

# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



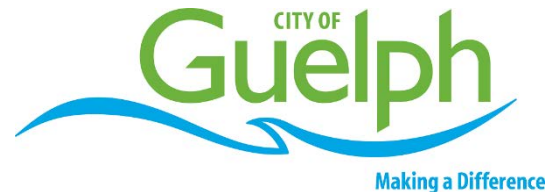
# Market Study, Nucleation Assisted Crystallization:

A tale of 17 households

Waterloo Region, City of Guelph

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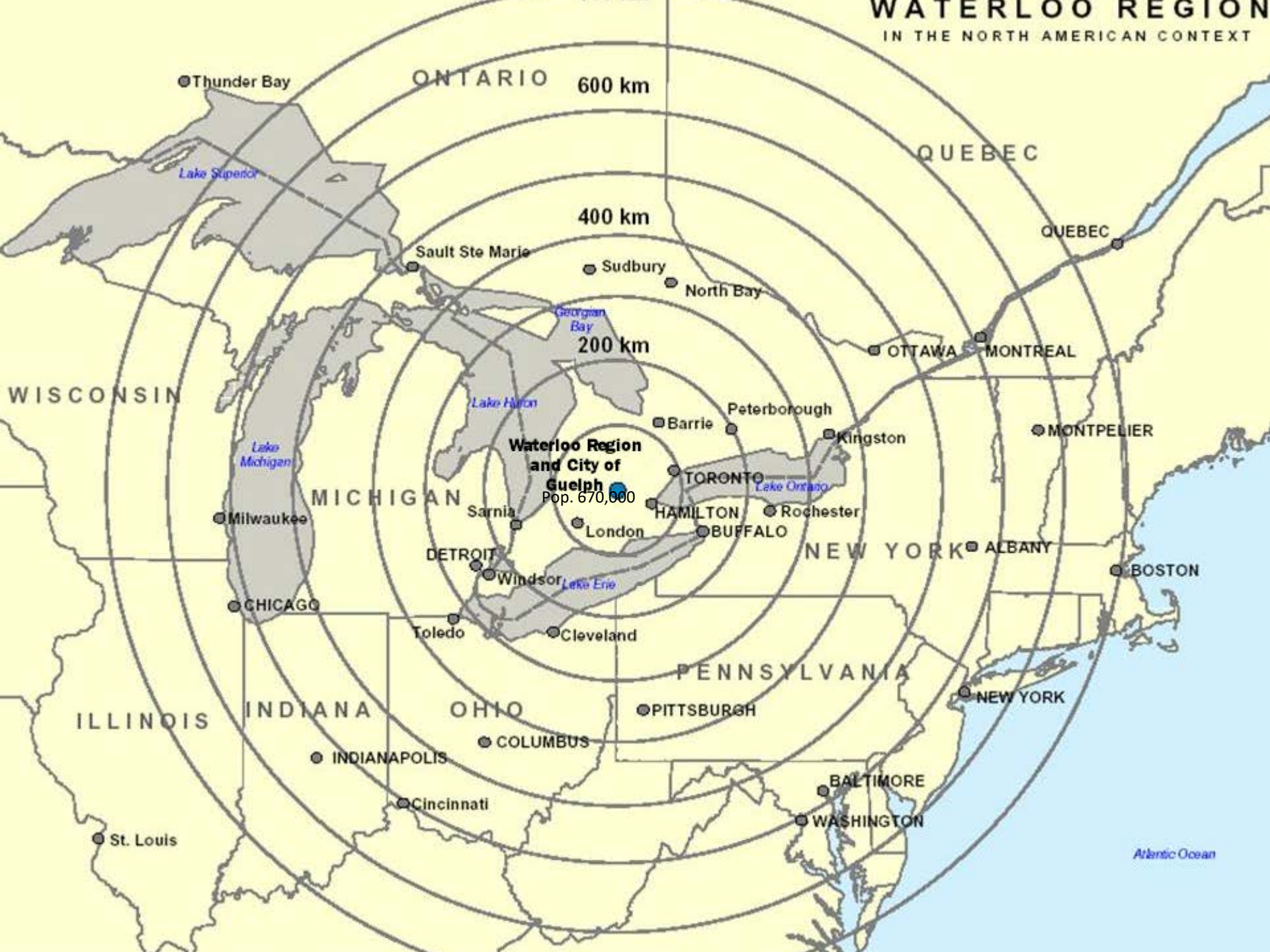


# Outline

- Why study residential water softeners?
- Study Method
- Study Results
- Next Steps, Municipal Policy
- Questions/Discussion



# WATERLOO REGION IN THE NORTH AMERICAN CONTEXT

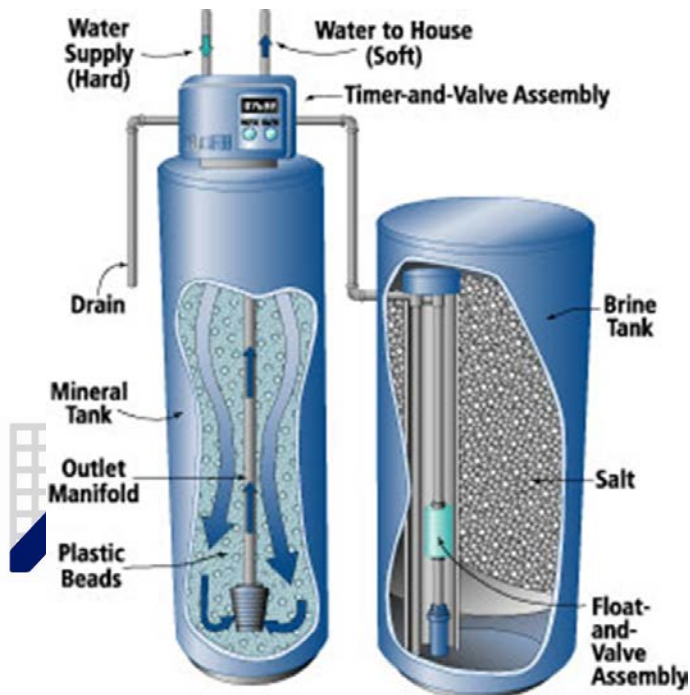




# Hard groundwater

- Up to 56 gpg hardness: "Very Hard," USGS
- Cambridge, Guelph, Kitchener, Waterloo
- 80% or 186,000 households use softeners
- Cation Exchange:

500 million gallons backwash  
27,555 U.S. tons salt



# Why do people soften?

- Prevent  $\text{CaCO}_3$  buildup on HW heater, plumbing fixtures and appliances
- Slippery feel
- Less soap
- Better taste?



# Environmental Impacts

- Accounts for 50% sodium chlorides at WWTP discharge and 25% downstream
- Threat to wildlife – NaCl approaching chronic levels
- TDS in wastewater limits reuse
- Backwash = 7% of household water
- 1 lb salt in softener = 4 lbs CO<sub>2</sub>e



# Research Partnership: Waterloo Region & Guelph



Waterloo test location, 36 gpg

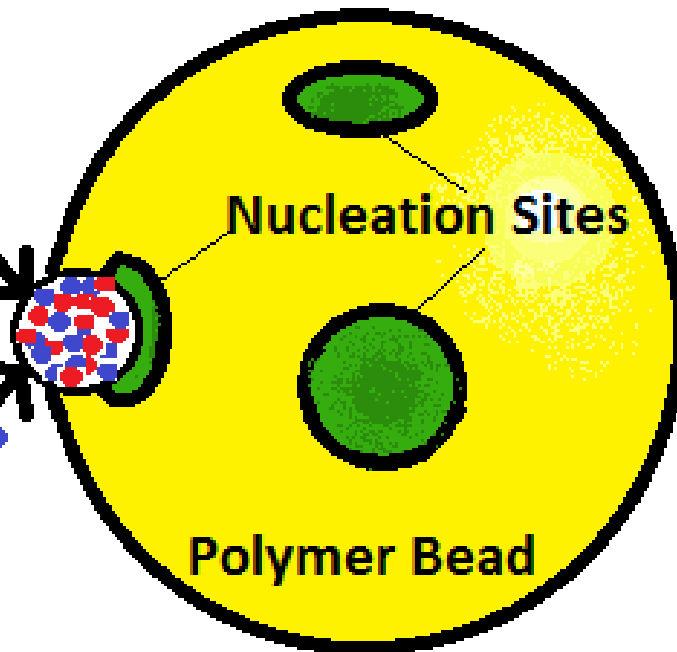
- Test softeners performance 2009 - 2012
- Educate:  
[www.watersoftenerfacts.ca](http://www.watersoftenerfacts.ca)
- Encourage better performance standards, NSF/ANSI, WaterSense
- Seek viable alternatives





# Nucleation Assisted Crystallization NAC/TAC: No salt or backwash water required

Mg and Ca ions collect on nucleation sites and form solid crystals that won't attach to surfaces



Region of Waterloo

## Pelican Natursoft NS3



Pelican media



FilterSorb SP3 by WATCH

## Watts OneFlow



Media "TAC" by Next



Max rated flow 10 gpm,  
half a gallon of media

# 2015 Bench testing in Waterloo

- Potential to reduce scale
- Media could last 4.5 years (3-person HH)
- Next step, field test in real households



# Research Method





# Reported NAC Benefits

- 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.



## Reported NAC Drawbacks

- 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.



## 13 of 18 homes chose to keep the unit

- 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.

# Why remove the unit?

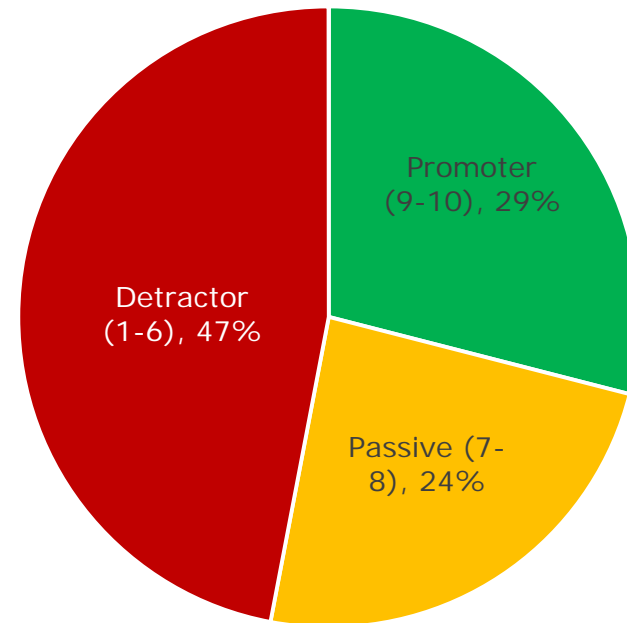
- poor perceived performance from the NAC unit in treating water.
- difference of opinions between individual members of the household (trade-off between benefit and experience).
- not willing to take on any extra steps to remove leftover residue the water conditioner left behind, regardless of how easy or difficult it was to wipe up/off.
- perceive that one household would not impact the environment in any significant way.



# "How likely are you to recommend NAC technology to a friend or neighbor?"

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

**Net Promoter Score (- 18)**



## Conclusions to inform policy

- A rebate on NAC not recommended
- Enhance [watersoftenerfacts.ca](http://watersoftenerfacts.ca)



# Proposed approach

1. Don't soften water at all
2. Use a salt/water-free alternative
3. SOFTEN HOT WATER ONLY!



# Salt/Water: Cambridge, Kitchener, Waterloo

<b>Det/semi/townhouses with softeners</b>	<b>94,067</b>
Population using softeners	292,221
Annual tons of salt used	18,000
Acre-feet/year of backwash water used	1,008
Tons/year CO <sub>2</sub> e from water/salt consumed	8,227
Per capita/year/gal backwash water used	1,124
Per capita Lbs/year salt used for softening	123





# Soften Hot Water Only

Assume Hot Water = 35% of total use

Annual water bill saving, 3 people	\$38.54
Annual Salt Bill Saving, 3 people	\$45.36
Gallons/cap/year water saved	766 (5% reduction)
Pounds/cap/year	80

\*98.5 % of homes with softeners do whole house

With \$50 rebate to change plumbing,  
payback is under 2 years



# Pilot Rebate Program: GHG, Water & Salt Savings, Cumulative

	2020	2021	2022	2023
Cum gal water Saving/yr	1,100	4,200	9,500	16,900
Salt saved tons/yr	20	60	99	139
Tons GHG saved/yr	84	305	417	583

1,000 people or 350 households per full year (from 2021); Launch June 2020

\* Using 2017 GHG EF

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