Village of McBride

50-Year Water Conservation Plan

January 2022

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1 INTRODUCTION

The Village of McBride 2021-2023 Strategic Priorities and Initiatives identifies the development of strategies under the BC Climate Action Charter to become carbon neutral. Water conservation efforts help reduce the energy requirements of the Village by reducing the energy required to treat and supply potable water to the community. The Official Community Plan Bylaw No. 682 also outlines various objectives with respect to water supply including:

- the need to preserve the watershed of Dominion Creek for community water supply purposes and supports any preservation techniques developed by government ministries responsible for the area,
- to maintain and enhance existing domestic water services in the Village, through on-going maintenance and upgrading programs
- to provide a satisfactory emergency supply of water for fire protection, within the Village boundaries, and
- to support and encourage economical use of water by residents of the Village of McBride

As part of the Village's ongoing efforts to achieve these objectives, the Village has updated its water conservation plan to look at the next 50 years of water usage and adopting ways to reduce its environmental impact. Additionally, the plan includes potential ways to adapt to climate change as they directly affect the Villages water source. This plan has been completed with the guidance from the *Water Conservation Guide for British Columbia* (2013).

Figure 1: Welcome to McBride

Benefits of Water Conservation Planning: Water conservation helps a community to sustain its water supply both economically and environmentally. For example, the current per capita demands for McBride have been reduced to meet the average British Columbia per capita water use by reducing water use by more than 60% from 1996 to 2019. A reduction in water demand through conservation will help to delay the future need to expand the water supply infrastructure and possibly allow for the consideration of alternative water sources to supply future demands. An alternative water source could enhance the current system by reducing the impacts, both environmental and sustainability, on a single source.

> The Village of McBride reduced its water consumption rate to the BC average in 2019. This achievement is a 60% reduction in water usage from 1996.

Implementing a water conservation plan benefits the community and system customers by lowering energy and long-term water costs. Capital upgrades for increasing water demands, attributed to growth, can be delayed as water conservation measures take effect. Operation and maintenance costs can be held to a consistent level.

Another benefit of water conservation is that demands on the community wastewater system are also reduced, which can defer the need to increase wastewater system capacity.

Water conservation also provides benefits to the environmental health of the Dominion Creek watershed by limiting the amount of water is diverted from the creek into the water supply system. This is key as Dominion Creek is a fish-bearing stream and maintaining adequate creek flows is crucial to fish spawning.

Planning Goals: Measurable goals are an effective way to evaluate water system planning objectives. Water conservation planning goals may include:

- Reducing annual water consumption;
- Eliminating, downsizing or postponing the need for capital projects;
- Improving the utilization and extending the life of existing facilities;
- Lowering variable operating costs;
- Avoiding or delaying new source development costs;
- Improving drought or emergency preparedness;
- Educating customers about the value of water;
- Improving reliability and margins of safe and dependable yields;
- Protecting and preserving environmental resources.

Not all of the sample goals in the above list will apply to the Village of McBride and to the unique characteristics of its water system. For example, the goal of “lowering variable operating costs” would not be a priority for a system, like McBride’s, that operates with no

pumping and benefits from having a source that is naturally elevated, providing operating pressure to the entire community with just one pressure zone.

1.1 History

The Village of McBride prepared a Water Conservation Plan in 2010 to assess water usage and prepare strategies to reduce the excessive demands on its water system. A number of strategies were outlined in the 2010 plan with varying levels of implementation. The objective of the water conservation plan was to achieve an efficient use of community water. Demand for water generally originates from: domestic, commercial, industrial, irrigation and fire protection needs; these demands will vary daily, seasonally, and during extreme climate periods. Water conservation techniques help ensure that water is available during these periods of fluctuation.

Water consumption in the Village of McBride has varied considerably over the past 25 years. A 1997 infrastructure study prepared by Stanley & Associates Engineering Ltd. reported that the total water usage in 1996 was 327,309 cubic metres (m^3), or 1281 litres per capita per day (L/cap/d). In 2007, the reported daily water use per capita was 970 L/cap/d; in 2008, the water usage was 827 L/cap/d. In 2018, water usage based on the water treatment plant flows was 436 L/cap/d; in 2019, the water usage was 494 L/cap/d (see Table 1.1).

Table 1.1 Historical Water Consumption Rates

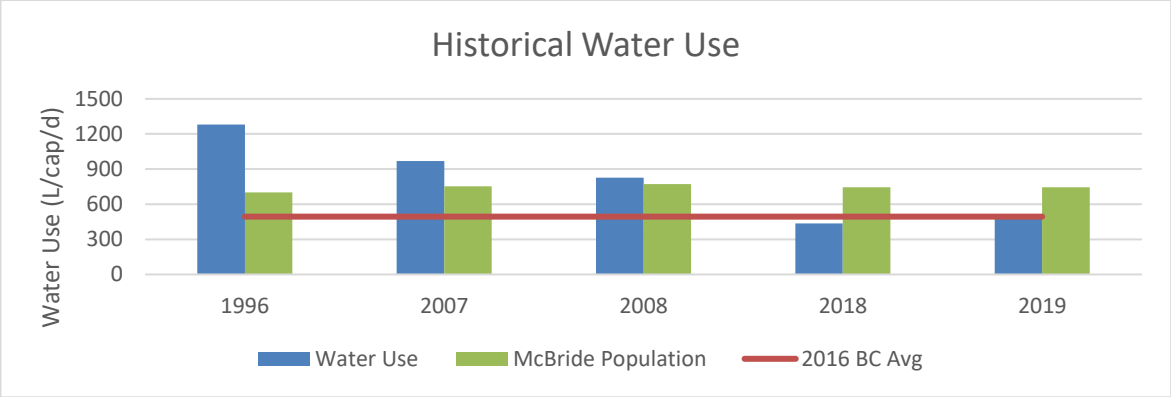
	1996	2007	2008	2018	2019	2016 BC Average
Population	700	754	773	745	745	-
Total Annual Consumption (m^3)	327,309	266,800	232,542	118,616	134,157	-
Average Day Demand (m^3/d)	897	731	637	325	368	-
Water Use per Capita (L/cap/d)	1281	970	827	436	494	494

The 2008 rate of consumption – though considerably less than the rate in 1996 – was 27 percent higher than the 2008 British Columbia daily consumption average of 649 L/cap/day (Environment Canada, 2007), and more than twice the domestic demand of 380 to 400 litres per capita used for municipal residential water supply planning.

However, over the next 10 years of implementing the 2010 water conservation plan, the Village of McBride continued to see reductions in daily consumption. Subsequently, 2018

and 2019 realized much lower rates of consumption than 2008. The 2019 daily consumption average of 494 L/cap/day met the 2016 British Columbia average water use. **The 2019 water consumption realizes a more than 60% reduction from the 1996 rates; this is an incredible achievement for the Village of McBride.** Figure 1 graphically shows the reduction in water use in relation to the population and the 2016 BC average.

Figure 2: Historic Water Use



2 THE VILLAGE OF MCBRIDE WATER SYSTEM

2.1 Description of System

Water Supply Source: The water source for the Village of McBride is Dominion Creek, a mountain creek located southwest of the Village. Water from the creek is treated and stored before it flows upon demand via gravity to the Village of McBride distribution system.

Figure 3: McBride (foreground) and Dominion Creek Watershed (background)

The Dominion Creek watershed (including upstream and downstream of the water intake) is 22 square kilometers. There is an abundance of riparian vegetation adjacent to the creek. Although the creek consists of a predominantly cobble-gravel substrate, high turbidity levels are observed in the Village's water supply during high precipitation

A "Boil Water" notice means the water can still be consumed once it has been boiled. A "Do not Consume" notice means that the water should not be consumed even if it is boiled.

events. A debris flow caused some damage to the Village water diversion intake system in 2001. Additionally, in 2020, a large rain event combined with snowmelt from freshet caused a significant rise in creek flows. This event resulted in high turbidity levels in the water treatment system resulting in a "Do not Consume" notice and an extended period of "Boil Water" notice while the water system was remediated. Low flows can be experienced during winters and during dry summers. These issues will likely be amplified due to ongoing climate change.

There are no land use activities or water withdrawal licenses upstream of the Village of McBride's Dominion Creek water withdrawal site. The Village holds Water License 115839, issued December 18, 2000 by the Province of British Columbia, which allows a maximum diversion from Dominion Creek and Little Dominion Creek of 300,000 m^3/year and maximum daily use of 1750 m3/day (20.25 litres/sec).

Water Treatment: Water is diverted from Dominion Creek utilizing a dam (see Figure 1) to impound water and provide sufficient ponding upstream to draw flows into two 60 m^3 underground fiberglass water settling tanks that are adjacent to the creek. Water flows from the tanks to the water treatment plant building where it is treated by ultra-violet light before being disinfected with liquid chlorine to maintain a chlorine residual of 0.4 to 0.5 mg/litre. The chlorinated water enters a 730 m^3 (730,000 litre) reservoir located under the water treatment plant building through a control valve that regulates the level in the reservoir before it is delivered to the Village distribution system. To meet health objectives, a minimum chlorine residual of 0.2 mg/litre is maintained in the distribution system.

In 2008 the Village of McBride retained Associated Engineering to prepare a report to identify treatment process options based on water quality information. The report concluded that the existing water treatment system does not meet the Health Canada guidelines for turbidity and a plan is currently in place to assess and size a filtration system to filter fine sediment particles.

Figure 4: Intake Dam Structure

Storage: As noted above, the reservoir holds 730 m^3 of chlorinated water for direct distribution to the Village water mains. Previously, the daily average usage was 637 m^3, there was no additional storage provided for high demand situations such as major fires, low-flow creek conditions caused by upstream snow or debris damming.

Typically, reservoirs are sized to provide storage for a maximum day demand (usually about 2.5 times average day demand) plus fire storage for a critical building and an additional allowance for emergencies and periods of high water demand. Water conservation efforts over the last 10 year have reduced average water usage to 367 m^3 which allows the reservoir to have more storage available for fire flows and emergency water losses. However, the reservoir does not meet the typical sizing criteria noted above and will need to be addressed in a future system upgrade.

Distribution System: The water distribution system serves a population of 690 residents (see Section 4) with over 17 kilometres of water mains and 46 hydrants. There are 293 residential connections and 40 connections that serve agricultural, commercial, industrial and institutional customers for a total of 333 connections.

There are 46 commercial, agricultural, industrial and institutional customers within the Village limits, including four large agricultural customers and two residential acreages customers, an industrial feed mill, a hospital, commercial and multi-family residential customers. There are 21 customers outside the Village boundary consisting of 13 large agricultural/residential customers and 8 residential acreages.

2.2 Current and Planned Projects

Projects carried out recently for the Village water system include:

- *Meter Installation to non-Village Customers* In 2009 and 2010, the Village installed meters to monitor water usage to the 21 agricultural and rural residential customers outside the Village boundary and most of the commercial/industrial/multi-family users within the Village boundary.
- *Water Treatment Facility Upgrade* An upgrade of the water treatment facility including ultra-violet treatment and a chlorine disinfection system was completed in 2010. The project cost of $525,000 was 70% funded under a federal-provincial infrastructure grant program. 2021 saw the replacement of the chlorine gas disinfection system with a liquid chlorine disinfection system to reduce operational costs and improve the overall safety of the system.
- *Water Intake Replacement* The old concrete pond intake was replaced in 2018 with two underground fiberglass tanks.
- *Asset Management and Maintenance Management Plans* The Village is currently in the process of creating asset management and maintenance management plans to assist administration and operations staff with capital replacement requirements and maintenance required to ensure longevity of Village water assets.

Projects that may need to be contemplated as a result of increased demand:

- *Expansion of Water Source* Expansion of the water source may be required depending on the growth of the community.
- *Installation of Filtration System* The installation of a treatment filtration system to address water quality (e.g. turbidity, pathogens, etc.) as the source becomes more stressed.
- *Water Main/Service Replacement Projects* Water audits completed in the future may identify water main sections or services that are leaking. Replacement of the water mains or services could reduce water consumption.

3 Conservation Planning Goals

3.1 Planning Goals

Identifying specific and measurable goals for water conservation is essential to assess the effectiveness of the plan and to determine if the adopted strategies and measures are working. The Village of McBride is progressively working towards conservation by recognizing the need to move toward metering. The volumetric monitoring of system demand provides information on where in the water distribution system the demands are greatest.

Conservation planning goals are presented below. The goals will form the basis of water conservation strategies that are presented in section 6.

a) *Reduce Water Consumption*

Today, the Village of McBride has reduced its water consumption from the 2008 average water demand of 827 L/cap/day, based on the average total Village consumption of 637 m^3/day, to below the 2007 British Columbia average water use of 649 L/cap/day. However, through general education and awareness over time, the 2016 British Columbia average water use has reduced to 494 L/cap/d. Even though this may be the British Columbia average, 494 L/cap/day is 1.24 times the water demand generally used for domestic water system planning of 400 L/cap/day.

The Village has seen considerable improvement and currently has an **average day per capita water consumption goal of 494 L/cap/d**. However, because there are very few industrial users and because the primary water demand of agricultural customers is for watering livestock and not for irrigation, an **ultimate objective is recommended to be 400 litres/capita/day**.

b) *Delay Expansion of Water Source*

The Village of McBride has relied on Dominion Creek for its water for over 60 years. The annual water consumption has historically at times exceeded the water diversion allotment of 300,000 m^3 allowed under the current water allotment. In 1996 the population of McBride was 700 and it was reported that 327,309 m^3 was consumed. With the total 2008 water usage of 232,505 m^3 and efforts to reduce water consumption rates as proposed in the above planning goal, maintaining the annual water consumption rate well below the water license allotment is very much achievable.

If a water usage rate of 400 L/cap/d is achieved, annual water consumption would be 100,740 m^3 for the current population of 690. A Village population of over 2,050 could be served before the water license allotment would be exceeded and an expansion of the existing source, or development of a new source, is required.

An achievable goal would be to maintain **annual water consumption from 100,000 to 150,000 m^3** until significant population growth or water demand for other uses such as industry would require adjusting this goal.

c) *Postpone Demand-Related Capital Projects*

Demand-related projects would include:

- Development of new water source(s) to supplement the Dominion Creek source;
- Expansion of the water storage reservoir;
- Expansion of water treatment facilities;
- Expansion of waste water treatment facilities.

Should goal b) above be achieved, it will be many years before a new or secondary source other than the existing Dominion Creek source would be needed. Efforts could focus on protecting and improving the water quality of existing source.

Under section 2.1 above, it is noted that the existing reservoir is not currently of sufficient capacity to meet storage requirement usually required for maximum day demand, plus fire flow and emergency storage. It is expected that expansion of the reservoir will be required even if consumption goals under a) and b) are achieved due to projected increased population. Alternatively, the flows from the creek intake could be utilized at a higher rate to keep up with demand at the cost of treatment. This is not ideal as it potentially introduces contaminants into the distribution system, but could be a mitigating factor to reduce the need for reservoir upgrade.

Improvements such as a filtration system or additional measures to improve turbidity reduction are needed now as recent years have seen increases in boil water and do not consume notices being issued. These upgrades will be needed regardless of any reduction in demand. However, further *expansion* of water treatment can be postponed if water conservation measures are taken.

Overall, the water treatment equipment and structure requirements have been substantially reduced through water conservation to date and will be further reduced if added water conservation measures are implemented.

Improvements to the wastewater treatment facility are underway. Though the waste water collection system itself may have deficiencies that are not related to the consumption of water, such as groundwater infiltration into sanitary sewers, in theory a reduction in water usage will effectively reduce waste water discharge and, in turn, reduce wastewater treatment requirements.

Not all of the capital improvements contemplated for the water system can be delayed or postponed as a result of water conservation, but expansion of facilities

may not be needed for several years if water conservation measures are implemented.

d) Educate Community About the Value of Water

Much can be gained by educating water users (which is everyone) about the value of water, and how the reduction in use will sustain the supply of water for generations to come. Community education efforts will target all ages as follows:

- Develop adult education programs designed to highlight water uses, water-saving technologies
- Develop a grade 4-6 education water conservation program, such as the "Wacky wet water" program used in Prince George
- Develop a high-school education program to comply with environmental science programs.

e) Improve Drought or Emergency Preparedness

As benefits are gained from water conservation, the Village of McBride can address options to improve its potential vulnerability to drought and emergency preparedness for water shortage situations. One of these options may be to increase storage capacity significantly to even out periods of water shortage caused either by low flows due to drought at the water source, Dominion Creek, or from high demand due to a large fire. Another option would be to establish water management procedures such as water or lawn sprinkler restrictions through development of a bylaw and enforcement.

Improving resilience against drought and water shortages are key in the Villages long-term success of water supply to the community.

f) Protect and Preserve Environmental Resources

The Village's exclusive reliance on Dominion Creek for its source of water makes the protection and preservation of the resource important goals. The first step would be to review the vulnerability of Dominion Creek by identifying the impacts of activities in the watershed and environmental changes that may affect the future supply of water (e.g. climate change impacts). Additional steps would be to consider management or regulatory measures to ensure protection of the watershed. Climate change mitigation and adaptation is further addressed in the Water Profile section.

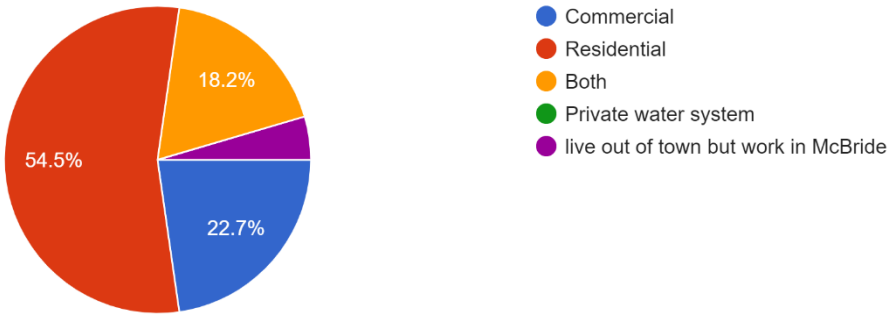
3.2 Community Involvement

Involving the community in the goal-development process is important for the success of the water conservation plan. Some suggestions for community involvement include:

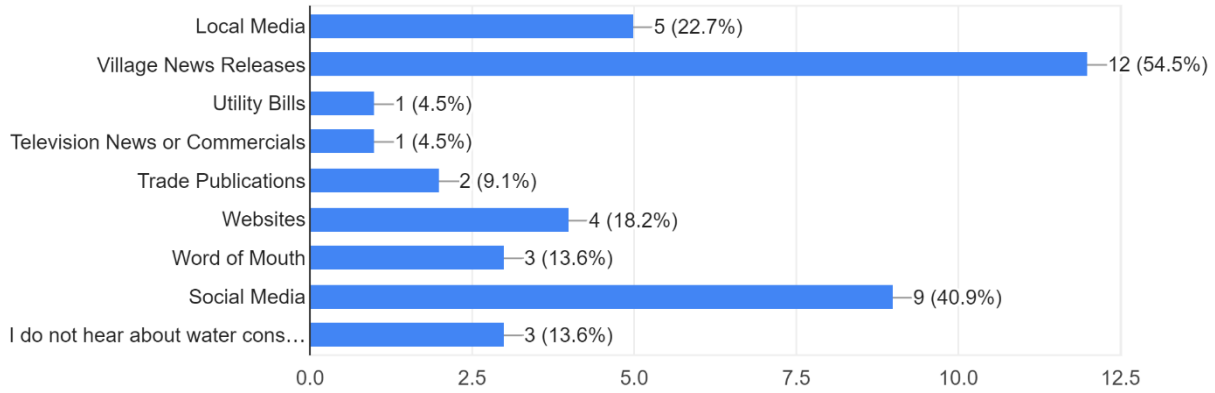
- Town Hall meeting(s) to explain the benefits of water conservation for McBride – reduced and deferred infrastructure expansion costs, the opportunity to reallocate resources to focus on projects such as improved water quality and storage, sustainability of the community's water source, environmental benefits;
- Educational programs for all ages as noted under goal d) above;
- Conduct 'water use' surveys in the community to create awareness with customers of areas where water is used in their homes, where they can reduce consumption, and to understand the residents support for further measures
- Voluntary water use and leakage audits to determine where plumbing systems may be failing;
- Encouraging use of water efficient fixtures through incentive programs, possibly in combination with water use and leakage audits.

Through updating this plan, the Village conducted public consultation through an online survey and a public presentation. The online survey focused on participant's knowledge of and use of water conservation tips and strategies as well as their experience with the water they consume. The survey saw 22 respondents. Key takeaways from the survey were:

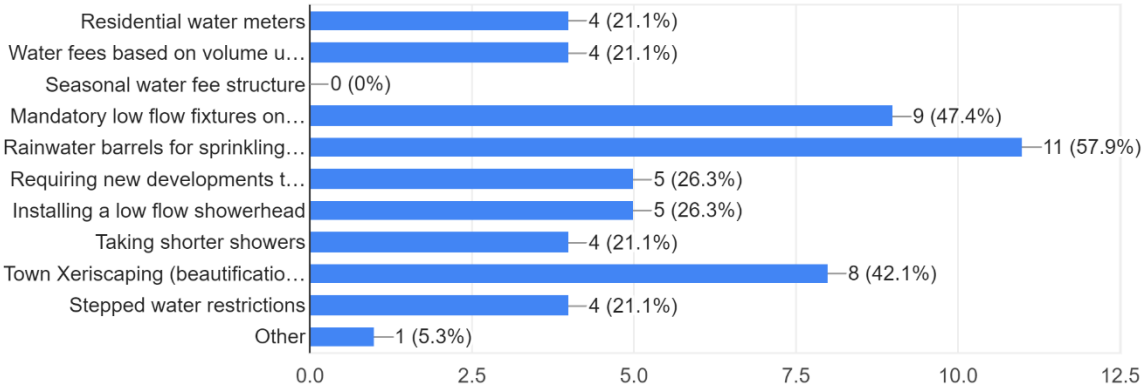
- Of the respondents, 12 were residential users, 5 were commercial users, 4 were both, and 1 lived outside the Village boundary, but worked in McBride;



- Overall, the respondents considered water efficiency important;
- Information regarding water conservation primarily received from the village news releases, social media, or the local media;



- Respondents were generally satisfied with their water pressures, chlorine levels, and clarity, but took note that the water quality could be improved;
- Most respondents already have low-flow toilets and showerheads, turn off the tap while brushing their teeth and only water their lawn once a week;
- Rain barrels for irrigation was identified as the most likely to be adopted conservation measure with mandatory low-flow fixture on new construction and town xeriscaping also scoring high.



- Over half of respondents would be more likely to install water conservation measures if there was a rebate and another 27% would consider it.

4 Water System Profile

A description and inventory of the existing Village water system is provided in Section 2. The characteristics and conditions of the system affecting the water system and the water system itself are presented in the water system profile. A summary of the characteristics of the Village of McBride water system is presented in the worksheet in Appendix A.1.

4.1 Population Trend and Projection

Canada Census records available from the BC Stats website reveals that the Village of McBride population has declined since reaching a high of 740 in 1996. The 2001 Census reported a population of 711, while the 2006 Census reported McBride's population declined to 640. The 2016 Census reported a population of 639, while the 2020 Census reported McBride's population increased to 671.

Census data is collected on a single day and though one of the goals is to enumerate the entire population on Census day, some people are not counted and an adjustment for net under-enumeration is made to determine the BC Stats population estimate. Table 4.1 shows the BC Stats population estimate for McBride from 2006 to 2020.

Since there are 21 water customers outside the Village of McBride boundaries that are provided water from the Village, a population of 74 persons is estimated over and above the Village population for 2016 and beyond. The final row in Table 4.1 is the total estimated population served with water by the Village of McBride.

> The average BC population growth rate between 2011 and 2020 was approximately 1.6%. The Village of McBride was slightly lower than average with a 1.3% increase.

For future population projections, the McBride Water Conservation Plan utilizes a serviced population of 745 in 2020. Based on BC Stats information, the Village has seen an approximate increase in population of about 1.3% per year from 2011 to 2020. Therefore, to account for a potential influx of population moving to Northern BC, a projected population increase of 1.5% is used. The 50-year population projections are shown in Table 4.1.

Table 4.1 – Estimated 2020 Population for the Village of McBride

	Population				*Projected Population*			
Year	**2006**	**2009**	**2016**	**2020**	***2025***	***2030***	***2050***	***2070***
BC Stats Population Estimate for McBride	661	674	639	671				
Estimated Population of Water Customers Outside of Village Boundaries (3.5 persons/connection)	95	95	74	74				
Estimated Total Population Served with Village Water	756	769	713	745	***800***	***860***	***1080***	***1305***

4.2 Quality and Quantity of the Water Supply

The water quality of McBride's water source, Dominion Creek, is generally considered to be good, though as indicated in the description of the water system in section 2.1, there are some water quality concerns as high turbidity is experienced in the water system during high precipitation events. Though the water supply is treated with ultra-violet light and disinfected with chlorine before it is distributed to customers, consideration should be given in the future to provide a filtration system.

The Village's water license allows for an annual withdrawal 300,000 m^3 from Dominion Creek and maximum daily withdrawal of 1750 m^3/day. Table 1.1 shows a sampling of historical water consumption rates from the Village's flow meter records. It is noted that the maximum annual withdrawal allotment was exceeded in 1996 when a consumption of 327,309 m^3 was recorded.

Reduction in water demand may have two impacts on water quality concerns within the Village of McBride.

- The cost of preventing and treating water contamination may be reduced with a reduction in usage of the water supply.
- A decrease in the volume of water treated from the Dominion Creek water source would ensure the treatment process maintains its effectiveness.

Presently, the Village does not have a flow meter on Dominion Creek to monitor the flow throughout the year. A flow meter should be installed near the dam to determine the changes in creek flows and identify potential low-flow scenarios.

4.3 Infrastructure Conditions

Section 2.2 lists projects completed to replace or upgrade the water system, including: installation of the water treatment facility; installation of meters to non-village customers; and installation of meters to multiple-family institutional, commercial, agricultural, and industrial users.

The water treatment plant records water usage and is an important component of water conservation efforts. It is important that reliable readings at the supply are recorded to compare flows from the supply with that of meters at the point of distribution – the demand. In theory, the supply flows should equal the demand flows, however, unmetered demands, such as leaks in the distribution system, are inherent in any water system. Supply and demand flow comparison can assist in determining the volume of leakage in the system and provide a base line for a leakage audit.

The water intake facility was replaced in 2018 and included considerations for settling larger sediment particles before entering the water treatment system. The reservoir was built in 1993; the ultraviolet treatment system was installed in 2010; and the liquid chlorine disinfection system installed in 2021. As indicated in section 2.1, additional water storage is needed for use during fire protection and emergency (drought).

The Village operates approximately 17 kilometers of water mains which are predominately constructed of asbestos cement pipe and can be prone to breaks and premature deterioration especially if the mains are exposed by an excavation and backfilled. Service connections are predominantly polyethylene and copper. Figures 1 and 2 show the approximate breakdown by age and material type of the watermains.

> Asbestos cement piping was commonly used for water mains in the 1970's and 1980's. There are many studies that show there are no adverse health affects from having these pipes in a community system. They are however brittle and prone to breaks leading to leakage.

Figure 5: Watermain Age

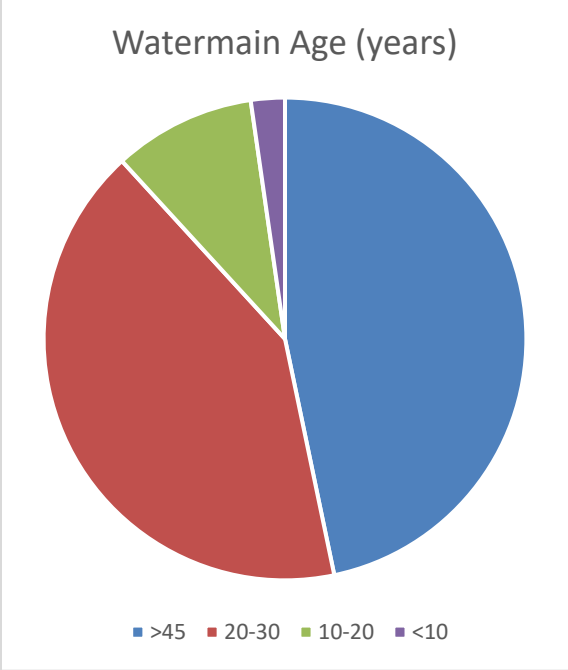
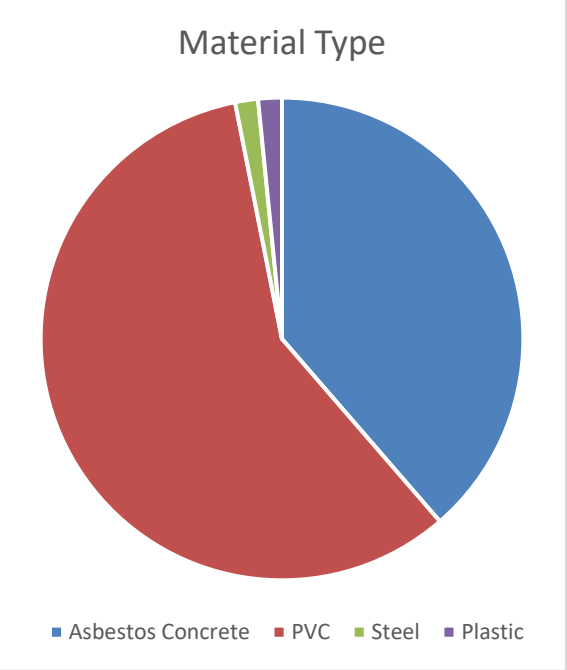


Figure 6: Watermain Material Type



The older sections of Village watermains are approaching the end of their life cycle. Though the system may be vulnerable to leakage, leaks within the system are easily detected. Due to the fact that McBride is primarily built on clay soils, water does not infiltrate and is observed as water pooling on the ground or road surface. The distribution system is gravity-fed and does not include any booster pumps or other infrastructure requiring power.

The Village of McBride is currently developing asset management and maintenance management plans for its infrastructure. These plans will include the condition of the infrastructure, expected remaining life, and estimated replacement cost of each asset. This is key in determining the replacement timeframe of the Village infrastructure and will allow the Village to determine the estimated funds needed for replacement. Replacement of the aging infrastructure, which are primarily asbestos concrete pipes that are prone to leak, with newer materials that have higher performance specifications will have significant water use reduction impacts.

4.4 Water Service Costs

The water system is gravity-fed as noted above, so the water treatment plant is the only contributor to the overall systems energy consumption. The annual energy costs of supplying water to the community are $3,736 (average of the previous five years).

Additionally, water supply costs also include operational and maintenance costs, administrative costs, as well as capital costs to repair and replace infrastructure. The average non-capital costs over the last 5 years of providing water service was $87,897.

Based on the Canada Core Public Infrastructure Survey for 2020, the estimated capital replacement cost of the water system is $9,425,000. However, as noted above, the Village is currently developing the replacement costs of its water system as part of its asset management plan.

The Village experienced major flooding of Dominion Creek in 2020 which created high turbidity levels in the Creek and in the water treatment system resulting in a "Do not Consume" notice and an extended "Boil Water" notice while the water system was remediated. While the "Do not Consume" notice was active, the Village purchased and provided interim potable water for the community. Once Dominion Creek turbidity levels returned to normal, the water reservoir was cleaned and the watermains were flushed. The total cost to the municipality to provide interim water and remediate the water system was $89,735.44. The Village recovered $38,938.19 of the costs through the Emergency Management British Columbia's Disaster Financial Assistance Program.

Climate change, as discussed in the next section, will likely lead to more frequent flood and heavy rainfall events which have impacts and costs similar to the 2020 "Boil Water" and "Do not Consume" notices.

The Village currently uses a flat-rate fee structure for all its water users. The water metering information has been used to determine high water usage customers and to educate them to reduce water consumption. The average annual water utility fees collected by the Village over the last 5 years was $143,202. Therefore, the fees collected are more than the non-capital costs to provide the water service. However, they are not providing sufficient funding to cover capital replacement costs. The fee rates should be reviewed once the asset management and maintenance management plans are complete to determine the required fees. It should be noted that due to the low population in McBride, adequately funding the water utility will likely cause user rates to increase drastically. Grant funding for capital replacement projects may offset some of the required costs.

4.5 Conditions Affecting the Water System and Conservation

Conditions that will have an impact on the water system or affect water conservation for the Village of McBride include:

- Low flows in Dominion Creek - There have been reports of low flows in winter and during dry summers in Dominion Creek. Implementing water conservation, and perhaps combined with the future expansion of water storage reservoirs, would reduce the vulnerability to these potential periods of short water supply.
- Open water taps during cold periods - There are reports that some customers leave water taps open in their homes or agricultural properties to prevent poorly insulated plumbing from freezing during cold winter periods. Alternatives to these methods can be suggested to customers once locations are established through conservation strategies.

Climate change will likely have considerable impacts on the water system and required conservation efforts. Recent years have seen increased rainfall intensity resulting in flooding and high turbidity events across the Robson Valley. Climate change projections show an increase in overall temperature as well as increased precipitation. See the table below for current and projected estimates of temperature and precipitation for the McBride area.

Table 4.2– Climate Data for McBride Area

	Current Mean	2021-2050 Mean	2051-2080 Mean
Annual Precipitation (mm)	813	862	914
Spring Precipitation (mm)	154	166	182
Summer Precipitation (mm)	236	244	240
Fall Precipitation (mm)	217	233	256
Winter Precipitation (mm)	206	219	236
Annual Temperature (°C)	1.3	3.3	5.2
Spring Temperature (°C)	0.9	3.0	4.8
Summer Temperature (°C)	11.2	13.3	15.5
Fall Temperature (°C)	1.6	3.3	5.3
Winter Temperature (°C)	-8.8	-6.8	-4.8

Table 4.2 illustrates the increase in annual precipitation in conjunction with higher average temperatures in all seasons. Increased precipitation may seem like there will be more water in the future. However, this is offset by the projected increase in large rainfall events. The actual impacts of the projected increased precipitation and temperatures must be further studied to determine the impacts over the next 50 years. It is recommended that a study be completed to determine the necessary infrastructure upgrades due to climate change in conjunction with water conservation targets.

Larger rainfall events can result in high turbidity events in Dominion Creek as previously discussed. Increased frequency of high turbidity events will affect the sizing and filtration method required to ensure potable water can be provided to the community during these events. In the short term, the increased likelihood of high-turbidity events could cause

more events similar to the 2020 water system flooding/contamination/"Boil Water"/"Do not Consume" notices which could lead to additional costs to the Village.

Also, increased overall temperatures during winter months may result in rain days instead of snow, resulting in lower snowpacks. This, combined with increased spring temperatures, could melt snowpacks faster, resulting in low-flow scenarios in Dominion Creek during summer months. Reducing water usage will result in less water drawn from Dominion Creek and allow more flow to be maintained in the creek during potential fish spawning seasons.

One potential option to offset low-flow scenarios is to increase the storage volume of water system. Additional water storage would need to be installed before the water treatment system so that chlorine residual levels of water supplied to the community are maintained.

4.6 Current Conservation Efforts

The Village of McBride began its water conservation effort through initiatives to meter customers outside of the Village limits in alignment with the 2010 Water Conservation Plan. In 2009, the Village installed meters to all 21 customers residing outside Village limits, consisting of 13 large agricultural customers and 8 residential acreages. Early metering results indicate that these customers are relatively high water users consuming 25% of the Village supply. Further flow monitoring will confirm this proportion of water demand from these users within the system. Depending on the type of agricultural use of water, on-site efficiencies may be encouraged to reduce water demand. These measures will require investigation of the customer operations and may include water use and leakage audits to determine if water demand can be reduced by improving water delivery and infrastructure condition.

The worksheet in Appendix A.2 lists the Village of McBride's current conservation activities.

5 DEMAND FORECAST

Using the water system data presented in sections 2 and 4 and applying the water consumption reduction goals from section 3, two demand forecasts are calculated to compare the impact of the proposed water conservation plan. The water demand forecast worksheet in Appendix A.3 was used to assist in preparing the Water Consumption Forecast tables below.

Table 5.1 – Water Consumption Forecast with No Change in Water Use

[1] Assume per capita water use remains constant over 20 year period.

	2019	2025	2030	2050	2070
Population	745	800	860	1080	1305
Water Use (L/cap/day) [1]	494	494	494	494	494
Avg. Day Demand (m^3/day)	368	395	425	534	645
Max. Day Demand (m^3/day)	700	751	808	1015	1226
Total Annual Water Use (m^3/yr)	134,157	140,642	155,067	194,735	235,305

Table 5.1 illustrates the increased average day, maximum day demands and total annual water use when the current water use of 494 L/cap/day is not reduced over the 20 year horizon. With the modest population growth rate at 1.5% and the water consumption in 20 years would not exceed the annual water license allotment. If water usage remained the same and growth rates were closer to 2.5%, the license would be exceeded.

Table 5.2 – Water Consumption Forecast with Water Conservation

[1] Assume progressive reduction in water use over 50 year period to ultimate goal of 400 L/cap/d.

	2019	2025	2030	2050	2070
Population	745	800	860	1080	1305
Water Use (L/cap/day)[1]	494	490	475	425	400
Avg. Day Demand (m^3/day)	368	392	409	459	522
Max. Day Demand (m^3/day)	700	745	777	872	992
Total Annual Water Use (m^3/yr)	134,157	143,080	149,103	167,535	190,530

Based on the projected water conservation targets and the population growth estimates, the water treatment and distribution system will be able to manage the demand for the next 50 years. Therefore, through water conservation capital improvements to the water treatment system that would otherwise be needed to supply increased nominal daily water demands can likely be avoided.

The reservoir will need to be increased in size to accommodate the non-nominal daily water demands such as maximum day demand, sufficient fire storage, and potential low-flow scenarios. Through water conservation the required timeline for proposed capital replacement/expansion funding would be deferred.

With the water conservation goals implemented, the water consumption forecast shown in Table 6.2 shows a dramatic decrease in average day and maximum day demands and the total annual water use. By maintaining the annual water usage below 300,000 m^3, the Dominion Creek source with the current water license allotment would be continue to supply water to McBride without the need for expansion for many years.

6 Conservation Strategies

Changes in water management are necessary to meet the planning goals of reducing water consumption, delaying expansion of the water source, postponing demand-related projects, educating the community about the value of water, improving drought and emergency preparedness and protecting and preserving environmental resources. The following strategies are recommended for implementation under the Village of McBride Water Conservation Program.

Strategy 1: Water Metering

One of the most effective tools to increase public awareness of water conservation, and inefficient water consumption, is the installation of water meters as a tool to conserve water and find leaks. When used in conjunction with volumetric pricing, and education programs to increase social acceptability, meters produce the most dramatic reductions in water consumption over all other conservation measures.

The introduction of metering in communities will usually coincide with a change in user rate billing practice from a flat-rate (fee per connection) method to a volumetric-rate (rate per litres use) method. For McBride, the limited installation of meters did not include a change from a flat-rate to a volumetric-rate method of billing. Rather, the strategy is to focus on determining where the high usages occur in the water distribution system and to work directly with high use customers to reduce their demand voluntarily. However, as water metering in the community becomes more universal, a volumetric-rate method of billing will be more practical. It is recommended that the commercial, industrial, and institutional users with water meters at this time could have their billing changed to volumetric-rate. Volumetric-rate billing can also be tiered to promote water conservation.

There are two methods of use billing:

- Flat-rate which low-volume users subsidize high-volume users.
- Volumetric-rate which coincides with metering and can be paired with a tiered rate system to further promote conservation.

It is believed that once users are aware of their water usage and are provided, through educational programs, with advice on measures to reduce their demand that overall water usage will be reduced. It will be important that metering is combined with other strategies listed below to be effective.

By way of example, the installation of meters in 2009 to non-Village customers has provided the Village with the valuable information in determining where high use is occurring. **Metering results indicated that 25% of the McBride's water is being used by 21 of its customers out of a total of 333 customers served – 6.3% of the Village's water customers consume 25% of its total supply.**

The metering program is recommended to be broken down as follows:

a) *Commercial, Multi-Family, Institutional, Industrial*
Implemented in 2010, the installation of meters to these typically high users helped determine if there are unusually high demands to businesses, apartment buildings, schools, public buildings and agricultural/industrial users. These types of customers will usually have larger service connections, longer lengths of on-site piping, and a higher number of plumbing fixtures than those of single-family residences. These characteristics would suggest a higher vulnerability to leakage and wasted water (e.g. dripping taps, faulty toilet float valves). Water meter reading occurs on a monthly basis.

ACTION: It is recommended that the any remaining businesses be metered. Metering results should be monitored to assess baseline usage with a future goal of changing billing to volumetric-rate rather than flat-rate.

b) *Voluntary Residential*
Community residents who wish to determine their own usage and take the lead in conservation will be provided the opportunity to have meters installed to their residences. Community leaders would be encouraged to begin the program with installation of meters at their residences. The Village will need to budget for these installations. It is suggested that 3-5 residences be assumed per annum for the five years, and depending on demand and financial priorities, more meter installations could be budgeted in subsequent years.

Volunteers will be identified through advertising, public education seminars, utility bill inserts and door hangers. The voluntary program would form the basis of an adult-oriented water conservation education program that would see the benefits of metering explained in detail, and the financial difference of water conserving activities.

To date, approximately 5 to 8 voluntary residential meters have been installed without a concerted effort to obtain volunteers.

ACTION: It is recommended that the Village purchase water meters for 3-5 residences per annum and coordinate volunteers through education and awareness programs.

c) *Residential – New Development*
An amendment to the Subdivision and Development Servicing Bylaw and the Water Bylaw was adopted in 2010 that required *all* new development, including single-family residential homes, would have meters installed. The meter is supplied by the Village and installed by the owner. Homeowners or contractors will assume cost of installation for these units as the cost of installation during construction will be

minimal. The Village will need to determine how many new developments would typically occur in a year and allocate an annual budget amount in its Capital Expenditure Plan. Recommendations for future years may include amendments to implement water meters in all houses sold and all home renovations over $20,000.

ACTION: It is recommended that the Village purchase water meters for a pre-determined amount of new construction residences per annum based on forecasted housing needs.

d) *Universal Water Metering*

The ultimate goal of installing meters to all existing customers in McBride will require funding assistance from the senior government, perhaps through an infrastructure program.

ACTION: It is recommended that the Village pursue funding assistance to implement universal water metering.

STRATEGY 2: WATER USE AND LEAKAGE AUDITS

Water use and leakage audits are methods that involve the investigation of areas within the distribution system where water use exceeds the expected demand. Water use audits examine the behavior patterns of how water is used and leakage audits investigate water distribution system and on-site plumbing system deficiencies that cause water to be wasted from leakage.

a) *Perform Village Infrastructure Water Use and Leakage Audits*

Water use - The Village will review its use of water at its own civic buildings and civic facilities. Lawn sprinkling and irrigation practices will be reviewed and restrictions will be incorporated into the Water Bylaw.

Leakage – The Village will perform a leakage detection program on its water distribution system to investigate potential sources of leakage. Though most major leaks are easily detected by tight underlying soils as water will migrate quickly to the ground surface, much slower leaks at valves, service connections, tees, and hydrants can be checked using modern leak detection equipment. Once leak locations are determined, repairs can be made. The leak detection program would also investigate civic buildings by checking internal plumbing piping, and plumbing fixture such as toilets, urinals and leaking taps.

> Fixing the leaks found during leakage audits are the most immediate conservation methods and can account for a significant portion of water loss.

ACTION: It is recommended that the Village budget for water use and leakage audits and to fix any leaks found.

b) *Voluntary Customer Water Use Survey*
A water use survey program will be developed for water customers who volunteer or request to have a water survey conducted at their residence or place of business. This program could be combined with information and education programs presented in Strategy 3.

ACTION: It is recommended that the Village prepare a water use survey program.

c) *Voluntary Customer Leakage Audit*
Similar to the voluntary water survey program in b) above, water customers would volunteer or request to have a water leakage audit completed of their water service within their property. This could be done in conjunction with a) to determine leakage of the service within property line.

ACTION: It is recommended that the Village include an allowance in the leakage audit budget for voluntary on-property audits.

STRATEGY 3: INFORMATION AND EDUCATION

British Columbians are generally poorly informed about the status of their water, its source, or the cost of delivery. 26% of Canadians have no idea where the water that flows from their tap comes from (BC Water & Waste Association). It is likely that fewer still have an understanding of the mechanisms and costs associated with water extraction and delivery, and wastewater treatment and disposal. This general misunderstanding of both the economic and environmental sustainability of drinking water makes conservation planning an uphill battle. The key to the success of a water conservation program is therefore public education.

a) *Educational Tools for Residential Metering Volunteers*
The following educational tools are recommended for implementation concurrent with the inception of the volunteer metering program:

- Distribute information pamphlets (Water Works Wonders Indoors and Water Works Wonders Outdoors) to volunteer meter users, and interested members of the public, to highlight ideas for reducing water consumption and possible associated savings as a result of metered water use;
- Public information sessions to display benefits of metering and water conservation;

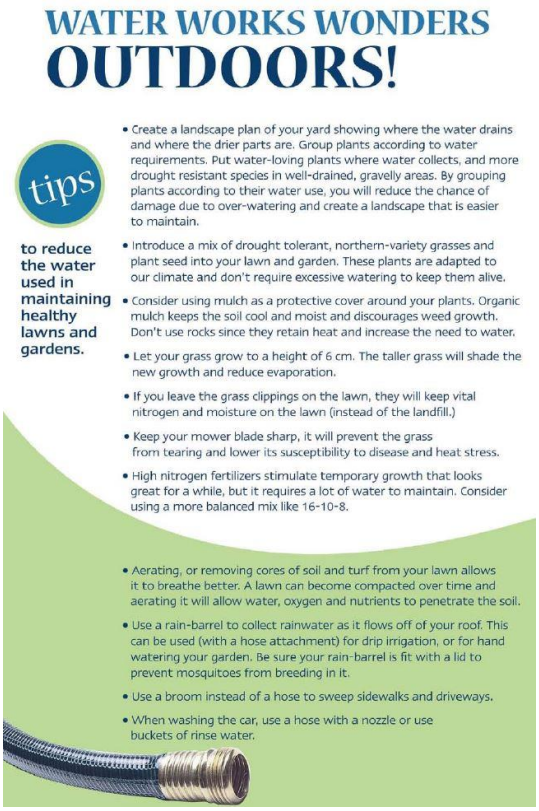
ACTION: It is recommended that the Village prepare information pamphlets and information session materials to distribute to the public.

b) *Develop Information Pamphlets*
Information pamphlets are a helpful tool to explain water conservation practices for specific areas within a household or business. The information pamphlets used as handouts at information meetings for the voluntary metering and audit programs, community events to promote water conservation, included with utility bills and made

adaptable for use on the Village of McBride website. The following are examples of pamphlets that have been used in other communities:

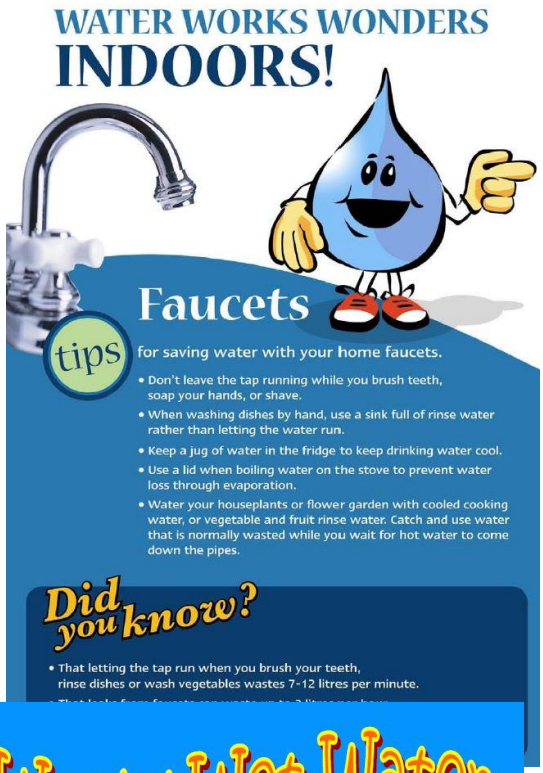
Water Works Wonders Outside

A pamphlet to highlight tips on how to decrease residential outdoor water consumption, provide a "Lawn Watering Guide", indicate ways to make a lawn and garden more water efficient, and outline specifics on the percent decrease in water consumption by each action. The brochure will also give some reasons "why" water users should conserve water by outlining facts about outdoor water use and indicating the financial costs of water.



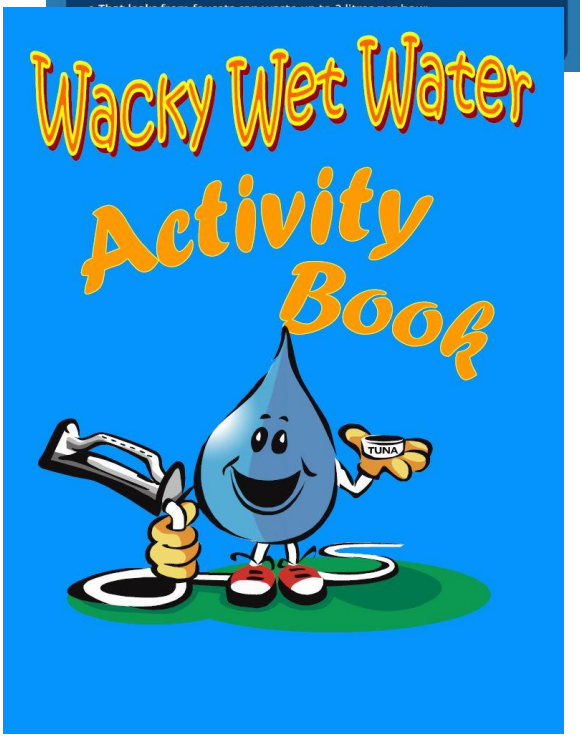
Water Works Wonders Inside

A brochure providing tips on how to decrease residential indoor water consumption and specifics on the percent decrease in water consumption by each action. The brochure will also give some reasons "why" water users should conserve water by outlining facts about indoor water use and indicating the financial costs involved with drinking water.



Water Works Wonders Initiative

A door hanger distributed to homes over the summer, handed out to interested residents at community events and included as part of the Water Works Wonders Conservation Kits. The door hanger will include information on water use restrictions and a lawn watering guide. It will also have information on the voluntary water meter program and contact information for people interested in becoming involved. The door hanger will include a fridge magnet to decrease the chance of immediately disregarding the information.



ACTION: It is recommended that the Village prepare information pamphlets and information session materials to distribute to the public.

c) *Northern Sustainable Landscaping*

Provide seminars on how to create a sustainable lawn and garden. The seminars will discuss all aspects of home gardening from drawing up a landscape plan, through to providing information on appropriate plant species for a northern ecosystem.

ACTION: It is recommended that the Village prepare a seminar on sustainable lawn care and gardening.

d) *General Education Campaigns*

Examples of general education campaigns that can be considered and implemented over the next 5 to 7 years depending on resources:

- Implement a "drinking water week"
- Implement an education programs to reach school aged children. e.g. "Wacky Wet Water" program
- Tailor a high-school education program to meet high-school curricula (IRP requirements). This education program would be prepared and handed over to high-school teachers for delivery.
- Provide a free water use audit both on paper and on the Village website. This will ask specific questions about water use and provide a calculated total of your daily water consumption. It will also include tips for saving water.
- Purchase and distribute (at a discounted price) rain-barrels to collect rain-water for garden use. Benefits include decreased water consumption for sprinkling, and increased awareness of the amount of water that comes off the roof – water that while not drinkable, can be used to fill many outdoor water demands.
- Provide weekly/monthly water conservation tips via the Village website and the Village Facebook group to keep water users informed.

ACTION: It is recommended that the Village develop a campaign including school materials and other examples provided.

STRATEGY 4: LOCAL GOVERNMENT LEADERSHIP AND REGULATORY MEASURES

The Village local government has the authority to use both incentives and disincentives to effectively convey the message that water is a limited resource, and to motivate voluntary water-use reductions. Another step available to local government is to demonstrate water conservation by example; by putting into practice water use management techniques, such as the provision of sustainable, environmentally friendly, and cost-effective landscape treatments for Village of McBride's climate and installing water-efficient plumbing fixtures and appliances in its own buildings and facilities.

a) *Lawn Sprinkling Restrictions*

The local government adopted a water bylaw amendment to allow lawn sprinkling on alternating days throughout the summer season. The strategy allows owners of even numbered residences to irrigate their lawns and gardens on even numbered days and owners of odd numbered residences to irrigate on odd numbered days. This reduces water use and is consistent with best lawn management practices. Further restrictions were also adopted which only allow sprinkling during the cooler periods of the day – evenings, through the night and mornings - by not permitting *any* sprinkling between 12 noon and 5pm. This reduces the amount of water that is lost to evaporation during sunny and hot periods.

Enforcement of the lawn sprinkling restrictions is not currently in place as the Village does not have a Municipal Ticketing Bylaw nor does it have a bylaw officer. The Village will monitor lawn sprinkling and if adherence is not met, will consider adopting a bylaw to enforce it.

ACTION: It is recommended that the Village advertise the lawn sprinkling restriction and monitor the program for 2 years with enforcement and ticketing bylaw in the third year.

b) *Village Water Use Efficiency Program*

The Village of McBride can demonstrate leadership in advancing water use efficiency in the following ways:

- Promote increased efficiencies in irrigation and landscaping for all Village-owned properties. Landscapes should be designed to minimize the effect they will have on the surrounding area by giving preference to regionally native plant species and the use of water conserving landscape techniques. This includes alternative turf and landscape management (using low water, natural grasses) on all parks, fields, boulevards and school yards, high efficiency irrigation systems (drip irrigation) for flower beds, and installation of sensors to turn sprinklers off with rain, or high winds. Grant requirements typically require this as a condition of funding.
- Develop a water conservation education and volunteer program for all Village of McBride employees.
- Promote a program to retrofit all Village offices and facilities to low flow fixtures and other water saving devices (including but not limited to low-flow shower heads, faucet aerators, and low flow toilets).

ACTION: It is recommended that the Village develop plans to assess and improve conservation efforts on Village properties.

c) *Village Led Low-Impact Development*

The Village of McBride can demonstrate leadership in reducing the impact of Village owned infrastructure on the environment and water needs using low-impact development strategies. These include strategies such as:

- absorbent landscaping;
- infiltration swales;
- rain gardens;
- pervious paving;
- infiltration trenches; and,
- green roofs.

Not all of the above will be applicable for McBride but provide examples of how rainwater can be utilized to limit rainwater runoff, reduce water use.

ACTION: It is recommended that the Village incorporate in the water use efficiency program low-impact development strategies.

STRATEGY 5: WATER EFFICIENCY INCENTIVE PROGRAM

a) Water- Saving Devices Subsidy

Include in the capital expenditure plan a program to assist customers - commercial, agricultural, and home owners - to install water-saving fixtures as part of renovations and upgrades.

An example is to provide subsidies for retrofitting homes and business to 6 litre toilets from 13 litre toilets. The program would include developing a list of CSA approved and independently tested low flow toilets. It is noted that prices for low-flow toilets range from $100 to $1000 and the more expensive models do not necessarily perform better than some lower priced models.

ACTION: It is recommended that the Village budget for a rebate or subsidy program for retrofitting homes.

b) Seek Grant Opportunities Water Efficiency Incentive Program

Seek grant opportunities from senior-level government programs to assist with the water efficiency incentive program described in a) above. The assistance of a senior government grant program can help to encourage water-efficient technology.

ACTION: It is recommended that the Village seek grant funding for a subsidy to offset operational costs.

7 Conservation Strategy Selection

Water conservation measures should be effective and consistent with the funding available to the municipality, but many factors can be used to assess which strategies to choose. The following factors were used to assess each strategy:

- Water Savings
- Targets High Use
- Reliability
- Technology or Measure Availability
- Political & Social Acceptability
- Cost

All the factors are on a scale of 1 to 5 with 1 being the lowest and 5 being the highest. Each of the strategies were assessed using the above criteria and are shown in Table 7.1.

Table7.1 – Strategy Selection Factors

Strategy	Water Savings	Targets High Use	Reliability	Technology or Measure Availability	Political &Social Acceptability	Cost
1.b) Voluntary Residential Water Meters	5	5	3	5	1	3
1.c) Residential Water Meters - New Construction	3	5	3	5	3	3
1.d) Universal Water Metering	5	5	3	5	1	1
2.a) Village Use and Leakage Audits	5	5	5	4	5	2
2.b) Voluntary Customer Water Use Survey	2	2	2	5	4	4
2.c) Voluntary Customer Leakage Audit	4	3	4	5	3	3
3.a) Residential Metering Volunteer Educational Tools	2	2	2	5	3	5
3.b) Information Pamphlets	2	2	2	5	3	5
3.c) Northern Sustainable Landscaping	4	3	4	5	3	5
3.d) General Education Campaigns	2	2	3	4	4	5
4.a) Lawn Sprinkling Enforcement	4	4	3	5	1	3
4.b) Village Water Use Efficiency Program	3	3	5	5	4	4
4.c) Village Led Low Impact Development	3	3	5	4	3	3
5.a/b) Water Saving Device Subsidy (with Grant Funding)	4	5	2	2	3	4

Water Savings is how much water will be conserved by a strategy if implemented and/or adopted. 1 would be little to no savings and a 5 would be more than 20% water savings. For example, when water meters were first implemented the water usage decreased by approximately 25%.

Targets High Use measures if a strategy will target uses that consume the most amount of water. 1 would be a strategy that aims to reduce water of a use that cannot be reduced by a large margin and a 5 would be a strategy that would target a high volume or flow use. Similar to the water savings, changing to low-flush toilets targets high use fixture, while showerheads are not as high water consumption fixtures.

Reliability measures how consistently a strategy can reduce water consumption. Typically, strategies that attempt to change behaviour to affect reduced consumption are less reliable than technological changes. 1 would be very inconsistent and a 5 would be very consistent. For example, changing a showerhead is a consistent change to water consumption, while introducing water restriction are less consistent depending on the person.

Technology or Measure Availability measures if the strategy can be obtained locally or within a short period of time. 1 would be difficult to obtain and a 5 would be readily available. For example, leakage testing is a specific task that may not be available locally, while the local hardware store will typically stock low flush toilets and showerheads.

Political & Social Acceptability measures how likely a strategy will be adopted by the public. 1 would be socially unacceptable or politically unpopular and 5 would be readily accepted. For example, the community survey indicated universal water metering is less favorable than using rain barrels for irrigation.

Cost of the strategy directly correlates to how quickly a strategy can be implemented. This is a key factor because even though a strategy may drastically conserve water, the high cost may prohibit it from being implemented. 1 is very expensive and a 5 is relatively cost effective. For example, developing information pamphlets is much cheaper than performing leakage audits.

Based on the above factors, the following strategies are ranked in priority order:

1. Village Use and Leakage Audits
2. Voluntary Residential Water Meters
3. Education regarding Northern Sustainable Landscaping
4. Village Water Use Efficiency Program
5. Water Saving Device Subsidy (with Grant Funding).

The results (Appendix B) demonstrate that implementation of technological rather than educational/behavioural strategies are more efficient even though public education is

important. However, some of the educational strategies can be implemented at a low cost, so there is benefit in initiating those in the near future as well.

Non-conservation efforts including a new reservoir and filtration system are identified for cost only due to the fact that they are health and safety projects and to identify future capital expenditure requirements.

8 IMPLEMENTATION

A proposed implementation schedule for the action items identified in Section 6 are presented in Table 8.1. Time frames, actions, and resources required are suggested for Village Council as it considers the annual Capital Expenditure Plan.

Table 8.1 – Water Conservation Plan Schedule

STRATEGY	ACTION	TIME FRAME (from 2021)	RESOURCES NEEDED
1. Water Metering			
a) Commercial, Multi-Family, Institutional, Industrial	Assess if any remain. Monitor baseline usage	ongoing	Public works to continue monitoring to assess baseline usage.
b) Voluntary Residential	Purchase 3-5 meters per annum	1 year & ongoing	Include budget item annually in Capital Expenditure Plan for water meters as required.
c) Residential – New Development	Purchase meters based on building permits/housing forecast	1 year & ongoing	Include budget item annually in Capital Expenditure Plan for water meters as required.
d) Universal Water Metering	Include in budget/ Pursue funding	5 to 10 years	Include budget item annually in Capital Expenditure Plan. Make grant application.
2. Water use and Leakage Audits			
a) Perform Village Water Use and Leakage Audits	Budget for audits and fix leaks found	3 to 5 years	Prepare budget and include in Capital Expenditure Plan, retain consultant/contractor.
b) Voluntary Customer Water Use Survey	Prepare water use survey program	2 to 5 years	Prepare budget and include in Capital Expenditure Plan, retain consultant.
c) Voluntary Customer Leakage Audit	Include budget for assumed volunteers	3 to 5 years	Prepare budget and Include in Capital Expenditure Plan, retain consultant.

Table 8.1 – Water Conservation Plan Schedule (Continued)

STRATEGY	ACTION	TIME FRAME (from 2021)	RESOURCES NEEDED
3. Information and Education			
a) Educational Tools for Residential Metering Volunteers	Prepare information pamphlets and information sessions	2 years & ongoing	Prepare budget and include in Capital Expenditure Plan, retain consultant.
b) Develop Information Pamphlets	Prepare information pamphlets to distribute to public	2 years & ongoing	Prepare budget and include in Capital Expenditure Plan.
c) Northern Sustainable Landscaping	Prepare seminar for public	3 to 5 years	Prepare budget and include in Capital Expenditure Plan, retain consultant
d) General Education Campaigns	Develop campaign including school materials, etc	3 to 7 years	Prepare budget and include in Capital Expenditure Plan.
4. Local Government Leadership			
a) Lawn Sprinkling Restrictions	Advertise and monitor program with enforcement	2 years & ongoing	Create bylaw for enforcement/ticketing.
b) Village Water Use Efficiency Program	Assess and improve conservation efforts on Village property.	2 years & ongoing	Council and administration to develop program for in-house efficiencies.
c) Village Led Low Impact Development	Incorporate low impact development in efficiency program	5 years & ongoing	Determine opportunities to incorporate low-impact development on Village projects and infrastructure
5. Water Efficiency Incentive Program			
a) Water- Saving Devices Subsidy	Conduct survey, develop program, include budget item for a rebate	5 years & ongoing	Retain consultant and include budget item annually in Capital Expenditure Plan.
b) Seek Grant Opportunities for Subsidy Program	Seek grant funding for rebate opportunity	2 to 5 years	Apply for grants to available senior government programs to implement 5a.

APPENDICES

A.1 - Village of McBride Water System Characteristics Worksheet

A.2 - Village of McBride Current Conservation Activities Worksheet

A.3 – Water Demand Forecast Worksheet for the Village of McBride

B – Strategy Selection Matrix

Appendix A.1 - Village of McBride Water System Characteristics Worksheet

A. SERVICE CHARACTERISTICS			Number
1. Estimated service population			745
2. Estimated service area (in km^2)			4.14
a) Kilometers of mains			17
b) Number of treatment plants			1
B. ANNUAL WATER SUPPLY	**Annual volume**	**Number of source points**	**% metered**
3. Total annual supply (2019)	134,157 m^3	1 (surface source)	30
C. SERVICE CONNECTIONS		**No. of Connections**	**% metered**
4. Residential (single family)		293	0
5. Other		40	0
6. Total connections		333	0
D. WATER DEMAND	**Annual Volume**	**Percent of Total**	**Per connection**
7. Metered residential sales	-		
8. Metered non-residential sales	-		
9. Other metered sales	-		
10. Unmetered sales	- m^3	-	- m^3
11. Non-account water			
12. Total system demand (total use)	134,157 m^3	100	403 m^3
E. AVERAGE & PEAK DEMAND	**Volume**	**Total supply capacity**	**Percent of total capacity**
13. Average-day demand	533 m^3	1750 m^3	37
14. Maximum-day demand	1210 m^3	1750 m^3	69
F. PRICING	**Rate structure**	**Metering schedule**	**Billing schedule**
15. Residential rate	Flat rate		Annual
16. Non-residential rate	Flat rate		Annual
17. Other rate	Flat rate		Annual

G. PLANNING	Preparing a plan	Date	Comment
18. Capital, facility or supply item			
19. Drought or emergency plan			
20. Water conservation plan	complete	2022	

SUMMARIZE SYSTEM CONDITIONS

H. PLANNING QUESTIONS	Yes	No	Comment
21. Is the system in a designated critical water supply area?		X	
22. Does the system experience frequency shortages or supply emergencies?	X		Water supply source, Dominion Creek, dried up once. Occasionally, the reservoir will empty during line break or fire.
23. Does the system have substantial unaccounted for and lost water?		X	
24. Is the system experiencing a high rate of population and/or demand growth?		X	
25. Is the system planning substantial improvements or additions?		X	

Appendix A.2 - Village of McBride Current Conservation Activities Worksheet

Water conservation measures	Approximate annual savings (if known)	Implemented since (date)	Is continued implementation planned?
Installation of water meter on properties outside Village boundary		October 2009	
Water conservation notification signs		2009	
Installation of water meters for all multiple family, commercial, institutional, agricultural and industrial users		2010	

Appendix A.3 - Water Demand Forecast Worksheet for the Village of McBride

	2019	5-year forecast	50-year forecast
A. TOTAL ANNUAL WATER DEMAND			
1. Current total annual water use	134,157 m3		
2. Current population served	745		
3. Residential water use per capita	180 m3/cap/yr (494 L/cap/d)		
4. Projected population		800	1305
5. Projected total annual water use (applying current per capita use)		140,642 m3	238,580 m3
6. Adjusted to forecast (per capita reduction goal)		179 m3/cap/yr **(490 L/cap/d)**	146 m3/cap/yr **(400 L/cap/d)**
7. Adjusted total annual water use		143,080 m3	190,530 m3
8.Current annual use and **adjusted annual water use** forecast	**134,157 m3**	**143,080 m3**	**190,530 m3**
9. Current and projected annual supply capacity	300,000 m3	300,000 m3	300,000 m3
10. **Difference** between total annual **water use** and total annual **supply capacity**	165,843 m3	156,920 m3	109,470 m3
B. AVERAGE-DAY AND MAXIMUM DAY DEMAND			
11. Current and forecast **average-day demand** (applying **current per capita use**)	368 m3	395 m3	645 m3
12. Current and forecast **adjusted average-day demand** (applying **per capita reduction goals**)	368 m3	392 m3	522 m3
13. **Current maximum-day demand**	700 m3		
14. Maximum-day to average-day demand **ratio**	1.9		
15. **Projected maximum-day demand** (applying **current per capita use**)		751 m3	1226 m3
16. Adjustment to maximum-day demand		745 m3	992 m3
17. **Current and forecast maximum-day demand** (applying **per capita reduction goals**)	700 m3	745 m3	992 m3
18. Daily supply capacity (per water license)	1750 m3	1750 m3	1750 m3
19. Ratio of maximum-day demand to daily supply	0.40	0.43	0.57

Appendix B – Conservation Selection Matrix

Strategy	*Rank*	*Overall Score*	Water Savings	Targets High Use	Reliability	Technology or Measure Availability	Political &Social Acceptability	Cost	Est. Initial Cost ($)	Est. Ongoing Cost ($)
Weight (%)	-	*100*	*30*	*20*	*10*	*10*	*15*	*15*	-	-
Rank	-	-	*6*	*4*	*2*	*2*	*3*	*3*	-	-
1.b) Voluntary Residential Water Meters	*2*	*78*	5	5	3	5	1	3	$ 10,000	$ 10,000
1.c) Residential Water Meters - New Construction	*7*	*72*	3	5	3	5	3	3	$ 10,000	$ 10,000
1.d) Universal Water Metering	*8*	*72*	5	5	3	5	1	1	$ 250,000	-
2.a) Village Use and Leakage Audits	*1*	*89*	5	5	5	4	5	2	$ 20,000	-
2.b) Voluntary Customer Water Use Survey	*14*	*58*	2	2	2	5	4	4	$ 5,000	-
2.c) Voluntary Customer Leakage Audit	*6*	*72*	4	3	4	5	3	3	$ 10,000	-
3.a) Residential Metering Volunteer Educational Tools	*16*	*58*	2	2	2	5	3	5	$ 4,000	-
3.b) Information Pamphlets	*15*	*58*	2	2	2	5	3	5	$ 4,000	-
3.c) Northern Sustainable Landscaping	*3*	*78*	4	3	4	5	3	5	$ 2,000	-
3.d) General Education Campaigns	*13*	*61*	2	2	3	4	4	5	$ 3,000	$ 1,000
4.a) Lawn Sprinkling Enforcement	*10*	*68*	4	4	3	5	1	3	$ 2,000	$ 20,000
4.b) Village Water Use Efficiency Program	*4*	*74*	3	3	5	5	4	4	$ 5,000	$ 5,000
4.c) Village Led Low Impact Development	*11*	*66*	3	3	5	4	3	3	$ 7,500	-
5.a/b) Water Saving Device Subsidy (with Grant Funding)	*5*	*73*	4	5	2	2	3	4	-	-

Non-Conservation Projects	Est. Initial Cost ($)	Est. Ongoing Cost ($)
New Reservoir for Fire Flow/MDD Capacity	$ 1,500,000	-
Filtration System	$ 500,000	$ 10,000