not required | Not required | Network+ \$58,800 Licenses=\$3/ customer/ year |

Table 47

The financial improvements or additional expenses (negative savings) are summarized below.

| Meter Reading Cost | Existing | Scenario 1 AMR Walk-by Readings bi-monthly | Scenario 2 - AMR Mobile Readings monthly | Scenario 3 - AMI Fixed Alone Readings monthly | Scenario 4 AMI Fixed GSU Readings monthly |
|---------------------------|----------|--|--|---|---|
| Meter Reading Software | \$ - | \$ 2,000 | \$ 2,000 | \$ 2,000 | \$ 2,000 |
| Collection Software | \$ - | \$ - | \$ - | \$30,000 | \$ - |
| Meter Data Management | \$ - | \$ - | \$ - | \$30,000 | \$ 30,000 |
| RF Licence | | | | | \$ - |
| Handheld Support Cost | \$ - | \$ 12,900 | \$ 9,488 | \$ 2,401 | \$ 377 |
| Mobile Unit Support Cost | | \$ - | \$ 10,125 | \$ 4,125 | \$ 0 |
| FN Data Collector Support | | \$ - | \$ - | \$67,500 | \$ 24,000 |
| WAN (Assuming cellular) | | | \$ - | \$45,000 | \$ - |
| Data Analyst | | | | \$65,000 | \$ 65,000 |
| IT Hardware - Support | | | | | |
| GSU System Sharing Fee | | | | | \$ 204,803 |
| | \$ - | \$ 14,900 | \$ 21,613 | \$ 246,026 | \$ 326,181 |
| | \$ - | \$(14,900.00) | \$(21,612.50) | \$(246,025.90) | \$(326,180.65) |

Table 48

4.4. Capital Costs

4.4.1. Project Scope

With any water meter project there are always complications that can prevent the replacement or radio transmitter installation from happening. These issues usually include water meter enclosed behind a finished wall, valves not operational, or plumbing fittings that would need to be replaced to complete the work. One part of having a successfully project is to convert as close to 100% of the water meters to the new technology as possible. To achieve this level of

completion, the Utility needs to allow the installation contractor to overcome most of the above issues. Allowing carpentry, plumbing, and valve replacement will allow the project to achieve over 97% complete. Although this extra work is not usually performed by the City meter shop it is vital for this to occur (as a one-time event). Not including this work in the project would likely reduce the conversion to below 90%.

The project will include performing either a meter change out where the old water meter is removed, a new meter and AMR/AMI radio transmitter is installed; or a retrofit where a radio transmitter is installed on existing water meters.

There was an option to upgrade existing water meter with a high resolution water meter registers to allow for some of the enhanced AMI/AMR features to all customers. The additional cost of this optional project scope is approximate \$450,000 (~6300 @ \$70 / register).

The customers can be broken into two categories small meter (SM – meters 15mm to 20mm) and large meters (LM – meters 25mm and greater). The table below summarizes how many meters in each category and their assumed work type (change out, retrofits).

| Category\ Work Type | Change out | Retrofit | Total |
|---------------------|---------------|--------------|---------------|
| Small Meter | 41,339 | 529 | 41,868 |
| Large Meter | 4,712 | 1,609 | 6,321 |
| Total | 46,051 | 2,138 | 48,189 |

Table 49

The following cost summaries are based on the above quantities.

4.4.2. Installation Cost

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|--|---------------------------|--------------------------|------------------------------------|-------------------------------------|
| SM - C/O | \$3,634,975 | \$ 3,634,975 | \$ 3,634,975 | \$3,634,975 |
| SM Extra Work | \$ 799,659 | \$799,659 | \$799,659 | \$799,659 |
| LM - C/O | \$ 181,185 | \$181,185 | \$181,185 | \$181,185 |
| LM Extra Work | \$ 80,945 | \$ 80,348 | \$ 80,348 | \$ 80,348 |
| Total Installation Cost | \$4,696,764 | \$ 4,696,167 | \$ 4,696,167 | \$4,696,167 |

Table 50

The SM - C/O and LM – C/O includes the installation portion of the changes out and retrofit work.

The Extra work where required (based on assumptions) for valve replacement, plumbing, wire replacement, carpentry, freezing pipe in lieu of curb stop operation, confined and crawl space entry.

4.4.3. AMI/AMR Supply Cost

The AMI/AMR project costs are summarized below by category.

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|--|------------------------------|-----------------------------|------------------------------------|-------------------------------------|
| SM - Radio | \$ 4,225,500 | \$4,225,500 | \$4,225,500 | \$4,225,500 |
| LM - Radio | \$ 180,000 | \$180,000 | \$180,000 | \$180,000 |
| ALL – Temperature Gauges | \$ - | \$250,000 | \$- | \$- |
| FN Collectors | \$ - | \$- | \$797,500 | \$200,000 |
| Handheld Devices | \$ 86,000 | \$ 49,750 | \$ 33,250 | \$ 36,250 |
| Mobile Devices | \$ - | \$ 40,000 | \$- | \$- |
| Software Implementation | \$ 9,600 | \$ 9,600 | \$196,800 | \$148,800 |
| Northstar Interfaces | \$ 32,000 | \$- | \$ 96,000 | \$ 64,000 |
| Server Hardware | \$ - | \$- | \$ 50,000 | \$ 25,000 |
| License (OS & DB) | \$ - | \$- | \$ 50,000 | \$ 25,000 |
| Meter Reading, data collection and MDM Software licenses | \$ 10,000 | \$ 10,000 | \$310,000 | \$160,000 |
| System Training | \$ 9,600 | \$ 9,600 | \$ 73,600 | \$ 57,600 |
| Contingency | \$ 91,054 | \$ 95,489 | \$120,253 | \$102,443 |
| AMR Supply | \$ 4,643,754 | \$4,869,939 | \$6,132,903 | \$5,224,593 |

Table 51

The temperature gauge cost assumes approximate 300 temperature gauges that will transmit water temperature to be installed at service addresses that have shallow services.

4.4.4. Meter Supply Cost

The meter supply costs are summarized below:

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|---------------------|------------------------------|-----------------------------|------------------------------------|-------------------------------------|
| SM | \$ 3,653,273 | \$3,653,273 | \$3,653,273 | \$3,653,273 |
| LM | \$ 41,575 | \$ 41,575 | \$ 42,025 | \$ 42,025 |
| Meter Supply | \$ 3,694,848 | \$3,694,848 | \$3,695,298 | \$3,695,298 |

Table 52

4.4.5. Consulting Support

The AMI/AMR subject matter expert consulting services costs are summarized below:

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|------------------------------|------------------------------|-----------------------------|------------------------------------|-------------------------------------|
| Procurement | \$85,000 | \$85,000 | \$85,000 | \$85,000 |
| Project Support (3 years) | \$700,000 | \$700,000 | \$700,000 | \$700,000 |
| Consulting | \$785,000 | \$785,000 | \$785,000 | \$785,000 |

Table 53

4.4.6. Internal Project Support

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|------------------------|------------------------------|-----------------------------|------------------------------------|-------------------------------------|
| PM | \$ 127,637 | \$127,637 | \$127,637 | \$127,637 |
| CIS (GSU) Support | \$ 140,000 | \$140,000 | \$140,000 | \$140,000 |
| Field Support | \$ 364,000 | \$364,000 | \$364,000 | \$364,000 |
| IT Support | \$ - | \$- | \$127,637 | \$127,637 |
| Project Support | \$ 631,637 | \$631,637 | \$759,273 | \$759,273 |

Table 54

4.4.7. Contingency

| Category | Scenario 1 Walk-by AMR | Scenario 2 AMR Mobile | Scenario 3 AMI Fixed (alone) | Scenario 4 AMI fixed with GSU |
|-------------------------|------------------------------|-----------------------------|------------------------------------|-------------------------------------|
| Contingency -0.1 | \$ 469,677 | \$469,617 | \$469,617 | \$469,617 |

Table 55

Glossary

1. AMI – Advanced Metering Infrastructure, a two-way communication network for meter reading and other functions
2. AMR – Automated Meter Reading, a one-way communication network or mobile data collection system used for meter reading
3. CIS – Customer Information System, a software application used to store information about customers; often includes billing functionality
4. FAN or FN – Fixed Area Network, a radio communications network that typically uses a matrix of data collectors
5. GPS – Geographical Positioning System, a method of determining location from satellites
6. ICI – Industrial, Commercial and Industrial, usually the largest customers, sometimes referred to as “commercial” customers
7. IT – Information Technology
8. KPI – Key Performance Indicator, a measurement used to manage performance
9. MDM – Meter Data Management System, the data repository for an advanced metering infrastructure system
10. QA – Quality Assurance, in IT, a QA system is used to test software prior to deployment in Production
11. RSR – Read Success Rate, the percentage of expected meter readings captured in the meter data management system or data repository; it is the key performance indicator of an AMI system



City of Greater Sudbury

**Automated Meter Reading / Advanced Metering Infrastructure /
Advanced Metering Analytics (AMR / AMI/ AMA) Feasibility Study**

February 17, 2017

Implementation Report

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City of Greater Sudbury

AMR / AMI / AMA Feasibility Study

Implementation Report

5.1 Introduction

This implementation report is an appendix to the AMR/AMI/AMA Feasibility Study and assumes the recommendation of a fixed network AMI technology is the approved technology. Some adjustments to this report if there is a modifications to these recommendations.

5.2 Procurement Strategy

A project of this nature has a number of components that need to be properly planned out to ensure the internal and external resources are available at the right time. The diagram below provides an overview of the components of the project that need to be planned.

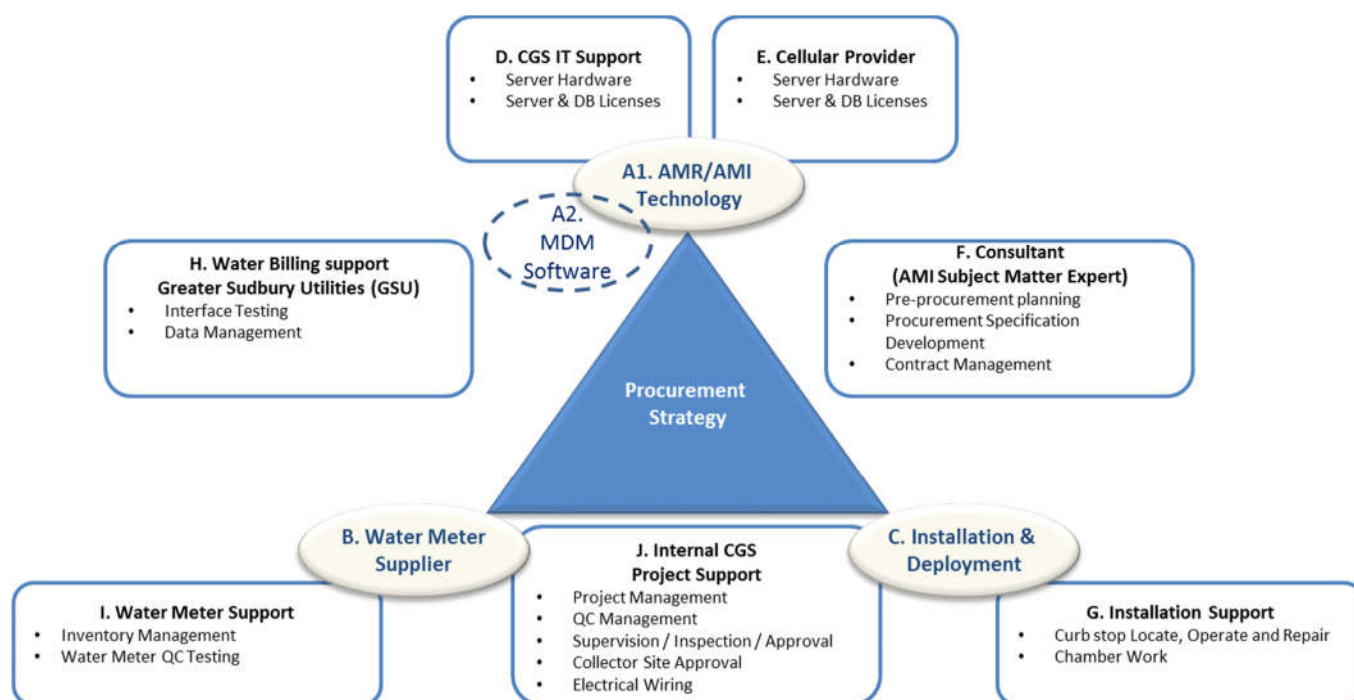


Figure 1

Some of these components will require a formal procurement process, other require sole sourcing and the remaining components may utilities existing contracts or City staff to perform the tasks. Where CGS

or GSU staff are required some form of backfill may be need to ensure the right staff with the right knowledge of existing system are able to participate in the project.

For those components that requires external resources the successful procurement strategy needs to answer a couple questions, first what components of the project should be grouped together, secondly what type of procurement is recommended (tender, RFP, sole source). The grouping of components can have a real effect on the competitiveness, price of the procurement and the mitigation of project risk.

5.2.1 Main Components of Work

The highest cost components of this project are A. AMR/AMI Technology, B. Installation & Deployment and B. Water Meter Supply. How these components are grouped can have a real impact on the number of bidders who may be interested in the project. Grouping them all together in a single turn-key project is likely the lowest risk approach, but it limits the number of bidders who would likely be interested in the project. Procuring each of these component separately will likely maximize the number of bidders that would be interested in the project but there is significant risk in ensure all components work together.

After reviewing the benefits and drawbacks we are recommending two Request for Proposals (RFP) be developed.

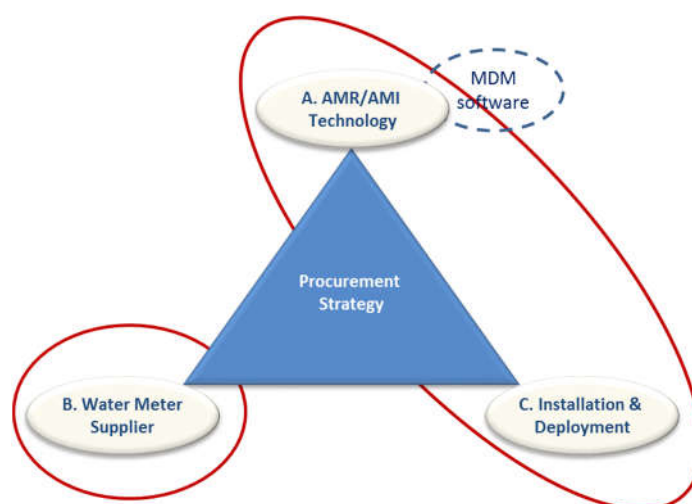


Figure 2

The first is for water meter and components supply, the second would group AMR/AMI together with installation and deployment. This approach puts the majority of the risk of the project on the AMI and Installation provider. The risk related to the water meter working with the AMR/AMI equipment selected is low and very manageable.

The MDM Software should be included as a part of the AMR/AMI and installation RFP but the procurement documents should allow this component to be separated and awarded separately. The reason we recommend this option is because some AMR/AMI vendors do not have a suitable and well develop MDM software. CGS evaluation team should be able to evaluate the merits of different providers MDM and award this components on how closely this software meets the business drivers.

MDM software providers may be able to submit a response to just the MDM component of the RFP. Although this may complicated the procurement, award and negotiation process we feel it will give CGS evaluation team the most flexibility to find a solution that meets the City needs.

5.2.2 Support Components

The table below summarized the recommended procurements and the estimated value of each component.

| Component (Ref to Diagram 1) | Resource | Type of Procurement | Estimated Value | Comment |
|---------------------------------|----------|-------------------------|-----------------|--|
| C. Installation & Deployment | External | Supply and Install RFP | \$4.7M | |
| A1.AMR/AMI Supply | | | \$4.8M | |
| A2.MDM Software | External | Included in AMR/AMI RFP | \$300K | This could be separated and negotiated separately if a MDM solution is better what is proposed by the AMI Vendor |
| B.Water Meter Supply | External | RFP | \$3.7M | |
| E. Cellular Provider | External | Negotiated | \$45K / year | CGS should include this service with the existing CGS cellular contract. |
| F.Consultant | External | RFP | \$785K | |
| G.Installation Support | Internal | None | N/A | Curb stop locates and repairs will be supported by existing CGS staff. |
| H.Water Billing Support | External | Negotiated | \$140K | GSU will be required to provide water billing support during the testing and installation phases of the project. |
| I.Water Meter Support | Internal | None | N/A | Existing CGS will support her Quality assurance and inventory management functions as required. |
| D.CGS IT Support | Internal | None | \$50K | Where the AMI vendor proposes an on-site software installation CGS will use their existing server network. |
| J.Internal CGS Project Support | Internal | None | \$375K Existing | CGS has existing resources (PM and supervision) to perform certain |

| Component (Ref to Diagram 1) | Resource | Type of Procurement | Estimated Value | Comment |
|---------------------------------|----------|---------------------|------------------|---|
| | | | \$375K new staff | project support tasks but we do anticipate requiring new temporary hires to fill some positions (inspection and supervision). |

Table 1

The priority would be to engage a consultant who will perform the detailed project task scheduling and critical path management.

5.3 Project Schedule

The table shows a high level project schedule. This plan is a snap shot in time and will provide the City of Greater Sudbury a benchmark to work towards achieving. The plan will continue to evolve as more information becomes known.

| WBS | Task Name | Duration | Start | Finish |
|--------------|---|-----------------|---------------------|---------------------|
| 1 | City of Greater Sudbury Implementation Schedule | 802 days | Mon 17-03-06 | Tue 20-03-31 |
| 1.1 | Project Management | 802 days | Mon 17-03-06 | Tue 20-03-31 |
| 1.1.1 | Start | 1 day | Mon 17-03-06 | Mon 17-03-06 |
| 1.1.2 | Project Management | 801 days | Tue 17-03-07 | Tue 20-03-31 |
| 1.2 | Pre-Procurement Task | 120 days | Tue 17-03-07 | Mon 17-08-21 |
| 1.2.1 | Develop and Award Consultant RFP | 80 days | Tue 17-03-07 | Mon 17-06-26 |
| 1.2.2 | Compile Potential Data Collector Locations | 60 days | Tue 17-03-07 | Mon 17-05-29 |
| 1.2.3 | GSU Engagement | 100 days | Tue 17-03-07 | Mon 17-07-24 |
| 1.2.3.1 | Agreement with GSU for Joint use of Existing Pole Locations | 20 days | Tue 17-03-07 | Mon 17-04-03 |
| 1.2.3.2 | Business Requirements for Data Interfaces | 20 days | Tue 17-06-27 | Mon 17-07-24 |
| 1.2.3.3 | Project Support Discussions | 20 days | Tue 17-06-27 | Mon 17-07-24 |
| 1.2.4 | Secure Project Team | 20 days | Tue 17-07-25 | Mon 17-08-21 |
| 1.3 | Procurement Phase | 150 days | Tue 17-06-27 | Mon 18-01-22 |
| 1.3.1 | Water Meter Procurement | 75 days | Tue 17-06-27 | Mon 17-10-09 |
| 1.3.1.1 | Develop Specifications | 10 days | Tue 17-06-27 | Mon 17-07-10 |
| 1.3.1.2 | Prepare Terms and Conditions | 5 days | Tue 17-07-11 | Mon 17-07-17 |
| 1.3.1.3 | Prepare Procurement Documents | 10 days | Tue 17-07-18 | Mon 17-07-31 |
| 1.3.1.4 | Conduct Proposal Period | 20 days | Tue 17-08-01 | Mon 17-08-28 |
| 1.3.1.5 | Review Proposal and Evaluation | 10 days | Tue 17-08-29 | Mon 17-09-11 |

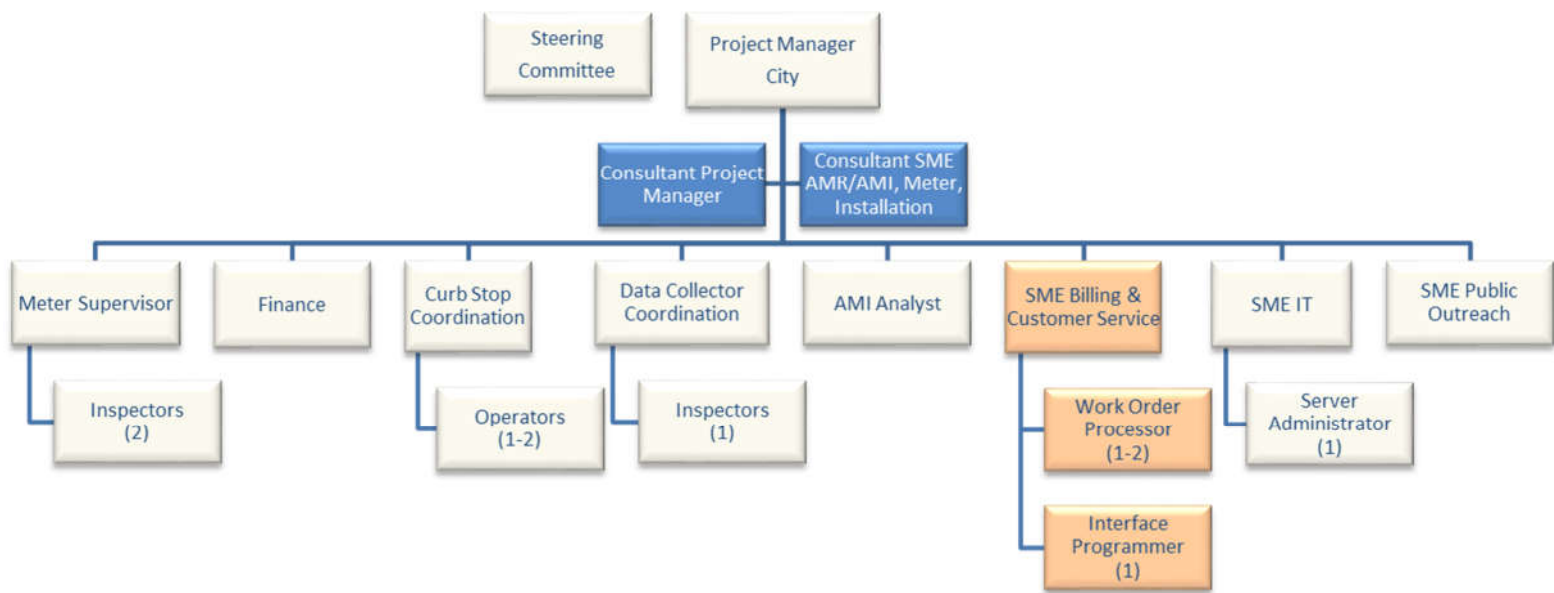
| | | | | |
|--------------|--|-----------------|---------------------|---------------------|
| 1.3.1.6 | Negotiate Agreement | 10 days | Tue 17-09-12 | Mon 17-09-25 |
| 1.3.1.7 | Meter Agreement Executed | 10 days | Tue 17-09-26 | Mon 17-10-09 |
| 1.3.2 | AMR / AMI and Installation Vendor Procurement | 150 days | Tue 17-06-27 | Mon 18-01-22 |
| 1.3.2.1 | Plan Data Collector Locations | 40 days | Tue 17-06-27 | Mon 17-08-21 |
| 1.3.2.2 | Plan Communications | 20 days | Tue 17-06-27 | Mon 17-07-24 |
| 1.3.2.3 | Plan IT and Data Management | 30 days | Tue 17-06-27 | Mon 17-08-07 |
| 1.3.2.4 | Develop Specifications - AMR / AMI | 20 days | Tue 17-06-27 | Mon 17-07-24 |
| 1.3.2.5 | Develop Specifications - Install | 10 days | Tue 17-07-25 | Mon 17-08-07 |
| 1.3.2.6 | Develop Specifications - MDM | 10 days | Tue 17-08-08 | Mon 17-08-21 |
| 1.3.2.7 | Prepare Terms and Conditions | 5 days | Tue 17-08-22 | Mon 17-08-28 |
| 1.3.2.8 | Engage AMR / AMI Vendors | 15 days | Tue 17-07-25 | Mon 17-08-14 |
| 1.3.2.9 | Prepare Procurement Documents | 20 days | Tue 17-08-29 | Mon 17-09-25 |
| 1.3.2.10 | Conduct Proposal Period | 40 days | Tue 17-09-26 | Mon 17-11-20 |
| 1.3.2.11 | Review Proposal and Evaluation | 15 days | Tue 17-11-21 | Mon 17-12-11 |
| 1.3.2.12 | Negotiate Agreement | 15 days | Tue 17-12-12 | Mon 18-01-01 |
| 1.3.2.13 | AMR / AMI Agreement Executed | 15 days | Tue 18-01-02 | Mon 18-01-22 |
| 1.4 | Start-up Phase | 85 days | Mon 18-01-08 | Fri 18-05-04 |
| 1.4.1 | Plan Business Process Changes | 20 days | Mon 18-01-08 | Fri 18-02-02 |
| 1.4.2 | Plan Data Collector Sites | 20 days | Mon 18-01-08 | Fri 18-02-02 |
| 1.4.3 | Vendor Mobilization | 40 days | Tue 18-01-23 | Mon 18-03-19 |
| 1.4.4 | Install Initial Data Collectors for POC | 20 days | Mon 18-02-05 | Fri 18-03-02 |
| 1.4.5 | Develop Communications | 40 days | Mon 18-01-08 | Fri 18-03-02 |
| 1.4.6 | Prepare Computer Environments | 20 days | Mon 18-01-08 | Fri 18-02-02 |
| 1.4.7 | Plan AMI Software Interfaces | 15 days | Mon 18-02-05 | Fri 18-02-23 |
| 1.4.8 | Develop AMI Software Interfaces | 20 days | Mon 18-02-26 | Fri 18-03-23 |
| 1.4.9 | AMI System and Installation (Initial User Acceptance Test) | 20 days | Mon 18-03-26 | Fri 18-04-20 |
| 1.4.10 | Move AMS into Production | 10 days | Mon 18-04-23 | Fri 18-05-04 |
| 1.4.11 | Release Initial Accounts for POC | 10 days | Mon 18-04-23 | Fri 18-05-04 |
| 1.5 | Installation / Deployment Phase | 497 days | Mon 18-05-07 | Tue 20-03-31 |
| 1.5.1 | Proof of Concept Phase (POC) | 110 days | Mon 18-05-07 | Fri 18-10-05 |
| 1.5.1.1 | Install Residential Installations (~5,000) | 80 days | Mon 18-05-07 | Fri 18-08-24 |
| 1.5.1.2 | Complete RSR and Network Performance Assessment | 10 days | Mon 18-08-27 | Fri 18-09-07 |
| 1.5.1.3 | Complete Final User Acceptance Test (FUAT) | 20 days | Mon 18-09-10 | Fri 18-10-05 |
| 1.5.2 | Issue Notice to Proceed with Installation | 0 days | Fri 18-10-05 | Fri 18-10-05 |
| 1.5.3 | Install Remaining Data Collectors | 120 days | Mon 18-10-08 | Fri 19-03-22 |
| 1.5.4 | Complete Meter and Endpoint Installations | 387 days | Mon 18-10-08 | Tue 20-03-31 |
| 1.5.5 | Substantial Completion | 0 days | Tue 20-03-31 | Tue 20-03-31 |

5.4 Project Support

A project of this nature requires a dedicated team that remains actively involved in the project from its beginning to its end. Active involvement will include participation in the procurement process, installation and system acceptance. This project will require individuals with certain expertise to perform each role. Most roles will not require 100% of any single person's time for the full duration of the project, but they will require that certain stakeholders be engaged full time during certain stages of the project. Key members of the City of Greater Sudbury and Greater Sudbury Utilities will need to set aside some time to support this project.

5.4.1 Project Organizational Chart

The diagram below illustrates the project organizational chart. The organizational chart assumes there will be resources available with the right skill to fill the role. Where this is not the case, additional roles can be added to the consultant's engagement. (SME – Subject Matter Expert)



5.4.2 Description of Roles

The following tables provide an explanation of the duties and responsibilities for each role and the estimated time (or % of a full time equivalent – FTE) that will be required during each phase of the project.

| | | | |
|------------------------|--|---------------|-------------------------|
| Role: | Project Manager | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Main point of contact for all project entities Accountable for project timeline, scope and cost <ul style="list-style-type: none"> Contract Compliance supports the PM PM does not need to be an AMR/AMI expert Sign off on all invoices and additional resource requests | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Pre-Procurement, Procurement <ul style="list-style-type: none"> 50% - 100% of an FTE Project Startup, POC and Installation <ul style="list-style-type: none"> 100% FTE – first year 50% - 80% FTE - after that Bad contractor – will require more time | | |

| | | | |
|------------------------|--|---------------|--|
| Role: | Contract Compliance | Organization: | AMR/AMI Subject Matter Expert (Consultant) |
| Tasks: | <ul style="list-style-type: none"> Main point of contact with Prime Contractor (AMR/AMI and Installation) Lead Progress Meetings (Agenda's, Scheduling, Minutes) Specification Compliance Progress Claim review and recommendation for approval Project Documentation (either directly or ensure others produce it accurately) Project Schedule review and approval (the installation contractor plan) Establish and monitor key project metrics | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Procurement <ul style="list-style-type: none"> Document creation Project Start up, POC <ul style="list-style-type: none"> 1 – 50% FTE Consultant Project Manager 1 – 50% FTE Consultant AMR/AMI, Meter and Installation SME Installation and Deployment <ul style="list-style-type: none"> 50% – 75% FTE Bad contractor – may require more time | | |

| | | | |
|------------------------|---|---------------|-------------------------|
| Role: | Meter Supervisor | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Review installation specification documents Review 5% to 10% of post installation photographs Resolve non-compliance or “Tasks” that prevent an installation Potentially take on Curb Stop Coordination tasks | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Procurement <ul style="list-style-type: none"> 25% FTE Project Start up and POC <ul style="list-style-type: none"> Business requirements review and approval 25% - 50% + Installation and Deployment <ul style="list-style-type: none"> Post installation review <ul style="list-style-type: none"> 5% - 10% of 48,000 = 2,400 – 4,800 picture review 5% - 10% of 48,000 = 2,400 – 4,800 inspections Task Resolution <ul style="list-style-type: none"> 2.5 - 5% of 48,000 = 1,200 – 2,400 Task resolution | | |

| | | | |
|------------------------|---|---------------|---------------------------|
| Role: | SME - Billing and Customer Service | Organization: | Greater Sudbury Utilities |
| Tasks: | <ul style="list-style-type: none"> Assist in the design of the interfaces Business Requirements review and approval Data Review and Exception Management Lead and perform testing <ul style="list-style-type: none"> CIS Testing (processing work orders, interfaces) AMI User Acceptance Testing AMI training | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Procurement <ul style="list-style-type: none"> 25% of an FTE Project Startup and POC <ul style="list-style-type: none"> Start up meetings 100% Installation and Deployment <ul style="list-style-type: none"> Data processing <ul style="list-style-type: none"> 1-2 people 25% - 50% | | |

| | | | |
|------------------------|--|---------------|-------------------------|
| Role: | Data Collector Coordination | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Review and approved changes to propagation study Site inspections Approve data collector sites <ul style="list-style-type: none"> Often requires working with outside organizations Approve and coordinate work to be performed at each site (in conjunction with the AMI installation contractor). | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Project Startup and POC (4 to 10 months) <ul style="list-style-type: none"> 1 – Supervisor 100% FTE; 100% inspector Installation and Deployment ¾ to 1 year (depends on how easy collector approvals are) <ul style="list-style-type: none"> 75% Supervisor 75% of field inspector | | |

| | | | |
|------------------------|---|---------------|-------------------------|
| Role: | AMI Data Analyst | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Business Requirements review and approval Data Review and Exception Management AMI User Acceptance Testing AMI training | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Project Startup and POC <ul style="list-style-type: none"> Start up meetings 50% Installation and Deployment <ul style="list-style-type: none"> 1 person 25% - 50% | | |

| | | | |
|------------------------|--|---------------|-------------------------|
| Role: | Curb Stop Coordination | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Coordinate the curb stop locates and repairs | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Procurement Project Start up and POC <ul style="list-style-type: none"> 10% - 25% of a supervisor Installation and Deployment <ul style="list-style-type: none"> 25% - 50% of a supervisor | | |

| | | | |
|------------------------|---|---------------|-------------------------|
| Role: | IT Server hardware and OS setup | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Set up the servers (hardware) Purchase of any additional OS and DB software (Licenses) Load and configure the OS software Coordinate any security reviews (threat assessment, risk assessment, penetration test) Applying new versions and patches. | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Project Start up and POC <ul style="list-style-type: none"> 1 hardware person 10% -25% of a FTE 1 security person 10% - 25% of a FTE Installation and Deployment <ul style="list-style-type: none"> 5% - 10% of a FTE | | |

| | | | |
|------------------------|---|---------------|-------------------------|
| Role: | Public Outreach | Organization: | City of Greater Sudbury |
| Tasks: | <ul style="list-style-type: none"> Coordinate the design and development of the Public Outreach program Design brand, logo etc. Approve materials and website Support media relations | | |
| Effort / Time Estimate | <ul style="list-style-type: none"> Project Start up and POC <ul style="list-style-type: none"> 1 Communications person 10% - 25% of a FTE Installation and Deployment <ul style="list-style-type: none"> 1 Communications person 10% of a FTE | | |

5.5 Fixed based AMI Data Collector Preparation

Our recommendation to deploy an AMI fixed network will require data collectors to be allowing the entire CGS service territory to be covered. To do this successfully, there are a number of considerations that need to be taken prior to procurement documents being released.

During procurement AMI Vendors will need to need to perform a propagation study to ensure they are planning enough data collector equipment to collect. A Propagation Study is a Vendors forecast on how well their network will collect transmissions. The model relies on a number of assumptions and the more “real” they can be, the better the models prediction.

- Assumption that are made in a Propagation Study are:

- Read Success Rate (RSR)
- Redundancy
- Indoor vs. Outdoor Installation

Topography and Density of Buildings

- Location of Data Collectors
- Height of Data Collectors
- Strength and Frequency of the Radio and Collectors

The more information and decisions the utility can provide prior to procurement the less risk the propagation model will be. The project key's performance indicator will be read success rate (RSR). If 99.5% of the radio transmitters are able to pass the RSR then we are confident:

- the right amount of network collector are installed across the territory;
- the radio transmitters are operating as designed; and
- the installation and radio transmitter setup processes into Northstar are successful.

Read Success Rate (RSR) is the key performance standard of the network that puts the onus on the AMI and Installation Vendors to figure out the details and requirements around the system to ensure that it meets or exceeds the measurable outcome. It is usually defined as follows:

- % of hourly readings to be captured by the network (usually 98.5%) of the last 30 days.
- % of daily readings to be captured by the network over the last 30 days.
- Redundancy Rate – Each radio transmitter must be heard by two data collectors.

5.5.1 Propagation Risk Assessment

The table below details the assumptions a Vendor needs to make in performing a propagation study. The risk level indicates the impact each can have on the deployment of the network. A low risk, is something that the specifications can easily address; no risk mitigation is required. A medium risk, indicates a factor that may have an impact on procurement or the total project cost. Mitigating a medium risk factor may require the City to get more detailed information or make a specification decision that will lead to higher cost. A high risk, is one that will have an impact on the viability of the propagation and will lead to an unknown higher cost or will prevent the City from measuring radio transmitter performance during installations. To mitigate these risks the procurement documents need significantly better information and procedures need to be put in place to secure locations for data collectors. Another option for mitigation would be to lower the expectations on where a fixed network may be deployed, allowing vendors to submit mobile AMR or AMI cellular technology for certain areas.

Fixed Network Propagation Study Risk Factors

| Factor | Risk Level | Risk Assessment |
|---|------------|---|
| Read Success Rate (RSR) | Low | <ul style="list-style-type: none"> • RSR is easily defined • Industry standard is 98.5% of hourly readings over the last 30 days. |
| Redundancy | Low | <ul style="list-style-type: none"> • Industry standard is a redundancy of 2 collectors per radio transmitter |
| Strength and Frequency of the endpoints and collectors | Low | <ul style="list-style-type: none"> • Manufacturers design their radio transmitter and data collectors with specific transmission frequency and strength so the only risk would relate to implementing a network whose manufacturer has never designed this type of system before. |
| Topography | Low | <ul style="list-style-type: none"> • This does not change and is known to the vendor • Building infill development is slow and usually redundancy allows endpoints to be heard by a second collector. |
| Indoor vs. Outdoor Endpoint Location | Med | <ul style="list-style-type: none"> • Installation challenges may prevent some endpoints from being installed outside (finished basement and commercial) • Mitigation: allow some residential endpoints to be installed inside, and provide strict specifications that would allow it. • Mitigation: allow hourly or per foot wire runs to be charged for commercial properties |
| Location of Data Collectors | High | <ul style="list-style-type: none"> • Potential sites are often not known • Sites that are known are often eliminated as not suitable (no power, no approval, being demolished) • Approval process can be very long • Sites are not always available where they are required • Mitigation: Prepare prior to procurement: <ul style="list-style-type: none"> • A validated list of buildings, poles, towers that can be used. • Make sure approval processes are worked out • New poles need to be an acceptable solution for some areas (although they can be a last resort) |

| Factor | Risk Level | Risk Assessment |
|---------------------------|------------|---|
| Height of Data Collectors | Med | <ul style="list-style-type: none"> • Building heights are not always known for all sites • Poles heights need to be assumed at 25 feet; vendors typically want to higher poles to reduce the number of collectors • Some systems require much higher data collectors (cell towers, water towers, etc.). Not having these can skew some vendors' studies and therefore their proposed network cost. • Mitigation: Prepare prior to procurement. <ul style="list-style-type: none"> • Get the height of as many locations as possible (even if only the number of floors). • Assume the poles are lower rather than higher, it is easier to eliminate equipment due to better than predicted performance. |

Table 2

5.5.2 Propagation Study Importance

The deployment of the network and the utilization of RSR are key components of a successful implementation. Tying payment of both the meter and transmitter installations to passing RSR provides great leverage in a contract and ensures installation issues get resolved by the vendor in a timely manner. If the network is delayed in any way that is not related to the vendor, they will start to put pressure and request to get paid for installations prior to meeting RSR. This has a number of follow on impacts including; Installation issues that will not be resolved and it lowers the incentive to resolve any issues within the propagation model. The diagram below depicts a common scenario with regards to a deployment of a network starting with a list of potential sites prior to the procurement propagation and illustrates what actually happens during a deployment.

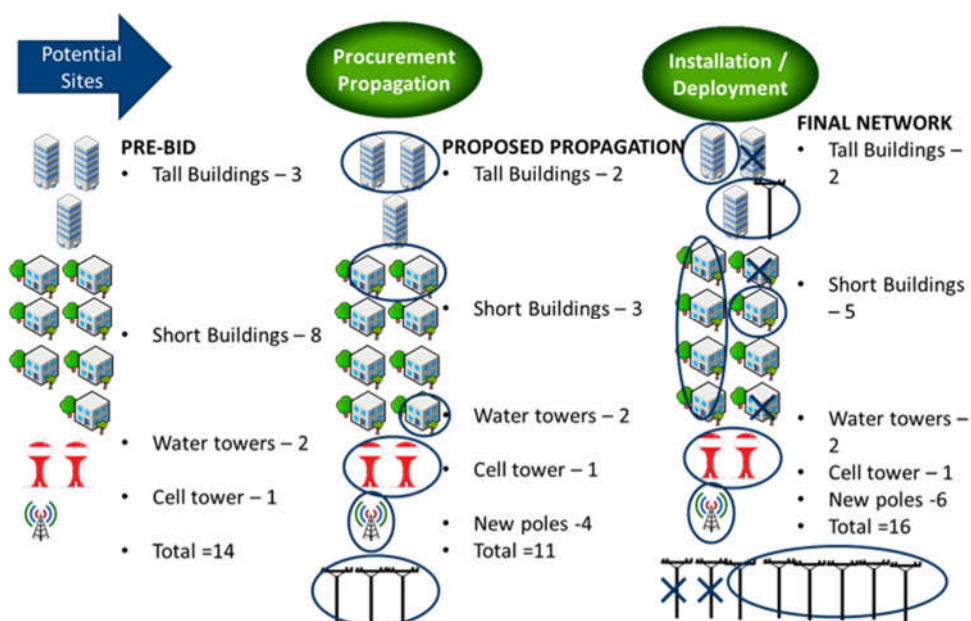


Figure 3 Propagation Study at Procurement compared to Final Installation

Notice the total number of collection devices increased from 11 during the procurement phase to 16 at the installation/deployment phase. Because three sites were eliminated after the procurement phase, five sites needed to be added during the installation/deployment phase resulting in a 45% increase in the network cost. This cost would be the Utility's responsibility to cover. It is easy to understand not having the correct list of viable addresses where collectors can be installed can have a big impact on the project cost.

The reality is that a deployment of a network typically has heavy utility involvement and the more upfront preparation that can be done, the chances of a successful deployment greatly improve.

If the propagation is altered during a deployment due to approval status changes and there are restrictions as to where a Data Collector can be installed, some meters may not be able to be read under the network. These holes in coverage could be blamed on the utility and would result in significant increases in deployment coordination time. Although, a project of this size is complex the majority of complications can be mitigated through the following:

- Have a qualified list of installation locations prior to procurement
 - Need to know the following attributes:
 - Type of Facility
 - Building
 - Water Tower
 - Communications Tower

- Right of Way Property
- Pole
- Etc.
- Owned / Leased
 - May not be able to place equipment on leased sites
- Heights of Buildings and Towers
- Access to backhaul (fiber, intranet, cell coverage, etc.)
- Contact person
- Understand the approval process and who is involved
- Dedicate full time resource(s) to coordinate the network deployment
- Put onus on the installation contractor but provide additional support where required.

CGS Implications:

CGS should start to put together a list of CGS facilities that could be used as a location for data collector equipment. This list should be in GIS and able to download and group by the above mention attributes.

5.5.3 Data Collection Equipment Installation Locations

Options for locations to site data collection equipment are evaluated in the following table.

Table 3: Location Options for Data Collectors

| Data Collector Location | Benefits | Drawbacks |
|--|--|--|
| CGS-owned Buildings and Structures | <ul style="list-style-type: none"> • Usually no monthly cost for space • Access to electric power (avoiding solar panels) • Potential access to network (avoiding backhaul costs) • Multi-story buildings increase coverage for data collectors. | <ul style="list-style-type: none"> • Maintenance of power and network connections • More susceptible to <ul style="list-style-type: none"> • Power being turned off • Intranet going down |
| Other City-owned Buildings and Structures | <ul style="list-style-type: none"> • Multi-story buildings increase coverage for data collectors. | <ul style="list-style-type: none"> • May have concerns mounting equipment on their roof • Separate agencies (Schools, Police, Fire, Water, Facilities) <ul style="list-style-type: none"> • Each may have different approval processes and conditions. |

| Data Collector Location | Benefits | Drawbacks |
|-----------------------------------|--|--|
| GSU's existing power poles | <ul style="list-style-type: none"> • \$22.35 to 41.28 per pole per year • Initial install fee: \$331 one-time fee | <ul style="list-style-type: none"> • Accessibility can be an issue when maintenance is required. Although this drawback is low on City owned poles. • |
| New Poles | <ul style="list-style-type: none"> • Poles can be installed anywhere. • Vendor has the ability to ensure no holes exist in the network | <ul style="list-style-type: none"> • Approval process may include politicians • Resident's don't like new poles installed in the residential neighbourhoods • Installation is more costly |
| Private Locations | <ul style="list-style-type: none"> • Communication towers may have capacity for additional antennas, particularly for public networks • Multi-story buildings increase coverage for data collectors. | <ul style="list-style-type: none"> • Need to negotiate leases • Monthly charges |

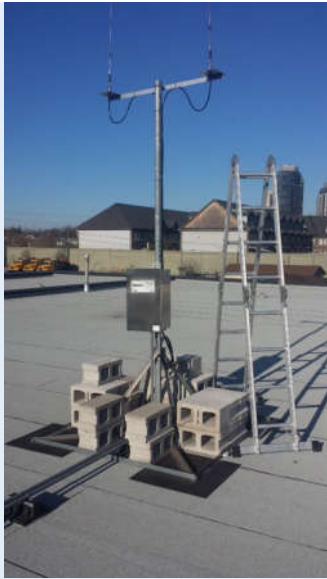

CGS Implications:


The City should plan to mount equipment on all the above locations with priority given to existing CGS buildings, GSU poles and either Hydro One poles or new poles in CGS service territory not covered by GSU. It is likely that new poles will be required.

5.5.4 Types of Data Collector Installations

The table below shows the types of data collector installations that will be required. The procurement specifications need to allow for all the different types of work for each of these, including by not limited to running electric and Ethernet wiring.

Table 4: Data Collector Mounting Options

| Data Collector Location | Picture | Benefits |
|-------------------------|--|---|
| Rooftop Mount |  | <ul style="list-style-type: none"> • No roof penetration is required • Vendor is responsible for wind testing • Easy to relocate for roof maintenance • Can be located so that it is not noticeable from the ground |
| Wall Mount |  | <ul style="list-style-type: none"> • Antenna can be installed at the highest point on the building • Collector can be installed inside in a secure location • Usually short electric and WAN wire runs during installation |

| Data Collector Location | Picture | Benefits |
|-------------------------|---|--|
| Pole Mount |  | <ul style="list-style-type: none"> • Able to fill in coverage if there are gaps in the network. |

5.5.5 Backhaul

Backhaul is the type of technology that is used to get the data from the data collectors back to the headend software. There are a number of different options on how this can be done and some may be more costly than others. These options are defined in the chart below:

Backhaul Methods

| Backhaul Type | Ease of Installation | Install Cost | On-going Cost | Availability |
|----------------|---|--------------|---------------|---|
| Ethernet | Wiring Required | \$\$ | \$0 | Limited to City buildings |
| Cellular | Cellular card installed by Vendor | \$ | \$/year | Unlimited – can be used for any type of collectors. |
| Fiber Optic | Requires a connection point. This point may not be anywhere near the roof where the collector would be installed. | \$\$\$ | \$0 | Limited to City buildings that have a connection point. |
| Point-to Point | Has had limited use in water AMI | \$\$\$ | \$0 | Unlimited |

Legend

\$0 - no additional cost per site
 \$ - between \$250 and \$500
 \$\$ - between \$500 to \$2,500
 \$\$\$ - over \$2,500

5.5.6 Data Collector Approval Process

Understanding and vetting out the Approval Process for each type of installation is an important step to be completed prior to procurement. For each type of installation a number of questions should be answered. These questions are included below.

City Building Installations

- Is there a facilities management division within the City?
- What is the Approval process?
- What is required?
 - Are there specific forms that have to be completed?
 - Are as built drawings required?
 - Is there a specific format of the drawings?
 - Are there any labelling requirements (Data Collectors, Wire / Conduit)?
- Who would approve a collector for each building?
- Who would approve where wiring should be run?
- Who would install and test secure router?
- Is there a specific type of router that should be used?
- Who would provide access to each building?
- Are there facility management Electricians that would perform this work or would wire runs need to be outsourced?

Pole Installations

- What is the Approval Process?
- Are new poles a viable option?
- Who approves mounting equipment on lighting poles?
- Who approves mounting equipment on power poles?
- What is the timeline for Approvals?

- Are there any costs involved?
- Are there specific forms that have to be completed?

Once the project has been approved these questions will provide a starting point for the discussions with the various departments and organizations.

For Information Only

2019 Development Charges Background Study and By-Law

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Monday, Mar 26, 2018

Type: Presentations

Resolution

For Information Only

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to operational matters.

Report Summary

The purpose of this report is to provide an overview of development charges as well as the steps planned for the 2019 Development Charges Background Study and related by-law to be approved by City Council before June 30, 2019.

Financial Implications

This report has no financial implications.

Signed By

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Background

The purpose of this report is to provide an overview of development charges as well as the steps planned for the 2019 Development Charges Background Study and related by-law to be approved by City Council before June 30, 2019.

In accordance with the Development Charges Act (DCA), the City of Greater Sudbury collects a development charge (DC) at the building permit stage to recover for growth related capital needs.

The City of Greater Sudbury's current by-law expires on June 30, 2019 as the by-law has a maximum life of 5 years. The DC Background Study and new by-law must be approved in order to collect DC's after June 30, 2019. The Background Study will illustrate the City's existing service levels, the growth related "short and long term" capital program on a ten year planning period from 2019 to 2028 for "soft" services and from 2019 to 2041 for "hard" services, and the proposed development charge rates. Examples of "soft" and "hard" services are identified within this report.

Hemson Consulting Ltd. (Hemson) will be assisting the City with development of the 2019 DC Background Study and related by-law as Hemson was the successful bidder for the RFP issued in 2017. The public meetings will be scheduled for Winter/Spring 2019 in advance for the approval of the new by-law by June 2019.

What are Development Charges?

Development charges are charges imposed by municipalities on developers/landowners to pay for increased capital costs related to growth. Development charges provide municipalities with a tool to help fund the infrastructure needed to serve new growth. They help finance the growth-related capital costs of providing important services like roads, water and wastewater services, police, fire and transit.

Growth related capital costs are costs that result from the expansion of services to meet the needs of new development. These capital costs are reduced by an allowance for provincial and/or federal grants and other sources of funding as well as other deductions required by the DC Act to determine the net capital cost for DC recovery.

In the City of Greater Sudbury, in accordance with the 2014 By-law, development charges are levied on the following municipal services: water, wastewater, roads, police, general government, libraries, fire, recreation, cemeteries, emergency and transit.

Development charges are imposed against new development, re-development and expansions for residential and non-residential buildings or structures.

The principle behind development charges is that “growth pays for growth”, meaning development pays the share of capital costs associated with new growth and development while taxpayers/ratepayers fund capital infrastructure that benefits the existing population. However, in reality, development charges cannot fully fund growth due to statutory limitations.

One of the issues stemming from the consultations leading up to the 2009 DC By-law was how costs not eligible for inclusion in the DC by-law would be addressed. This led to the adoption of a Policy on Development Cost Sharing for the City in 2011.

When development takes place in the City, new infrastructure (ie. roads, sewers, watermain, traffic signals, etc), both internal and external to the development typically has to be constructed. In some cases, this infrastructure will solely benefit the developer, in other cases the City and/or third parties may benefit from the new infrastructure. The Policy on Development Cost Sharing standardizes how development costs not covered in the DC by-law are shared between the developer, the City and third party land owners.

Services Eligible for DC Recovery

The DC Act allows full 100% recovery from “hard” and “protection” services and 90% recovery from “soft” services as listed below. The maximum planning period for capital growth related projects is 10 years for “soft” services and up to 2041 for “hard” services.

1. 100% Cost Recovery
 - Protection Services and Other
 - i. Fire Services
 - ii. Police Services
 - iii. Transit Services
 - Engineered Services (“Hard” Services)
 - i. Roads and Related
 - ii. Water
 - iii. Sanitary Sewer
 - iv. Drains and Stormwater
2. 90% Cost Recovery (“Soft” Services)
 - Library
 - Parks and Trails
 - Indoor Recreation
 - Cemeteries
 - Emergency Medical Services/Emergency Preparedness
 - General Government (Studies)

3. Other Potential Eligible Services (90% Cost Recovery)
(Note these services were not part of the 2014 by-law)
- Public Works (Buildings and Fleet)
 - Parking
 - Housing
 - Long-Term Care
 - Employment Services
 - Provincial Offences
 - Child Care
 - Public Health
 - Airport
 - Waste Management (Diversion) – new eligible service area with recent amendments to DC Act

Services Ineligible for DC Recovery

In accordance with the DC Act, the following services are ineligible for DC recovery:

- Cultural and entertainment facilities including museums, theatres, art galleries
- Tourism facilities including convention centres
- Park land acquisition
- Hospitals
- Headquarters for general administration of municipalities and boards
- Waste management
- Other services prescribed by legislation

Eligible Growth Related Projects

The following are some examples of eligible growth related projects:

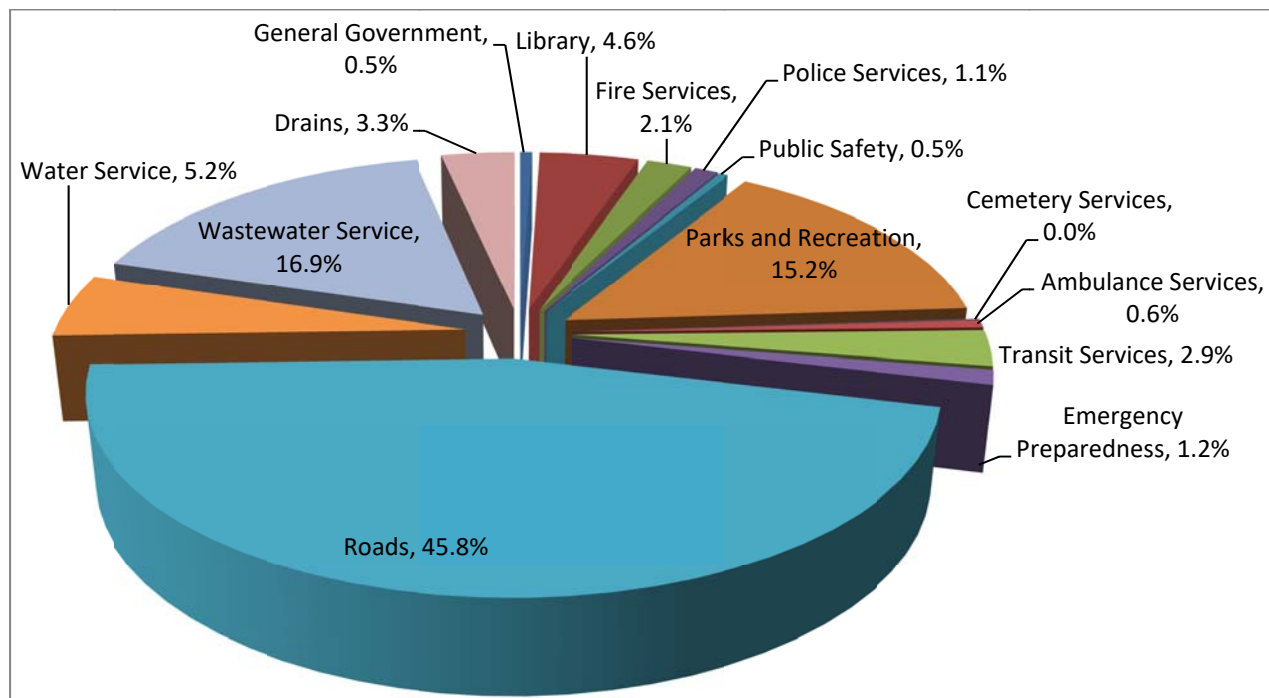
- Adding square footage to a building
- Adding a vehicle to the existing fleet thereby increasing the number of vehicles used by the City
- Adding a road lane, turning lane, streetlights, etc.
- Adding additional roads or buildings to maintain/improve existing service levels
- Required equipment for new staff hires (Police and Firefighters)
- Water main upgrades from existing 300mm to 600mm
- Studies that have a growth component (water master plan, official plan, etc)

Current DC Rate Structure

The following DC rates are in effect until June 30, 2018, before the rates are adjusted based on the report presented to the Finance & Administration Committee in March 2018.

| Servicing | Single Family (per unit) | Semi Detached (per unit) | Multiples and Apartments (per unit) | Industrial (per sq ft) | Commercial / Institutional (per sq ft) |
|--------------------------------|-------------------------------------|-------------------------------------|--|-----------------------------------|---|
| All Services | \$16,150 | \$11,571 | \$9,784 | \$4.63 | \$9.08 |
| Excluding Water | \$15,303 | \$10,964 | \$9,270 | \$4.14 | \$8.56 |
| Excluding Wastewater | \$13,421 | \$9,616 | \$8,131 | \$3.06 | \$7.42 |
| Excluding Water and Wastewater | \$12,574 | \$9,009 | \$7,617 | \$2.57 | \$6.90 |

The development charges collected are used to fund various growth related projects by service area as identified in the 2014 DC Background Study. As illustrated below, the most significant portion of DC's collected for residential development is used for growth related projects in Roads.



Key Steps of the DC Study Process

1. The City has retained Hemson Consulting to prepare population, household and employment forecasts and a development charges background study and by-law. The Outlook for Growth to 2046 report projects out 30 years to 2046 and has been completed using information from the 2016 Census in addition to recent building permit activity. The forecast includes three scenarios; low, reference and high growth. The report recommends using the reference scenario for financial planning and growth management policy purposes.

- The Outlook for Growth to 2046 report was presented to Planning Committee on April 9th, 2018, and included the following major findings:
- CGS stands out as the only major urban area in Northern Ontario with a growing population. By contrast Thunder Bay, Sault Ste. Marie, Timmins and North Bay have all either experienced no increase or a declining population since 2001;
- Greater Sudbury is expected to grow over the next 30 years by between 6,900 to 15,000 people, 6,000 to 8,400 households and 6,400 to 11,000 jobs under the reference and high growth scenarios;
- Shifting patterns in fertility and mortality rates in Ontario will affect the growth outlook;
- The age structure of the population will have a wide range of influence on how Greater Sudbury grows, specifically housing demand;
- Mining continues to be the most important economic factor affecting the growth outlook for Greater Sudbury. It creates variability with respect to the City's economic outlook, and over the longer term can be influenced by resources outside Greater Sudbury such as the Ring of Fire west of the James Bay, and
- Sudbury acts as a regional service centre for nearby municipalities including North Bay and Sault Ste Marie and provides a draw with additional amenities. This regional service function provides some stability to the long term growth outlook.

2. Inventories to determine historic average service levels

Historic average service levels are calculated based on the estimated replacement values for all existing assets in service for the past 10 years and the City's population.

The average service level sets a cap on eligible DC funding, with the exception for water and wastewater services as there is no service level limitation. The City cannot use DC's to increase level of service above 10 year historic average; thereby it establishes the "maximum allowable" charge.

3. Growth-related capital projects

City Council must express their intent to undertake growth-related capital projects in order to be eligible. The total capital cost is reduced by the portion benefiting existing community as well as grants, subsidies, uncommitted DC reserve funds and 10% of 'soft' service capital costs where applicable.

4. Calculate DC rates

Hemson will calculate the DC rates based on the 10 year historic average service levels, population/household growth and growth-related capital projects.

5. DC policy choices

City staff and Hemson will present proposed policy choices to be reflected in the 2019 by-law. An example of policy choices includes review of area-rating DC's as well as secondary unit exemptions, and exemptions for Downtown Centres and Community Improvement Plan Areas.

6. Public Consultation and Development Stakeholder Group

City staff will prepare a communication strategy for the community to share their concerns and input on growth related projects, 2019 DC background study and by-law.

In addition, a development stakeholder group has been created that will provide comments for consideration in the preparation of the DC background study and by-law. There will be three development stakeholder group meetings (first meeting is scheduled for April 18, 2018) as well as the creation of a dedicated email for the public/development community to provide comments for consideration.

7. New DC by-law and policies conforming with the Development Charges Act

Staff and Hemson Consulting Ltd will present the DC Background Study and by-law to the Finance & Administration Committee in Winter/Spring 2019 for approval before June 30, 2019.

Proposed Schedule

The proposed schedule for future presentations to Council for the 2019 DC Background Study and related by-law in time for approval before June 30, 2019 will be as follows:

1. Finance and Administration Committee meetings: Winter/Spring 2019; Presentation of any growth related capital projects and/or by-law and policy changes for approval and/or direction.
2. Finance and Administration Committee during January 2019: Presentation of draft 2019 DC Background Study and DC rates.
3. Public Consultation meeting in January/February 2019.
4. Finance and Administration Committee meeting in late February 2019: Statutory Public Meeting.
5. Finance and Administration Committee meeting in March 2019: Council passage of new DC by-law.

Conclusion

City staff and Hemson Consulting Ltd will continue to develop the 2019 DC Background Study and by-law for presentation to City Council during the Winter/Spring of 2019.

For Information Only

Customer Service Issues and Principles

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Monday, Mar 26, 2018

Type: Presentations

Resolution

For Information Only

Relationship to the Strategic Plan / Health Impact Assessment

This report relates to the pillar "Responsive, Fiscally Prudent, Open Governance" in that it outlines the development of a customer service strategy for the City.

Report Summary

The purpose of this report is to share with Council the issues and principles identified as priority areas to enhance the organization's customer service culture. The issues below have been identified as those that an enterprise-wide customer service strategy needs to address, while the principles are those that should be used to guide the development of such a strategy.

Financial Implications

There are no financial implications associated with this report.

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Customer Service at the City of Greater Sudbury: Issues and Principles

Purpose

The purpose of this report is to share with Council the issues and principles identified as priority areas to enhance the organization's customer service culture. The issues below have been identified as those that an enterprise-wide customer service strategy needs to address, while the principles are those that will be used to guide the development of such a strategy.

Background

In January 2018, staff presented a report to Council entitled "Evolving Service Strategy and 311". This report, and the subsequent presentation made to Finance and Administration Committee on February 6, provided an overview of the strategy staff are developing to establish clear expectations about the service experience people have when doing business with the City. As part of that report, staff identified that focusing on transaction-oriented business processes, including a particular focus on 311 services, will allow staff to produce a series of plans to evolve the organization's policy, process design, technology utilization and staff training, all of which will assist us to ensure that service promises are consistently delivered.

Customer Service Issues at the City of Greater Sudbury

This section describes issues associated with customer service practices at the City of Greater Sudbury and identifies approaches that could be considered to address them. The basis for determining the issues and approaches is a review of a number of sources, including:

- ◆ Employee feedback
- ◆ Citizen survey (2016)
- ◆ Data from 311 and call centre statistics
- ◆ Best practice review including contact with other municipalities and review of other municipalities' customer service strategies
- ◆ Review of findings from the 7th *Citizens First* report on drivers impacting customer satisfaction from the Institute for Citizen-Centred Service (ICCS). The ICCS is a Canadian institute established in the late 1990s to sustain and further develop efforts to improve citizen satisfaction with public sector service delivery in Canada. Their national study, the *Citizens First* report, has

been published at regular intervals since 1998 and analyzes what people think of customer service delivery in Canadian government agencies and what the priorities are for improvement.

These sources help identify the organization's "current state" as well as the issues to be considered when assessing the City's fit with leading, contemporary customer service practices. The detailed research conducted to inform the analysis of the priority areas presented in this report can be found in Appendix A.

Based on the information available, staff have identified five issues that the City should address in order to improve the customer service experience.

1. Policies, Standards and Workflow

Customer service has been identified as a priority by Council, the City's Executive Leadership Team, and municipal employees. It was a key principle associated with the organizational restructuring that occurred in 2016. It was also identified as one of the organizational areas of focus in response to the 2016 employee survey. It is a core mandate of the organization, reflected in the City's Vision, Mission and Values. Finally, Council's Strategic Plan *Greater Together* identifies "refocus on customer service" as a priority.

However, the City does not currently have a common set of policies, standards or workflows that reflect an enterprise approach to customer service. Historically, departments and divisions had little standard guidance to follow when determining customer service approaches. This resulted in inconsistencies and gaps that did not support effective service delivery across the whole organization. In leading organizations and in the data provided by *Citizens First*, it is clear that some additional level of corporate guidance in the form of policies, standards and workflows should exist to ensure the customer experience reflects a "best practice" example.

The City of Greater Sudbury could address this issue by:

- ◆ Comparing existing policies, standards and workflows with best in class examples to identify gaps, modifications or other changes that ensures Greater Sudbury's approach aligns with contemporary leading practice
- ◆ Identifying data requirements for work processes that are considered important for the customer service experience to facilitate performance measurement and feedback with a view to ensuring sufficient, appropriate information is in the right staff's hands, at the right time, to support a focus on service outcomes
- ◆ Regularly seeking and acting on customer service feedback from citizens and employees

2. Service Consistency

This issue reflects not only the absence of corporate guidance described above, but it also reflects the perceived gap between frontline employee survey feedback and the overall corporate perception of the relative priority that "customer service experience" has among a list of corporate issues. *Citizens First* and best practice municipalities indicate that service design across channels needs to reflect a consistent experience. Similarly, the nature of staff interaction in the customer service experience should reflect a

consistent level. For example, a relatively new employee should be just as prepared for common customer service interactions as a seasoned, longer-serving employee so that a customer has a consistent experience with either one.

One of the key issues identified as part of the research conducted in examining customer service issues relates to the lack of regular, routine measurement of our customer service performance. Without reliable, regular data, it is difficult to identify issues – and therefore difficult to devise solutions to resolve them. Measurement is the foundation of a customer service strategy. As noted in Appendix A, the City does not have an entire corporate view of our customer service performance due to missing data on several levels and for different reasons (e.g., different tracking systems, etc.).

The City of Greater Sudbury could address this issue by:

- ◆ Establishing standards for customer service that focus on timeliness, accuracy, and responsiveness;
- ◆ Agreeing on a set of key performance indicators and a regular reporting framework on those KPIs for customer service
- ◆ Defining “first call resolution” and measuring accordingly
- ◆ Developing a process that effectively addresses issue resolution including cross-departmental collaboration, training, process flow charts, and timeline standards
- ◆ Establishing and measuring against customer service response standards

3. Training and Development

While some areas of the organization have localized customer service training and have been very successful in making changes to meet the needs of their specific stakeholders, there remains a need to identify an approach for an enterprise-wide customer service program. Similarly, in the 311 area, training has historically been done on a peer-to-peer basis following an in-house manual. There is an opportunity to review what the training covers, how it covers it, and how it is delivered. Recently, job responsibilities in 311 have been rearranged to ensure that responsibility for the development and implementation of training and quality assurance programs for 311 staff is a specific accountability, to ensure that we can conduct consistent training that allows us to improve on performance over time.

The research also shows that although the leadership competency of “citizen/customer focus” is included in the City’s talent management competency dictionary, we lack systems to identify, foster, and grow that competency in our employees (current, future and potential).

Finally, interdepartmental collaboration is improving; however, there are process enhancements that can still be made. For example, there can be improvements in the flow of information to and from 311 and operations, to reduce the potential for information and process gaps.

Key actions that could address this issue include:

- ◆ Include customer service competencies in all recruitment processes
- ◆ Recognize and celebrate customer service best practices across the organization

- ◆ Source and implement an enterprise-wide customer service program along with a leadership support toolkit
- Establish a customer service commitment statement for leaders and employees to create a sense of accountability and a guiding principle for service expectations
- Review 311 and operating department business processes related to customer service
- Ensure a rigorous and effective issue resolution process
- Empower employees to provide excellent customer service and provide them with the tools to do so effectively
- Establish clear service expectations with the community through a combination of education, communication, and standards.

4. Technology Support

The City currently uses Active Citizen Requests (ACR) as its Customer Relationship Management (CRM) software. This system is used by many, but not all areas, which means that in some cases informal methods of communication are used to receive, handle, and close citizen inquiries. A number of areas are working to establish processes to use ACR (at all, or more effectively). Ultimately, this will result in improved customer service and will also allow for improved tracking of information such as number of calls, escalation of calls, and the rate of inquiries closed (on time and late).

311 service request calls are tracked using ACR, while public works cases are tracked internally through different software, CityWorks. The two systems are integrated at a number of levels but there remain opportunities for stronger integration.

Technological integration will be a significant factor in the discussions associated with the change in CRM over 2018-2019. As Council is aware, the company that developed ACR is no longer supporting the system and a new customer relationship management system must be sourced. As an initial step in that process, an RFP was issued to retain a consultant to develop a CRM business plan and that work will begin shortly. This process will provide an opportunity to look at how CityWorks can be integrated within a new system to streamline the customer service experience.

The drive to change our customer service processes, compounded with the need for a new CRM platform, presents a number of opportunities and challenges. The market has evolved significantly since 2007, and CRM software now offers improved functionalities. The City's ACR currently has limited capacity to integrate with other CGS software. The opportunity exists given the changing market to identify a CRM solution that would assist the City in achieving its customer service, engagement, and operational goals and requirement, while streamlining our CRM processes further.

Key actions that could address this issue include:

- ◆ Continue the process to source a new CRM system
- ◆ Ensure buy-in and commitment to a standard tool for the handling and resolution of requests and complaints by all departments

- ◆ Review and assess technological integration with other City systems that perform or are related to customer service for alignment and consistency

5. Role of the 311 Call Centre

Municipalities with an enterprise-wide customer service strategy use their call centres differently than the City of Greater Sudbury does. Needs, trends, and operational and community requirements have evolved over the last several years, and there is an opportunity to adapt the 311 call centre operations to match those changes. Data shows that 311 operators have the required capacity to implement those changes, and there is an opportunity to review the team's structure to more clearly emphasize customer service excellence and process improvement. This is currently underway, with the successful recruitment of a new Manager of 311 and Customer Service and by focusing the role of an existing staff member on training and quality assurance.

There are, equally, opportunities to create consistency in 311's processes, and in how departments deal with and involve 311 and opportunities to more consistently track and use 311 data, both as it relates to call centre performance and customer trends and satisfaction.

After-hours calls to 311 are handled by a third-party contractor. This can lead to differences in customer service standards, and ultimately decreased customer satisfaction. A review of data from after-hours calls is currently being conducted, and service recommendations will emanate from that review later within the next few months.

Key actions that could address this issue include:

- ◆ Continue to review the structure, roles and job descriptions in 311 to maximize resources available and align roles with organizational need and community expectations
- ◆ Establish a training and quality assurance program for 311 staff
- ◆ Establish processes to integrate 311 operations with operators to ensure accuracy and timeliness associated with responses
- ◆ Review operating hours for the 311 call centre with a focus on customer satisfaction and cost effectiveness

Customer Service Principles

This section describes a set of customer service principles informed by from the issues described above. These principles are those that staff believe should apply to the development of a customer service strategy for the City of Greater Sudbury, and should be reasonably expected to address the issues identified above.

Recommended Principles

1. We have agreed upon standards for customer service.
2. We recruit, train and empower employees to provide great customer service and recognize those who go the extra mile.
3. We resolve issues on a first contact basis where possible.
4. Our staff are knowledgeable and consistently have the information they need to provide the right answer.
5. We are committed to measuring and improving our customer service performance.
6. We use technology to effectively leverage customer service opportunities and address customer service issues.
7. A positive customer service culture is part of the City of Greater Sudbury brand.

None of the above principles can stand alone: they are all interconnected. For example, resolving an issue on the first call (principle 3) cannot reasonably be achieved without measuring our success (principle 5), ensuring that staff have the knowledge to resolve the issue (principle 4), the support of the senior leaders in the organization to go the extra mile (principle 2), and the training and the technology to support their work (principles 2 and 6).

Each of the principles is outlined in more detail below.

Principle 1: We have agreed upon standards for customer service.

The City of Greater Sudbury has committed to customer service excellence in a number of foundational documents. However, there remains a need to clearly identify through policies, standards, and processes what that commitment means. The lack of such tools has historically led to inconsistent customer service practices across the organization, which in turn leads to citizens not knowing what to expect when they engage with the municipality.

As shown in Appendix A, the Institute for Citizen-Centred Services (ICCS) identifies “delivery timeliness” as one of the top two drivers for customer satisfaction. The report also identifies that customer expectations are increasing as it relates to the amount of time they expect to wait to receive a service or have an issue resolved.

This first principle also addresses issues associated with access and consistency of service. As has been shared previously with Council, customer service is provided across the City of Greater Sudbury thousands of times each day in several ways using a variety of media: indirectly (users of municipal infrastructure), directly (in person, in the field, by phone, email, social media or website). The level of service is changeable based on *how* citizens access the service.

By establishing standards for customer service, which are supported by policies, workflow processes, training, and appropriate technology, the City of Greater Sudbury can address a number of issues outlined earlier in this report. Customer service standards will ensure that employees and citizens alike will know

what customer service expectation they should have when engaging with the municipality – no matter which area of the organization they are engaging with.

Principle 2: We recruit, train and empower employees to provide great customer service and recognize those who go the extra mile.

Organizations that excel at customer service have developed or sourced a formal, enterprise-wide customer service training program that is delivered to all frontline employees and that emphasizes the organization's customer service philosophies. Recruitment tools and processes in these organizations routinely address the need for customer service skills, either through interview tools, assessment tools, or reference checks.

The City of Greater Sudbury's talent management framework includes a "customer/citizen focus." It is defined as, "The desire to work closely with internal and external customers (e.g., citizens of CGS, residents, patients, colleagues, other divisions/departments, community partners, key stakeholders, etc.) to meet and exceed their expectations. It is the ability and willingness to understand and address their needs and continually provide high levels of service by keeping customer needs at the forefront of activities. Individuals with high levels of this competency demonstrate a strong commitment to delivering excellent service and achieving customer service outcomes to a high standard of quality." This competency includes the following key behaviours:

1. Takes personal responsibility for delivering quality service.
2. Addresses underlying customer/stakeholder needs.
3. Monitors and improves quality of customer service.
4. Uses a long-term perspective; acts as a trusted advisor.

Recruitment and retention that establish a baseline of customer/citizen focus, supported by formal and ongoing training, is by the senior levels of the organization. The training should include at a minimum decision-making, communication, conflict resolution, positive body language and other important customer service skills. These components are vital to ensuring that City of Greater Sudbury employees are capable of, and supported in, providing great customer service.

In addition, in organizations where customer service is prioritized, employees who provide exceptional customer service are recognized in a public setting and celebrated for their efforts. The City of Greater Sudbury WISE recognition program speaks to customer service excellence; however, this principle decentralizes the responsibility for recognizing – both identifying and celebrating – customer service to all staff, and to citizens as well. Celebrating customer service excellence should reasonably be expected to positively impact on the organization's reputation.

This principle also incorporates one of the City's underlying customer service philosophies, which equates respect with service. This means that just as staff are empowered to make customer service decisions, they are equally empowered to cease the delivery of service when dealing with violence, harassment, or otherwise unacceptable behaviour in the workplace.

Principle 3: We resolve issues on a first contact basis wherever possible.

In their 2014 report, the ICCS identified “issue resolution” as the second of the top two drivers that impact customer satisfaction. This driver is a composite of factors that include:

1. I have confidence that any future issues will be addressed to my satisfaction.
2. Any issues I encountered in the service process were easily resolved.
3. Any complaints I made about my service experience were addressed to my satisfaction.

They note that the strong impact that issue resolution has on satisfaction is a major new finding for the 2014 study, and the ICCS recommends that all jurisdictions should take action to address issue resolution, and citizens’ perceptions of it.

The supporting data in the ICCS report indicates that issue resolution has much to do with resolving barriers to getting service (such as finding the information they need, knowing where to go and what the process is), and issues with staff, as it does with timeliness (ie, having to wait too long to have the issue resolved).

Additionally, first call resolution is a criterion associated with customer service excellence in high performing organization, and clear definition of the term, along with clear targets, are key elements of a service strategy driven by citizen needs and expectations.

By addressing issue resolution, the City will be addressing one of the primary drivers associated with customer satisfaction with government services. It is worth noting that the ability of staff to resolve issues on a first contact basis speaks to a variety of underlying support structures and needs, including: appropriate issue identification, appropriate knowledge base, appropriate training, appropriate leadership support and buy-in, and appropriate tools to measure and track success.

Principle 4: Our staff are knowledgeable and consistently have the information they need to provide the right answer.

The ICCS 2016 report identifies “staff knowledge” as one of several factors that should be improved across government services to positively impact on customer satisfaction, specifically as it relates to citizens’ perception of their interaction with staff.

Customers expect staff who are providing service to them to have the information they need to provide the service. They expect the information they receive to be accurate. They expect that staff are both knowledgeable and competent, and they expect to be able to trust the information they receive.

The City should increasingly focus on creating pathways for the effective transfer of knowledge to those who provide frontline customer service. At the City of Greater Sudbury, there are a number of elements that would seem to indicate that our interdepartmental collaboration processes do not easily allow for knowledge to be transferred to those involved in customer service.

Increasing the knowledge of staff to be able to address issues – or, equally, to be effective navigators to direct people to the right person immediately – will build the City’s capacity to enhance customer satisfaction.

This principle addresses issues associated with resolution rates (that is, case closures) as well as some of the issues associated with the role of the 311 call centre who may be, at times, unable to provide information – or up-to-date information – to residents.

Principle 5: We are committed to measuring and improving our customer service performance.

One of the key issues identified in the customer service issues is the lack of formal, routine measurement of customer service performance at the City of Greater Sudbury. As noted previously, organizations that excel at customer service measure and evaluate the customer experience within their organization. This includes regular surveys using a variety of tools such as mystery shoppers and quantitative data such as first call resolution ratios.

Identifying key performance indicators that speak to our performance as an organization is a foundational element of a customer service strategy. Regular reporting on performance allows us to be responsive to needs and trends, and informs our decision-making.

Measurement is not only on a quantitative level: there are also improvements to be made by measuring and analyzing qualitative efforts. For example, the ICCS recommends that issues faced by clients be tracked and analyzed to identify potential improvement strategies.

Organizations with high customer service performance measure themselves against standards that they have defined for themselves as well as standards accepted as “best practice” in the industry. Measuring our performance means that we can recognize where we are doing well and improve where there are gaps. It also means that we can participate in processes such as the Service Quality Measurement (SQM) Group and other recognizes quantitative analyses.

This principle underlies and informs all other proposed principles.

Principle 6: We use technology to effectively leverage customer service opportunities and address customer service needs.

The ICCS 2014 report identifies a growth in customer preference for accessing government services online. This is in line with the increase that has been seen in the use of mobile technology to access the City’s digital platforms (website, etc.) over the last two years. Currently, more than 53% of users access our services through a mobile platform and that number will continue to grow.

Social media inquiries and complaints account for a small but growing number of ACR cases created. More than 300 emails are sent to the @311 email address each month. As well, e-government services are

becoming a must-have rather than a nice-to-have for all levels of government. Finally, as outlined previously, the City's Customer Relationship Management (CRM) is at the end of its useful life.

This principle speaks to the potential that the City of Greater Sudbury has to leverage technology differently than it has in the past. Specifically, there is alignment between the development of a new IT Strategy and the opportunity to leverage technology and technological through the sourcing of a new CRM system that should allow the City to more effectively identify, track, and resolve issues – all in the service of meeting customer needs and expectations.

The effective use and deployment of appropriate technological solutions is also an underlying principle that will allow for other principles – like rigorous measurement – to be fully established and successful.

Principle 7: A positive customer service culture is part of the City of Greater Sudbury brand.

This principle differs from the previous six in that it is both a principle and an outcome of adopting a strategy that encompasses the recommended principles. By developing – and marketing – a City of Greater Sudbury brand that includes a positive customer experience, we state that the customer experience is part of the planning process for all departments of the City of Greater Sudbury. Whether it be a communication program, a recreation program, a new sign-up process, a Council report, or a direct customer service interaction, this principle states that the customer experience is at the heart of what we do.

Next Steps

The principles described above will be used as the basis for the development of an enterprise-wide customer service strategy. This work is currently underway. A steering committee has been established to lead that process, in parallel with the work being conducted on the replacement of the City's Customer Relationship Management system. While these projects require separate workflows and processes, they are intrinsically connected and must evolve in parallel: a new CRM will support the City's customer service vision, approach, principles, and strategy. Equally, the City's customer service strategy will rely on technology to deliver appropriate, timely, and relevant data to support our work.

Resources Cited

City of Greater Sudbury Citizen Service Policy. <https://www.greatersudbury.ca/linkservid/5F3604D8-E1DB-580B-68019C491790EAEA/showMeta/0/>

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Appendix A: Research and Data

Purpose

The purpose of this appendix is to provide an overview of the research conducted and the findings informing the identification of issues related to customer service for the City of Greater Sudbury.

Employee Views of Our Customer Service Capacity

Frontline employees generally see a need for change in the corporation's customer service approach. Although this item scored ninth highest in grand driver averages in the 2016 employee survey, it accounted for the third highest decrease since 2014, with a decrease of 5.1%. It also received the least number of responses in the question of things "most in need of change" at the organizational level, with only 49 respondents identifying it as one of the two most important (1.7% of responses). However, this item received the lowest score when comparing the City of Greater Sudbury response to the municipal database of the survey service provider, Metrics@Works, with a difference score of 13%. This driver was proportionally more important to frontline employees.

The same was true in the 2014 employee survey: while customer service culture did not rank highly in terms of importance, there was a significant (11 percentage point) drop from 2012 to 2014. It also scored low in comparison with the municipal benchmarking database from Metrics@Works.

As data from the Institute for Citizen-Centred Services (ICCS) shows, the relatively low overall placement of "customer service culture" in the employee survey in the list of important issues is an indicator of a need for change. High-performing organizations place a high value on, and understand how to influence, customer service culture.

Based on feedback from employees, when an internal community engagement task force was established in 2015, it was quickly expanded to include customer service as these were seen to be intrinsically linked. Work conducted in that group identified a number of themes associated with what was perceived as an organizational gap related to customer service and community engagement. These themes were: the ability to respond quickly and consistently to issues, the availability of processes to support consistent responsiveness, the availability of appropriate training for staff on facilitation, conflict resolution, customer service, and engagement, and the need for ongoing education to citizens about what they can expect from the City.

Citizen Views of Our Customer Service Capacity

In 2016, the City conducted a citizen perception survey, which surveyed 1,200 random households for levels of satisfaction with local quality of life and opinions on municipal services.

- ◆ Half of residents that were surveyed (50%) said they had need of some kind of customer service contact with the City over the previous year.

- ◆ A large majority of the customer service contact over the previous year was via telephone – in fact, more than three-quarters of residents who contacted the City had contact by telephone (77%).
- ◆ Most residents were satisfied with the customer service they received.
- ◆ 78% of residents were either ‘very’ satisfied (47%) or ‘somewhat’ satisfied (31%).

This perception to some extent points to a need to delve more deeply into the citizen experience of the City’s customer service capacity. As an example of how other data may mitigate the findings of the Citizen Survey, the ICCS report establishes that one of the key drivers of customer satisfaction is timeliness of response: regular feedback received to the City of Greater Sudbury indicates that there is an opportunity to enhance our consistency in the delivery of accurate information.

The qualitative feedback received about the City’s performance at a general level through different mechanisms (eg, through social media, media stories, calls to staff, letters to the editor, public engagement sessions, anecdotal evidence) reflects a neutral to negative perception of the City’s capacity to deliver service. This can reasonably be considered to extend to our capacity to deliver customer service.

It is noteworthy that the City of Greater Sudbury’s only recent source of quantifiable data relating to customer service is from the 2016 Citizen Survey. This speaks to the need to undertake more routine measurement of customer service satisfaction. As part of this effort, a 2018 Citizen Survey is to be launched imminently.

311 Data and Call Centre Statistics

The City’s 311 service is one of the first points of contact with residents across the community, providing first-contact customer service on over 18,000 calls and 350 @311 emails each month. The 311 Call Centre is staffed by 7 full-time Call Centre Representatives, supplemented by 3 part-time positions, as well as an ACR Software Administrator and a Supervisor. Calls are answered by 311 staff between 8 am and 4:30 pm, with after-hours service provided by a third party contractor.

There is a significant volume of data that is available about the 311 system, including:

- ◆ Calls – volume, topic, department, number of calls after hours
- ◆ Type of call – transfer, ACR, information
- ◆ Customer experience – on-hold time, call abandonment rate, first call resolution rate
- ◆ ACR cases – resolution on time, case escalation rate, late resolution
- ◆ Call centre performance – agent active time, agent talk time.

An average of data pulled from 311 over the last year shows that the rate of “ACR cases closed on time” varies significantly from one department to the next. This is reflective of the fact that different departments have different standards for “closing” a case, as well as different definitions of what “closing” a case means. It is also worth noting that an IT issue in the ACR system impedes the City’s ability to accurately measure the Roads and Water/Wastewater “closed on time” data and the current

“closed on time” data is thought to include cases wherein no metrics are associated (that is, cases where we do not have a definition for “closed on time”).

Some data for the past 12 months from 311 is as follows:

| For the Past 12 Months (March 1st 2017 - February 28th 2018) | |
|---|--|
| # of calls answered by 311 | 218,557 (average of 18,213/month) |
| % first call resolution | 39% |
| % direct transfers by name/extension | 26% |
| French Calls | 3.80% |
| Heaviest Day | 13-Apr 1,242 calls answered |
| Average Talk Time | 54 |
| % Abandoned Calls | 1.78% |
| Active Time per day | 41.96% 27.83% |
| Calls Answered After Threshold (20 seconds) | 6.46% |
| Calls Abandoned After Threshold | 1.08% |
| Top 5 Calls by Department | Solid Waste Tax Department Building Services Roads Department By-law Enforcement |
| # of calls received After Hours | 31,320 |
| # of ACR case created by 311 | 28,213 |
| Top 5 ACR Case Types | Potholes Blue Box Request Green Cart Request Garbage Collection Plowing |
| Emails Received @311 (started tracking in May 2017) | 4,752 |

Best Practice

Assessing “best practice” included a review of other municipalities and organizations that have reviewed their customer service approaches and established customer service strategies. These include: Windsor, Ajax, Barrie, Brantford, Regina, Markham, Kawartha Lakes, Oshawa, and Halton Region.

Common themes found as part of this best practice review include:

- ◆ **Consistency across channels:** organizations embarking on customer service strategies recognize the importance of ensuring a seamless experience for the customer, regardless of which channel they use to engage with the municipality (ie, website, telephone, email, in person).
- ◆ **Role clarity and staff empowerment:** organization leaders must be role models when it comes to customer service and understand and support a customer-oriented service standard. This is demonstrated in several ways, especially with training and tools for staff who deliver customer service, and by processes and a culture where staff are empowered to make decisions “in the moment” about how to provide excellent customer service.
- ◆ **Timeliness:** there is a substantive focus on standards designed to ensure that responses are provided within a reasonable timeframe and that issue resolution is timely. This is supported by a framework to guide the consistent provision of quality customer service.
- ◆ **Rigorous measurement and benchmarking:** organizations that excel at customer service measure and evaluate the customer experience within their organization. This includes regular surveys using a variety of tools such as mystery shoppers and quantitative data such as first call resolution ratios. Employees who provide exceptional customer service are recognized in a public setting and celebrated for their efforts.
- ◆ **Access:** several examples exist of municipalities enhancing the customer experience by adopting different operating hours, expanded services at some locations, and “one-stop shop” counters. This is consistent with, for example, the City of Greater Sudbury’s current approach of using Citizen Service Centres throughout the community in various municipal service buildings.

Staff also interviewed several other municipalities and conducted a site visit at Halton Region. Halton is an example of a municipality that is recognized for its customer service excellence. It has been awarded the Service Quality Measurement (SQM) Group’s annual award for the highest customer service in government, for a number of years. This recognizes government organizations based on their rate of First Call Resolution (FCR) – which is the number of calls required to resolve an issue, answer a question or receive a requested service. The data from Halton reflects a high performing call centre:

- ◆ 90% of Halton Region callers made only one call to get their matter resolved. The average top performing call centre FCR score is 84% and the average government FCR score is 76%.
- ◆ 92% of callers were satisfied overall with their call centre experience.
- ◆ 96% of customers were satisfied overall with the customer service representative who handled their call.

Citizens First Study

As noted in the full report, the ICCS is a Canadian institute established in the late 1990s to sustain and further develop efforts to improve citizen satisfaction with public sector service delivery in Canada. The *Citizens First* study is a study that has been conducted every couple of years since 1998. It establishes measures with respect to citizens’ satisfaction with and expectations of service from Canadian

government, at all levels. It notes that the five drivers of client satisfaction that represent the greatest opportunity to improve the service experience are:

- ◆ Service design
- ◆ Delivery timeliness
- ◆ Staff interaction
- ◆ Channel functionality
- ◆ Issue resolution

Twenty-one components are considered within the five drivers of satisfaction. The components were scored on a matrix that measures impact (high to low) and performance (high to low). The 21 components associated with the five drivers are below, ordered from highest to lowest in terms of their impact on overall customer satisfaction.

| | | | |
|----|--|----|---|
| 1 | Confident future issues will be resolved | 11 | Staff were knowledgeable |
| 2 | Issues were easily resolved | 12 | I received the service I was seeking |
| 3 | Amount of time to receive the service | 13 | Amount of time to get access to the service |
| 4 | Amount of time to get help | 14 | Staff understood my needs |
| 5 | Complaints were addressed | 15 | Staff treated me fairly |
| 6 | Received needed information | 16 | Process to access to the service was easy |
| 7 | I felt good about my staff interaction | 17 | Staff treated me with courtesy |
| 8 | Staff made every effort to address my needs | 18 | Achieve needs by my preferred channel |
| 9 | Satisfied with my experience using the main method | 19 | Easy to access the service by my preferred method |
| 10 | The process to receive the service was easy | 20 | Knew where or how to find the service |
| | | 21 | My personal information was protected |

As can be seen, of the 21 issues, five stand out as priorities for improvement by Canadian governments. The five are related to the drivers of issue resolution and delivery timeliness.

- ◆ Confident future issues will be resolved
- ◆ Issues were easily resolved
- ◆ Amount of time to receive the service
- ◆ Amount of time to get help
- ◆ Complaints were addressed

A sixth component – “Received needed information” – also ranks in the high impact/low performance quadrant. This implies that staff are properly trained to recognize what information to share with

customers and have the ability to do so. These components provide a solid basis for identifying priority issues for the City of Greater Sudbury to consider as part of a customer service strategy.

The study also outlines the difference between service standards and service expectations – for instance:

- ◆ Most expect to wait on hold for no more than 2 minutes (with a shift toward only 1 minute in the most recent study). Demand for wait times under 1 minute has doubled since the previous study, from 16% to 33%.
- ◆ When it comes to expectations for receiving a call-back in response to a message left at a government office, there has been a significant increase in expectations of hearing back within the hour (from 24% to 36%) and the expectation to hear back within the next business day has shifted down from 23% to 14%.
- ◆ The average number of minutes Canadians are willing to search for information for a routine service on a government website is 6.5 minutes which reflects a shift toward even shorter times in the most recent study.
- ◆ The average number of web pages Canadians are willing to search is 3-5 pages. The proportion expecting to search only 1 or 2 pages has increased from 27% in the 6th Citizens First Study to 35% in this most recent report.
- ◆ Most citizens (57%) hold the view that the hours at government offices should be more flexible.

For Information Only

Section 391 Charges - Update of Existing Projects

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Monday, Feb 26, 2018

Type: Correspondence for
Information Only

Resolution

For Information Only

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to operational matters.

Report Summary

The purpose of this report is to provide the Finance and Administration Committee with an update on Section 391 charges collected up to December 31, 2017.

Financial Implications

This report has no financial implications.

Signed By

Report Prepared By

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Background

The purpose of this report is to provide Finance and Administration Committee with an update on Section 391 charges collected up to December 31, 2017. This report provides the total funds received and funds to be received in the future as development occurs and building permits are issued.

Summary of Capital Projects funded with Section 391 Charges

The City is authorized to charge Section 391 recovery charges in accordance with By-Law 2017-6. These charges were put in place before the City updated the Development Charges By-law, and were established to recover from the benefitting landowners the growth related capital costs paid by the City. The three projects are: South End Rock Tunnel, Watermain on Ste.Agnes/Montee Principale, and Water and Sewer capital costs on Kingsway East. These recovery charges will continue to be collected at the building permit stage, as new development occurs until total financing including interest is collected.

Below is a continuity schedule illustrating the Section 391 charges collected up to December 31, 2017, and remaining balances that will be collected when development occurs and building permits are issued.

South End Rock Tunnel:

On October 25th, 2006 City Council authorized By-Law 2006-300 and approved the collection of Section 391 Charges to recover \$4 million of growth related costs from benefitting landowners, over a 40 year period, plus interest.

| | |
|---|---------------|
| Amount to be recovered from Benefitting Landowners in the South End | \$4,000,000 |
| Add: Accumulated Interest to December 31, 2017 | \$1,924,124 |
| Less: Section 391 Charges Collected up to December 31, 2017 | (\$1,119,589) |
| Balance to be recovered from Benefitting Landowners at the Building Permit Stage (2018 to 2046) | \$4,804,535 |

Council funded the \$4.0 million from the Capital Financing Reserve Fund – Wastewater, so annual contributions are contributed back to this reserve fund. During 2017, the City collected \$75,842 (\$73,553 in 2016).

January 1, 2017 to December 31, 2021 rates in accordance with By-Law 2017-6 are \$1,913 for a single residential home, \$1,148 for a multiple dwelling per unit and \$7.02 per sq. metre for commercial or industrial. These rates will increase every five year period to account for the time value of money and the accumulated interest. These charges are in addition to the City's Development Charges since this project was not included in the Development Charges Background Study and related by-law.

Lionel E. Lalonde Centre/St-Agnes/Montee Principale

On March 29th, 2006 City Council authorized By-Law 2006-27 and approved the collection of Section 391 Charges to recover \$105,000 of growth related watermain cost from benefitting landowners, over a 20 year period, plus interest.

| | |
|---|-----------|
| Amount to be recovered from Benefitting Landowners on Ste.Agnes / Montee Principale | \$105,000 |
| Add: Accumulated Interest to December 31, 2017 | \$57,665 |
| Less: Section 391 Charges Collected up to December 31, 2017 | (\$0) |
| Balance to be recovered from Benefitting Landowners at the Building Permit Stage | \$162,665 |

Council funded the \$105,000 from the Capital Financing Reserve Fund – Water, so annual contributions are contributed back to this reserve fund.

In accordance with By-Law 2017-6 the rate is \$495 for a single residential home. This charge is in addition to the City's Development Charges since this project was not included in the Development Charges Background Study and related by-law.

Kingsway Industrial Park - Sewer and Water Enhancements:

On February 28th, 2007 City Council authorized a Section 391 recovery charge and approved by-law #2007-54F on March 7th, 2007, to recover \$3.8 million of growth related costs from benefitting landowners, over a 20 year period, plus interest.

| | |
|---|-------------|
| Amount to be recovered from Benefitting Landowners on Kingsway (as of Dec 31, 2017) | \$2,155,348 |
| Add: Accumulated Interest to December 31, 2017 | \$990,287 |
| Less: Section 391 Charges Collected up to December 31, 2017 | (\$6,626) |
| Balance to be recovered from Benefitting Landowners at the Building Permit Stage (2018 to 2027) | \$3,139,009 |

It was estimated that \$3.8M of growth related capital costs will be incurred from 2007 to 2019. As of December 31, 2017, the City spent \$3,105,380 in which \$2,155,348 is to be recovered from Section 391 charges.

Council approved internal borrowing from the Capital fund, so annual contributions are contributed to reduce this debit balance. There were no Section 391 Charges collected from 2014 to 2017.

2017 rates in accordance with By-Law 2017-6 are \$3,502 for a single residential home, \$1,886 for a multiple dwelling per unit and \$12.32 per square metre for commercial or industrial. These rates were increased on January 1, 2013 (every five year period so has been increased on January 1, 2018) to

account for the time value of money and the accumulated interest. These charges are in addition to the City's Development Charges since this project was not included in the Development Charges Background Study and related by-law.

Conclusion

In accordance with By-law 2018-2 (2018 Water and Wastewater Rates and Charges By-Law), staff will continue to recover these costs from the benefitting landowners and keep Council apprised of annual revenues received.

For Information Only

Asset Management Program

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Wednesday, Apr 04,
2018

Type: Correspondence for
Information Only

Resolution

For Information Only

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to the sustainable infrastructure priority as identified in the Strategic Plan.

Report Summary

The purpose of this report is to present the state of the City's Asset Management Program to Council by outlining the major steps and milestones to develop and implement the City's Asset Management Plan in accordance with the new provincial regulations.

Financial Implications

There are no financial implications associated with this report.

Signed By

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Asset Management Program

Background

The City is responsible for the maintenance and operation of assets valuing \$2.8 billion. These assets are critical for the delivery of service levels expected by the residents of the City of Greater Sudbury.

The City, like most Canadian municipalities, must overcome multiple challenges in managing assets including aging infrastructure; expectations of higher levels of service with minimal financial impact; increasingly demanding and complicated legislation with environmental requirements; and mitigation of the increased risk involved with the execution of service delivery. Due to these increasing pressures, the City will need to implement a focused and calculated approach to address these challenges through the development of a detailed asset management plan.

Asset management is the systematic and coordinated activities and practices of an organization to optimally and sustainably deliver on its objectives through cost-effective life-cycle management of assets. In June 2011, the province of Ontario released a long-term infrastructure plan for Ontario entitled *Building Together*. *Building Together* laid out a standardized and calculated approach to asset management planning. *Building Together* in conjunction with the *Infrastructure for Jobs and Prosperity Act, 2015* established a criteria and timeline for all municipalities to have an Asset Management Plan in place by December 31, 2016. An asset management plan was required by this date in order to be eligible for Federal and Provincial Government Funding. The City of Greater Sudbury's Asset Management Plan (2016), was produced by KPMG in conjunction with City staff. The plan reflects an approximate level of the financial requirements associated with maintaining City assets in a good state of repair.

On May 25, 2017 the Government of Ontario released a proposed Asset Management Regulation which they requested feedback from municipalities. Feedback was received, taken under consideration and on December 13, 2017 the province approved *O. Reg. 588/17: Asset Management Planning for Municipal Infrastructure* under the *Infrastructure for Jobs and Prosperities Act, 2015*. The effective date of *O. Reg. 588/17* is January 1, 2018, however there are no requirements to be met for this date. The new Provincial Regulation alters the proposed phasing period reported to Finance and Administration on October 24, 2017.

The purpose of this report is to present the state of the City's Asset Management Program to Council by outlining the major steps and milestones to develop and implement the City's Asset Management Plan in accordance with the new provincial regulations. This report is a follow-up to the Asset Management Strategy report provided to Council in October 2017.

Asset Management Program Status Report

The next steps in the progression of the City's asset management plan are summarized in Table 1. Additional information for these milestones is also provided below Table 1.

| Table 1: Steps and Milestones | | | |
|--------------------------------------|--|------------------------------------|---|
| | Milestone | Date Required (Legislation) | Status |
| 1 | Asset Management Policy | July 1, 2019 | Complete |
| 2 | Capital Prioritization Tool | - | In Progress |
| 3 | Asset Management Plan (Phase 1) for core infrastructure assets (roads, bridges and culverts, water, wastewater and stormwater management) that discusses current levels of service and the cost of maintaining those services. | July 1, 2021 | In Progress |
| 4 | Asset Management Plan (Phase 2) for all municipal infrastructure assets that discusses current levels of service and the cost of maintaining those services. | July 1, 2023 | Data collection underway; Phase 2 plan to commence following Phase 1 implementation |
| 5 | Asset Management Plan (Phase 3) for all municipal infrastructure assets that builds upon the requirements achieved in 2023. Additional requirements include proposed levels of service, the activities required to achieve the proposed levels of service and a financial plan to fund the activities. | July 1, 2024 | Phase 3 plan to commence following Phase 2 implementation |
| 6 | Annual review of Asset Management Progress following implementation of the Phase 3 asset management plan. | July 1 (annually) | July 1 (annually) |
| 7 | Asset Management Policy and Plan updates. | Every 5 years | Every 5 years |
| 8 | Internal and External Transparency - Policies and Plans shall be provided to the ministry or any persons as requested and will be posted to the City's website. | Once Completed | Once Completed. |

1. Attached as Appendix A is the City's Enterprise Asset Management Policy which has been created to meet the legislative requirements which are discussed below.
 - The purpose of the policy is to outline the City's municipal goals and plans for continuous improvement and adoption of best practices regarding asset management planning.
 - The policy provides a framework to achieve the City's goals and plans with the introduction of critical asset management guiding principles.
 - A citywide commitment and collaboration is required for the successful implementation of the asset management program. The asset management policy defines the roles and responsibilities of different groups such as Council, the City's Executive Leadership Team, the City's Asset Management Coordinator, Divisional and Sectional Leaders, Financial Services and Asset Users and Operators.
2. Currently in development is the Capital Prioritization Tool. This tool will provide a link to the Capital Budget Policy which will be provided under a separate report. The Capital Prioritization Tool is being developed in accordance with the asset management guiding principles outlined within the Enterprise Asset Management Policy with the objective of achieving the following:
 - The purpose of the Capital Prioritization Tool is to ensure a clear and calculated approach to capital funding allocation by assisting decision makers with strategically prioritizing what needs are most important and in understanding how they can be addressed.
 - The Capital Prioritization Tool will consider legislative requirements such as the Accessibility for Ontarians with Disabilities Act.
 - Risk management is a major component to support the life-cycle of an asset. The City's risk management goals involve identifying, understanding and mitigating the risks involved with owning and operating infrastructure assets. A risk exposure assessment will be incorporated into the Capital Prioritization Tool to ensure the City takes the best approach to manage and maintain assets within an acceptable level of risk.
3. The primary milestone of the asset management program is the Asset Management Plan. As a minimum the first iteration of the City's Asset Management Plan will include core infrastructure assets as per legislation.
4. Following the completion of the asset management plan for core infrastructure, the City will continue working on the asset management plan to incorporate all municipal infrastructure assets such as Fleet and Buildings and Facilities.

5. The Phase 3 asset management plan will include additional clarity on proposed levels of service, inventory/lifecycle management, as well as a financial strategy which incorporates solutions to address any funding shortfall, a financial strategy to service growth (ex. development changes) and a risk analysis.

Next Steps

1. The City is in the process of implementing an enterprise-wide method for capital prioritization. The prioritization process will differ from the envelop system from previous years and will support the key principles outlined in the Enterprise Asset Management Policy.

The proposed capital prioritization process will provide Council the opportunity to establish capital priorities through categories such as Public Safety, Environment, Transportation, Recreation, Land Use Planning, Corporate Support, Health and Economic Development. This process will be presented to the Finance and Administration Committee as a part of the Budget direction report scheduled for the May 15, 2018 meeting.

Technical experts within City departments will prioritize projects using an enterprise-wide tool being developed by City staff. The tool will be distributed with the 2019 Budget Call. A committee of peers will rank the projects using this tool and ELT will prepare the capital budget on the basis of this prioritization.

2. The Capital Budget Policy is being refined to reference the Long Term Financial Plan and consider the priorities outlined by the proposed capital prioritization process. The revised Capital Budget Policy will be provided in June.
3. Capital Budget Deliberations and Approval will occur in Early 2019.

Conclusion

This report provides information on the steps staff will be taking to implement an enterprise wide approach to evolving the City's asset management program and prioritizing capital investment.

The timeline for development and implementation of the City's asset management program has been outlined by the Province under the *Ontario Regulation 588/17*. The success of the City's asset management program relies on the collaboration of all City departments. Staff within Corporate Services will work with individual departments to ensure the City meets and achieves the steps and milestones as outlined.

Asset management will continue to provide the City with a framework for consistent, calculated, reliable and transparent decision making. Staff will update Council regularly on the status of the City's asset management plan.

References

1. Ministry of Infrastructure Ontario (2011) Building Together – Guide for municipal asset management plans. (Online: <https://www.ontario.ca/page/building-together-guide-municipal-asset-management-plans>). Queen's Printer for Ontario 2012.
2. Infrastructure for Jobs and Prosperity Act, 2015. (Online: <https://www.ontario.ca/laws/statute/15i15>). Queen's Printer for Ontario 2015.
3. Ontario Regulation 588/17. (Online: <https://www.ontario.ca/laws/regulation/r17588>). Queen's Printer for Ontario 2018.
4. KPMG (2016) City of Greater Sudbury Municipal Asset Management Plan. KPMG, Sudbury, Ontario. (Online: <http://agendasonline.greatersudbury.ca/index.cfm?comid=58&year=2016&lang=en&browse=Search#browsebycommittee>). November 28th, 2016.

Enterprise Asset Management Policy

1. Introduction:

Asset management planning is the process of making the best possible decisions regarding the acquisition, operating, maintaining, renewing, replacing and disposing of infrastructure assets and is regarded as best practice for long-term financial planning. The objective of the City of Greater Sudbury Enterprise Asset Management Policy is long-term sustainability through principles which target a coordinated and consistent asset management approach for all asset classes in accordance with O. Reg. 588/17: *Asset Management Planning for Municipal Infrastructure*.

The City of Greater Sudbury (the City) strives to ensure a high quality of life is provided to the public through municipally funded services including water and wastewater services, storm water management, intricate transportation networks, public transit, emergency services, sport and recreation, cultural services and solid waste management.

Many of the assets belonging to the City have long-term lifecycles spanning over decades such as roads networks and buildings, while other asset lifecycles are short in comparison such as advancing technology and security or capacity requirements. Long-term lifecycles require operational maintenance and rehabilitation or renewal activities to ensure the established levels of service are delivered.

Over time the City has addressed the development and implementation of asset management strategies to manage asset lifecycles. The City has proactively examined and implemented long-term rehabilitation and replacement strategies through condition assessments and reporting on the state of the infrastructure.

During the year-end of December 31st, 2016, the City reported a total investment of \$2.826 billion in tangible capital assets (TCA) at historical cost; for which an estimated total replacement cost of over \$7 billion has been determined. These tangible capital assets contribute to the high quality of life enjoyed by city residents and are essential to deliver the necessary levels of service. The TCA included in this description are shown in Figure 1 below.

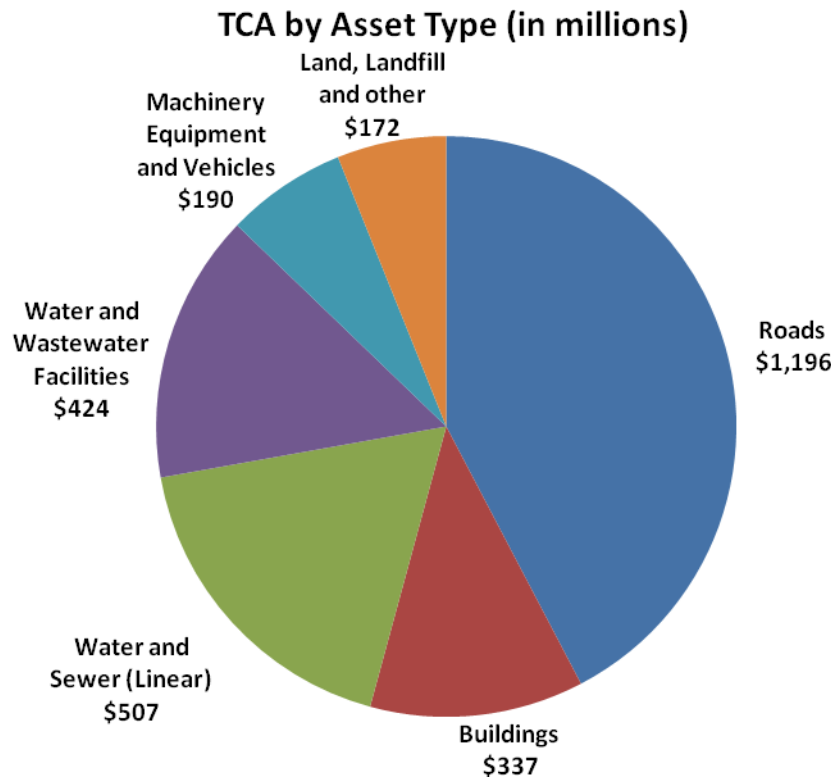


Figure 1: Tangible Capital Assets owned by the City to date. The term other represents assets under construction which includes roads, buildings, water and wastewater infrastructure, etc.

The Enterprise Asset Management program strives to achieve sustainability through established levels of service, asset level of service, cost effective life cycle management and risk assessment. This policy will play a critical role in guiding the development of consistent asset management practices across the City.

2. Policy Statement

The City of Greater Sudbury ensures its municipal infrastructure systems are supported by plans and financing decisions that demonstrate effective service support and appropriate regard for managing lifecycle costs.

3. Application

This policy applies to the lifecycle management activities of physical assets that are owned and operated by the City of Greater Sudbury. This policy sets out the organization's commitments and expectations for decisions and activities concerning asset management.

4. Purpose

This policy provides guidance applicable to the whole organization and all of its services to minimize the risk of service interruption or increased cost due to asset failure while supporting the consistent delivery of expected service levels.

5. Terms and Definitions

Asset: a) are held for use in the production or supply of goods and services, for rental to others, for administrative purposes or for the development, construction, maintenance or repair of other tangible capital assets;
b) have useful economic lives extending beyond an accounting period;
c) are used on a continuing basis; and
d) are not for resale in the ordinary course of operations.

Asset Level of Service (ALoS): The condition and performance expectation for a given asset in order to produce desired levels of service.

Asset Management: The systematic and coordinated activities and practices of an organization to optimally and sustainably deliver on its objectives through cost-effective life cycle management of assets.

Asset Management Plan: Long-term plans that outline the asset activities and programs for each service area and resources applied to provide a defined level of service in the most cost-effective way.

Enterprise Asset Management Program: The application of asset management principles and practices on an enterprise level to ensure a consistent, coordinated, cost effective and sustainable approach across all City departments to achieve the enterprise asset management goals.

Fiscal Stewardship: The representation of planning, attention, conservancy, care and management of the City's financial resources.

Life-Cycle: The time interval stages involved in the management of an asset beginning with the identification of the need for the asset, through design, construction and commissioning, maintenance and rehabilitation of the asset and concluding with the decommissioning and disposal of the asset.

Life-Cycle Costs: The total cost of an asset through its life including planning, design, construction, acquisition, operation, maintenance and rehabilitation and disposal costs.

Levels of Service (LoS): describes the outputs or objectives an organization or activity intends to deliver to customers via the respective asset class.

Risk Management: Coordinated activities to direct and control an organization with regard to risk.

Strategic Plan: A plan containing the long-term goals and strategies of an organization. Strategic plans have a strong external focus, cover major portions of the organization and identify major targets, actions and resource allocations relating to the long-term survival, value and growth of the organization.

6. Enterprise Asset Management Goals

To provide a framework and principles for asset management strategies that:

- Ensure legislative requirements are achieved;
- Create understanding about and optimize asset life-cycle costs while maintaining acceptable levels of service;
- Ensure existing and future asset needs are prioritized;
- Link investment decisions to service outcomes;
- Demonstrate financial sustainability through full life-cycle cost planning;
- Focus on long-term considerations and decision making.

7. Principles

The City owns, operates and maintains a wide variety of assets. The objective of the Enterprise Asset Management Policy is to ensure acceptable levels of service over the long term are satisfied by appropriate asset management practices throughout an asset's service life.

Asset Management guiding principles and practices will help to achieve the City's goals to provide the required services to support community needs by:

- Establishing full life-cycle costing principles aligned with asset management strategies that minimize ownership costs over the asset's service life;
- Maintaining assets in order to deliver defined levels of service that meet legislative requirements and customer expectations;
- Reducing reactive maintenance by emphasizing a planned asset maintenance approach;
- Risk management strategies to support service delivery at expected levels of service;
- Clear and continuous connections to the corporation's long-term financial plan and related financial policies;

- A system of performance monitoring and reporting on asset level of service and the impacts of potential changes in policy, levels of service or risk;
- Desired asset level of service will inform choices about appropriate maintenance strategies;
- Coordinate asset management planning to provide connection with multiple interrelated assets;
- Development and evolution of asset management knowledge, messaging and competencies across the corporation and with the public to ensure participation, feedback and appropriate use of the Enterprise Asset Management Program;
- Capital assets that the City does not require to meet its current or future program or operational needs are disposed;
- Align Infrastructure planning and priorities with the principles outlined in section 3 of the Infrastructure for Jobs and Prosperity Act, 2015 including:
 - alignment with Ontario's land-use planning framework;
 - promote economic competitiveness and innovation;
 - continued provision of core public services such as health care and education;
 - protect the health and safety of workers involved in the construction and maintenance of infrastructure assets.
- Minimize the impact of infrastructure on the environment and design infrastructure to be resilient to the effects of climate change. Monitor vulnerabilities caused by climate change and anticipate costs to manage vulnerabilities.
- Maintain assets to protect the safety of the public and health & safety of our employees.

8. Key Documents in Asset Management Framework

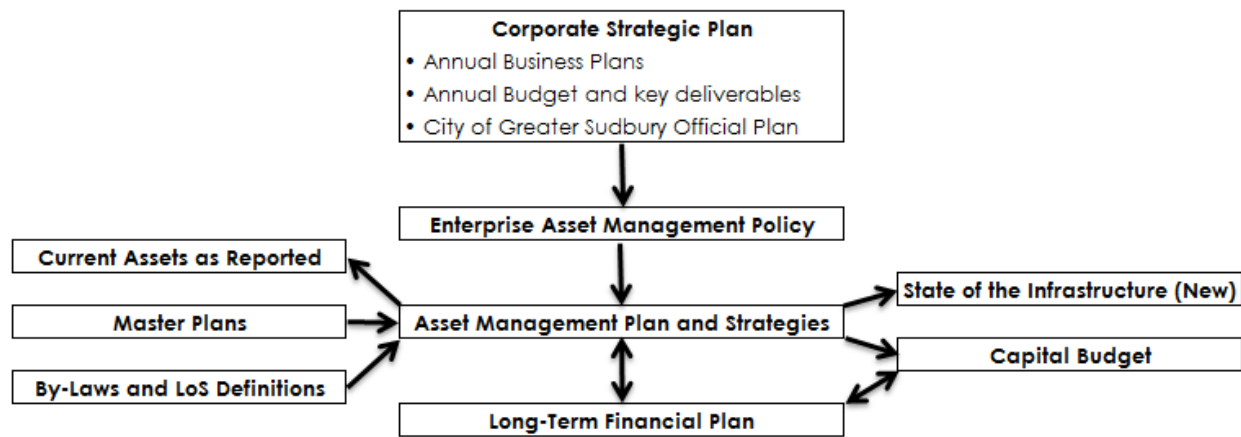


Figure 2: Key Documents in the City's Asset Management Framework.

1. Corporate Strategic Planning Documents

The mission of the City of Greater Sudbury as detailed in strategic planning documents provides the overall direction and requirement for Asset Management Policy and Planning. The annual work planning process drives the production of the budget which is the authoritative source of levels of service. These levels of service place a demand on assets.

2. Enterprise Asset Management Policy

The Asset Management Policy will establish the goals and outline the key principles for the enterprise asset management program. This policy is intended to provide clear asset management direction.

3. Asset Management Plan

The Asset Management Plan will be developed in accordance with Building Together – Guide for Municipal Asset Management Plans, the International Infrastructure Management Manual, 2015, O.Reg. 588/17: Asset Management Planning for Municipal Infrastructure, 2017 and the principles included in Section 3 of the Infrastructure for Jobs and Prosperity Act, 2015. Information collected and analyzed shall include:

- Sustainable financial planning with an understanding of impacts on the level of service delivered;
- Changing demographics and economic trends;
- AODA accessibility standards, Water Opportunities Act, Safe Drinking Water Act, Occupational Health and Safety Act, Ontario's land-use planning framework, Planning Act, and other applicable legislation and standards;

- An understanding of current asset inventories and condition, as well as projected performance, remaining service life, future needs and costs;
- A clear understanding of risks related to assets and the City's ability to mitigate the risks including consequences of failure and contingency planning;
- The feasibility of acquiring or constructing new assets.

The capital threshold to determine which assets will be included within the asset management plan shall be in accordance with the City's Capitalization Threshold as outlined in the Tangible Capital Asset Policy.

3.1. Asset Management Strategy

The Asset Management Strategy requires collaboration between all personnel listed within section 9 Roles and Responsibilities.

The strategy will reflect levels of service expectations and the department's planned outcomes. Asset maintenance practices will continue to be developed and implemented with the objective of maximizing asset life-cycle and reliability by carrying out interventions at the right place and the right time considering budgetary and resource constraints.

The strategy will also include prioritization of required maintenance, rehabilitation and construction projects combined with budget requirements to be incorporated in the City's budget planning.

9. Roles and Responsibilities

Council

- Establish levels of service expectations.
- Approve the enterprise asset management plans.
- Approve asset investment and service delivery requirements for capital and operations through the annual budget process.

Executive Leadership Team

- Endorse asset management plans and strategies.
- Create an asset management governance structure.
- Develop administrative plans to address Council's level of service expectations.
- Demonstrate support for and encourage application of the Asset Management Principles.
- Produce a "State of the infrastructure" report to Council at least once per term.
- Ensure alignment of Asset Management Plans and Strategies with organizational objectives and strategies.
- Recommend asset investment and service delivery required for capital and operating through the annual budget process.

Asset Management Coordinator

- Establish policies and practices to ensure consistency across the corporation.
- Encourage information sharing throughout the departments.
- Provide input and guidance or assistance for development of divisional asset management plans following a standardized and consistent methodology.
- Provide support during the development of levels of service.
- Review, develop, recommend and implement asset management policies, guiding principles, plans and strategies.
- Review and monitor the performance of Asset Management Plan and Strategies for continuous improvement.
- Coordinate financial planning, strategic planning and information technology requirements.
- Produce reporting of asset class data.
- Ensure compliance with provincial asset management legislation and standards.
- Ensure accountability for implementation of goals and objectives.
- Lead the implementation of asset management initiatives.

Divisional and Sectional Leaders

- Ensure project, operations and maintenance work is consistent with enterprise asset management objectives.
- Liaise with all stakeholders with respect to asset management objectives and levels of service.
- Provide input and direction for development of divisional asset management plans.
- Responsible for the development and implementation of asset management plans and strategies.
- Coordinate sectional asset management reporting.
- Development of asset inventories, condition assessments and risk assessments.
- Develop and implement data collection requirements to meet asset management objectives.
- Lead the implementation of asset management initiatives.

Financial Services

- Provide financial business partnerships to departments.
- Ensure the financial stewardship of financial assets and records.
- Ensure consistent and pertinent financial reporting.

Asset Users and Operators

- Provide input on current levels of service.
- Provide input on current status of asset function and life-cycle.
- Provide input on asset needs to meet approved levels of service.
- Participate in the development and implementation of divisional asset management plans.
- Regularly review asset documentation, data collection requirements, data inputs/outputs and asset measurement tools for relevance with existing policies and practices.
- Respect assets under their care and responsibility including implementing any preventative maintenance programs, and operating in accordance with defined operating limits, guidelines, and regulatory limitations.

10. Reference Material

KPMG (2016) City of Greater Sudbury Municipal Asset Management Plan. KPMG, Sudbury, Ontario. (Online: <http://agendasonline.greatersudbury.ca/index.cfm?comid=58&year=2016&lang=en&rowse=Search#browsebycommittee>). November 28th, 2016.

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The City of Greater Sudbury 2018 Budget, 2018. (Online: <https://www.greatersudbury.ca/city-hall/budget-and-finance/2018-budget/>)

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For Information Only

Election Compliance Audit Committee

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Wednesday, Mar 28,
2018

Type: Correspondence for
Information Only

Resolution

For Information Only

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to operational matters.

Report Summary

This report updates Council on the changes made to the Municipal Elections Act since 2014 in regards to the Election Compliance Audit Committee, and the process for recruiting and appointing three citizens to the Election Compliance Audit Committee for the term between December 1, 2018 to November 30, 2022.

Financial Implications

There are no financial implications associated with this report.

Signed By

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Recommended by the C.A.O.

Ed Archer
Chief Administrative Officer
Digitally Signed Apr 3, 18

Executive Summary

The purpose of this report is to provide information to Council on the legislative requirement to appoint persons to an Election Compliance Audit Committee for the upcoming municipal election, and to provide information on the recent changes made to the *Municipal Elections Act* pertaining to the operation and mandate of Election Compliance Audit Committees.

Background

In 2009, Bill 212, "An Act to Promote Good Government", was passed by the Ontario legislature, which amended the *Municipal Elections Act* and made it mandatory that all municipalities and local boards appoint an Election Compliance Audit Committee prior to October 1st of each election year.

The Election Compliance Audit Committee is not a Committee of Council in the ordinary sense of Committees established by Council under the authority of the *Municipal Act*. The primary difference is that the Election Audit Compliance Committee is completely independent and is granted specific decision making powers under the *Municipal Elections Act*. Decisions of the committee are not subject to ratification by Council and may be appealed to the Superior Court of Justice within 15 days after the decision is made.

Any eligible elector who believes on reasonable grounds that a candidate has contravened a provision of the *Municipal Elections Act* relating to election campaign finances may apply after the election for a compliance audit of the candidate's election campaign finances. Applications for a compliance audit must be made to the City Clerk within 90 days after the latest of the following dates:

- 1) The filing date under section 88.30;
- 2) The date the candidate filed a financial statement, if the statement was filed within 30 days after the applicable filing date under section 88.30;
- 3) The candidate's supplementary filing date, if any, under section 88.30;
- 4) The date on which the candidate's extension, if any, under subsection 88.23 (6) expires.

Additionally, there are new regulations in the *Municipal Elections Act* governing the spending of registered third parties. Some of these new regulations pertain to the Election Audit Compliance Committee. Similar to the process used for

candidates, any eligible elector who believes on reasonable grounds that a registered third party who is registered in relation to the election in the municipality has contravened a provision of the *Municipal Elections Act* relating to campaign finances may apply for a compliance audit of the campaign finances of the registered third party. Applications for a compliance audit must be made to the City Clerk within 90 days after the latest of the following dates:

- 1) The filing date under section 88.30;
- 2) The date the registered third party filed a financial statement, if the statement was filed within 30 days after the applicable filing date under section 88.30;
- 3) The registered third party's supplementary filing date, if any, under section 88.30;
- 4) The date on which the registered third party's extension, if any, under subsection 88.27 (3) expires.

The powers and functions of the Election Compliance Audit Committee are detailed in section 88 of the *Municipal Elections Act*, and can be summarized as follows:

- Consider a compliance audit application received from an elector in regards to a candidate or a registered third party, and decide if it should be granted or rejected.
- If the application is granted, appoint an auditor licensed under the *Public Accounting Act*, 2004.
- Receive and consider the auditor's report
- Decide whether to commence a legal proceeding against a candidate and/or registered third party for an apparent contravention

Recent Changes to the Municipal Elections Act

There have been a number of changes made to the *Municipal Elections Act* since 2014, which will affect the Election Compliance Audit Committee in the upcoming term.

One legislative change that has been made to the *Municipal Elections Act* since the last election pertains to the recovery of costs from an applicant. Previously, if the Election Compliance Audit Committee's report indicated that there was no apparent contravention and the committee found that there were no reasonable grounds for the application, the council or local board was

entitled to recover the auditor's costs from the applicant. However, in the most recent version of the legislation, this provision has been removed and there is no similar provision to allow for the recovery of costs from an applicant.

Another legislative change that has been made to the *Municipal Elections Act* since the 2014 election pertains to the committee's decision on an application. Once the committee has made the decision to grant or reject an application, they must now provide brief written reasons for their decision, and provide those to the candidate, the clerk, and the applicant. This new requirement is found in section 88.33(8) of the *Act*. Previously there was no requirement for the committee to provide any written reasons for their decisions.

A further change relates to how the meetings of the election compliance audit committee are held. The new provisions of the *Act* still provide that the meetings of the Election Compliance Audit Committee shall be open to the public, but now allow deliberations in private.

Composition of the Committee

For the 2010 municipal election, Council appointed three citizens and one alternate to the Committee. This process was followed again for the 2014 municipal election, and again a committee of three citizens and one alternate was chosen. This composition has been successful for the 2010 and 2014 municipal elections and staff will proceed with a similarly constituted committee for the upcoming 2018 election. The committee members in the past have been paid a \$200 per diem, and this amount will be used again for the upcoming term.

The City of Greater Sudbury will begin to advertise for citizens to sit on the Election Compliance Audit Committee shortly for the term from 2018 to 2022. The opportunity will be advertised in the media, circulated to professional bodies representing regulated professions and posted on the CGS website. To ensure no potential conflicts, each of the applicants will be required to sign a statement agreeing not to prepare or audit the election financial statements of any candidate for office in the Municipal or School Board elections in the Greater Sudbury area, or for any registered third parties, and stating that they were neither a candidate, nor a member of an election campaign team.

As the Election Compliance Audit Committee may be asked to review applications pertaining to members of Council, the last two Councils wished to minimize potential conflicts and had a staff group, comprising of management staff from Clerks Services and Finance, complete a review of applicants and recommend appointments to Council. The same process will be followed in 2018 unless Council directs otherwise.

The committee requires individuals with the ability to work independently with minimal guidance from CGS staff, as staff would be in a conflict situation if the application concerned a sitting member of Council. Because of these powers and because the Committee has the ability to retain auditors and commence legal proceedings without consultation with staff, the municipality is seeking very specific, professional skill sets from the Committee members.

The applicants will be interviewed over the summer and the interviews will be constructed to ascertain how each applicant demonstrates:

- Experience in receiving and understanding financial information, preferably with knowledge and understanding of municipal election financing rules;
- Experience working in a profession that imposes professional standards on its members, where breach of those standards may lead to discipline
- Analytical and decision making skills;
- Experience working on a committee, task force, tribunal, disciplinary panel or similar body;
- Excellent written and oral communication skills.

A report will be presented to Council in September of 2018 with regards to the recommended appointees to the Election Compliance Audit Committee for the term December 1, 2018 - November 30, 2022.

Resource Links

Municipal Elections Act

<https://www.ontario.ca/laws/statute/96m32>

Municipal Election - Creation of a Compliance Audit Committee, Report presented May 14, 2010:

<http://agendasonline.greatersudbury.ca/index.cfm?pg=agenda&action=navigator&id=254&itemid=2597&lang=en>

Election Compliance Audit Committee – Nominees, Report presented September 14, 2010:

<http://agendasonline.greatersudbury.ca/index.cfm?pg=agenda&action=navigator&id=260&itemid=3393&lang=en>

Election Compliance Audit Committee, Report presented May 27, 2014:

<http://agendasonline.greatersudbury.ca/index.cfm?pg=agenda&action=navigator&id=722&itemid=8691&lang=en>

Election Compliance Audit Committee, Report presented September 9, 2014:

<http://agendasonline.greatersudbury.ca/index.cfm?pg=agenda&action=navigator&id=786&itemid=8942&lang=en>

Request for Decision

Fleet - External Services Agreement

Presented To: Finance and
Administration
Committee

Presented: Tuesday, Apr 17, 2018

Report Date Wednesday, Apr 04,
2018

Type: Managers' Reports

Resolution

THAT the City of Greater Sudbury authorizes the General Manager of Corporate Services to enter into an agreement with Manitoulin-Sudbury District Services Board (MSDSB) for the provision of Paramedic fleet services as outlined in the report entitled "Fleet – External Services Agreement" from the General Manager of Corporate Services, presented at the Finance and Administration Committee meeting on April 17, 2018;

AND THAT the City of Greater Sudbury authorize that a business case be prepared for the 2019 budget in order to convert part-time employee hours to a Permanent Full Time employee to be funded by MSDSB for the purposes of servicing MSDSB vehicles.

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to operational matters.

Report Summary

This report highlights the recommendations and benefits of entering into an agreement to provide fleet services to the Manitoulin-Sudbury District Services Board.

Financial Implications

Funding for the costs of this initiative would be provided for by the Manitoulin-Sudbury District Services Board.

Signed By

Report Prepared By

Shawn Turner
Director of Assets and Fleet Services
Digitally Signed Apr 4, 18

Division Review

Ed Stankiewicz
Executive Director of Finance, Assets
and Fleet
Digitally Signed Apr 4, 18

Financial Implications

Jim Lister
Manager of Financial Planning and
Budgeting
Digitally Signed Apr 4, 18

Recommended by the Department

Kevin Fowke
General Manager of Corporate
Services
Digitally Signed Apr 4, 18

Recommended by the C.A.O.

Ed Archer
Chief Administrative Officer
Digitally Signed Apr 4, 18

Background

Fleet Services provide vehicle/equipment acquisition, maintenance, and disposal services to City departments. The types of vehicles/equipment serviced include Heavy Trucks and Equipment (Plows, Graders, Loaders etc.), light and medium duty fleet (cars, vans, trucks), specialty equipment (Zamboni, Sweepers, etc.), and Emergency Vehicles (Fire and Paramedic Services).

Fleet Services currently maintain a fleet of 24 ambulances and 13 Primary Response Units (P.R.U) that are operated by C.G.S. These units are highly specialized and include sophisticated machinery specific to the service. As a result, some Fleet Services technicians have studied to attain Emergency Vehicle Technician Certifications (E.V.T). The servicing of emergency vehicles such as ambulances by certified technicians provides more reliable equipment, thus enhancing the safety of the public and emergency personnel. Additionally, having knowledgeable technicians who are trained to work on emergency vehicles will influence the organization's reputation and provide customer assurance that quality work will be performed.

In the fall of 2017, Assets and Fleet staff were approached by the MSDSB Chief of Paramedic Services in order to ascertain the possibility of Fleet Services entering into an agreement to service some MSDSB Ambulances and Primary Response Units (P.R.U.). Currently, MSDSB Ambulances are serviced by a variety of businesses throughout their coverage area and they would like to consolidate them into a smaller list of providers.

MSDSB provides paramedic services to a geographic area that includes Foleyet to the north, Hagar & Noelville to the east, Massey to the west and Manitoulin Island to the South. The map below provides an overview of the service area.



The Agreement

Fleet Services does not currently have the capacity to provide service to MSDSB. Although the Lorne Street garage has the physical space to expand, Fleet does not have the appropriate amount of infrastructure (ex. Hoists, diagnostics), and human resources to perform this additional service. This was articulated to MSDSB, and they have responded by offering to bear the cost of increased capacity at the Lorne Street garage.

Discussions with MSDSB have yielded the following general conditions:

- The proposed agreement would require Fleet services to provide repair and maintenance services to 15 ambulances and 4 P.R.U. Services would include all scheduled maintenance as dictated by regulation and repairs as required.

Services excluded would consist of body work, GPS/Satellite equipment and other services that are not provided by Fleet Services for C.G.S. operated ambulances.

- MSDSB would be responsible for paying for the increase in capacity that would be required to service their needs. In particular, MSDSB would pay a fixed monthly fee that would cover the cost of one Full Time Equivalent (FTE) and any associated expenses. Additionally, a one-time cost of purchasing and installing an additional hoist and/or other requirements would also be provided by MSDSB.
- MSDSB would pay an hourly charge on service provided in consideration of shop supplies, building maintenance, utilities, administration, etc.
- Services such as parts and contracted services procurement would garner a 10% markup to cover associated handling costs.
- Delivery and pickup of vehicles are the responsibility of MSDSB.
- Future cost escalations will be determined by the applicable contract or index (ex. C.B.A. for labour, C.P.I. for general expenses).
- The term of the agreement will be for one (1) year, with options for renewal on an annual basis. If either party wishes to terminate, a six (6) month notice is required.

The above noted conditions would result in a tentative agreement that would be beneficial for both MSDSB and C.G.S.

Benefits for MSDSB would include:

- Access to skilled labour that is familiar with the vehicles and the specialized equipment included with the units.
- Consistency in workmanship.
- One point of contact for servicing a large number of their vehicles.

Benefits for C.G.S. would include:

- MSDSB would pay to cover some of the fixed costs of the Lorne garage, thereby increasing the capacity for other fleet activities.

- Potential to benefit from economies of scale on increased parts purchases for ambulances.
- Increased capacity would allow for some residual – approximately 25% of F.T.E.'s time - to be utilized on C.G.S. priorities.

Summary

A servicing agreement between Fleet Services and MSDSB would be mutually beneficial. Fleet Services would benefit financially and with increased capacity. MSDSB would benefit from consistent and quality workmanship with one point of contact.

It is recommended that the City of Greater Sudbury authorize that a business case be prepared for the 2019 budget to convert part time employee hours to a permanent full time employee to be funded by MSDSB for the purposes of servicing MSDSB vehicles

It is also recommended that the City of Greater Sudbury pass a resolution to authorize the General Manager of Corporate Services to enter into an agreement with Manitoulin-Sudbury District Services Board (MSDSB) for the provision of Paramedic fleet services.

Request for Decision

The Federation of Canadian Municipalities Funding: Municipal Asset Management Program

| | |
|---------------|--|
| Presented To: | Finance and Administration Committee |
| Presented: | Tuesday, Apr 17, 2018 |
| Report Date | Tuesday, Mar 13, 2018 |
| Type: | Managers' Reports |

Resolution

THAT the City of Greater Sudbury authorizes the Executive Director of Finance, Assets and Fleet to apply for and enter into agreement relating to the Federation of Canadian Municipalities' Municipal Asset Management Program Grant for the City's Building Condition Assessments and Designated Substance Surveys of City of Greater Sudbury Fire Halls and further that the City of Greater Sudbury commits \$25,000 to conduct the project, all of which is further described in the report entitled "The Federation of Canadian Municipalities Funding: Municipal Asset Management Program", from the General Manager of Corporate Services, presented at the Finance and Administration Committee meeting on April 17, 2018.

Relationship to the Strategic Plan / Health Impact Assessment

This report refers to Council's priority to determine acceptable levels of infrastructure service. This priority rests under the Sustainable Infrastructure pillar of Council's 2015 - 2018 Strategic Plan.

Report Summary

This report requests Council's approval to apply for funding from the Federation of Canadian Municipalities Municipal Asset Management Program.

Financial Implications

The City's contribution of \$25,000 will be funded from the Council approved 2018 Capital Budget.

Signed By

Report Prepared By

Nicholas Zinger
Corporate Asset Management
Coordinator
Digitally Signed Mar 13, 18

Manager Review

Shawn Turner
Director of Assets and Fleet Services
Digitally Signed Mar 13, 18

Financial Implications

Jim Lister
Manager of Financial Planning and
Budgeting
Digitally Signed Mar 27, 18

Recommended by the Department

Kevin Fowke
General Manager of Corporate
Services
Digitally Signed Apr 3, 18

Recommended by the C.A.O.

Ed Archer
Chief Administrative Officer
Digitally Signed Apr 3, 18

The Federation of Canadian Municipalities Funding: Municipal Asset Management Program

Program Description

The Federation of Canadian Municipalities (FCM) has launched a Municipal Asset Management Program (MAMP) to provide funding for projects that will enable municipalities to further their asset management practices. The FCM's goal for this program is to help municipalities make informed investment decisions in order to deliver maximum value for investments in infrastructure assets, such as roads, buildings and water and sanitation systems.

An example of an eligible activity includes data collection and reporting to further asset management needs.

FCM will provide funding for up to 80% of total eligible project costs, to a maximum of \$50,000. A Council Resolution is a mandatory component of the MAMP application process.

Intention

The City owns, operates and maintains 24 Fire Halls; some of which are located in remote locations due to the geographic footprint of the City limits.

The Assets Section has identified building condition assessments (BCA) and designated substance reports (DSS) of Fire Halls as a focus for improved asset class data collection. This data will assist the City to make more informed decisions about repair and renewal of these buildings.

If successful in receiving a grant, the eligible funding will be applied to retain a Building Science Consultant to assess the existing Fire Halls. The consultant will be responsible for assessing Fire Hall building components existing condition and to ensure legislative compliance such as the *Accessibility for Ontarians with Disabilities Act, 2005* and *O. Reg. 278/05: Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations*.

The report submission will adhere to the City's standard condition rating system to enhance the City's Asset Management Database. The data collection will have a lasting effect on the City's asset management capacity by clearly identifying the remaining life-cycle of building components as well as hazardous materials contained within the facilities. This will assist the City in appropriately managing these assets until renewal and achieve the maximum value of life-cycle costing.

The expected consulting fee for this project is approximately \$75,000. This sum allows the City to be eligible for up to \$50,000 in funding. The remainder of the cost will be funded from the Council approved 2018 Capital Budget.



City of Greater Sudbury Charter

WHEREAS Municipalities are governed by the Ontario Municipal Act, 2001;

AND WHEREAS the City of Greater Sudbury has established Vision, Mission and Values that give direction to staff and City Councillors;

AND WHEREAS City Council and its associated boards are guided by a Code of Ethics, as outlined in Appendix B of the City of Greater Sudbury's Procedure Bylaw, most recently updated in 2011;

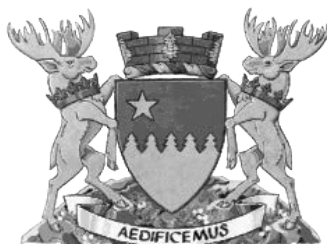
AND WHEREAS the City of Greater Sudbury official motto is "Come, Let Us Build Together," and was chosen to celebrate our city's diversity and inspire collective effort and inclusion;

THEREFORE BE IT RESOLVED THAT Council for the City of Greater Sudbury approves, adopts and signs the following City of Greater Sudbury Charter to complement these guiding principles:

As Members of Council, we hereby acknowledge the privilege to be elected to the City of Greater Sudbury Council for the 2014-2018 term of office. During this time, we pledge to always represent the citizens and to work together always in the interest of the City of Greater Sudbury.

Accordingly, we commit to:

- Perform our roles, as defined in the Ontario Municipal Act (2001), the City's bylaws and City policies;
- Act with transparency, openness, accountability and dedication to our citizens, consistent with the City's Vision, Mission and Values and the City official motto;
- Follow the Code of Ethical Conduct for Members of Council, and all City policies that apply to Members of Council;
- Act today in the interest of tomorrow, by being responsible stewards of the City, including its finances, assets, services, public places, and the natural environment;
- Manage the resources in our trust efficiently, prudently, responsibly and to the best of our ability;
- Build a climate of trust, openness and transparency that sets a standard for all the City's goals and objectives;
- Always act with respect for all Council and for all persons who come before us;
- Ensure citizen engagement is encouraged and promoted;
- Advocate for economic development, encouraging innovation, productivity and job creation;
- Inspire cultural growth by promoting sports, film, the arts, music, theatre and architectural excellence;
- Respect our historical and natural heritage by protecting and preserving important buildings, landmarks, landscapes, lakes and water bodies;
- Promote unity through diversity as a characteristic of Greater Sudbury citizenship;
- Become civic and regional leaders by encouraging the sharing of ideas, knowledge and experience;
- Work towards achieving the best possible quality of life and standard of living for all Greater Sudbury residents;



Charte de la Ville du Grand Sudbury

ATTENDU QUE les municipalités sont régies par la Loi de 2001 sur les municipalités (Ontario);

ATTENDU QUE la Ville du Grand Sudbury a élaboré une vision, une mission et des valeurs qui guident le personnel et les conseillers municipaux;

ATTENDU QUE le Conseil municipal et ses conseils sont guidés par un code d'éthique, comme l'indique l'annexe B du Règlement de procédure de la Ville du Grand Sudbury dont la dernière version date de 2011;

ATTENDU QUE la devise officielle de la Ville du Grand Sudbury, « Ensemble, bâtissons notre avenir », a été choisie afin de célébrer la diversité de notre municipalité ainsi que d'inspirer un effort collectif et l'inclusion;

QU'IL SOIT RÉSOLU QUE le Conseil de la Ville du Grand Sudbury approuve et adopte la charte suivante de la Ville du Grand Sudbury, qui sert de complément à ces principes directeurs, et qu'il y appose sa signature:

À titre de membres du Conseil, nous reconnaissons par la présente le privilège d'être élus au Conseil du Grand Sudbury pour le mandat de 2014-2018. Durant cette période, nous promettons de toujours représenter les citoyens et de travailler ensemble, sans cesse dans l'intérêt de la Ville du Grand Sudbury.

Par conséquent, nous nous engageons à :

- assumer nos rôles tels qu'ils sont définis dans la Loi de 2001 sur les municipalités, les règlements et les politiques de la Ville;
- faire preuve de transparence, d'ouverture, de responsabilité et de dévouement envers les citoyens, conformément à la vision, à la mission et aux valeurs ainsi qu'à la devise officielle de la municipalité;
- suivre le Code d'éthique des membres du Conseil et toutes les politiques de la municipalité qui s'appliquent à eux;
- agir aujourd'hui pour demain en étant des intendants responsables de la municipalité, y compris de ses finances, biens, services, endroits publics et du milieu naturel;
- gérer les ressources qui nous sont confiées de façon efficiente, prudente, responsable et de notre mieux;
- créer un climat de confiance, d'ouverture et de transparence qui établit une norme pour tous les objectifs de la municipalité;
- agir sans cesse en respectant tous les membres du Conseil et les gens se présentant devant eux;
- veiller à ce qu'on encourage et favorise l'engagement des citoyens;
- plaider pour le développement économique, à encourager l'innovation, la productivité et la création d'emplois;
- être une source d'inspiration pour la croissance culturelle en faisant la promotion de l'excellence dans les domaines du sport, du cinéma, des arts, de la musique, du théâtre et de l'architecture;
- respecter notre patrimoine historique et naturel en protégeant et en préservant les édifices, les lieux d'intérêt, les paysages, les lacs et les plans d'eau d'importance;
- favoriser l'unité par la diversité en tant que caractéristique de la citoyenneté au Grand Sudbury;
- devenir des chefs de file municipaux et régionaux en favorisant les échanges d'idées, de connaissances et concernant l'expérience;
- viser l'atteinte de la meilleure qualité et du meilleur niveau de vie possible pour tous les résidents du Grand Sudbury.