# Upper Qu'Appelle Water Supply Project

# Water Scarcity, Water Supply, Water Security

## An Economic Impact & Sensitivity Analysis

**November 2012** **South Central Enterprise Region**

Top: Gardiner Dam Lake Diefenbaker
Center: Southern Alberta Canal
Bottom: Qu'Appelle Valley Lakes

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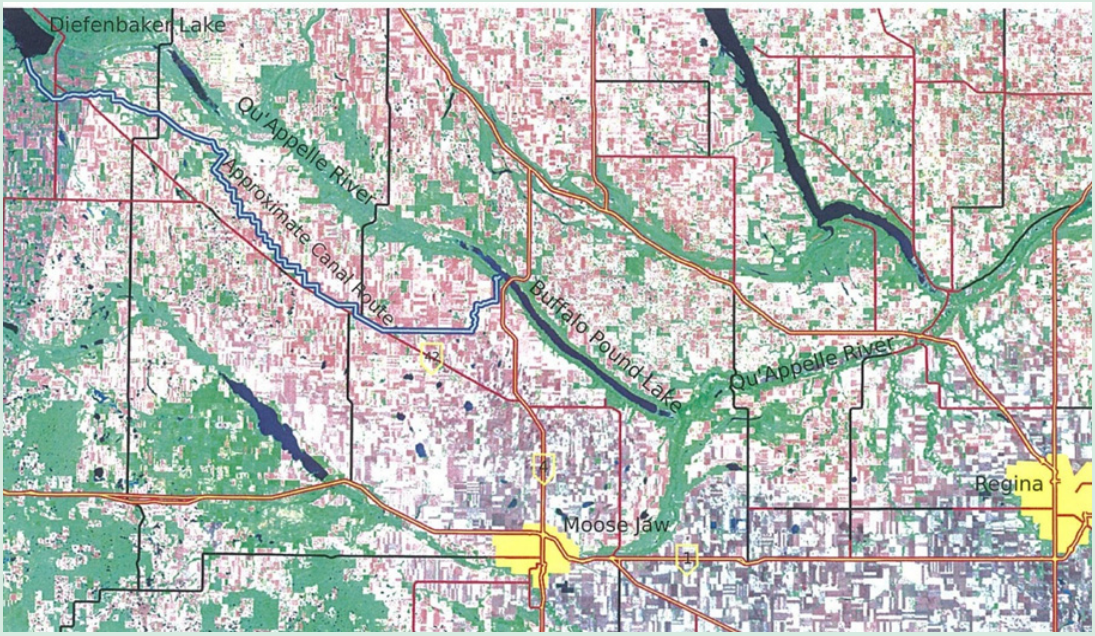
## Upper Qu'Appelle Regional Water Conveyance



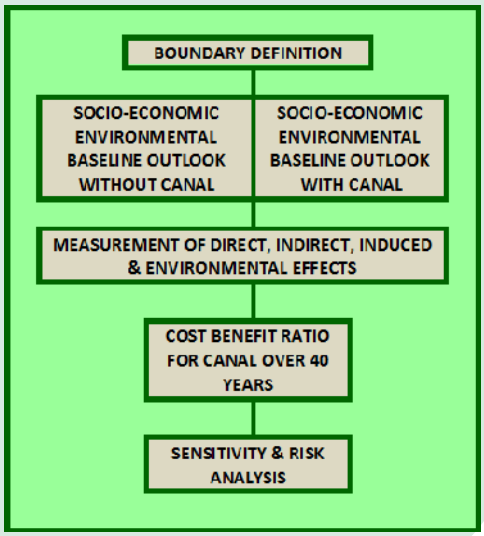

The Qu'Appelle Conveyance is a project to seasonally move waters from Lake Diefenbaker near the Qu'Appelle Dam along a nearly ninety kilometer canal to the Buffalo Pound Lake north of Moose Jaw. The project involves four main elements consisting of a pump station at Lake Diefenbaker, a canal to Buffalo Pound Lake, a booster pump station along the canal route and a spillway into Buffalo Pound Lake. Canal crossings for farmers and transportation crossings would also be constructed as a part of the capital works. AECOM engineering design studies have estimated the total capital costs for the project at almost $1.2 billion, while annual operating costs for the canal have been estimated to grow from $4.5 million to $11.5 million when the canal is operating at full capacity.

## Socio-Economic Environmental Evaluation Framework

To make decisions on major expenditures such as the Conveyance, it is necessary to determine the costs and benefits derived from the investment. For this purpose, a socio-economic environmental evaluation framework measured the impacts from the canal investment and provided a sensitivity and risk analysis of the results. Five main steps were involved in the analysis.

1. Defining the regional impact boundary for the impact of the canal.
2. Creating outlooks for the regional economy with and without the canal.
3. Measuring direct, indirect and induced economic and environmental effects.
4. Measuring the cost benefit ratios.
5. Undertaking a sensitivity and risk analysis.

Results from the evaluation were positive with net benefits well in excess of the cost of the water supply project.



# Visionary Saskatchewan Water Planning in the 20th Century

The South Saskatchewan River Project led to construction of the Gardiner and Qu'Appelle Dams and the formation of Lake Diefenbaker in the 1960s. The vision for the project, however, remains incomplete.

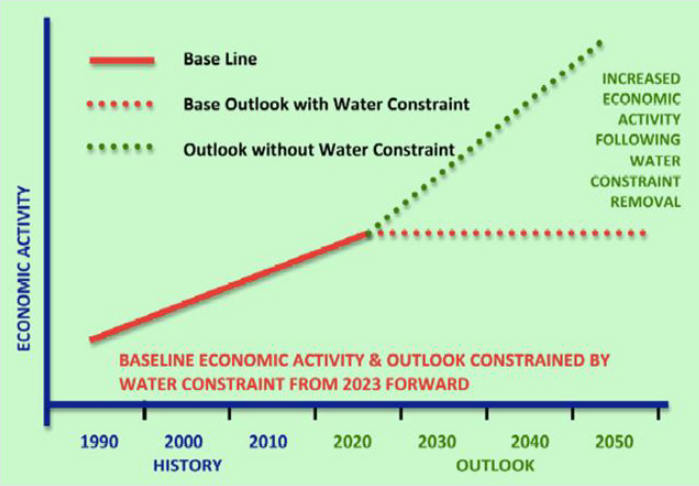
Photo Source: AAFC-PFRA

Following the 1930s droughts, Saskatchewan's leaders saw the need to improve water security for agriculture, municipalities and industry. Lake Diefenbaker was to provide the "water heart" for the province with water supplied through canals and pipelines from the lake to the four points of the compass. While water was moved from the Lake to the northeast towards Saskatoon and southeast into the Qu'Appelle River, the full benefits of Lake Diefenbaker's abundant water supplies have never been fully developed. The Upper Qu'Appelle Conveyance continues the work and visionary planning that was one positive legacy from the 1930s droughts.

# Why is the Conveyance Needed Now?

Southern Saskatchewan and the Moose Jaw-Regina Industrial Corridor is growing. Its demands for water are already coming close to meeting the capacity of the existing water supply infrastructure through the Upper Qu'Appelle. In time these water supply constraints will limit economic and social growth.

Studies by the Saskatchewan Watershed Authority in 2012 concluded that: *water demand (use) in the Qu'Appelle River Basin is going to rise in the future.* They noted that *water uses from human, industrial and agricultural uses will have increased by 134% by 2040 and 171% by 2060 from 2010 levels.* The demands arose primarily from irrigation and potash growth.




Already some water related economic opportunities in the region have had to adapt to the emerging water scarcities. Western Potash made arrangements with the City of Regina to purchase a long term supply of sewage water from the city.

Expanded irrigation opportunities for over 100,000 acres that could increase farm incomes, stabilize rural populations and create a foundation for even higher valued added food production cannot proceed without secure water supplies. Other potash expansions and mines and industrial facilities in the Qu'Appelle watershed will also require water certainty prior to making their multi billion dollar investments. Planning, design, approval and construction of such large water infrastructure can take many years. Some water outlook estimates suggest major water constraints could be experienced by 2023; about the time it would take to get the conveyance in place.

**Upper Qu'Appelle Canalized Channel**

The existing Upper Qu'Appelle water supply, through 35 kms of channelized river, has a design capacity of 14 $m^3/s$. Current investigations show flow capacity at 6 $m^3/s$ - less than half the design capacity. The remaining 63 kms of the natural river channel is also losing capacity as the channel meanders, silts and erodes. Issues of water quality and flooding have been studied for decades with only limited resolution.

**Meandering Qu'Appelle Natural Channel**

# Does the Conveyance Make Economic Sense?

The cost of building and operating the Conveyance can be considered against the direct, indirect and induced benefits arising from the canal investments and the economic developments made possible by the secure water that removes water supply constraints. Following a review of water intensive development opportunities in the canal impact area, the benefits from the canal were identified as:

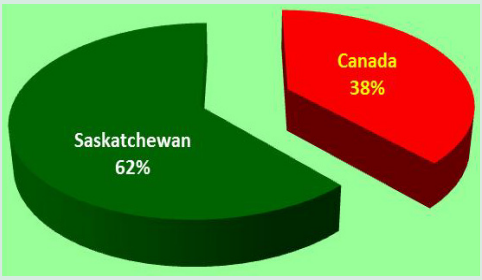
- An increase in the number of potash expansions and mines;
- Over 100,000 irrigated acres;
- New agricultural value added activities including cow-calf operations, greenhouses, food processors and packers;
- New industrial developments in the Moose Jaw - Regina corridor including an ethanol plant, a refinery, and a fertilizer plant.; and
- An increased population in the Regina - Moose Jaw Corridor.

**Results from the analysis over a forty year period suggest:**

- Benefit cost ratios for the project of between 1.5:1 and 2.7:1;
- Stimulated direct investment of $17 Billion for the $1 Billion project investment;
- An increase in Gross Domestic Product of $130 Billion;
- An increase in Personal Income of $29 Billion;
- Increased employment of 426,125 person years;
- Returns to governments in taxes in excess of $36 Billion;
- A $250 million benefit from adapting to climate change.

**Benefits accrue to both Canada (38%) & Saskatchewan (62%).**

Photo Source: Parsons




# Other Water Security, Environmental & Economic Effects

Currently, the clean waters from Lake Diefenbaker are moved to Buffalo Pound where they are treated in the granular activated charcoal filter for industrial and human consumption in the Moose Jaw-Regina area. Following municipal and industrial water use, waters are returned to the Lower Qu'Appelle River.

Water quality declines throughout the system. In the upper reaches of the Qu'Appelle algae blooms, silting and farm chemicals reduce the purity of water leaving the Lake. When waters are returned from industrial or municipal use there are more chemicals and raw sewage introduced into the Qu'Appelle, further reducing water quality, increasing algae blooms in the lower lakes and reducing the environmental quality of river waters creating hazards for fish and wildlife.

The Conveyance will address some of these water quality issues. Lake Diefenbaker waters are remarkably pure. The upland canal route will reduce end loading of farm chemicals from natural runoff. Contaminants in the Upper Qu'Appelle from silting, algae and other sources will no longer be added to the water supply.

Algae Bloom on Mission Lake

Waters returned to the Lower Qu'Appelle lakes will have fewer contaminants and downstream algae blooms can be reduced for all residents and cabin owners through the Valley. In addition, the security of the water supply from the reliable Lake Diefenbaker source can also secure the water required annually to maintain the natural flow of the river downstream from Buffalo Pound Lake.

The projected maximum annual water use by the Conveyance would account for only 4% of the annual mean Lake Diefenbaker discharge over the past 100 years, well below flow variability, and can be accommodated by modified lake water management.

Global warming is expected to result in changes to the climate of the watershed resulting in higher temperatures, increased precipitation and a periodic increase in the frequency of extreme weather events in the form of droughts and floods. The developments can challenge the natural river flow and the natural habitat of the river valleys. By creating a major water diversion option, water managers can be expected to increase their water management and security tools to adapt to a changing climate with benefits both the Qu'Appelle and the South Saskatchewan River watersheds.

Other benefits also result from the Conveyance, including an improved investment climate, food market development, sustainable rural communities, renewable energy generation and improved water security for recreational property, wildlife and fish habitats.

## A Long Term Investment in Saskatchewan's Future

Water security has always been important for Saskatchewan. Prior to settlement, First Nations moved with the droughts and wintered in the river valleys. Droughts of the 1930s created a human and environmental tragedy that lasted for generations. It set the foundation, however, for visionary water planning with the formation of a secure water supply in Lake Diefenbaker and a distributional opportunity for all regions of the province. The water investments in the 1940s, 1950s and 1960s are still benefiting generations of Saskatchewan residents. Over 100,000 acres has been irrigated around the Lake, clean hydro electric power is generated from turbines at Coteau Creek, tourism has grown around the water source and wildlife have thrived in the healthy man made aquatic environment.

In 1980, Regina and Moose Jaw requested the federal and provincial governments complete a comprehensive water supply study that concluded municipal requirements for raw water could be met from Buffalo Pound Lake via the existing Qu'Appelle River channel to 2030, with the addition of granular activated carbon treatment. At the time, water quality rather than water supply issues were paramount and central to the evaluation. At the time a multi-purpose canal via several routes through the Qu'Appelle and Thunder Creek as far as the Souris was identified. In the thirty years since there have been major changes in the levels of development and scope of opportunities available to the area. The population of the two cities is much larger and expected to continue to grow. Significantly, the population of the two cities, the industrial corridor and surrounding centres, may approach half a million people by 2060.

Decisions taken in the 1950s to proceed with the Gardiner and Qu'Appelle dams and to create Lake Diefenbaker are today seen as visionary. Investments in the Conveyance will once again require the longer term view to build a secure water supply capacity to meet the water needs of the economy, society and environment for years to come during an era of growth and climate change.

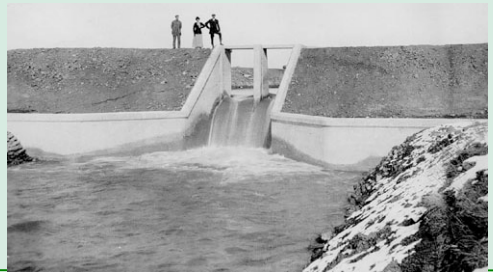
## Looking Ahead

The Conveyance, like many other large multi-purpose water supply canals in Canada, can last for generations with effective management and upkeep. No one can predict the future, but it is certain that with growth and opportunity will come increasing demands for water security for industries, for cities and a natural environment challenged by climate change. Saskatchewan is fortunate to have one of the largest undeveloped natural water resources in the world providing the foundation platforms for provincial, national and global food supply. These are in the undeveloped irrigated acres and the potash deposits that extend throughout the Qu'Appelle watershed. Food and fertilizers are now urgently needed for expanding world and prairie populations. Saskatchewan has the economic and natural resources to make a major contribution to domestic and global food needs.

The social, economic and environmental benefits of the Conveyance can last for centuries and provide southern Saskatchewan with water management options to benefit generations of children with sustainable water supplies, jobs and incomes. This social, economic and environmental evaluation has demonstrated positive returns from the large investments required to complete the Conveyance. A range of public and private financing options exist to reduce the risk for government in undertaking the project. While the investment would happen over a five year period, the benefits will continue to be felt for decades to come and be seen to be beneficial for society, the economy and natural environment of Saskatchewan.

This discussion paper was prepared by Clifton Associates Ltd. on behalf of Enterprise Saskatchewan of Saskatchewan Economic Development and the South Central Enterprise Region.

Copies of the full report are available from:
Saskatchewan Economic Development



1913 - A "New" Irrigation Canal and Gate in Southern Alberta,
Source:
Glenbow Archive