A Salt-free Alternative to Residential Water Softeners: Market Research Study (2019)

For Regional Municipality of Waterloo and City of Guelph

Final Report

A Longitudinal Research Study with residents of Waterloo Region and the City of Guelph about water softeners and water conditioners including in-home trial.

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Acknowledgement

The project team wishes to acknowledge the efforts and the spirit of our study participants, and the lengths they went to. There was one family who felt they had to drop out of the study not long after the installation of the unit.

The other seventeen families participated in all phases of the study and engaged with each other online to talk about how they were adapting to the different technology. Four households in Guelph chose not to keep the water conditioner at the end of the study, but we thank them for sticking with the process to the very end.

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A. Introduction

The Region of Waterloo and City of Guelph in Ontario, Canada are neighbouring communities with a total population of about 750,000 people living in 270,000 households. These communities rely mostly on groundwater for their drinking water supplies. Because of the minerals contained in groundwater, water customers in these municipalities receive very "hard water". These minerals can cause scaling of water using fixtures and appliances, and are often attributed as posing an aesthetic difference in dishwashing and showering. More than 70% of households in these municipalities rely on water softeners to condition hard water, by using salt. These softeners waste 1.9 billion litres of backwash water and discharge 25,000 tonnes of salt in wastewater per year.[1]

Since 2009, the municipalities have jointly funded local performance testing of cation exchange softening systems to better understand how they work and how much water and salt they consume. They also launched a joint web site, Water Softener Facts to educate the public.

In 2014, the municipalities tested a new technology that treats hard water without needing backwash water and salt. This new technology, which employs template-assisted or nucleation-assisted crystallization (NAC/TAC), has shown promise as an alternative to cation exchange softening.

The partners hired Metroline Research Group Inc. to conduct a water conditioner market study with residents to:

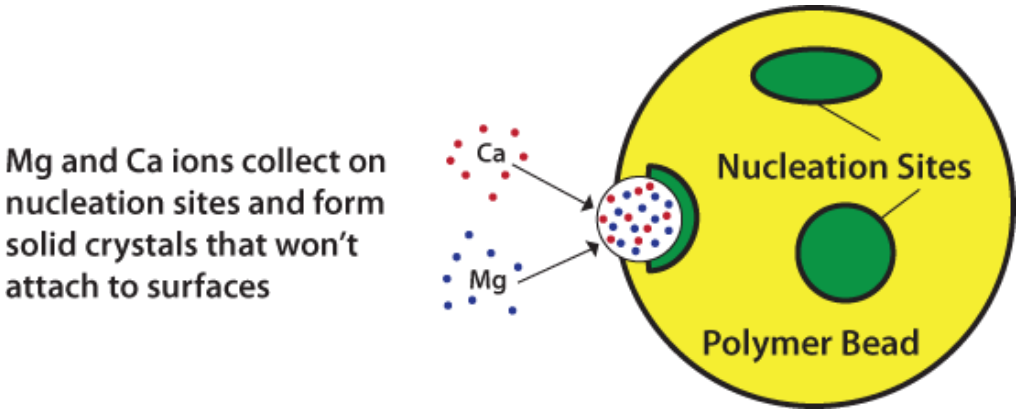
- Understand homeowner perceptions and attitudes towards NAC/TAC technology after using them for 12 months.
- Gather information about real-world performance of NAC/TAC units under normal conditions.
- Compare salt and water consumption with study homes before and after NAC/TAC units were installed.
- Evaluate and recommend policies, goals and tactics to achieve market transformation away from salt-based softeners to more environmentally friendly alternatives.

1 Environmental Impact Study of Residential Water Softeners for the City of Guelph and Region of Waterloo, Stantec Consulting Ltd., December 21, 2016

A1.Description of Media Induced Crystallization

The NAC/TAC units use polymeric beads with nucleation sites to convert dissolved hardness into microscopic crystals. These crystals are then released by the beads (or "media") and remain as insoluble particles that will not form scale on surfaces. No salt, water, or energy is required. Figure 1 below illustrates the crystallization process.[2]

Figure 1 - Nucleation Assisted Crystallization/Template Assisted Crystallization



A recent study published by the U.S. Water Reuse Research Foundation (WRF) concluded that NAC/TAC may be an effective alternative to traditional ion exchange water softening technology. This study showed that NAC/TAC reduced scale buildup on water heater elements by over 90 per cent, matching the effectiveness of salt-based water softeners. The NAC/TAC units needed no salt or water to operate.[3]

The treatment process these units employ has been referred to as:

- NAC – Nucleation Assisted Crystallization
- TAC – Template Assisted Crystallization
- MIC – Media Induced Crystallization
- MIP -- Media Induced Precipitation

All the names above refer to the same crystallization process that binds calcium and magnesium together. For the purposes of this study, we've used NAC/TAC when referring to these water treatment systems.

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2 See Water Softener Facts

3 Evaluation of Alternatives to Domestic Ion Exchange Water Softeners, Water Reuse Foundation, 2014

B. Detailed Work Plan

Here is the detailed work plan devised and followed for this study. Primarily the study was completed on task and on time.

Design	•Kick-off meeting •Survey design/methodology
Phone Survey	•Benchmark numbers •Study participant identification
Focus Groups	•More in-depth conversation about water •Refine participant list
Legal/Vetting	•Home visits, final participant list •Participant waiver, project instructions
Technical Memo #1	•Final approved methodology, participant details •Survey & focus group results, including presentation
Installation	•Metroline secures units, organizes process •Licensed plumber to install
Monitoring (A)	•Ongoing discussion via discussion forum
Monitoring (B)	•Continue to engage online via discussion forum •Focus group after 12 months
Technical Memo #2	•Review final focus group learning •Final steps
End of Field Test	•Possible removal of units and restoration of softener •Testing of identified units
Analysis	•Bring together findings from all parts of study •Report writing
Final Project Report	•Executive summary, study results •Observations & recommendations, presentation

C. The Community

Hard water is a fact of life in Waterloo Region and the City of Guelph, with hardness ranging from 17 – 38 grains per U.S. gallon (291 – 649 mg/L), which is considered "very hard." Those who were born here and grew up here have accepted it or are adjusted to it. Those who move here from elsewhere have to do their own adjusting, and there are often comments about the taste, the smell, and the need for extra soap and shampoo.

To combat that, over 70 per cent of households (over 80 per cent of single family homes) have ion-exchange water softeners installed. As a result, a lot of water is used in backwash to regenerate the softener, and tonnes of salt are deposited into the wastewater stream, making its way to local surface water bodies. Due to cost and complexity, local municipalities do not remove sodium from the wastewater stream.

One of the biggest lessons learned from this project is how little homeowners think about the amount of wasted water and quantity of salt put into the water system because of water softeners. When study participants were interviewed for a final time at the end of the study, this was the 'lightbulb' moment of their participation.

> "I didn't ever really think about where the salt goes…as stupid as that sounds. It's made a big difference because now I'm aware of how much salt I am no longer putting into the environment…"

This process was designed to narrow down the two communities to find households that would be open to trying the NAC/TAC technology. With very little information, they agreed to allow us into their lives for a year and put the test unit into their home.

The test participants in essence were not chosen at random. While the households that participated in the initial telephone survey were randomly selected, the households who participated in this test were selected based on a number of criteria.

Some selection factors were obvious, such as already having an ion-exchange water softener, fixtures and appliances in good working order, and no impending major life changes planned, such as moving homes or installing a pool. Conversations with participants, visits to their homes, and simple water testing established bona fides in these areas.

Other selection factors were just as important, to find households that would be open and engaged throughout the test. These were more subjective in nature:

- have an average to slightly above average level of concern about the environment
- have some interest in taking an active role to help their community
- being open to new ideas

After that, the study needed to cover a good cross-section of family types, from young families to empty nesters.

C1. Participant Selection Process

The project began with a random telephone survey of over 1,000 homes across Waterloo Region and the City of Guelph. In addition, 218 residents completed a similar survey online through social media or website links. The survey identified potential households through qualifying questions, but also asked questions related to perceptions and attitudes towards water softeners, their use, and the way they affect our environment. The baseline data presented in this report will inform future communications plans by identifying barriers or objections, plus measuring awareness and concerns about alternative technologies. The full results of the telephone survey can be found in Appendix 1.

Analysis of the data from the telephone survey and online survey was carried out to look for households to add to the list for the focus group stage. Some of the criteria included:

- an interest and opt-in to receive further contact about the study
- owner of a single family home in Waterloo Region or City of Guelph
- living in a household of 2-5 people
- has a working water softener 10 years old or less
- has a dishwasher and washing machine less than 15 years old
- doesn't have an in-ground swimming pool, hot tub, or in-ground irrigation system
- attitudinally or behaviourally, was positively pre-disposed with at least some concern towards the environment

A short listed group of about thirty (30) households per community who indicated interest in the test, and met the basic qualifications, was selected for further conversation. Twenty-eight (28) residents were subsequently invited to participate in one of four focus groups to discuss their perceptions, attitudes and interest in participating further. Twenty-six (26) attended on the day of the groups and were part of the discussion. The results of these exploratory focus groups can be found in Section 2.0 of this report.

After the focus groups, the Metroline project team conducted home visits to validate the learning and observe the water softener, appliances, and general condition of each property. Eighteen (18) households were selected from the group to participate in the study. Nine study homes were selected in Guelph and nine homes in Waterloo Region.

The test units were installed by professional plumbers into the eighteen homes in late November, early December of 2017. For the most part, homeowners chose to leave their existing ion exchange water softener in place so they could resume

using it after the test if they wished, and they were reminded about every 60 days to flush the standing water out of that system during the course of the test.

Throughout the test, Metroline was in contact with homeowners using a private discussion forum. This forum was used to get feedback from participants, ask and answer questions, and allowed the test participants to organically discuss the project and any challenges or success stories among themselves.

At the end of the test, a short survey was distributed to residents to get their individual opinions and to provide some direction for the final focus group discussion guide. The focus groups were conducted in January, 2019 – one night in Waterloo Region, and one night in Guelph.

The residents who took part in this test did so in part as a way to benefit their community, to help the environment, and out of an interest in the new technology. As an added benefit to them, residents were able to keep their test unit at no cost at the end of the study, and they were compensated for their time financially for participating in the focus groups and the online discussion forum during the test.

C2. Participant Profile

The residents who were finally selected to participate in this study steadily expressed interest throughout the process, many doing some of their own research outside the confines of the study, to find out more about the technology and the topic.

The study looked for a cross-section of demographics and household composition, however, as the participant list was narrowed down, all these residents were seen to have some sense of pride in their community, and a desire to make it a better place.

All participants lived in single family homes, and lived in households of two to five people. Children represented different age groups from infant to post-secondary student up to young adult.

While most of the houses in the study were at least 10 years old, they represented a broad cross-section up to 150 years old. Study homes had all copper piping, all pex piping, or some combination/retro-fit of both.

Table 1 - Property Descriptions

Community	Age of Home (Est.)	How long owned	Type of Plumbing	HH size	Adults	Full baths	1/2 baths
Cambridge	20	5	Copper/Pex	4	2	2	0
Cambridge	150	17	Copper/Pex	4	2	2	0
Cambridge	45	3	Copper/Pex	5	2	2	1
Kitchener	20	4	Copper	4	2	2	2
Kitchener	27	15	Copper	4	2	2	1
Kitchener	100	4	Copper/Pex	5	2	2	1
Waterloo	30	3	Copper/Pex	3	2	2	1
Waterloo	125	3	Copper	2	2	3	0
Waterloo	50	4	Copper	2	2	1	1
Guelph	12	12	Pex	4	3	2	2
Guelph	50	17	Copper	2	2	1	0
Guelph	45	25	Copper	4	4	2	0
Guelph	22	22	Copper	4	4	3	1
Guelph	37	22	Copper	2	2	2	1
Guelph	20	7	Copper/Pex	4	2	2	1
Guelph	12	12	Copper	5	5	2	1
Guelph	50	5	Mostly Pex	4	2	2	1
Guelph	3	3	Pex	4	2	2	1

As part of the study, Flowie water meter sensors (by Alert Labs) were installed in test homes. Water use results were tracked for 13-14 months. Results were uploaded using built-in cellular modems. They worked well except for one property where, even with an antenna extension, were unable to get a consistent connection throughout the test.

More detailed participant profiles, including water use details for most homes, can be found in Appendix 1.

D. Summary of Results

In the end, thirteen of the eighteen homes in this study decided to keep their NAC/TAC unit and continue to use it. Eight of nine homes in Waterloo Region retained their unit (one dropped out early in the process), and five of nine homes in Guelph (all completed the study) kept their units.

While conducting analysis, a large number of factors were reviewed in order to try and identify any patterns or similarities among the study participants who did not keep their water conditioner unit at the end of the test.

This included looking at household composition, age of home, type of plumbing, various fixtures, average water use, behavioural patterns, and so on. No consistent themes could be identified.

These three factors were identified by those who did not keep their unit:

- Poor perceived performance from the TAC/NAC unit, or that it does not do a good enough job treating or conditioning the water.
- Differences of opinions between the participant who signed up for the study and other members of their household. This may be related to their concern for the environment.
- Homeowners who have a lot of chrome and glass, and felt they were not willing to take on any extra cleaning or film/residue that the water conditioner left behind, regardless of how easy or difficult it was to wipe up/off.

The biggest benefits to switching to a TAC/NAC unit were seen to be:

- No longer having to buy salt, bring it home or having it delivered, and/or remembering to load it into their ion-exchange softener.
- saving money (less water, less electricity, no maintenance on the machine)
- Reducing environmental impact.
- Ability to drink the water from all taps in the home without concern for salt content.
- Reduced or cleaned out calcium build up in the pipes of the home.

> "We were getting banging in the pipes when showering, so I descaled the shower head and that seemed to fix the problem. I'm happy about that. We never softened our cold water previously so we may have had scale build up in the pipes..."

Figure 2 - Calcium residue left on driveway and sidewalk when using outside tap

The biggest perceived drawbacks to a TAC/NAC unit were seen to be:

- Dishwasher not cleaning properly or leaving a film/residue/staining on the dishes and cutlery.
- No indication that the system is working.
- No indication that the media needs to be replaced.
- It is not mainstream technology, so it could be a complication to those selling their homes.

About two-thirds of the participants say that participating in this test has changed the way they think about water use:

"Awareness of impact of salt use with softeners has inspired dialogue with friends & family which has created interest in finding alternative water conditioning systems for their households…"

"There are several things that we are doing to hurt the environment. Using salt to soften our water is one of those things. However, consumers are fickle and if they do not see benefit without inconvenience, those solutions will not be adopted…"

Households that are keeping their TAC/NAC units:

- Don't see many barriers, or find them minor enough that they have adapted to them over the course of the test.
- Feel a sense of pride about helping the environment.
- Appreciate the convenience associated with no salt, no maintenance.
- In some cases could become, or have become, ambassadors for the technology.

Those that asked for the TAC/NAC unit to be removed:

- Could not get past the major barrier (perceived or real) which related to their dishwasher, or the film/residue it left on countertops and showers.
- Had some conflict within the household about the trade-off between benefits and barriers.
- Felt they were making too much of a sacrifice in performance and lifestyle over their ion-exchange softener, and that there one household would not impact the environment in any significant way.

E. Conclusions/Recommendations

Residents expressed a variety of reactions to the use of a NAC/TAC unit throughout the course of the study, but can be segmented into three groups:

The first group (3 out of 17, or 18%) have become ambassadors for the product and the test. They do not notice any significant differences in their lifestyle, and are very happy they are doing something to help the environment.

The largest group (10 out of 17, or 42%) did find the NAC/TAC technology necessitated more wiping up and cleaning, and perhaps a need for more soap/shampoo, and definitely a lot more vinegar for cleaning and rinsing. However, the adjustments and effort required do not rise to the level that they want to stop using the NAC/TAC water conditioner and the associated environmental benefits (or the reduced amount of effort and maintenance compared to their water softener).

The last group (4 out of 17, or 24%) asked for the units to be removed at the end of the test. For these residents, the downsides for them outweighed the benefits. They did not like the film/staining on marble countertops, glass shower doors, and were frustrated that their dishwasher no longer cleaned properly.

There was a gap between residents of Guelph and of Waterloo Region in terms of who retained and who removed the test unit. Our analysis did not uncover any underlying consistent themes based on geography, household size, age of home, etc.

Recommendation: In our debrief following the final focus groups, we recommended lab testing the media on some of the units to see if there are any insights to be gained from that. We have gathered the media from four units, and provided them to the Region of Waterloo for further testing. Two of the samples (one from each community) were drawn from households who were from our "ambassadors" segment above, who retained their units after the test. The other two samples (one from each community), came from those who asked us to remove their units after the test.

Test participants felt that the government should offer a rebate to encourage homeowners to purchase a unit when considering a new or replacement product in the future. The rebate amount would be something that brings the price of a NAC/TAC unit into the range of an average ion-exchange water softener (with a presumed price of approximately $1,000).

Recommendation: While it is unlikely that the Region of Waterloo or City of Guelph will be endorsing the technology or a specific model of NAC/TAC technology, it may be worth considering offering a rebate as a 'passive' way to encourage residents who are doing their research. In the final focus groups, residents indicated they think the rebate should be enough to bring the cost of NAC/TAC technology in line with ion-exchange softeners.

Over and above offering rebates, the test participants overwhelmingly agree that there is a role for the government to play related to water softening or conditioning technology:

Educating residents about water softeners/conditioners generally, including alternatives to ion-exchange softeners, and how to understand the pros and cons of each investing in testing and research to help find alternative solutions

While the results of this study, with 13 of 18 households keeping their unit, were not enough for an "endorsement" or "recommendation" in any form, it does indicate some interest in the product for the future. This test has created a lot of understanding around NAC/TAC technology use in Waterloo Region and Guelph.

Recommendation: Keep and enhance watersoftenerfacts.ca. This is a useful tool for all residents and seems somewhat unique on the Internet, in that it provides unbiased education and information, and is not produced by a manufacturer or retailer of these water softener/conditioner products.

Recommendation: Create a section on watersoftenerfacts.ca to share the learning from this study, and some initial best practices based on the results:

- How the units performed
- What are the biggest benefits as noted by participants
- What are possible drawbacks as noted by participants
- Top things to know or consider before installing a NAC/TAC unit
- Ways to tell if the NAC/TAC technology is working

In the future, it will be important that potential buyers of a TAC/NAC unit are provided with information about what to expect after installation. This is likely the primary responsibility of the vendor or manufacturer, but the government can play a supporting role by posting information about the experience in a local context.

Detailed Findings

1.0 Initial telephone survey

The detailed findings from the telephone survey can be found in Appendix 2, and the survey itself can be found in Appendix 3a.

1.1 Attitudes Towards Water and The Environment

- Top environmental issues in their community - Overall, urban sprawl/population growth was mentioned most often, at 33%. This was significantly more prevalent in Guelph (44%), ranking first, compared to Waterloo Region (21%), where this ranked fifth. Energy costs (30%) and concerns about air quality/pollution (28%) were mentioned second and third most often. After that, concerns about water quality (27%) and water levels/availability (22%) were mentioned fourth and fifth overall.
- 86% of residents in both communities recognize and strongly agree (scored 5 out of 5) that "we all have a responsibility to protect the environment". Similarly, for two statements worded in a negative fashion 84% of residents **disagree** that "it's not worth doing things to help the environment if others don't do the same", and 76% of residents **disagree** that their "behaviour and lifestyle does not contribute to climate change".
- Most residents (89%) feel that being environmentally friendly is at least "somewhat" important for their lifestyle.
- 41% of residents overall had done some activity, without pay, in the last 12 months to help the environment. Almost two-thirds (63%) of residents say their activity was something they did on their own, not organized through a group.
- 1 in 5 of those who did some activity (20%) did so through an environmental or citizen action group. This was more likely to happen in Guelph (26%) than in Waterloo Region (13%).
- 28% partook in a volunteer activity through a social group or sports team. Those who qualified for further participation in the study and were interested in finding out more were significantly more likely to mention partaking in a volunteer activity (33%) compared to those who qualified and were **not** interested in participating (19%).
- Residents rate the importance of water conservation in their household fairly high. Overall the average score was 7.8 out of 10. 35% of residents rate it "very" important (scoring 9 or 10). Only about 1 in 10 residents (11%) say that water conservation is **not** important to their household (scored 1-5).
- Asked how they are conserving water, watering the lawn/garden less often was mentioned most often by residents, indeed almost half (47%) of all those interviewed indicate they are watering their lawn/garden less often than they used to.
- A close second was having low-flow toilets in their home, at 46%.

1.2 Water Use Fixtures/Appliances

- Residents were read a list of fixtures or appliances that use water, and asked if they have/use one for their household.
- Salt-based water softeners were mentioned most often, with 84% telling us they have one in their home.
- One-third of households that do **not** have a softener told us they aren't sure why they need one. A further 15% said they don't want or need one.
- Almost, but not all (96%), households told us that if they had a water softener in their home, it was in good working order.
- A small cohort of residents (16%) feel they are "very" familiar with how water softeners work (scoring 9 or 10 on a knowledge scale). The balance of the group were split between saying "somewhat" familiar (scoring 6-8), at 42%, and being "not" familiar (scoring 1-5).
- About half of the households in this survey (51%) have water softeners that are 5 years old or less. 30% have a water softener that is 6-10 years old, and 15% whose water softener is 11+ years old. 4% of homeowners do not know the age of their water softener.
- Households with a working water softener were read a list of choices to understand how their water softener recharges. About half (49%) say their softener regenerates automatically (Demand regeneration). 42% say their softener has a schedule and regenerates on that schedule (Time-based regeneration). The balance recharge manually (4%), or weren't sure how their softener regenerated (5%).
- Overall, 41% of respondents with a working water softener are putting in at most a bag every 2 months (6 or less per year). 33% are using a bag every 1-2 months (7-12 per year), and 15% are using more than one bag a month (13 or more). 11% of the respondents could not identify how many bags of salt they used per year.
- Two-thirds (66%) of respondents in the study who have a water softener in their home find it "very" important to have a working water softener. 24% find it "somewhat" important, while about 1 in 10 (10%) find it to not be very important to them.
- The main benefit, mentioned by about half (51%) of respondents, was that a water softener can help extend and preserve the life of appliances and hot water tanks in this area. 39% say that softened water is better for their hair and/or skin. Women (42%) were more likely to mention this than men (35%). A third of respondents (33%) say that softened water reduces the amount of soap that gets used. Waterloo Region residents (37%) were more likely to mention this than Guelph (30%).
- Two-thirds of residents in this survey say they have no concerns about using a water softener. Residents of Waterloo Region (71%) were more likely to say this than Guelph residents (61%). The primary concern that residents have would be that the salt used by the water softener is bad for the environment (15%). The second largest concern was the amount of salt that people are adding to their diet through drinking or cooking with softened water (10%).

1.3 Gauging Interest In The Pilot Program

- 19% of residents told us they were aware of alternative water conditioning technologies, however when pressed, could not tell us anything further. Two-thirds (65%) of the group who said they were aware of alternatives had nothing further to add. If we add that back to the original question, then only 6% are actually aware of alternative technologies and could provide an answer. Among those who are aware, the primary responses were related to "magnets", "carbon filtering", and "reverse osmosis". Across the entire study, less than 20 people out of 1,000 talked about TAC/NAC/MIP or MIC.
- We asked everyone with a working softener about their interest in participating in an in-home test of alternative water conditioning technology.
- Overall, 45% of those who have a working water softener were interested in participating (scored 4 or 5 on a 5-point scale). 15% were not very interested (scored 2 or 3), and 40% were not interested at all (scored 1).
- Interest was significantly lower in the 60+ year age group, where 31% said they were very/somewhat interested, compared to 49% of those 40-59 years, and 55% of those 18-39 years.
- Those with a university education were most likely to say they were interested in the study (52%), compared to 41% of those with college education, and 32% of those with high school education.

2.0 Exploratory Focus Groups

2.1 Focus Group Details

These focus groups were conducted so that we could find out more about perceptions and attitudes related to water conservation and water softeners. Additionally, we were able to get to know potential study participants on a deeper level and help us identify if they would be a good potential study participant.

The groups were conducted in August, 2017

- Guelph – Tuesday August 15th
- Waterloo Region – Tuesday August 22nd

In Guelph, the groups were conducted at a local hotel, and in Waterloo Region the groups were held at Metroline's focus group facility in Kitchener. The groups lasted 75-90 minutes. Each group had 7-8 participants.

All groups were conducted by the Project Manager, Dave Kains. A discussion guide was developed in conjunction with project teams from Waterloo Region and Guelph and is attached to this report. (See Appendix 3b.)

2.2 Interested in Sustainability

The conversation in the focus groups mirrored a lot of the learning from the survey related to conservation behaviours and knowledge about water softeners. In many cases, the focus group participants, after being selected/screened to advance this far in the study, tended to be a little more aware or interested in water conservation and environmental sustainability than the average resident.

They are aware of the need to conserve, but as with many residents we interview across Canada, are not really sure why they have to conserve:

> "When we all conserve, not enough water gets used, which means our rates go up to cover cost, so what's the benefit?"

However, virtually everyone who participated in the focus groups claim that a primary driver of why they conserve water is for the sake of the environment as much or more as it is for their water bill. Typically, they have rain barrels, they do not water their lawn, they are careful how much water is used inside their home, watching shower lengths, buying water and energy efficient appliances, etc.

In addition to water conservation, we discovered these respondents were active in energy conservation too – reducing their footprint in general. They are watching how much electricity they are using, several own or are considering an electric car, etc.

2.3 Feelings about Water Softeners

All respondents have water softeners in their home, and most consider them a necessity:

> "My friends live in an apartment with hard water. They have to replace their coffee maker a lot, and take their showerheads off to soak in something at least 3-4 times a year…"
> "If you live in Cambridge it's a must have, the water is so hard…"

"When we didn't have one for a while we used up our coffee maker quickly and our other appliances…"
"Our first house didn't have one (softener) and it was awful. We had to replace all taps and showerheads at least once. At the time I didn't know the difference in how your clothes clean or your hair feels. But now I notice the difference…"
"The difference is night and day, especially if you are used to it and it breaks or maybe you move…"

The benefits of using a water softener:

- Extends the life of your appliances
- No scale build up on shower walls, in coffee makers or kettles, or around taps/sinks
- Less residue on dishes, silverware and glassware
- Use less soap
- Clothes cleaned better
- Fewer or no streaks on counters or tile floors

The concerns about using a water softener:

- Softener uses a lot of water when recharging
- Puts salt into the water system
- Taste of softened water
- Worry about ingesting extra salt through drinking/cooking with softened water
- Buying/carrying/loading salt
- "Things" get slippery from the softened water
- Can be noisy in the middle of the night when it runs

2.4 Pilot Study Questions/Concerns

Respondents were offered a sheet describing the pilot study in more detail, and after reviewing we discussed it as a group.[4] Here is a summary of the main questions they had after reading. If any communications to the community result from this pilot study, it will be important to address these concerns to alleviate worries:

- What other countries is this technology being used in?
- What does the water feel like?
- Can you drink from the tap, is it safe?
- What is the media made from? Is it safe?
- So this media will be easily available?
- Do most people who use these units like it and have kept it?
- What is the new technology called?
- Is there anywhere else in Canada who is thinking of this?
- The media inside, how is that disposed of - is it recycled, is it hazardous?
- Is the media a filter?
- Is it just 4 years and then you replace it or are you able to look at it and see if it needs replacing?
- Is there a short version of how the technology works?
- Is there a by-product or residue?
- Will it feel different?
- Some appliances the warranty is voided if you don't have a softener, does this fall under a softener category?
- How big is the unit?
- Is it safe to drink?
- How would it work in terms of clothing and washing machines?
- Does it get hooked up to the same system we currently have?
- Is there a reason why we haven't adapted this technology here?
- The different types of piping aren't an issue? We don't have the copper pipes because we're a newer build.

[4] Included with this report as Appendix 3c.

3.0 Home Visits

The initial selection process for the focus group had worked as designed, and all focus group attendees were willing volunteers who fit the mould of a study participant.

Of the 28 participants from the focus groups, 23 were selected to move to the Home Visit stage. Those not selected were contacted and thanked for their time and effort to that point.

Members of the project team completed a home visit with a total of twenty-three (23) households. There were several purposes for the home visit:

- Confirm that the existing water softener was in good repair and was softening the water in the household.
- Conduct a brief audit with the homeowner about the appliances and fixtures present in the household, and then confirm they appeared to be in good repair.
- Discuss the study further on an individual level with potential participants to assess their interest and answer any questions they might have.

A standardized home visit process and form was developed for consistency.

While at the home, the project team member conducted a simple water hardness test using test strips. This helped evaluate that the softener was working

After completing the home visits, it was noted that all 23 homes would be good candidates for the study. Further review, and a desire to get the best cross-section of the population possible created a list of 18 homes to participate.

17 out of 18 primary selections agreed to continue in the study, with one household backing out after discussing it further as a family. One of the 'alternates' was contacted and included in the 18 homes.

4.0 Memorandum of Understanding (MOU)

After selection was complete and all paperwork regarding next steps was finalized, our project team members returned for another home visit. At this visit, we asked a decision maker in the home to review (in advance) the Memorandum of Understanding of the study.

The purpose of the MOU is to give homeowners further information about what they can expect during the test.

Signing a Memorandum of Understanding signifies commitment on the part of the homeowner (consistent with Community Based Social Marketing principles).

The MOU was developed by Metroline and reviewed by their counsel.

A copy of the Memorandum of Understanding can be found in Appendix 3c.

5.0 NAC/TAC Unit and Supplier Selection

At the time of commencing this study, there were three main manufacturers of the media used in several marketed NAC/TAC water treatment units. Quotations from across Ontario were requested for delivery and installation of one of the following units, each using a slightly different crystallizing template media:

- Pelican NaturSoft (Model NS3 or NS6 depending on household size)
- Filtersorb MAC (3 litres media)
- Watts One Flow (3 litres media)

Metroline Research Group, as the independent contractor, made the purchase decision for a single supplier, based on lowest cost. All study participants received the same units to make sure results between residences were comparable.

A separate selection process took place to identify a plumber to install all eighteen units across the two communities. The plumbing company was intentionally selected separately and was not associated with the company that supplied the units.

To avoid any potential bias, perceived endorsement or privacy concerns, the unit selected, the plumber doing the installation, and any identifying information about the study participants will remain confidential and protected by Metroline.

6.0 Monitoring Phase

6.1 Focus groups after installation

Test participants in each community came together about 6-8 weeks after installation, for a quick check on their reactions.

Interestingly, after reviewing the comments from these focus groups at the end of the research, it became apparent that those who asked for the unit to be removed made up the majority of the people in these focus groups who had the most difficulties adapting.

The positive and negative reactions to the water conditioner unit initially expressed in these focus groups continued throughout the monitoring phase and into the final focus group/survey.

Positives

- Quieter, no recharge
- Like knowing they are using less water, electricity, and salt
- Not having to buy and fill up the salt
- A feeling they are helping the environment
- Able to drink from any tap in the house
- For some, they were able to notice their pipes being 'cleaned' by the unit as they had calcium deposits showing up in their faucet aerators and shower heads

Negatives

- Family reactions/perceptions to the water (not feeling as "soft")
- Dishwasher not cleaning the dishes to the same extent, leaving stains
- Film forming on drinking glasses, cutlery
- Dishwasher not as effective in removing food residue on the dishes
- Shower doors and counters having a film/residue
- Film forming on countertops and sink

The discussion guide used for these focus groups can be found in Appendix 3e.

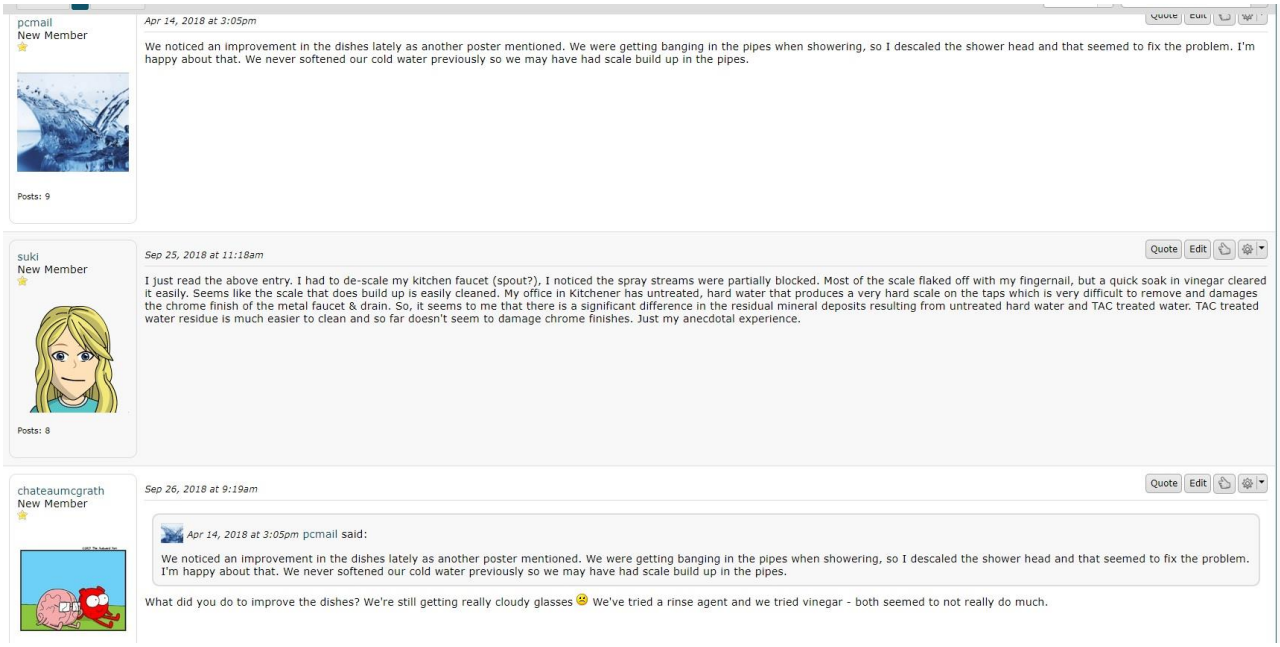
6.2 Bulletin board

In order to stay connected with test participants, an online discussion forum was created for this study. All participants were engaged and participated.

Additionally, this forum provided a way to ask questions and gauge reactions to the technology, and quickly identify barriers or difficulties.

An added benefit was the organic way that test participants, by sharing information about how they were adapting in their household, encouraged discussion among the participants as a group. They shared experiences and provided their own tips to others.

Probably the most active discussion was around experiences with the dishwasher, where participants experienced the most challenges. They were able to talk about how they tried different soaps, used vinegar, and sought other solutions.



6.3 Flowie data

The "Flowie" water sensor, from Alert Labs, was obtained for this study by Waterloo Region.

They were installed in all homes that took part. One participant dropped out early, and at a second property, we had difficulty getting a consistent signal, even after installing an antenna extender.

The reactions by test participants were positive.

During the course of the study, the Flowie sensors reported potential water leaks which were relayed to the test participants. They helped test participants to identify taps that were left dripping, garden hoses or sprinklers left running overnight by accident, and leaking toilets they were not aware of beforehand.

A summary of the data collected for each property (total 12 month water use, average monthly water use) is included in the Participant Profiles in Appendix 1.[5]

The Flowie devices were installed 4-6 weeks before the installation of the TAC/NAC water conditioner unit. In this manner, for many of the homes, we were able to identify patterns related to their water softener recharge.

We used the following criteria when identifying likely recharge information:

- Looked for unusual (higher) water use between 1am and 5am.
- Looked for patterns (ex. every 5 days)
- Looked for similar water usage within the pattern
- Made sure that the pattern stopped after the installation date of the TAC/NAC machine

In four of the seventeen homes, we could not confidently identify any patterns within the parameters defined above.

We used this information to try and identify any patterns for those who kept their unit, and those who had it removed, but there was no consistent learning. The home in Guelph who recharged most often did not keep their unit, but the one for Waterloo Region (that used the most water for recharge we could in the study) did keep their unit.

[5] Note – No attempt was made to audit these findings against the water bills for the property.

Findings:

- Six out of seventeen homes had units that recharged once a week, and almost all used about 200 litres of water per time
- Three of seventeen homes recharged two or three times a month
- Four of seventeen homes recharged 5-10 times a month
- Four of seventeen homes were those where we could not identify any patterns or times of day

Detailed information regarding water use and water softener recharging can be found in Appendix 1.

6.4 End of study survey

The Net Promoter Score, or NPS, is a standard industry metric for measuring customer experience.

Respondents are asked how likely they would be to recommend an organization on a 10-point scale.

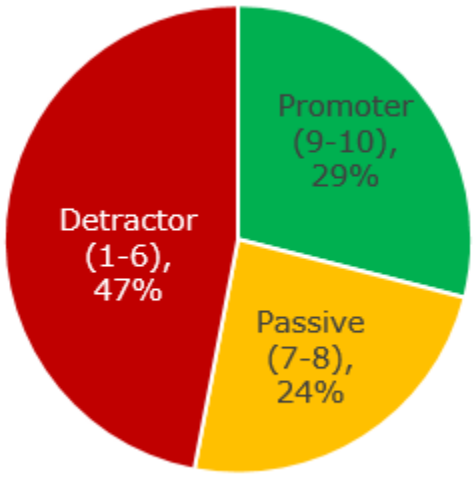
Promoters will score 9 or 10, those who are Passives will score 7 or 8. All the rest, called Detractors, will score between 1 and 6.

The NPS is calculated by subtracting Detractors from Promoters. The higher the score, the better the customers feel about the product. The goal for any company, product or service would be to have an NPS score of at least zero.

Question 6.4a NPS Recommendation

Now that you have had one in your home for a year, how likely are you to recommend this technology to a friend or neighbour, instead of a water softener?

Figure 3 - Net Promoter Score



The overall NPS for the new water conditioner technology for the seventeen residents who participated in the entire test is -18 (29% Promoters - 47% Detractors).

Question 6.4b: What are the biggest advantages of this technology?

"I figure it is roughly equivalent in cost in the long-term compared to a conventional water softener. So the main benefits are not having the hassle of refilling salt and being environmentally friendly…"

"The greatest benefit is reducing environmental impact. Another benefit is that it has a slightly smaller footprint than a water softener. And finally, not having to do any setup or configuration on it is nice as well…"

"Removes any deposits previously adhering to plumbing. Ability to drink the softened cold water. Lack of noise. Less use of water. Less use of salt and the pollution of rivers. Less water use…"

Question 6.4c: What are the biggest drawbacks or barriers to use?

"I'm not 100% convinced that it is doing anything at all…"

"Slight scale deposit on dishes and chrome fixtures. Can be fixed but is a bit of an inconvenience…"

"Dishes not coming out as sparkling as a regular softener. It seems some of our cutlery has become pitted or has unexplained blemishes on it. Tea and coffee stains are not well removed, even though we double the amount of detergent. The water does not feel as soft as when we used our salt based softener…"

"I have no idea how to figure out when the media needs replacing. Should I start testing my water periodically for hardness?"

"Appliances still scale (especially dishwasher and kettle/coffee maker). Concerned that this affects the life of appliances. It's hard to lather soap in the shower. Dishwasher does not clean dishes as well…"

Question 6.4d Tell us about any creative workarounds or solutions you may have tried or come up with as a result of this new technology.

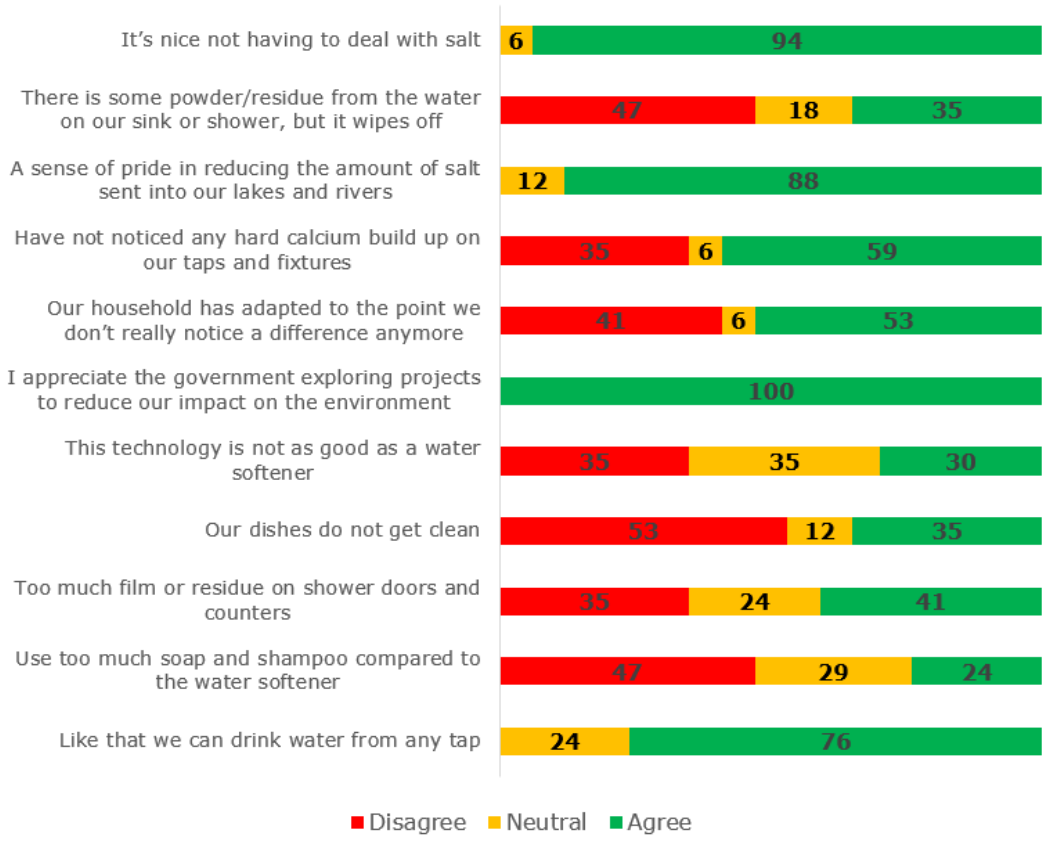
"Vinegar in dishwasher and also in the laundry wash as a softener helped a lot. Use vinegar to clean faucets and fixtures and it removes deposits. Still having problems with deposits on shower head and shower fixtures though…"

"I keep vinegar in a spray bottle to use around sinks and taps. Periodically I take the shower heads off and soak them in cleaning vinegar which is 10% acetic acid by volume which is twice the strength of regular vinegar. We are just used to it now and have created new habits…"

"Cleaning vinegar was a much needed resource in battling this residue problem. We use it for cleaning tea cup and for cleaning sinks and shower stalls. We did not have the same success for the dishwasher. Even with the vinegar in the dishwasher, it still left a white stain on the door…"

"I tried vinegar in the dishwasher, but it didn't seem to help much. Turning off the heat dry on the dishwasher helped more…"

Figure 4 – Question 6.4 e: Impressions of the new water conditioner technology



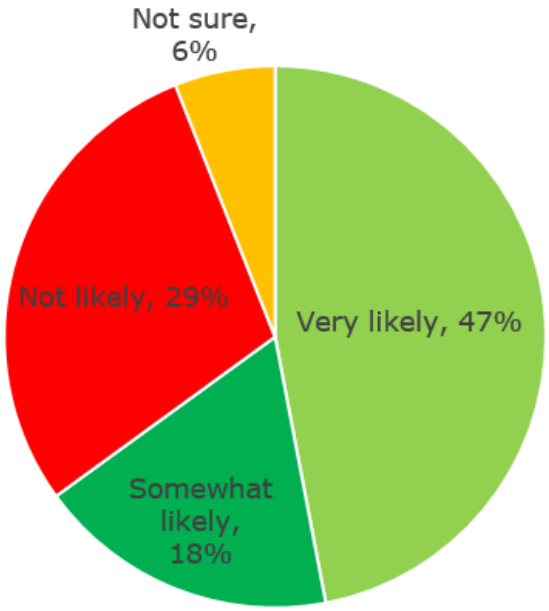
Question 6.4f: Has participating in this test changed the way you think about the water your household uses or the water system in general?

Two-thirds agreed that they are thinking about the water their household uses, or about the water system in general.

If yes: How do you think about water differently?

"Awareness of impact of salt use with softeners has inspired dialogue with friends & family which has created interest in finding alternative water conditioning systems for their households…"
"There are several things that we are doing to hurt the environment. Using salt to soften our water is one of those things. Like this pilot project, we must try different things to move ourselves forward to find solutions that will minimize our impact. However, consumers are fickle and if they do not see benefit without inconvenience, those solutions will not be adopted…"
"My water bill has gone down but haven't noticed too much of a difference in the two systems…"
"I watch my water use each month. I had no idea that so much salt was going into the environment from water softening…"
"I hadn't previously thought about salt affecting the watershed…"

Figure 5: Question 6.4g Likely to keep water conditioner?



Why likely to keep?	Why **not** likely to keep?
"The pros easily outweigh the cons…" "Very easy to use and feel good about the environmental benefits. Side effects are minor and we can work around them…" "It is very convenient not worrying about salt and we like the lessened impact on the environment. That is very important to us..."	"We really like the idea of not using salt (more because of environmental issues than the effort involved). On the other hand, we are unhappy with dishwasher performance and are concerned that appliances, like coffee makers, may not last as long…" "The members of my household disagree about it. I want to keep it, but the rest of the people in the house don't…" "I am not sure how I would explain the presence of the new system to someone purchasing my home, especially with the dishes issue..."

A copy of this survey can be found in Appendix 3f.

7.0 Final focus groups

In the end, thirteen of the eighteen homes in this study decided to keep their NAC/TAC unit and continue to use it. That is eight of nine homes in Waterloo Region (one dropped out early in the process), and five of nine homes in Guelph (all completed the study, then four asked for the units to be removed).

It appears the primary reasons for not wanting to keep the unit going forward can be summed up by three areas:

- poor perceived performance from the TAC/NAC unit, or that it does not do a good enough job treating or conditioning the water
- Differences of opinions between the participant who signed up for the study and other members of their household. This may be related to their concern for the environment
- homeowners who have a lot of chrome and glass, and were not willing to undertake any extra cleaning or film/residue that the water conditioner left behind, regardless of how easy or difficult it was to wipe up/off

The biggest benefits to switching to a TAC/NAC unit were seen to be:

- no longer having to buy salt, bring it home or delivered and/or remember to load it into their ion-exchange softener
- saving money (less water, less electricity, no maintenance on the machine)
- reducing environmental impact
- ability to drink the water from all taps in the home without concern for salt content
- reduced or cleaned out previous calcium build up in the pipes of the home

The biggest perceived drawbacks to a TAC/NAC unit were seen to be:

- dishwasher not cleaning properly or leaving a film/residue/staining on the dishes and silverware
- no indication that the system is working
- no indication that the media needs to be replaced
- it is not mainstream technology, so it could be a complication to those selling their homes

About two-thirds of the participants say that participating in this test has changed the way they think about water use:

> "Awareness of impact of salt use with softeners has inspired dialogue with friends & family which has created interest in finding alternative water conditioning systems for their households…"
>
> "There are several things that we are doing to hurt the environment. Using salt to soften our water is one of those things. However, consumers are fickle and if they do not see benefit without inconvenience, those solutions will not be adopted…"

Households that are keeping their TAC/NAC units:

- don't see many barriers, or find them minor enough that they have adapted to them over the course of the test
- feel a sense of pride about helping the environment
- appreciate the convenience associated with no salt, no maintenance
- in some cases could become, or have become, ambassadors for the technology

Those that asked for the TAC/NAC unit to be removed:

- could not get past the major barriers related to their dishwasher, or the film/residue it left on countertops and showers
- had some conflict within the household about the trade-off between benefits and barriers
- felt they were making too much of a sacrifice in performance and lifestyle over their ion-exchange softener, and that there one household would not impact the environment in any significant way

Most feel there is a role for the government to play in promoting the technology in some fashion:

- educating residents about alternatives to ion-exchange softeners, and what the pros and cons of each are
- offering rebates so the TAC/NAC technology is priced in the same range as ion-exchange softeners (target is under $1,000)

In the future, it will be important that potential buyers of a TAC/NAC unit are provided with information about what to expect after installation. This is likely the primary responsibility of the vendor or manufacturer, but the government can play a supporting role by posting information about the experience in a local context.

The discussion guide used in these focus groups can be found in Appendix 3g.

8.0 Post study

8.1 Unit removals

Participating homes that wished for the unit to be removed were contacted after the final focus groups.

The plumbing contractor for the study visited those properties to remove all traces of the water conditioner unit, and restored the ion-exchange water softener.

8.2 Media testing

During the initial debrief with the project team following the focus groups, it was recommended and decided that media from within some of the units would be lab tested.

The purpose of the testing was to look for any significant differences in the media from homes that had their units removed, and those who kept their units.

Due to the relative difficulty of simply being able to get a sample of the used media, it was decided that the full media from four homes in the study would be removed (and replaced as needed).

Two homes from Waterloo Region, and two from Guelph were selected. In both communities, we selected a home that had a positive experience and retained their unit, and a home where the unit was removed. Relevant results, if any, will be published at a later time.

Appendices

Appendix 1 – Detailed Participant Profiles

Appendix 2 – Telephone Survey Findings

Appendix 3 – Supporting documents

Appendix 1 – Participant Profiles/Water Use Data

Table 2 - Water Use Data

House #	People in home	Annual water use	Estimated recharges/ month	Average litres per recharge	Estimated monthly litres	Projected annual Litres	Projected annual m3	Percent of total water use	Recharge frequency
Guelph									
1	4	n/a	Not identified						
2	2	102.7 m3	3	100	300	3,600	3.6	3.5%	Every 10 days
3	4	148.1 m3	4	200	800	9,600	9.6	6.5%	Every 7 days
4	4	117.3 m3	4	200	800	9,600	9.6	8.2%	Every 7 days
5	4	297.0 m3	4	200	800	9,600	9.6	3.2%	Every 7 days
6	5	300.9 m3	4	115	460	5,520	5.5	2.0%	Every 7 days
7	4	212.8 m3	Not identified						
8	4	143.8 m3	7	130	910	10,920	10.9	7.6%	Every 4 days
9	2	107.4 m3	2	300	600	7,200	7.2	6.7%	Every 2 weeks

Waterloo Region									
House #	People in home	Annual Water use	Estimated recharges/ month	Average litres per recharge	Estimated monthly litres	Projected annual Litres	Projected Annual m3	Percent of water	Recharge frequency
1	4	189.3 m3	4	100	400	4,800	4.8	2.5%	Every 7 days
2	4	115.8 m3	Not identified						
3	2	94.2 m3	4	200	800	9,600	9.6	10.1%	Every 7 days
4	3	125.6 m3	2	180	360	4,320	4.3	3.4%	Every 2 weeks
5	2	98.4 m3	10	120	1,200	14,400	14.4	14.6%	Every 3 days
6	4	123.2 m3	6	100	600	7,200	7.2	5.8%	Every 5 days
7	4	142.4 m3	Not identified						
8	5	119.6 m3	5	120	600	7,200	7.2	6.0%	Every 5-6 days

Participant Profile – Guelph – House #1

Category	Home Visit survey
Age of House	22 years
How long participants have lived there	22 years
Number of residents	4 Adults
Type of plumbing in the home	Copper
Number of bathrooms	3 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	n/a
Monthly average	n/a

Participant Profile – Guelph – House #2

Category	Home Visit survey
Age of House	37 years
How long participants have lived there	22 years
Number of residents	2 Adults
Type of plumbing in the home	Copper
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	2 Yes, 1 No
Showerheads – low-flow?	No
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes

Category	Home Visit survey
12 month water use[6]	102,708 L / 102.7 m3
Monthly average[7]	8,559 L / 8.6 m3

Participant Profile – Guelph - House #3

Category	Home Visit survey
Age of House	20 years
How long participants have lived there	7 years
Number of residents	2 Adults 2 Children
Type of plumbing in the home	Mostly copper Some Pex
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	148,079 L / 148.1 m3
Monthly average	12,340 L /12.3 m3

Participant Profile – Guelph – House #4

Category	Home Visit survey
Age of House	3 years
How long participants have lived there	3 years

[6] Water use calculated by reviewing reported data from the Flowie water meter between December 1st, 2017 and November 30th, 2018.
[7] Monthly average calculated by dividing the total reported water use by twelve months.

Category	Home Visit survey
Number of residents	2 Adults 2 Children
Type of plumbing in the home	Pex
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	117,310 L / 117.3 m3
Monthly average	9,776 L / 9.8 m3

Participant Profile – Guelph – House #5

Category	Home Visit survey
Age of House	45 years
How long participants have lived there	25 years
Number of residents	4 Adults
Type of plumbing in the home	Copper
Number of bathrooms	2 Full
Toilets - low-flow?	Yes
Showerheads – low-flow?	No
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	296,996 L / 297.0 m3
Monthly average	24,750 L / 24.7 m3

Participant Profile – Guelph – House #6

Category	Home Visit survey
Age of House	12 years
How long participants have lived there	12 years
Number of residents	5 Adults
Type of plumbing in the home	Copper
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	300,893 L / 300.9 m3
Monthly average	25,074 L / 25.1 m3

Participant Profile – Guelph – House #7

Category	Home Visit survey
Age of House	50 years
How long participants have lived there	5 years
Number of residents	2 Adults, 2 Children
Type of plumbing in the home	Mostly Pex/some copper
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	2 Yes 1 No
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes

Category	Home Visit survey
12 month water use	212,820 L / 212.8 m3
Monthly average	17,735 L / 17.7 m3

Participant Profile – Guelph – House #8

Category	Home Visit survey
Age of House	3 years
How long participants have lived there	3 years
Number of residents	2 Adults, 2 Children
Type of plumbing in the home	Pex
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	143,790 L / 143.8 m3
Monthly average	11,983 L / 12 m3

Participant Profile – Guelph – House #9

Category	Home Visit survey
Age of House	47 years
How long participants have lived there	17 years
Number of residents	2 Adults
Type of plumbing in the home	Copper
Number of bathrooms	1 Full
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes

Category	Home Visit survey
Dishwasher	Yes
Aerators on faucets	Hard water drinking tap
12 month water use	107,352 L / 107.4 m3
Monthly average	8,946 L / 8.9 m3

Participant Profile – Waterloo Region – House #1

Category	Home Visit survey
Age of House	32 years
How long participants have lived there	4 years
Number of residents	2 Adults 2 Children
Type of plumbing in the home	Copper
Number of bathrooms	2 Full, 2 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	189,337 L / 189.3 m3
Monthly average	15,778 L / 15.8 m3

Participant Profile – Waterloo Region – House #2

Category	Home Visit survey
Age of House	27 years
How long participants have lived there	15 years
Number of residents	2 Adults 2 Children

Category	Home Visit survey
Type of plumbing in the home	Copper
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes, kitchen only
12 month water use	115,766 L / 115.8 m3
Monthly average	9,647 L / 9.6 m3

Participant Profile – Waterloo Region – House #3

Category	Home Visit survey
Age of House	50+ years
How long participants have lived there	4 years
Number of residents	2 Adults
Type of plumbing in the home	Copper
Number of bathrooms	1 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes, drinking faucet
12 month water use	94,217 L / 94.2 m3
Monthly average	7,851 L / 7.9 m3

Participant Profile – Waterloo Region – House #4

Category	Home Visit survey
Age of House	30 years
How long participants have lived there	3 years
Number of residents	2 Adults 1 Children
Type of plumbing in the home	Mostly copper Some Pex
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	125,584 L / 125.6 m3
Monthly average	10,465 L / 10.5 m3

Participant Profile – Waterloo Region – House #5

Category	Home Visit survey
Age of House	125 years
How long participants have lived there	3 years
Number of residents	2 Adults
Type of plumbing in the home	Copper
Number of bathrooms	3 Full
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes

Category	Home Visit survey
Aerators on faucets	Yes
12 month water use	98,380 L / 98.4 m3
Monthly average	8,198 L / 8.2 m3

Participant Profile – Waterloo Region – House #6

Category	Home Visit survey
Age of House	145 years
How long participants have lived there	17 years
Number of residents	2 Adults 2 Children
Type of plumbing in the home	Mostly copper Some Pex
Number of bathrooms	2 Full
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	123,183 L / 123.2 m3
Monthly average	10,265 L / 10.3 m3

Participant Profile – Waterloo Region – House #7

Category	Home Visit survey
Age of House	100+ years
How long participants have lived there	4 years
Number of residents	2 Adults 3 Children
Type of plumbing in the home	Copper and Pex

Category	Home Visit survey
Number of bathrooms	2 Full, 1 Half
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	142,416 L / 142.4 m3
Monthly average	11,868 L / 11.9 m3

Participant Profile – Waterloo Region – House #8

Category	Home Visit survey
Age of House	30 years
How long participants have lived there	5 years
Number of residents	2 Adults 2 Children
Type of plumbing in the home	Mostly copper Some Pex
Number of bathrooms	2 Full
Toilets - low-flow?	Yes
Showerheads – low-flow?	Yes
Washer/Dryer	Yes
Dishwasher	Yes
Aerators on faucets	Yes
12 month water use	119,632 L / 119.6 m3
Monthly average	9,969 L / 10.0 m3

Appendix 2 – Telephone Survey Findings

Telephone Survey Methodology

Project Initiation and Questionnaire Design

At the project launch meeting, the Metroline team met with Waterloo Region and City of Guelph team members to explore the objectives of the study and to review the work plan.

After this meeting Metroline prepared an initial draft survey which was reviewed by the Waterloo Region and City of Guelph joint team.

When the final survey was approved, Metroline conducted a pre-test with 19 residents via telephone to ensure understanding and test the survey length.

Metroline purchased a random sample of directory listed telephone numbers for Waterloo Region and the City of Guelph from a professional sample provider. We then supplemented the sample with randomly generated numbers from within cellular exchanges. In the end, 28% of the telephone surveys were completed via mobile devices.

Survey Population and Data Collection

Between May 16 and June 21, 2017, 1,000 telephone surveys were completed. The average survey took about 10 minutes.

At the overall level, the results of this survey can be considered accurate to within +/-3.1%, 19 times out of 20 (95% Confidence Interval). It is important to note that within sub-groups, the sample is smaller, and the margin of error will increase accordingly. As an example, at the community level (Waterloo Region vs. Guelph) the margin increases to +/-4.4%, 19 times out of 20.

Our sampling software randomly generated households to call from within the sample frame (listed numbers and mobile numbers). Calling took place 7 days a week, between the hours of 1pm and 9pm on weekdays, and between 10am and 3pm on weekends.

After an initial non-contact, we returned to the number at least 3 more times (at various times of day and day of week) before substitution.

To qualify for this study, respondents were:

- Male or female
- 18 years and older
- Full-time resident of Waterloo Region or City of Guelph
- Connected to the municipal water supply
- Own and live in a single family home (detached or semi-detached)

Before working on this project, interviewers received a thorough briefing including conducting practice interviews with supervisory staff. All calling took place in our supervised, monitored call centre, and at minimum 10% of interviews conducted by an interviewer were validated.

Table 3 - Summary of Call Attempts

Final Call Attempts	Calls
Completed Interviews	1,000
Busy/No Answer	34,504
Respondent Unavailable/callback	951
Refusals	7,087
Not In Service	11,298
Language Barrier	248
Incomplete Surveys	55
Disqualified/Quota Full	1,421
Total Dials	56,564

Data Analysis and Project Documentation

After all telephone interviews were completed and verified, the Metroline Project Manager reviewed the results of open-ended questions to develop a code list. Where possible, the codes used in the pre-campaign survey were used post-campaign.

Our internal data processing team worked on preparing data tables and coding the open-ended responses.

Data tables were prepared to a standard set of cross-tabulation banners, and included statistical testing (primarily z-test and u-tests) to understand statistically significant differences between sub-groups.

This report provides a detailed description of the telephone survey, with directional information from the online survey shown where different from the telephone survey results.

A copy of the survey used in this research can be found as Appendix 1b.

Notes on Reading This Telephone Survey Report

This report presents the findings of the statistically valid, random telephone survey. Where applicable, we will provide directional learning from the online survey, which is not statistically valid given the self-selected sampling methodology.

Where statistically significant and relevant, differences between specific sub-groups are mentioned in the analysis (for example, community, gender, household size, etc.).

While sophisticated procedures and professional staff have been used to collect and analyze the information presented in this report, it must be remembered that surveys are **not** predictions. They are designed to measure opinion within

identifiable statistical limits of accuracy at specific points in time. This survey is in no way a prediction of opinion or behaviour at any future point in time.

Online Survey

In addition to the telephone survey, Metroline provided both the Region of Waterloo and City of Guelph a link to an online survey. This link was shared digitally via social media, through websites, and so on.

As residents can self-select to complete this survey, and not all residents would have seen the link, this survey is not considered statistically reliable.

However, it is a good opportunity for residents interested in the study to have a voice.

Additionally, any residents who met all the qualifications for the study were considered and/or contacted for further screening and participation in other facets of the study.

In total, 218 residents across the two communities met the basic requirements of the study (home owners, working water softeners, etc.)

Attitudes towards water and the environment

1.1 Top environmental issues

In your opinion, what are the top three issues facing our area related to the environment? (Base – Full Sample, n=1,000)

Table 4 - Top Environmental Issues

Asked Unaided (Full sample, n=1,000), rank order by Total Highlighted cells show a statistically significant difference	Total	Guelph	Region of Waterloo
1.Urban sprawl/population	33%	44%	21%
2.Energy costs	30%	32%	27%
3.Air quality	28%	26%	30%
4.Water quality	27%	27%	27%
5.Water availability/levels	22%	30%	13%
6.Vehicle emissions/idling	19%	15%	22%
7.Litter	16%	13%	18%
8.Pesticide use	14%	14%	13%
9.Safe drinking water	13%	9%	16%
10.Water treatment	10%	13%	8%
11.Waste reduction	8%	11%	4%
12.Nestle plant	3%	5%	--
13.Wildlife conservation	1%	2%	1%
14.Climate change	1%	2%	1%
15.Public transit/Active transportation	1%	1%	1%
16.Pollution	1%	1%	1%
Don’t know/none	13%	6%	19%

The first question asked in the telephone survey was to get residents to identify what they see as the top environmental issues in their community.

Overall, urban sprawl/population growth was mentioned most often, at 33%. This was significantly more prevalent in Guelph (44%) compared to Waterloo Region (21%), where this ranked fifth.

Energy costs (30%) and concerns about air quality/pollution (28%) were mentioned second and third most often.

After that, concerns about water quality (27%) and water levels/availability (22%) were mentioned fourth and fifth overall.

Water levels/availability is statistically a higher concern for Guelph residents (30%) compared to Waterloo Region residents (13%). Possibly this is because Guelph is more visible in the community with the Water Use Bylaw (Billboards, radio, etc.) than happens in Waterloo Region, particularly in the summer of 2017 which had more rain.

In the online study (n=218), residents were able to see the list of options or write in their own. The ranking of items remains virtually the same, however more were likely to click urban sprawl (59%) and energy costs (51%) as their top concerns.

1.2 Attitudes towards the environment

Here are some statements about your feelings on the environment. Please tell me how strongly you agree or disagree with each. (Base – Full sample, n=1,000)

86% of residents in both communities recognize and strongly agree (scored 5 out of 5) that "we all have a responsibility to protect the environment".

Similarly, for the two statements worded in a negative fashion (last two in table), 84% of residents **disagree** that "it's not worth doing things to help the environment if others don't do the same", and 76% of residents **disagree** that their "behaviour and lifestyle does not contribute to climate change".

Although percent scores were different in the online survey, the basic sentiment and ranking was similar.

Table 5 - Attitudes towards the environment

Highlighted cells show a statistically significant difference		Strongly agree (5)	Somewhat agree (4)	Disagree (1-3)
We all have a responsibility to protect the environment				
	Total	86%	10%	4%
	Guelph	86%	10%	4%
	Waterloo Region	86%	10%	4%

Highlighted cells show a statistically significant difference		Strongly agree (5)	Somewhat agree (4)	Disagree (1-3)
Our household makes an effort to reduce waste and recycle [8]				
	Total	69%	25%	6%
	Guelph	65%	30%	5%
	Waterloo Region	73%	20%	7%
I am willing to make sacrifices for the sake of improving the environment				
	Total	45%	33%	22%
	Guelph	43%	35%	22%
	Waterloo Region	47%	31%	22%
We make an effort to buy locally grown food when possible [9]				
	Total	44%	30%	26%
	Guelph	40%	33%	27%
	Waterloo Region	47%	27%	26%
I am willing to spend more on environmentally better alternatives				
	Total	28%	33%	39%
	Guelph	26%	36%	38%
	Waterloo Region	30%	31%	39%

[8] Waterloo Region had only recently implemented new curbside collection policies for waste, organics and recycling when this survey was conducted, and this significant shift in policy likely influenced the scores for this question.
[9] Score for Waterloo Region possibly influenced by proximity to St. Jacob's Farmers Market.

Highlighted cells show a statistically significant difference		Strongly agree (5)	Somewhat agree (4)	Disagree (1-3)
Any changes I make to help the environment need to fit in with my lifestyle				
	Total	19%	23%	58%
	Guelph	16%	22%	62%
	Waterloo Region	22%	25%	53%
I **don't** believe my behaviour and lifestyle contributes to climate change				
	Total	12%	12%	76%
	Guelph	10%	9%	81%
	Waterloo Region	15%	16%	69%
It's **not** worth me doing things to help the environment if others don't do the same				
	Total	10%	6%	84%
	Guelph	8%	6%	86%
	Waterloo Region	11%	7%	82%

1.3 Environmentally friendly lifestyle

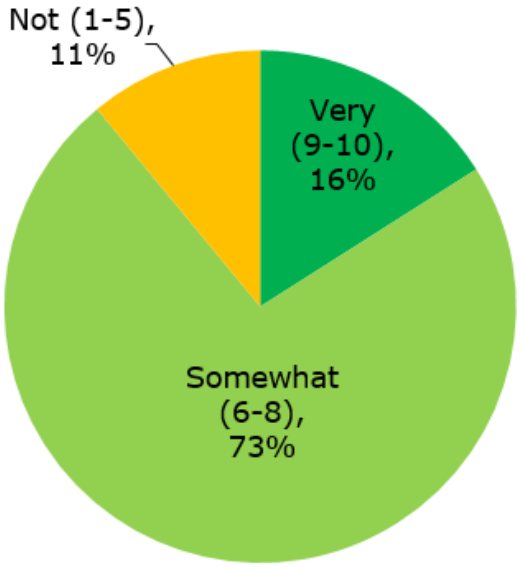
How much does being environmentally friendly factor into your lifestyle?

Most residents (89%) feel that being environmentally friendly is at least "somewhat" important for their lifestyle.

16% said it was something "very" important to them (scored 9 or 10) to factor into their lifestyle.

The largest majority (73%) said it was somewhat important (scored 6-8) to factor into their lifestyle.

Figure 6 - Environmentally Friendly Lifestyle (Full sample - n=1,000)



Overall, the mean score was 7.0 out of 10, and there were not statistically significant differences between the two communities.

1.4 Volunteer work for environmental causes

In the past 12 months, did you/anyone in your household engage, without pay, in any activities aimed at conservation or protection of the environment? This could be a roadside garbage cleanup, planting trees, etc.?(Base - Full Sample, n=1,000)

41% of residents overall had done some activity, without pay, in the last 12 months to help the environment.

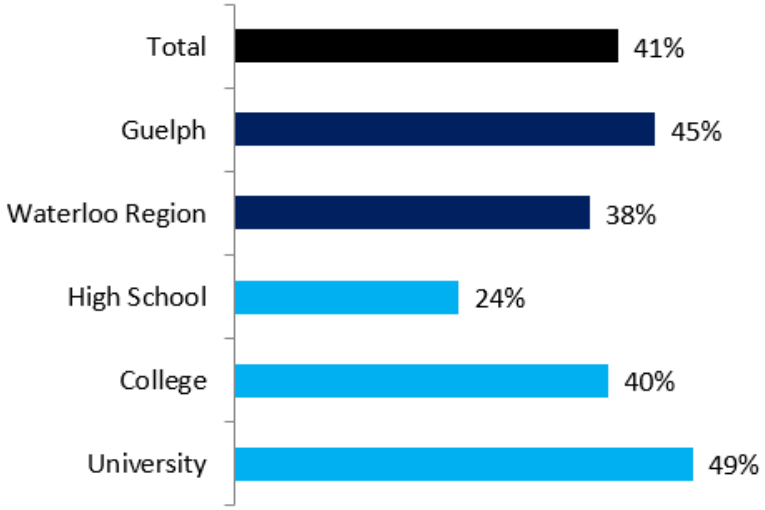
In Guelph, the number was slightly higher than Waterloo Region, but this was not statistically significant at the 95% Interval.

Highest level of education completed played a role. Those with post-secondary education were more likely to say they participated in some kind of activity.

Those homeowners who met the basic qualifying criteria for the study (including age of softener, age of appliances, etc.) and were interested in participating further in the test were more likely to have been active in this type of activity. 52% of those who were interested in participating in the study had volunteered in the past 12 months, compared to 33% of those who qualified but were not interested in participating in the in-home test.

In the online study, where those who clicked into the survey are likely more aware of the environment or are more civic minded, the percentage was higher. 52% told us they had volunteered for this type of activity in the past 12 months.

Figure 7 - Did volunteer work past 12 months



1.5 Type of volunteer work

Were these activities done…? (Base – Those who volunteered, n=414)

Table 6 - Types of volunteer work

Multiple response, totals may not add to 100% (Base – Those who volunteered, n=414)	Total	Guelph	Waterloo Region	Interested in study	Not interested in study
on behalf of an environmental or citizen action group	20%	26%	13%	19%	20%
on behalf of a charitable or social/sports team (for example, roadside cleanup)	28%	29%	26%	33%	19%
independently, that is, not on behalf of a group or organization	63%	58%	69%	63%	66%

*Shaded cells are statistically significantly higher

Almost two-thirds (63%) of residents say their activity was something they did on their own, not organized through a group.

1 in 5 of those who did some activity (20%) did so through an environmental or citizen action group. This was more likely to happen in Guelph (26%) than in Waterloo Region (13%).

28% partook in a volunteer activity through a social group or sports team. Those who qualified for further participation in the study and were interested in finding out more were significantly more likely to mention (33%) compared to those who qualified and were **not** interested in participating (19%).

Those under 60 years were significantly more likely to have participated with an environmental or citizen action group, and on behalf of a charitable or social/sports team than those over 60 years of age.

1.6 Importance of Water Conservation

How important is the practice of water conservation in your household? (Base – Full sample, n=1,000)

Table 7 - Importance of water conservation

	Total	Guelph	Waterloo Region
Mean score	7.83	7.84	7.82
Very (9-10)	35%	34%	37%
Somewhat (6-8)	54%	57%	51%
Not (1-5)	11%	9%	12%

Residents rate the importance of water conservation in their household fairly high. Overall the average score was 7.8 out of 10.

35% of residents rate it "very" important (scoring 9 or 10).

Only about 1 in 10 residents (11%) say that water conservation is **not** important to their household (scored 1-5).

Statistically, there were no significant differences between the two communities.

In the online survey, a similar number of residents told us they were "not" concerned (13%), however slightly more told us they were "somewhat" concerned (60%) over "very" concerned (27%).

1.7 Water Use Perception

Compared to other households similar in size and number of people would you say your household uses…water? (Base – Full Sample, n=1,000)

As is typical for this question, the largest majority of residents feel their household uses a 'similar' amount of water (39%) or 'a little less' water (39%) than other households of similar size and number of people.

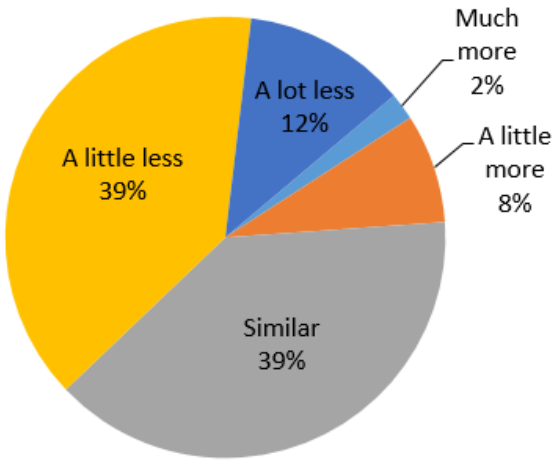
Previous research on this topic has indicated that residents are not really connected to the reality of how much water they use compared to other people.

At the ends of the spectrum, 10% of residents are willing to admit they likely use more water than other households, and 12% of residents feel they use "a lot less" than other households.

There were no statistically significant differences between communities.

Those in the online survey were slightly more likely to say they used "more" water, at 14% compared to 10% of the telephone survey.

Figure 8 - Water Use Perception



1.8 Water Conservation Methods

How does your household conserve water? (Base – Full Sample, n=1,000)

Residents were asked how their household conserves water. In the telephone survey, this question was asked unaided – we did not read any of the possible responses to the resident.

Watering the lawn/garden less often was mentioned most often by residents, indeed almost half (47%) of all those interviewed indicate they are watering their lawn/garden less often than they used to.

A close second was having low-flow toilets in their home, at 46%.

Guelph residents mentioned some of these water conservation methods more often than those in Waterloo Region:

- Using low-flow toilets (50% compared to 42% in Waterloo Region)
- Running full loads in dishwasher/washing machine (46% vs. 36% in Waterloo Region)
- Using low-flow showerheads (39% vs. 32% in Waterloo Region)
- Having a front load/efficient washing machine (29% vs. 21% in Waterloo Region)

Table 8 - Water Use Perception

Asked Unaided – Rank order by response overall	Total	Guelph	Waterloo Region
Use low-flow toilets (low/dual flush)	50%	50%	49%
Water the lawn/garden less or not all	47%	46%	48%
Full loads in dishwasher/washing machine	45%	46%	44%
Rain barrels	44%	44%	43%
Low-flow showerheads	38%	39%	36%
Front load/efficient washing machine	29%	29%	30%
Shorter/less frequent showers	17%	18%	16%
Wash car less often	16%	16%	15%
Turn off water when not using	9%	11%	7%
Reuse grey water	3%	4%	2%
Flush less often	2%	2%	2%

The numbers for Waterloo Region were compared against the 2013 survey conducted for the Water Efficiency Master Plan Update. They were found to vary on percentage but had a similar statement/ranking of responses, in part because this question was asked unaided, the study had a smaller sample and was restricted to singly family homeowners. [10]

In the online survey, residents could see the list of variables that we had and select from them. This led to much higher behaviour scores. As an example, 90% of residents in the online survey told us they were watering their lawn/garden less often, if at all, compared to 47% in the telephone survey.

Water use fixtures/appliances

2.1 Fixtures/Appliances owned

Does your household have/use any of the following? (Base – Full Sample, n=1,000)

Residents were read a list of fixtures or appliances that use water, and asked if they have/use one for their household.

Salt-based water softeners were mentioned most often, with 84% telling us they have one in their home.

Table 9 - Fixtures/appliances owned

Asked Aided (List was read out) – Rank order by overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
Water softener that uses salt or potassium	84%	85%	83%
A water efficient dishwasher	70%	70%	71%
Kitchen or bathroom faucet aerators	52%	60%	45%
A rainwater collection system (rain barrels/tanks, etc.	49%	46%	51%
A powered humidifier attached to your furnace	32%	28%	36%
A water treatment system such as reverse osmosis, filtration, or UV treatment	22%	19%	24%
A water cooler that uses large water bottles	14%	10%	18%
Swimming pool (not the inflatable or portable kind)	11%	11%	11%
Hot tub	10%	8%	13%

[10] SOURCE: ROW Water Efficiency Master Plan Update, Technical Memo #3, Lura/Metroline/econics, June 2013

Asked Aided (List was read out) – Rank order by overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
In-ground irrigation system	6%	5%	7%
Water softener or conditioner that does not use salt	2%	2%	2%

The numbers for Waterloo Region were compared against a 2013 survey, and tended to be higher than the 2013 survey. Likely the difference is due to the sample definition, whereby the Master Plan survey was all residents and this study was restricted to those in single family homes. [11] For example in the 2013 survey 70% of respondents had a salt-based water softener, compared to 83% in this study.

In this question, residents in the telephone survey were read the list of appliances/fixtures. The results in the online survey were very similar as a result. In the online survey, 82% of single family households had a water softener.

2.2 Homes with no water softener

Why do you not have a water softener? (Base – No water softener in home, n=162)

Table 10 - Homes with no water softener

Asked Unaided – Rank order by response overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
Not sure why I need one	33%	35%	30%
Don't want/need one	15%	15%	15%
Last one broke and we haven't replaced	13%	7%	19%
Cannot afford one	11%	9%	12%
Too much work	8%	7%	9%
Don't like the taste of softened water	4%	4%	4%
No space	4%	6%	1%
Have one but don't use it	3%	6%	1%
Uses too much salt	3%	6%	1%

[11] SOURCE: ROW Water Efficiency Master Plan Update, Technical Memo #3, Lura/Metroline/econics, June 2013

Asked Unaided – Rank order by response overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
Bad for the environment	3%	5%	1%
Looking to get one	3%	--	5%
Don't know	4%	2%	6%

One-third of households that do not have a softener told us they aren't sure why they need one.

A further 15% said they don't want or need one.

The only statistically significant difference came from those who said they had a softener that broke and has not been replaced (13% overall). 19% of Waterloo Region residents without a water softener indicated this to be a reason, compared to 7% of Guelph residents without a water softener.

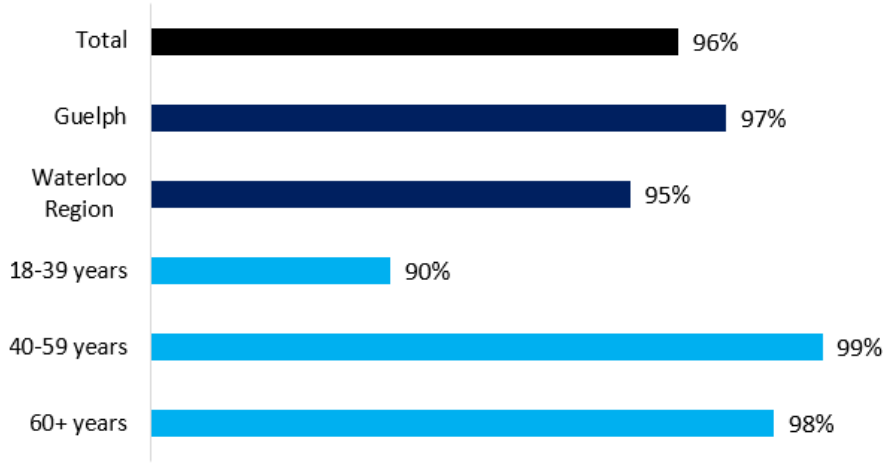
2.3 Working Softener

Is your water softener in good working order? (Base – Has a water softener, n=838)

Almost, but not all (96%), households told us that if they had a water softener in their home, it was in good working order.

The group most likely to say their softener is **not** working is the 18-39 year olds, otherwise there were no statistical differences.

Figure 9 - Working Water Softener



2.4 Water Softener Knowledge

How knowledgeable would you say you are about how water softeners work? (Base – Has a water softener, n=838)

A small cohort of residents (16%) feel they are "very" familiar with how water softeners work (scoring 9 or 10 on a knowledge scale).

The balance of the group were split between saying "somewhat" familiar (scoring 6-8), at 42%, and being "not" familiar (scoring 1-5).

The scores were statistically similar across the two communities.

Men were more likely to say they are at least "somewhat" familiar than women. In total, two-thirds of males (65%) said they were either "very" familiar (20%) or "somewhat" familiar (45%). This contrasts strongly with women, where only one-third said they are at least "somewhat" familiar, with only 7% saying "very" familiar.

Table 11 - Water Softener Knowledge

Highlighted cells show a statistically significant difference	Total	Male	Female
Very (9-10)	16%	20%	7%
Somewhat (6-8)	42%	45%	26%
Not (1-5)	42%	35%	67%

2.5 Security Screen

Do you work in, or do any family members or close friends work for/in…? (Base – Has water softener, n=838)

4% of respondents in the telephone survey were disqualified from further participation, either because they work in some capacity for a water utility (3%) or they are involved in making or selling water softener or treatment systems (<1%).

In the online survey, more residents did not pass the security screen for further participation. 15% overall were involved in areas that were too close to the topic, the majority (11%) overall worked for a municipal or regional water utility.

2.6 Age of Water Softener

Approximately how old is your water softener? (Base – Has water softener, n=838)

Table 12 - Age of water softener

	Total	Guelph	Waterloo Region
Less than 2 years	23%	22%	25%
3-5 years	28%	27%	30%
6-10 years	30%	31%	28%
11 or more years	15%	16%	13%
Don’t know	4%	4%	4%

About half of the households in this survey (51%) have water softeners that are 5 years old or less.

30% have a water softener that is 6-10 years old, and 15% whose water softener is 11+ years old.

4% of homeowners do not know the age of their water softener.

The age of the softener has a correlation to the age of the home. Homes that were built in the past 10 years have newer softeners (68% of softeners are under 5 years old), homes that are 11-24 years old tend to have older softeners (45% of softeners are under 5 years old), then when a house is 25-49 years old some are needing to be replaced, so the average age goes down again (55% of softeners are less than 5 years old).

2.7 Softener Regenerating

How does your water softener system regenerate (recharge)? (Base – Have a water softener in working order, n=808)

Households with a working water softener were read a list of choices (see chart) to understand how their water softener recharges.

About half (49%) say their softener regenerates automatically (Demand regeneration).

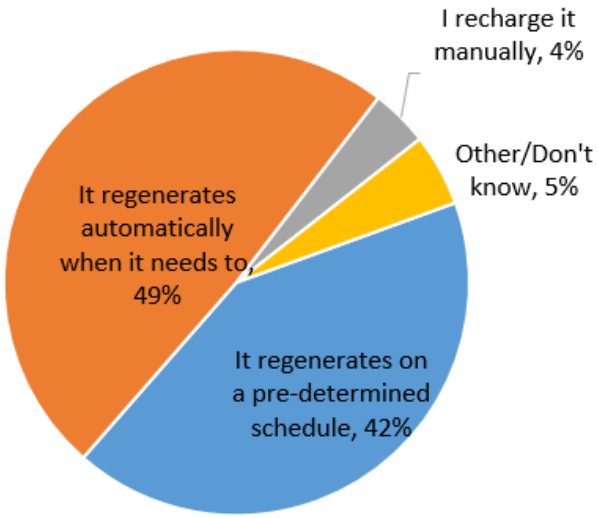
42% say their softener has a schedule and regenerates on that schedule (Time-based regeneration).

The balance of households recharge manually when they feel it is needed, or they do not know when/why their water softener charges.

There were no statistically significant differences across the two communities.

The results are similar to the Region of Waterloo Water Efficiency Master Plan survey in 2013, where 51% told us their softener regenerates automatically, and 39% regenerates on a pre-determined schedule. [12]

Figure 10 - Softener Regenerating



[12] Source: ROW Water Efficiency Master Plan Update, Technical Memo #3, Lura/Metroline/econics, June 2013

2.8 Adding Salt

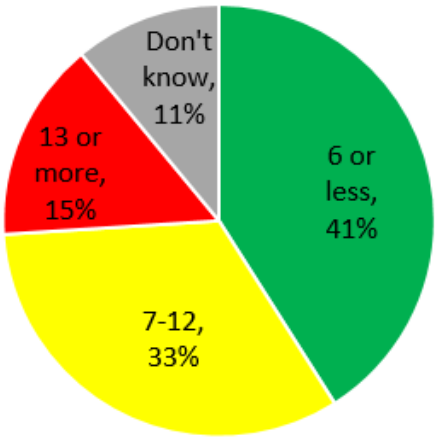
How many 20kg bags of salt do you add to your water softener in an average month? (Base – Have a water softener in working order, n=808)

Although the question was asked per month, the results were converted to annual amounts to make them easier to digest.

Overall, 41% of respondents with a working water softener are putting in at most a bag every 2 months (6 or less per year).

33% are using a bag every 1-2 months (7-12 per year), and 15% are using more than one bag a month (13 or more). 11% of the respondents could not identify how many bags of salt they used per year.

Figure 11 - Bags of Salt added per year



There were no statistically significant differences between Guelph and Waterloo Region, although there are some differences between other sub-groups.

- Women (17%) were considerably more likely than men (5%) to say they don't know how many bags per salt are used per year
- Respondents 60+ years (46%) were more likely to use 6 bags or less per year than respondents 40-59 years (39%) or 18-39 years (also 39%)
- Respondents who qualified to continue further in the test were less likely to say they didn't know how much salt they added per year (6%) compared to those who qualified but were not interested (13%) and those who had a working softener but disqualified for another reason for further participation (16%)
- Household size had a direct impact on the bags of salt used per year, as the larger the home, the more water to be used. Two-thirds (65%) of single person homes use 6 or less bags of salt per year. Homes with 5+ people were most likely to say 13 or more bags per year (24%), compared to households of 3-4 people (15%), 2 people (14%) or single person households (4%)

2.9 Areas where water is softened

How much of your household water is softened? (Base – Have a water softener in working order, n=808)

Those with a working water softener were asked how much of their water was softened, and then read a list of response options.

12% of households say that all water used by their home (indoor and outdoor) goes through their water softener.

40% of households said that all indoor water in their home was softened.

A further 22% told us their hot water was softened and most of the cold water used by their home was softened.

19% say that only the hot water is softened, and 7% did not know.

2.10 Water Softener Importance

How important is having a working water softener to your household? (Base – Have a water softener working or not, n=838)

Two-thirds (66%) of respondents in the study who have a water softener in their home find it "very" important to have a working water softener.

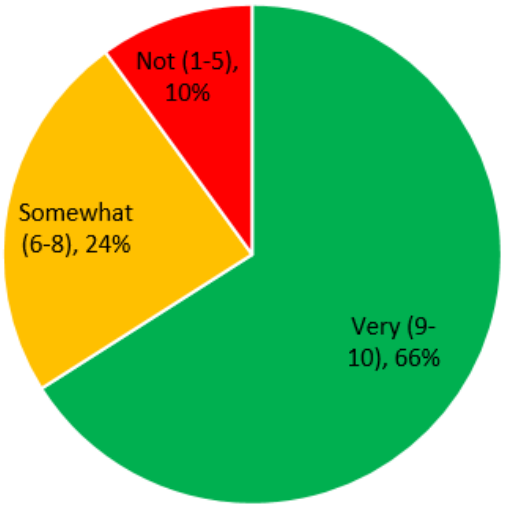
24% find it "somewhat" important, while about 1 in 10 (10%) find it to not be very important to them.

These findings were statistically consistent across the two communities.

Age was a factor. Those 60+ years were more likely to say it is "very" important (74%), compared to those 40-59 years (66%) and those 18-39 years (54%).

In the online survey, a similar number of residents find having a water softener very/somewhat important, but fewer scored it as "very" important (9 or 10), at 53%. 38% scored it as "somewhat" important (6-8).

Figure 12 - Importance of Water Softener



2.11 Benefits of Water Softeners

What are the biggest benefits of using a water softener, if any? (Base – Full Sample, n=1,000)

Table 13 - Benefits of water softeners

Asked Unaided – Rank order by overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
Preserves the life of appliances and hot water tanks	51%	53%	49%
Better for my hair and/or skin	39%	36%	42%
Use less soap	33%	30%	37%
Fewer spots on dishes/glasses/silverware	26%	26%	27%
Softer clothes	19%	15%	23%
Fewer streaks on mirrors, floors	11%	14%	7%
Softer water (general)	4%	4%	4%
Better for pipes/makes them last longer	2%	1%	2%
Reduces lime/calcium	2%	2%	2%
Cleans better	1%	2%	<1%
Better water quality	1%	1%	2%
Feels/tastes better	1%	1%	1%
Don’t know/no benefit	8%	8%	9%

Whether a household had a water softener or not, we asked respondents to tell us what they feel are the biggest benefits of using a water softener?

The main benefit, mentioned by about half (51%) of respondents, was that a water softener can help extend and preserve the life of appliances and hot water tanks in this area.

39% say that softened water is better for their hair and/or skin. Women (42%) were more likely to mention this than men (35%).

A third of respondents (33%) say that softened water reduces the amount of soap that gets used. Waterloo Region residents (37%) were more likely to mention this than Guelph (30%).

Fewer spots on dishes and glassware was mentioned fourth-most often, by about a quarter (26%) of respondents.

Having softer clothes was mentioned about 19% of respondents. Residents of Waterloo Region were more likely (23%) to mention this than Guelph residents (15%).

Once again, in the online survey residents could read the response options, so the scores tended to be significantly higher, although the basic sentiment is the same. For example, "preserving the life of appliances and hot water tanks" was clicked by 87% of the residents in the online survey.

2.12 Concerns about Water Softeners

What concerns do you have about using a water softener, if any? (Base – Full Sample, n=1,000)

Table 14 - Concerns about water softeners

Asked Unaided – Rank order by overall Highlighted cells show a statistically significant difference	Total	Guelph	Waterloo Region
No concerns/nothing/don't know	66%	61%	71%
Bad for the environment/adds salt to water system	15%	15%	15%
Adds salt to water for drinking/cooking	10%	11%	9%
Uses a lot of water	5%	6%	4%
Cost	5%	5%	5%
Carrying/loading salt	2%	3%	2%
Not good for plants	1%	1%	2%
Keeping up with maintenance	1%	1%	1%
Softened water is not good to drink	1%	1%	<1%
Don't need/like them	1%	1%	1%

Two-thirds of residents in this survey say they have no concerns about using a water softener. Residents of Waterloo Region (71%) were more likely to say this than Guelph residents (61%).

The primary concern that residents have would be that the salt used by the water softener is bad for the environment (15%).

The second largest concern was the amount of salt that people are adding to their diet through drinking or cooking with softened water (10%).

There were some differences based on the last level of education:

- Those who had completed high school were most likely to say they had no concerns (77%), compared to those with college education (69%) and university education (61%)
- Those with university education most likely to mention the effect of salt on the environment (21%) compared to those with college education (11%) and high school education (7%)
- Those with university education most likely to mention the effect on water inside the home for drinking/cooking (13%), compared to those with college education (9%) and high school education (7%)

Interest in participating in the study was also a factor:

- Those who qualified for the study and were interested in further participation were **less** likely (62%) to indicate they had no concerns compared to those who qualified but had no interest in further participation (78%)
- Those who qualified and were interested were twice as likely to mention the effect of the salt on the environment (21%) than those who were not interested (11%)

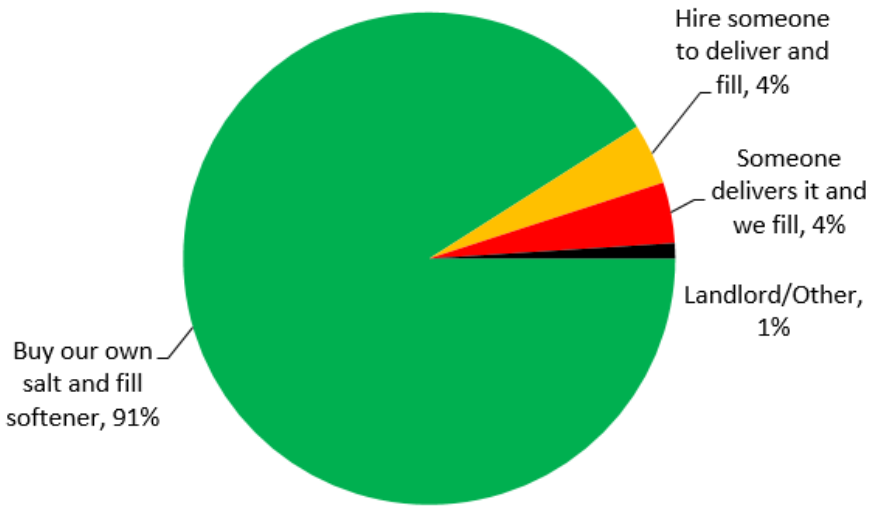
In the online survey, as residents were able to see response options, the number who had no concerns was significantly lower (22%), and the scores were different for the options:

- 45% said "bad for the environment"
- 37% said they did not like "carrying bags of salt"
- 36% said it "adds salt to water for drinking/cooking"
- 26% said it "uses a lot of water"
- 23% said it was "not good for plants"

2.13 Salt Maintenance

How do you maintain the salt in your water softener? (Base – Have a water softener in working order, n=808)

Figure 13 - Salt Maintenance



9 out of 10 households (91%) with working water softeners told us they shop for and buy the salt themselves, bring it home, then fill the water softener.

9% do not shop for their own salt, hiring a service to deliver the salt to their home or having someone else bring it to them.

The proportions were the same statistically across the two communities.

There were some differences among sub-groups:

Those 60+ years were most likely to hire a service to bring salt to their home (16%), compared to those 40-59 years (6%) and those 18-39 years (2%)

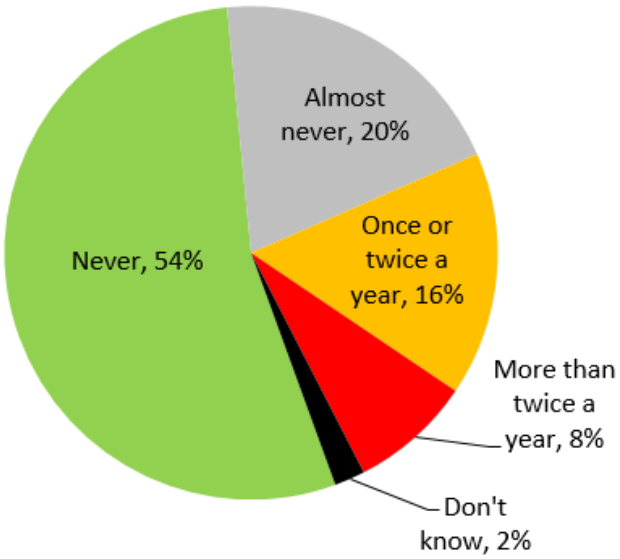
Those who qualified for the study and were interested in further participation were **less** likely (5%) to hire a service to bring them salt compared to those who qualified but had no interest in further participation (11%)

Those in single person households (29%) were significantly more likely to hire a service to bring salt to their home when compared to households of two people (8%) and those in households of three or more (6%)

2.14 Filling Softener

How often, if ever, do you find yourself forgetting to fill your softener so that the salt runs out? (Base – Have a working softener and fill it themselves, n=765)

Figure 14 - Filling Softener



About three-quarters of households (74%) say they "never" (54%) or "almost never" (20%) forget to fill their water softener when the salt gets low.

About one-quarter of households (24%) say they forget to put salt in their water softener "once or twice a year" (16%) or "more than twice a year" (8%).

The results were statistically similar across the two communities.

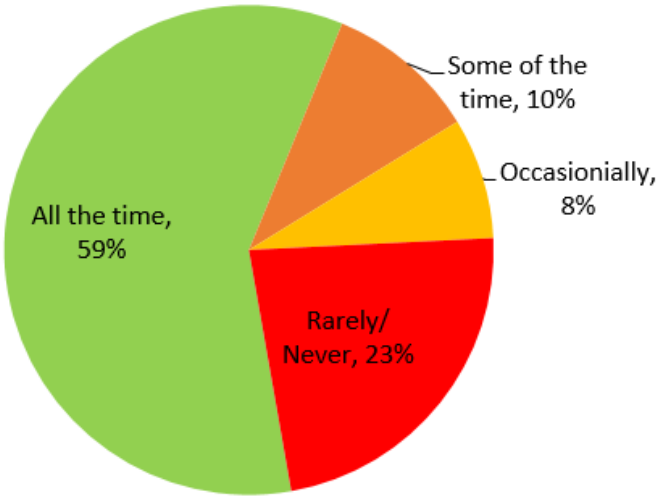
Age was a factor in forgetting to put salt in the softener. 41% of those 18-39 years admitted they forget to put salt in their water softener at least once a year, compared to 24% of those 40-59 years, and 13% of those 60+ years.

Those who qualified for the study and were interested in further participation were **more** likely (27%) to forget to fill their softener at least once a year compared to those who qualified but had no interest in further participation (19%).

2.15 Differences in the water

Do you notice the difference in your water if the softener is out of salt or isn't working properly? (Base – Have a water softener in working order, n=808)

Figure 15 - Water Differences



A majority of respondents (59%) feel they notice "all the time" when their water softener is low on salt or isn't functioning properly.

18% of respondents say they notice "some of the time (10%) or "occasionally" (8%).

23% of respondents say they rarely if ever notice it.

There were no statistically significant differences to report.

Gauging interest in the pilot program

3.1 Awareness of alternative technology

Today in our area the vast majority of water softeners are using what is called "ion exchange" technology, and that process requires salt. Are you aware of any other technology that exists that do not require salt to condition hard water? (Base – Full Sample, n=1,000)

The large majority of respondents (80%) are not aware of any alternative technologies on the market today.

About 1 in 5 (19%) say they are aware of some alternative technologies, and we asked them which ones they were thinking of in the next question.

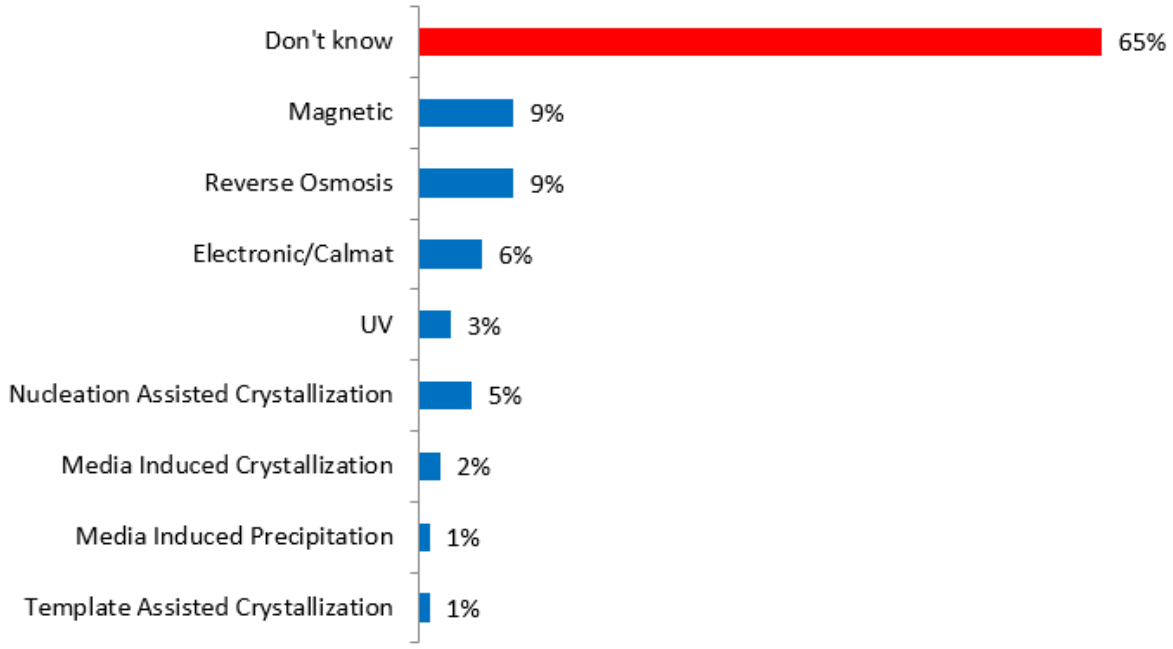
Men (24%) were more likely to say they are aware than women (14%).

Those with university education were more likely to say they are aware (22%) than those with college education (18%) and those with high school education (13%).

3.2 Alternative Technologies

What other technologies are you aware of? (Base – Aware of alternative technologies, n=188)

Figure 16 - Other Water Conditioning Technologies



19% of residents told us they were aware of alternative water conditioning technologies, however when pressed, could not tell us anything further. Two-thirds (65%) of the group who said they were had nothing further to add. If we add that back to the original question, then only 6% are actually aware of alternative technologies and could provide an answer.

The answer given most often was using a magnetic technology (9%). This may be the same as the electronic system mentioned (6%), the brand name 'Calmat' was mentioned and that it is available at Costco.

3.3 Interest in Pilot Study

The Region of Waterloo and City of Guelph have been conducting testing and investigation into various technologies related to water conditioning. One step under consideration would be to conduct an in-home test, where some homeowners will be selected to participate in a pilot program. This would involve being part of a study where a water conditioning technology unit would be installed in their home for one year at no expense to the homeowner. If this study proceeds, how interested would you be in finding out more/participating? (Base – Have a water softener in working order, n=808)

We asked everyone with a working softener about their interest in participating in an in-home test of alternative water conditioning technology.

Overall, 45% of those who have a working water softener were interested in participating (scored 4 or 5 on a 5-point scale). 15% were not very interested (scored 2 or 3), and 40% were not interested at all (scored 1).

Interest was significantly lower in the 60+ year age group, where 31% said they were very/somewhat interested, compared to 49% of those 40-59 years, and 55% of those 18-39 years.

Those with a university education were most likely to say they were interested in the study (52%), compared to 41% of those with college education, and 32% of those with high school education.

Table 15 - Interest in pilot study

5-pt. interest scale Highlighted cells show a statistically significant difference	Total	Guelph	Water-loo Region	18-39 yrs.	40-59 yrs.	60+ yrs.	High School	College	Univer-sity
Very (5)	28%	28%	28%	32%	31%	21%	21%	25%	33%
Somewhat (4)	17%	19%	14%	23%	18%	10%	11%	16%	19%
Not very (2-3)	15%	15%	16%	17%	16%	13%	11%	20%	14%
Not (1)	40%	38%	42%	28%	35%	56%	57%	39%	34%

Correlated to age, those with smaller households of one or two people were less likely to be interested in the study compared to those with larger households:

- Household size of one – 29% at least somewhat interested
- Household size of two – 39% at least somewhat interested
- Household size of three-four – 52% at least somewhat interested
- Household size of five or more – 47% at least somewhat interested

In the online survey, residents tended to be more interested in participating in the pilot study. Overall, 62% of these residents were interested (scored 4 or 5). The correlations for age group and size of household found in the telephone survey were consistent in the online survey.

Appendix 3 – Documents

- Telephone survey
- Pilot study description
- Memorandum of Understanding
- Exploratory focus group discussion guide
- Monitoring phase focus group discussion guide
- Monitoring phase final participant survey
- Post-test focus group discussion guide

Appendix 3a – Telephone Survey

Good…., my name is…., of the Metroline Research Group. We are calling today to conduct a survey about water with residents of …. <Waterloo Region/Guelph>…. The survey will take about 10-12 minutes to complete. Do you have the time now, or can I arrange a better time to call you back?

Arrange callback as needed

S1. Do you live in…?

PN: Watch Quotas

- Guelph → Skip to S3.
- Region of Waterloo → Ask S2.
- Other → Disc.

S2. Where do you live in Waterloo Region/Guelph?

PN: Do Not Read List.
PN: Watch Quotas

- Kitchener
- Waterloo
- Cambridge
- City of Guelph
- Townships → Disc.

S3. Where you live, do you get most of the water for inside your house from…?

- …the municipal water supply
- …a well/lake/river → Disc.

S4. Indicate Gender:

PN: Watch Quotas

- Male
- Female

S5. What is your age?

PN: All respondents will be 18 years and older, quota to represent population

S6. Who is responsible for opening and paying the utility bills for your household?

- I am
- Shared equally with someone else in the household
- Someone else in the household → Disc.
- My landlord/included in the rent

S7. Do you currently own or rent your home?

- Own
- Rent → Disc.

S8. Do you live in a…?

- ...single detached home
- …semi-detached home
- …row or townhouse → DISC.
- …condominium townhouse/apartment → DISC.
- …other → DISC.

Section 1 – Attitudes Towards Water and the Environment

In your opinion, what are the top three issues facing our area related to the environment?

PN: Do not read list

PN: Accept three replies

- Air quality
- Vehicle emissions/idling
- Urban sprawl/population increase
- Water quality
- Safe drinking water
- Water levels
- Water Treatment
- Water availability/levels
- Pesticide use
- Energy costs
- Litter
- Other

I am going to read you some statements about your feelings on the environment. Please answer each one using a scale of 1-5, where '1' means "Strongly Disagree", and '5' means you "Strongly Agree", or choose a number in between. PN: Rotate presentation order.

- I am willing to make sacrifices for the sake of improving the environment
- I am willing to spend more on environmentally better alternatives
- We all have a responsibility to protect the environment
- Our household makes an effort to reduce waste and recycle
- We make an effort to buy locally grown food when possible
- I don't believe my behaviour and lifestyle contributes to climate change
- Any changes I make to help the environment need to fit in with my lifestyle
- It's not worth me doing things to help the environment if others don't do the same

How much does being environmentally friendly factor into your lifestyle? Use a scale of 1-10, where '1' means "I don't really do anything that is environmentally friendly", and '10' means "I'm environmentally friendly in **everything** I do"?

I don't really do anything that is environmentally friendly **I'm environmentally friendly in everything I do**

1 2 3 4 5 6 7 8 9 10

In the past 12 months, did [you/anyone in your household] engage, without pay, in any activities aimed at conservation or protection of the environment?

- Yes
- No

1.5 Were any of these activities done:

PN: Ask if 1.4=1

- on behalf of an environmental or citizen action group?
- on behalf of a charitable or social/sports team (for example, roadside
- cleanup)
- independently, that is, not on behalf of a group or an organization?

1.6 Using a scale of 1-10, where '1' means "Not Important" and '10' means "Very Important", how important is the practice of water conservation in your household?

Not Important to Very Important

1 2 3 4 5 6 7 8 9 10

1.7 Compared to other area households similar in size and number of people would you say your household uses…?

- …much more water
- …a little more water
- …a similar amount of water
- …a little less water
- …a lot less water

1.8 How does your household conserve water?

PN: Rotate Presentation order

- Use low-flow toilets (low flush/dual flush)
- Use low-flow showerheads
- Have a front load or other efficient clothes washer
- Water the lawn/garden less often or not at all
- Wash car less often
- Make sure full loads in dishwasher/washing machine
- Other
- Do not read: Don't know

Section 2 – Water Use Fixtures/Appliances

2.1 Does your household have/use any of the following?

	Yes	No	**Do not read:** Don't know
Water Softener System that uses salt or potassium	1	2	3
Water Softener or Conditioner that does not use salt	1	2	3
A water treatment system such as reverse osmosis, filtration, or UV treatment	1	2	3
A powered humidifier attached to your furnace	1	2	3
Swimming Pool (**not** the inflatable kind)	1	2	3
Hot Tub	1	2	3
In-ground irrigation system	1	2	3
A water efficient dishwasher	1	2	3
Kitchen or bathroom faucet aerators	1	2	3
A rainwater collection system (rainbarrels/tanks, etc.)	1	2	3
Water cooler using bottled water	1	2	3

2.2 Why do you not have a water softener?

PN: Ask if salt-based softener not mentioned in 2.1
PN: Do not read list.

- Can't afford one
- Last one broke and we haven't replaced
- Not sure why I need one
- Too much work
- Other

PN: After response skip to 2.11

2.3 Is your water softener in good working order?

PN: Ask if salt-based softener mentioned in 2.1

- Yes = 1
- No = 2

2.4 How knowledgeable would you say you are about how water softeners work?

PN: Ask if salt-based softener mentioned in 2.1

Not Knowledgeable at all to Very Knowledgeable

1 2 3 4 5 6 7 8 9 10

2.5 Do you work in, or do any of your family members or close friends work for/in…?

PN: Answers are Yes/No

- A municipal or regional water utility
- A company that makes or sells water purification systems
- A company that makes or sells water treatment/softening systems

2.6 Approximately how old is your water softener?

PN: Ask if salt-based softener mentioned in 2.1

- Not sure because it was in the house when you bought it
- Less than 2 years
- 3-5 years
- 6-10 years
- 11 or more years
- **Do not read**: Don't know

2.7 How does your water softener system regenerate (recharge)?

PN: Ask if salt-based softener mentioned in 2.3

- It regenerates (recharges) on a pre-determined schedule
- It regenerates (recharges) automatically when it needs to
- I recharge it manually when I think it is needed
- Other
- **Do not read**: Don't know

2.8 How many 20kg bags of salt do you add to your water softener in an average month?

PN: Ask if salt-based softener mentioned in 2.3

- Half a bag
- 1 bag
- 2 bags
- 3 bags
- 4 bags
- Other
- **Do not read**: Don't know

2.9 How much of your household water is softened?

PN: Ask if working softener mentioned in 2.3
PN: Single response

- All indoor and outdoor water
- Indoor water only
- Hot water and most cold water
- Hot water only
- Other
- **Do not read**: Don't know

2.10 How important is having a working water softener to your household?

PN: Ask if salt-based softener mentioned in 2.1

- Not Important to Very Important

1 2 3 4 5 6 7 8 9 10

- Don't know

2.11 What are the biggest benefits of using a water softener?

PN: **Do not read list.**
PN: **Accept all replies**

- Fewer spots on dishes/glasses/silverware
- Fewer streaks on mirrors, floors
- Use less soap
- Better for my hair and/or skin
- Softer clothes
- Preserves the life of appliances and hot water tanks
- Other
- **Do not read**: Don't know

2.12 What concerns do you have about using a water softener?

PN: **Do not read list**.
PN: **Accept all replies**

- Bad for the environment/adds salt to water system
- Uses a lot of water
- Not good for plants
- Adds salt to water for drinking/cooking
- Carrying bags of salt is heavy/hard
- Other
- **Do not read**: Don't know

2.13 How do you maintain the salt in your water softener?

PN: Ask if 2.13 >=2

- We have a service that brings salt on a regular basis and fills our softener
- We have a service that delivers the salt but we have to fill the softener
- We buy our own salt and fill the softener
- **Do not read**: Landlord takes care of it
- **Do not read**: Don't know

2.14 How often, if ever, do you find yourself forgetting to fill your softener so that the salt runs out?

PN: Ask if 2.13 >=2

- Never
- Almost never
- Once or twice a year
- More than twice a year
- **Do not read**: Don't know

2.15 Do you notice the difference in your water if the softener is out of salt or isn't working properly?

PN: Ask if 2.13 >=2

- All the time
- Some of the time
- Occasionally
- Rarely/Never

Section 3 – Gauging Interest in Our Test

PN: Ask this section if resident owns their home, has a water softener that is less than 10 years old and in good working order

3.1 Today in our area the vast majority of water softeners are using what is called "ion exchange" technology, and that process requires salt. Are you aware of any other technology that exists to condition hard water?

- Yes
- No
- Don't know

3.2 What other technologies are you aware of?

PN: Ask if 3.1 = 1
PN: Do not read list.

- Template Assisted Crystallization (TAC)
- Nucleation Assisted Crystallization (NAC)
- Media induced precipitation (MIP)
- Media induced crystallization (MIC)
- Other
- **Do not read:** Don't know

3.3 The Region of Waterloo and City of Guelph have been conducting testing and investigation into various technologies related to water conditioning. One step under consideration would be to conduct an in-home test, where some homeowners will be selected to participate in a pilot program. This would involve being part of a study where a water conditioning technology unit would be installed in their home for one year at no expense to the homeowner. If this study proceeds, how interested would you be in finding out more/participating?

Not interested to Very Interested

1 2 3 4 5

3.4 Opt in: If this study proceeds, may we contact you again to discuss it further?

PN: Ask if 3.3 = 4, 5

- Yes
- No

Section 4 - Other demographics

4.1 How old is your home?

- Less than 5 years
- 6-10 years
- 11-24 years
- 25-49 years
- 50-99 years
- More than 100 years
- **Do not read**: Don't know

4.2 How many people live in your household full-time?

4.3 How many are 17 years or younger?

4.4 How many other people, if any, live in your household part-time, for example a student who comes home for the summer, etc.?

4.5 Last level of education

4.6 Household income

4.7 Time living in the area

Section 5 – If interested in the Test….

5.1 Marital status

5.2 Respondent occupation

5.3 How long lived in area?

5.4 Postal code and/or nearest major intersection

5.5 Name

5.6 Telephone

5.7 Email address

Appendix 3b – Exploratory focus group discussion guide

Discussion Guide

Water Conditioner Pilot Study

75 minutes

Guelph – August 15th, 2017

Kitchener – August 22nd, 2017

Introduction and Warm-up (5-8 minutes)

- Lobby introduction
- Confidentiality
- Everybody is here tonight because they are interested in the pilot study that we are managing related to alternative water conditioner technologies. I have more information for you about the program and a chance to ask questions later in our session. First though, I'd like to talk in more general terms
- Round table introduction
- Which part of Guelph/Region of Waterloo do you live in?
- How long have you lived in Guelph/Region of Waterloo?
- Tell us a bit about yourself

Water Conservation – Importance/Responsibility (10-15 minutes)

- How much does being environmentally friendly factor into your lifestyle?
  - In what ways?
- How are you environmentally friendly/what do you do to help the environment?
- How important is water conservation?
  - Why?
- How do you conserve water?

Water Softeners (20 minutes)

- You all have water softeners in your home right?
  - Have you always had a water softener?
  - Lived in area but no softener?
  - Difference?
  - Lived elsewhere where it wasn't needed
- What are the biggest benefits of using a water softener?
- What concerns do you have about using one?
- How much do you know about how your softener works?
  - Explore?
- How much of the water that flows through your household is softened?
  - Do you know?
  - Why so little/so much?
- Do you buy salt and bring it to the house, or do you pay a delivery service?
- How often do you buy/have it delivered/fill up the softener?
- How often, if ever, do you find yourself forgetting to fill your softener?
- Do you notice the difference in your water if the softener is out of salt or isn't working properly?

Introduce Pilot Study (15-20 minutes)

Give brief introduction – you expressed some interest in participating in this pilot study related to alternative technology to a traditional water softeners, and are here tonight to talk more about it. I'm going to hand this out for you to read over and we can talk further.

After review - In general, the City/Region has been testing the effectiveness of this technology to treat our water in this area, but not in a real world situation over a longer period of time. We are looking to work with 9 or 10 homeowners who will partner with us for about a year. The unit will be installed in your home by a licensed plumber at no cost to you, and you will carry on in a normal fashion. On two occasions we'll get everyone together to review the experience, and you will be asked to join an online discussion board with others in the test. You will be able to post and respond to questions throughout the test period, and we will ask you questions as well. At the end of the study, you can keep the test unit or have our plumber return and remove it.

Discuss and answer questions, including what people think about the amount of water and salt.

Check and gauge interest in participating

Discuss Next Steps (10-15 minutes)

Let participants know the next stage of the process is to follow up with them individually, and arrange a home visit which should last 20-30 minutes

Give sheets to fill out with contact information, mailing address, etc. and possible times for the home visit – include possible dates and times

- Wrap-up

Appendix 3c – Pilot study description

Why are we doing this pilot study?

Waterloo Region and the City of Guelph mainly draw drinking water from groundwater sources defined as "hard water". Hard water is healthy to drink, but contains calcium, magnesium and other minerals that can form scale on water heaters, appliances and fixtures. To prevent scaling, an estimated 186,000 homes in the two communities use salt-based ion-exchange water softeners that remove these minerals. These water softeners use at least 1.9 billion litres of water to 'recharge' every year, and discharge about 25,000 tonnes of salt into the water system each year, which ends up in local rivers.

In the last three years, Waterloo Region and the City of Guelph co-funded research into alternative technologies that condition the water but do not use salt or need water to 'recharge'. This research included installing units at municipal facilities and running extended testing. The research concluded that these alternative technologies are a viable method for treating hard water in our area. It also concluded that the media inside the unit that removes minerals from the water would last about four years before needing replacement.

Salt-based softeners use an ion exchange process to remove virtually all the 'hardness' (calcium and magnesium) from the water and soften it. These alternative technologies prevent minerals from scaling up plumbing systems, appliances and fixtures, but do not soften the water.

The research project so far has deemed the most effective technology is called "Template Assisted Crystallization", or TAC.

TAC conditioners use a highly specialized media consisting of polymeric beads. When the water passes through the unit, nano-crystals consisting of the minerals in hard water are formed. The crystals grow on the bead until they reach a particular size and then break-off. These microscopic crystals are stable and remain suspended in the water flow instead of forming hard mineral scale on the surfaces in your plumbing system.

TAC technology was first employed as an alternative to conventional water softeners roughly 15 years ago in Germany, where it is accredited by the German Technical and Scientific Association for Gas and Water, the most rigorous accreditation standard for evaluating water softener alternatives. It was introduced to the U.S.A. and Canada about 7 years ago.

TAC systems do not require salt to be purchased and added, nor does it use additional water to re-charge. The study conducted by Waterloo Region and Guelph determined that the annual cost of the alternative unit (replacement cost of the media divided by four years) would be in the neighbourhood of $125-$225, comparing favourably to $150-$300 annually for an ion exchange softener (cost of salt, recharge water, and energy).

The next step in this research process will be to identify a sample of households in each community that are willing to try the alternative technology units in their home for a period of one year. There will be **no cost** to the homeowner to participate in the test.

Here is the process:

- The initial surveys (by telephone or online) identified homes that meet the basic criteria for the study and had interest in finding out more. To be consistent in the finding from this study, we need to create a homogeneous, representative group.
- From the focus groups and some other sources, we will identify a short list of pilot study participants. From there we will arrange a time to drop by your home to ask a few more questions and take an inventory of appliances and fixtures connected to the water system.
- After the final group is identified and selected, we will notify you. Our team will need to install a device on your water meter that will allow us to better track your water consumption before the study begins, and during the study. The installation of the test unit will take place approximately mid-November. The unit will remain installed in your home for 12 months.
- A licensed plumber will come to your home at a pre-arranged appointment, disconnect your current water softener, and then install the test unit.
- At the end of the study, you will have the option to keep the test unit at no cost to you, or have our licensed plumber return to remove it and re-connect your old softener.

What's in it for me as a study participant?

- Most importantly, you will help the environment by using less water, less hydro, and by not adding salt to the water system.
- You will not have to buy salt and load the softener, or pay someone else to deliver the salt and you will also save money on your hydro and water bills
- You have an opportunity to try out an alternative technology relatively new to our area
- The names and addresses of all study participants will remain anonymous and the results will be presented in aggregate form to protect privacy
- All test members will join an online forum where you can share experiences and answer questions that we ask you periodically about the test
- You will participate in a focus group with other study participants twice during the study to discuss your experiences
- At the end of the study, you have an opportunity to keep the test unit at no cost to you (approximate retail value of $1,500), or have us remove it and re-connect your old one

In addition, over the course of the test you will receive about $400 for participating as requested in the online forum, surveys, and focus groups.

Appendix 3d. – Memorandum of Understanding

Memorandum of Understanding

Project owner: **Metroline Research Group Inc**. and,

Homeowner:

Address:

This Memorandum of Understanding (MOU) sets forth the terms and understanding between Metroline Research Group and the homeowner related to the water conditioner pilot program.

Background

Waterloo Region and the City of Guelph mainly draw drinking water from groundwater sources defined as "hard water". Hard water is healthy to drink, but contains calcium, magnesium and other minerals that can form scale on water heaters, appliances and fixtures. To prevent scaling, an estimated 186,000 homes in the two communities use salt-based ion-exchange water softeners that remove these minerals. These water softeners use at least 1.9 billion litres of water to 'recharge' every year, and discharge about 25,000 tonnes of salt into the water system each year, which ends up in local rivers.

In the last three years, Waterloo Region and the City of Guelph co-funded research into alternative technologies that condition the water but do not use salt or need water to 'recharge'. This research included installing units at municipal facilities and running extended testing. The research concluded that these alternative technologies are a viable method for treating hard water in our area. It also concluded that the media inside the unit that removes minerals from the water would last about four years before needing replacement.

The next step in this research process will be to conduct a pilot project, where nine (9) households in each community will try the alternative technology units in their home for a period of one year. There will be **no cost** to the homeowner to participate in the test.

Purpose

This MOU will outline the roles, responsibilities, and requirements of participating in the pilot project.

The primary goal of this project is to gain an in-depth understanding of how residents feel about using a TAC water conditioner unit in their home, and how it may impact the lifestyle of the household, if at all.

The above goals will be accomplished by undertaking the following activities:

Installing a temporary device to the water meter that will provide more detailed data on water use in the home than is currently available;

Installing a TAC water conditioner unit in November, 2017 which will be used until late November/December 2018, and bypassing your current ion-exchange water softener but leaving it attached to the system;

An adult decision maker in the household will attend two focus groups (January, 2018 and January, 2019) to discuss experiences;

An adult decision maker will participate in an interactive online discussion forum on a regular basis with other members of the pilot project, Metroline staff, and representatives from the Region of Waterloo and City of Guelph project teams;

Description of the Project

In mid-late November, 2017, a licensed plumber will be scheduled to come to the home at a pre-arranged appointment and install the test unit. The unit will be purchased from a supplier in Ontario, and will be an established manufacturer of water conditioners that use Template Assisted Crystallization technology (also known as NAC or MIC).

The intent is to place the unit near the existing ion-exchange softener, and that existing softener will be bypassed (no water will flow through). The homeowner will be asked to power down that unit so it does not try to recharge. Final placement will be discussed with the homeowner and will take the advice of our licensed plumber.

The pilot project will assume responsibility for the installation and removal of the test unit, and will repair or replace the unit should it be defective.

Existing salt-based ion exchange softener

When the TAC unit is installed, we will ask you to power down your existing softener. Then, on a couple of occasions during the test, we will send you a reminder on the discussion board to turn on your existing softener, take it off bypass, then run a tap for about 30-60 seconds and then put it back on bypass and power down again. This will exchange the water in your softener and salt tank in an effort to reduce or avoid any buildup or bacteria that may accumulate over time.

Existing home water system

When first installed, the TAC technology, in addition to conditioning the water coming into the home, will work in the home's existing water system, trying to remove any calcium deposits that may have accumulated in pipes or hot water tank. Depending on the age of the home and how much water softening has been done in the past, this could last 4-6 weeks.

Role & Responsibility – Metroline Research Group

- As the project manager, Metroline agrees:
- to keep the homeowner informed of the project, expectations and progress
- to use only licensed plumbers to install and/or remove the test units in your home
- to keep your identity confidential (unless there is a specific request or situation where the homeowner authorizes us to identify them to the City of Guelph or Region of Waterloo)
- to remove the enhanced water meter device at the end of the study
- to remove the test unit at the end of the study if the homeowner no longer wishes to have it connected
- to provide the homeowner with an owner's manual and contact information for the retailer of the TAC unit at the end of the study should the homeowner decide to continue using the TAC unit

Role & Responsibility - Homeowner

As the homeowner, you agree:

- that you have no current plans to sell and/or move during the course of the study
- that you do not have any plans to install an in-ground pool, in-ground irrigation system, hot tub, or other item/device/fixture that will use a consistent amount of water that is not currently installed in the home
- to allow temporary installation of a device that provides enhanced data on household water usage
- to allow installation of a TAC test unit in your home for about one year, or longer if you decide to keep it
- to attend and participate in the focus groups
- to participate in the online discussion forum
- to allow a project team member access to and our equipment in your home throughout the test, with appropriate notice and arrangement
- willingness to share copies of your water bills throughout the test
- to complete tasks as requested from time to time (for example, taking photos of fixtures or appliances, turning on current softener when asked to flush the tank, take photos of fixtures/appliances, take water samples, etc.)

Reporting

At the end of the program (and any updates during the pilot program), Metroline Research Group will share learning from the program with both the Region of Waterloo and City of Guelph. As agreed, the identities of participants will remain confidential.

Financial Incentives

The homeowner, in exchange for their time and opinion, will receive a total of $400.00 at the end of the study when attending the final focus group (January, 2019). Besides this agreed upon amount or any payment(s) that may need to be stipulated in an Addendum to this MOU, Metroline Research Group has no other legal and financial obligations.

Confidentiality

Each party agrees that it shall not, at any time, after executing the activities of this MOU, disclose any information in relation to these activities or the affairs of business or method of carrying on the business of the other without consent of both parties.

Homeowner Notifications

- Homeowners should notify Metroline via email (waterstudy@metroline.ca) in the following situations or similar:
- If you find any difficulties with water pressure, notice any water leakage, around the test unit particularly, but anywhere in general
- If you have a household member move out, or someone come to stay with you for an extended period of time. A week or a month for example (A weekend doesn't count).
- If you will be going away and the house will be empty for a week or more.
- If the initial 'flushing' period has passed after installation, and you still have concerns about the water
- If you see calcium buildup beginning to occur on fixtures

Duration

This MOU is at-will and may be modified by mutual consent of members of the Project Team from Metroline Research Group and the homeowner. This MOU shall become effective upon signature by a member of the Project Team from Metroline Research Group and the homeowner, and will remain in effect until modified or terminated by mutual consent. In the absence of mutual agreement by the Metroline Project Team and the homeowner this MOU shall end on January 31st, 2019.

Liability and Release

For best practices in market research, the identities of various parties involved in the project are hidden from each other, known only by Metroline. However, the manufacturer does provide a warranty on the TAC product, and the licensed plumber completing the installation will ensure that the system is installed properly and does not leak. Because this is market research for testing purposes, we cannot predict what types of problems or impacts may be felt by the homeowner – that is for you to tell us throughout and at the end of this project. If you encounter a problem, injury, loss or damage, please notify Metroline immediately to determine how the impact can be minimized. But by agreeing to participate in this research in accordance with this MOU, the Homeowner explicitly agrees that Metroline Research Group Inc. will not be held responsible for any problems, injuries, loss, or damage caused by the product, its installation, and/or the proper or improper use by the Homeowner.

Signatures

Metroline Research Group Inc.
Name:
Title: Partner:
Address: 301-7 Duke Street West, Kitchener, Ontario, N2H 6N7
Telephone: (519)584-7700
E-mail: waterstudy@metroline.ca

By signing, I acknowledge and confirm I am an authorized representative of the corporation.

Signed in __ this ____ day of ____, 2017.

Signature:

Homeowner:
Name:
Address:
Telephone:
E-mail:

By signing, I acknowledge and confirm I am an owner and decision maker for this address.

Signed in __ this ___day of ____, 2017.

Signature:

Appendix 3e – Monitoring Phase Focus Group Discussion Guide

Discussion Guide

17-05-008

Water Conditioner Study – After Install

Waterloo Region – Monday February 5th, 2018 at 5:30pm

Guelph – Tuesday February 13th, 2018 at 6:00pm

- Welcome
- We're 6 months into our process overall, working directly with you for about 3 months
- Everyone was identified, interviewed, had their home visited, and we installed the equipment

We will want to talk a bit more about some of the steps in a bit, but first:

- Let's talk about the overall experience
- Don't over think, scale of 1 to 10, how do you feel about the water conditioner unit?
  - Why did you score it like that?
- After installation, did you experience any significant change in the look and feel of the water as the system transitioned, possibly removing extra scaling?
  - For how long?
  - Has it settled down?
- Let's talk about pros and cons
  - Pros – no salt installation, no recharge, no waste, etc.
  - Cons – Water is hard, buildup on fixtures, more shampoo, taste of water, streaks/stains on shower glass, steel appliances, etc.
  - Explore pros and cons in detail
- How, if at all, have you changed the way you do things as a result of having this water conditioner? Strategies?
  - More cleaning/scrubbing
  - Using more vinegar
  - Washing things differently
  - Drinking water from different source than tap?
  - What concerns do you have, if any?
  - Possible damage to appliances
  - Stains on the fixtures, damage to fixtures
  - Will this clear up?
  - There are about 10 months left in the process
  - How are you feeling about that?
  - If the study was to end today, would you likely keep this new conditioner unit and use it, or switch back to your water softener?
  - Why?

Appendix 3f – Monitoring phase final survey

Hard to believe it's been a year since we installed the water conditioner in your home. Our test is coming to an end.

This survey should only take 5-8 minutes to complete. We'll use these results as a base for the focus group discussion in early January.

Q1: Now that you have had one in your home for a year, how likely would you be to recommend this technology to a friend or neighbour, instead of a water softener?

Not likely at all to Very Likely

1 2 3 4 5 6 7 8 9 10

Q2: Why are you likely/not likely to recommend?

Q3: In your opinion, what are the biggest benefits of this technology?

Q4: What would you say are the biggest drawbacks or barriers to use?

Q5: Tell us about any creative workarounds or solutions you may have tried or come up with as a result of this new technology. As an example, we spoke in the last focus group and online about putting vinegar in the dishwasher. Did you try that? Anything else?

Please let us know.

Q6: Please tell us how strongly you agree or disagree with the following statements as it describes your household.

PN: Rotate Presentation

	Strongly disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Strongly agree
It's nice not having to deal with salt	1	2	3	4	5
There is some powder/residue from the water on our sink or shower, but it wipes off	1	2	3	4	5
There is a sense of pride in knowing that we are reducing the amount of salt sent into our lakes and rivers	1	2	3	4	5
Have not noticed any hard calcium build up on our taps and fixtures	1	2	3	4	5

	Strongly disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Strongly agree
Our household has adapted to the point we don't really notice a difference anymore	1	2	3	4	5
I appreciate the government exploring projects like this as a way to reduce our impact on the environment	1	2	3	4	5
This technology is not as good as a water softener	1	2	3	4	5
Our dishes do not get clean	1	2	3	4	5
Too much film or residue on shower doors and counters	1	2	3	4	5
Use too much soap and shampoo compared to the water softener	1	2	3	4	5
Like that we can drink water from any tap	1	2	3	4	5

Q7a: Has participating in this test changed the way you think about the water your household uses or the water system in general?

- Yes
- No

Q7b: If yes – ask: What has changed?

Q8: Now that the test is coming to an end, would you like to keep the water conditioner and continue using it?

- Yes
- No

We look forward to discussing this with you at the focus group in January. As a reminder:

Waterloo Region – Wednesday January 9th, 2019 at 7pm
Guelph – Thursday January 10th, 2019 at 7pm

We will send you some instructions on how to remove and bring the device attached to your water meter. It is simply a matter of releasing the rubber strap and unplugging it.

Appendix 3g – End of test Focus Group Discussion Guide

Discussion Guide

17-05-008

Water Conditioner Study – Final focus groups

Waterloo Region – Wednesday January 9th, 2019 at 7:00pm

Guelph – Thursday January 10th, 2019 at 7:00pm

- Welcome
- Thanks for coming tonight, thanks for participating in the project
- Let's talk about the last year, and we encourage open and honest discussion

Overall Experience

- First, let's talk about what you see as the biggest benefits to this system?
- What about the biggest drawbacks/barriers to keeping or using the system?
- What do you know now that you wish you had learned earlier in the process?
- Passing time
- As time passed over 2018, how did your perception change, if at all?
  - Forget that it was there?
  - Wish that you could get rid of it?
  - Somewhere in between?
- Did you adapt?
  - Why or why not?
  - What did you need to adapt?
    - Using vinegar more, etc.
    - Drinking water from all taps without concern, etc.
- Did you speak with friends or family about the water conditioner unit?
  - What did you say?
  - What kinds of reactions did you get?
- Where do you notice a difference the most?
  - Dishwasher? Shower doors? Others?
  - How do you clean the residue?
- What about the reduced impact on the environment?
  - How has that impacted you? Other members of your household? Do they agree?
- Did you notice significant difference in soap/shampoo use over the course of a year?
- What about being able to drink the water from any tap anywhere? Valuable/not?
- What do you think this says about our government for trying to do this?
  - Positive/neutral/negative impact?
  - Why?
- Do you think the Region/City should promote this technology?

  - Why/why not?
- Has participating in this test changed the way you think about the water your household uses or the water system in general?
  - How has it changed?
  - What do you think about differently?
- Have you noticed any changes in the way you do things?
  - Are these changes inside your home or all the time?
- What do you think these units cost compared to a traditional water softener? More/same/less?
  - Why?
- Do you think if people were educated about the environmental benefits of this technology, they would want to buy want at full price, presuming they are between $1,000 and $2,000?
- Do you think it would be worthwhile for the Region to offer rebates toward the purchase of this new technology?
  - Why or why not?
  - What would be reasonable if the purchase price was say $1,500?
- How likely are you to keep the water conditioner?
  - Why/why not?
  - What are the biggest areas of concern?
- Talk about next steps
  - If keeping:
    - We will be in touch with you individually with a package of information which will give you more information about the unit, and a local company to contact with questions or replacement media in a couple years
  - If not keeping:
    - We will organize with the plumbing company, then contact you to schedule a time for them to come to your home, similar to what we did during the installation phase

Table of Figures