

**Town of Portugal Cove - St. Philip's
Water and Wastewater Metering Study**

Final Report

August 1, 2016

**G.A. Isenor Consulting Limited
in association with
Blaine S. Rooney Consulting Limited**

August 1, 2016

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Attention Chris Milley, P.Eng.
Town Manager/Engineer

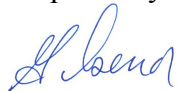
**Re: Town of Portugal Cove-St. Philip's
Water and Wastewater Metering Study**

We are pleased to submit the Town of Portugal Cove - St. Philip's Water and Wastewater Metering Study Final Report to the Town.

The report has investigated the current water usage pattern, meter systems, customer service, the benefits and disadvantages of metering water, and the projected impact of metering on water loss control and for billing wastewater charges. The report provides estimated costs for the average customer for both water and wastewater service as well as estimated fire protection charges.

We thank Town staff for their cooperation and assistance during the course of this study and we appreciate the opportunity to be of service to the Town of Portugal Cove - St. Philip's on this important issue.

Respectfully submitted



G. Isenor, P.Eng.
G. A. Isenor Consulting Limited

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Executive Summary

The Town of Portugal Cove - St. Philip's (PCSP) is located on the eastern Avalon Peninsula of the Province of Newfoundland and Labrador. The study is to provide an opinion on the Project Feasibility with a study objective of "providing assistance to the Town in their review of the benefits and disadvantages of water metering and provide a recommendation for water and wastewater rates." PCSP estimates it will purchase approximately 810,000 m³ of treated water from the Regional Water Authority in 2016. The Town currently has 1,188 residential household water customers, 20 commercial water customers, 1064 residential household wastewater customers and 22 commercial wastewater customers.

Water meters are widely used in Canada for the billing of water and wastewater service and their usage has proven to be a reliable method to fairly bill residential and commercial users for the services provided. Quarterly billing for these services is the most common for small water systems based on meter readings. The most common method of reading new meter installations is by the use of Radio Frequency Drive-by reading devices which allow all meters to be read by driving by the house or business in a vehicle.

The following are the key conclusions/recommendations in this report:

- It is concluded that the installation of water meters on all current and future customers in PCSP is feasible and desirable as meters would benefit all customers by providing an accurate measurement of usage for billing purposes and would assist in reducing non-revenue water;
- It is recommended that PCSP install water meters for all residential and commercial customers connected to the water system with drive-by radio frequency reading capability. The water meters should be read for a period of one year prior to issuing bills based on the water meter readings to give customers time to get accustomed to the devices and to reduce internal leaks (dripping faucets, leaking toilets, etc) prior to their usage for billing purposes.
- It is recommended that PCSP implement a comprehensive water loss control program in concert with the installation of the water meters to identify water loss locations and make the necessary repairs to reduce the water purchased from the Regional Water Authority.
- It is recommended that PCSP consider transition over a number of years from the partial cost recovery model for the provision of water and wastewater service to a Full Cost Recovery system which will result in the water and wastewater customers paying all costs related to the provision of the service.

1 Introduction

The Town of Portugal Cove - St. Philip's (PCSP) is located on the eastern Avalon Peninsula of the Province of Newfoundland and Labrador. PCSP was amalgamated in 1992 and one of the largest municipalities in the Province. It borders the City of St. John's to the east, and the Town of Paradise to the west.

Businesses within the community itself, however, are numerous and include farms, convenience stores, restaurants & cafes, construction yards, gardening centres, hair salons, garages & service stations, and bed & breakfast. The Town's ferry terminal provides daily access to and from Bell Island.

The Town operates its own water distribution and wastewater collection/treatment systems. The water system is unmetered with customers charged a fixed water tax for the service. Treated water for the distribution network is provided by the adjoining Regional Water Authority. Wastewater is treated at two modern wastewater treatment plants operated by the Town.

The Water and Wastewater Metering Study was commissioned by the Town to investigate the feasibility of the proposed water metering project.

1.1 *Background*

PCSP is reviewing the benefits and disadvantages of installing water meters on existing residential properties currently connected to the Town's water supply system and all new residential connections in the Town. The current plan does not include the metering of commercial properties. In the Project Charter the Town notes that water metering is a statistically proven method to encourage water conservation and reduce water usage. Metering allows customers to gain significant control over their water bills and will allow the Town to reduce the volume of water purchased from the Regional Water Authority.

The current system is that all connected customers are supplied with an unlimited supply of water and are charged an annual water tax and, as such, this does not provide a fair and equitable means of charging for the service provided since all residential units do not use the same amount of water. Water metering will allow the Town to bill users based on

actual water used while providing every user with a fair charge for the actual water they consume.

Water metering is also an essential component of any water loss program as it allows the Town to constantly review the volume of water sold versus the volume purchased from the Regional Water Authority. Water loss control is a key component of good management of a water supply/distribution network. Usage data is also invaluable for future planning for growth in the Town.

Water meter consumption data has historically been used by many municipalities as the basis for charging for wastewater service based on the premise that “water in” equals “water out” for most customers. In cases where it can be shown that there is a significant usage of the water that does result in discharge to the wastewater system (i.e. ready mix concrete plants where water is added to the concrete mixture and trucked off-site or landscaping garden centres where the water is used for plant maintenance) it can be metered in such a way as to provide data on water discharge to the wastewater system.

The vast majority of water systems in Canada have been metered for decades and the systems available have a proven successful track record with both users and municipalities who provide the service.

1.2 *Objective of the Study*

The study objective is “to provide assistance to the Town in their review of the benefits and disadvantages of water metering and provide a recommendation for water and wastewater rates.”

2 Description of Existing System

PCSP is located on the Avalon Peninsula adjacent to St John's and has a population of approximately 7,350. The majority of customers who are connected to PCSP services receive both water and wastewater service. Presently there are 1,208 residential and commercial customers receiving water service and 1,086 residential and commercial customers receiving wastewater service. Presently none of the customers are metered although the Town has identified the desire to install water meters on all existing residential properties currently connected to the PCSP's system and all new residential developments. If PCSP installs meters then it will be the first community in

Newfoundland and Labrador to implement community wide water metering. In addition, there is a Regional Water Authority study that recommends a regional implementation of universal water metering.

2.1 *Water System*

PCSP receives treated water from the St John's Regional Water Authority through a metered connection point at a cost of \$0.589 per cubic meter (m³) and then is responsible for its distribution to its customers connected to the system. The distribution system in PCSP was started in 1981. In addition to distribution mains there are individual customer service connections with service box shut offs and hydrants for the provision of fire protection service. The reservoir is owned and maintained by the Regional Water Authority. PCSP projects it will purchase in the area of 810,000 m³ for 2016 at a cost of \$477,090.

2.1.1 *Current Rates/Billing/Fire Protection*

The water system is currently funded through an annual water tax which for 2016 is set at \$475.00 per unit for residential household customers and \$505.00 per unit for commercial customers. There are also separate rates for the fish plant and the ferry water fill up. In addition, there are connection fees for existing residential and commercial customers and new construction along with other charges for hydrant use, and turn on and reconnection fees. The revenue generated from the water tax is applied to the direct cost of providing the service including the purchase cost of water, transmission and distribution costs but does not include any non-direct administration costs, replacement costs or debt servicing costs. There is currently no separate fire protection charge identified for use of the water system in supplying that service.

2.1.2 *Existing Consumption Comparison*

PCSP estimates it will purchase approximately 810,000 m³ of treated water from the Regional Water Authority in 2016. The Town currently has 1,188 residential household customers and 20 commercial customers. While no firm data exists in PCSP on average consumption for residential users the accepted average consumption for unmetered customers in Atlantic Canada is a maximum of 272 m³ per customer per year. Using this average result's in a total estimated residential consumption of 323,136 m³ per year. While no data exists for commercial customers it appears that the majority of the PCSP commercial customers are not large water users. Given the limited information available

consumption for these facilities has been taken as ten times residential (2,720 m³ per unit per year) to be conservative.

This yields total annual projected water consumption by the customers of 377,536 m³. Comparing the projected water purchase volume of 810,000 m³ results in 432,464 m³ of non-revenue water which is approximately 53% of all of the water purchased from the Regional Water Authority. Water meters, if installed, would allow the Town to determine if the non-revenue water is within the PCSP system or on private property after the meter location.

The installation of meters for all residential and commercial customers will have a direct impact on the estimated 377,536 m³ used by customers and will have an indirect impact on the 432,464 m³ of non-revenue water if PCSP implements a comprehensive water loss control program. The water loss control program will utilize the water usage information provided by individual residential and commercial meters in concert with zone metering to assist in locating the areas of highest water loss. PCSP will need to install zone meters at strategic locations in the water system as part of the water loss control program. The use of individual meter readings in concert with zone meter readings is commonly used in by other water providers as the basis of locating areas of highest water loss. These areas can then be subject to more detailed investigation to locate and remediate problems. This methodology will allow PCSP to focus on those areas of highest loss first.

2.2 *Wastewater System*

PCSP collects and treats its wastewater through its collection system and has two Sequence Batch Reactor (SBR) treatment plants which were constructed in the mid-2000s and meet the new federal regulations. The collection system includes mains, manholes, service laterals and pumping stations. The treated wastewater is discharged into Conception Bay.

2.2.1 *Current Rates/Billing*

The wastewater system is funded through an annual wastewater tax which is currently set at \$175.00 per unit for residential customers and \$235.00 per unit for commercial customers. In addition, there are connection fees for existing residential and commercial customers and new construction. The revenue generated from the wastewater tax is applied to the direct cost of providing the service including the collection and treatment costs but does not include any indirect administration costs, replacement cost or debt servicing.

2.2.2 Existing Wastewater Flows

The wastewater flow exiting the treatment plants was provided by the Town and totaled 417,980 m³ in 2015. This compares to the estimated customer water usage of 377,536 m³ and is much lower than the projected water purchased from the Regional Water Authority (810,000 m³). This suggests that the high amount of non-revenue water is not the result of higher than average water usage by individual customers in PCSP. It also leads to the conclusion that the vast majority of the non-revenue water is not leaking, directly or indirectly, into the wastewater collection system.

3 Metering System

3.1 Review of Metering & Reading Technologies

3.1.1 Measuring Element

Different manufacturers offer different water volume measurement technologies. The majority of PCSP customers are residential with water service pipe sizes of either 19-mm (3/4-inch) or 25-mm (1 inch). All single family residential customers should have 16-mm (5/8 inch) water meters installed regardless of the service pipe size for maximum accuracy. Meter technologies suited to this service size include multi-jet, single-jet, fluidic oscillator, magnetic sensors and positive displacement.

For residential customers, either the positive displacement design or the magnetic sensors are the preferred styles of meter. Meters used for residential customers must be able to accurately register across a wide range of usage. Both of these styles have been found to offer accuracy from a small rate of use (such as minor plumbing leaks) to a high rate of usage (examples showers and lawn irrigation) and to have a long lifespan.

Multi-jet and single jet meters have not gained acceptance in Canada, although they are popular in other countries.

Turbine or compound (turbine & positive displacement combined) meters are typical for larger users. The choice of larger meter design depends on range of flow as well as whether fire flow must be accommodated.

The current standard water meter used in Canada consists of a brass body, a metal frost plate bolted to the bottom (it breaks and saves the meter casing if the water in it freezes),

a plastic measuring element inside and a separate meter readout device on top. The two are connected with a magnetic drive.

Concerns over lead leaching from the brass body used in many water meters led to regulations in the US limiting the amount of lead in the brass. All meter manufacturers now must meet very low lead content tolerances. The two brands of meters operating in the majority of the Canadian market are Neptune and Sensus. Neptune responded by eliminating lead in its brass and casts its meter body in-house. Sensus offers a non-metallic meter body made of a composite of plastic and fiberglass (iPERL) with electronic flow measurement (no moving parts).

Thus for standard meters that will form the bulk of the installations if PCSP moves to metering, it is suggested that the standard meter adopted utilize either a brass casing which meets minimal lead content standards (or preferably no lead) or the non-metallic meter body of fiberglass and plastic.

Although the Canadian government has considered imposing measurement standards for retail water meters, they have not yet done so. The American Water Works Association (AWWA) has developed industry standards for water meter accuracy. For example, AWWA C700-09 covers cold-water meters, displacement type with bronze main case. Maintaining meter accuracy is the responsibility of the water utility with the AWWA standards considered the benchmark for accuracy.

3.1.2 Meter Readout

The objective of installing meters is to obtain accurate and timely individual customer meter readings indicating water consumption in a form and format suitable for calculating water bills.

Meter Readout - There are a number of levels of sophistication available for this:

- **Direct Reading** – Meters can be read directly from a dial on the top of the meter. At one time this was the only way to read meters. In Canada, winter freezing conditions require that meters be installed inside a premise. This method is no longer practical due to limited indoor meter accessibility by meter readers. It is no longer considered practical to count on meter readers routinely being able to carry out direct reads off residential meters. In many cases homes are unoccupied during the day. Even if someone is home, the occupant may not allow access to meter readers. This is less of an issue for commercial customers. Some form of

remote reading device is essential for residential customers if regular actual meter readings are to be obtained.

- **Outside Remote** - This involves running wires from the meter to an outside wall, drilling a hole in the wall and mounting a meter readout device (or “puck”) on the outside wall¹. Meter readers must attend each property in order to obtain meter readings directly from the puck.

The meter reader is equipped with a portable data recorder which is battery powered. It is plugged into a stand overnight at the office where it is recharged as well as being loaded with customer data related to those meters scheduled to be read. In order to get a reading the meter reader must walk up to where the puck is located on the outside wall of the premises. A touch read gun is swiped across the puck sending a signal to the meter which responds with an actual reading as well as location identifier. No batteries are required in the meter for the interrogation signal to function. The touch read gun is either connected directly to the portable data recorder or it sends a signal to the recorder by radio frequency. At days end the portable data recorder is plugged back into the stand connected to the billing computer in order to download the gathered information which includes not only the meter readings but other information such times each readings were taken (useful for monitoring meter reader efficiencies).

- **Radio Frequency (RF)** – The meter transmits readings using radio frequency technology. The transmitter can be integrated with the meter or wall mounted beside the meter. The wall mounted option opens the supply of the equipment to second party vendors. This method allows readings to be taken remotely without having to enter private property. In all cases the receivers’ record transmitted meter readings and their associated location identifiers. There are three methods of gathering of the meter readings:
 - **RF Walk By** – Meter readers walk down the street gathering readings;
 - **RF Mobile Drive By** – The receiver is mounted in a vehicle which follows a route. It interrogates meters as it goes; and,
 - **RF Fixed Network** – Fixed networks can canvas meters over a wider area and receive readings on an ongoing basis. This method has the advantage of being able to receive spot readings (example final readings when a

¹ Older technology had odometer readout devices as well as pin arrays that required plugging into with the reading device. These methods are now obsolete.

home is sold) and to monitor usage patterns (such as for leakage studies) but is more complex to install.

The RF technology offers enhanced ability for leak detection, tamper detection and backflow.

As the list progresses above, the methods are:

- increasingly more expensive to install;
- are cheaper to read; and,
- are more information granular (can obtain more information detail).

The AWWA also has standards relating to meter reading technology. For example, AWWA C707-10 provides standards for encoder-type remote registration systems. Although the touch read system of outside readers is described above, it is no longer commonly installed in new systems. It is more cumbersome to read and is vulnerable to inaccessibility, particularly in the winter. For new installations, like PCSP, it is felt that RF Mobile drive-by technology would offer the best solution. This is generally accepted as the preferred approach and is the approach preferred in this report.

3.1.3 Metering Equipment Availability

The retail water meters used by Canadian water utilities are virtually all (if not all) of American manufacture. There are six American manufactures which sell the majority of residential and commercial water meters in the US including Sensus, Neptune, Hersey, Badger, Master Meter and Elster/Kent.

The Canadian market is not so diverse. Neptune is the dominant supplier, providing meters in Canada since at least 1920. Sensus meters are also installed in many Canadian municipalities. Meters of other manufacture are potentially available as well through distributors though their use is not widespread.

3.2 Cost of Installing Universal Metering

The cost of installing meters has been prepared by Vigilant Management as follows:

Exhibit 1 Estimated cost of Metering

Estimate Prepared By: Grant Horwood		Date Prepared: April 20, 2016		
Project Description: BUDGETARY		Budgetary estimate only		
Refer to project Charter		This estimate is based on high level knowledge and data that exists at this stage of the project. Construction costs are a significant factor in determining the budget and cannot be accurately determined without firmer pricing from local contractors.		
DESCRIPTION OF WORK	unit of measure	UNIT PRICE	QTY	COST
Consulting				
Project Management				
Vigilant	LS			\$ 44,100.00
Consultant - Rate Study & Model Development				
Phase 1	LS			\$ 16,500.00
Phase 2	LS			\$ 14,500.00
Meter Consultant	Est			\$ 15,000.00
Supply and Installation				
Supply meters (incl. transmitter)	each	\$300.00	1100	\$ 330,000.00
Installation (meter only)	each	\$160.00	1100	\$ 176,000.00
Communication System	LS			\$ 45,000.00
Additional reinstatement costs	each	\$250.00	1100	\$ 275,000.00
Data Reading and Analysis				
Data Reading	day	\$600.00	260	\$ 156,000.00
Data Analysis	Est.			\$ 50,000.00
Staff Training	Est.			\$ 10,000.00
Contingencies				
Consultant Fees	25%			\$ 22,525.00
Construction/Implementation	25%			\$ 112,750.00
DISCLAIMER:	SUBTOTAL			\$ 1,267,375.00
	TAXES	15%		\$ 190,106.25
	TOTAL			\$ 1,457,481.25

3.3 Meter Reading and Billing Costs

Based on meter reading information from other locations it is estimated the cost of meter reading will be approximately \$1.50 per reading. This cost is based on using existing staff and vehicle using radio frequency drive-by meter reading technology. This would yield a total cost of \$7,266 per year based on an allowance of \$1.50 per reading (to include staff time, vehicle and meter reading/recording equipment etc.), 1,211 customers and four (quarterly) reads per year.

The installation of water meters will require the Town to issue quarterly bills to all customers. This will require the preparation and issuing of 4,832 water and wastewater bills annually based on the current count of 1,208 customers. Based on information from other water systems it is estimated that each bill costs between \$1.75 and \$2.50 to produce and mail. Using the higher value, \$2.50 per bill, this will cost approximately \$12,080 per year. Rounding of the meter reading and billing costs results in an annual cost of approximately \$19,500 for both. This does not include any costs for any required changes to the billing software for metered consumption billing or any increase in customer contact costs by administrative staff.

3.4 *Installation Options*

The installation can be handled by either the PCSP retained contractors or by contractors hired by the supplier. Given the desire to have the meters installed in a compressed time line and the normal demands on PCSP staff, it is recommended supplier retained contractors be used for the installation. The majority of municipalities that we are aware of that have transitioned from unmetered to metered have used supplier retained contractors. If the decision to proceed with metering is made it should start with the requirement that all new construction be metered. Details of the residential customer's installation will depend on the meter installation locations available as some properties may have fully finished basements while others may be unfinished. All meters must be installed in an area not subject to freezing.

4 Billing and Customer Service

PCSP currently bills for water and wastewater services annually as a water and wastewater tax. It is common throughout North America for water and wastewater service, whether delivered by a Municipality or Utility, to be billed more frequently than annually. This applies whether billings and rates are based on consumption as measured by water meters or flat rates. Quarterly billings are the most common with monthly billing becoming increasingly prevalent especially with commercial customers and the development of electronic reading and billing systems.

There will need to be changes to PCSP's billing system if metering is adopted for water and ultimately wastewater service. The billing system should have the capabilities to handle the reading and billing requirements of moving to metering. Generally, meter readings are transferred in digital file form from the reading units to be used in the billing

system. The system will have to process and store a customer base of 1,200 meters plus an allowance for growth. The use of an electronic reading system will ensure that accurate meter readings are used in determining the correct billings.

There will have to be several capabilities included in the billing and customer service system to accommodate the transition to universal metering. Provision in the system will have to include information on account number, customer type, meter size, meter number, installation date, reading and billing history, consumption, breakdown between base and consumption charges, comments and notes from customer contact.

Billing and reading history will have to be maintained in the system so it is available online to the customer service representatives. It would be preferable that two years of reading and billing history be maintained in the system which means that if billing is on a quarterly basis there would be the last eight billings and reading data and for those meters billed monthly there would be the last 24 readings and billing data.

Reporting should be organized to provide operational and management data for PCSP to operate the system. This would include revenue reports broken down between base and consumption, revenue by billing period for customer type and meter size along with miscellaneous billing charges broken down by type, consumption in cubic meters for total sales and by meter size and by customer type with comparison by meter size with the same billing period the previous year.

It is likely that if universal metering is implemented it will be based on an automated read system. Generally quarterly billing is the accepted method for residential and monthly billing for multi-residential, commercial, industrial and institutional customers. More frequent billing could be facilitated by reading more frequently but billing, mailing and processing costs would need to be considered against the benefits of more frequent billings.

There will be several customer service changes that will need to be considered when implementing universal metering. These include:

- a) Increased customer call volume as water bills will be issued more frequently than once per year and will fluctuate based on usage.
- b) Billing edit requirement to review out of range bills with standards and previous bills.
- c) Meter reading requirements with the installation of meters.
- d) Meter maintenance requirements both for the installation of new customers and follow up for meters in service such as non-registering meters.

A policy will have to be developed on how to handle large abnormal consumption situations such as leaky toilets to address customer concerns. This could include providing dye tablets to customers for use in determine wastage, suggestions on how to determine whether there is overnight consumption by reading the meter after the last use at night and before the first use in the morning and perhaps extended payment plans or partial write-offs for one-time wastage. These items may require the reallocation of existing staff or additional staff.

5 Benefits & Disadvantages of Metering

5.1 *Benefits*

There are a number of advantages to water metering:

- **User Pay** – Customers will pay for what they use (the user pay principle). This is probably the best reason to meter since it is the fairest way of recovering the cost of providing water service. Unmetered flat rate charges result in small water users, typically seniors and customers with small families, subsidizing large water users. Adding wastewater to the water bill adds to the fairness of recovering water and wastewater system costs.
- **Reduced Use** - The introduction of water metering has proven to be effective in reducing water consumption. This does not mean that customers will have a lower level of service. Reductions typically come about through identifying plumbing leaks and repairing them, reduced wastage such as not letting taps run needlessly and more careful outdoor usage and general conservation awareness. The Town of Amherst, Nova Scotia has seen its average residential consumption decline to 180 m³ per year compared to the estimated 272 m³ per year before metering. This decline is expected to continue as people become more conservation minded and aware of the savings they can achieve in their water and wastewater bills. Based on observed water usage in areas that have had meters installed for a number of years it is anticipated that the average residential usage in the Town, in the longer term, will be in the order of 160 m³ per year. In the short term it is suggested that the usage will be in the order of 200 m³ per year. A check of Towns in Nova Scotia that have had meters installed for more than 5 years indicates that the average usage is 180 m³ and continuing to decrease at a rate of 1.5% to 2% per year at the present time. Given that customers will have to adjust to the newly installed meters it is felt that the use of 200 m³ per customer per year is a reasonable expectation for the first few years after installation of the meters. It is reasonable to expect this number to decline further as users become aware of the

fact that they can control their costs for water (and potentially wastewater) by monitoring their own usage.

- Reduced Supply Cost from Reduced Customer Consumption-** in PCSP the reduced supply cost is significant since the treated water is being purchased from the Regional Water Authority and paid for on a volume basis. Unmetered customers pay a fixed rate. Reduced usage resulting from metering will result in lowering the PCSP's purchased water costs. The following table lays out the projected direct savings resulting from reduced consumption following the installation of meters. The following calculations show the direct reduction in supply costs based on the current cost of water from the Regional Water Authority (\$0.589 per cubic meter).

Exhibit 2 – Projected Savings in the Cost of Water Resulting from Meter Installation

Projected current usage			377,536	c.m. year
Projected usage based on 200 cm per year on average			277,600	c.m. year
Projected usage based on 180 cm per year on average			249,840	c.m. year
	Reduction resulting from 200 cm per year usage		99,936	c.m. year
	Reduction resulting from 180 cm per year usage		127,696	c.m. year
<u>Dollar Savings based on \$0.589 /c.m.</u>				
	Based on 200 cm per year usage	\$	58,862	per year
	Based on 180 cm per year usage	\$	75,213	per year

- Reduced Supply Cost from Reduced Non-Revenue Water**
 The installation of meters will allow the Town to improve its non-revenue water program and thereby reduce the Supply Cost from the Regional Water Authority. The following calculation shows the potential savings from improved leak detection and repairs of the distribution system. As noted in Section 2.1.1 the reductions in non-revenue water requires the implementation of a water loss control program which will utilize the metered usage provided by individual residential and commercial meters in concert with strategically located zone meters to assist in locating the areas of highest water loss. The zone meters would be installed as part of a water loss control program which would determine their sized and location.

Exhibit 3 – Estimated Cost Savings from Reduced Non-Revenue Water

<u>Reductions and dollar savings with improved water loss control</u>			
Current Non Revenue Water total	432,464	c.m. year	
		c.m. /year	\$/year
	20%	86,493	\$50,944
	30%	129,739	\$76,416
	40%	172,986	\$101,889
	50%	216,232	\$127,361

- **Reduced Sewage System Loading** – Many of the reductions in water usage, such as repairing plumbing leaks and more water efficient fixtures, also result in reduced discharges to the wastewater system. This reduces wastewater flows and overall system costs as well as freeing up capacity in the Town’s system for future growth without further capital investment.
- **Supply Cost vs Revenue Linkage** - Once metered, with customers paying based on volume of use, there will be a better link between water supply costs and revenues, which can help to protect against year-end revenue versus supply cost divergence.
- **Affordability** – With water being metered, customers have more control over their water bill. This allows customers with limited resources to have more control over their water and sewage bill.
- **Careful Users Benefit** – Customers who already are careful water users as well as those who change their usage habits once metered benefit from water metering.
- **Environmental Stewardship** – With metering, customers are more likely to be more careful with water usage and to reduce water wastage. This benefits all users connected to the Regional Water Authority system by extending the life of the existing source of supply and water treatment system.
- **Industry Recommended Practice** – Both the American Water Works Association and the Water Environment Federation recommend universal metering as the preferred method of recovering water and wastewater system costs based on the user pay principle. The St John’s Regional Water Authority is recommending a regional implementation of universal water metering to reduce the need for new water sources and greater treatment capacity.

5.2 *Disadvantages*

There are some issues that are considered disadvantages of metering:

- **Revenue security** – Flat rate charges represent a stable revenue source. Charges tied to metered rates are subject to fluctuation and thus instability due to seasonal, conservation or other issues. This can be partially offset by having a rate structure that includes both a base and consumption rate
- **Cost** – Metering comes at a financial cost. The meters must be paid for as installed. Larger meters need periodic calibration and maintenance and the small meters (the focus of a metering program) need end-of-life replacement (generally 20 years based on average throughput).
- **Theft** – With metering, there can be incentives to theft that are not present if customers are charged the flat rate.

The need to control negative situations which have the potential to arise is a disadvantage of any project that any municipality may initiate. The following is a list of situations that may arise from the water metering process which must be monitored and addressed throughout the project's implementation:

- **Public Perception** – Many customers will conclude that with metering their costs will go up. Fears of immediate costs to the customer can be allayed by PCSP paying for the metering program and recovering the cost over a period of time. That way the customer has no initial outlay. Over the long term, there will be supply savings which help offset the program costs. In addition, customers have control over their water bill through careful usage, if cost is an issue.
- **Metering Implementation** – A professional meter installation program, including a series of steps from initial customer contact to installation, is essential in a successful program. A call center for customers to contact with questions and appointment management is advantageous.
- **Metered Billing Implementation** – There are various strategies such as mock billing in order to ease the transition from flat rate to metered billings. In addition, the metered billing process must be tested and proven so that there are no glitches when the first metered billings are issued. Customer service staff must be well trained to respond to initial questions so that customers have their legitimate concerns answered and there is no groundswell of negative reaction to the program.
- **Revenue Death Spiral** – Water consumption volumes that are used to formulate user rates following metering must be carefully and conservatively estimated and monitored. Overoptimistic water usage projections could result in revenue

deficiencies, which then necessitate further rate increases to offset the revenue shortfalls (“revenue death spiral”). It is suggested that after initial installation the water meters be read for one year before they are used for billing purposes. This will allow customers to get accustomed to the metering program and will provide the PCSP with valuable usage information such that the initial water rates can be set more accurately and well as providing time for any billing and accounting changes to be planned and implemented

- **Changes in Who Pays** – There may be cases where multi-unit flat rate charges to individual users will have to be replaced by a single bulk meter and single customer. These situations should be identified in advance of new billings going out so that the customers can address the issue in a timely manner.

5.3 *Residential verses Universal Metering*

PCSP currently has approximately 1,188 residential customers and 20 commercial customers. Based on discussions with the Town, the majority of the commercial customers are small (convenience stores, take-out restaurants, offices) with limited usage. Given this background it is recommended that all customers be metered at the same time rather than just residential customers. It will be easier for the staff and for the commercial customers to be included initially. As well it will alleviate the fear by some residential customers that the commercial customers are being given an advantage and all customers are treated the same resulting in better public acceptance.

6 Projected Rates Based on Current Cost Recovery

6.1 *Cost Information on Operations*

This section of the report identifies that the water and wastewater rates are based on the current allocation of costs. The inclusion of all costs is generally referred to as full cost recovery and impact of this is shown in Section 7 Projected Rates Base on Full Cost Recovery with and without meters.

6.2 *Estimated Water System Rates*

The current water and wastewater taxes include the direct cost of providing the service but do not include indirect costs, replacement cost or debt servicing. The current system does not recover the full cost of providing the water and wastewater services. The

shortfall in revenue from the current user fees is made up the general tax rate. In order to have rates that include the full cost of service all costs should be reflected in the rates over time. This ensures that the users of the water and wastewater service are being charged the full cost of service and not being subsidized by general rate payers. Implementation of a full cost recovery system will mean less general taxes need to be collected for water and wastewater and should result in lower general taxes for everyone in PCSP.

While it is premature to get a reliable indication of what the future water and wastewater rates will be with metering, the following example has been prepared to give an indication of what the future rates may look like. In preparing the estimated rates it is noted that two variables are included, one relates to how much water the average customer will use after meters are installed and the second relates to how successful the Town is at finding and reducing the non-revenue water in the system. To make the rates comparable with the current water and sewer tax the estimated rates in this section of the report do not include any charges for administration, replacement cost or debt servicing.

The water system revenue requirements were taken from the Town's budget and are summarized below including the projected budgets if 20% or 50% of the non-revenue water is reduced based on an average residential consumption of 200 m³/year/customer.

Exhibit 4 – Current Cost Recovery Revenue Requirements

Name	No change in Non-revenue Water	20% reduction in Non- Revenue Water	50% reduction in Non- Revenue Water
Expenses			
Administration and General	Not included	Not included	Not included
Transmission and Distribution	\$327,910	327,910	327,910
Water Supply	\$477,090	426,146	349,729
Current Debt Servicing Costs	Not included	Not included	Not included
Debt Payment for New Meters	\$65,800	\$65,800	\$65,800
Replacement	Not included	Not included	Not included
Total	\$870,800	\$819,856	\$743,439
Reduced costs from reduced consumption			
consumption = 200 cm/year/customer	(\$58,862)	(\$58,862)	(\$58,862)
Adjusted Total Budget	\$811,938	\$760,994	\$684,577

It is noted that the revenue required in this report include the projected debt repayment charges for the installation of water meters based on an estimated capital cost of

\$1,500,000 less \$680,000 in funding from senior levels of government (net cost to PCSP = \$680,000) with a 20-year debt repayment period and an interest rate of 5% per annum.

The required revenue must be divided between the Fire Protection Charge, the Base Charge to all water customers and the Commodity charge based on usage. The Fire Protection Charge is usually collected from all properties that are within the service distance of a hydrant which is generally 300 meters (1,000 feet) of a hydrant. Generally, it is recovered by either an average fee per property or from a charge on the tax rate based on the assessed value of the properties that benefit from the service.

A comparison of Fire Protection Charges in smaller communities indicates that between 20% and 25% of the total revenue requirement comes from the fire protection charge. Using 25% this would amount to a Fire Protection Charge as follows:

Exhibit 5 – Current Cost Recovery Estimated Fire Protection Charge

	No change in Non-revenue Water	20% reduction in Non-Revenue Water	50% reduction in Non-Revenue Water
Adjusted Total Budget	\$811,938	\$760,994	\$684,577
Percent allocation to Fire Protection	25%	25%	25%
Fire Protection Charge	\$202,985	\$190,248	\$171,144

The remainder, \$608,954 (\$570,745 for 20% reduction or \$513,433 for a 50% reduction), must be paid by the customers in Base and Commodity Charges.

Given the size of the System it is suggested that a base charge should be set to recover approximately 40% of the total revenue from Customer Rates. A base (fixed) charge of 40% provides a balance between the revenue security which fixed charges offer with 60% based on consumption harnessing the benefit of metering and promoting conservation as customers can have control over their water usage and therefore their bill.

Exhibit 6– Current Cost Recovery Base and Commodity Revenue Required from Water Customers Assuming 40% of Required Revenue

	No change in Non-revenue Water	20% reduction in Non- Revenue Water	50% reduction in Non- Revenue Water
Revenue Required from Customers	\$608,954	\$570,745	\$513,433
Percentage of Rate from Base Charge	40%	40%	40%
Base Charge	\$243,581	\$228,298	\$205,373
Commodity Charge - 60% of total	\$365,372	\$342,447	\$308,060

The methodology set out by AWWA was used to assign base charges using capacity ratios for the various meter sizes. Exhibit 7 outlines the capacity ratios based on the estimated number of meters to be installed in Town. The actual number of meters and the size of the Commercial meters will have to be determined at the time of installation. The base rates are calculated for each meter size in Exhibit 8.

Exhibit 7 – Capacity Factor Calculation for Water

Meter Size	Estimated no. of meters	Capacity Factor	Total Capacity Factor
16 X 19 mm	1,188	1.0	1,188.0
19mm	12	1.5	18.0
25mm	4	2.5	10.0
37mm	1	5.0	5.0
50mm	1	8.0	8.0
75mm	2	16.0	32.0
TOTAL	1,208		1,261.0

Exhibit 8 – Current Cost Recovery Base Charge for Water Customers per Year based on 40% of Revenue

		No change in Non- revenue Water	20% reduction in Non- Revenue Water	50% reduction in Non- Revenue Water
% of Rates from Base Charge		40%	40%	40%
Revenue from Base Charge		243,581	228,298	205,373
Total of Capacity Factors		1,261.0	1,261.0	1,261.0
Base per Capacity Factor Unit		193.17	181.05	162.87
Calculated Base Charge per Year by Meter Size				
Meter Size	Capacity Factor	40% Base	40% Base	40% Base
16 X 19 mm	1.0	193.17	181.05	162.87
19mm	1.5	289.75	271.57	244.30
25mm	2.5	482.91	452.61	407.16
37mm	5.0	965.83	905.23	814.33
50mm	8.0	1,545.32	1,448.36	1,302.92
75mm	16.0	3,090.64	2,896.72	2,605.85

The commodity charge has been calculated to recover 60% of user rate revenues (see above). Existing unmetered customers are estimated to use 272 m³/year/customer. Metering normally results in some decrease in usage due to more careful water usage, particularly outdoor usage and repairs to leaky plumbing previously unnoticed. Rates have been calculated based on a usage of 200 m³/year/customer. These numbers must be reassessed once the meters are installed, but before metered billings are issued based on a test period of one year. [Exhibit 9](#) provides a comparison of the revenue required for each of the flow possibilities.

Exhibit 9 – Current Cost Recovery Commodity Charge for Water Customers per m³ based on 60% of Revenue

Commercial Average Use = 2,000 cm/year	No change in Non- revenue Water	20% reduction in Non- Revenue Water	50% reduction in Non- Revenue Water
Number of Residential Customers	1,188	1,188	1,188
Annual Use per Residential Customer	200	200	200
Number of Commercial Customers	20	20	20
Annual Use per Commercial Customer	2,000	2,000	2,000
Total Water Sold	277,600	277,600	277,600
Total Revenue Required	365,372	342,447	308,060
Commodity Price per Cubic Meter	1.32	1.23	1.11

Exhibits 10 Provides the estimated average rates for residential water customers based on 200 m³/year consumption on average.

Exhibit 10 – Current Cost Recovery Estimated Water Rates

	Base charge	Commodity charge	Total
No Change in Non-revenue Water	193.17	263.24	456.40
20% reduction in Non- Revenue Water	181.05	246.72	427.77
50% reduction in Non- Revenue Water	162.87	221.95	384.81

Exhibit 11 has been prepared to compare the theoretical flat rate based on the current cost to the calculated average rates based on meters being installed. To do this a number of assumptions were made as follows:

- The fire protection rate would only apply to existing water customers and would be charged out as an average fee. Given this the average fire protection rate for average customer would be $\$202,985/1,208 = \168 per customer with no reduction in non-revenue water;
- The average current cost of providing water service would be a total of \$805,000 based on the total costs in Exhibit 4 above (\$870,800) less the debt servicing cost of providing the new meters (\$65,800). This yields an existing cost of \$666 per customer ($\$805,000/1208 = \666).

Exhibit 11 – Current Cost Recovery Comparison of Metered Rates to Flat Rates for Water Customers

	Base charge	Commodity charge	Fire Protection Charge	Total
No Change in Non-revenue Water	193.17	263.24	168.00	624.40
20% reduction in Non- Revenue Water	181.05	246.72	168.00	595.77
50% reduction in Non- Revenue Water	162.87	221.95	168.00	552.81

6.3 *Estimated Wastewater System Rates*

The wastewater system revenue requirements were taken from the Town's budget as outlined in Exhibit 12.

Exhibit 12 – Current Cost Recovery Wastewater System Revenue Requirements

Name	Amount
Expenses	
Administration and General	Not included
Collection, Pumping and Treatment	\$400,000
Current Debt Servicing Charges	Not included
Amortization	Not included
Total	\$400,000

The required revenue must be divided between the Base Charge to all Customers and the volumetric charge based on usage.

Given the size of the System it is suggested that a Base Charge should be set to recover approximately 40% of the total revenue from Customer Rates. A base (fixed) charge of 40% provides a balance between the revenue security which fixed charges offer with 60% based on volumetric discharge harnessing the benefit of metering and promoting user pay.

Exhibit 13 – Current Cost Recovery Wastewater Base and Volumetric Revenue Required Assuming 40% of Required Revenue

Revenue Required from Customers	\$400,000
Percentage of Rate from Base Charge	40%
Base Charge	\$160,000
Volumetric Charge - 60% of total	\$240,000

The methodology set out by AWWA was used to assign base charges using capacity ratios for the various meter sizes. Exhibit 14 outlines the capacity ratios based on the estimated number of meters to be installed in Town. The actual number of meters and the size of the Commercial meters will have to be determined at the time of installation. The base rates are calculated for each meter size in Exhibit 15.

Exhibit 14 – Capacity Factor Calculation for Wastewater

Meter Size	Estimated no. of meters	Capacity Ratio	Total Capacity Factor
16 X 19 mm	1,064	1.0	1,064.0
19mm	14	1.5	21.0
25mm	3	2.5	7.5
37mm	2	5.0	10.0
50mm	1	8.0	8.0
75mm	2	16.0	32.0
TOTAL	1,086		1,142.5

Exhibit 15 – Current Cost Recovery Base Charge for Wastewater Customers per Year based on 40% of Revenue

% of Rates from Base Charge	40%	
Revenue from Base Charge	160,000	
Total of Capacity Factors	1,142.5	
Base per Capacity Factor Unit	140.04	
Calculated Base Charge per Year by Meter Size		
Meter Size	Capacity Factor	40% Base
16 X 19 mm	1.0	140.04
19mm	1.5	210.07
25mm	2.5	350.11
37mm	5.0	700.22
50mm	8.0	1,120.35
75mm	16.0	2,240.70

The volumetric charge has been calculated to recover 60% of user rate revenues (see above). Existing unmetered customers are estimated to use 272 m³/year/customer. Metering normally results in some decrease in usage due to more careful water usage, particularly outdoor usage and repairs to leaky plumbing previously unnoticed. Rates have been calculated based on a usage of 200 m³/year/customer. These numbers must be reassessed once the meters are installed, but before metered billings are issued based on a test period of one year. Exhibit 16 provides the Volumetric Charge based on having 47 unmetered customers at 272 m³/year each and the balance at 200 m³/year. Commercial customers have been assigned 2,000 m³/year each.

Exhibit 16 – Current Cost Recovery Volumetric Charge per m³ based on 60% of Revenue

Commercial Average Use = 2,000 cm/year		No change in Non-revenue Water
Number of Metered Residential		1,017
Annual Use per Residential Customer		200
Number of Unmetered Residential		47
Annual Use per Residential Customer		272
Number of Commercial Customers		22
Annual Use per Commercial Customer		2,000
Total Chargable Effluent		260,184
Total Revenue Required		240,000
Volumetric Charge per Cubic Meter		0.92

Exhibits 17 provides the estimated average rates for residential customers.

Exhibit 17 – Current Cost Recovery Estimated Volumetric Rate

	Base charge	Volumetric charge	Total
Average Residential Customer	140.04	184.48	324.53

To compare the theoretical flat rate based on the current cost to the calculated average rates in Exhibit 17 it was assumed that the average current cost of providing wastewater service would be a total of \$400,000 (see Exhibit 12). This yields an existing cost of \$368 per customer based on having 1086 customers ($\$400,000/1086 = \368).

7 Projected Rates Based on Full Cost Recovery

7.1 *Full Cost Recovery*

Full Cost Recovery Rates is generally the term used to indicate that the rates include the direct costs of providing the service as well as indirect costs of supporting the service

delivery and finally replacement cost and debt servicing. Water rates set in this manner based on metered consumption follow the user pay principal, that being; those that use the service pay for it in proportion to their use of the service. In the case of PCSP the direct costs include the cost of purchased water and transmission and distribution costs. Indirect costs include administration and general, engineering and other costs generally allocated from the Town on some systematic basis that recognizes the use of these resources in delivering the service. The better the breakdown of particularly direct costs the more complete and defensible the rates are. Indirect costs included in the rate structure allocated by the Town can be based on an analysis of costs attributable to providing the service. The estimated costs for Full Cost Recovery are presented with and without the installation of meters to allow the Town to see the difference.

7.2 Replacement Cost

Replacement charges on water and wastewater related fixed assets are included in full cost recovery rates to recognize the use of the economic life of the assets based on their original cost. In rate structures that include replacement charges, the funds generated are usually placed in a reserve account and used for asset replacement or to fund the principal portion of debt repayment. Different water and wastewater fixed assets have different projected lives and although the replacement is only an estimate of their useful lives it does recognize the using up of the asset in providing the service. In the case of PCSP the historic cost of the water related fixed assets is \$12.7 million while the annual amortization is \$387,000 while the historic cost of wastewater assets is \$14.9 million and the annual amortization is \$436,000.

7.3 Debt Servicing Costs

Debt servicing costs including both principal and interest are also included in full cost recovery rates. Due to the long term nature of water and wastewater infrastructure, the significant cost of these assets and their relatively long useful lives, the amortization of the debt is usually in the 20 year range. The cost of servicing this debt should also be included in the rate structure to recover those costs from those using the service. In the case of PCSP debt servicing costs for water amount to \$248,000 per annum while those for wastewater amount to \$595,000 per annum.

7.4 Administration and General

Administration and General charges were estimated based on charges imposed by other water systems that the study team has observed. As noted earlier in the report the cost of meter reading and billing has been estimated to be approximately \$19,500 while the cost

of general administration including an allowance for insurance, senior staff, auditing and office space is estimate to be \$20,000 per year yielding a total cost of \$39,500 with meters and \$20,000 without meters

7.5 *Estimated Water System Rates*

The current water and wastewater tax includes the direct cost of providing the service but do not include indirect costs, replacement cost or debt servicing. In order to have rates that include the full cost of service all costs should be reflected in the rates over time. This ensures that the users of the water and wastewater service are being charged the full cost of service and not being subsidized by general rate payers.

While it is premature to get a reliable indication of what the future water and wastewater rates will be with metering the following example has been prepared to give an indication of what the future rates may look like if the full cost of providing the service was included. In preparing the estimated rates it is noted that two variables are included, one relates to how much water the average customer will use after meters are installed and the second relates to how successful the Town is at finding and reducing the non-revenue water in the system. .

The water system revenue requirements were taken from the Town's budget and are summarized below including the projected budgets if 20% or 50% of the non-revenue water is reduced based on an average residential consumption of 200 m³/year/customer.

Exhibit 18 – Full Cost Recovery Water Revenue Requirements

Name	No change in Non- revenue Water		20% reduction in Non- Revenue Water		50% reduction in Non- Revenue Water	
	Excluding Meters	Including meters	Excluding Meters	Including meters	Excluding Meters	Including meters
Expenses						
Administration and General	\$20,000	\$39,500	\$20,000	\$39,500	\$20,000	\$39,500
Transmission and Distribution	\$327,910	\$327,910	\$327,910	\$327,910	\$327,910	\$327,910
Water Supply	\$477,090	\$477,090	\$477,090	\$426,146	\$477,090	\$349,729
Current Debt Servicing Costs	\$248,000	\$248,000	\$248,000	\$248,000	\$248,000	\$248,000
Debt Payment for New Meters	\$0	\$65,800	\$0	\$65,800	\$0	\$65,800
Replacement	\$387,000	\$387,000	\$387,000	\$387,000	\$387,000	\$387,000
Total	\$1,460,000	\$1,545,300	\$1,460,000	\$1,494,356	\$1,460,000	\$1,417,939
Reduced consumption savings						
consumption = 200 cm/year	\$0	(\$58,862)	\$0	(\$58,862)	\$0	(\$58,861)
Full Cost Recovery Total Budget	\$1,460,000	\$1,486,438	\$1,460,000	\$1,435,494	\$1,460,000	\$1,359,078

It is noted that the revenue required in this report include the projected debt repayment charges for the installation of water meters based on an estimated capital cost of \$1,500,000 less \$680,000 in funding from senior levels of government (net cost to PCSP = \$820,000) with a 20-year debt repayment period and an interest rate of 5% per annum.

The required revenue must be divided between the Fire Protection Charge, the Base Charge to all Customers and the Commodity charge based on usage. The Fire Protection Charge is usually collected from all properties that are within the service distance of a hydrant which is generally 300 meters (1,000 feet) of a hydrant. Generally, it is recovered by either an average fee per property or from a charge on the tax rate based on the assessed value of the properties that benefit from the service.

A comparison of Fire Protection Charges in smaller communities indicates that between 20% and 25% of the total revenue requirement comes from the fire protection charge. Using 25% this would amount to a Fire Protection Charge as follows:

Exhibit 19 – Full Cost Recovery Estimated Fire Protection Charge

	No change in Non- revenue Water		20% reduction in Non- Revenue Water		50% reduction in Non- Revenue Water	
	Excluding Meters	Including meters	Excluding Meters	Including meters	Excluding Meters	Including meters
Adjusted Total Budget	\$1,460,000	\$1,486,438	\$1,460,000	\$1,435,494	\$1,460,000	\$1,359,078
Percent allocation to Fire Protection	25%	25%	25%	25%	25%	25%
Fire Protection Charge	\$365,000	\$371,610	\$365,000	\$358,873	\$365,000	\$339,770

The remainder, \$1,114,829 (\$1,076,620 for 20% reduction or \$1,019,309 for a 50% reduction), must be paid by the customers in Base and Commodity Charges.

Given the size of the System it is suggested that a base charge should be set to recover approximately 40% of the total revenue from Customer Rates. A base (fixed) charge of 40% provides a balance between the revenue security which fixed charges offer with 60% based on consumption harnessing the benefit of metering and promoting conservation as customers can have control over their water usage and therefore their bill.

Exhibit 20– Full Cost Recovery Base and Commodity Revenue Required for Water Customers Assuming 40% of Required Revenue

	No change in Non- revenue Water		20% reduction in Non- Revenue Water		50% reduction in Non- Revenue Water	
	Excluding Meters	Including meters	Excluding Meters	Including meters	Excluding Meters	Including meters
Revenue Required from Customers	\$1,095,000	\$1,114,829	\$1,095,000	\$1,076,620	\$1,095,000	\$1,019,309
Percentage of Rate from Base Charge	40%	40%	40%	40%	40%	40%
Base Charge	\$438,000	\$445,931	\$438,000	\$430,648	\$438,000	\$407,724
Commodity Charge - 60% of total	\$657,000	\$668,897	\$657,000	\$645,972	\$657,000	\$611,585

The methodology set out by AWWA was used to assign base charges using capacity ratios for the various meter sizes. Exhibit 21 outlines the capacity ratios based on the estimated number of meters to be installed in Town. The actual number of meters and the size of the Commercial meters will have to be determined at the time of installation. The base rates are calculated for each meter size in Exhibit 22.

Exhibit 21 – Capacity Factor Calculation for Water

Meter Size	Estimated no. of meters	Capacity Factor	Total Capacity Factor
16 X 19 mm	1,188	1.0	1,188.0
19mm	12	1.5	18.0
25mm	4	2.5	10.0
37mm	1	5.0	5.0
50mm	1	8.0	8.0
75mm	2	16.0	32.0
TOTAL	1,208		1,261.0

Exhibit 22 – Full Cost Recovery Base Charge for Water Customers per Year based on 40% of Revenue

		No change in Non- revenue Water		20% reduction in Non- Revenue Water		50% reduction in Non- Revenue Water	
		Excluding Meters	Including meters	Excluding Meters	Including meters	Excluding Meters	Including meters
% of Rates from Base Charge		40%	40%	40%	40%	40%	40%
Revenue from Base Charge		438,000	445,931	438,000	430,648	438,000	407,724
Total of Capacity Factors		1,261.0	1,261.0	1,261.0	1,261.0	1,261.0	1,261.0
Base per Capacity Factor Unit		347.34	353.63	347.34	341.51	347.34	323.33
Calculated Base Charge per Year by Meter Size							
Meter Size	Capacity Factor	40% Base	40% Base	40% Base	40% Base	40% Base	40% Base
16 X 19 mm	1.0	347.34	353.63	347.34	341.51	347.34	323.33
19mm	1.5	521.02	530.45	521.02	512.27	521.02	485.00
25mm	2.5	868.36	884.08	868.36	853.78	868.36	808.33
37mm	5.0	1,736.72	1,768.17	1,736.72	1,707.57	1,736.72	1,616.67
50mm	8.0	2,778.75	2,829.07	2,778.75	2,732.11	2,778.75	2,586.67
75mm	16.0	5,557.49	5,658.13	5,557.49	5,464.21	5,557.49	5,173.34

The commodity charge has been calculated to recover 60% of user rate revenues (see above). Existing unmetered customers are estimated to use 272 m³/year/customer. Metering normally results in some decrease in usage due to more careful water usage, particularly outdoor usage and repairs to leaky plumbing previously unnoticed. Rates have been calculated based on a usage of 200 m³/year/customer for metered customers. These numbers must be reassessed once the meters are installed, but before metered billings are issued based on a test period of one year. Exhibit 23 provides a comparison of the revenue required for each of the flow possibilities.

Exhibit 23 – Full Cost Recovery Commodity Charge for Water Customers per m³ based on 60% of Revenue

		No change in Non- revenue Water		20% reduction in Non- Revenue Water		50% reduction in Non- Revenue Water	
		Excluding Meters	Including meters	Excluding Meters	Including meters	Excluding Meters	Including meters
Number of Residential Customers		1,188	1,188	1,188	1,188	1,188	1,188
Annual Use per Residential Customer		272	200	272	200	272	200
Number of Commercial Customers		20	20	20	20	20	20
Annual Use per Commercial Customer		2,720	2,720	2,720	2,720	2,720	2,720
Total Water Sold		377,536	292,000	377,536	292,000	377,536	292,000
Total Revenue Required		657,000	668,897	657,000	645,972	657,000	611,585
Commodity Price per Cubic Meter		1.74	2.29	1.74	2.21	1.74	2.09

Exhibits 24 Provides the estimated average rates for residential customers based on 200 m³/year consumption on average for metered customers and 272 m³/year consumption on average for unmetered customers.

Exhibit 24 – Full Cost Recovery Estimated Water Rates at Consumption of 200 m³/year for Metered Usage and 272 m³/year for Unmetered Usage

	Excluding Meters with usage of 272 cubic meters/year/residential customer			Including Meters with usage of 200 cubic meters/year/residential customer		
	Base	Commodity	Total	Base	Commodity	Total
No Change in Non-revenue Water	\$347.34	\$473.34	\$820.69	\$353.63	\$458.15	\$811.78
20% reduction in Non- Revenue Water	\$347.34	\$473.34	\$820.69	\$341.51	\$442.45	\$783.96
50% reduction in Non- Revenue Water	\$347.34	\$473.34	\$820.69	\$323.33	\$418.89	\$742.23

7.6 Estimated Wastewater System Rates

The wastewater system revenue requirements were taken from the Town’s budget as outlined in Exhibit 25.

Exhibit 25 – Full Cost Recovery Wastewater System Revenue Requirements

Name	Amount
Expenses	
Administration and General	\$20,000
Collection, Pumping and Treatment	\$400,000
Current Debt Servicing Charges	\$595,000
Amortization	\$436,000
Total	\$1,451,000

The required revenue must be divided between the Base Charge to all Customers and the Commodity charge based on usage.

Given the size of the System it is suggested that a base charge should be set to recover approximately 40% of the total revenue from Customer Rates. A base (fixed) charge of

40% provides a balance between the revenue security which fixed charges offer with 60% based on effluent discharge harnessing the benefit of metering and promoting user pay.

Exhibit 26 – Full Cost Recovery Wastewater Base and Commodity Revenue Required Assuming 40% of Required Revenue

Revenue Required from Customers	\$1,451,000
Percentage of Rate from Base Charge	40%
Base Charge	\$580,400
Volumetric Charge - 60% of total	\$870,600

The methodology set out by AWWA was used to assign base charges using capacity ratios for the various meter sizes. Exhibit 27 outlines the capacity ratios based on the estimated number of meters to be installed in Town. The actual number of meters and the size of the Commercial meters will have to be determined at the time of installation. The base rates are calculated for each meter size in Exhibit 28.

Exhibit 27 – Capacity Factor Calculation for Wastewater

Meter Size	Estimated no. of meters	Capacity Ratio	Total Capacity Factor
16 X 19 mm	1,064	1.0	1,064.0
19mm	14	1.5	21.0
25mm	3	2.5	7.5
37mm	2	5.0	10.0
50mm	1	8.0	8.0
75mm	2	16.0	32.0
TOTAL	1,086		1,142.5

Exhibit 28 – Full Cost Recovery Base Charge for Wastewater Customers per Year based on 40% of Revenue

% of Rates from Base Charge		40%
Revenue from Base Charge		580,400
Total of Capacity Factors		1,142.5
Base per Capacity Factor Unit		508.01
Calculated Base Charge per Year by Meter Size		
Meter Size	Capacity Factor	40% Base
16 X 19 mm	1.0	508.01
19mm	1.5	762.01
25mm	2.5	1,270.02
37mm	5.0	2,540.04
50mm	8.0	4,064.07
75mm	16.0	8,128.14

The effluent charge has been calculated to recover 60% of user rate revenues (see above). Existing unmetered customers are estimated to use 272 m³/year/customer. Metering normally results in some decrease in usage due to more careful water usage, particularly outdoor usage and repairs to leaky plumbing previously unnoticed. Rates have been calculated based on a usage of 200 m³/year/customer. These numbers must be reassessed once the meters are installed, but before metered billings are issued based on a test period of one year. Exhibit 29 provides the Effluent charge based on having 47 unmetered customers at 272 m³/year each and the balance at 200 m³/year. Commercial customers have been assigned 2,000 m³/year each.

Exhibit 29 – Full Cost Recovery Effluent Charge for Wastewater Customers per m³ based on 60% of Revenue

Commercial Average Use = 2,000 cm/year		No change in Non-revenue Water
Number of Metered Residential		1,017
Annual Use per Residential Customer		200
Number of Unmetered Residential		47
Annual Use per Residential Customer		272
Number of Commercial Customers		22
Annual Use per Commercial Customer		2,000
Total Chargable Effluent		260,184
Total Revenue Required		870,600
Volumetric Charge per Cubic Meter		3.35

Exhibits 30 provides the estimated average rates for residential customers.

Exhibit 30 – Full Cost Recovery Estimated Effluent Rate at Consumption of 200 m³/year

	Base charge	Volumetric charge	Total
Average Residential Customer	508.01	669.22	1,177.23

8 Findings

The following findings have been prepared based on the water and wastewater metering study:

- The current water tax is \$475 per residential customer and \$505 per commercial customer while the current wastewater tax is \$175 per residential customer and \$235 per commercial customer and does not include the full cost of providing water service.
- The current rate structure consisting of a water and wastewater tax should be transitioned to one based on a base and consumption charge that gradually includes the full cost of service which would include indirect costs including administration costs as well as replacement cost and debt servicing. These costs would be moved from the tax base to the water and wastewater customers.
- While consumption savings of 25 to 30 percent historically can be achieved by the installation and use of water meters the largest potential savings lies in the reduction in the amount of purchased water by reducing the amount of non-revenue water in the distribution system.
- PCSP should undertake a program to universally meter all water customers both residential and commercial:
 - Universal metering is recommended by both AWWA and WEF
 - Universal metering supports the user pay principal

- Universal metering is the best way to differentiate between large users and small users regardless of meter size
 - Universal metering is essential to accurately determine and control non-revenue water
 - Universal metering gives customers the opportunity to influence their water and wastewater bills
 - Universal metering reduces requirement to develop more capacity
 - Universal metering provides for improved Environmental Stewardship by reducing water consumption and sewage generation
- It is estimated that PCSP will have to install 1,208 meters;
 - The current technology, radio frequency drive-by remote read, is a good option for universal metering (costing has been estimated based on drive-by remote read);
 - The capital cost to install universal metering is estimated to be \$1,500,000
 - PCSP has identified outside funding support in the amount of \$680,000 which has been included in the calculations in this report
 - To support universal metering, the current water and wastewater by-laws should be updated (items such as one service one meter, plumbing to be satisfactory, dedicated space for meters in all new construction, etc);
 - PCSP should determine water rates in the future, including a “Base” and “Usage or Volumetric” rates structure, utilizing the methodologies recommended by AWWA (water) and WEF (wastewater);
 - The operating cost to read all meters is estimated to be \$7,300 annually while the cost of preparing and issuing quarterly bills to all customers is estimated to be \$12,200 for a total additional operating cost of \$19,500 not including billing changes or administrative support.;
 - Contracting out the installation of the required meters is a good option providing the contractor has proven customer service capabilities;
 - Any customers with single services, primarily rental and condominium units, must have advance notice of the change such that agreements can be altered or developed and implemented prior to the conversion in billing;

- New construction should be metered before connection to the system;
- The transition from unmetered to metered needs a comprehensive public communications plan before initiation;
- PCSP will need to have a comprehensive training program for staff to ensure they can address customer issues related to universal metering
- PCSP should consider sending out unmetered bills for a period of time (minimum 12 months and consumption levels are established water) which show the metered consumption even though the bill will be based on unmetered rates to allow customers to adapt to the changed format and to address any wastage issues;
- PCSP currently recovers part of the total cost of the water and wastewater system through the existing rates as they do not include costs for administration and general, debt repayment or replacement costs of the system;
- It is recommended that PCSP transition to rates for water and wastewater service based on a Full Cost Recovery model that covers all costs associated with constructing, operating and replacing the systems;
- A separate Fire Protection Charge should be adopted that is paid from general revenue to ensure water customers only pay for the delivery of water. It is estimated that this charge will be approximately \$350,000 per year with full cost recovery;
- Estimated annual rates based on the Current Cost Recovery budget, including base and usage charge, for the average residential water customer with metering are:
 - \$456.40 without a reduction in the volume of non-revenue water;
 - \$427.77 with a 20% reduction in the volume of non-revenue water; and,
 - \$384.81 with a 50% reduction in the volume of non-revenue water
- The estimated annual rate for wastewater based on the Current Cost Recovery budget, including base and usage charge for the residential wastewater customer with metering is \$324.53.

- Estimated annual rates based on Full Cost Recovery, including base and usage charge, for the average residential water customer with and without metering are:

	Excluding Meters with usage of 272 cubic meters/year/residential customer			Including Meters with usage of 200 cubic meters/year/residential customer		
	Base	Commodity	Total	Base	Commodity	Total
No Change in Non-revenue Water	\$347.34	\$473.34	\$820.69	\$353.63	\$458.15	\$811.78
20% reduction in Non- Revenue Water	\$347.34	\$473.34	\$820.69	\$341.51	\$442.45	\$783.96
50% reduction in Non- Revenue Water	\$347.34	\$473.34	\$820.69	\$323.33	\$418.89	\$742.23

- The estimated annual rate for wastewater based on the Full Cost Recovery budget, including base and usage charge for the residential wastewater customer with metering is \$1,177.23;
- PCSP should consider establishing transitioning from the current rate/tax charge to Full Cost Recovery rates over a number of years;
- Rates for metered water and wastewater charges should only be established after the meters have been installed and read for at least 12 months.
- Metered water usage should be constantly monitored as most communities see a reduction in usage after the installation of meters.