Subject:	Jordan Station Foundation Drain and Sump Pump Disconnection Pilot Program
To:	Committee of the Whole – Community Services & Infrastructure
From:	Public Works Department

Report Number:	PW-06-22
Wards Affected:	4
Date to Committee:	April 6, 2022
Date to Council:	April 20, 2022

Recommendation:

Receive and file for information, Report PW-06-22 regarding Jordan Station Foundation Drain and Sump Pump Disconnection Pilot Program; and

Approve the pilot Foundation Drain and Sump Pump Disconnection Program subsidy program; and

Direct staff to implement the pilot Foundation Drain and Sump Pump Disconnection Program as recommended.

Purpose:

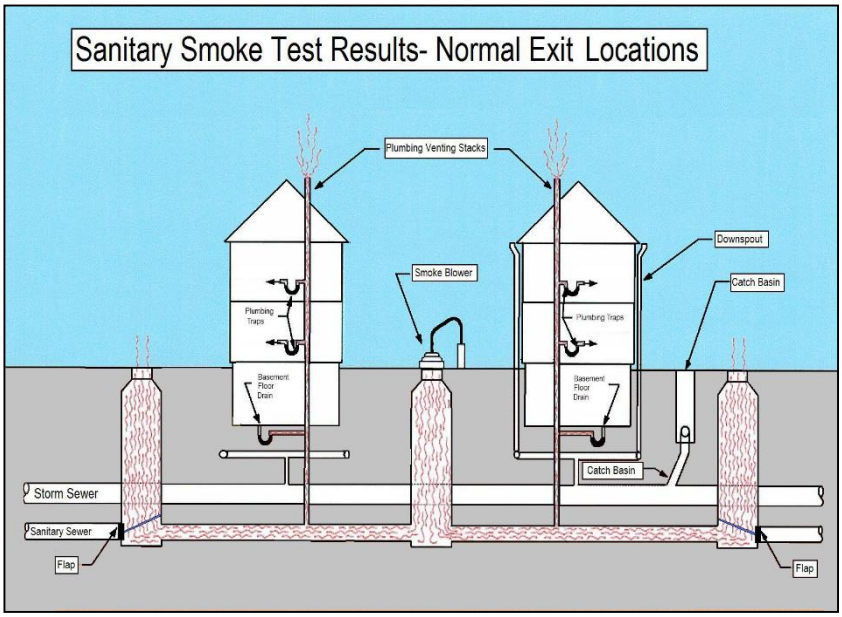
The Town of Lincoln to conduct a foundation drain investigation in the community of Jordan Station and develop a strategy to reduce the amount of inflow and infiltration (I/I) entering the sanitary sewer system from private property sources. The purpose of this report is to provide Council with the investigation findings and strategy recommendations.

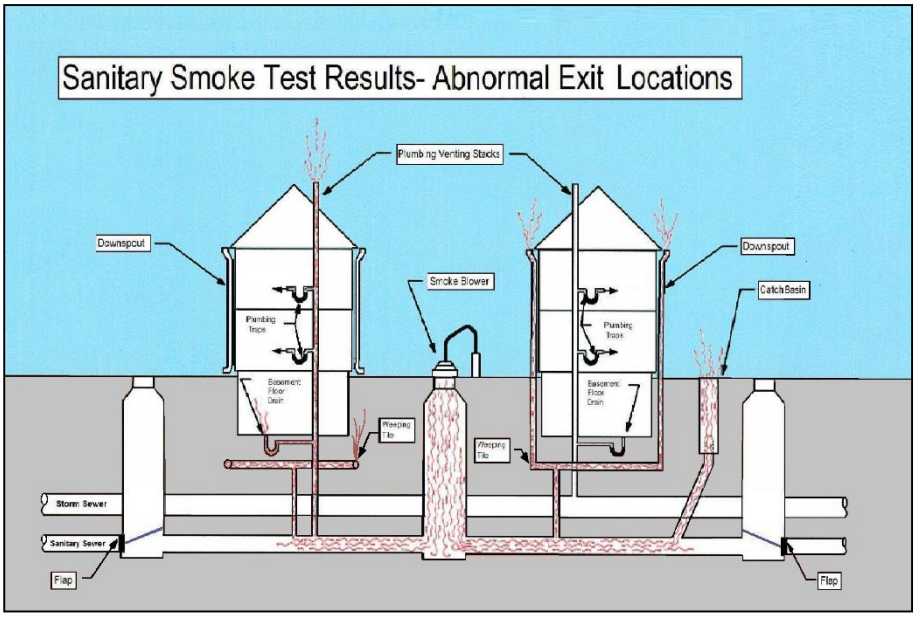
Background:

In the spring of 2017, during various wet weather events, 20 properties in Jordan Station reported basement flooding. Subsequent investigation found high levels of inflow and infiltration, or I/I, in the sanitary system of which a significant portion was attributed to private property contributions. The Town also experienced 11 events that required bypass pumping between 2017 and 2020.

Inflow and infiltration (I/I) are components of flow in sewers that are generated from rainwater and groundwater. Inflow refers to the direct flow of rainwater into sewers from surface runoff. Infiltration refers to the groundwater flow sources entering the sewer through cracks in the pipes, manhole defects, or other sources. Possible sources of I/I from the Town sanitary system, or Public system, are cross connections from storm sewers, uncapped cleanouts at property line, broken sewer laterals, misaligned lateral connections, cracked or broken pipes or leaky maintenance holes. Possible sources of I/I on the private sides are downspout connections, foundation drains or sump pump connections, cross connections, uncapped cleanouts, or broken sewer laterals.

In July 2018 the Town completed smoke testing in Jordan Station area. A smoke test consists of the creation of non-toxic smoke using a specialized smoker, which is then sent through storm, sanitary or foundation drainage pipes. This allows any breaches or cross connections within the system to be observed and noted. Once the sanitary system is pressurized by the smoker's fan and the non-toxic liquid smoke is atomized, the smoke will follow the path of least resistance. During the test, smoke emitted from the plumbing vent stacks are expected whereas, smoke emitting from a damaged lateral, roof eaves, basement window wells, and basement floor drains are considered atypical and noted by technical staff.





In Fall 2018 and Spring 2019 the Town completed the Campden and Jordan Station Downspout Disconnection Pilot Program. As part of the program, all properties within Campden and Jordan Station that are connected to the sanitary sewer system will receive up to 4 free rain barrels, including all piping required to connect to your existing downspouts. The intent of the program was to promote provide public education on the benefits of disconnecting downspouts from the sanitary sewer system, the benefits of rainwater harvesting and reducing surface runoff or standing water on private properties. The program had a total of 48% of properties participate in the program by ordering at least 1 rain barrel.

In 2019 GMBP completed the initial foundation drain/sump pump investigation. The program was paused in early 2020 due to concerns related to entering private properties during COVID.

In 2020, the Town completed a sanitary system rehabilitation program to address sources of extraneous flow within the public portion of the sanitary sewer system. The rehabilitation works were completed based on the 2017 Jordan Station I/I investigation and CCTV program results and were intended to address public side sources of I/I. Following these installation of rain barrels and our public side improvements, the Town successfully went almost 25 months without any emergency bypass events.

Following the mid-February 2022 snow melt and significant rainstorm, the Town was required to bypass pump at the Bridgeport Sewage Pumping Station. This was a significant event that resulted in many sanitary systems in Southern Ontario being overwhelmed.

The Region is currently completing the construction of the Bridgeport Sewage Pumping Station Upgrades to support development in the Jordan Station catchment area. The sizing of this station is based on the Region's standards for sanitary flows and their acceptable limits for I/I. These limits for I/I are lower than what is currently observed in the Jordan Station area and the upgrades are not intended to provide additional pumping capacity for the level of I/I currently in the due to private side connections.

Further reducing the amount of extraneous flow in the system will help prevent future basement flooding or emergency bypass pumping and the disconnection of any foundations draining to the sanitary sewer will assist this goal.

Report:

Private Side Extraneous Flow Connection Investigations

From September 3 to September 5, 2019, GMBP staff, accompanied by Town of Lincoln staff, canvassed all homes in the target area to provide educational materials to the homeowners. An introductory letter and information brochure were developed by GMBP to communicate to homeowners the objectives of the program, information on how and why to participate in the program, as well as best practices related to I/I reduction and reducing risk of basement flooding.

At least two attempts were made to contact each homeowner face-to-face for an introductory visit and follow-up inspection. Of the 183 target homes that were canvassed, direct contact was made with 102 homeowners while 81 did not respond. Appointments were scheduled and completed at 31 homes.

Activity	Homes	Percent
Target Homes	183	100%
No Answer (2 Contact Attempts)	81	44%
Contact Made with Homeowner	102	56%
Inspection Complete	31	17%
No Response Post-Introduction	35	19%
Participation Declined	34	19%
Booked appointment – Not home	2	1%

The home inspections involved investigation of foundation drain configurations, downspout connectivity, lateral condition using CCTV inspection (where possible), and any other notable drainage-related features, to identify sources of Inflow/Infiltration to the sanitary sewer system.

Foundation Drains:

The presence and characteristics of sump pumps are to determine if the foundation drain discharges to the sanitary sewer, or to the storm sewer, or if one even exists. Sump pumps observed during inspections were categorized as follows:

- Discharge to Surface: where the sump pump was confirmed by visual inspection to discharge to the ground surface.
- Discharge to Sanitary: either directly or indirectly through a sump pump and confirmed by inspection.
- Discharge to Storm: either directly or indirectly through a sump pump and confirmed by inspection.
- Discharge Unknown: where the discharge of the foundation drain (and sump pump) could not be confirmed by inspection.

Of the 31 properties inspected, four were found to have the foundation drain connected to the sanitary sewer, two directly, and two through a sump pump. Sixteen properties were found to have sump pumps discharging to the ground surface, and two to the local storm sewer. At nine properties the discharge point of the foundation drain could not be determined.

The following provides a summary of the discharge location of the properties that allowed inspections to be completed:

Homes Inspected	**31**
By Gravity to Sanitary	2
Sump Pump to Sanitary	2
By Gravity to Storm	0
Sump Pump to Storm	2
Sump Pump to Surface	16
Discharge not Confirmed	9

Downspout Connectivity:

Downspouts observed during inspections were categorized as: Not Connected, Indirect Connection, or Direct Connection. Where downspouts were observed to be directly connected, it was assumed that they were connected to the foundation drain unless observed otherwise. The inspection also included an inventory of downspout location, assessment of surface grade at discharge point, and the complexity of disconnection, (i.e. would a tripping hazard or risk of flood result from disconnection) if required.

Of the 31 homes inspected, the number of downspouts per home ranged from two to eight, though a typical home may usually have three or four. Almost all downspouts (89%)

were not connected to the sewer system, with roughly a third of the homes using rain barrels and half with French drains discharging somewhere on the property.

Downspout Connectivity	Homes	Downspouts
Total Homes Inspected	**31**	**133**
Not Connected to Sanitary	28	118
Direct Connection to Sanitary	0	0
Indirect Connection to Sanitary	0	0
Unknown Discharge Point	4	17

Disconnection of all downspout connections, direct or indirect, from the sanitary or storm sewer is considered a Best Practice for I/I reduction and basement flooding prevention and is a relatively simple, low-cost initiative to implement.

Lateral Condition:

The Town of Lincoln authorized GMBP to undertake more detailed property assessments using CCTV inspection to determine the condition of the private property lateral and confirm foundation drain connections that were otherwise undetected by surface observation. Of the 31 homes, a total of 16 sanitary service laterals were inspected with CCTV using a mini push camera that could be inserted through the sanitary cleanout or basement floor drain to navigate the portion of lateral beneath the home. The other 15 homes did not have an adequate access point.

Investigation findings:

- Laterals were typically accessed via the interior sanitary cleanout. Most cleanouts were elevated, although some were in the floor.
- Laterals were predominantly PVC.
- Service laterals and connections were generally in fair to very good condition. At a few properties, the launch was terminated prior to reaching the mainline due to restrictions in the line.
- Minimal lateral defects were noted, although one property with a hairline fracture and two properties with grease / soap build-up were found.
- Recommendations included flushing any unused toilets or bathtubs (i.e. in the basement) once every few months in order to clear the line of any debris/solid pileups.

Other Features:

During inspections, where possible, GMBP also noted the existence of other household drainage features, including backwater valves, interior floor drains, and interior sanitary cleanouts. Of the 31 homes inspected, four had backwater valves and 12 had interior

drains, though most were inaccessible. All had interior sanitary cleanouts, though roughly only about half were accessible.

Number of Homes Inspected	31
Homes with Backwater Valves	4
Homes with Interior Drains	12
Homes with Interior Sanitary Cleanouts	31

The Town of Lincoln is committed to reducing I/I and improving resiliency against basement flooding in Jordan Station through improvements to municipally owned infrastructure and through private property foundation drain disconnection.

The voluntary inspection program has to date resulted in a low participation rate of approximately 17%. Of the 31 homes inspected, four (13% of all homes in the area) were found to have foundation drains discharging to the sanitary sewer either through a direct connection, or through a sump pump. Projecting this rate over the entire study area of 183 properties suggests that as many as 23 properties may currently have foundation drain connections to the sanitary sewer.

Further effort to identify and disconnect foundation drains from the sanitary sewer is recommended to reduce the potential for future basement flooding and emergency bypass pumping in Jordan Station by reducing inflow and infiltration from private properties. These efforts will include targeted

Jordan Station Foundation Drain and Sump Pump Disconnection Pilot Program Development

Basement flooding due to wet weather generally occurs via one of the following three mechanisms:

- Sanitary sewer surcharging due to peak extraneous flow that exceeds the sewer capacity, resulting in sewer backups.
- Storm sewer surcharging under extreme rainfall events that exceed storm sewer capacity, causing or combined with overland flooding, leading to inundation of sanitary sewer manholes and surcharging of the sanitary sewer, resulting in sewer backups.
- Overland flooding, in some cases due to storm sewer surcharging, causing surface flow to enter window wells, doorways, foundation drains, etc.

These flooding mechanisms highlight the interaction of both the sanitary and stormwater collection systems in incidences of flooding. Thus, it is advisable to remove private drainage connections from both the sanitary and storm sewer systems where it is feasible and will not negatively impact areas vulnerable to surface flooding. This is the current,

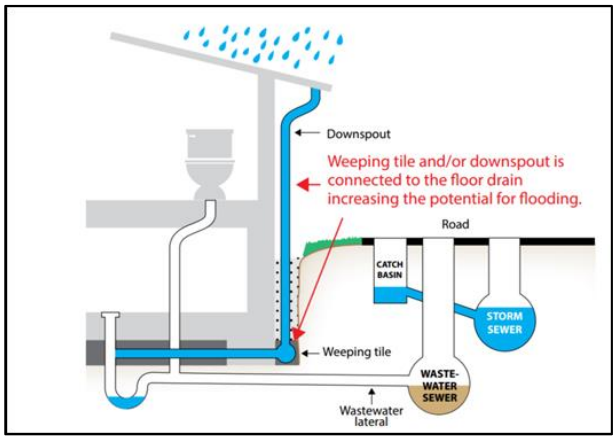
established engineering Best Practice for I/I reduction, basement flooding prevention, and environmental benefits. Rainwater should be considered a valuable resource that is best managed as close to its source as possible to replicate the hydrologic system that was in place prior to development.

Best Practices:

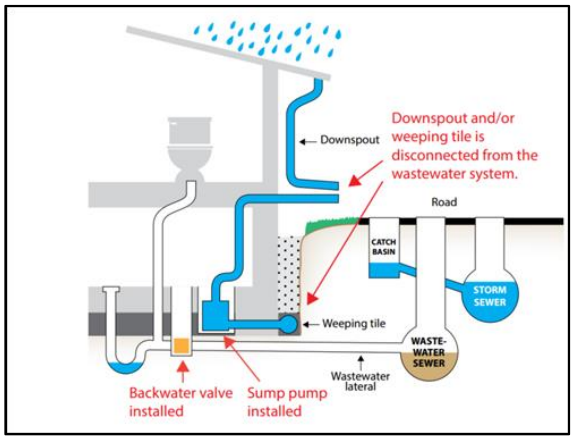
In view of the above, our Consultant and staff recommend the following decision-making model for private property I/I reduction work and to increase the level of protection against basement flooding:

1. Disconnect all downspouts; redirect all directly connected and indirectly connected downspouts to a point of falling grade at least 1.5m away from the foundation wall.
2. Disconnect all foundation drains from sanitary laterals, redirect them to a new sump and sump pump to discharge to the exterior ground surface at a point of falling grade at lease 1.5m away from the foundation wall.
3. Disconnect all sump pumps from sanitary laterals, redirect them to discharge to the exterior ground surface at a point of falling grade at lease 1.5m away from the foundation wall.
4. Install backwater valves on sanitary laterals upstream of weeping tile connections where moderate to high risk of flooding exists. Backwater valves must only be installed in homes where weeping tiles/sump pumps are already, or will be, disconnected.

Improper Drainage Configurations



Best Practice Configuration



Images from "A Guide to Flooding Prevention and Recovery", Halton Region

Pilot Program Funding and Subsidies:

There are many examples of government agencies providing grants, loans, rebates, or partial to full-subsidies for these programs. The rationale for supplying financial incentives to homeowners hinges on increasing participation for the benefit of all through system improvements such as reduced basement flooding, overflows, pumping and treatment

costs. Generally, a larger financial incentive will influence more homeowners to participate in the program.

Investment in I/I reduction programs can mitigate several potential and costly impacts:

- Environmental Impacts:
    - Sewage overflows, markedly at peak capacity, damage sensitive ecosystems and the natural environment.
    - Any overflow affects groundwater, local ecosystems, and water quality in lakes, streams, and rivers.
    - Clear water entering the system through infiltration could be a major factor contributing to lower groundwater levels and could affect local water resources.
- Potential Health & Safety Risks:
    - Sewage overflows, bypasses, and basement flooding present a public health risk.
- Exceeding Sewer Capacity:
    - Excessive I/I flows consume sewer capacity that could be required for existing residents and future approved growth. The extra flow can overload the sewage collection system pipes, causing backups or surcharging. Raw sewage can potentially overflow at locations, including basements before it reaches the treatment plant.
- Financial Impacts:
    - During wet weather events, the increased flows in the sanitary system raise the operational and capital costs at facilities and treatment plants as the additional flows must be conveyed and treated.
    - Decontamination measures to treat sewer overflows and basement back-ups (i.e., compensation claims management procedures) can be extensive and costly.
    - I/I decreases the life of a sewer pipe because its support structure (bedding & embedment) erodes as I/I enters the sewer. This erosion could require new or accelerated capital works to replace pipes and facilities.

In summary, reducing I/I flows provides a number of benefits including cost savings and improvements to the environment. These include reduced conveyance costs (pumping), reduced treatment costs, and hydraulic benefits (plants and pipes will be in service longer and cost less to maintain). Also, reducing sewer overflows and their associated health risks, property damage, and environmental effects provide both environmental and social benefits.

Based on a comprehensive review of municipal bylaws and subsidy programs across Ontario the following pilot subsidy program is proposed:

1. Foundation Drain Disconnection Subsidy – Eligible to all homeowners with disconnected downspouts and would include the installation of a sump pump to

grade or a connection to the storm system where available. Recommended subsidy: 100% to a maximum of $6,750.
2. Sump Pump Disconnection Subsidy – Eligible to all homeowners with disconnected downspouts and foundation drains. Sump pumps are to be rerouted to grade of a connection to the storm system where possible. Recommended subsidy: 100% to a maximum of $2,000.
3. Downspout Disconnection Subsidy – Eligible to all homeowners. Recommended subsidy: 100% to a maximum of $675.
4. Lateral Lining Subsidy – Eligible to all homeowners deemed required based on CCTV inspection. Recommended subsid: 100% to a maximum of $4,000.
5. Backwater Valve Installation Subsidy – Eligible to all homeowners with disconnected downspouts, foundation drains and sump pumps, and have completed lateral lining if Town deemed required based on CCTV inspection. Recommended subsidy: 50% to a maximum of $675.

Pilot Program Delivery:

There are generally two approaches to retaining a contractor: a passive approach, where individual home owners are responsible for having the work completed, or an active approach led by either the Town or a consultant responsible for coordinating all work by one or more contractors and minimizing effort required by home owners.

Passive Approach - Home Owner Led

- The typical approach used by municipalities that offer subsidies but are otherwise not actively perusing private property I/I remediation and basement flooding protection.
- Following the inspection phase, the homeowner will be provided with recommendations for the required work. The homeowner is responsible for obtaining up to three quotes for the recommended work, paying to have the work completed, submitting a subsidy application for approval by the Town, then the Town reimburses the homeowner for the subsidized amount.
- This approach places the onus on the home owner to coordinate and pay for the work up front, without any real incentive, and will require significant effort by the Town (or their consultant) to achieve participation, and to manage the application/approval process.
- This approach is not recommended for Jordan Station, but it could be adopted as a best practice for areas that are less of a priority for I/I reduction.

Active Approach – Town/Consultant/Contractor Led

- A more effective approach, that minimizes effort by the homeowner, is to retain and manage a roster of one to three qualified contractors to complete the work.
- Initial contractor procurement is achieved through a Tender or Request for Quotation process.
- For each property, the selected contractor will be required to consult with the homeowner to confirm the actual work required, then complete the work at the

tendered prices. The Town's/Consultant's Program Manager will oversee, and document all work by the contractor(s) and provide contract administration services.

- ***This approach is recommended for the Jordan Station pilot program***.

Proposed Implementation of Pilot Program:

Phase 1: Voluntary Foundation Drain and Sump Pump Disconnection Pilot Program

Staff propose that a 12-month voluntary pilot program be implemented.

1. Work with legal on development of waivers
2. Re-Introduction of Inspection Program and Overview of the Disconnection Pilot Program
3. Complete Property Inspections
4. Prepare Preliminary Work Plans
5. Retain a Qualified Contractor
6. Confirm Work Plans and Collect Waivers
7. Complete the Work
8. Investigation to assess level of extraneous flow reduction
9. Report back to Council with Update

Phase 2: Mandatory Foundation Drain and Sump Pump Disconnection Pilot Program (if required)

Should the Town not observe an acceptable level of uptake to meet a target level of extraneous flow reduction, it is recommended that the pilot program transition to a mandatory disconnection pilot program. The following outlines the required actions to transition into Phase 2:

1. By-Law Review and Update by Legal Counsel
2. Re-Introduction of now Mandatory Inspection and Disconnection Pilot Program
3. Complete Property Inspections of Outstand Properties
4. Confirm Work Plans and Collect Waivers
5. Complete the Work

Financial, Legal, Staff Considerations:

Financial: Recommendations for the Jordan Station Foundation Drain and Sump Pump Disconnection Pilot Program include financial support in the form of subsidies. The Town of Lincoln has received funding for 60% the Pilot Program Subsidy from the Niagara Region CSO Program. Costs associated with this pilot program have been included in the 2022 wastewater operational budget with the assumption of 31 requiring foundation drain disconnection, downspout disconnection, lateral lining and back water valve.

Cost savings or financial benefits associated with this work include staffing and overtime costs associated with bypass pumping operations; pumping and treatment costs associated with increased levels of I/I in system; reducing sewer, pumping station and treatment plant

upgrades by proving additional capacity in the system, supporting development and growth across Town by allowing additional capacity in the system. The non-fiscal costs that need to be considered if this work were to be not completed includes environmental costs associated with bypass pumping to the environment, social impact costs associated with noise and disruptions during bypass pumping events and/or potential basement flooding.

Staffing: Staff would work closely with the Consultant and the property owners in Jordan Station to provide public education

Legal: A waiver will need to be developed as part of this pilot program. The current Bylaw allows for grandfathering of connection of foundation drains and sump pumps to the sanitary system for properties constructed prior to 2007. Downspouts are not permitted to be connected for any properties. If the voluntary pilot program is determined to not be successful it is recommended that the Bylaw be amended to remove the grandfathering clause where the Director determines that extraneous flow is a significant concern.

Public Engagement Matters:

From September 3 to September 5, 2019, GMBP staff, accompanied by Town of Lincoln staff, canvassed all homes in the target area to provide educational materials to the homeowners.

All property owners need to understand the significant impact that their downspouts and foundation drains, whether directly or indirectly connected to the sewer system, have on the likelihood of their, or their neighbour's basement flooding in the future, the environmental cost of sewer overflows, and the utility rate costs for the treatment and conveyance of extraneous flow. A clear explanation of this cause and effect will achieve buy-in of those homeowners who may not understand the impact that their drainage can have on their property, their neighbour's property, and the community.

Repeated and consistent messaging and mailed or hand delivered material typically achieves higher compliance rates. As a minimum, the following materials are recommended as part of the Public Education campaign to promote homeowner compliance with the pilot program: Introductory Letter, Pilot Program Fact Sheet, Inspection Record and Work Plan, Waiver, Maintenance Information, Public Information Centre (drop in style) and a dedicated Speak Up Lincoln page.

Conclusion:

The initial Jordan Station Foundation Drain and Sump Pump Investigation has been completed. The disconnection of any foundations drains and sump pumps draining to the sanitary sewer will assist the Town of Lincoln in reducing the amount of extraneous flow in the system to help prevent future basement flooding and emergency bypass pumping. The proposed pilot subsidy and Foundation Drain and Sump Pump Disconnection Pilot Program which has been based on best practices is recommended. Staff will continue to

work closely with senior staff, Council, industry experts, and Lincoln residents to ensure successful delivery of the pilot program.

Respectfully submitted,

Gillian Harris, P.Eng., PMP
Associate Director, Public Works
905-563-2799 Ext.286

Appendices:

Appendix A 2019 Jordan Station Foundation Drain Public Education Materials
Appendix B Presentation

Report Approval:

Report has been reviewed by the Director of Public Works and the Director of Finance, Administration and Innovation. Final approval is by the Chief Administrative Officer.