

COMMITTEE OF THE WHOLE – JUNE 16, 2008

WATER FOUNTAINS AND AERATION DEVICES IN STORM WATER MANAGEMENT FACILITIES

Recommendations

The Commissioner of Engineering and Public Works, the Director of Public Works and the Director of Development / Transportation Engineering recommend:

1. That Council provide direction to Staff with respect to the installation of an electrically driven water fountain in the assumed storm water management pond located at Rutherford Road and Napa Valley Avenue in Block 53, and at Rutherford Road and Weston Road in Block 39.

Economic Impact

The implementation, operation and maintenance of fountains and/or aeration devices within storm water management facilities on a permanent basis will impact current operating and capital budgets. The degree of budget implications will vary depending on the total number of fountains and/or aeration devices installed throughout the City and the period of time in which they remain in operation.

Based on the results of the Block 10 Sugar Bush water fountain pilot project, the total capital cost to purchase and install one water fountain unit is about \$40,000. The yearly operating and maintenance cost is approximately \$14,000 excluding life-cycle replacement costs as detailed on Attachment No. 1 to this report.

The approved 2008 Capital Project No. PW-2001-08 allocates \$180,000 to initiate year one of a five year implementation plan for the installation of water fountain/aeration devices in assumed storm water management facilities throughout the City. Based on the pilot test, the Public Works Operating Budget will need to be increased by approximately \$20,000 per new fountain to provide for the associated annual operating, maintenance, storage and life-cycle costs.

Communications Plan

The residents in the vicinity of a storm water management facility that has been selected for the installation of a fountain or aeration device will be notified by direct mailing in advance of the device being installed.

Purpose

Council, at its meeting of May 26, 2003, requested Staff to investigate the feasibility, need and costs associated with the installation of water fountains in the City's storm water management facilities (SWMF). In response to this request, Staff submitted a comprehensive report on the matter to the Committee of the Whole meeting on August 18, 2003. Council, at its meeting on August 25, 2003, adopted the following resolution:

"That Council agrees in principle with installing water fountains in storm water management ponds and directs staff to assess and evaluate the operation of electrically driven and wind driven fountains and provide a report to Council."

Subsequently on May 25, 2004, Council adopted the recommendations of Item 2, Report No. 9, of the Budget Committee that directed:

“Staff provide a report on a Five Year Plan for implementation of aeration devices for storm water management ponds; and

All future subdivision agreements include a clause requiring developers to supply and install, at their cost, water aeration devices in storm water management ponds where the City deems it to be appropriate and necessary.”

Then on June 26, 2006, Council adopted the recommendations of Item 37, Report No. 37, of the Committee of the Whole as follows:

“That aeration devices be installed in storm water management ponds where water conditions are positively identified as breeding grounds for mosquitoes, as determined by the Region of York’s Health Unit or where water quality concerns have been identified by Staff, and then only if a more economical solution can not be found;

That water fountains be installed in storm water management ponds to visually enhance and promote the City of Vaughan in highly visible areas adjacent to arterial roads and/or within key district centre areas of the City, provided that the pond is deemed to be a suitable candidate for a water fountain as assessed by Staff on a site specific basis;

That a Storm Water Management Pond Water Fountain Pilot Project be implemented at the Sugarbush Pond located just north of Highway 7 between Bathurst Street and Thornhill Woods Drive to fully assess the installation, operation and maintenance requirements of electrically driven water fountains; and

That the Five Year Implementation Strategy for the installation, operation and maintenance of fountains and aeration devices in storm water management ponds and all associated financial implications be deferred for consideration to a future Budget Committee meeting, following the completion of the Storm Water Management Pond Water Fountain Pilot Project.”

Later on November 12, 2007, Council adopted the recommendations of Item 33, Report No. 50, of the Committee of the Whole requesting that:

“Staff provide a report on water aeration devices for storm water management ponds.”

The purpose of this report is to present the findings of the Sugarbush Pond Water Fountain Pilot Project and to seek direction from Council with respect to installing water fountains in two storm water management facilities located in Woodbridge.

Background – Analysis and Options

For context, storm water management techniques are necessary to mitigate the effects of urbanization on the hydrologic cycle, and have been incorporated as part of the municipal services in new development in the City since the early 1980’s. Currently, the City owns approximately 120 SWMF. It is anticipated that through further development within the City, an additional 80 SWMF will be constructed over the next 20 years. SWMF are designed to maintain the existing hydrologic cycle while protecting water quality and preventing increased erosion and flooding. Over the last few years, new storm water management facilities have been integrated as focal features in new communities.

Summary of Pilot Project Findings

Pursuant to Council direction, the City purchased one electrically driven water fountain unit for the purpose of conducting a pilot project to accurately assess the financial, operational and maintenance implications of its use in a SWMF. The electrically driven fountain was installed and operated by Public Works Department Staff in the Sugarbush SWMF over a two year period during the summer months of 2006 and 2007.

The Sugarbush SWMF is located just north of Highway 7 between Bathurst Street and Thornhill Woods Drive in Block 10. One of the key factors considered in the selection of this pond for the pilot project was its significant set back from existing residential dwellings and roadways. In addition, there was good visibility of the fountain from both Highway 7 and Highway 407, hydro electricity was readily available to it from the surrounding residential community, and it was easily accessible for installation, operation and maintenance purposes. The fountain was installed during the summer months after the power source and all related infrastructure had been secured. By all accounts, the water fountain improved the visual esthetics of the SWMF and enhanced, in a small way, the livability of the neighbouring community.

From a financial perspective, the total one time capital cost to purchase and install the fountain unit was \$39,800. The yearly operating and maintenance cost (excluding the life-cycle replacement cost) was \$13,400. A detailed cost breakdown including staffing needs and equipment has been included in Attachment No. 1. It should be noted that capital and operating costs will vary depending upon the required size of the fountain, the maintenance schedule and the duration of operation.

The results of the pilot project also identified a number of logistical and technical challenges as summarized below.

1. A minimum permanent pool depth of 1.8 metres is required in order to ensure water fountains in storm ponds will function properly. Ministry of Environment guidelines recommend a mean permanent pool depth between 1.0 and 2.0 metres. It is important to note that few storm water management ponds are designed to meet the upper range of this criterion.
2. Where permanent pool depths are less than 1.8 metres, excavation is required up to the perimeter of the existing permanent pool resulting in the creation of steeper side slopes around the perimeter of the permanent pool which increases the risk to public safety.
3. In order to ensure that fountains continue to function properly and that water quality control features of the pond are not compromised, re-establishment of the pond's desired permanent pool depth is required after every 2nd summer season as sediment accumulation in ponds retrofitted with fountains is significantly accelerated. This results in increased clean-out operations including excavation, removal and disposal of sediment materials. The turbulence in the water caused by the pump units within the fountains cause increased re-suspension of silts and sands within the permanent pool area of the ponds.
4. As the unit is susceptible to damage from freezing, significant staff time, labour and equipment is required to remove the unit in the fall and replace it in the spring so that it is not subject to freezing. Due to the nature of the installation and removal activities, it is anticipated that at a minimum a 5 tonne 25' boom truck is required to allow for ease of installation and removal of each fountain unit.
5. The electrically driven water fountain unit must be removed from the SWMF and stored during the winter months. Based on the physical size of the water fountain used at the pilot project location, storage space equivalent to a small office is required for each fountain. If the City was to purchase additional units, dedicated storage space would be

required, as residual space at the existing works yards is not available. One solution to this problem is to construct a storage shed within the pond to house the fountain over the winter months. The Town of Milton has taken this approach for their fountain located in the pond adjacent to Highway 401.

6. Significant Staff time is required for regular twice a week inspection of each fountain unit.
7. The pilot project revealed that the pump unit within the fountain needed to be completely re-built after the 3rd summer seasons due to the abrasive nature of the water in the permanent pool of the pond which contains suspended silts and fine sands. The cost to re-build a single pump unit is about \$3,000.
8. Significant additional costs may be required in cases where excavated sediment accumulation material from permanent pools is found to be contaminated and thereby requiring proper disposal in accordance with provincial regulations and guidelines.
9. One of the key design functions of a SWMF is to settle out the suspended silts, fine sands and sediments that are collected by the run-off as it travels along the roadways before entering the facility. The settling of sediments is achieved by storing the water in the SWMF for an extended period of time (generally 48 hours after a rain event), which allows the sediments to settle out and accumulate on the bottom of the facility. This function allows cleaner water to then be released from the storm water facility back into the natural environment. Once the accumulation of sediments at the bottom of the pond gets to a certain depth, it would need to be cleaned out. The introduction of a water fountain in a SWMF is somewhat counter productive to the water quality function of the SWMF as it acts to agitate the water in the permanent pool which can cause the sediments to be re-suspended in the water.

The above matters should be factored into the decision process where an additional water fountain is being proposed.

Site Specific Technical Feasibility Investigation

The Pilot Project has reinforced the need to undertake a detailed technical feasibility investigation on a site specific basis in order to determine if a water fountain may be installed in a specific storm pond.

As a result, and in accordance with previous Council direction, where an assumed SWMF is identified as a breeding ground for mosquitoes, and where a more economical solution can not be achieved, the installation of a wind driven aeration device or electrically driven water fountain may be considered based on the following criteria:

1. Depth of permanent water pool in the pond.
2. Existing silt build up in the pond.
3. Availability of hydro electricity to the pond area.
4. Feasibility of bringing a power supply to the pond site.
5. Accessibility for installation, operation and maintenance.
6. Potential disruption in water quality functionality of the pond.
7. Susceptibility to vandalism.
8. Overall public safety.
9. Aesthetic value/benefits.
10. Visibility in the community.

11. Susceptibility of disturbance to neighboring residential areas due to increases in noise or other disruptive factors.

Water Aeration Devices

Given the significant costs and limited application potential associated with operating electrically driven water fountains in storm water management ponds, a less expensive and more practical option for providing aeration to stagnant water in ponds is available.

In assumed SWMF where water conditions have been positively identified as breeding grounds for mosquitoes known to carry the West Nile Virus (as determined by the Region of York's Health Unit) or where other water quality concerns have been identified by Staff (such as odours caused by stagnant water), wind driven aeration devices may be installed. It is important to note that aeration devices only serve to maintain movement of the water in the pond but do not produce a spray of water like the water fountain.

The capital costs associated with the supply and installation of a wind driven aeration device is approximately \$3,500. The annual operating cost is approximately \$1,500.

Wind driven aeration devices may be installed and operated in storm ponds as required on a site-specific basis where funding remains available and has been approved in accordance with yearly budget deliberations.

Timing for Installation of Aeration Devices / Water Fountains

Developers are required to design and construct new storm water management facilities and maintain them until assumption by the City. During the construction of the subdivision, storm water management ponds are generally exposed to significant sediment loading and often require cleaning before assumption by the City. As a result, it is not practical to equip a SWMF with a wind driven aeration device or an electrically driven water fountain until the tributary drainage area is established and the facility has been assumed by the City.

Environmental Sustainability

Over the past few years, the City has made a renewed commitment to the environment. This includes the on-going development of an Environmental Master Plan, and looking at issues associated with sustainability. Given the growing concern over unnecessary usage of hydro electricity, and the promotion of energy conservation in general, the use of hydro powered water fountains in storm water management ponds would not be consistent with the City's new "green" approach to environmental issues.

The implementation of water fountains in storm ponds will increase the City's inventory of non-sustainable infrastructure. Given the results of the pilot project, peak operation and maintenance activities associated with fountains will be required in the spring and fall seasons which are typically the busiest times of the year for Public Works operations Staff. The introduction of additional operation and maintenance responsibilities associated with water fountains will impact service levels unless additional resources are provided.

Neighbouring Municipalities

Based on an informal poll, a small number of our neighbouring municipalities have installed water fountains in a few prominent storm water management facilities for esthetic reasons only. For example, the Town of Milton has had a fountain operating in the storm water management facility located adjacent to Highway 401 for a number of years. In discussions with staff at the Town of Milton, they expressed very similar operational and maintenance concerns with respect to water fountains to those outlined in this report.

Ministry of Environment Guidelines & Initiatives

Storm water management pond design guidelines commonly used by municipalities within Ontario are adopted from the Storm Water Management Planning and Design Manual published by the Ontario Ministry of Environment (MOE). Mosquito abatement measures within storm water management ponds are not addressed in the current version of the design manual. However, the MOE has established a storm water management pond West Nile Virus working group which includes representatives from several Ministries, Conservation Authorities and Health Units.

A report entitled "A Jurisdictional and Literature Review of Storm Water Management Ponds and West Nile Virus, January 2007" was recently updated by this group. The conclusions of this report suggest that storm water management ponds do not pose a significant West Nile Virus risk unless they are improperly designed, poorly operated or improperly maintained thereby allowing for the presence of stagnant water.

Further, the working group is preparing a draft document entitled "Best Practices for Reducing the Risk of West Nile Virus in Storm Water Management Ponds" scheduled to be released shortly by the Ministry of Environment. The monitoring of over 750 storm water management ponds was conducted mainly in Southern Ontario between 2003 and 2006 for the preparation of this Best Practices document.

It is anticipated that these guidelines will assist municipalities, land developers, health units and other stake holders to consider what best practices may be necessary in managing ponds to reduce the risk of West Nile Virus.

Candidate Sites for Water Fountains

Based on the preliminary desk top review of the design parameters associated with the assumed SWMF in prominent areas of the City, it has been determined that the storm water management pond located at Rutherford Road and Napa Valley Avenue in Block 53, and at Rutherford Road and Weston Road in Block 39 qualify as potential candidate ponds for the installation of fountains. A detailed field investigation will be required to assess the current state of these SWMF prior to proceeding with the purchase and installation of the fountains.

Relationship to Vaughan Vision 2020

In consideration of the strategic priorities related to Vaughan Vision 2020, the recommendations of this report will assist in the pursuit of excellence in service delivery.

However, the installation of water fountains in storm water management facilities tends to conflict with the strategic goals and objectives related to:

- Leading and promoting environmental sustainability;
- Enhance productivity, cost effectiveness and Innovation;
- Ensure Financial Sustainability; and
- Maintaining assets and infrastructure.

Regional Implications

There will be no Regional implications resulting from the adoption of this report.

Conclusion

It is anticipated that the City will own and operate approximately 202 storm water management facilities over the next 20 years.

The Block 10 Sugarbush Pond Pilot Project provided an accurate assessment of the financial, operational and maintenance requirements related to the installation of water fountains in storm ponds. The pilot project revealed that the total capital costs to purchase and install the Sugarbush water fountain unit was \$39,800. The annual operating and maintenance cost was \$13,400 excluding life-cycle replacement costs. In addition, the pilot study identified that the implementation, operation and maintenance of fountains or aeration devices within storm water management ponds on a permanent basis will result in significant impacts to the current operating and capital budgets. In addition to costs, a number of other logistical and technical constraints were noted during the pilot project resulting in limited application potential for water fountains in storm ponds. A less expensive and much more practical option for providing aeration to stagnant water in ponds is available by installing wind driven aeration devices. These devices can easily be installed in virtually any wet pond with little effort. The capital cost associated with a wind driven aeration device is approximately \$3,500. The yearly operating costs are approximately \$1,500.

The use of electrically driven fountains is not keeping with the overall move towards environmental sustainability and energy conservation, or the City's commitment to the environment in general. On the other hand, water fountains in prominent storm water management ponds provide certain esthetic qualities. Accordingly, staff is seeking direction from Council with respect to the installation of an electrically driven water fountain in the assumed storm water management pond located at Rutherford Road and Napa Valley Avenue in Block 53, and at Rutherford Road and Weston Road in Block 39.

Attachments

1. Sugarbush Pond Water Fountain Pilot Project Cost Summary

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Respectfully submitted,

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**SUGARBUSH POND
WATER FOUNTAIN PILOT PROJECT
COST SUMMARY**

Description	One Time Capital Costs	Operation & Maintenance Costs per year
Purchase Price of Water Fountain	\$ 21,500	N/A
Installation of Electrical Service: <ul style="list-style-type: none"> • 220 volt 3 Phase Service 	\$11,000	N/A
Installation of Water Fountain: <ul style="list-style-type: none"> • 4 hours minimum with boom truck and 2 staff • Electrician and helper • Excavate a 2 m deep pool (excavator/float cost) • Sample testing of excavated material & its disposal 	\$500 \$1,000 \$3,200 (8 hour day) \$2,600 **	\$500 \$1,000 \$1,600 \$1,300 **
Regular Inspection: <ul style="list-style-type: none"> • 2 days per week 1.5 hrs/day for one operator for 5 months 	N/A	\$2,500
Hydro per unit. <ul style="list-style-type: none"> • 2,600 Kwh per month from billing 	N/A	\$1,500
<ul style="list-style-type: none"> • Miscellaneous mechanical repairs, includes re-building of pumps every 3rd season 	N/A	\$2,500
Un-installation Cost: <ul style="list-style-type: none"> • 4 hours minimum with boom truck and 2 staff • Electrician and helper 	N/A	\$500 \$1,000
Rental Storage Cost: <ul style="list-style-type: none"> • Storage unit estimate 	N/A	\$1,000
Total Cost	\$39,800	\$13,400

Note:

** In retrofit situations where a fountain will be installed in an existing and assumed storm water management pond, environmental sample testing of excavated material will be required prior to disposal or re-use of excavated material. A minimum of two samples per pond would be required estimated at \$1,300 per sample. If the excavated material is deemed to be contaminated and regulated material, the disposal cost could be up to \$250 per cubic meter in addition to the above noted costs.