AUGUST 10, 2023 FLOOD INVESTIGATION REPORT

DRAFT SUMMARY REPORT WARD 8

Asset Management (Water Resources)
Infrastructure and Water Services
December 14, 2023

Flood Investigation Report (Ward 8)

August 10th, 2023 Flooding Event

INTRODUCTION

The event that occurred on August 10th, 2023, produced an average of 60 mm of rain throughout the city over a period of 5 hours, with a peak recorded volume of 107 mm at the Colonnade Road gauge. Furthermore, the intensity of the storm reached a peak of 190 mm/hr at the Colonnade rain gauge. The storm followed a West to East band in the south portion of the City Core with a return frequency of approximately 100 years (1% change of occurring in any given year). Other parts of the city experienced a lesser event, in the range of a 10 year to 50 year storm. Due to the nature of the storm (high peak intensity and high volume), sanitary sewers, storm sewers and overland drainage systems were all affected.

To date there are 474 reports of flooding related to the August 10th, 2023 rainfall event. For those reported through 311, the property that flooded was recorded but no further information was provided such as the entry point of the water. In the past, first response would visit flooded properties but once water had receded, the entry source was difficult to determine. As such First response chose to discontinue physical responding to calls following a flood event and simply recorded the property that flooded. Many of the reports are therefore via AMB questionnaire distributed to residents by councilors or individual calls/emails forwarded to AMB or through public meeting(s) at community level.

Preliminary analysis of the flood reports shows that the source of flooding varied by neighbourhood depending on the age and configuration of the sewer system. For many, flooding occurred via floor drains and basement plumbing, indicating that the sanitary sewer system was overwhelmed due to high extraneous flows from weeping tiles connected to the sanitary system (homes constructed before the mid-1960s). In other cases, flooding was caused by surcharging of the storm sewer system, which backed up water into the weeping tiles (homes constructed after the mid-1960s). There were also many instances of overland flooding due to the lack of a well-defined overland flow system that caused property damage, closed roads and in some cases, entered basements via windows, reverse slope driveways and other openings. When a basement is flooded, the water drains back into the sanitary system via the floor drain, which further exacerbates surcharging of the sanitary sewer system.

To provide a preliminary understanding of the flooding that was experienced, flood reports are grouped into clusters where a cluster is defined as a grouping of homes that have flooded in a particular area. Four clusters accounting for approximately 42 flood reports were identified I Ward 8. The remaining flooding reports (approximately 6) did not fall into a specific cluster and at the time of writing this report, they are suspected as being a local issue most likely related to the private property, however infrastructure issues are not ruled out.

1.0 DIFFERENT TYPES OF SEWER SYSTEMS

The City of Ottawa is serviced by various types of sewer systems. Prior to 1948, the City constructed combined sewers in urban areas, in which both domestic sewage and surface runoff were conveyed in the same piped system. Such systems were prone to surcharging during large rainfall events and overflows to surface water bodies often occurred. The surcharging of these systems also caused sewage to backup into some basements.

From 1948 to 1961 the City constructed sanitary sewers and surface runoff was conveyed using ditches and shallow storm sewers. The practice at the time was to use the deeper sanitary sewer pipes to capture foundation drain flow, thereby eliminating the need for sump pumps in homes. This practice unfortunately led to excess flow in the sanitary system during large rainfall events.

In 1961 the City of Ottawa passed a bylaw that required that all new sewer systems be fully separated. In other words, a sanitary sewer system would be designed for domestic flow only and a deeper storm system would capture surface runoff and foundation drain flow. The City even proceeded to separate sewers in some of the combined areas, however due to outlet restrictions, the storm sewers were shallow and foundation drains remained connected to the sanitary sewers. Also, in many areas where ditch drainage existed, the City constructed storm sewers, but again due to various drainage conditions or limitations the sewers were shallow and foundation drains remained connected to the sanitary system. ***All areas that have foundation drains connected to the sanitary sewers are referred to as partially separated. Figure 1.0 below, shows an approximate outline of the partially separated systems (in yellow) and fully separated systems (in red) in the southern portion of the City core, which was most affected by the storm.***

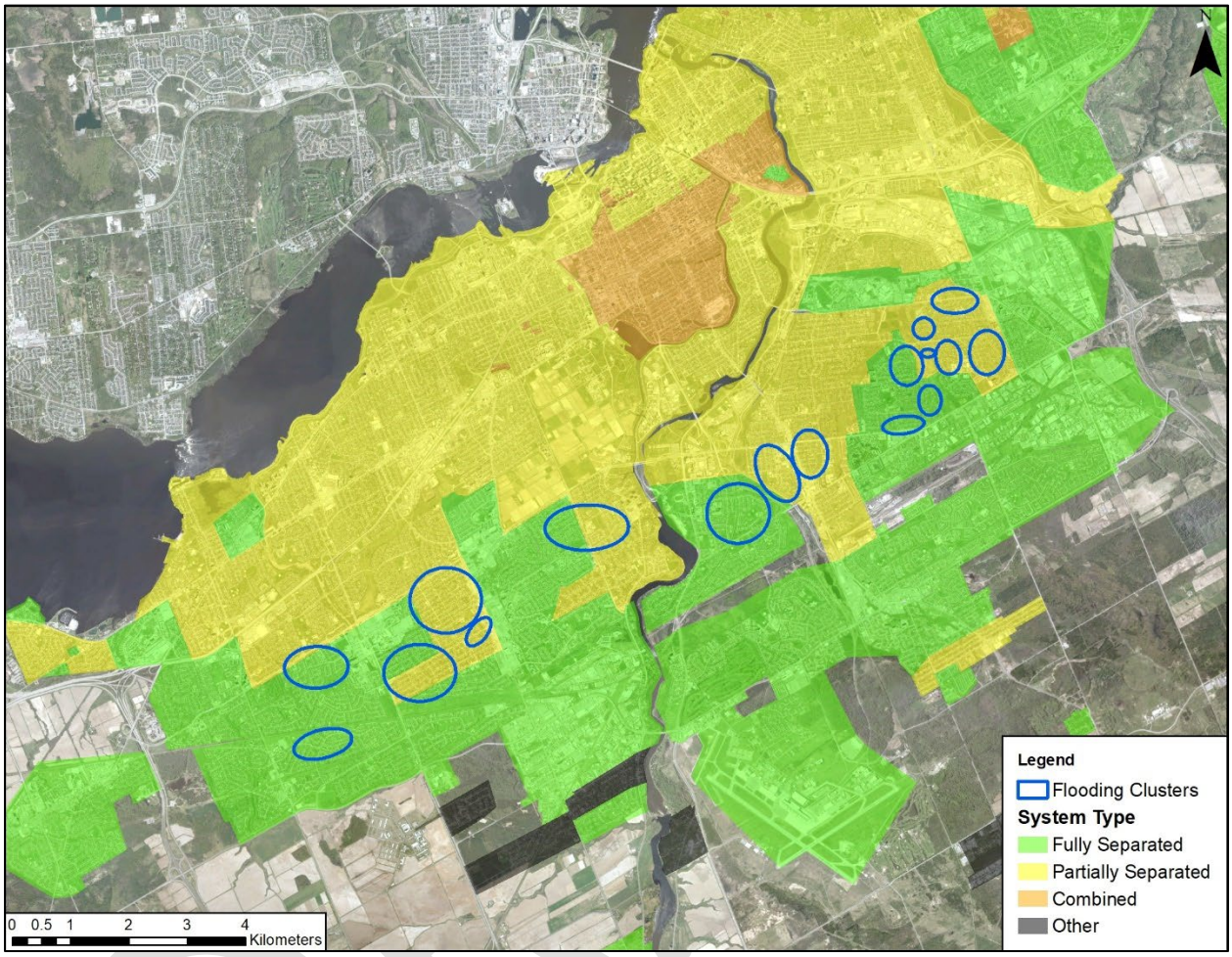

Figure 1 – System Type and Flooding Clusters

2.0 CHARACTERISTICS OF RAINFALL EVENT

The average rainfall in the partially separated area was 60 mm with a peak recorded volume of 107 mm. The peak intensity of the event reached 190 mm/hr at the Colonnade rain gauge. Although the event did not reach the peak 100 year peak intensity of 243 mm/hr, it lasted longer than a typical storm, therefore the sustained intensity created an effect similar to a 100 year storm. Figures 2 and 3 below show the Intensity Duration Frequency (IDF) curves for the event at the Colonnade and Mooney's Bay rain gauges. It is apparent from the graphs that as the storm progressed, the curve moved into the 100 year range due to the sustained intensity over a long period of time.

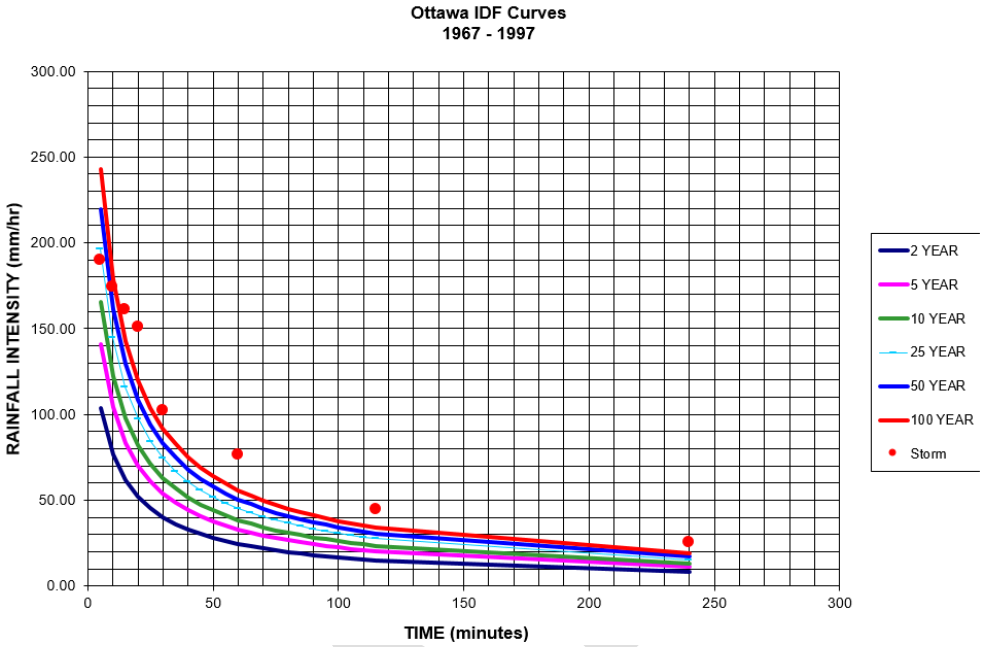

Figure 2 - Colonnade Road Rain Gauge

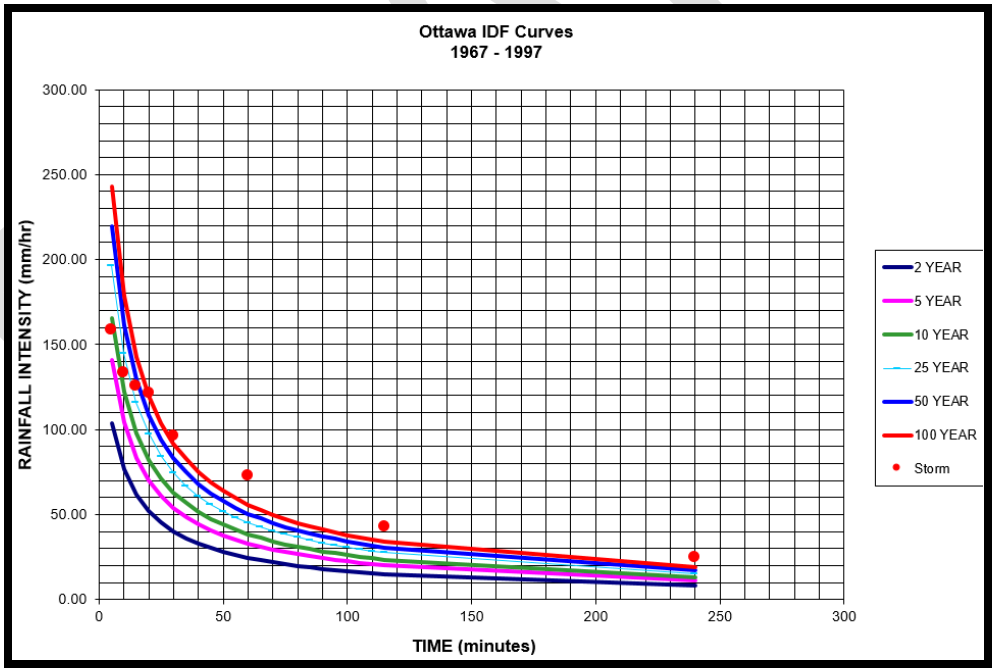

Figure 3 – Mooney's Bay Rain Gauge

Although the storm of August 10th affected the entire city, the peak of the storm followed a band near the south end of the City core. The rain gauges along that band showed the greatest rainfall

volume and intensity. Figure 4.0 shows the approximate path where the highest rainfall was experienced.

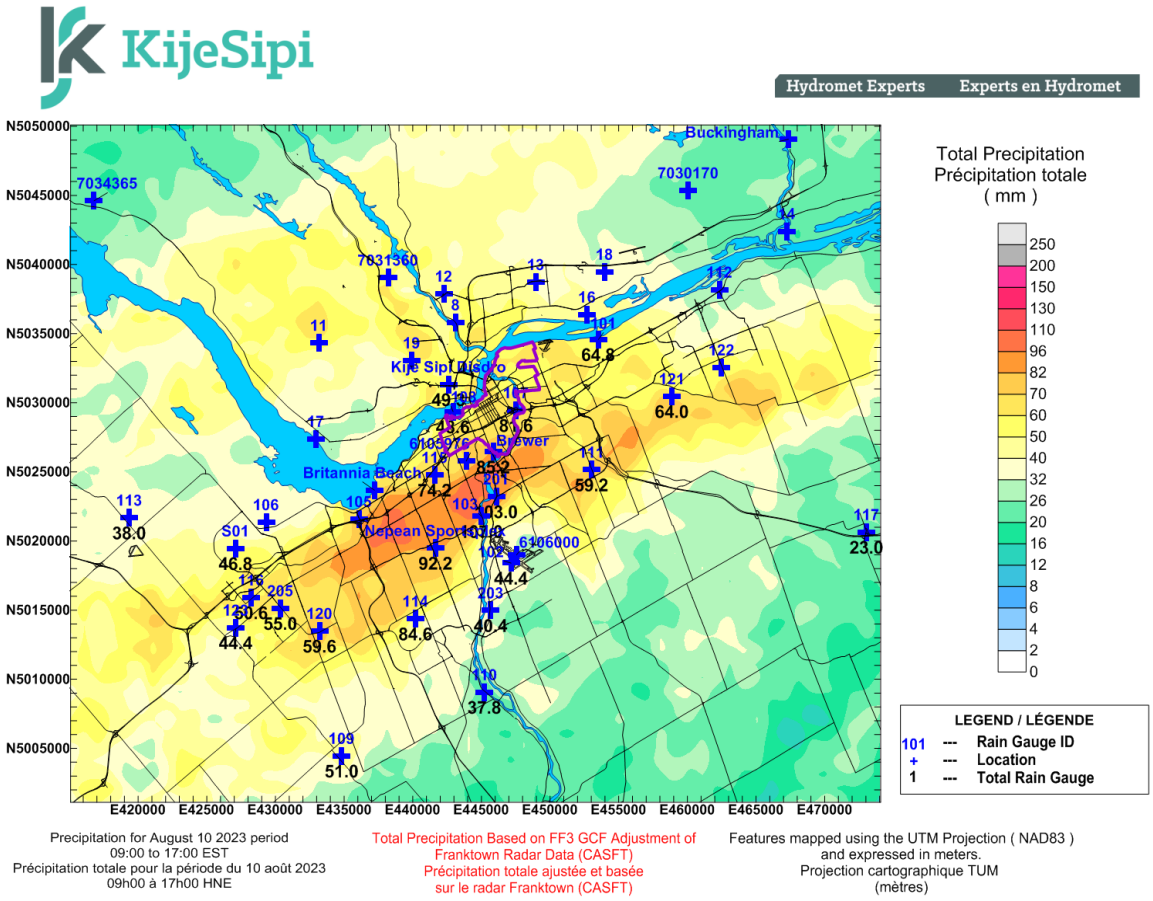

Figure 4 – Path of Storm Peak

In contrast, the event of September 9th, 2004 that caused over 1700 occurrences of basement flooding in the City, produced approximately 140 mm of rain over a 24 hour period. That event did not have a high peak intensity, but the volume saturated the ground and surcharged the sanitary system in the partially separated area due to flow from foundation drains. A similar event occurred in October 2017. The event of this year was both high volume/long duration and high intensity, thus impacting the sanitary system, the storm sewer system and the overland system, as explained in the next section.

3.0 GENERAL OVERVIEW OF FLOODING:

The rainfall of August 10th had both high volume and high intensity, thus impacting the sanitary sewers, the storm sewers and the overland drainage system. Various areas were impacted differently depending on the type of sewer system.

Partially Separated Systems: These systems were constructed prior to the early-mid 1960s and have weeping tiles connected to the sanitary sewers. When a high volume of rain falls over an extended period of time, much of the rainfall infiltrates into the ground and reaches the weeping tiles. This flow then enters the sanitary system causing surcharge since the flow contribution from weeping tiles is much greater than the domestic flow and can exceed the capacity of the sanitary sewers during an extreme storm. This surcharged water then flows back into basements via floor drains and basement plumbing. Many of the flooded areas on August 10th, flooded due to surcharging from the sanitary sewer system.

Fully Separated Systems: In fully separated systems, foundation drains (weeping tiles) are connected to the storm sewer and not the sanitary sewer. However, these systems are also prone to surcharge when too much surface water enters the storm sewer via catch basins. Storm sewers are design to capture frequent rainfall events, so when a critical event occurs, these systems can surcharge. In newer subdivisions, the flow entering the system is restricted and excess runoff is managed on the surface, but most older areas do not have these types of controls as to not exacerbate surface flooding. When the storm sewer surcharges, water can backup around the weeping tiles and enter the basement via foundation joints and cracks. We suspect that this occurred in some of the flooding clusters.

Ditch Systems: Ditch systems are often like Partially Separated system in that weeping tiles can be connected to the sanitary sewers (prior to mid 1960's). In many instances, residents may redirect their sump pumps to the house's internal pluming if there is no adequate outlet outside the building. Like storm sewers, ditches are designed to convey runoff from smaller frequent events with excess flow being directed to the street or even onto private property.

Surface drainage: In newer subdivisions, roadways and easement are designed to convey overland flow to an outlet, consisting usually of a ditch system or watercourse. Old neighbourhoods, however, have no clearly defined overland flow system and water can accumulate at low points and spill through private property. If the depth of ponding or flow is excessive, water can enter homes via windows, reverse slope driveways or other openings, and can also damage yards. This flow can also impede traffic and damage vehicles. This was the case in many of the flooding clusters.

Combined impact: If a home floods due to storm sewer surcharge or surface water entering via a window, water will accumulate in the basement and drain back out via the floor drain. This

drain is connected to the sanitary sewer and can lead to surcharging of the sanitary sewer if many flooded homes are all draining at once. This can then impact homes further downstream as the sanitary system becomes surcharged. We suspect some area flooded due to this combined impact.

Information collected following the event of August 10th indicated that in many of the incidents, water entered homes either through the basement floor drain or via basement plumbing. This is indicative of a potential sanitary sewer backup or a sanitary sewer service connection malfunction. The information also noted that many other the incidents were attributed to storm sewer backup, windows and foundation cracks.

It is to note that some homes on a particular street flooded when other adjacent homes did not. It is possible that the homes that were flooded have lower basement elevations than adjacent homes or that adjacent homes have protective plumbing.

A summary of the flooding investigation to date is provided in the following section.

4.0 FLOODING CLUSTERS:

The following section describes the flooding that occurred on August 10th, 2023 on a cluster by cluster basis and provides a possible explanation as to the causes in each flooding cluster.

Note that a cluster is defined as a group of homes that have flooded in a general area. There are also isolated locations that reported basement flooding. Some of them may be the result of sewer system backup (as noted below), however due to the randomness of these locations, it is considered that many of these flooding occurrences are related to service connection problems, internal plumbing deficiencies or local grading deficiencies, and not as a result of a backup of the City's sewer system (See Section 5.0).

To provide a quick assessment of capacity constraints of the sewer system, where applicable, the models developed over recent years and calibrated for the September 2004 event, were updated using the August 10th event and used to better understand system performance accounting for operational constraints during the event.

4.1 Centrepointe Cluster:

- **Location and System Characteristics:** Six (6) properties reported flooding in this cluster. This cluster is not a typical cluster, in that it consists of homes that are not grouped together closely, indicating that the problem may be individual as opposed to systematic. It is added here however as to show improvements to the system since the

last flooding events. The system is fully separated (weeping tiles are connected to the storm sewers) with inlet controls in catch basins.

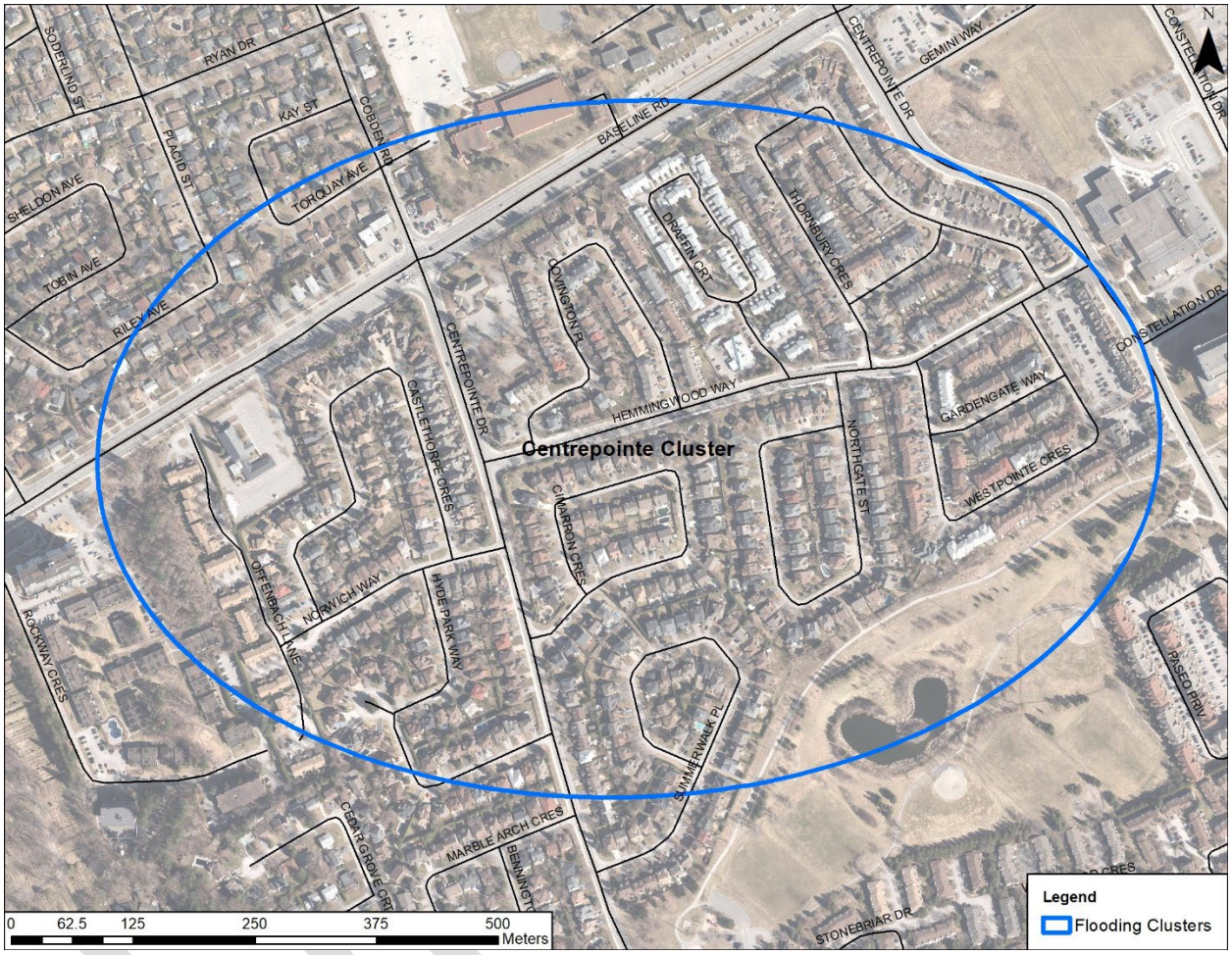

Figure 5 – Centrepointe Cluster, August 10 Flooding

- **Type of Flooding:** First response data does not provide any indication as to how the properties flooded. This area is fully separated, and stormwater management controls were implemented following a study in 2015 (i.e. control devices were installed in catch basins to limit the flow entering the storm sewer system).

- **Previous Flooding:** This cluster reported over 100 cases of basement flooding in the event of June 27th, 2002. The cause of flooding was surcharging of the storm sewer that backed up into the residential weeping tiles.

- **Previous Investigations and Remedial Measures:** The Centrepointe Dual Drainage Study was completed by WSP in 2017. The study involved the creation of a detailed dual drainage model to confirm the existing level of service and recommend infrastructure improvements. This model was integrated with the Craig Henry dual drainage model in 2018 to confirm the final recommendations. Inlet control devices were recommended and installed in 2018 to minimize the risk of storm sewer surcharge. The level of service was improved throughout the catchment and generally ranges from 10 to 100 year.

- **Current Investigation:** A review of the computer models showed that the storm sewer system would have surcharged during the August 10th event, however the level of surcharge would have been reduced due to the implementation of inlet control devices throughout the basin. Some sections of the storm sewer system would have surcharged to basement elevation and homes without a properly functioning backwater valve would have experienced basement flooding. The fact that only 6 properties reported basement flooding and that they were not grouped together, leads to the conclusion that faulty or missing backwater valves failed to protect against localized sewer surcharge.

- **Probable Cause of Flooding:** The measures that were implemented following the 2017 and 2018 studies increased the level of service in the area, which is apparent by the greatly reduced number of flooding reports compared to 2002. The event of August 10th, 2023 was greater than the level of protection for this system, which means that surcharging in some areas was expected. Residential backwater valves provide additional protection in these instances. It is suspected that the homes that flooded had faulty or missing backwater valves.

- **Next Steps:** Stormwater management control work has been undertaken in the past 10 years to improve the level of service and no additional measures are anticipated. Communication to residents about inspecting their lateral lines and installing backwater valves should be undertaken.

4.2 Crestview Cluster:

- **Location and System Characteristics:** Fifteen (15) properties reported flooding in the August 10th, 2023 event. Similarly to the Centrepointe cluster, the homes that reported flooding are not grouped closely together, again indicating the possibility of individual issues as opposed to system wide issues. The area is a mix of fully separated storm sewers, and ditch systems with weeping tiles potentially connected to the sanitary system (i.e. partially separated)

Figure 6 – Crestview Cluster, August 10 Flooding

- **Type of Flooding:** First response data does not provide any indication as to how the properties flooded.

- **Previous Flooding:** There are over 80 historical reports of basement flooding in this cluster in events from 1979, 1996, 2000, 2002, 2004, 2005 and 2017. Approximately 60 of these incidents occurred in 2004, 2005 and 2017, which produced events that typically created flooding via the sanitary system. This is evident by the fact that over 40 homes flooded in September 2004, which was due to the surcharge of the sanitary system. Home that reported flooding in areas with storm sewers are much less in numbers and were influenced by high intensity invents in 1996, 2000 and 2002.

- **Previous Investigations and Remedial Measures:** Following the event of September 2004, the City undertook a detailed study of the City View and Crestview area and determined that the cause of flooding from that event was a combination of excess extraneous flow into the sanitary system combined with a surcharged trunk sanitary sewer. The trunk sewer was upsized in 2009, which resulted an increased level of service in the sanitary sewershed. The fact that only 6 homes reported basement flooding in 2017 is indicative that the measures of 2009 worked at improving the level of service. Following the event of 2004 as well as subsequent events, the city encouraged residents to install backwater valves through its protective plumbing program.

- **Current Investigation:** The homes that reported flooding in this event are located along a storm sewer system that is uncontrolled. It appears that the homes in this sector flooded due to storm sewer surcharge. A review of the sewer computer models for this area show that the storm sewer would surcharge to basement elevation during the event of August 10th, 2023. However, the homes that flooded are not closely grouped together. This may indicate that homes that flooded may have had backwater valves that failed or that they had lower basements or that their weeping tile lateral pipe in is poor condition.

- **Probable Cause of Flooding:** Surcharging in the storm system due to the severity of the event is the most likely cause of basement flooding in this area. Homes with missing or faulty backwater valves would have been most at risk.

- **Next Steps:** The City will be further investigating the storm sewer system to see if stormwater management in the form of control devices can be implemented to reduce storm sewer surcharge. Communication to residents about inspecting their lateral lines and installing backwater valves should be undertaken.

4.3 City View Cluster:

- **Location and System Characteristics:** Eleven (11) properties reported flooding in the August 10th, 2023 event. Similarly to the Centrepointe and Crestview cluster, the homes that reported flooding are not grouped closely together, again indicating the possibility of individual issues as opposed to system wide issues. The area is drained with ditches with weeping tiles potentially connected to the sanitary system (i.e. partially separated)

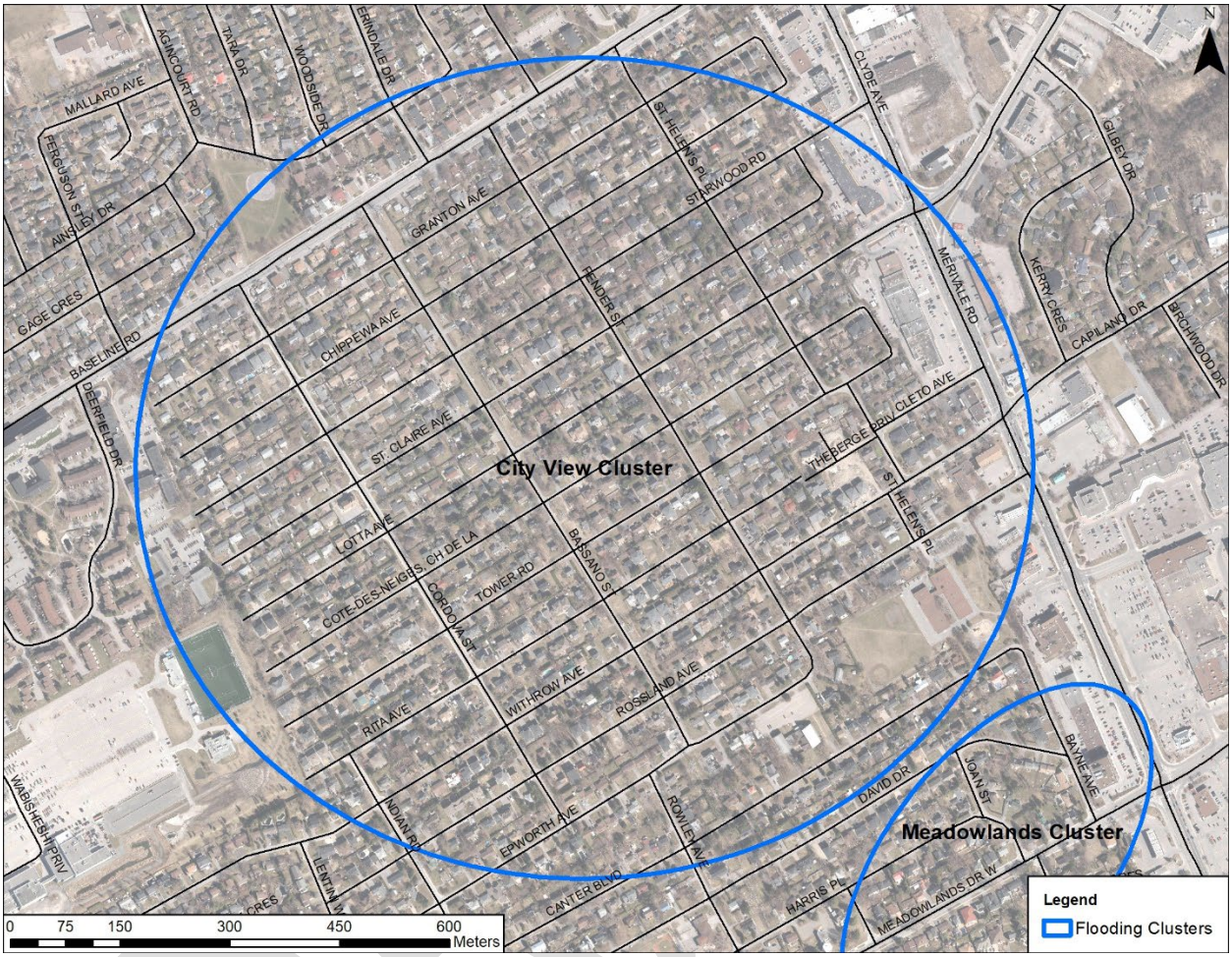

Figure 7 – City View Cluster, August 10 Flooding

- **Type of Flooding:** First response data does not provide any indication as to how the properties flooded.

- **Previous Flooding:** This area suffered widespread flooding in the event of September 9th, 2004, where over 50 homes reported incidents of basement flooding. Other smaller incidents of flooding were also reported in 1996, 1997, 1998, 1999, 2005 and 2006. None of the other incidents formed clusters like the event of 2004.

- **Previous Investigations and Remedial Measures:** Following the event of September 2004, the City undertook a detailed study of the City View area and determined that the cause of flooding from that event was a combination of excess extraneous flow into the sanitary system combined with a surcharged trunk sanitary sewer. The trunk sewer was

upsized in 2009, which resulted an increased level of service in the sanitary sewershed. The fact that only 6 homes reported basement flooding in 2017 is indicative that the measures of 2009 worked at improving the level of service. Following the event of 2004 as well as subsequent events, the city encouraged residents to install backwater valves through its protective plumbing program.

- **Current Investigation:** The homes that reported flooding are sporadic in location and not indicative of a widespread infrastructure issue. We do not have information as to how the homes flooded at this time, but it is suspected that local issues such as lateral pipes in poor conditions or surface flooding due to poor grading may be the cause.

- **Probable Cause of Flooding:** Local issues due to lateral pipe condition or site grading may be the cause. If weeping tiles or sump pumps are connected to the lateral pipe, then any partial blockage on the lateral pipe would create a backup into the home.

- **Next Steps:** Communication with residents will be required to explain the benefits of installing backwater valves, having their lateral pipes inspected and how to protect homes from surface flooding. The sporadic nature of the flooding may be indicative of private property issues, more specifically the condition of their lateral pipes or property grading.

4.4 Meadowlands Cluster:

- **Location and System Characteristics:** Ten (10) properties reported flooding in the August 10th, 2023 event. The area was developed in the early 1960s and is mostly serviced by ditches except for homes along Meadowlands which are serviced by a storm sewer. This area is generally considered partially separated with weeping tiles most likely connected to the sanitary system, although some homes may have connections to the storm sewer.

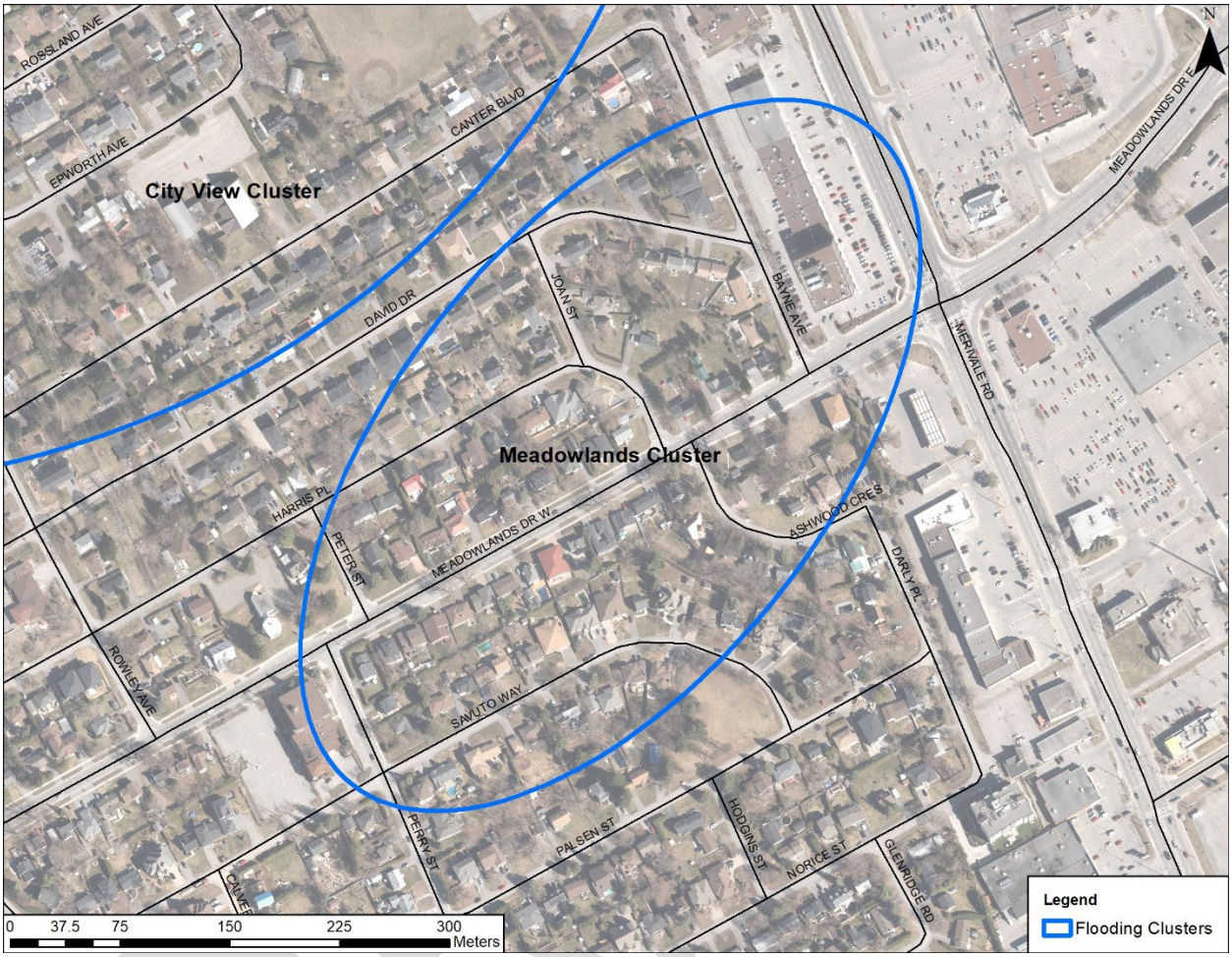

Figure 8 – Meadowlands Cluster, August 10 Flooding

- **Type of Flooding:** First response data does not provide any indication as to how the properties flooded.

- **Previous Flooding:** This area has incidents of flooding in 2000, 2001, 2004, 2005 and 2008. The incidents did not create specific cluster and problems were deemed to be related to private property.

- **Previous Investigations and Remedial Measures:** Given the sporadic nature of many of the previous flooding incidents, no investigation was undertaken in the past.

- **Current Investigation:** The homes that reported flooding are located along storm sewers, which leads to believe that storm sewer surcharge may have been the cause of flooding. A review of the storm system computer model for a similar critical event shows that the surcharging from this sewer would have reached basement elevations and even the surface at some locations. The lack of reported flooding in this area from the 2004 events tends to indicate that this area is not prone to flooding from the sanitary sewer, however a review of the sanitary model indicates that there was also potential for sanitary surcharge reaching basements in an extreme event.

- **Probable Cause of Flooding:** Preliminary analysis indicates that surcharging of the storm sewer was the most likely cause of flooding in this cluster. Furthermore, sanitary sewers may have been indirectly impacted due to flooded basements draining back to the sanitary system via floor drains.

- **Next Steps:** Communication with residents will be required to explain the benefits of installing backwater valves and how to protect homes from flooding. Further analysis will be required to confirm the source of basement flooding. The local storm and sanitary sewer systems will also be reviewed to see if any improvements can be done to reduce the surcharge level during critical events.

5.0 FLOODING IN NON-CLUSTER GROUPS:

As noted in Section 4, clusters are defined as a group of nearby homes that have flooded. Approximately 48 reports were submitted in Ward 8 regarding basement flooding. Thirty-six (42) of those are within four cluster groups while the remaining 6 are assumed being due to property issues. Although some of these may have flooded due to a localized sewer surcharge, it unlikely since other nearby homes would have also reported basement flooding. It is very likely these individual locations flooded due to a private property issue such as tree roots in the sewer lateral, roof leader connected to the foundation drain or damage to the sewer lateral pipe. Furthermore, flooding in ditch areas may have resulted to an overwhelmed sump pump or lot grading issues. This does not mean however, that the sanitary or storm systems did not surcharge since neighbours may have simply not reported flooding or they may have had installed a backwater valve.

Given the sporadic nature of these occurrences, it is recommended that these homes have their sewer lateral inspected or that they apply to the Protective Plumbing Program since the inspection will identify issues on the property. If flooding occurred due to sump pumps being overwhelmed, then a new or additional pump would be required. Should

there be no issues with the private connection, the City will then look at the individual location in greater detail.

6.0 ROADWAY FLOODING

There were many reports of flooded streets during the August 10th event impeding vehicles and the flow of traffic. If a flooded roadway does not impact buildings, it should be left to drain on its own if possible. If leaves are blocking catch basins, residents can remove the blockage if it is safe to do so, but in no case should maintenance hole covers be lifted to drain the street. A sudden surge or water into the sewers, especially the sanitary sewers, will lead to basement flooding. The design standard of these older neighborhoods never accounted for this amount of excess surface runoff. Older subdivisions are not designed like newer ones, where water spills from street to street until it reaches an outlet. In many instances water drains between properties. The City cannot change this flow path and residents are encouraged to flood proof their foundations and any building openings. The City can however share our overland flow information with residents and help them by identifying way they can protect themselves. This is especially critical when reverse slope driveways are located at a low spot on a street.

7.0 LEVEL OF SERVICE AND PUBLIC EXPECTATIONS:

Most of the homes in the hardest hit areas of the City were constructed in the early to mid-1960s when the design standard was quite different than today's standard. As we noted earlier in the report, prior to the mid-1960s, weeping tiles were connected to the sanitary sewer system, which can cause surcharging of sanitary sewer during critical events. Disconnecting all of these weeping tiles would be a significant undertaking that would take a significant amount of time with massive disruption to any given community, and it would also require changes to private property plumbing at the homeowner's expense. Given the rare occurrence of these events in the past, protective plumbing offered a good solution that provided additional protection. As these events increase in frequency in the future, residents may need to look to additional measures, over and above what the city can do on the sewer system, to protect their properties.

Storm sewers in the 1960s were designed to capture runoff from events that are much smaller than what they are designed for today. This means that excess runoff must be managed on the surface, which is challenging due to overland flow systems that also lack modern design. Roads in new subdivisions are designed to run like rivers during critical events, where water cascades from one street to another until it reaches an outlet. In older

areas however, water can accumulate in low-lying areas, cut through private property and pond in rear yards, which occurred during the August 10th event. Creating a well-defined overland flow system in topographically challenged areas can be very difficult to achieve. Upgrading sewer systems can help with frequent storm events, but such infrastructure upgrades will take decades to achieve since upgrading a local system would only push the problem to the downstream system. Storm sewer are only designed to capture runoff from frequent events, so even if all the sewers are upgraded, the overland flow system during critical events would still be problematic. The City will look at ways of improving the overland system as sewers are upgraded, but the topographical constraints of these older areas will make it near impossible to provide a level of service equivalent to what is provided today in new subdivisions.

The City is working diligently at upgrading its infrastructure to provide the best level of service feasible, but such changes can take decades to implement. Given the increase in flooding events due to climate change, future works will need to include private property measures. The City cannot implement work on private property, but City engineers can use their knowledge and expertise to help residents find the best way of protecting themselves until the infrastructure is upgraded.

8.0 PROTECTIVE PLUMBING PROGRAM:

Since the inception of the program in 2004, more than 3,000 homes have had backwater valves installed. This program has been active for almost twenty years and is open to all residents of the city. Information on sewer backups and flooding can be found on the City's website at:

https://ottawa.ca/en/residents/water-and-environment/wastewater-and-sewers/sewer-backups-and-flooding.

Furthermore, information on the City's Protective Plumbing program can be found at:

https://ottawa.ca/en/residents/water-and-environment/wastewater-and-sewers/sewer-backups-and-flooding#residential-protective-plumbing-program

It is important to note that the City strives to minimize sewer surcharge and thus provide adequate basement protection to all homes in the City, however due to the age of the sewer system in some areas as well as the design standard at the time of construction, it is impossible to provide the same level of service throughout the City. This is why backwater valves are important as a second line of defense. Even new subdivisions that have the most up to date standard have sanitary and storm backwater valves installed

because there are often unknowns that can occur in complex collection systems that can cause water to backup to basement levels.

9.0 PROTECTIVE PLUMBING FAILURE:

In some instances, it appears that homes with existing protective plumbing reported basement flooding following this event. This could have occurred for four reasons: 1) the valve malfunctioned, 2) improper maintenance of the valve, 3) the storm valve functioned properly and while closed, groundwater overwhelmed the foundation drainage system and water entered through cracks and openings, or 4) the sanitary valve functioned properly and while closed, all internal drainage (toilets, tubs, showers, sinks) bubbled out through the floor drain. It is to note that backwater valves are the responsibility of the owner and any inspection, maintenance or repairs should be undertaken by the owner.

10.0 311/FIRST RESPONSE:

Residents are typically encouraged to call 311 to report flooding, however many residents complained that their calls to 311 were not getting through or that they never heard back after leaving a message. The sheer number of calls overwhelmed the 311 system and left many residents in the dark. Furthermore, the lack of site visits following flood reports meant that information indicating how a home flooded was not recorded. This information is critical when doing a post flood analysis to determine if the cause of flooding was related to the storm sewer, sanitary sewer or overland drainage. As a results, Infrastructure and Water services sent out questionnaires with the help of Councillor's staff asking residents to explain how they flooded. This created a delay in assessing the impact of the flood since questionnaires needed to be returned before any analysis could be finalized. In the future, the City should include this questionnaire on their Sewer Backup and Basement flooding website page asking residents to fill in it and forward to the City. In addition, 311 and First Response should provide callers with the questionnaire or direct them to the city website.

11.0 Next Steps:

The information presented herein is based on a cursory analysis of the sewer system using existing computer models and/or historical information. The next steps will consist of further simulating the actual event to determine if additional causes to the ones described above were responsible for the flooding and determine if infrastructure improvements are warranted and feasible to reduce the risk of future flooding.

It is to note, that infrastructure solutions are long term solutions that can take up to decades to implement, however residents are looking for faster solutions to their problem. Residents are encouraged to look at ways of flood proofing the individual properties in addition to what the City will be undertaking with respect to infrastructure work. We are currently looking a way in which City staff can share information with homeowners to assist them in finding solutions to floodproof their homes while long term infrastructure work is undertaken. Any flood proofing work within the City Right of Way will be done by City staff, but any work on private property will be the responsibility of the owner.

As recommended in a Council motion, a website should be created outlining the challenges identified in this memo, outlining areas of the city most at risk and providing homeowners with information that will allow them to better understand their own situation and find ways of improving their level of protection. Finally, good information is critical when trying to understand how a system flooded. Residents should call 311 to report a flood and a survey should be sent to them so that they can relay to City staff how they flooded. In addition, it is recommended that 311operators be provided with an information flooding package that they can quickly relay to the callers during flooding events.

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