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## Program Implementation Costs, Savings and Schedule

(All costs in 000's)

Program	Totals	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
		1	2	3	4	5	6	7	8	9	10	11	12
<b>Municipal</b>													
System Leak Detection	\$200	\$100	\$100	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Savings MLd	9.2	4.6	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
Watering Restrictions	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Savings MLd	58.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Single-family</b>													
Toilet Replacement	\$9,250	Pilot \$7	\$924	\$924	\$924	\$924	\$924	\$924	\$924	\$924	\$924	\$924	\$924
Savings MLd	13.8	0.0	1.4	2.8	4.1	5.5	6.9	8.3	9.7	11.0	12.4	13.8	13.8
Clothes Washer Replacement	\$2,640		\$25	\$291	\$291	\$291	\$291	\$291	\$291	\$291	\$291	\$291	\$291
Savings MLd	2.6		0.0	0.3	0.6	0.9	1.2	1.5	1.7	2.0	2.3	2.6	2.6
Outdoor Water Audits	\$7,363		Pilot \$25	\$815	\$815	\$815	\$815	\$815	\$815	\$815	\$815	\$815	\$815
Savings MLd	29.5		0.0	3.4	6.6	9.9	13.2	16.4	19.7	23.0	26.2	29.5	29.5
Toilet Replacement in New Construction	\$1,340	Pilot \$50	\$117	\$117	\$117	\$117	\$117	\$117	\$117	\$117	\$117	\$117	\$117
Savings MLd	5.5	0.2	0.7	1.2	1.6	2.1	2.6	3.1	3.6	4.1	4.5	5.0	5.5
<b>Multi-family</b>													
Toilet Replacement - Public	\$432	Pilot \$90	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31	\$31
Savings MLd	1.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.9	1.0	1.1	1.2
Toilet Replacement - Private	\$2,851		\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259
Savings MLd	8.0		0.7	1.5	2.2	2.9	3.6	4.4	5.1	5.8	6.5	7.3	8.0
Clothes Washer Replacement	\$288				\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32	\$32
Savings MLd	1.4				0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4
Outdoor Water Audits	\$174			\$17	\$17	\$17	\$17	\$17	\$17	\$17	\$17	\$17	\$17
Savings MLd	0.7			0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7
<b>ICI</b>													
Toilet Replacement	\$774			\$77	\$77	\$77	\$77	\$77	\$77	\$77	\$77	\$77	\$77
Savings MLd	2.4			0.2	0.5	0.7	1.0	1.2	1.4	1.7	1.9	2.2	2.4
Outdoor Water Audits	\$500				\$56	\$56	\$56	\$56	\$56	\$56	\$56	\$56	\$56
Savings MLd	2.5				0.3	0.6	0.8	1.1	1.4	1.7	1.9	2.2	2.5
Indoor Water Audits	\$780			\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78
Savings MLd	3.1			0.3	0.6	0.9	1.2	1.6	1.9	2.2	2.5	2.8	3.1
<b>All</b>													
High-Efficiency Toilets	\$1,890	\$158	\$158	\$158	\$158	\$158	\$158	\$158	\$158	\$158	\$158	\$158	\$158
Savings MLd	1.2	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2
<b>Summary</b>													
Cost of WEP Programs	\$28,481	\$398	\$672	\$1,712	\$2,855	\$2,855	\$2,855	\$2,855	\$2,855	\$2,855	\$2,855	\$2,855	\$2,855
Program Support Costs	\$4,272	\$60	\$101	\$257	\$428	\$428	\$428	\$428	\$428	\$428	\$428	\$428	\$428
TOTAL WEP COSTS	\$32,753	\$457	\$773	\$1,969	\$3,284	\$3,284	\$3,284	\$3,284	\$3,284	\$3,284	\$3,284	\$3,284	\$3,284
Peak Day Savings ML/d	81.1	5.2	11.2	14.7	22.1	29.4	36.8	44.2	51.6	59.0	66.3	73.7	81.1
AADD Savings ML/d	51.8	5.2	11.2	14.5	18.7	22.8	27.0	31.1	35.2	39.4	43.5	47.7	51.8
Wastewater Reduction ML/d	39.2	0.6	2.0	5.3	9.1	12.8	16.6	20.4	24.1	27.9	31.7	35.4	39.2

## Appendix B

### Water Efficiency Plan Measures System Leak Detection

<b>Program Schedule:</b>	2004 and 2005	<b>Benefit to Cost Ratio:</b>	N/A
<b>Measure Costs:</b>	\$200,000	<b>Estimated Participation:</b>	100%
<b>Support Cost @ 15%:</b>	\$ 30,000		
<b>Total Program Costs:</b>	\$230,000		
<b>Maximum Water Savings:</b>	9.2 ML/d	<b>Maximum Incentive:</b>	N/A
<b>Target Water Savings:</b>	9.2 ML/d	<b>Recommended Incentive:</b>	N/A

#### Program Description

The WEP's leak detection program involves determining all aspects of non-revenue water. The intent is to complete all of the necessary calculations to quantify Peel's International Leakage Index (ILI), to compare this value with other similar systems, and to determine the cost-effective level of leakage based on Peel's distribution infrastructure data (length/diameter of mains, number of services/connections, pressures, etc.). This must be done to accurately assess the potential for reducing non-revenue water in a cost-effective way.<sup>1</sup>

If there is a significant potential for reducing system leakage it will likely involve temporary District Meter Areas (DMAs). This process involves supplying small areas (about 3,000 homes each) through a single or dual feed, metering and data logging this supply, and comparing the data to a set of specific calculations to quantify the level of leakage. Only areas with potentially high levels of leakage are investigated further. Region staff will remain responsible for actually repairing leaks. The use of DMAs will enable the Region to quantify actual leak rates.

Until an ILI analysis is completed the potential to reduce leakage is an estimate, however, based on the results of leak reduction programs completed in other areas (e.g., Toronto, Kitchener, Region of York) it is expected that reductions of about 1 to 2% of Peel's AADD may be achieved. The costs identified for this measure are related to the completion of an ILI analysis and the design of DMAs within the Region (depending on the results of the ILI analysis). It is estimated that it would take two years to design and test a Region-wide DMA system.

#### DMAs will be used to:

- ◆ Identify improperly operated control valves within the system
- ◆ Establish baseline profiles to identify/quantify future changes in leakage
- ◆ Prioritize maintenance programs, i.e., larger leaks can be repaired first

Because this measure is ongoing and the leakage factor is currently unknown it is not possible to calculate a cost/benefit ratio, however, this measure is considered a Best Management Practice.

<sup>1</sup> NOTE: Water savings assigned to this measure are estimated only until ILI study is completed.

## Monitoring and Evaluation

The use of the DMA methodology for system leak detection and maintenance involves monitoring and quantifies the level of leakage eliminated. It is recommended that the Region staff track the number of leaks identified, leakage rates, locations of leaks, cost of repairs, etc.

## Water Savings Calculations

### Assumptions:

- ◆ The projected AADD in 2015 is expected to be 613 ML/d
- ◆ A leakage reduction of 1.5% of the 2015 AADD is assumed until more analysis is completed

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<b>Maximum Water Savings (MWS):</b>	<b>9.2 ML/d</b>
MWS = Leakage reduction target x AADD	
= 1.5% x 613 ML/d	
= 9.2 ML/d	
<b>Target Water Savings (TWS):</b>	<b>9.2 ML/d</b>
TWS = Maximum water savings x Estimated participation	
= 9.2 ML/d x 100%	
= 9.2 ML/d	
<b>Maximum Incentive (MI):</b>	<b>N/A</b>
<b>Recommended Incentive (RI):</b>	<b>N/A</b>
<b>Cost/Benefit Ratio (RI/MI):</b>	<b>N/A</b>
<b>Full Program Cost (to design and test DMAs):</b>	<b>\$200,000</b>
Cost = 100 DMAs x \$2,000/DMA	
= \$200,000	
<b>Support Costs @ 15%:</b>	<b>\$ 30,000</b>
<b>Total Program Cost:</b>	<b>\$230,000</b>

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## Toilet Replacement Program – Single-Family

<b>Program Schedule:</b>	2005 to 2015	<b>Benefit to Cost Ratio:</b>	0.34
<b>Pilot Program:</b>	2005	<b>Estimated Participation:</b>	77,110 homes
<b>Measure Costs:</b>	\$9,250,000		154,220 toilets
<b>Support Cost @ 15%:</b>	\$1,387,500		
<b>Total Program Costs:</b>	\$10,637,500		
<b>Maximum Water Savings:</b>	31.4 ML/d	<b>Maximum Incentive (avg.):</b>	\$175 per toilet
<b>Target Water Savings:</b>	13.8 ML/d	<b>Recommended Incentive:</b>	\$60 per toilet

### Program Description

Water used for flushing toilets typically accounts for about 30% of indoor water demands. One of the greatest potential savings in the WEP is from replacing non-efficient toilets in single-family homes with toilets that flush with no more than six litres. The average life expectancy of a residential toilet is generally considered to be about 25 years – equating to a change-out rate of 4% per year or a total change-out of 44% during the 11-year program. At this time the Province has not mandated the installation of 6-litre toilets in replacement situations, i.e., homeowners can install non-efficient toilets in existing locations. That said, the goal of this WEP measure is to make 6-litre toilets the “fixture of choice” by offering an incentive to homeowners.

A one-year pilot program involving about 5,000 toilets<sup>1</sup> is recommended to test delivery and administration issues, incentive amounts, participation rates and disposal issues.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating homes.

It is important to the success of this measure that only toilets that meet the Region’s criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with the design flush volume (typically six litres) for the life of the toilet.

To help track program success and effectiveness, the Region should establish a methodology to estimate the number of water-efficient toilets installed in existing housing during the program period, regardless of whether they are subsidized or not.

<sup>1</sup> Although most showerheads currently meet OBC requirements for maximum flow rates (and many actually flow at less than this rate due to mineral build-up in the fixture) the Region may wish to include the replacement of any “high flow” showerheads observed during the toilet replacements activities. The associated savings, however, would be minimal compared to toilets and are not considered in calculations.

## Water Savings Calculations

### Assumptions:

- ◆ All homes constructed after January 1, 1996 include 6-litre toilets
- ◆ 1995 single-family population = 664,000
- ◆ 90% of the 1995 single-family population do not have 6-litre toilets = 597,600
- ◆ 3.41 people per single-family household (avg. Mississauga and Brampton)
- ◆ 2 toilets per household
- ◆ 44% participation
- ◆ 154,220 toilets installed as part of program (90% x 664,000 persons ÷ 3.41 pph x 2 toilets per house x 44% participation)
- ◆ 5 flushes per person per day (f/p/d), 8 flushes per toilet per day (f/t/d)
- ◆ Avg. savings of 10.5 litres per flush (based on 6-litre replacement toilet)
- ◆ Avg. incentive of \$60 is used for the following calculations, though it is anticipated that the measure may involve higher rebates for toilets that exceed the Region's minimum criteria for performance and savings, and less than this amount may be provided for toilets that just meet this criteria.

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**Maximum Water Savings (MWS):** **31.4 ML/d**

$$\begin{aligned} \text{MWS} &= \text{Number of flushes} \times \text{Water saved} \times \text{Number of participants} \\ &= 5 \text{ f/p/d} \times 10.5 \text{ litres/flush} \times 90\% \times 664,000 \text{ persons} \\ &= 31.4 \text{ ML/d} \end{aligned}$$

**Target Water Savings (TWS):** **13.8 ML/d**

$$\begin{aligned} \text{TWS} &= \text{Maximum water savings} \times \text{Estimated participation} \\ &= 31.4 \text{ ML/d} \times 44\% \\ &= 13.8 \text{ ML/d} \end{aligned}$$

**Maximum Incentive (MI):** **\$175 per toilet**

$$\begin{aligned} \text{MI} &= \text{Number of flushes} \times \text{Water saved} \times \text{Cost of water saved} \\ &= 8 \text{ f/p/d} \times 10.5 \text{ L/f} \times \$2.09 \text{ per L/d} \\ &= \$175 \text{ per toilet} \end{aligned}$$

**Recommended Incentive (RI):** **\$60 per toilet (avg.)**

**Cost/Benefit Ratio (RI/MI):** **0.34**

**Program Cost:** **\$9,250,000**

$$\text{Cost} = 154,220 \text{ incentives @ } \$60 \sim \$9,250,000$$

**Support Costs @ 15%:** **\$ 1,387,500**

**Total Program Cost:** **\$10,637,500**

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## Clothes Washer Replacement Program – Single-Family

<b>Program Schedule:</b>	2006 to 2015	<b>Benefit to Cost Ratio:</b>	0.48
<b>Pilot Program:</b>	2006	<b>Estimated Participation:</b>	52,800 homes
<b>Measure Costs:</b>	\$2,640,000		
<b>Support Cost @ 15%:</b>	\$396,000		
<b>Total Program Costs:</b>	\$3,036,000		
<b>Maximum Water Savings:</b>	13.2 ML/d	<b>Maximum Incentive:</b>	\$105
<b>Target Water Savings:</b>	2.6 ML/d	<b>Recommended Incentive:</b>	\$50

### Program Description

Clothes washers account for an average of about 23% of the total indoor water demands of single-family homes.<sup>1</sup> Efficient washers use only about 60% of the water and 40% of the energy that conventional washer use.<sup>2</sup> Therefore, the expected total savings from converting to an efficient washer is about \$60 per year,<sup>3</sup> or about \$2,200 over the life of the washer.<sup>4</sup> Although efficient or horizontal-axis washers use substantially less water and energy they also cost about \$400-\$600 more than conventional washers, meaning that the payback period for the customer is about 7 or 8 years.

Because efficient washers also use substantially less energy the Region may wish to partner with an energy provider such as Enbridge Consumers Gas. A software program provided by Maytag illustrates that the energy savings accounts for about 75% of the total savings (i.e., about \$45 of the \$60 savings per year is from reduced energy required to heat the water, run the motor, and reduced drying time). It is anticipated that a \$100 incentive (i.e., \$50 from the Region related to water savings plus \$50 from the energy provider related to energy savings) will entice sufficient participation in this program.

### Monitoring and Evaluation

Because the savings related to installing efficient washers is well known, there is no additional monitoring required for this measure.

<sup>1</sup> AWWARF Residential End Use Study.

<sup>2</sup> Manufacturer literature, various field studies.

<sup>3</sup> Based on washing 5 loads per week, using 50% hot & 50% cold water, gas water heater, electric dryer, and includes all water and energy savings for both the washer and dryer. Rates used are as follows: Water: \$0.55/m<sup>3</sup>, Sewer: \$0.65/m<sup>3</sup>, Gas: \$0.30/m<sup>3</sup>, Electricity: \$0.15/KWH. A table of results is presented in Appendix A.

<sup>4</sup> Based on a 20-year lifecycle and an annual increase of 6% in water and energy costs.

## Water Savings Calculations

### Assumptions:

- ◆ The projected AADD in 2015 is expected to be 613 ML/d
- ◆ Single-family population in 2015: 1,000,000
- ◆ Assume 90% will not have efficient washers = 900,000 persons
- ◆ Average of 3.41 persons per household (pph): 264,000 households
- ◆ 100% of households have clothes washer = 264,000 washers
- ◆ Lifecycle of residential washer is 25 years; annual change-out rate is 4%
- ◆ 40% of existing washers changed-out between 2006 and 2015 = 105,600 washers
- ◆ 50% replaced with h-axis washers = 52,800
- ◆ Cost of energy savings equals two times cost of water savings
- ◆ Average water savings is 15 Lcd (estimates range between 10<sup>5</sup> and 20<sup>6</sup> Lcd)
- ◆ Average water savings is 50 L/household/day (50 Lcd x 3.41 pph ~ 50 L/household)

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**Maximum Water Savings (MWS):** **13.2 ML/d**

MWS = Water saved per household x Number of households  
 = 50 L x 264,000 households  
 = 13.2 ML/d

**Target Water Savings (TWS):** **2.6 ML/d**

TWS = Maximum water savings x Replacement rate x Estimated participation  
 = 13.2 ML/d x 40% x 50%  
 = 2.6 ML/d

**Maximum Incentive (MI):** **\$105 per household**

MI = Water saved x Cost of water saved  
 = 50 litres/household x \$2.09 per L/d  
 = \$105 per household

**Recommended Incentive (RI):** **\$50 per washer**

**Cost/Benefit Ratio (RI/MI):** **0.48**

**Program Cost:** **\$2,640,000**

Cost = 52,800 incentives @ \$50  
 = \$2,640,000

**Support Costs @ 15%:** **\$396,000**

**Total Program Cost:** **\$3,036,000**

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<sup>5</sup> Based on saving 50 litres per load and completing 5 loads per week per household, with a population density of 3.4 persons per single-family household.

<sup>6</sup> Based on the AWWARF Residential End Use Study, Mayer, et al., 1999.

## Outdoor Water Audit Program – Single-Family

<b>Program Schedule:</b>	2006 to 2015	<b>Maximum Incentive:</b>	\$70
<b>Measure Costs:</b>	\$7,362,500	<b>Recommended Incentive:</b>	\$25
<b>Support Cost @ 15%:</b>	\$1,104,375		
<b>Total Program Costs:</b>	\$8,466,875		
<b>Maximum Water Savings:</b>	29.5 ML/d	<b>Benefit to Cost Ratio:</b>	0.36
<b>Target Water Savings:</b>	29.5 ML/d	<b>Estimated Participation:</b>	294,500 homes

### Program Description

Recent research indicates that irrigation reduction programs can be effective in reducing peak demands in the single-family sector. Pilot programs completed in the Regions of Durham and Halton have shown an average peak day savings of about 200 litres per household. Both pilots involved the distribution of water efficiency items (e.g., rain gauges, hose washers) and information pamphlets to participating households. To be conservative, it is expected that savings in Peel will average no less than 100 litres per household on peak water demand days.

To make the project more effective and cost-effective, Peel's program is expected to target homes with a high summer to winter water demand ratio.

Peel's single-family outdoor water audit measure is expected to cost about \$25 per home including materials and labour. Each audit may involve students "delivering" program materials at the front door of each home as well as mailings, newspaper, radio, or TV ads, billboards, etc. The exact method used by Peel to educate the public will be determined through discussions with other Regions or areas, and from the results of a pilot program scheduled for 2006.

### Monitoring and Evaluation

Monitoring will be conducted as part of the Pilot Program and may continue for two additional years to ensure that water savings are sustained (program costs in the second year of the pilot are restricted to monitoring alone; there is no customer contact during the second year).

Water production data should be monitored throughout the summer months to help identify water demand patterns related to weather patterns and the effects of public announcements, etc. A billing data analysis may also be periodically undertaken by the Region to assess long term savings of participating households.

## Water Savings Calculations

### Assumptions:

- ◆ There will be about 294,500 single-family households in 2015
- ◆ 100% of these households will be eligible (though the program may focus only on “high use” customers)
- ◆ Maximum day irrigation demand in the single-family sector is 200 ML/d
- ◆ Water savings of 100 litres per household per day (L/h/d) can be achieved on peak demand days

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**Maximum Water Savings (MWS):** **29.5 ML/d**

MWS = Water savings x Number of households  
= 100 L/h/d x 294,500 households  
= 29.5 ML/d

**Target Water Savings (TWS):** **29.5 ML/d**

TWS = Maximum water savings x Estimated participation  
= 29.5 ML/d x 100%  
= 29.5 ML/d

**Maximum Incentive (MI):** **\$70 per household**

MI = Water saved x Cost of water saved  
= 100 L/h/d x \$0.70 per L/d  
= \$70 per household

**Recommended Incentive (RI):** **\$25 per household**

**Cost/Benefit Ratio (RI/MI):** **0.36**

**Program Cost:** **\$7,362,500**

Cost = 294,500 households x \$25 per audit  
= \$7,362,500

**Support Costs @ 15%:** **\$1,104,375**

**Total Program Cost:** **\$8,466,875**

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## Toilet Replacement Program – New Construction

<b>Program Schedule:</b>	2004 to 2015	<b>Benefit to Cost Ratio:</b>	0.12
<b>Measure Costs:</b>	\$1,340,000	<b>Estimated Participation:</b>	134,000 toilets
<b>Support Cost @ 15%:</b>	\$201,000		
<b>Total Program Costs:</b>	\$1,541,000		
<b>Maximum Water Savings:</b>	5.5 ML/d	<b>Maximum Incentive (avg.):</b>	\$85 per toilet
<b>Target Water Savings:</b>	5.5 ML/d	<b>Recommended Incentive:</b>	\$10 per toilet

### Program Description

Since January 1, 1996 the Ontario Building Code has mandated the use of 6-litre toilets in all new construction. Unfortunately, many of the toilets being installed fail to meet customer performance expectations (resulting in double-flushing, “holding the handle”, or replacing trim components), or they have trim components (usually the flapper) that require changing every five years or so. When improper trim components are installed, however, the initial water savings associated with installing the toilet is lost or at least compromised. What’s more, it is often very difficult or expensive for homeowners to obtain original trim components. A recent study<sup>1</sup> has identified that it is common for toilets to flush with 11 litres or more when a “standard” or buoyant flapper replaces the originally supplied flapper – a loss of five litres per flush!

One of the greatest potential water savings in the WEP is from ensuring that only those toilets that meet customer performance expectations and will continue to flush with no more than six litres over their entire lifecycle are installed in new construction. This measure assumes that an average of five litres per flush can be gained for toilets in new construction by the Region offering rebates to builders that install only toilets meeting Peel’s requirements for performance and long term water savings.

A pilot program involving the new home builders is planned to commence in 2004. Identification of the selection criteria and identification of the approved toilets will be resolved prior to the initiation of the pilot program.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating homes.

It is important to the success of this measure that only toilets that meet the Region’s criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with the design flush volume (typically six litres) for the life of the toilet.

<sup>1</sup> MaP Testing, Veritec Consulting Inc., 2003

## Appendix B - Water Efficiency Plan Measures

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To help track program success and effectiveness, the Region should establish a methodology to estimate the number of water-efficient toilets installed in existing housing during the program period, regardless of whether they are subsidized or not.

### Water Savings Calculations

#### Assumptions:

- ◆ All homes constructed after January 1, 1996 include 6-litre toilets
- ◆ A savings of 5 litres per flush can be obtained by installing only pre-selected toilets
- ◆ Approx. 74,400 new homes/apartments constructed between 2004 and 2015
- ◆ Avg. of about 1.8 toilets per new home (includes single-family and multi-family)
- ◆ About 134,000 toilets installed between 2004 and 2013
- ◆ About 8.2 flushes per day per toilet (includes single-family and multi-family) = 1,100,000 flushes per day

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**Maximum Water Savings (MWS):** **5.5 ML/d**

$$\begin{aligned} \text{MWS} &= \text{Number of flushes} \times \text{Water saved} \\ &= 1,100,000 \text{ flushes/day} \times 5 \text{ litres/flush} \\ &= 5.5 \text{ ML/d} \end{aligned}$$

**Target Water Savings (TWS):** **5.5 ML/d**

$$\begin{aligned} \text{TWS} &= \text{Maximum water savings} \times \text{Estimated participation} \\ &= 5.5 \text{ ML/d} \times 100\% \\ &= 5.5 \text{ ML/d} \end{aligned}$$

**Maximum Incentive (MI):** **\$85 per toilet**

$$\begin{aligned} \text{MI} &= \text{Number of flushes} \times \text{Water saved} \times \text{Cost of water saved} \\ &= 8.2 \text{ f/t/d} \times 5 \text{ L/f} \times \$2.09 \text{ per L/d} \\ &= \$85 \text{ per toilet} \end{aligned}$$

**Recommended Incentive (RI):** **\$10 per toilet**

**Cost/Benefit Ratio (RI/MI):** **0.12**

**Program Cost:** **\$1,340,000**

$$\begin{aligned} \text{Cost} &= 134,000 \text{ incentives} @ \$10 \\ &= \$1,340,000 \end{aligned}$$

**Support Costs @ 15%:** **\$201,000**

**Total Program Cost:** **\$1,541,000**

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## Toilet Replacement Program - Multi-Family Public Housing

<b>Program Schedule:</b>	<b>2004 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.17</b>
<b>Measure Costs:</b>	<b>\$432,000</b>	<b>Estimated Participation:</b>	<b>7,200 toilets</b>
<b>Support Cost @ 15%:</b>	<b>\$64,800</b>		
<b>Total Program Costs:</b>	<b>\$496,800</b>		
<b>Maximum Water Savings:</b>	<b>1.2 ML/d</b>	<b>Maximum Incentive (avg.):</b>	<b>\$350</b>
<b>Target Water Savings:</b>	<b>1.2 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$60</b>

### Program Description

This program is designed to replace 100% of old inefficient toilets in the public housing sector.<sup>1</sup> Rebates will be available to all Social Housing, homes for the aged, hostels, and Children's Services buildings, etc.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating homes.

It is important to the success of this measure that only toilets that meet the Region's criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with the design flush volume (typically six litres) for the life of the toilet.

To help track program success and effectiveness, the Region should establish a methodology to estimate the number of water-efficient toilets installed in existing housing during the program period, regardless of whether they are subsidized or not.

A pilot program to replace toilets in public housing is planned to commence in 2004.

<sup>1</sup> Although most showerheads currently meet OBC requirements for maximum flow rates (and many actually flow at less than this rate due to mineral build-up in the fixture) the Region may wish to include the replacement of any "high flow" showerheads observed during the toilet replacements activities. The associated savings however, would be minimal compared to toilets and are not considered in calculations.

## Water Savings Calculations

### Assumptions:

- ◆ 6,551 inefficient suites<sup>2</sup>
- ◆ Average of 1.1 toilets per suite
- ◆ 7,200 inefficient toilets
- ◆ 2.5 persons per suite, total population of 16,380
- ◆ 7 flushes per person per day (f/p/d); 17.5 flushes per suite per day (f/s/d); 16 flushes per toilet per day (f/t/d)
- ◆ Savings of 10.5 litres per flush (L/f)

---

### Maximum Water Savings (MWS): 1.2 ML/d

$$\begin{aligned}
 \text{MWS} &= \text{Number of flushes} \times \text{Water saved} \times \text{Number of participants} \\
 &= 7 \text{ f/p/d} \times 10.5 \text{ L/f} \times 16,380 \text{ persons} \\
 &= 1.2 \text{ ML/d}
 \end{aligned}$$

### Target Water Savings (TWS): 1.2 ML/d

$$\begin{aligned}
 \text{TWS} &= \text{Maximum water savings} \times \text{Estimated participation} \\
 &= 1.2 \text{ ML/d} \times 100\% \\
 &= 1.2 \text{ ML/d}
 \end{aligned}$$

### Maximum Incentive (MI): \$350 per toilet

$$\begin{aligned}
 \text{MI} &= \text{Number of flushes} \times \text{Water saved} \times \text{Cost of water saved} \\
 &= 16 \text{ f/t/d} \times 10.5 \text{ L/f} \times \$2.09 \text{ per L/d} \\
 &= \$350 \text{ per toilet}
 \end{aligned}$$

### Recommended Incentive (RI): \$60 per toilet (avg.)

### Cost/Benefit Ratio (RI/MI): 0.17

### Program Cost: \$432,000

$$\begin{aligned}
 \text{Cost} &= 7,200 \text{ incentives @ } \$60 \\
 &= \$432,000
 \end{aligned}$$

### Support Costs @ 15%: \$64,800

### Total Program Cost: \$496,800

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<sup>2</sup> The Region currently operates 68 Peel Living property locations with 6551 units. This number includes apartments and townhouses. It is anticipated that an insignificant number of these have had efficient toilets installed.

## Toilet Replacement Program – Private Multi-Family

<b>Program Schedule:</b>	<b>2005 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.16</b>
<b>Measure Costs:</b>	<b>\$2,851,200</b>	<b>Estimated Participation:</b>	<b>47,520 toilets</b>
<b>Support Cost @ 15%:</b>	<b>\$427,680</b>		
<b>Total Program Costs:</b>	<b>\$3,278,880</b>		
<b>Maximum Water Savings:</b>	<b>8.8 ML/d</b>	<b>Maximum Incentive (avg.):</b>	<b>\$350</b>
<b>Target Water Savings:</b>	<b>8.8 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$60</b>

### Program Description

This program is designed to replace at least 90% of old inefficient toilets in the privately-owned multi-family housing sector<sup>1</sup> with water-efficient fixtures.

In 1995 (the year prior to the 1996 requirement of the Ontario Building Code to install water-efficient toilets in all new construction) there were about 150,000 persons living in 60,000 privately owned apartment suites in the Region of Peel. It is assumed that about 20% of these suites have since had their inefficient toilets replaced with 6-litre units.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating homes.

It is important to the success of this measure that only toilets that meet the Region's criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with the design flush volume (typically six litres) for the life of the toilet.

To help track program success and effectiveness, the Region should establish a methodology to estimate the number of water-efficient toilets installed in existing housing during the program period, regardless of whether they are subsidized or not.

<sup>1</sup> Although most showerheads currently meet OBC requirements for maximum flow rates (and many actually flow at less than this rate due to mineral build-up in the fixture) the Region may wish to include the replacement of any "high flow" showerheads observed during the toilet replacements activities. The associated savings however, would be minimal compared to toilets and are not considered in calculations.

## Water Savings Calculations

### Assumptions:

- ◆ All apartment suites constructed after January 1, 1996 include 6-litre toilets
- ◆ As of 1995, about 150,000 people lived in privately-owned multi-family buildings in Peel
- ◆ 80% of suites have not had water-efficient toilets installed = 120,000 persons
- ◆ 90% of inefficient suites will participate = 108,000 persons
- ◆ 2.5 people per suite (p/s) = 43,200 inefficient suites participating
- ◆ 1.1 toilets per suite (t/s) = 47,520 toilets
- ◆ 7 flushes/person/day; 17.5 flushes/suite/day; 16 flushes/toilet/day (f/t/d)
- ◆ Savings of 10.5 litres per flush

---

**Maximum Water Savings (MWS):** **8.8 ML/d**

MWS = Number of flushes x Water saved x Number of participants  
= 7 f/p/d x 10.5 L/f x 120,000 persons  
= 8.8 ML/d

**Target Water Savings (TWS):** **8.0 ML/d**

TWS = Maximum water savings x Estimated participation  
= 8.8 ML/d x 90%  
= 8.0 ML/d

**Maximum Incentive (MI):** **\$350 per toilet**

MI = Number of flushes x Water saved x Cost of water saved  
= 16 f/t/d x 10.5 L/f x \$2.09 per L/d  
= \$350 per toilet

**Recommended Incentive (RI):** **\$60 per toilet (avg.)**

**Cost/Benefit Ratio (RI/MI):** **0.16**

**Full Program Cost:** **\$2,851,200**

Cost = 47,520 incentives @ \$60  
= \$2,851,200

**Support Costs @ 15%:** **\$427,680**

**Total Program Cost:** **\$3,278,880**

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## Clothes Washer Replacement Program – Multi-Family

<b>Program Schedule:</b>	<b>2007 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.10</b>
<b>Measure Costs:</b>	<b>\$287,500</b>	<b>Estimated Participation:</b>	<b>5,750 washers</b>
<b>Support Cost @ 15%:</b>	<b>\$43,125</b>		
<b>Total Program Costs:</b>	<b>\$330,625</b>		
<b>Maximum Water Savings:</b>	<b>1.4 ML/d</b>	<b>Maximum Incentive:</b>	<b>\$500</b>
<b>Target Water Savings:</b>	<b>1.4 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$50</b>

### Program Description

Efficient washers use about 60% of the water and 40% of the energy of conventional washers.<sup>1</sup> A 1999 study by the City of Toronto found an average of about 17.4 suites per washer in an apartment building and that each suite saves about 14 litres per day when efficient washers are installed. Based on these numbers, the savings per day per washer is about 244 litres.

The total savings (water and energy) from converting to efficient washers is about \$300 per washer per year.<sup>2</sup> Although efficient or horizontal-axis washers use substantially less water and energy they also cost about \$400-\$600 more than conventional washers, meaning that the payback for the facility is about two years.

Because efficient washers also use substantially less energy, the Region may wish to partner with an energy provider such as Enbridge Consumers Gas. A software program provided by Maytag illustrates that the energy savings accounts for about 70% of the total savings (i.e., about \$200 of the \$300 savings per year is from reduced energy required to heat the water, run the motor, and reduced drying time). It is anticipated that a \$100 incentive (i.e., \$50 from the Region related to water savings plus \$50 from the energy provider related to energy savings) will entice sufficient participation in this program.

It is anticipated that an effective multi-residential clothes washer replacement program will result in virtually 100% of these appliances being replaced with efficient models by 2015.

### Monitoring and Evaluation

A billing data analysis may be periodically undertaken by the Region to assess long term savings from participating buildings. Information on installation rates of water efficient clothes washers may be obtained from multi-residential clothes washer service companies in return for receiving the incentive.

<sup>1</sup> Manufacturer literature, various field studies.

<sup>2</sup> Based on using 50% hot & 50% cold water, gas water heater, electric dryer, and includes all water and energy savings for both the washer and dryer.

## Water Savings Calculations

### Assumptions:

- ◆ In 2015 there will be 250,000 person living in about 100,000 privately owned apartment suites in Peel
- ◆ Average of 2.5 persons per suite
- ◆ About 17.4 suites per clothes washer<sup>3</sup> (s/cw) = 5,750 washers
- ◆ Water saved is 14 litres per suite per day (L/s/d)

---

**Maximum Water Savings (MWS):** 1.4 ML/d

$$\begin{aligned} \text{MWS} &= \text{Water saved} \times \text{Number of suites} \\ &= 14 \text{ L/s/d} \times 100,000 \\ &= 1.4 \text{ ML/d} \end{aligned}$$

**Target Water Savings (TWS):** 1.4 ML/d

$$\begin{aligned} \text{TWS} &= \text{Maximum water savings} \times \text{Estimated participation} \\ &= 1.4 \text{ ML/d} \times 100\% \\ &= 1.4 \text{ ML/d} \end{aligned}$$

**Maximum Incentive (MI):** \$500 per washer

$$\begin{aligned} \text{MI} &= \text{Water saved} \times \text{Number of suites} \times \text{Cost of water saved} \\ &= 14 \text{ L/s/d} \times 17.4 \text{ s/cw} \times \$2.09 \text{ per L/d} \\ &= \$500 \text{ per clothes washer} \end{aligned}$$

**Recommended Incentive (RI):** \$50 per washer

**Cost/Benefit Ratio (RI/MI):** 0.10

**Full Program Cost:** \$287,500

$$\begin{aligned} \text{Cost} &= 5,750 \text{ incentives} @ \$50 \\ &= \$287,500 \end{aligned}$$

**Support Costs @ 15%:** \$43,125

**Total Program Cost:** \$330,625

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<sup>3</sup> City of Toronto Clothes Washer Replacement Program, 1999.

## Outdoor Water Audit Program – Multi-Family

<b>Program Schedule:</b>	<b>2006 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.36</b>
<b>Measure Costs:</b>	<b>\$174,000</b>	<b>Estimated Participation:</b>	<b>87 buildings</b>
<b>Support Cost @ 15%:</b>	<b>\$26,100</b>		
<b>Total Program Costs:</b>	<b>\$200,100</b>		
<b>Maximum Water Savings:</b>	<b>1.0 ML/d</b>	<b>Maximum Incentive:</b>	<b>\$0.70 per L/d</b>
<b>Target Water Savings:</b>	<b>0.7 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$0.25 per L/d</b>

### Program Description

Similar to the ICI sector indoor water audit program, this outdoor water audit program is intended to offer multi-family residential buildings an incentive to reduce their peak day water demands. The incentive is based on the rate of irrigation water saved and maintained on “peak-type” days.

This program will be offered to all multi-family residential buildings in the Region, however, it is expected that only facilities with high irrigation demands will participate.

Reducing irrigation demands affects the Region’s water supply but does not affect wastewater flows. It is recommended that the Region use a capacity buy-back rate of \$0.25 per litre per day of peak day water savings providing the savings are maintained. Generally, it is expected that the site would require some type of automatic irrigation control system to ensure that savings are maximized and sustained.

The costs associated with this program are related to providing incentives to reduce irrigation demands; the amount of incentive received by a site would be calculated in relationship to the reduction in irrigation demands achieved.

### Monitoring and Evaluation

Buildings participating in this program must document changes made to irrigation systems and water savings achieved (e.g., through data logging the irrigation meter). A billing data analysis may also be periodically undertaken by the Region to assess long term savings.

## Water Savings Calculations

### Assumptions:

- ◆ It is estimated that there are 125 multi-family residential buildings in the Region that over-water their landscape<sup>1</sup>
- ◆ 70% of these buildings will participate = 87 participating sites<sup>2</sup>
- ◆ Participating sites will save an average of 8,000 litres per day (L/d) on peak demand days<sup>3</sup>

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**Maximum Water Savings (MWS):** **1.0 ML/d**

MWS = Number sites x Water savings  
= 125 sites x 8,000 L/d  
= 1.0 ML/d

**Target Water Savings (TWS):** **0.7 ML/d**

TWS = Maximum water savings x Estimated participation  
= 1.0 ML/d x 70%  
= 0.7 ML/d

**Maximum Incentive (MI):** **\$0.70 per L/d**

Must be less than \$0.47 to be cost-effective.

**Recommended Incentive (RI):** **\$0.25 per L/d**

**Cost/Benefit Ratio (RI/MI):** **0.36**

**Full Program Cost:** **\$174,000**

Cost = 87 sites x 8,000 L/d x \$0.25 L/d  
= \$174,000

**Support Costs @ 15%:** **\$26,100**

**Total Program Cost:** **\$200,100**

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<sup>1</sup> Based on using the same ratio as determined as part of Toronto's 1999 Irrigation System Assessment & Audit Pilot Program.

<sup>2</sup> Strictly an assumption.

<sup>3</sup> To be conservative this value is 50% of the savings achieved as part of Toronto's 1999 Irrigation System Assessment & Audit Pilot Program.

## Toilet Replacement Program – ICI

<b>Program Schedule:</b>	2006 to 2015	<b>Benefit to Cost Ratio:</b>	0.17
<b>Measure Costs:</b>	\$853,160	<b>Estimated Participation:</b>	7,795 (Flush Valve)
<b>Support Cost @ 15%:</b>	\$127,974		3,839 (Gravity)
<b>Total Program Costs:</b>	\$981,134		
<b>Maximum Water Savings:</b>	12.2 ML/d	<b>Maximum Incentive:</b>	\$440
<b>Target Water Savings:</b>	2.4 ML/d	<b>Recommended Incentive:</b>	\$100 (Flush Valve)
			\$60 (Gravity)

### Program Description

The program is designed to replace a significant portion of inefficient toilets in the industrial/commercial/institutional (ICI) sector with water-efficient units flushing at no more than six litres. The average life expectancy of a residential toilet is generally considered to be about 25 years – equating to a change-out rate of 4% per year or a total change-out of 40% during the 10-year program. The same change-out rate has been assumed for toilets in the ICI sector.

At this time the Province has not mandated the installation of 6-litre toilets in replacement situations, i.e., ICI personnel are free to replace non-efficient toilets with other non-efficient toilets. That said, the goal of this WEP measure is to make 6-litre toilets the “fixture of choice” by offering an incentive to those replacing toilets.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating ICI facilities.

It is important to the success of this measure that only toilets that meet the Region’s criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with the design flush volume (typically six litres) for the life of the toilet.

To help track program success and effectiveness, the Region should establish a methodology to estimate the number of water-efficient toilets installed in existing ICI facilities during the program period, regardless of whether they are subsidized or not.

## Water Savings Calculations

### Assumptions:

- ◆ All toilets installed in new construction after January 1, 1996 have 6-litre toilets installed
- ◆ 1995 population in Peel was 831,000
- ◆ 70% are employees or students (assume 7% pre-school, 8% over 65 years old, 15% non-working)  
= 581,700 persons
- ◆ One toilet for every 10 persons in this sector = 58,170 toilets
- ◆ 40% of non-efficient toilets will be replaced during program = 23,268 toilets
- ◆ 50% of these will be replaced with water-efficient models = 11,634 toilets
- ◆ One-third of these toilets are flush valve units; 3,878 flush valve units
- ◆ Two-thirds of these toilets are gravity units; 7,756 gravity units
- ◆ Average person flushes two times/day at work/school = 20 flushes/day/toilet
- ◆ Average water savings = 10.5 litres per flush or 210 litres per toilet per day (L/t/d)

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**Maximum Water Savings (MWS):** **12.2 ML/d**

MWS = Number of flushes x Water saved x Number of participants  
 = 2 f/p/d x 10.5 L/f x 581,700 households  
 = 12.2 ML/d

**Target Water Savings (TWS):** **2.4 ML/d**

TWS = Maximum water savings x Estimated participation  
 = 12.2 ML/d x 20%  
 = 2.4 ML/d

**Maximum Incentive (MI):** **\$440 per toilet**

MI = Number of flushes x Water saved x Cost of water saved  
 = 20 f/t/d x 10.5 L/f x \$2.09 per L/d  
 = \$440 per toilet

**Recommended Incentive (RI):** **\$60 per gravity toilet**  
**\$100 per flush valve toilet**

**Avg. Incentive:** = (2 toilets x \$60 + 1 toilet x \$100) ÷ 3 toilets = **\$73.33**

**Cost/Benefit Ratio (RI/MI):** **0.17**

**Full Program Cost:** **\$853,160**

Cost = 11,634 incentives @ \$73.33  
 = \$853,160

**Support Costs @ 15%:** **\$ 127,974**

**Total Program Cost:** **\$981,134**

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## Outdoor Water Audit Program – ICI

<b>Program Schedule:</b>	<b>2007 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.29</b>
<b>Measure Costs:</b>	<b>\$500,000</b>	<b>Estimated Participation:</b>	<b>250 sites</b>
<b>Support Cost @ 15%:</b>	<b>\$75,000</b>		
<b>Total Program Costs:</b>	<b>\$575,000</b>		
<b>Maximum Water Savings:</b>	<b>5.0 ML/d</b>	<b>Maximum Incentive:</b>	<b>\$0.70 per L/d</b>
<b>Target Water Savings:</b>	<b>2.5 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$0.20 per L/d</b>

### Program Description

Similar to the indoor water audit program for the ICI sector, the outdoor water audit program is intended to offer ICI facilities an incentive to reduce their demands. The incentive would be based on the irrigation water saved and maintained on “peak demand-type” days. Many components of the water treatment/supply infrastructure must be sized to meet peak water demands, which may occur only a few days per year and are largely caused by high irrigation requirements after periods of hot and dry weather. What’s more, although high peak demands increase infrastructure requirements, they generate very little revenue. Reducing peak demands, therefore, is very beneficial to the Region.

This program will be offered to all ICI facilities in the Region, however, it is expected that only facilities with high irrigation demands will participate.

Reducing irrigation demands affects the Region’s water supply but does not affect wastewater flows. It is recommended that the Region use a capacity buy-back rate of \$0.20 per litre per day of peak day water savings providing the savings are maintained. Generally, it would be expected that the ICI site would require some type of automatic irrigation control system to ensure that savings are maximized and sustained.

The costs associated with this program are related to providing incentives to reduce irrigation demands; the amount of incentive received by a site would be in relationship to the reduction in irrigation demands achieved.

### Monitoring and Evaluation

Buildings participating in this program must document changes made to irrigation systems and water savings achieved (e.g., through data logging the irrigation meter). A billing data analysis may also be periodically undertaken by the Region to assess long term savings.

## Water Savings Calculations

### Assumptions:

- ◆ Peak day irrigation for the ICI sector in 2015 will be about 29 ML/d
- ◆ About 500 large ICI sites with automatic irrigation in 2015 (based on ratio of Toronto and Peel population)
- ◆ Average of 36,000 litres per day per sites is used for irrigation<sup>1</sup>
- ◆ Average summer irrigation reduced by 5,000 litres per site per day (L/s/d); peak day irrigation can be reduced by 10,000 litres per site per day (L/s/d)<sup>2</sup>
- ◆ 50% participation rate = 250 participating sites

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**Maximum Water Savings (MWS):** **5.0 ML/d**

$$\begin{aligned} \text{MWS} &= \text{Number of sites} \times \text{Potential reduction} \\ &= 500 \times 10,000 \text{ L/s/d} \\ &= 5.0 \text{ ML/d} \end{aligned}$$

**Target Water Savings (TWS):** **2.5 ML/d**

$$\begin{aligned} \text{TWS} &= \text{Maximum water savings} \times \text{Estimated participation} \\ &= 5.0 \text{ ML/d} \times 50\% \\ &= 2.5 \text{ ML/d} \end{aligned}$$

**Maximum Incentive (MI):** **\$0.70 per L/d**

**Recommended Incentive (RI):** **\$0.20 per L/d**

**Cost/Benefit Ratio (RI/MI):** **0.29**

**Full Program Cost:** **\$500,000**

$$\begin{aligned} \text{Cost} &= 250 \text{ sites} \times 10,000 \text{ L/site/d} \times \$0.20 \text{ per L/d} \\ &= \$500,000 \end{aligned}$$

**Support Costs @ 15%:** **\$75,000**

**Total Program Cost:** **\$575,000**

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<sup>1</sup> Toronto's 1999 Irrigation System Assessment & Audit Pilot Program

<sup>2</sup> IBID

## Indoor Water Audit Program – ICI

<b>Program Schedule:</b>	<b>2006 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.10</b>
<b>Measure Costs:</b>	<b>\$780,000</b>	<b>Estimated Participation:</b>	<b>N/A</b>
<b>Support Cost @ 15%:</b>	<b>\$117,000</b>		
<b>Total Program Costs:</b>	<b>\$897,000</b>		
<b>Maximum Water Savings:</b>	<b>12.5 ML/d</b>	<b>Maximum Incentive:</b>	<b>\$2.09 per L/d</b>
<b>Target Water Savings:</b>	<b>3.1 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$0.25 per L/d</b>

### Program Description

This measure is intended to identify cost-effective water-efficiency measures at ICI sites. It is expected that site water audits will be conducted as part of the program and an incentive will be offered to participants based on the verified savings achieved. All ICI sites will be eligible to participate in the program.

Although it is not possible to determine all of the details of Peel's program at this time, a pilot ICI indoor water audit project currently being implemented in Toronto is expected to be completed by mid-2004. This pilot project will identify the potential for water savings using this type of capacity buy-back methodology and to evaluate the customer's acceptance of the buyback rates.

The incentive provided to each site will be entirely dependent upon the amount of water actually saved rather than upon potential water savings. To qualify, the water savings must be maintained and should be the result of a change in process or equipment, etc., rather than simply a change in water using habits (which are not as secure). The water savings at each site must be verified, e.g., by metering and data logging demands, before rebates will be issued.

Since outdoor irrigation demands are not included in this measure, it is expected that most of the associated water savings will affect both water supply and wastewater flows, and are therefore worth \$2.09 per litre per day. Water savings related to toilet replacements and outdoor water uses are considered as other measures in the WEP.

### Monitoring and Evaluation

Each participating site must provide substantiating evidence to the Region, such as an engineering report, demonstrating water savings achieved and sustained. The Region may also periodically obtain a billing data analysis showing long term savings from the participating sites.

## Water Savings Calculations

### Assumptions:

- ◆ 2015 water demand in the ICI sector will be approx. 178 MLd based on current billing data
- ◆ Estimated potential savings = 7%<sup>1</sup>
- ◆ Target savings of 25% of potential savings
- ◆ Virtually all of the water savings are expected to affect both water supply and wastewater flows

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**Maximum Water Savings (MWS):** **12.5 ML/d**

$$\begin{aligned} \text{MWS} &= \text{Total water demand} \times \text{Potential water savings} \\ &= 178 \text{ ML/d} \times 7\% \\ &= 12.5 \text{ ML/d} \end{aligned}$$

**Target Water Savings (TWS):** **3.1 ML/d**

$$\begin{aligned} \text{TWS} &= \text{Maximum water savings} \times \text{Potential water savings} \\ &= 12.5 \text{ ML/d} \times 25\% \\ &= 3.1 \text{ ML/d} \end{aligned}$$

**Maximum Incentive (MI):** **\$2.09 per L/d**

**Recommended Incentive (RI):** **\$0.25 per L/d**

**Cost/Benefit Ratio (RI/MI):** **0.10**

**Pilot Program Cost:** **\$780,000**

$$\begin{aligned} \text{Cost} &= 3.1 \text{ ML/d} \times \$0.25 \text{ per L/d} \\ &= \$780,000 \end{aligned}$$

**Support Costs @ 15%:** **\$117,000**

**Total Program Cost:** **\$897,000**

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<sup>1</sup> Data from the California Urban Water Conservation Council's Guide to Data and Methods for Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices' Working Draft states that the weighted average potential water savings in the ICI sector is 17.8%, but when toilets and irrigation savings are removed the potential is reduced to about 7%.

## High-Efficiency Toilet Replacement Program – All Sectors

<b>Program Schedule:</b>	<b>2004 to 2015</b>	<b>Benefit to Cost Ratio:</b>	<b>0.74</b>
<b>Measure Costs:</b>	<b>\$2,100,000</b>	<b>Estimated Participation:</b>	<b>52,500</b>
<b>Support Cost @ 15%:</b>	<b>\$315,000</b>		
<b>Total Program Costs:</b>	<b>\$2,415,000</b>		
<b>Maximum Water Savings:</b>	<b>9.1 ML/d</b>	<b>Maximum Incentive:</b>	<b>\$54</b>
<b>Target Water Savings:</b>	<b>1.2 ML/d</b>	<b>Recommended Incentive:</b>	<b>\$40</b>

### Program Description

The program is designed to encourage the installation of “micro flush” toilets, i.e., toilets that flush with less than that required by code. For example, dual-flush toilets, common in many parts of Asia and mandated in Australia, offer the user the choice of selecting a full 6-litre flush to remove solid waste or a “short” flush (typically between 3.0 and 3.8 litres) to remove liquid-only waste. Studies have shown that dual-flush toilets save between 25-30% more water than single-flush 6-litre toilets. Another example is the 4-litre per flush pressure-assist toilet. These toilets store the mains pressure (typically about 50 psi) to use when flushing. Pressure-assist toilets offer very high levels of flushing performance, similar to that provided by flush valve models, they do not use flappers or ballcocks (which can leak), and cannot be adjusted to flush with more than their design volume. Studies<sup>1</sup> have shown these toilets often flush with only 3.6 to 3.8 litres of water, thereby offering significant water savings over conventional 6-litre models.

It is anticipated that the Region will offer a higher rebate amount to those participants installing high-efficiency flush toilets, i.e., \$100 per fixture vs. \$60 for 6-litre models. Toilets in all customer sectors will be eligible for the rebate.

Implementing the high-efficiency toilet program is more cost-effective than expanding infrastructure to provide the same volume of water, though it is not as cost-effective as other programs in the WEP. The intention of the program is to reward the use of more efficient technology and ultimately “raise the bar” for toilet performance and savings. The city of Los Angeles currently offers a significantly higher rebate for high-efficiency toilets. It is expected that many municipalities in both the Greater Toronto Area and the U.S. will adopt this type of rebate structure.

### Monitoring and Evaluation

Monitoring is expected to include inspection of a number of toilet installations (measuring flush volumes, checking for proper trim components and installation, completing customer satisfaction survey, etc.). The Region may also wish to conduct periodic or continual billing data analysis to assess long term savings from participating homes.

<sup>1</sup> MaP Testing, Veritec Consulting Inc., Mississauga, ON, 2003

## Appendix B - Water Efficiency Plan Measures

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It is important to the success of this measure that only toilets that meet the Region's criteria are subsidized or rebated, i.e., only toilets that meet customer performance expectations and will continue to flush with no more than the design flush volume for the life of the toilet.

Note that the incentive offered by the Region for the installation of high-efficiency toilets is in addition to the "standard" incentive, i.e., \$60 incentive (standard incentive) + \$40 (high efficiency) = \$100 total incentive.

### Water Savings Calculations

#### Assumptions:

- ◆ About 350,000 toilets will be installed or replaced in Peel between 2004 and 2015
- ◆ Avg. number of flushes per toilet (all sectors) is about 13.0
- ◆ Additional water savings = 2.0 litres per flush or 26 litres per toilet per day (L/t/d)
- ◆ High-efficiency toilets will make up 15% of potential market

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**Maximum Water Savings (MWS):** **9.1 ML/d**

MWS = Water saved x Number of toilets  
= 26 litres per day x 350,000 toilets  
= 9.1 ML/d

**Target Water Savings (TWS):** **1.2 ML/d**

TWS = Maximum water savings x Estimated participation  
= 9.1 ML/d x 15%  
= 1.2 ML/d

**Maximum Incentive (MI):** **\$54 per toilet**

MI = Additional water saved x Cost of water saved  
= 26 litres per day x \$2.09 per L/d  
= \$54 per toilet

**Recommended Incentive (RI):** **\$40 per toilet**

**Cost/Benefit Ratio (RI/MI):** **0.74**

**Measure Cost:** **\$2,100,000**

Cost = 350,000 x 15% @ \$40  
= \$2,100,000

**Support Costs @ 15%:** **\$315,000**

**Total Program Cost:** **\$2,415,000**

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# Appendix C

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## California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs)

**BMP 01:** Water Survey Programs for Single-Family and Multi-Family Residential Customers

**BMP 02:** Residential Plumbing Retrofit

**BMP 03:** System Water Audits, Leak Detection and Repair

**BMP 04:** Metering with Commodity Rates for all New Connections and Retrofit of Existing

**BMP 05:** Large Landscape Conservation Programs and Incentives

**BMP 06:** High-Efficiency Washing Machine Rebate Programs

**BMP 07:** Public Information Programs

**BMP 08:** School Education Programs

**BMP 09:** Conservation Programs for CII Accounts

**BMP 10:** Wholesale Agency Assistance Programs

**BMP 11:** Conservation Pricing

**BMP 12:** Conservation Coordinator

**BMP 13:** Water Waste Prohibition

**BMP 14:** Residential ULFT Replacement Programs

# Appendix D

## Assumptions, Values and Calculations Used in Water Efficiency Plan

### Population

Year	Population	Single-Family	Multi-Family
1995	831,000	663,979	167,021
2003	1,027,800	821,225	206,575
2015	1,257,000	1,004,358	252,642

### Households

Year	Households	Single-Family	Multi-Family
1995	243,695	194,715	66,808
2003	301,408	240,828	82,630
2015	368,622	294,533	101,057

### Water Demands by Region - Lcd

Demand	Value	Reference
Gross water demands	505	Water production data
Average residential (net) water demand	283	Billing data
Residential indoor water use	255	Assume 10% used outdoors

### Residential Water Demands by Area/Sector - Lcd

Year	Average	Single-Family	Multi-Family
Brampton	260	275	190
Mississauga	300	345	190

### Water Demand Breakdown – Single-Family Household (AWWARF REUS)

—» Toilet 28%	—» Clothes Washer 22%	—» Shower 19%
—» Faucet 15%	—» Leaks 11%	—» Bath 3%
—» Dishwasher 2%		

### Toilet Data

Item	Value	Reference
Toilets per single-family home	2.0	estimated
Toilets per multi-family home	1.1	estimated
Flushes per capita per day - single-family home	5.0	AWWARF End use study
Flushes per capita per day - multi-family home	7.0	Monitoring in Region of York
Savings per flush (installing 6-L toilet)	10.5	estimated
Natural change-out rate per year	4%	Industry standard

**Persons per Household**

Peel	3.18	Census
Mississauga	3.35	Calculated
Brampton	3.52	Calculated
Multi-Family apartments	3.50	Calculated

**Demand Ratios** (based on 1995-2003 data)

Peak Day / Average Day:	1.49
Peak Day / Winter Day:	1.64
Peak Day / Summer Day:	1.29
Summer Day / Winter Day:	1.19
Winter Day / Average Day:	0.93

**Effects of 1996 Ontario Building Code (Water Efficiency Section)**

On January 1, 1996, the Ontario Building Code began mandating the installation of 6-litre toilets and showerheads with maximum flow rates of 9.85 litres per minute in new construction. These requirements result in lower water demands in households constructed after 1995.

**Historical Temperature and Precipitation**

The following chart shows average temperature and precipitation data for the Toronto area from 1840 to 1990. Note that the average rainfall during the summer months is about 73 mm per month, or about 16.8 mm per week (0.66 inches per week).

Criteria	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily Maximum (°C)	-1.3	-0.6	4.4	11.5	18.2	23.5	26.5	25.3	20.9	14.2	7.7	1.4
Daily Mean (°C)	-4.5	-3.8	1	7.5	13.8	18.9	22.1	21.1	16.9	10.7	4.9	-1.5
Rainfall (mm)	22.7	25.2	41	58.1	67.8	67	71	82.5	76.2	62.7	70.2	44.8
Snowfall (cm)	35.5	28.6	22.7	7.3	0.1	0	0	0	0	0.5	6.1	34.1

Historical averages, however, are no guarantee of projections.

**Demand Components under Various Scenarios**

Demand Component	2015		
	Prior to OBC	With OBC	With OBC and WEP
AADD	635 MLd	613 MLd	555 MLd
Avg. Winter Day	590 MLd	571 MLd	517 MLd
Avg. Summer Day	703 MLd	679 MLd	615 MLd
Peak Day	965 MLd	932 MLd	793 MLd
Outdoor Use avg. summer	112 MLd	108 MLd	98 MLd
Outdoor Use Peak Day	375 MLd	362 MLd	277 MLd
Irrigation avg. summer (assume 60% outdoor water is irrigation)	67 MLd	65 MLd	59 MLd
Irrigation Peak Day (assume 80% outdoor water is irrigation)	300 MLd	290 MLd	221 MLd
Irrigation - City Parks	30 MLd	29 MLd	26 MLd
Irrigation - Multi-Family	30 MLd	29 MLd	26 MLd
Irrigation - ICI	30 MLd	29 MLd	26 MLd
Irrigation - Single-Family	210 MLd	203 MLd	182 MLd
Wastewater Flows	635 MLd	613 MLd	574 MLd
UFW @ 12.8%	81 MLd	79 MLd	71 MLd



