UNIVERSAL WATER METER PROGRAM IMPLEMENTATION FRAMEWORK

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this report is not to determine the feasibility of implementing a universal water metering program, but to outline the following considerations for implementation:

- Water Meter Selection,
- Options for Procurement of Services,
- Cost estimates, and
- Phasing Plan,
- Schedule

This assessment will enable the City to develop a financial strategy for funding this project (which includes investigating Senior Government Grant opportunities). The costing and phasing strategy will facilitate the planning and financing process for implementing the water meter program while the schedule includes the steps for successful implementation.

1.2 JUSTIFICATION FOR UNIVERSAL WATER METERING

A key goal for the City of Grand Forks is to create a long term, healthy, and viable future for the community. A key element in achieving this goal is providing long term sustainable infrastructure which includes a supply of healthy drinking water for the community.

With ongoing use and the passage of time, existing water system infrastructure deteriorates. In order to maintain existing levels of service at the current consumption rates, significant investment and reinvestment in the City's water infrastructure is required to ensure that the asset base is preserved and that future generations are able to enjoy the same quality of service. Even though the City's water supply is currently adequate and the City's rate of growth could be considered low, there is a social, economic and environmental responsibility and commitment from the municipality, in its <u>Sustainable Community Plan,</u> to conserve water by implementing a universal water metering program to assist in ensuring the long term viability of the City's water system for future generations.

With a focus on the optimization of the municipality's water system resources, the City is also implementing the strategies outlined in the <u>Water Conservation Plan</u>, <u>Water Demand Management Action Plan</u>, and the <u>Drought Management and Conservation Plan.</u> Each of these studies has supported the recommendation of implementing a universal water metering program to reduce water consumption. The <u>Universal Water Metering Feasibility Assessment</u> indicates the City would achieve substantial economic, environmental and social benefits through a universal water meter program.

Besides playing an important role in reducing demand and potentially delaying infrastructure upgrades, universal water meters also give a municipality an accurate tool to:

1. predict future flows,
2. determine the significance of mainline leaks,
3. set water rate structures ensuring that there is equitable cost allocation, and
4. determine who to target with further conservation measures.

To maximize the reduction of water use through metering, the program's other critical elements should include public education about water conservation and its importance, along with setting appropriate rate structures.

A universal water metering program also represents an opportunity for the City to provide for stewardship and wise use of its water resources.

2.0 WATER METER SELECTION CRITERIA

The purpose of consumption meters is to accurately measure flow for the purpose of billing. It is important that the type of meters chosen is accurate, precise, easily accessible and have repeatable results.

Large consumption meters (38mm diameter and greater) are used for ICI uses (industrial, commercial, and institutional) including apartments and strata units. Small consumption meters (32mm diameter and smaller) are used for single family dwellings.

2.1 Types of Meters

There are several types of water meter in common use. Selection is based on different flow measurement methods, the type of end user, the required flow rates, and accuracy requirements. The most common for accurate record keeping and billing purposes are positive displacement meters for dwellings, and compound meters for ICI units.

Table 1 - Types of Meters

Type of Meter	Technology	Usage	Comments
Positive Displacement **(Recommended)**	Records how many times a definite volume of water enters a chamber, rotates, and exits that chamber.	Residential, or other low flow applications that require accurate measurements	Highest pressure loss, Most Accurate, Requires low flows
Turbine and Propeller	These meters have rotor blades that are turned by the flowing water. The rate at which the blades turn is proportional to the amount of water passing through the meter.	Less accuracy during low flow, older technology, takes more space	Less pressure loss, Less accurate on low flows

Compound **(Recommended)**	These meters have both a positive displacement chamber for smaller flows, and a turbine chamber for larger flows.	Commercial, especially with sprinkler systems, or other highly variable flow rates.	Accurate on high and low flows
Magnetic	Water flowing through a magnetic meter creates a magnetic field that is measured and correlated to flow.	Distribution, treatment or pumping systems. Not usually for billing purposes since less accuracy during very low flow	Least pressure loss, Less accurate on very low flows

2.2 Meter Reading Technologies

There are several technologies available for sending meter information (Meter Interface Units, *MIUs*) and collecting this information (Automated Meter Reading Devices, *AMRs*), each with its own advantages and disadvantages as noted in the following tables. Radio based systems are quickly becoming the preferred meter reading technology for many municipalities in North America.

Table 2 - Meter Reading Technologies

Technology	**Description**	**Advantages**	**Disadvantages**
Direct read	Manually read numbers on meter	▪ Lower meter supply cost Lower installation cost	▪ Low read success rate ▪ Need access to meter ▪ Higher labour cost ▪ Need to re-enter data
Remote pulsar read	Manually read numbers on outside of building	▪ No access to meter needed Acceptable read success rate	▪ Higher supply and installation costs ▪ Higher maintenance of remote reader ▪ Manual meter reading still required ▪ Requires periodic verification between remote and actual meter register volume ▪ Need to re-enter data
Interface remote read	Use a hand-held interface to take readings from an outside location. Reading is automatically stored.	▪ No access to meter needed ▪ High read success rate ▪ Encoded signal thus captured read is from the meter register ▪ Less labour required – more reads per day due to remote reading ▪ Not affected by minor flow disturbances ▪ Reduced *Read to Bill* time	▪ Higher supply and installation costs ▪ Higher maintenance for remote reader ▪ No transcription necessary
Telephone read	Meter is connected to a telephone modem which either calls periodically with the reading, or receives calls to request the reading	▪ No meter readers required ▪ Can program unit to profile water use ▪ Excellent read success rate ▪ Reduced *Read to Bill* time	▪ Requires access to land phone line ▪ Higher supply costs

Radio read **(Recommended)**	Meter is connected to a radio system (MIU), which is activated by either 1) someone walking on the street, 2) someone driving by (i.e. mounted on a garbage truck), or 3) receivers placed on power poles that transmit back to a central location	▪ Excellent read success rate ▪ Can be fully automated with fixed area network ▪ Lower labour costs ▪ Effective leak and fraud detection ▪ Scalable system capable of reading gas and electrical meters ▪ Reduced *Read to Bill* time	▪ Higher supply and installation costs ▪ Battery replacement and disposal issues. Certain models offer 20 year battery lifespan ▪ Large infrastructure set up costs for fixed area network

Reference: Establishing a Metering Plan to Account for Water Use and Loss, InfraGuide Innovations and Best Practices, Potable Water, National Guide to Sustainable Municipal Infrastructure, September 2003

3.0 PUBLIC VS. PRIVATE INSTALLATION AND MAINTENANCE

There are several methods of procurement that municipalities generally use to have meters supplied, installed, read, and maintained on a wide scale using either or both the private sector or the municipality's own resources. The tables below compare various options.

Table 3- Meter Purchase

PURCHASE		
	Advantages / Disadvantages	Comment
Private Sector	▪ Larger installation companies can supply and install and possibly give a reduced rate ▪ Perception of profits going to investors	Preferred Method
Municipality	▪ Can tender installation so that all contractors can submit ▪ More control over brand names and type of meters chosen	

Table 4- Meter Install

INSTALL		
	Advantages / Disadvantages	Comment
Private Sector	▪ More resources are available ▪ Less administration for municipality ▪ Less control of installations ▪ Less direct contact with public during complaints ▪ Public perception that profits do not stay in the community	Preferred Method
Municipality	▪ Can be more flexible ▪ Can handle public complaints directly ▪ Investment stays in the community ▪ Not enough resources ▪ More administration for municipality ▪ Public perception that private sector is more efficient	

Table 5- Meter Reading

READING		
	Advantages / Disadvantages	Comment
Private Sector	▪ Loss of control for municipality ▪ Less of the municipality's resources consumed ▪ Could be combined with gas meter reading to reduce costs	
Municipality	▪ Chance to receive public opinions ▪ Greater demand of municipality's resources	Preferred Method

Table 6- Meter Maintenance

MAINTENANCE		
	Advantages / Disadvantages	Comment
Private Sector	▪ No demand on municipality's resources for calibration and replacement	Preferred Method
Municipality	▪ Can control which meters are used as replacement and can upgrade if necessary	

Table 7- Billing

BILLING		
	Advantages / Disadvantages	Comment
Private Sector	▪ Less paperwork and resources required for municipalities	
Municipality	▪ Can add to tax bill ▪ Can use water use information to target public education ▪ This task is generally perceived as a municipality's job	Preferred Method

Based on the above, we have developed 2 options for water meter procurement which need further consideration.

4.0 PROCEDURES FOR PROCUREMENT OF SERVICES

4.1 Method 1 - Request for Proposals (Recommended)

One proven method to obtain services is to prepare a Request for Qualifications (RFQ) followed by a Request for Proposals (RFP). Once the RFQ is analyzed, 3 parties are pre-qualified and are chosen to respond to an RFP. The details of the RFP can be written to take into account the strengths and specialities of the 3 parties, leaving other generalities out such as would be required if anyone was invited to submit.

For example, an RFQ could solicit proposals from any party for any and all aspects of the installation through to on-going maintenance and billing. During the analysis of this stage, the municipality can decide which direction it wants to go; whether to use the private sector as much as possible, or to include the municipality's force's as much as possible. If no parties were interested in the maintenance and billing, the direction of the RFP would be geared only toward installation. If a short-listed company wants to combine water and gas meter reading together, the RFP guidelines could be broad enough to include this combination. Analysis of the RFP would be used to determine the installation and on-going costs.

Details of the sizes and types of the meters would be determined by the installation contractor, with guidelines provided by the municipality. Therefore this method is similar to a design/build project.

4.2 Method 2 – Tender out Detailed Specifications

Another method would be to do a detailed analysis of each home to determine the requirements, put it all in one package and let a contractor bid on the package. This could be done by rating each house and ICI unit, or a representative sample, in 3 pricing categories depending on the difficulty of installation. An accurate estimate for the cost of the installation could be measured by estimating the total number of each category.

Once the responses to the Request for Expressions of Interest and Qualifications are received, the city will determine what scenario is most appropriate (Method 1 or Method 2).

5.0 COST ESTIMATE

The following table outlines the budgetary cost estimates based on recent discussions with reputable contractors and suppliers. Cost comparisons were made to other communities of similar size to Grand Forks to fill in any minor data gaps. A contingency allowance was included to allow for unknown items such as service connections included the City's current database, any additional isolation valves, heat tape to prevent line or meter freezing or challenging points of entry such as crawl spaces or trailers. HST is not included in this estimate.

Description	Unit	Est. Qty.	Unit Price	Amount
Supply and Install Residential Water meters (inside version)	ea	1800	$520.00	$936,000.00
Supply and Install Residential Water meters (pit version)	ea	20	$1,100.00	$22,000.00
Supply and Install Mobile Data Collection System and Meter Reader	LS	1	$30,000.00	$30,000.00
Extraordinary Sized Residential Connections	ea	25	$600.00	$15,000.00
Allowance for unique Installations - plumbing and carpentry	LS	1	$35,000.00	$35,000.00
			Contingency	$103,800.00
			Planning and Engineering Support	$75,000.00
			TOTAL	**$1,216,800.00**

5.1 Cost Savings

The implementation of a universal water metering program has been shown to reduce water consumption by approximately 25%. This decrease in water use will also result in a reduction in the annual power consumption for all well pumps. The amount of power utilized by the City for all well pumps, measured in kilowatt-hours (kW-hr) for 2010, is 1,014,217 kW-hrs.

Using a power rate of $0.07/kW-hr, the relative annual power costs for 2010 are approximately:

- 1,014,217 kW-hrs x $0.07/kW-hr: $71,000 per year

Assuming a 25% reduction in the water use, it is reasonable to expect a 25% reduction in the amount power utilized by the well pumps. A 25% reduction in water use in 2010 could have resulted in a savings to the City of $17,750, and 253,555 kW-hr of power. The relationship between kW-hr and kg's of CO_2e emissions is 45.7 kW-hr per 1 kg of CO2e. Using this relationship, a 25% reduction in water use would result in a decrease of approximately 5,550 kg of CO_2e emissions.

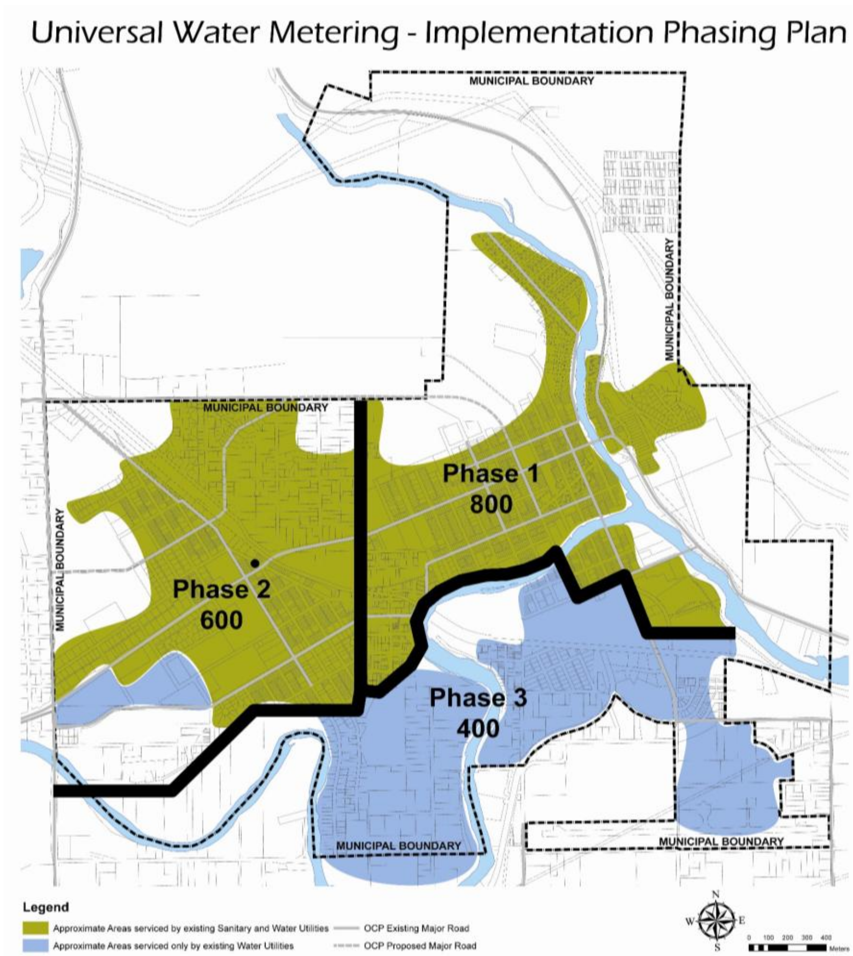
6.0 PHASING AND SCHEDULE

Due to time and financial constraints, this project will proceed in phases over the next three years. Since almost all installations will be indoors, there are no seasonal restrictions on scheduling. Based on level of service as outlined by Figure 7.1 in the City's Sustainable Community Plan, the project could be phased as follows:

- Phase 1 (2011) – Areas serviced by the Sanitary and Water Utilities, approximately 800 residential meters
- Phase 2 (2012) – Areas serviced by the Sanitary and Water Utilities, approximately 600 residential meters
- Phase 3 (2013) – Areas serviced by only by the Water utility, approximately 400 residential meters

A sketch of the phasing plan is located below in **Figure 1**.

Figure 1 -



The following table outlines the budgetary cost estimates for a phased approach.

Phase 1 - Description	Unit	Est. Qty.	Unit Price	Amount
Supply and Install Residential Water meters (inside version)	ea	800	$520.00	$416,000.00
Supply and Install Residential Water meters (pit version)	ea	5	$1,100.00	$5,500.00
Supply and Install Mobile Data Collection System and Meter Reader	LS	1	$30,000.00	$30,000.00
Extraordinary Sized Residential Connections	ea	10	$600.00	$6,000.00
Allowance for unique Installations - plumbing and carpentry	LS	0.4	$35,000.00	$14,000.00
			Contingency	$47,150.00
			Planning and Engineering Support	$40,000.00
			TOTAL	**$558,650.00**

Phase 2 - Description	Unit	Est. Qty.	Unit Price	Amount
Supply and Install Residential Water meters (inside version)	ea	600	$520.00	$312,000.00
Supply and Install Residential Water meters (pit version)	ea	5	$1,100.00	$5,500.00
Supply and Install Mobile Data Collection System and Meter Reader	LS	0	$30,000.00	$0.00
Extraordinary Sized Residential Connections	ea	10	$600.00	$6,000.00
Allowance for unique Installations - plumbing and carpentry	LS	0.3	$35,000.00	$10,500.00
			Contingency	$33,400.00
			Planning and Engineering Support	$25,000.00
			TOTAL	**$392,400.00**

Phase 3 - Description	Unit	Est. Qty.	Unit Price	Amount
Supply and Install Residential Water meters (inside version)	ea	400	$520.00	$208,000.00
Supply and Install Residential Water meters (pit version)	ea	10	$1,100.00	$11,000.00
Supply and Install Mobile Data Collection System and Meter Reader	LS	0	$30,000.00	$0.00
Extraordinary Sized Residential Connections	ea	5	$600.00	$3,000.00
Allowance for unique Installations - plumbing and carpentry	LS	0.3	$35,000.00	$10,500.00
			Contingency	$23,250.00
			Planning and Engineering Support	$10,000.00
			TOTAL	**$265,750.00**

The following schedule for either the complete installation or a phased approach will allow for a timely implementation schedule.

February 2011 -	Investigate Senior Government Grant opportunities
	Water Meter (Conservation) Communications & Education Program
May 2011-	Implement a Financial and Procurement Strategy
	Public Information Sessions
May 2011-	Issue a Request for Qualifications
June 2011-	Request for Proposals
July 2011-	Award project
	Initiate New Water Tracking Process
July -October 2011-	Completion of Commercial Installations (if any)
July 2011 – March 2012(13)-	Completion of Residential Installations
April 2012(13)	Investigate New Utility Rates and Mock Billing

The City may wish to also consider other water conservation measures such as the development of a water conservation policy, installation of low flow fixtures, water restrictions and requiring drought tolerant landscaping for inclusion into City Plans (OCP) and Bylaws (Zoning, Building and Subdivision and Development Servicing) as part of this process.

We also recommend that the City develop a public education program about water conservation, universal metering and its importance throughout the entire process.

7.0 REFERENCES

City of Grand Forks - Universal Water Metering Feasibility, Urban Systems, October 2000

Establishing a Metering Plan to Account for Water Use and Loss, InfraGuide Innovations and Best Practices, Potable Water, National Guide to Sustainable Municipal Infrastructure, September 2003

Drought Management and Conservation Plan , Dobson Engineering, 2005

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