

**Water for Economic Development: a Report Prepared for
SouthGrow Regional Alliance on Water Reuse, Opportunities
for Innovative Waste Water and Water Treatment Processes
and Storm Water Mitigation**

Submitted by Robert D. Tarleck, M.A., November 25, 2013



“The near term inevitability of climate change has become part of both the scientific consensus and the political mainstream.”

Institutional Adaptations to Climate Change Project: Integration Report—the Case of the South Saskatchewan River Basin

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Introduction:

“No one has really got their minds focussed on having a good, intelligent conversation around what we are going to do to accomplish three things: conserve water for the ecosystem, preserve water for recreational and human use, and at the same time facilitate the transfers from existing users to new users that need to have access to that water because we have a growing economy.”

Rob Renner, former Alberta Minister of Environment, 2008

When Rob Renner made these remarks he was aware of the work the SouthGrow was doing on the *Water for Economic Development* project. Although I have no direct knowledge, I suspect that he hoped his remarks would trigger a province-wide reconsideration of how we use, reuse, and protect water resources in Alberta. And certainly they have done that.

But the water discussion has also changed. One of the ways the water discussion has evolved since Minister Renner’s remarks grows out of our growing awareness of the projected influences of climate change in Alberta and the world. No longer restricted to fringe groups, climate change has gone Main Street.

The *Institutional Adaptations to Climate Change Project: Integration Report* includes the following note:

“Climate data and models show that the Canadian Prairies have warmed even more quickly than the rest of the globe, and projections for the future strongly suggest warmer, wetter winters and hotter, drier summers. Although the overall change in temperature will create a longer growing season, cold winters that kill off many pests and diseases and store water as snow will be lost. The warming climate will cause some extra precipitation in the late winter and spring, but the summers will be drier, with much of the rainfall coming in fewer and more intense storms.”

Introduction, continued

The Climate Variability theme is introduced here to frame the discussions that follow about the related topics of:

- Irrigation Security;
- Water Efficiency Initiatives in the Food Processing Sector;
- Other Industrial and Commercial Water Users;
- Innovative Municipal Water Use Technologies;
- Water Use Champions in the Institutional Sector;
- Recreation Water Use and Reuse;
- Rainwater and Greywater: Challenges and Opportunities;
- Wetland Preservation and Flood mitigation; and
- The role of the Government of Alberta in Water Management.

“No resource is more vital to humanity than water. Yet supplies of safe water are shrinking as demand is on the rise. Today, 70 percent of the earth’s surface is covered by hundreds of major bodies of water. But less than three percent is fresh water—the rest is seawater.”

“Water Stewardship: Good for Business. Good for Society”

Irrigation Security: Anchor to the Southern Alberta Economy

Writing in "Drive for Water for Communities," Shilpa Stocker said this about the role of irrigation in the economy of southern Alberta:

"Irrigation districts need to be viewed as part of the solution, and as the most significant opportunity to improve the region's overall efficiency and conservation of water."



Irrigation Security, continued

While a water allocation chart authored by the Alberta Water Research Institute indicates that irrigation and other agricultural uses accounts for 45% of water allocation in Alberta, the percentage is much higher in southern Alberta. Most assessments indicate that about agriculture accounts for 80% of water use in southern Alberta, dwarfing all other users.

Irrigation-dependent agriculture is the anchor of the southern Alberta economy, and any policies and programs regarding water use and reuse must be based on that consideration. Perhaps it is inevitable that we begin this water conversation with an examination of irrigation security.

During a recent workshop held at the Canada Agriculture Centre in Lethbridge on the topic of Irrigation Security, one irrigation farmer volunteered the opinion that he was more worried about floods than droughts. In light of the dramatic floods in southern Alberta in June, 2013, this assessment should not come as a surprise.

However, this is not the whole story. Some scientists suggest that rather than drought and floods in southern Alberta being unrelated events, they are both consequences of increasing climate variability in this region. Two sides of one coin.

Those who predict a warmer, dryer future for southern Alberta find confirmation for this conclusion in some ancient trees in the Whaleback area of the southern Alberta Rocky Mountains. The rings of these long-dead trees, some more than 800 years old, are an invaluable resource that helps us to understand changing precipitation patterns over centuries.

The tightly-packed rings of these trees reveal a history of alternating wet and dry periods in the South Saskatchewan River Basin. But in addition to the expected year-to-year variations in precipitation, the tree rings record a progressive decrease in participation. This finding is consistent with other scientific projections for the Canadian prairies. Floods and drought, then, are two sides of the same issue.

Irrigation Security, continued

Fortunately, we are the beneficiaries of one of the most efficient irrigated agricultural systems in the world.

- Alberta irrigators demonstrated foresight in creating farmer-directed regional irrigation districts to manage water in their region.
- Alberta irrigation districts transitioned from canals carved out of the prairie to lined canals to reduce water seepage and then irrigation pipes that dramatically reduce water loss.
- Irrigation farmers typically make effective use of computer-assisted technology to reduce water application and ensure water is applied in the most effective manner and at the appropriate time.
- Alberta irrigation employees provide assistance to irrigation farmers on a variety of topics related to water efficiency.
- There is an expectation that food producers will make increasing use of satellite imagery to assist them in making wise water decisions.
- There has been consideration of adopting earlier-maturing crops or crop varieties with the goal of reducing water consumption.
- There is an emerging concern about the likelihood of an increasing frequency of droughts. At a recent Irrigation Security conference in Lethbridge it was suggested that one-in-ten year cycles could in the future become one-in-four over coming decades. Agricultural groups are beginning to discuss how we might adjust to climate variability.
- There is a related concern about predictions that southern Alberta will likely be faced with an increasing frequency of extreme storm events as a consequence of climate variability. Climate variability would have a direct financial impact on farmers but also on the entire region if the storm should be sufficiently severe to degrade or even destroy crops. To assist it in building a flood mitigation program, the City of Lethbridge developed a computer-generated image of the Oldman River at Lethbridge at 120% of the flood level of 1995. You will find this image on page 8.

Food Processing Sector: Smart Water Use and Reuse:

“The Successful company in 2030 will be the one that recognizes the possible outcomes of the global crises we face, and one nimble and tenacious enough to embed this recognition into their strategy and business processes.”

Indra Nooyi, PepsiCo Chairman and Chief Executive Officer, May, 2009

At the request of Alberta WaterSmart, I met with plant managers and technical directors of three southern Alberta food processing operations: McCain's, PepsiCo, and Richardson Seeds.

The following discussion about a possible role for the food processing industry in a southern Alberta sustainable water use partnership is based in part on those meetings.

McCain

My meeting with the manager of technical directors at the McCain plant east of Coaldale revealed deep corporate knowledge and commitment regarding sustainable water use. The company has put in place water manufacturing processes that minimize water use and divert wastewater to a settling pond so that it might be subsequently be used to irrigate crops.

McCain has a target for reducing water consumption at its southern Alberta plant by an additional 50%.

Food Processing Sector, continued



PepsiCo

PepsiCo's Lethbridge plant is part of a global company commitment to sustainable water use. In April 2010 PepsiCo adopted a goal of improving company water efficiency by 20% by 2015. Many of those savings have already been achieved.

In India, PepsiCo has helped farmers to adopt an agronomic practice in paddy cultivation known as "direct seeding." Rather than growing seedlings in a nursery, then planting them, and then flooding the field, the practice involves planting the seeds directly into the ground. This makes field flooding unnecessary and results in water saving of as much as 30%.

The Lethbridge plant has made significant reductions in the amount of water required to manufacture a litre of soft drink.

Richardson Seeds

Richardson Seeds is a Canadian company with plants throughout North America. The Lethbridge management team understands the close relationship between water efficiency and profitability. The team reviews all the plant processes to ensure it is achieving maximum water efficiencies.

Other Industrial and Commercial Water Users:

A number of non-agricultural firms located in southern Alberta, many of them small, locally-owned companies, have shown leadership in water management.

ECB Enviro North America

ECB Enviro is a Fort Macleod-based company that is active in building and operating biomass plants based on German technology. The first plant, in the Rave Industrial Park in the County of Lethbridge, is already generating energy, although its official opening is several weeks away.

The plant receives the waste material from dairy operations in the region and burns this to generate energy. At present, this energy is entered into the Alberta energy grid, though the plant also has the capacity to export steam to nearby industrial customers. The residue from the operation can be used as fertilizer. A second plant is already being planned for Southern Alberta.

Alvin Reinhard Fritz, Architect Inc.

Alvin Fritz, who has his office in the County of Lethbridge, has designed buildings in Alberta and British Columbia that feature water efficiency and energy efficiency. The Southern Alberta Bible Camp project used treated rain water and grey water for toilets and urinals. Unfortunately, he brought this project on stream before the Alberta Government's recent relaxation of regulations governing the use of rain water.

SEGO Industries

The SEGO Industries Lethbridge office was responsible to the successful implementation of the rain water/greywater reuse system at the Southern Alberta Bible Camp. For a period of eighteen months the system exceeded provincial standards for water quality.

Park Place Mall & Kevin Brees, Manager

Kevin Brees and the Park Place Mall won a Lethbridge Chamber of Commerce Environmental Award for a number of environmental initiatives in the mall. These include a roof-top garden irrigated by rain water.

Neudorf Plumbing, Rick Neudorf, owner, operator

When I began to study water efficiency I quickly discovered that plumbers were under-appreciated resource people with respect to water reduction measures. Rick Neudorf is the owner-operator of a family-based plumbing company in southern Alberta.

Rick tracks the release of new water-efficient products and technologies that are suitable for application in southern Alberta.

The Building Industry

This is a sometimes-unappreciated pool of highly-skilled professionals and tradesmen. They will engage in water efficiency and water reuse initiatives when there is customer demand and a regulatory framework which they believe they can work with.



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Innovative Municipal Water Use Strategies

The City of Lethbridge:

- The City of Lethbridge pioneered the use of drought-resistant native trees and shrubs to reduce water use associated with landscaped park space.
- The City of Lethbridge wastewater treatment plant earned a national environmental award for its innovative energy-capture system. This tertiary level treatment plant captures methane gas which is then used to operate the plant.
- The City uses treated wastewater to irrigate a major sports field adjacent to the plant.
- The City uses stormwater for a number of neighborhood lagoons.
- The City uses these neighbourhood lagoons, as well as several man-made wetlands areas, as a wetlands water purification process.
- The City influences the impact of stormwater runoff entering the river through an elementary school "Save the Fish" program emphasizing the need to protect fish habitat.
- The City prohibits the washing of cars on paved surfaces and places collars around stormwater drains during paving operations.
- The City has reduced the use of road salt, fertilizers and herbicides with the goal of reducing contamination of the river system.

The City of Calgary:

The City of Calgary is one of a number of Alberta cities assuming leadership in water reuse. At the core of the Calgary what is called the "30/30 plan", commitment to reduce per capita consumption by 30% over the next thirty years. The City of Calgary has on-going reuse initiatives involving rain water, storm water and waste water.

- The Calgary Zoo uses rain water captured on the roof for irrigation and habitat maintenance.
- The Vento Apartment has reduced the use of potable water for toilet flushing by 61% by using rain water captured on the roof.
- Calgary has an active program for using storm water for irrigating parks.
- The Calgary Water Centre has reduced potable water use dramatically by using grey water and storm water for toilet flushing and irrigation.
- Calgary uses waste water for the cooling tower at the Bonnybrook Power Plant.
- Calgary plans to use wastewater from the Pine Creek Wastewater Treatment Plant to irrigate a future golf course.
- Calgary has established an Integrated Planning model to deal with water reuse issues.
- The City of Calgary has established a 30/30 target, which involves reducing water consumption rates by 30% over a 30 year period.

*This discussion is restricted to Lethbridge and Calgary, as I was not able to access communities within the SouthGrow Alliance.

Institutional Sector Water Champions:

There are probably a number of southern Alberta institutional water champions, but I am aware of only a few.

- The University of Lethbridge has adopted several water smart programs:
 - The U of L installed high efficiency urinals which the manufacturer claims can reduce water consumption by 40,000 litres per installation.
 - The U of L has significantly reduced the application of herbicides and fertilizers with the goal of minimizing ground and water contamination.
- Winston Churchill High School installed a drinking water fill station, where students can refill water bottles. While this may at first blush seem to be an unimportant initiative, when one considers that many bottlers use as much as two to four litres of water to produce one litre of bottled water, this initiative is seen from a different perspective. It also serves to reduce the number of water bottles entering the waste stream.
- In one southern Alberta middle school students and teachers developed an environmental park featuring hardy native plant species requiring minimal watering. However, as innovative as this project was, it died over time. The lesson reinforced here is that environmental projects generally require champions, not only to establish them, but to maintain them into the future.

Opportunities for Recreation Water Stewardship

Albertans like to play and when they engage in recreational activities, it often involves water, ice, or snow. Whether they are boating, fishing, canoeing, water-skiing, swimming, or rafting down a river in summer, Albertans expect access to clean, safe water. And in the winter we are no less dependent upon snow and ice.

Unfortunately, recreation activities sometimes subject our rivers and streams to unintended environmental pressures. It is in the interest of every resident of southern Alberta to deal with these threats in a balanced but determined manner.

The impact of motorized recreation vehicles in fragile headwaters and wetland and headwater areas has come into particular scrutiny over the last few years. A majority of recreation vehicle users operate in a responsible manner. And their organization has taken a leadership role in working towards a balance between recreation activities and the environment.

However, those ATV and trail bike owners who don't follow the rules pose a threat to watershed and wetland areas. The *Draft South Saskatchewan Regional Plan: 2014-2024* notes that since the beginning of development in southern Alberta we have witnessed the loss of an estimated 64% of our wetlands.

Such a dramatic loss of wetlands habitat in a little more than one hundred years should give us pause to consider the need for more effective monitoring and control of recreational, as well as industrial, use of environmentally fragile ecosystems.

Good News Stories about Recreation Water Stewardship

On the positive side of the ledger, we see evidence that recreation activities can be conducted in a water-friendly manner.

- I have previously mentioned the commitment of RV associations to play a positive role in environmental stewardship and to minimize trail and off-trail damage in headwaters and wetland areas. But there are other examples.
- Some municipalities have begun using stormwater, trapped rainwater, and treated wastewater to meet the irrigation needs of sports fields.
- Some communities have been looking at more efficient methods of water application.
- Golf courses are generally viewed as high-water-use operations. Golf clubs in southern Alberta are beginning to appreciate that they have a role to play in creating a water-smart southern Alberta. Part of the solution is likely to come through appropriate use of rainwater and stormwater and perhaps the adoption of drought-resistant varieties of plant materials.
- Boaters can contribute to the effort to prevent invasive species from degrading healthy aquatic ecosystems. *The Draft South Saskatchewan Plan* notes that the three most noxious aquatic invasive species in southern Alberta are zebra mussels, quagga mussels and Eurasian water-milfoil. As well as threatening aquatic ecosystems, such infiltrations would result in "high economic costs associated with affected water infrastructure." *Draft South Saskatchewan Plan*.
- While the response to the invasive species threat is multi-jurisdictional, recreation boaters can make an important contribution to the battle by checking their boats to ensure they are not inadvertently transferring these species into southern Alberta waters.

Rainwater, Greywater, Stormwater: Challenges and Opportunities

Alberta Guidelines for Residential Rainwater Harvesting Systems

The Government of Alberta has developed Rainwater Harvesting Guidelines for residential use. The guidelines are recommended for the safe design, construction and maintenance of residential rainwater harvesting systems, provide additional detail than what is present in the current code and supports conformance to *CAN/CSA 128.1 Design and Installation of Non-Potable Water Systems/Maintenance and Field Testing of Non-Potable Water Systems*. The Alberta Building Code and the National Plumbing Code requirements have precedence over these guidelines.

In addition to the guidelines, a handbook was developed to provide broader understanding of the technical components of the guidelines. Both documents can be downloaded below

Page 1

Introduction

Rainwater harvesting (RWH) is the ancient practice of collecting rainwater and storing it for later use. RWH systems are comprised of a roof catchment, conveyance network, rainwater storage tank, pump, and fixtures where rainwater is utilized. Most systems also incorporate treatment technologies to improve the quality of rainwater before and/or after storage, and include provisions for periods of insufficient rainfall (a water make-up supply) and times of excessive rainfall (overflow provisions). The most important consideration when designing and installing a RWH system are the pertinent provincial codes and regulations, standards, and municipal bylaws. Other considerations include how the design, installation and management of RWH systems can affect the quantity of water saved and the quality of rainwater harvested, as well as cold weather suitability of the system. The design and installation guidelines are presented in several sections, organized by the different Rain

2. Rainwater Storage & Tank Sizing

3. Rainwater Quality & Treatment

4. Water Make-up System & Backflow Prevention

Rainwater, Greywater, Stormwater, Continued



The *Rainwater Harvesting Guide* developed by the Alberta Reclaimed Water Working Group represents an important step forward in the campaign to raise the bar with respect to how Alberta can make effective, safe use of rainwater.

The Guide and Handbook explain the objectives of the legislation and explain how a home owner or builder can meet the requirements of the legislation. The Guide is an encouraging first step.

However, there is a need for clarification regarding the inclusiveness of that Rainwater Harvesting Regulations. While the Harvesting Guide speaks specifically of *residential applications*, there are some in the industry who interpret it more broadly. One municipal Mechanical Inspector writes:

“As far as the rainwater reuse, it can be used in any type of occupancy from single family, multifamily to commercial or industrial, as long as all of the Alternative Solutions (Variances) have been obtained and the requirements of the [Rainwater Harvesting Guidelines](#) are met, including all referenced codes and documents.”

As encouraging as the document is, I think there is a need for clarity about how broadly it might be interpreted.

Rainwater, Greywater, Stormwater, Continued

The Alberta Reclaimed Water Working Group is presently working on regulations respecting the reuse of greywater. I have been advised that there are two principal issues facing the Working Group with respect to the reuse of greywater:

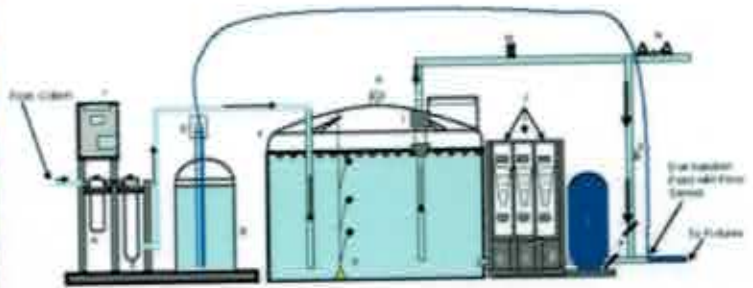
- What guidelines and regulations must be put into place to ensure the safe reuse of greywater, and
- After municipal regulatory officials sign-off on the initial installation, what agency will be responsible for subsequent investigations to ensure that maintenance is being carried out and that the system continues to meet code.

Public safety, of course, comes first. And Albertans want to be confident that water is not being used in a fashion that imperils either personal safety or food safety. Nevertheless, towns, villages, and counties will want to follow this issue with interest.

Communities in the SouthGrow Alliance also have a financial interest in this issue. As much as they may support the principle of greywater reuse, they may be unwilling to pick up the unexpected costs of continued enforcement of regulations. Responsibility for on-going monitoring has not been finalized at the time of this writing.

Rainwater, Greywater, Stormwater, Continued

Examples of the Growing Involvement of the Private Sector in Rainwater Harvesting Technologies, RAINSTORMSOLUTIONS



Wetland Preservation and Flood Mitigation



“In southern Alberta approximately 64% of wetlands have disappeared since the beginning of development.”

The Draft South Saskatchewan Regional Plan: 2014-2024

Following page: A Computer-generated image of the Oldman River Flow at Lethbridge at 120% of the 1995 Storm Flow

Oldman River at Lethbridge at 120% of the 1995 storm.



Wetland Preservation and Flood Mitigation, Continued

The Draft South Saskatchewan Report says this about wetlands:

Wetlands are highly diverse and complex conditions, and have long been recognized for contributions they make to human and ecosystem health. They provide benefits including resiliency to drought and flood conditions, water purification, ground-water recharge, and recreation opportunities, and they are centres of high biodiversity.

Given the wide range of environmental and economic benefits of wetlands, it is not surprising that SouthGrow communities would see it in their interests to work with other organizations and agencies to protect and rebuild this vital resource. Lacking the resources to take on this challenge unassisted, SouthGrow communities will need to identify potential partners in government, business, irrigation districts and interested regional and community organizations. This will be a classic case of partnership building.

In the face of the near term inevitability of climate change, the challenge of building on the natural resiliency of the watershed of southern Alberta as a first defence against floods is all too obvious. The computer-generated image on the previous pages is being used by the City of Lethbridge to give them an approximation of what the Oldman River would look like at Lethbridge with a volume of water equivalent to the 1995 storm plus 20%. Whatever other mitigation steps SouthGrow communities might choose to take, it seems evident that resilience should begin by protecting the natural system we already have in place.

- There is an additional concern about potential contamination of croplands, ponds, streams, rivers, aquifers and irrigation infrastructure by contaminated stormwater. This is already a serious problem in some other countries.
- There is some interest in the need for better planning for extreme weather events that could represent a threat to the agricultural sector of southern Alberta.
- There is some interest in the connection between healthy wetlands areas and resilience to extreme weather events and the need to plan for these events. Sixty-Four percent of Alberta's wetlands have already been lost to development.

The Government of Alberta: Rob Renner Vision Revisited

When then Minister of Environment Rob Renner made his statement in 2008 about wanting to start a conversation about water, he probably never imagined that this discussion would become one of the dominating issues in Alberta public life.

Along the way, the conversation has changed a little. In 2008 a core part of the discussion was how we might reach province-wide agreement for dealing with the issue of transferring or selling water licenses. And between the lines, one could detect shadows of the old debate over the practicality of transferring water from the water-rich North to the water-starved South.

When Renner issued his call for a dialogue, there was no firm agreement about climate variability and its expected impact on southern Alberta, and the rest of Alberta for that matter. Rather than considering inter-basin transfers, the *Draft South Saskatchewan Regional Plan 2014-2024* speaks about adaptive capacity. It notes that "continued population growth and economic development will depend on using the existing water allocations as efficiently as possible." And then it reminds the reader of the provincial goal of a 30% improvement in water use efficiency and productivity by 2015. And in a subsequent paragraph, in case we didn't get the message, it introduces the related themes of: climate change adaptation, drought management; and flood response. Two concerns expressed by some at a recent workshop are that wetlands protection does not take effect for two years and the Government of Alberta retains broad discretionary power.

And then the document goes on to address the expected impact of climate variability. Although this is a draft document, it is hard to believe that it represents a dramatic divergence from the position of the Government of Alberta. Water is very clearly high on the agenda of the Government of Alberta.

Another revealing action was the direction to the Alberta Reclaimed Water Working Group to develop a framework for water reuse.

Municipal regulators and people in the water industry are presently becoming familiar with the much anticipated *Rainwater Harvesting Guide and Manual*. For Albertans interested in water reuse, this is an encouraging first step. They are now awaiting release of the similar guide for greywater.

The Government of Alberta: Rob Renner Vision Revisited, continued

One would not expect the Government of Alberta to be linking predictions about a dryer future for southern Alberta with a concern about more frequent flood events. But that is what transpired. Alberta is clearly moving towards a broader view of water management.

The Draft South Saskatchewan Regional Plan had this to say about flood preparedness:

“Appropriate flood management contributes to long-term community sustainability and resiliency. Mitigating impacts from flooding reduces risk to public safety, developments and infrastructure, provides environmental benefits and results in savings in tax dollars for post-flood recovery costs.”

Following the massive infrastructure and property damage resulting from the June, 2013 storm, at least one municipality has initiated an inventory of its flood mitigation measures with a view to upgrading its existing plan.

In summary, in light of the twin challenges of increasingly-frequent drought and increasing frequency of flood events, it is even more important for SouthGrow Regional Alliance communities to view the Province of Alberta as a key water partner.

Recommendations for Action:

1. Municipalities should consider the advisability of developing a strategic plan governing efficient water use, water reuse and flood mitigation.
2. Municipalities should develop a municipal water reduction target.
3. Municipal regulatory officials should be familiar with the *Rainwater Harvesting Handbook* so that the municipality might access the opportunities in the legislation.
4. Municipal officials should follow up on the anticipated *Greywater Reuse Handbook*.
5. Consider a practical plan for modelling some water efficiency equipment and strategies within your municipal operation.
6. Ensure water efficiency is a consideration in all municipal tenders for which water is relevant.
7. Pursue Water Partnerships in the community and region.
8. Partnerships should include industrial users in both the food processing and general manufacturing sectors.
9. In building water partnerships, don't ignore the institutional sector.
10. Include the construction, development and trades sectors, including plumbers.
11. Undertake an inventory of existing storm mitigation infrastructure and planning.
12. Consider the advisability of developing a flood mitigation plan based on a projection of 120% of the storm of 1995. This could be used to support possible applications for provincial infrastructure funds.

