UPDATE ON LISGAR DISTRICT
BASEMENT WATER INFILTRATION INVESTIGATION
CITY OF MISSISSAUGA

Introduction

The Lisgar District in the west end of Mississauga suffered basement water infiltration on several occasions over the latter part of the 2000's with 187 homes reportedly affected in total over this period. The City of Mississauga, as a result, initiated a detailed investigation of the causes and potential solutions, plus undertook a variety of active measures with the goal of preventing future occurrences. This brief provides a summary of the current state of these activities with a view to inform local citizens of the status, along with an outline of near-term actions.

The Lisgar District has a "3-pipe" drainage system (storm, sanitary and foundation drain collector), compared to the more conventional "2-pipe" system (storm and sanitary only). 3-pipe systems are used in areas where depths are too shallow to permit the roadway storm sewer to be placed deep enough to drain the foundation drains (weeping tiles) to a suitable outlet (i.e. creek). Although less common than the 2-pipe system, 3-pipe systems have been installed in various other municipalities across the GTA, including Brampton. The design of each of the components of the 3-pipe system, including the foundation drain collector system (which has been implicated in the water infiltration events in the Lisgar District), was the responsibility of the engineering firms retained by the subdivision developers. The responsibility for construction of the whole system rests with the developers and is overseen by the developers' engineers, who then certify to the City that the construction conforms to the original design plans.

Recap of where we were as of April 2013

Last April (2013), the City provided a detailed presentation to area residents on the first phase of the Lisgar District work. It also provided an opportunity for local residents to ask questions of City staff and its consultant, AMEC Environment & Infrastructure.

At that time, the City reported on the study findings to-date, offered an outline of potential causes and factors influencing the situation and provided detail on next steps including the second phase of the study. A focus at that time related to "What has changed in the past few years"?

Some of the speculated changes included:

- climate
- development
- aging basements/infrastructure
- groundwater levels
- changes to homes (walk outs / drainage connections)
- lot grading

The City and its consultant reported that during storms, water is entering the dedicated foundation drain collector (FDC) much more quickly and significantly than would normally be expected (i.e. surcharge). Based on the work conducted to that point, the Team (City and Consultant) was able to eliminate a number of causes and also refine certain aspects of the next phase of the investigation.

Due to the unknowns, further investigations were required; this brief outlines the substance of those investigations.

Scope of Additional Works by Consultant (Phase 2) and City Forces

The following works have been undertaken by the Team since the April 2013 meeting as part of the Phase 2 Investigation:

- Additional monitoring gauges
- Storm sewer leakage tests
- Additional analyses
- Testing, inspection, and repair of FDC system
- High water protocol
- Creek maintenance and inspection

Preliminary Findings from Phase 2 Investigation

The following has been established based on the additional data collected over 2013:

- The additional monitoring and testing during Phase 2 showed that surcharge of the FDC system continues to be observed
- Data from the FDC trunk sewer south of Britannia Road indicates that surcharging during larger storms would be expected, which could in turn affect upstream areas
- Data from FDC outlet (deep storm sewer) suggests that this system surcharges, hence would be expected to have an impact on upstream FDC sewers during larger storms
- Storm sewer leakage tests have clearly demonstrated a relatively rapid and direct connection between storm sewer system and the FDC system. Under high flows, storm sewer water is leaking into the common utility trench and ultimately into the FDC system
- Continuous flows observed at certain FDC laterals which might suggest that there is a continuous supply of water to the FDC
- Chemical analyses during dry weather confirm the observations cited above, as FDC water samples are very similar to those taken from the storm sewer utility trench, the creek and the Osprey Marsh Pond, and dissimilar to groundwater samples
- No connection between water levels in the Osprey Marsh Pond and FDC system surcharging has been currently identified; however, the lack of major storms in 2013 limits this finding
- A review of sanitary sewer monitoring data from the Region of Peel indicates no surcharging during identified FDC surcharge events; results confirm that the sanitary sewer system is not a cause or contributor to basement infiltration

The following table summarizes what is known so far and where further analysis and assessment are required. Note that additional possible causes / factors were identified since April 2013.

New Factor	Possible Cause / Factor	Level of Influence		Notes
		April 2013	May 2014	
	Groundwater	Low/Not Applicable	Low	
	GO Station	Low/Not Applicable	Not Applicable	
	Sanitary System	Low/Not Applicable	Not Applicable	
	Cross-Connections	Low/Not Applicable	Low	Known cross-connections repaired
	Creek Backwater	Further Assessment Required as part of Phase 2	Low to Contributing	Additional field monitoring in 2014
	Osprey Marsh Pond (SWM) Backwater		Low to Contributing	Additional field monitoring in 2014
	FDC Inflow/Infiltration		Low	
	FDC Hydraulics		Assessment and Analysis Underway (Phase 3)	
	FDC Tailwater			
	FDC Depths			
	Lot Grading			
	Basement Construction/ Changes			
	Stormwater to Utility Trench		Contributing to Primary	Validated by 2013 storm sewer leakage tests
✓	FDC Maintenance	These items were not originally identified at the April 2013 public meeting and have been subsequently considered based on follow-up analysis and assessment (some have yet to be analyzed). This will be completed as part of Phase 3.	Low	FDC system flushed since study start-up; FDC systems are closed, hence would typically only require nominal maintenance
✓	Creek Maintenance		Not Applicable to Low	Lands regulated by Conservation Halton; work needs to balance ecological impacts. City forces have cleared creek (sediment / vegetation) since study start-up
✓	FDC Design		Assessment and Analysis Underway (Phase 3)	
✓	FDC Construction			
✓	Basement Walkouts			

Remaining Work and Timelines

The Team continues to make progress in determining potential causes and factors contributing to the basement infiltration matter. The focus of the 2013 program (Phase 2) was on additional monitoring and data collection, in order to more definitively assess identified potential causes/factors of basement infiltration for which insufficient information was previously available. The 2013 program is considered to have been successful, as valuable monitoring data have now been collected, allowing for the previously noted findings to be established/refined.

The focus of the current and remaining investigation over 2014 (Phase 3) is to use the data collected over 2012/2013 to establish recommendations for improvements to the FDC system. Given that efforts to-date have been focused on data collection, some time must now be spent to undertake complete analyses of these data. This effort will include computer modelling in order to corroborate the observations made in the field and assist in undertaking a mitigation analysis. A thorough background data review will also be conducted in order to reconcile observed instances of basement infiltration and monitoring data with the originally intended drainage system performance. Some additional field testing is also proposed to evaluate the effectiveness of a potential mitigation measure (i.e. clay collars at storm sewer outfalls to block inflows to utility trenches).

Given the extensive amount of remaining analyses, it is anticipated that recommendations stemming from the work will be released in a Corporate Report early in 2015. With the completion of the study, the City of Mississauga will be better able to assess the status of ongoing claims for damages, and also bring forward any recommendations made by the Consultant and associated budget implications, for Council consideration, in early 2015. Clearly some of the recommendations have the potential to be costly, as such the City needs to ensure that the right fixes are made to achieve a successful outcome.