Municipality of McDougall

2.0 Drinking Water System

Asset Management Plan

December 2013

2.0 DRINKING WATER SYSTEM

Contents

2.0 DRINKING WATER SYSTEM

STATE OF INFRASTRUCTURE

2.1 Inventory

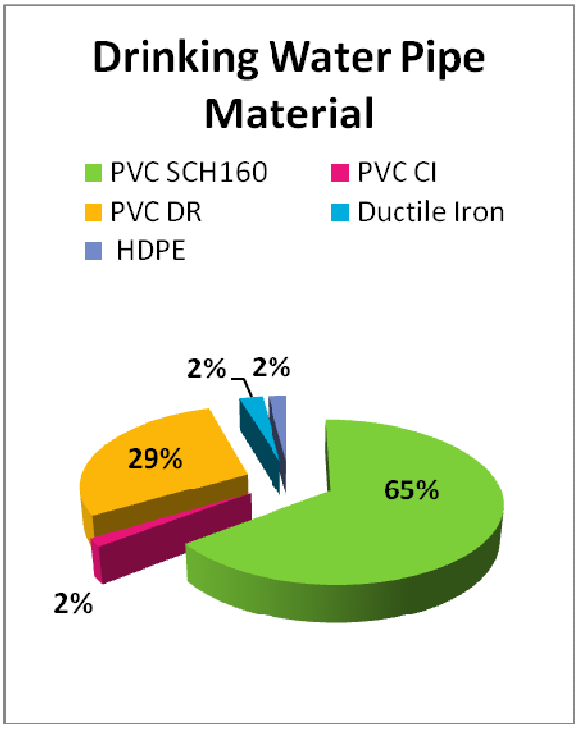
The Municipality's drinking water system consists of a network of pipes, maintenance holes, valves, hydrants, connections, a pumping station, and a chlorination room.

The current inventory is broken down in Figure 2.1. The source of the information is the Asset Inventory Registry.

For analysis, the Municipality relied on internal knowledge of the system, contract documents, and Engineering reports.

Figure 2.1: Drinking Water Inventory Summary

Asset Type	Asset Component	Inventory
Linear	**Local Pipes** 400mm 350mm 300mm 250mm 200mm 150mm	308m 4,433m 40m 1,055m 3,715m 5,366m
	Valves & Chambers	90
	Hydrants	95
	Equipment	13
	Service Connections	343
Facilities	Chlorination Room in Parry Sound Water Tower	1
	Water Dept. Storage & Sampling Structure	1
	Pumping Station Structure	1



2.2 Valuation

The drinking water system services 353 households and was installed in 1988, expanded in 2005 by a private development and expanded once more in 2007 by the Municipality when the latest Parry Sound Water Tower was installed. The historical cost of the drinking water system is shown at 2007 values when the most recent construction was undertaken.

The historical cost is shown without inflation apart from 1988 assets for which no 2007 values were available; these assets have been inflated using CPI figures to 2007 values.

The historical cost of drinking water facilities apart from the Chlorination Room is higher than the replacement cost. This is because McDougall no longer operates an intake facility off of Georgian Bay to supply water to its residents. Instead, McDougall re-chlorinates drinking water from the Parry Sound Water Tower.

The estimated replacement value of the system is based on 2007 values, inflated using CPI figures to 2012 values. The estimated current replacement value (2012) of the drinking water system is $10,994,076 or $31,145 per user in McDougall. Figure 2. 2 shows the breakdown of historical and replacement costs.

2.0 DRINKING WATER SYSTEM

Figure 2.2: Drinking Water System Historical & Replacement Value

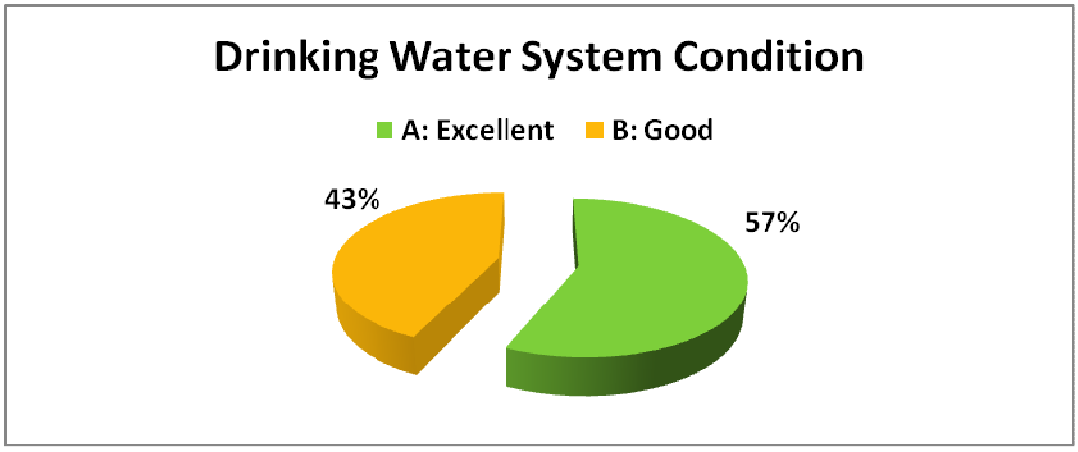
Asset Type	Asset Component	Historical Cost 2007	Replacement Value 2012	Percent of Replacement
Linear	**Local Pipes** 400mm 350mm 300mm 250mm 200mm 150mm	 $508,116 $1,439,469 $14,800 $723,663 $1,260,530 $2,534,220	 $372,801 $1,566,142 $16,102 $787,345 $1,371,174 $2,863,669	 3.4% 14.2% 0.1% 7.2% 12.6% 26.0%
	Valves & Chambers	$940,636	$1,023,412	9.3%
	Hydrants	$253,650	$282,000	2.6%
	Equipment	$39,748	$43,852	0.4%
	Service Connections	$2,294,500	$2,496,416	22.7%
	Value Sub Total	***$10,019,331***	***$10,834,076***	***98.5%***
Facilities	Chlorination Room in Parry Sound Water Tower	$36,200	$40,000	0.4%
	Water Dept. Storage & Sampling	$20,000	$20,000	0.2%
	Pumping Station Structure	$374,812	$100,000	*0.9%*
	Value Sub Total	***$431,012***	***$160,000***	***1.5%***
Total Values		***$10,450,343***	***$10,994,076***	***100%***

2.3 Condition Assessment

The condition report in Figure 2.3 was developed by Municipal Staff with consideration of current legislative requirements, and Engineering reports. The Municipality chose to rely on Municipal Staff and Engineering reports in determining the condition of the system due to the number of external variables and high degree of internal knowledge of the system. Condition assessment criteria are available in the Appendix 1.0.

Figure 2.3: Drinking Water System High Level Condition Assessment

Asset Type	Asset Component	Condition
Linear	**Local Pipes** 400mm 350mm 300mm 250mm 200mm 150mm	 A A A A A A
	Valves & Chambers	B
	Hydrants	A
	Equipment	A
	Service Connections	A
Facilities	Chlorination Room in Parry Sound Water Tower	A
	Water Dept. Storage & Sampling	A
	Pumping Station Structure	A



2.4 Lifecycle Activities

The drinking water assets can be split into four categories of life with corresponding asset management activities. These activities are described in Figure 2.4.

Figure 2.4: Drinking Water System Lifecycle Activities

Activity	Definition	Life Remaining
Minor Maintenance	Planned activities: inspections, monitoring, cleaning, flushing, testing, etc.	75-100%
Major Maintenance	Unplanned maintenance & repair: repairing water main breaks, repairing valves, replacing pipes, etc.	50 - 75%
Rehabilitation	Upgrades & rehabilitation: lining pipes, protection in piping, etc.	25 - 50%
Replacement	End of asset life: decommission, remove old asset and install a new asset that does the same job	0 -25 %

2.5 Life Expectancy

There are numerous direct and indirect variables that affect useful lives of water assets such as climate, soil condition, and installation practices. With this in mind, the Municipality chose to rely on Municipal Staff and Engineering reports in gauging useful life and life remaining for McDougall's drinking water system.

Figure 2.5 shows the useful life of the drinking water assets; Figure 2.6 shows the remaining lives and the lifecycle activities that are being applied.

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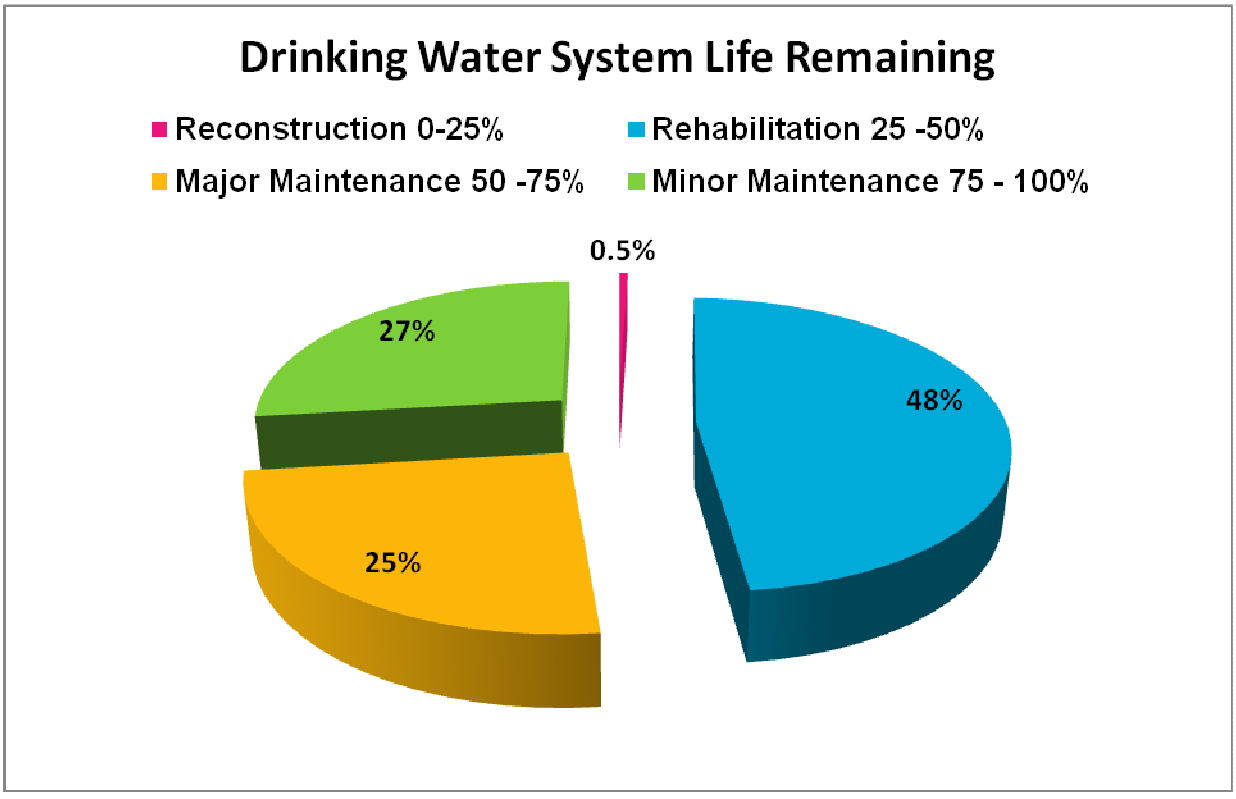
Figure 2.5: Drinking Water System Useful Life

Asset Type	Asset Component	Useful Life
Linear	**Local Pipes** 400mm 350mm 300mm 250mm 200mm 150mm	 75 75 75 75 75 75
	Valves & Chambers	50
	Hydrants	50
	Equipment	28
	Service Connections	50
Facilities	Chlorination Room in Parry Sound Water Tower	75
	Water Dept. Storage & Sampling	25
	Pumping Station Structure	75

Figure 2.6: Drinking Water System Remaining Useful Life



DESIRED LEVEL OF SERVICE

2.6 Target Levels of Service

The service levels in this plan are defined by two overarching performance measures community and operational.

Community Levels of Service: Community levels of service indicate how the community perceives the service and determines whether or not the service is valuable to the public.

Operational Levels of Service: Operational levels of service are the technical activities that bring community levels of service into action. They include resource allocations to create and maintain service levels that users expect and value**.**

Figures 2.7 and 2.8 cover drinking water. These figures identify target levels of service, and current performance relative to measures identified. Future demand drivers, forecasts and effects are discussed in the Asset Management Plan Introduction Section 8.0 and includes all of the assets covered in the plan.

Figure 2.7: Drinking Water Community Levels of Service 2012

Performance Measure	Level of Service Objective	Performance Measure Process	2012 Performance Measured	Desired Level of Service
Purpose	Managing the water distribution system in accordance with all applicable legislation.	Number of customer service requests relating to quality/water taste.	0 Customer requests.	5 Customer requests.
Reliability	Provide users with a consistent supply of drinking water.	Number of unexpected interruptions of service.	0 Unexpected interruptions.	0 Unexpected interruptions.
Safety	Provide users with a safe supply of drinking water.	Number of contamination. Number of pipe line breaks per 100km. Repair time after pipe breaks. Customer service request response time.	0 Contamination cases. 0 Pipe line breaks per 100km. No breaks. Completed within 24 hours in 2012.	0 Contamination cases. 0 Pipe line breaks per 100km. 12 hour repair time after pipe breaks. 12 hour response time.
Quality	Maintaining and continually improving the D.W.Q.M.S.	Number of improvements to the D.W.Q.M.S.	3 D.W.Q.M.S. improvements in 2012.	5 D.W.Q.M.S. improvements annually.
Capacity	Providing enough drinking water to residents with water connections and sufficient volume for fire protection.	Number of customer service requests relating to water pressure.	0 Customer service requests relating to water pressure.	5 Customer service requests relating to water pressure.

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Figure 2.8: Drinking Water Operational Levels of Service 2012

Performance Measure	Level of Service Objective	Performance Measure Process	2012 Performance Measured	Desired Level of Service
Operations	Water quality meets legislative requirements.	Inspections schedule. Water main flushing schedule.	Inspections completed daily. Annual flushing complete in 2012.	Daily inspections (M.O.E. regulation). Annual water main and hydrant flushing (M.O.E. regulation).
Maintenance	Respond to customer service maintenance requests and provide scheduled maintenance.	Work related to customer maintenance requests and scheduled maintenance completion times.	2 Customer service requests. Maintenance & repairs completed within 24 hours after beginning/notice.	3 Customer service requests. Maintenance & repairs completed within 12 hours after beginning/notice.
Renewal	Useful lives of infrastructure should be increasing with the replacement of components.	Infrastructure useful lives.	Average useful life is increasing with renewals. 2012 Average Life: 71%	Infrastructure components are replaced before the end of the asset's lifecycle.
Upgrade/New	Residents and businesses who have access to Municipal water receive a sufficient amount of quality drinking water while maintaining a supply for fire protection.	Provision of water infrastructure to users who are eligible.	All users with Municipal water access have enough quality water. There is an ample amount of water for fire protection.	All users with Municipal water access have enough quality water. There is an ample amount of water for fire protection.

ASSET MANAGEMENT STRATEGY

2.7 Non Infrastructure Solution – Asset Hierarchy

An asset hierarchy provides a base for planning renewal, maintenance and rehabilitation. The structure allows the Municipality to focus its resources on assets that have been identified as critical assets. These assets have a high consequence of failure but not necessarily high risk of failure. Since not all assets can be maintained at the desired level of service prioritizing work on critical assets over low risk ones ensures that the system is protected against the most severe risks. Implementation of this strategy in the planning process has inherent cost savings and efficiencies. Figure 2.9 identifies critical assets in the drinking water system. Drinking water system risks are further explored in the Appendix 4.0.

Figure 2.9: Critical Assets

Ranking	Service Hierarchy	Service Level Objective	Critical Risk
1	Chlorination Room	Treat drinking water to legislated levels.	Untreated drinking water discharge, contamination and service disruption
2	Distribution Network	Distribute quality drinking water throughout the system.	Untreated drinking water discharge, contamination, service disruption.
3	Hydrants	Facilitate firefighting efforts.	Inability to efficiently fight fire.

2.8 Maintenance & Operations Plan

Maintenance Activities: include all actions necessary for keeping assets at their operable capacity. These actions were previous discussed in Figure 2.4 relative to useful life remaining.

Reactive Maintenance: unplanned repair work carried out in response to service request, break down or disruption.

Planned Maintenance: identified repair work indicated by the asset's useful life remaining figure in the Asset Inventory Registry. These activities include inspection, assessing condition based on asset's past performance, scheduling and tracking work to establish a centralized maintenance history and improve service delivery data collection.

Operational Activities affect service levels as they determine day to day servicing of the drinking water system. These activities determine waste water quality, life of equipment, etc.

The Municipality will operate and maintain assets to the desired level of service identified above. These activities will be within approved budgets. Strategies being considered include:

- Annual inspections to determine up to date condition status, maintenance and planned renewals for incorporation into the annual Environment Budget.
- Scheduling maintenance activities in a priority sequence to ensure that the highest risk assets are addressed before lower risk assets.
- Maintaining the Asset Inventory Registry.
- Maintaining service risk and mitigation strategy database.
- Undertaking capital activities through a planned replacement and renewal system**.**

2.9 Renewal & Replacement Plan

The Municipality will undertake renewal and replacement activities to maintain desired levels of service and minimize infrastructure related risks. The following Figure 2.10 criteria will act as McDougall's guide to determining whether major work on an asset should be considered.

Figure 2.10: Capital Planning Tool

Criteria	Weighting
High consequence of failure	20%
High utilization	20%
Identified in critical asset hierarchy	15%
Total value represents the highest net value to Municipality	10%
Has highest age relative to assets in group	10%
Has high operational or maintenance costs	10%
Replacement cost is less than maintenance and/or operating cost	10%
Where replacement with modern equivalent asset would yield material savings	5%
Total	**100%**

2.10 Disposal Plan

Disposal includes any activity associated with removing a decommissioned asset from the Municipality. These activities include sale, demolition or relocation to another department. Only pumping equipment assets have been identified in this AM Plan as requiring disposal. The following procedures are followed by the Municipality when disposing of assets.

Surplus capital assets will be disposed of in the following manner:

- Disposals will be authorized by C.A.O and Management Staff
- Competitive bid process through a Request for Quotations
- Public auction
- Trade-In

Invitations to bid on capital assets offered for sale by the Municipality will be:

- Posted on the Municipality's website for at least 14 days before the closing date of the invitation to bid
- Published in at least one edition of the local newspapers

2.11 Procurement Methods

The Municipality will refer to its internal Procurement Policy (By-Law 2007-09) and Tender Policy (By-Law 2007-10) when purchasing new assets. McDougall will endeavor to where possible follow sustainable purchasing strategies and consider costs based on the lifecycle of the asset.

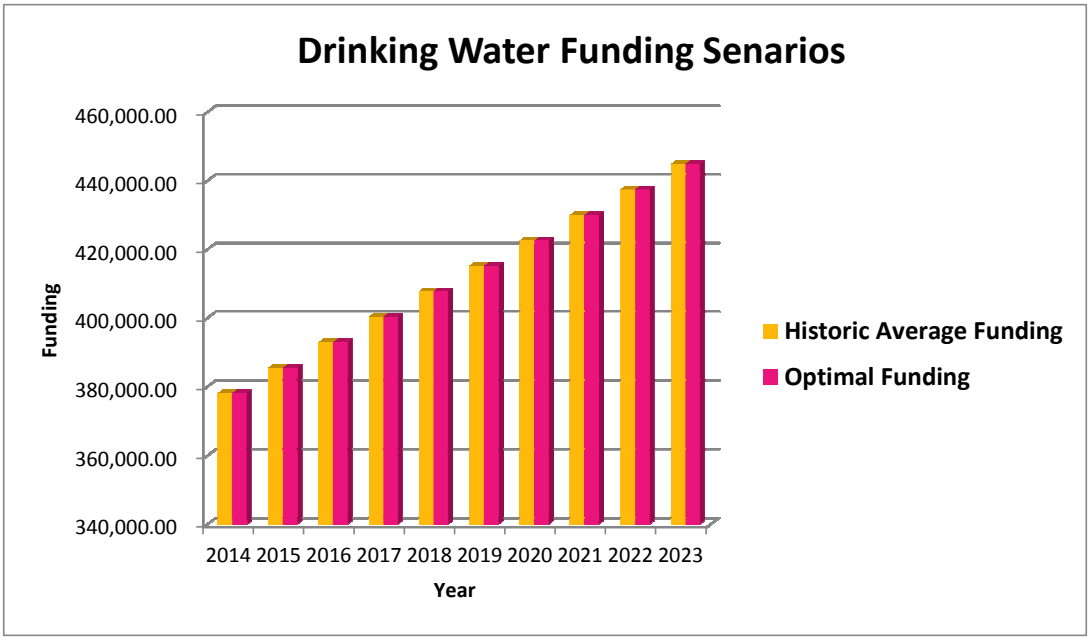
2.12 Risks Involved with the Plan

Optimal Capital Funding vs. Budgeted Capital Funding

The Municipality has adopted this Asset Management Plan to obtain efficiency in operation. The decision to pursue the Plan was based on the historic average spending and revenue compared against additional future needs. Since average revenue over the last three years covers all projected expenditures for the next 10 years, historic average funding is optimal funding.

Scenario 1: Optimal funding for all drinking water system expenditure over the next 10 years is $4,114,362 including inflation of 2% annually. Based on 10 years, a budget of $411,436 would be required annually for optimal operating, reserve building, capital renewal and replacement.

Figure 2.11: Optimal vs. Budgeted Funding Strategies



What McDougall Cannot Do

The Municipality is able to allocate and generate the funding required annually to sustain the drinking water system. This funding provides for all operations, renewals and capital reserve building (Scenario 1). McDougall is able to fund the system and there are no gaps.

Service Consequences

Asset lifecycle activities that the Municipality decides not to undertake after consideration of the asset hierarchy, planned maintenance strategy and replace/renewal ranking guide may impact users' service experience. These consequences are explored in Figure 2.12.

Figure 2.12: Service Consequences & Mitigation

Action	Consequence	Mitigation Strategy
Critical assets will be maintained to higher standards than low risk assets.	o More minor repair work for Municipal Staff o Stress on resources o Reactive maintenance	o Regular inspections of minor assets
The Municipality will only stock basic replacement parts for critical assets.	o Long wait times for replacement parts o Service interruptions	o Routine preventative maintenance on minor assets in poor condition o Scheduled maintenance on minor assets
Drinking water assets will continue to deteriorate and they will only be repaired or replaced when breakage occurs despite planning due to financial constraint.	o Stress on resources o Service interruption o Reactive maintenance o Possible contamination	o Identification and monitoring of assets in poor condition

2.0 DRINKING WATER SYSTEM

FINANCING STRATEGY

This section contains the financial requirements of the Asset Management Plan discussed in the previous subsections. For data confidence information see Appendix 3.0.

2.13 Ten year Drinking Water System Expenditure Projections

The expenditure forecast for the next 10 years is shown in Figure 2.13. It includes projections for non infrastructure solutions, operating, renewal, reserve building, and maintenance activities. Note that all costs are shown with 2% annual inflation on 2010-2012 spending averages.

The total renewal and maintenance expenditure excluding asset replacement reserve contributions is $166,504 or $472 per user over the next 10 years. If reserve contributions are included the total, it rises to $596,620 or $1,690 over 10 years. Note neither of these totals include operating expense which is projected to be between $320,000 and $390,000 annually.

For comparative purposes Figure 2.8 shows drinking water expenditures from 2010 to 2012. Note that all costs are shown without inflation.

Figure 2.13: Projected Operating & Capital Expenditure

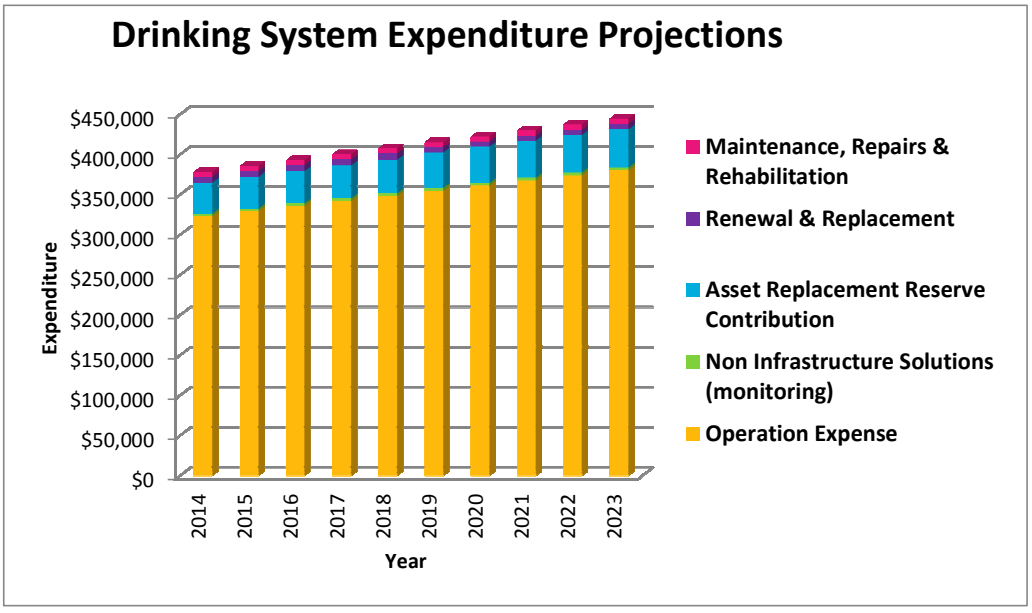
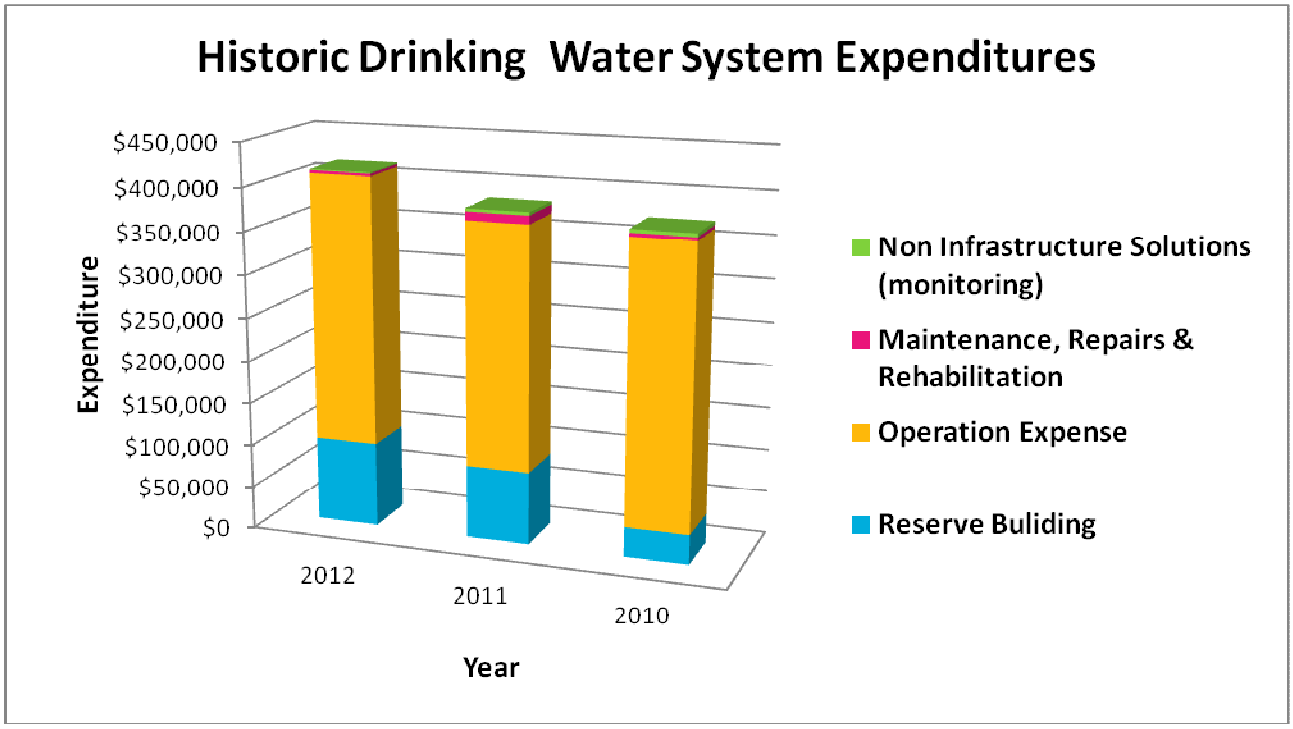


Figure 2.14: Historical Drinking Water System Expenditures



Over the last three years the Municipality has not replaced or renewed any major drinking water assets. Instead the Municipality has focused on reserve building. Going forward there are projected replacements and renewals beginning in 2017 as asset conditions continue to deteriorate. These renewals are mainly minor assets such as pumping equipment and building repairs and total $ 72,324 over the 10 years (includes inflation). Looking towards the next 20 years a series of major asset lives come up for renewal namely hydrants and service connections, further resources will be required and reserve building is important to ensure financial sustainability in the future.

2.14 Ten year Drinking Water System Funding Projections

The funding forecast for the next 10 years is shown in Figure 2.15. Funding requirements cover all renewal, maintenance, and operating expenses. Note that all revenue projections are shown with 2% annual inflation on 2010-2012 values.

Figure 2.15: Drinking Water System Funding Projections

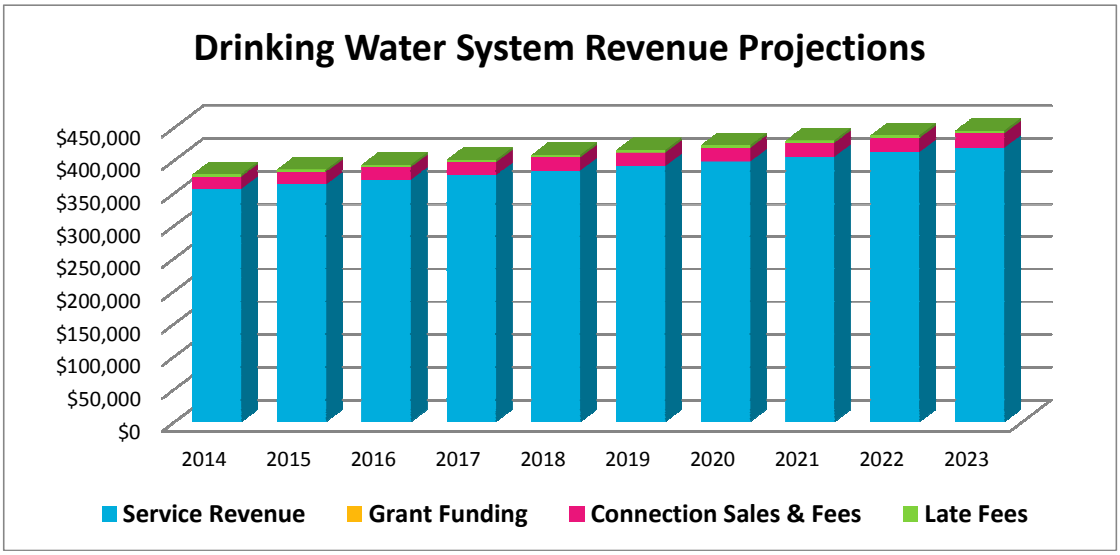
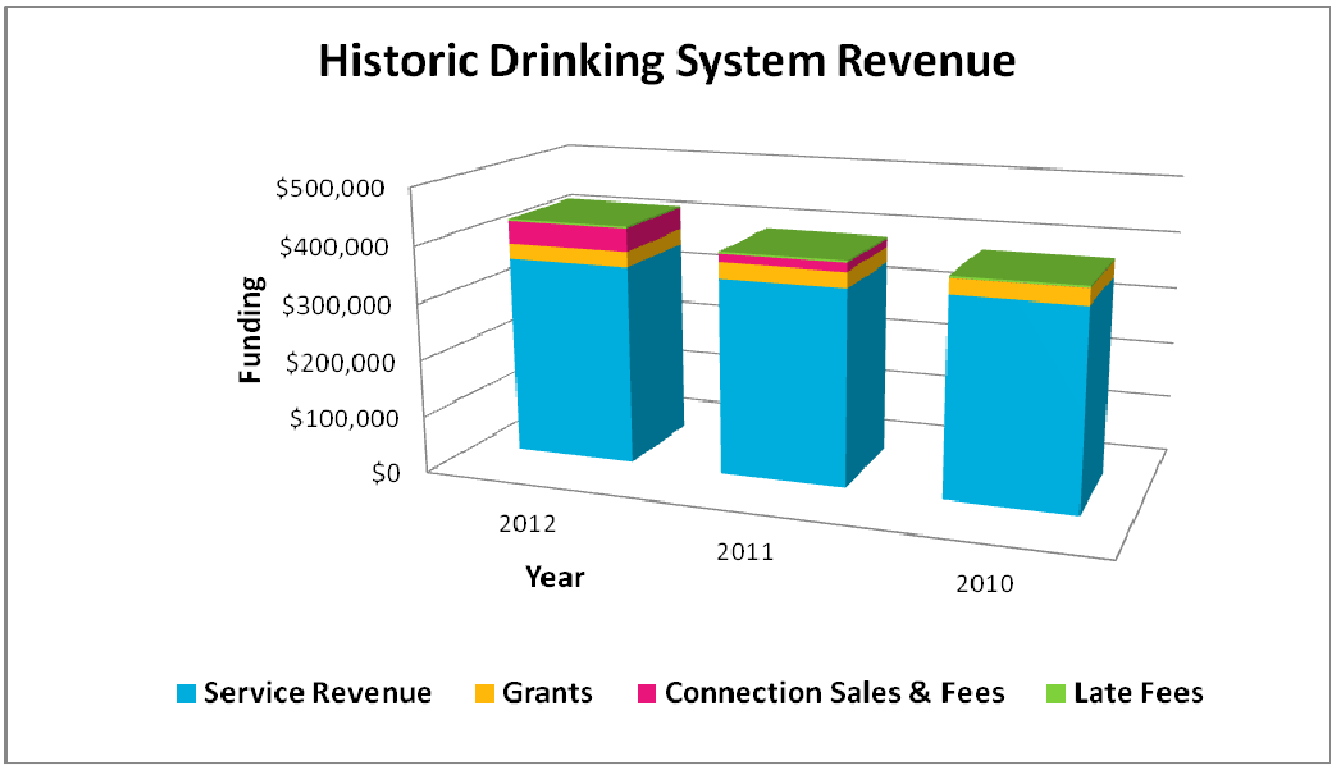


Figure 2.16: Historical Drinking Water System Revenue



2.0 DRINKING WATER SYSTEM

2.15 Sustainability of Service Delivery

The key indicator for service delivery sustainability that has been considered in the financing of the drinking water system Asset Management Plan is the asset renewal funding ratio. This ratio is the most important indicator. It reveals how much of the capital renewals the Municipality will be able finance and how big the infrastructure gap is.

Asset Renewal Funding Ratio

Asset Renewal Funding Ratio 100%

The ratio above indicates that all renewals are fully funded for the next 10 years with the Asset Management Plan in place. There is no infrastructure gap.

APPENDIX
1.0 CONDITION ASSESSMENT CRITERIA

Condition		
A	**Excellent:** no noticeable defects, some aging or wear may be visible. Immediate action is not required	Normal PM
B	**Good:** Only minor deterioration or defects are evident. Immediate action is not required	Normal PM + Minor M.
C	**Fair:** Some deterioration or defects are visible; function is still adequate. Analysis of repair and/or replacement options is recommended.	Normal PM + Major M.
D	**Critical:** Extensive deterioration, barely functional. Immediate action required	Major Repair + Rehab.
F	**Failed:** No longer functioning. Immediate action required	Rehab. Unlikely = Replace

Capacity	
A	System can support over 100% of demand
B	System can support over 90-99% of demand
C	System can support over 80-89% of demand
D	System can support over 70-79% of demand
F	System can support less than 70% of demand

Performance	
A	Exceeds / Meets all Performance Targets
B	Minor Performance Deficiencies
C	Considerable Performance Deficiencies
D	Major Performance Deficiencies
F	Does not meet any Performance Targets

Reliability		
A	As Specified by Manufacturer	Never Failed
B	Random Breakdown	Fails every 20 Years
C	Occasional Breakdown	Fails every 5 Years
D	Periodic Breakdown	Falls every 2 Years
F	Continuous Breakdown	Fails Annually

2.0 LEVELS OF SERVICE CRITERIA

Current Levels of Service

The service levels in this plan are defined by two overarching performance measures: community and operational. These performance measures will enable McDougall to track its progress against targeted outcomes and use those results to improve the Municipality's service delivery.

Community Levels of Service:

Community levels of service indicate how the community perceives the service and determines whether or not the service valuable to the public.

These performance measures include:

Purpose: Does the service satisfy users' needs?

Reliability: Does the service have the capability to maintain its functions on a routine basis?

Safety: Are the users protected from potential risks associated with the service?

Quality: Does the service fulfill its purpose to a high degree of excellence?

Capacity: Is the service at, under or over its capacity?

Operational Levels of Service

Operational levels of service are the technical activities that bring community levels of service into action. They include resource allocations to create and maintain service levels that users expect and value.

2.0 DRINKING WATER SYSTEM

These activities affect the annual operating budget as the following performance measures:

Operations: routine activities that provide the service.

Maintenance: routine activities that keep the infrastructure functioning at the desired level of service.

Renewal: non-routine activities that extend the useful life of an infrastructure asset at the desired level of service.

Upgrade: non-routine activities that raise the level of service that the infrastructure can provide.

3.0 DATA CONFIDENCE

Confidence Grade	Description
A Very Reliable	Data is complete and estimated to be accurate ± 2%.
B Reliable	Data is complete and estimated to be accurate ± 10%.
C Uncertain	Data is substantially complete but up to 50 % is extrapolated and estimated to be accurate ± 25%.
D Very Uncertain	Data is over 50% incomplete; most data is extrapolated or estimated. Accuracy is estimated between ± 40%.
E Unknown	Little to no data is available at present.

Data	Confidence Assessment	Source
Operation Expenditure	A	Based on actual spending records. Consideration given to historical records.
Maintenance Expenditure	A	Based on actual spending records. Consideration given to historical records.
Projected Renewals	B	Taken from asset registry, Municipal Water Works Staff recommendations and industry standards
Asset Useful Lives	B	Based on Municipal Water Works Staff recommendations and industry standards

4.0 D.W.Q.M.S. RISK ASSESSMENT MATRIX

Date of Assessment: Sept/28/2011
Risk Assessment Team: Bruce Butler, Steve Goman, Tim Hunt

DWQMS Risk Threshold: RPN ≥ 10

Recognize						Assess				Control			
Element or Process Step						Risk Evaluation							
#	Process Category	Description of Process	Hazardous Event	Potential Hazard	Current Available Control Measures	Likelihood (1-5)	Severity (1-5)	Detectability (1-5)	Assessed Risk (L + S + D = 1 to 15)	CCP? Yes / No	Critical Control Limits (qualitative or quantitative; use appropriate units)	Relevant Procedures	Potential Additional Controls
1	Upstream Transmission	Upstream Water Quality from Town of Parry Sound (Tower)	Inadequate disinfection active pathogens	Biological contamination of water - Adverse Water Quality Incident	Under Town's control: Town is required to report any known water quality issues to the Municipality (Resolution 2005/588, sections 7 & 18) Booster chlorination at the tower Town controls in place	3	3	1	7	No - outside Municipal Control	—	—	Continuious review of procedure with Town to ensure smooth response and understanding.
2	Upstream Transmission	Upstream Water Quality from Town of Parry Sound (Tower)	Inadequate chlorine residual	Biological contamination of water	Booster chlorination at the tower Online monitoring of chlorine residual - pump moderates itself to set point. SCADA monitoring available at Tower - alarms to Town system & dialer calls Municipality	1	2	1	4	Yes	Rechlorination monitored and adjusted to maintain chlorine residual as per O. Reg. 169/ O. Reg. 170	*PW-DW-SOP-012-006*, "Continuous Monitoring of Residual Chlorine"	None.
3	Upstream Transmission	Upstream Water from Town of Parry Sound through Feeder Main to North Tower	Break in Feeder Main to North Tower	Insufficient supply of consumable water	1 week Municipal supply of water held within Tower New Town watermain (approx 90% installed since 2007) Backflow prevention on Town side of line	2	3	1	6	No	—	—	Continue to review with town to improve for emergency response procedure to respond to feeder main breaks (with links to Town as required)
4	Upstream Transmission	Upstream Water from Town of Parry Sound through Feeder Main to North Tower	Break in Feeder Main to North Tower	Insufficient supply of water - fire flows	6-8 hours' worth of water held within Tower (assuming two hydrants flowing) Pumper trucks would be used - lots of non-potable water sources in the area New Town watermain (approx 90% installed since) Back-check on Town side of line	2	3	1	6	No	—	—	Continue to review with town to improve for emergency response procedure to respond to feeder main breaks (with links to Town as required)
5	Upstream Storage	Stored Water - Elevated Tower	Animal Intrusion / Sabotage	Chemical contamination or physical damage to infrastructure	Town controls security at Tower Intrusion/SCADA alarms (Town - Tower; McDougall - pumping room) Double-gated	1	5	5	11	No - outside Municipal Control	—	—	None.

DWQMS Risk Threshold: RPN ≥ 10

Recognize						Assess				Control			
Element or Process Step						Risk Evaluation							
#	Process Category	Description of Process	Hazardous Event	Potential Hazard	Current Available Control Measures	Likelihood (1-5)	Severity (1-5)	Detectability (1-5)	Assessed Risk (L + S + D = 1 to 15)	CCP? Yes / No	Critical Control Limits (qualitative or quantitative; use appropriate units)	Relevant Procedures	Potential Additional Controls
6	Upstream Storage	Stored Water - Elevated Tower	Animal Intrusion / Sabotage	Biological contamination	Town controls security at Tower: intrusion/SCADA alarms (Town - Tower; McDougall - pumping room), double-gated Rechlorination station	1	5	5	11	Yes	Rechlorination monitored and adjusted to maintain chlorine residual as per O. Reg. 169/ O. Reg. 170	***PW-DW-SOP-012-006***, "Continuous Monitoring of Residual Chlorine"; applicable Town of Parry Sound procedures	None.
7	Booster Chlorination (Municipal)	Booster Chlorination facility	Malfunction of Booster Chlorination Station	Biological contamination of water - Adverse Water Quality incident	Preventive maintenance for equipment as per manual SCADA & alarming Calibration as required - check of analyzer once weekly Two pumps - redundancy of equipment One injection point	1	1	1	3	Yes	SCADA monitoring of booster station in place	***PW-DW-SOP-012-006***, "Continuous Monitoring of Residual Chlorine"; ***PW-DW-SOP-013-002***, "Calibration of Continuous Chlorine Analyzer"	Develop Template for monitoring of hypochlorite levels in storage tank to be recorded during weekly checks.
8	Distribution (Municipal)	Watermain - distribution, infrastructure	General physical failure of watermains due to aging, deterioration	Insufficient supply (all purposes)	Distribution system infrastructure all installed since 1988 Corrosion control on newer infrastructure. Infrastructure review conducted once annually. Asset management program being developed..	2	2	3	7	No	—	—	None.
9	Distribution (Municipal)	Watermain - distribution, infrastructure	Physical failure of feeder watermain (from Tower) due to aging, deterioration	Insufficient supply (all purposes)	Feeder watermain is 2 years old PVC construction; wrapped; anodes on bolts Infrastructure review conducted once annually. Asset management program being developed..	1	5	1	7	No	—	—	None.

*DWQMS Risk Threshold: **RPN** ≥ 10*

Recognize						Assess				Control			
Element or Process Step						Risk Evaluation							
#	Process Category	Description of Process	Hazardous Event	Potential Hazard	Current Available Control Measures	Likelihood (1-5)	Severity (1-5)	Detectability (1-5)	Assessed Risk (L + S + D = 1 to 15)	CCP? Yes / No	Critical Control Limits (qualitative or quantitative; use appropriate units)	Relevant Procedures	Potential Additional Controls
10	Distribution (Municipal)	Watermain - distribution, infrastructure	Biological contamination occurring during regular operations - i.e. biofilms	Biological contamination of water - Adverse Water Quality Incident	Booster chlorination at the Tower Weekly bacteriological monitoring of system Flushing program in place	1	2	2	5	Yes	Rechlorination monitored and adjusted to maintain chlorine residual as per O. Reg. 169/ O. Reg. 170	***PW-DW-SOP-011-002,*** "Flushing Procedure for Distribution System"; ***PW-DW-SOP-012-002***, "Taking Bacteriological Samples"; ***PW-DW-SOP-012-006***, "Continuous Monitoring of Residual Chlorine"	None.
11	Distribution (Municipal)	Watermain - distribution, infrastructure	General chemical/physical contamination - i.e. iron, manganese, turbidity, etc.	Chemical contamination of water	PVC infrastructure installed. Increased sampling for THMs (monthly) - at Municipality's discretion No Schedule 23/24 sampling requirement	1	2	3	6	No	---	---	None.
12	Distribution (Municipal)	Watermain - distribution, infrastructure	Lead contamination (chemical)	Chemical contamination of water	Sampling program in place No lead infrastructure in Municipal system.	1	2	2	5	No	—	—	None.
13	Distribution (Municipal)	Watermain - commissioning of new watermains	Contamination of water new connections to distribution system	Biological contamination of water - Adverse Water Quality Incident	All contractor work supervised by Municipal staff or on-site engineer - good control over commissioning operations.	1	3	1	5	Yes	Sampling program for new watermains: limits as per AWWA Standard C651	***PW-DW-SOP-011-001,*** "New Watermain Disinfection"; ***PW-DW-SOP-012-002,*** "Taking Bacteriological Samples"	
14	Distribution (Municipal)	Cross-connections & backflows - all services	Cross-connections and/or backflows in Municipal distribution system	Biological or chemical cross-contamination of water	Backflow bylaw in place (2003): any new connection (including residential) has to have a backflow prevention device Vulnerability with grandfathered installations - bylaw covers about 5% of existing buildings No periodic inspection required	2	3	5	10	Yes	Backflow bylaw in place	***Bylaw #2005-16:*** Section 9.15 (backflow prevention)	Implement backflow unit inspection requirement for higher-volume water users.

DWQMS Risk Threshold: RPN ≥ 10

Recognize						Assess				Control			
Element or Process Step						Risk Evaluation							
#	Process Category	Description of Process	Hazardous Event	Potential Hazard	Current Available Control Measures	Likelihood (1-5)	Severity (1-5)	Detectability (1-5)	Assessed Risk (L + S + D = 1 to 15)	CCP? Yes / No	Critical Control Limits (qualitative or quantitative; use appropriate units)	Relevant Procedures	Potential Additional Controls
15	Distribution (Municipal)	Dead ends	Stagnant water - low chlorine residuals, bacterial regrowth	Biological contamination of water - Adverse Water Quality incident	Flushing program in place Sampling program in place	2	2	2	6	Yes	Rechlorination monitored and adjusted to maintain chlorine residual as per O. Reg. 169/ O. Reg. 170	***PW-DW-SOP-011-002,*** "Flushing Procedure for Distribution System"; ***PW-DW-SOP-012-002,*** "Taking Bacteriological Samples"	None.
16	Distribution (Municipal)	Watermain - distribution, infrastructure	Physical failure of watermain	Biological contamination of water - Adverse Water Quality incident	Distribution system infrastructure from 1988 Corrosion control on joints in some areas SCADA monitoring in place - trend analysis of flows Sampling programs in place	2	3	2	7	Yes	As per O. Reg. 169/ O. Reg. 170	***PW-DW-SOP-012-002,*** "Taking Bacteriological Samples"; ***PW-DW-SOP-012-005,*** "Manual Determination of Residual Chlorine"	None.
17	Distribution (Municipal)	Fire hydrant performance	Malfunction of hydrants (leaks, freezing etc)	Water loss, loss of pressure for fire flows	Pumper trucks available (filled off hydrant) Hydrant inspection program (tied in with flushing program) Known issues with hydrants are typically resolved within 1 week Hydrants checked more frequently in winter	3	1	3	7	No	—	—	None.
18	Distribution (Municipal)	Customer linkages - private connections	Cross-contamination and/or backflow private connections	Biological or chemical contamination of water	Bylaws provide Municipality with ability to turn off customer water supply until issues are brought into compliance.	2	3	3	8	Yes	Backflow bylaw in place	***Bylaw #2005-16:*** Section 9.15 (backflow prevention)	None.
19	Distribution (Municipal)	Water delivery system - Public-use water tap	Failure of back-flow prevention devices	Biological or chemical contamination of water	Backflow preventer on tap Backflow prevention on main (redundancy) Solenoid-activated flow - button must be pressed for flow	1	2	4	7	Yes	Backflow bylaw in place	***Bylaw #2005-16:*** Section 9.15 (backflow prevention)	None.

DWQMS Risk Threshold: ***RPN*** **≥ 10**

Recognize						Assess				Control			
Element or Process Step						Risk Evaluation							
#	Process Category	Description of Process	Hazardous Event	Potential Hazard	Current Available Control Measures	Likelihood (1-5)	Severity (1-5)	Detectability (1-5)	Assessed Risk (L + S + D = 1 to 15)	CCP? Yes / No	Critical Control Limits (qualitative or quantitative; use appropriate units)	Relevant Procedures	Potential Additional Controls
20	Distribution (Private)	Water delivery system - Water Station - Unauthorized hauling station	Failure of or lack of back-flow prevention devices	Biological or chemical contamination of water	No control measures in place.	2	5	5	12	No - outside Municipal Control	—	***Bylaw #2005-16:*** Section 3.3 (Offences)	
21	Distribution (Private - downstream)	Customer elements - customer system issues	Lead in private service systems (pipes, welds)	Chemical contamination of water (lead)	Sampling program in place. Some observed lead in customer elements.	2	1	2	5	No - outside Municipal Control	—	—	Education programs for public - work with Public Health as required.

2.0 DRINKING WATER SYSTEM

5.0 FUNDING SCENARIOS – OPTIMAL VS. HISTORIC AVERAGE

2012 Drinking Water Financing	*Scenario One - Optimal & Historic Funding*										
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
REVENUE											
Service Revenue	355,732	362,707	369,682	376,658	383,633	390,608	397,583	404,558	411,533	418,508	425,484
Grants											
Increase Development Fees %											
Increase Service Fees %											
USER											
Connection Sales & Fees	18,682	19,048	19,415	19,781	20,147	20,513	20,880	21,246	21,612	21,979	22,345
Late Fees	3,663	3,734	3,806	3,878	3,950	4,022	4,093	4,165	4,237	4,309	4,381
TOTAL REVENUE	**378,077**	**385,490**	**392,903**	**400,316**	**407,730**	**415,143**	**422,556**	**429,969**	**437,383**	**444,796**	**452,209**
OPERATION EXPENSE											
Annual Operation Expense	314,271	320,433	326,595	332,757	338,920	345,082	351,244	357,406	363,568	369,731	375,893
Vehicle Overhead	8,981	9,157	9,333	9,509	9,685	9,862	10,038	10,214	10,390	10,566	10,742
Debt Repayment - Development Charge											
CAPITAL EXPENSE											
Renewal & Replacement	7,344	7,488	7,632	7,776	7,920	6,160	6,270	6,380	6,490	6,600	7,564
Maintenance, Repairs & Rehabilitation	5,776	5,889	6,003	6,116	6,229	6,342	6,456	6,569	6,682	6,795	6,909
Non Infrastructure Solutions (monitoring)	3,086	3,147	3,207	3,268	3,328	3,389	3,449	3,510	3,570	3,631	3,691
Disposal Activities											
Expansion Activities											
RESERVE BULIDING											
Asset Replacement Reserve Contribution	38,618	39,375	40,133	40,890	41,647	44,308	45,099	45,891	46,682	47,473	47,410
Contribution Smoothing %											
Contribution Smoothing $											
Contributed Reserve	461,543	500,161	539,536	579,669	620,558	662,205	706,513	751,613	797,504	844,185	891,659
TOTAL EXPENSE	**378,077**	**385,490**	**392,903**	**400,316**	**407,730**	**415,143**	**422,556**	**429,969**	**437,383**	**444,796**	**452,209**
NET INCOME (deficit)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

*** All figures shown in CAD $**
****Inflation assumption is 2 %**

***** Forecasted revenues & expenditures are based on 2010 - 2012 actual spending (average)**

6.0 PROJECTED 10 YEAR CAPITAL RENEWAL & REPLACEMENT PROGRAM

Asset Component	Quantity	Unit	Useful Life	Life Remaining	2019 Renewals	2024 Renewals
Water Pumping Station - repairs	1	each	75	67%	$ 5,000	
Water Dept. Storage & Sampling - repairs	1	each	25	23%		$ 20,000
Chemical metering pumps	2	each	10	40%	$ 6,000	
Continuous Free Chlorine Residual Analyzer	2	each	15	60%		$ 7,500
Alarm System complete with SCADA	3	each	10	40%	$ 25,000	
				Total Program	**$ 36,000**	**$ 27,500**