

Consolidated Clause in Works Committee Report 2, which was considered by City Council on April 25, 26 and 27, 2006.

14

**Rainwater Harvesting Demonstration Project at
Exhibition Place (Ward 19)**

City Council on April 25, 26 and 27, 2006, adopted this Clause without amendment.

The Works Committee recommends that City Council adopt the staff recommendations in the Recommendations Section of the report (February 23, 2006) from the General Manager, Toronto Water.

Purpose:

To report on a proposed rainwater harvesting demonstration project at Exhibition Place.

Financial Implications and Impact Statement:

The estimated cost to design a Rainwater Harvesting (RWH) demonstration system at the Better Living Centre of Exhibition Place is \$25,000.00 (net of GST), including all charges. Funding for the design of this project is available in the approved 2006 Toronto Water Capital Budget under WBS Element No. CWW447-01 - SWM INA/EA.

The Deputy City Manager and Chief Financial Officer has reviewed this report and concurs with the financial impact statement.

Recommendations:

It is recommended that:

- (1) the General Manager, Toronto Water, in collaboration with the General Manager and Chief Executive Officer of Exhibition Place, and in consultation with the Chief Building Official and the Medical Officer of Health, undertake the development of a detailed design with construction cost estimates and an anticipated implementation workplan and schedule, for a rainwater harvesting system to be implemented at the Better Living Centre of Exhibition Place;
- (2) the Rainwater Harvesting system noted in Recommendation (1) would utilize intercepted stormwater “roof runoff” to supply water for toilet flushing purposes, for toilets within the facility, landscape irrigation around the facility and facility cleaning purposes;

- (3) the Rainwater Harvesting system noted in Recommendation (1) also contain an option for augmenting the rainwater collection system with lake water, during dry weather periods in the non-winter period; and a potable water supply is provided for back-up purposes only, during conditions when the other water supply systems are inoperable; and
- (4) the General Manager, Toronto Water, report to Works Committee, upon completion of the detailed design noted in Recommendation (1) with estimate costs, potential funding contributions by other agencies and expected timelines for implementation; and
- (5) the General Manager, Toronto Water, pursue joint funding opportunities for the implementation of such Rainwater Harvesting demonstration systems for application within the City, with other agencies.

Background:

In an ongoing effort to meet the goals of the Wet Weather Flow Master Plan (WWFMP) as adopted by Toronto City Council (September 2003), a Rainwater Harvesting (RWH) Workshop was hosted by the City of Toronto on May 24, 2005, with financial support from Canada Mortgage and Housing Corporation (CMHC). The rainwater harvesting concept takes the issue of stormwater control one step further by not only managing the pathway taken by stormwater runoff to the receiving waters but also diverting it to on-site non-potable uses. This is consistent with the WWFMP hierarchical approach to stormwater management which begins with the control of stormwater runoff at source. In this approach, rainwater would be captured and directed on-site to non-potable uses such as irrigation and toilet flushing thereby, reducing potable water use, saving energy and operating costs, and supporting the WWFMP goals. Further, in 2003, Council approved the City's Water Efficiency Plan, wherein a number of measures, aimed at reducing water consumption, were identified for implementation across all sectors, as a way of deferring capital works expansion in the City's water and wastewater treatment infrastructure, while providing additional capacity to accommodate future growth projections. The implementation of a rainwater harvesting system, in new construction or retrofit situations may be a viable option to support this initiative in certain cases. Further, the implementation of a rainwater harvesting system, wherein intercepted stormwater runoff is used for non-potable purposes, could also be used to help promote public education and communication efforts on the wasteful use of high quality drinking water.

Control of rainwater at the lot level offers effective source control to offset the damaging impact of storm events. Effective water reuse can also help offset the costs of energy and infrastructure. Rainwater harvesting is an "at-source" option for the control of stormwater runoff, which also supports one of the principles adopted in the development of the City's Wet Weather Flow Master Plan, wherein rainwater is recognized as a resource. While rainwater harvesting is a new concept in Toronto, it has been successfully employed in other countries, such as Germany, Australia and the United States. Rainwater has been used for both domestic and industrial purposes, including garden and landscape irrigation, toilet flushing, cleaning, laundry, cooling and production processes. Relevant regulations in these countries have been revised or developed for the construction and operation of rainwater harvesting systems.

The current Ontario Building Code restricts the use of non-potable water (or dual water source) where a municipal supply of potable water is available. The Ministry of Municipal Affairs and

Housing (MMAH) is conducting a review of the use of “green” technologies such as rainwater harvesting. This review will also consider whether there should be amendments to the Plumbing Code. City Council at its meeting of October 26, 27, 28 and 31, 2005, in adopting Clause 24 of Report 9 from the Policy and Finance Committee requested the Province to amend the Ontario Building Code, subsection 7.1.6.3(2), to permit the use of non-potable water for limited uses, even in situations where a supply of potable water is available.

Comments:

Control of rainwater at the lot level offers effective source control to offset the damaging impact of stormwater runoff. Effective water reuse can also help offset the costs of energy and infrastructure expansion. Without effective control of wet weather flow, the City will experience intense pressure on our urban ecosystem and infrastructure. Toronto Water has the following objectives in pursuing a rainwater harvesting demonstration project:

- Demonstrate that rainwater harvesting is viable and that appropriate safeguards can be implemented to support changes to the Ontario Building Code.
- Demonstrate that rainwater harvesting is a viable on-site stormwater management measure, for inclusion in future redevelopment and development proposals.
- Demonstrate that rainwater harvesting can be effectively implemented in a retrofit situation, particularly for large impervious surfaces – in particular large commercial/ industrial/ institutional roof areas.
- Raise public awareness about the merits of rainwater harvesting and the wasteful use of high quality “drinking water”.

The following three sites were selected for consideration in carrying out a rainwater harvesting demonstration project during a design charette following the Rainwater Harvesting Workshop hosted in Toronto, May 2005. During and subsequent to the design charette, City staff from across the affected divisions namely: Toronto Water, City Planning, Parks, Forestry and Recreation, Toronto Public Health, Technical Services, and Building worked together with staff from CMHC, Ministry of Municipal Affairs and Housing, Ministry of Health, Exhibition Place, Metro Zoo, MintoUrban Communities, international experts in rainwater harvesting, and consultants to review design options at the three sites. A brief description of the rainwater harvesting concepts considered at these sites is provided in the following.

Exhibition Place – Better Living Centre (BLC):

The Better Living Centre has approximately 19,500 m² of roof area with potential space in the basement to house a rainwater harvesting storage vessel. The main water consumption (approximately \$13,000.00 for 2004) for indoor use is toilet flushing and building cleaning (which does not require high quality potable water). Exhibition Place receives more than five million visitors per year. Exhibition Place is currently considering the upgrading of the BLC into a year-round operating facility. It has been estimated that the installation of rainwater tanks with minimum storage capacities will be sufficient for toilet flushing and floor cleaning purposes. Further, because of the good public access, visibility and the high number of visitors to this

facility, a rainwater harvesting demonstration project at this facility provides a unique public education opportunity.

At present, Exhibition Place already pumps untreated lake water for irrigation and street cleaning purposes. A rainwater harvesting demonstration project at this facility will further eliminate the need of using potable water for non-drinking usage. This project will also provide data to support future Ontario Building Code revision for the installation of future rainwater harvesting systems as well as obtain experience on both health and safety, and technical aspects, associated with the implementation of a successful system.

Based on an estimated average rainfall event of 10 mm (representing about 80 percent of the rainfall events in a typical year along the Toronto Waterfront area), the total roof area of 19,500 m² would provide approximately 195 m³ of rainwater for storage and reuse. It is proposed that the major utilization of the captured rainwater would be for toilet flushing in public washrooms. Floor washing is another practical application if there is extra storage volume. Two design options have therefore been recommended with preliminary cost estimates.

Option 1 is a smaller scale demonstration system and is recommended as a pilot for the introduction of rainwater harvesting system to the City. Approximately 15 m³ of rainwater would be stored in two pre-fabricated 2000 gallon tanks placed on the ground floor and used for toilet flushing. Although this option will not capture the entire roof runoff water, the storage volume proposed is sufficient to support the uses noted. The cost to construct this type of system has been estimated at \$120,000.00.

Option 2 represents a full scale facility with the construction of two 100 m³ storage tanks in the basement to capture the total roof runoff for a 10 mm rainfall event, estimated at 195 m³. While the larger storage volume will provide a longer rainwater supply which could serve other purposes, it has been estimated that this type of system could cost \$650,000.00.

Based on the above, it is recommended that a design be undertaken for the construction of the rainwater harvesting demonstration system noted in Option 1, wherein more accurate cost estimates can be attained; the design satisfies the requirements of the Chief Building Official; and that appropriate safeguards can be incorporated in the design to protect human health, to the satisfaction of the Medical Officer of Health.

Toronto Zoo – Horticultural Building:

The Horticultural Building at the Toronto Zoo houses equipment and has three adjacent green houses which are the nurseries for the plants used in the Zoo displays for different regions of the world. The facilities have approximately 1,975 m² of roof area. The steps involved in designing the RWH system would be to (1) consider the possible uses of the rainwater and their water requirements (2) calculate the amount of rainwater which can be collected from the catchment areas, and (3) determine how to store the collected water, size the tank and design the delivery systems. A proposed RWH storage tank could capture the roof runoff water to be used for toilet flushing, watering of plants in the greenhouses, and irrigation of the Zoo landscaping areas.

Toronto Water will continue to work with the Toronto Zoo to explore the feasibility for the design and implementation of this rainwater harvesting system.

MintoUrban Communities - Roehampton Avenue:

MintoUrban Communities is planning an eighteen-storey multi-unit residential building on a 30 m by 60 m lot at Roehampton Avenue in Toronto. This building has approximately 900 m² of roof area. Among the potential uses for the captured rainwater would be irrigation of the trees and shrubs, flushing of toilets on the lower floors, and the cooling tower. Ontario Plumbing Code restrictions would need to be addressed if rainwater harvesting methods are incorporated.

Conclusions:

Toronto Water, through the implementation of the City's Wet Weather Flow Master Plan, is committed to the development of source control measures such as rainwater harvesting at public and private development sites. Rainwater harvesting at the lot level offers effective source control to mitigate the impacts of storm events. Effective water reuse can also help offset the costs of energy and infrastructure expansion.

Several sites have been considered for the construction of a rainwater harvesting demonstration project. At this time, it is recommended that Toronto Water work together with Exhibition Place to undertake a detailed design of such a system for the Better Living Centre at Exhibition Place. The design of this system provides an opportunity to develop accurate cost estimates; demonstrate whether the system can be designed to incorporate the necessary requirements and public health safeguards, to the satisfaction of the City's Chief Building Official and Medical Officer of Health.

Further, because the Better Living Centre provides good public access, visibility, and has a high number of visitors, a rainwater harvesting demonstration project at this facility provides a unique public education opportunity for rainwater harvesting systems and the wasteful use of high quality drinking water.

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The Works Committee also considered a communication (March 4, 2006) from Karen Buck and Karey Shinn, Community Co-Chairs, Ashbridges Bay Sewage Treatment Plant Neighbourhood Liaison Committee.