

Executive Summary

“Assessment of Storm and Sanitary Systems in Thornhill” Report, August 2006

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EXECUTIVE SUMMARY

Introduction

The Town of Markham retained R.V. Anderson Associates Limited to conduct an assessment of the storm and sanitary sewer systems in Thornhill in order to determine if the Town's sewer design and construction standards and/or their operation and maintenance practices contributed to the basement flooding and surface flooding that occurred in Thornhill during the major storm on August 19, 2005. This report summarizes the data that was reviewed as well as the findings and recommendations.

Scope of Study

This assessment was based on a high level review of information provided by the Town of Markham and several meetings with staff from the Town's Community and Fire Services Commission and Development Services Commission. This assessment did not include the following: a hydraulic analysis of the storm or sanitary sewer systems; a physical inspection of the sewer systems or overland flow routes; a review of flood damage claims; or consultation with the Toronto and Region Conservation Authority (TRCA), the Region of York, insurance companies or any residents. It is beyond the scope of this study to identify the specific causes of flooding on individual properties or to quantify the adequacy of the existing sewer systems.

Description of Existing Systems

The majority of Thornhill was developed in the second half of the 20th century. Most of Thornhill is serviced by separate storm and sanitary sewer systems. The Town's sanitary sewer system drains into the Regional sanitary sewer system. The storm sewers discharge into either the East Branch of the Don River or German Mills Creek – both streams flow southerly through Thornhill.

There is no history of widespread flooding in Thornhill prior to August 19, 2005. There was some localized flooding in the southwest part of Thornhill approximately 20 years ago and this flooding was attributed to heavy rainfall.

Storm Event on August 19, 2005

On Friday afternoon, August 19, 2005, the Town of Markham, as well as surrounding municipalities in the Greater Toronto Area (GTA), experienced a rainstorm event that caused considerable flooding and damage. According to the Insurance Bureau of Canada, the expected payout to help Southern Ontario recover from the August 19th storm will reach \$400 million for approximately 15,000 claims.

The TRCA issued a Flood Safety Bulletin at 10:30 a.m. and a Flood Advisory at 3:15 p.m. on August 19, 2005 to all of the municipalities within their jurisdiction. Most of Thornhill received in excess of 120 mm of rain on August 19th and the rainfall intensity over a three-hour period exceeded a 100-year return period. The Town responded to approximately 150 service requests in Thornhill that were related to flooding on August 19th. The Town also received numerous calls from residents after business hours on August 19th and over the weekend. The residents that called after 5:00 p.m. on August 19th were advised to contact their insurance companies and these calls were not recorded.

Due to the short duration of flooding on August 19th, the Town did not declare an emergency. The Town did not qualify for flood relief from the Province of Ontario under the Ontario Disaster Relief Assistance Program since the Minister of Municipal Affairs and Housing indicated that there was insufficient justification for flood relief from the Province.

When responding to the service requests, Town staff noted that in many cases, the sanitary sewers were surcharged in front of those houses that reported basement flooding. A sanitary sewer overflow occurred near the intersection of Bayview Avenue and Steeles Avenue and this was attributed to surcharging of the Regional sanitary sewer system. The Town reported that water from swollen creeks flowed into open manholes. Surface flooding was also widespread on August 19th and the Town has estimated that the cost for repairs to road and storm drainage facilities alone will be approximately \$2.6 million.

Causes of Flooding

There is no information readily available to determine the type of flooding (e.g. basement flooding, surface flooding) and the cause(s) of flooding (e.g. blockage in the building

drain or the main sewer, high sewage flows due to inflow and infiltration, inadequate outlet capacity, inadequate overland flow route) on a specific property. Basement flooding is a complex process and it is usually difficult to pinpoint a specific cause.

In light of the fact that a large part of Thornhill was developed prior to the advent of modern stormwater management practices, it is likely that some areas in Thornhill do not have adequate overland flow routes. Therefore, during extreme wet weather events, such as the one that occurred on August 19th, it is likely that significant surface flooding would occur in some areas and this would allow stormwater to drain into basements through cracks in the basement walls and through basement windows. In this case, stormwater could then drain directly into the sanitary sewer system through the floor drains. Stormwater could also enter the sanitary sewer system through roof downspouts and through sanitary manhole lids that are located in areas that are susceptible to surface ponding.

In other words, it is possible that most of the basement flooding that occurred in Thornhill on August 19th was instigated by surface flooding. It would not be practical to design the sanitary sewer system to convey large volumes of stormwater that enters through floor drains. It is expected that the potential for basement flooding and surface flooding could be reduced dramatically if adequate overland flow routes were provided.

Design and Construction Standards

The majority of the storm and sanitary sewer systems in Thornhill were constructed over the second half of the 20th century. Although the design standards for these systems have changed significantly over this period, these systems have performed reasonably well over the past 50 years without any incidences of widespread flooding prior to August 19, 2005.

The evolution of the Town's sewer design standards is consistent with that in other Ontario municipalities. Since 1937, it has been a legal requirement in Ontario for municipal sewers to be designed by a professional engineer. Similarly, over the past 35 years, the design of all municipal sewers in Ontario had to be approved by the Ministry of the Environment.

Prior to 1971, the Township of Markham was responsible for inspecting private sewers and plumbing. Since 1971, the Building Code has specified the requirements for construction of private sewers and plumbing. The Region of York was responsible for their inspection during the period of 1971 to 1999. Since 1999, the Town of Markham has been responsible for inspection of private sewers and plumbing.

The areas within Thornhill that were developed prior to 1980 are more susceptible to flooding than the areas that were developed after 1980 since the design standards prior to 1980 did not adequately address the potential for flooding during a major storm. In other words, the drainage systems that were constructed prior to 1980 were properly designed for the standards that were in place at that time. However, these drainage systems have not been upgraded to meet current standards. It is also noted that the areas that were developed after 1980 were also susceptible to flooding on August 19th since their drainage systems were only designed to handle the runoff from a 100-year storm (the intensity of the rainfall on August 19th exceeded a 100-year return period for a three-hour duration).

Operation and Maintenance Practices

The Town of Markham, like most Ontario municipalities, does not have a formal program for cleaning and inspection of the storm sewers. The Town typically cleans and inspects storm sewers prior to reconstruction of roads. Catch basins are cleaned every two years on local roads and once per year on main roads.

The Town has compiled a detailed inventory and prepared detailed mapping of their storm and sanitary sewer systems and is currently utilizing a computerized maintenance management system (Hansen) to generate work orders, partially track costs and record the service history for each sanitary sewer and manhole. The Town is planning to expand their maintenance management system to include the storm sewer system.

Based on the results of several benchmarking studies, the Town's sanitary sewer cleaning and inspection cycle is better than most municipalities in Ontario. It is also noted that the number of sanitary sewer back-ups in the Town between 2000 and 2004 was similar to the average reported by other large lower-tier municipalities in Ontario's Municipal Performance Measurement Program.

The Town has recently joined the National Water and Wastewater Benchmarking Initiative and this will assist the Town in monitoring their investment in various operation and maintenance (O&M) programs for their sanitary sewer systems so that these programs can be optimized to achieve the desired performance standards.

Sewer Renewal Programs

The Town's storm sewer renewal program is driven primarily by the road reconstruction program and this approach is consistent with that used by most other Canadian municipalities. The investment in renewal of the storm and sanitary sewer systems in

Thornhill has been increasing in recent years. The costs for renewal of these systems will increase even more as they age.

The Town has conducted a proactive sanitary sewer renewal program over the past 10 years and most of the sewers with significant defects have reportedly been rehabilitated. The focus of the Town's sanitary sewer renewal program has been on rehabilitation rather than replacement in an effort to extend the life of the sewer while minimizing costs and disruption to residents.

The Town recently received an "industry achievement award" from the North American Society of Trenchless Technology for their significant contributions to the development of technology and to the growth of the trenchless industry in the last 15 years. The Town has also been actively involved in the Centre of Advancement of Trenchless Technology (CATT) at the University of Waterloo and the National Guide to Sustainable Municipal Infrastructure (InfraGuide) in recent years.

Conclusions

The intensity of the storm that occurred on August 19, 2005 exceeded a 100-year return period over a three-hour duration and this was the primary cause of the flooding that occurred across the GTA on that date. Although the majority of Thornhill was developed prior to 1980, with lower design standards than the current standards, the sewer systems have performed reasonably well prior to August 19, 2005. The Town's O&M practices and renewal programs are consistent, if not better, than other municipalities in the GTA. In our opinion, the design, construction and maintenance of the sewer systems cannot be blamed for the flooding on August 19, 2005.

Recommendations

The Town should conduct detailed studies of the sanitary sewer and storm drainage systems in Thornhill, particularly in the areas that were developed prior to 1980, in order to identify opportunities to reduce the potential for flooding in a cost effective manner. These detailed studies will likely identify the need for the Town to install inlet controls in parts of the storm sewer system; replace existing sewers with larger sewers; construct storage facilities; implement a regular storm sewer cleaning and inspection program; eliminate extraneous flows from the sanitary sewer system; and establish overland flow routes.

In the interim, the Town should implement a roof downspout disconnection program; enhance the public awareness program; review the need for a basement flooding protection subsidy program; and review the need for a 24/7 control and dispatch centre

for public works. In addition, the Town should prepare a plan for full life cycle costing of the storm and sanitary sewer systems with a reasonable useful life expectancy for these assets. The Town should continue to monitor the performance of their systems in order to ensure that the investment in these systems is sufficient and that the investment is expended in an efficient manner.

