


A Strategic Approach to Water Conservation

Planning for the Future

2007-2011

Aquatera Utilities Inc. Water Conservation Plan

Submission to Alberta Environment
2008

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Executive Summary

To meet the growing demand on its water supply, in 2003 Aquatera Utilities Inc. made an application to Alberta Environment to increase its water diversion licence limits. In late 2006, Aquatera received a five-year interim licence allowing additional volumes over and above the current diversion licence to be withdrawn from the Wapiti River. As one of the requirements of this interim licence, Aquatera has been mandated to prepare a water conservation plan, to include at minimum:

- methods and strategies to reduce water usage when the river flow is less than the in-stream objective at the point of diversion
- a public education plan
- results of a third party review
- performance measures

In the absence of provincial government water conservation planning guidelines, Aquatera conducted its own research to understand current best practices in water conservation planning and North American water conservation initiatives. This research included compilation and analysis of web-based information (including legislation, reports, case studies, manuals and conservation guidelines) from Canadian and U.S. sources; conservation-related textbooks; telephone and personal interviews with water and wastewater utilities in Alberta, British Columbia and Ontario; personal interviews with Aquatera employees; and compilation of data and statistics from Aquatera.

Research indicates that:

- Many municipalities use the guidelines based on those established by the United States Environmental Protection Agency (USEPA);
- Integrated resource planning (IRP), which balances demand-side and supply-side measures is an emerging approach for municipal infrastructure.

“Preparing and implementing a conservation plan can involve a level of commitment and resource allocation comparable to that required for conventional water supply planning efforts. Although supply-side approaches to amplifying water system capacity are different from demand-side methods, both result in increased system capacity so commensurate investments are justifiable.”¹

¹ Handbook of Water Use and Conservation, p.2.

Goal of this Document:

In addition to outlining Aquatera's Water Conservation Plan, this document is intended to be an information/education tool to assist Aquatera with its long-term strategic water conservation planning. While Aquatera has actively implemented many water conservation measures over the past several years, the opportunity exists to link measures to conservation goals and to develop methods to evaluate whether the measures have achieved the desirable objectives. In essence, this document will inform the reader not only understand *what* measures have been implemented in the past, but also *what* is being planned for the future and *what practices* will provide the foundation for planning in a strategic manner.

This water conservation plan incorporates the goal of responsible stewardship of natural resources, while safeguarding the ongoing business practices of Aquatera, as well as the economic growth and development in the region.

Water Conservation Terms Used in this Document:

To facilitate the reader's comprehension, definitions for water conservation terminology used in this document are as follows:

<i>Strategy</i>	Development of the water conservation plan
<i>Plan</i>	Result of identifying conservation measures to be implemented within programs, budget and timeline
<i>Program</i>	Category of similar measures
<i>Conservation Measure</i>	Specific water conservation action
<i>Performance Measure</i>	How the conservation measure is evaluated

This document also includes:

- A look at water use in Canada and northern Alberta
- Benefits of a planned, long-term water conservation strategy
- Description of Aquatera's water and wastewater infrastructure
- Description of how Aquatera customers use water
- Aquatera's water conservation history
- A water conservation toolbox
- Methods of selecting conservation measures
- Aquatera's 2008 Water Conservation Measures (including methods and strategies to reduce water usage when river flow is less than the in-stream objective at the point of diversion)
- Five-year implementation plan

A sound water conservation plan is goal-oriented, cost-effective and practical in design and implementation.²

² Handbook of Water Use and Conservation, p. 3.



The Canadian Perspective

The Myth of Super Abundance³

In Canada, as in other countries, all freshwater sources are now under noticeable pressure in the face of growing domestic requirements, and other, sometimes conflicting, demands.⁴

As Canadians, we often hear that we are fortunate to live in a water rich country. However, over-consumption of water in Canada is a reflection of our misperception that freshwater is an infinite resource.⁵ In truth, only a very small portion is actually renewable. Though scarcities, particularly seasonal shortages, are already a reality in many parts of the country, we continue to take our water for granted.

Canadians are extremely heavy users of water, using more water per capita than any other nation except for the United States. Canadians used an average of 335 litres of water per person per day for household purposes in 2001 (Environment Canada, 2004). The quantity of water used for domestic purposes depends on a number of factors, including household size and family composition, housing density, climate, household wealth, public education, and water rates (Racoviceanu, 2005).⁶ Urban consumers in Canada use over twice as much as their European counterparts, with significant levels of wastage and inefficiencies.⁷ Between 1972 and 1996, Canada's rate of water withdrawals increased by almost 90 percent, while our population increased by only 33.6 percent over the same time period.⁸

When the well is dry, we know the worth of water.

Benjamin Franklin

³ Thinking Beyond the Pipes and Pumps.

⁴ Threats to Water Availability in Canada – A Perspective

⁵ Connecting the Drops p. 1

⁶ Connecting the Drops, p. 10

⁷ Flushing the Water: Examining Urban Water Use in Canada, p.1

⁸ Government of Canada

Our Local Situation

Historically, residents of the Prairies have been used to a generally safe and uninterrupted source of clean water. In northern Alberta, we may not feel the need to conserve water because we do not experience the disparity in water supply like other areas around the globe, or even in the southern part of the Province. However, many factors – along with our misconceptions about the limits of water – are putting pressure on our water resource. These include population growth, economic development, the effects of unpredictable weather patterns, and the increasing environmental policies of our water systems. There are real limits to how much water we can count on.

Locally, over the past several years, our economy has been driving the population upwards, making Grande Prairie one of Canada's fastest growing cities. In 2007 alone, the City's population grew at an unprecedented rate of 6.69 percent and its population reached 50,000. It is projected that within 20 years, Grande Prairie could reach a population of nearly 100,000.⁹ Communities and subdivisions within the County of Grande Prairie are experiencing similar heavy growth.

As the population and economy grow, it becomes even more important to think about using existing water supplies wisely. "It costs money to supply, treat, dispose of and re-treat water. The energy required to meet these demands is enormous and also carries with it an environmental price tag."¹⁰ Increased air pollution and other types of pollution caused by this population and economic growth can also affect the amount of quality water we can access.

Aquatera Utilities Inc., Alberta's first regional utility corporation, provides the City of Grande Prairie with water, wastewater, garbage collection and recycling services. Since 2002, it has extended its water and wastewater services to the Hamlet of Clairmont, the Town of Sexsmith, the Grande Prairie Regional Airport, as well as several areas within the County of Grande Prairie in close proximity to the City.

It is without question that one of Aquatera's greatest challenges is meeting its obligation to provide a safe, secure and sustainable source of water for all its regional customers. It must balance the needs of a growing population and increased service area, with economic, environmental and social factors.

The Evolution of Water Management in Canada

Traditionally, most municipal water management in Canada has predominantly focused on providing "supply side" management techniques to meet consumer demands.¹¹ As demand increases, water and wastewater delivery and treatment systems are expanded, and additional water is diverted from water

⁹ City of Grande Prairie Population Statistics 2007

¹⁰ Government of Alberta

¹¹ Soft Path for Water in a Nutshell

sources. The cost of expanding water delivery systems, however, is rapidly escalating. More stringent standards and regulations are also escalating the costs of improved water and wastewater treatment.¹²

Many municipalities in Canada are now developing water conservation strategies using supply and demand management techniques. “Supply-side management relates to energy and water conservation measures at the utility level through the use of technology . . . and better operational methods.”¹³

Demand-side management is a complementary approach to increasing supply infrastructure by reducing the amount of water used by individual consumers. It focuses on water users and aims to reduce demand by increasing the efficiency of water use. Conservation, not more water, becomes the primary goal in meeting an urban area’s water needs.

“Water supply management is a one-time solution focused on large-scale, centralized infrastructure to buy a community time until the next issue, whereas demand management relies on smaller-scale, more diffuse solutions that can be implemented over time.”¹⁴

Tony Maas, POLIS Project on Ecological Governance

¹² Government of Canada

¹³ Connecting the Drops, April 2, 2007.

¹⁴ Drop by Drop – Urban Water Conservation Practices in Western Canada, 2004, p.8.



Untapping Aquatera's Potential

Managing our Water Today for Tomorrow

To meet increases in demand to its water and wastewater systems due to population and economic growth Aquatera can either:

- Increase capacity by expanding the water and wastewater infrastructure at escalating costs, or:
- Strategically implement water conservation measures that will help “free-up” capacity within the existing system (*note: this system would include the upgrades that are presently being implemented – see Water System Profile p. 14*).

Since 2004, Aquatera has been very proactive in incorporating water conservation measures. It has primarily targeted its residential customers, as this group comprises the largest sector of water users. In addition, while Aquatera has implemented some indoor conservation measures, its main efforts have been on outdoor conservation through behaviour management and hardware/technology measures. Reducing spring/summer water demand will reduce the pressure on the water and wastewater system when it is experiencing its highest demand. Since the system infrastructure must be built to meet this peak demand, which can be as much as 50 percent higher than average day demand, it makes economic sense to lower peak demand.

However, there is even greater potential for Aquatera's water conservation efforts. By developing a long-term water conservation plan using supply and demand management, Aquatera will be able to secure water for the future. It will be able to draw “new” water from better use of existing supplies, and through a change in consumers' water-use habits and attitudes. Water saved through strategic conservation planning would be used to meet the needs of additional consumers without having to increase supply as much.

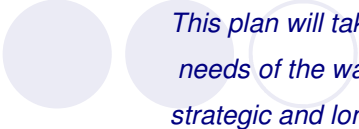
FACT

Based on three rules of water conservation – reduce, repair and retrofit – a typical household can reduce water consumption by 40 percent or more, with little or no effect on lifestyle.¹⁵

¹⁵ Sustaining Our Water Supply, Government of Canada

Objectives of the Long-Term Water Conservation Plan

- Develop and implement programs aimed at:
 - Reducing seasonal peak demand
 - Reducing water loss and waste (uneconomical, impractical, or unreasonable use of water resources)
- Identify supply and demand issues and/or opportunities that can be addressed through water conservation
- Improve both internal and external public awareness of the value of water and water conservation
- Reduce costs of maintaining and expanding water delivery
- Meet or exceed the environmental requirements established by Alberta Environment
- Establish methods for monitoring the effectiveness of each measure



This plan will take water conservation to the next level, by applying it to the needs of the water and wastewater system in a holistic manner that is both strategic and long-term.



Benefits of a Long-Term Strategy

As a planned approach to water conservation, Aquatera's long-term water conservation strategy will contribute to a sustainable and healthy resource. Curbing water use will provide a number of benefits to the consumer, the community, the environment as well as to Aquatera. These benefits are:¹⁶

- **Reduced water and wastewater infrastructure spending**

Water efficiency, which will result in a reduced demand for water, has the potential to delay or eliminate the need for additional facilities to meet future demand for water and wastewater treatment. It also will reduce the cost of collecting and treating wastewater as flows are subsequently reduced.

- **Environmental quality improvements**

Increased water use efficiency reduces the volume of water used by consumers and wastewater going to treatment facilities. It can reduce water diverted and the pollution loadings on our lakes and rivers by reducing the volumes of wastewater that we have to treat.

Reduced water use helps to preserve and protect surface waters for fish and wildlife habitat and our natural attractions. These are essential to the economic health of our tourism and outdoor recreation industries. The more water we use – even if we return most of it to the system – the more damage we do to the environment (i.e. the disruption of natural habitats and the introduction of contaminants.)¹⁷

- **Energy conservation**

Water efficiency also means being more efficient with the use of energy. Less energy is used to heat water, and to pump potable water and wastewater, resulting in major energy savings.

- **Water quality improvements**

Protecting ecosystems that produce water is one way to ensure the quality, as well as the quantity of our water. Natural aquifers and eco-systems that sustain them are key to the overall quality of the water supply as are policies that keep the introduction of contaminants from industrial (i.e. pulp and paper plant) and individual (pouring paint down a drain) pollution to a minimum. Another way to ensure quality is through the direct intervention of urban water treatment. Arguably, the less water and wastewater a municipality has to treat, the better it will be able to conduct and monitor the treatment process.

¹⁶ Drop by Drop, p. 5.

¹⁷ The Environment Canada National Action Plan, p. 3.

- **Improved opportunity to support a growing economy**
Water conservation allows more intensive development on existing water and sewer infrastructure, as less water is required per household or business. Water conserved is generally cheaper than water provided through building a new water plant.
- **Flexibility to meet changing needs within the system**
Demand-side management activities offer far more flexibility than major capital improvements; water utilities can develop, expand, or reduce a given program quickly to meet current conditions.
- **Development opportunities, increased competitiveness and job creation**
The move to water efficiency will trigger new economic activities for water-related manufacturing and service sectors, encouraging new business opportunities and job creation. Increased efficiency also means lower costs to business, leading to increased competitiveness.
- **Managing our Future**
Curbing water use is also important for managing future environmental risk. Our water supply faces uncertainty due to large scale environmental changes, natural and manmade, such as long-term weather cycles, climate change, erosion, and population growth. Learning to use less water now will help sustain the sources of our water.



Aquatera's Water Source

Most Albertans get their water from surface water such as rivers and lakes. The runoff from rain and snow renews our surface water source each year. In some years there is more runoff, in other years there is less.

The Wapiti River is Aquatera's water source. Many people depend on the water from the Wapiti not only for drinking and use in daily life, but for recreation and tourism, economic development, and to sustain a healthy aquatic ecosystem. If the demand for surface water is ever higher than the supply, there simply will not be enough available to balance the needs of the population, the environment and the economy.¹⁸

There are seven major river basins in Alberta. The Wapiti River is fed by the Peace/Slave River basin. This river basin covers a total area of 293,000 km² and drains more water than any other river basin in Alberta. It includes the Wapiti, Smoky, Little Smoky, Wabasca and the Peace River—Alberta's largest river. The W.A.C. Bennett Dam, a hydroelectric dam on the Peace River in British Columbia, influences the amount of water flowing into Alberta.¹⁹

Alberta is estimated to have more ground water than surface water; however, only .01 percent of this ground water is thought to be recoverable. Unlike central Alberta, which has a good supply of groundwater for municipal and agricultural needs, northern Alberta has less good quality, useable groundwater, with the majority used for oil and gas operations.²⁰

Managing our Water

Since the 1930s, water management in Alberta has primarily been the responsibility of the provincial government. Through Alberta's *Water Act*, regulators ensure that industrial, commercial and public developments do not negatively impact aquatic ecosystems. The *Environmental Protection and Enhancement Act* protects the aquatic environment by regulating point-source pollution from places like water treatment plants and refineries. Federal laws also apply to Alberta's waterways, through the *Navigable Water Protection Act*, the *Fisheries Act* and the *Canadian Environmental Protection Act*.

¹⁸ Water for Life, p. 2.

¹⁹ Water for Life, p. 2.

²⁰ Water for Life, p. 3

Aquatera engages in two primary activities that affect water: withdrawing water to provide potable water to its customers, and discharging treated sewage. It is also responsible for operating and maintaining drinking water and wastewater treatment facilities to meet with provincial legislation. The primary goal of Aquatera's water conservation plan is to ensure that it can provide adequate and safe water to its customers, while continuing to be a responsible steward of the environment.



Water System Profile

A good system profile is an important precursor to identifying future benefits of water conservation in supporting short- and long-term management of water resources.

Withdrawal of Water

In Alberta, the right to diversion and use of all water is regulated by the province under the *Water Act*. The Act requires that a licence be obtained before diverting and using surface water and ground water. In Alberta, we use the principle of “first in time, first in right.” This principle, which has been in existence since 1894, means that water rights are prioritized according to how senior the licence is, regardless of the use. The older the licence, the higher that user is on the priority list.²¹

In order to meet the growing demand on its water supply, in late 2006 Aquatera was issued an additional allocation to its licence to divert water from the Wapiti. *(This is an interim licence for five years. The intention is that a 25 year permanent licence will be negotiated once the aquatic assessment process is complete and there is opportunity to evaluate the credit for return flows.)* Due to the low levels of precipitation in the area throughout the year, accompanied by the population boom, in 2006 Aquatera exceeded its previous diversion licence. Of this water that Aquatera withdraws from the Wapiti, approximately 80 to 90 percent is treated and returned to the river.

The Smoky River, which also flows through the area, is currently being studied to assess its viability as an alternative raw water source. The study is being conducted by Associated Engineering for the South Peace Water Supply Region Committee, on which Aquatera participates.

Water Quality

Aquatera continues to meet the water quality requirements set out by the province. In 2003, a 0.5 NTU turbidity quality standard applied. Aquatera currently operates under a 0.3 NTU turbidity standard and in the future will be subject to a more stringent 0.1 NTU turbidity water quality standard, as provincial regulations become more stringent.

²¹ Water for Life Info Book. P. 13.

From the River to the Tap

Aquatera has one Level III Water Treatment Facility, which services a population of approximately 55,000 in the following region:

- The City of Grande Prairie
- The Town of Sexsmith
- 20 ¼ sections north of the City in the County, which includes the Hamlet of Clairmont
- 6 ¼ sections south of the City in the County, which can be or are serviced, including Wedgewood connected in 1989, and the Dunes subdivision, recently connected in 2007
- 2 ¼ sections in the County east of the City (Carriage Lane – 2006; Taylor Estates – 2007; Maple Ridge – 2008)
- The Grande Prairie Regional Airport

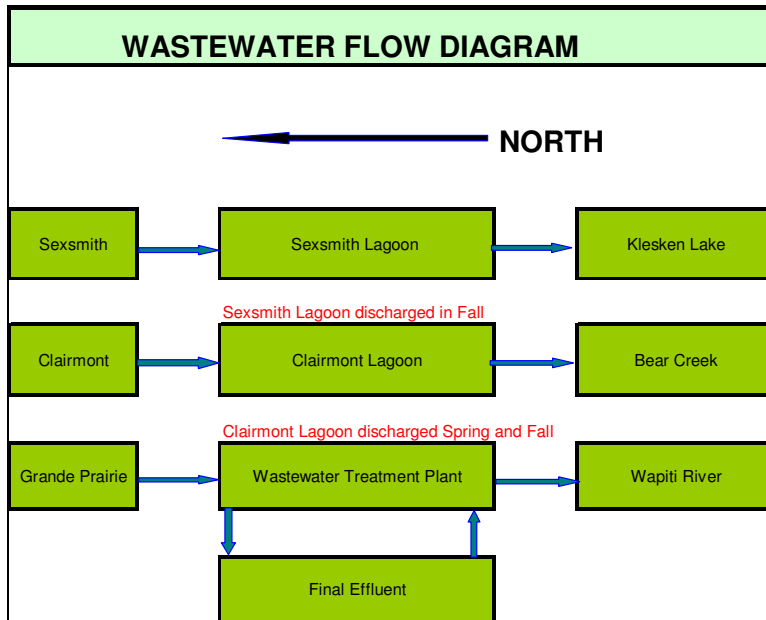
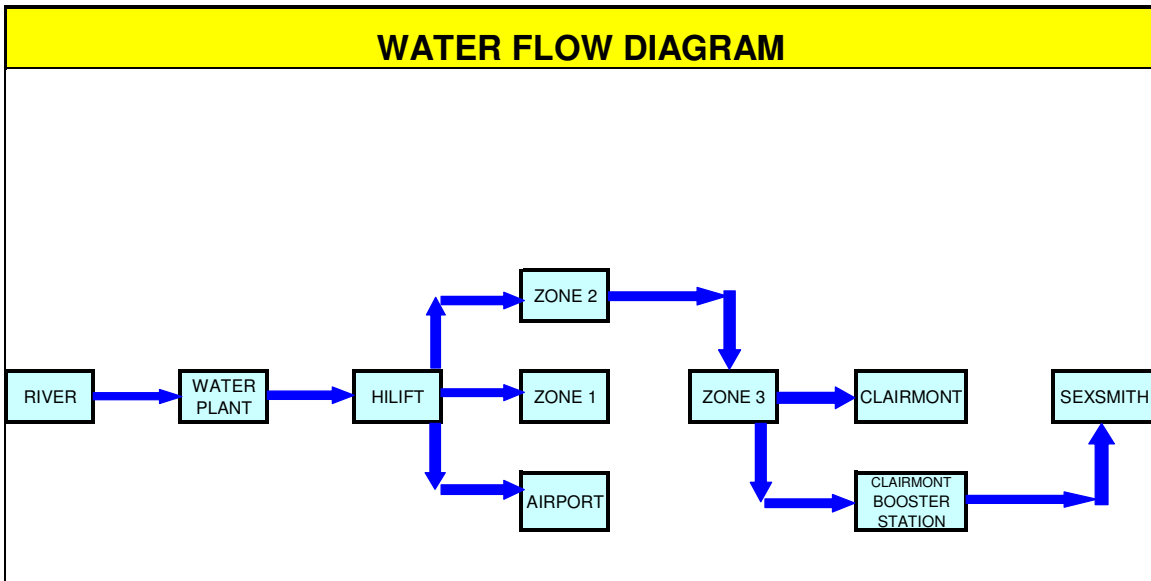
This equates to approximately 1813 ha plus the City (6320 ha) and Sexsmith (260 ha) for a total of approximately 8393 ha. Aquatera’s potential service area is the entire County of Grande Prairie including all towns and hamlets.

River water from the Wapiti River is pumped into two storage ponds (raw water settling ponds) to allow initial settlement of particulate within the water to occur. Each pond has a storage capacity of approximately 70 ML (six days). Settling accumulation reduces this capacity by about 10% - 15%. These ponds are located adjacent to the Raw Water Pump Station on the north shore of the Wapiti River (east of the Highway 40 bridge). Raw water is then pumped to the Water Treatment Facility for further treatment.

The treatment facility has a process capacity of 52+/- ML/day during normal operating conditions while meeting the current water quality requirements. Once the water is treated and chlorinated, it passes into a 1.0 ML clearwell and is then piped to the adjacent 9.0 ML reservoir. From this reservoir, the potable water is pumped by the hi-lift pumps into Aquatera's distribution system for consumption by the community.

2007 Water System At-a-Glance	
1 raw water pump station	40 ML
1 level III water treatment facility	capacity 52 ML
6 potable water pump stations	
6 pressure zones <i>*(see chart on next page)</i>	
1 booster station (Clairmont)	
6 filtered water storage reservoirs	<i>*storage capacity 35.8 ML</i>
336 kilometres of distribution lines	

Pressure Zones	*Capacity
Zone 1	10.0 ML
Zone 1A (airport)	3.3 ML
Zone 2	16.0 ML
Zone 3	2.5 ML
Clairmont	1.0 ML
Sexsmith	3.0 ML
TOTAL	35.8 ML



Constraints and Operational Challenges of Aquatera's Water and Wastewater Facilities

- Distribution lines are not large enough to transfer an adequate amount of water between Zones 2 and 3. To address this issue, additional reservoir capacity will be added to Zone 3 with a dedicated transmission line constructed between Zone 2 and 3. The reservoir cost is \$5 million; lines are \$3.3 million. The reservoir will have a 4.5 ML capacity with an ultimate capacity at 7 ML (for future growth). This project is currently underway with construction to occur in 2008/2009.
- It is continually becoming more challenging to meet the increasing demands on the system as well as the increasing regulatory requirements. Aquatera has made several infrastructure improvements and additions to address these challenges.
- Testing is being conducted on Aquatera's distribution lines, some of which have been in place since the 1950s. In the 1970s, an extensive water main replacement of many of the cast iron pipes was conducted, though some older pipes are still in place.
- Downstream, Weyerhaeuser has a high volume licence to divert water, which impacts the amount of water Aquatera is able to withdraw from the Wapiti.

Year	Recent/Upcoming Capital Upgrades/Expansion to Address System Challenges	Approximate Cost
2006	Transmission line to the Regional Airport and additional reservoir	\$5 Million
2006-2007	Water Treatment Facility filter upgrades	\$1 Million
2006-2007	Raw water pipeline twinning phase 5/6	\$2 Million
2007-2009	Raw water transfer pumps	\$2 Million
2007-2009	Zone II to Zone III transmission line and additional Zone III reservoir	\$6 Million
2009-2010	Addition to source of supply (intakes)	\$3 Million

Note: The addition to source of supply was upgraded to ensure a sustainable intake system. All other upgrades were done to increase capacity.



Aquatera's Water Use Profile

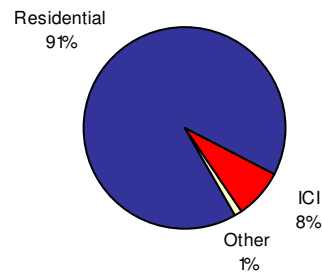
Understanding the nature and dynamics of water use is essential to sound water supply planning and effective water conservation planning. It is necessary to characterize water use by system customers in some detail, to help identify conservation measures and programs appropriate for the system.

Customers by Sector

Aquatera – which has a universal metering program in place – has approximately 17,519²² service connections as follows:

- About 91 percent of its customers fall within the *residential* customer class, which includes both single family and multi-family connections.
- *Industrial, commercial, and institutional (ICI)* customers—which include schools, hotels, hospitals, restaurants, office buildings, retail centers, oil and gas operations and manufacturing plants — comprise about eight percent of Aquatera's water accounts.
- The remaining one percent includes *other* accounts – government accounts, churches, and seasonal landscaping.

Aquatera Customers by Sector 2006



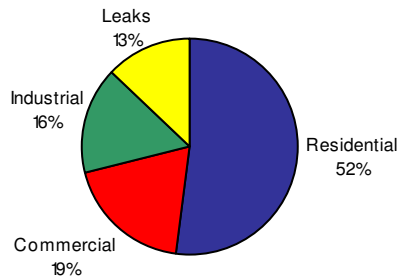
Water Demand by Sector

Aquatera does not record water demand by sector. However, Environment Canada provides the following breakdown for urban water use by sector, compiled from water use surveys and studies across Canada.²³ Aquatera's usage per sector would closely reflect these statistics.

²² From 2006 Aquatera Utilities Inc. statistics

²³ Environment Canada Website

Urban Water Demand By Sector, Environment Canada



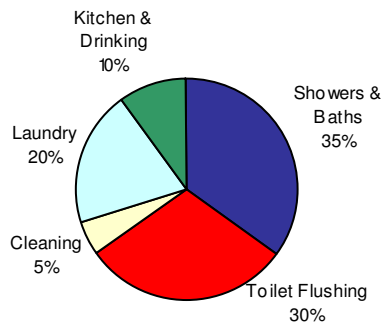
ICI

Even though ICI customers generally represent less than 10 percent of customer accounts, they account for about 35 percent of urban water demand. While ICI customers use considerably higher volumes than residential customers, they are a widely diverse group, so water use varies significantly with each individual customer. By understanding who the largest water users are and their water use trends, it is possible that financial savings can be realized by both ICI consumers and Aquatera through water conservation measures.

Residential

The residential customer *sector* uses the most water. It is essential to understand how this sector uses water in order to target water conservation measures. Aquatera does not collect data specific to residential water use (indoor and outdoor). The following diagram, however, illustrates typical urban residential water use in Canada in the winter months.

Typical Residential Water Use in Canada



Leaks and Unaccounted-for-Water

A significant percentage of the total water entering supply-line systems is lost to leaking pipes. In most cases, if unaccounted-for-water in a municipal system exceeds 10 to 15 percent, a leak detection and repair program will be cost-effective. Studies have shown that for every \$1.00 spent in communities with leak detection programs, up to \$3.00 can be saved.²⁴

Leaks are categorized as non-revenue water. Non-revenue water is water that Aquatera treats and distributes, but is not billed to customers. This includes water lost through system leakage and main breaks and meter inaccuracies and theft, for example.

Presently Aquatera takes some steps to respond to problems associated with leakage (i.e. meter replacement; pipe analysis; flushing of lines). However, it has been several years since a detailed water loss analysis has been conducted to determine the current volume of apparent and real losses. Many Canadian municipalities have prevented significant losses through establishing a leak detection program.

- Between 1998 and 2004, the Halifax Regional Water Commission reduced water leakages by 27 million litres of water a day, a cost saving of \$500,000 annually.
- Since 2000, the City of Toronto has saved 11 percent through leak detection.
- Since implementing its leak detection program in 2003, the Region of Halton, Ontario has saved an estimated 2163 m³ per day in water loss (an amount the equivalent in demand of 2370 single family households), and saved approximately \$35,802 in electricity costs from 2003 to 2005.

²⁴ Government of Canada, Freshwater Website

Tracking Demand and Trends

Aquatera tracks demand using the following measures:

- Total monthly and annual system demand
- Average day demand
- Monthly Minimum Day Demand
- Monthly Maximum Day Demand
- Annual Minimum Day Demand
- Annual Maximum (Peak) Day Demand
- Peak Hours

Population, economic growth, and expansion of Aquatera's service area have had a direct impact on water demand. There are, however, several other influential factors as well such as types of ICI customers and weather patterns. Historical information on the levels of precipitation in Alberta each year can be obtained in the *Water Supply Outlook for Alberta* document prepared by Alberta Environment.²⁵

Total Annual System Demand

Total annual system demand represents the total volume of water used by all customers in a calendar year.

In Aquatera's service region, total annual system demand includes:

- Customers within the City of Grande Prairie, Clairmont, Sexsmith, the Regional Airport and areas in the County of Grande Prairie.
- Water used in the delivery of services such as fire fighting, street cleaning, etc.
- Non-revenue water including water lost through system leakage.

Since 2000, total annual system demand for water in Aquatera's service region has increased, due in part to population growth, economic development and regional expansion. Total annual system demand was higher in 2006, likely due in part to a lower-than-average precipitation rate that year.

²⁵ Alberta Environment , Water Supply Outlook for Alberta,

Total Annual System Demand (water plant meter data)

Year	TOTAL m ³	Regional Additions
2000	4,982,350	Wedgewood included with City
2001	5,155,609	
2002	5,366,277	
2003	5,527,675	
2004	5,928,455	
2005	6,423,209	Clairmont added to system in October
2006	7,778,880	Sexsmith and some County added
2007	7,377,529	

Average Day Demand

Average day demand represents a water system's average daily use over a one-year period. It is calculated based on total volume of water pumped into the distribution system. The total volume supplied in a year is divided by 365 days.

Since 2000, Aquatera's average day demand has increased. While population growth and regional expansion again are significant factors, it is important to understand and assess any other factors that may be responsible (i.e. increase of large ICI water users).

Maximum Day (Peak) Demand

Maximum day demand is the highest total water use experienced by a water supply system during a single calendar year. (Note: Aquatera also tracks peak week and peak month.)

Water usage over the past seven years shows that although water use remains relatively constant throughout the year, use peaks in the summer. This seasonal increase is due to outdoor demand when water is required to irrigate lawns, gardens and parks. During the growing season, water use can increase by as much as 50 percent.²⁶ Changes in maximum day (peak) demand are largely dependent on weather conditions and their effects on seasonal outdoor water use.

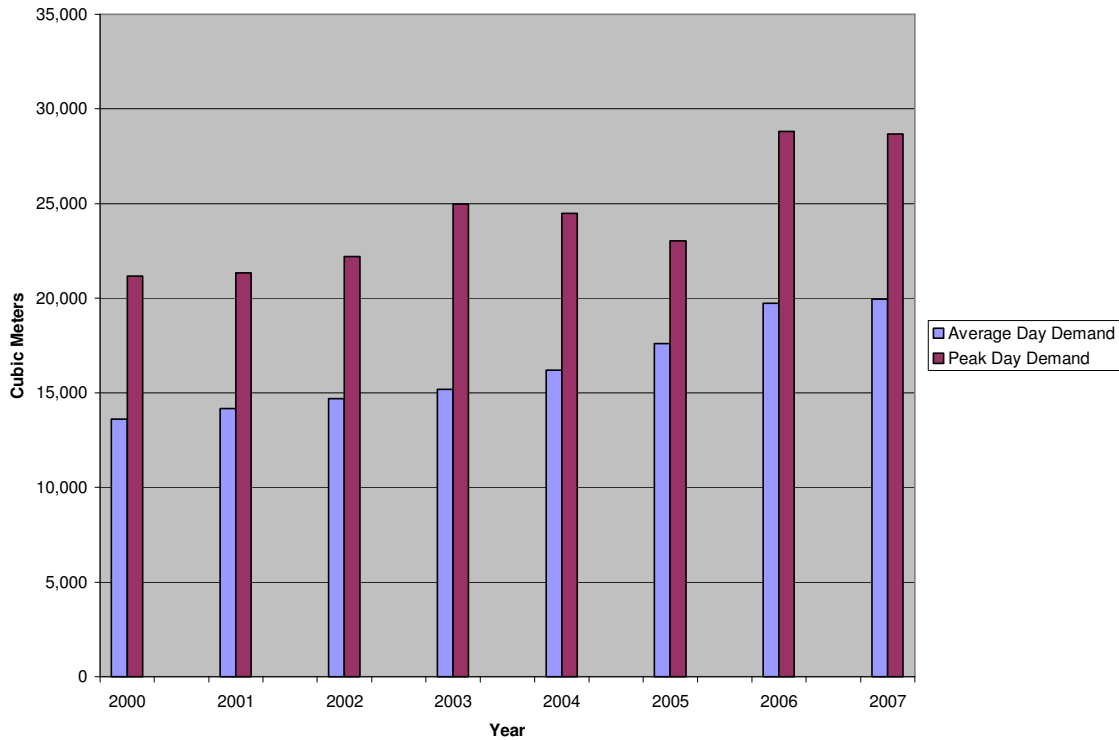
When comparing Aquatera's average day demand and annual peak day demand, data indicates that while average day demand is rising steadily, trends in peak demand have been less consistent. To understand why, and to evaluate the effectiveness of Aquatera's conservation program, one needs to do an analysis of the various factors that could be influencing peak demand in the different years. For example, peak demand increased at a higher rate than usual in 2006, likely due to the low rate of precipitation that year.

²⁶Government of Canada, The Management of Water Website

Maximum (Peak) Day Demand

Year	Average Day Demand m ³	Peak Day Demand m ³	Month
2000	13,613	21,167	June
2001	14,164	21,338	July
2002	14,702	22,193	June
2003	15,186	24,968	July
2004	16,198	24,484	June
2005	17,598	23,037	July
2006	19,733	28,817	June
2007	19,950	28,675	July

Comparison of Average Day & Peak Day Demand



Peak Hours

Peak hours of usage generally fall between 6 AM to 8 AM and 6 PM and 8 PM. By understanding typical residential indoor water use (illustrated on p. 19), one can identify what causes peak demand at these times and can more easily decide where to direct conservation measures.

Flushing Our Drinking Water

Aquatera has taken several steps to ensure that its water quality meets stringent provincial requirements. However, like other municipal systems, this water is treated to be high-quality water that is safe to drink. Most residential water is used for purposes other than drinking and food preparation. Statistics show that only about 10 percent of water is used in the kitchen and for drinking. On the other hand, about 65 percent is used in the bathroom, mostly for bathing and flushing. The high-quality water we use to flush down our toilets and drains must again be treated, now at the wastewater facility, in order to safely return it to the river. Treating water to return to the river is a significant expense.

As such, efforts to reduce indoor residential use should concentrate on the bathroom, followed by changes to water-using appliances.²⁷ Aquatera promotes a range of low-flow fixtures and devices through incentives and through public education (see page 28).

Seasonal Water Usage and Drinking Water

Outdoor water use, which occurs primarily in the summer, is not labeled on the residential water use pie chart, which represents winter water usage. It is important to remember, however, that during the summer household water use can increase by as much as 50 percent due to outdoor water use. As much as half of this may be wasted, through loss due to over-watering and evaporation. It should be noted that a reduction in outdoor use will have a greater effect on licencing than indoor use because the outdoor use is 100 percent savings on the licence while indoor has only a 20 percent savings due to the return flow credit.

In assessing water usage in the residential sector, it is clear that this sector represents a logical target not only for indoor, but outdoor water conservation. Other customer classes, however, need also to be assessed for potential water savings.

²⁷ Government of Canada, CMHC, 1999.



Aquatera's Present Water Conservation Programs

Since 2004, Aquatera has implemented a number of supply- and demand-side water conservation measures in an effort to reduce water consumption. However, even as far back as the 1960s as a municipal facility operated by and for the City of Grande Prairie, metering had been introduced. Today, universal metering – a key step in implementing a successful water conservation strategy – is in place for all Aquatera customers.

While supply-side conservation measures (i.e. metering) benefit Aquatera customers throughout the region, the focus of the demand-side measures introduced in recent years has been on customers in the City of Grande Prairie. Responsibility for implementation of these measures has been with the Marketing Coordinator. However, water conservation will now be guided by Aquatera's Environmental Coordinator, a new position established in June of 2007.

While the effects of Aquatera's current conservation measures (as presented in Table 1) have not been formally evaluated and analyzed, they were selected for their potential water savings. Some measures have been informally evaluated based on their ease of implementation, and how well they have been adopted by the public. For the most part, most of the measures have been well-received. These have "set the stage," creating the right environment for a strategic and planned approach to water conservation.

A conservation *incentive* increases customer awareness about the value of reducing water use.

A conservation *measure* is the device that actually reduces demand.

A utility conservation *program* includes a strategic combination of incentives and measures.

Aquatera's Water Conservation Program 2007 (Table 1)

Present Measure	Targets	Indoor	Outdoor	Implemented Since*
TECHNOLOGY				
Water metering program	All customers	◆	◆	1960s
Upgrading meters	All customers	◆	◆	2006-2007
Leak Detection & Repair	Infrastructure	◆	◆	Ongoing
Upgrading infrastructure – reduce system loss & improve water quality	Infrastructure	◆	◆	Ongoing as needed
ECONOMIC STRATEGIES				
Sewer and wastewater charges	All customers	◆	◆	Pre-Aquatera
Increased water and sewer rates	All customers	◆	◆	2007
Water use charges based on consumption	All customers	◆	◆	Pre-Aquatera
Utility bills mailed monthly with consumption information	All customers	◆	◆	1986
COMMUNICATIONS/PUBLIC EDUCATION				
Advertising/promotion to support conservation measures	Residential	◆	◆	2004
Events/Public Exhibitions	Residential/ICI	◆	◆	2004
Web site	Residential/ICI	◆	◆	2004
Partnerships (city, retail)	Residential	◆	◆	2004
School Outreach Program – grade 2 program & facility tours	Residential	◆	◆	2006
Inserts in water bills (monthly newsletter)	All customers in GP	◆	◆	2003
Internal communications			◆	
○ Staff given information to share water restriction updates	All customers			2004
Xeriscaping book giveaway	Residential		◆	
INCENTIVES				
Source substitution – rainbarrel sales	Residential		◆	2004/5
Encourage water efficient technologies		◆		
- showerhead sales	Residential			2007
- toilet tank bags giveaways	Residential			2007
- faucet aerator giveaways	Residential			2004
- swivel faucet aerator giveaways	Residential			2004
- toilet leak detection tablets giveaways	Residential			2004
Provide technical assistance		◆		2007 only
○ Contract plumber	Residential			
SPONSORSHIP				
Xeriscaping contest with Communities in Bloom	Residential		◆	2004
Sponsor xeriscaping workshop	Residential		◆	2005
LEAD BY EXAMPLE				
Xeriscaping at treatment plant	All customers		◆	2004
Water efficient technology in some Aquatera buildings	All customers	◆		2004
HIRE ENVIRONMENTAL COORDINATOR				
	All customers	◆	◆	June 2007
POLICIES/BYLAWS				
Voluntary water restrictions	All customers		◆	2004
MEASUREMENT				
Customer satisfaction survey	Residential in GP	◆	◆	2004

r = residential ICI = industrial, commercial, institutional other = churches, seasonal landscaping, municipal
 Aquatera is presently compiling information on annual budget for each measure.

Description of Present Water Conservation Measures

TECHNOLOGY

Universal Metering

All of Aquatera's customers are metered. A water metering program for all customers is one of the first programs that should be undertaken to account for water used in a distribution system. Studies show that metered households typically use 20 to 50 percent less water than those charged a flat rate, and the amount of wastewater they produce is reduced by 10 percent.²⁸ Case studies also show that including sewage treatment in rate calculations generates greater water savings. When used in conjunction with volumetric pricing and education programs to increase social acceptability, water meters produce the most dramatic reductions in water consumption over all other measures.²⁹ Residential meters not only enable customers to more easily detect leaks, but they provide a mechanism for customers to gauge their own water use.

Automated Meters

With 100 percent of customers already metered, Aquatera was successfully able to retrofit all customers with new automated meters by the end of 2007. Automated meter reading (AMR) improves billing accuracy, eliminates bi-monthly estimated readings, and improves staff safety and production as meters are read remotely in a fraction of the time.

Leak Detection and Repair

- Replacement of all meters with automated meters.
- Pipes are in various types of conditions (some have been in place since the 50s). Aquatera is conducting random testing to assess the integrity of these pipes by sending samples to qualified laboratories for analysis. An extensive water main replacement was completed in the 70s to replace cast-iron pipes. Pipes are now approximately 50% PVC and 50% AC. Some pipes from the 50s are still used in the distribution system.
- Upon receiving a call from the public, Aquatera responds to leaks. In this situation, personnel use a sound detector to find where the leak is located; however, the accuracy of the present sound detector in use is unreliable.
- Lines are tested between Clairmont and Sexsmith annually. One-quarter of the lines in Grande Prairie are tested each year on a rotating basis. Water used to flush the lines is unaccounted-for water.
- Other sources of water loss (i.e. fire hydrants, theft) are not measured.

²⁸ National Infraguide Case Study

²⁹ Journal of American Water Works Association, August 1999, 91 (8) 66-73.

ECONOMIC STRATEGIES

- Aquatera bills customers on a constant block rate (charge for water increases uniformly as consumption increases) with a base charge based on meter size.
- Wastewater charges are consumption-based with a fixed charge based on meter size. In 2007, water and wastewater rates were increased to better reflect the actual cost of water. In a recent study conducted by the City of Red Deer comparing rates in 20 Alberta communities, Aquatera's rates fall approximately mid-way between the lowest and the highest rates. Studies indicate that rate structures that charge for the amount of water used encourage more efficient water use among customers.
- Utility bills are mailed monthly to provide customers with timely consumption information. Combined with AMR, customers can make up-to-date monthly comparisons of their water use, and can detect leaks within their homes or businesses early on.

INCENTIVES

- Aquatera provides its customers with a number of incentives—predominantly subsidized fixtures aimed at water efficiency. These indoor and outdoor water efficient technologies are an effective tool facilitating the reduction of seasonal peak demand as well as peak hour demand. Due to the increasing cost of subsidizing these fixtures, Aquatera has suspended the program this year until further evaluation; however, it is providing education to the public to inform them where to purchase rainbarrels and low-flow fixtures.
 - Rainbarrel sales have been very successful. While their water savings have not been determined, rainbarrels serve to educate consumers on alternative watering sources. Aquatera conducted rainbarrel sales for one day, for both 2004 and 2005. The rainbarrels were subsidized by Aquatera to reduce the cost to their customers and encourage their use.
 - In 2007, Aquatera held its first low-flow showerhead sale. These showerheads were subsidized by Aquatera. In the one-day sale, approximately 4000 showerheads were sold.
 - Aquatera also provides customers with contact information for a local plumber who will provide technical assistance at a reduced rate to customer requiring assistance to identify potential water leaks or inefficiencies in their residences or buildings, and to install low-flow fixtures.

COMMUNICATIONS AND PUBLIC EDUCATION

- A significant part of Aquatera's water conservation promotion has been communication with consumers. Educational and informational materials have been directed to the water-using public to support specific conservation measures.
- Methods of communicating to the public have included radio PSAs, newspaper ads, bill inserts (includes a newsletter), the Aquatera website and bill boards.
- Aquatera also promotes water conservation at trade fairs and local events. It offers educational give-a-ways such as a xeriscaping book (low-water landscaping), outdoor conservation gift packs and low-flow hardware.
- Aquatera's school outreach program includes grade 2 classroom visits when staff time permits; facility tours are offered to students of varying grades.
- Aquatera partners with the City of Grande Prairie Communities in Bloom to sponsor a xeriscaping contest within the City during the week that the Communities in Bloom judges visit. It also works with City retailers to ensure they have water efficiency hardware available to the public.
- Internally, a script is developed so staff can address questions about water restrictions.

SPONSORSHIP

Sponsorships are an effective method of demonstrating Aquatera's environmental stewardship to the public, as well as educating the public about water conservation. The Communities in Bloom xeriscaping contest is one example. Aquatera also sponsors a workshop to educate citizens about applying xeriscaping to their own yards.

LEAD BY EXAMPLE

Aquatera has upgraded some of its facilities with water smart devices and landscapes. These upgrades are mostly evident at the Water Treatment Facility.

HIRING OF AN ENVIRONMENTAL COORDINATOR

In June of 2007, Aquatera hired an environmental coordinator who will be responsible for overseeing Aquatera's water conservation strategy.

POLICIES/BYLAWS

The City – Aquatera Utility Bylaw (C-1139) regulates and provides for the terms, conditions, rates and charges for the supply and use of the Water, Wastewater and Solid Waste Utilities provided by Aquatera Utilities Inc. While Aquatera does promote voluntary odd-even watering during the summer, this bylaw does have the provision for mandatory water restrictions for outdoor watering. These can be implemented when water in the storage reservoirs are low, during extended heat drought, or during emergencies. This past year, no public complaints were received regarding the restrictions. Aquatera is supported by the City's emergency response team and enforcement department when it puts watering restrictions into place.

MEASUREMENT TOOLS

Aquatera does not measure the effects of its conservation measures on water demand. It does, however, conduct a customer satisfaction survey for all services every few years. This survey does not specifically ask questions about water conservation measures, but is useful in gauging customers' overall satisfaction of water and wastewater services.



Conservation Toolbox

The following “conservation toolbox” contains a sampling of common water conservation measures available for consideration by Aquatera. These measures and best practices are recommended by a variety of sources including the Alberta Water Council, the University of Victoria’s “Soft Path to Water,” and the United States Environmental Protection Agency (USEPA).

Aquatera will be exploring the fullest range of conservation measures practical, not limiting their analysis only to the measures mentioned here. Those involved in conservation planning should also consider new technologies and approaches as they become available.

General Categories	Specific Examples
Socio-political strategies	<ul style="list-style-type: none"> ▪ Technical assistance ▪ Water policy ▪ Water-use permits ▪ Landscaping ordinances ▪ Water restrictions (i.e. drought response plan) ▪ Plumbing codes for new structures ▪ Appliance standards ▪ Regulations and by-laws ▪ Turf limitation by-laws
Communication & Public Education	<ul style="list-style-type: none"> ▪ Information with billing ▪ Media relations ▪ Publications ▪ Community events ▪ Outdoor advertising ▪ Internet ▪ Surveys & Research methods ▪ Stakeholder meetings ▪ Internal education (staff, board & elected officials) ▪ Workshops and seminars ▪ Eco-education programs ▪ Lead by Example ▪ School Outreach <ul style="list-style-type: none"> ○ School programs ○ Class tours of facilities ○ Contests for students

<p>Structural and operational strategies</p>	<ul style="list-style-type: none"> ▪ Metering Program ▪ System audits and leak detection/repair ▪ Consumptive losses (water supply diversion against wastewater treatment flows returned to source) ▪ Water conservation staff ▪ Landscape efficiency ▪ Soil moisture sensors ▪ Watering timers ▪ Micro and drip irrigation ▪ Cisterns ▪ Rain sensors ▪ Efficient irrigation systems ▪ Soaker hoses ▪ Repair teams to reduce leaks in buildings ▪ Water audits ▪ Pressure reduction ▪ System rehabilitation ▪ Efficient technology <ul style="list-style-type: none"> ○ Dual flush toilets ○ Low-flow faucets ○ Efficient appliances (dishwashers/washing machines) ▪ Recycling and reuse – ranging from cooling and process water, to grey water for toilets or irrigation, to treating and reclaiming wastewater for reuse ▪ Convert park irrigation to non-potable water ▪ Monitor truck fill usage ▪ Control water wastage at recreational facilities
<p>Economic strategies</p>	<ul style="list-style-type: none"> ▪ Rebates for more efficient technologies (e.g. toilets, showers, faucets, appliances, drip irrigation) ▪ Tax credits for reduced use ▪ Full-cost recovery policies and life-cycle analysis ▪ High-consumption fines and penalties ▪ Pricing structures <ul style="list-style-type: none"> ○ Seasonal rates ○ Increasing block rates ○ Marginal cost pricing ○ Daily peak-hour rates ▪ Sewer and wastewater charges ▪ Trading of water rights or water use permits ▪ Link grants to water conservation



Selecting and Evaluating 2008 Water Conservation Measures

To meet its conservation objectives, Aquatera used several criteria to evaluate potential conservation measures for implementation.

Each utility establishes its own set of criteria when selecting measures, based on their own circumstances and priorities. The following model, utilized by Aquatera, combines practices used by cities within Canada, as well as recommendations from the USEPA Water Conservation Planning Guide.

Aquatera's Process for Selecting Conservation Measures

1. Identify an initial list of water conservation measures taken from the Conservation Toolbox and Aquatera's present water conservation measures.
2. Develop a "long list" list of potentially acceptable measures from both sources.
3. Develop screening criteria to derive a "short list" of acceptable measures.

Criteria for Ranking

Criteria used in selecting conservation measures were as follows:

- Cost effectiveness
- Ease of implementation
- Budgetary considerations
- Staff resources and capability
- Environmental impacts
- Estimated water savings
- Regulatory approvals
- Public acceptance
- Consistency with other programs
- Applicability

Program monitoring and evaluation

Once conservation measures have been implemented, they will be evaluated for their effectiveness in achieving the desired objectives. Aquatera's universal metering program facilitates the monitoring and evaluation of water conservation measures. Changes in water usage and trends of individual customers or customer groups participating in the pilot program can be easily tracked, as well as changes on a much greater scale such as overall or seasonal demand on the entire system.

A plan for monitoring and evaluation should address data collection, modeling and other issues that will be important in tracking the effects of water conservation on demand over time. Aquatera may need to collect new kinds of data (such as more detailed data on demand by customer class) in order to effectively assess the measure, or group of measures, and assess whether or not the desired objective has been achieved.³⁰

Recent developments in Alberta's Water for Life strategy

In 2003, the Alberta Water Council adopted the *Water for Life* strategy, which promotes the use of water conservation to achieve:

- A safe, secure drinking water supply
- Healthy aquatic eco-system
- Reliable quality water supplies for a sustainable economy

However, the Alberta Water Council acknowledges its need for greater understanding of water conservation, efficiency and productivity. In 2006, a project was undertaken to provide information and guidance to the Province in the area of water conservation, including recommendations for evaluating conservation measures.

The findings in this report have not yet been adopted as part of the *Water for Life* strategy; however, the report recommends a list of performance measures for the municipal sector that are already being applied in municipalities, or could potentially be applied in water conservation planning.³¹ This data may be of assistance to Aquatera in establishing an effective evaluation process. The evaluation measures from the report are summarized in Appendix C.

³⁰ USEPA Advanced Water Conservation Guidelines, p. 139.

³¹ Alberta Water Council, Conservation, Efficiency and Productivity Final Report, January 2007, p. 8.



Water Conservation at Work in Canada

FACT

The City of Thunder Bay's leak detection program has significantly decreased the time and manpower it takes to detect leaks with electronic leak detection. The need for a drilling crew and equipment has been eliminated. The current method of pinpointing leaks takes a two-man crew 15-30 minutes. This translates into [a savings of] about \$465/location in wages alone to detect a single leak.³²

FACT

In 2005, the City of Calgary began a pilot project for reducing the volume of water used for flushing of pipes. Crews began using a portable flow meter from Ireland to accurately measure the flow rate/velocity in the Return to Service procedure on site. Additional flow meters were purchased in 2006. Using this and other methods, the volume of water required to run the Return to Service procedures has dropped by at least 75 percent and the time required to perform them has been cut by about two-thirds.³³

³² Ontario Centre for Municipal Best Practices, Best Practice Summary Report, October 2006.

³³ City of Calgary Year End 2006, Water Conservation Report.



Appendix A



***2008 Water Conservation
Measures for Implementation***



Aquatera's 2008 Water Conservation Measures

(Table 2)

TECHNOLOGY				
Continued Measures	Targets	Indoor	Outdoor	Infrastructure
Water metering program – completion of meter upgrade program	All customers	•	•	
Water Accounting & Loss Control	Infrastructure			•
Upgrading infrastructure – reduce system loss & improve water quality	Infrastructure			•
New Measures for Implementation in 2008				
Identify methods to maximize treatment process efficiencies	Infrastructure			•
Research methodology for full system water loss audit and system leak detection	Infrastructure			•
ECONOMIC STRATEGIES				
Sewer and wastewater charges	All customers	•	•	
Water use charges based on consumption	All customers	•	•	
Utility bills mailed monthly with consumption information	All customers	•	•	
COMMUNICATIONS/PUBLIC EDUCATION				
Advertising/promotion to support conservation measures	All customers	•	•	
Events/Public Exhibitions	All customers	•	•	
Web site	All customers	•	•	
Partnerships (city, retail)	Residential	•	•	
School Outreach Program – grade 2 program & facility tours	Residential	•	•	
Inserts in water bills (monthly newsletter)	All customers	•	•	
Internal communications Employees provided with information on water conservation to respond to public inquiries.	All customers	•	•	
Xeriscaping book giveaway	Residential		•	
Trade Shows	Residential/ICI		•	
New Measures for Implementation 2008				
Voluntary residential on-line water audits	Residential	•	•	
Face-to-face communication with local car washes to reduce their Total Suspended Solids (TSS) to reduce flushing of lines	ICI			•
Increase media relations	All customers		•	
Update and enhance water conservation component of website	All customers		•	
Internal communications – provide education on water conservation to all employees and board	Internal		•	

ICI = industrial, commercial, institutional other = churches, seasonal landscaping, municipal

SPONSORSHIP				
Continued Measures	Targets	Indoor	Outdoor	Infrastructure
Xeriscaping contest with Communities in Bloom	Residential		●	
New Measures in 2008				
Sponsor water-wise demonstration garden at QEII Dream Home	Residential		●	
LEAD BY EXAMPLE				
Continued Measures				
Xeriscaping at selected Aquatera facilities	All customers		●	
Water efficient technology in selected Aquatera buildings	All customers	●		
New Measures for Implementation in 2008				
Identify potential retrofits in Aquatera, city and county facilities	Other	●		
STAFFING				
Continued Measures				
Environmental Coordinator	All customers	●	●	●
POLICIES/BYLAWS				
Continued Measures				
Utility bylaw with water conservation component	All customers	●	●	
New Measures for Implementation 2008				
Revise present bylaw	All customers	●	●	
Develop low-flow fixture bylaw for new construction and renovations	All customers	●		
MEASUREMENT				
Continued Measures				
Customer satisfaction survey	All customers	●	●	
New Measures for Implementation 2008				
Improve and formalize systems to track water conservation measures	All customers	●	●	●

ICI = industrial, commercial, institutional other = churches, seasonal landscaping, municipal

Description of New and Continued Water Conservation Measures for Implementation in 2008

Goals, Measures, Timelines and Evaluation

Aquatera has expended considerable effort over the past four years implementing numerous water conservation measures. A detailed description of these measures was summarized on page 26 - 30.

This document describes Aquatera's water conservation plan for 2008. Included will be a brief summary those measures already implemented in previous years that will be continued in 2008 (some of this information is repeated from earlier sections of this document as Appendix A is intended to also be used as a stand-alone document. Based on findings from Aquatera's practices, as well as the successes/challenges of other municipalities, the document also lists new water conservation measures for implementation in 2008.

The following pages will also outline Aquatera's water conservation goals; timelines; methods of evaluation; and methods and strategies for reducing water usage when the river flow is less than the in-stream objective at the point of diversion.

Combined, all new and continued water conservation measures will provide the water utility with a full range of measures that include:

- Communications Program (internal and external)
- Structural Changes Program
- Operational Changes Program
- Water Loss Program (includes structural and operational aspects)
- Economic Incentive Program
- Regulatory Control Program
- Educational Program
- Monitoring and Evaluation Program (ongoing in order to make changes to the Plan as required)

2008 WATER CONSERVATION GOALS

Establish effective methods of evaluation for current and new water conservation measures in order to set realistic per capita water usage goals in 2009.

Reduce seasonal peak demands.

Reduce water loss and waste.

Improve awareness of the value of water, where it comes from, and increase participation in water conservation initiatives.

Implement conservation practices that will not cause a significant change in the quality of life or impede economic growth and development.

Increase water use productivity.

TECHNOLOGY

Water metering program upgrade

Schedule

Present customers were 100 percent upgraded to new automated meters by December 2007. Ongoing program with new customers.

Description

With 100 percent of customers already metered, Aquatera was successfully able to retrofit all customers with new automated meters by the end of 2007. Automated meter reading (AMR) improves billing accuracy, eliminates bi-monthly estimated readings, and improves staff safety and production as meters are read remotely in a fraction of the time. Aquatera has over 19,000 meters in its data base. New meter growth is estimated at 806 accounts based on the installs to date. This rate is between 2004 and 2005 levels. The increase for 2008 is 63% over 2007. All new customers receive new automated meters.

Evaluation

- Track trends over time and compare with other municipalities that are not metered
- Track improvements in billing accuracy
- Track time and financial savings for Aquatera employees reading meters
- Evaluate safety
- Track customer feedback

Water Accounting and Loss Control

Schedule

Ongoing

Description

Loss Prevention Program

- Pipes are in various types of conditions (some have been in place since the 50s). Aquatera is conducting random testing to assess the integrity of these pipes by sending samples to qualified laboratories for analysis. An extensive water main replacement was completed in the 70s to replace cast-iron pipes. Pipes are now approximately 50 percent PVC and 50 percent AC. Some pipes from the 50s are still used in the distribution system.
- Lines are tested between Clairmont and Sexsmith annually. One-quarter of the lines in Grande Prairie are tested each year on a rotating basis. Water used to flush the lines is unaccounted-for water.

Leak Detection & Repair

- Upon receiving a call from the public, Aquatera responds to leaks. In this situation, personnel use a sound detector to find where the leak is located; however, the accuracy of the present sound detector in use is unreliable.

Potential losses in other sources of non-revenue water

- Sources such as fire hydrants, rinks, theft, etc. are not measured.
- Replacement of all meters with automated meters has reduced the potential for errors associated with meters.

System Audit

- System losses should be kept to less than 10 percent; however, presently Aquatera does not conduct a system audit.

Research

- Conduct research to determine best practice for leak detection & repair
- Conduct research to determine best practice for conducting a system audit

Evaluation

- Track response time to reported leaks
- Track water lost during flushing of lines to test for leaks
- Track cost of man hours required for flushing of lines
- Pressures and volumes are trended at plant for line breaks
- Track research findings and suitability for Aquatera's system

Infrastructure Upgrades

Upgrade schedule

- Raw water transfer pumps (2007-2009)
- Raw water flow meter (2008)
- Zone II to Zone III transmission line and addition to Zone 3 reservoir (2007-2009)

Description

- This project (raw water transfer pumps) involves upgrading three pumps to 900 hp from 550 hp, as well as the diesel back-up pump. These pumps transfer raw water from the raw water pump station to the water treatment plant. The current raw water transfer pumps cannot meet the capacity of the upgraded raw water line (twinning completed 2007) and with the increased size of the line, multiple pumps are required with small benefit and an increase in energy usage.
- A raw water flow meter was added to accurately determine the volume of raw water withdrawn from the river. Prior to this installation pump draw down tests were used to determine pump capacity and pump run-times were used to determine withdrawal volumes. These tests were a snap-shot as the pump capacity could change depending on water levels in both the river well and the raw water storage ponds.
- Distribution lines are not large enough to transfer an adequate amount of water between Zones 2 and 3. To address this issue, additional reservoir capacity will be added to Zone 3 with a dedicated transmission line constructed between Zone II and III. The reservoir will have a 4.5 ML capacity with an ultimate capacity at 7 ML (for future growth).

Evaluation

Upon completion of upgrades, at set intervals track success of upgrades in achieving project objectives.

Identify methods for maximizing treatment process efficiencies

Schedule

Currently working with supplier to investigate

Description

Identifying types of seals that conserve water, or reuse the same water for lubrication of the seal.

Evaluation

Research completed by December 2008

ECONOMIC STRATEGIES

Sewer and Wastewater Charges

Schedule

Ongoing

Description

- Aquatera bills customers on a constant block rate (charge for water increases uniformly as consumption increases) with a base charge based on meter size.
- Wastewater charges are consumption-based with a fixed charge based on meter size. In 2007, water and wastewater rates were increased to better reflect the actual cost of water. In a recent study conducted by the City of Red Deer comparing rates in 20 Alberta communities, Aquatera's rates fall approximately mid-way between the lowest and the highest rates. Studies indicate that rate structures that charge for the amount of water used encourage more efficient water use among customers.

Evaluation

Monitor conservation-friendly rate structures in other Alberta municipalities and regularly track against Aquatera's rates.

Utility bills with consumption information

Schedule

Monthly

Description

- Utility bills are mailed monthly to provide customers with timely consumption information. Combined with AMR, customers can make up-to-date monthly comparisons of their water use, and can detect leaks within their homes or businesses early on.
- New utility bills show actual usage.

Evaluation

Conduct an informal survey to determine if customers are utilizing their water bill to monitor their water usage and if, as a result, they are changing their water habits.

SPONSORSHIP/PARTNERSHIPS

Xeriscaping contest with Communities in Bloom

Schedule

Summer

Description

Aquatera sponsors the Communities in Bloom xeriscaping contest, in collaboration with the City of Grande Prairie.

Evaluation

Track annual participation and feedback.

Water-wise garden at QEII Dream Home

Schedule

Spring 2008

Description

Sponsor water-wise xeriscaping demonstration garden at the QEII dream home as an education tool directed at home and business owners.

Evaluation

Informal feedback on project from public, QEII Foundation employees and Aquatera employees.

LEAD BY EXAMPLE

Xeriscaping and low flow fixtures at Aquatera facilities

Schedule

Ongoing

Description

- Xeriscaping at water treatment plant and Eco Centre
- Low flow fixtures in some Aquatera facilities
- Compost demonstration area at Eco Centre
- Xeriscaping at Bear Creek Depot
- Planning xeriscaping for 2009 at landfill site

Evaluation

- Question on biannual customer satisfaction form to determine if public perceives that Aquatera sets an example.
- Question on biannual customer satisfaction form to determine if public has learned conservation ideas from Aquatera's examples and if they have change their habits as a result.

Retrofits and xeriscaping in Aquatera, city and county facilities

Schedule

Completed by 2008

Description

Examine potential to improve opportunities for parties to lead by example to reach a wider audience.

- Investigate possibility of a demonstration garden at the new library/art gallery
- Investigate possibility of a demonstration garden at the new multiplex

Evaluation

Completed by year-end

WATER CONSERVATION STAFFING

◆ Environmental Coordinator (permanent position)

Description

In June of 2007, Aquatera hired an environmental coordinator who will be responsible for overseeing Aquatera's water conservation strategy. This individual is on leave until May 2009. Aquatera employees will be assigned specific responsibilities to address the water conservation strategy.

POLICIES/BYLAWS

Revise present utility bylaw

Develop a new low-flow fixtures bylaw

Schedule

Approved by December 2008

Description

The present City – Aquatera Utility Bylaw (C-1139) regulates and provides for the terms, conditions, rates and charges for the supply and use of the Water, Wastewater and Solid Waste Utilities provided by Aquatera Utilities Inc. While Aquatera does promote voluntary odd-even watering during the summer, this bylaw does have the provision for mandatory water restrictions for outdoor watering. These can be implemented when water in the storage reservoirs are low, during extended heat drought, or during emergencies. In 2007, no public complaints were received regarding the restrictions. Aquatera is supported by the City's emergency response team and enforcement department when it puts watering restrictions into place.

The **revised bylaw** will more clearly define when the Aquatera Manager may impose the following actions:

- mandatory calendar watering;
- a ban on non-essential water use, and;
- as a last resort, impose a state of emergency.

The **new water-efficient fixtures bylaw** will address water efficient technology for new construction and renovations requiring a permit.

Specific details of both bylaws still under review.

Evaluation

- Track number of public complaints and questions to Aquatera
- Track non-compliance
- Track negative media publicity through clippings
- Internal feedback - Ease of implementation
- Identify potential water savings through USEPA & Environment Canada benchmarking data
- Compare through metering a sample of new high efficiency houses with a sample of houses built pre-1980 (new construction and renovations)

EVALUATION

Bi-annual customer satisfaction survey

Schedule

Fall 2008

Description

Water conservation program questions are one component of Aquatera's customer satisfaction survey. Additional questions can be added for further evaluation of conservation measures.

Water Conservation Tracking

Schedule

Fall 2008

Description

Develop improved means of monitoring and tracking water demands through water billing and water metering data.

COMMUNICATION/EDUCATION

Aquatera Communication Plan 2008

GOALS

1. Enhance consumer awareness of water conservation issues and the value of water
2. Promote changes in consumer attitudes and behavior – create a water conservation ethic
3. Targeted communications:
 - Change behaviours and create buy-in through targeted communications to support supply-side and demand-side conservation initiatives.
 - Information and education directed at a specific target group for a specific purpose.
4. Enhance Aquatera's reputation in the community as an organization that cares about the environment.

OBJECTIVES

1. Increase the amount of positive local media coverage about Aquatera and conservation initiatives and utilize media as an avenue of free advertising for water conservation initiatives.
2. Increase the number of students reached through the school education program without increasing the number of human resources required for program delivery.
3. Increase the number of customers/students accessing Aquatera's website for water conservation information.
4. Increase knowledge and buy-in of the benefits of a water conservation program among Aquatera staff.
5. Increase public participation in water conservation initiatives.

AUDIENCES

Internal

Aquatera staff
Aquatera board
Municipal staff in Aquatera service region
Municipal councils in Aquatera service region

External

Residential – single family dwellings; multi-family dwellings
Industrial
Commercial – includes retailers; car washes
Institutions
Schools – elementary and junior high
Homebuilder's Association, Construction Association, builders, real estate companies
Landscape professionals
Garden centres

STRATEGIES AND TACTICS

Strategy 1: Utilize media relations as a cost-effective method of promoting water conservation and advertise Aquatera's conservation initiatives

- Send out monthly news release (minimum) specifically highlighting Aquatera's water conservation initiatives and upgrades to the water system and relate them to how they will benefit the community (i.e. new meters; plant upgrades, etc.)
- Utilize newsletters and publications of local businesses and organizations as a "free" opportunity to promote water conservation (i.e. Chamber of Commerce, company employee newsletters).

- Article in Communities in Bloom spring edition of Homes magazine promoting water efficiency in lawns and gardens.

Strategy 2: Promote Aquatera as a community- minded and environmentally conscious organization

- News releases to promote water conservation technologies in Aquatera's buildings
- Pitch stories to media to highlight Aquatera's involvement in community
- Support community events in Aquatera's service region and, when possible, utilize these as an opportunity to promote water conservation.

Strategy 3: As population and service region expands, utilize the website to reach additional audiences and provide additional tools to teach water conservation.

Website

- Update and enhance water conservation component of website.
- Incorporate a voluntary residential water audit component to website.
- Incorporate a classroom component to website.

Strategy 4: ICI – Reduce non-revenue water lost as a result of excessive total suspended solids (TSS) from car washes.

- Meet personally with local car wash owners/managers to educate and motivate them to stay below the maximum TSS (allowed 500 mg/l). Almost all local car washes are exceeding the maximum allowed, which results in excessive flushing of sumps (non-revenue water). Before imposing mandatory compliance, Aquatera employees are first taking an education and information approach, working with management to gain compliance. The program commenced in January 2008. A follow-up visit will take place May 2008. Increased compliance results in savings to the utility as Aquatera does not have to treat this water to return to the river.

Strategy 5: Reduce peak demand (seasonal and daily) by promoting conservation initiatives that will have a direct effect on these peak times.

Spring/Summer (Outdoor)

- Two Billboards June/July - 4 weeks; August - advertising voluntary water restrictions
- Daily Herald Tribune Ads – July 4 & 18, black and white, full page ads advertising water restrictions and summer water conservation ideas
- Community Connections – full page Voluntary Calendar Watering Restriction ad, Summer 08 issue.
- Xerilandscaping Contest – collaboration with Communities In Bloom – contest encourages water efficient landscaping. Two categories - entire yard or a portion. \$1000 and \$500 cash prize. Communities in Bloom administers the contest.
 - Xerilandscaping Contest newspaper advertising – 4 column ad in the Daily Herald-Tribune June 13, 20, 27, July 4
 - Xerilandscaping Contest radio advertising – 30 sec ads on 4 stations (98.9, 104.7, 93.1, 97.7) June 14 – 20.
- PSA's on 3 local radio stations (98.9, 104.7, 93.1) – 15 sec ads running in rotation from May 15 – Aug 15. Messages include a efficient lawn watering tip and a reminder about voluntary calendar watering restrictions in effect from July 1 – August 31.
- Brochures on efficient lawn watering and xerilandscaping
- Know No Waste Newsletter (utility bill insert, 18,000 copies monthly to all service areas (July, August)
- Sponsorship demonstration garden at the 2008 QEII Dream Home – includes signage and information on site about water efficient landscaping.
- Door knockers available with Mandatory and Voluntary Calendar Watering Restriction information, if needed.
- Xeriscaping books are offered as prizes for contests and draws.

Indoor Water Conservation

- Community Connections – full page indoor water conservation ad – winter 2008.
- Know Waste Newsletter (utility bill insert, 18,000 copies monthly includes all service areas) – water conservation message featured January and December
- Brochures – Indoor Water Conservation – Mailing of dye tablets to all new Aquatera accounts.

General Water Conservation Information

- Mailing of water conservation brochures to all new Aquatera accounts.

Strategy 6: Reduce peak demand (seasonal and daily) by collaborating with retailers to ensure they can provide updated information on water efficiency technologies and measures.

- Distribute “shelf-talkers” with information about indoor and outdoor water conservation technologies to local hardware/homes stores.
- Distribute information sheets on outdoor water conservation efficiency technologies to all garden centres, including Dunvegan, Canadian Tire, Walmart, Peavy Mart, Home Depot, and Costco.

Strategy 7: Utilize community events to provide opportunities to promote and encourage water conservation for all users.

- Home Show Mar 8-11, 2008 – display featuring water conservation message including providing toilet tank banks, dye tablets, aerators as well as other promotional materials with a water conservation message “just enough, not too much”.
- Earth Day, April 2008 – corporate display with water conservation message including promotional items and door prizes with a water conservation message.
- Environment Week, June 2008 - corporate display with water conservation message including promotional items and door prizes with a water conservation message.
- Municipal Government Day Low-Flow Fixture Make Over Contest – a maximum of \$1000 will be reimbursed to a customer for replacing standard fixtures with low-flow models (i.e. front loading washing machine, toilets, shower heads, landscaping, pressure washers). Radio and print advertising will accompany contest.

Strategy 8: Reach all water users, and instill a water conservation ethic in our young people, through the education of youth.

- Develop and implement an interactive water conservation school presentation for primary grades - Fall 2008.
- Provide school tours of the water treatment plant

Strategy 9: Increase buy-in for all new water conservation initiatives by ensuring they are promoted well before implementation and by ensuring communications is in place to address any problems with existing conservation programs.

- Meet regularly with Environmental Coordinator to stay updated on new programs and potential problems with existing programs.
- Develop a communication plan for all new initiatives.
- Ensure employees responding to the public are equipped with information to address questions/concerns.

Strategy 10: Develop a stronger sense of ownership and buy-in of Aquatera’s water conservation program by providing information to staff and creating opportunities for Aquatera employees to communicate their feedback about the program.

- Develop and implement email survey to all employees and board to assess views on the program.
- Provide regular education to employees and board.
- Develop systems to improve information-sharing and feedback on water conservation measures among different Aquatera divisions.

Strategy 11: Provide information to support specific water conservation measures (smart choices will only be made when these choices are understood).

- Develop a comprehensive advertising plan that will provide information on water conservation measures.
- Utilize media relations to convey repeated messages about water conservation (consumers need to be “hit” with the message several times).
- Develop internal systems to ensure Aquatera employees have adequate information to address public’s questions/concerns.

Strategy 12: Develop and implement tools to evaluate public education/communication.

- Develop pre- and post knowledge survey for school program, incorporated into a presentation evaluation form.
- Incorporate questions to assess effectiveness of conservation advertising and knowledge of water conservation. Use for benchmarking.
- Build into website a method of tracking usage.
- Establish a formal system to monitor and track phone calls requesting information on water conservation or filing complaints about specific water conservation initiatives.
- Establish a system to monitor and track internal feedback about water conservation education initiatives.

Evaluation

Overall water conservation program

- Track number and tone of calls received regarding individual water conservation measures
- Track media coverage - tone and numbers
- Track budget
- Track website usage (water conservation section)
- Track feedback from biannual survey

Outdoor (Summer) Water Use

- May observe per capita water use decrease in summer (i.e. June, July, August, September)
- Track trend over time (yearly)

Indoor Water Use

- Select a sampling of winter months, and track per capita water use
- Track trend over time (yearly)

School program

- Track knowledge through pre- and post-presentation surveys to track knowledge acquired.
- Track number of participants
- Track number of call-backs to schools

Retail program

- Informal feedback from retailers as to effectiveness of information.

Events

- Track public feedback at events

Internal education program

- Pre-and post-survey to assess beliefs and knowledge of savings for the water utility.
- Informal feedback

ICI - Car Wash Education Program

- Track compliance levels
- Measure water used to flush sumps (non-revenue)
- Track potential reductions in water use after each visit.
- Track man-hours and HR cost of flushing

LOW RIVER FLOW

Methods and strategies for reducing water usage when the river flow is less than the in-stream objective at the point of diversion.

In-stream objectives are set by Alberta Environment to protect the aquatic environment. Aquatera monitors the in-stream flow objectives on a weekly basis and records the data in the Water Diversion Report.

In 2007, the river flow was less than the in-stream objective at the point of diversion from April 2 to 16, August 12 to 18 and August 27 to September 1. When this occurs, Aquatera ensures it replaces 100 percent of the water it diverts (treated effluent is stored when river flows are higher for use as return flow as required at a future date).

It is preferable to Aquatera to have a water conservation plan that is continuous and effective, rather than attempt to implement certain strategies each time the river flow is less than the in-stream objective at the point of diversion (this can occur at frequent intervals).

However, for extended periods of low river flow, it is necessary to implement a plan that would include:

- mandatory calendar watering;
- a ban on non-essential water use, and;
- as a last resort, impose a state of emergency.

Aquatera is presently revising its bylaw to more clearly define when the Aquatera Manager may impose such actions. The bylaw revisions will ensure that certain water conservation measure will come into effect when imposed license conditions restrict water use and action is necessary to protect water treatment and fire flows.

Restrictions will be communicated through newspaper, TV and radio advertising, as well as through media relations.



Appendix B



Water Conservation Implementation Plan 2007 - 2011

YEAR 1 – 2007

Conduct research on development & implementation of a strategic water conservation plan

Year 2 - 2008

CREATE INTERNAL READINESS AND DEVELOP 2008 WATER CONSERVATION PLAN

Evaluate, Educate and Motivate

GOAL: Obtain understanding about and agreement on the need for a long-term water conservation plan among board, staff and public.

Develop and Implement Plan

IMPLEMENTATION OF FIRST STAGES OF THE WATER CONSERVATION STRATEGY

Phase 1: Define Water Conservation Needs

Water Use Profile and Forecast

Identify Water Conservation Goals

Phase 2: Choose the Appropriate Measures and Incentives

Identify and Evaluate Water Conservation Measures

Identify and Evaluate Water Conservation Incentives

Analyze Relative Benefits and Costs of Measures

Phase 3: Draft the Plan

Draft a plan

Develop, implement and incorporate a strategic communication plan

- The plan will support Aquatera's specific conservation efforts, promote Aquatera as a responsible steward of the environment, and highlight Aquatera's leadership in conservation.

Continually evaluate the conservation plan

YEAR 3, 4, 5 – 2009, 2010, 2011

Full implementation of the water conservation plan

- Set milestones
- Conduct monitoring and on-going evaluation
- Identify new technologies/best practices
- Allow for flexibility and make modifications to the plan as required



Appendix C

**Sample Municipal Sector Performance Measures from Alberta Water Council
Conservation, Efficiency and Productivity Final Report, January 2007**

Performance Measure	<i>Description</i>	<i>Data Source</i>	Reporting Scale	<i>Source Type</i>	Water Returned to the Environment (Intentional)	Water Lost	Analysis
Full-Metering – amount of water used (m ³)	All municipal water customers should be metered so that costs are directly linked to water usage. Residential water customers who are metered generally use less water due to monthly water bills, which correlate to amount of water use.	Meter – monthly meter readings	Municipal Watershed Province	Treated freshwater – surface and/or ground	Water returned to source if sewage treatment plants and storm water collection system are linked to source water.	Evaporation Seepage Consumption	Trend over time and comparison to other municipalities who are not metered
Full-Cost Accounting – utilities should adopt rates based on cost of service.	Charges for water should include all costs related to the operation of the water and wastewater utilities including capital costs.		Municipal				Trend over time (yearly) and in comparison to other municipalities of similar size
System Losses – amount of water lost in system (m ³) through: - WTP and related network; - WWTP and related network	Keep system losses to less than 10%	Meter and estimate	Municipal Watershed Province	Treated freshwater – surface and/or ground Raw Sewage Storm Water		Seepage through leak prone piping	Trend over time (monthly or yearly) and in comparison to other municipalities
Large Water Use Audits – amounts of water used (m ³)	Large industrial and institutional water users to undertake regular audits	Meter	Municipal	Treated freshwater – surface and/or ground		Evaporation Seepage Consumption	Large water users to undertake regular (yearly) audits, encourage the reuse/recycle of water and compare yearly production numbers to amount of water use.
Promotion of water Re-Use or Alternate Use – amount of non-potable water used per year (m ³)	Encourage non-potable water users to use untreated source water, treated wastewater and/or grey water	Meter and estimate	Municipal Watershed	Untreated source water Treated wastewater Grey water	Water returned to source if sewage treatment plants and storm water collection system are linked to source water	Evaporation Seepage Consumption	Conduct cost/benefit analysis. Some water re-use alternatives may only be viable during the spring, summer and fall months.

WTP = Water Treatment Plant; WWTP – Wastewater Treatment Plant

Performance Measure	<i>Description</i>	<i>Data Source</i>	Reporting Scale	<i>Source Type</i>	Water Returned to the Environment (Intentional)	Water Lost	Analysis
Water Use Targets (litres/person/day)	Set goals for residential amount of water used per capita per day	Meter production, numbers from WTPs and population	Municipal Watershed Province	Treated freshwater – surface and/or groundwater	Water returned to source if sewage treatment plants and storm water collection system are linked to source waters	Evaporation Seepage Consumption	Trend over time, may have a reflection on the effort put into education and promotion of water conservation and efficiency
Water Use Restrictions (l/p/d)	Drought response plan	WTP production numbers	Municipal Watershed Province	Treated freshwater – surface and/or ground	Water returned to source if sewage treatment plants and storm water collection system are linked to source waters	Evaporation Seepage Consumption	High demand and emergency demand restrictions need to be determined, usually during dry/drought times of the year when demand exceeds supply
Consumptive Losses	Water supply diversion against wastewater treatment flows returned to source	WTP and WWTP production numbers	Municipal Watershed Province	Treated freshwater – surface and/or ground Treated wastewater Temperature and rainfall data (Environment Canada)	Water returned to source if sewage treatment plants and storm water collection system are linked to source waters	Evaporation Seepage Consumption	Provides a measure of how much water is being returned to the source; the goal is to have as much going back to the source as possible

Performance Measure	<i>Description</i>	<i>Data Source</i>	Reporting Scale	<i>Source Type</i>	Water Returned to the Environment (Intentional)	Water Lost	Analysis
Education/Promotion	Encourage non-potable water users to use untreated source water, treated wastewater or grey water instead of drinking water (i.e. for watering golf courses, city parks, road allowances, industrial process water, etc) and encourage the use of low flush toilets, low flow shower fixtures, etc.	Meter and estimate	Municipal Watershed Province	Untreated source water Treated wastewater Grey water Treated freshwater – surface and/or ground	Water returned to source if sewage treatment plants and storm water collection system are linked to source waters	Evaporation Seepage	Conduct cost benefit analysis. Some water re-use alternatives may only be viable during the spring, summer and fall months. Trend over time and observe per capita municipal water decrease.
	Promote Efficient Outdoor Water Use, landscape Planning and Efficiency	Encourage use of drought-tolerant natural vegetation, proper lawn or park watering, etc. Encourage use of rain water (with barrels or cisterns)	Municipal Watershed Province	Treated freshwater – surface and/or ground Treated wastewater Grey water	Water returned to source if sewage treatment plants and storm water collection system are linked to source waters	Evaporation Seepage	Trend over time (yearly). May observe per capita municipal water use decrease in summer. ³⁴

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Appendix D



Endnotes

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