



**Partners in
Project Green**

A Program of Toronto and Region Conservation Authority

GreenBiz Caledon: Best Practices in Water Management & Efficiency

May 31st, 2022

8:30am to 10:00am

We respectfully acknowledge that we are situated on the Traditional Territories and Treaty Lands, in particular those of the Mississaugas of the Credit First Nation, as well as the Anishinaabe of the Williams Treaty First Nations, the Huron Wendat, the Haudenosaunee, and the Metis Nation.

As stewards of land and water resources within the Greater Toronto Region, Toronto and Region Conservation Authority appreciates and respects the history and diversity of the land and is grateful to have the opportunity to work and meet on this territory.



Additional Resources

- yrnature.ca/acknowledging_land
- edgeofthebush.ca
- native-land.ca
- Text 1-855-917-5263 with your City and Province to learn whose traditional territory you're on
(standard text messaging rates may apply)



Agenda

- Introduction to GreenBiz
- Water Management & Efficiency Workshop
 - Why is water efficiency important?
 - How to prepare for a water audit
 - How to conduct a water audit
 - After a water audit
 - Best Practices in water management
 - Stormwater management and resilience
- Question & Answer Period

GreenBiz



Caledon



Introduction to GreenBiz



GreenBiz Resource Hub & Workshops

- **Free resources & support** to help businesses reduce their **carbon footprint, green their operations, and save on their bottom line**
- **Resource Hub** launching in June with tools, checklists, videos and more
- **Expert-led workshop series** provided throughout the year with practical steps for taking action
- Attend all four workshops for a chance at the **grand prize draw!**

Register for the next workshop today!

<https://partnersinprojectgreen.com/greenbiz-resource-hub/>

Brought to you by:





Workshop Series

- **Best practices** and **action-oriented** guidance from a number of experts
- Help you **implement strategies** within your organization
- **Networking** opportunities with **like-minded** businesses
- Opportunities to learn about **additional incentives** to implement projects
- Entry in a raffle for a **grand prize** if you attend all four sessions!

Register for the next workshop today:

<https://partnersinprojectgreen.com/greenbiz-resource-hub/#GreenBiz-Workshop>





Workshop Series



Water Efficiency

May 31, 2022

- Best practice in conserving water
- Low impact development for stormwater management



Energy Management

June 7, 2022

- Energy savings, carbon reduction, habits of efficient companies
- Low carbon transportation



Waste Reduction

September, 2022

- Waste reduction strategies
- Waste audit tools and best practices



Employee Engagement

October, 2022

- Best practice in engaging employees
- Drive workplace sustainability actions



Resource Hub



- Launching next week!
- Free action-oriented videos, tools, and materials
- Share with your team and drive action at your company

<https://partnersinprojectgreen.com/greenbiz-resource-hub/#GreenBiz-Hub>





Putting Sustainability to Practice

- Access to **tools, guides, videos, and resources**
- **Develop** internal **knowledge** and **capacity**
- **Identify opportunities** cost **savings** and improving your environmental **impact**
- **Network and collaborate** with like-minded businesses
- Learn how to **access additional government incentives**





Region of Peel Water Efficiency Support

- Region of Peel website will be updated with resources and relevant programs – keep an eye out for updates: <https://www.peelregion.ca/water/efficiency/>
- Personalized support available to help businesses achieve water saving goals
- New and improved water audit program coming soon in 2022
 - Eligible businesses will receive a subsidized audit with a consultant to identify water saving opportunities
 - Eligibility will be determined through a screening process

If you'd like to be added to a waitlist to receive more information about our new programs please email fariha.ahmed@peelregion.ca



Today's Speaker



Bruce Taylor, Enviro-Stewards

btaylor@enviro-stewards.com

519-578-5100

Bruce is a Fellow of the Canadian Academy of Engineering and the founder of Enviro-Stewards, which is a Best for the World classified B Corporation, recipient of Global Compact Canada's SDG Goal award, and the only Canadian company to win a Global SDG award.





Water Management & Efficiency Workshop

A woman with dark hair, wearing a light-colored blazer, is smiling and looking towards a man. The man is wearing glasses and a dark suit, and is seen from the side. They appear to be in a professional setting. A large green semi-circular overlay is positioned on the left side of the image, containing white text.

Why Water Efficiency Is Important

The Inherent Value of Water:



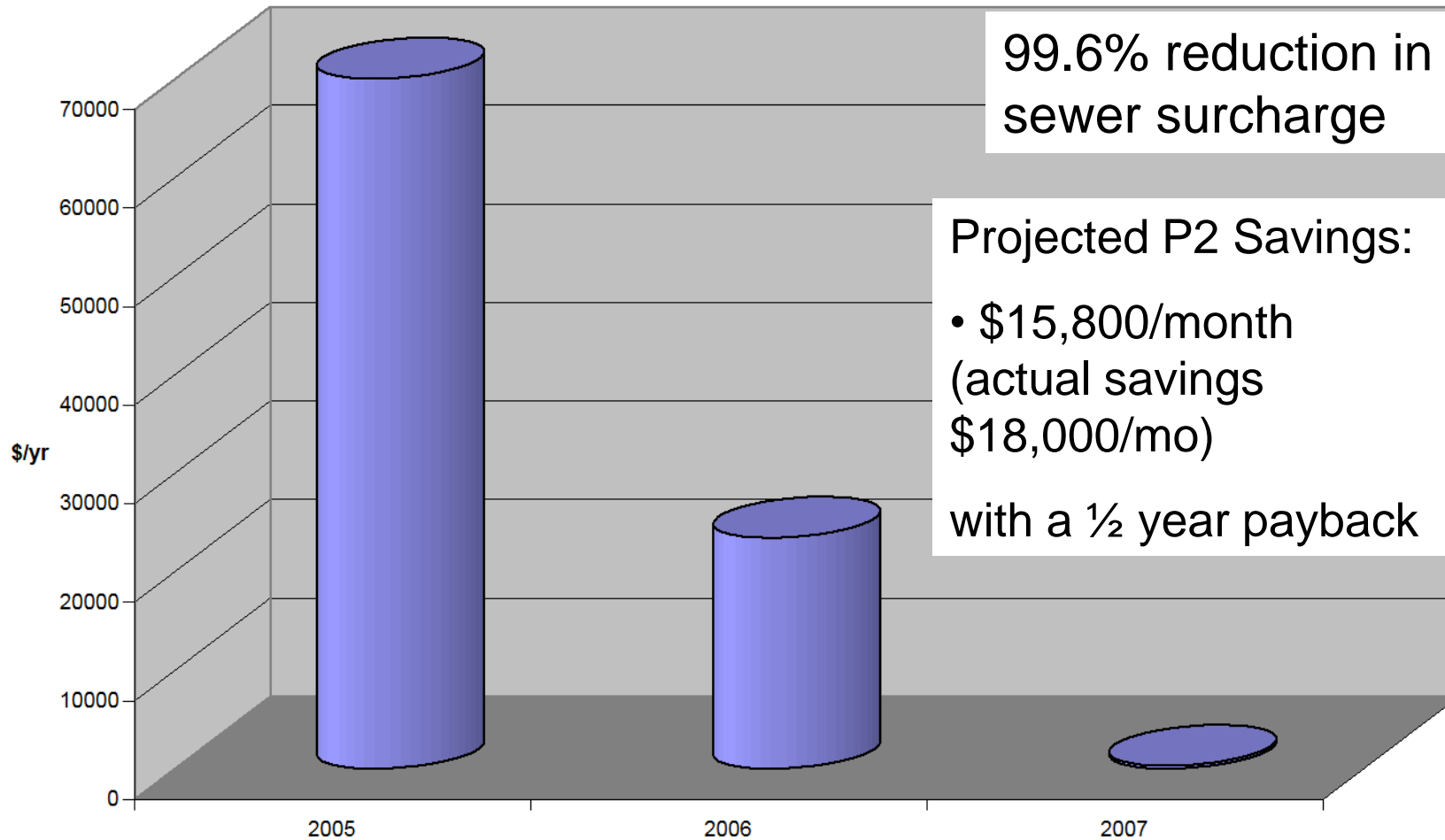
The Business Value of Water:

- How long could your business survive without water & sewer treatment?



Positive Feature in MOE TRA Act Guidance and in Globe & Mail Article:

Sanitary Sewer Surcharge




Report on **Business** | YOUR BUSINESS

Industry News | Economy | Your Business | Commentary | Managing

Featured: • Your Business home • Start • Grow • Exit • Business Categories

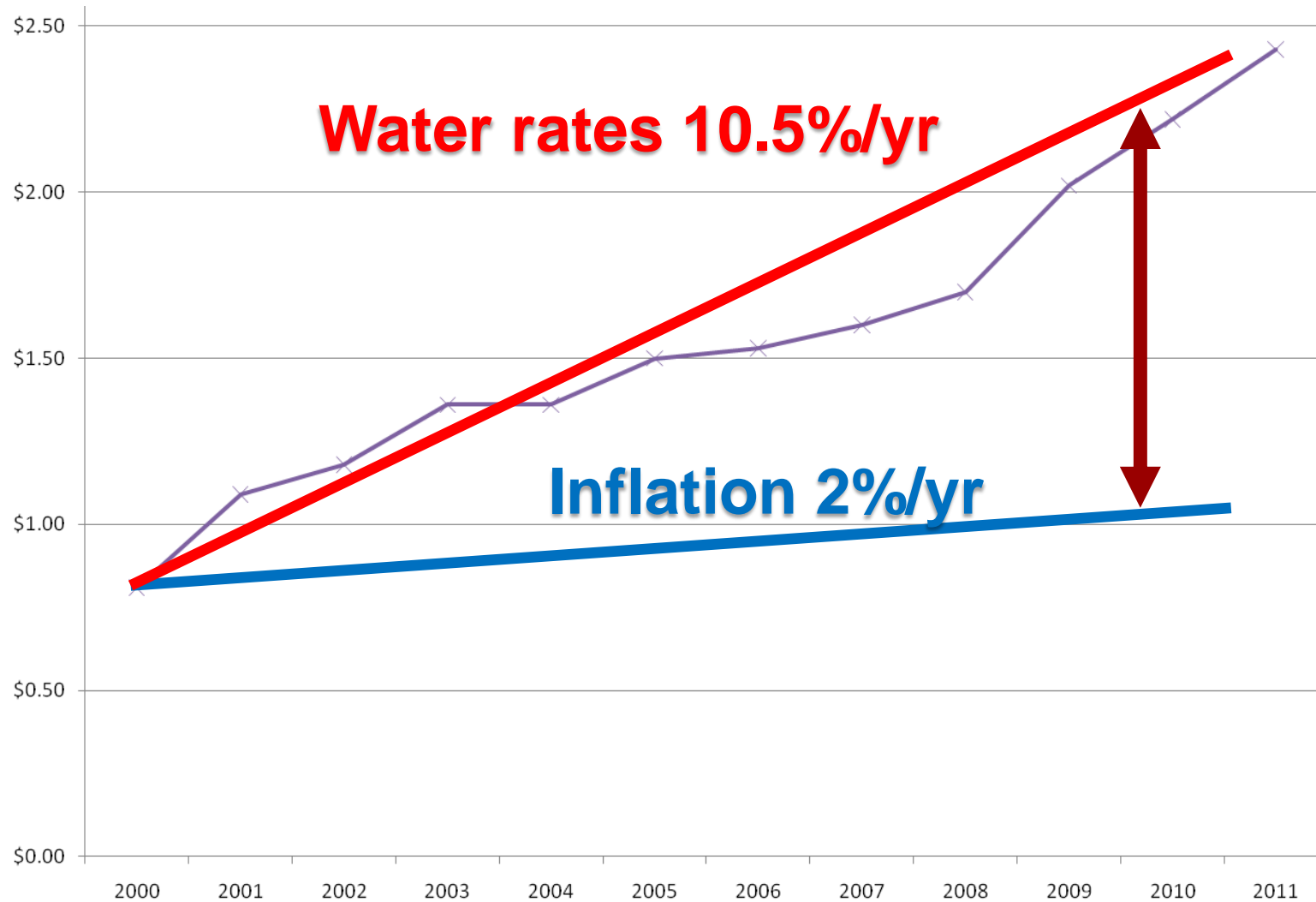
Transportation
Cleaners of gunk go green



Tanker-truck washing company tackles its waste problems and saves money in the process

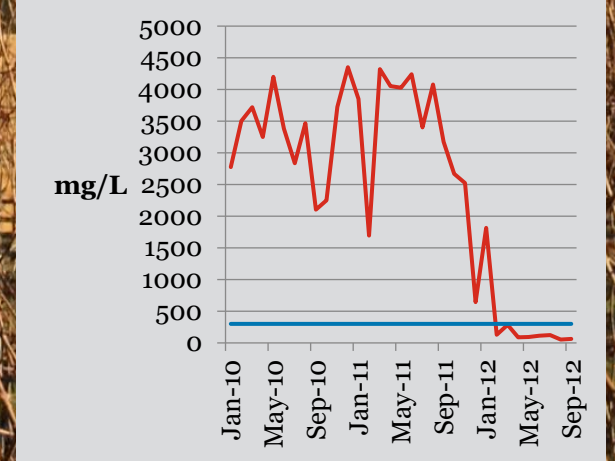
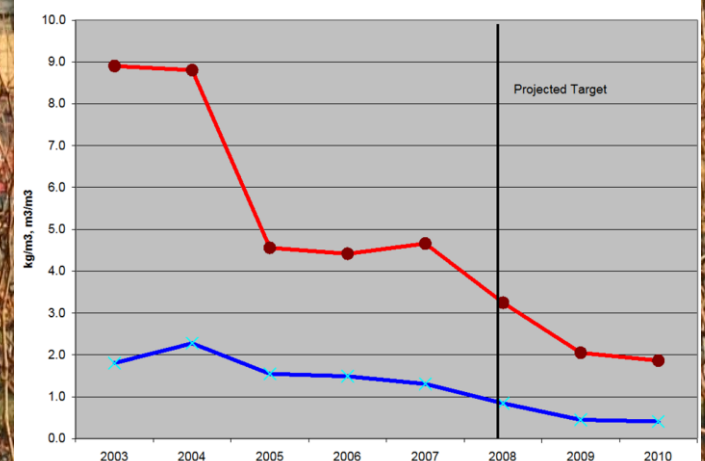


If you are not conserving water, your margins are shrinking!



Jackson Triggs

\$1.5 million capital cost savings



Embedded Water (Water Footprint):

Case study: Bonduelle

- **\$460,151/year** food savings with <1 year payback
- 265,584 kg/year food saved
 - **321,385 meals/yr**
 - 1,670 tonnes/yr embedded GHG
 - 7,601 m³ of water in production
 - **85,518 m³** of water in supply chain



Conestoga Meats

2018 SWR Partnership Award



Region of Waterloo

- 2012: water & energy study savings tracked by Conestoga Meats:
 - 43 % reduction in energy
 - 20% reduction in water
- 2018: food study found 50,000 kg/yr of food
 - 19,489 meals/yr
 - 400 tonnes/yr GHG
 - **300,000 m³/yr** of water (equivalent to **more than half** of all water consumed by packaging plant)



Embedded Carbon Footprint (Energy water nexus)

- Municipality's largest footprint component is for energy used to treat water & wastewater
- Footprint (and cost) is much higher if it is chilled water, hot water, and/or contains ingredients & raw materials



Region of Waterloo
Wastewater Treatment

Ontario's Regional ICI Water Conservation Programs

(locations that have concluded it is cheaper to buyback capacity)



Region of Waterloo



York Capacity Buyback

2019 OWWA Public Sector Award:

- High participation rate
- Integration of co-benefits (energy, climate adaptation, P2 & embedded water)
- Average **36% water savings/facility**
- Average payback of 1.5 years

2018 OWWA Private Sector Award:

WATER SAVING:
>37,000 m³/year

TOTAL OPERATIONAL SAVINGS: \$285,000

Payback: Less than 6 months

*Payback period includes water incentives, energy and operational savings.



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How to prepare for a water audit

Approach.

Preventing root causes.

1. **Who** are your champions?
2. **What** are your wastes?
3. **Why** are your wastes generated?
4. **Where** can they be improved?
5. **When** should they be implemented?
6. **How** can implementation be expedited?

Who.

Gaining buy-in.

- To facilitate change, a multi-disciplinary team participates in kick-off and progress meetings
- Stakeholders include management, engineering, maintenance, operations, QA/QC, purchasing

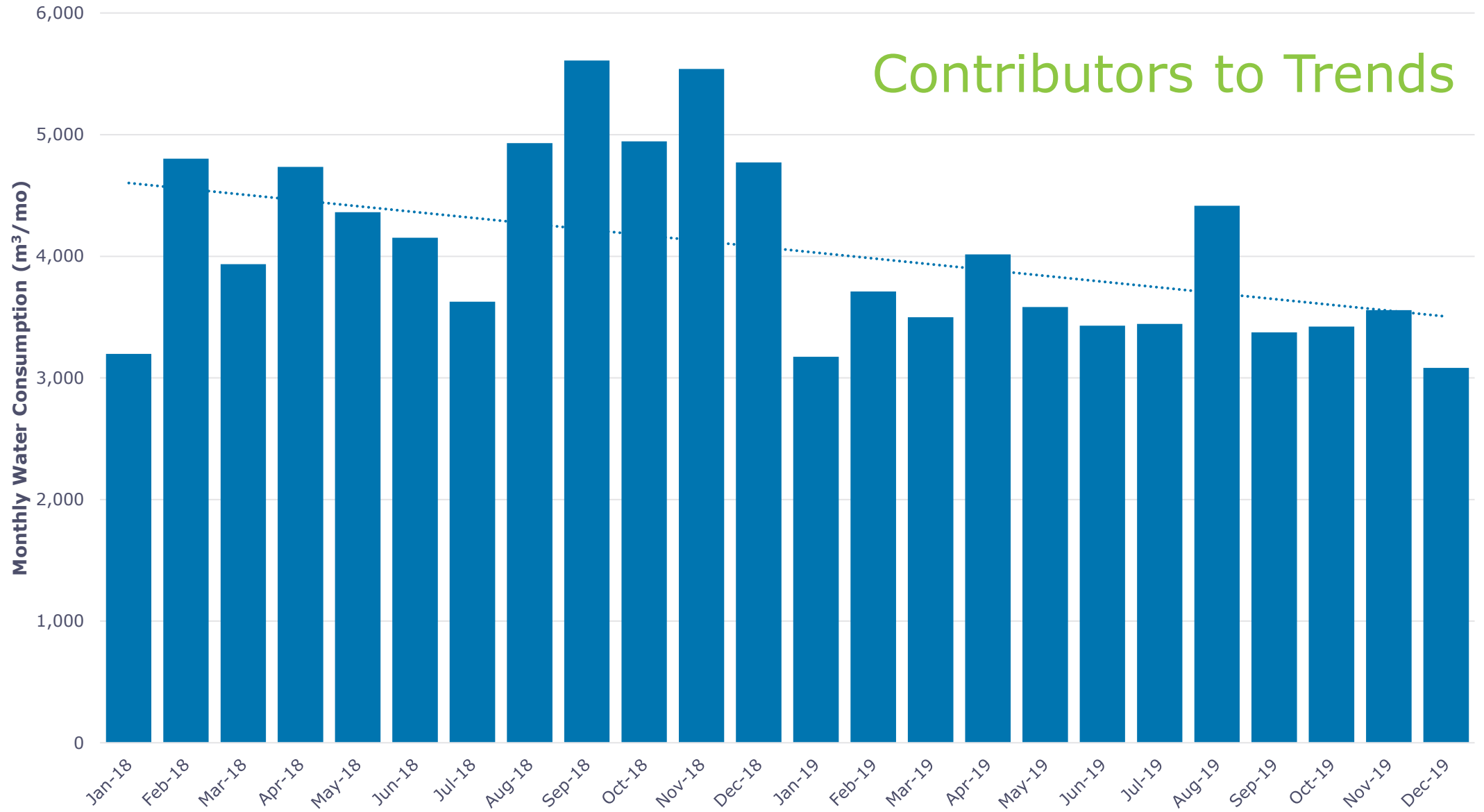


What

What background information is already available:

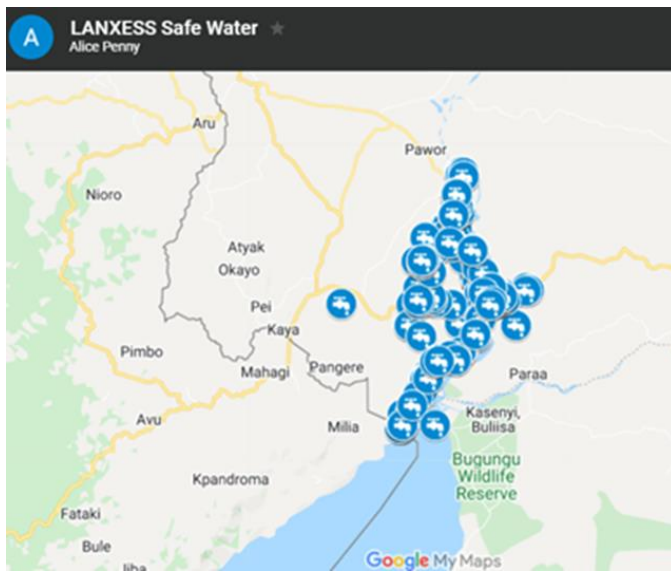
- Monthly water & sewer bills
- Submeters (boilers, cooling towers, etc.)
- Potential homes for reused water (irrigation, toilets, cooling towers, etc.)
- Floorplan
- Previous or related studies
- Planned capital expenditures (roof replacement, equipment upgrades, business growth plans, etc.)
- Water Quality specifications for significant water consuming processes

Water.



Strategic Water Targets:

- Water Neutral Organization
- Water Neutral Products/Services



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How to conduct a water audit

Approach.

Preventing root causes.

1. **Who** are your champions?
2. **What** are your wastes?
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Gaining buy-in.

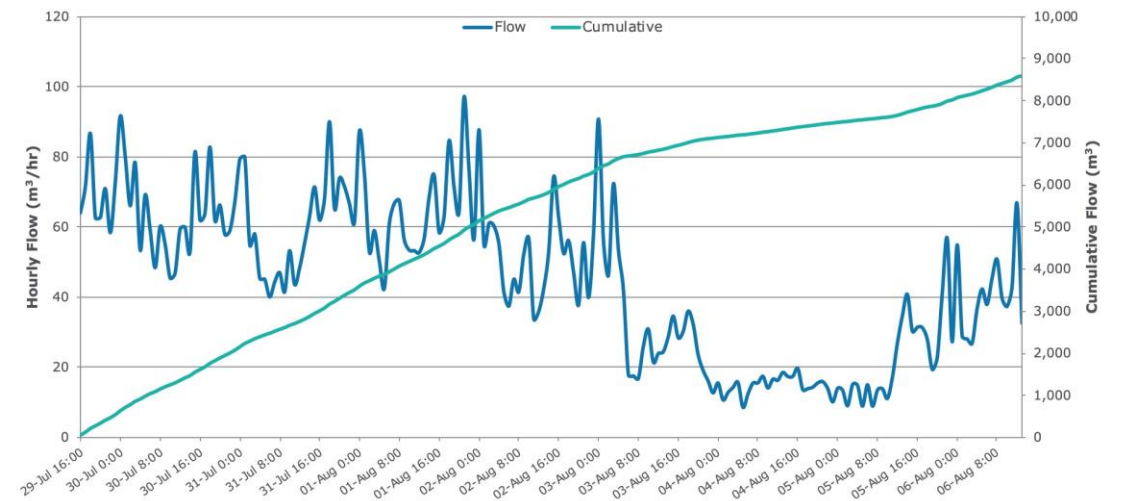
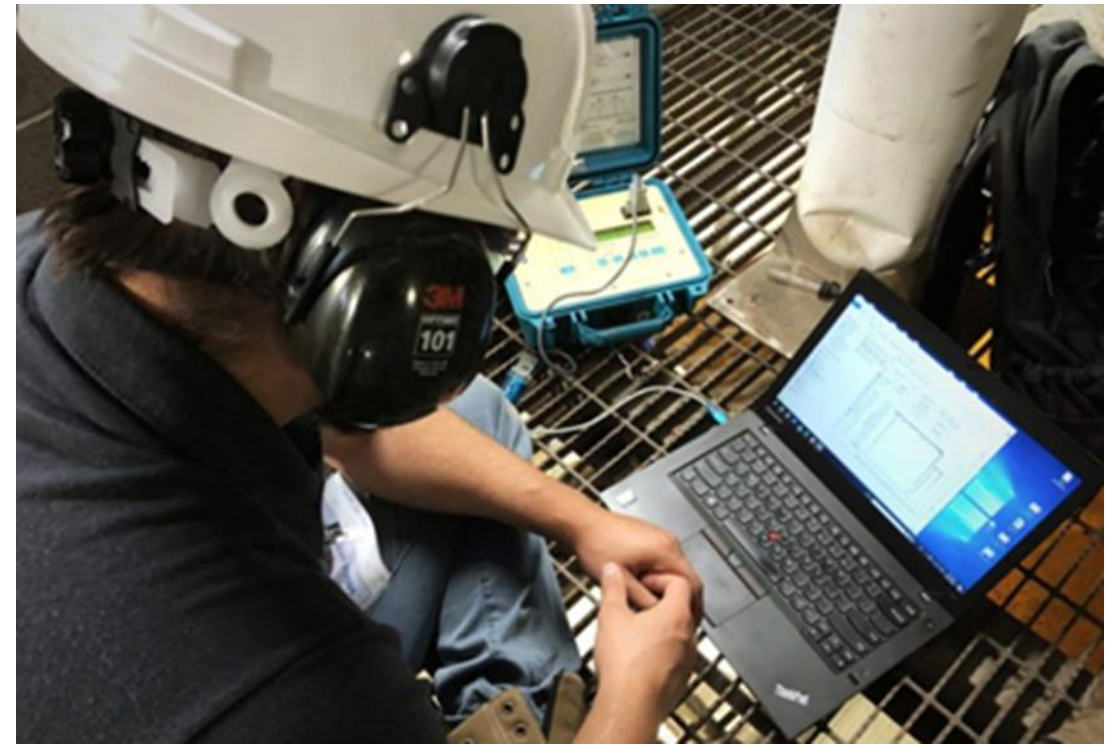
- To facilitate change, a multi-disciplinary team participates in kick-off and progress meetings
- Stakeholders include management, engineering, maintenance, operations, QA/QC, purchasing



What.

Collecting reliable data.

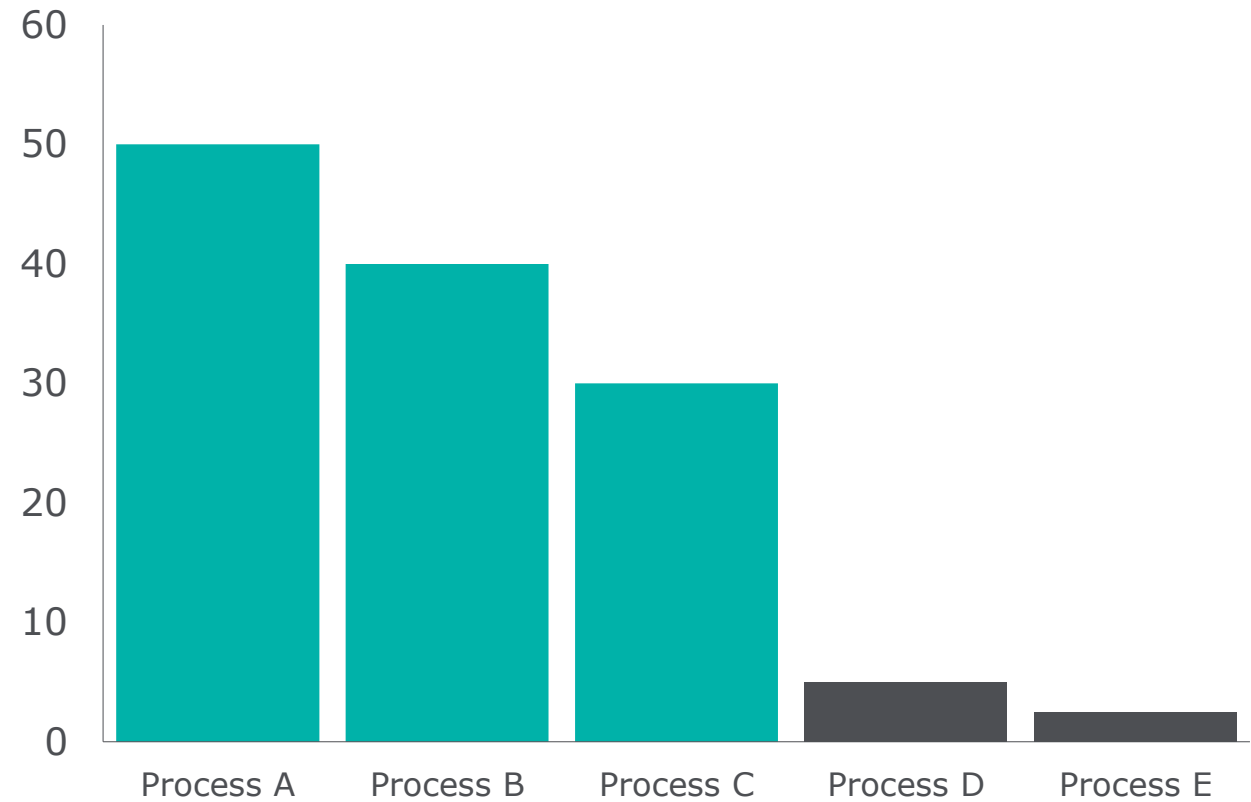
- A detailed and systematic assessment of utility consumption and waste generation



Where.

Where in the process to intervene.

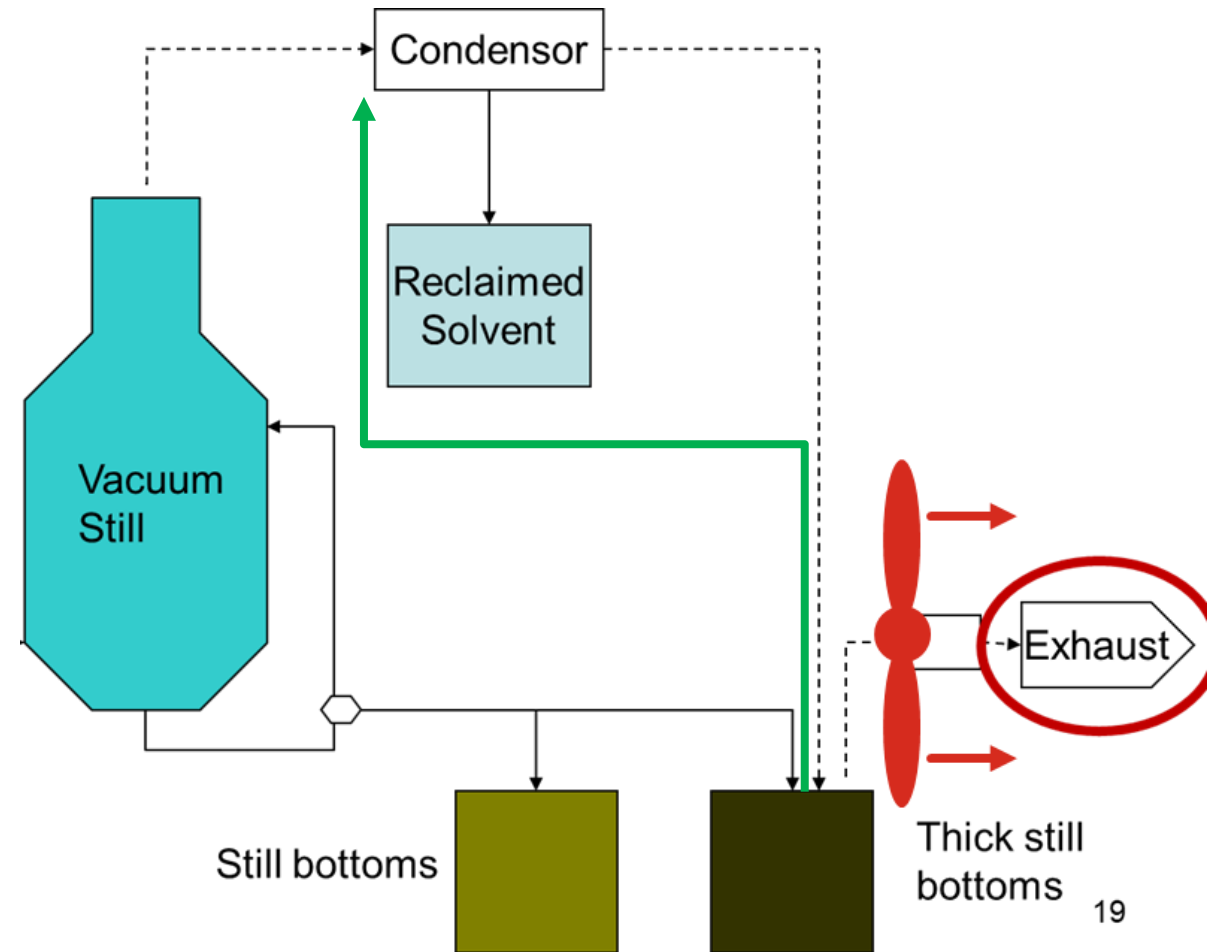
- The Pareto principle:
80% of the contribution is frequently generated by 20% of the population



Why: Root Cause Analysis

For Example:

- if study electricity ... new motor
- If study thermal ... heat exchanger
- If study toxics ... recover solvent, and
 - Save even more energy & money
 - Reduce worker exposure
 - Reduce toxic emissions
 - Reduce supply chain footprints



Why: Water job is the water accomplishing (and what quality is needed)

Cold City Water





Purpose: Seal

Warm Water to Drain
 \$88,000

Hot City Water




Purpose: Cleaning

Hot Water to Drain
 \$46,000

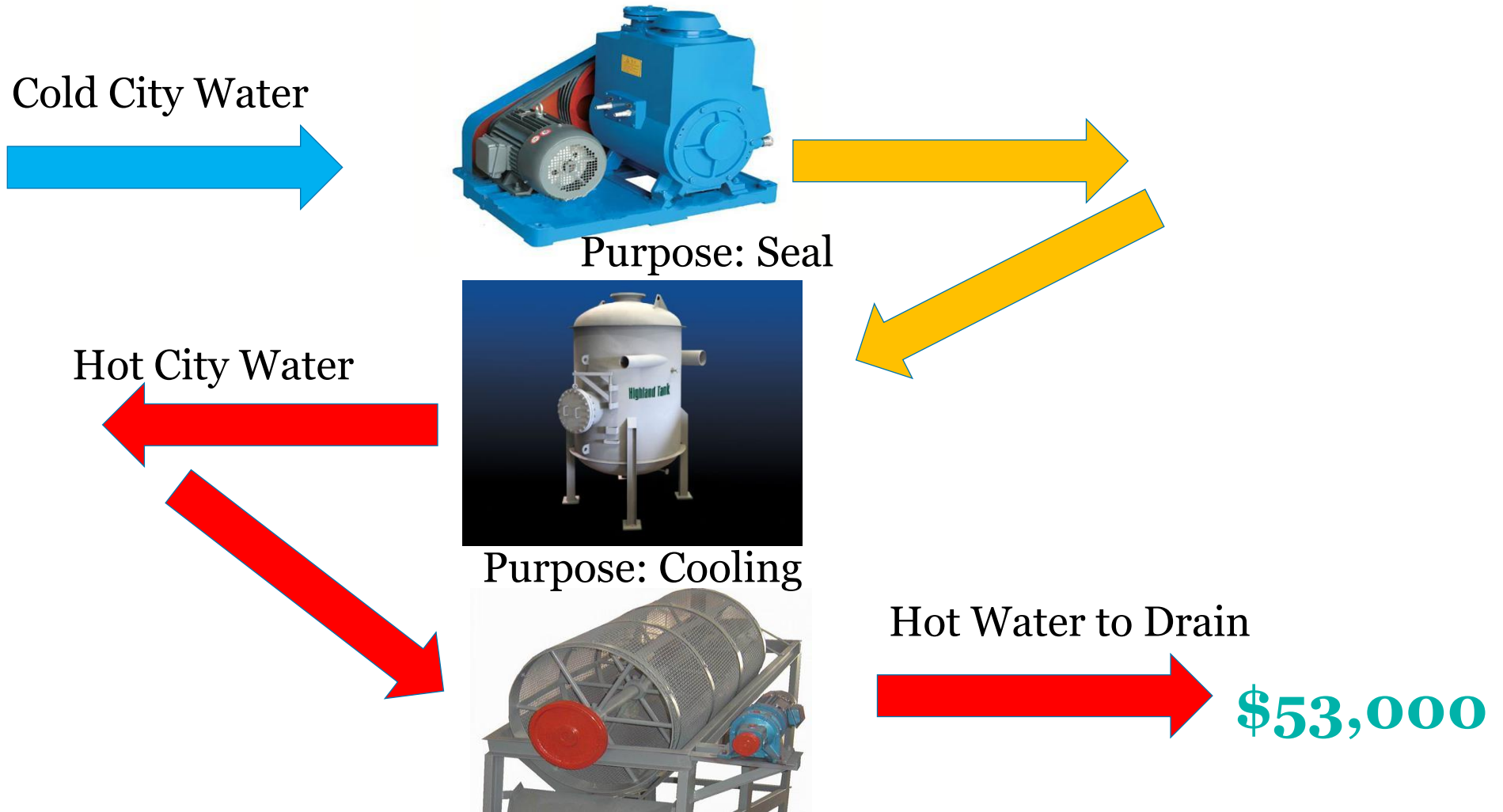
Cold City Water




Purpose: Cooling

Warm Water to Drain
 \$29,000

\$163,000



\$110,000/yr less to operate!

Progress meeting.

Vetting concepts.

- Each idea is vetted to ensure robust solutions are retained



A woman with dark hair, wearing a light-colored blazer, is smiling and looking towards a man. The man is wearing glasses and a dark suit, and is seen from the side. They appear to be in a professional setting. A large green semi-circular overlay is positioned in the lower-left quadrant of the image, containing the text 'After a water audit' in white.

After a water audit

Harvest & Communicate Gains

Opportunity Cost

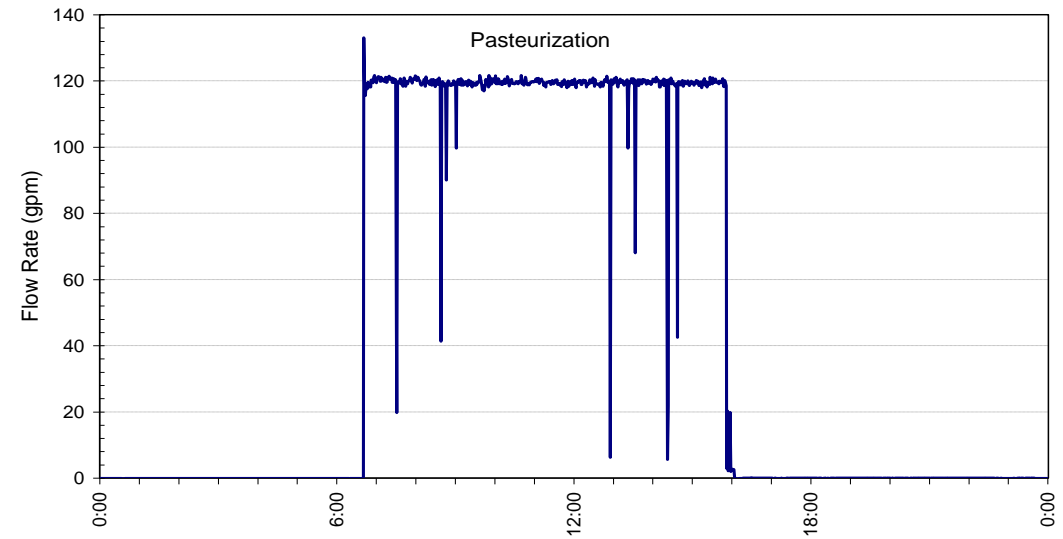
- Each month that a measure is not implemented loses 100% of its' opportunity cost
- Implementation can be hindered by conventional capital project funding processes (e.g. red hose)



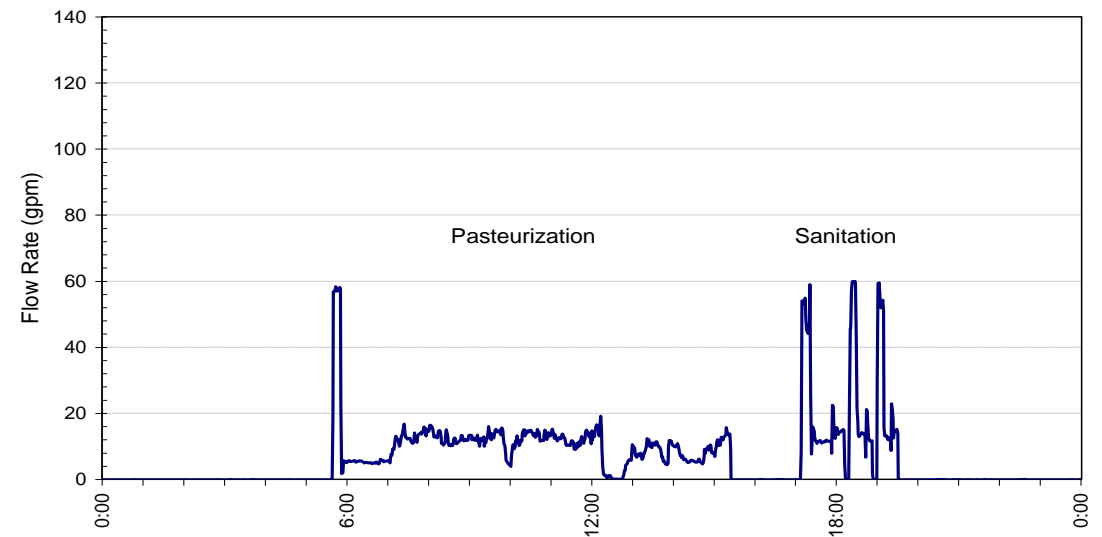
Rubber on the Road: Implementation & tracking.

- Project management
- Engineering design
- Funding applications
- Commissioning
- Verification logging
- Reporting

Before



After



Communicating Gains

Dextran, 2019 Clean50 Award



“We were astonished as we investigated and learned of the payback as a result of the work.”

George Usher, Technical Director, Dextran Products

Integrated Assessment found:

- **\$109,760/yr** of water savings (45,450 m³/yr),
- **\$10,600/yr** of natural gas & chemical savings, and
- **\$8,800/yr** of sugar ingredient savings.

Measures implemented thus far have an **average payback of 0.3 years** and are saving:

- \$55,300/yr
- 17,800 m³/yr of water (7 Olympic pools/yr)
- 28,600 m³/yr of natural gas (10 homes heated)
- 56 tonnes/yr of GHG (12 car's emissions)



Techs, Drugs, and Rock & Roll

Integrated system assessment at Dextran Products identified and implemented measures to save water & energy and increase profits.

Drugs

- Dextran Products manufactures and sells dextran and derivative products. Their applications include treating neonatal anemia in pigs
- Dextran was looking to slash their water use to save money, comply with municipal programs, and to be a socially-responsible company

Techs

- Partners in Project Green (PPG) has been working with businesses in the Greater Toronto Area to showcase best practices in water efficiency
- Dextran selected Enviro-Stewards from PPG's roster due to the integrated nature of their assessments and their confidence to entirely base their compensation on the results achieved

Rock & Roll

- The integrated assessment identified \$109,760/yr of water savings (45,450 m³/yr), \$10,600/yr of natural gas & chemical savings, and \$8,800 of sugar ingredient savings
- Dextran & Enviro-Stewards are presently implementing the measures. Measures implemented thus far have an average payback of 0.3 years and are saving:
 - \$55,300/yr
 - 17,800 m³/yr of water (7 Olympic pools)
 - 28,600 m³/yr of natural gas (10 homes heated)
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engineering
change

Municipal Water Efficiency Eco-Cluster

POSTED JUNE 13, 2019

Project Summary

A co-benefit of the water conservation measures is the avoidance of 223 tonnes/yr of GHG broken down as follows:

- 1.4 tonnes/yr avoided by the Region to supply water and treat wastewater
- 110 tonnes/yr avoided by Waterloo Brewing for reduced evaporative losses
- 94 tonnes/yr avoided by Waterloo Brewing's supply chain for hop & grain production
- 18 tonnes/yr avoided by Waterloo Brewing's beer transfer trucks



Maple Lodge Farms: 2019 Clean50 Award

- Implementation commenced one month from assessment
- Guaranteed minimum savings
- **\$3.44 million/yr** identified with an average payback under 2 years (6,735 tonne/yr GHG)



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Best practice in water management

Why

Identifying root causes.

What is the why about this picture

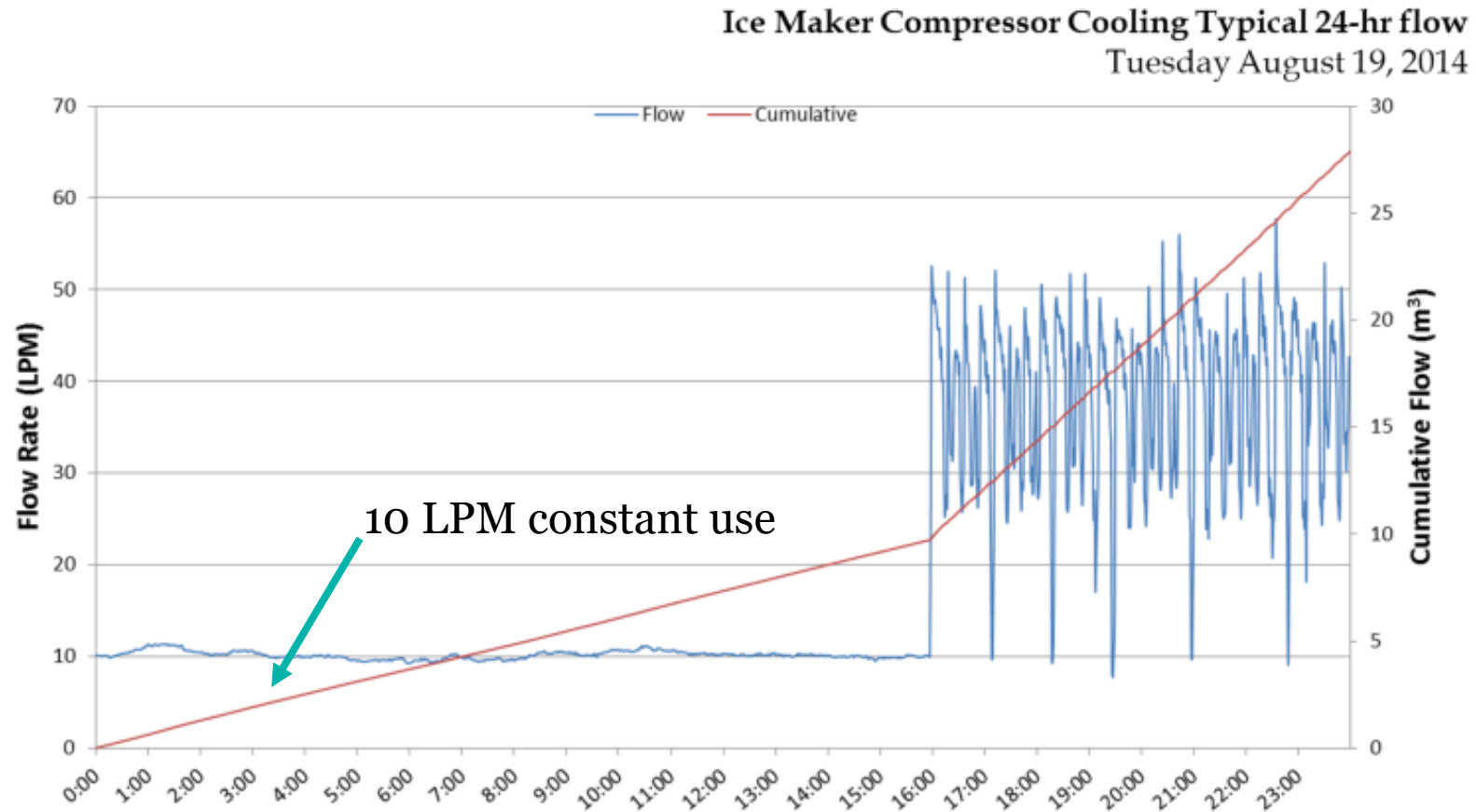
**Gain 40,000 BTU/hr
from blowers heat**

**Gain 31,400 BTU/hr
from condensing water
vapour in room chillers**



Common Findings

What you don't know can hurt your bottom line



Common Findings

What you don't know can hurt your bottom line

- Manually set or uncontrolled water uses



Common Findings

What you don't know can hurt your bottom line

- Once-through cooling (water-cooled fridge/freezer/ice maker/compressors/condensers/etc.)



Common Findings

What you don't know can hurt your bottom line

- Using water for a task that doesn't need it



Common Findings

What you don't know can hurt your bottom line

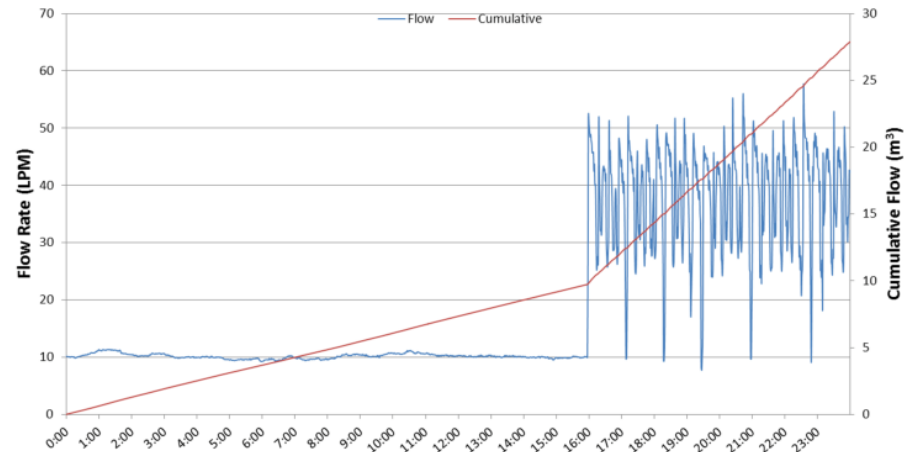
- Broken valves



Common Opportunities

Sub-metering

- Install meters on specific processes to measure consumption
- Record meter readings to manage consumption
- Identify significant/anomalous water use
- Implement conservation measure(s)



Common Opportunities

Flow controls

- Temperature regulating valves, flow restrictors, rotameters, conductivity controllers, level sensors, etc.



Common Opportunities

Fixture upgrades



3 LPF toilets



0.65 L/min faucets

Common Opportunities

Fixture upgrades



M-70 FLOW TEST		
	STANDARD	LOW FLOW
PSI	FLOW (gpm)	
20	3 ¼	2 ¼
30	4 ¼	2 ¾
40	5 ⅛	3 ¼
50	5 ⅞	3 ¾
60	6 ¾ 25.6	4 ⅙ 15.6
70	7 ½ LPM	4 ½ LPM
80	7 ¾	4 ⅞
90	8 ¼	5
100	9	5 ⅙

Common Opportunities

Eliminate once-through cooling

- Upgrade equipment to air-cooled, reuse water in another process, install/tie into cooling tower



Common Opportunities

Water reuse

- Relatively clean water in a process with lower water quality needs, treating appropriately for use in another process

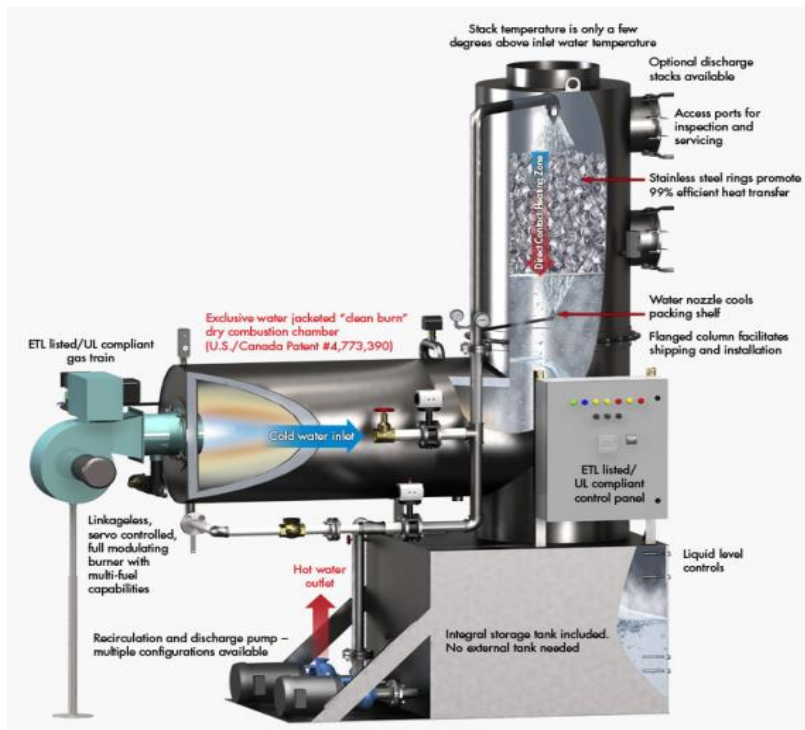


Avoid Optimizing Components (Rather than the System)

Direct Contact Water Heater: 97% Efficient

Cooling Tower: Paying to Get Rid of Heat

Preheat with refrigeration then heat: 2/3 less energy!



(elect., chem, water)

Integrated Energy & Water Conservation

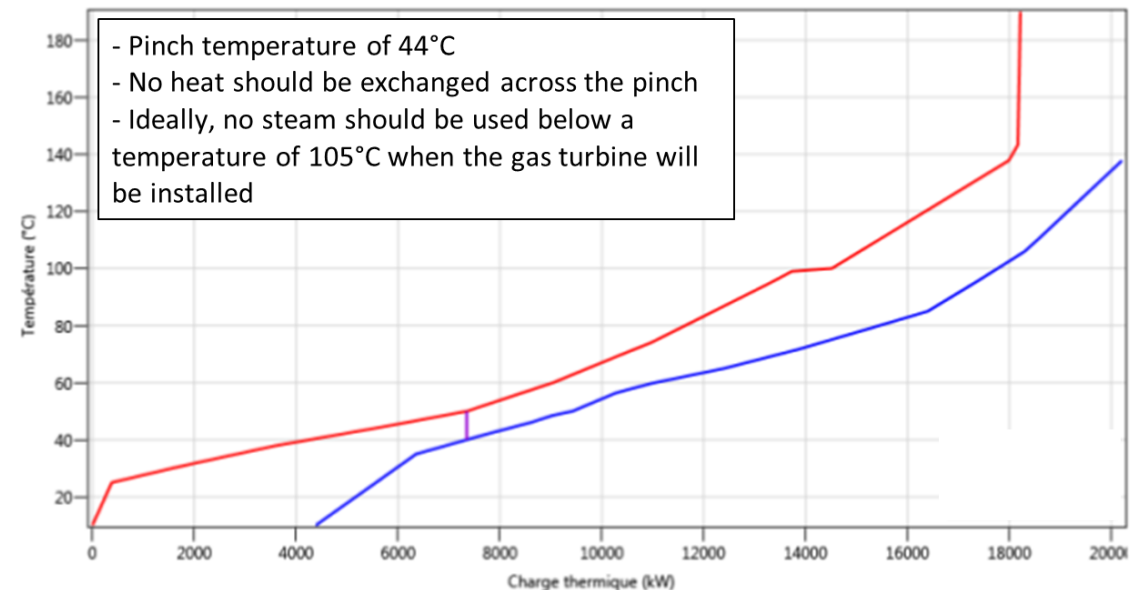
Process Integration Study:

Found Opportunities to save

- 3,233,000 kWh/yr
- 4,570,000 m³/yr of gas
- 123,000 m³ of water

\$1,645,000/yr with
under 2-year payback

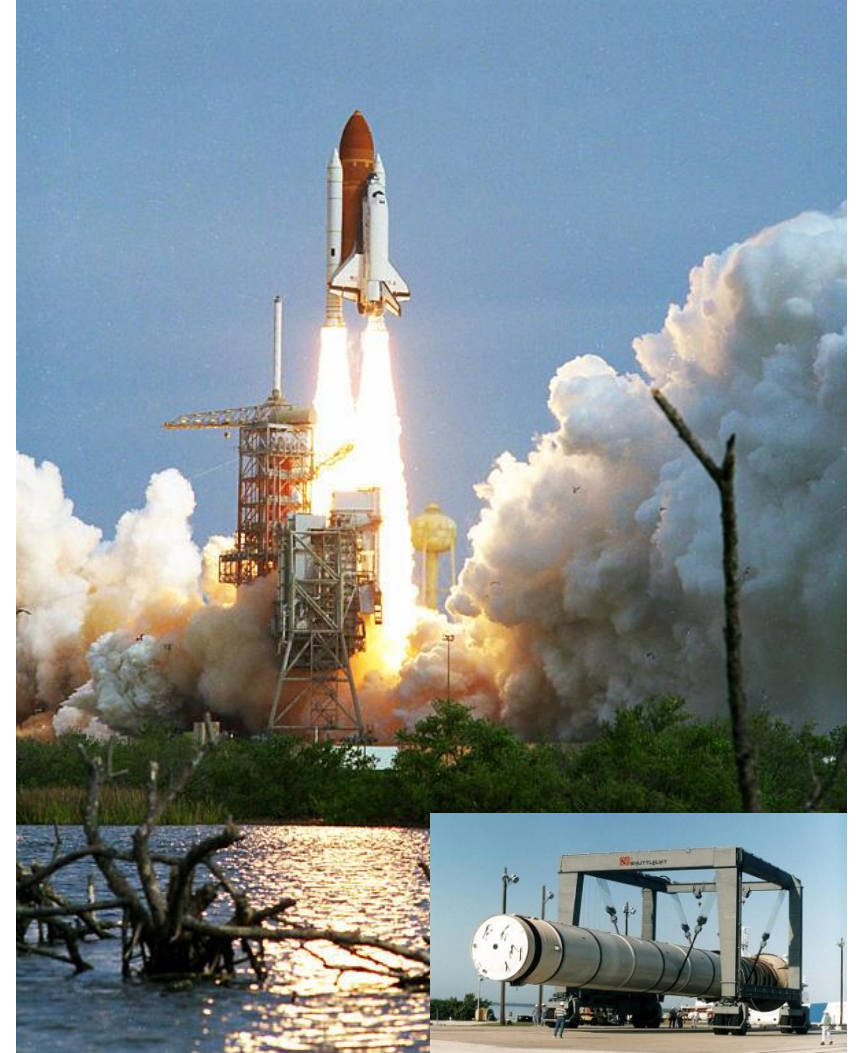
\$2.35 million/yr!



Continuous Improvement Cape Canaveral, Florida

P&W Corporate Policy: Continuously Seek Ways to Reduce Three Largest Waste Streams

- Space Shuttle SRB Thrust Vector Control Clean Room
- SRB Refurbishment Facility Cooling Water System
- SRB Robotic Hydrolase Facility Washwater Recycling



SRB Hydrolase Facility Cape Canaveral, Florida

Wastewater Recycling:

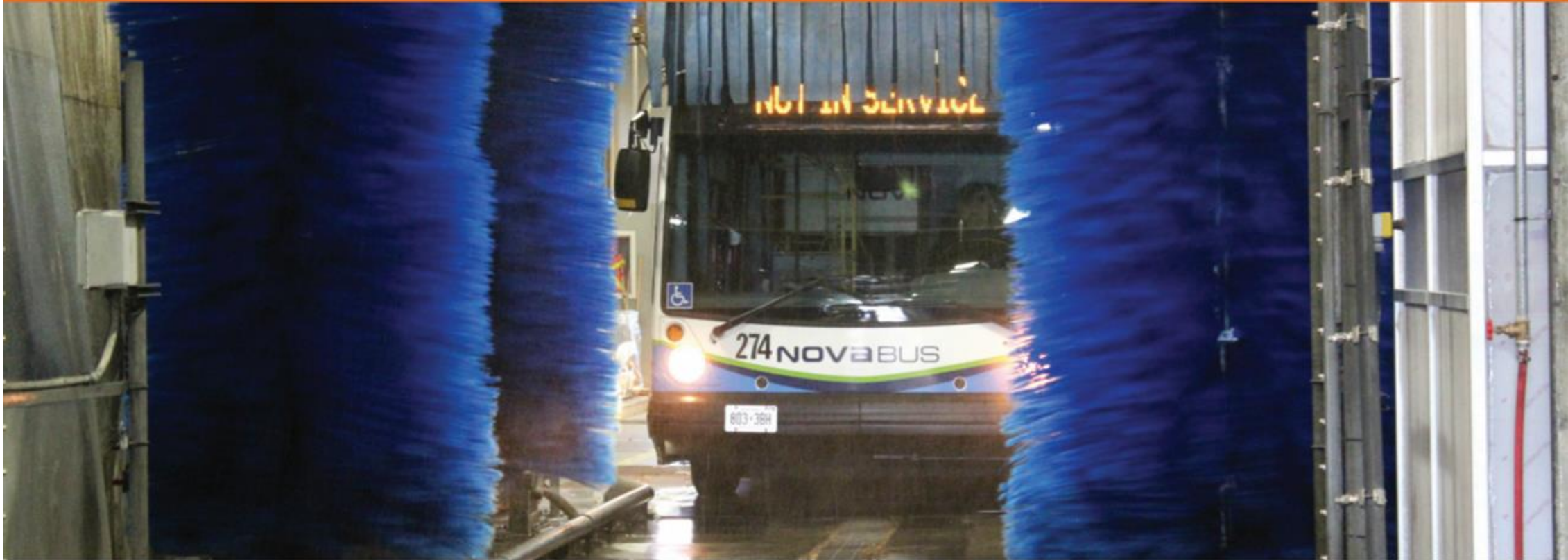
- Sequencing of Unit Processes
- Treatability Testing
- Increasing Process Efficiencies
- Process Controls
- Design & Commissioning

Achieved P&W's objective to recycle 100%
of the water used to clean the booster rockets



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Stormwater management & resilience



MATCHING WATER QUALITY TO TASK:

City of Guelph Transit Bus Wash Rainwater Harvesting Project

Guelph Buswash:

- Reduce
 - Retrofit nozzles
- Reuse
 - final rinse as initial rinse
 - Harvest rainwater from roof for final rinse (less city water, less spot remover & soap)

Phase 1:	850 m ² (9,150 ft ²) of roof,	13.5 m ³ of storage	\$150,000
Phase 2:	3,400 m ² (36,600 ft ²) of roof,	50.5 m ³ of storage	\$160,000



Majority of cost was for tankage and rerouting roof drains

Enviro-Stewards: Carbon & Water Neutrality



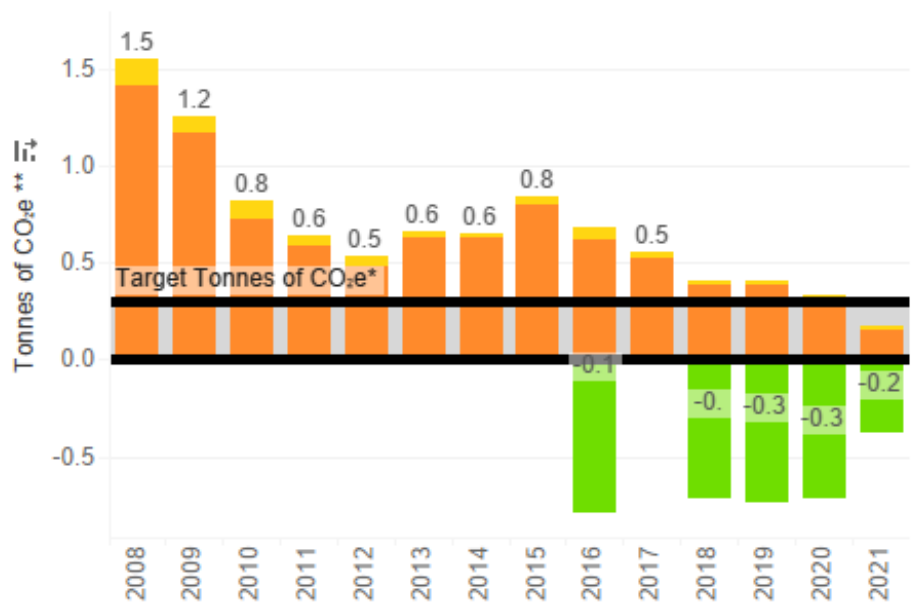
Enviro-Stewards' Footprint:

- 97% less outside air required
- 78% reduction in GHG/employee
- 0 L/yr tap water for living wall for 5 yrs
- May 2021 added affordable smart blue roof

Enviro-Stewards' Handprint:

- +3.76 tonnes/yr of GHG remain
- -119,858 tonnes/yr due to our work (avoiding 30,000 tonnes per tonne)

GHGs Over Time vs Target



Category
 Electricity
 Gas & Stationary Combustion
 Offsets & RECs

*Total annual values below the Target CO2e line indicate years when your target has been met!

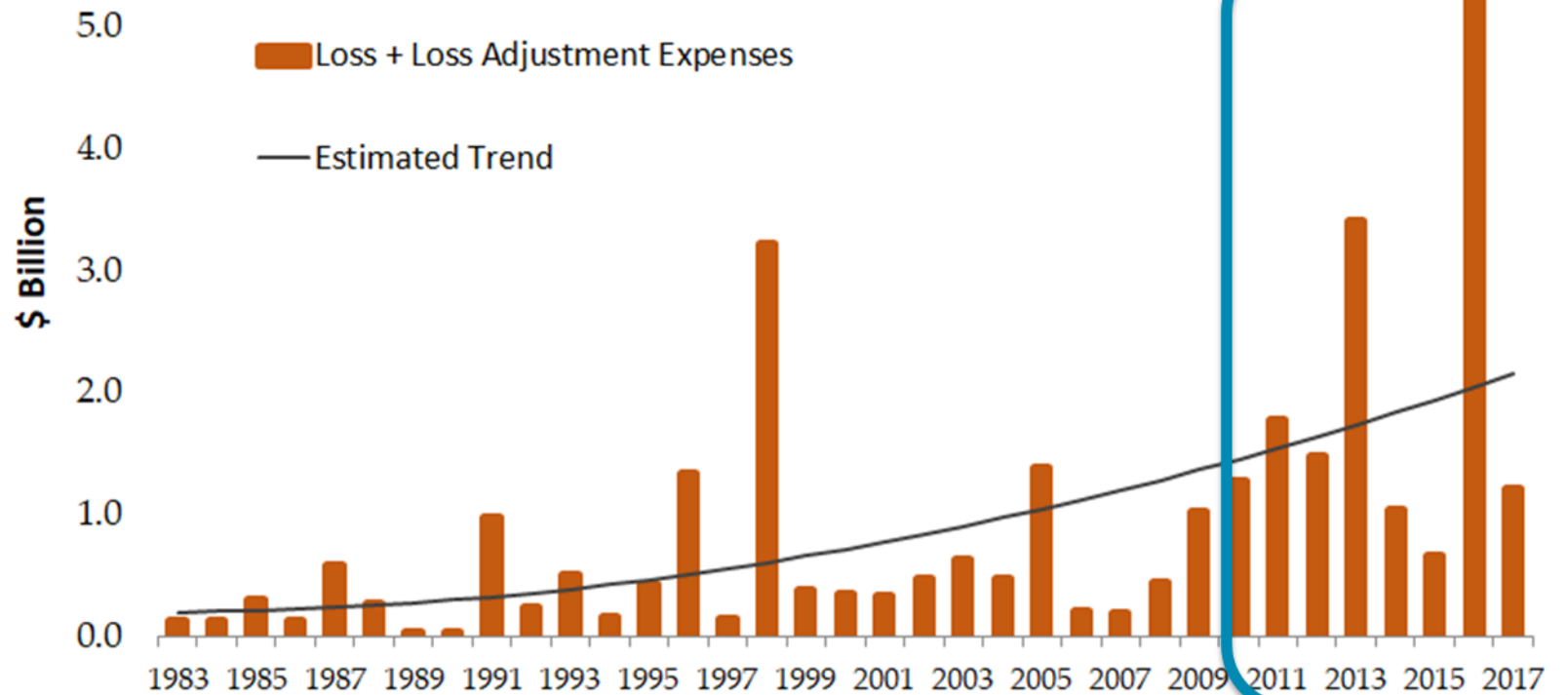
** values are /intensity metric if applicable



INSURANCE INCENTIVES FOR FLOOD RISK REDUCTION

"Water damage is now the *leading cause* of personal property claims. Over the last 10 years, water losses for personal property claims have *doubled...*"

Intact Financial Corporation, 2017



Risk Reduction (at Scale)

Blue Roof Design

- Facility Scale: CVC Head Office
- Street Scale: Southdown area of Mississauga



Active vs. Passive Blue Roofs

Active

- Valve configuration and controller used to regulate roof discharge
- Controller programmed to optimize release of ponded water
- “Smart” system approach



Passive

- Use of stagnant hydraulic structures such as weirs, drains, orifice plates to regulate the release of rainwater from a rooftop



Historical Roof Design Loads

Ontario Building Codes (assessed by WSP)

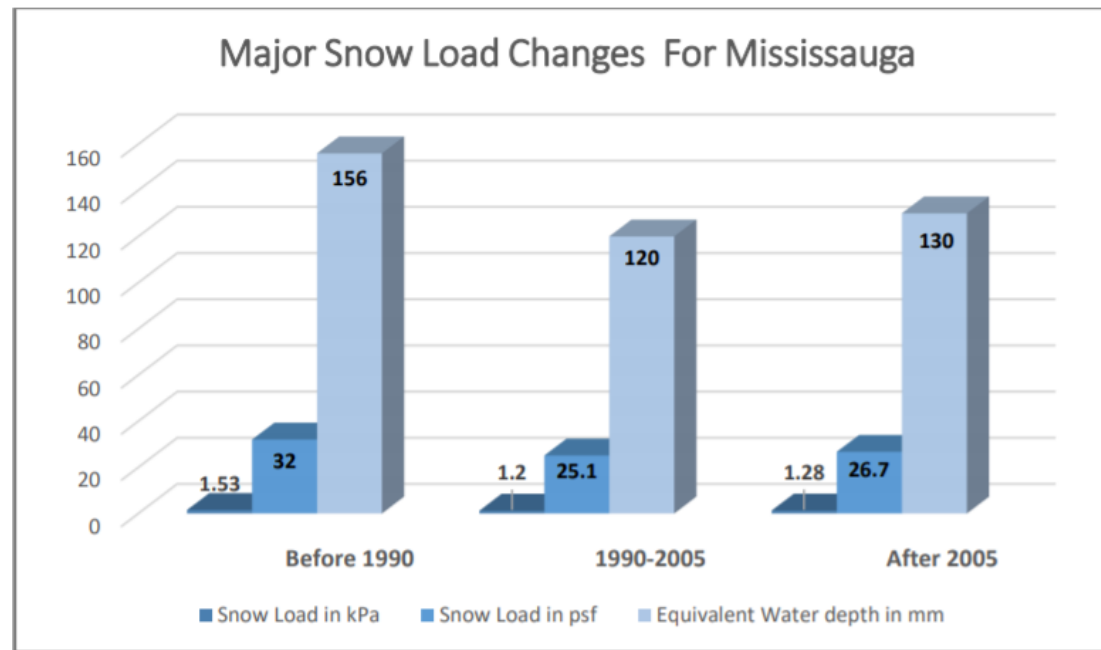


Figure 4 Historical major changes of snow load requirements for Mississauga

- Reference: https://sustainabletechnologies.ca/app/uploads/2020/07/Smart-blue-roof-feasibility-study_Jul2020.pdf

Enviro-Stewards Demonstration Affordable Smart Blue Roof (ASBR)

#CBC | MENU | Beijing 2022

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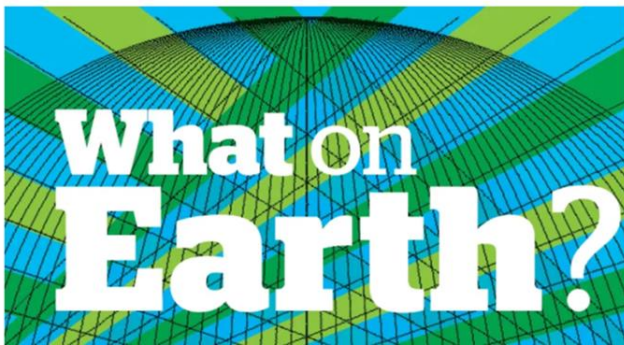
Science · What on Earth?

Blue roofs could help reduce the flooding effects of big storms



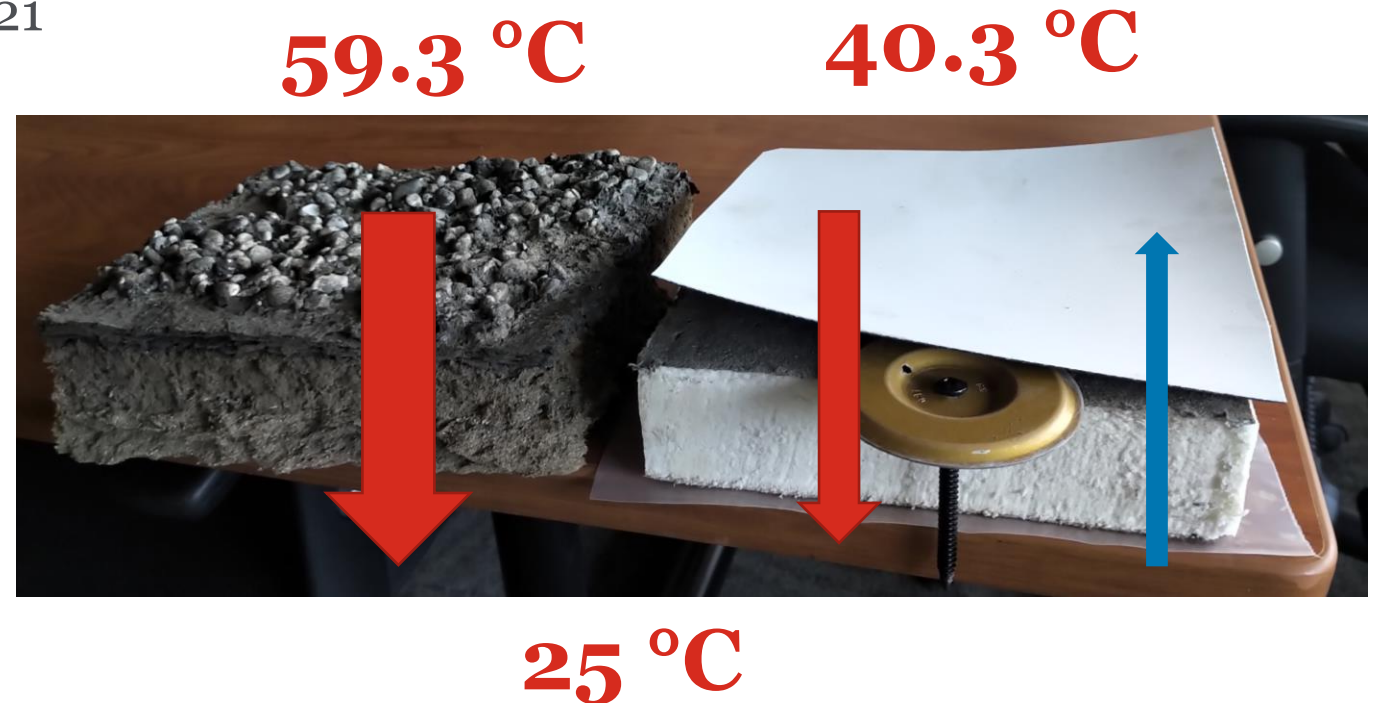
Also: An extravaganza of new emissions targets

CBC News · Posted: Apr 23, 2021 4:00 AM ET | Last Updated: April 23, 2021



Enviro-Stewards Demonstration Affordable Smart Blue Roof (ASBR)

- Replaced Roof:
 - air temperature 30°C on May 21, 2021
- Lighter materials (saves 5lb/ft²)
- Thermal Savings
 - R-value: 50% savings
 - Colour: 55% savings
 - Net 78% reduction!



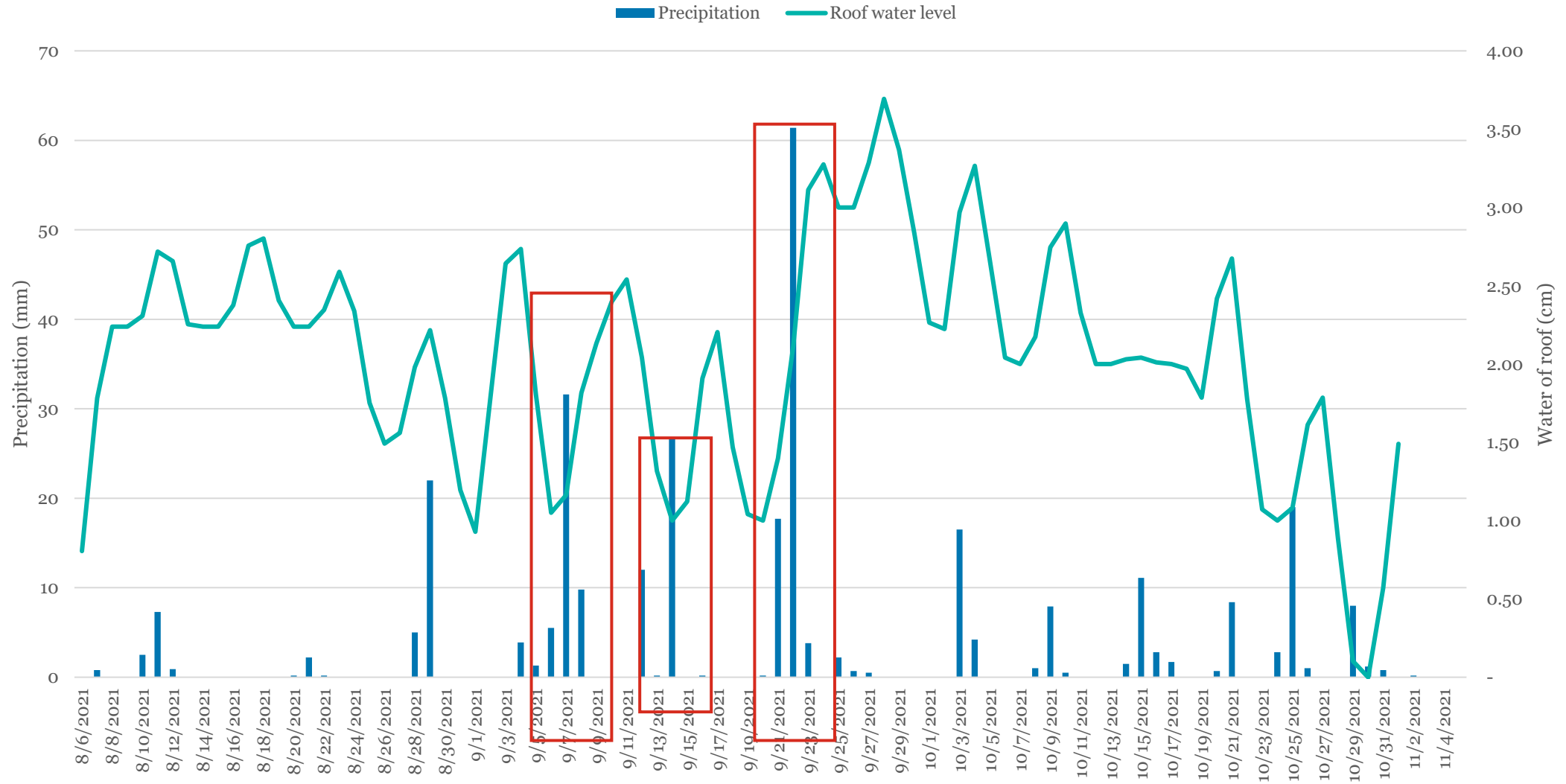
Note: a bucket of water on the roof May 21st measured 20°C (cooler than the indoor temperature) which indicates evaporating water from the roof could potentially reverse the direction of heat flow (provide AC) even on 30°C days!

Results of First Season's Operation:

- Flooding Risk Reduction (reduced runoff during storm itself)
 - From weather station (rainfall) & roof water depth logs: **m³/yr and litres/second avoided**
- Water Conservation (reuse of rainwater)
 - From flowmeter differential: **m³/yr saved; ion exchange regenerations avoided**
- Air Conditioning Savings (due to blue roof, liner colour & insulation)
 - Temperature differential across roof & HVAC logging: **kwh/yr saved and GHG reduction**
- Heating Savings (due to better insulation)
 - Temperature differential across roof & HVAC logging: **m³/yr saved and GHG reduction**
- Life of Roof Liner (due to cooler liner temp)
 - Liner temp (underwater) vs reference liner temp (suspended) and life expectancy curves

Stormwater charges avoided

A total of **59.24 cubic meters** avoided over three storms.

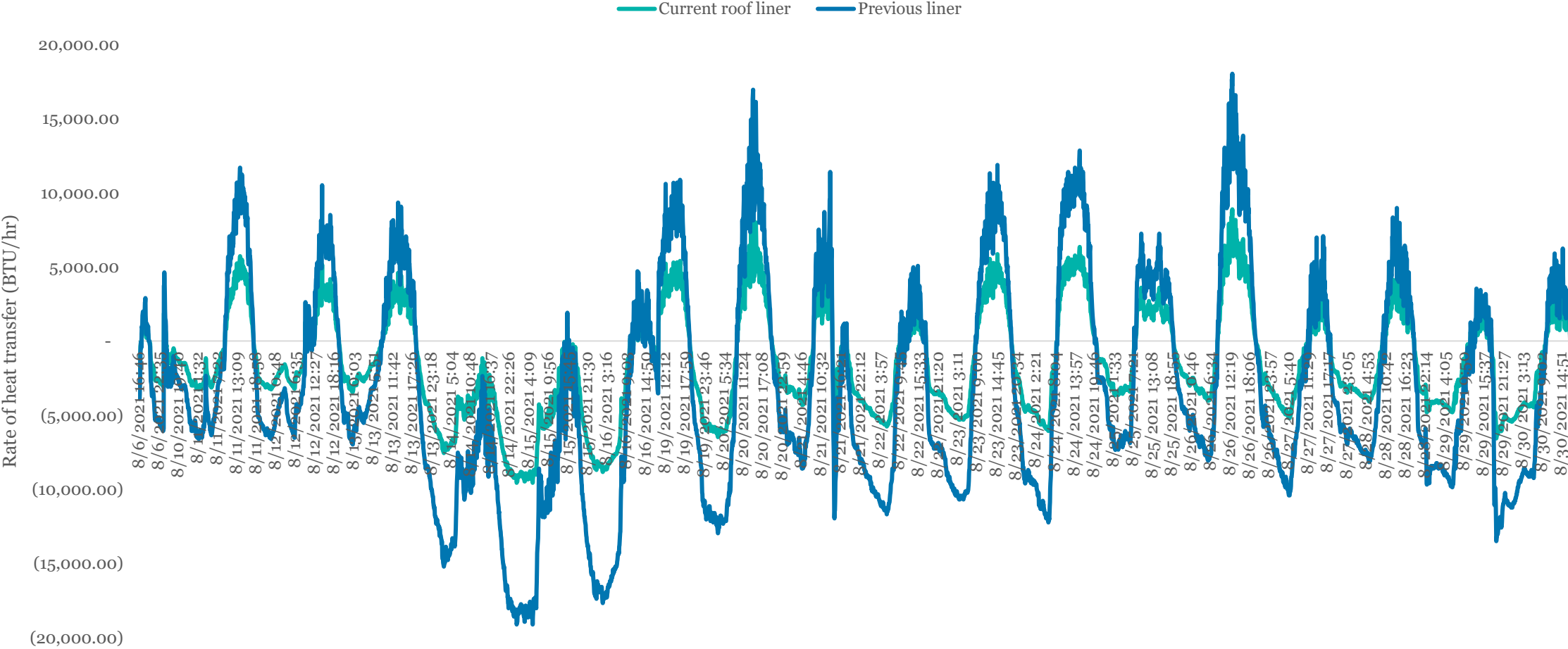


**Last season had 3 storm events over 25 mm.
The ASBR retained 100% of this water!**



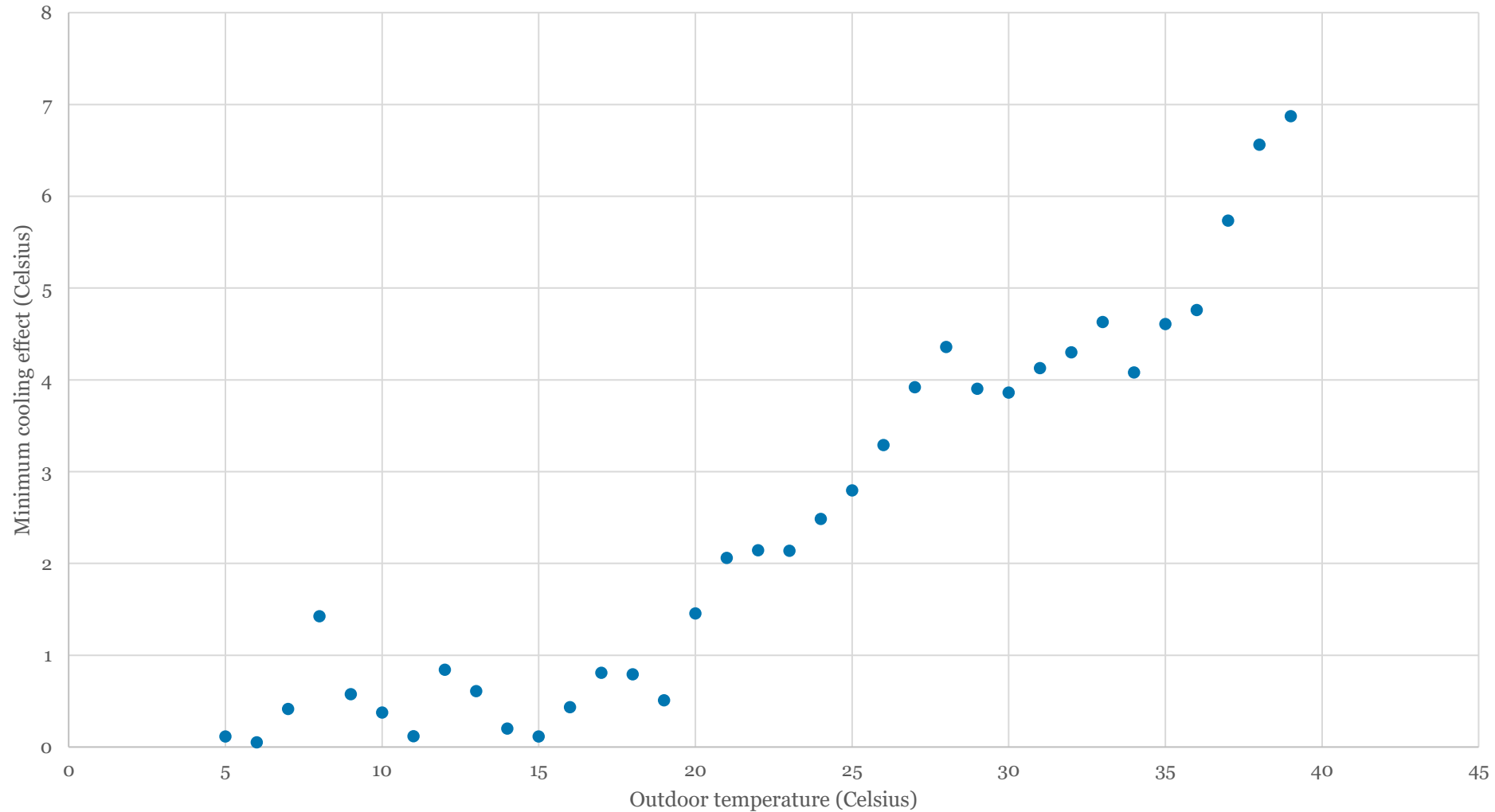
Energy savings - electricity

Load on air conditioning system **reduced by 43%**.



Roof Liner vs Outdoor Temperature

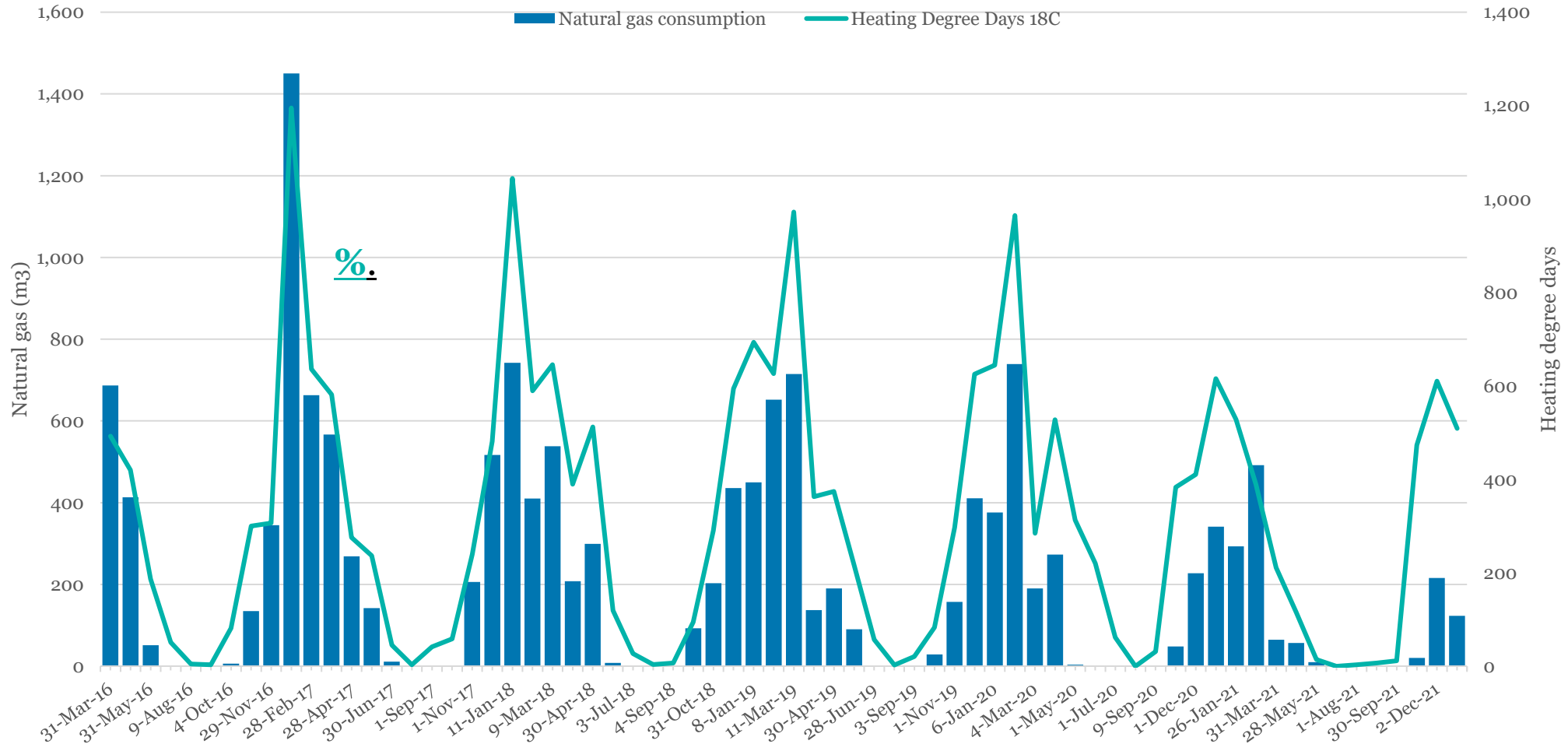
The hotter it is, the greater the cooling (AC) benefit!



Also, recall that during install on May 21, white liner was also **10°C** higher than air temp!

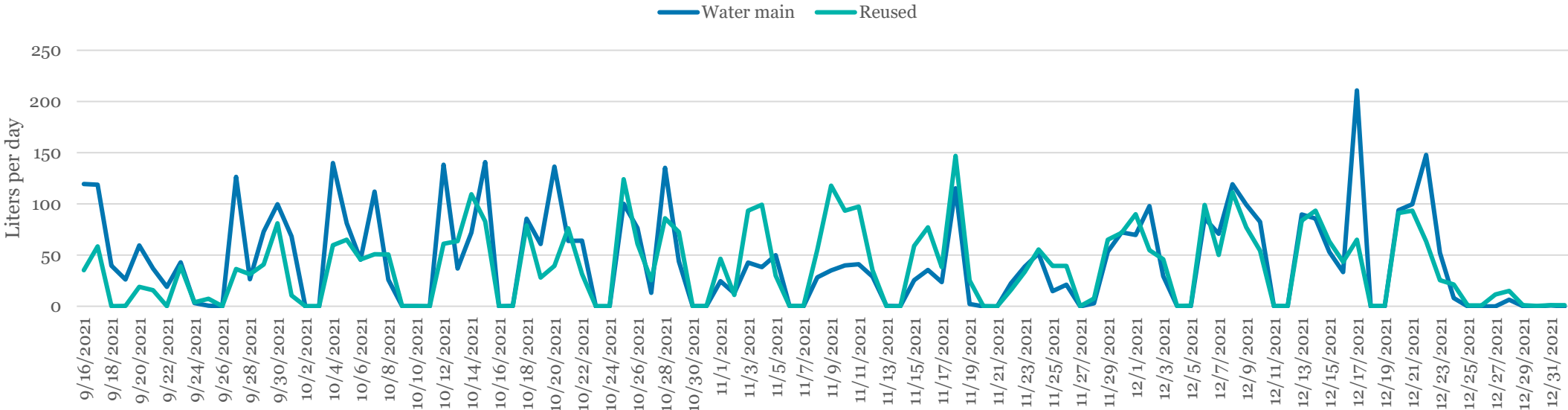
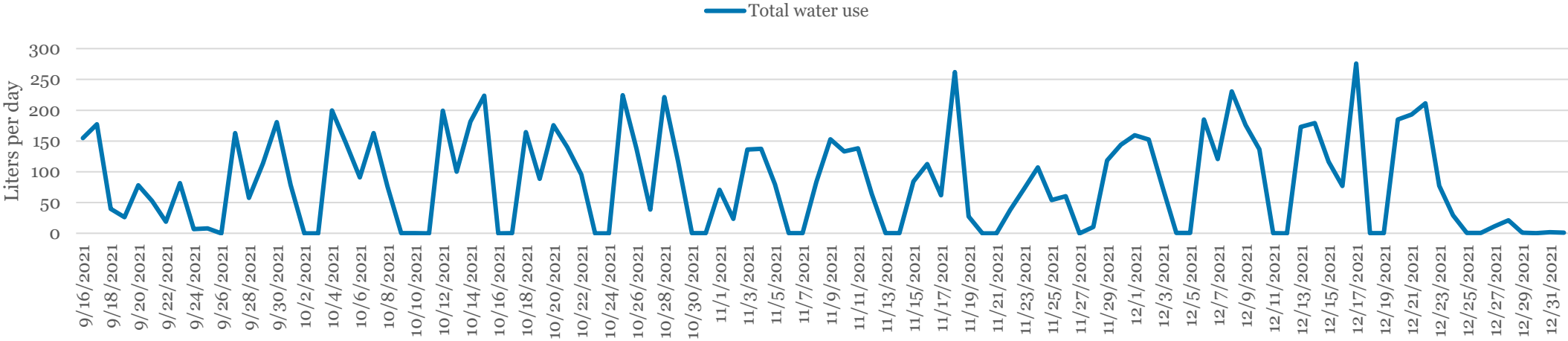
Energy savings – natural gas

Space heating demand reduced by 50%.



Water savings

Since September 2021, water consumption has been reduced by 56%.



Questions & Answers:





Partners in Project Green

A Program of Toronto and Region Conservation Authority

Thank you. Any questions?

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