Water Conservation Near-term Priority Initiatives

Introduction

This appendix details water conservation initiatives. Though the following evaluations are based on research, including journal articles, government studies, and program performance in other jurisdictions, the values must be further refined during program development for each initiative and, in some cases, from the results of pilot projects. That said, the relative cost and conservation-effect comparisons should be robust.

List of Initiatives:

Residential Water-Use Education Program

This is a foundational conservation program. It is a sustained, multi-media education and advertising program that could reduce indoor residential water use by 440 million litres per year—1.5% of total water use in Saskatoon.

An ongoing program, run every other year, that will:

- Serve as a hub for a larger suite of conservation programs;
- Trigger behaviour changes that increase conservation;
- Spur the repair of in-home leaks (leaks consume 13% of indoor residential water);
- Help residents understand where water is used, the need for conservation, the benefits from it, and ways they can conserve; and
- Increase likelihood residents will take other conservation actions (e.g., participate in rebate programs or buy water-saving appliances).

A water conservation education program could have many components, including:

- A suite of integrated videos, pamphlets, and web pages;
- Online tools to estimate household savings and payback times, and to prioritize actions;
- Self-audit guides and aids (e.g., bags to check shower flow rates, a “10 things you can do” list);

- A conservation pledge (e.g., households commit to 5 to 10 water-saving behaviours);
- A focus on leak detection and repair (a leaking toilet can waste up to 1,000 litres/day); and
- Advertising (e.g., social media, billboards, bus-boards, radio, utility bill stuffers, etc.).

This program could be delivered in collaboration with or by community-partner organizations.

Summary table

Initiative	**Residential water-use education program**
Targeted water use	Residential, overall and MDD
Viability and suggested priority	Education and awareness programs should form the core to a linked set of conservation initiatives
Initiative Scale and Duration	Run every second year. Conservation savings are assumed to appear in year 1 and to persist if the program is re-run regularly. Scale can vary
Duration of Conservation Effects	2 years, i.e., 1 year after the program ends. To maintain the effects, this program would have to be run every second year
Delivery mechanisms	Homeowner education and advertising (primary)
Total Litres Saved	440 million litres per year, 1.5%
MDD Reduced	3.3 million litres per day, 1.5%
Greenhouse gas reduction	189 tonnes per year; 3,784 over 20 years
Cost to City	$226,000 annually. This amount could be split among staffing, community-partner program deliverers, printing, advertising, etc.
Cost to Household	Negligible. Targets conservation from behavior change
Payback period for household	No cost to the household, with potential savings of $12 per year per household
Cost per litre per year saved	0.57 cents. Each year the program runs it costs $226,000 and creates conservation savings of 440 million litres
Synergies and co-benefits	Cost savings for residents, a central information hub that can connect people to many other conservation programs and incentives
Challenges, limitations, risks	Potential to increase wastewater concentrations; difficult to measure if several conservation programs are running

Next steps	Further research, program design, materials development, engagement, market research, cost estimation, and other planning is needed

Affordable Housing Energy and Water Conservation Pilot

Work with an affordable housing provider to improve both energy and water efficiencies. This work may include conducting audits and assessments, developing training for building operators and tenants, applying for grants, and implementing upgrades.

Cress Housing has expressed interest in exploring opportunities with the City of Saskatoon through the Sharing Prosperity Through Reconciliation Partnership Agreement between the City of Saskatoon and the Saskatoon Tribal Council. A workshop with Cress Housing and City departments (Sustainability, Indigenous Initiatives, Planning and Development) is being planned to identify initiatives and partnership opportunities to improve efficiencies in affordable housing.

Summary table

Initiative	**Affordable housing energy and water conservation pilot**
Targeted water use	Indoor residential, overall
Viability and suggested priority	Replacing toilets and other fixtures is a key program to reach water conservation targets. This initiative prioritizes efficiency improvements in affordable housing
Initiative Scale and Duration	To be determined
Duration of Conservation Effects	+20 years (savings from upgrades would essentially be perpetual)
Delivery mechanisms	To be determined. Could include audits, retrofits, repairs, building operators training, and education material for tenants
Total Litres Saved	To be determined. Replacing a 13-litre-per-flush toilet with a 4.8-litre will save 23,700 litres per toilet per year
MDD Reduced	To be determined
Greenhouse gas reduction	To be determined
Cost to City	To be determined
Cost to affordable housing provider	To be determined
Payback period for household	To be determined

Cost per litre per year saved	To be determined
Synergies and co-benefits	Tailors' conservation to low- and moderate-income households or those experiencing energy poverty
Challenges, limitations, risks	To be determined
Next steps	Host workshop to identify opportunities, begin planning and budgeting initiative, research funding opportunities

Advanced Metering Infrastructure (AMI) Dashboard and Library

AMI can help conserve water and support a larger suite of conservation programs. Deploying education programs within the AMI web presentment platform can connect residents and businesses to water conservation and encourage residents and businesses to monitor their water use. Tools could include how to create a water and energy budget, and how to decrease costs and save water and energy.

Summary table

Initiative	**AMI dashboard and library**
Targeted water use	All water uses and users
Viability and suggested priority	Education and awareness programs should form the core to a linked set of conservation initiatives.
Initiative Scale and Duration	Run every second year. Conservation savings are assumed to appear in year 1 and to persist if the program is re-run regularly. Scale can vary
Duration of Conservation Effects	2 years, i.e., 1 year after the program ends. To maintain the effects, this program would have to be run every second year
Delivery mechanisms	Online tools and education material on AMI web presentment portal
Total Litres Saved	400 million litres per year, 1%
MDD Reduced	1.1 million litres per day, 0.5%
Greenhouse gas reduction	172 tonnes per year, ongoing, or 3,440 tonnes over 20 years
Cost to City	$10,000 annually to develop and operate suite of education and water conservation tools on the AMI web presentment portal
Cost to household	Variable for upgrades, finding and fixing leaks; negligible from behavior changes

Payback period for household	Instant, with potential savings of $12 per year per household
Cost per litre per year saved	0.03 cents each year the program runs
Synergies and co-benefits	Instant payback opportunities for residents, a central information hub that can connect people to many other conservation programs and incentives
Challenges, limitations, risks	Potential to increase wastewater concentrations; difficult to measure if several conservation programs are running
Next steps	Ensure all conservation initiatives make maximum use of AMI data. Deploy education programs to ensure that residents and businesses are aware of AMI and its benefits

Water Conservation Environmental Grant

The Environmental Cash Grant is available to local community organizations who are helping Saskatoon meet its environmental leadership goals and is awarded to groups on an annual basis. In 2017, $10,000 was added to the Environmental Grant for projects related to water efficiency and protection of water resources. In the five years the water conservation grant has been offered, $50,000 has been awarded to support 13 projects. This has leveraged over $500,000 in funding from the community and other organizations. In 2022, the amount was increased to $15,000.

This work involves reviewing the success of these community initiatives and based on those results, consider increasing the amount of money available to a proposed $50,000 and broaden the criteria for eligible recipients, beyond the non-profit, cooperative, and charitable sectors to include businesses and community groups. This would support more ambitious, larger scale, or longer-term initiatives.

Summary Table

Initiative	**Water conservation environmental grant**
Targeted water use	ICI indoor and outdoor, MDD and overall
Viability and suggested priority	Builds on the success of an existing program. High priority as it can lead to innovative work in the community—water conservation pilots, demonstrations, and programs
Initiative Scale and Duration	An additional $35,000 per year for 10 years
Duration of Conservation Effects	Variable
Delivery mechanisms	Financial incentives (primary)
Total Litres Saved	Not calculable
MDD Reduced	Not calculable

Greenhouse gas reduction	Not calculable
Cost to City	$50,000 per year, for a proposed duration of 10 years
Cost to business and payback	Not calculable
Cost per litre per year saved	Not calculable
Synergies and co-benefits	Builds capacity in community, develops partner organizations, removes barriers for organizations that want to pursue conservation programs
Challenges, limitations, risks	To be determined with program review
Next steps	Develop recommendations for Council that include expanding both the dollar amount of the Grant and the eligibility criteria

Civic Water Conservation - Maximize Watering Efficiency in Parks

This is based on the results of a 2021 irrigation pilot project to implement evapotranspiration (ET)-based irrigation technologies and programing, and to maintain healthy turf. This work is the next step to optimize the irrigation network and involves:

- Completing a radio-communication survey:
  - Identify areas of poor radio communication.
  - Upgrade or install equipment where needed.
- Implement ET irrigation procedures in approximately 40 available locations that have appropriate software and technology – identify 10 comparable control parks to help analyze results and calculate savings:
  - Gap analysis of existing settings.
  - Document new irrigation programing procedures and settings.
  - Develop education and training materials for Parks Operators.
- Continue turf quality assessments to ensure program settings are correct.
- Continue irrigation water benchmarking and monitoring for the 2022 season:
  - Develop measurement and verification methods for irrigation water use.
  - If possible, hire a dedicated controls specialist.
  - Investigate and implement water meter monitoring software.
  - Look for meters that have not been downsized yet and downsize them if possible.
  - Review utility accounts to ensure sewer charges are not being applied.
  - Investigate if Saskatoon Water's rain collectors can be used by Parks to supplement weather data that triggers rain delays.

Summary table

Initiative	**Maximize watering efficiency in parks**
Targeted water use	Civic outdoor, MDD
Viability and suggested priority	A high priority because park irrigation accounts for more than half of City's own water use and conservation could save hundreds of thousands of dollars per year. Park watering efficiency was ranked as a top priority in public engagement survey
Initiative Scale and Duration	This optimizes ET-based watering in about 10% of the irrigation systems. Future phases to scale up further are planned
Duration of Conservation Effects	20+ years
Delivery mechanisms	Infrastructure and operating improvements (primary)
Total Litres Saved	18 million liters per year, <0.1%
MDD Reduced	15,000 litres per day, 0.1%
Greenhouse gas reduction	8 tonnes per year, ongoing, or 155 tonnes over the estimated 20-year life of the equipment
Cost to City	$100,000 in 2022, $2,500,000 to implement in ET-ready Parks
Payback period for City	3 years for 2022 work, 6 years for broader implementation
Cost per litre per year saved	0.24 cents per litre based on 20-year conservation effect
Synergies and co-benefits	Reduced operating costs for Parks department
Challenges, limitations, risks	Savings are based on 10-year average water use; however, temperature and precipitation vary from year to year which affects water use
Next steps	Initiate project for the 2022 season

Civic Water Conservation - Irrigation Audit and Area Reduction Project (transitioning irrigated area to naturalized area)

Naturalized parks require little or no supplemental water after establishment. Transitioning 5% of current irrigated park area to a naturalized state could save 40 million litres of water per year. This work is the first step towards completing this action and includes:

- Research:
  - Select sites to be audited prioritizing parks that are identified for upgrades.
  - Gather existing information for priority sites.
  - Review Park Design Standards and other guiding documents.

- Irrigation system audit (including areas that exceed park standards, areas of overspray and areas to naturalize):
  - Review existing designs.
  - Conduct field inspections.
  - Record findings into report.
- Engagement:
  - Coordinate work with internal stakeholders such as Parks and Community Development.
  - Conduct public engagement in coordination with Parks as part of overall park upgrade projects.
- Irrigation redesign, planting plan and tender:
  - Complete irrigation system modification designs.
  - Complete naturalized planting, establishment, and long-term maintenance plans.
  - Complete cost estimates.
  - Manage tender and construction of redesigned sites.
- Construction
- Post-Commissioning Performance Analysis:
  - Complete an analysis of costs, overall water savings, and impact on maximum daily demand for future project business cases.

This project is included in the Natural Infrastructure Fund application.

Summary table

Initiative	**Irrigation audit and area reduction project**
Targeted water use	Civic outdoor, MDD
Viability and suggested priority	A high priority because park irrigation accounts for more than half of City's own water use and reducing irrigated area by 5% could save $100,000 per year. Increase naturalization was ranked as a top priority in public engagement survey
Initiative Scale and Duration	A small-scale project that will help develop techniques and approaches to eventually transition 30 hectares of irrigated area to naturalized area. Future phases to scale up are planned
Duration of Conservation Effects	+20 years (savings would essentially be perpetual)
Delivery mechanisms	infrastructure and landscape changes (primary), policy and standards changes (secondary)
Total Litres Saved	32,000 litres per year
MDD Reduced	351 litres per day
Greenhouse gas reduction	0.01 tonnes per year, ongoing, or 0.28 tonnes over the 20-years

Cost to City	$307,780 and leveraging $411,420 from Natural Infrastructure Fund (if approved)
Payback period for City	Cost analysis and impact on overall and MDD water use is included in the scope of the project. At this pilot scale, project payback will be small
Cost per litre per year saved	1.59 cents per litre based on 20-year conservation effect
Synergies and co-benefits	Reduced long-term maintenance, increased biodiversity, and improved habitat connectivity. Additional emission reduction from less turf mowing
Challenges, limitations, risks	Risk that naturalization may not be accepted by the community, particularly during establishment. Engagement and communication is important
Next steps	Hire a consultant, initiate project for the 2022 season

Civic Water Conservation - Spray Pad and Paddling Pool Water Reuse

The purpose of this pilot project is to research the feasibility of various spray pad and paddling pool water reuse options, and then design and implement the preferred option as a pilot to reduce the City's overall water use in operations. Reusing spray pad water for irrigation could replace 155 million litres of potable water currently used for park and tree irrigation. This work involves:

- Research:
  - Gather existing information for potential sites, select a suitable site.
  - Review public health restrictions and other regulatory requirements.
- Spray pad/paddling pool redesign:
  - Develop options such as bioswale and/or cistern.
  - Detail design and cost preferred option including water reuse system and planting plan.
  - Manage tender and construction of detail design.
- Construction
- Engagement:
  - Coordinate work with internal stakeholders such as Facilities, Parks, and Community Development.
  - Conduct neighbourhood level public engagement, engage the community association of neighbourhood where selected site is located.
- Post-Commissioning Performance Analysis:
  - Document research and feasibility findings.
  - Update spray pad standards to include water reuse options.
  - Complete an analysis of costs, overall water savings (including how much park watering is offset), and impact on maximum daily demand for future project business cases.

This project is included in the Natural Infrastructure Fund application.

Summary table

Initiative	**Spray pad and paddling pool water reuse**
Targeted water use	Civic outdoor, MDD
Viability and suggested priority	A priority because two thirds of the City's own water use in facilities and operations is used outdoors in the summer
Initiative Scale and Duration	A small-scale project, 1 site, that will help develop techniques and approaches to water reuse at up to 51 spray pads and paddling pools in the city and to update spray pad standards in future developments
Duration of Conservation Effects	20 years, assumed life span of new equipment
Delivery mechanisms	infrastructure and landscape changes (primary), policy and standards changes (secondary)
Total Litres Saved	7.8 million liters per year, <0.01%
MDD Reduced	23,000 litres per day, 0.1%
Greenhouse gas reduction	2 tonnes per year, ongoing, or 38 tonnes over 20-years
Cost to City	$291,249 and leveraging $389,323 from Natural Infrastructure Fund
Payback period for City	Estimated 9 years, $40,000 per year, subject to feasibility study
Cost per litre per year saved	4.58 cents per litre based on 20-year conservation effect
Synergies and co-benefits	Reusing spray pad water for irrigation could replace 155 million litres of potable water currently used for park and tree irrigation. Increased biodiversity and additional shade trees near park amenities also help people cool off in the summer
Challenges, limitations, risks	Regulatory restrictions are not yet fully understood, construction will disrupt park and spray pad access
Next steps	Hire a consultant, initiate project for the 2022 season

Civic Water Conservation - Spray Pad Improvements

The purpose of the project is to identify and analyze efficiency improvements that reduce water use at spray pads without reducing services levels. This work involves:

- Identifying and installing technology improvements (e.g., timers, nozzles, cycling buttons, temperature sensors) at priority spray pads.
- Tracking water use changes.

- Documenting program settings (e.g., feature run times).
- Through the summer play program, seeking play experience feedback.
- Analyze water use and play experience.
- Summarizing results, and if favorable, implementing changes to remaining spray pads.

Summary table

Initiative	**Spray pad improvements**
Targeted water use	Civic outdoor, MDD
Viability and suggested priority	A priority because two thirds of the City's own water use in facilities and operations is used outdoors in the summer
Initiative Scale and Duration	Scale will depend on costs and available budget
Duration of Conservation Effects	20 years, assumed life span of new equipment
Delivery mechanisms	Infrastructure and operating improvements (primary)
Total Litres Saved	To be determine (savings analysis is included in project scope)
MDD Reduced	To be determine (savings analysis is included in project scope)
Greenhouse gas reduction	To be determine (savings analysis is included in project scope)
Cost to City	To be determined
Payback period for City	To be determined - Cost analysis, including return on investment, is included in project scope
Cost per litre per year saved	To be determined
Synergies and co-benefits	Potential to address structural water budget issues for park irrigation and spray pads
Challenges, limitations, risks	Technologies, opportunities, and costs are not yet fully researched
Next steps	Further research on programming and technologies, engagement, cost estimation, and implementation

Civic Water Conservation - Revenue Loss Audit and Mitigation Project Phase 2

Phase 1 quantified and tracked authorized unbilled, unmetered water consumption within the City and calculated the revenue loss to Saskatoon Water.

Phase 2 builds on the results of Phase 1 to develop mitigation and implementation strategies to reduce and prevent water revenue loss. This work will include:

- Research into best practices across Canada.
- Work with the departments involved in unbilled authorized consumption to ensure water use strategies and standards are in place.
- Identify methods to find and fix leaks in the distribution system.

Summary table

Initiative	**Revenue loss audit and mitigation project - phase 2**
Targeted water use	Overall, unbilled and leaks
Viability and suggested priority	The magnitude of potential savings—hundreds of millions of litres per year—make this initiative a top priority
Initiative Scale and Duration	Audit and research that will lead to infrastructure monitoring, maintenance, repair, and upgrading
Duration of Conservation Effects	1 year. This program would have to be run continuously
Delivery mechanisms	audits and research (primary), policy/standards changes, infrastructure upgrades (secondary)
Total Litres Saved	not applicable
MDD Reduced	not applicable
Greenhouse gas reduction	not applicable
Cost to City	$21,500
Payback period for City	not applicable
Cost per litre per year saved	not applicable
Synergies and co-benefits	Will lead to water conservation that doesn't reduce water utility revenues. Active leak detection can reduce the number of breaks, reduce disruptions, and more effectively plan repairs
Challenges, limitations, risks	Real-world leak-reduction potentials and costs should be determined through pilot projects.
Next steps	Research and determine appropriate targets, spending levels and planning