



Water Shortage Response Plan

Prepared by:
City of Camrose
5204 – 50 Avenue
Camrose, AB
T4V 0S8

Prepared for:
Alberta Environment & Parks
Twin Atria Building #111
4999 – 98 Avenue
Edmonton, AB
T6B 2X3

Purpose and Scope of this Document

This municipal Water Shortage Response Plan [WSRP] was developed by the City of Camrose [the City] in order to determine the risks of water shortage as a result of increasing raw water usage by the City and its regional customers, and as a result of current or potential drought conditions. Water shortages are bound to occur, but sustainability during these times can be ensured by analyzing all possible strategies to mitigate the consequences, whether or not directly caused by the proposed extra activity. This WSRP will form the foundation of an action plan in order to provide a flexible framework to guide the City on drought prevention, drought mitigation, and drought response procedures. This action plan is proposed for normal yearly operations as well as for years with lower than average water supply, and will even be helpful in instances of unforeseen emergency circumstances that would cause a water shortage.

The components of the WSRP include:

- An assessment of the risks of water shortages,
- An evaluation of a variety of options to deal with water shortages based on how much extra water would potentially be required and how much it will cost, and
- A planned implementation schedule with triggering criteria, which shall be monitored for effectiveness. This implementation schedule will help the City minimize the adverse effects of drought on public health and safety, economic activity, environmental resources, and individual lifestyles during a drought event.

This WSRP includes the substance of the Alberta Environment and Sustainable Resource Development [AESRD, now renamed to Alberta Environment & Parks or AEP] guide, “Preparing Water Shortage Response Plans” and has adapted ideas and best practices from a number of different WSRPs and/or Drought Management documents. In addition to the “Preparing Water Shortage Response Plans” guide, acknowledgements are also given to:

- “2011 Water Shortage Response Plan.” City of Vancouver. 21 Feb. 2011. Web. Accessed on 14 Oct. 2014.
- “Alberta’s Agriculture Drought Risk Management Plan.” Government of Alberta- Policy, Strategy and Intergovernmental Affairs Division, May 2010. Web. Accessed on 14 July 2014.
- AMEC Earth & Environmental. “Municipal Drought Management Plan Guidance Document.” City of Shallow Creek, Northern Colorado Water Conservancy District, Aug. 2011. Web. Accessed on 14 July 2014.

- AMEC Earth & Environmental. "Sample of a Municipal Drought Management Plan." City of Shallow Creek, Northern Colorado Water Conservancy District, June 2011. Web. Accessed on 14 July 2014.
- Bruneau, Susanna. "Drought Adaptation and Management: Implementation Guidelines." Battle River Watershed Alliance, Sept. 2013. Web. Accessed on 14 July 2014.
- Bruneau, Susanna. "Drought Adaptation and Management: Policy Advice." Battle River Watershed Alliance, Sept. 2013. Web. Accessed on 14 July 2014.
- Bruneau, Susanna. "Understanding the Policy Context for Drought Management in the Battle River and Sounding Creek Watersheds." Battle River Watershed Alliance, 29 June 2013. Web. Accessed on 14 July 2014.
- "City of Santa Monica: Water Shortage Response Plan." Department of Public Works, Water Resources Division, 2009. Web. Accessed on 14 Oct. 2014.
- "Drought- Ready Communities: A Guide to Community Drought Preparedness." National Drought Mitigation Center et al. May 2011. Web. Accessed on 14 July 2014.
- "Water Management in Southern Alberta: Key Opportunities for Water Storage, Allocation, Flood and Drought Management." Alberta Society for Sustainable Water Management and Related Technologies, 1 March 2010. Web. Accessed on 14 Oct. 2014.

Information has also been taken from:

- The City of Camrose "Water Distribution System 2006 Master Plan Update". Prepared by Associated Engineering for the City of Camrose.
- City of Camrose "Make it Your Home" Brochure
- City of Camrose Proposed 1.6 million m³ Municipal Demand Increase Driedmeat Lake Water Supply Analysis. AESRD, Terry Chamulak, 23 Nov. 2012.
- City of Camrose Water Conservation / Water Use Policy. Adopted by City Council on 26 June 2006.
- City of Camrose Water Conservation / Water Use Bylaw #2494/06. Approved by City Council on 26 June 2006.
- City of Camrose Population Projections for 2011 to 2036. Prepared by b&a Planning Group, December 31, 2012.
- Municipal Census 2014
- www.cargill.ca
- www.battleriverwatershed.ca
- Canola Council of Canada, Agriculture and Agri-Food Canada. Web. Accessed on 18 Nov. 14.
- Correspondence from Alberta Environment, dated April 17, 1990. RE: "City of Camrose Water Supply"

- Correspondence from AESRD, dated June 14, 2013. RE: “Water Act Preliminary Certificate and Licence Conditions to divert an additional 1,580,000 cubic meters of water from Driedmeat Lake for Municipal and Commercial Purposes”
- Correspondence from AESRD, dated November 23, 2012. RE: “City of Camrose Proposed 1.6 million m³ Municipal Demand Increase Driedmeat Lake Water Supply Analysis”, prepared by Terry Chamulak, regional hydrologist

Background Summary

The City of Camrose is located on Highway 13, approximately 70 kilometers southeast of Edmonton. The City is a community of approximately 18,044 people and serves as a regional center to more than 100,000 people. The region has some of the richest farmland in western Canada and a robust economy that is based on agriculture, as well as industry, manufacturing, retail, health & medical services, and education.

The City of Camrose draws its water from Driedmeat Lake, which is a part of the Battle River watershed. A dam structure was installed by the Province at the downstream end of Driedmeat Lake in 1973 to stabilize the lake levels and provides water storage. This water storage was increased in 2009 when the Province upgraded the weir to provide 600mm of additional depth. The weir upgrade replaced an existing fish ladder to better allow aquatic species to migrate into the lake from downstream sections of the Battle River. The weir upgrade also included the installation of a “riparian gate” to allow the Province to better control the flow of water to the downstream environment and to downstream users.

The City’s water intake, intake pumping station, and collector well pumping station are used to screen out fish and weeds from the raw lake water and pump water to the water treatment plant. The City of Camrose recently constructed a new raw water pumping station, replacing an existing 50+ year old intake pumping station and 30+ year old collector well pumping station. The new raw water pump station was designed to deliver water directly to the City’s WTP, and was sized to accommodate both the City’s long-term water flow needs, as well as the industrial water needs of a newly constructed canola crushing facility as outlined further below. The new facility was commissioned in February 2016, and is now currently under the operational and maintenance control of the City.

The water treatment plant [WTP] was built and commissioned in 1987/1988, and a Granular Activated Carbon contactor facility was added in 2009 to help reduce organic carbon levels in the treated water. These facilities are located within the City limits at 3701 – 50 Street. There are three potable water storage reservoirs in the City: the first is on the WTP property and the

other two are located within Rudy Swanson Park (located at 5602 – 44 Avenue). There are also two main pumping stations and one booster station that are used to push potable water from reservoirs to the City distribution system, as well as to the City's regional partners.

Alberta is one of the major contributors to the canola industry, growing a substantial amount of the crop yearly. Between 2013 and 2015, a new canola crushing facility was built by Cargill Limited a few kilometers southeast of Camrose within E ½-24-46-20-W4. This facility was designed to receive canola from farms within a ~300 km radius, and is to process an estimated 850,000 tonnes of canola per year. The canola processing facilities transform harvested seeds into canola oil and livestock meal, which are then manufactured into a wide variety of products. Canola processing requires large amounts of raw water in order to wash seeds and extract the maximum amount of oil. The nearest feasible water source for the Cargill plant was determined to be Driedmeat Lake. Other water sources including groundwater were investigated and dismissed. As a result, the Cargill canola processing facility was designed to tie into the City's raw water supply line, bypassing the need to build an entirely new water intake system in the lake. The amount of water used by the Cargill facility each year is equivalent to approximately 3,460 people, based on the City's current raw water diversion rate of 340 litres per capita per day.

Municipal growth will also increase the City's overall water demands at Driedmeat Lake in the future. Treated water is provided to all of the City's 18,000+ residents, the non-local student population at the Augustana Campus of the University of Alberta (which is typically not included in municipal census data), and a number of regional customers including the Village of Bittern Lake, Camrose County's residential subdivision of Braim, and Camrose County's Hamlet of Ohaton. The City has agreements in place with each of these regional customers. The original agreements committed the City to providing a combined total of 70 million litres (ML) of water per year. The City's agreement with the Village of Bittern Lake was amended in 2005 to allow the Village to provide water to Camrose County's "Erwick" industrial subdivision. This amendment granted an additional 16 ML of water per year, but places restrictions as to the maximum flow rate and the times when water is permitted to be drawn for this industrial subdivision.

In late 2012, the City retained Brown and Associates Planning Group to update its municipal growth projections to the year 2036. As a result of that review, the City's municipal growth is expected to continue at an average rate of 2% per year, which is equivalent to approximately 400-600 new residents per year. The City population, including the base and non-local student population but not including regional customers or the equivalent population from Cargill's operations, is estimated to grow to ~30,000 people in 2036. Should the City's population grow

at levels lower than 2% per year, the timeframe to reach the 30,000 population threshold will extend beyond 2036.

The projected municipal growth, coupled with the canola processing facility's water requirements, brought to light the City's need for additional water to meet long-term water needs. In 2012, the City reinitiated discussions with the Province regarding an outstanding application from 2002 for additional water diversion from Driedmeat Lake. In 2013, the Province issued a new license to the City (in the form of Preliminary Certificate #00183363-00-00) which would allow the City to draw an additional 1,150,000 m³ of raw water annually for municipal water supply (urban and rural), plus an additional 430,000 m³ of raw water for Cargill's industrial needs. This combined allocation of 1,580,000 m³ annually would augment the City's existing water allocation of ~3,083,800 m³ of water annually (or ~3,084 dam³). The new license also identifies that the rate of diversion from the lake cannot exceed 0.3 cubic metres per second (m³/sec).

Prior to the new license coming into effect, the Preliminary Certificate identified a number of tasks that the City was required to complete. The first major task is an upgrade to the City's water intake and pumping station to supply water to the City & its regional partners in accordance with the new license. This upgrade was commenced in late 2014 and was completed in February 2016.

One of the other major tasks is the development of a water operations plan for the City. This water operations plan is to cover at least three main items:

1. A description of water management during normal and water short operations,
2. Monitoring and reporting programs, and
3. Contact information for the City of Camrose waterworks facility.

This Water Shortage Response Plan document is intended to serve as the City's "water operations plan" in accordance with the conditions of Preliminary Certificate #00183363-00-00.

Risk Assessment

As part of the City's assessment of the risk to its water supply, the City recognizes an existing study that was completed by the Province in 2012. The "Driedmeat Lake Water Supply Analysis" study, as completed by AEP regional hydrologist Terry Chamulak, used the Battle River Water Management Model and was completed in order to analyze the potential effects on Driedmeat Lake levels and outflow resulting from a 1,600,000 m³ (or 1,600 dam³) municipal demand increase.

As part of that study, a Base Case (BCV7) was simulated using the current City license of 3,084 dam³/year. Additionally, a future scenario (C1) was simulated using a 4,684 dam³ municipal demand. The difference between the two scenarios of 1,600 dam³/year corresponds approximately to the volume of water designated in the Preliminary Certificate #00183363-00-00 (the amount stated in the preliminary certificate is actually 1,580 dam³/year).

Both scenarios were modeled under the criteria of:

- Driedmeat Lake water level at 685.20m above mean sea level (ASL), which is the new Full Supply Level (FSL) for Driedmeat Lake
- In-stream flow criteria applied between FSL and a 684.27m Minimum Operating Level (MOL). This MOL corresponds to the elevation of the bottom of the fish ladder opening in the new weir structure on Driedmeat Lake (installed by the Province in 2009), as is located ~920mm (3 feet) below the elevation of the new weir structure (300mm or ~1 foot below the elevation of the “old” weir).
- Additional / new withdrawals from the lake would be permitted between April 1 and November 30 when flow rates in the Battle River equal or exceed 1.42 m³/s, and between December 1 and March 31 when flow rates in the Battle River equal or exceed 0.7 m³/s.

Using these criteria and other data, a weekly water level duration curve for Driedmeat Lake was created. Scenarios BCV7 and C1 exhibited similar water level trends, indicating that the proposed municipal demand increase has a negligible impact on water levels. The only time that lower levels were observed in Scenario C1 was during the 2001 to 2005 drought, but the water levels still did not drop below the minimum operating level of 684.27m.

In the conclusion section of the report, Mr. Chamulak notes that these modeling results “indicate that the proposed City of Camrose 1,600 dam³ municipal water demand increase will not measurably impact Driedmeat Lake’s water levels nor will there be any appreciable impact on the downstream flow regime” (Chamulak, 11). This does not mean that a water shortage will not occur, but suggests the additional water license will be sustainable, even during water shortages.

Ultimately, this study was a key factor in the Province issuing a new water license (in the form of a Preliminary Certificate) to the City. While the City recognizes the conclusion that the new license would be sustainable during water shortages, the City also recognizes that there still is some risk to water availability.

As outlined in the terms of the draft license to divert water (as described by Preliminary Certificate #00183363-00-00; license number yet to be assigned), the City would be restricted to the amount of water that it could divert from Driedmeat Lake. The draft license notes that this would only occur when the water level in Driedmeat Lake was at or below the MOL, and when the flow in the Battle River dropped below the 1.42 m³/sec and 0.7 m³/sec flow rates noted above. Should those conditions exist, then the City's diversion from Driedmeat Lake would be restricted to that of the City's "older" licenses (i.e. a maximum of ~3,084 dam³/year). This would represent a reduction roughly equivalent to 1/3rd of the combined licenses (3,084 dam³ plus 1,580 dam³).

The City would continue to be allowed to divert water from Driedmeat Lake even during a time of imposed water restrictions. However, it is possible that the rate of diversion would also be restricted by the Province; this is not currently identified within the draft license. If a proportional diversion rate reduction of 1/3rd was imposed by the Province, for instance, the maximum diversion rate might be reduced to 0.2 m³/sec or 200 litres per second (i.e. 2/3rds of the 0.3 m³/sec maximum diversion rate outlined in the draft license). For comparison purposes, the City's maximum diversion from Driedmeat Lake over recent history was 10.01 ML/day, which occurred on July 9th, 2014. As this is equivalent to 116 litres per second or 0.116 m³/sec, the City does not anticipate any concerns with a potential reduction to the diversion rate, particularly since the implementation of a water shortage response plan will also help the City reduce its diversion rates from Driedmeat Lake.

Current Water Operations Initiatives

The City of Camrose is conscientious of the need for water conservation, and has worked hard over the past few decades to increase water efficiency. These efforts demonstrate the City's commitment to water conservation. Some examples of the City's current and/or annual projects and initiatives include:

- "Be Wise with Water" campaign: actively promoting water conservation through public and classroom education, rebate programs (water conservation kits, toilet rebates), and local advertising.
 - By way of example, since the beginning of the Toilet Rebate Program, 1084 high volume toilets have been replaced with low-flow models (to the end of 2016). The City estimates that this has led to a savings of ~41,500 cubic metres of water annually.
- Performing water audits in residential and non-residential properties

- Starting in late 2012, the City has offered a new service of conducting water audits within homes or businesses. These audits are intended to document existing water-consuming devices within a facility (such as toilets, sinks, showers, wash bays, etc.), and provides the homeowner or business owner with a summary of our findings as well as recommendations for how the owner can reduce their water consumption.
- Uni-Directional Flushing (UDF) Program
 - The City cleans the inside of municipal watermain on a regular basis to remove accumulated biofilm growth and sediment. This improves the quality of water being delivered to the customer. This program isolates individual watermain to ensure that water is flushed through only one section at a time, resulting in higher velocities and less water used than what is seen through traditional watermain flushing programs. By continuing this program on an annual basis, the City has seen that initial turbidity readings are consistently getting better each year. This has led to shorter run times and less water used as compared to what was required during the earlier years of this program.
 - Through the UDF program, City crews also exercise each water valve within the City at least once every two years. Leaky or corroded valves are thus identified and fixed on a proactive basis, resulting in less risk of watermain breaks at corroded valves and less water being wasted.
- Water Treatment Plant Backwash Water re-use system
 - The rapid sand filters at the City's water treatment plant are backwashed on a regular basis to remove trapped contaminants and to ensure proper operation of the filters. This backwash water is non-potable and is held in a storage tank before being pumped directly to the sanitary sewer system. In 2010, the City installed transfer pumps in the backwash water holding tank to allow City crews to divert this non-potable water to City water trucks. This water can then be used by City departments for various non-potable purposes, including the watering of trees, flushing of sanitary sewers, dust control on roadways, etc. This initiative has greatly reduced the use of potable water for non-potable municipal purposes.
 - The City is currently investigating the potential benefits and liabilities associated with allowing private users to also access this non-potable water source.
- Cast iron watermain replacement program
 - Over the past 40 years, cast iron watermain have been systematically replaced with newer materials, drastically reducing the number of watermain breaks each year (from over 2,000 per year to less than 30 per year). As of the end of 2017,

the City anticipates that it will have only one block of cast iron watermain remaining within the City.

- Water metering
 - 100% of all businesses and residences in Camrose are metered. Studies have shown that municipalities with a high proportion of water meters have a lower water consumption rate per capita than municipalities with lower proportions of metered properties.
 - In 2015, the City completed a 7-year program to replace the existing water meters with modern “radio read” meters. By replacing the older water meters, the City has drastically reduced the risk of leaks within the water meter, which would result in unaccounted for (and unbilled) water usage.
 - The City has previously approved the purchase and installation of a truck-mounted meter reading system which will allow the City to measure flows on a more frequent basis. In the future, the new meters will be able to also allow the City to identify leaks within a home or business immediately.
- Consumption-based water & wastewater utility rates
 - Utility charges for water and wastewater are proportionate to the amount of water used, in addition to a flat charge per month for each account. Studies have shown that municipalities and private utility companies which charge for water on a per unit basis have a lower water consumption rate per capita than municipalities and utilities which charge their utility rate payers solely on a flat rate basis.
 - The water supply agreement between the City and Cargill establishes that water meters for the Cargill facility will be based on an “increasing block rate” structure, which charges higher rates for higher levels of water consumption.
 - In 2015, the City undertook a review of municipal water rates from across the Province to see what other rate structures are currently being used. In future years, the City is hoping to further investigate options for encouraging additional water conservation through a reworking of the City’s water rate structure. City Administration anticipates that this review will investigate other rate structure options such as “increasing block rates” or “seasonal block rates”, which are more effective at encouraging water conservation than even the existing water rate structure.
- Aquatic Center practices
 - At the City-owned and operated Aquatic Centre, the City uses older pre-treated and recycled pool water to maintain water levels in the hot tub instead of using new water.

- Water is recycled and treated in the facility to reduce the amount of wastewater produced and to reduce the amount of new water needed.
- In 2017, the City of Camrose initiated work related to the expansion of the Aquatic Centre. As part of this work, the existing Aquatic Centre will see an extensive upgrade which will also reduce water consumption within the facility.
- Watering of municipal sports fields
 - Wherever possible, the City's parks department restricts the watering of municipal sports fields to the early morning hours to reduce evaporative losses.
- Use of mulch for landscaped areas
 - The City's parks department uses recycled wood chippings as mulch within various planting beds and around the "wells" of newly planted trees to help retain moisture and reduce watering requirements.
 - The City is currently investigating the potential benefits and liabilities associated with allowing private users to also access the City's supply of mulch material for their own properties.
- Golf course irrigation
 - The City-owned & operated Camrose Golf Course currently uses only non-potable water for the irrigation of all of its fairways, tee boxes and greens. This is done through use of water stored within Mirror Lake (which is part of the Camrose Creek system running through the middle of the City), under license #00247786-00-01.
- Inspections
 - For all new property developments, the City installs or oversees the installation of new water and sewer services. This ensures that new services are properly installed, and reduces the possibility of water leaks and/or unwanted infiltration into the sanitary and storm systems.
 - The City also monitors the installation of new utilities and services by private contractors in all new subdivisions. This monitoring includes the review of 3rd party leakage testing on all installed infrastructure. Similar to what was noted above, this reduces the possibility of leaky or faulty infrastructure.
- Partnerships with organizations such as the Battle River Watershed Alliance (BWRA)
 - The BRWA is a community partnership working to sustain and improve the health of the Battle River Watershed. The BWRA runs multiple education and outreach activities, including educational workshops, field trips, and various contests for students of all ages. Recent research done by the BWRA includes drought management, source water protection, and water quality with respect to non-point source pollution management. They are also largely involved in

many riparian restoration projects. The City of Camrose is a founding member of the BRWA and continues to support the activities of the BRWA in various ways.

In addition to the initiatives noted above, there are two main governing documents that the City uses to help guide the City's efforts to water conservation. The "Water Conservation / Water Use Policy" and the "Water Conservation / Water Use Bylaw" were developed by City Administration and adopted by City Council in 2006. These documents outline the City's approach to dealing with water shortages, whether those shortages occur as a result of drought, infrastructure failures, unexpected failures of a major water system component resulting in a sudden shortage of water supply capabilities, or any other unpredictable event. In general terms, the bylaw & policy are set up on the basis of four distinct water conservation stages, and identify the restrictions imposed at each stage (with Stage 4 being the most restrictive).

The above water conservation programs and strategies establish a strong foundation for dealing with water shortages. This foundation allows the City to prepare for water shortages and minimize the adverse effects. In this WSRP, the City has further researched the improvement and/or addition of options for dealing with a water shortage.

Options that are being researched further for possible implementation include:

- Seek technical and financial assistance
- Water rights and cooperative agreements
- Enhancement of existing public education programs in proportional response to water shortages being experienced
- Reducing the frequency of hydrant flushing as water shortage stages progress, until the City's UDF program is stopped altogether.
- Restriction to water usage in restaurants, cafeterias, and other food-related businesses, as well as in hotels and other lodging services.
- Restrictions to ornamental non-recirculating fountains and outdoor watering
- Private and/or municipal swimming pool restrictions
- Expanding water audit program to commercial/industrial and residential users.
- Expanding restrictions to bulk water users and expanding use of filter backwash water at the City's water treatment plant.
- Encourage residents to utilize rain barrels to reduce outdoor water demand
- Encouraging the use of low-impact stormwater management techniques for new or existing developments, including xeriscaping and the use of hardy and native landscaping materials.
- Reuse of treated wastewater from the City's storage lagoons for non-potable purposes (watering trees, sanitary sewer flushing, etc.)

- Temporarily reducing the base output pressure set points of the City’s potable water pumping stations to reduce the overall operating pressure of the water distribution system. This would potentially reduce the volume of water used by City residents and businesses for any time-based uses such as showering, washing food or washing vehicles, as opposed to volume-based uses such as filling pots for cooking or filling batch reactors.
- Provide opportunities for community and stakeholder engagement regarding input and feedback on plans, and incorporating this input into future versions of this water shortage response plan and related plans.

Through each of the existing and proposed initiatives listed above, the City recognizes its corporate responsibility of “leading by example” to the citizens and businesses within Camrose, and seeks to be a model through its early and voluntary implementation of these initiatives.

Monitoring and Triggering

The City of Camrose recognizes that water shortages may exist for a number of reasons. While the most likely reason would be a water shortage due to extended periods of drought, operational emergencies such as mechanical failures at the City treatment or pumping facilities could result in immediate water shortages. While much of the following discussion is related to drought-related triggers, many of the same triggers can also assist the City with responding to sudden and/or short-term water shortages due to mechanical issues.

Through the use of monitoring programs, early warning signs of drought can be recognized in order to possibly reduce the negative effects of severe weather. The earlier severe weather can be predicted, the more time there is to prepare.

The City currently uses a variety of existing programs in order to monitor “water availability” within Driedmeat Lake and to predict severe weather that would drastically affect water supply. (The City has loosely defined “water availability” as the amount of remaining water that is stored in the lake, being situated above the pre-determined “minimum operating level” of the new weir of 684.28m ASL. Once the level of Driedmeat Lake drops to 684.27m or lower, the City’s permitted diversion from Driedmeat Lake may be restricted by the Province.)

The following are a few of the key monitoring programs that are currently being used by the City:

- Alberta Environment & Parks (AEP) records the elevation of Driedmeat Lake at the outfall of the lake (Water Survey of Canada Station #05FA020) every 15 minutes. This information is posted on the AEP website.
- AEP also records the flows of the Battle River at the Highway 21 crossing near Duhamel, just upstream of Driedmeat Lake (Water Survey of Canada Station #05FA011) every 15 minutes. This information is also available on the AEP website.
- AEP Water Supply Outlook provides monthly summaries for a variety of parameters, such as snowpack and precipitation
- The City monitors and records daily precipitation (rain and snow) at two locations within the City
- The City also monitors long-term weather forecasts for Camrose and the surrounding area
- The City measures how much raw water is pumped out of Driedmeat Lake
- The City continuously monitors the quality of raw water that is being pumped out of Driedmeat Lake, as well as the quality of potable water that is produced by the WTP
- The City continuously monitors the volume of potable water that is being stored in its various water reservoirs, as well as the condition / status of its various potable water pumping stations throughout the City.
- The City also monitors the amount of water used by its various regional customers (Village of Bittern Lake, Camrose County, and Cargill Limited)

The City uses the above monitoring programs, in part, to predict future water availability within Driedmeat Lake (as well as for various other municipal purposes). The City has used this information to develop specific triggering criteria which can be used to implement advanced conservation measures, depending on the anticipated water shortage that is occurring or that is expected to occur. By doing so, the City hopes to proactively reduce water consumption system-wide in order to stretch the remaining available water in Driedmeat Lake for as long as possible before provincially-imposed restrictions would be imposed (such as those identified in the Risk Assessment section above).

To assist with the City's decision-making process, City Administration has developed a MS Excel-based model to estimate the timeframe to when there will be no more "available water" within Driedmeat Lake. The model has been developed to account for a variety of "inputs" (mainly average precipitation in the area and the flows seen in the Battle River, upstream of the lake) and "outputs" (including City water diversion from the lake, average evaporative losses, and losses from the lake through both the fish ladder and the riparian gate, both located in the Driedmeat Lake weir structure). While this model is fairly simple in its structure, the model has proven to still be a valuable tool to estimate the number of days of available storage remaining in the lake.

The City's model has been set up to identify a number of specific water storage scenarios. Listed in order from lowest risk to highest risk for the City, the scenarios are:

1. Where the amount of storage in the lake is predicted to increase
2. Where there is more than 120 days (4 months) of available storage remaining.
3. Where there is between 60 and 120 days (2 to 4 months) of available storage remaining.
4. Where there is between 30 and 60 days (1 to 2 months) of available storage remaining.
5. Where there is less than 30 days (1 month) of available storage remaining.

Since the spring of 2015 and on a weekly basis during non-winter months, City Administration reviews available data through the identified monitoring programs to estimate the current length and severity of potential water shortage conditions. These estimates are used by the City to identify what needs to be done in order to reduce the consequences of a current or potential water shortage. Specifically, the City can use this information to implement any of the four "stages" that were identified in the City's Water Conservation / Water Use bylaw and policy. The following table identifies the current triggers being used by the City.

Table 1: Current Triggers and Management Actions

Trigger Point: Reservoir Storage (Days until "Available Storage" reaches zero)	Water Shortage Stage	Response Target: Water Use Reduction Goal (as %)
> 120 days	Stage 1 – Watch	0 to 5%
60 – 120 days	Stage 2 – Warning	5 to 15%
30 – 60 days	Stage 3 – Critical	15 to 25%
< 30 days*	Stage 4 – Emergency Measures	25 to 33%

*Note: once the amount of "available storage" drops reaches zero (0) days, the City's diversion of water from Driedmeat Lake would be restricted. Whether the City's diversion from the lake is actually restricted will depend primarily on the flow within the Battle River, as measured at the Water Survey of Canada Station #05FA011.

The water use reduction goals or target noted above would increase with each water shortage stage. The 33% water use reduction goal listed for Stage 4 (Emergency Measures) would allow the City to quickly adapt to any water diversion restrictions imposed by the Province (in accordance with the new license), as described in the Risk Assessment section above.

While the triggers noted in the above table focus on the anticipated number of days of available water storage in Driedmeat Lake, the more advanced management action "stages" may also be implemented in response to emergency operational issues that may arise from time to time.

Plan Implementation Schedule

For each of the four drought stages previously described, actions must be taken in order to reach the targeted percentage of water use reduction. The water use reduction and response strategies in Stage 1 through Stage 4 vary in scope and intensity. A variety of actions could be implemented by the City to help meet the targeted water use reductions. The following is a summary of the actions that are currently being considered by the City of Camrose. The following list is by no means meant to be exhaustive or conclusive, as it is the City's intent to monitor the plan for effectiveness, as will be explained later in this document.

Stage 1 Water Shortage - Watch

Storage Trigger: Greater than 120 days

Water Use Reduction Target: 0 to 5%

Anticipated Responses:

- Public water conservation education
 - The City will maintain an advertisement campaign in relation to methods for residences and businesses to conserve water. A public awareness campaign may include advisory of potential water shortage by news release, and education programs regarding water conservation measures.
- Continue with and develop/implement new incentive-based programs to encourage conservation of water
- Residents and businesses will be asked to voluntarily reduce outdoor water use
 - Only water lawns between the hours of 6 am to 9 am, and 7 pm to 11 pm
 - Do not wash impervious surfaces with pressurized water
 - Wash vehicles with buckets and sponges
- Request that businesses voluntarily reduce their water use including:
 - Restaurants and catering businesses will be asked to voluntarily restrict serving water with meals except at the customer's request
 - Lodging establishments will be asked to voluntarily reduce the frequency of changing of linens for guests staying more than one night, except for health and safety reasons.
- No specific restrictions imposed at the City's bulk water filling stations
- Regional customers will be notified of these measures and will be asked to participate on a voluntary basis or as required by their respective service agreements

Stage 2 Water Shortage - Warning

Storage Trigger: 60 to 120 days

Water Use Reduction Target: 5 to 15%

Anticipated Responses:

- Continue with public water conservation education

- Advertisements in the local newspapers, announcements on local radio stations and television.
- Outdoor water restrictions
 - Residents and businesses must restrict watering of lawns between 6 am to 9 am and from 7 pm to 11 pm.
 - Flowerbeds, vegetable gardens, and newly-laid sod may be watered at any time by hand provided that the water used has been drawn from a rain barrel or other storage device which has been filled solely from rain water, or a hose with a nozzle fitted with a trigger shut-off to restrict water flow.
 - Sprinklers and water toys may be used for recreational purposes by children as long as children are actively playing; includes pools of a capacity not more than 1,000 litres.
- Restaurants and catering businesses are asked to not automatically serve water with meals, but rather serve water when a customer requests it
- Lodging establishments are asked to not change sheets more often than every four days for the same guests, except for health and safety reasons. They will also be encouraged to place visible information in bathrooms regarding water conservation
- Vehicles can only be washed with bucket and hand held hose or at a commercial car wash
- Implementation and enforcement of fines for violating these restrictions
 - All consumers or persons are prohibited from wasting water. The Bylaw Officer or designate may take action under the Water Conservation / Water Use Bylaw if a consumer or person is found to be wasting water. In determining if an activity constitutes wasting water, consideration will be given to the following:
 - The volume of water reasonable required to perform the activity undertaken
 - The length of time that water has been allowed to run
 - The degree of control exercised over the flow of water
 - The purpose to which the water is being put
 - The stage of conservation on water consumption presently in place
 - The existence of any other factors reasonably suggesting that the wasting of water is occurring or has occurred
 - Special circumstances where the consumer or person can show to the satisfaction of the City that the use of water was necessary.
- Regional customers will be notified of these measures and will be required to participate as required by their respective service agreements.
- The City may also look at more extreme options such as lowering the normal operating pressure of the water distribution system to indirectly reduce the amount of water being used within homes and businesses.
- Contact the Province to advise them of the current water supply situation

Stage 3 Water Shortage - Critical

Storage Trigger: 30 to 60 days

Water Use Reduction Target: 15 to 25%

Anticipated Responses:

- Continue with public water conservation education
 - Advertisements in the local newspapers, announcements on local radio stations and television, and road signs placed in high traffic areas.
- Outdoor water restrictions
 - All outdoor and non-essential water use is prohibited. This includes:
 - Watering of lawns
 - Washing of cars
 - Washing of impervious surfaces (sidewalks, pads, exteriors of buildings, etc.)
 - Recreational use of sprinklers and water toys, as well as the filling of swimming pools. This includes the City of Camrose Spray Park.
 - Fountains using potable water
 - Cleaning of municipal water pipes (i.e. the Uni-Directional Flushing program), except in circumstances where this restriction would pose a health or safety concern.
 - Flowerbeds, vegetable gardens, and newly-laid sod may only be watered by hand, provided that the water used has been drawn from a rain barrel or other storage device which has been filled solely from rain water, or from a hose with a nozzle fitted with a trigger shut-off to restrict water flow. Unsupervised watering will not be permitted under any circumstance.
- Restaurants and catering businesses shall not automatically serve water with meals but may serve water when a customer requests it.
- Lodging establishments shall not change sheets more often than every four days for the same guests, except for health and safety reasons.
- Implementation and enforcement of fines for violating these restrictions
- Regional customers will be notified of these measures and will be required to participate as required by their respective service agreements.
- The City may also look at more extreme options such as lowering the normal operating pressure of the water distribution system to indirectly reduce the amount of water being used within homes and businesses.
- Contact the Province to advise them of the current water supply situation, and to start investigating options for potential technical and/or financial assistance

Stage 4 Water Shortage – Emergency Measures

Storage Trigger: Less than 30 days

Water Use Reduction Target: 25 to 33%

- Conditions that would lead to a Stage 4 Drought are highly unlikely. If this occurs, the City will implement a rationing program to ensure that consumers receive water for essential uses. Emergency measures will be required, to be determined on a situational basis by the City Manager.

Anticipated Responses:

- Continue with public water conservation education
 - Advertisements in the local newspapers, announcements on local radio stations and television, road signs placed in high traffic areas, and door to door campaigns.
- All non-essential water use is prohibited
 - No outdoor watering will be allowed, and indoor water use will be restricted.
- Bulk water sales will be allowed for residential use only.
- Implementation and enforcement of fines for violating these restrictions
- The policy measures will be reviewed in this stage for the following groups:
 - Businesses that depend on water to deliver a product or service, for example
 - Commercial car washes
 - Market gardens
 - Greenhouses
 - Commercial farm contractors
 - Golf course greens
 - Residential water necessities including lawns with new sod
- Regional customers will be notified of these measures and will be required to participate as required by their respective service agreements.
- The City may also look at more extreme options such as lowering the normal operating pressure of the water distribution system to indirectly reduce the amount of water being used within homes and businesses.
- Contact the Province to advise them of the current water supply situation, and to finalize options for potential technical and/or financial assistance

As part of the management actions for the more critical stages of drought, the City also recognizes that cooperation must occur between users of the Battle River watershed. The Province of Alberta uses a “First in Time, First in Right” system for the priority of water use. This system allocates water to a licensed users based on the user’s priority (or seniority): the earlier a license was granted, the greater its priority.

The City currently has three licenses with priorities of 1958, 1978, and 1982. Once the City has satisfied all conditions of the Preliminary Certificate #00183363-00-00, the City understands that its new license will have a priority of 2002. There are two major water users on the Battle River that have priorities more senior than the City’s original 1958 license. These belong to the Department of National Defense and Alberta Power (2000) Ltd., both of whom draw water directly from the Battle River. During periods of extreme water shortage, the City could consider entering into water sharing agreements with these and other users (in accordance

with Section 33 of the *Water Act*) to ensure the continued availability of water for Camrose and its regional customers.

- City of Camrose water licenses, drawing from Driedmeat Lake:
 - 1958-05-14-001 for 1,233,480 m³.
 - 1978-06-26-001 for 863,440 m³.
 - 1982-02-22-001 for 986,780 m³.
 - Preliminary Certificate #00183363-00-00 for 1,580,000 m³ (which would ultimately lead to a new license with priority 2002-02-20-002).
- Major notable water licenses along the Battle River or its tributaries include:
 - 1951-09-12-00 Department of National Defense (Municipal), which draws from the Battle River for 5,017,077 m³.
 - 1955-03-24-001 Alberta Power (2000) Ltd. (Commercial), which draws from the Battle River for 456,388,310 m³.
 - 1963-05-14-005 City of Wetaskiwin (Municipal), which draws from Coal Lake for 2,468,000 m³.
 - 1972-06-02-001 Enerplus Corporation (Industrial), which draws from the Battle River for 2,466,960 m³.
 - 1973-04-10-003 Alberta Environment and Sustainable Resource Development (Dewatering), which draws from Ribstone Creek for 1,019,691 m³.
 - 1976-08-27-001 Alberta Power Ltd. (Commercial), which draws from the Battle River for 234,373,900 m³.
 - 1979-11-60-01 Enerplus Corporation (Industrial), which draws from Coal Lake for 1,275,420 m³.
 - 1981-11-09-001 City of Wetaskiwin (Municipal), which draws from Coal Lake for 1,850,230 m³.
 - 1983-02-08-011 Ducks Unlimited Canada, Edmonton (Enhancement), which draws from Iron Creek for 1,255,194 m³.
 - 1985-02-22-006 Town of Wainwright (Municipal), which draws from the Battle River for 1,728,400 m³.
 - 1988-09-08-003 Ducks Unlimited Canada, Edmonton (Management), which draws from Nelson Creek for 1,253,218 m³.
 - 1993-04-28-001 Ducks Unlimited Canada, Edmonton (Enhancement), which draws from the Battle River for 1,596,735 m³.
 - 1993-05-12-001 Big Hay Lake Drainage District (Management), which draws from Big Hay Lake for 1,808,280 m³.
 - 2005-04-13-002 Alberta Environment and Sustainable Resource Development (Management), which draws from Driedmeat Lake for 1,150,000 m³.

Monitoring of Plan Effectiveness

This Water Shortage Response Plan is not a fully comprehensive document – it does not include every situation that could ever occur, nor does it include every possible drought mitigation measure or response. As time progresses and the needs of the Camrose water system grow and evolve, the current WSRP should be reviewed and updated to ensure that remains effective.

The following are some suggestions that the City might consider using to help with future evaluations of the WSRP:

- The conditions of the water supply system should be recorded.
 - This may include the drought indicator data such as reservoir levels, river flow rates, precipitation, etc., as well as demand side data such as water treatment plant production, water obtained from direct flow rights, storage amounts, etc.
- Document any key issues, challenges, and concerns that arose during:
 - Drought monitoring
 - Drought mitigation activities
 - Status of the mitigation related activities to date and other relevant factors (i.e. budget)
 - Implementation of each stage of the drought response program
 - The level of effort expended by the City on public education measures
 - Number of incentives distributed
 - Number of citations delivered to customers
 - Input from local health authority and other key stakeholders
 - Public perceptions and response to the drought
 - This may include documenting comments provided at public meetings or City Council meetings and any e-mails or letters sent to the City regarding the drought response.
 - Formal public surveys may also be used to gather public input depending on the magnitude of the drought and City budget available for the survey.
 - Track how favorably the public reacted to the selected mitigation or response strategy
 - Consider a review process of alternative means to engage the public
- Other items that may be of note:
 - Technical feasibility

- Is the selected mitigation or response strategy still technically feasible and will that mitigation or response strategy continue to work as intended?
- Are there any new mitigations or response strategies that could or should be added?
- Did implementation occur in a timely manner during each stage? How can it be improved for the next water shortage?
- Did the City have sufficient staffing resources available to implement each action?
- Perceived benefits
 - Did the selected mitigation or response strategy result in the desired reduction to water usage system-wide? Were there certain sectors of the community (i.e. residential, certain industries, etc.) which responded more effectively to the selected mitigation or response strategy?
 - How might the City amend the mitigation or response strategies based on the noted response?
- Cost effectiveness
 - What was the cost of implementing the selected mitigation or response strategy? This will require a consideration of all factors, including staff time, advertising, etc.
 - How do the implementation costs compare with the real or perceived benefits?
- Environmental sensitivity and other impacts
 - What were the environmental benefits/costs to implementing the mitigation and/or response strategy? The City will need to consider the benefits/costs for any new additions as well.
 - Are there any environmental issues or other impacts that should be further considered?

These suggestions provide a foundation to assess the effectiveness and practicality of the WSRP. The City shall continually assess and develop the WSRP to improve its effectiveness.

Finally, the City should schedule reviews of the WSRP on a regular basis. As a minimum, the current recommendation is that the WSRP would be reviewed after any major water shortage event (where the City initiates Stage 3 or Stage 4 of this plan) or every 5 years, whichever comes first.

Contact Information

As part of the requirements of Preliminary Certificate #00183363-00-00, a water operations plan (i.e. this Water Shortage Response Plan) is to include contact information for the City of Camrose waterworks facility. As there are a number of internal stakeholders affected by the WSRP document, the following is a list of all affected stakeholders.

- Engineering Services (author of this plan)
 - Key contact: Jeremy Enarson, Director of Engineering
 - Mailing address: 5204 – 50 Avenue, Camrose, AB, T4V 0S8
 - Physical address: 5204 – 50 Avenue, Camrose
 - Phone: 780-672-4428 (office)
 - E-mail: engineer@camrose.ca
- Public Works
 - Key contact: Sean Mascaluk, Superintendent of Utilities
 - Mailing address: as above
 - Physical address: 4204 – 51 Avenue, Camrose
 - Phone: 780-672-5513 (office)
 - E-mail: utilities@camrose.ca
- City of Camrose Water Treatment Plant
 - Key contact: Allan Baier, Senior Operator
 - Mailing address: as above
 - Physical address: 3701 – 50 Street, Camrose
 - Phone: 780-672-8471 (office)