

Installing Low-Flow Showerheads

Submitted to:
Southwest Florida Water Management District

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Background

Water is one of the world's most precious resources. Without it, we couldn't drink, bathe, wash our clothes or grow food. Without it, we would cease to be. It is projected that by 2025, 30 countries will fall below the 1,000 m³ minimum needed per person for agriculture, drinking, washing clothes and bathing.¹ Significant water shortages are already affecting several U.S. states, including Texas, Louisiana, Alabama, Georgia, Minnesota, South Dakota, Montana and Arizona.² Much of the central U.S. and Florida are also experiencing abnormally dry or moderate drought conditions.³

Daily showering is a ritual that many of us take for granted. Showering is one of the largest contributors to overall water use in a home⁴ and can account for up to 25% of a household's overall energy costs, depending on use.⁵ Showering has been estimated to account for 22% of individual water use in North America.⁶ The nuclear family will spend up to \$400 annually for water, wastewater and electricity to heat the water.⁷ That same family could cut their shower-related costs in half by simply replacing their current showerheads with low-flow substitutes.⁸ Regular showerheads use approximately 4–6 gallons of water per minute, while low-flow showerheads generally expel 2–3 gallons of water per minute — nearly a 50% reduction.⁹

If each member of a four-person family showered 10 minutes daily with a conventional showerhead dispensing 4 gallons of water per minute, the family would consume a remarkable 58,400 gallons of water annually. Simply replacing the traditional showerhead with a low-flow showerhead could result in a savings of 29,200 gallons of water each year.

It is clear that installing low-flow showerheads is a worthwhile investment, both from an economic and an environmental perspective. However, not surprisingly for environmental psychologists, not everyone is rushing out to buy and install this energy and water-efficient product. This is due to the real and perceived barriers associated with this sustainable behavior.

Barriers and Benefits

The activity of switching from high- to low-flow showerheads can be broken down into two distinct behaviors. The first behavior involves obtaining the showerhead, while the second involves its installation.

The barriers to obtaining a showerhead include inconvenience, cost and knowledge.¹⁰ Not only is a trip to a hardware store to purchase a low-flow showerhead an inconvenience, but buying a showerhead also involves a small up-front cost. In addition, the homeowner may need to research their own water system and their families' personal showering preferences and match such factors to the right low-flow showerhead.¹¹ To overcome the barrier of cost, some municipalities offer free low-flow showerheads. It is worth noting that while a low-flow showerhead assists with

conserving water and can cut down on energy expenses, these advantages alone may not be sufficient for most people to invest their time and money into buying a new showerhead, even though the long-term savings outweigh the short-term costs. If the cost of water is low, the potential long-term monetary savings may be irrelevant to the individual in the short-term.¹² Therefore, low cost of water and low cost of heating water are potential barriers to installing low-flow showerheads, while high cost of water is a potential benefit to their purchase and installation.

Overcoming the barrier of a lack of knowledge will involve addressing ignorance regarding how much water a regular showerhead dispenses and the costs associated with heating this water, as well as which low-flow showerheads are worth purchasing. Initiatives that involve labeling high-efficiency showerheads, such as the U.S. EPA's WaterSense program or Australia's Water Labeling and Efficiency Scheme (WELS), assist consumers in purchasing efficient devices.¹³

The barriers to installing a low-flow showerhead include inconvenience and knowledge. Even after a showerhead has been obtained, it takes time to install the showerhead and the task may seem daunting to someone who lacks knowledge in this area. Free home retrofits, whereby a trained professional comes into one's home and makes the change, are nearly foolproof. However, many people are not interested in switching out their showerheads because of the perceived discomfort that is associated with low-flow replacements. Perceived discomfort of a low-flow showerhead is perhaps the most significant barrier to replacement¹⁴ and, in some cases, a genuine concern.¹⁵ When low-flow showerheads are installed in high-pressure water systems, the result can be an abrasive, dry spray.¹⁶ Lowering water pressure is a simple solution to counter this negative effect.¹⁷ In some cases, offering free retrofits to landlords who own several apartment buildings is a smart way to install many low-flow showerheads, quickly and easily.¹⁸

Benefits to switching from a higher flow to a lower flow showerhead include decreased costs related to heating water/water usage and conserving water.

Summaries of Programs

Educational campaigns promoting the benefits of low-flow showerheads abound, but informational-intensive campaigns are rarely effective at promoting behavior change.¹⁹ For example, Scott Geller, a pioneer in environmental psychology, evaluated the effectiveness of a workshop to promote residential energy conservation.²⁰ Based on questionnaires completed upon finishing the workshop, participants had greater awareness of energy issues, higher appreciation for what could be done in their homes to reduce energy consumption and were willing to make the workshop's advocated changes to their homes.²¹ However, follow-up visits to the 40 participants' homes revealed that only 8 of the 40, who were all given free low-flow showerheads, actually had installed them.²² Two people on the workshop waiting list, which acted as the control group, installed low-flow showerheads under their own volition, further suggesting that the workshop was quite ineffective at facilitating changes in behavior

that reduced energy and water use.²³ Similar studies have produced the same discouraging results, indicating that behavior is not as closely related to attitudes as was originally thought.²⁴ Municipalities waste hundreds of millions of dollars each year promoting water and energy conservation tips and methods that, based upon the research literature, have little likelihood of being acted on.

While there are hundreds of programs worldwide designed to encourage people to swap out their conventional showerheads for low-flow replacements, unfortunately, there are few assessments of such programs. However, based upon our knowledge of what barriers need to be overcome and what benefits need to be promoted, a general assessment of effectiveness can be made.

There are many web sites that offer helpful information regarding why low-flow is preferable, how to swap out your old showerhead for a new one, how to choose an appropriate showerhead and other related issues. These sites help overcome the barriers of a lack of knowledge of what to buy and how to install the device, but they are really only targeted at people who are interested in making the switch in the first place.

Do-it-Yourself Kits, Sydney Water, Australia

An improvement over solely educational efforts are programs that offer rebates or free low-flow showerheads and other bathroom water-saving devices.²⁵ One such voluntary in-home low-flow fixture program is carried out through Sydney Water, a New South Wales state-owned corporation, which runs Australia's largest urban water conservation program.²⁶ The corporation offers free Do-It-Yourself (DIY) kits to state residents.²⁷ The kits are advertised via their web site and by paper publications. The DIY kits come with aerators to install on kitchen and bathroom taps and flow aerators for showerheads.²⁸ To obtain a free kit, one must first contact Sydney Water and then wait for an application form to be sent via mail.²⁹ Residents then return the application form to participating postal offices in exchange for their free kit, which comes complete with detailed installation instructions.³⁰ If the consumer does not feel comfortable installing the devices themselves, Sydney Water offers WaterFix, a program in which a trained plumber will come into one's home and install all devices for a one-time payment of \$22, \$160 cheaper than what it would cost normally for the same service.³¹

Sydney Water reports that over 10,500 customers have already received DIY kits, contributing to a savings of 119 million liters annually.³² They also claim that since 1999 more than 300,000 homes have had water-saving devices installed, contributing to a savings of 6,200 million liters of water annually.³³ However, it is unknown how much the installation of shower flow regulators or low-flow showerheads contributes to these savings, as other devices were installed as well.

Seniors Helping Seniors, Phoenix, Arizona

In a review of the City of Phoenix programs conducted between 1990–1996, the “best bet” for conserving water was found to be raising the cost of water.³⁴ A 10% increase in pricing of water could save 409 gallons of water per household per month, up to 1 billion gallons per year citywide.³⁵ As mentioned in the barriers/benefits discussion portion of

this report, raising the price of water provides an additional incentive for people to install low-flow showerheads and other water-saving devices. If raising the price of water is not an option, the report suggests that the next best bet for total citywide savings is a citywide ordinance mandating water-saving devices for all new or replacement fixtures, and estimates a savings of 20 million gallons for the city of Phoenix annually. According to this review, the next best bet is a targeted retrofit program. The best of such Phoenix programs is “Seniors Helping Seniors,” in which senior citizens are trained to help other seniors, people at 125% of poverty level or below, and disabled persons retrofit their homes. The program resulted in a reported 108 gallon savings of water per year per household, with a total of 4,941 households retrofitted from 1989–1995.¹

While the “Seniors Helping Seniors” project was a good bet compared to other similar programs that did not target a specific portion of the population, the City of Phoenix report was not able to determine the cost of the program and, therefore, its cost/benefit is indeterminable. And again, like with the Sydney Water program, the retrofits went beyond showerhead replacement, which makes the effect on water consumption from low-flow showering devices unclear.

A Better Idea and Homeworks

Other home retrofit programs similar to “Seniors Helping Seniors” include “A Better Idea,” offered by the Los Angeles Department of Water and Power (DWP), and “Homeworks,” offered by United Illuminating of Connecticut (UIC).³⁶ Both programs used a primary contractor and nonprofit community agencies.³⁷ DWP would send a crew of installers and two canvassers to a neighborhood for the day. A van bearing the utility and program logos acted as a base camp for implementers, who corresponded through walkie-talkies. Canvassers went door-to-door to schedule appointments; installers were close by when called upon. If no one was home, canvassers left door hangers to encourage customers to call to schedule an appointment. Devices installed upon visits included low-flow showerheads, among other water-saving devices, as well as energy education. In 1993, DWP visited 76,960 homes and projected the savings to be 19.4 GWh and 1.3 MW annually. The participation in low-income areas was around 58%, significantly higher than the rate in higher-income areas, suggesting that free home retrofit programs ought to target lower income populations, just as was discovered in the Phoenix report.

Similarly, the “Homeworks” program operated in low-income neighborhoods between 1990 and 1995, until all 100,000 eligible customers in the target market received home retrofits. Initially, a letter was mailed to target neighborhoods seven to ten days prior to home visits. A few days prior, canvassers went door-to-door to schedule appointments and left door hangers. The utility offered installation of low-flow showerheads and faucet aerators, among other energy-saving services. “Homeworks” annual budget was \$534,550, and the program was estimated to save 2.1 GWh annually, for a levelized cost of \$0.032 per kWh of saved energy, indicating that the program was very cost-effective.

¹ This reported reduction of 108 gallons a year is almost certainly an error, but the authors have not been able to obtain the actual figure.

Water-Wise Home Retrofits, Delta, B.C.

The Corporation of Delta, based in Delta, BC, ran a water-wise home retrofit program in 1997.³⁸ The city's water-wise program included educational outreach and free voluntary in-home, low-flow fixtures and retrofits.³⁹ Their educational outreach included a series of seven ads designed to promote water conservation in Delta, which used a cartoon character named "Spout." The ads were printed in the Delta Page and Indo-Canadian papers. In addition, the Delta Recycling Society and the Water Conservation Team designed a four-minute promotional video of water conservation that aired on the local cable channel, DCTV, 15 times. They also held several community events to promote water-wise gardening and in-home water conservation tips by means of public displays. The Water-Wise Home Retrofit program conducted 260 home retrofits between July and August of 1997. After the first ad in the Delta Page, 100 residents called with interest. A retrofit involved the installation of one low-flow showerhead (\$7 CDN), one swivel aerator (\$4 CDN), one bathroom aerator (\$1 CDN) and one toilet pop flush (\$5 CDN). Seconds of all items were offered at the above-mentioned fees. Feedback on annual water savings resulting from the home retrofit were provided to each household to help make the benefits salient.⁴⁰

Retrofits were performed for approximately \$14 CDN per household, with a projected annual savings of 39,000 liters of water per household.⁴¹ Potential water savings were estimated at 10.4 million liters annually. While the program seemed to be successful in 1997, the Engineering Programs Coordinator of the Corporation of Delta has observed very little interest in their indoor water-saving kits in the past couple of months and may consider revamping the program.⁴²

Barrie Water Conservation Program⁴³

Barrie, Ontario, is one of the fastest growing communities in Canada with a current population of 115,000, which was expected to reach 185,000 by 2021. By 1994, Barrie's wastewater flows had reached nearly 80% of the wastewater system's capacity, and approximately \$24 million USD was planned to bolster surface water infrastructure to compensate for the expanding population. Construction was scheduled to start in 2000. If plans were followed through, the city would have spent over \$61 million USD in ten years from 1994–2004 on water and sewerage supply, an average of \$672 USD per resident. The Municipal Works Department conducted an environmental survey and found that if they implemented a water conservation strategy, infrastructure expansion could be postponed for 10–25 years and interest payments on borrowed capital could be avoided.

The program was designed around the replacement of standard flow toilets and showerheads with ultra-low-flow devices. To offset costs of installation, the city had contractors bid for installation rates and gave exclusive rights to the lowest tender. Homeowners were also given the option to replace the equipment themselves or to hire a plumber on their own, and a rebate program was developed to help offset the cost of purchasing the products for homeowners. Low-flow toilet rebates were offered at \$130 USD and showerhead rebates at \$7.17 USD.

To promote the program, Barrie used various mass media techniques including newspaper advertisements, displays at home shows and shopping malls, and water bill inserts posted to consumers. As well, two nonprofit organizations, the Green Community Initiative and Environmental Action Barrie, promoted the program. The promotional material explained the different models of ultra-low-flow toilets, showerheads and aerators available and asked residents to contact the city for more information about joining the program. The material also warned residents that if a sufficient amount of water were not saved through this initiative, the city would be faced with expensive additions to the water pollution control plant and possibly the construction of an additional water treatment center, which could raise water utility rates. Residents who inquired about the program were sent information kits, which included a list of eligible water-saving devices, the program's guidelines and a list of plumbing contractors. Residents paid \$47.57 USD for one toilet replacement, or \$76.28 for two. There is no indication of how much a resident paid for the installation of low-flow showerheads.

The homeowner paid on average \$47.57 USD, the cost of installation for the program. The average yearly payback was \$49.38 USD. Therefore, the cost for residents to change their current devices for low-flow replacements was offset in one year, with expected yearly savings thereafter of approximately \$49 USD. Also, residents did not suffer from any rate increases, as enough water was saved to avoid expensive additions to the water pollution control plant and the construction of a new water treatment center. By February of 1999, a total of 11,500 households had joined the program, with an average of 1.4 toilets and 1.6 showerheads installed per household. This equates to a total overall water savings of 470,886 gallons per day for all households combined. From 1995 to 1999, a total of \$3.3 million USD was spent assisting the 11,500 households. Sixty-two percent of the costs (\$2,069,783 USD) went toward fixtures and rebates for the toilets and showerheads. The remainder of the \$3.3 million USD was divided between program administration and delivery costs, which included program evaluation (22%) and homeowner costs associated with installation (16%). The total cost per household to run the program was about \$290 USD. Government agencies, mainly the city, the Ontario Clean Water Agency and the Ministry of the Environment paid about \$242 USD of this amount, and households were responsible for the remaining \$48 USD.

This program was deemed cost-effective, considering the millions of dollars that were saved from avoided infrastructure expansion costs. The projected costs associated with wastewater flow increases were \$19.6 million USD, and the program cost \$3.3 million USD, a deferral of approximately \$16.3 M USD. The projected cost for construction of new water infrastructure was \$24 million USD and was also deferred for seven years. In addition, the Ontario Clean Water Agency estimated that 825 more jobs were created through the labor-intensive water conservation program than would have been created through the infrastructure program.

Resource Conservation in Ashland, Oregon⁴⁴

Ashland, Oregon, has delivered effective energy efficiency, air quality, composting and recycling programs in addition to its water conservation initiative. In fact, the latter four programs were based on the energy efficiency program model, which was initiated in 1982.

In 1992, the water conservation project was developed. Residents of Ashland were offered free water audits, which included leak detection, and examination of toilets and showerheads. The audits were conducted by the city's trained water analyst and lasted from 30 minutes to an 1 ½ hours per household. Also as part of the program, Ashland offered free showerhead replacement and rebates for toilet replacement and changed their water rates to an inverted block structure, in which rates increased with higher usage.

The program was marketed through inserts in electricity bills, which were simple enough for people to read whilst providing enough basic information about the program and the savings to entice residents to phone the city for more information. Other advertising methods included ads in the home improvement section of the local newspaper, ads placed during local interest radio broadcasts, presentations to local groups and videos that were aired on community access television. Ashland concludes that the most effective mode of advertisement was by word-of-mouth, or social diffusion, whereby residents who were satisfied with the financial savings from the programs would spread the word to their friends and neighbors. There was no formal attempt at promoting social diffusion, but program coordinators believe it was an integral part of advertising the program.

Daily water savings were estimated at 290,000 gallons, 200,000 gallons short of their goal, but still resulted in delaying the construction of increased water supply until 2021. The program also resulted in a 514 MWh annual savings from reduced water heating and 43 million gallons of wastewater were reduced per year. The showerhead and faucet aerator portion of the program cost \$15,896 USD, and approximately 800 showerheads were installed by the end of 1994. This would equate to a program cost of approximately \$20 USD per household, with an annual savings of 362 gallons of water per household annually. This program is quite cost-effective, especially when compared to the alternative — millions of dollars for increasing water supplies through infrastructure change.

Low-Flow Showerhead Pilot

The most effective programs involve directly installing low-flow showerheads. These programs are successful as they simultaneously target the barriers to acquisition and installation of these showerheads. Similar to the Los Angeles Department of Water and Power and the United Illuminating of Connecticut initiatives, it is suggested that municipalities hire contractors and nonprofit agencies to install low-flow showerheads and other water-saving devices in homes.

As noted previously, these initiatives made use of canvassers who went door-to-door explaining the program to residents and scheduling appointments with installers who were working close by. The vans that carried the utility and program logos would help to both legitimize the program and create community awareness that it was occurring. Since these programs have already been found to not only be cost-effective and have high participation rates, it is suggested that they be used as the basis for this pilot strategy. The comments below are meant to provide suggestion on how these already successful programs might be improved upon.

Soliciting Participation: Beyond explaining the importance of reducing water consumption to the resident, it is important to focus on the money lost as a result of inaction rather than savings that accrue from acting. People are generally more motivated to avoid a loss of money than they are to save the same amount of money.⁴⁵ In addition, providing normative information by noting the percentage of households who have installed the devices along with personal anecdotes of other residents can be used to enhance the perceived social appropriateness of the activity.

Social Diffusion: When a household decides to install a low-flow showerhead or other water-efficient devices, their actions are invisible to the large community. As a consequence of this invisibility, the installation of these devices has little opportunity to promote others engaging in this action. It is recommended, therefore, that homeowners be asked if a sticker could be placed on the side of their recycling container indicating that they have reduced their water use by installing water-saving devices in their home. Residents should not be asked to install the sticker themselves, but rather simply for permission to have the sticker placed on their recycling container the next time it is put out. Past programs have shown that having the stickers affixed by the contractors on set-out dates will dramatically increase the number of recycling containers with stickers over what would occur if the residents placed the stickers themselves.

Expanding Reach: If the installation of low-flow showerheads and other water-efficient devices cannot be done for free, it is suggested that homeowners be provided with the opportunity to pay for their installation out of their water and, perhaps, their energy savings. Manitoba Hydro has initiated a program where residents have the opportunity to pay for the cost of home retrofits through the actual savings that accrue from the installation. This approach allows a household to benefit immediately from obtaining the cost-saving device while not having to cover its up-front costs. The cost for the

installation and the devices themselves are simply paid for out of the cost savings to the household. Once these costs have been covered, the households' utility bills are reduced accordingly. This permutation provides two advantages. First, it allows communities who cannot afford to front the costs of a free installation program to nonetheless offer the service. Second, it allows more costly renovations, such as the installation of low-flow toilets, to be included in a program.

Providing Feedback: Given the low cost of water, it will be important to provide feedback to households on the amount of water they personally saved, as well as the amount of water the community saved by installing low-flow showerheads. Bill stuffers can be placed in utility bills, but bill stuffers are rarely read. It would be more effective to place what appears to be a handwritten note in red ink directly over the top of the bill indicating the annual water and energy savings for them personally and for the larger community.

Strategy 1: The first strategy involves providing no-cost installation of low-flow showerheads and aerators as done by the Los Angeles Department of Water and Power and the United Illuminating of Connecticut.

Strategy 2: The second strategy is identical to the first, except that the methods set out above regarding soliciting participation, social diffusion and feedback are added to the second strategy.

Variant Strategy: For communities who cannot afford to pay for the installation of the low-flow showerheads, an additional strategy would involve having the costs of the device and the installation deducted from residents' water and/or energy bills.

Pilot Evaluation

The effectiveness of the two strategies is evaluated by randomly assigning two neighborhoods into either Strategy 1 or 2. Since Strategy 2 involves social diffusion, these neighborhoods need to be geographically distant from one another, such as different communities of a city. In total, it is suggested that 100 contiguous homes be selected for each strategy. Past water and energy data for two years prior to the introduction of the strategies would be compared to the same data following the introduction of the strategies with seasonal variations in temperature partialled out. It is suggested that water and energy data for a minimum of two years should be examined following the introduction of the strategies. Further, the percentage of homes agreeing to participate in the two strategies should also be assessed.

Endnotes

- ¹ McKenzie-Mohr, D. (2005).
- ² Heddinghaus, T. (2006). US Drought Monitor. *Climate Prediction Center. August 29*. Online, internet: <http://nm.water.usgs.gov/drought/index.html>
- ³ Ibid.
- ⁴ BC Hydro, 2006. *Power smart tips and products*. Online, Internet: <http://www.bchydro.com/powersmart/elibrary/elibrary699.html>
- ⁵ Ibid.
- ⁶ Earth Easy, 2006. *Low-flow aerators*. Online, Internet: http://www.eartheasy.com/live_lowflow_aerators.htm
- ⁷ Peart, V. 2001. The conservation balancing act: Part II in the bathroom. Online, Internet: http://edis.ifas.ufl.edu/FY138#TABLE_1. University of Florida, FIS Extension.
- ⁸ Ibid.
- ⁹ BC Hydro, 2006; Peart, 2001.
- ¹⁰ McKenzie-Mohr & Smith, 1999
- ¹¹ Stanton, pers. comm., 2006
- ¹² Patterson, 2004
- ¹³ Ibid
- ¹⁴ Mecca, Ecotech Water, pers. comm., 2006
- ¹⁵ Patterson, 2004
- ¹⁶ Ibid.
- ¹⁷ Ibid.
- ¹⁸ Ibid.
- ¹⁹ McKenzie-Mohr & Smith, 1999
- ²⁰ Geller, 1981; cited in McKenzie-Mohr & Smith, 1999
- ²¹ Ibid.
- ²² McKenzie-Mohr & Smith, 1999
- ²³ Ibid.
- ²⁴ Winter, 2000; McKenzie-Mohr & Smith, 1999; Schultz, 1998; Schultz, Oskamp & Mainieri, 1995
- ²⁵ Examples of such programs:
Public Works Incentive Program
Visit: http://www.cityofprescott.net/_d/conservation_app.pdf;
Council's Showerhead Exchange Program
Visit: http://www.wsc.nsw.gov.au/files/2360/File/Showerhead_Exchange_Program.pdf;
City of San Luis Obispo Utilities Free Showerhead Program
Visit: <http://www.ci.san-luis-obispo.ca.us/utilities/conservation.asp#Showerhead>;
NSW Light Globe (and Showerhead) Replacement Program
Visit: <http://www.originenergy.com.au/home/template.php?pageid=1605>;
San Antonio Water System Reduce Your Overhead
Visit: http://www.saws.org/conservation/how_you_can_help/showerhead.shtml
Charlotte-Mecklenburg Utilities Showerhead Swap
Visit: <http://www.charmeck.org/Departments/Utilities/WaterSmart/home.htm>
- ²¹ Sydney Water, 2004
- ²² Sydney Water, 2006
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ Ibid.
- ²⁶ Ibid.
- ²⁷ Ibid.
- ²⁸ Ibid.
- ²⁹ Campbell, 1999
- ³⁰ Ibid.

³¹ SWEEP, 2005

³² Ibid.

³³ Government of Canada web site

³⁹ Ibid.

⁴⁰ Ministry of Environment.

⁴¹ Ibid.

⁴² Lukowska, E. (2006). Personal Communication. Program Contacts: **Delta Municipal Hall**, 4500 Clarence Taylor Crescent, Delta, BC Canada V4K 3E2 (Tel): (604) 946-4141 (E-mail) webmaster@corp.delta.bc.ca

⁴³ Reilly, D. (2004). Barrie water conservation program. Tools of Change Web site, Kassirer, J. <http://www.toolsofchange.com/English/firstsplit.asp> Program Contacts: Green Industry Office, 135 St. Clair Avenue West, 5th Floor, Toronto, ON M4V 1P5. (Phone) (416) 314-7898, (Fax) (416) 314-7919, (Email) defoebr@ene.gov.on.ca. Barry Thompson, City of Barrie. 70 Collier St Box 400, Barrie, ON L4M 4T5, (Phone) (705) 739-4220 ext 4557, (Fax) (705) 739-4247, (Email) BaThompson@city.barrie.on.ca.

⁴⁴ Lealess, S. (Undated). Resource conservation in Ashland, Oregon. Tools of Change, Jay Kassirer. <http://www.toolsofchange.com/English/firstsplit.asp> Program Contact: Dick Wanderscheid, Director of Administrative Services. Department of Community Development, City of Ashland, 20 East Main St., Ashland, OR 97520. (Phone) (541) 552-2061, (Fax) (541) 488-5311, (Email) wandersd@ashland.or.us OR www.ashland.or.us.

⁴⁵ McKenzie-Mohr & Smith, 1999