

Flagstaff Water Utility

Toilet Rebate Program

The City of Flagstaff Water Utility serves the community of Flagstaff, AZ, a city of 61,000 people located in northern Arizona. The city's economy includes a sizeable tourism industry and a state university. Median household income was \$37,586 as of 1999.¹

UTILITY DEMOGRAPHICS

As of December 2003, the City of Flagstaff Water Utility had 16,937 connections, 89.5% of which were residential. Of their total connections, 12,553 were single family residential, 2,600 were multifamily residential, 1,492 were commercial, 40 were manufacturing, and 252 were landscaping meters. The City of Flagstaff is 64.4 square miles. As of 2004, the City of Flagstaff's residential water use, in gallons per capita per day (gpcd) was 125. The utility's total water deliveries in 2004 were 8,249.2 AF.²

| TOILET REBATE PROGRAM | |
|----------------------------|-------------------------|
| Rebate Amount: | 50%, up to \$100 |
| Eligible Customers: | SF, MF, ICI |
| Customers analyzed: | SF |
| Program Years: | 1991 - 2005 |
| Years Analyzed: | 2000, 2001 |

UTILITY RATE STRUCTURE AND PRICES

The City of Flagstaff has a tiered rate structure. The monthly base rate for service is \$6.48 for single family customers, which includes zero gallons of water. The fee structure for water consumption for ¾ inch meters is as follows:

| Usage | Price |
|------------------------|--------------------------|
| 0 – 5,000 gallons | \$2.83 per 1,000 gallons |
| 5,001 – 15,000 gallons | \$3.32 per 1,000 gallons |
| 15,000+ gallons | \$4.71 per 1,000 gallons |

CURRENT CAPACITY AND WATER SOURCES

The City of Flagstaff has a capacity of 20.5 million gallons per day, 13 million gallons per day, or 63.4%, of which comes from local wells. The remaining 7.5 million gallons per day, or 36.6%, comes from local surface water.

FUTURE PLANS TO MEET DEMAND

The population within the City of Flagstaff's service grew at an average rate of 4.0% per year between 2000 and 2004.³ For short- to mid-term needs, additional groundwater wells may be drilled. Long-term needs may require the acquisition of surface water rights from farms, and the use of Central Arizona Project (CAP) water. Conservation and reuse are currently the main strategies by which the city is working to ensure the future water supply.

¹ U.S. Census Bureau, American Fact Finder

² 2004 Consumer Confidence Report. City of Flagstaff Water Utility.

³ Population Change – 2000 Census to July 1, 2004 Estimate for Arizona, Counties, and Incorporated Places. Arizona Department of Economic Security.

TOILET REBATE PROGRAM - DESCRIPTION

From 1991 to 2004, the City of Flagstaff offered a rebate of 50%, or up to \$100 per toilet, for replacement of high water use toilets with ultra low flush toilets (toilets with a 1.6 gallon or less flush volume). The rebate was in the form of either a credit on the customer's water bill or as a check issued to the customer. Single family, multifamily, and commercial customers were eligible for the rebate; however, new homes were not eligible.

OTHER FLAGSTAFF WATER UTILITY CONSERVATION PROGRAMS

Conservation Rates, increasing block rate, 1988-present
Conservation/Drought Response Ordinance, 1988-present
Showerhead & Aerator Replacement, Mid-1980's-present
Rain Barrel Distribution, July 2003-present
Landscape Conversion Incentives, 2004-present
High Efficiency Washing Machine Rebates, July 2005-present
Hot Water Recirculator Rebates, July 2005-present

In January 2004, the maximum rebate was reduced to \$50 per toilet. In addition, the rebate was offered to new homes if choosing dual-flush toilets (\$50 rebate) or waterless urinals (\$100 rebate). A resident could replace an ultra low flush toilet with a dual flush toilet and still receive the \$50 rebate.

In July 2005, the rebate for ultra low flush toilets was terminated. The City implemented a rebate of \$100 for dual flush and high efficiency pressure assisted toilets (1.2 gallons per flush or less).

METHODOLOGY

Please see the General Methodology for the specific procedures and techniques used for all ECoBA analyses.

The analysis includes only single family households that received toilet rebates during the years 2000 and 2001. The water savings were calculated and a cost benefit analysis was performed for the years 2000 and 2001. The findings refer to these years only, not to the ongoing program. The lifespan of the toilets, which is used as the period of analysis, was assumed to be twenty years.⁴

All quantified costs and benefits have been discounted to the first year of the analysis (2000) and inflated to 2004 dollars. The discount rate used in this analysis was 6.2%. The CPI values that were used in this analysis were the 2004 value of 188.9 and the 2000 value of 172.2.

The populations studied for this analysis was comprised of all participants who received rebates for one or more toilets. There were 67 usable participants out of 113 total in 2000, and 80 out of 132 in

⁴ Pekelney, D.M. et al. *Guidelines to Conduct Cost-Effectiveness Analysis of Best Management Practices for Urban Water Conservation*. California, 1996.

2001, for a total of 147 usable participants out of 245. Forty percent, or 98, of the possible participants were unusable because they moved during the time period of the analysis.

All City of Flagstaff single family residential households that were not participants in this analysis were used as the control group. The average pre-measure water use of the participants (92,560 gallons) was higher than the weighted average pre-measure water use of the control group (78,400 gallons).

- For year 2000 toilet rebates, the control group consisted of 11,054 households in 1998, 11,361 households in 1999, 11,573 households in 2000, 11,788 households in 2001, and 12,403 in 2002.
- For year 2001 toilet rebates, the control group consisted of 11,348 households in 1999, 11,560 households in 2000, 11,775 households in 2001, 12,390 households in 2002, and 12,624 households in 2003.

ASSUMPTIONS

Please see the General Assumptions for the specific conditions and rules underlying all ECoBA analyses.

The number of connections is the maximum number of connections billed from throughout the year.

The average cost of installation of a toilet in the Flagstaff area is \$80 (from conversations with plumbers in the Flagstaff area).

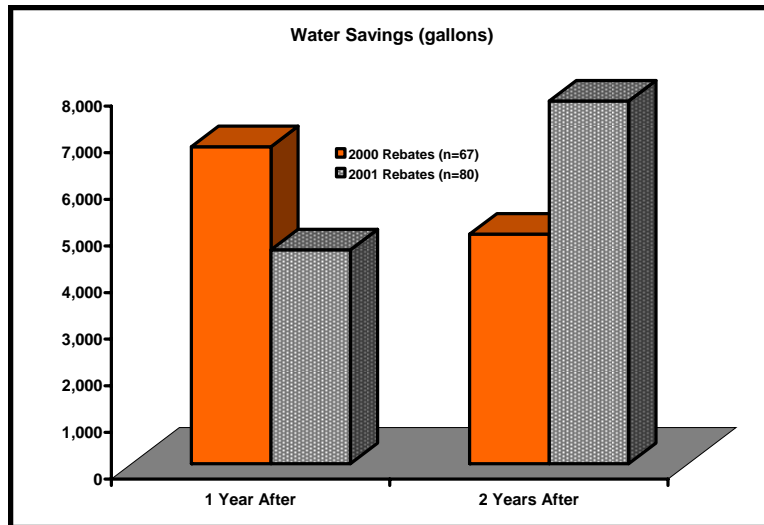
Forty percent of the participants in this analysis had their new toilets professionally installed; 60% installed them on their own.

The value of the water saved was calculated by multiplying the amount of water saved by the price of water (\$3.32 per 1,000 gallons) at the average level of use of the participants (falls into the second tier: 5,000 – 15,000 gallons per month).

Labor costs included 50 hours of labor for processing of rebates at \$15 per hour.

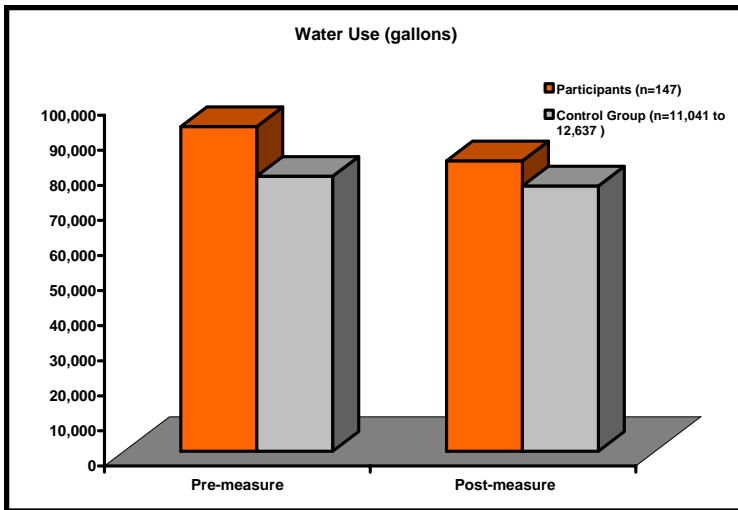
An annual cost of \$20 for program materials was assumed.

An annual cost of \$20 for advertising of the program was assumed.



RESULTS - WATER SAVINGS

In the first year after the 2000 toilet rebates, the water savings amounted to 455,391 gallons, or 6,797 gallons per participant per year (gppy) (7.7% of pre-measure water use). The second year after the toilet rebates, the water savings amounted to 329,874 gallons, or 4,923 gppy (5.6% of pre-measure water use). The average water savings per year was 392,632 gallons (1.2 AF), or 5,860 gppy (6.6% of pre-measure water use). **The total water savings over the twenty year assumed lifespan of the toilets was 7,852,643 gallons (24.1 AF), or 117,204 gallons per participant.**



The first year after the 2001 toilet rebates, the water savings amounted to 366,792 gallons, or 4,585 gppy (4.8% of pre-measure water use). The second year after the toilet rebates, the water savings amounted to 622,364 gallons, or 7,780 gppy (8.1% of pre-measure water use). The average water savings per year was 494,578 gallons (1.5 AF), or 6,182 gppy (6.5% of pre-measure water use). **The total water savings over the**

twenty year assumed lifespan of the toilets was 9,979,984 gallons (30.4 AF), or 123,644 gallons per participant.

Total water savings for the two years studied was 822,183 gallons, or 5,593 gppy (6.0% of weighted average pre-measure water use) during the first year after, and 952,237 gallons, or 6,478 gppy (7.0% of weighted average pre-measure water use) during the second year after. **The total savings over the twenty year assumed lifespan of the toilets was 17,744,200 gallons (54.5 AF), or 120,709 gallons per participant.**

During the two years before replacing high water use toilets with ultra low-flush toilets, participants' water use was ---117.6% of the control group's use, on average. During the two years after replacing the toilets, their use was 109.7% of the control group's use, on average. The participants' water use decreased by 10.5% from pre-measure to post-measure, whereas the control group's use decreased by 3.5% during the same period. **The resulting overall water savings attributed to this program was 7.0%.**

RESULTS - COST BENEFIT ANALYSIS

Costs and benefits listed below represent the entire lifespan of the program (twenty years).

2000 REBATES

- ◆ The quantified cost to the utility was \$7,565. This cost includes the cost of materials, \$22, advertising, \$22, labor, \$823, and incentive

payments, \$6,698. This is a cost of \$113 per participant, including \$0.33 for materials, \$0.33 for advertising, \$12 for labor, and \$100 in incentive payments.

- ◆ The quantified benefit to the utility was \$0.
- ◆ The quantified cost to the participants was \$17,563. This cost includes the cost of the toilets, \$15,211, and installation, \$2,352. This is a cost of \$262 per participant, including \$227 for the toilets and \$35 for installation.
- ◆ The quantified benefit to the participants was \$20,384. This benefit includes water bill savings, \$13,685, and toilet rebates, \$6,698. This is a benefit of \$304 per participant, including \$204 in water bill savings, and \$100 in toilet rebates.

| 2000 Quantified Costs and Benefits | | | | | | | |
|------------------------------------|---------|----------------|--|--------------|----------|--------------------|----------|
| Utility | | | | Participants | | | |
| Costs | | Benefits | | Costs | | Benefits | |
| Materials | \$22 | Not Quantified | | Toilets | \$15,211 | Rebates | \$6,698 |
| Advertising | \$22 | | | Installation | \$2,352 | Water Bill Savings | \$13,685 |
| Labor | \$823 | | | Total | \$17,563 | Total | \$20,384 |
| Incentive Payments | \$6,698 | | | | | | |
| Total | \$7,565 | | | | | | |

UTILITY PERSPECTIVE - 2000

Results of the cost benefit analysis show a net benefit (net present value) of -\$7,565 from the utility perspective. This is a net benefit of -\$113 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot saved from the utility perspective was \$314.**

PARTICIPANT PERSPECTIVE - 2000

Results of the cost benefit analysis show a net benefit (net present value) of \$2,820 from the participant perspective. This is a net benefit of \$42 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$729.**

OVERALL PERSPECTIVE - 2000

Results of the cost benefit analysis show a net benefit (net present value) of -\$4,744 from an overall perspective. This is a net benefit of -\$71 per participant. The quantified costs to the participants and utility were greater than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$1,043.**

2001 REBATES

- ◆ The quantified cost to the utility was \$8,430. This cost includes the cost of materials, \$21, advertising, \$21, labor, \$775, and incentive payments, \$7,614. This is a cost of \$105 per participant, including \$0.26 for materials, \$0.26 for advertising, \$10 for labor, and \$95 in incentive payments.
- ◆ The quantified benefit to the utility was \$0.

- The quantified cost to the participants was \$19,250. This cost includes the cost of the toilets, \$16,606, and the cost of installation, \$2,644. This is a cost of \$241 per participant, including \$208 for the toilets and \$33 for installation.
- The quantified benefit to the participants was \$24,486. This benefit includes water bill savings, \$16,872, and toilet rebates, \$7,614. This is a benefit of \$306 per participant, including \$211 in water bill savings, and \$95 in toilet rebates.

| 2001 Quantified Costs and Benefits | | | | | | | |
|------------------------------------|---------|----------------|--|--------------|----------|--------------------|----------|
| Utility | | | | Participants | | | |
| Costs | | Benefits | | Costs | | Benefits | |
| Materials | \$21 | Not Quantified | | Toilets | \$16,606 | Toilet Rebates | \$7,614 |
| Advertising | \$21 | | | Installation | \$2,644 | Water Bill Savings | \$16,872 |
| Labor | \$775 | | | Total | \$19,250 | Total | \$24,486 |
| Incentive Payments | \$7,614 | | | | | | |
| Total | \$8,430 | | | | | | |

UTILITY PERSPECTIVE - 2001

Results of the cost benefit analysis show a net benefit (net present value) of -\$8,430 from the utility perspective. This is a net benefit of -\$105 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot saved from the utility perspective was \$278.**

PARTICIPANT PERSPECTIVE - 2001

Results of the cost benefit analysis show a net benefit (net present value) of \$5,236 from the participant perspective. This is a net benefit of \$65 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$634.**

OVERALL PERSPECTIVE - 2001

Results of the cost benefit analysis show a net benefit (net present value) of -\$3,194 from an overall perspective. This is a net benefit of -\$40 per participant. The quantified costs to the participants and utility were greater than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$912**

ALL YEARS

- The quantified cost to the utility was \$15,995. This cost includes the cost of materials, \$43, advertising, \$43, labor, \$1,597, and incentive payments, \$14,312. This is a cost of \$109 per participant, including \$0.29 for materials, \$0.29 for advertising, \$11 for labor, and \$97 in incentive payments.
- The quantified benefit to the utility was \$0.
- The quantified cost to the participants was \$36,813. This cost includes the cost of the toilets, \$31,817, and the cost of installation, \$4,996. This is a cost of \$250 per participant, including \$216 for the toilets and \$34 for installation.

- The quantified benefit to the participants was \$49,581. This benefit includes water bill savings, \$35,269, and toilet rebates, \$14,312. This is a benefit of \$337 per participant, including \$240 in water bill savings, and \$97 in toilet rebates

| ALL YEARS | | | | Quantified Costs and Benefits | | | |
|--------------------|----------|----------------|--------------|-------------------------------|--------------------|----------|--|
| Utility | | | Participants | | | | |
| Costs | | Benefits | Costs | | Benefits | | |
| Materials | \$43 | Not Quantified | Toilets | \$31,817 | Toilet Rebates | \$14,312 | |
| Advertising | \$43 | | Installation | \$4,996 | Water Bill Savings | \$35,269 | |
| Labor | \$1,597 | | | | | | |
| Incentive Payments | \$14,312 | | Total | \$36,813 | Total | \$49,581 | |
| Total | \$15,995 | | | | | | |

UTILITY PERSPECTIVE - ALL YEARS

Results of the cost benefit analysis show a net benefit (net present value) of -\$15,995 from the utility perspective. This is a net benefit of -\$109 per participant. The quantified costs to the utility were greater than the quantified benefits to the utility. **The cost per acre-foot saved from the utility perspective was \$294.**

PARTICIPANT PERSPECTIVE - ALL YEARS

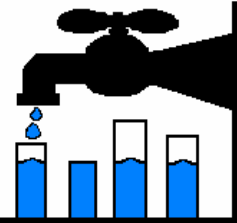
Results of the cost benefit analysis show a net benefit (net present value) of \$12,768 from the participant perspective. This is a net benefit of \$87 per participant. The quantified costs to the participants were less than the quantified benefits to the participants. **The cost per acre-foot of water saved from the participant perspective was \$676.**

OVERALL PERSPECTIVE - ALL YEARS

Results of the cost benefit analysis show a net benefit (net present value) of -\$3,227 from an overall perspective. This is a net benefit of -\$22 per participant. The quantified costs to the participants and utility were greater than the quantified benefits to the participants and utility. **The cost per acre-foot of water saved from an overall perspective was \$970.**

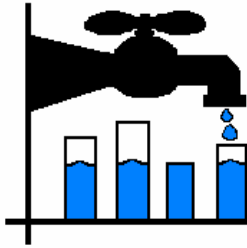
Flagstaff Water Utility

Toilet Rebate Program



| 2000 | | Results of Cost Benefit Analysis-Lifespan (20 Years) | | |
|----------------------------------|--|--|-----------------|-----------------|
| | PARTICIPANT | OVERALL | UTILITY | |
| <u>Present Value Costs</u> | | | | |
| | Costs to Utility | 7,564 | NA | 7,564 |
| | Costs to Participants | NA | 17,563 | 17,563 |
| | Costs to Others | NA | NA | 0 |
| | Total Costs | \$7,564 | \$17,563 | \$25,128 |
| <u>Present Value Benefits</u> | | | | |
| | Total Water Savings | 24.10 AF | 24.10 AF | 24.10 AF |
| | Benefits to Utility | 0 | NA | 0 |
| | Benefits to Participants | NA | 20,384 | 20,384 |
| | Benefits to Others | NA | NA | 0 |
| | Total Benefits | \$0 | \$20,384 | \$20,384 |
| <u>Cost Benefit Calculations</u> | | | | |
| | Net Present Value (NPV) (Total Benefits - Total Costs) | -\$7,565 | \$2,820 | -\$4,744 |
| | Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings) | \$314 /AF | \$729 /AF | \$1,043 /AF |

- UNQUANTIFIED COSTS AND BENEFITS**
- Costs**
- Landfill disposal of old toilets.
 - Energy and water consumed to manufacture new toilets.
- Benefits**
- Financial savings on sewer bills for participants.
 - Avoided cost of acquisition and distribution of water saved.
 - Environmental benefits of reduced water use.
 - Increased public awareness about water conservation.
 - Increased customer satisfaction with the utility.
 - Reinforces need to conserve water and desirability of conserving.
 - Water saved for future municipal use.



Flagstaff Water Utility Toilet Rebate Program

2001

Results of Cost Benefit Analysis-Lifespan (20 Years)

| | UTILITY | PARTICIPANT | OVERALL |
|---|------------------|------------------|------------------|
| <u>Present Value Costs</u> | | | |
| Costs to Utility | 8,430 | NA | 8,430 |
| Costs to Participants | NA | 19,250 | 19,250 |
| Costs to Others | NA | NA | 0 |
| Total Costs | \$8,430 | \$19,250 | \$27,680 |
| <u>Present Value Benefits</u> | | | |
| Total Water Savings | 30.36 AF | 30.36 AF | 30.36 AF |
| Benefits to Utility | 0 | NA | 0 |
| Benefits to Participants | NA | 24,486 | 24,486 |
| Benefits to Others | NA | NA | 0 |
| Total Benefits | \$0 | \$24,486 | \$24,486 |
| <u>Cost Benefit Calculations</u> | | | |
| Net Present Value (NPV) (Total Benefits - Total Costs) | -\$8,430 | \$5,236 | -\$3,194 |
| Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings) | \$278 /AF | \$634 /AF | \$912 /AF |

ALL YEARS

Results of Cost Benefit Analysis-Lifespan (20 Years)

| | UTILITY | PARTICIPANT | OVERALL |
|---|------------------|------------------|------------------|
| <u>Present Value Costs</u> | | | |
| Costs to Utility | 15,995 | NA | 15,995 |
| Costs to Customers | NA | 36,814 | 36,814 |
| Costs to Others | NA | NA | 0 |
| Total Costs | \$15,995 | \$36,814 | \$52,808 |
| <u>Present Value Benefits</u> | | | |
| Total Water Savings | 54.45 AF | 54.45 AF | 54.45 AF |
| Benefits to Utility | 0 | NA | 0 |
| Benefits to Customers | NA | 49,581 | 49,581 |
| Benefits to Others | NA | NA | 0 |
| Total Benefits | \$0 | \$49,581 | \$49,581 |
| <u>Cost Benefit Calculations</u> | | | |
| Net Present Value (NPV) (Total Benefits - Total Costs) | -\$15,995 | \$12,768 | -\$3,227 |
| Cost Effectiveness Analysis (CEA) (Total Costs ÷ Total Water Savings) | \$294 /AF | \$676 /AF | \$970 /AF |

