
Appendix B

Smoke Test Report

Aquafor Beech Ltd.,
6-202-2600 Skymark Avenue
Mississauga ON CA L4W 5B2

March 13, 2020

Attention: Dave Maunder, M.Sc., P. Eng.,
Project Manager / Principal

Re: 2019 Brantford Storm Sewer Smoke Testing
(Support Information for North East Flood Remediation Study)

Thompson Flow Investigations Inc. (TQI) is pleased to submit this Report on all FINDINGS and OBSERVATIONS found during the storm sewer smoke testing project. The report is focused on the Storm Sewer Smoke Testing work undertaken by Thompson Flow Investigations Inc. (TQI) in the fall of 2019 as part of the North-East End Flood Remediation Study by the City of Brantford.

The purpose of this intensive smoke testing of the storm sewer system in specific locations was intended to check connections to the street storm sewers. Suspected cross connections with the sanitary system were also noted.

A total of **86** results were found. TQI categorized FINDINGS as any connections or cross connections to the storm sewer system that smoked such as downspouts, roof drains, broken laterals, weeping tiles, reverse grade driveway drains, catch basins and manholes encountered during the work. OBSERVATIONS regarded those appurtenances that did not smoke.

These results were documented and identified on plans and discussed in this report.

SCOPE OF REPORT

The report consists of the following sections:

1. Introduction and Study Area
2. TQI - Smoke Testing Approach
3. Results
4. Comments

1. INTRODUCTION AND STUDY AREA

Thompson Flow Investigations Inc. (TQI) was retained by Aquafor Beech Ltd. to undertake smoke testing in the fall of 2019 in North-East area of Brantford. The storm sewers were smoke tested in ten (10) different locations as selected by Aquafor Beech Ltd. The 10 locations are highlighted in yellow on the **Location Plan** which follows.

2. TQI – SMOKE TESTING APPROACH

The storm sewer smoke testing investigation was carried out in September of 2019 at 10 specific locations in the North East end of Brantford.

It should be remembered that smoke testing is a “one way” test. If a source is located, it definitely exists. If sources are not found they might still exist. Unlike dye testing however, smoke testing can reveal sources that were not suspected. (Dye testing is specific to a suspect source).

The weather and ground conditions were excellent for smoke testing allowing good transmittance of smoke up through the soil and various appurtenances. TQI avoids testing on wet or windy days (after significant rain, ponded water and wet soil impede smoke transmittance and as well, wind carries smoke away).

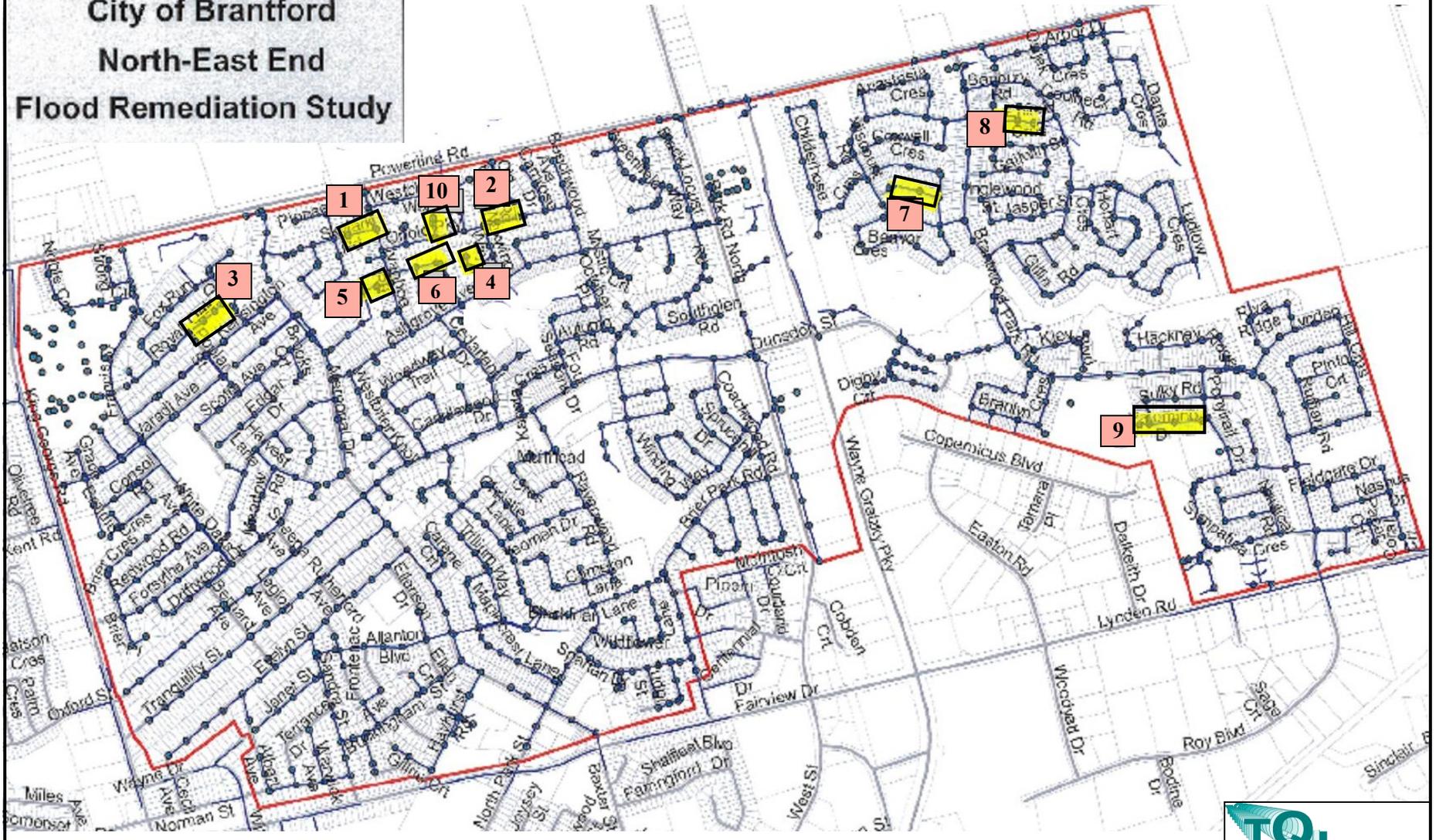
With a direct connection, larger quantities of smoke will be visible. With an indirect connection (smoke must travel through cracks in pipes and through backfill), only small quantities of smoke will be visible.

Any cross connections, such as a building’s plumbing system connected to the storm sewer, will be evidenced by smoke exiting at a building’s plumbing vent pipe (located on the roof) during the testing.

Figures 1 & 2 below are illustrations re TQI’s smoke testing.

Figures 3 & 4, which were created by the Region of Peel, illustrate normal and abnormal smoke exit locations.

City of Brantford
North-East End
Flood Remediation Study



Location Plan
Smoke Test Locations (10)



Pressurized liquid smoke tank

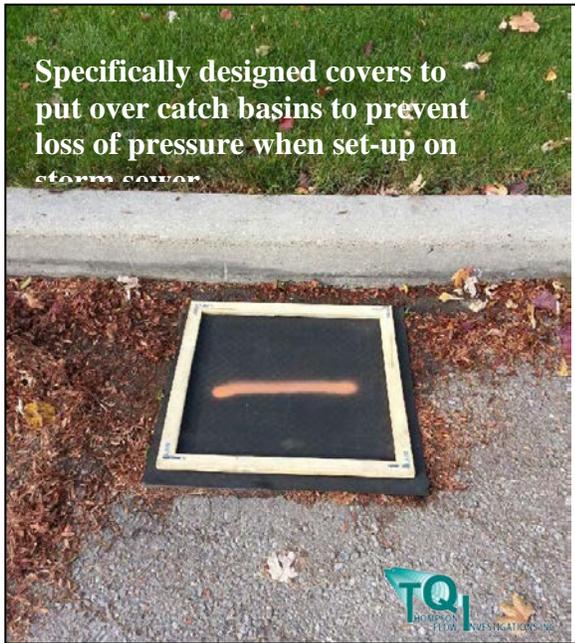
Smoke generator / blower

Initial setup of smoker unit



Smoker unit in operation

FIGURE 1: GENERIC SMOKE TESTING OPERATION



Can verify that downspouts that enter into the ground are correctly connected to the storm sewer.

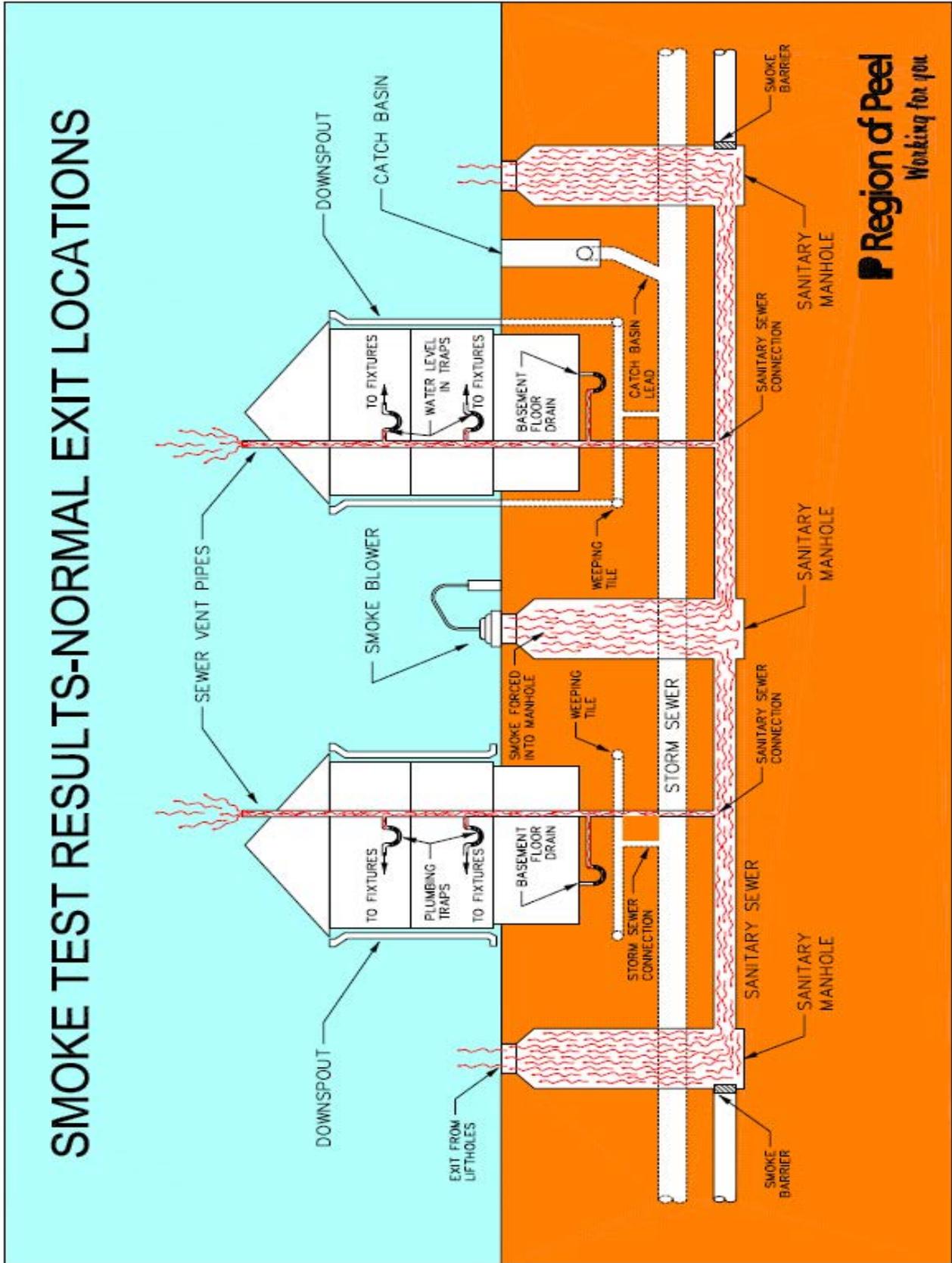
BENEFITS OF SMOKE TESTING STORM SEWER LINES



Can verify that roof drains are correctly connected to the storm sewer.

Assist in identifying plumbing cross-connections (i.e., Roof vent should not “smoke” when set-up on storm sewer).





Region of Peel
Working for you

Figure 3

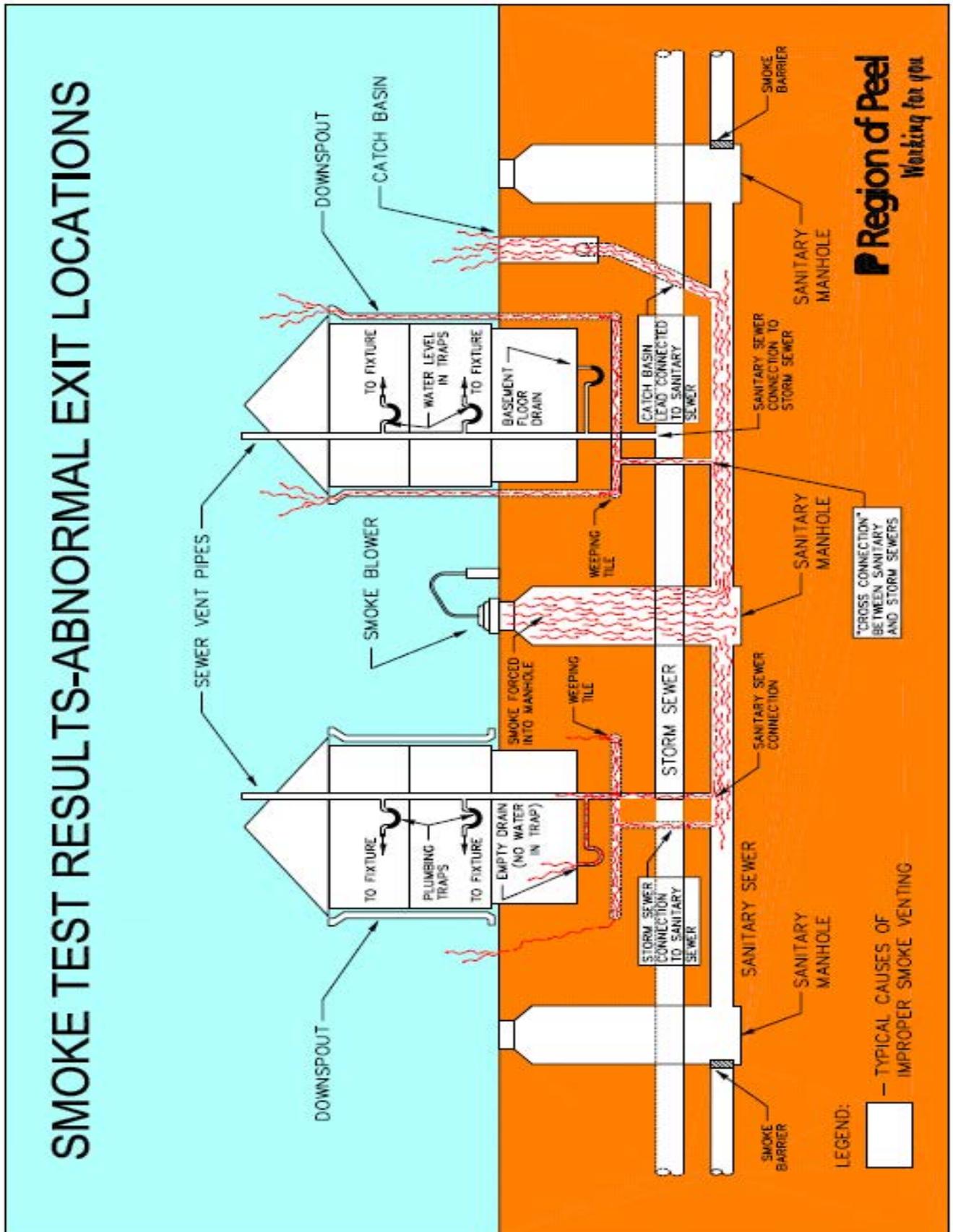


Figure 4

2.1 OPERATIONAL PROCEDURES

- a) General Communication - A notification flyer was developed and delivered to residents in the 10 specific locations to be smoke tested to notify residents of the program. A copy is included on the following page.
- b) Fire & Police Communication - The Fire Services for the City of Brantford were notified by City personnel regarding the testing commencement and its general location prior to the start of the program. In the morning of the smoke testing, the Fire Department was called by the TQI project manager and given a specific area in which the testing was being carried out on that day. As well, at the end of the day, the Fire department was called completing the day's smoke testing activity. Throughout the day, any resident concerns brought to our attention were addressed / resolved on site by TQI or with the Fire Department or the City was notified if no resolution was possible.

- c) Traffic Control & Safety –

Safety Meetings were held on site with all staff by the Project Manager at the start of the day to go over the work and review the safety aspects of the work we were doing. Any concerns were addressed.

TQI personnel filled in Confined space entry forms each day prior to manhole entry as part of our safety procedure. MTO Book 7 was followed for short and very short duration work.

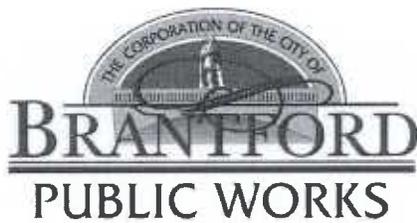
- d) Field Operations –

1. Each smoke test isolated roughly 200 m of sewer. Specially developed “flaps” which largely block the air space above the flow in the sewer pipes were placed in strategic manholes by TQI to help achieve greater pressurization of the system. Additionally, when testing the storm sewer, specialized ‘matts’ were placed on the catch basins to prevent loss of pressurization.
2. A combination smoke generator and blower specifically designed for smoke testing was utilized. This unit sits directly over a manhole (avoiding pressure losses from a ventilator hose) and features a 5 hp motor directly driving a large fully enclosed fan blade. This unit is capable of blowing over 4100 cfm (cubic feet per minute) of air

against a static pressure equal to 3 inches of water. This is almost three times the air movement achievable with the less powerful, older style manhole ventilators using a ventilator hose.



3. Once a sewer segment was “set up” for testing and the smoke / blower unit started, the field crew walked along the segment noting any evidence of smoke exiting at the surface and connected to the storm sewer.
 - e) Documentation - When “smoke” was found exiting at the surface, the crew noted the location and its nature on field maps prepared by TQI. The crew also took digital photos and video footage of any I/I sources found and any other abnormalities for discussion and recommendations. In some cases smoke which was clearly visible on-site due to “movement against a background” was hard to see in a still photo. In these cases, video footage allowed TQI to determine the connection and in many cases capture a still photo alleviating this problem.
 - f) Reporting - After completion of the smoke testing in the field, TQI reviewed the field maps and notation as well as any pictures and videos taken on-site. Results were verified and noted on a results map. The report and documentation was then prepared for the project. Results have been digitally shown on maps (with a different symbol for each type of finding found) and in databases as well as in Photo sheets by study area location in the report.



August 26, 2019

**NOTICE OF STORM SEWER SMOKE TESTING
IMPORTANT PUBLIC NOTICE- Please Read Carefully
September 9th to September 13th, 2019**

Dear All Area Residents/Business Owners/Tenants/Agencies:

The City of Brantford is currently undertaking the North-East End Flood Remediation Study to investigate the causes of flooding, identify any deficiencies in the infrastructure, and recommend solutions to reduce risk of future flooding in the area.

As part of this study, Thompson Flow Investigations Inc. (TQI) will be conducting **smoke testing of the storm sewer system in your neighbourhood** weather permitting, within the above noted time period.

Storm sewer Smoke Testing will be undertaken to help the City identify roof drain (downspout) and foundation drain connections, and any cross connections with the sanitary sewer system. This information will allow more accurate modelling of the storm drainage system.

The testing will be performed over a day or two within the September 9th to September 13th time period, on weekdays between 8:30 a.m. and 6:30 p.m.

The test consists of blowing highly visible non-toxic “smoke” into the storm sewer system at manholes and observing the locations where the smoke exits to the surface (manholes, catch basins, roof top plumbing vents, connected downspouts, yard drains etc).

The “smoke” that is used is manufactured for this purpose. It is non-toxic, odourless, non-staining (on clothing, draperies or furniture) and has no known effects on people or pets. If you come into contact with the “smoke” it is not harmful to your health and will dissipate within a few minutes of the test completion.

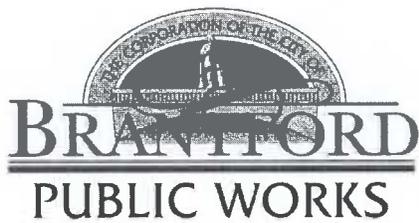
The fire department will be notified during testing. **Please do not be concerned if you see smoke coming out of your rooftop drains or street manholes. This is normal.**

During the testing, it will be necessary for **TQI staff to briefly enter onto your property (front and back yards)** to observe & record smoke exit points. TQI staff will be wearing identification badges, orange safety vests and will *not* need to enter into your home. **It is not necessary for you to be home during the test, as the primary concern is external connectivity.**

Smoke should not enter your building, unless you have a cross connection to the sanitary system:

- A leak due to defective, damaged /improper plumbing (including traps, tubs, showers, pipes)
- Dry traps (infrequently used drains) or uncapped piping rough-ins

To help prevent “smoke” unnecessarily entering your building in the case of a cross connection; **the City asks you to pour a liter of water into your basement floor**



drains, and unused showers, sinks and piping rough-ins PRIOR to the start of testing on September 9th. The water added to the traps will be effective for several months.

The City looks forward to working with you and having our contractor complete this work during the noted time period, weather permitting.

If you have any questions or if you or any members of your family have any health conditions that you feel we need to be aware of, please contact one of the following:

Karen Dennison,
Project Manager
Thompson Flow Investigation Inc. (TQI)
416-806-8330 (also on-site)

Nahed Ghbn, Senior Project Manager Water Resources
City of Brantford
519-759-4150 ext. 5262
nghbn@brantford.ca

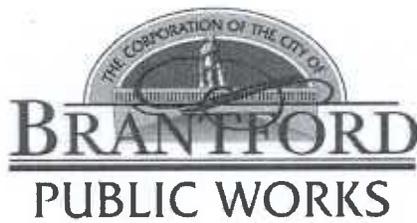
If you are a tenant, we ask that you please forward this information onto the property owner.

Yours truly,

A handwritten signature in blue ink, appearing to read 'W. Teufel', written over a light blue circular stamp.

Wendy Teufel,
Manager, Design & Construction

Cc:
Councillor Richard Carpenter, Councillor Cheryl Antoski
Councillor Dan McCreary, Councillor Greg Martin
Russ Loukes, P. Eng., Acting General Manager of Public Works
Nahed Ghbn, P. Eng., Engineering Services



SMOKE TESTING OF SEWER SYSTEMS

Frequently Asked Questions

1. What is the purpose of smoke testing?

The purpose of this testing is to confirm connectivity of roof downspouts to the storm sewer system allowing more accurate modelling of the drainage system for flood control. The purpose is also to locate any cross connections where unwanted rainwater is entering the sanitary sewer system. If a source is found, steps can be planned to correct it.

2. What are the benefits of smoke testing?

“Smoke” testing is a cost effective and quick method of testing connectivity to the sewer system and locating potential improvements. The “smoke” vapour is harmless and will disappear after only a few minutes.

3. What should I do to prepare for the smoke testing?

When you receive notice that smoke testing will take place, you should ensure that all traps under your sinks, floor drains and any plumbing rough-ins have water in them.

4. What does it mean if smoke enters my house?

If smoke enters your home during the test, it means there are cross connections to the sanitary system and /or plumbing deficiencies (pipes or dry traps within the house).

5. What should I do if smoke enters my house?

If “smoke” does enter your home and causes you concern, note the location of the smoke and contact the **Project Manager** at **416-806-8330** on-site to help explain the situation.

6. If smoke gets into the house, what do I do? How long will it take for the smoke to clear?



If any of the harmless “smoke” does get into your home, simply open a few windows for ventilation. The “smoke” will disappear in a few minutes after test completion.

7. I have pets and will not be at home during the testing. Should I be concerned about their safety?

The “smoke” is not harmful to people or pets. However, it would be a good idea to leave an upstairs window partially open for ventilation, should any smoke happen to enter your home during the testing process.

3. RESULTS

3.1. OVERVIEW OF RESULTS BY FINDING TYPE

The **86** results included **56** FINDINGS (connections and cross connections to the storm sewer that smoked) and **30** OBSERVATIONS (those appurtenances that did not smoke) which affected the storm sewer system. The results are summarized on the chart which follows.

Results which have the potential to affect the storm sewer system capacity and effectiveness include the following types:

<u>Findings:</u>	
	DS directly connected to STORM Sewer
 	Former downspout with inadequate disconnection (requires CAP to seal)
	SAN Plumbing Vent Stack-Smoke seen during Storm Sewer Testing
	Storm CB Inlets (adding flow to STORM Sewer)
	Foundation Drains/Window Wells connected to Storm Sewer
	DS field found directly connected to the storm sewer
	Basement Sump Pit Lateral outlet to STORM
	Smoke in Basement - Unknown Source
<u>Observations:</u>	
	Downspout - no smoke - unknown connection
	Stairwell Drains - Did NOT smoke during storm Sewer Testing
	Downspout exit is too close to foundation wall

Storm Sewer Smoke testing - Summary of Results Brantford - 10 Locations

Result Type		Loc 1	Loc 2	Loc 3	Loc 4	Loc 5	Loc 6	Loc 7	Loc 8	Loc 9	Loc 10	Total # of Findings
		Skylark Rd	Oriole Pwy	Royal Oak Dr	Canary Dr	Hemlock Crt	Wedge-wood Dr	White Owl Cresc	Enfield Cresc	Palomino Dr	Thicket-wood Crt	
	Downspouts directly connected to STORM sewer - smoked	1	-	-	-	-	3	-	-	-	-	4
	Sanitary Plumbing Vent Stacks - Smoke seen (Storm Sewer Tested) - cross connection	1	4	-	-	1	1	1	2	4	-	14
	Storm Field Inlets / cB's (adding flow to Storm Sewer) - smoked	-	-	-	-	1	-	-	2	2	1	6
	Foundation Drains/Window Wells connected to storm sewer - smoked	2	-	1	-	-	-	-	-	-	-	3
	Driveway Drains connected to Storm Sewer	6	-	-	-	2	2	-	-	-	3	13
	Smoke in Basement - Unknown Source	-	-	-	-	-	1	2	-	2	-	5
	Sump Pit / Clean Out Source of Smoke	1	2	-	1	1	2	2	2	-	-	11
Total # Findings =		11	6	1	1	5	9	5	6	8	4	56
	Downspout - no smoke - unknown connection	-	-	8	8	-	-	1	1		-	18
	Former downspout with inadequate disconnection (requires CAP to seal)	-	-	2	1	1	1	-	-	1	-	6
	Stairwell Drains that did NOT smoke during Storm Sewer Testing	1	-	1	2	-	1	-	-	-	1	6
Total # Observations =		1	0	11	11	1	2	1	1	1	1	30
Total # Observations & Findings =											86	

3.2. RESULTS BY SPECIFIC LOCATION

There are 10 specific study area locations as seen in the Location Plan attached for reference.

We have organized the following by location:

- Results maps depicting all the findings and Observations (those appurtenances that did not smoke)
- Photo sheets of all Findings have also been attached organized by Location.

Also at the end of this report section, a database of all the Findings (connections and cross connections) to the storm sewer that smoked) organized by location and street has been attached.

Finding #1

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Finding #2

Finding Code: (DD) 

Brantford: 

Driveway Drain Connected to Storm System

Location: 



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Finding #3

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Finding #4

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Finding #5

Finding Code: (SP LAT) §

Brantford [REDACTED]

Sump Pit Connected to Storm System via Lateral

Location: [REDACTED].



Defect Description: A sump pit in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



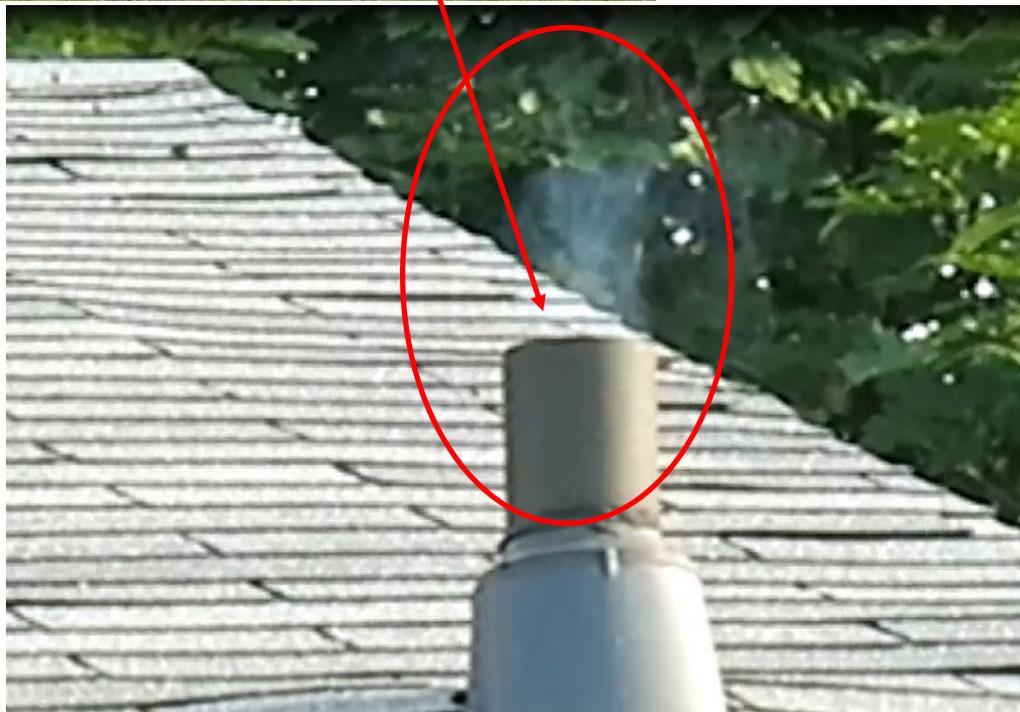
Finding #6

Finding Code: (PV) PV

Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during the storm testing indicating a connection with the storm sewer system. Sanitary smoke testing or dye testing is recommended to confirm the plumbing interconnection. As well, the basement sump pit was connected via a lateral to the storm sewer establishing a definite connection of weeping tiles to the storm sewer.



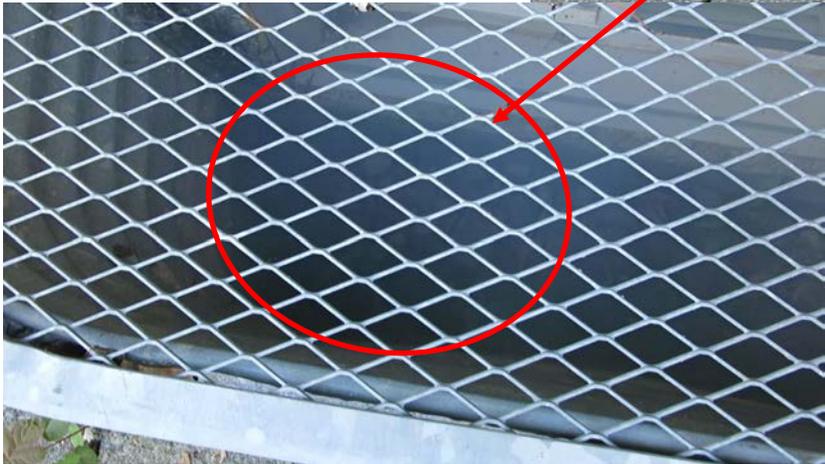
Finding #7

Finding Code: (WW) WW

Brantford: [REDACTED]

Window Well with connection to the Storm System

[REDACTED]



Defect Description: Window well connection to the storm sewer was observed. This is evidence of weeping tile (foundation drain) connection to the storm sewer. Ensure positive drainage (grading) away from the house.



[REDACTED]

Finding #8

Finding Code: (WW) **ww**

Brampton: [REDACTED]

Window Well with connection to the Storm System

Location: [REDACTED]



Defect Description: Window well connection to the storm sewer was observed. This is evidence of weeping tile (foundation drain) connection to the storm sewer. Ensure positive drainage (grading) away from the house.



Finding #9

Finding Code: (DS)



Brantford: [REDACTED]

Downspout Connected to Storm System

Location: [REDACTED]



Defect Description: Downspout is connected to the storm sewer. Requires disconnection and discharge to the surface with positive drainage 1 m away from the building foundation wall to prevent sewer inflow via the weeping tiles.

[REDACTED]



Finding #10

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



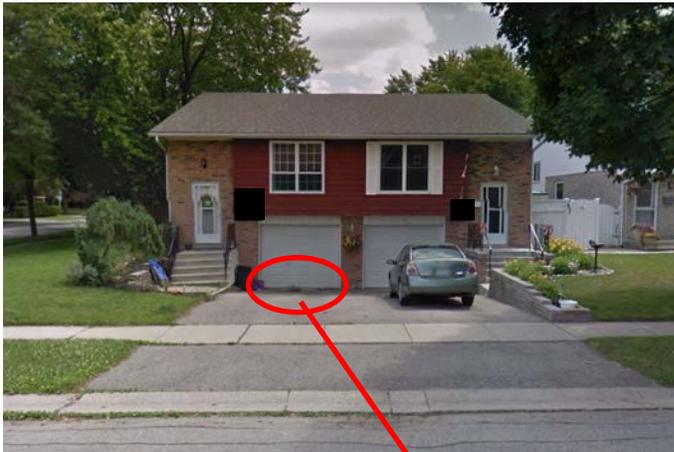
Finding #11

Finding Code: (DD) 

Brantford: 

Driveway Drain Connected to Storm System

Location: 



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Storm Sewer
Smoke Testing

Photosheet 11

Finding #12

Finding Code: (PV) **PV**

Brantford: [REDACTED]

Plumbing Vent Stack with
connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #13

Finding Code: (SP-LAT) 

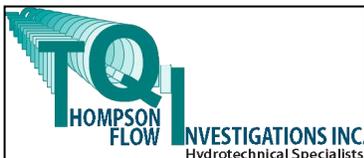
Brantford: 

Sump Pit Connected to Storm System via Lateral

Location: 



Defect Description: A sump pit in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #14

Finding Code: (SP-LAT) §

Brantford: [REDACTED]

Sump Pit Connected to Storm System via Lateral

Location: [REDACTED]



Defect Description: A sump pit in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #15

Finding Code: (PV) 

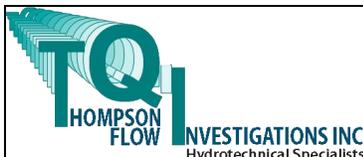
Brantford: 

**Plumbing Vent Stack with
connection to Storm Sewer**

Location: 



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #16

Finding Code: (PV) **PV**

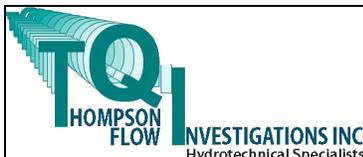
Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



[REDACTED]

Finding #17

Finding Code: (PV) **PV**

Brantford: [REDACTED]

Roof Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the roof (plumbing vent?) during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



[REDACTED]

Finding #18

Finding Code: (WW) WW

Brantford: [REDACTED]

Window Well with connection to the Storm System

Location: [REDACTED]



Defect Description: Window well connection to the storm sewer was observed. This is evidence of weeping tile (foundation drain) connection to the storm sewer. Ensure positive drainage (grading) away from the house.



Finding #19

Finding Code: (SP-LAT)

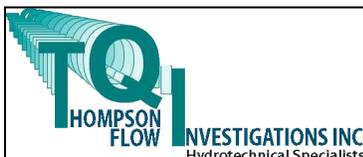
Brantford: [REDACTED]

**Sump Pump Pit Connected
to Storm System**

Location: [REDACTED]



Defect Description: Drains to likely old sump pit that is under concrete.



Finding #20

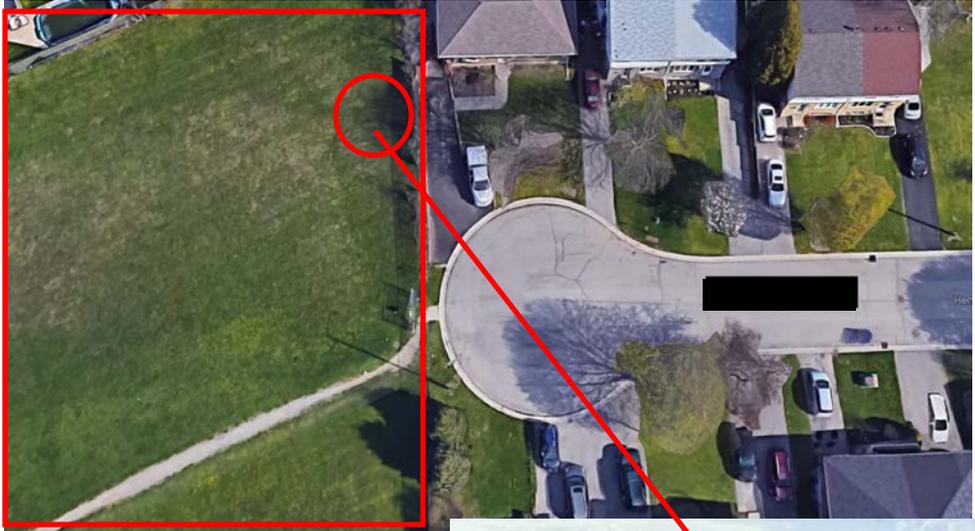
Finding Code: (CB)



Brantford: [REDACTED]

Catchbasin Connected to Storm System

Location: [REDACTED]



Defect Description: The park ditch Inlet CB's are connected to the storm sewer on Hemlock Ct. Surface water from the park during rain events is directed to the storm sewer on Hemlock Ct utilizing capacity.

[REDACTED]



Finding #21

Finding Code: (CAP)



Brantford: [REDACTED]

Improperly Disconnected Downspout with connection to Storm System

Location: [REDACTED]



Defect Description: Downspout is connected to the storm sewer. This repair requires capping the former downspout connection to the storm sewer. Any downspout discharge to be directed to the surface with positive drainage 1 m away from the building foundation wall to prevent sewer inflow via the weeping tiles.



[REDACTED]

Finding #22

Finding Code: (SP-LAT) §

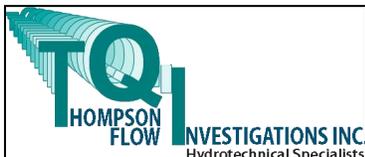
Brantford: [REDACTED]

Sump Pit / Clean Out Connected
to Storm System via Lateral

Location: [REDACTED]



Defect Description: A sump pit in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #23

Finding Code: (PV) 

Brantford: 

**Plumbing Vent Stack with
connection to Storm Sewer**

Location: 



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #24

Finding Code: (DD)



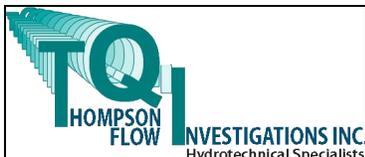
Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.



Finding #25

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.

[REDACTED] D



Finding #26

Finding Code: (DS) 

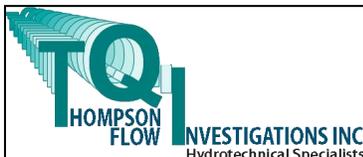
Brantford: 

**Downspout Connected
to Storm System**

Location: 



Defect Description: Downspout is connected to the storm sewer. Requires disconnection and discharge to the surface with positive drainage 1 m away from the building foundation wall to prevent sewer inflow via the weeping tiles.



Finding #27

Finding Code: (SP-LAT) §

Brantford: [REDACTED]

Sump Pump Pit out Connected to Storm System via Lateral

Location: [REDACTED].



Defect Description: A sump pump pit in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #28

Finding Code: (DS) 

Brantford: 

Downspout Connected to Storm System

Location: 



Defect Description: Downspout is connected to the storm sewer. Requires disconnection and discharge to the surface with positive drainage 1 m away from the building foundation wall to prevent sewer inflow via the weeping tiles.



Finding #29

Finding Code: (DS) 

Brantford: 

**Downspout Connected
to Storm System**

Location: 



Defect Description: Downspout is connected to the storm sewer. Requires disconnection and discharge to an appropriate outlet with positive drainage away from the building foundation wall to prevent sewer inflow.



Finding #30

Finding Code: (DD)



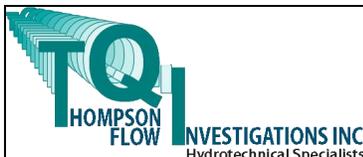
Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the driveway during smoke testing of the storm sewer system.



Finding #31

Finding Code: (CAP)



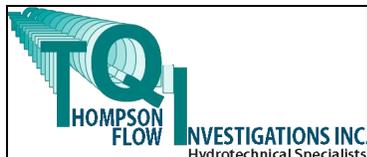
Brantford: [REDACTED]

Improperly Disconnected Downspout with connection to Storm System

Location: [REDACTED]



Defect Description: Downspout is connected to the storm sewer. This repair requires capping the former downspout connection to the storm sewer. Any downspout discharge to be directed to the surface with positive drainage 1 m away from the building foundation wall to prevent sewer inflow via the weeping tiles.



[REDACTED]

Finding #32

Finding Code: (PV) **PV**

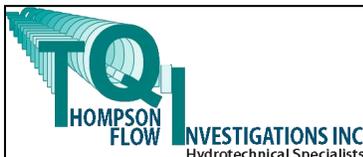
Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Heavy smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #33

Finding Code: (SP-LAT) 

Brantford: 

**Sump Pit / Cleanout Connected
to Storm System via Lateral**

Location: 



Defect Description: A sump pit / cleanout in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #34

Finding Code: (OTHER)

Brantford: [REDACTED]

Unknown Source connected to Storm System

Location: [REDACTED]



Defect Description: Smoke appeared at the eavestrough but the nearest downspout was disconnected. Source is unknown but could be a broken plumbing vent discharging into the eaves and the san lateral is connected to the storm sewer (a cross connection). Smoke test sanitary system or dye test to confirm connection.



Finding #35

Finding Code: (DD)



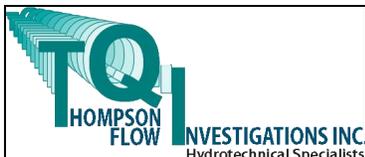
Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.



Finding #36

Finding Code: (SP-LAT) 

Brantford: 

**Sump Pit / lean Out Connected
to Storm System**

Location: 



Defect Description: A sump pit / clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #37

Finding Code: (SP) §

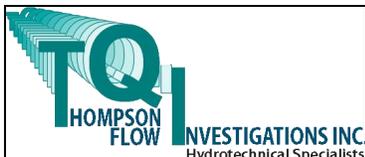
Brantford: [REDACTED]

Sump Pit/Clean Out Connected to Storm System

Location: [REDACTED]



Defect Description: An area under floor boards, not visible, is the likely source for smoke. A sump pit /clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



[REDACTED]

Finding #38

Finding Code: (SP) §

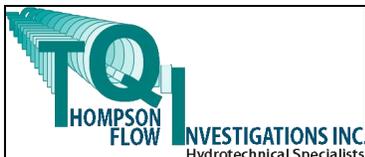
Brantford: [REDACTED]

Sump Pit /Clean Out Connected to Storm System

Location: [REDACTED]



Defect Description: A sump pit / clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #39

Finding Code: (SP) §

Brantford: [REDACTED]

Sump Pit /Clean Out Connected to Storm System

Location: [REDACTED]



Defect Description: A sump pit / clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



Finding #40

Finding Code: (PV) PV

Brantford: [REDACTED]

**Plumbing Vent Stack with
connection to Storm Sewer**

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



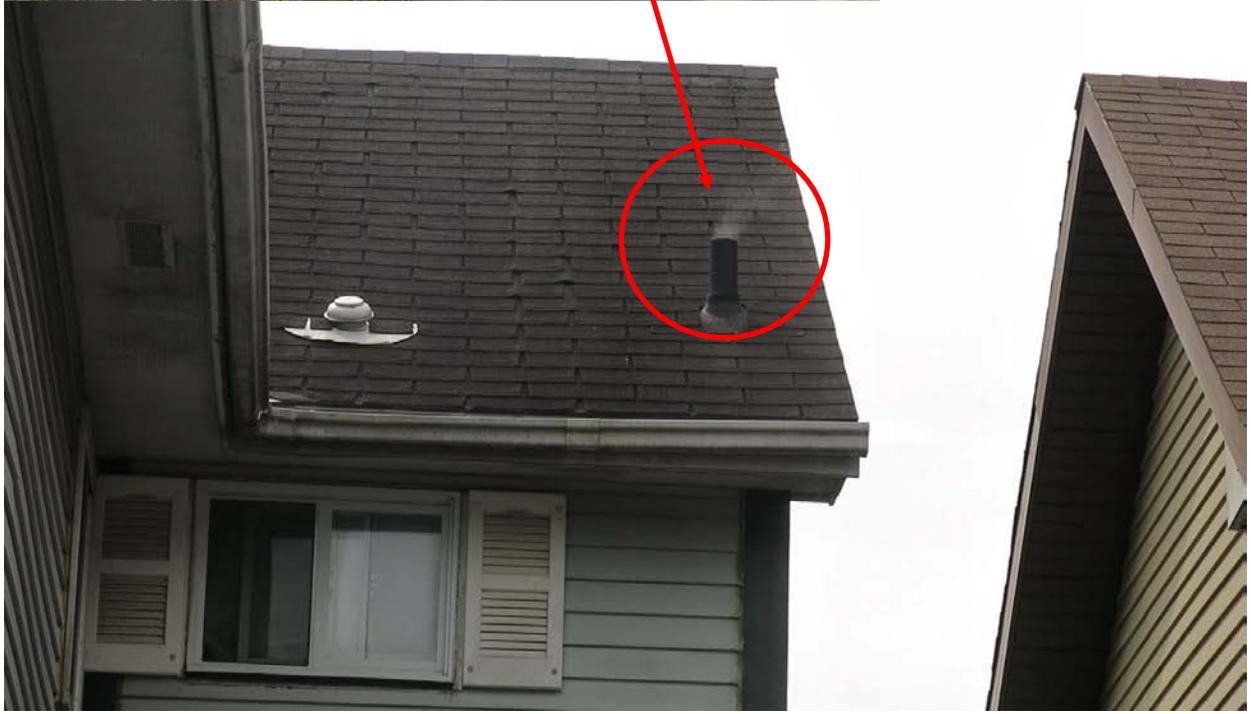
Finding #41

Finding Code: (PV) **PV**

Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #42

Finding Code: (SP-LAT)



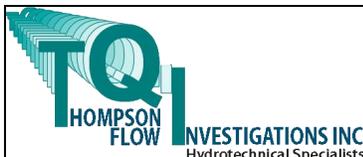
Brantford: [REDACTED]

Sump Pit /Clean Out Connected to Storm System

Location: [REDACTED]



Defect Description: A sump pit / clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



[REDACTED]

Finding #43

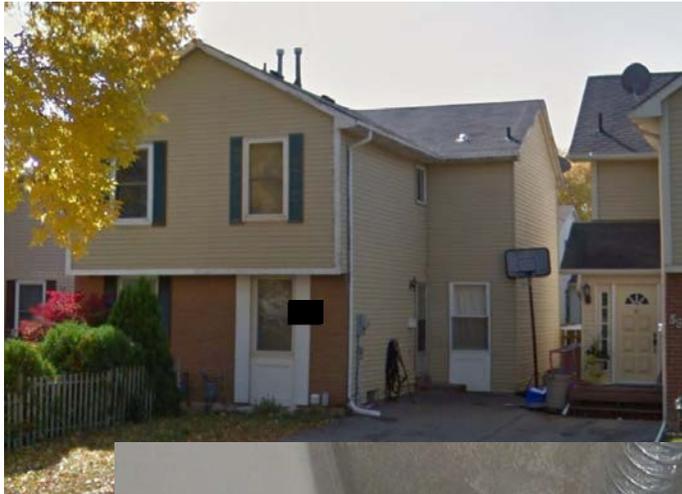
Finding Code: (SP-LAT)



Brantford: [REDACTED]

Sump Pit/Clean Out Connected to Storm System

Location: [REDACTED]



Defect Description: A sump pit / clean out in the basement is connected to the storm sewer via the weeping tiles and storm lateral. This smoked during our storm testing filling the basement with smoke. A definite connection to the storm sewer through this source.



[REDACTED]

Finding #44

Finding Code: (PV) **PV**

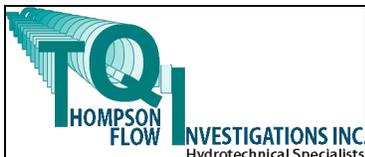
Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



[REDACTED]

Finding #45 & 46

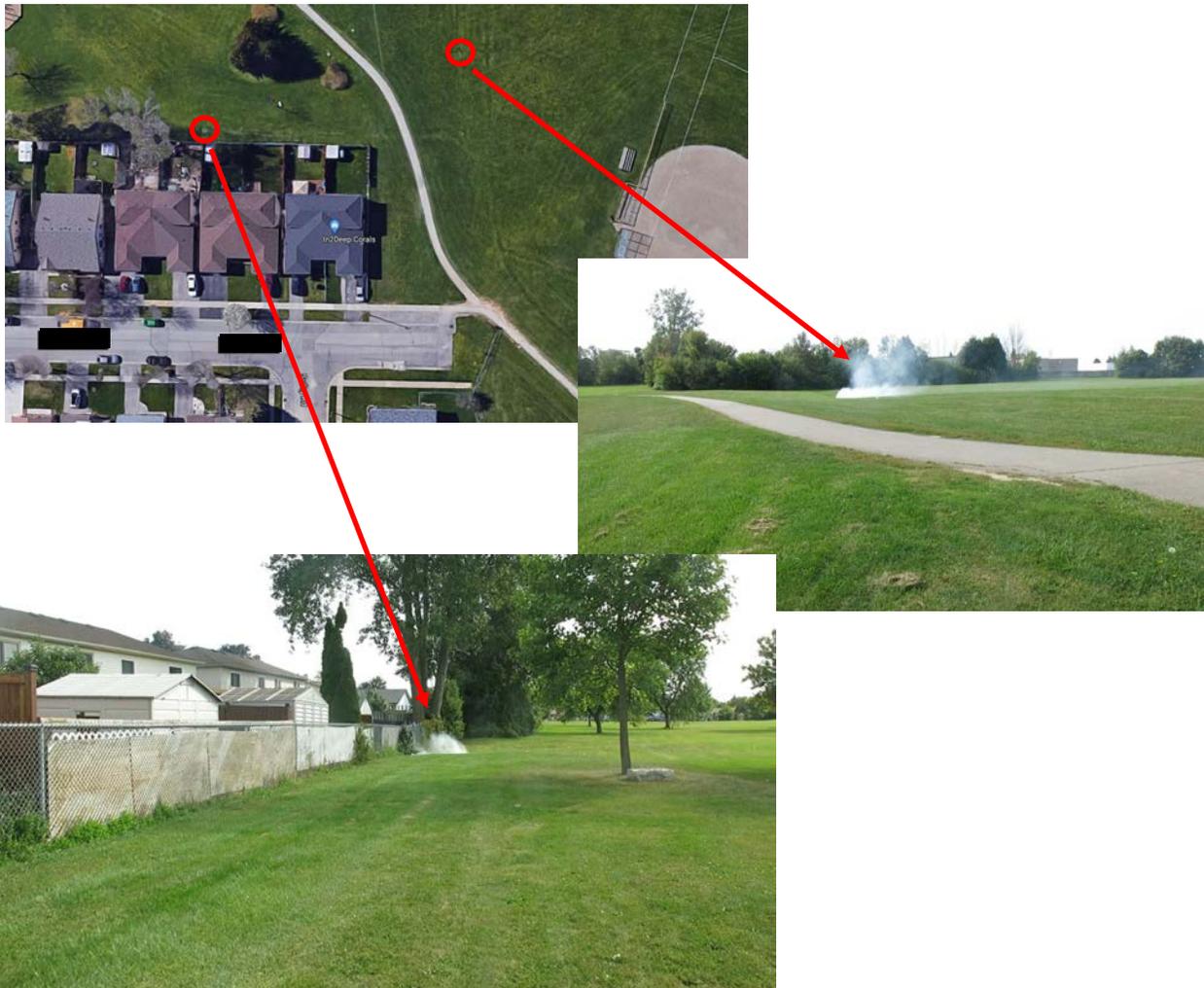
Finding Code: (CB)



Brantford: [REDACTED]

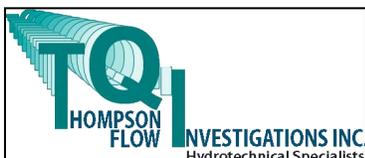
Catchbasin Connected to Storm System

Location: [REDACTED]



Defect Description: CB leads connect to Palomino Dr . The park ditch Inlet CB's are connected to the storm sewer on Palomino Dr. Surface water from the park during rain events is directed to the storm sewer utilizing capacity.

[REDACTED]



Finding #47

Finding Code: (PV) PV

Brantford: [REDACTED]

**Plumbing Vent Stack with
connection to Storm Sewer**

Location: [REDACTED].



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #48

Finding Code: (PV) **PV**

Brantford: [REDACTED]

Plumbing Vent Stack with
connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #49

Finding Code: (PV) **PV**

Brantford: [REDACTED]

Plumbing Vent Stack with
connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #50

Finding Code: (IP)



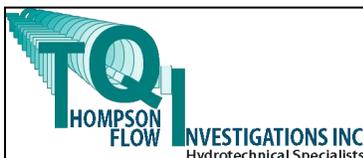
Brantford: [REDACTED]

Possible Internal Plumbing
Connected to Storm System

Location: [REDACTED]



Defect Description: Smoke appeared in basement coming out of the walls. Unknown source possible plumbing cross connection issue. The san lateral is connected to the storm sewer (a cross connection). Smoke test sanitary system or dye test to confirm connection.



[REDACTED]

Finding #51

Finding Code: (PV) **PV**

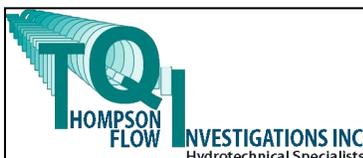
Brantford: [REDACTED]

Plumbing Vent Stack with connection to Storm Sewer

Location: [REDACTED]



Defect Description: Smoke was seen from the plumbing vent during storm smoke testing indicating a connection with the storm sewer system. Sanitary sewer smoke testing or dye testing is recommended to confirm connection of the plumbing to the storm sewer prior to any corrective action.



Finding #52

Finding Code: (IP)



Brantford: [REDACTED]

**Possible Internal Plumbing
Connected to Storm System**

Location: [REDACTED]



No Internal Picture Available.

Defect Description: Smoke in basement coming out of the wall. Unknown source but suspect cracks in foundation and weeping tile connection to storm sewer.



Finding #53

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.

[REDACTED]



Finding #54

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED].



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.



Finding #55

(STCB)



Brantford: [REDACTED]

Storm Catch Basin with indirect connection to Sanitary Sewer

Location: [REDACTED]



Sanitary Sewer
Smoke Testing

Defect Description: We smoked the sanitary sewer in this one location and observed an indirect connection from the storm catch basin to the sanitary sewer exists. The catch basin leads need to be inspected to ensure they are not leaking and re-lined as necessary. This CB also smoked during storm sewer smoke testing.



Finding #56

Finding Code: (DD)



Brantford: [REDACTED]

Driveway Drain Connected to Storm System

Location: [REDACTED]



Defect Description: Reverse grade driveway drain is directly connected to the storm sewer as evidenced by visible smoke at the surface drain in the reverse grade driveway during smoke testing of the storm sewer system.

[REDACTED]



TQI 2019 Smoke Testing - Finding Database - Brantford (All Locations)

Finding #	Defect Code	Location Map #	Finding Property Address			Photosheet #	Photo/Video Folder Filename
			Street #	Street Address	Location wrt Building		
1	DD				FM	1	F#1&2 - [REDACTED] DD(2)
2	DD				FM	2	F#1&2 - [REDACTED] - DD(2)
3	DD				FM	3	F#3&4 - [REDACTED] - DD(2)
4	DD				FM	4	F#3&4 - [REDACTED] - DD(2)
5	SP				BASEMENT	5	F#5 - [REDACTED] - SP
6	PV				ROOF	6	F#6 - [REDACTED] - PV
7	WW				SLF	7	F#7&8 - [REDACTED] - WW(2)
8	WW				SLM	8	F#7&8 - [REDACTED] WW(2)
9	DS				BL	9	F#9 - [REDACTED] DS
10	DD				FM	10	F#10&11 - [REDACTED] - WW(2)
11	DD				FM	11	F#10&11 - [REDACTED] - WW(2)
12	PV				ROOF	12	F#12 - [REDACTED] PV
13	SP				BASEMENT	13	F#13 - [REDACTED] SP
14	SP				BASEMENT	14	F#14 - [REDACTED] - SP
15	PV				ROOF	15	F#15 - [REDACTED] - PV
16	PV				ROOF	16	F#16 - [REDACTED] - PV
17	PV				ROOF	17	F#17 - [REDACTED] - PV
18	WW				SRM	18	F#18 - [REDACTED] - WW
19	SP				BASEMENT	19	F#19 - [REDACTED] SP
20	CB				BL	20	F#20 - [REDACTED] r - CB
21	CAP				SRF	21	F#21 - [REDACTED] - CAP
22	SP				BASEMENT	22	F#22 - [REDACTED] - SP
23	PV				ROOF	23	F#23 - [REDACTED] - PV
24	DD				FM	24	F#24&25 - [REDACTED] DD
25	DD				FM	25	F#24&25 - [REDACTED] - DD
26	DS				SRF	26	F#26 - [REDACTED] - DS
27	SP				BASEMENT	27	F#27 - [REDACTED] r - SP
28	DS				SLF	28	F#28 - [REDACTED] DS
29	DS				SLF	29	F#29 - [REDACTED] - DS
30	DD				FM	30	F#30 - [REDACTED] - DD
31	CAP				SLF	31	F#31 - [REDACTED] CAP
32	PV				ROOF	32	F#32 - [REDACTED] - PV
33	SP				BASEMENT	33	F#33 - [REDACTED] r - SP
34	OTHER				FM	34	F#34 - [REDACTED] - OTHER
35	DD				FL	35	F#35 - [REDACTED] - DD
36	SP				BASEMENT	36	F#36 - [REDACTED] - SP
37	SP				BASEMENT	37	F#37 - [REDACTED] - SP
38	SP				BASEMENT	38	F#38 - [REDACTED] - SP
39	SP				BASEMENT	39	F#39 - [REDACTED] SP
40	PV				ROOF	40	F#40 - [REDACTED] - PV
41	PV				ROOF	41	F#41 - [REDACTED] - PV
42	SP				BASEMENT	42	F#42 - [REDACTED] - SP
43	SP				BASEMENT	43	F#43 - [REDACTED] - SP
44	PV				ROOF	44	F#44 - [REDACTED] - PV
45	CB				N/A	45	F#45&46 - [REDACTED] - CB
46	CB				N/A	46	F#45&46 - [REDACTED] - CB
47	PV				ROOF	47	F#47 - [REDACTED] PV

Finding #	Defect Code	Location Map #	Finding Property Address			Photosheet #	Photo/Video Folder Filename
			Street #	Street Address	Location wrt Building		
48	PV				ROOF	48	F#48&49 - [REDACTED] - PV
49	PV				ROOF	49	F#48&49 - [REDACTED] - PV
50	IP				BASEMENT	50	F#50 - [REDACTED] - IP
51	PV				ROOF	51	F#51 - [REDACTED] - PV
52	IP				BASEMENT	52	F#52 - [REDACTED] - IP
53	DD				FL	53	F#53 - [REDACTED] - DD
54	DD				FL	54	F#54 - [REDACTED] - DD
55	CB				CURB	55	F#55 - [REDACTED]t - CB
56	DD				FL	56	F#56 - [REDACTED]t - DD

4. **COMMENTS:**

4.1. **COMMENTS RE BASEMENT SUMP PITS**

As TQI carried out the smoke testing of the storm sewers numerous residents came out to tell us that they had smoke in their basements. TQI investigated those homes where the resident was home and letting us know they had an issue. Many homes were not investigated (resident not home) but could have the same issue.

TQI found smoke emanating from sump pits which were connected to the storm sewer laterals. Most of these sump pits were actual pits in the concrete floor but some were simply a 100 mm pipe access to the weepers and storm sewer. Some residents informed us that when their basement was flooded, the water came from these “pits”.

From this information and our smoke testing results, it appears that when the storm sewer surcharges it backs up the storm laterals and floods basements through these “sump pits”. Simply plugging these pits could also create another problem. With the sump “pits” plugged hydrostatic uplift could occur and heave basement floors.

Flooding of these basements from storm water can be minimized if the storm sewer is prevented from surcharging by controlling all the inlets to it. New storm systems are designed / constructed in this way. Another control measure would be to eliminate the storm laterals, blocking them well away from the house, say at the property line. Sump pumps would then be needed in those “sump pits” and any roof downspouts would need to be discharged to a suitable place on the ground surface. If the affected homes are not connected to the storm sewer, storm sewer surcharging would not directly affect them.

In Conclusion:

TQI will be happy to respond to any inquiries or clarifications you may have regarding this report for the fall 2019 storm sewer Smoke Testing in the City of Brantford.

Yours truly,



Karen Dennison, M.Eng., P.Eng
Partner,
Thompson Flow Investigations Inc. (TQI)

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905-607-2728 Office