
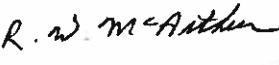



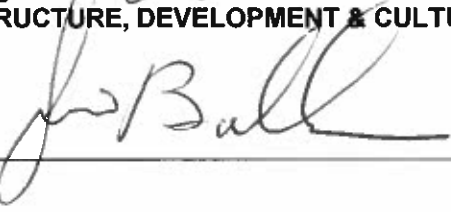
TO: GENERAL COMMITTEE

SUBJECT: MAPLEVIEW WATER TOWER ICING MITIGATION SOLUTION

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CHIEF ADMINISTRATIVE OFFICER APPROVAL: JON M. BABULIC   
CHIEF ADMINISTRATIVE OFFICER

**RECOMMENDED MOTION**

1. That the Mapleview Water Tower Icing Mitigation Preferred Solution for a Drain and Gutter installation be authorized to proceed in 2011, with the additional amount required of \$310,000 funded from the Water Rate Reserve 12-05-0580.
2. That a sole source contract be negotiated with Landmark Municipal Services to construct the Mapleview Water Tower Icing Mitigation Preferred Solution for a Drain and Gutter installation in an amount not to exceed \$250,000.

**PURPOSE & BACKGROUND**

3. The purpose of this staff report is to recommend the Preferred Solution to capturing melting precipitation from the roof of the water tank, and conveying the melt water to the ground in a safe manner and to award the contract for the construction to Mapleview Water Tower on a sole source basis in accordance with sections 14 and 15 of the Procurement By-law 2008-121.
4. The Mapleview Water Tower was constructed by Landmark Municipal Services in 1990. Until 2010, the City of Barrie did not receive any reports of falling ice incidents. However, three falling ice incidents in late 2010 and early 2011 demonstrated the potential for property damage and risk to human health. Appendix "A" summarizes the locations (marked as red triangles).
5. In response, on April 18, 2011, Council adopted Motion 11-G-086 (refer to Appendix "B") which instructed staff to investigate mitigation options. Through a competitive procurement process, staff retained a building de-icing specialist to provide recommendations in order to mitigate icing on the Mapleview Water Tower. Subsequently, Fishburn/Sheridan and Associates (FSA) was determined to be the Successful Respondent. The consultant was to investigate and report on potential causes of ice shedding, submit mitigation options, evaluate the options and make a recommendation for the preferred option to be implemented to mitigate ice falling hazards.
6. Also as part of Motion 11-G-086, staff were to report back to General Committee as to the Preferred Solution and the construction implementation approach.

**ANALYSIS**

7. FSA advised that there are two basic types of ice formation on high structures: Icicle and Sheet. Differing strategies would have to be developed as it was understood that both of these formations were observed. FSA also undertook a historic weather review.
8. FSA presented their findings at two meetings to City staff, including Water Operations, Engineering, Legal and Finance departments. The various options that were evaluated by the Consultant are as follows (with additional detail in Appendix 'C'):

OPTION	DESCRIPTION	CAPITAL COST	OPERATING COST	SCORING
1	Monitor and React	Nil	\$3,000	35
2	Complete capture, melting and transportation of precipitation	\$125,000 - \$250,000	\$2,600	75
3	Partial capture, melting and transportation of precipitation	\$60,000 - \$120,000	\$1,000	70
4	Partial melting and redirection of precipitation	\$35,000 - \$70,000	\$600	68
5	Redirection of precipitation	\$23,000 - \$46,000	Nil	56

9. FSA's recommended Option 2 as the Preferred Solution. Implementation of this option involves a custom heat traced trough surrounding the upper sloped ring similar to an eavestrough. Melt water is then conveyed through vertical heat traced drain pipes to an adjacent storm sewer.
10. It would be prudent to utilize the original design-builder of the Maplevue Water Tower, Landmark Municipal Services, to implement the Preferred Solution because of the unique, complex nature of the structure including the steel connections, exterior painting and interior coating repair work that will be needed. This approach will ensure the long term integrity of the water tower structure.
11. The 2011 – 2020 Capital Plan, employed a Business Risk Exposure Model to prioritize renewal driven projects. Capital needs were assessed a probability and consequence of failure of an existing asset or circumstance, as well as a redundancy factor. The redundancy factor considers the availability of other assets to provide the same level of service. The outcome of the probability of failure, consequence of failure and redundancy, results in a risk exposure score. The risk exposure scores of various needs can be compared to determine which needs should be considered the highest priority for capital funding.
12. If this Preferred Solution was known at the time of developing the 2011-2020 Capital Plan, it would have been considered using the above approach. The project would have received a high to extreme risk score given the high probability of ice falling off or flying off the water tower, and the consequence of this event being possible serious personal injury and property damage with resultant financial implications.
13. There is no level of redundancy at present (ie. no second water tower) for the Maplevue Water Tower which serves water pressure needs in Zone 3 South.

14. The 2011 work plan for the Engineering Department can accommodate the staff hours required to project manage the study, design, including obtaining necessary approvals, and to finalize the design documents and undertake the construction administration for this project. There may be temporary delays to other projects, such as, Well 4A pumphouse design, already included in the work plan, during peak work times, however these impacts are not expected to be significant, as the total time required for the work being recommended in this report, is not a substantial portion of the overall work plan for 2011.
15. The risks of not proceeding with this work in 2011 prior to winter include: public health and safety concerns associated with the "Do Nothing" approach. Due to the close proximity of businesses, the ice build-up on the Mapleview Water Tower presents a significant liability risk to the City of Barrie and to local businesses. When the ice starts to thaw and is lifted by the wind, it becomes a wind driven projectile. There is not only the potential of damage to private property but given the nature of the businesses nearby, the chance of serious personal injury. Staff have requested a provisional price for tank roof maintenance cleaning as part of the scope of work in the event that the proposed work cannot be completed prior to conditions being conducive to ice formation.
16. Staff concur with FSA's recommendation to implement Option 2, complete capture, melting and conveyance of precipitation.
17. Staff also concur that the Preferred Solution be constructed by Landmark Municipal Services as per the drawing and specifications prepared by FSA at an estimated total project cost of \$250,000.

#### **ENVIRONMENTAL MATTERS**

18. There are no environmental matters related to the recommendation.

#### **ALTERNATIVES**

19. The following alternatives are available for consideration by General Committee:

- |                |                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alternative #1 | General Committee could decide to Do Nothing (i.e. status quo).<br><br>This alternative is not recommended since staff believe that action is required now that there has been reported observations of falling ice.                                                                                                                                                      |
| Alternative #2 | General Committee could decide to select a different option as outlined in Paragraph 9 and as described further in Appendix "C".<br><br>This alternative is not recommended as the Preferred Option provides a permanent and complete solution to the liability issue.                                                                                                    |
| Alternative #3 | General Committee could decide to not sole source the construction of the Preferred Option to Landmark Municipal Services.<br><br>This alternative is not recommended since any further modification of the tower structure should be done by Landmark as they are the design builder of the original structure and are the most familiar with these types of structures. |

**FINANCIAL**

20. Estimated total project costs are \$340,000, including design, construction, contingencies, and non-refundable HST, as outlined in Appendix "D". Of this amount, \$30,000 was approved by motion 11-G-086 to be funded from the Water Rate Reserve for the initial investigation.
21. The construction phase of this project is not included in the 2011 Business Plan. Staff is recommending that an additional \$310,000 be allocated from the Water Rate Reserve (12-05-0580), to undertake the construction component of this project in 2011.
22. FSA has indicated that the annual Operating cost will be \$2,600 per year including staff time, energy and replacement of the heating cables several times over the life of the tower structure.

**LINKAGE TO 2010-2014 COUNCIL STRATEGIC PLAN**

23. The recommendations included in this Staff Report are not specifically related to the goals identified in the 2010-2014 City Council Strategic Plan.

APPENDIX "A"

OBSERVED FALLING ICE LOCATIONS



**APPENDIX "B"**

**MOTION 11-G-086**

**11-G-086      MAPLEVIEW WATER TOWER ICING MITIGATION INVESTIGATION**

1.      That the Mapleview Water Tower Icing Mitigation Investigation be authorized to proceed in 2011, and funded in the amount of \$30,000, excluding HST, from the Water Rate Reserve 12-05-0580.
  
2.      That subsequent to the investigation, a Staff Report be prepared to provide recommendations as to the preferred solution and construction implementation approach. (ENG014-110411) (File: A19-MAP)

**APPENDIX "C"**

**OPTIONS EVALUATED**

**Option 1: Monitor and React**

This options reflects current 'emergency' operational strategy employed by the City of Barrie and adopted measures consists of view roof top conditions via roof mounted camera, and if potential ice shedding risks are noted, City staff are assigned to barricade the surrounding area and perform a controlled removal of the potential falling ice.

**Option 2: Complete capture, melting and transportation of precipitation**

This option represents the most thorough execution of the risk reduction approach to the mitigation. This measure includes installation of a circumferential gutter around the eve of the upper cone surface with ice melting cables to capture any precipitation from the upper roof surface. Two downspouts will bring the runoff to the ground level and will be connected to the storm sewer. Ice retention netting to be installed on the exterior portion of the main roof surface and additional ice retention fins will be attached to the top of the roof surface and would serve to segregate ice into smaller elements before they reach the edge of the roof.

**Option 3: Partial capture, melting and transportation of precipitation**

This option represents a measured risk reduction approach and includes the elements as stated in option 2 except installation of a partially circular gutter extending 120 degree around the more prone northeast and southeast sectors of the perimeter along the eve of the upper cone surface to catch all precipitation and a complete solution for managing precipitation to the ground.

**Option 4: Partial melting and redirection of precipitation**

This option represents a measured risk reduction approach which targets the higher ice shedding risk but does not capture or transport the precipitation down to the ground level and would include a heat-traced drip edge to direct runoff down and away from the building face, to fall freely to the ground, for the same 120 degree radius as above.

**Option 5: Redirection of precipitation**

This option relies on the use of an unheated drip edge to direct runoff away from the tower face and would include addition of ice retention fins and ice retention netting to segregate sliding ice into smaller elements before they reach the edge of the roof.

APPENDIX "D"

ANTICIPATED PROJECT COSTS

<b>Component</b>	<b>Cost (Rounded)</b>
Design, staff time Spent to date (Motion 11-G-086) From Water Reserve Rate	\$17,701
Estimated Tender	\$250,000
Contract Admin., Inspection & Material Testing	\$32,299
Sub- Total Design and Construction Costs	\$300,000
Construction and Project contingencies	\$33,000
Sub-Total with Contingencies	\$333,000
Non refundable HST	\$7,000
<b>TOTAL PROJECT WORK (Rounded)</b>	<b>\$340,000</b>

<b>Funding Details</b>	<b>Costs</b>
Total Funds available under Motion (Motion 11-G-086) from Water Reserve Rate	\$30,000
Total Project funds required	\$340,000
<b>TOTAL FUNDS NEEDED FROM THE WATER RESERVE RATE</b>	<b>\$310,000</b>