Water Conservation Plan

Engineering Services & Water Resources
Brandon, Manitoba
May 2013

Executive Summary

The City of Brandon relies on the Assiniboine River as a primary water source and the underground aquifers as a secondary source. As the City of Brandon is the second largest city in the Province of Manitoba it holds the most senior water rights and has priority to withdraw from the Assiniboine River. The Province of Manitoba strives to be a leader in protecting its natural resources. One of the steps the Province has taken to protect its water resources is to have shorter license agreements and for senior water users to have a water conservation plan in place before license renewal. This ensures the user is mindful of the water source and takes environmental and economic responsibility for its community and others downstream.

Early in 2011 the City of Brandon formed a Water Conservation Committee made up of City staff, residents of the community, and staff from the Province of Manitoba to develop a water conservation plan for the city. The committee's mission statement is to "Conserve and protect water use for present and future generations on both a community and corporate level".

The committee took a holistic approach to develop this plan encompassing not only water quantity but quality for the community as a whole. With the aid of the POLIS work book, the plan includes an overview of our community profile highlighting our water system, infrastructure, ecological and hydrological information along with our water conservation targets for the next 30 years and a series of actions the City can undertake on both a corporate and community level.

Over the last ten years our water consumption per capita has declined while maintaining our increase in population. It was determined that the City of Brandon's target is to continue to reduce water consumption while maintaining future growth in population by reducing 10% of the overall water consumption per capita over every 10 years over a 30 year period. The water consumption reduction will be measured on an annual basis to ensure we are on track to meeting our targets. It should be noted that when evaluating to see if the City has met the future targets, the industry/commercial sector may show significant changes depending if a business moves into or out of the Wheat City. The following table shows Brandon's estimated total raw water requirement projected for 2016 and 2021 if Brandon does not implement any water conservation measures.

Year	Population	Raw Water Requirement (m^3)	Per Capita (L)/day
2001 (census)	39,716	8,338,552	575
2006 (census)	41,511	8,592,660	567
2011 (census)	46,061	8,515,800	507
2016	47,903 (est.)	8,856,432 (est.)	507
2021	49,819 (est.)	9,210,689 (est.)	507

The intent of this plan is to be utilized similarly to the Environmental Strategic Plan (ESP) where various goals and actions are set out for the distribution system, community at large and the City as an organization to implement. The Water Conservation Committee will aid in the implementation of the plan, working with partnerships in the community and city departments to ensure we are meeting our water conservation efforts for present and future generations.

Forward

Brandon, as the second largest city in Manitoba is currently growing in both in population estimated over 46,000 people and land mass through expropriation. Recent population forecasts estimate an upward trend in the City and surrounding areas through the coming years. With this estimated expansion of population comes responsibility for the City to have a plan to maintain the current and future populations' water supply.

The City of Brandon is a leader in environmental stewardship so naturally the City stepped up to the plate to write its first-ever formal Water Conservation Plan in Brandon. This plan is intended to be a stand-alone living document yet complimenting the City's Environmental Strategic Plan (ESP), focusing on the City's activities and operations so that the City can continue to lead by example and set standards for residents, industry, and stakeholders. The purpose of this plan is to set out a series of actions for the municipality both on the community and corporate level. These actions range from immediate to long term to reduce the City's water consumption while still maintaining excellent quality and quantity for current and future generations.

This plan would not be possible without the help and commitment from the community at large, community groups, City staff and management who provided feedback and data to create this plan. On behalf of the City's Water Conservation Committee we would like to present the City of Brandon's first Water Conservation Plan.

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List of Acronyms and Abbreviations

WCP: Water Conservation Plan

MCWS: Manitoba Conservation and Water Stewardship

ESP: Environmental Strategic Plan

CSP: Community Strategic Plan

WCC: Water Conservation Committee

ARVA: Assiniboine River Valley Aquifer

TOC: Total Organic Carbon

COSEWIC: Committee on the Status of Endangered Wildlife In Canada

ARWDS: Assiniboine River Water Demand Study

WTF: Water Treatment Facility

MWWTF: Municipal Waste Water Treatment Facility

IT: Information Technology

1.0 Introduction

1.1.0 The Purpose and Goals of the Water Conservation Plan

The purpose of this plan is to set out a series of actions for the city both on the community and corporate level. These actions range from immediate, short and long term with the goal of reducing the City's water consumption while still maintaining excellent quality and quantity for current and future generations.

1.2.0 Background

Since the inception of our city's Community Strategic Plan (CSP) in spring of 2004, utilizing the collaborative efforts of city employees and members of our diverse community, Brandon has established a framework for an ongoing process to "shape tomorrow together". Water conservation is not in isolation; jurisdictions need to include other environmental approaches, such as mitigating and adapting to the impacts of climate change. Our city's strategic plan also incorporates specific programs to reduce greenhouse gas emissions as well as overall energy use reduction. Alternatives to pesticide use as well as specific bans have moved our community towards protection of our valuable water resource. More importantly, a specific category dedicated to conserving water, Brandon's Water Conservation Plan (WCP) was initiated with the goals/objectives cited as

1. To conserve water as a resource in the community and

2. To continue to protect our water supply

In establishing the WCP, there were three key components identified:

- The ability **to maintain our current supply,** quality and quantity of water may be jeopardized by the predicted population expansion and by impacts on our main source of water, the Assiniboine River.
- **Aging infrastructure** dictates responsible water use to allow for fiscal planning for improvement and replacement of existing structures.
- Proactive partnerships between the city, individual citizens, community groups, businesses and industry **to reduce the consumption of treated water for use in non-potable applications** will be essential in overall water conservation.

It is important to recognize that Brandon's Water Conservation Plan (WCP) focuses on actions for water quality and quantity, and that alone will not ensure the sustainability of the community. This plan along with other City plans such as the Integrated Water Sourcing Plan, Water Efficiency Strategy, Water Source Review, and the Environmental Strategic Plan must work hand in hand in order to achieve our water conservation goals over the next thirty years.

This plan was developed by the Water Conservation Committee, comprised of city officials (community services, environment, and water utility), a Regional Biologist from Manitoba Conservation and Water Stewardship, residents at large and members from the dissolved Protecting Prairie Waters Committee. The committee solicited expertise from sources when needed (Manitoba Conservation and Water Stewardship, and other city department heads). These members have genuine interests and concerns with Brandon's water supply in the future. Over the years there have been various water conservation initiatives undertaken by other groups and organizations within our community that are not related to the City of Brandon. These groups are Manitoba Hydro, Royal Bank of Canada, Protecting Prairie Waters, Brandon School Division, Manitoba Conservation and Water Stewardship through the Province of Manitoba. The WCP recognizes their efforts and sees opportunity to continue to partner together to reach our common goals and objectives associated with water conservation in our community. The structure of this plan came from the POLIS group out of the University of Victoria in British Columbia. The POLIS group created a Water Conservation Planning Guide and Handbook for British Columbia's communities that our committee tailored to suit Brandon's needs. This guide is based on a seven step process:

Step 1: Introduction

This step defined community values as to why water conservation is important to our community and conducted a public visioning exercise of what our water source will look like in the next 20-50 years. Responses to public surveys indicated areas where further education to our community is required. This step provided rationale and defined the scope of the plan and provided the methodology used to develop the plan.

Step 2: Compile a Community Water System Profile

The committee compiled information related to population and demographics of Brandon, the different sectors of the water system users, identified social and cultural factors affecting our watershed and any governance issues applicable to our watershed and water system. Gathered information created both a watershed and infrastructure and water use portrait.

Step 3: Forecasting Demand

This step helped the committee to get a sense of our potential water future. The committee described changing demographics and trends, possible impacts of climate change on our community and then we extrapolated current demands on our water system over the next 5-50 years.

Step 4: Setting targets for a Sustainable Community Water Future

This step identified water use reduction targets for the present and future. The targets were determined by the committee from looking at steps 1 and 2 to set a target for the community as a whole.

Step 5: Reviewing Demand Management Measures and Tools

The committee took an interest in other communities of the same size to see what they have done in terms of water conservation. Literature and case studies regarding various water conservation tools and measures were reviewed, as well as our own current and past conservation programs.

Step 6: Selecting Conservation Measures

This step enabled the committee to understand the options available for evaluating current and proposed water conservation measures.

Step 7: Implementing for Success

This was the final step in this process and provided a road map for the committee to get the water conservation plan off the ground. Water conservation initiatives were described in detail (barriers, cost, time line, scope, staff roles and responsibilities).

We have identified aspects of our current water management that will be impacted with expected population growth. The results of the survey indicate a need for public involvement through ongoing education and consultation. Since this is a living document, public participation will be a vital part of the process of conservation.

Canadians are among the highest water users in the world and our community is no exception. However, on a national level, by comparison to other jurisdictions of similar population size, our city has been proactive in water conservation, as will be demonstrated in *Water System Supply Demand.* Our intent is to continue our progress by cataloguing existing efforts towards reducing water use, refining these efforts to ensure maximum benefits and identifying new opportunities to enhance water quality and supply. Our target is to reduce the overall per capita water consumption by 10% over a 10 year period. Much of this approach must encapsulate the idea of managing water demand rather than increasing supply. Our current water source, the Assiniboine River as well as 2 aquifer wells, has faced challenges in the past (mostly water quality) not to mention our aging infrastructure. It is hoped that with proper approaches to water management, we expect to defer some capital costs while maintaining water quality and quantity.

As previously mentioned in developing this plan, our committee sought expertise from various sources and will continue to engage Brandon University, Assiniboine Community College, scientists, various environmental groups and water system users to implement the plan.

The Committee's mission statement:
"Conserve and protect water use for present and future generations on both a community and corporate level"

An introduction to our development of this plan was presented to Brandon City Council in September 2011 and the intent is to have the plan endorsed upon completion. As in past practices, meetings have been held with the public utilities board in regards to water/sewer rates etc. representing all stakeholders. We will continue to engage the public and business sector by requesting their input and will promote the plan through the media, the city website and public events.

2.0 Community Profile

In 2011 the City of Brandon had a population of 46,061 people (Stats Canada, 2012). The average age of Brandon's population is 37 years. There are 19,322 residential dwellings throughout the city (stats Canada, 2012). The City is the second largest city in the Province of Manitoba and obtains the majority of its water supply requirements from the Assiniboine River. The City obtained its first surface water license issued by the Province of Manitoba on January 26, 1965 and a groundwater license November 16, 1994.

The following figure illustrates the order of water licensing within the province. This figure was obtained through the Assiniboine River Water Demand Study from Manitoba Conservation and Water Stewardship (Genivar et. al., 2012).

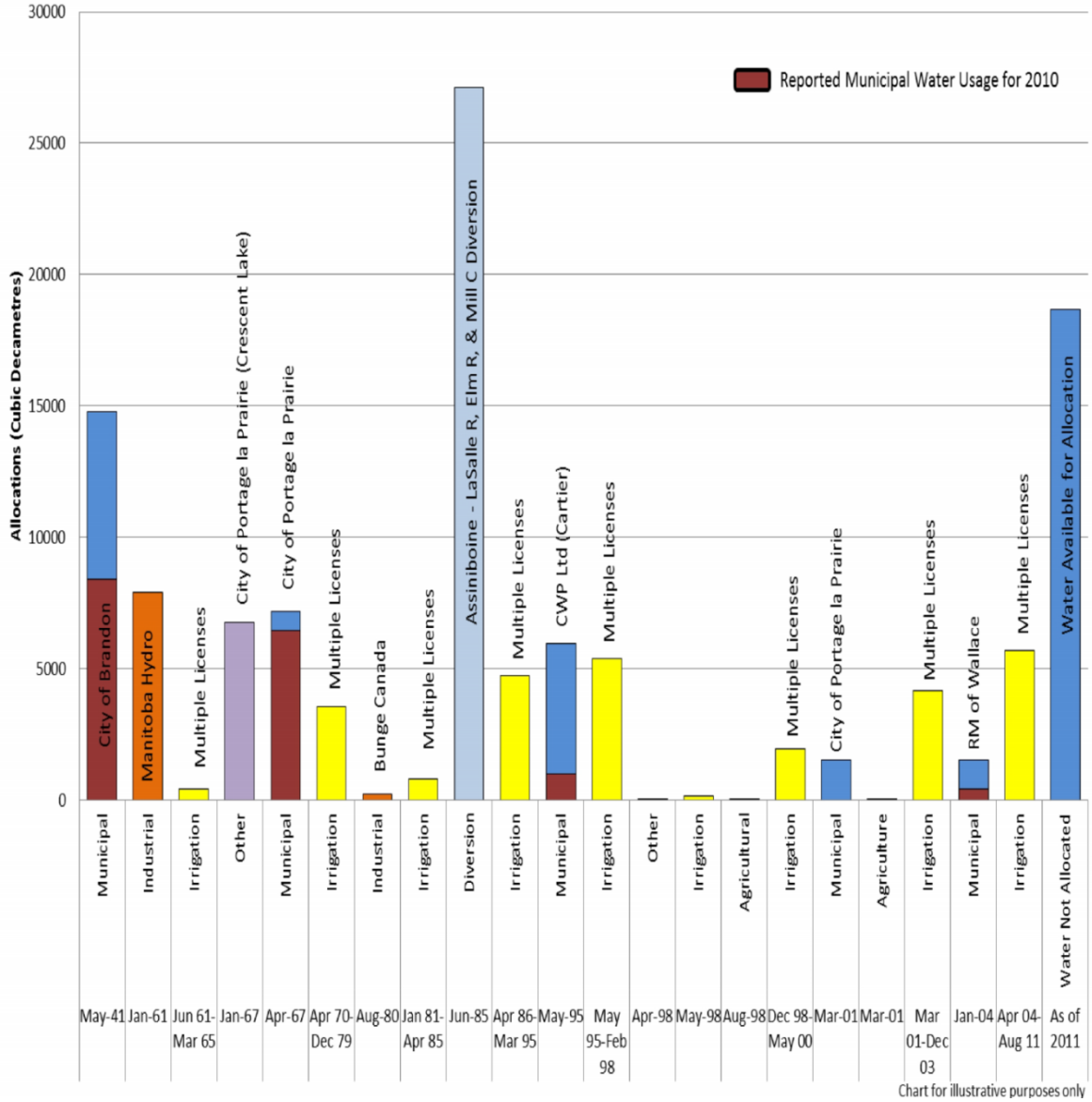


Figure 1 Order of precedence of Assiniboine River water rights licenses (Assiniboine River Water Demand Study, 2012)

Brandon's dominant industry is agriculture. Large companies such as Maple Leaf Foods utilize our treated water supply. The City's economic growth relies on the farming community bringing retail and commercial business to the city. The City is exploring an alternative water source for large industries by reusing the water from the City's Industrial Water Reclamation Facility.There are two post-secondary institutions in the City and the Brandon School Division operates fourteen schools. The City of Brandon as an organization has 12 municipal buildings and employs over 600 people to offer services to the residents of Brandon.

The City of Brandon has a hub of recreation activities that rely on our water supply. These activities are fishing, boating, pontoon tours, camping, pools, sprinkler parks, and hockey

rinks, pontoon tours, camping, spray parks, pools, local groups' use Assiniboine River for slalom and jump course, and as well, local marine dealerships test their products on the river and Ducks Unlimited Canada utilizes the river to top up their duck ponds and interpretive ponds.

The City does not share our water source with other surrounding communities; however, Brandon does recognize that it has a responsibility to protect the Assiniboine River so our neighbouring communities downstream have a clean water source to access. Within our community there are several environmental groups that share a common interest to protecting our water source and supply. These groups are Ducks Unlimited Canada, Riverbank Discovery Center, Brandon Environment Committee, Assiniboine Hills Conservation District, Royal Bank of Canada and the Province of Manitoba (Manitoba Conservation and Water Stewardship). These groups take on public engagement activities, funding opportunities, and youth programming.

2.1.0 Water System Profile

As previously stated the City withdraws its water primarily from the Assiniboine River unless the City faces challenges with spring runoff or during the summer months when the water contains increased levels of turbidity and total organic carbon (TOC). In these events where the water quality is subject to being compromised, the City blends the river source with groundwater from its underground aquifer to continue to improve the water quality and meet the demands of the community. The City's river water withdrawal is governed by the Province and allows the City to divert up to 14,808 cubic decameters of water annually at a maximum withdrawal rate of 0.59m^3/s. The flow in the river is maintained by regulated discharges from the Lake of the Prairies Shellmouth Dam located upstream from Brandon. In addition to the river the City has in place two high capacity emergency use supply wells that draw groundwater from Assiniboine River Valley Aquifer (ARVA). These wells are primarily intended for emergency purposes in the event a catastrophe takes place upstream (e.g. chemical spill) see figure 2 for the location of the wells along the Assiniboine River on Brandon's Source Water Map.

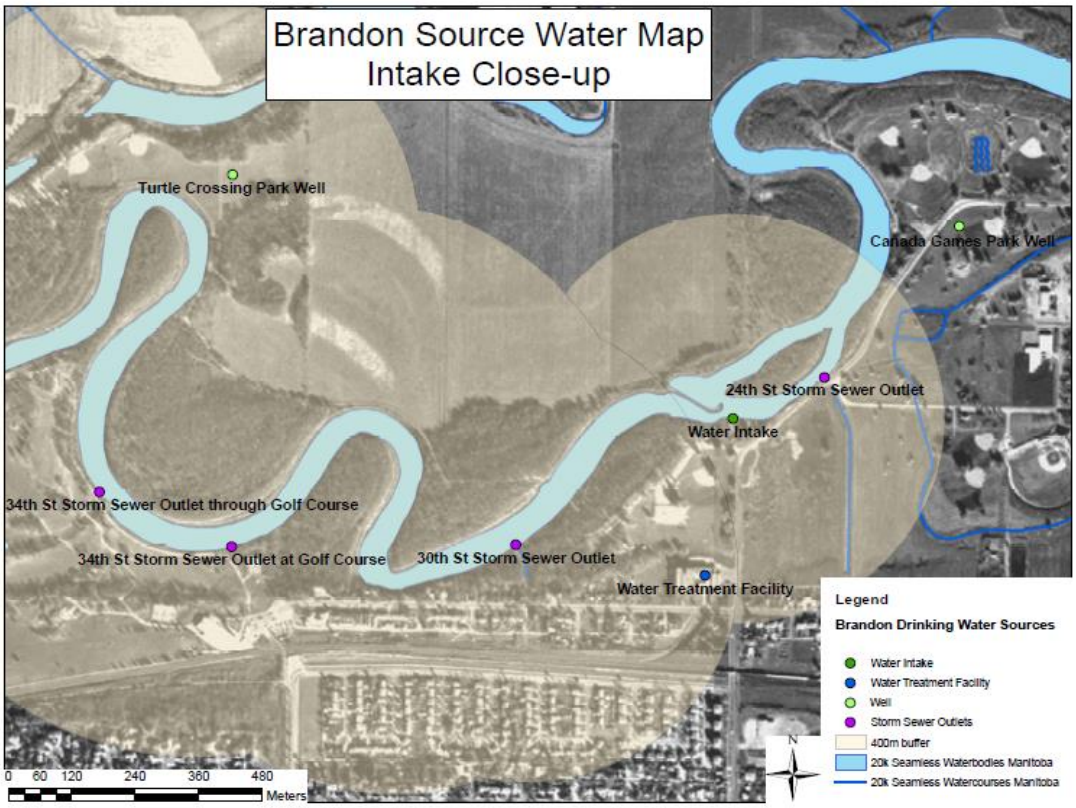


Figure 2 Brandon's Water Source Map illustrating emergency wells

2.1.1. Ecological Health

The Assiniboine River is home to many living organisms. There is an estimated fifty different fish species that are sensitive to the change in the water quality and quantity. For a complete list of fish species in the Assiniboine River refer to Appendix 1. There are also eight Freshwater mussel species found in the Assiniboine River, Fat Mucket, Three Ridge, Pink Heelsplitter, White Heelspliter, Pocketbook, Black Sand Shell, Pigtoe and Maple Leaf. The Maple Leaf mussel is designated as “endangered” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

2.1.2. Hydrological information:

The Assiniboine River Basin covers approximately 163,000km^2 in Manitoba, Saskatchewan and North Dakota. The Assiniboine River passes through several largely populated areas in a south easterly direction Brandon, Portage La Prairie and Winnipeg (Genivar et. al., 2012).

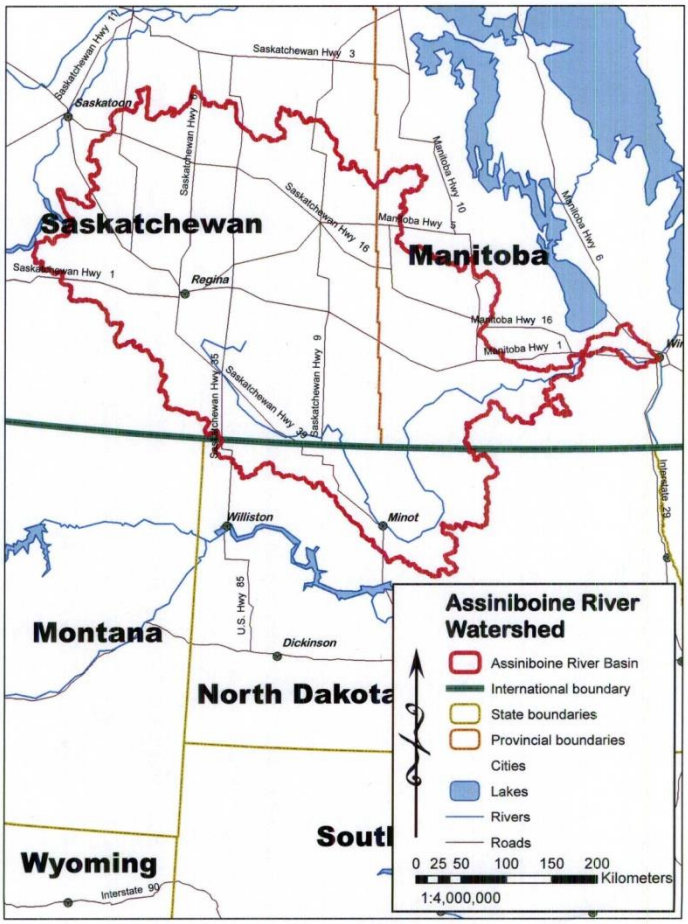


Figure 3 Assiniboine River Watershed (Manitoba Conservation & Water Stewardship, 2012)

The Assiniboine River has variability in annual stream flows with peaks occurring in the spring and low flows occurring in the fall and winter. The Province of Manitoba has invested in infrastructure of the Shellmouth Dam near Russell to protect large populated areas downstream against flood and drought conditions (Genivar et al., 2012).

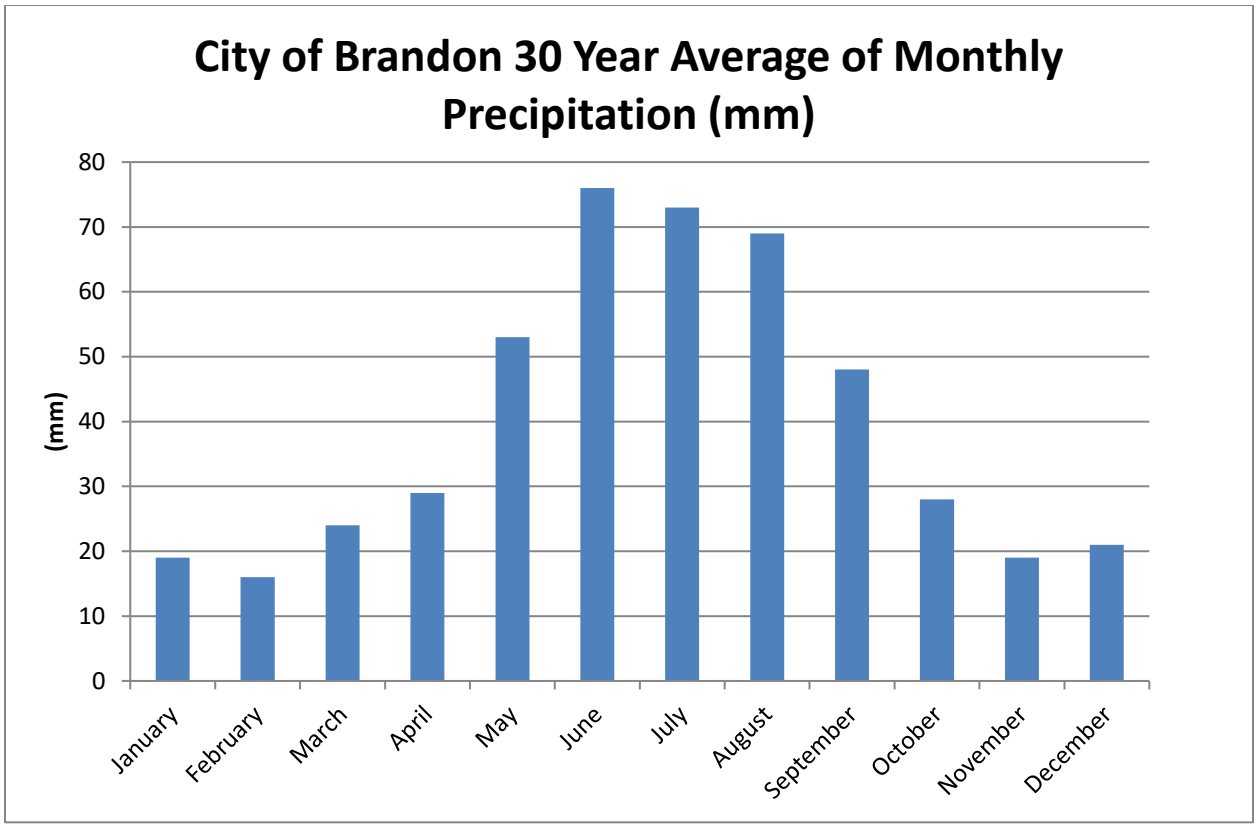


Figure 4 City of Brandon's30 year Annual Precipitation Chart (Weathernetwork, 2012)

2.1.3. Climate Change

The Assiniboine River has ample amount of water available to communities for use for any given year. However, over the last decade scientists, politicians, and municipal decision makers are more considerate towards the impacts of climate change playing a role on our water supply leading to possible water deficits. However, over the last decade, scientists, politicians and municipal decision makers have become concerned with the impact climate change may have on this very water supply. Recently Genivar et al., did a study on the climate change projections for the Assiniboine River. The projections indicate that the temperature is to increase on a range from 1-6°C; precipitation will increase for winter, spring and fall with the largest increase in the spring and an increase for summer drought (Genivar et. al, 2012).

2.2.0. Infrastructure Portrait

2.2.1 Water Treatment Plant

The City of Brandon's Water Treatment Plant is a 7,211 square meter building constructed in 4 different phases. The first phase was constructed from 1905 to 1946, second phase built in 1958, third phase built in 1977, and the sludge dewatering section was built in 1999. For a complete illustration on how water is treated refer to appendix 3.

2.2.2. Water Treatment Process

Water flows from the Assiniboine River to the intake wells through four gates located in the intake structure on the river bank.

Our water treatment facility utilizes a conventional water treatment process. We practice multiple barrier concepts as the guiding principle for providing safe drinking water. Low lift pumps deliver the raw water directly to three solid contact units inside the water plant. These units have a total combined capacity of 67 Mega liters a day. The two smaller process trains have a daily capacity of 20 Mega liters each. The largest process train has a daily capacity of 27 Mega liters. Each process train combines the functions of solids contacting, mixing, coagulation, flocculation, solids water separation and sludge removal inside a single tank. Alum and polymers are added at the low lift pumps for flocculation and coagulation. Lime and soda ash are added into the solids contact units to soften the water. Following filtration the water is disinfected with chlorine and UV.

2.2.3 Water Quality Standards

The treated water that our water system produces has a defined number of parameters that are used to establish and monitor potable water quality. These parameters are to be in compliance with the Province of Manitoba Drinking Water Quality Standards Regulation under the Drinking Water Safety Act.

The Province of Manitoba has adopted a number of health based parameters and the City is required to operate the water system in a manner that achieves the water quality standards specified in below in Table 1. The following express the maximum acceptable concentration for our supply specified.

Table 1 List of water quality parameters and standards adopted by the Province of Manitoba

Parameter	Quality Standard
Total coliform	Less than one total coliform bacteria detectable per 100 mL in all treated and distributed water
E.coli	Less than one E. coli bacteria detectable per 100 mL in all treated and distributed water
Chlorine residual	• A free chlorine residual of at least 0.5 mg/L in water entering the distribution system following a minimum contact time of 20 minutes • A free chlorine residual of at least 0.1 mg/L at all times at any point in the water distribution system
Turbidity	• Less than or equal to 0.3 NTU in 95% of the measurements in a month of the effluent from each operating filter • Not exceed 0.3 NTU for more than 12 consecutive hours of filter operation • Not exceed 1.0 NTU for any continuous measurement
Total trihalomethanes (THMs)	Less than or equal to 0.10 mg/L as locational running annual average of quarterly samples
Arsenic	Less than or equal to 0.01 mg/L

Benzene	Less than or equal to 0.005 mg/L
Fluoride	Less than or equal to 1.5 mg/L
Lead	Less than or equal to 0.01 mg/L in the water distribution system
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)
Trichloroethylene	Less than or equal to 0.005 mg/L
Tetrachloroethylene	Less than or equal to 0.03 mg/L
Uranium	Less than or equal to 0.02 mg/L
UV Dose	UV dose of not less than 24 mJ/cm^2, in 95% of the water entering the distribution system

2.2.4. Distribution System

The majority of the water distribution system is made up of PVC (40.7%) and Cast Iron pipes (20.8%). Cast Iron was installed between 1894 to the 1980's. PVC has been used from 1972 to the present. There are about 14,000 service connections.

As described in the City's Public Water Supply Annual Report of 2011, "the high lift pumps at the water plant convey water to the distribution system and the 9th Street Reservoir. The pumps at the reservoir force the water into the main distribution system. There are also two transfer pumps inside the water plant that can pump directly to the reservoir, bypassing the distribution system. These pumps also act as a backup for the high lift pumps. The reservoir also acts as a short term water reserve for the city if additional water demand is required. There are four booster stations located on the distribution system which help to maintain constant water pressure throughout the City."

2.2.5 Waste Water Collection and Land Drainage Systems

The waste water collection system is made of clay tile pipes (47.1%) installed between 1909 and 2007. 23.8% of the pipes are PVC installed between 1964 and 2010 and concrete installed between 1909 and 2006 makes up 22.5% of the pipes.

The land drainage system consists of 72.7% concrete pipes, 18% PVC, 6% clay, and 4% CMP. Installation dates range from 1904 to present.

2.2.6. Waste Water Treatment Plant

The Municipal Wastewater Treatment Facility (MWWTF) consists of a primary treatment building, a sequencing batch reactor, a disinfection facility and a lagoon system. The following information was

obtained through the City's Engineering Services and Water Resources. In August of 2013 the Waste Water Treatment Plant will become centralized.

Primary Treatment

Primary treatment begins in the Main Lift Station which receives all of the wastewater generated in the City of Brandon. The first step in primary treatment is screening which is accomplished by bar screens with a bar spacing of 12 mm. The waste collected on the bar screens are disposed of at the City's landfill. The next step in the primary treatment occurs in the Primary Treatment Building which houses the "head-end works" for the MWWTF. This step includes grit removal, which is accomplished by a gravity vortex grit removal unit; further screening is accomplished by fine screens with an effective opening size of 4 mm. All of the grit and screenings are disposed of at the City's landfill. Once the partially treated wastewater leaves the primary treatment building it enters the Sequencing Batch Reactors.

Sequencing Batch Reactor

Sequencing Batch Reactors (SBR)s are a fill-and-draw, non-steady state activated sludge process in which one or more reactor basins are filled with wastewater during a discrete period and operated in a batch treatment mode. The SBR accomplishes equalization, aeration, and clarification in a timed sequence in a single reactor basin. By varying the operating strategy aerobic, anaerobic, or anoxic conditions can be achieved to encourage the growth of desirable microorganisms.
A single cycle for each reactor consists of five discrete periods, Fill, React, Settle, Decant and Idle.

Disinfection

The partially treated effluent from the SBR's is then sent to the disinfection facility for disinfection through Ultraviolet light technology. Once the water has passed through the UV facility it is ready to be disposed back into the Assiniboine River or into the Lagoon System for further treatment.

Lagoon System

The lagoon system was constructed in 1963 and acted as the City's wastewater treatment facility until 1975. In 1975 an aeration facility was constructed that increased wastewater treatment during the coldest months of the year. In 1994 the SBR's were added and the need for the lagoons was reduced. The existing anaerobic treatment lagoon cells were converted into sludge receiving cells and sludge isolation cells. The aerobic lagoon cells were retained for excess wet weather flow treatment as well as a treatment facility to accommodate any treatment that could not be achieved in the SBR's.

2.2.7. Water as a Utility

The City applies for a Water Withdrawal and Operating license through the province and the rate in which the City can charge for water is determined by the Public Utilities Board. The City of Brandon distributes its water to seven sectors residential, industry, commercial, municipal, Fed/Prov, schools and churches.

The table below illustrates the rates the City charges by quantity in cubic meters. Brandon currently has a declining block rate where the more water consumed by a user, the more the water rate decreases. In the future the City of Brandon intends to move towards a more uniform rate where a user would be charged the same per litre for all water volumes of water use.

Table 2 City of Brandon's Water Rates per cubic meter Treasury Department, 2012

Water Consumption	Water	Sewer	Total Water Rate
First 150 cubic meters	$1.53	$0.81	$2.34
Next 2850 cubic meters	$1.31	$0.81	$2.12
Over 3000 cubic meters	$1.21	$0.72	$1.93

3.0 Water System Supply Demand

Over the last eight years Brandon has been actively promoting conservation initiatives. Between 2004 and 2011 residential use decreased by 0.6%, commercial decreased by 31%, industrial increased by 45%, federal/provincial use decreased by 9.2%, municipal use decreased by 8.1%, school use decreased by 12% and church use decreased by 25%. The data represented below in Table 3 shows a gradual decrease in majority of the categories itemized below in metered water consumption while maintaining a growing in population. Please note that in 2011 the municipal category has been changed a bit on the financial end and now includes a few locations that were in other categories in previous years approximately 3,670m^3 of 2011 municipal increase is because of this. As previously stated the commercial and industrial sectors can vary greatly depending on new businesses entering or leaving the community.

Table 3 Metered Water Consumption from the City of Brandon in (m^3)

Group	2004	2005	2006	2007	2008	2009	2010	2011	2012
RESIDENTIAL	3,313,004	3,315,659	3,468,296	3,316,906	3,280,843	3,343,763	3,186,626	3,293,080	3,397,572
COMMERCIAL	1,481,483	1,260,938	1,285,141	1,240,746	1,195,290	1,086,865	1,021,976	1,017,486	1,020,622
INDUSTRIAL	1,286,428	1,417,799	1,304,796	1,493,598	1,683,173	1,703,537	1,837,166	1,864,270	1,844,513
FED/PROV	292,985	284,712	313,305	301,896	257,343	272,457	262,933	265,326	267,741
MUNICIPAL	132,191	101,038	77,176	109,912	106,269	97,672	96,363	121,482	95,610
SCHOOL	124,971	107,691	113,587	97,674	102,748	113,253	107,651	110,303	108,185
CHURCH	10,031	10,757	11,030	10,072	9,970	8,827	7,921	7,514	8,747
Total	6,641,093	6,498,594	6,573,333	6,570,805	6,635,635	6,626,374	6,520,637	6,679,461	6,742,990
Pump to distribution	7,564,050	7,401,860	7,590,320	7,628,090	7,772,400	7,639,570	7,673,000	7,612,760	7,393,760

3.2.0 Water Calculations for Non-Metered Water Use

The City of Brandon recognizes that through some of its own operations there is a water loss as not all water is metered and can be measured precisely. The City's Engineering and Information and Technology Departments work together to calculate an estimate of non-metered water as described in the paragraphs below and the following section.

"The metering at the water treatment facility is read giving a total volume of water pumped to the distribution for each year. These reading are from a Mag-meter or flow meter located on the main water line leaving the facility.

As stated above, water meters throughout the City are read each quarter. Some of these quarterly meter readings overlap the year end. Personnel from Information Technology (IT) perform a calculation on what the actual total volume of water is for each specific meter for that year. There are a number of practices that city does within its operations that are not metered. Below is a list of activities the City performs which is not included in table 3.

- Every year the Engineering Department uses water from the hydrants to consolidate the soil when underground installations are done. This water usage is calculated for the number of hoses times the amount of time they do this work.

- The distribution section or utilities section estimates the amount of water losses from water breaks within the City each year. Some 40 – 50 main breaks occur each year.

- The streets and roads section uses water from hydrants to keep down the dust while street sweeping occurs. There are specific color-coded hydrants that are flushed before the water is used to keep down complaints of dirty water on the distribution system.

- Parks and Recreation use City potable water for work projects performed each year.

- The distribution section designates certain hydrants for contractor water use each year. Each of these hydrants is equipped with a portable water meter to indicate the amount of water the contractor uses.

- The bulk water sale, located at the water treatment facility, is coin-operated and open twenty-four hours a day to supply water to the private and commercial water haulers. This water is not included in the metered water pumped from the facility to the distribution system.

- The fire department uses City potable water to fight fires and grass fires within the City of Brandon. They do have some training which again they use potable water.

- Each year the distribution section flushes water mains and what is called dead end lines. This water usage is estimated."

3.2.1. Estimated Non-Metered Water Use Results

"Each year in January and February, a note is sent out to all the City sections or departments in question that have control over the use of City potable water. Each section sends in a report of the water that is used outside of any water metering that occurs throughout the prior year." This water usage is all tabulated into what is called the non-metered water usage for that year.

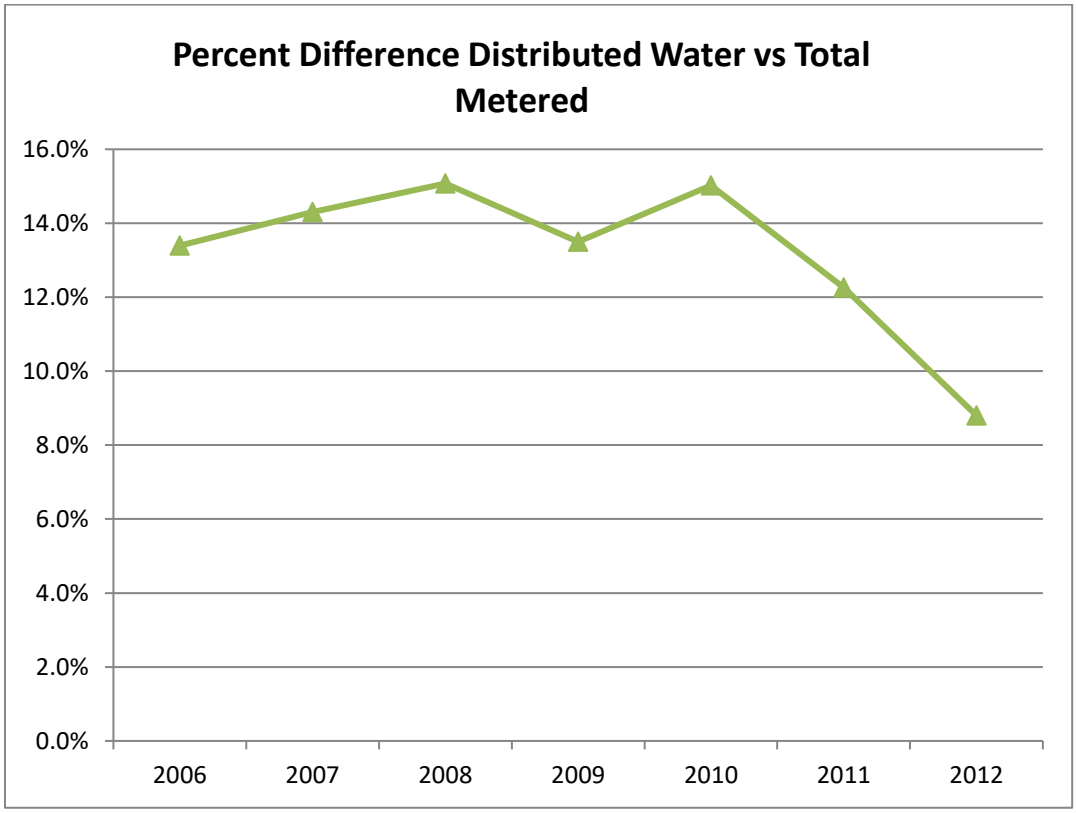


Figure 5 Total percent metered water from water treatment facility vs. Metered distribution system

The main meter readings are the ones from the water treatment facility and the total metered water reading sent from Information Technology. These meter readings will fluctuate year to year depending on whether the year is a dry one or a wet year. This will indicate whether there is a substantial amount of lawn watering during the summer months. The consumer meters that overlap the year end are prorated to get a year by year consumption reading. These two readings are subtracted to give the total percent metered water from water treatment facility vs. metered distribution system.

Other such water volumes as stated in the previous section are subtracted from the sub-total of the above paragraph. Because these volumes of water are an estimate of the most probable number, it makes the unaccounted for water somewhat discretional.

The total water produced subtracting the total water counted for produces the unaccounted for water volume. By performing a percentage calculation, the percentage of unaccounted for water is calculated for each year" (City Engineering Department).

4.0 Setting targets for a Sustainable Community Water Future

Members of the water conservation committee studied past water consumption trends and identified that the water consumption is declining as we maintain a growing population. It was determined that the City of Brandon's target is to continue to reduce water consumption while maintaining future growths in population by reducing 10% of the overall per capita water consumption every 10 years over a 30 year period. The water consumption reduction will be measured on an annual basis to ensure we are on track of meeting our targets.

The following table shows Brandon's estimated total raw water requirement projected for 2016 and 2021 if Brandon does not implement any water conservation measures.

Table 4 Estimated Raw Water Consumption to 2021 based on census years

Year	Population	Raw Water Requirement (m^3)	Per Capita (L)/day
2001 (census)	39,716	8,338,552	575
2006 (census)	41,511	8,592,660	567
2011 (census)	46,061	8,515,800	507
2016	47,903 (est.)	8,856,432 (est.)	507
2021	49,819 (est.)	9,210,689 (est.)	507

4.1 Impacts of water use reduction on the waste water treatment and collection system

The reduction of water on the wastewater treatment system will have minimal impact as the wastewater treatment process can only treat as much water as what the water treatment plant sends to the distribution system. The concern with reduction in water consumption will impact the collection system in some parts of the City. The infrastructure in place relies on moving waste by water in the sewer system from the user to the waste water treatment plant. As new technologies evolve this will be less of a concern.

5.0 Taking Action on Water Conservation

The Water Conservation Committee will be proactive in water conservation and will work in partnership with the community, lead by example, and engage the citizens of Brandon on water conservation. The following action charts identify how the City will be proactive in achieving our water conservation targets. These action charts are broken into The City of Brandon as an organization, the water distribution system, and the community at large.

In past years the City of Brandon has implemented a number of water conservation initiatives both within its own organization and within the community.

Reduce the amount of treated water within City Operations				
Actions	**Steps**	**Measurements**	**Timeline**	**Responsibility**
Perform a water audit within municipal buildings	Investigate/audit ways municipal buildings can do to conserve water	# of Litres saved	Short	• Meter Department • Environment Initiatives Manager • Maintenance • Chargehand Operations Utility Department
Incorporate monitoring water accounts into employee responsibilities	Determine info to gather on accounts and what it is used for	Staff person hired	Short	• Development Services
Water Recovery infrastructure in spray parks to water flowers	Investigate infrastructure	# Litres saved	Short	• Parks Department
Purchase hanging basket reservoirs	Budget for 220	# of baskets	Short	• Parks

for all city hanging baskets	baskets	# of Litres saved		Department
Educating staff	Workshop, brochures	# of staff present at workshop # of handouts distributed	Immediate	• Water Conservation Committee
Install Low Flow fixtures in city buildings	Replace all toilets to low flow toilets in city buildings over a short period of time	# of toilets installed # of Litres saved	Medium	• Maintenance
Have City Departments accountable for water usage	Install meters	# of meters installed	Medium	• All City Departments • Water Conservation Committee
Reduce the amount of treated water in the community				
Actions	**Steps**	**Measurements**	**Timelines**	**Responsibility**
Grey Water Recovery Systems	Explore opportunities	# of facilities with grey water recovery infrastructure # of Litres saved	Short	• Water Conservation Committee • Brandon Area & Planning Department • Development Services
Reuse water from Industrial Water Reclamation Facility	Explore alternative water sources for large industry users	# of end users	Medium to long	• Utility Department
Residential holding tanks for sump pump water	Promote to public	# of homes # of Litres saved	Short	• Water Conservation Committee • Brandon Area Planning

				Department
Public Engagement Campaign	Develop a public engagement campaign (brochures, workshops, promote water conservation through local media, websites)	# of people engaged	Immediate	• Water Conservation Committee
Promote Low Flow toilets	Develop a permanent incentive program for residents	# of Litres saved # of toilets installed	Short	Water Conservation Committee
Promote Rain Barrels, and water saving appliances/devices	Educate on benefits of rain water	# of people in attendance of workshop	Immediate	Water Conservation Committee

Reducing treated water loss within the City of Brandon's Distribution System				
Actions	Steps	Measurements	Timelines	Responsibility
Annual Leak Audit	Continue an annual leak audit (sound fire hydrants, and sound valves).	Leak detection equipment	Immediate	• Chargehand Operations Utility Department
Monitor sewers for leak detection	Continue detecting leaks through televised monitors on an	# of inquiries # of visual leaks	Immediate	• Chargehand Operations Utility Department

	annual basis			
Check backflow devices and check valves	Continue inspecting homes to ensure these devices are working properly	# of homes checked/year # of homes with unusual consumption	Immediate	• Meter Department • Utility Billing Dept.
Issue meter boxes to contractors	Ensure each contractor/user has a meter box	# of boxes issued	Immediate	• Civic Services • Meter Department
Complete frozen tap program within the next 5 years (2016)	Lower water lines to prevent freezing. Approx. 120 homes left to complete	# of frozen taps completed/ year # of Litres of water saved	Immediate-short	• Chargehand Operations Utility Department • Homeowner
Upgrade leak detection equipment	Request for funds	# of equipment upgraded	Short	• Chargehand Operations Utility Department
Upgrade water meter software	Request for funds	# of new meters installed Upgrade installed	Medium	• Chargehand Operations Utility Department • Engineering • IT Dept.
Cathodic Protection	Mandatory for new developments, cathodic protection is installed with every repair of the distribution system to prevent leaks	# installed # of water main breaks	Medium	• Chargehand Operations Utility Department
Flushing	Flush water pipes in problem areas	# of flushes	Immediate	• Chargehand Operations

practices	of the city	Volume of water flushed		Utility Department
Improve flushing practices	Research liner protection in problem areas of the city	# of liners installed	Long	• Chargehand Operations Utility Department

6.0 Implementing for Success

The implementation of this plan will be responsibility of the water conservation committee members. The committee will work with the community, and all city departments to ensure that we meet our long term water conservation target. The committee will meet quarterly to see that the plan stays on track and that actions are being implemented.

6.1.0. Budget Process

The key to successful implementation of this plan is for City departments to see the importance of water conservation and apply the necessary upgrades in equipment and staffing to their annual budget requests. City Council needs to recognize the measureable efforts of water conservation, and the community as a whole must be good stewards of our shared water resource and educate others.

This living document will be re-evaluated every five years to ensure we are on track and to consider improvements or changes as required to meet our water conservation goals. This plan is supported by City Council, senior administration and the Brandon Environment Committee.

Appendix 1

Fish Species in the Assiniboine River

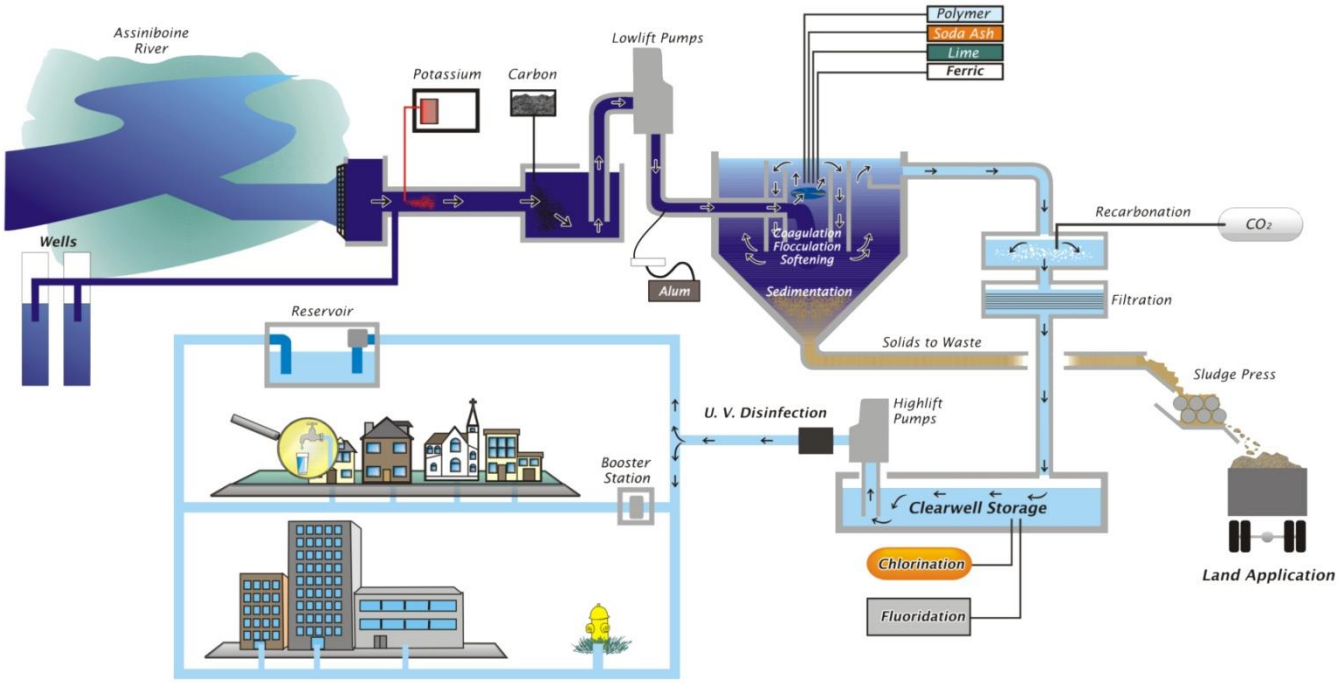
Common Names of Fish Species found in the Assiniboine River

• Northern Pike • Goldeye • Mooneye • Chestnut Lamprey • Quillback Sucker • White Sucker • Silver Redhorse Sucker • Golden Redhorse Sucker • Shorthead Redhorse Sucker • Black Bullhead • Channel Catfish • Stonecat • Tadpole Madtom • Trout-perch • Burbot • Brook Stickleback • Ninespine Stickleback • Rock Bass • Iowa Darter • Johnny Darter • Yellow Perch • Blackside Darter • River Darter • Sauger	• Sand Shiner • Finescale Dace • Fathead Minnow • Flathead Chub • Blacknose Dace • Longnose Dace • Creek Chub • Lake Sturgeon • Central Mudminnow • Walleye • Freshwater Drum • Spotfin Shiner • White Bass • Common Carp • Common Shiner • Silver Chub • Golden Shiner • Emerald Shiner • River Shiner • Bigmouth Shiner • Blackchin Shiner • Blacknose Shiner • Spottail Shiner

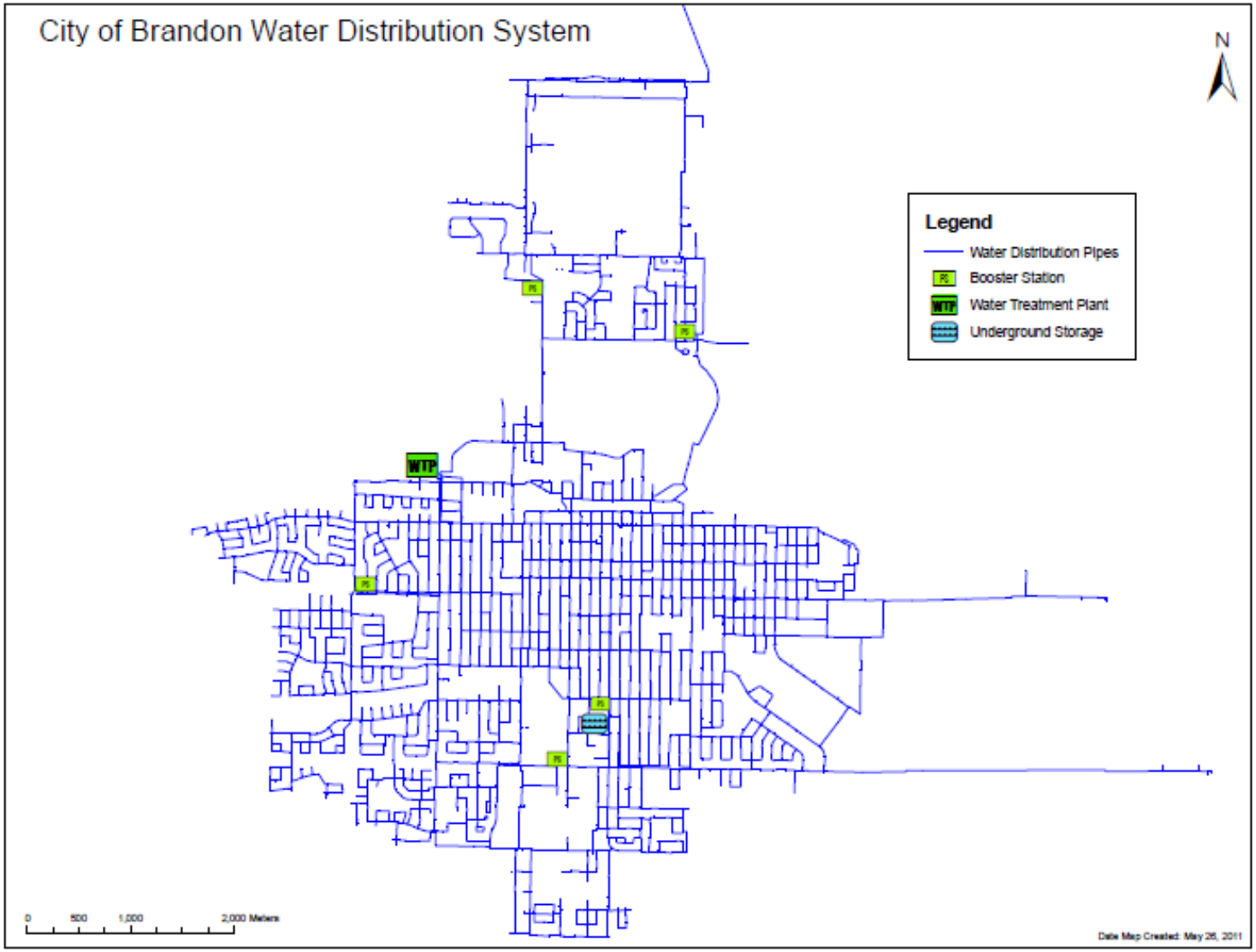
Appendix 2

Drawings of the Water Treatment Facility and Water Distribution System

River to Tap...



We Treat it Right


City of Brandon Water Distribution System
N
Legend
Water Distribution Pipes
Booster Station
Water Treatment Plant
Underground Storage
WTP
0
500
1,000
2,000 Meters
Date Map Created: May 26, 2011

List of individuals involved

Brad McIntosh-Water Treatment Plant Manager and Co-Chair of the Committee

Lindsay Hargreaves- Environmental Initiatives and Co-Chair of Committee

Tom Keep-Environmental Initiatives Manager- City of Brandon

Rae Smith-resident at large

Perry Roque-Director of Community Services

Bruno Bruederlin- Regional Fisheries Biologist for Manitoba Conservation & Water Stewardship

Larry Rolfe- Chargehand for City of Brandon's Operations Utility Department

List of supporting documentation

Assiniboine River Water Demand Study

Brandon's Community Strategic Plan

Brandon's Water Supply Review -KGS

Brandon's Integrated Water Sourcing Plan-KGS

Brandon's Water Efficiency Plan

Brandon's Water Supply Annual Report

Environmental Strategic plan

Polis Institute Water Conservation guide and handbook

Water Efficiency Report

References

Statistics Canada. 2012. *Brandon, Manitoba (Code 0091) and Manitoba (Code 46)* (table). *Census Profile*. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released May 29, 2012. http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E (accessed July 12, 2012).

City of Brandon Engineering Services & Water Resources. 2012.2011 Public Water Supply Annual Report. Brandon, Manitoba.

City of Brandon.2002. City of Brandon Water and Wastewater Utility Unaccounted for Water. Brandon, Manitoba.

Genivar, Stantec, and Associated Engineering.2012. Assiniboine River Water Demand Study Climate Change Assessment. 111-14759-00 CL-3038-2010/11.