




Hamilton

INFORMATION UPDATE

TO: Mayor Eisenberger and Members of Council	WARD(S) AFFECTED: CITY WIDE
DATE: July 9, 2010	
SUBJECT: Storm Emergency Response Group and Flooding (City Wide) (ESI.10.14)	
SUBMITTED BY: Dan McKinnon, C. Tech Acting Senior Director Environment & Sustainable Infrastructure Public Works Department	SIGNATURE: 

Over the past five years Hamilton and other southern Ontario municipalities have experienced significant rainfall events with intensities, durations and frequency of re-occurrence that is unprecedented for our area. Public Works is committed to assessing, analysing and implementing storm water management improvements to mitigate these unprecedented events, however, it is important to note that flooding is a complex issue.

This update provides a comprehensive summary of the Public Works response to flooding and may serve as a useful reference document in regards to that response. Process and protocol improvements and solutions to address flooding, both complete and ongoing, have been established through the Storm Emergency Response Group (SERG) committee and also collaboratively throughout the Public Works Department.

Information for the following areas will be provided: inspections, system monitoring and studies; the capital program; property damage mitigation; operations and maintenance; communications; and new storm water management techniques.

1.0 Executive Summary

Extreme weather events can bring with them a variety of challenges and issues relating to flooding and property damage. There can be a range of mechanisms by which properties are damaged or flooded and although the information provided by property owners after an event may not accurately describe the technical situation that gave rise to the damage, Public Works has endeavoured to analyze all situations that may cause flooding and developed plans to address them as much as is possible.

To date, the City has inspected 80% of all its combined, sanitary and storm sewer mains, including all of the SERG focus flood areas, with a total of 450 km of inspections being completed since July, 2009 (section 2.1). In addition through the new sewer lateral

inspection program 3,000 laterals (public portion) have also been inspected (section 2.2). These inspections have driven a rehabilitation program (section 2.3), through which the City has addressed approximately 200 km of sewer main, virtually eliminating pipes, with structural conditions indicating the end of their service life, from the system (section 2.4). While the inspection and rehabilitation program has been crucial to address Hamilton's aging infrastructure, these techniques also assist in mitigating flooding. This inspection program underscores the fact that recent flooding is an issue of capacity and not the structural condition of the system.

Overall infrastructure network and flood analysis, through a complete understanding of the existing major and minor systems design standards (section 2.5), hydraulic model simulations (section 2.6), analysis of rainfall gauges and radar data (section 2.7), and flow monitoring techniques (section 2.8), will collectively and ultimately lead to far more effective mitigation measures than condition inspections.

In addition to overall network analysis, a number of studies have been completed for specific flooded areas (section 2.10), with remedial plans being brought forward as capital works. Other studies have been completed at the watershed level (section 2.11) to ensure the mitigation of impacts from existing and future developments.

Completed capital works relative to the last five years totalled \$160 million gross (section 3.1), and proposed capital works for the next five years totalled \$407 million gross (section 3.2). A detailed listing of all capital works has been included as Appendix A to this report, including an individual ward summary of all initiatives completed or planned.

Private property improvements are often the best option and most expedient solution to address flooding. Within this report there is an update on the successful roll out of the protective plumbing program (3P) (section 4.1), including the downspout disconnection pilot program (4.2), and integration with the sewer lateral management program (section 4.3).

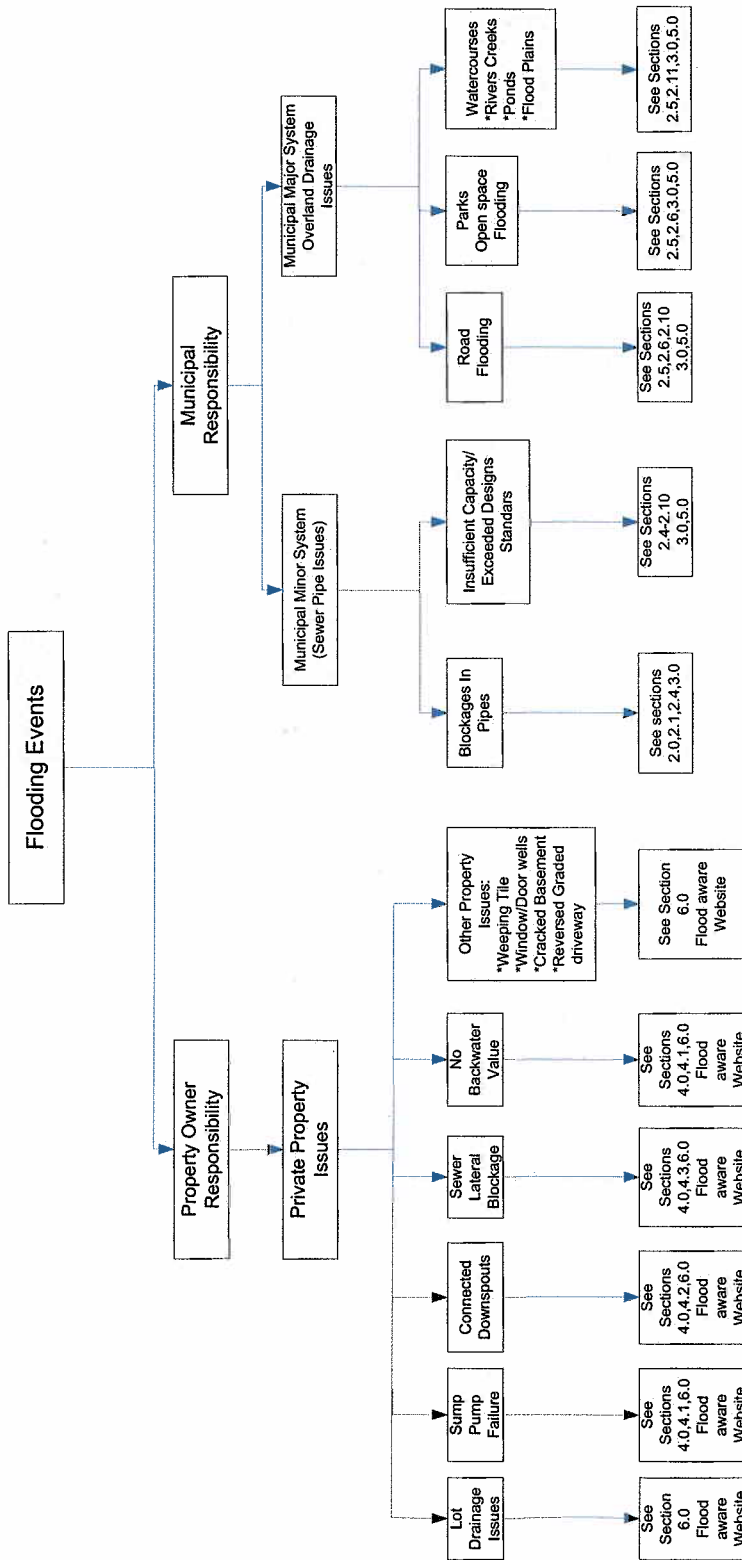
Prior to a storm event Public Works staff endeavour to ensure prioritized infrastructure sites such as inlets, outfalls, catch basins, and culverts are inspected and cleared as per standard procedures. Post event inspections and clean ups are also conducted (section 5.0).

Communications will also continue to play a vital role during storm events producing public service announcements and information for residents (section 6.0). Information has also been supplied through the City's Flood Aware web site - www.hamilton.ca/floodaware - a convenient resource for residents to learn what the City is doing to address flooding and to review helpful tips (section 6.0). Over the summer the flood aware website will be updated to make it more user-friendly.

The following report also outlines some of the new techniques being promoted in the City to address future storm water management (section 7.0). An update on the actions of the Independent Community Panel is provided in Section 8.0.

Figure 1 on the following page outlines the various types of flooding that can occur during a storm event, and outlines which section in this report has relevant information.

Figure 1



2.0 Inspections, System Monitoring and Studies

2.1 CCTV and Zoom Camera inspections

The City of Hamilton has approximately 2,600 km of sewer mains within its wastewater and storm water collection system, made up of approximately 40,000 individual pipe segments. Since 2003 the City, through the Environment and Sustainable Infrastructure Division of Public Works, has been very proactive with CCTV camera and zoom camera assessments and to date approximately 80% of the entire network has been inspected. This 80% represents the local system that directly services all properties within the City.

In addition to the ongoing inspection program for capital analysis, in recent years inspections have been prioritized to SERG areas for flood and capital analysis. For instance, since the flood events of July and August 2009, inspections were prioritized by the volume of flood complaints in many areas, with approximately 450 km of inspections completed in the fall of 2009, which have helped to determine the structural condition of these pipes, presence of blockages and/or any other operational issues present in those areas. It is important to note that through this entire inspection program, only a few minor maintenance issues were discovered, and staff have determined that none would have contributed to the flooding.

As part of the inspection program, the City is currently assessing the large trunk mains within the system to determine if issues of debris build up need to be addressed.

2.2 Lateral CCTV Inspections

In recent years the inspection technology has advanced to a point whereby sewer laterals (public portion) can also be inspected from the City mainline pipe. Since 2008, with the inception of this lateral inspection program, approximately 4,000 laterals have been inspected, with 20% following the capital road program and 80% being completed within SERG areas.

2.3 Cured in Place Pipe (CIPP) – Rehabilitation Program

Figure 2 on the following page shows that to date approximately 200 km of sewer main has been rehabilitated through a cured in place lining process, at a cost of approximately \$47 million. This seamless cured in place pipe (liner) prevents infiltration and exfiltration, restores structural integrity (50 years plus life), and eliminates joints that can weaken and allow root intrusion. As a “no dig” technology the liner is applied through the manholes, and as such, the field work takes weeks as opposed to months and is completed at one third of the cost of traditional open cut replacement.

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Figure 2 shows the significant numbers for both mainline sewer and lateral inspection by ward, and also includes the number of kilometres of sewers that have been rehabilitated (lined) as a result of the inspection data.

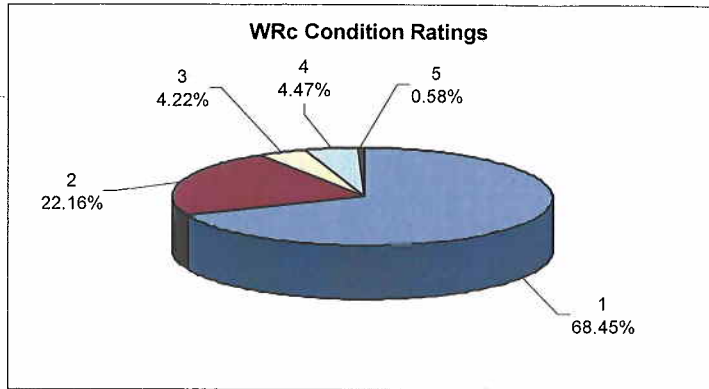
Figure 2

WARD	Mainline Inspection (km)		Lateral Inspection (Count)	Mainline Lining (km)	
	CCTV	ZOOM	CCTV	Completed	Initiated
W01	61.05	115.31	82	16.89	1.64
W02	71.54	104.87	193	15.25	5.00
W03	113.37	132.89	381	30.61	4.87
W04	121.36	132.81	1,267	31.22	3.58
W05	78.12	167.07	439	8.67	1.96
W06	85.53	152.77	235	16.84	1.00
W07	117.60	216.47	483	26.56	3.36
W08	120.38	259.39	330	17.98	1.07
W09	36.96	133.64	101	9.09	0.90
W10	49.13	144.00	271	2.44	0.78
W11	22.08	81.44	0	0.78	0.32
W12	54.76	174.47	2	0.97	0.25
W13	64.42	133.16	123	16.17	1.22
W14	0.62	3.36	0	0.00	0.00
W15	27.24	89.62	0	0.30	0.45
OTHER	1.53	2.02	0	0.25	0.01
Total	1,025.70 km	2,043.28 km	3,907 (Count)	194.01 km	26.40 km

2.4 Overall Structural Condition Rating

Through CCTV and Zoom camera inspections, all sewer mains are graded from 1 - 5 using the WRc^{3d} edition (Water Research Council) international engineering standard. A pipe rated condition grade "1" would be considered to be in excellent condition, while a pipe with a condition grade "5" would be considered to be at the end of its structural design life. Through the inspection program, and subsequent rehabilitation program, Hamilton has virtually eliminated all grade 5 pipes from the wastewater collection system as can be seen in Figure 3. Eliminating all grade 5 pipes from our system is a significant achievement and ensures that when heavy rain occurs that the system works at its optimum. While it is rare that with the current structural condition of the system would contribute a sewer back up, maintaining an aggressive asset management program in this regard is essential to keep the system in good shape.

Figure 3

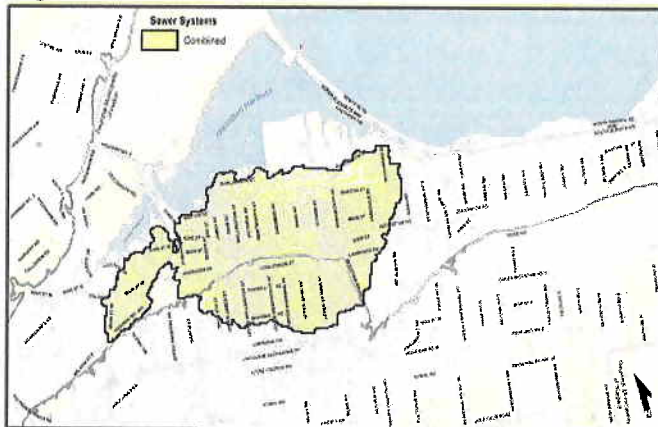


It should be noted that while the structural condition of the sewer network has increased significantly through the above program, post flooding inspections did not reveal pipe defects and/or design and operational issues that could adequately explain the flooding events. For example, following the flooding event of July 2009, approximately 450 km of sewer main were inspected but only a handful of minor maintenance issues were identified and none are believed to have contributed to the widespread flooding that occurred. It should also be noted that the above inspections provide an excellent record of condition, however, in the analysis of flooding it is the performance of the storm system, including overall capacity and flow characteristics that are essential to understand. There are other techniques far more adept for this purpose and will be explained further in the sections below.

2.5 Existing Minor and Major System Design Standards

The delivery of stormwater management services in Hamilton can be categorized in two ways depending on geographic area. Specifically, there is the Combined Sewer Service Area and the Separated Storm Sewer Area. Figure 4 shows the geographic delineation between the two areas in Hamilton. (The area outlined in black is the combined service area).

Figure 4



Common to both types of systems is the fact that the underground pipes (Minor System) have a limited carrying capacity by design. The engineered conveyance capacity of the sewers can be quantified by the design return period expressed as 1:5 year storm for example. This can be simply interpreted as the sewer pipes were sized to convey no more than the runoff generated by a rainfall event that is typically experienced once in every five years. Rainfall greater than a 1:5 year rainfall event would cause the pipe to overflow. The design return period for sewers in the various communities in Hamilton are generally summarized below.

Ancaster	2 year
Flamborough, Stoney Creek, Glanbrook, Dundas	5 year
City of Hamilton (pre-amalgamation)	17 year

Uncommon between the Combined Sewer Service Area and the Separated Storm Sewer Area is the Major System. It is important to note that the combined sewer service area does not have an engineered Major System. Generally, the Major System is comprised of components to manage rainfall volume that exceeds the capacity of the Minor System. These include channels and ditches, roadways, and ponds. These Major System components are similarly engineered to a design return period. Generally, the 1:100 year rainfall event is used to size this infrastructure.

It is important to understand that both the Minor System and Major System have the threshold servicing capacity. When the volume of rainfall exceeds the design capacity of the infrastructure, diminished services are experienced including flooding.

Additional conditions that cause hydraulic demand in sewer systems to exceed the carrying capacity are listed below:

- Severe rainfall
- Changes in adjacent property characteristics
- Increased population
- Increased impervious land area (pavement)
- Illegal plumbing connections (i.e. downspouts connected to the sanitary system)
- Saturated and/or frozen ground causing excessive runoff
- Debris, obstructions and sedimentation which reduce capacity

2.6 Computer Models

Computer models are utilized to compare the conveyance capacity of existing sewer infrastructure relative to the demand placed upon them from rainfall runoff generated from abutting properties and right of way.

In a well designed drainage system where land use practice and private drainage are within originally designed limits, a computer model generally confirms the performance is as it was originally designed. Occasionally, a computer model will show that a sewer system is not able to convey the calculated flow indicating a change to original design

loading characteristics. In this event staff may undertake forensic investigation to determine what has changed.

A robust and calibrated computer model can predict the location within a collection system where the capacity will be exceeded when applying progressively more demanding rainfall events. This approach was used to identify and validate known "hot spots" within the Lower East End Drainage Study (LEEDS) area. With these findings a capital program has been initiated to improve the service level in the LEEDS areas of greatest need.

Currently, the City has assembled the following computer models:

- Citywide Trunk Combined Sewers (>750 mm diameter)
- Citywide Trunk Sanitary Sewers (>450 mm diameter)
- Various Combined sub-catchments (all diameters) - LEEDS

Under construction are the following computer models with estimated completion by end of 2010.

- Citywide Combined Sewer System (all diameters)
- Citywide Sanitary Sewer System (all diameters)

Models yet to be initiated are the following.

- Citywide Separated Storm Sewer (all diameters)
- Citywide Overland Flow Model

Upon completion of each type of model, staff may better understand the performance of the collection systems, validate observed flooding and develop capital programs to move toward a common level of service across all property owners in the City.

2.7 Rainfall Data Systems

The City had a network of 19 rain gauges which was recently expanded to 30 rain gauges, whose readings are further analysed in conjunction with RADAR data. The combined analysis provides a detailed characterization of intensity, geographic extent, direction and speed of an event, which when synthesized allows staff to better correlate flooding patterns with dynamic rainfall events. SERG hired a Rainfall Analysis Consultant in 2006 and again in 2009 to quantify recent extreme rainfall events. A characterization of events allows the City to better understand the performance of the collection system in terms of its designed service level versus the demand that nature puts on it. In all cases the extreme events analyzed exceeded the carrying capacity of the underground pipe networks (Minor System) and in 2009, the designed overland flow/drainage systems (Major System).

This analysis, which will continue with future events, will prove useful in understanding trends in the character of rainfall events, especially in the context of Climate Change and how the City designs Minor and Major Stormwater Management (SWM) Systems; Emergency Preparedness Planning and Education and Outreach.

2.8 Sewer Pipe Flow Monitoring

Over the last few years, the Environment and Sustainable Infrastructure Division, installed temporary flow monitors at key locations, specifically the Fessenden and Mary/Ferrie neighbourhoods. Flow monitoring allowed staff to determine whether the collection system was performing as expected, as the monitors revealed whether sanitary sewers are receiving substantial amounts of rainwater inflow. A reduction in inflow will reduce the total flow within a sanitary pipe and therefore reduce the chances of Sanitary Backups or unnecessary infrastructure upgrades. This monitoring approach is available for inspection in future separated sewer areas as required.

2.9 Real Time Control

Real Time Control (RTC) will improve the operation of the combined sewer system at outfalls, combined sewer overflow tanks and Wastewater Treatment Plant. Controlling stormwater flows through RTC will optimize conveyance capacity in the most downstream reaches thus improving conditions in the immediately upstream catchments. The use of RTC will help to reduce overflows to receiving waters such as Hamilton Harbour. It is important to note that while RTC will alleviate flow issues at certain key points, the benefit for reducing local flooding may be difficult to quantify.

2.10 Area Specific Stormwater Studies

These studies are undertaken to review the extent of the existing problem and to recommend actions to fix the problem or to implement mitigating measures to reduce the impact and frequency of the flood-events. These studies also consider situations up-stream and down-stream in order not to relocate problems to other neighbourhoods.

The recommendations include site specific improvements, i.e. the size of pipes through reconstruction, to a wide variety of storm water management technologies including controlling/delaying the flow of water to the sewers so they do not surcharge (back-up) or are directed to retention/detention ponds to control the flow and also improve the quality of the water that eventually ends up in the harbour or lake.

Neighbourhood

Ainslie Wood / Westdale
Garner Neighbourhood MDP
Greenhill
Mountview
Sanatorium
Fessenden

Larger Area

Stoney Creek Urban Boundary Expansion (SCUBE)
Lower East End Drainage Study (LEEDS)
Stormwater Master Plan

2.11 Sub-Watershed & Related Studies

Sub-Watershed studies provide a basis for the protection, maintenance and enhancement of surface water and groundwater quality and quantity through environmentally sound and responsive policy development. The resulting plan will provide recommendations as to where and how future development activity can occur so as to minimize flood risks, stream erosion, degradation of water quality and negative impacts on natural systems, including groundwater.

Sub-watershed studies investigate the existing conditions of the subwatershed for hydrology, hydraulics, hydrogeology, fisheries, water quality, slope stability, and terrestrial ecology, and recommends management measures to mitigate impacts from existing and future development. The following is a list of studies complete or underway that meet this category:

Davis Creek - Lower Master Plan Class EA
Davis Creek - Upper
Hannon Creek Subwatershed Study
South Waterdown Subwatershed study

3.0 Capital Program – Improvements and Expenditures

Through the detailed analysis of inspections, system monitoring tools and various studies at the neighbourhood, community and city wide level; significant work has been completed and/or has been programmed within the capital budget to address storm water management and flooding within the City. SERG Initiatives and the prevention and mitigation of flooding is a priority within the capital process as per Council's direction. The following summarizes capital works completed from 2005 until present (gross) and also capital works planned for the next 5 years (gross) that will have a direct or indirect impact to reduce flooding. It should be noted that storm water sustainability analysis will be presented, along with information in regards to a storm water rate, at a future committee meeting.

3.1 CAPITAL WORKS 2005 – 2010, \$(000)

SERG Initiatives	\$5,550
Pipe Upgrades/Replacements	\$40,445
Inspection, Maintenance, & Rehabilitation	\$70,844
CSO Upgrades	\$50,032
Investigations	\$4,380
Backwater Valve Pilot Project	\$100
Total	\$171,351

3.2 CAPITAL WORKS PLANNED FOR NEXT 5 YEARS, \$(000)

All proposed works are tentatively scheduled and subject to annual council approval as part of the standard capital process.

WWTP Pump House	\$75,000
SERG Initiatives	\$37,800
Storm Infrastructure	\$5,920
Stormwater Mgmt Ponds	\$35,104
WWW Master Plan Projects	\$191,330
Inspection, Maintenance & Rehabilitation:	\$94,540
Real Time Control	\$10,000
Protective Plumbing Program (3P)	\$3,000
Accelerated Capital	<u>\$20,000</u>
Total	\$472,694

A detailed project listing of the above, actual and forecasted, capital expenditures can be found within Appendix A of this report.

4.0 Property Mitigation Measures

In addition to capital expenditure, the overall SERG analysis has determined that property improvements to mitigate future flooding is critical in many areas, and may often be the homeowners best option. Property improvements are one of the most expedient solutions and through these initiatives the property owner has complete control. A survey of property owners who installed backwater valves as part of the City's initial pilot program, the results have shown people were very satisfied with the program and that they did not experience flooding during the July/August 2009 storms. As a result of this positive result and as per Council resolution, the City has implemented the Protective Plumbing Program (3P) and made significant progress with in this regard.

4.1 Protective Plumbing Program (3P)

As approved by Council on October 7, 2009, this program offers grants and loans to residents whose properties have been subject to sewer surcharge related flooding during one or more of the City's 12 eligible dates. The 3P Program is designed to provide financial assistance to homeowners who have equipment installed to isolate their home from the City's sewers during heavy rainfall events, thereby helping to protect their home from a sewer back-up into their basement.

Eligible property improvements included under the program include:

- 1) Installation, by a licensed plumber, of a backwater valve;
- 2) Installation, by a licensed plumber, of a sump pump, in conjunction with a backwater valve;
- 3) Sewer lateral repairs; and
- 4) Disconnection of downspouts.

Building permits are required for these works; however, residents who are eligible for funding under the 3P program have the building permit fee paid for under the 3P program. Reimbursement does not take place until all conditions have been met, including a satisfactory final inspection by the building department.

Eligibility for 3P corresponds to previous flooding events and the date on which the improvement was completed, must be completed after July 26, 2009. Previous flooding dates eligible for the program are defined by past implementation of the Compassionate Grant Program.

Between 2005 and 2008, there were 2,837 payments made under the Compassionate Grant Program, at an average of \$654.23 each, for a total of \$1.9 million in payments from 2005 to 2008. Each of these residents has received a letter from the City confirming their eligibility in the program and inviting them to participate.

When the program began in October, 2009, there were approximately 2,891 compassionate grant recipients from storm events in 2009. These residents have also received correspondence from the City confirming their eligibility in the program and inviting them to participate. As at April 26, 2010, there were a total of 4,266 compassionate grant recipients from storm events in 2009, receiving an average grant of \$744.21 each, for a total of \$3.2 million in compassionate grant payments, to date, for two major storm events in 2009. As the list of recipients is updated, the resident receives a letter from the City confirming their eligibility and providing information about the program.

As at April 26, 2010, there have been a total of 7,103 compassionate grant payments made to City of Hamilton residents, totalling just over \$5 million, from 2005 to April 26, 2010.

Since the implementation of the 3P program Public Works has received 1,049 applications, 909 have been processed and approved as at April 26, 2010. From these approved applications, a total of \$1.7 million has been paid out as grants under the 3P program. In order to ensure that all residents who are eligible for 3p are aware of the program three separate rounds of correspondence is being delivered directly to their homes. Additionally Public Works has advertised the program in local media and will continue to do so.

4.2 Downspout Disconnection Program

Public Works retained UEM Consulting to begin a Downspout Disconnection Pilot Program in October 2009 in the lower east end of the City. Downspout disconnection is widely accepted as a good practice to assist in removing flow from the minor and major system. In the Hamilton context this is program that staff feel is worth exploring. Analysis of programs in other communities reveals that such a program requires close monitoring and usually takes the form of the municipality playing a reference/guidance role. It is important to note that disconnecting downspouts must be done in a careful manner to ensure that flows are not directed in a way that creates downstream surface flooding.

As part of this program, UEM Staff, in partnership with Green Venture, visited approximately 800 properties and either spoke with residents directly or left information to offer an assessment of their downspouts. To date UEM staff have assessed approximately 400 properties and recommended approximately 230 for disconnection by Green Venture. The work continues, and as of April 27th, 2010, 66 properties have been disconnected. Letters for those homeowners whose properties were determined not eligible for downspout disconnection will also be sent out in the near future.

As a future program, UEM is currently completing their assessment and recommendations for an on-going downspout disconnection program in Hamilton.

4.3 Integration with Sewer Lateral Management Program (SLMP)

Residents that are eligible for the Protective Plumbing Program are also deemed eligible to receive a CCTV inspection of their sewer lateral free of charge. Information on the Sewer Lateral Management Program (SLMP), including integration with 3P, is available on the Internet and is provided to customers in mailed/delivered information and eligibility packages. Eligible residents can request the City to arrange for a City contractor, or they can hire their own contractor, to perform their lateral inspection. Once reviewed, customers that have submitted the required information are reimbursed an amount equal to the amount paid to City contractors for these services.

5.0 Operations and Maintenance Measures

Through experience from previous flooding events Public Works has identified a list of sensitive inlets and outlets that are inspected prior to heavy rains. The purpose of the inspections is to clear the structures of debris and to confirm they are clear and ready for the next rainfall event. The list of sensitive inlets and outlets continues to expand as new flooding areas are identified, as part of the overall analysis. It should be noted, that due to the intensity of storm events and the subsequent conveyance of debris during and shortly before rain events, structures may not remain clear for the duration of a storm event.

Following recent flooding events staff conducted CCTV and Zoom camera inspections of the most severely affected areas. The purpose of the CCTV and Zoom inspection is to identify pipe structural failures or pipe blockages that could explain the flooding. As discussed earlier, even though a significant number of sewer mains were inspected, only a few minor maintenance issues were revealed, and staff have determined that none would have contributed to the flooding. The practice of conducting large scale video inspection of collection systems is not recommended directly after extreme storm events that are known to exceed the capacity of the system. In future staff will endeavour to use modelling to conduct forensic analysis of these events to determine the most cost effective response.

Prior to forecasts of severe rain events, each of the 5 road districts are responsible to inspect and clear specific storm inlets, catch basins, culverts, box culverts, and outfalls at a number of locations identified on the district's storm drainage inspection priorities list. As well, inspections are conducted during the event (pending the intensity of the event) at those sites identified as priority sites. Once again, from the experience gained with recent intense storms, structures may not remain clear during a storm event. Post event inspections are also conducted and the necessary clean up is scheduled and then completed.

Outside of the forecast event inspections, the districts are directed to be inspected routinely for all sites identified on their drainage inspection sheets. Priority sites are to be photographed for comparison records against previous reports. The ranking of a site can change on the priority list as a result of any change in the frequency of the required debris removal or documented flooding issues. These sites have been flagged due to their history and the list is reviewed and amended as part of the overall analysis.

6.0 Communications / Education / Outreach

A communication plan, as approved by the SERG committee, called "Flood Aware" was developed to address the recommendations in the Independent Review Panel's report. The plan outlined communication objectives, key stakeholders, a spokesperson protocol, draft key messages, a communication strategy and tactics. To brand the social marketing program, a program identifier was created to be used in all communication materials. SERG reviewed several options and agreed on "Flood Aware".

The Flood Aware brochure/advertisement, a four-page advertising/editorial feature, was developed to share helpful information with the residents of Hamilton about how to prepare for flooding during severe rain events and the measures that the City of Hamilton is taking to address flooding in the city. The feature provided flood protection and prevention tips, insurance recommendations, the steps to take when making a property damage claim with the City of Hamilton, public health recommendations and an overview of ongoing studies and plans that the City of Hamilton is undertaking to address flooding.

The communication piece was inserted into the Hamilton Spectator in July 2007 and was also delivered to nearly every household in Hamilton through the Free Press. Additional copies were printed and provided to residents at various City of Hamilton public information sessions related to the flooding issue in Hamilton. It was also posted on the Flood Aware Web site.

Seasonal Flood Aware Ads were created - one per season – to share helpful flood protection tips for residents throughout the year. The ads were published in both the Hamilton Spectator and Hamilton Community Newspapers throughout the year, as well as other City publications. The ads are also posted on the Flood Aware Web site for future reference.

A Flood Aware Web Site web site has been created – www.hamilton.ca/floodaware - to provide a convenient resource for residents to learn more about what the City of Hamilton is doing to address flooding in the city and to review helpful tips. In addition to the above, various communications protocols and procedures have and will continue to be an integral part of SERG.

Communication updates on the City's progress are shared through councillor newsletters and briefings and Information Updates, such as this one. Staff have also attended councillor ward meetings to share information with affected residents.

Communications has been, and will continue to be, a key role in the roll out of SERG related programs such as the Basement Flood Relief Pilot Program and the 3P Protective Plumbing Program. Also, all information for these programs is centralised on the City's web site.

Finally, communications is a key component within the Emergency Operations Centre. During the July 26th storm, three media updates were sent out during the six hours in order to provide info to the community about the impacts of the storm. The updates were also provided to councillors so they could share the information with their constituents.

7.0 New Storm Water Management Techniques

New development and re-development follow the storm drainage policy adopted in May 2004. This drainage policy contains specific requirements and procedures to manage storm runoff.

In addition to the above, Development Engineering has engaged the development community to encourage Low Impact Development (LID) techniques that promote retention of storm runoff on site. Although this is a new development in stormwater management techniques, there are projects where permeable pavement or rainwater cisterns have been implemented and proposed. A few examples of this strategy include the City of Hamilton's Environmental Laboratory, which received LEEDs designation,

incorporates the use of cisterns and storm water retention, City Hall has a new Green Roof, McMaster Innovation Park parking lot has permeable pavement proposed, and rainwater cisterns have been proposed for each lot in "The Graystones" rural subdivision in Greensville.

LID techniques are also proposed in future development areas of the City including the Airport Employment Growth District. We have acknowledged the restrictions that the City of Hamilton has to promote infiltration on the site due to the clay nature of the existing soils. However, the goal of these techniques is to maintain the existing water balance model on the site for new developments by promoting, wherever possible, infiltration, evaporation or re-use of rainwater.

8.0 Independent Community Panel

In 2006 Public Works convened the Independent Community Panel at the direction of City Council. The panel was initiated to engage the community and relevant stakeholders to review actions undertaken by the City and make recommendations on how to respond to and plan for severe weather in the future. As a result of this action the panel made 26 recommendations for the City to consider for planning and responding to flooding. To date all of the original 26 recommendations have been implemented.

Following up on the original assessment the panel was re-convened in 2009 and reviewed the ongoing actions of the City respecting severe weather and flooding. An additional 23 recommendations were made and currently Public Works continues to implement these recommendations where possible.

Conclusion

This report summarizes how Public Works has responded over the last few years in variety of ways to reduce and mitigate the affects of severe weather as it relates to flooding in the City of Hamilton. It is clear that our weather is changing and as a result a corresponding change is required in our expectations of how our infrastructure serves us. Mature wastewater and storm water collection systems that our so integral to our community and way of life were never designed for what appears to be the "new normal" when it comes to weather. Road flooding, swale and sewer system surcharging are all indications that the minor and major systems described above are unable to handle the "new normal" which is expected to occur more regularly.

Public Works is committed to undertaking whatever steps are necessary to mitigate the affects of these events but acknowledges that improvements to the system as a whole will be costly and require years to implement. It is also important to note that system wide improvements to ensure events such as that of July 26, 2009 will not create flooding in future are not practical and would likely be unaffordable. Programs such as 3P provide effective short term solutions that property owners can undertake quickly to help themselves in this regard. Communication is critically important to help our

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residents understand what is happening and what the City is doing in response to support and protect them. The Flood Aware web site is being reconfigured to provide even more information in a user friendly and concise format. Public Works encourages visiting this site for reference on what the City is doing in this regard.

Copy to:

Chris Murray, City Manager

Rose Caterini, City Clerk, Corporate Services Department

Gerry Davis, General Manager, Public Works Department

Roberto Rossini, General Manager, Finance and Corporate Services Department

Carolyn Biggs, Legislative Assistant, Corporate Services Department

Mary Gallagher, Manager, Legislative Services/Deputy Clerk, Corporate Services

Kelly Anderson, Public Affairs Coordinator, Public Works Department

Jillian Stephen, Acting Director, Rapid Transit, Public Works Department

Rob Norman, Acting Director, Strategic Planning, Public Works Department

Alan Kirkpatrick, Acting Manager, Strategic Planning, Public Works Department

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