

APPENDIX I

Program Descriptions

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Toilet Replacement - ULF**Single Family Detached Residential**

Incentive	\$60 Rebate	
Savings Per Participant	120 litres per average day	
Cost Per Participant	\$261.00	
		Ten Year Total
Number of Participants		3,600
Number of Toilets		8,280
Program Costs		\$939,600
Program Savings (litres per average day)		432,000
Cost per Litre per Average Day Saved		\$2.18
Monitoring Cost		\$101,000

Program Description

A rebate of \$60 per toilet would be offered to any resident who replaces a high volume flush toilet with a 6.0 litre ultra-low-flush toilet (ULF). Ideally the rebate should only be offered to homeowners with homes built prior to 1996¹. However, since post-1996 homeowners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for ULF toilets be increased to \$60 per approved toilet from the current \$40 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions**Savings**

- Pre-1996 housing stock is 24,300 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 20,074 units
- 3.0 persons per household⁵
- 2.3 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 6 litres⁹
- 360 participants targeted per year¹⁰

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
x number of flushes per person per day
x number of persons per household

$$\text{Savings per Participant} = (14 - 6) \times 5.0 \times 3.0 = 120 \text{ litres per average day}$$

Costs per Participant

- Assume 2.3 toilets per participant
- Total Rebate cost is \$138.00
- Marketing cost is \$38.00
- Program management cost is \$60.00
- Project management cost is \$25.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 City of Guelph Telephone Survey completed July 2008.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on ULF toilet manufacturer's specifications
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 40% of sales were ULF.

Toilet Replacement - HET

Single Family Detached Residential

Incentive	\$75 Rebate
Savings Per Participant	138 litres per average day
Cost Per Participant	\$290.00
	Ten Year Total
Number of Participants	1,350
Number of Toilets	3,105
Program Costs	\$391,500
Program Savings (litres per average day)	186,300
Cost per Litre per Average Day Saved	\$2.10
Monitoring Cost	\$101,000

Program Description

A rebate of \$75 per toilet would be offered to any resident who replaces a high volume flush toilet with a High Efficiency Flush toilet (HET). Ideally the rebate should only be offered to homeowners with homes built prior to 1996¹. However, since post-1996 homeowners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for HET toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- Pre-1996 housing stock is 24,300 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 20,074 units
- 3.0 persons per household⁵
- 2.3 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 4.8 litres⁹
- 135 participants targeted per year

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
x number of flushes per person per day
x number of persons per household

$$\text{Savings per Participant} = (14 - 4.8) \times 5.0 \times 3.0 = 138 \text{ litres per average day}$$

Costs per Participant

- Assume 2.3 toilets per participant
- Total Rebate cost is \$172.50
- Marketing cost is \$37.50
- Program management cost is \$60.00
- Project management cost is \$20.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 City of Guelph Telephone Survey completed July 2008.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on HET toilet manufacturer's specifications
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 15% of sales were HET.

Toilet Replacement – Dual Flush**Single Family Detached Residential**

Incentive	\$75 Rebate	
Savings Per Participant	156 litres per average day	
Cost Per Participant	\$290.00	
		Ten Year Total
Number of Participants		4,050
Number of Toilets		9,315
Program Costs		\$1,174,500
Program Savings (litres per average day)		631,800
Cost per Litre per Average Day Saved		\$1.86
Monitoring Cost		\$101,000

Program Description

A rebate of \$75 per toilet would be offered to any resident who replaces a high volume flush toilet with a Dual Flush toilet (DF). Ideally the rebate should only be offered to homeowners with homes built prior to 1996¹. However, since post-1996 homeowners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for DF toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions**Savings**

- Pre-1996 housing stock is 24,300 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 20,074 units
- 3.0 persons per household⁵
- 2.3 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 3.6 litres⁹
- 405 participants targeted per year

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
x number of flushes per person per day
x number of persons per household

$$\text{Savings per Participant} = (14 - 3.6) \times 5.0 \times 3.0 = 156 \text{ litres per average day}$$

Costs per Participant

- Assume 2.3 toilets per participant
- Total Rebate cost is \$172.50
- Marketing cost is \$37.50
- Program management cost is \$70.00
- Project management cost is \$10.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 City of Guelph Telephone Survey completed July 2008.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on 12 – 3 litre flushes and 3 – 6 litres flushes per day per household
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 45% of sales were DF.

Clothes Washer Replacement

Single Family Detached Residential

Incentive	\$100 Rebate
Savings Per Participant	77 litres per average day
Cost Per Participant	\$150.00
	Ten Year Total
Number of Participants	10,900
Number of Clothes Washers	10,900
Program Costs	\$1,635,637
Program Savings (litres per average day)	841,210
Cost per Litre per Average Day Saved	\$1.94
Monitoring Cost	\$101,000

Program Description

A rebate of \$100 per clothes washer would be offered to any resident who replaces a high volume clothes washer with a water efficient model. This measure applies to all residents who are purchasing a new clothes washer. Significant energy savings can be attributed to water efficient clothes washers. Not only do they use less hot water, the machines themselves are inherently energy efficient. Energy providers may be interested in partnering in this program.

It is recommended that the Smart Wash rebate amount for water efficient clothes washers be increased to \$100 per approved washer.

Assumptions

Savings

- All housing stock of 31,155 units¹
- 23% already have water efficient clothes washers²
- Remaining potential is 23,989 units
- 3.0 persons per household³
- 0.37 wash cycles per person per day⁴
- Average consumption per cycle of existing clothes washer is 125 litres⁵
- Average consumption per cycle of replaced clothes washer is 55.5 litres⁶
- 1,090 participants targeted per year

Savings per Participant = (Existing clothes washer volume – Replaced clothes washer volume)
x number of cycles per person per day x number of persons per household

$$\text{Savings per Participant} = (125 - 55.5) \times 0.37 \times 3.0 = 77 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$100.00
- Marketing cost is \$10.00
- Program management cost is \$30.00
- Project management cost is \$10.00

References

- 1 City of Guelph. Planning Department July 2008.
- 2 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 3 City of Guelph. Planning Department July 2008.
- 4 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 5 Based on analysis of Energy Star Canada listing, 2008.
- 6 Based on analysis of Energy Star Canada listing, 2008.

Humidifier Replacement

Single Family Detached Residential

Incentive	\$75 Rebate	
Savings Per Participant	51litres per average day	
Cost Per Participant	\$105.00	
		Ten Year Total
Number of Participants		9,280
Number of Humidifiers		9,280
Program Costs		\$974,691
Program Savings (litres per average day)		473,420
Cost per Litre per Average Day Saved		\$2.06
Monitoring Cost		\$101,000

Program Description

A rebate of \$75 per powered central humidifier would be offered to any resident who replaces a high volume humidifier with a water efficient model. This measure applies to all residents who are purchasing a new powered central humidifier. Research studies from communities nearby indicate that only 28% of homes in the area have central humidifiers.

Assumptions

Savings

- All housing stock of 31,155 units¹
- 69%, or 21,497 of homes in the area have central humidifiers²
- 5% are already water efficient³
- Existing humidifiers use 128 litres/day during the heating season⁴
- Water efficient humidifiers use 0.8 litres/day during the heating season⁵
- 147 heating days per season
- 928 participants targeted per year

Savings per Participant =

$$\frac{(\text{Existing humidifier volume} - \text{Replaced humidifier volume})}{\text{x number of heating days / number of days in the year}}$$

$$\text{Savings per Participant} = (128 - 0.8) \times 147 / 365 = 51 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$75.00
- Marketing cost is \$10.00
- Program management cost is \$15.00
- Project management cost is \$5.00

References

- 1 City of Guelph. Planning Department. July 2008.
- 2 Regional Municipality of York. Water Use Efficiency Master Plan Update Research Study. August, 2006.
- 3 Assumption.
- 4 Independent testing by ETL SEMKO, Desert Springs Corp.
- 5 Independent testing by ETL SEMKO, Desert Springs Corp.

Floor Drain Replacement

Single Family Detached Residential

Incentive	\$60 Rebate
Savings Per Participant	43 litres per average day
Cost Per Participant	\$90.00
	Ten Year Total
Number of Participants	10,000
Number of Floor Drains	10,000
Program Costs	\$900,000
Program Savings (litres per average day)	430,000
Cost per Litre per Average Day Saved	\$2.09
Monitoring Cost	\$101,000

Program Description

A rebate of \$60 would be offered to any resident who replaces water consuming floor drain primer with an approved waterless unit. In the late 1970's the Ontario Building Code (OBC) required all floor drains in new housing to be primed with water. The water forms a seal in the drain so that dangerous gases can rise and enter the house. In the early 1990's a new seal was developed that does not use water. The seal is approved by the OBC.

Assumptions

Savings

- All housing stock of 31,155 units¹
- Assume 1.8 litres per hour of constant water use²
- 1,000 participants targeted per year

Savings per Participant =

$$\frac{(\text{Existing primer flow rate} \times \text{hours} \times \text{days})}{\text{number of days in the year}}$$

$$\text{Savings per Participant} = (1.8 \times 24 \times 365) / 365 = 43 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$60.00
- Marketing cost is \$10.00
- Program management cost is \$15.00
- Project management cost is \$5.00

References

¹ City of Guelph. Planning Department. July 2008.

² Assumption.

Grey Water Reuse

Single Family Detached Residential

Incentive	\$1,000 Rebate
Savings Per Participant	90 litres per average day
Cost Per Participant	\$5,000
	Ten Year Total
Number of Participants	100
Number of Grey Water Reuse Systems	100
Program Costs	\$500,000
Program Savings (litres per average day)	9,000
Cost per Litre per Average Day Saved	\$55.56
Monitoring Cost	\$15,000

Program Description

Grey water reuse is a measure that is currently receiving a lot of attention across Canada and around the world. As these technologies evolve from a cost and a water savings perspective, and as water rates continue to increase, it is thought that these measures will prove to be recommended water saving measures in the future. In delivery of the program it is recommended that the City provide a one time \$1,000 rebate for home owners retrofitting their home with grey water reuse systems.

Assumptions

Savings

- All housing stock of 31,155 units¹
- Assume reuse water will be used for flushing 6 litre flush toilets, ²
- 10 participants (demonstration sites) targeted per year

Savings per Participant =

(Flush volume x number of flushes per day per person x number of persons)

$$\text{Savings per Participant} = 6.0 \times 5 \times 3.0 = 90 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$1,000.00
- Marketing cost is \$800.00
- Program management cost is \$2,400.00
- Project management cost is \$800.00

References

¹ City of Guelph. Planning Department. July 2008.

² Assumption.

Rain Water Harvesting

Single Family Detached Residential

Incentive	\$2,000 Rebate
Savings Per Participant	171 litres per average day
Cost Per Participant	\$6,000
	Ten Year Total
Number of Participants	100
Number of Humidifiers	100
Program Costs	\$600,000
Program Savings (litres per average day)	17,090
Cost per Litre per Average Day Saved	\$35.11
Monitoring Cost	\$15,000

Program Description

Rain water harvesting is a measure that are receiving a lot of attention across Canada and around the world. The City of Guelph, and in particular, the University of Guelph, are viewed as leaders in research and promotion of these technologies. As these technologies evolve from a cost and a water savings perspective, and as water rates continue to increase, it is thought that these measures will prove to be recommended water saving measures in the future. It is recommended provide a \$2,000 rebate for home owners retrofitting their home with a rainwater harvesting system.

Assumptions

Savings

- All housing stock of 31,155 units¹
- Assume rain water will be used for flushing 6 litre flush toilets and outdoor summer irrigation, ²
- Average irrigation demand is 29,526 litres over a season³
- 10 participants (demonstration sites) targeted per year

Savings per Participant =

(Flush volume x number of flushes per day per person x number of persons) +
(Irrigation demand / number of days in the year)

Savings per Participant = (6.0 x 5 x 3.0) + (29,526 / 365) = 171 litres per average day

Costs per Participant

- Total Rebate cost is \$2,000.00
- Marketing cost is \$800.00
- Program management cost is \$2,400.00
- Project management cost is \$800.00

References

- ¹ City of Guelph. Planning Department. July 2008.
- ² Assumption.
- ³ American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.

Low Flow Showerheads

Single Family Detached Residential

Incentive	Free supply and installation	
Savings Per Participant	110 litres per average day	
Cost Per Participant	\$111	
		Ten Year Total
Number of Participants		3,650
Number of Showerheads		6,935
Program Costs		\$404,595
Program Savings (litres per average day)		400,900
Cost per Litre per Average Day Saved		\$1.01
Monitoring Cost		\$23,000

Program Description

Low flow showerheads would be one of the three measures offered in a Water Efficient Home Visit service. The service would complete 365 home visits per year targeting homes built prior to 1996¹. During the visit, the advisor would inspect and test the flow rate of the showerheads. Low flow showerheads would be installed on all of the showers with a flow rate greater than 12 litres per minute. Low flow showerheads save approximately 40%² of the water during a shower while maintaining good shower performance. In addition to reducing water bills, low flow showers contribute to lower energy bills due to the less hot water used.

Assumptions

Savings

- Pre-1996 housing stock is 24,300 units³
- 70% already have low flow showerheads⁴
- Remaining potential is 7,290 units
- 3.0 persons per household⁵
- 1.9 showerheads per household⁶
- 0.72 showers per person per day⁷
- Average length of shower is 7.6 minutes⁸
- Average flow rate per existing showerhead is 15 litres per minute⁹
- Average flow rate per replaced showerhead is 8.3 litres per minute¹⁰
- 365 home visits completed annually

Savings per Participant = (Existing shower flow rate – Replaced shower flow rate)
 x number of showers per person per day x average length of shower
 x number of persons per household

$$\text{Savings per Participant} = (15-8.3) \times 0.72 \times 7.6 \times 3.0 = 110 \text{ litres per average day}$$

Costs per Participant

- Assume 1.9 showerheads per participant
- Equipment cost is \$20.90
- Installation cost is \$30.00
- Marketing cost is \$15.10
- Training cost is \$5.00
- Program management cost is \$30.00
- Project management cost is \$10.00

References

- 1 Ontario Building Code (OBC) mandated low flow showerheads in all newly construction homes and buildings effective October 1, 1990.
- 2 Experience from York Region program where they installed 106,000 low flow showerheads from 1998 to 2004.
- 3 City of Guelph. Planning Department. July 2008.
- 4 Assumption
- 5 City of Guelph. Planning Department. July 2008.
- 6 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 9 Experience from York Region program where they installed 106,000 low flow showerheads from 1998 to 2004.
- 10 Experience from York Region program where they installed 106,000 low flow showerheads from 1998 to 2004.

Kitchen Faucet Aerators

Single Family Detached Residential

Incentive	Free supply and installation	
Savings Per Participant	29 litres per average day	
Cost Per Participant	\$62	
		Ten Year Total
Number of Participants		580
Number of Kitchen Faucets		580
Program Costs		\$36,158
Program Savings (litres per average day)		17,150
Cost per Litre per Average Day Saved		\$2.11
Monitoring Cost		\$23,000

Program Description

Low flow kitchen faucet aerators would be one of the three measures offered in a Water Efficient Home Visit service. The service would complete 365 home visits per year targeting homes built prior to 1996¹. During the visit, the advisor would inspect and test the flow rate of the kitchen faucet. Low flow faucet aerators would be installed on all of the kitchen faucets with a flow rate greater than 10 litres per minute. Low flow faucet aerators save approximately 24%² of the water during use. In addition to reducing water bills, low flow faucet aerators contribute to lower energy bills due to the less hot water used.

Assumptions

Savings

- Pre-1996 housing stock is 24,300 units³
- 84% already have low flow kitchen faucets⁴
- Remaining potential is 3,888 units
- 3.0 persons per household⁵
- 1 kitchen faucet per household⁶
- Average length of use is 8.4 minutes per day⁷
- Average flow rate per existing kitchen faucet is 11.8 litres per minute⁸
- Average flow rate per replaced faucet is 8.3 litres per minute⁹
- 365 home visits completed annually
- 16% participation rate¹⁰

Savings per Participant = (Existing faucet flow rate – Replaced faucet flow rate)
x average length of use per day

$$\text{Savings per Participant} = (11.8 - 8.3) \times 8.4 = 29 \text{ litres per average day}$$

Costs per Participant

- Equipment cost is \$3.00
- Installation cost is \$6.00
- Marketing cost is \$10.00
- Training cost is \$5.00
- Program management cost is \$30.00
- Project management cost is \$8.00

References

- 1 Ontario Building Code (OBC) mandated low flow faucets in all newly construction homes and buildings effective October 1, 1990.
- 2 Engineering estimate based on data from Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 3 City of Guelph. Planning Department. July 2008.
- 4 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 5 City of Guelph. Planning Department. July 2008.
- 6 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 9 Manufacturer's data. Niagara Conservation Corp.
- 10 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.

Leakage Repair

Single Family Detached Residential

Incentive	Free supply and installation
Savings Per Participant	108 litres per average day
Cost Per Participant	\$216
	Ten Year Total
Number of Participants	110
Number of Leaks	110
Program Costs	\$23,619
Program Savings (litres per average day)	11,780
Cost per Litre per Average Day Saved	\$2.01
Monitoring Cost	\$23,000

Program Description

Leakage repair would be one of the three measures offered in a Water Efficient Home Visit service. The service would complete 365 home visits per year targeting homes built prior to 1996¹. During the visit, the advisor would inspect for any water leakage throughout the house. Upon locating a leak, the advisor would repair if possible or for more difficult repairs refer the customer to a plumber. Leaks in homes can account for up to 13.7%² of the total household usage. In addition to reducing water bills, reducing leakage can contribute to lower energy bills due to less hot water loss.

Assumptions

Savings

- Pre-1996 housing stock is 24,300 units³
- 97% of the homes are leak free⁴
- Remaining potential is 729 units
- 3.0 persons per household⁵
- 35.9 litres per day per person of leakage⁶
- 365 home visits completed annually
- 3% participation rate⁷

Savings per Participant = Existing leakage rate per person per day x number of persons per household

$$\text{Savings per Participant} = 35.9 \times 3.0 = 108 \text{ litres per average day}$$

Costs per Participant

- Equipment cost is \$6.00
- Installation cost is \$20.00
- Marketing cost is \$10.00
- Training cost is \$30.00
- Program management cost is \$120.00
- Project management cost is \$30.00

References

- 1 Ontario Building Code (OBC) mandated low flow faucets in all newly construction homes and buildings effective October 1, 1990.
- 2 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 3 City of Guelph. Planning Department. July 2008.
- 4 Assumption
- 5 City of Guelph. Planning Department. July 2008.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Assumption

Watering Timer

Single Family Detached Residential

Incentive	\$20 Rebate
Savings Per Participant	24 litres per average day
Cost Per Participant	\$49
	Ten Year Total
Number of Participants	5,000
Number of Watering Timers	5,000
Program Costs	\$245,000
Program Savings (litres per average day)	118,360
Cost per Litre per Average Day Saved	\$2.07
Monitoring Cost	\$101,000

Program Description

A rebate of \$20 per watering timer would be provided when a resident purchases and installs a watering timer on their lawn watering system. Research has indicated that generally residents don't know how much water to put on their lawns and how long to water their lawns.¹

Assumptions

Savings

- All housing stock of 31,155 units²
- Flow rate of existing garden hose is 12 lpm³
- Residents water 120 minutes per week during the irrigation without a timer⁴
- Residents water 80 minutes per week during the irrigation season with a timer⁴
- 18 week irrigation season⁴
- 500 participants targeted per year

Savings per Participant =

$$\frac{(\text{hose flow rate} \times \# \text{ of minutes per week (without timer)} \times \# \text{ of weeks in irrigation season}) - (\text{hose flow rate} \times \# \text{ of minutes per week (with timer)} \times \# \text{ of weeks in irrigation season})}{365}$$

Savings per Participant = $((12.0 \times 120 \times 18) - (12.0 \times 80 \times 18)) / 365 = 24 \text{ litres per average day}$

Costs per Participant

- Total Rebate cost is \$20.00
- Marketing cost is \$12.00
- Program management cost is \$12.00
- Project management cost is \$5.00

References

- 1 Toronto Water Wiser Summer Landscape Visit Program Savings Verification, 2005 - 2008.
- 2 City of Guelph. Planning Department July 2008.
- 3 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 4 Assumption.

Water Efficient Landscape Visit

Single Family Detached Residential

Incentive	Free supply and installation
Savings Per Participant	74 litres per average day
Cost Per Participant	\$127
	Ten Year Total
Number of Participants	10,000
Program Costs	\$1,270,000
Program Savings (litres per average day)	740,000
Cost per Litre per Average Day Saved	\$1.72
Monitoring Cost	\$156,920

Program Description

Water efficient landscape visits have been implemented in York Region and City of Toronto for the last six years with great success in getting homeowners to use less water in the summer. The program was introduced in the City of Guelph in 2008. Trained advisors visit homeowners and provide advice on proper lawn care and maintenance and water efficient landscaping techniques.

Assumptions

Savings

- All housing stock of 31,155 units¹
- Savings of 74 litres per average day²
- 1,000 home visits completed annually

Savings per Participant = Savings per household per average day

Savings per Participant = 74 litres per average day

Costs per Participant

- Collateral material cost is \$10.00
- Visit cost is \$70.00
- Marketing cost is \$30.00
- Program management cost is \$12.00
- Project management cost is \$5.00

References

¹ City of Guelph. Planning Department July 2008.

² Water Wiser Summer Landscape Visit program savings verification, 2005 - 2008.

Incentive	\$15 Rebate for Rain Barrels/ \$100 Rebate for Larger Storage Tanks	
Savings Per Participant	21 litres per average day	
Cost Per Participant	\$133.85	
		Ten Year Total
Number of Participants		6,500
Number of Rain Barrels		5,000
Number of Larger Storage Tanks		1,500
Program Costs		\$870,000
Program Savings (litres per average day)		136,340
Cost per Litre per Average Day Saved		\$6.38
Monitoring Cost		\$56,000

Program Description

A rebate of \$15 per rain barrel and \$100 per larger storage tank would be offered to any resident who makes a purchase for their residence. This measure applies to all residents in City of Guelph. It has been estimated that rain barrels on average save approximately 3 litres of water per average day. This is due to their limited capacities and that they only fill during rain events, approximately ten per summer. Rain barrels, however are large visual icons and are excellent educational tools. They positively contribute towards the attitude that we don't need to use a lot of municipal water to have beautiful, healthy yards. In addition, rain barrels can assist municipalities manage major storm events by adding a buffer between the home's eaves troughs and the storm sewer. Many utilities consider rain barrels as a partial solution towards inflow and infiltration of the sewer system. Larger storage tanks, holding approximately 3,000 litres of water, appeal to a smaller group of residents. Although more expensive, the larger volume of storage provides a higher average day water savings. The rain barrels and storage tanks could be sold at special sales events or at local retailers.

Assumptions

Savings

- All housing stock of 31,155 units¹
- Rain barrels save 1,134 litres per irrigation season²
- Assume 500 rain barrel participants per year³
- Larger storage units hold approximately 3,000 litres of water⁴
- Assume 10 rain events per summer⁵
- Assume 150 larger storage tank participants per year⁶

Savings per Participant =

$$\left(\left(\text{number of large tank participants} \times \text{volume of tank} \times \text{number of rain events} / \text{number of days in a year} \right) + \left(\text{number of rain barrel participants} \times \text{rain barrel savings per year} / \text{number of days in a year} \right) \right) / \text{number of overall participants}$$

$$\text{Savings per Participant} = ((150 \times 3,000 \times 10 / 365) + (500 \times 1,134 / 365)) / 650 = 21 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$34.62
- Marketing cost is \$34.62
- Program management cost is \$57.69
- Project management cost is \$6.92

References

- 1 City of Guelph. Planning Department July 2008.
- 2 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006, rain barrels on average are drained 6 times per season and have a capacity of 189 litres.
- 3 Assumption.
- 4 Per product literature, Bushman Products
- 5 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 6 Assumption.

Toilet Replacement - ULF

Multi Family Residential

Incentive	\$60 Rebate
Savings Per Participant	60 litres per average day
Cost Per Participant	\$175
	Ten Year Total
Number of Participants	2,000
Number of Toilets	3,000
Program Costs	\$350,000
Program Savings (litres per average day)	120,000
Cost per Litre per Average Day Saved	\$2.92
Monitoring Cost	\$119,000

Program Description

A rebate of \$60 per toilet would be offered to any apartment building owner who replaces a high volume flush toilet with a 6.0 litre ultra-low-flush toilet (ULF). Ideally the rebate should only be offered to building owners with apartments built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for ULF toilets be increased to \$60 per approved toilet from the current \$40 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- Pre-1996 housing stock is 11,478 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 9,482 units
- 1.5 persons per household⁵
- 1.5 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 6 litres⁹
- Approximately 500 toilets replaced annually, based on a 25 year and renovation
- 200 participants targeted per year¹⁰

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
 x number of flushes per person per day
 x number of persons per household

Savings per Participant = (14 - 6) x 5.0 x 1.5 = 60 litres per average day

Costs per Participant

- Assume 1.5 toilets per participant
- Total Rebate cost is \$90.00
- Marketing cost is \$30.00
- Program management cost is \$40.00
- Project management cost is \$15.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 Assumption.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on ULF toilet manufacturer's specifications
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 40% of sales were ULF.

Toilet Replacement - HET

Multi Family Residential

Incentive	\$75 Rebate
Savings Per Participant	69 litres per average day
Cost Per Participant	\$198
	Ten Year Total
Number of Participants	750
Number of Toilets	1,125
Program Costs	\$148,500
Program Savings (litres per average day)	51,750
Cost per Litre per Average Day Saved	\$2.87
Monitoring Cost	\$119,000

Program Description

A rebate of \$75 per toilet would be offered to any apartment building owner who replaces a high volume flush toilet with a High Efficiency Flush toilet (HET). Ideally the rebate should only be offered to building owners with apartments built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for HET toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- Pre-1996 housing stock is 11,478 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 9,482 units
- 1.5 persons per household⁵
- 1.5 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 4.8 litres⁹
- Approximately 500 toilets replaced annually, based on a 25 year and renovation
- 75 participants targeted per year¹⁰

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
x number of flushes per person per day
x number of persons per household

Savings per Participant = $(14 - 4.8) \times 5.0 \times 1.5 = 69$ litres per average day

Costs per Participant

- Assume 1.5 toilets per participant
- Total Rebate cost is \$112.50
- Marketing cost is \$30.50
- Program management cost is \$40.00
- Project management cost is \$15.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 Assumption.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on HET toilet manufacturer's specifications
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 15% of sales were HET.

Toilet Replacement – Dual Flush**Multi Family Residential**

Incentive	\$75 Rebate	
Savings Per Participant	78 litres per average day	
Cost Per Participant	\$198	
		Ten Year Total
Number of Participants		2,250
Number of Toilets		3,375
Program Costs		\$445,500
Program Savings (litres per average day)		175,500
Cost per Litre per Average Day Saved		\$2.54
Monitoring Cost		\$119,000

Program Description

A rebate of \$75 per toilet would be offered to any apartment building owner who replaces a high volume flush toilet with a Dual Flush toilet (DF). Ideally the rebate should only be offered to building owners with apartments built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for DF toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions**Savings**

- Pre-1996 housing stock is 11,478 units³
- 17.4% already have low flush toilets⁴
- Remaining potential is 9,482 units
- 1.5 persons per household⁵
- 1.5 toilets per household⁶
- 5 flushes per person per day⁷
- Average flush volume per existing toilet is 14 litres⁸
- Average flush volume per replaced toilet is 3.6 litres⁹
- Approximately 500 toilets replaced annually, based on a 25 year and renovation
- 225 participants targeted per year¹⁰

Savings per Participant = (Existing toilet flush volume – Replaced toilet flush volume)
x number of flushes per person per day

x number of persons per household

Savings per Participant = $(14 - 3.6) \times 5.0 \times 1.5 = 78$ litres per average day

Costs per Participant

- Assume 1.5 toilets per participant
- Total Rebate cost is \$112.50
- Marketing cost is \$30.50
- Program management cost is \$40.00
- Project management cost is \$15.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph. Planning Department July 2008.
- 4 City of Guelph Telephone Survey completed July 2008.
- 5 City of Guelph. Planning Department July 2008.
- 6 Assumption.
- 7 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 8 Average measured flush volume from existing toilets, York Region Water Use Efficiency Master Plan Research, August 2006.
- 9 Based on 6 – 3 litre flushes and 1.5 – 6 litres flushes per day per household
- 10 Current replacement rate of 2,000 per year determined from City of Guelph Telephone Survey completed July 2008. Based on Guelph toilet sales event in 2008, 45% of sales were DF.

Clothes Washer Replacement

Multi Family Residential

Incentive	\$200 Rebate per washer
Savings Per Participant	1,120 litres per average day
Cost Per Participant	\$2,220
	Ten Year Total
Number of Participants	120
Number of Clothes Washers	600
Program Costs	\$264,000
Program Savings (litres per average day)	134,400
Cost per Litre per Average Day Saved	\$1.96
Monitoring Cost	\$99,000

Program Description

A rebate of \$200 per clothes washer would be offered to any apartment building owner who replaces a high water volume clothes washer with a water efficient model. This measure applies to all apartment building owners who are purchasing a new clothes washer. Significant energy savings can be attributed to water efficient clothes washers. Not only do they use less hot water, the machines themselves are inherently energy efficient. Energy providers may be interested in partnering in this program.

Assumptions

Savings

- All high-rise apartment stock of 13,530 units¹
- 20% already have water efficient clothes washers²
- Remaining potential is 10,824 units
- 80 suites per building, equals 135 buildings³
- Water efficient clothes washers save 14 litres per suite per day⁴
- 12 participants targeted per year

Savings per Participant =

Savings from water efficient clothes washer
x number of apartments per building

Savings per Participant = 14 x 80 = 1,120 litres per average day

Costs per Participant

- 5 clothes washers per building
- Total Rebate cost is \$1,000.00
- Marketing cost is \$200.00
- Program management cost is \$800.00
- Project management cost is \$200.00

References

- 1 City of Guelph. Planning Department. July 2008.
- 2 Assumption
- 3 City of Toronto Washer Replacement Program.
- 4 City of Toronto Washer Replacement Program.

Low Flow Showerheads

Multi Family Residential

Incentive	Free supply and installation	
Savings Per Participant	55 litres per average day	
Cost Per Participant	\$104.30	
		Ten Year Total
Number of Participants		1,720
Number of Showerheads		2,236
Program Costs		\$179,573
Program Savings (litres per average day)		94,680
Cost per Litre per Average Day Saved		\$1.90
Monitoring Cost		\$33,000

Program Description

Low flow showerheads would be one of the three measures offered in a Water Efficient Apartment Visit service. The service would complete 172 apartment visits per year targeting units built prior to 1996¹. During the visit, the advisor would inspect and test the flow rate of the showerheads. Low flow showerheads would be installed on all of the showers with a flow rate greater than 12 litres per minute. Low flow showerheads save approximately 40%² of the water during a shower while maintaining good shower performance. In addition to reducing water bills, low flow showers contribute to lower energy bills due to the less hot water used. An energy utility may be interested in partnering in this program.

Assumptions

Savings

- Pre-1996 housing stock is 11,478 units³
- 70% already have low flow showerheads⁴
- Remaining potential is 3,443 units
- 1.5 persons per household⁵
- 1.3 showerheads per household⁶
- 0.72 showers per person per day⁷
- Average length of shower is 7.6 minutes⁸
- Average flow rate per existing showerhead is 15 litres per minute⁹
- Average flow rate per replaced showerhead is 8.3 litres per minute¹⁰
- 172 apartment visits completed annually

Savings per Participant = (Existing shower flow rate – Replaced shower flow rate)
x number of showers per person per day x average length of shower
x number of persons per household

$$\text{Savings per Participant} = (15 - 8.3) \times 0.72 \times 7.6 \times 1.5 = 55 \text{ litres per average day}$$

Costs per Participant

- Assume 1.3 showerheads per participant
- Equipment cost is \$14.30
- Installation cost is \$20.00
- Marketing cost is \$25.00
- Training cost is \$5.00
- Program management cost is \$30.00
- Project management cost is \$10.00

References

- 1 Ontario Building Code (OBC) mandated low flow showerheads in all newly construction homes and buildings effective October 1, 1990.
- 2 Experience from York Region program where they installed 106,000 low flow showerheads from 1998 to 2004.
- 3 City of Guelph. Planning Department. July 2008.
- 4 Assumption
- 5 City of Guelph. Planning Department. July 2008.
- 6 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 9 Experience from York Region program where they installed 106,000 low flow showerheads from 1998 to 2004.
- 10 Manufacturer literature, Niagara Conservation.

Incentive	Free supply and installation	
Savings Per Participant	29 litres per average day	
Cost Per Participant	\$54	
		Ten Year Total
Number of Participants		280
Number of Kitchen Faucets		280
Program Costs		\$14,875
Program Savings (litres per average day)		8,100
Cost per Litre per Average Day Saved		\$1.84
Monitoring Cost		\$33,000

Program Description

Low flow kitchen faucet aerators would be one of the three measures offered in a Water Efficient Apartment Visit service. The service would complete 172 apartment visits per year targeting units built prior to 1996¹. During the visit, the advisor would inspect and test the flow rate of the kitchen faucet. Low flow faucet aerators would be installed on all of the kitchen faucets with a flow rate greater than 10 litres per minute. Low flow faucet aerators save approximately 24%² of the water during use. In addition to reducing water bills, low flow faucet aerators contribute to lower energy bills due to the less hot water used.

Assumptions

Savings

- Pre-1996 housing stock is 11,478 units³
- 84% already have low flow kitchen faucets⁴
- Remaining potential is 1,836 units
- 1.5 persons per household⁵
- 1 kitchen faucet per household⁶
- Average length of use is 8.4 minutes per day⁷
- Average flow rate per existing kitchen faucet is 11.8 litres per minute⁸
- Average flow rate per replaced faucet is 8.3 litres per minute⁹
- 172 home visits completed annually
- 16% participation rate¹⁰

$$\text{Savings per Participant} = (\text{Existing faucet flow rate} - \text{Replaced faucet flow rate}) \times \text{average length of use per day}$$

$$\text{Savings per Participant} = (11.8 - 8.3) \times 8.4 = 29 \text{ litres per average day}$$

Costs per Participant

- Equipment cost is \$3.00
- Installation cost is \$6.00
- Marketing cost is \$10.00
- Training cost is \$5.00
- Program management cost is \$20.00
- Project management cost is \$10.00

References

- 1 Ontario Building Code (OBC) mandated low flow faucets in all newly construction homes and buildings effective October 1, 1990.
- 2 Engineering estimate based on data from Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 3 City of Guelph. Planning Department July 2008.
- 4 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 5 City of Guelph. Planning Department July 2008.
- 6 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 7 Regional Municipality of York. Water Use Efficiency Master Plan Update Research. 2006.
- 8 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 9 Manufacturer's data. Niagara Conservation Corp.
- 10 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.

Leakage Repair

Multi Family Residential

Incentive	Free supply and installation	
Savings Per Participant	108 litres per average day	
Cost Per Participant	\$216	
	Ten Year Total	
Number of Participants	50	
Number of Leaks	50	
Program Costs	\$11,156	
Program Savings (litres per average day)	5,560	
Cost per Litre per Average Day Saved	\$2.01	
Monitoring Cost	\$33,000	

Program Description

Leakage repair would be one of the three measures offered in a Water Efficient Apartment Visit service. The service would complete 172 apartment visits per year targeting units built prior to 1996¹. During the visit, the advisor would inspect for any water leakage throughout the apartment. Upon locating a leak, the advisor would repair if possible or for more difficult repairs refer the customer to a plumber. Leaks in homes can account for up to 13.7%² of the total household usage. In addition to reducing water bills, reducing leakage can contribute to lower energy bills due to less hot water loss.

Assumptions

Savings

- Pre-1996 housing stock is 11,478 units³
- 97% of the apartments are leak free⁴
- Remaining potential is 344 units
- 1.5 persons per household⁵
- 72 litres per day per person of leakage⁶
- 172 home visits completed annually
- 3% participation rate⁷

Savings per Participant = Existing leakage rate per person per day
x number of persons per household

$$\text{Savings per Participant} = 72 \times 1.5 = 108 \text{ litres per average day}$$

Costs per Participant

- Equipment cost is \$6.00
- Installation cost is \$20.00
- Marketing cost is \$10.00
- Training cost is \$30.00
- Program management cost is \$120.00
- Project management cost is \$30.00

References

- 1 Ontario Building Code (OBC) mandated low flow faucets in all newly construction homes and buildings effective October 1, 1990.
- 2 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 3 City of Guelph. Planning Department July 2008.
- 4 Assumption
- 5 City of Guelph. Planning Department July 2008.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Assumption

Toilet Replacement - HET

New Development Residential

Incentive	\$10 Rebate	
Savings Per Participant	18 litres per average day	
Cost Per Participant	\$60	
		Ten Year Total
Number of Participants		2,250
Number of Toilets		6,750
Program Costs		\$135,000
Program Savings (litres per average day)		40.500
Cost per Litre per Average Day Saved		\$3.33
Monitoring Cost		\$0

Program Description

A rebate of \$10 per toilet would be offered to any home builder who installs a High Efficiency Flush toilet (HET) instead of the minimum required ULF toilet¹. Although, the rebate appears to be a small amount, it could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their toilets at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient toilets than the ULF toilets.

It is recommended that the City’s Royal Flush Toilet Rebate Program’s toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- Approximately 900 new home starts annually²
- Assume 25% would participate³
- 3.0 persons per household⁴
- 3.0 toilets per household⁵
- 5 flushes per person per day⁶
- Average flush volume of ULF toilet is 6.0 litres⁷
- Average flush volume per replaced toilet is 4.8 litres⁸
- 225 participants targeted per year

Savings per Participant = (ULF toilet flush volume – HET toilet flush volume)
x number of flushes per person per day
x number of persons per household

$$\text{Savings per Participant} = (6 - 4.8) \times 5.0 \times 3.0 = 18 \text{ litres per average day}$$

Costs per Participant

- Assume 3.0 toilets per participant
- Total Rebate cost is \$30
- Marketing cost is \$5.00
- Program management cost is \$20.00
- Project management cost is \$5.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 CMHC.
- 3 Assumption.
- 4 City of Guelph. Planning Department July 2008.
- 5 Assumption.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Manufacturer product literature for ULF toilets.
- 8 Manufacturer product literature for HET toilets.

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Toilet Replacement – Dual Flush

New Development Residential

Incentive	\$10 Rebate	
Savings Per Participant	36 litres per average day	
Cost Per Participant	\$60	
		Ten Year Total
Number of Participants		2,250
Number of Toilets		6,750
Program Costs		\$135,000
Program Savings (litres per average day)		81,000
Cost per Litre per Average Day Saved		\$1.67
Monitoring Cost		\$0

Program Description

A rebate of \$10 per toilet would be offered to any home builder who installs a Dual Flush toilet (DF) instead of the minimum required ULF toilet¹. Although, the rebate appears to be a small amount, it could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their toilets at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient toilets than the ULF toilets.

It is recommended that the City’s Royal Flush Toilet Rebate Program’s toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- Approximately 900 new home starts annually²
- Assume 25% would participate³
- 3.0 persons per household⁴
- 3.0 toilets per household⁵
- 5 flushes per person per day⁶
- Average flush volume of ULF toilet is 6.0 litres⁷
- Average flush volume per replaced toilet is 3.6 litres⁸
- 225 participants targeted per year

Savings per Participant = (ULF toilet flush volume – DF toilet flush volume)
x number of flushes per person per day
x number of persons per household

$$\text{Savings per Participant} = (6 - 3.6) \times 5.0 \times 3.0 = 36 \text{ litres per average day}$$

Costs per Participant

- Assume 3.0 toilets per participant
- Total Rebate cost is \$30
- Marketing cost is \$5.00
- Program management cost is \$20.00
- Project management cost is \$5.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 CMHC.
- 3 Assumption.
- 4 City of Guelph. Planning Department. July 2008.
- 5 Assumption.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Manufacturer product literature for ULF toilets.
- 8 Manufacturer product literature for DF toilets.

Clothes Washer Replacement

New Development Residential

Incentive	\$80 Rebate	
Savings Per Participant	33 litres per average day	
Cost Per Participant	\$108	
		Ten Year Total
Number of Participants		2,250
Number of Clothes Washers		2,250
Program Costs		\$243,000
Program Savings (litres per average day)		73,680
Cost per Litre per Average Day Saved		\$3.30
Monitoring Cost		\$0

Program Description

A rebate of \$80 per clothes washer would be offered to any home builder who installs an Energy Star Water Efficient clothes washer instead of a standard top loading model. The rebate could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their clothes washers at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient clothes washers.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Assume 25% would participate²
- 3.0 persons per household³
- 0.37 wash cycles per person per day⁴
- Average consumption per cycle of standard clothes washer is 125 litres⁵
- Average consumption per cycle of Energy Star clothes washer is 55.5 litres⁶
- 225 participants targeted per year

Savings per Participant = (Standard clothes washer volume – Energy Star clothes washer volume)
x number of cycles per person per day x number of persons per household

$$\text{Savings per Participant} = (125 - 55.5) \times 0.37 \times 3.0 = 33 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$80.00
- Marketing cost is \$5.00
- Program management cost is \$20.00
- Project management cost is \$3.00

References

- 1 CMHC.
- 2 Assumption.
- 3 City of Guelph. Planning Department July 2008.
- 4 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 5 Based on analysis of Energy Star Canada listing, 2008.
- 6 Based on analysis of Energy Star Canada listing, 2008.

Humidifier Replacement

New Development Residential

Incentive	\$75 Rebate
Savings Per Participant	51litres per average day
Cost Per Participant	\$125.00
	Ten Year Total
Number of Participants	2,700
Number of Humidifiers	2,700
Program Costs	\$337,500
Program Savings (litres per average day)	137,700
Cost per Litre per Average Day Saved	\$2.45
Monitoring Cost	\$0

Program Description

A rebate of \$80 per powered central humidifier would be offered to any home builder who installs an approved water efficient humidifier instead of a standard model. The rebate could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their humidifiers at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient humidifier. Building practises have changed over the past ten years and less and less humidifiers are being installed. This program is designed to manage a very small market sector which could disappear in coming years.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Standard humidifiers use 128 litres/day during the heating season²
- Water efficient humidifiers use 0.8 litres/day during the heating season³
- 147 heating days per season
- 270 participants targeted per year

Savings per Participant =

$$\frac{(\text{Standard humidifier volume} - \text{Water Efficient humidifier volume}) \times \text{number of heating days}}{\text{number of days in the year}}$$

$$\text{Savings per Participant} = (128 - 0.8) \times 147 / 365 = 51 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$75.00
- Marketing cost is \$20.00
- Program management cost is \$20.00
- Project management cost is \$10.00

References

- 1 CMHC.
- 2 Independent testing by ETL SEMKO, Desert Springs Corp.
- 3 Independent testing by ETL SEMKO, Desert Springs Corp.

Floor Drain Replacement

New Development Residential

Incentive	\$60 Rebate
Savings Per Participant	43 litres per average day
Cost Per Participant	\$105
	Ten Year Total
Number of Participants	2,700
Number of Floor Drains	2,700
Program Costs	\$283,500
Program Savings (litres per average day)	116,100
Cost per Litre per Average Day Saved	\$2.44
Monitoring Cost	\$0

Program Description

A rebate of \$60 per floor drain would be offered to any home builder who installs an approved waterless drain seal instead of a standard primer kit. The rebate could be bundled with other rebates to form a “Builder’s Package”. The long term objective of this program is to transform the builder market to using more floor drain seals. Building practises have changed over the past ten years and more builders are using the waterless drain seals. This program is designed to manage a very small market sector which could disappear in coming years.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Assume 1.8 litres per hour of constant water use²
- 270 participants targeted per year

Savings per Participant =
(Standard primer flow rate x hours x days)
/ number of days in the year

$$\text{Savings per Participant} = (1.8 \times 24 \times 365) / 365 = 43 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$60.00
- Marketing cost is \$10.00
- Program management cost is \$30.00
- Project management cost is \$5.00

References

- ¹ CMHC.
- ² Assumption.

Grey Water Reuse

New Development Residential

Incentive	\$1,000 Rebate
Savings Per Participant	90 litres per average day
Cost Per Participant	\$3,500
	Ten Year Total
Number of Participants	100
Number of Grey Water Reuse Systems	100
Program Costs	\$350,000
Program Savings (litres per average day)	9,000
Cost per Litre per Average Day Saved	\$38.89
Monitoring Cost	\$0

Program Description

Grey water reuse is a measure that is currently receiving a lot of attention across Canada and around the world. As these technologies evolve from a cost and a water savings perspective, and as water rates continue to increase, it is thought that these measures will prove to be recommended water saving measures in the future. In delivery of the program it is recommended that the City provide a one time \$1,000 rebate for home builders installing home with grey water reuse systems at part of new home construction.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Assume reuse water will be used for flushing 6 litre flush toilets, ²
- 10 participants (demonstration sites) targeted per year

Savings per Participant =

(Flush volume x number of flushes per day per person x number of persons)

$$\text{Savings per Participant} = 6.0 \times 5 \times 3.0 = 90 \text{ litres per average day}$$

Costs per Participant

- Total Rebate cost is \$1,000.00
- Marketing cost is \$800.00
- Program management cost is \$1,200.00
- Project management cost is \$500.00

References

¹ CMHC.

² Assumption.

Rain Water Harvesting

New Development Residential

Incentive	\$2,000 Rebate
Savings Per Participant	171 litres per average day
Cost Per Participant	\$5,500
	Ten Year Total
Number of Participants	100
Number of Rain Water Harvesting Systems	100
Program Costs	\$550,000
Program Savings (litres per average day)	17,090
Cost per Litre per Average Day Saved	\$32.18
Monitoring Cost	\$0

Program Description

Rain water harvesting is a measure that is receiving a lot of attention across Canada and around the world. The City of Guelph, and in particular, the University of Guelph, are viewed as leaders in research and promotion of these technologies. As these technologies evolve from a cost and a water savings perspective, and as water rates continue to increase, it is thought that these measures will prove to be recommended water saving measures in the future. In delivery of the program it is recommended that the City provide a one time \$2,000 rebate for home builders installing rain water harvesting systems as part of new home construction.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Assume rain water will be used for flushing 6 litre flush toilets and outdoor summer irrigation,²
- Average irrigation demand is 29,526 litres over a season³
- 10 participants (demonstration sites) targeted per year

Savings per Participant =

(Flush volume x number of flushes per day per person x number of persons) +
(Irrigation demand / number of days in the year)

Savings per Participant = (6.0 x 5 x 3.0) + (29,526 / 365) = 171 litres per average day

Costs per Participant

- Total Rebate cost is \$2,000.00
- Marketing cost is \$600.00
- Program management cost is \$2,400.00
- Project management cost is \$500.00

References

¹ CMHC.

² Assumption.

³ American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.

Low Flow Showerheads

New Development Residential

Incentive	\$10 Rebate	
Savings Per Participant	16 litres per average day	
Cost Per Participant	\$35	
		Ten Year Total
Number of Participants		4,500
Number of Showerheads		8,550
Program Costs		\$157,500
Program Savings (litres per average day)		73,870
Cost per Litre per Average Day Saved		\$2.13
Monitoring Cost		\$0

Program Description

A rebate of \$10 per showerhead would be offered to any home builder who installs a water efficiency showerhead instead of a standard 9.5 lpm model. The rebate could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their showerheads at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient showers.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- 3.0 persons per household²
- 1.9 showerheads per household³
- 0.72 showers per person per day⁴
- Average length of shower is 7.6 minutes⁵
- Average flow rate per standard showerhead is 9.3 litres per minute⁶
- Average flow rate per replaced showerhead is 8.3 litres per minute⁷
- 450 participants annually

Savings per Participant = (Standard shower flow rate – High Efficiency shower flow rate)
 x number of showers per person per day x average length of shower
 x number of persons per household

$$\text{Savings per Participant} = (9.3 - 8.3) \times 0.72 \times 7.6 \times 3.0 = 16 \text{ litres per average day}$$

Costs per Participant

- Assume 1.9 showerheads per participant
- Rebate cost is \$19.00
- Marketing cost is \$3.00
- Program management cost is \$10.00
- Project management cost is \$3.00

References

- 1 CMHC.
- 2 City of Guelph. Planning Department July 2008.
- 3 Assumption
- 4 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 5 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 6 Manufacturer product literature, Niagara Conservation.
- 7 Manufacturer product literature, Niagara Conservation.

Kitchen Faucet Aerators**New Development Residential**

Incentive	\$5 Rebate	
Savings Per Participant	8 litres per average day	
Cost Per Participant	\$18	
		Ten Year Total
Number of Participants		4,500
Number of Kitchen Faucets		4,500
Program Costs		\$81,000
Program Savings (litres per average day)		37,800
Cost per Litre per Average Day Saved		\$2.14
Monitoring Cost		\$0

Program Description

A rebate of \$5 per kitchen faucet would be offered to any home builder who installs a water efficient kitchen faucet instead of a standard 9.3 lpm model. The rebate could be bundled with other rebates to form a “Builder’s Package”. In addition, builder’s buy their faucets at a cheaper wholesale price. The long term objective of this program is to transform the builder market to using more efficient kitchen faucets.

Assumptions**Savings**

- Approximately 900 new home starts annually¹
- 3.0 persons per household²
- 1 kitchen faucet per household³
- Average length of use is 8.4 minutes per day⁴
- Average flow rate per standard kitchen faucet is 9.3 litres per minute⁵
- Average flow rate per water efficient faucet is 8.3 litres per minute⁶
- 450 participants annually

Savings per Participant = (Standard faucet flow rate – Replaced faucet flow rate)
x average length of use per day

$$\text{Savings per Participant} = (9.3 - 8.3) \times 8.4 = 8 \text{ litres per average day}$$

Costs per Participant

- Rebate cost is \$5.00
- Marketing cost is \$5.00
- Program management cost is \$5.00
- Project management cost is \$3.00

References

- 1 CMHC.
- 2 City of Guelph. Planning Department July 2008.
- 3 Assumption.
- 4 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 5 Manufacturer product literature, Niagara Conservation.
- 6 Manufacturer product literature, Niagara Conservation.

Watering Timer

New Development Residential

Incentive	\$20 Rebate
Savings Per Participant	24 litres per average day
Cost Per Participant	\$57
	Ten Year Total
Number of Participants	3,000
Number of Watering Timers	3,000
Program Costs	\$171,000
Program Savings (litres per average day)	71,010
Cost per Litre per Average Day Saved	\$2.41
Monitoring Cost	\$0

Program Description

A rebate of \$20 per watering timer would be provided when a builder installs a watering timer on the lawn watering system of a new house. Research has indicated that generally residents don't know how much water to put on their lawns and how long to water their lawns.¹ The rebate could be bundled with other rebates to form a "Builder's Package".

Assumptions

Savings

- Approximately 900 new home starts annually²
- Flow rate of existing garden hose is 12 lpm³
- Residents water 120 minutes per week during the irrigation without a timer⁴
- Residents water 80 minutes per week during the irrigation season with a timer⁴
- 18 week irrigation season⁴
- 300 participants targeted per year

Savings per Participant =

$(\text{hose flow rate} \times \# \text{ of minutes per week (without timer)} \times \# \text{ of weeks in irrigation season}) -$
 $(\text{hose flow rate} \times \# \text{ of minutes per week (with timer)} \times \# \text{ of weeks in irrigation season})$

Savings per Participant = $((12.0 \times 120 \times 18) - (12.0 \times 80 \times 18)) / 365 = 24 \text{ litres per average day}$

Costs per Participant

- Total Rebate cost is \$20.00
- Marketing cost is \$12.00
- Program management cost is \$20.00
- Project management cost is \$5.00

References

- 1 Toronto Water Wiser Summer Landscape Visit Program Savings Verification, 2005 - 2008.
- 2 CMHC.
- 3 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 4 Assumption.

Water Efficient Landscape

New Development Residential

Incentive	\$200 Rebate
Savings Per Participant	74 litres per average day
Cost Per Participant	\$285
	Ten Year Total
Number of Participants	3,000
Program Costs	\$855,000
Program Savings (litres per average day)	222,000
Cost per Litre per Average Day Saved	\$3.85
Monitoring Cost	\$0

Program Description

A \$200 rebate would be provided to a builder who designs and installs water efficient landscaping at its new house. The design would meet certain minimum criteria as set out by the City of Guelph including, water efficient plants, turf coverage and mulch. The rebate could be bundled with other rebates to form a “Builder’s Package”.

Assumptions

Savings

- Approximately 900 new home starts annually¹
- Savings of 74 litres per average day²
- 300 home visits completed annually

Savings per Participant = Savings per household per average day

Savings per Participant = 74 litres per average day

Costs per Participant

- Rebate cost is \$200
- Collateral material cost is \$10.00
- Marketing cost is \$30.00
- Program management cost is \$40.00
- Project management cost is \$5.00

References

- ¹ City of Guelph. Planning Department. July 2008.
- ² Water Wiser Summer Landscape Visit program savings verification, 2005 - 2008.

Toilet Replacement - ULF

Industrial, Commercial, Institutional

Incentive	\$60 Rebate
Savings Per Participant	590 litres per average day
Cost Per Participant	\$1,280
	Ten Year Total
Number of Participants	290
Number of Toilets	2,320
Program Costs	\$371,200
Program Savings (litres per average day)	171,100
Cost per Litre per Average Day Saved	\$2.17
Monitoring Cost	\$99,000

Program Description

A rebate of \$60 per toilet would be offered to any ICI building manager who replaces a high volume flush toilet with a 6.0 litre ultra-low-flush toilet (ULF). Ideally the rebate should only be offered to building managers with buildings built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for ULF toilets be increased to \$60 per approved toilet from the current \$40 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- 1,228 business units³
- 40% already have low flush toilets⁴
- Remaining potential is 737 units
- 8 toilets per building⁵
- 5 flushes per person per day⁶
- 20 persons on premise per day assumed
- Average flush volume per existing toilet is 11.9 litres⁷
- Average flush volume per replaced toilet is 6 litres⁸
- 29 participants targeted per year⁹

$$\begin{aligned} \text{Savings per Participant} &= (\text{Existing toilet flush volume} - \text{Replaced toilet flush volume}) \\ &\quad \times \text{number of flushes per person per day} \\ &\quad \times \text{number of persons on premise per day} \end{aligned}$$

$$\text{Savings per Participant} = (11.9 - 6.0) \times 5.0 \times 20 = 590 \text{ litres per average day}$$

Costs per Participant

- Assume 8 toilets per participant
- Total Rebate cost is \$480.00
- Marketing cost is \$300.00
- Program management cost is \$400.00
- Project management cost is \$100.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph Business Listing, 2008.
- 4 Assumption.
- 5 Experience from York Region program where they installed 254,000 early closing flappers from 1998 to 2004.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Based on ULF toilet manufacturer's specifications
- 9 Based on other local programs such as Region of Waterloo.

Toilet Replacement - HET

Industrial, Commercial, Institutional

Incentive	\$75 Rebate
Savings Per Participant	710 litres per average day
Cost Per Participant	\$1,400
	Ten Year Total
Number of Participants	110
Number of Toilets	880
Program Costs	\$154,000
Program Savings (litres per average day)	78,100
Cost per Litre per Average Day Saved	\$1.97
Monitoring Cost	\$71,000

Program Description

A rebate of \$75 per toilet would be offered to any ICI building manager who replaces a high volume flush toilet with a high efficiency flush toilet (HET). Ideally the rebate should only be offered to building managers with buildings built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for HET toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- 1,228 business units³
- 40% already have low flush toilets⁴
- Remaining potential is 737 units
- 8 toilets per building⁵
- 5 flushes per person per day⁶
- 20 persons on premise per day assumed
- Average flush volume per existing toilet is 11.9 litres⁷
- Average flush volume per replaced toilet is 4.8 litres⁸
- 11 participants targeted per year⁹

$$\begin{aligned} \text{Savings per Participant} &= (\text{Existing toilet flush volume} - \text{Replaced toilet flush volume}) \\ &\quad \times \text{number of flushes per person per day} \\ &\quad \times \text{number of persons on premise per day} \end{aligned}$$

$$\text{Savings per Participant} = (11.9 - 4.8) \times 5.0 \times 20 = 710 \text{ litres per average day}$$

Costs per Participant

- Assume 8 toilets per participant
- Total Rebate cost is \$600.00
- Marketing cost is \$300.00
- Program management cost is \$400.00
- Project management cost is \$100.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph Business Listing, 2008.
- 4 Assumption.
- 5 Experience from York Region program where they installed 254,000 early closing flappers from 1998 to 2004.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Based on HET toilet manufacturer's specifications
- 9 Based on other local programs such as Region of Waterloo.

Toilet Replacement – Dual Flush

Industrial, Commercial, Institutional

Incentive	\$75 Rebate
Savings Per Participant	830 litres per average day
Cost Per Participant	\$1,550
	Ten Year Total
Number of Participants	18
Number of Toilets	144
Program Costs	\$279,000
Program Savings (litres per average day)	149,400
Cost per Litre per Average Day Saved	\$1.87
Monitoring Cost	\$71,000

Program Description

A rebate of \$75 per toilet would be offered to any ICI building manager who replaces a high volume flush toilet with a dual flush toilet (DF). Ideally the rebate should only be offered to building managers with buildings built prior to 1996¹. However, since post-1996 building owners needing a replacement toilet can still purchase a high volume flush toilet, it will be necessary to provide the rebate to all consumers. Life expectancy of a residential toilet is approximately 25 years² so by far the majority of toilet replacements will be from the pre-1996 housing stock.

It is recommended that the Royal Flush rebate amount for DF toilets be increased to \$75 per approved toilet from the current \$60 rebate per toilet. In addition, that the City's Royal Flush Toilet Rebate Program's toilet eligibility criteria be changed from Maximum Performance Test (MaP) to Unified North American Requirements (UNAR) to ensure sustained water savings and a high level of customer satisfaction amongst program participants.

Assumptions

Savings

- 1,228 business units³
- 40% already have low flush toilets⁴
- Remaining potential is 737 units
- 8 toilets per building⁵
- 5 flushes per person per day⁶
- 20 persons on premise per day assumed
- Average flush volume per existing toilet is 11.9 litres⁷
- Average flush volume per replaced toilet is 3.6 litres⁸
- 18 participants targeted per year⁹

$$\begin{aligned} \text{Savings per Participant} &= (\text{Existing toilet flush volume} - \text{Replaced toilet flush volume}) \\ &\quad \times \text{number of flushes per person per day} \\ &\quad \times \text{number of persons on premise per day} \end{aligned}$$

$$\text{Savings per Participant} = (11.9 - 3.6) \times 5.0 \times 20 = 830 \text{ litres per average day}$$

Costs per Participant

- Assume 8 toilets per participant
- Total Rebate cost is \$600.00
- Marketing cost is \$300.00
- Program management cost is \$400.00
- Project management cost is \$100.00

References

- 1 Ontario Building Code (OBC) mandated 6.0 litre per flush toilets in all newly construction homes and buildings effective October 1, 1996.
- 2 California Urban Water Conservation Council. Cost-Effectiveness Analysis of Urban Water Conservation Best Management Practices.
- 3 City of Guelph Business Listing, 2008.
- 4 Assumption.
- 5 Experience from York Region program where they installed 254,000 early closing flappers from 1998 to 2004.
- 6 American Water Works Association, Research Foundation. Residential End Uses of Water Study. 1999.
- 7 Regional Municipality of Waterloo. Water Efficiency Master Plan Update Research Study. May 24, 2006.
- 8 Based on DF toilet manufacturer's specifications
- 9 Based on other local programs such as Region of Waterloo.

Clothes Washer Replacement

Industrial, Commercial, Institutional

Incentive	\$200 Rebate
Savings Per Participant	4,095 litres per average day
Cost Per Participant	\$10,000
	Ten Year Total
Number of Participants	20
Number of Clothes Washers	300
Program Costs	\$200,000
Program Savings (litres per average day)	81,900
Cost per Litre per Average Day Saved	\$2.44
Monitoring Cost	\$68,400

Program Description

A rebate of \$200 per clothes washer would be offered to any Laundromat owner who replaces a high water volume clothes washer with a water efficient model. This measure applies to all Laundromat owners who are purchasing a new clothes washer. Significant energy savings can be attributed to water efficient clothes washers. Not only do they use less hot water, the machines themselves are inherently energy efficient. Energy providers may be interested in partnering in this program.

Assumptions

Savings

- 20 Laundromat in Guelph¹
- 20% already have water efficient clothes washers²
- Potential of 16 Laundromats remaining
- 15 washers per laundry mat³
- Water efficient clothes washers save 273 litres per washer per day⁴
- 2 participants targeted per year

Savings per Participant = Savings from above reference study x number of washers per Laundromat

$$\text{Savings per Participant} = 273 \times 15 = 4,095 \text{ litres per average day}$$

Costs per Participant

- 15 clothes washers per Laundromat
- Total Rebate cost is \$3,000.00
- Marketing cost is \$2,000.00
- Program management cost is \$4,000.00
- Project management cost is \$1,000.00

References

- 1 City of Toronto Washer Replacement Program Survey, results prorated for City of Guelph.
- 2 Assumption
- 3 City of Toronto Washer Replacement Program Survey.
- 4 City of Seattle Laundromat study.

Pre-Rinse Spray Valves

Industrial, Commercial, Institutional

Incentive	Free supply and installation
Savings Per Participant	368 litres per average day
Cost Per Participant	\$1,158
	Ten Year Total
Number of Participants	150
Number of Nozzles	225
Program Costs	\$173,700
Program Savings (litres per average day)	55,200
Cost per Litre per Average Day Saved	\$3.15
Monitoring Cost	\$61,000

Program Description

Pre-rinse spray valves would be provided in a Water Efficient Commercial Visit service. The service would complete 15 small commercial visits per year targeting businesses with cafeterias and commercial kitchens. During the visit, the advisor would inspect and test the flow rate of the pre-rinse spray valves. Low flow pre-rinse spray valves would be installed on all of the valves with a flow rate greater than 10 litres per minute. Low flow pre-rinse spray valves have a flow rate of 6 litres¹ per minute while maintaining good cleaning performance. In addition to reducing water bills, low flow pre-rinse spray valves contribute to lower energy bills due to the less hot water used.

Assumptions

Savings

- 167 potential units²
- 5% already have low flow pre-rinse spray valves³
- Remaining potential is 3,325 units
- 1.5 valves per business⁴
- 245 litres per valve per day savings⁵
- 15 small commercial visits completed annually

Savings per Participant = savings per valve x number of valves replaced

Savings per Participant = 245 x 1.5 = 368 litres per average day

Costs per Participant

- Assume 1.5 valves per participant
- Equipment cost is \$127.50
- Installation cost is \$75.50
- Marketing cost is \$200.00
- Training cost is \$80.00
- Program management cost is \$600.00
- Project management cost is \$75.00

References

- 1 Regional Municipality of Waterloo. Pre-rinse Spray Valve Research Study. January 2005.
- 2 Potential developed from Guelph Business Listing, 2008.
- 3 Assumption.
- 4 Assumption.
- 5 Regional Municipality of Waterloo. Pre-rinse Spray Valve Research Study. January 2005.

Audit and Capacity Buyback

Industrial, Commercial, Institutional

Incentive	\$0.30 per litre per average day saved
Savings Per Participant	40,000 litres per day
Cost Per Participant	\$54,000
	Ten Year Total
Number of Participants	15
Program Costs	\$1,164,058
Program Savings (litres per average day)	600,000
Cost per Litre per Average Day Saved	\$1.35
Monitoring Cost	\$included

Program Description

A rebate or capacity-buyback of \$0.30 per litre per average day would be provided to large volume industrial clients who replace inefficient processes with water efficient processes. The capacity buyback would be available to any client who participated in the ICI Water Audit program. Ten audits would be completed each year and it is anticipated that 1.5 of the audited clients will implement water saving measures. Savings would have to be verified before the capacity-buyback is paid.

Assumptions

Savings

- All ICI building stock of 2,620 units¹
- 10 audits completed per year
- 1.5 of those audited clients will implement water saving measures and become a participant²
- Average 40,000 litres per day savings per participant³

Savings per Participant = Savings per participant as referenced above

Savings per Participant = 40,000 litres per day

Costs per Participant

- 10 audits per year
- 1.5 of those audited clients will implement water savings
- Average savings per participant per day is 40,000 litres
- Capacity buyback is \$0.30 per litre per average day saved
- Average cost of an audit is \$3,500.00
- Average cost for monitoring and verification is \$2,000.00
- Program management cost is \$1,500.00
- Project management cost is \$1,000.00

References

- ¹ Based on Guelph ICI billing data.
- ² Based on results from York Region's Industrial Audit Program from 1998 to 2004.
- ³ Based on results from York Region's Industrial Audit Program from 1998 to 2004.

Distribution Leakage Reduction

Municipal

Incentive	
Savings Per District Meter Area	115,000 litres per average day
Cost Per District Meter Area	\$15,900
	Ten Year Total
Number of District Meter Areas	15
Program Costs	\$238,500
Program Savings (litres per average day)	1,725,000
Cost per Litre per Average Day Saved	\$0.14
Monitoring Cost	\$included

Program Description

Active Leak Detection Overview

Over the last 10 years, there has been considerable progress in the development of practices and techniques to identify and reduce losses in water distribution systems. There are in essence three types of leaks associated with a water distribution system, which are:

1. Reported leaks, which come to the surface, and are repaired
2. Unreported leaks, which do not surface, but are economic to repair (larger leaks). These leaks are best found using District Meter Areas (DMAs)
3. Background leakage, which do not surface, and are not economic to repair (very small leaks). These leaks can be reduced by flow modulation, using Permanent DMAs

The methods of leak detection fall into two main categories, namely “passive” and “active” leak detection, which can conveniently be defined as follows:

Passive leak detection

Repair of reported leaks

Active leak detection

Traditional leak detection sounding survey and leak pinpointing

Temporary flow monitoring, using the District Meter Area (DMA) methodology

Permanent flow monitoring, using permanent DMAs

District Meter Area Approach

The approach used to complete leak detection using District Meter Areas is as follows:

1. Conduct initial meetings and site inspections with City staff.
2. Design of DMAs based on meetings with City staff and review of water distribution system map
3. Identification of associated valve closures and potential flow metering locations.
4. The City completes the tapings for the temporary flow meters, including installing any chambers.
5. Set up DMAs and data log the flows for 7 days.
6. Identify the recorded Night Flow, establish Legitimate Night Flow (or Background Leakage), and Identify Potential Leakage.
7. Identify DMAs where leakage is evident and complete methods to find the general area of the leak (step-testing) within the DMA.

8. Pinpoint the leaks using acoustic leak detection and correlation methods and report on the locations for a directed repair program.
9. The City of Guelph repairs the identified leaks
10. Repeat DMA operation after the identified leaks have been repaired, to confirm leakage reduction.
11. Report on the findings of the program with procedures for an ongoing Water Loss Management Program to be undertaken by the City staff.

Assumptions

Savings

- 15 Temporary District Meter Areas (DMAs) to be completed over first 3 years of 10 year plan
- Average 115,000 litres per day savings per DMA
- 1,725,000 litres per day in saving from the completion of 15 DMAs

Costs per Participant

- 15 Temporary DMAs completed over a three year period
- Average cost for implementing a temporary DMA is \$13,300 which includes design, installation of temporary flowmeter and data logging for 7 days, step testing and leak pinpointing, and verifying savings after the leak repair
- Note providing insertion points, operation of all valves, repairing leaks would be the responsibility of the City of Guelph
- Program management cost is \$1,600 per DMA
- Project management cost is \$1,000 per DMA

Broad-scale Public Education

Annual Cost	\$142,000
Total 10 Year Cost	\$1,420,000

Program Description

Technical solutions can only go so far in achieving overall water savings. Education that changes habits and attitudes towards water use is needed to finish the job. An important element of the City's water efficiency program has been public outreach and education. These activities are intended to educate and change the water-use attitudes of Guelph's residents. It is the intent to continue this very important element of the overall program. Activities that will be undertaken include:

- Literature including booklets, leaflets and flyers
- Two water efficiency bulletins distributed in the water bills annually
- Display booths at home shows, fairs, environmental days and other community events
- Displays at the City Hall
- Presentations at service clubs, community and youth groups
- City of Guelph Water Efficiency website

In addition to traditional education and communication strategies, it is recommended that the City develop and pursue a community based social marketing (CBSM) approach to education. Highly effective in the solid waste education programs during the past decade, CBSM techniques are being introduced more and more into water conservation and efficiency programs across North America.

It is anticipated that the Water Conservation and Efficiency Public Advisory Committee created for the Master Plan Update process will remain active in the future to provide direction and resources towards implementing an effective education strategy.

Youth Education

Annual Cost	\$103,000
Total 10 Year Cost	\$1,030,000

Program Description

It is intended that the City develops an educational program that meets current Ontario Curriculum standards and can be delivered by the City's elementary school teachers. The program and supporting Teacher's Manual, Student Activity Book and video would be developed to support the current Ontario Provincial Curriculum at the Grade 7 and 8 levels - specifically targeting Geography and Science expectations, but incorporating language, art and mathematics activities. An interactive website would be developed where teachers can direct their students for assistance on projects or to have fun completing the water quiz. A poster drawing contest resulting in an annual calendar would be held every year.

In addition to the Grade 7 program, it is suggested that the City continues its participation in the popular Waterloo-Wellington Children's Groundwater Festival. Thousands of students have learned about water in the out-of-doors at the annual Children's Water Festival. The festival is a five day event where Grade 3 to 5 students learn by participating in over 40 curriculum based activities about water and the environment.