Town of Kingsville

Advanced Metering Infrastructure (AMI) Consulting Services

Financial Report

Submitted by:

Diameter Services

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Acronyms and Terms

Acronym or Term	Expansion	Definition
A.M.R.	Automated Meter Reading	Typically refers to a drive-by meter reading system to automate “on foot” meter reading.
A.M.I.	Advanced Metering Infrastructure	A network of fixed based equipment that captures detailed consumption information from the metering population that is retrieved by data collection software on at least a daily basis.
BCV	Building Control Valve	A water shut-off valve installed before the meter so the water entering the building can be shut-off.
C/I	Cut-In	Where a meter has never been installed and the plumbing requires modification to allow for the installation of a water meter.
C/O	Change-out	Used in connection with either a large or small meter change-out/replacement.
Customer Engagement - Passive	n/a	A customer facing business process that provides limited information in a paper format for the single purpose of water billing.
Customer Engagement - Interactive	n/a	A customer facing business process that provides information in a paper and digital format for the purposes of water billing, bill comparison to previous periods and payments data.
Customer Engagement - Progressive	n/a	A customer facing business process that provides information digital (paperless) format for the purposes of provide customers with water billing, bill comparison to previous periods, payments data, online payment, setting consumption alerts/alarms, consumption behavior analytics, and potentially online service requests.
FN	Fixed Network	See A.M.I. definition
IM	Intermediate Meters	Meters that are 1.5” or 2”.
LM	Large Meter(s)	Meters that are 3” or larger (3”, 4” 6”, 8”)
M.D.M.	Meter Data Management	Software application that helps manage and ensure the accuracy and completeness of the volumes of data provided by a fixed network for billing, analysis, reporting and presentment.
M.I.S.	Meter Installation Software	Software that captures the details of the installation including meter serial #, transmitter identification #, account information of where the equipment was installed.

Acronym or Term	Expansion	Definition
S&I	Supply and Installation	Includes capital cost of item as well as its installation
SM	Small Meters	Meters that are either 5/8” or 3/4" or 1”
Transmitter	n/a	A radio device connected to the water meter to provide meter readings for either a mobile or fixed network meter reading system.
UME	Unitized Measuring Element	Unitized Measuring Element is the field replaceable measuring chamber used in conjunction with the Town’s OMNI meters.

Table 1 - Summary of Acronyms and Terms

1. ORGANIZATIONAL GOALS & NEEDS

1.1. Introduction

The Town of Kingsville engaged Diameter Services to provide metering and Advanced Metering Infrastructure (AMI) consulting services. The purpose of this engagement was to evaluate the Town's current metering assets and provide AMI technology alternatives to the current drive-by meter reading system, understand how the Town and its citizens would benefit from such an investment and support the Town's Strategic Plan.

As a part of this exercise, the Town of Kingsville and Diameter Services looked beyond the meter reading and billing functions to discover some of the broader challenges faced by the Town. This process provided the opportunity to address how an Advanced Metering Infrastructure will help the Town address these challenges.

Some of the challenges and opportunities the Town of Kingsville is looking to address through this project include:

- Providing an understanding to customers of their usage
- More timely resolution of (billing) issues
- Reduced estimates
- Reduced Meter Reading Costs while increasing Meter Reading Safety
- Better and more proactive communication with customers on (potential) billing issues
- Improving the Town's metering asset data
- Enhancing the Town's customer service
- More timely resolution of meter maintenance issues
- Minimizing revenue loss
- By law enforcement
- Demand Monitoring / Planning

1.1. Goals and Needs

These challenges and opportunities were a central theme in discussions with the Town and an AMI technology project either directly or indirectly impacts virtually all of them. This includes customer service enhancements, cost reductions, more efficient operations and better data especially as it relates to the Town's largest water consumers.

This water meter replacement and AMI project also aligns with many areas of Kingsville's Strategic Plan and Council's Priorities. The Strategic Plan outlined "improved communication with residents, business owners and visitors" as a key objective. AMI clearly provides opportunities to achieve this objective through enhanced data, more timely data, and proactive customer engagements through a customer portal as a few examples.

This AMI project will also contribute to the Town's ability to "effectively manage corporation resources and maximize performance in day-to-day operations". Simply put, better more reliable billing data will streamline processes and largely eliminate exception handling helping to better utilize staff resources. Similarly, the opportunity to provide more "self-service" tools to customers including proactive notification of leaks and fewer high bill complaints generally serves to enable staff to satisfy other areas that may be currently underserved.

All the previously mentioned challenges, goals and objectives form the justification of this project and contribute to its business case.

A business case of this nature is most successful when:

1. **The goals identified in the business case align with the Town of Kingsville's goals:** The Town of Kingsville as a whole and the Water Department itself has stated goals that can specifically align with the results of this project. The Business Drivers outlined herein and their respective rankings will reflect Kingsville's desire to enhance customer service and to 'effectively manage and operate the distribution system and to continuously improve the distribution system's performance.' The role of AMI technology in addressing those Business Drivers is discussed.
2. **Functionality of the system meets the needs of the Water Department and the communities and citizens it serves:** Just because a technology allows for certain functionality does not necessarily mean it addresses the needs of a utility and the communities it serves. The AMI business drivers assessment (ranking) allows Kingsville to hone in on those technology features that address the specific utility needs. Although AMI technology is the focus of the Town of Kingsville, AMR information has been included for reference only. Both AMR and AMI are assessed to show how well each technology meets the functional need.
3. **Capital cost estimate should match the real costs:** The capital costs used in the business case should include the full scope to successfully implement the recommended approach. This cost should be revisited as the Town progresses through the technology upgrade process (i.e., after procurement and at key milestones during installation phase).
4. **Benefits should extend outside just the meter to cash process:** The business drivers need to look beyond the meter to cash process. This may include benefits to the Town and to the customer that may be more difficult to calculate but offer improved efficiencies, service levels or societal benefits such as a reduction in CO2 emissions.

Understanding existing challenges and establishing priorities is fundamental to benchmarking the success of any water meter replacement and meter reading technology review. It is important that the business case clearly show the expected impact to the customer as well as to the Town of Kingsville.

2. AMI BUSINESS DRIVERS

2.1. Connecting Project Goals with AMI/AMR Business Drivers

In collaboration with the Town of Kingsville, the Diameter Services team reviewed, assessed and ranked 37 different AMI/AMR business drivers. To frame the overall analysis, Diameter Services has identified six categories where AMI/AMR technology offer benefits:

1. **Revenue Protection (RP)**
   Ability to identify areas of revenue improvement, reduce theft and tampering, respond quicker to stopped meters, and an improved ability to apply the right meter technology to customer applications.

2. **Operational Efficiency (OE)**
   Improvements in response time to maintenance issues; reduced meter reading costs and hazards; reduced exceptions, effort to bill and

   additional trips into the field to collect data.

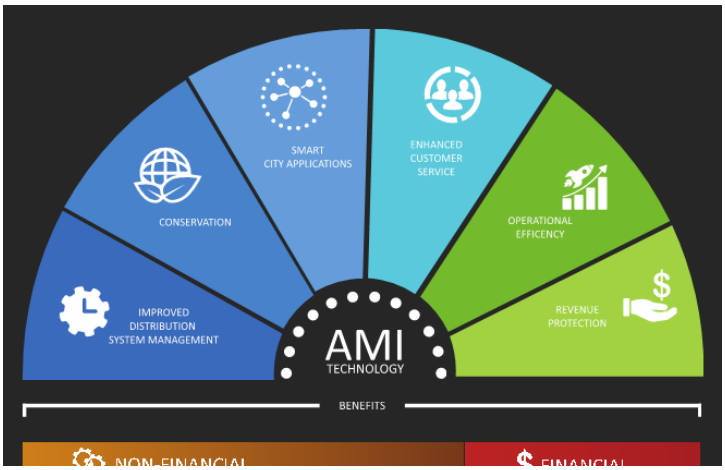


Figure 1 - Business Driver Categories

3. **Improved Distribution System Management (DS)**
   Improvements in the utility's ability to manage its distribution system through district leak detection, dynamic water balance, system wide leak detection, discrete water quality monitoring and more efficient code enforcement.

4. **Enhanced Customer Service (CS)**
   Improvements in customer service through the ability to provide customers' consumption information, online access to consumption, alerts to avoid high water bills or damage, and customer leak detection.

5. **Societal Benefits (SB)**
   Improvements in water conservation and carbon emissions.

6. **Smart Utility/Smart City (SC)**
   Improvements to areas beyond water consumption by leveraging the network for other organizational needs.

2.2. Evaluating Business Drivers

AMI and AMR technology have different features and functionality. The movement to a specific technology should be driven by looking at the importance of various business drivers and selecting the technology that best addresses those drivers. When features or functionality within the AMI/AMR technology address a challenge or improve delivery of water service, it is considered a **business driver.**

The Diameter Services team reviewed 37 different business drivers with the Town of Kingsville's staff to determine the organization's needs and identify the best technology fit. The development and assessment of the business drivers provides a definition of the actions Kingsville should expect to implement, first by identifying what is important to the Utility followed by matching the technology that supports these actions.

A business driver may have a financial or non-financial impact (benefit or cost). For the purposes of this report, they have been separated. If a business driver has both a financial and non-financial impact, it will show up accordingly. Only those financial business drivers that were defined by the Town of Kingsville as important or essential have been quantified in terms of financial benefit or cost. See Table 2 for definitions of important or essential.

AMI/AMR technology will improve a water utility's operations in a number of areas; some can be easily calculated, while others will show a qualitative improvement in a respective area. AMI/AMR technology should be considered a tool that the utility uses to improve how the utility operates. The areas of improvement often do not have a direct financial improvement but are still critical to the utility achieving the broader goals of the organization.

To evaluate business drivers, Diameter developed a scoring system that allowed Kingsville to establish the importance of each business driver and by extension the goals of the project.

Importance to the water utility is defined and scored using the table below.

Score	Importance	Description
0	Not Important	The Town will not implement the business driver in the future
1	Future	The Town may implement the business driver
2	Important	The Town will implement the business driver immediately
3	Essential	The Town will implement the business driver immediately and it is critical to the project

Table 2 – Business Drivers Score and Importance to the Town

AMI/AMR technologies function differently, have different operational impacts on the utility and provide different benefits partially due to the differences in data each provides. Depending on the technology, the Town of Kingsville will be able to either fully achieve, partially achieve, or not achieve specific business drivers. This system of scoring is designed to accomplish two things. First, it prioritizes those business drivers that are most important to the Town of Kingsville and secondly, it helps to define the technology alternatives that provide required functionality, which is key to developing cost/benefit results. The following criteria is used in this determination:

Score	Ability to Support the Business Driver	Description
	Does not support a Driver	The business driver as described cannot be implemented using this technology.
	Partially supports a Driver	The business driver as described can be partially implemented using the technology.
	Fully supports a Driver	The business driver as described can be fully implemented using the technology.

Table 3 – Scoring: Ability to Support the Business Driver

2.3. Business Driver Assessment Summary

To provide a high-level overview of the workshop findings, an overview of the business drives and how they were ranked is provided below. This aims to provide a quick snapshot of the business drivers and related priorities for the AMI/AMR project.

ID	Revenue Protections (RP)		Score
RP 1	Zero Consumption - Tampering		1
RP 2	Zero Consumption - Stopped Meter		2
RP 3	Payment Deferral		0
RP 4	Zero Consumption (Turned off for Non-payment)		0
RP 5	Zero Consumption - Empty Pipe Alert		0
RP 6	Detect Misapplied meters		2
RP 7	Support for Leak forgiveness Program		2
	Operational Efficiency (OE)		
OE 1	Reduce Regular Meter Reading Costs		2
OE 2	Same Day Final Reads		2
OE 3	Improve Meter Reading Safety		2
OE 4	Meter Reading Reliability - Reduce Re-reads		3
OE 5	Reading Technology Failures		3
OE 6	Detect Wire Problems		1
OE 7	Remote Turn-off / Turn-on		1
OE 8	Better Data for Customer Inquiries		3
OE 9	Move to Monthly Billing		2
	Improved System Distribution Management (DS)		
DS 1	District Metering		0
DS 2	Water Balance Calculation Frequency		1
DS 3	Acoustics Leak Detection (ALD) - Hydrant Monitoring		1
DS 4	Detect Backflow Events		2
DS 5	By law Enforcement		2
DS 6	Pressure Monitoring		0
DS 7	Temperature Monitoring - Frozen Services		0
DS 8	Demand Monitoring/Planning – Customer Level		3
DS 9	Demand Monitoring/Planning – Customer Level		2
	Customer Service Enhancements (CS)		
CS 1	Customer Engagement		N/A
CS 2	Not Applicable		N/A
CS 3	Customer Engagement - Passive	See Table 1 for Definitions	3
CS 4	Customer Engagement - Interactive		2
CS 5	Customer Engagement - Progressive		2
CS 6	Leak Detection - Small		3
CS 7	Leak Detection - Broken Pipe		3
CS 8	Vacation Monitoring		2
	Societal Benefits (SB)		
SB 1	Conservation Program Support		1
SB 2	Climate Change - Reduced CO2		2
	Smart Cities (SC)		
SC 1	Smart Cities - Smart Lighting		**1**
SC 2	Smart Cities – Transportation		**0**
SC 3	Smart Cities - Public Safety (Gun shots, earthquakes)		**0**
SC 4	Wastewater Monitoring		**0**
SC 5	Water Quality Monitoring		0
SC 6	Garbage Monitoring		0

Table 4: Business Driver Assessment (higher score is more important)

The following provides a summary of the business driver assessment summarizing only those ranked as Essential (Score of 3) or Important (Score of 2).

ID	Revenue Protections (RP)	Score	AMI	AMR
RP 2	Zero Consumption - Stopped Meter	3		
RP 6	Detect Misapplied meters	3		
RP 7	Support for Leak forgiveness Program	3		
	Operational Efficiency (OE)			
OE 1	Reduce Regular Meter Reading Costs	**3**		
OE 2	Same Day Final Reads	3		
OE 3	Improve Meter Reading Safety	2		
OE 4	Meter Reading Reliability - Reduce Re-reads	3		
OE 5	Reading Technology Failures	3		
OE 8	Better Data for Customer Inquiries	3		
OE 9	Move to Monthly Billing	2		
	Improved System Distribution Management (DS)			
DS 4	Detect Backflow Events	2		
DS 5	By law Enforcement	2		
DS 8	Demand Monitoring/Planning – Customer Level	3		
DS 9	Demand Monitoring/Planning – Customer Level	2		
	Customer Service Enhancements (CS)			
CS 3	Customer Engagement - Passive	3		
CS 4	Customer Engagement - Interactive	2		
CS 5	Customer Engagement - Progressive	2		
CS 6	Leak Detection - Small	3		
CS 7	Leak Detection - Broken Pipe	3		
CS 8	Vacation Monitoring	2		
	Societal Benefits (SB)			
SB 2	Climate Change - Reduced CO2	2		

Table 5: Business Driver Assessment (Essential or Important Ranking)

As shown above, the Town identified 21 Business Drivers that were deemed Important or Critical to the Project. 19 of the 21 Important or Critical Business Drivers were fully satisfied by AMI whereas AMR only fully supported one of them. The remaining 2 business drivers were partially supported by AMI. Note that 12 of the 21 Business Drivers *were not supported by AMR at all*.

3. CAPITAL COST

The financial assessment builds on the database analysis. The financial model that was developed incorporates both the initial capital costs and the financial operational impacts on the key Utility functions including: meter reading, meter maintenance, customer service and billing, Information Technology (IT) and distribution management. The financial model allows the Town of Kingsville to compare the financial implications of the key technologies that are the most applicable. Each technology has been setup as a different scenario.

3.1. Scenarios

The financial model looks at the capital costs associated with two AMI technology scenarios and calculates the benefits of the system implementation as compared to the current technology and business processes. The two technologies addressed were a standalone AMI fixed network (Scenario 1) and a third-party AMI network using the existing cellular network (Scenario 2). The scenarios, technology, and key assumptions are detailed below. Scenario 0 is the Town's Existing Drive-by Scenario that is used for comparison in the Operational Improvement calculations provided below.

Scenarios	Description
Scenario 0 - Existing Situation – Drive-by Meter Reading.	The Town of Kingsville currently reads its water using a drive-by meter reading technology and bills its customers quarterly.
Scenario 1 – Standalone AMI Fixed Network on an accelerated project schedule	This scenario assumes that Kingsville will install radio transmitters as well as perform meter replacements over a 15-month timeframe (3-month startup and 12-month implementation). This Scenario assumes a standalone AMI system is deployed across the Town's entire service territory. Water meters would be replaced according to the replacement criteria.
Scenario 2 – Cellular AMI Network on an accelerated project schedule	This scenario assumes that Kingsville will install radio transmitters as well as perform meter replacements over a 15-month timeframe (3-month startup and 12-month implementation). It further assumes the network infrastructure would be owned by a third party and operate across a cellular (or similar) network. Kingsville would pay a monthly fee to access the network. Water meters would be replaced according to the replacement criteria.

Table 6 - Technology Scenarios Definition

3.2. Revenue Improvement

One way to improve revenue is to replace aging meters. As meters become older, like many mechanical devices, the parts begin to wear down and the meter becomes less accurate over time. This accuracy degradation varies across the flow range of the meter and is caused by factors such as water velocity through the meter, water quality and age.

Understanding the true state of one's entire meter population isn't necessarily practical because of the process involved. While meters can be sent out for testing across the flow range, it is a costly and lengthy process and may not be a true indication of meter accuracy across the meter population in any event because of the various factors influencing accuracy.

An alternative to large scale and lengthy test procedures is to estimate revenue improvement using Neptune's SEER® Program which provides an estimated accuracy based on the water meter size, age, and manufacturer.

Estimated Accuracy (SEER)	
Age	**Meter Accuracy**
1	99.66%
2	99.32%
3	98.98%
4	98.64%
5	98.30%
6	98.00%
7	97.70%
8	97.10%
9	97.10%
10	96.80%
11	96.45%
12	96.10%
13	95.75%
14	95.40%
15	95.12%
16	94.80%
17	94.48%
18	94.16%
19	93.83%
20 or greater	93.51%

Table 7 - Neptune SEER Water Meter Accuracy Estimate by Age

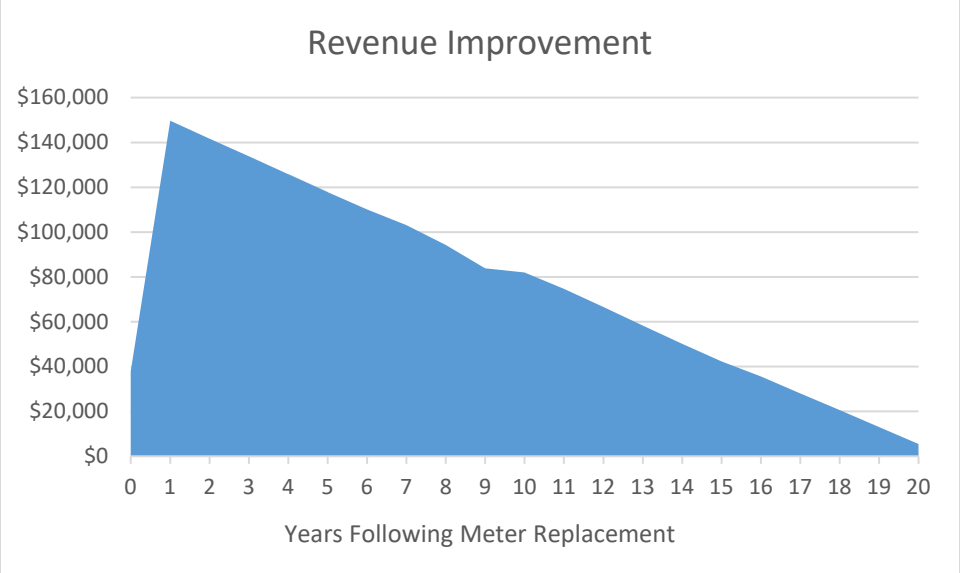
The chart represents an average meter accuracy across age category and meter size. Neptune's SEER® (Statistical Evaluation for the Enhancement of Revenue) analysis tool is specifically

designed to identify Non-Revenue Water at the water meter level[1]. SEER Model can determine meter accuracy within a 95% confidence interval. Because this accuracy data has been provided by the manufacturer, we recommend taking a conservative approach to these expected accuracy improvements when calculating revenue loss.

To account for this, we have applied a 2% decline to the initial increased revenue over the meter's 20-year life. After 20 years (the presumptive life of the meter), the increase in revenue seen when the meters are new goes to zero.

3.3. Revenue Improvement Calculation

The chart below shows the annual revenue improvements that can be expected with mechanical water meters. As mechanical meters have a life expectancy of 20 years before needing to be replaced, the revenue gain from meter replacements was shown over that same 20-year timeframe. Notice the downward trend as the water meters become older and less accurate. By year 20 following the meter change-out, the Town of Kingsville should not expect any further revenue improvements associated with its meter change-out.



Graph 1 – Mechanical Meter Revenue Improvements estimate over 20 years

Once all the meters are changed out, the Town can expect $149,683 in revenue improvement in Year 2 due to accuracy gains and additional sewer revenues all things being equal. As the meter declines in accuracy, the annual revenue increases will decline year over year.

The potential water and sewer revenue improvements from the meter replacement equals $1.575M (non-discounted) over the 20-year life of the meters which would be considered a conservative estimate.

[1] https://www.neptunetg.com/products/water-meters/metering-system/seer/

3.4. Financial Operational Impacts

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 more difficult to estimate, especially when they are based on time estimates or a theoretical efficiency calculation. Both types of costs are included in the operational financial impact calculations.

The financial impact calculation for each technology scenario is expected to deliver an estimate; some savings may be real, and others may create efficiencies where headcount reductions may not be desired. The assumed changes, and the overall financial impact of these changes, are summarized by function: meter reading, customer service and water billing, meter maintenance, distribution system management and IT support costs.

The detailed assumptions and calculations for each functional area are detailed below.

3.4.1. Meter Reading Impact

The Town of Kingsville 's meter reading is performed by internal resources. The meter readers use drive-by data collectors to gather information from radio transmitters attached to meters. The meter reading obtained by the mobile data collection units is transferred to via the meter reading software to the Diamond Customer Information System for billing. Individual meters are read quarterly (and customers are billed quarterly) and the annual cost to perform monthly meter reading is over $58,000 annually for staff time and vehicle costs. (Meter Reading equipment is accounted for I.T. Costs).

The annual estimated meter reading costs for Scenario 0 (Manual Meter Reading) as compared to Scenarios 1,2 and 3 using AMI as well as the financial impact is summarized below.

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Cost	$58,943	$-	$-
Financial Impact*	$-	$58,943	$58,943
Budgetary Impact	$-	$-	$-
Efficiencies	$-	$58,943	$58,943

Table 8 - Meter Reading Cost Impact by Scenario

** The financial impact is what was used in the cashflow analysis.*

Scenarios 1&2 would eliminate meter reading costs, and this is shown as an annual financial improvement in the financial model. Since these are internal resources expected to be redeployed elsewhere within the Town, there is no budgetary impact considered. (Note that the costs for an AMI analyst to manage the head-end data collection software, is captured in I.T. operational costs).

3.4.2. Water Billing and Customer Service Impact

Within the customer service and water billing functions, there were several areas identified that could be impacted by the application of AMI technology. Some of these situations include estimated administration costs. Where technology may reduce the quantity or amount of effort required to

resolve, we have calculated this as a cost reduction. In fact, it may be unlikely that Kingsville will reduce their costs by these amounts, therefore they represent productivity improvements (efficiencies) or reductions.

An explanation of the situations is as follows:

- Leak Forgiveness: where a portion of the customer bill is written off due to the occurrence of a leak.
- Water Bill Estimates: where the billing agent could not obtain a valid reading and they are required to estimate the water bill based on past consumption
- High bill complaint: where a customer calls to complain of a high-water bill. This requires a truck roll in some instances.
- Zero Consumption: where consumption has not changed between the current and past reading.
- Non-Payment: costs associated with collecting payments.

The table below estimates the costs associated with these situations. The costs are based on a blended hourly rate of $47.76 per hour.

Customer Service Function	Quantity	Read Cost	Extended
Leak Forgiveness	Estimated to be $10,000 annually.		
Estimates	1100	$ 11.94	$ 13,134.55
High Bill Complaints Phone Calls*	75	$71.64	$5,373.23
High Bill Complaints (Truck Rolls)	37	$110.00	$447.77
Calls to Customer Service	1300	$7.98	$10,369.13
Final Reads	650	$7.98	$5,184.57
Total			**$44,509,25**

Table 9 - Water Billing and Customer Service annual Cost

*High Bill complaint phone calls were estimated to take 1.5 hours in total staff time. These calls typically take up the time of numerous staff members and when their time is combined the estimate was 1.5 hours per call on average.

Following review with Kingsville's customer service and billing department project team members, the estimated impact technology will have on the above activities is summarized in the table below by Scenario.

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Leak Forgiveness	No Impact	Reduce Quantity by 50%	Reduce Quantity by 50%
Estimates	No Impact	Reduce Quantity by 90%	Reduce Quantity by 90%
High Bill Complaints Phone Calls*	No Impact	Reduce Quantity by 40%	Reduce Quantity by 40%
High Bill Complaints (Truck Rolls)	No Impact	Reduce Quantity by 25%	Reduce Quantity by 25%
Zero Consumption /Stopped Meter	No Impact	No Impact	No Impact
Calls to Customer Service	No Impact	Reduce Quantity by 35%	Reduce Quantity by 35%
Shut-off for Non-Payment (Truck Roll Avoidance)	No Impact	No Impact	No Impact
Reduction in calls for Final Reads	No Impact	Reduce Quantity by 25%	Reduce Quantity by 25%

Table 10 - Water Billing and Customer Service Impact by Scenario

Based on what is found in other water utilities, it is expected that AMI data will allow Kingsville to find efficiencies within this department. Staff will be allowed to focus on higher value-added activities since technology will deliver detailed and timely consumption data to both the Town and customers to elevate the efficiency of delivering excellent customer service. As a result, most of examples listed in Table 5 are considered annual efficiency gains and do not provide a budgetary impact. The exception is leak forgiveness and billing estimates both of which are expected to have a budgetary impact.

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Leak Forgiveness	$10,000.00	$5,000.00	$5,000.00
Water Bill Estimates	$13,134.55	$1,313.46	$1,313.46
High Bill Complaints Phone Calls	$5,373.23	$3,223.94	$3,223.94
High Bill Complaints Truck Rolls	$447.77	$223.88	$223.88
Zero Consumption / Stopped Meter	$-	$-	$-
Calls to Customer Service	$10,369.13	$6,739.94	$6,739.94
Reduction in calls for Final Reads	$5,184.57	$3,888.42	$3,888.42
Total	**$44,509.25**	**$20,389.64**	**$20,389.64**
Financial Impact	$-	**$24,119.61**	**$24,119.61**
Budgetary Impact	$-	**$16,821.09**	**$16,821.09**
Efficiencies	$-	**$7,298.52**	**$7,298.52**

Table 11 - Water Billing and Customer Service Financial Impact by Scenario

3.4.3. Water Meter Maintenance Impact

Applying technology to Kingsville's water meter maintenance group may impact several tasks that are the responsibility of the department. In reviewing these tasks with Kingsville, financial benefit can be calculated although would be considered an efficiency gain where staff would be freed up for other tasks. Therefore, much of the tasks Kingsville's meter shop performs today would continue, but with a lessor quantity; the project team determined the financial impact would be minimal, but with meaningful efficiency gains.

The benefits which had value and their respective impact is identified below:

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Radio Transmitter Maintenance/replacement (Labour)	No Impact	No Impact	No Impact
Radio Transmitter - Maintenance/replacement (Product)	No Impact	No Impact	No Impact
Billing Issues	No Impact	50% Reduction	50% Reduction
Stopped Meters - Exchange Meter	No Impact	50% Reduction	50% Reduction
High Consumption	No Impact	50% Reduction	50% Reduction
High Consumption / Check for Leaks	No Impact	50% Reduction	50% Reduction
Meter Backwards	No Impact	No Impact	No Impact

Table 12 - Water Meter Maintenance Impact by Scenario

The financial impacts are calculated in the below table. These should be considered annual efficiency gains that will not impact department budgets.

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Radio Transmitter – Maintenance	No Impact	No Impact	$No Impact
Radio Transmitter – Maintenance	No Impact	No Impact	$No Impact
Billing Issues	$3,702.80	$1,851.40	$1,851.40
Stopped Meters - Exchange Meter	$1942.20	$971.10	$971.10
High Consumption	$854.49	$427.25	$427.25
High Consumption / Truck Rolls	$4,125.00	$2,062.50	$2,062.50

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Meter Backwards	No Impact	No Impact	$No Impact
Total	**$10,624.49**	**$5,312.25**	**$5,312.25**
Financial Impact	$-	$-	$-
Budgetary Impact	$-	$-	$-
Efficiencies	$-	**$5,312.25**	**$5,312.25**

Table 13 - Water Meter Maintenance Financial Impact by Scenario
** a positive number is considered a "savings", a negative number is considered a "cost"*

3.4.4. Distribution System Management Impact

Meter reading technology can be used to better manage and potentially monitor system wide non-revenue water. Consumption data that an AMI system provides is an opportunity for utilities to focus on reducing non-revenue water. District metering for example, enables the utility to compare water being consumed in a district during a specific time period, 2 a.m. to 4 a.m. as an example, with the water being provided to the district over the same time period so water losses can be determined. This requires not only a district meter with an AMI transmitter but also time stamped interval data (15 minute or hourly data) at the district meter as well as the consumption points with the appropriate resolution so water losses can be calculated.

A second way for a utility to improve distribution management would be to structure the AMI fixed network to collect acoustic leak detection sensors, allowing Kingsville to identify when and where a distribution system leak is occurring. This would require leak detection devices to be installed on approximately every 10th property.

The Town of Kingsville has relatively new plastic distribution mains for the most part and does not experience a great deal of distribution system losses. Neither DMA nor acoustic leak detection have been budgeted in the Capital Cost section as a result. However, AMI provides the Town both options if, in the future, distribution system losses become a problem. A reduction in Real Losses was not factored into the financial assessment since there was little opportunity seen in this area.

The reduction in Apparent Losses in this section attributed to AMI technology stems from the ability to "right size" meters at each service, more quickly respond to meters that are not registering or are not registering properly and better respond to water theft. For example, meters that are too large for their intended purpose can be identified and changed to maximize revenue and reduce Apparent Losses at that location. And with daily consumption information, utilities can identify meters which have potentially stopped or where bypasses may have been opened.

A very conservative .5% of total Real and Apparent Losses experienced at Kingsville today were attributed to Apparent Losses as described above. Apparent Losses due to meter inaccuracies were captured in Section 1.3 above.

Because there is limited opportunity to improve on Real Losses and meter inaccuracies were captured earlier the table below is just focused on Apparent Losses due to theft and meter right-sizing.

Description	Variables	Water Loss Cost
Total Water Losses (M3)	647,444	
Real Losses (M3) estimate	431,839	
Real Losses (%)	6.1%	
Real Losses ($) (@ wholesale cost of water)	$0.68	$293,651
Unbilled Authorized Consumption Plus Total Apparent Losses (M3) estimate	215,605	Apparent Losses Due to Meter Accuracy Loss was included in Section 1.3
Apparent Losses Due to Theft, Meter (Right) Sizing (%)	.5%	
Apparent Losses Due to Theft, Meter (Right) Sizing (M3)	35,397	
Apparent Losses Due to Theft, Meter (Right) Sizing ($)	$1.66	$58,758
Total		**$352,409**

Table 14 – Distribution System Management Estimated Real and Apparent Water Losses 2019

Preparing the above report on a frequent basis would allow the Town to better measure changes in non-revenue water. The ability to identify seasons or one-off events contributing to water losses can help the Town better focus on reduction efforts. The impact technology can have on reducing both real and apparent water losses is estimated in the table below. Note that *no impact* was anticipated for Real Losses since the Town's current Real Losses are low and there is limited opportunity to improve them at a reasonable cost. As a result, only the $38,192 reduction in Apparent Losses due to meter right-sizing and theft reduction is included in the following table.

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Real Losses	($293,651)	($293,651)	($293,651)
Apparent Losses (not including losses due to meter inaccuracy)	($58,758)	($20,565)	($20,565) ($58,758)
Total Non-revenue Water	**($352,409)**	**($314,216)**	**($314,216)**
Financial Impact *	$0	**$38,192**	**$38,192**
Budgetary Impact	$0	**$38,192**	**$38,192**
Efficiencies	$0	$0	$0

Table 15 - Distribution System Management Financial Impact
* a positive number is considered a "savings", a negative number is considered a "cost"

3.4.5. IT Operational Cost Impact

Meter reading software and equipment currently in use by Kingsville requires very little IT support to operate and maintain.

Introduction of AMI technology will require additional IT support due to the number of software applications being added and the interfaces that need to be supported. Most of the water AMI vendors are moving (or have moved) to a Software as a Service (SaaS) model. For this reason, we have assumed all software will be SaaS that calculates their license cost on an annual basis based on the number of transmitters. The table below summarizes the IT support assumptions:

IT Software Activities	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Meter Reading software - SaaS	$4,000/year	N/A	N/A
AMI Collection Software - SaaS	Not Required	$3.00/endpoint (includes package with MDM)	$3.00/endpoint (includes package with MDM)
Meter Data Management	Not required	As outlined above	As outlined above
Customer Portal	Not required	$2.50/endpoint	$2.50/endpoint

IT Software Activities	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
RF license	$3,048	Vendor specific Not included	Not required
Handheld Support (reading & Maintenance)	$2,875/year/ handheld and cradle (3 of each)	Handhelds = 2 on-going Support =$1,500 / handheld/ year; Cradle=$1,000/ cradle/year	Handhelds = 2 on-going Support =$1,500 / handheld/ year; Cradle=$1,000/ cradle/year
Fixed network Data Collector Support	Not Required	$2,000/Collector/ year	Not Required
Wide Area Network Costs	Not required	$720/year/ Collector	Not Required
AMI Data Analyst	Not required	10% of FTE	10% of FTE
AMI Network Sharing Fee	Not Required	Not Required	Not Required
Cellular AMI Costs	Not Required	Not Required	$5.00/endpoint/ Year

Table 16 - IT Support Assumptions by Scenario

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

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Meter Reading software - SaaS	$4,000	$ -	$ -
AMI Collection Software	$ -	$26,124	$26,124
Meter Data Management	$ -	$ -	$ -
Customer Portal	$ -	$ 21,770	$ 21,770
RF license	$ 3,048	$ -	$ -
Handheld Support (reading & Maintenance)	$8,625	$5,000	$5,000

	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Fixed network Data collectors (NaaS)	$ -	$16,000	$ -
Wide Area Network Costs	$ -	$5,760	$ -
AMI Data Analyst (Internal position @ Town of Kingsville)	$ -	$16,009	$16,009
AMI Network Sharing Fee	$ -	$ -	$ -
Cellular AMI Costs	$ -	$ -	$43,540
Total	**$15,673**	**$90,663**	**$112,443**
Financial Impact*	$ -	($74,990)	($96,770)
Budgetary	$ -	($74,990)	($96,770)
Efficiencies	$ -	$ -	$ -

Table 17 - IT Support Financial Impact by Scenario

* a positive number is considered a "savings", a negative number is considered a "cost"

3.4.6. Summary of Operational Impacts

The financial impact of AMI technology plays a big role in the benefit to the utility. The table below summarizes the departmental financial impact detailed above. Each scenario outlines the operational cost change to what is deployed today and is the value put into the net present value calculation.

Operational Cost Category	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Operational - Meter Reading	No Impact*	$58,943	$58,943
Operational - Meter Maintenance	No Impact	$5,312	$5,312
Operational - Customer Services	No Impact	$24,119	$24,119

Operational Cost Category	Scenario 0 - Existing Drive-by Meter Reading	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Operational - System Management Improvements	No Impact	$38,192	$38,192
Operational - IT Costs	No Impact	($74,990)	($96,770)
Total Financial Impact	**No impact**	$51,576	$29,796
Budgetary Impact	**No impact**	$(36,798)	($58,578)
Efficiencies	**No impact**	**$88,374**	**$88,374**

Table 18 - Operational Financial Impact Summary

3.5. Capital Costs

The capital cost of Scenarios 1 and 2 assumes the project will be done as a single continuous project with no delays or pauses in the deployment as this would lead to increased costs (i.e. Project Management). Where finance capacity is unavailable, alternative deployment strategies can be explored.

The capital cost assumes the project is done with external resources. Project support is provided through a combination of internal and external (consulting) support resources.

Capital Costs for Scenario 0 have not been included since that scenario is simply a continuation of the current yearly change-out volumes with no changes in technology or additional resource requirements.

3.5.1. Project Scope

A project of this nature is not a typical engineering project. It is a combination of products, services and software applications that need to be supported by both internal and external resources. When planning for an AMI project, the main cost categories would include:

- Installation Costs
- AMI/AMR Supply and Implementation Costs including software licensing and implementation
- Water Meter Supply Costs
- Project Support – Consulting Costs
- Project Support – Internal Resource Costs
- Contingency

At the end of the cost section, we compare total capital costs (all categories) for the three replacement criteria to provide some understanding of the cost impacts of the different strategies.

3.5.2. Key Assumptions by Scenario

The financial model has several 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 are detailed in Appendix A.

3.5.3. Installation Cost

With any water meter project, there are always complications that can prevent the meter replacement or radio transmitter installation from happening. These issues usually include the water meter being enclosed behind a finished wall, valves not being operational, plumbing fittings that need to be replaced, or changes to the meter pit or pit lid to complete the work. The ability to convert as close to 100% of the water meters to the new technology as possible is a fundamental measurement of a successful program. To achieve this level of completion, the Town of Kingsville needs to allow the installation contractor to overcome most of the above issues. Allowing for carpentry, plumbing, and valve replacement will support the project in achieving over 97% completion. Not including this work in the project would likely reduce the conversion to below 90%.

The table below summarizes the installation cost for both scenarios. It should be noted that these costs are expected to be the same regardless of technology.

Summary of Installation Work	Quantity	Total Cost
LM - C/O	30	$52,500
LM - Retrofit	16	$1,505
LM - Extra Work	53*	$10,210
IM – C/O	130	$57,500
IM - Retrofit	26	$1,890
IM – Extra Work	113*	$24,225
SM - C/O	7396	$537,545
SM - Retrofit	1110	$65,575
SM - Extra Work	4,122*	$185,785
Sensus Handhelds (Reprogram Registers)	2	$8,000
Grand Total	**12,945**	**$944,735**

Table 19 - Capital Cost - Installation Cost Summary

Meter change-outs for small meters (SM - C/O) for 5/8", 3/4" and 1" meters, intermediate meters (1.5" and 2") and large meters (3", 4", 6" and 8") include the installation portion of the change out. Retrofit work (leaving the meter in situ, AMI transmitter installation, reprogramming meter register) is outlined separately.

* Please Note: The Extra Work where required (based on assumptions) is for valve replacement, plumbing, wire replacement, carpentry, freezing pipe in lieu of curb stop operation, meter pit repairs, excavation, confined and crawl space entry. There can be multiple Extra Work line items at a single installation – such as valve replacement, minor construction/remediation work and crawl space entry at the same location.

Lastly, we have assumed $8,000 in handheld equipment for the re-programming of Sensus meter registers to high resolution. Understanding the specifics of the meters to be re-programmed and whether all Sensus protocol registers (from different meter manufacturers) installed at Kingsville can be re-programmed with the same equipment will need to be fleshed out with the Town.

3.5.4. AMI Technology Cost

Scenario 1, 2 or 3, are applicable to any AMR or AMI system manufacturer. The AMI/AMR project costs are summarized below by category.

Description	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
AMR/AMI Supply		
SM - Radio	$794,500	$1,094,940
IM - Radio	$15,030	$22,605
LM - Radio	$4,220	$5,500
FN Collectors	$282,000	$-
Software (SaaS – included in IT Operational Costs)	$-	$-
Implementation	$25,250	$25,250
Training	$13,500	$13,500
License (Included in IT Operational Costs)	$-	$-
Handheld	$5,000	$5,000

Description	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Contingency (Software Interfaces)	Included below in Section 1.5.8	
Total	**$1,139,500**	**$1,166,795**

Table 20 - AMI Technology Cost Summary

The implementation costs would be associated with interfacing to the Diamond CIS, customer portal, the AMI data collection software and the MIS (meter installation system). Interface costs are vendor associated costs and do not include Town effort required in the interface development.

A standalone AMI network (Scenario 1) includes costs for data collectors and the associated installation/implementation not required in Scenario 2. However, because the costs for radio transmitters in Scenario 1 are expected to be less than cellular radio transmitters the AMI technology costs are quite comparable. It is important to note that there have been limited *large scale* AMI cellular quotes available in the Canadian market and the costs for the radio transmitter and the on-going (cellular) operational costs mentioned in Table 16 are estimates.

3.5.5. Water Meter Supply Cost

The following assumptions have been made regarding meters that need to be replaced and meters that can remain because they are relatively new and already have a high-resolution register. It is understood no meters will be upgraded with just a new register as part of this project and that the meters that will remain in place have high resolution capability.

Recommended Work Type	Explanation
Change-out (Inside)	5/8” to 1.5”” sized meters that are 10 years or older will be replaced with mechanical meters whereas 2” and larger meters of this same vintage will be replaced with non-mechanical meters. All locations will require a radio transmitter to be installed. A new wire-run from the meter to the outside radio transmitter may be required. 40% of inside installations were estimated for new wire-runs. Appointments will be necessary at these inside meter locations.
Change-out (Pit)	5/8” to 1.5” sized meters that are 10 years or older will be replaced with mechanical meters whereas 2” and larger meters of this same vintage will be replaced with non-mechanical meters. Meters designed for pit installations will be required. All pit locations will require a radio transmitter designed for pit applications to be installed. No appointments will be required at these locations.

Recommended Work Type	Explanation
Retrofit (Inside)	High resolution capable encoder meters that are less than 10 years old will be fitted with new radio transmitters. Meter registers will need to be reprogrammed for high resolution. All locations will require 3 wires from the meter register to the radio transmitter located on the exterior of the premises. Appointments will be necessary.
Retrofit (Pit)	High resolution capable encoder meters that are less than 10 years old will be fitted with new radio transmitters *designed for pit applications*. Meter registers will need to be reprogrammed for high resolution. All locations will require 3 wires from the meter register to the radio transmitter. No appointments will be required.
Change-out (crawl space)	5/8" to 1.5" sized meters that are 10 years or older will be replaced with mechanical meters. All locations will require a radio transmitter to be installed. A new wire-run from the meter to the outside radio transmitter may be required. 40% of inside installations were estimated for new wire-runs. Appointments will be necessary at these inside meter locations. Crawl space locations carry a premium because of the associated safety requirements.
Retrofit (crawl space)	High resolution capable encoder meters that are less than 10 years old will be fitted with new radio transmitters. Meter registers will need to be reprogrammed for high resolution. All locations will require 3 wires from the meter register to the radio transmitter located on the exterior of the premises. Appointments will be necessary. Crawl space locations carry a premium because of the associated safety requirements.

Table 21 - Water Meter Replacement Criteria

Although the meter replacement criterion is defined by age, the existence of a high-resolution register is also a key factor since the cost of the register by itself is nearly that of the entire meter. It is understood that in Kingsville's case, all meters to be retained are already fitted with encoder registers with the appropriate resolution. Based on the meter replacement criteria assumed above, the meter supply costs only (not including AMI technology costs) are summarized below:

Summary of Meter Costs by Size of Meter			
Meter Size	**Quantity**	**Scenario 1 - AMI (Standalone)**	**Scenario 2 - Cellular**
5/8"x3/4"	4725	$448,875	$448,875
5/8"x3/4" (pit meter)	2570	$321,250	$321,250
3/4"	18	$2,268	$2,268

Summary of Meter Costs by Size of Meter			
Meter Size	**Quantity**	**Scenario 1 - AMI (Standalone)**	**Scenario 2 - Cellular**
3/4" (pit meter)	7	$1,092	$1,092
1”	20	$3,800	$3,800
1” (pit meter)	56	$12,320	$12,320
1.5”	4	$1,600	$1,600
1.5” (pit meter)	6	$2,580	$2,580
2”	120	$102,000	$102,000
3”	11	$26,400	$26,400
4”	13	$36,400	$36,400
6”	4	$18,000	$18,000
8”	2	$13,000	$13,000
Grand Total	**7556**	**$989,585**	**$989,585**

Table 22 - Capital Cost Water Meter Supply Cost Summary

It should be noted that due to the Town of Kingsville’s on-going meter change-out program, the quantity of meters to be changed may differ somewhat at the time of the project.

3.5.6. Project Support – Internal Resources Costs

Internal Town of Kingsville costs were not included in the Financial Model.

Examples of Roles the Town should consider during implementation on an AMI System Include:

- Project Management
- IT Support during interface development
- AMI Data Analyst/Champion
- CIS Support
- Field Support – Supervisors, Inspectors, Curb stop support and repair
- Data Collector Coordination
- Communications - Public Outreach

3.5.7. Project Support – Consulting Costs

The AMI/AMR subject matter expert consulting services costs for the entire project are summarized below:

Assumption	Scenario 1 - AMI (Standalone)	Scenario 2 - Cellular
Phase 2 – Procurement	$65,000	$65,000
Phase 3 – Start Up	$75,000	$75,000
Phase 4 – Proof of Concept	$50,000	$50,000
Phase 5 – Installation	$100,000	$100,000
Phase 6 – Close Out	$8,000	$8,000
Total	**$298,000**	**$298,000**

Table 23- Project Consulting Support Cost

The procurement includes the development of a single procurement document and process. Where the procurement is broken into more than one procurement additional cost may apply.

Program management assumes a full-service project lead that includes contract management, interfacing support, installation Contractor management, public outreach, meeting management, key performance indicator monitoring and quality assurance. Field inspections is an optional service that could be incorporated into the QA services but has been assumed to be an internal resource.

3.5.8. Contingency

Assumption	Scenario 1 - AMI (Standalone)	Scenario 3 - Cellular
Installation Contingency	$187,347	$187,347
Software Interface Contingency	$9,688	$9,688
Total	**$197,035**	**$197,035**

Table 24 - Capital Cost Contingency

A project of this nature does require some contingency for un-expected installation, integration or meter costs. Also, AMI networks do have ever expanding functionality and there may be some opportunities to expand the use the of the network once an AMI system is selected.

3.5.9. Summary of Capital Costs

The table below provides a summary of AMI capital costs based on installing mechanical water meters for meters under 2" and non-mechanical meters for meters 2" and larger.

Assumption	Scenario 1 - AMI (Standalone)	Scenario 2 - AMI (Cellular)
Install	$944,735	$944,735
Meter Supply	$989,585	$989,585
AMR/AMI Supply	$1,139,500	$1,166,795
Consulting	$298,000	$298,000
CIS Support (Interfaces)	$67,500	$67,500
Internal Project Support	$-	$-
Contingency 0.1	$197,035	$197,035
Total	**$3,636,355**	**$3,663,649**

Table 25 - Capital Cost Summary by Category

The above costs were used in the Cashflow analysis and spread out according to the deployment schedule.

For comparison purposes, the least cost AMR scenario is shown below.

Assumption	Least Cost AMR Option
Install	$911,990
Meter Supply	$989,585
AMR/AMI Supply	$804,820
Consulting	$266,750

Assumption	Least Cost AMR Option
CIS Support (Interfaces)	$22,500
Internal Project Support	$-
Contingency 0.1	$182,398
Total	**$3,178,043**

Table 26 - Capital Cost Summary (Least Cost AMR Option)

The least cost AMR option would have the opportunity to maintain 377 existing radio transmitters already installed. It would avoid any associated installation expenses such as appointments and new wire-runs at these locations since these locations would remain "as is". This option would utilize the existing meter reading software and interfaces. As a result, other savings realized with this option include the elimination of most software interfaces and software contingency since new AMI head-end data collection software and the customer portal will not be necessary. Implementation and Training associated with new software packages is also not necessary.

Fixed Data Collector and Implementation costs are also no longer necessary and consulting services have been reduced to reflect the fact less effort will be required to manage software interfaces between vendors and the necessary testing.

It should be emphasized that while this option is expected to save approximately $485,606, it will not satisfy the business drivers associated with this project as outlined earlier in the report.

3.5.10. Cashflow

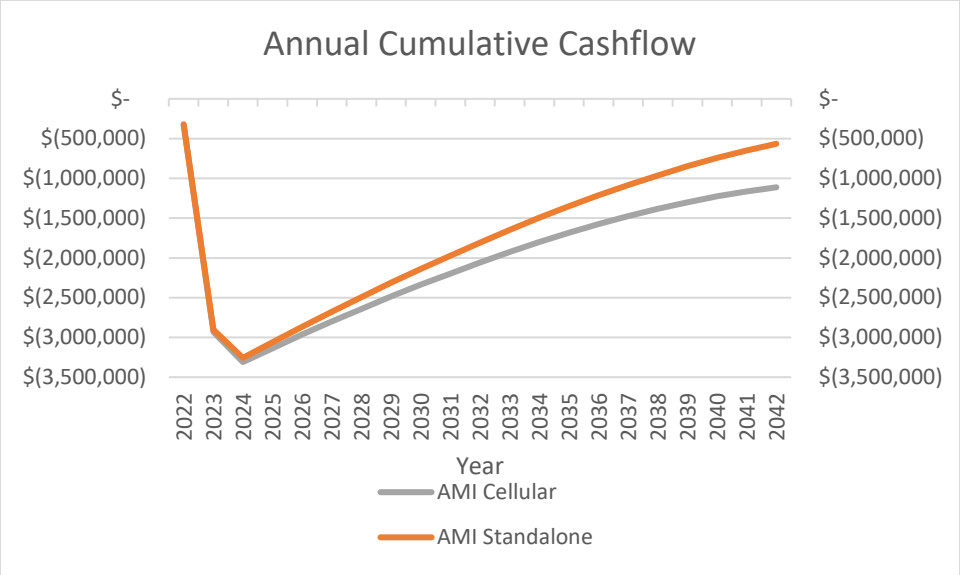
Both the operational financial impacts and the Capital costs were used in a long term financial cashflow model.

Due to delays in invoicing the Town should expect invoiced value in accordance with the table below which includes an inflationary component of 2%.

Scenarios	Total	2022	2023	2024
Scenario 1- AMI (Standalone)	($3,716,689)	($371,668)	($2,787,517)	($557,503)
Scenario 2 - Cellular	($3,718,604)	($371,860)	($2,788,953)	($557,790)

Table 27 – Annual Cash Outlay

The following graph considers both the capital cost in the first two years of the project and the on-going benefits.



Graph 2 - Capital Cost and Operational Cashflows of AMI project using mechanical meters

The diagram shows there is a substantial investment in the project in the first few years. However, after the 2-year investment, the revenue improvements along with the operational improvements in areas such as meter reading, customer service and system management show a (non-discounted) increase in cashflow of approximately $197,545 (Scenario 1) in Year 3 of the project.

3.5.11. Results

Combining the financial impact estimated by area (meter reading, customer service and billing, meter maintenance, distribution management, IT) and the capital costs allows the total life cycle cost to be calculated. The Net Present Value (NPV) provides a good comparison between scenarios over time taking into account the present value of benefits over 20 years as well as the present value of costs incurred in the first 2 years of the project.

Table 24 below shows a negative NPV for Scenarios 1 and 2. Based on NPV solely, Scenario 2 is expected to be the worst-case scenario because of the high operational costs of cellular radio transmitters. The benefits provided by Scenarios 1 and 2 are all expected to be virtually the same.

The summary of the capital expenditure and the NPV of each project scenario (using mechanical metering for the required meter replacements) is summarized below. Note that Scenario 2 assumes the Town of Kingsville will bear the full cost of the monthly cellular data fees associated with implementing this technology.

	Scenario 1 - AMI (Standalone)	**Scenario 2 - Cellular**
Capital Costs	$3,636,355	$3,663,649
NPV	**$(986,862)**	**$(1,429,783)**

Table 28 - Capital Cost and NPV for the Entire Project using Mechanical Meters

Advanced Metering Infrastructure (AMI) provides a myriad of benefits to help improve a water utility's performance in areas such as metering, customer service, water loss management, pressure and backflow management. In addition, one of the major benefits of AMI is to help the Town of Kingsville with its "customer experience" associated with the provision of water services. While there is value in doing so such as the Town's reputation among its citizens, measuring the dollar value of a "happier customer' is virtually impossible and therefore is not included in the NPV calculations but contribute to achieving the Town's business drivers and customer service strategy.

3.5.12. Financial Implications of Extending the Project Duration

Extending the duration of an investment such as a meter replacement and AMI implementation project can help utilities better manage annual budgets and avoid the need for debt financing where reserves aren't available. However, this approach comes at a cost.

Typically, meter vendors will price both meters and AMI infrastructure more aggressively the shorter the duration of the project. This makes sense from the standpoint that their costs are more predictable in the short-term as is the exchange rate. And in fixed priced contracts, exchange rate variability plays a significant risk of doing business in Canada since most metering vendors are U.S. based. As a result, the longer the project duration the more "risk" is built into the price to account for labour rate increases, material prices, material availability and exchange rates.

Increasing the duration of the project also reduces installation economies of scale. Project Management costs increase, travel time (ie. cost) for installers to and from the location increases, and warehousing costs increase as a few examples.

Not only do costs increase when extending a project over such a long duration but so do realization of benefits as mentioned earlier. An AMI project requires complete installation to fully realize all its benefits. In addition, customers expect the same level of service and extending the project duration will provide customers different levels of service for a significant period-of-time.

4. RECOMMENDATIONS

The recommendations within this chapter are derived from analysis and Kingsville's feedback on potential direction and alternatives. The recommendations should guide the Town's decisions relating to the AMI project.

4.1. Detailed recommendations

Recommendation R1: Diameter recommends the Town of Kingsville implement AMI Technology for to achieve both non-financial and financial benefits associated with the business drivers.

Diameter recommends the Town of Kingsville implement AMI since only AMI will satisfy the Business Drivers and the AMR alternative, for the most part, will not. As outlined above, the Town identified 21 Business Drivers that were deemed Important or Critical to the Project and all 21 were partially or fully satisfied by AMI whereas only 10 were supported by AMR. The additional cost for an AMI system to pay for the additional network, software, and integration costs (approximately $485,606) comes at a small premium compared to maintaining the existing AMR technology. The existing AMR technology which will presumably the lowest cost due the opportunity to leverage existing endpoint assets and software interfaces.

The Town identified multiple opportunities to improve the meter to cash process, water operations and customer service levels with water customers. Examples of improvement opportunities include increasing meter reading reliability, performing same day final reads, improving meter reading safety, customer leak detection, detecting backflow, reducing estimates, and understanding both individual customer demand and system-wide water demand. These examples support both the Town's Strategic Plan and the Town Council Priorities and are much more readily achievable with AMI justifying the additional spend over AMR.

The additional Customer functionality will provide new ways for the Town to engage their water customers, reduce complaints or concerns about their water bills and lead to happier customers.

Recommendation R2: Diameter recommends a "Turnkey" Procurement Strategy as opposed to soliciting the market for the separate components.

The procurement would include the following main elements in a single RFP:

1. AMI Technology - transmitters, AMI infrastructure (collectors/repeaters), headend software, training, implementation and an Optional customer portal
2. Meter Data Management Repository (MDM)
3. Meter Supply - Water meters, wires and connectors
4. Installation - project management, external installation services, data management

Separating the elements into individual RFPs is not typically recommended unless a utility is looking for a "best-in-class" solution in a particular area. All the major meter and AMI vendors can provide the elements of the RFP and so the Town is not limiting the competition by pursuing this path. Further, multiple RFPs are more costly and time-consuming and not necessary in Kingsville's case.

Recommendation R3: Diameter recommends allowing for existing assets / infrastructure to be used during Procurement.

The Town's existing radio transmitter assets may provide opportunities to reduce costs of an AMI project and Diameter recommends all approaches to achieving the desired AMI result should be considered. The Town currently has approximately 586 radio transmitters that could be re-used for AMI depending on the solution chosen saving the Town approximately $55,000 in the initial project. The remaining (~8,200) radio transmitters deployed in Kingsville cannot be re-used for AMI regardless of the vendor chosen.

Similarly, existing wires can mostly likely be re-used by at least one vendor regardless of whether 2 wires or 3 wires are available. While most AMI systems require 3 wires connected at the meter and at the radio transmitter, Sensus does provide the option of leveraging existing wires without the need to re-run new wires. The Financial Model has provided a $70,000 allowance for running the appropriate wires if they are not available at each location, which can potentially be eliminated. The Financial Model also provided for $187,000 in installation contingency – part of which was due to uncertainty around wires.

Diameter recommends allowing all vendors to propose what they believe to be the best, most cost-effective approach to implement AMI for the Town of Kingsville. Some vendors, such as Sensus, will be able to utilize existing infrastructure (radio transmitters, wires) to a greater extent than other vendors. However, all vendors will realize this prior to bidding and will have the opportunity to provide the most aggressive proposal to combat other vendors' advantages.

Recommendation R4: Diameter recommends changing meters that are 10 years or older.

Historically, water meter replacement decisions were driven by the expected accuracy loss of a utility's meter population. Depending on specific characteristics of the utility's water (such as hardness), water meter replacements were historically between 15 and 25 years. Now, with more water meters - and all radio transmitters - requiring batteries, the replacement decision for both devices are often driven by expected battery failure (usually 20 years or less).

When completing full system wide meter replacements and/or meter reading technology upgrades, additional factors drive decisions to change meters such as the remaining asset value in the meter. That is, if the cost of a return visit is more than the remaining asset value of the meter, utilities will often change the meter while at the premises performing their primary work. Additional customer disruption is another reason utilities will opt to change meters while already at a location.

In Kingsville's case and regardless of the AMI vendor chosen, virtually all the radio transmitters will need to be changed meaning all locations need to be visited.

Nearly 73% of the Town's water meters are 15 years or older and just under 14% of the Town's meters are between 10 and 14 years old. Diameter recommends changing all meters 10 years and older because of the meter's limited remaining asset value, to maximize consumption revenue, to eliminate additional customer disruption in the short to medium term, ensure compatibility with the chosen AMI reading system and to ensure the meter provides the appropriate data (ie. resolution) to the radio transmitter to take advantage of its functionality.

Recommendation R5: Diameter recommends the Town install mechanical small meters (up to 1.5" in diameter) and non-mechanical meters for 2" and larger meters.

Non-mechanical meters in smaller sizes carry a significant premium over mechanical meters of approximately 50%. Additional functionality available in non-mechanical meters can push this premium to 100%.

Kingsville has no requirement for the additional functionality available in non-mechanical meters such as pressure or temperature monitoring or remote shut offs. The Town's water hardness is below the provincial average and considered on the softer side. Therefore, no unanticipated meter accuracy loss is expected. As such, there is no compelling event for the Town to install non-mechanical meters in the smaller sizes and Diameter recommends mechanical meters up to 1.5".

Larger non-mechanical meters can generally be justified because of greater accuracy over a broader flow range (and subsequently more revenue for the utility), their ability to maintain accuracy for the life of the meter, the fact no strainer is required, and their cost is in line with mechanical meters of similar sizes. Non-mechanical meters in the larger sizes have been installed at utilities for the past 15 years or more and generally function as expected. For these reasons, Diameter recommends non-mechanical meters for 2" and larger meters.

Recommendation R6: Diameter recommends a 20% contingency on the installation portion of the project.

Due to factors such as amalgamations and I.T. system changes, the Town lacks historical asset information in some cases including meter sizing, meter location (pit vs. indoor) and wire details that connect radio transmitters to the meter itself. All these factors impact the installation costs of the project and in some cases the capital costs. A 1.5" meter is more expensive than a ¾" meter and so too is its installation; having details on all meters currently installed helps determine accurate project costing to the extent possible.

Diameter has attempted to be as accurate as possible given the information available on all costing aspects of the project. That said, the Town should budget a 20% contingency to account for unknown factors in this project.

Recommendation R7: Diameter recommends a 3-month Startup and a 12-month Implementation for the Project.

Diameter generally recommends reasonably condensing project roll-out timeframes to the extent possible given the size, scope and available budget for the implementation.

Lengthening the duration of a project increases the cost and delays realization of all the benefits from an AMI system implementation. For example, increasing the project from fifteen months to 24 months increases the project management costs associated with the project and potentially adds inflationary components to the costs. At the same time, to realize all the benefits of the AMI investment (understanding aggregate water demand, uniform enhanced customer service) the AMI system needs to be completely implemented.

Given the size and scope of Kingsville's implementation, the likelihood of a single vendor providing the entire solution mitigating some of the I.T. system integration complexities, Diameters recommends a total implementation timeframe of 15 months.

Appendix A

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1	Utility Name	Town of Kingsville	Town of Kingsville
2	Project Name	Water Meter Replacement and AMI System	Water Meter Replacement and AMI System
3	Interest (Discount rate)	2.00%	2%
4	Inflation (costs)	2%	2%
5	Rate Increase / Growth (revenue)	2.30%	2.30%
6	Completion %	100%	100%
7	Project Duration (months) - Startup	3	3.00
8	Project Duration (months) - Production	12	12
9	Contingency Rate (of installation)	20%	20%
	Economies of Scale	0%	0%
10		$ (3,590,875.00)	$ (3,618,169.50)
11			
12			
13			
1.001	Change Out Installation - 15mm	0.00%	0.00%
1.002	Change Out Installation - 15 X 20mm	100.00%	100.00%
1.003	Change Out Installation - 20mm	100.00%	100.00%
1.004	Change Out Installation - 25mm	100.00%	100.00%
1.005	Change Out Installation - 31mm	100.00%	100.00%
1.0021	Change Out Installation - 37mm	100.00%	100.00%
1.0031	Change Out Installation - 50mm	100.00%	100.00%
1.0041	Change Out Installation - 75mm	100.00%	100.00%
1.005	Change Out Installation - 100mm	100.00%	100.00%
1.006	Change Out Installation - 150mm	100.00%	100.00%
1.007	Change Out Installation - 200mm	100.00%	100.00%
1.008	Change Out Installation - 250mm	100.00%	100.00%
1.009	Change Out Installation - 15 X 20mm - Residential Pit	100.00%	100.00%
1.01	Change Out Installation - 20mm - Residential Pit	100.00%	100.00%
1.011	Change Out Installation - 25mm - Residential Pit	100.00%	100.00%
1.012	Change Out Installation - 31mm - Pit	100.00%	100.00%
1.0021	Change Out Installation - 37mm - Pit	100.00%	100.00%

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.0031	Change Out Installation - 50mm - Pit	100.00%	100.00%
1.0041	Change Out Installation - 75mm - Pit	100.00%	100.00%
1.0051	Change Out Installation - 100mm - Pit	100.00%	100.00%
1.0061	Change Out Installation - 150mm - Pit	100.00%	100.00%
1.0071	Change Out Installation - 200mm - Pit	100.00%	100.00%
1.0081	Change Out Installation - 250mm - Pit	100.00%	100.00%
1.013	Retrofit with appt Installation - 15mm	100.00%	100.00%
1.014	Retrofit with appt Installation - 15 X 20mm	100.00%	100.00%
1.015	Retrofit with appt Installation - 20mm	100.00%	100.00%
1.016	Retrofit with appt Installation - 25mm	100.00%	100.00%
1.017	Retrofit with appt Installation - 31mm	100.00%	100.00%
1.018	Retrofit with appt Installation - 37mm	100.00%	100.00%
1.019	Retrofit with appt Installation - 50mm	100.00%	100.00%
1.02	Retrofit with appt Installation - 75mm	100.00%	100.00%
1.021	Retrofit with appt Installation - 100mm	100.00%	100.00%
1.022	Retrofit with appt Installation - 150mm	100.00%	100.00%
1.023	Retrofit with appt Installation - 200mm	100.00%	100.00%
1.024	Retrofit with appt Installation - 250mm	100.00%	100.00%
1.025	Retrofit with NO APPT REQ Installation - 15mm - pit	100.00%	100.00%
1.026	Retrofit with NO APPT REQ Installation - 15 X 20mm - Pit	100.00%	100.00%
1.027	Retrofit with NO APPT REQ Installation - 20mm - Pit	100.00%	100.00%
1.028	Retrofit with NO APPT REQ Installation - 25mm - Pit	100.00%	100.00%
1.029	Retrofit with NO APPT REQ Installation - 31mm - Pit	100.00%	100.00%
1.03	Retrofit with NO APPT REQ Installation - 37mm - Pit	100.00%	100.00%
1.031	Retrofit with NO APPT REQ Installation - 50mm - Pit	100.00%	100.00%
1.032	Retrofit with NO APPT REQ Installation - 75mm - Pit	100.00%	100.00%
1.033	Retrofit with NO APPT REQ Installation - 100mm - Pit	100.00%	100.00%
1.034	Retrofit with NO APPT REQ Installation - 150mm - Pit	100.00%	100.00%
1.035	Retrofit with NO APPT REQ Installation - 200mm - Pit	100.00%	100.00%
1.036	Retrofit with NO APPT REQ Installation - 250mm - Pit	100.00%	100.00%
1.037	Strainer Installation - 50mm	100.00%	100.00%
1.038	Strainer Installation - 75mm	0.00%	0.00%
1.039	Strainer Installation - 100mm	0.00%	0.00%
1.04	Strainer Installation - 150mm	0.00%	0.00%

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.041	Strainer Installation - 200mm	0.00%	0.00%
1.042	Strainer Installation - 250mm	0.00%	0.00%
1.043	Plumbing Minor S&I - 15 to 20mm (Change Outs)	7.00%	7.00%
1.044	Plumbing Normal S&I - 15 to 20mm (Change Outs)	4.00%	4.00%
1.045	Plumbing Minor S&I - 25mm (Change Outs)	7.00%	7.00%
1.046	Plumbing Normal S&I - 25mm (Change Outs)	4.00%	4.00%
1.047	Plumbing Major S&I (WMI) - 15 to 25mm	0.50%	0.50%
1.048	Plumbing Fitting S&I - 37mm	0.00%	0.00%
1.049	Plumbing Fitting S&I - 50mm	0.00%	0.00%
1.05	Plumbing Fitting S&I - 75mm	0.00%	0.00%
1.051	Plumbing Fitting S&I - 100mm	0.00%	0.00%
1.052	Plumbing Fitting S&I - 150mm	0.00%	0.00%
1.053	Plumbing Fitting S&I - 200mm	0.00%	0.00%
1.054	Plumbing Fitting S&I - 250mm	0.00%	0.00%
1.055	Plumbing Major S&I (plumber) - 37mm and greater	25.00%	25.00%
1.057	BCV Install S&I - 13 to 20mm	5.00%	5.00%
1.059	BCV Install S&I - 25mm	5.00%	5.00%
1.06	BCV Install S&I - 37mm	0.00%	0.00%
1.061	BCV Install S&I - 50mm	0.00%	0.00%
1.062	BCV Install S&I - 75mm	0.00%	0.00%
1.063	BCV Install S&I - 100mm	0.00%	0.00%
1.064	BCV Install S&I - 150mm	0.00%	0.00%
1.065	BCV Install S&I - 200mm	0.00%	0.00%
1.066	BCV Install S&I - 250mm	0.00%	0.00%
1.067	Isolation Valve Install S&I - 13 to 20mm	0.00%	0.00%
1.068	Isolation Valve Install S&I - 25mm	0.00%	0.00%
1.069	Isolation Valve Install S&I - 37mm	0.00%	0.00%
1.07	Isolation Valve Install S&I - 50mm	0.00%	0.00%
1.071	Isolation Valve Install S&I - 75mm	0.00%	0.00%
1.072	Isolation Valve Install S&I - 100mm	0.00%	0.00%
1.073	Isolation Valve Install S&I - 150mm	0.00%	0.00%
1.074	Isolation Valve Install S&I - 200mm	0.00%	0.00%
1.075	Isolation Valve Install S&I - 250mm	0.00%	0.00%
1.076	Kornerhorn - KH2 S&I 15X20mm	0.00%	0.00%

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.077	Kornerhorn - KH3 S&I 20mm	0.00%	0.00%
1.078	Freeze (15mm to 25mm)	0.00%	0.00%
1.079	Resetter - 15mm to 15X20mm	0.00%	0.00%
1.08	Resetter - 20mm	0.00%	0.00%
1.081	Resetter - 25mm	0.00%	0.00%
1.082	Small System Premium	0.00%	0.00%
1.083	Crawl Space	2.00%	2.00%
1.084	Confined Space 37mm-50mm	100.00%	100.00%
1.084	Confined Space 75mm and greater	100.00%	100.00%
1.085	Large Meter Surveys	100.00%	100.00%
1.086	Residential Wire run to the Outside	40.00%	40.00%
1.087	Intermediate Wire run to the Outside	40.00%	40.00%
1.088	Commercial Wire run to the Outside	40.00%	40.00%
1.089	Carpentry Minor	7.00%	7.00%
1.09	Carpentry Normal with Box	2.00%	2.00%
1.091	Handhelds to Re-program Sensus Meters	100.00%	100.00%
1.092	Contingency	20.00%	20.00%
1.093	Water Meter Supply PD - 15mm x 20mm - Pit	100.00%	100.00%
	Water Meter Supply PD - 20mm - Pit	100.00%	100.00%
	Water Meter Supply PD - 25mm - Pit	100.00%	100.00%
	Water Meter Supply PD - 31mm - Pit	100.00%	100.00%
	Water Meter Supply PD - 37mm - Pit	100.00%	100.00%
	Water Meter Supply PD - 50mm - Pit	100.00%	100.00%
1.094	Water Meter Supply PD - 15X20mm	100.00%	100.00%
1.095	Water Meter Supply PD - 20mm	100.00%	100.00%
1.096	Water Meter Supply PD - 25mm	100.00%	100.00%
1.097	Water Meter Supply PD - 31mm	100.00%	100.00%
1.098	Water Meter Supply PD - 37mm	100.00%	100.00%
1.099	Water Meter Supply PD - 50mm	100.00%	100.00%
1.1	Water Meter Supply C715 NonMechanical - 15mm	0.00%	0.00%
1.101	Water Meter Supply C715 NonMechanical - 15X20mm	0.00%	0.00%
1.102	Water Meter Supply C715 NonMechanical - 20mm	0.00%	0.00%
1.103	Water Meter Supply C715 NonMechanical - 25mm	0.00%	0.00%
1.104	Water Meter Supply C715 NonMechanical - 31mm	0.00%	0.00%

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.105	Water Meter Supply C715 NonMechanical - 37mm	0.00%	0.00%
1.106	Water Meter Supply C715 NonMechanical - 50mm	0.00%	0.00%
1.107	Water Meter Supply COMP - 75mm	0.00%	0.00%
1.108	Water Meter Supply TURB- 75mm	0.00%	0.00%
1.109	Water Meter Supply FM- 75mm	0.00%	0.00%
1.11	Water Meter Supply COMP - 100mm	0.00%	0.00%
1.111	Water Meter Supply TURB- 100mm	0.00%	0.00%
1.112	Water Meter Supply FM- 100mm	0.00%	0.00%
1.113	Water Meter Supply COMP - 150mm	0.00%	0.00%
1.114	Water Meter Supply TURB- 150mm	0.00%	0.00%
1.115	Water Meter Supply FM- 150mm	0.00%	0.00%
1.116	Water Meter Supply COMP - 200mm	0.00%	0.00%
1.117	Water Meter Supply TURB- 200mm	0.00%	0.00%
1.118	Water Meter Supply FM- 200mm	0.00%	0.00%
1.119	Water Meter Supply COMP - 250mm	0.00%	0.00%
1.12	Water Meter Supply TURB- 250mm	0.00%	0.00%
1.121	Water Meter Supply FM- 250mm	0.00%	0.00%
1.1211	Water Meter Supply non-mechanical- 75mm	100.00%	100.00%
1.1212	Water Meter Supply non-mechanical FM - 75mm	0.00%	0.00%
1.1213	Water Meter Supply non-mechanical- 100mm	100.00%	100.00%
1.1214	Water Meter Supply non-mechanical FM - 100mm	0.00%	0.00%
1.1215	Water Meter Supply non-mechanical- 150mm	100.00%	100.00%
1.1216	Water Meter Supply non-mechanical FM - 150mm	0.00%	0.00%
1.1217	Water Meter Supply non-mechanical- 200mm	100.00%	100.00%
1.1218	Water Meter Supply non-mechanical FM - 200mm	0.00%	0.00%
1.122	Register Only - High Resolution encoder Res	0.00%	0.00%
1.122	Register Only - High Resolution encoder INT	0.00%	0.00%
1.123	Register Only - High Resolution encoder LM	0.00%	0.00%
1.124	Strainer Supply TURB- 75mm	0.00%	0.00%
1.125	Strainer Supply TURB- 100mm	0.00%	0.00%
1.126	Strainer Supply COMP - 150mm	0.00%	0.00%
1.127	Strainer Supply COMP - 200mm	0.00%	0.00%
1.128	Strainer Supply COMP - 250mm	0.00%	0.00%
1.129	Radio Transmitter - RF Supply - Wall	100.00%	0.00%

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.13	Radio Transmitter - RF Supply - Wall	100.00%	0.00%
1.131	Radio Transmitter - RF Supply - Wall	100.00%	0.00%
1.132	Radio Transmitter - RF Supply - Pit	100.00%	0.00%
1.133	Radio Transmitter - RF Supply - Pit	100.00%	0.00%
1.134	Radio Transmitter - RF Supply - Pit	100.00%	0.00%
1.135	Radio Transmitter - CELL Supply - Wall	0.00%	100.00%
1.136	Radio Transmitter - CELL Supply - Wall	0.00%	100.00%
1.137	Radio Transmitter - CELL Supply - Wall	0.00%	100.00%
1.138	Radio Transmitter - CELL Supply - Pit	0.00%	100.00%
1.139	Radio Transmitter - CELL Supply - Pit	0.00%	100.00%
1.14	Radio Transmitter - CELL Supply - Pit	0.00%	100.00%
1.141	Pressure Gauge	0.00%	0.00%
1.142	Temperature Gauge	0.00%	0.00%
1.143	**Acoutistic Leak Detection Device**	0.00%	0.00%
1.144	**Handhelds - Meter Reading**	-	-
1.145	**Cradle - Meter Reading**	-	-
1.146	Handhelds - Maintenance	2.00	2.00
1.147	Cradle - Maintenance	2.00	2.00
1.148	Handhelds - Installation Contractor	-	-
1.149	Cradle - Installation Contractor	-	-
1.15	Mobile lite	-	-
1.151	Full Mobile	-	-
1.152	Multi-handheld cradle	-	-
1.153	Data Collectors (Itron) - Supply	-	-
1.153	Data Repeater (Itron) - Supply	-	-
1.154	Data Collectors Deployment (Itron) - Installation	-	-
1.155	Data Collectors Deployment (Itron) - Supply and Install Poles	-	-
1.156	Data Collectors Deployment (Itron) - Management/Approval	-	-
1.157	Data Collectors Deployment (Itron) - Extra/Electrical/ Misc/ Trench	-	-
1.153	Data Collectors (Non-Itron)- Supply	8.00	-
1.154	Data Collectors Deployment (Non-Itron) - Installation	8.00	-
1.155	Data Collectors Deployment (Non-Itron) - Supply and Install Poles	2.00	-
1.156	Data Collectors Deployment (Non-Itron) - Management/Approval	8.00	-
1.157	Data Collectors Deployment (Non-Itron) - Extra/Electrical/ Misc/ Trench	8.00	-

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.158	Meter Reading Software - Initial License	-	-
1.159	Meter Reading Software - Implementation	-	-
1.16	Meter Reading Software - User Training	-	-
1.161	Collection Software (Itron) - Initial License	-	-
1.162	Collection Software (Itron) - Implementation	-	-
1.163	Collection Software (Itron) - User Training	-	-
1.164	Collection Software (Itron) - Servers/Hardware	-	-
1.165	Collection Software (Itron) - Operating & DB Licenses	-	-
1.161	Collection Software (Non-Itron)- Initial License	-	-
1.162	Collection Software (Non-Itron)- Implementation	1.00	1.00
1.163	Collection Software (Non-Itron)- User Training	1.00	1.00
1.164	Collection Software (Non-Itron)- Servers/Hardware	-	-
1.165	Collection Software (Non-Itron)- Operating & DB Licenses	-	-
1.166	MDM Software - Initial License	1.00	1.00
1.167	MDM Software - Implementation	1.00	1.00
1.168	MDM Software - User Training	1.00	1.00
1.169	MDM Software - Servers/Hardware	-	-
1.17	MDM Software - Operating & DB Licenses	-	-
1.166	Field Services Software - Initial License	-	-
1.167	Field Services Software - Implementation	-	-
1.168	Field Services Software - User Training	-	-
1.169	Field Services Software - Servers/Hardware	-	-
1.17	Field Services Software - Operating & DB Licenses	-	-
1.171	Customer Portal Software - Initial License	-	-
1.172	Customer Portal Software - Implementation	3.00	3.00
1.173	Customer Portal Software - User Training	2.00	2.00
1.174	Customer Portal Software - Servers/Hardware	-	-
1.175	Customer Portal Software - Operating & DB Licenses	-	-
1.176	Contingency	25%	25%
1.177	Interfaces - To MIS	10.00	10.00
1.178	Interfaces - To Meter Reading Software	-	-
1.179	Interfaces - To Collection Software	10.00	10.00
1.18	Interfaces - To MDM Software	5.00	5.00
1.181	Interfaces - To Customer Portal Software	5.00	5.00

Reference	Assumption	Scenario 1- AMI (Stand-alone)	Scenario 2 - AMI (Cellular)
1.182	**Phase Optional**	1.00	1.00
1.183	**Phase 2 - Procurement**	1.00	1.00
1.184	**Phase 3 - Start Up**	1.00	1.00
1.185	**Phase 4 - POC**	1.00	1.00
1.186	**Phase 5 - Installation**	1.00	1.00
1.187	**Phase 6 - Close Out**	1.00	1.00
1.188	**Phase 1 - Disbursements**	0%	0%
1.189	**Phase 2 - Disbursements**	0%	0%
1.19	**Phase 3 - Disbursements**	0%	0%
1.191	**Phase 4 - Disbursements**	0%	0%
1.192	**Phase 5 - Disbursements**	0%	0%
1.193	**Phase 6 - Disbursements**	0%	0%
1.194	A. Project Manager	0%	0%
1.195	B. Curbstop / Meter Box Repair Coordination	0%	0%
1.196	C. Curbstop / Meter Box Repair - Construction	0%	0%
1.197	D. Data Collector Coordination	0%	0%
1.198	E. Field Supervisor	0%	0%
1.199	F. Field Inspector	0%	0%
1.2	G. AMI Anaylst/Champion	0%	0%
1.201	H. IT SME - Hardware	0%	0%
1.202	I. IT SME - Applications	0%	0%
1.203	J. IT SME - Interface	0%	0%
1.204	K. Public Outreach	0%	0%
1.205	L. Billing and Customer Service Supervisor	0%	0%
1.206	M. Billing and Customer Service Billing Agent	0%	0%
1.207	N. Change Management	0%	0%

No index entries found.