

---

TO: GENERAL COMMITTEE

SUBJECT: MAPLEVIEW WATER TOWER ICING MITIGATION INVESTIGATION

PREPARED BY AND KEY CONTACT: G. KING, P. ENG, PMP *G. King*  
SENIOR PROJECT ENGINEER - ENVIRONMENTAL (Ext. 4532)

SUBMITTED BY: R. W. MCARTHUR, P. Eng. *R. W. McArthur*  
DIRECTOR OF ENGINEERING

GENERAL MANAGER APPROVAL: R. J. FORWARD, MBA, M.Sc., P. Eng. *R. J. Forward*  
GENERAL MANAGER OF INFRASTRUCTURE, DEVELOPMENT & CULTURE

CHIEF ADMINISTRATIVE OFFICER APPROVAL: JON M. BABULIC *Jon Babulic*  
CHIEF ADMINISTRATIVE OFFICER

---

**RECOMMENDED MOTION**

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.

**PURPOSE & BACKGROUND**

3. The Mapleview Water Tower was constructed by Landmark Municipal Services in 1990 for the Barrie Public Utilities Commission who at that time managed Barrie's water supply and distribution system.
4. There had been no known reports of falling ice from the Mapleview Water Tower until recently when the following incidents were reported:
  - a) Initial reported incident occurred on December 30, 2010. A piece of ice approximately 30cm x 30cm hit a vehicle located on the Barrie Ford property.
  - b) A second incident occurred on or about January 5, 2011 and was witnessed by City staff while standing in the parking lot. A large sheet of ice approximately 90cm x 90cm landed some 14m from the base of the tower towards Mapleview Drive West.
  - c) A third known incident occurred sometime around January 8, 2011 where a sizeable chunk of ice left a basketball size hole in the communication shelter on the south east corner of the City property.
5. The naturally occurring winds and heat from the sun have been sufficient to control the snow and ice in the past. However, it appears now under certain conditions that this is not sufficient.
6. Upon receipt of the incident report, City staff immediately attended the site and in consultation with Barrie Ford cordoned off the immediate area where ice was observed to have landed. In addition, City staff coordinated the removal of icicles, snow and ice from the top of the tank. These measures continue to be in place. Monitoring of the top of the tank by video camera is done daily and during any snow fall events.

7. An incident review was undertaken by City staff to determine why there was falling ice, specifically for the winter of 2010/2011. The review noted the following:
  - a) The water tower was repainted in 2004 and the City's painting specialist consultant reported that the "workmanship was of high quality". Due to the close proximity of the adjacent properties, an upgraded coating system was implemented that is anticipated to last approximately 25 years. In 2011, Water Operations will be carrying-out their regular condition assessment of the coatings.
  - b) There has been no change in the operations of the water tower in regards to operating levels, procedures and demand.
  - c) Water Operations has included in the 2011 Business Plan funding for the washing of the structure which will improve the appearance and promote surface run-off but will not likely mitigate the icing problem.
  - d) The amount of communications infrastructure (ex. dishes, antennas) has been steadily increasing on top of the water tower and may have caused an obstruction, resulting in snow accumulation; however, this was not likely a significant contributing factor.
  - e) The 2009 Water Tower retrofit safety improvements included an increase to the height of a vent and the addition of a kick plate around the safety rail that prevents tools/equipment (e.g. screwdrivers) from rolling off the top of the water tower. This was not likely a contributing factor.
8. Staff contacted Landmark Municipal Services (Landmark), the original design-builder of the Mapleview Water Tower, to determine if icing was a new phenomenon being experienced elsewhere and how in their experience could this be mitigated. Landmark reported that they were unaware of other recent incidents that began occurring this year.
9. After several options were reviewed, Landmark recommended that a system of heat trace wiring be installed at the top of the water tower along with a series of heat traced rain gutters and downpipes. This solution would create several operational concerns. The Town of New Tecumseth, in the Alliston area, had installed heat tracing on a standpipe that was located close to several houses. From discussions and observations, it does not appear that the heat tracing in this case is achieving the desired intent of clearing the snow from the entire top of the tank.
10. It was determined that a building de-icing specialist should be obtained using a competitive process to seek input and provide their recommendations in order to mitigate icing on the Mapleview Water Tower.

#### **ANALYSIS**

11. While the barricading off of the area temporarily mitigates the liability to the City, it does not offer a permanent solution to the liability issue. The barricading off also results in a small reduction in the service level that the adjacent property owners have become accustomed to.
12. The Icing situation likely arose as a result of a weather event and the uniqueness of the water tower structure.
13. Without undertaking an in-depth analysis it could be speculated that the temperature and wind events that contributed to the ice build-up this year may reoccur. A deicing specialist would be able to analytically determine as to the probability of this reoccurring.

14. An investigation needs to be undertaken utilizing specialist consultants and contractors.
15. Landmark is the largest constructor of water towers in Canada and the original design-builder of the Maplevue Drive Water Tower (also the Ferndale and Bayfield towers). It would be prudent to keep Landmark involved with any potential changes to the structure to ensure the long term integrity of the tower structure, which typically has a lifespan of 75-100 years if maintained properly.
16. If the solution requires interior tank work, construction must occur after August 2011 to avoid the high water demand season. To ensure that the solution will be in place prior to the first snow accumulation, the solution must be in place likely at the end of October 2011. With these tight timelines, it would be prudent to have the original water tower design/construction specialist undertake the retrofit works with the de-icing specialist consultant as part of the solution-driven team. Once the Staff Report is provided to General Committee that recommends the Preferred Solution, direction will be sought in potentially retaining the services of Landmark to ensure the long-term integrity of the structure.
17. As can be seen below, there is limited space on the City property with the square water tower lot being approximately 30 metres x 30 metres (not including access road) and the diameter of the tower bowl being approximately 26 metres (note that due to the angle of the aerial photograph, the vertical height is askew but the tower base can be seen as being in the centre of the property).



18. The current American Water Works Standard (AWWA M42 – Steel Water Storage Tanks) states that a distance of 6.1 metres (twenty feet) should be available from the edge of the tank to the property line. This allows for any snow, icicles and rain to fall directly down onto the tower property. The 6.1 metres does not allow for wind effects on the falling ice and snow. The current distance is approximately 1.8 metres (six feet). We are unaware of why these decisions were made at that time.

19. Any known capital works requirements are incorporated into the annual capital planning cycle. The complaints of falling ice were first received December 30, 2010. The complaints and resulting investigation occurred after the development of the capital plan was complete. This project, if approved, would result in an adjustment to the 2011 Business Plan. Due to the public safety issue associated with the falling ice, this issue should be addressed prior to the next winter season.
20. 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 product 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.
21. Should this issue have been considered using this approach undertaken in the development of the capital plan, it would have received a high to extreme risk score given the potentially 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.
22. 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.
23. 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 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.
24. The risks of not proceeding with this work in 2011 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 Maplevue 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.
25. Any future water tower locations should have adequate buffer lands to minimize potential damage or personal injury, similar to what was done for the more recent Ferndale Water Tower.

#### **ENVIRONMENTAL MATTERS**

26. The following environmental matters have been considered in the development of the recommendation:
  - a) The solution should avoid the use of de-icing applications that are not conducive to the environment; and,
  - b) The solution should minimize future hydro energy costs.

**ALTERNATIVES**

27. The following Alternative is available for consideration by General Committee:

**Alternative #1**

General Committee could maintain the existing situation with respect to falling ice (i.e. Status Quo).

This Alternative is not recommended as a safety concern has been identified and therefore the City should respond to minimize or eliminate it.

**FINANCIAL**

28. There is no impact to the City of Barrie's insurance premiums until a significant loss occurs, which would be the case with personal injuries.
29. The total cost of the recommendations in this Staff Report is \$30,000, excluding HST. The detailed Breakdown is provided below:

Component	Costs
Consultant ( by competitive RFP)	\$15,000
Project Costs (staff, testing, field services)	\$10,000
Project Contingencies	\$5,000
Total Project Estimated Costs	\$30,000

30. This project is not included in the 2011 Business Plan. Staff is proposing to fund the Total Project Estimated Costs of \$30,000 from the Water Rate Reserve (12-05-0580).
31. The subsequent Staff Report that recommends the Preferred Solution will include funding requirements both for Capital and Operating budgets.

**LINKAGE TO COUNCIL STRATEGIC PRIORITIES**

32. The recommendation(s) included in this Staff Report are not specifically related to the goals identified in the 2010-2014 City Council Strategic Plan.