Water Conservation Plan

Prepared for
Peace River Regional District

Integrated Sustainability

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The information presented in this document was compiled for the Peace River Regional District solely for the purpose of recommending what components should be included in a Water Conservation Plan suited to the Regional District's municipal and Electoral Area characteristics and responsibilities.

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1 BACKGROUND

1.1 Peace River Regional District (PRRD)

The Peace River Regional District (PRRD) was established in 1967 and is geographically the largest regional district in British Columbia, encompassing over 119,000 square kilometers. It serves seven incorporated communities and four electoral areas that represent over 40 unincorporated (rural) communities. There are also eight First Nations communities located within the PRRD boundary, including the traditional lands of the McLeod Lake Indian Band.

The board of directors for the PRRD and Hospital District are made up of twelve (12) Electoral Area and Municipal Directors.

Four Electoral Area Directors are elected for a four-year term to represent the following rural Electoral Areas:

- Electoral Area "B"
- Electoral Area "C"
- Electoral Area "D"
- Electoral Area "E"

Eight Municipal Directors are appointed by the councils of the seven-member municipalities of the Peace River Regional District:

- District of Chetwynd
- City of Dawson Creek
- City of Fort St. John
- District of Hudson's Hope
- Village of Pouce Coupe
- District of Taylor
- District of Tumbler Ridge

1.2 Population

The population census information indicates the population in the PRRD decreased from 62,942 in 2016 to 61,532 in 2021.This decrease of 2.2 percent is in contrast to the previous 4.8 percent increase in population between 2011 and 2016.

The population distributions within the municipalities and Electoral Areas in 2021 were as follows:

- District of Chetwynd (2,302)
- City of Dawson Creek (12,323)
- City of Fort St. John (21,123)
- District of Hudson's Hope (841)
- Village of Pouce Coupe (762)
- District of Taylor (1,317)

- District of Tumbler Ridge (2,399)
- Electoral Area "B" (5,379)
- Electoral Area "C" (5,974)
- Electoral Area "D" (4,793)
- Electoral Area "E" (2,660)

1.3 Water Supply

1.3.1 Member Municipalities

Each of the seven-member municipalities have conventional municipal potable water distribution systems.

District of Chetwynd

The District of Chetwynd sources its potable water from the Pine River. The water is first treated using settling ponds, after which it is pumped through strainers and a microfiltration system before being chlorinated. Treated water is stored in two clear wells before being pumped to the distribution system and water reservoirs for storage to serve approximately 1,135 buildings and a population of about 3,100. Water distribution also includes a water fill station that is used by community members who are not connected to the distribution system.

(https://www.gochetwynd.com/wp-content/uploads/2023/01/Annual-Water-Report-2022-District-of-Chetywnd.pdf)

The District of Chetwynd has a Water Fees, Charges & Regulations Bylaw (916, 2010) that authorizes the Director to "from time to time" place restrictions on the use of water for irrigation or uses other than "normal internal domestic use".

The District of Chetwynd has also established a Water Conservation Program guideline document titled Water Wise Tips for the public on the subject of water providing suggestions on methods to conserve water use including laundry, bathroom, kitchen, yard and driveway measures.

City of Dawson Creek

The City of Dawson Creek obtains its potable water from the Kiskatinaw River via 16 km through a series of five reservoirs before being treated via chemically-enhanced clarification, mixed media filtration, GAC filtration, and UV disinfection with a capacity of up to 14,500 m^3/d.

The City also operates a wastewater reclamation facility in partnership with Shell Canada for production wells as well as irrigation use for municipal properties, the rodeo, and a golf course.

(https://www.dawsoncreek.ca/en/Home-Property-Utilities/water-and-sewer-treatment.aspx#Water-supply-system)

The City also has a Water Conservation Measures Bylaw (3844, 2008) that imposes water use restrictions every year from May 1st to October 1st. including watering lawns, washing boats or motor vehicles, washing exterior building and ground surfaces, and hauling bulk water for non-potable use, and using water to fill garden ponds and fountains or private hot tubs and swimming pools, depending on the stage.

City of Fort St. John

The City of Fort St. John obtains water from five (5) shallow wells along the Peace River. The water is fluoridated and treated through media filtration before being chlorinated and distributed to the community in conjunction with two treated water reservoirs with about 43,000 m^3 capacity as well as rural dispensing stations.

The City adopted municipal water service Bylaw No 2457 in 2019 which establishes a water metering and billing system. There are no water conservation measures in the Bylaw.

(https://www.fortstjohn.ca/assets/Documents/Bylaws/Planning~Development/Water-Regulation-Bylaw.pdf)

The City's consolidated Water Regulation Bylaw (2457, 2019) does allow for restrictions and prohibitions regarding lawn and yard irrigation, car washing, private pool filling, and irrigation when there is a water shortage by issuing public notices in writing to affected customers and/or through media. The City also has escalating violation fines for violating water restrictions.

District of Hudson's Hope

The District of Hudson's Hope normally draws its water from the Peace River and its water treatment plant incorporates dual-barrier nano-filtration and disinfection, serving about 1,000 residents through a municipal water distribution system.

(https://hudsonshope.ca/district-office/public-works/water-services/)

The District of Hudson's Hope has a Water Service Regulation Amendment Bylaw No. 930, 2022 which in Section 5 includes provisions for water protection and conservation. It states that Council may, at any time it deems to be in the public interest, may direct all connected owners or occupiers to reduce or discontinue the use of water. In addition, all private water users are required to install a water meter and remote readout in a manner and location acceptable to the District.

Village of Pouce Coupe

The Village of Pouce Coupe purchases its potable water from the City of Dawson Creek and distributes it to the residents.

(https://poucecoupe.ca/government/public-works/water-sewer/)

Village of Pouce Coupe's Water Conservation Bylaw (927, 2009) contains provisions for Council to declare the activation of up to four (4) water conservation stages with a 72-

hour notice. While a stage declaration can be made by Council at any time, if no declaration is made by Mar 1 of a given year, Stage 1 water conservation measures are activated automatically. The declarations include restriction regarding lawn watering, the use of hoses to apply water, gardens, decorative landscape, watering trees and the use of water to wash vehicles and ground surfaces, depending on the Stage declared.

District of Taylor

The District of Taylor has a Water Conservation Bylaw No. 716, 2000. It prohibits individuals from allowing appliances to deteriorate in a manner that wastes water as well as allowing hoses to run unnecessarily and the over-watering of plants and lawns. In addition, it applies staged irrigation and water-use restrictions and allows for the use of micro and drip irrigation for daily irrigation between specific hours through to Stage 3 restrictions.

(https://districtoftaylor.com/wp-content/uploads/2023/05/716-2006-Bylaw-to-Regulate-Conservation-of-Water.pdf)

The District of Taylor has a Water Conservation Bylaw (716, 2006) empowering the District Council to declare up to three (3) stages of water use restrictions. Like the other municipal members of the PRRD, Phase 1 restrictions automatically begin on May 1 each year, unless otherwise announced through local newspaper announcements. The initial focus is on sprinkler irrigation days and times, with noted exceptions, and consider all domestic water use applications.

District of Tumbler Ridge

The District of Tumbler Ridge obtains its potable water for the community's water distribution system from two high-production groundwater well (Flatbed Creek Wells 7 & 8). Other wells supply water to an Industrial Park and are used to supplement flows from Wells 7 & 8 during high water demand situations. A dedicated water main transmits water from Wells 7 & 8 to a water treatment process consisting of chlorine pre-treatment (iron oxidation) followed by manganese greensand filters for removal of iron and manganese removal and then chlorination, before being pumped to a treated water storage reservoir.

The District of Tumbler Ridge also operates a bulk water facility also supplies water to commercial water haulers from the community water system.

Water System Annual Report 2022.pdf

1.3.2 Electoral Areas

While most of the homes and businesses within the four Electoral Areas typically rely on individual wells, the Peace River Regional District provides water through water transfer stations in Electoral Area B and operates a municipal water distribution system serving the airport subdivision in Electoral Area C.

Electoral Area B

As a result of a successful referendum held for Area B in 2017, the PRRD constructed five water stations in Area B; however, during the commissioning of the Rose Prairie water station in 2019, sulfides were found in the water, so the water station stayed closed. PRRD is now exploring solutions for reopening. The stations are located at Buick Creek, Prespatou, Feye Spring, and Boundary, providing potable water that meets Northern Health water quality standards for filtration and disinfection.

One of the advantages of providing community water through water supply stations is there is no water distribution system leakage and water losses, and the effort to obtain water from the station and transport it to residences increases public awareness of the importance of water conservation as excess water use results in not only additional cost for the water but also transportation costs.

Electoral Area C

The PRRD also operates and maintains a water distribution serving the airport subdivision within Electoral Area C and has established a Water-User Rates Bylaw (1846, 2009).

1.4 Water Challenges

Increasing demand for water as a result of population and economic growth combined with climate change impacts increases stress on natural water resources and associated aquatic and riparian ecosystems within the region.

A regional water conservation plan that provides consistent and common measures to conserve water within the municipal water distribution systems and considers electoral area measures, taking into consideration water service make-up and characteristics, would be an important tool in improving water management and efficiencies as well as anticipating future infrastructure costs to improve and expand services and address the replacement of aging water resource infrastructure.

2 WATER CONSERVATION PLANS

2.1 Plan Preparation

The preparation of the water conservation plan involves an assessment of existing and future water demands, establishing an inventory of existing water resources including groundwater, surface water, and precipitation, and implementing technology and social measures to minimize water losses and excessive consumption through improved efficiencies of use.

2.2 Water Conservation Definition

Water conservation is the socially beneficial practice of reducing water use by using water efficiently to reduce unnecessary water usage and addressing water losses and, in the process, ensuring that water supply meets both societal water consumption and

environmental needs. This requires careful planning and the successful implementation of effective water management practices.

2.3 Water Management Principles

This Water Conservation Plan follows four (4) basic principles in water management:

1) **Water is a valuable resource**. It is essential for the health and well-being of society, commerce, industry, and the environment.
2) **Water is a finite resource**. Water availability is limited by many factors including seasonally variable weather and precipitation patterns; geography; geological surface and subsurface characteristics and storage capacities; water quality; designated and assigned water rights; and the costs of treatment, storage, and distribution.
3) **Water is a renewable resource**. Water use is part of the hydrological cycle and returning water to the environment after use (e.g., wastewater-treated effluent) invariably results in changes to water quality that can affect downstream or downgradient uses. Water management requires awareness of water applications that may impair water quality and stewardship responsibilities.
4) Water is a shared **resource**. Water sustains life on earth and is a common resource that is shared with others and the environment.

A Water Conservation Plan is an important requirement for member municipalities and Regional District as a whole and represents a community and stakeholder initiative to conserve water. It incorporates an understanding that there are many ways to conserve potable water and that not all are suitable for every community.

2.4 BC Water Conservation Strategy

Water conservation has been an important focus in British Columbia for a long time. The 1998 publication "A Water Conservation Strategy for British Columbia" prepared by the BC Water Conservation Strategy Working Group, supported by the Ministry of Environment, Lands and Parks, represents the province's efforts at that time to become a "water-use efficient province". It notes that 76 percent of the regional districts and municipalities had developed or were in the process of developing water use efficiency programs including water restrictions, media announcements, plumbing fixture and appliance programs, metering systems, and promoting water-efficient irrigation. It also states that at that time over 17 percent of surface water sources serving communities in the province had reached or were near reaching their capacity to reliably supply water and that, in some regions, groundwater levels were declining, and one-third of aquifers were vulnerable to contamination.

The development of a Water Conservation Plan is an important requirement for municipalities and regional districts, as it represents a community and stakeholder-

developed initiative to conserve water and is a requirement to obtain senior government funding for water and wastewater infrastructure projects.

There are many ways to conserve potable water, and they are not all suitable for every community.

2.5 BC Government Guidance

As noted in Section 2.4, the BC Government has been a strong advocate for water conservation, having drafted a provincial strategy in 1998.The document provides a good summary of water-use efficiency tools that are intended to assist municipal and regional governments in developing a water supply management plan that is customized to local areas and circumstances.

2.5.1 Regulatory Tools

Regulatory tools are legal instruments intended to establish barriers against unnecessary water use. They include mandatory and enabling legislation, regulations, policies, standards, and guidelines such as:

1) Building and plumbing code restrictions (federal and provincial regulations) including toilets, faucets, showerheads, garburators, water and sewer lines, downspouts, water processing, and cooling systems.
2) Landscape requirements (local bylaws and provincial guidelines) including pervious surfaces, xeriscapes, slope, and soil covers.
3) Outdoor water use restrictions (local bylaw) including lawn and garden, washing, and swimming pools.
4) Provincial legislation and regulatory requirements to consider water use efficiency in plans.
5) Bylaws for new construction including the installation of meters, low flow fixtures, and improved standards for installation and construction of water mains.
6) Municipal effluent regulations to reduce upstream water quality impacts.

2.5.2 Economic and Financial Tools

Economic and financial tools include both incentives and disincentives to reinforce the value of water and motivate individuals and corporations to reduce excessive water use and recover true costs. Examples of economic and financial tools include:

1) Financial incentives to install efficient water-use fixtures and appliances including low-interest or forgivable loans, tax credits, rebates, and buy-backs of inefficient devices.
2) Fines for non-compliance with regulatory requirements.
3) Pricing structures including marginal cost pricing strategies, increasing block rates, and seasonal rates.

4) Program funding for activities promoting water conservation such as supporting environmental youth teams.
5) Establishment of full-cost pricing and surcharges linking sewer costs with water use.

2.5.3 Operations and Maintenance Tools

Operations and maintenance tools address physical changes or improvements to water-use equipment, devices, and processes. Examples include:

1) Encouraging the use of water-efficient irrigation systems that minimize evaporative water losses and match agronomic requirements for plant health.
2) Ditch and canal liners to minimize water loss to ground and covers to minimize evaporative losses.
3) Dual potable and non-potable water distribution systems.
4) Moisture monitoring devices and improved urban and agricultural irrigation scheduling.
5) Irrigation water audits.
6) Landscaping activities including contouring, xeriscaping, and trenching soil moisture retention.
7) Water distribution system leak detection and repair programs.
8) Use of rain sensors for automatic irrigation systems.
9) Encouragement of rainwater harvesting.
10) Promotion of recirculating and other efficient water-cooling systems.
11) Promotions encouraging the use of water-efficient appliances and machinery including washing machines, dishwashers, car washes, ice machines, commercial laundries, and water pressure reduction.

2.5.4 Communications and Education Tools

Communication and education tools are intended to facilitate and encourage voluntary water conservation actions and to support other tools. Examples of communications and education tools include:

1) Competitions, awards, and recognition programs.
2) Demonstration sites and information centers.
3) One-on-one meetings with major water users.
4) Irrigation design and scheduling guides.
5) Social marketing campaigns including public broadcasting announcements, brochures and handouts, public displays, slogans, bill inserts, advertising and news bulletins, special public events, internet sites, door-to-door campaigns, newspaper articles, and radio/Television programs.

6) Published materials including "How to" manuals, case studies, technical reports, and resource libraries.
7) School programs and materials including activity books, games, video and CDs, poster contests, in-class visits, demonstrations, "teach the teacher" guides, curriculum guides and special project committees, seminars, and workshops with specific water users.

2.5.5 Market Development Use Tools

Market development tools serve to increase the availability of water-use efficient products and services as well as to encourage improvements and innovations in product development and include:

1) Research grants and scholarships.
2) Research contracts.
3) Government procurement policies.
4) Cap and trade systems to gain "water equivalency units".
5) Product labeling (e.g., "Water Smart").
6) Education and liaison with professional associations, trades, industries, wholesalers, and retailers.
7) Point of purchase education programs.
8) Product testing, standards, and performance certification programs.

3 PROJECTING WATER DEMANDS AND SUPPLY NEEDS

3.1 General

The development of a water conservation plan begins with assessing present water demands, determining future water demands, and comparing the demands against the water supply. This involves consideration for population and industry growth and establishing the associated water demands to sustain that growth.

Each of the member municipalities and Electoral Areas within the PRRD have unique characteristics that affect water consumption and water use practices. Like most municipalities and regional districts who distribute water through water distribution networks, the majority of the member municipalities within the PRRD have established water conservation bylaws that apply increased water use restrictions through a staged response to drought conditions affecting water supply. These are similar to those established by member municipalities of other regional districts within the province including Metro Vancouver who has established a Drinking Water Conservation Plan that has two complementary documents: 1) Drinking Water Conservation Policy which details the Greater Vancouver Water District Commissioner's decision-making process for activating and deactivating the four (4) Stages of the Drinking Water Conservation Plan

and the implementation process for member jurisdictions; and 2) Drinking Water Management Plan which sets out the three over-reaching goals to provide clean safe drinking water, ensure sustainable use of water resources and ensure the efficient supply of water. A key difference between Metro Vancouver and the PRRD is that Metro Vancouver is responsible for the supply of water to the member jurisdictions; whereas the PRRD has only limited supply responsibilities with respect to the airport subdivision in Electoral Area E and the bulk water transfer stations in Electoral Area B. In addition, the staged water use restrictions established by Metro Vancouver in consultation with their member jurisdictions are uniformly incorporated into the member jurisdiction's bylaws; whereas, each of the member jurisdictions within the PRRD have established their own bylaws.

As the member jurisdictions are currently responsible for their own water supply, water demand projections, and conservation measures, the PRRD could work to harmonize the member jurisdiction's water conservation bylaws in a similar manner to Metro Vancouver, and could consider efforts to promote water conservation generally within the regional district as well as similar measures to promote water conservation for the airport subdivision in Electoral Area E and alternate measures (e.g. pricing, plumbing standards and the preparation of guidelines and public information for the region as a whole.

The following sections are focused on considerations for the bulk water stations within Electoral Area B.

3.2 Historical User Water Consumption

Table A presents the number of users, total bulk water station consumption and associated per user water use over the past four years (2019, 2020, 2021, and 2022) for Electoral Area B, as provided by the PRRD. This represents a small segment of the population that utilizes water stations within the regional district, and does not include the water treatment and distribution systems that serve the member municipalities and the airport.

Table A suggests the water use per user has decreased over the past four years with a notable drop from 475 L/d per user in 2019 to 285 L/d per user in 2020 and averaging 284 L/d per user over 2020 - 2022. Census Canada indicates the average household occupancy is 3.2 persons so, assuming each user represents a household, the average water consumption per person would be about 90 L/d per capita.

For comparative purposes, the Water Research Foundation (WRF) carried out an extensive US$1.6M survey of domestic water consumption in 2016 involving almost 24,000 randomly selected single-family residences within 23 study-site utilities from across North America, including Canada. The study found there had been a significant 22 percent reduction in per capita residential indoor water use since a similar study was carried out in 1999 as a result of the introduction of higher efficiency water-use appliances and fixtures into the North American market reduced the daily per capita consumption from about 245 L/d in 1999 down to 190 L/d per person, as illustrated in Table B.

Table A. Historical PRRD Electoral Area B Bulk Water Transfer Station Consumption

Year	Users	Total Annual Production (m^3)	Revenue ($/$m^3$)	Water Consumption (L/d/User)
2019	333	57,747	$1.95	475
2020	426	44,324	$4.07	285
2021	459	49,439	$4.27	295
2022	448	44,507	$4.11	272
Average (1)	444	46,090	$4.15	284

(1) Average for 2020 – 2022 to compare with 2019 which had a different pricing policy.

Table B. 2016 WRF North American Residential Water Consumption Study

WATER USE	Per Capita Water Consumption*	
	(L/d)	(%)
Shower & Bath	47	25%
Toilet	53	28%
Laundry	36	19%
Dishwasher	3	1%
Faucet	42	22%
Misc	9	5%
TOTAL	**190**	**100%**

** Water Research Foundation. 2016. Residential End Uses of Water – Version 2.*

The 2016 WRF study also noted a large proportion of the surveyed households were using older low-efficiency water-use toilets and appliances and estimated their eventual replacement with higher-efficiency fixtures and appliances would result in a further reduction in residential indoor water use to about 120 L/d per capita.

Note the per capita water consumption shown in Table B does not include irrigation water use which can double domestic water demands during the summer. While the indicated user in Table A could represent a household, it could also be a commercial water delivery service or commercial use. Similarly, some of the station's water production may have been used for irrigation or commercial purposes. If it were all used for domestic household consumption, the indicated average domestic per capita water consumption for Electoral Area B of 90 L/d per capita is significantly lower than the high efficiency estimate of 120 L/d per capita estimated in the WRF study.

3.3 Potential Effect of Increased Unit Cost of Water

Table A also illustrates the cost per cubic meter charged by the PRRD for the past four years. Of particular note is the doubling of the cost per cubic meter from just under $2 in 2019 to just over $4 in 2020.This corresponds with a significant reduction in the per capita water use from 150 L/d per capita in 2019 down to 90 L/d per capita in 2020, which has remained essentially the same since 2020 under the same pricing structure.

While increases in pricing structure generally have a modest influence in affecting water consumption practices and water conservation, the doubling of the cost of bulk water between 2019 and 2020 corresponds with a 40 percent reduction in water consumption per user, which has since been maintained since that time along with the unit cost. The average annual cost of water per user in 2019 was $338/year per user, whereas in 2020 the cost was $423/year per user (a 25 percent increase).

4 WATER CONSERVATION PLAN CONTENTS

4.1 Plan Intentions

Water Conservation Plans, also referred to as Water Action Plans, are intended to responsibly manage water use by implementing water conservation and efficiency practices, encouraging innovative alternative water management and supply solutions, and establishing community water supply resiliency. This includes implementing water meters for educational purposes rather than with a focus on billing. Increased water bills in proportion to metered water use do little to change water consumption habits. However, using the information to provide feedback and inform the user of water use in comparison to community averages or aspirations for conservation can be much more effective than the associated metered water costs. Other measures include irrigation system management; encouragement and use of alternative water sources; water reuse and recycling; and community engagement.

4.2 Plan Goals

A Water Conservation Plan should be based on specific goals which help guide decisions about water supply and management, such as:

1) Support PRRD in meeting regional water management expectations.
2) Reduce water consumption and cost within the PRRD.
3) Contribute to community water supply resiliency concerning the impacts of climate change.
4) Reduce or minimize water use associated with GHG (e.g., pumping versus truck transport) and energy consumption related to climate change impacts.
5) Strengthen the region's sustainability profile and help build a sustainability culture within the general community within the district.

6) Create public educational opportunities to strengthen understanding and buy-in for the Water Conservation Plan.

4.3 Plan Targets

A Water Conservation Plan should also have specific measurable targets that can be easily referenced and understood, such as attaining specific per capita water consumption or associated water supply cost targets. For PRRD this could be an aspiration to reduce the per capita average daily consumption to, say, 200 L/d per person, representing about a 25 percent reduction, over the next 10 years, or about 3 percent per year.

Both the targets and reporting on the targets must be common public knowledge and aspirations, requiring routine public engagement and reporting.

4.4 Implementation Strategy

The Water Conservation Plan needs to be translated into an Action Plan to meet the goals and achieved the targets. Some actions that could be considered for an Implementation Strategy include:

4.4.1 Improve Water-Use Efficiencies

Improve water efficiency progress by focusing on areas of high-water use including irrigation and non-revenue-water losses that may be occurring in areas that have community water service (e.g., Electoral Areas B and C).

4.4.2 Improve Transparency in Water Service Fees

Improve transparency in water service fees by shifting the cost burden for water utilities from a property-tax basis to commodity user-fee charges. While the initial capital costs can be based on a property tax model, the property tax burden could be gradually transferred to metered charges for water usage. This approach should be cautiously implemented as the economic viability of establishing and operating the water infrastructure depends on a known and predictable revenue base. Increased commodity charges will tend to reduce consumption, which is the goal; however, if usage drops below a critical level there may be insufficient revenues to sustain the infrastructure.

4.4.3 Eliminate Non-Revenue Water Losses & Water Metering

The larger and older the water distribution system, the greater the amount of what is referred to as non-revenue water losses, water losses due to distribution pipe leakages as well as unauthorized and un-metered water service connections. Most municipal jurisdictions have established leak detection and repair programs or contract services for this work, as well as a program of infrastructure renewal and replacement. These water losses, if left unchecked, can account for doubling the community's water demands. Metering can be a useful tool for tracking the extent of the water losses that are occurring,

although the technology exists to detect and identify leakage without implementing a water meter program.

Experience shows that water metering isn't a very effective tool, in and of itself, for reducing water consumption as the cost of water is generally significantly less than many other commodities and living costs. However, it can be very effectively used to verify the quantity of water that is being lost through the distribution system, and for reporting back to the consumers so they are aware of their water use and can modify their consumption. BC Hydro has successfully implemented this approach for their household and commercial metering programs, routinely reporting power consumption summaries and comparisons to their customers.

4.4.4 Modify Building Bylaw (No. 2131, 2014)

Modify Building Bylaw (No. 2131, 2014) to specify performance and/or certification requirements for water use fixtures and appliances to obtain a plumbing permit. For example, Section 2.6 exempts the repair or replacement of plumbing fixtures from requiring a permit "*unless the repair includes an extension, relocation, or addition of fixtures, such as installing a new bathroom or relocating a kitchen*". This could be modified to require any new fixture to be compliant with, for example, Chapter 6 of the 2021 International Plumbing Code (IPC) in compliance with Section 604.4 and Table 604.4 regarding the stated maximum flow rates and consumption for high-efficiency plumbing fixtures and fixture fittings established by the US EPA, and compliance is identified on the fixtures by a blue WaterSense label. In some cases, low-flow fixtures have been shown in a retrofit to reduce water usage by as much as 60 percent over standard fixtures.

Faucets and showerheads designed to meet the lower flow standards compensate for the lower flow rate using aeration to produce a vigorous spray, or redirecting flow through larger but fewer laminar-flow openings. Similarly, modern low-flush toilets have been hydraulically redesigned to eliminate clogging or incorporate pressure assist mechanisms to produce a more jet-like flush.

For example, this could be implemented by placing the content of ICC Table 604.4 to the current PRRD Building Bylaw as indicated in Table C along with a reference to the 2020 ANSI/RESNET/ICC 850 Standard.

Replacing showerheads with *WaterSense*-labeled models can save 4 gallons (15 L) of water per shower.

According to the US EPA (https://www.epa.gov/watersense/about-watersense):

- Replacing faucets with *WaterSense*-labeled models can save up to 700 gallons (2,650 L) of water per year and are up to 30 percent more efficient than a standard faucet.
- Replacing a clock-based irrigation controller with WaterSense-labeled models can save up to 15,000 gallons (57,000 L) of water per year.
- Replacing inefficient toilets with WaterSense models can save up to 13,000 gallons (49,000 L) per year.

Table C. Example US EPA Defined High-Efficiency Plumbing Fixture Standards

Plumbing Fixture or Fixture Fitting	Maximum Flow Rate or Quantity
Lavatory, private	2.2 gpm (8.3 L) at 60 psi
The lavatory, public (metering)	0.25 gallon (1 L) per metering cycle
The lavatory, public (other than metering)	0.5 gpm (1.9 L) at 60 psi
Shower head or Hand-held spray	2.5 gpm (9.5 L) at 80 psi
Sink faucet	2.2 gpm (8.3 L) at 60 psi
Urinal	1.0 gallon (3.8 L) per flushing cycle
Water closet	1.6 gallons (6 L) per flushing cycle

As most plumbing fixture and faucet manufacturers market into the US, where an increasing number of states have adopted high-efficiency standards, it is expected that other jurisdictions will inherently adopt these products and water use efficiencies with time. WaterSense performance criteria are now part of the US national plumbing standard, and have been adopted in Canada through the Standards Council of Canada/Canadian Standards Association ASME A112.19.2/CSA B45.1 Ceramic Plumbing Fixtures, and the BC Plumbing Code 2018 (Division B-Section 2.2: Materials and Equipment) now also requires compliance with that standard.

4.4.5 Public Communications and Education

A Public Communications strategy, explaining the importance of water conservation to the region as well as the goals, targets, and implementation plan, is an important measure to get buy-in for the Water Conservation Plan. While members of the community realize the importance of water in their lives, many of them are unaware of the beneficial impact on the community of efficient water use and the aggregate achievements that can be made.

A Water Conservation education program could be established as a resource for educators (elementary & high school), community groups, water managers, purveyors, elected local government officials, and community leaders. This material would also be of use as a resource for media and businesses. Some implementation ideas include:

1) Establish educational resource materials regarding the Water Conservation Program for schoolteachers including presentation materials, information brochures, and in-class contests regarding the importance of not wasting water.

2) Establish seminars, presentations, and workshop materials to introduce water conservation strategies, share information and solicit ideas and information on community water efficiency and reduction successes.
3) Develop "water efficiency in the workplace" presentations and materials for specific industrial, commercial, and institutional water users.
4) Develop materials for social media describing water conservation measures and tracking and reporting on goals and program targets. Implementing water efficiency programs are characteristically voluntary measures and rely on public acceptance and feedback to induce individual action. Engage a variety of media including local television and radio news representatives, community connectors, and local organizations.
5) Actively record and report the results of water use efficiency measures and target status. Regular reporting helps to maintain interest, and the feedback on the progress to reaching community goals, targets, and unexpected achievements increases and encourages public support.

4.4.6 Landscape Alternatives

In addition to choosing a smart irrigation system that is aware of off-setting precipitation events rather than simply activating an irrigation system using a timer, plant selection can also significantly reduce irrigation demands on water resources. This includes the following:

1) Alternative lawn choices such as wildflower or clover mixes often require much less watering compared to other grass mixes and provide flowers for pollinators.
2) Letting grass go yellow during hot summer months. Grass naturally goes into a stage of dormancy during hot weather and can survive with little water for up to a month.
3) Xeriscaping with drought-resistant plants can greatly reduce or eliminate the need for landscape irrigation.
4) Provide educational materials on irrigation practices that can significantly reduce water consumption including the best time of day for irrigation and the frequency and quantity of water required by specific vegetation. Lawns only need about 1 inch of water, including rain, to stay green in the hottest months. For shrubs, trees, and flowers it is best to water in short bursts to allow the water to seep into the ground.
5) Watering in the early mornings or late evenings when the weather is coolest allows for water to evaporate less compared to watering at the hottest times of the day.

4.4.7 Rainwater Harvesting

While rainwater harvesting is not, in itself, a water conservation measure, it can reduce the demands on municipal water supplies.

4.4.8 Consider Alternative Water Sources and Management

Well-planned water supply management and securing water supply sources will provide greater opportunities to successfully deliver water cost-effectively. Planning, implementing, and evaluating the impact of alternative water sources such as rainwater harvesting, greywater recycling, and water reuse includes the following steps:

1) Analyze water use characteristics within the service area through water use surveys and soliciting consumer feedback via e-mail and social media forums.
2) Prepare and monitor demand forecasts.
3) Identify existing demand/interest for alternative water sources including rainwater harvesting for potable and non-potable water use applications, greywater recycling, and water reclamation/reuse.
4) Develop a long-term water supply plan to ensure there will be a reliable, cost-effective water service to meet community needs.
5) Develop contingency plans in the event of severe climate change impacts (e.g. extended period of drought) on existing potable water resources.

4.4.9 Encourage Market Development and Innovation

In coming years many technological innovations are expected to be introduced to achieve more efficient use of water, in particular in the area of irrigation. Often such innovations can have difficulties getting established due to unintended restrictions in plumbing codes and Bylaws. A committee focused on monitoring the progress and implementation of the water conservation plan could also include in its activities an active awareness of changes and advances in water conservation technologies and practices that could be adapted to conditions within the PRRD.

4.4.10 Online Tools

Informing the public about what they can do to conserve water can have a great impact on the success of a Water Conservation Program, particularly if there is an opportunity to learn in the process.

A very successful tool was developed by the New South Wales (NSW) government in Australia. Faced with water shortages the government created a new policy requiring all new construction permits to enter information on the government Building Sustainability Index (BASIX) website, considered to be one of the strongest sustainable planning measures to be undertaken in Australia. BASIX is assessed online using the BASIX assessment tool. The tool checks both energy and water consumption elements of a proposed development or building against sustainability targets to reduce water and energy consumption in homes across NSW. Introduced on 1 July 2004, BASIX has become an integrated part of the government's planning system and has reduced potable water consumption and greenhouse gas emissions for new homes built in NSW as well as winning numerous awards.

While BASIX addresses both energy and water consumption, concerning water conservation applicants for a BASIX certificate must enter information to obtain a building permit for single or multi-dwellings including site area, roof area, condition, and unconditioned floor area, number of bedrooms, floor area, number of bedrooms and bathrooms, total garden area, and number of plumbing fixtures, construction type and other details that can affect water consumption. The tool then presents the applicants with an estimate of the amount of water consumption associated with the proposed structure and presents a wide array of options to conserve water, with the target of selecting and committing to specific water conservation measures of the applicants choosing until a forty percent (40%) reduction in water consumption is achieved, and a construction permit is awarded. Building inspectors then verify the selected water conservation measures are implemented.

The overall intent of implementing BASIX was to reduce the impact of new development on community water resources, but it had a significant and unintended effect in that individuals wanting to implement water conservation measures to reduce their water footprint also accessed the BASIX website and learned about and adopted options for water conservation without the need to obtain a building permit. The result was much greater reductions in water use throughout NSW such that there was concern the revenue required to support operations of the water utility might be jeopardized as a result of the decreased water use.

Conservation measures in the BASIX tool include:

- Rainwater harvesting with potable and non-potable use.
- Stormwater collection for non-potable use.
- Wastewater reclamation and non-potable reuse.
- Greywater recycling.
- Private surface water dams.
- High-efficiency water fixtures and appliances.
- Landscape irrigation methods.

Notes regarding how to input a project to BASIX can be found at the following URL link: https://www.basix.nsw.gov.au/iframe/new-to-basix/new-to-basix.html

5 INITIAL WATER CONSERVATION PLAN MEASURES

5.1 Water Conservation Plan Purpose

A water conservation plan involves assessing and meeting existing and future water demands on groundwater and surface water resources, and the implementation of technology and social measures to minimize water losses and excessive consumption through improved efficiencies of use. Further, an effective plan is one that can provide

meaningful conservation measures on an ongoing basis rather than only during periods of drought.

Water conservation is the socially beneficial practice of reducing water use by using water efficiently to reduce unnecessary water usage and addressing water losses and, in the process, ensuring that water supply meets both societal water consumption and environmental needs. This requires careful planning and the successful implementation of effective water management practices involving the engagement of water consumers and the provision of feedback on the region's ability to attain its water conservation goals.

The following section describes some basic water efficiency methods and tools that are recommended for adoption by the PRRD that address water supply characteristics for both the member municipalities and Electoral Areas.

5.2 Six Water Conservation Measures

The PRRD Water Conservation Plan consists of the following six (6) water conservation measures:

1) Harmonization of staged water use restrictions that recognize the unique water supply characteristics of the member jurisdictions.
2) Adopt building and plumbing code requirements for new construction that require new water fixtures and appliances meet minimum low-flow water use standards including: toilets, urinals, faucets, showerheads, domestic dishwashers and laundry machines. This includes modifications that enable the implementation of non-potable water distribution systems and greywater recycling.
3) Requirement for all new irrigation systems to have automatic controls and to have annual inspections to verify they conform to the water-use restrictions.
4) Commitment by member jurisdictions and the District to conduct annual leak detection and repair programs for community water distribution systems.
5) The creation and maintenance of a regional water conservation web site that reports monthly total water consumption for each community water distribution systems, annual reports on leak reduction efforts for each system, and provides guidance and resource information for the community on water conservation measures.
6) Establishment of full-cost pricing for all water distribution methods within the region that accurately represent the total cost of providing water through both community water distribution systems and bulk water transfer stations.

5.2.1 Building and Plumbing Code Changes

Plumbing codes affect all new construction and plumbing renovations within the region for both buildings served by a municipal water distribution system and those served by individual wells or bulk water transfer. Incorporating requirements to install water-efficient low-flow plumbing fixtures and appliances within the plumbing code will inherently

promote water conservation and efficiency throughout the regional district. The municipal building and plumbing codes modifications include the following low-flow standards for new and renovation construction permits with respect to plumbing fixtures and appliances:

Toilets: International Plumbing Code (IPC) or Uniform Plumbing Code (UPC) certified for a maximum flush volume of 4.8 Lites (1.28 gallons) per flush for residential fixtures.

Urinals: IPC or UPC certified for a maximum of 1.9 Litres (0.5 gallons) per flush.

Showerheads: IPC or UPC certified for a maximum flow rate of 9.5 Litres per minute (2.5 gpm).

Faucets: IPC or UPC certified for lavatory faucets to have a maximum flow rate of 4.5 Litres per minute (1.2 gpm) and kitchen faucets to have a maximum flow rate of 6.8 Litres per minute (1.8 gpm).

Irrigation Systems: Specifies the use of low-flow high-efficiency irrigation equipment including low-flow sprinkler heads, drip irrigation systems and the use of rain sensors to prevent unnecessary watering.

Dual-Plumbing: Provision for dual-plumbing for non-potable water distribution within a building following the provisions of the National Building Code, including methods for back-flow prevention and make-up water.

Greywater Recycling: Provision for greywater recycling for use in collecting bath and shower water for use in toilet and urinal flushing and for shallow-burial landscape irrigation purposes.

Rainwater Harvesting: Provision for rainwater harvesting for use in either potable or non-potable water applications. The Plumbing Code should reference **CSA B805-18/ICC 805-2018 Rainwater harvesting systems** for single-family residential applications; multi-family residential applications; and non-residential applications following requirements to ensure building materials that come into contact with the collected rainwater, address any risks for contamination and appropriate treatment requirements for potable water consumption.

5.2.2 Staged Water Use Restrictions

Harmonize the municipal water conservation bylaws currently in place by the member municipalities. This could be an amalgamation of the existing bylaws or it could be, for example, to follow the 3-stage water-use restrictions stated within the 2006 District of Taylor – Water Conservation Bylaw No. 716. 2006 - Schedule "A" – Outdoor Water Use Restrictions, which are briefly summarized as follows

a) **Stage 1 – Reduced Lawn Watering**
   During Stage 1 no person shall use a sprinkler to water a lawn growing on a property except on an odd numbered day between the hours of 6:00 a.m. to 8:00 a.m. and 8:00 p.m. to 10:00 p.m.
   A person may also:

- water trees, shrubs, flowers and vegetables on any day with a sprinkler during the prescribed hours for Stage 1 lawn watering and on any date at any time if watering is done by hand-held container or a hose equipped with a shut-off nozzle;
- water newly planted trees, shrubs, flowers and vegetables by any method during installation and within the following 24 hours;
- use micro-irrigation or drip-irrigation systems to water trees, shrubs, flowers and vegetables at any time on any day;
- under the authority of a Permit, water new sod on installation and during the first 21 days after installation, and water newly seeded lawns until growth is established or for 49 days after installation, whichever is less, but only during the prescribed Stage 1 lawn watering hours;
- water all-weather playing fields at any time if failure to do so will result in a permanent loss of plant material; and
- wash a vehicle with water using a hand-held container or hose equipped with a shut-off nozzle and at car dealerships or commercial car washes.

Exceptions to Stage 1 restrictions include: Nurseries, Farms, turf farms, golf courses and tree farms are exempted from the restrictions; and Public Authorities watering lawns and boulevards on any day but no more than three days per week.

b) Stage 2 – Reduced Lawn Watering and Limited Water Use

During Stage 2 no person shall use a Sprinkler to water a lawn growing on a property except on an odd numbered day between the hours of 6:00 a.m. to 8:00 a.m. and 8:00 p.m. to 10:00 p.m. No person shall use Water to wash sidewalks, driveways or parking lots, exterior windows or exterior building surfaces, except as necessary for applying a product such as paint, preservative and stucco, preparing a surface prior to paving or repainting bricks, or if required by law to comply with health or safety regulations.

A person may

- water trees, shrubs, flowers and vegetables on any day with a Sprinkler during the prescribed hours for Stage 2 lawn watering and on any day at any time if watering is done by hand-held container or a hose equipped with a shut-off nozzle;
- water newly planted trees, shrubs, flowers and vegetables by any method during installation and for the following 24 hours;
- use Micro-irrigation or Drip-irrigation systems to water trees, shrubs, flowers and vegetables at any time on any day;
- water all weather playing fields at any time if failure to do so will result in a permanent loss of plant material; and

- wash a vehicle with Water using a hand-held container or hose equipped with a shut-off nozzle and at car dealerships and commercial car washes.

Exceptions to Stage 2 restrictions include: Nurseries, Farms, turf farms, golf courses and tree farms are exempted from the restrictions; and Public Authorities watering lawns and boulevards on any day but no more than three days per week.

c) Stage 3 — No Lawn Watering, Severe Water Use Restrictions

During Stage 3 no person shall: water a lawn or Boulevard; fill a swimming pool, hot tub or garden pond; fill or operate a decorative fountain at any time; wash a Vehicle or a Boat with Water; or use Water to wash sidewalks, driveways or parking lots, exterior windows or exterior building surfaces, except as necessary for applying a product such as paint, preservative and stucco, preparing a surface prior to paving or repainting bricks, or if required by law to comply with health or safety regulations.

A person may:

- water trees, shrubs, flowers and vegetables on any day between the hours of 4:00 a.m. to 10:00 a.m. and 7:00 p.m. to 10:00 p.m. if watering is done by hand-held container or a hose equipped with a shut-off nozzle;
- water newly planted trees, shrubs, flowers and vegetables between the hours 4:00 a.m. to 10:00 a.m. and 7:00 p.m. to 10:00 p.m. only by hand-held container or a hose equipped with a shut-off nozzle during installation and during the following 24 hours after installation is completed;
- use Micro-irrigation or Drip-irrigation systems to water trees, shrubs, flowers and vegetables on any day between the hours of 4:00 a.m. to 10:00 a.m. and 7:00 p.m. to 10:00 p.m.; and
- water all playing fields and golf course at any time, but only if failure to do so will result in a permanent loss of plant material.

Exceptions to Stage 3 restrictions include: golf courses may water "greens" only as required to maintain them in good playing condition. Nurseries, Farms, turf farms and tree farms are exempted from the restrictions; and commercial vehicle washes.

5.2.3 Irrigation System Automatic Controls

In order to comply with the staged water use restrictions, all irrigation systems have to be automatically controlled to operate within the time periods indicated in Section 3.1.2.

5.2.4 Annual Leak Detection and Repair Program

A municipal potable water distribution system annual leak detection and repair program is a proactive strategy to identify and repair leaks and water losses with the goals of reducing water wastage, minimizing financial losses associated with repair costs, and

ensuring the efficient operation, sustainability and reliability of the water distribution system.

The key components and objectives include:

- Installation and use of flow meters, pressure sensors, acoustic listening devices, and Geographic Information Systems (GIS) data to monitor and analyze the performance of the water distribution network. and
- The use of leak detection techniques incorporating acoustic monitoring (listening for the sound of water leaking from pressurized pipes which can also be used to locate underground leaks), and monitoring for abnormal pressure variations within the system, monitoring flow data for unaccounted-for water use (e.g., late night flow monitoring or comparing total water treated to the sum of metered connections).

Once leaks are detected, they are prioritized based on size, location, and potential impact on the water supply system and critical leaks are addressed urgently. This program includes the prompt repair of identified leaks, often involving excavation and the replacement of damaged pipes, valves, or fittings.

The costs of leak detection and the successful repairs will be reported annually within the Water Conservation Plan public information web site to enable the public to understand the level of effort required and to be aware of and report any signs of leakage (e.g. crack pavement or sink-hole development). The reports will include information on the number and location of leaks, the volume of water saved, and the cost savings.

5.2.5 Water Conservation Plan Web Site

Public education and awareness are a critical component of the Water Conservation Plan. A Water Conservation Plan web site will be established: Some programs engage in public to inform residents and businesses about community water conservation efforts and successes, as well as serve as a technical resource on measures to reduce water consumption, including rainwater harvesting, greywater recycling, as well as the importance of water conservation and the municipalities' and regions' efforts to reduce water losses.

By implementing an annual leak detection program, municipalities can minimize water losses, reduce operating costs, extend the life of their infrastructure, and contribute to the conservation of precious water resources. It's an essential component of responsible water resource management for urban areas.

The web site's communication and education tools are intended to facilitate and encourage voluntary water conservation actions. Examples of communications and education tools include:

1) Youth competitions, awards, and recognition programs regarding water conservation.
2) One-on-one meetings with major water users.

3) Irrigation design and scheduling guides.
4) Social marketing campaigns including public broadcasting announcements, brochures and handouts for public events, public displays, slogans, utility bill inserts, advertising and news bulletins, newspaper article preparation and submissions, and radio/television program submissions.
5) Online materials including "How to" manuals, case studies, technical reports, and resource libraries.
6) Establish educational resource materials regarding the Water Conservation Program for school-teachers including presentation materials, information brochures, and in-class contests regarding the importance of not wasting water.

Some implementation ideas currently being explored include:

1) Establish seminars, presentations, and workshop materials to introduce water conservation strategies, share information and solicit ideas and information on community water efficiency and reduction successes.
2) Develop "water efficiency in the workplace" presentations and materials for specific industrial, commercial, and institutional water users.
3) Develop materials for social media describing water conservation measures and tracking and reporting on goals and program targets. Implementing water efficiency programs are characteristically voluntary measures and rely on public acceptance and feedback to induce individual action. Engage a variety of media including local television and radio news representatives, community connectors, and local organizations.
4) Actively record and report the results of water use efficiency measures and target status. Regular reporting helps to maintain interest, and the feedback on the progress to reaching community goals, targets, and unexpected achievements increases and encourages public support.

5.2.6 Establishment of Full-Cost Pricing

Economic and financial tools include both incentives and disincentives to reinforce the value of water and motivate individuals and corporations to reduce excessive water use and recover true costs. These measures include:

- Although the plumbing code provision changes to require low-water-use fixtures and appliances are intended for new construction, financial incentives will be implemented to encourage the replacement of existing fixtures and appliances with efficient water-use fixtures and appliances.
- Gradual establishment of full-cost pricing and surcharges linking sewer costs with potable water use costs such that life-cycle costs for the water and sewer capital and operations and maintenance costs are recovered.

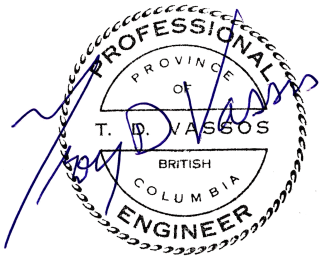
6 CLOSURE

Integrated Sustainability would like to thank the PRRD for the opportunity to support the Water Conservation Plan. We trust that this meets the needs and expectations of PRRD.

Please contact the undersigned at any time should you have any questions or comments.

Sincerely,

Integrated Sustainability



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