Core Area Inflow & Infiltration Program - 2022 Report

Capital Regional District | October 2022

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CORE AREA INFLOW & INFILTRATION PROGRAM

2022 REPORT

EXECUTIVE SUMMARY

The Core Area Liquid Waste Management Plan (CALWMP) sets out goals and commitments for the municipalities, First Nations and Capital Regional District (CRD) to manage I&I through the Core Area I&I Management Plan. The Core Area I&I 2022 Report documents progress toward meeting these commitments for the period of 2021 to mid-2022.

In general, municipalities with aging sewer infrastructure are addressing areas with elevated I&I through sewer catchment analysis, investigations, rehabilitation and targeted sewer renewal. The municipalities with newer sewer infrastructure are focusing on I&I prevention. Overviews of municipal I&I actions, along with specific actions from this reporting period, are as follows:

- Colwood diligently inspects its new underground infrastructure to manage and prevent I&I. In 2021 and 2022, Colwood updated its Sewer Master Plan and its sanitary sewer model. As part of the work, sewer flow data loggers were installed at three municipal pump stations and at the Department of National Defence's Belmont pump station. These meters were later purchased by the CRD for long-term data collection at these pump stations.

- Esquimalt completed a municipal I&I Management Plan that includes a detailed 10-year plan for addressing I&I and reducing flows below 4xADWF (average dry weather flow) by 2030. Next steps include assessing funding mechanisms to pay for the work and updating bylaws to enable progress regarding private property I&I. In 2021-2022, Esquimalt carried out spot repairs to prevent structural failures of sewer and stormwater pipes at various locations on Esquimalt Road and Lampson Street. It also installed or repaired 44 sanitary laterals, 32 stormwater laterals and 5 catch basins. Working with the CRD, Esquimalt identified and removed a sewer cross-connection to the Gorge Waterway.

- Langford has a rapidly expanding new sewer system. Langford diligently inspects new connections and is incentivized to monitor and repair the sewer system to preserve sewer capacity for future growth. Since mid-2021, Langford repaired 33 inspection chambers, plugged or sealed approximately 30 leaky sewer manholes, video inspected 6 inspection chambers and repaired or replaced 3 sewer manhole frames and covers. In late 2022, Langford plans to camera inspect the sewer mains around Florence Lake and Setchfield and to investigate the Happy Valley catchment for I&I during the fall rains.

- In 2021 to mid-2022, Oak Bay completed a Sanitary Sewer master plan and is currently undertaking a Storm Drain master plan. Reports were completed (or in progress) for addressing sewer upgrades around Beach Drive, Dalhousie, Orchard and Sandowne. Oak Bay added, repaired or replaced approximately 600 meters of sanitary sewer pipe, 12 sewer manholes and 50 laterals to the property line with inspection chamber. Oak Bay dye tested 128 laterals and found 20 cross connections, 12 of which were fixed. It also disconnected several overflows from manholes, removed several abandoned sewer lateral connections and rehabilitated various parts of its storm drain system.

- Saanich continues its sewer maintenance and repair program, including camera inspections, sewer relining, smoke testing and flow monitoring. In 2021-2022, Saanich repaired or replaced 1,951 meters of sanitary sewer, 251 sewer connections (with inspection chambers) and 7 manholes. It also camera inspected 33,500 meters of sewer main and performed 3 spot repairs. In the Wetherby Sanitary Lift Station catchment, Saanich smoke tested 2,671 meters of sewer, which led to 22 I&I-related repairs. Other key initiatives included the development and calibration of an updated sanitary sewer model and the development of a program for inspecting and replacing "no-corrode" (tarpaper) sewer laterals.

- Victoria continues to manage its sewer repair and replacement work according to its sewer master plan. In 2021-2022, Victoria relined or replaced 2,740 meters of sewer pipe, 8 manholes and 189 sewer laterals. It camera inspected 40 kilometers of sanitary sewer mains and 1,044 sewer laterals. It carried out 650 detailed manhole inspections, added 25 inspection chambers and fixed three cross-connections. Victoria completed a report entitled “Comprehensive Inflow and Infiltration Reduction Plan: Public- and Private-Side Actions”, which was presented to city council in November 2021.

- View Royal continued its programs related to sewer maintenance and repairs, camera inspections, sewer flushing and flow monitoring. In 2021-2022, View Royal camera-inspected and flushed 2,976 metres of sewer pipe, inspected 292 sewer manholes and identified and repaired one residential cross-connection. View Royal is in the process of upgrading the Helmcken Bay pump station, which will include the addition of a flow meter.

- Esquimalt Nation hired a consultant to inspect their sewer system and prepare a report containing recommendations for maintenance, repairs, and I&I reduction in 2018. In 2019 and 2020, the First Nation removed/capped four unused sewer laterals, completed a point repair, grouted a manhole and renewed its pump station. Further work will require funding from Indigenous Services Canada.

- Songhees Nation does routine sewer maintenance and repairs, as needed. In 2015, the Nation hired a consultant to investigate its sewer system for I&I sources and to provide detailed designs for remediation. The work is ready for tender and awaiting funding from Indigenous Services Canada.

Through the Core Area I&I Program, the CRD continues to work with its municipal and First Nations partners on I&I-related management and reduction efforts. This includes regional flow monitoring, standardizing I&I approaches, preparing management plans and annual reports, education programs and private property I&I initiatives. This also involves coordination with municipalities and national organizations that are dealing with similar issues. Key actions completed in 2021-2022 include:

- working on the 5-year update to the I&I Management Plan for submission in early 2023
- updating I&I rates for the core area. The results are summarized in Section 5; the analyses will be documented in updated I&I Management Plan
- comparing measured flows to the sewer flow allocations in Bylaw No. 4304 (Section 6)
- update of a report documenting the status of existing municipal private property I&I programs from around North America

The work accomplished by all participants will continue to support the regional effort to control and reduce municipal I&I flow rates; however, continued and focused work is still needed to meet the CALWMP commitment of reducing wet weather flows below four times average dry weather flow at the Clover Point and McLoughlin Point wastewater treatment plants by 2030. Municipalities that contribute to Clover Point with older sewers, and inherently higher I&I, will need to allocate additional resources and accelerate efforts to meet their respective I&I reduction targets.

1. BACKGROUND

1.1 Overview

The CRD completed a CALWMP in July 2000 to serve the municipalities of Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria, View Royal, Esquimalt Nation and Songhees Nation. The plan provides a strategy for managing liquid waste and was approved by the Ministry of Environment. Section 5 of the CALWMP addresses the *Management of Infiltration and Inflow and Control of Wastewater Overflows* (see Appendix A).

Each year, the CRD's Core Area Liquid Waste Management Committee, comprised of core area representatives, submits a CALWMP status report to the Province. In order to prepare this report, the Committee requires annual reports from the CRD departments involved in the implementation of the CALWMP. This report provides the update for the Core Area I&I Program and includes data from 2021 to mid-2022. The report is divided as follows:

- Section 1 - Background
- Section 2 – I&I Program Initiatives
- Section 3 - Municipal and First Nations I&I Initiatives
- Section 4 – Overflows
- Section 5 – I&I Rates for the Core Area
- Section 6 – Sewer Allocations
- Section 7 – Summary

1.2 Study Area

The CRD's core area is a partnership of seven local governments and two First Nation areas. These include Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria, View Royal, the Esquimalt Nation and the Songhees Nation. The core area has a total land area of about 215 km^2 and a population of approximately 320,000 people.

In the core area, municipal sewer flows are discharged into CRD trunk sewers. Prior to December 2020, these trunk sewers conveyed sewage to either the Clover or Macaulay point pump stations, where the flows were screened and pumped out through deep sea outfalls. As of December 2020, the flows are conveyed to a treatment plant located at McLaughlin Point.

A map of the core area sewers is located in Figure 1.1. The Clover Long outfall is shown on the map because sewer modelling predicts that it will be the only location that overflows for sub 5-year rainfall events. A summary of sewer infrastructure in the core area is located in Table 1.1.

Figure 1.1: Map of the Capital Regional District Core Area

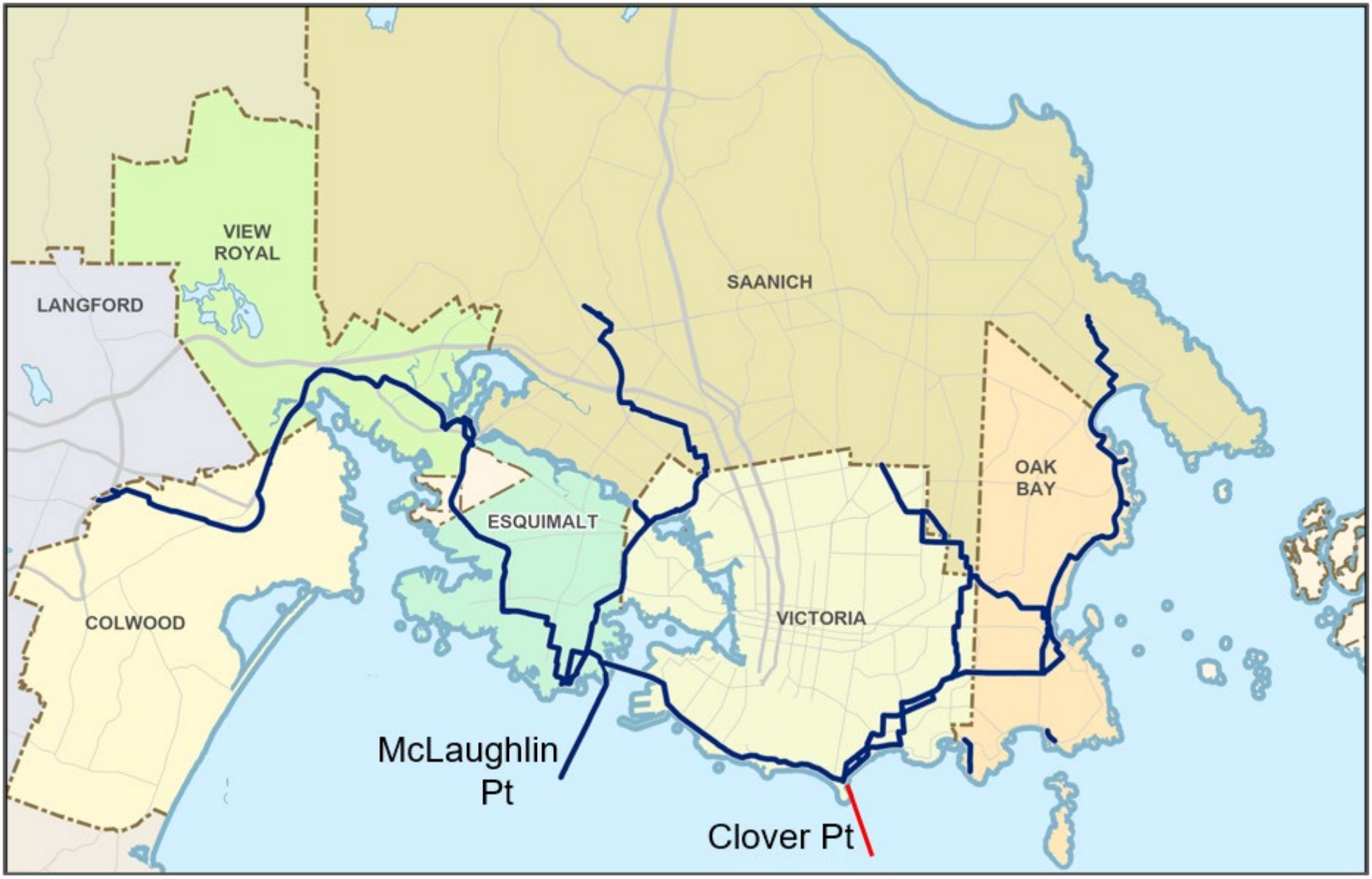


Table 1.1: Sewer Infrastructure in the CRD Core Area

** Excludes Hartland Landfill site, but includes Hartland Leachate Line*

Jurisdiction		Gravity Sewers (km)	Force Mains (km)	Man holes	Pump Stations	Laterals **	Average Pipe Age *** (years)	% Developed Properties Connected to Sewer
Colwood	Municipal	37.1	7.3	568	10	2159	19	45%
	Private	5.2	3.7	120	12		20	
	Gov't of Canada	6.7	2.7	125	6		31	
Esquimalt	Municipal	56.8	4.0	874	12	3404	55	100%
	Private	0.2	0.0	3	0		86	
	Gov't of Canada	15.6	4.5	368	23		50	
Langford	Municipal	117.5	22.1	1769	14	8522	16	83%
	Private	11.4	2.1	167	10		15	
Oak Bay	Municipal	100.2	2.0	1312	7	3813	75	100%
	Private	2.4	1.4	32	3		27	
Saanich	Municipal	550.3	19.3	6474	36	29,475	40	94%
	Private	7.1	0.0	121	0		32	
Victoria	Municipal	233.3	3.2	2855	12	13676	94	100%
	Private	0.0	0.0	3	2		N/A	
View Royal	Municipal	44.7	5.8	864	17	2119	34	96%
	Private	2.4	0.6	33	5		17	
First Nations	Esquimalt	1.4	0.3	22	1	N/A	27	100%
	Songhees	N/A	0.3	N/A	1	N/A	N/A	99%
CRD Owned *		51.9	48.2	293	16	3	22	N/A
Total		1,247	128	15,979	200	62,646		

*** Some estimated*

**** Includes both gravity and force mains*

1.3 Core Area I&I Program

The I&I program is guided by the Core Area I&I Subcommittee, which was established in the mid-1990s to work regionally to identify various methods of reducing and controlling I&I. The subcommittee comprises representatives from the CRD, Colwood, Esquimalt, Langford, Oak Bay, Saanich, Victoria and View Royal, and typically meets several times per year.

I&I program staff provide educational services to the public and technical support to municipalities to help promote reduction of the amount of rainwater and groundwater entering the sanitary sewer system to achieve the CALWMP commitment of reducing wet weather flows below four times average dry weather flow at Clover Point and the McLoughlin Point wastewater treatment plant by 2030.

The goals of the program are to:

- assist members with regulatory compliance
- coordinate and analyze regional flow monitoring and analysis
- promote the inspection and repair of private property laterals through education

- assist with prioritization of I&I reduction work required to reduce sewage overflows
- support sewer asset management programs
- support efforts to maintain sewer capacity needed for future growth, densification and climate change

I&I program staff carry out a variety of I&I specific tasks, including:

- preparing annual I&I reports, I&I Management Plans and Overflow Management Plan updates
- developing and analyzing flow meter data for I&I analyses
- assisting municipalities with tasks related to I&I reduction
- developing and executing private property I&I initiatives
- efforts to improve the ongoing quality of flow data and rainfall data
- national leadership in I&I initiatives, such as private property initiatives and benchmarking
- working in collaboration with Metro Vancouver and other neighboring jurisdictions
- working with Integrated Water Services (IWS) to generate monthly wastewater flow/I&I reports for each core area municipality and First Nation (aimed at municipal engineering staff and First Nations administration).
- working with IWS, vetting core area SCADA sewer flow data for use in annual cost sharing, monthly reports, etc.

1.4 Past Reports

Since 2001, a regional effort of flow monitoring and analysis has been undertaken, resulting in many regional initiatives. The results of this work are documented in reports summarized in Table 1.2. Of key interest are the I&I Management Plan – see executive summary in Appendix B.

Table 1.2: Key Program Reports by Year

Year	Reports Completed
2005	• I&I Analyses Results Report: October 2001 to March 2004 • Biennial Report for the Ministry
2006	• I&I Analyses Results Report: October 2004 to April 2005
2007	• I&I Analyses Results Report: October 2005 to April 2006 • Biennial Report for the Ministry
2008	• Overflow Management Plan • I&I Analyses Results Report: October 2008 to March 2010
2009	• Biennial Report for the Ministry
2010	• I&I Analyses Results Report: October 2010 to March 2012
2011	• n/a
2012	• I&I Management Plan
2013	• Annual Reports for 2012
2014	• Overflow Management Plan: 5 Year Update • Annual Reports for 2013
2015	• Annual Reports for 2014
2016	• n/a
2017	• Annual Reports for 2016 • I&I Management Plan: 5 Year Update (included annual report for 2015)
2018	• Annual Reports for 2017
2019	• 2019 Annual Report (includes info for 2018 to mid-2019)
2020	• 2020 Annual Report (includes info for 2019 to mid-2020)
2021	• 2021 Annual Report (includes info for 2020 to mid-2021)

2. I&I PROGRAM INITIATIVES

2.1 General Initiatives

I&I Management Plan 5-year Update

The core area I&I Management Plan is updated every 5 years. The last update was submitted to the Province in 2017. The 5-year update will be complete in late 2022. Key additions include:

- using the core area sewer model (built in 2018) to predict overflow locations and volumes for different return period storms and climate change scenarios
- comparing measured sewer flows to allocated sewer flows in the CRD sewer bylaw
- more specific municipal I&I reduction plans
- the updated I&I education approach
- full I&I analyses of ~80 flow metering sites

2.2 Private Property I&I and Education Initiatives

In North America, it is often estimated that half of all I&I comes from private properties. As such, it is important that municipalities adopt strategies for addressing it; however, addressing private property I&I has proven difficult for the following reasons:

1. It's uncommon.
   - the only municipalities with significant approaches for dealing with private property I&I are a small number of American municipalities that were required to address it to avoid substantial fines from regulators (i.e., the EPA)

2. It is expensive
   - finding problems is expensive (e.g., $250 for a camera inspection per property)
   - addressing the problems can cost thousands of dollars
   - who pays, etc.?

3. Liability
   - requiring or carrying out work on property brings potential liabilities to the municipality

4. It's complicated
   - private property I&I is only a significant problem if the overall catchment has an I&I problem
   - cross-connections (inflow) may be the main source of "fast" I&I in these catchments but finding cross-connections is complex
   - lateral replacement programs are theoretically easier to set up; however, the downside is that they generally apply to all properties, not just properties in catchments with high I&I; (note that for a private property lateral to be a source of infiltration, the groundwater table needs to be higher than the level of the lateral, which may not be the case)

The CRD's I&I program staff continue to work toward workable private property I&I options for the core area. The work completed prior to 2021 is chronicled by year in Appendix C. Key work completed in 2021 to mid-2022 includes:

Update of the Private Property I&I Options from North America

In 2011, the CRD commissioned a report summarizing the private property I&I programs used across North America. In 2014, the CRD updated this report to answer additional questions and to increase the focus on what's happening in Canada. In 2021-2022, the CRD hired a consultant to update this report. The consultant contacted the municipalities noted in the previous versions of the report to determine the current status of their I&I programs, lessons learned, etc. A copy of the updated report is located in Appendix E.

2.3 Education

CRD staff have taken steps to educate the public on the topic of I&I. One goal of the program is to encourage home owners to camera-inspect and maintain their underground sewer lateral, which will result in lower private property I&I. A second goal is to provide education showing where I&I comes from and the problems it creates, so that when funding is required and/or rehabilitation work is proposed in local neighborhoods, the public has a better understanding of why the work is required. The work completed prior to 2021 is chronicled by year in Appendix D.

Due to the pandemic, minimal education work was completed during the last two years. The education materials and approach are ready for implementation but are designed to be implemented in person with a focus on key stakeholder groups. For example, the education approach includes presentations at realtor offices as part of their monthly "lunch and learns". These were put on hold during the pandemic. Online presentations to this group were determined to be far less effective.

2.4 Future Initiatives

Table 2.1: Anticipated Next Steps for Supporting I&I Reduction

Action	Description / Timeline
Assessing the Accuracy of Municipal Pump Station Flow Data – Phase 2	• In 2021, a project was carried out to check the accuracy of municipal pump station flow data generated by the I&I program (Phase 1). For a small number of pump stations, it was found that the methods used to create the flow data were not suitable. The purpose of Phase 2 is to assess options for getting reliable flow data for these pump stations.
Rain Gauge Network Review / Calibration Checks	• Rainfall data is critical to I&I calculations. The purpose of the project will be to do calibration checks of each of the core area owned rain gauges and to confirm that data is being stored accurately in SCADA.
Pump Station Flow Data for Saanich	• Saanich currently cannot derive sewer flow data from its pump stations. The CRD and its consultants will work with Saanich to assess options and may provide resources for implementation.
Municipal Pump Station Real Time Flows / I&I Monitoring	• Sewer flow data for a number of municipal pump stations is currently generated every few years using SCADA data (i.e., wetwell levels and pump starts/stops.) The calculations are already setup online. The process can be updated to generate the flow data in real-time, with minimal additional setup cost. A benefit of doing this is that the flows can be monitored in real-time for I&I.
Interactive Display	• Finalize an interactive I&I display for outreach events aimed at the general public, etc.
Data collection, investigation and planning to address catchments that exceed their sewer allocations	• Focus on catchments that exceed their allocations in Oak Bay and Victoria. (Similar work was already funded by the CRD for Esquimalt (Section 2.6) • Includes finalizing the pilot project that involved sewer investigation work in three Oak Bay catchments with high I&I. The work included camera inspections, smoke testing and manhole inspections. The final step is to follow up on the smoke testing results to find the specific defects resulting in the "errant smoke".

3. MUNICIPAL & FIRST NATIONS INITIATIVES

Colwood

Colwood diligently inspects its new underground infrastructure to manage and prevent I&I. In 2021 and 2022, Colwood updated its Sewer Master Plan and its sanitary sewer model. As part of the work, sewer flow data loggers were installed at three of Colwood's municipal pump stations and the Department of National Defence's Belmont pump station. These meters were later purchased by the CRD and they continue to collect data for future use. Considerable cost saving were achieved because the meters were already installed and the online data service was already setup.

Esquimalt

Esquimalt I&I Reduction Plan Project

In 2021 to mid-2022, Esquimalt worked on the following I&I-related actions:

- completed the I&I Management Plan, which includes a 10-year plan to address I&I concerns and reduce flows below 4xADWF
- carried out spot repairs to main lines of both the storm and sanitary collection system due to structural failure at various locations on Esquimalt Road and Lampson Street; design of further repairs on Lampson Street, Munro Street and a new forcemain in Saxe Point is complete, with construction expected in fall 2022
- installed 22 new sanitary laterals, 19 new stormwater laterals and 5 catch basins
- repaired or replaced 22 sewer laterals and 13 stormwater laterals that were impacted by blockages or failures
- released a tender in late 2021 for cleaning, inspection and service ratings of the remaining portions of the storm and sanitary collection systems; completion of the work is expected by the end of 2022
- continued working with CRD Source Control to find possible cross connections into the Gorge Waterway; in 2021-2022, one direct cross connection was removed as a result of this work
- determine a funding mechanism/bylaw for addressing I&I from both public and private property sewers and laterals (late 2022/early 2023)
- adopt a bylaw (late 2022/early 2023) to provide a mechanism for the Township to deal with private property laterals; work will be focused on a review of the draft model bylaw from the CRD, cost for works and how the works will be carried out; it will also determine a mechanism that will allow work to occur on private property and how the costs associated with these activities will be allocated between the various stakeholders involved

Langford

Langford has a rapidly expanding new sewer system. It diligently inspects new connections and is incentivized to monitor and repair the sewer system to preserve sewer capacity for future growth. Since mid-2021, Langford carried out the following I&I related actions:

- repaired 33 inspection chambers, including repairs to lids, collars, boxes, etc.
- plugged or sealed approximately 30 sewer manholes along with frame reinstatement
- video inspected 6 inspection chambers
- repaired or replaced 3 sewer manhole frames and covers
- annual CCTV work is scheduled for fall 2022, with a focus on areas around Florence Lake, Setchfield; I&I specific inspections are planned for the Happy Valley catchment during the fall rains

Oak Bay

Oak Bay's capital projects included:

Windsor Sanitary - Phase 1
- replaced 186 meters of clay pipe (200 millimetre) with larger PVC pipe (300 millimetre)
- added 5 new sanitary manholes
- added 1 new lateral to the property line with an inspection chamber
- reconnected 11 sanitary sewer laterals with new wyes
- disconnected several overflows from manholes
- removed several abandoned connections to the sewer system

Windsor Sanitary - Phase 2
- replaced 314 meters of clay pipe (200 millimetre) with larger PVC pipe (300 millimetre)
- added 5 new sanitary manholes
- reconnected 27 sanitary sewers laterals with new wyes
- reconnected 2 storm sewer laterals sewers with new wyes
- disconnected several overflows from manholes
- removed several abandoned connections to the sewer system

Storm Drain Work
- in the Thompson storm drain, installed 2 new manholes, 112 meters of new storm mains, 4 catch basins, 4 sewer laterals to properly line with inspection chambers; also reconnected 1 storm drain lateral at the storm main
- in the Mayhew storm drain, installed 38 meters of storm main, 3 new storm drain manholes and 2 catch basins.

Consultant Reports and Projects (In Progress)
- Beach Drive Sanitary Sewer Feasibility Study and Options analysis
- Dalhousie Sanitary: survey, design, tender for approximately 578 meters of new sewer main, 220 meters of new storm main plus related lateral reconnections & new/replaced catch basins
- storm drain master plan

Consultant Reports and Projects (Complete)
- Sandowne Storm & Sanitary Network Analysis: Functional Level Upgrading Design for Sandowne Easement catchment
- Orchard/Newport Storm Water Model Development Report
- sanitary sewer master plan

Sewer Work Focused on Trenchless Technology (i.e. pipe bursting)
- in the Mountjoy area, 38 meters of storm main was pipe bursted and crews replaced 1 catch basin and 2 storm laterals
- in the Uplands sewer easement, 90 meters of combined sewer was pipe bursted, 4 sewer laterals were reconnected and 1 new sanitary sewer manhole was added.

Notable Maintenance carried out by Public Works
- completed 10 storm main spot repairs and 5 sewer main stop repairs
- repaired 2 storm sewer manholes and two sanitary sewer manholes
- repaired 1 stormwater lateral and 2 sewer laterals
- on the Island Road storm drain, replaced 55 meters of clay pipe (100 millimetre) with larger PVC Pipe (200 millimetre) and installed 1 new storm manhole
- flushed 9.8 kilometers of storm mains and 16.5 kilometers of sewer main

Oak Bay's engineering records show that:

- 35 new sewer laterals were installed and 12 were replaced
- 57 new storm laterals were installed and 6 were replaced
- note that the above numbers include services for 28 new buildings
- Oak Bay dye tested 128 laterals and found 20 cross connections, 12 of which have been fixed

Note that some of this work overlaps calendar years and thus may be documented in I&I Annual Reports for consecutive years.

Saanich

Saanich replaces and renews its sanitary sewer infrastructure through its capital and maintenance programs. The following capital and maintenance activities were completed in 2021-2022:

- camera inspected and assessed 33,512 meters of sanitary sewer main and 12,122 meters of checklist lines (lines requiring frequently scheduled maintenance)
- replaced 1,951 meters of sanitary sewer along with 142 new sewer service connections and inspection chambers
- repaired 23 sewer service connections and replaced an additional 7; as part of this work, 5 new inspection chambers were installed
- repaired 7 manholes
- completed spot repairs on 3 sewer mains
- lined 79 sewer service connections
- smoke tested 2,671 meters of sanitary sewer in the Wetherby Sanitary Lift Station catchment and repaired 22 of the 25 identified I&I issues
- camera inspected and smoke tested the Cordova Bay Lift Station; 3 I&I issues were identified and repairs are being planned
- removed and abandoned three aging lift stations; as part of this work, 17 sewer service connections were replaced with new low pressure systems (62 meters of sanitary sewer forcemain)
- inspected 67 potential no corrode sanitary service connections

The following planning initiatives were completed in 2021-2022:

- developed and calibrated an updated sanitary sewer model; the work included flow monitoring of key locations and contained recommendations for addressing system deficiencies and prioritize planning initiatives
- developed a "no-corrode sewer lateral inspection and replacement program"
- flow metered the Brett Lift Station, Wetherby Lift Station and Ash Lift Station catchments to identify peak wet weather flows and I&I values

Work in progress in mid-2022 included:

- camera inspecting the remaining 23,035 metres of Saanich's checklist lines (lines requiring frequently scheduled maintenance)
- camera inspection program planning for Saanich's critical sanitary sewers
- Planning the replacement of two sewer pump stations
- Inspecting the 56 remaining potential no corrode sanitary service connections and developing a "no- corrode" replacement strategy
- operational reviews of the Beach Park and Albina Lift Stations, including smoke testing of their catchments
- developing an internal flow monitoring program operating procedure
- sewer lining projects for two sanitary sewer lift station wet wells with high I&I

Victoria

City of Victoria continues to manage its sewer repair and replacement of its infrastructure as part of Sewer Master Plan, which was fully updated in 2018. Highlights of the I&I-related work carried out in 2021 are summarized as follows:

- a comprehensive I&I reduction on private properties report was prepared by Urban System Ltd and presented to Council in November 2021
- 2 FloDar flow meters with special sensors were installed that allow peak flows to be monitored during surcharge conditions
- City of Victoria staff camera inspected 18.5 kilometers of sanitary sewer mains; contractors inspected an additional 12.4 kilometers of sewer mains and 887 sanitary sewer laterals
- 63.9 kilometers of sanitary sewer mains were cleaned by City staff
- 1,553 meters of sanitary sewer mains were lined using cured in place technology; the work included the replacement of 2 sanitary sewer vents and 2 sanitary sewer flush tanks with standard terminal manholes
- City staff replaced 7 sanitary sewer manholes and 55 sewer laterals
- City staff repaired 34.4 meters of sewer mains and 28 sewer laterals
- 24 sanitary sewer laterals were relined using T-liner technology, with the focus on sealing the main/lateral interface; as part of this work, 17 inspection chambers were also installed
- 1,034 meters of sanitary sewer mains was replaced by open trench excavation
- approximately 650 sewer manholes were inspected using a 3D camera and Manhole Assessment Certification Program level 2 reports were generated for each
- the Disaster Mitigation and Adaptation Fund program under a federal grant has commenced; the program's goal is to upgrade select sewer, storm drain and water main infrastructure over the next 9 years to address challenges due to natural hazards (e.g., earthquakes, climate change, as well as increased demand); the design and construction work started in late 2020 and will continue until 2028
- the City has applied for the Investing in Canada Infrastructure Program grant to fund design and construction of new alignment of sanitary sewer mains and to separate the combined manholes where both the sanitary sewer and storm drain lines run side by side; this program's intent is to reduce I&I
- the City continues to address and evaluate the I&I issues associated with private properties; this includes the building permit related requirement for all new developments to obtain the separate storm drain connection and consider rainwater management system on private property; all permits associated with major renovations are required to confirm their connections to the City's storm drain system via inspections or dye tests to determine if the property may require a new storm drain connection

Highlights of the City of Victoria's I&I-related work carried out in the first half of 2022 are summarized as follows:

- City of Victoria staff camera inspected 7,100 meters of sanitary sewer mains; contractors inspected an additional 2,133 meters of sewer mains and 157 sanitary sewer laterals
- 27,550 meters of sanitary sewer mains were cleaned by City staff
- 1,510 meters of sanitary sewer mains will be lined using cured in place technology under the City's annual lining contractor
- 1 sanitary sewer manhole was replaced
- 50 meters of sanitary sewer mains were repaired by City staff
- 19 sewer laterals were repaired and 36 sanitary sewer laterals have been replaced by City staff
- 27 sanitary sewer laterals were relined by T-liner technology with the focus on sealing the main/lateral interface; as part of this work, 8 inspection chambers were also installed
- 270 linear meters of sanitary sewer main were replaced by open trench excavation
- 3 cross connected inflow catch basins were fixed

View Royal

View Royal continues its sewer maintenance and repair program, which includes camera inspections, sewer flushing and flow monitoring. In 2021 to mid-2022, View Royal has completed the following sewer work related to I&I:

- camera-inspected and flushed 2976 meters of sewer main
- inspected 292 sewer manholes
- identified and repaired one residential sewer cross connection
- replaced two sewer gate valves on the Helmcken Bay sewer force main
- started upgrading the Helmcken Bay pump station, which will include the addition of a flow meter

Esquimalt First Nation

In 2018, the Esquimalt Nation hired a consultant to inspect its sewer system and prepare a report containing recommendations for maintenance, repairs and I&I reduction. In 2019 and 2020, the First Nation removed/capped four unused sewer laterals, completed a point repair, grouted a manhole and renewed its pump station. Further work will require funding from Indigenous Services Canada.

Songhees First Nation

Songhees Nation does routine sewer maintenance and repairs, as needed. In 2015, the Nation hired a consultant to investigate its sewer system for I&I sources and to provide detailed designs for remediation. The work is ready for tender and awaiting funding from Indigenous Services Canada.

4. OVERFLOWS

4.1 Overview

Sanitary sewer overflows are releases of raw sewage into storm drains and/or local waterways. The majority of sewer overflows occur during heavy rainfall events as a result of I&I overwhelming the capacity of the sewer system. Overflows may also occur as a result of sewer blockage, pipe failure and pump station failures.

Sewer overflows can expose people, pets and the environment to sewage, harmful chemicals, infectious bacteria, viruses, parasites, etc. The risks associated with sewage releases are influenced by the following characteristics of the receiving environments:

- public use (e.g., shoreline access, kayaking, swimming, shellfish harvesting)
- habitat sensitivity (e.g., productive or endangered habitats such as shellfish areas, kelp beds and herring spawning sites)
- flushing characteristics (e.g., exposed coast line or in-land waters)

Reducing I&I will decrease the frequency, volume and duration of sewer overflows.

4.2 Reported Overflows

CRD staff monitor regional overflow points with overflow sensors. The core area municipalities monitor their pump stations for overflows. When overflows occur, they are investigated, documented and reported to Emergency Management BC.

Figure 4.1 summarizes the overflows by year between 2005 and mid-2022. Note that discharges to high sensitivity receiving environments have been dramatically reduced since the Trent pump station was commissioned in late 2008. The few recent discharges to high sensitivity receiving environments were due

to massive storms (i.e., 100-year return period) or related to the construction of the treatment plant project conveyance system upgrades during storms.

Figure 4.2 summarizes the specific overflow events by year for 2016 to mid-2022 (excluding overflows from the combined sewers in the Uplands). Note that the vast majority of overflow hours occur during very large storm events when conditions are saturated.

It is expected that there will be a reduction in locations with overflows and overflow hours as a result of conveyance system upgrades related to the core area treatment plant project—fully online since early 2022.

Additionally, the Humber and Rutland pump stations overflow during most moderate-to-large rainfall events. These pump stations receive flows exclusively from the Uplands area of Oak Bay, which has fully combined sewers (one set of pipes for both sewer and stormwater). Oak Bay has an approved plan with the Province for separating the sewers in these catchments with the end goal of eliminating overflows.

Figure 4.1: Graphical Comparison of Rainfall versus Overflows

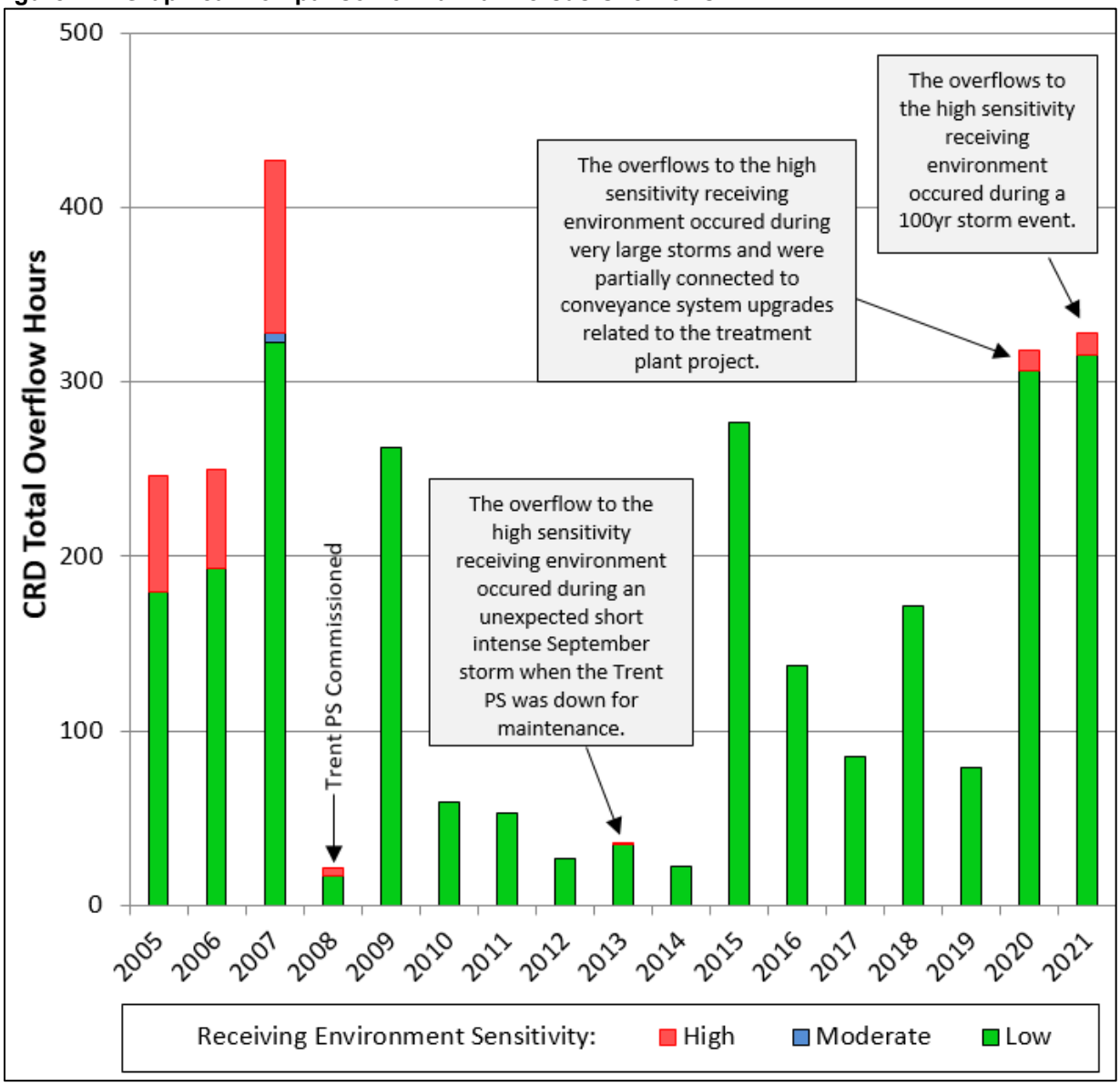
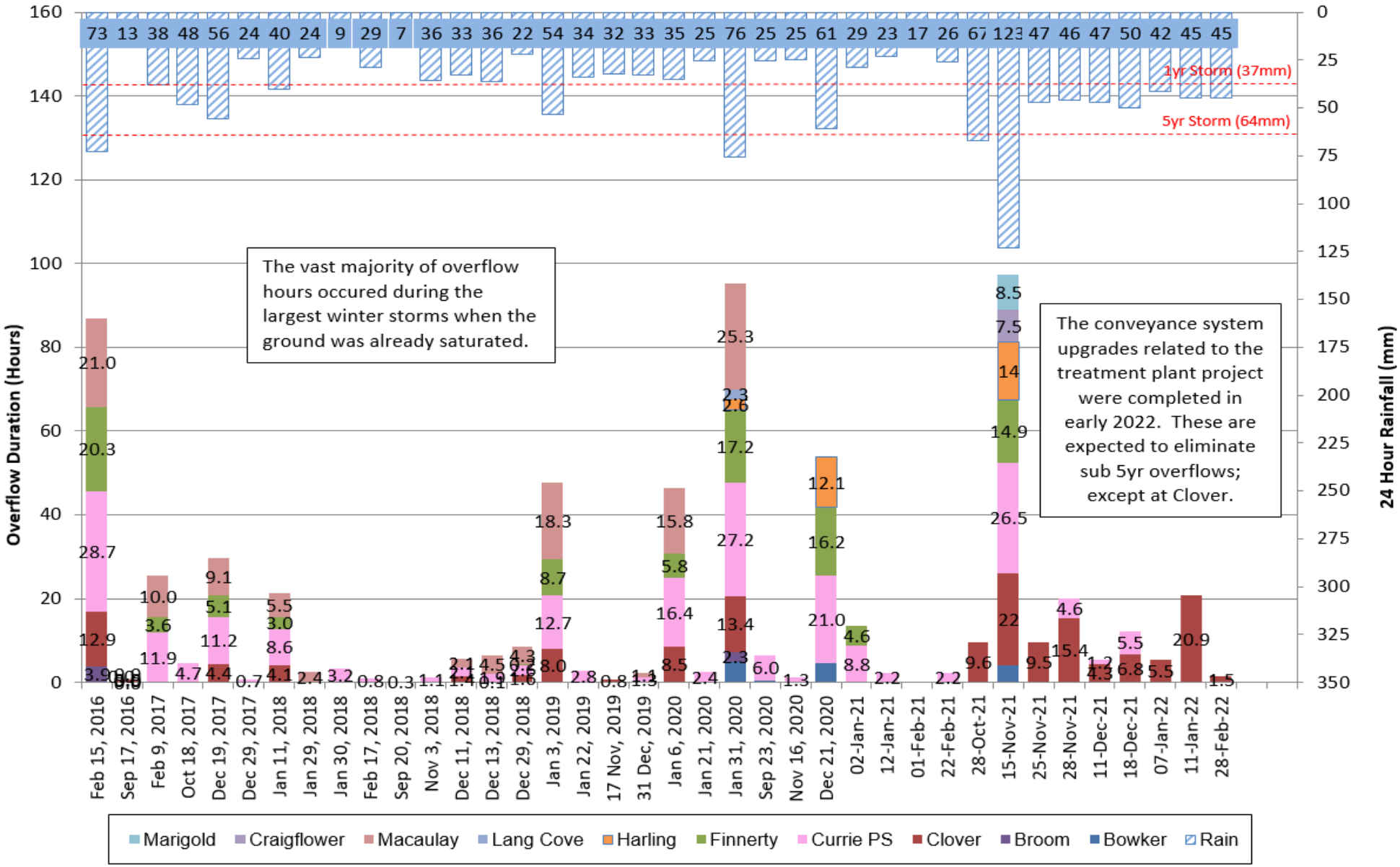


Figure 4.2: CRD Overflows from January to June 2022 (excluding the Uplands)



5. I&I RATES FOR THE CORE AREA

Regional I&I flow rates for the core area are generally analyzed every three years because there are not enough significant storm events to justify I&I analyses on an annual basis. In general, there are between 0-3 significant storm events per year. The most recent I&I results analysis was completed using data up to March 2022. The results are documented in this report.

The results of the I&I analyses are summarized as follows:

- A map of the entire core area displaying the most recent 5-year peak I&I rates for individual catchments is located in Figure 5.1.

- The individual I&I rates within each municipality have been converted into an overall weighted average for each municipality and compared with previous years' estimated I&I rates (see Table 5.1). This table is useful in providing a performance measure benchmark for each municipality to track overall I&I trends, but it must be interpreted with caution because it summarizes a vast amount of data into single municipal averages. For instance, a single very high I&I sub-area could skew the overall municipal average, or a single year of erratic weather and/or flow data could lead to misleading results. Therefore, it is prudent to allow sufficient time to measure the full effect of any I&I reduction work in addition to gathering, compiling and analyzing weather patterns and I&I rates to track overall trends.

- I&I tends to predictably increase as sewers age due to the deterioration of sewer material, types of sewer material, the environment and the installation practices of the day.

- In general, the rate of I&I tends to increase in proportion to the age of the system due to deterioration of sewer material, types of sewer material, the environment and the installation practices of the day. Older systems usually need more work than newer systems. The primary goal of the I&I program is to reduce I&I to an optimum cost-benefit level. It is expensive to size wastewater facilities to accommodate vast amounts of I&I, but it can be equally expensive to rehabilitate or replace sewers to reduce I&I. Therefore, the optimal I&I level is the most cost-effective combination of I&I reduction and I&I accommodation.

Figure 5.1: I&I Rates Map for the CRD Core Area

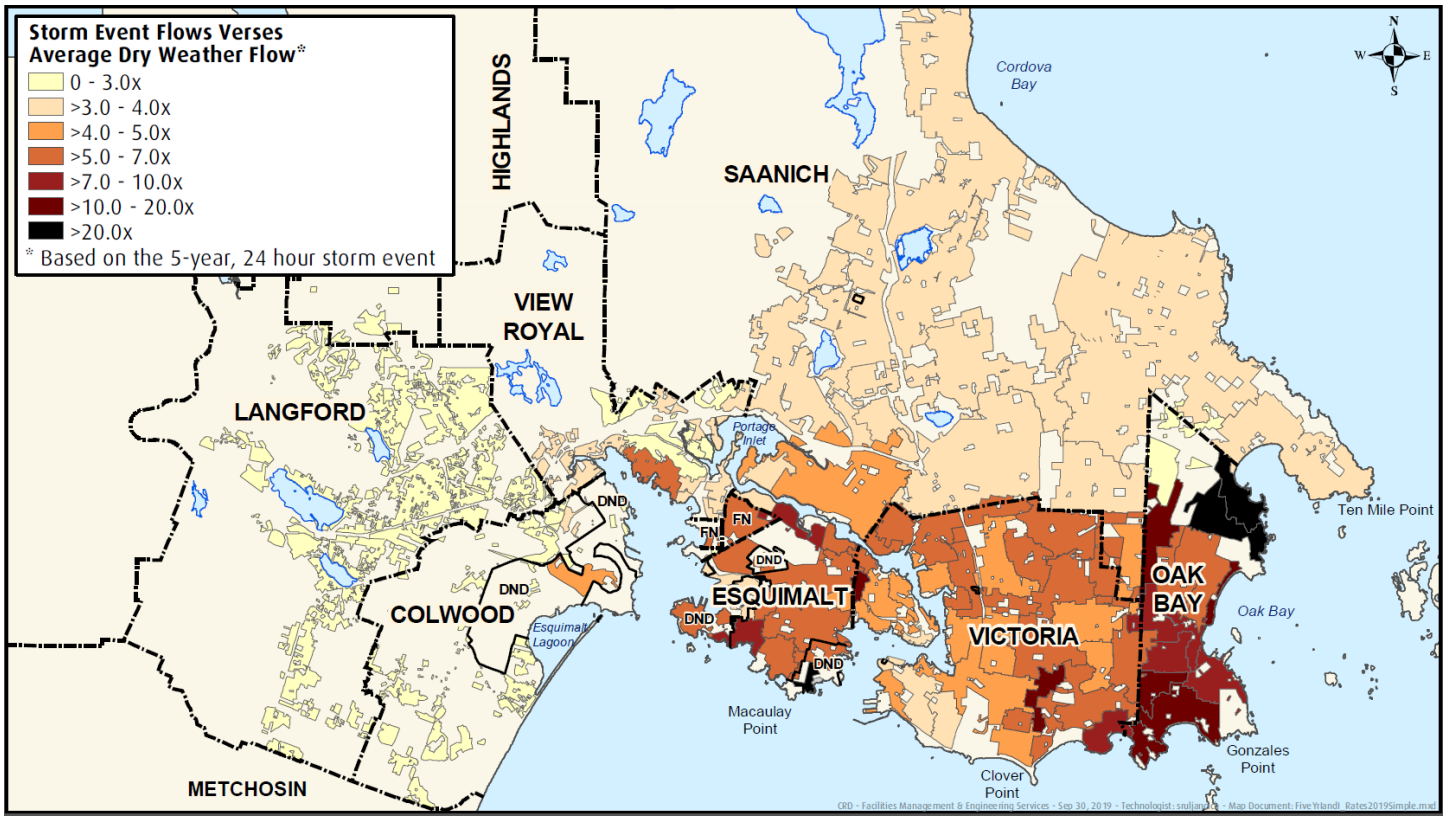


Table 5.1: Summary of CRD Core Area Municipal Peak 5-Year I&I Rates

Municipality	Ave. Age of Sewers	Estimated 5-Year I&I Rate [1] (L/ha/day)						5-Year Peak Flows [1] Compared to Average Dry Weather Flow
		2010	2012	2014	2016	2019	2022	
Colwood	20	10,309	8,540	7,965	8,777	8,777	8,777 [5]	2.3 x ADWF
Esquimalt	87	52,412	52,599	48,727	51,471	48,786	56,015	6.9 x ADWF
Langford	17	11,023	9,364	9,222	10,606	8,587	10,291	2.0 x ADWF
Oak Bay [2]	76	51,873	48,133	46,600	55,686	56,123	56,123 [3]	9.0 x ADWF
Saanich	48	15,514	13,613	15,427	15,223	14,369	15,932	3.4 x ADWF
Victoria	95	96,734	94,281	84,650	76,026	73,490	75,162	5.4 x ADWF
View Royal	35	12,322	12,294	13,216	14,525	11,541	16,037 [4]	3.5 x ADWF
First Nations	43	35,160	35,160	48,052	48,052	38,573	44,457	5.1 x ADWF

[1] Based on peak 24-hour flows. The rates are generally based on data from multiple flow meters, which are interpolated into a weighted average over each particular municipality. A 5-year storm event I&I flow rate is used, since the Municipal Sewage Regulation stipulates that a sewer system must be able to convey flow under this condition without an overflow.

[2] Excludes the combined sewer in the Uplands (which has I&I rates over 200,000 l/ha/day). Also excludes overflows from the rest of Oak Bay's sewer system because the overflow volumes aren't currently measured..

[3] Oak Bay's rate was not updated due to routine sub 5-year overflows. It's expected that these overflows will be eliminated (except in the Uplands) due to the treatment plant project conveyance system upgrades (early 2022) and that future storms will be suitable for updating Oak Bay's overall I&I rate.

[4] View Royal's increased rate is the result of changes in how the rate was calculated.

6. SEWER ALLOCATIONS

CRD Bylaw No. 4304 (2020) includes maximum allowable sewer flows for each input into the core area trunk sewer system. Each input has an allocated average dry weather flow and an allocated peak daily flow.

Table 6.1 compares measured peak 24 hour flows to the allocated flows from Bylaw No. 4304 and was prepared for information purposes only. Cells highlighted in grey note planned upgrades or known issues. Some of the known issues will be resolved now that the conveyance system upgrades related to the treatment plant project are complete (early 2022). Others are being addressed with current and planned future capital projects.

Table 6.1: Measured Flows (2022) versus Allocated Flows from Bylaw No. 4304

Allocation Point	Allocated Peak Daily Flow (ML/day)	Peak 24 Hr. Flow for a 5-yr Storm	
		ML/day	% of Allocated Capacity
COLWOOD			
Total *Parson's minus Meaford. (During large storm events, the Parson's meter is not reliable and the storm flows are calculated. The Parson's meter is being replaced in late 2022).*	**18.8**	**7.7**	**41%**
ESQUIMALT			
Esquimalt Panhandle	0.48	0.44	91%
Lang Cove PS	5.12	2.95	58%
Dockyard	4.04	3.52	87%
Kinver	1.76	2.20	125%
Pooley Place *(Flows are based on a correlation with an adjacent catchment. Catchment is not suitable for metering due to small size and multiple connections to the CRD system.)*	0.24	0.21	87%
Devonshire	7.40	10.91	147%
Wilson	1.48	1.48	100%
Head	6.72	7.82	116%
Anson	0.97	0.63	65%
Total	**28.36**	**30.16**	**106%**
LANGFORD			
Total *(Meaford)*	**56.48**	**17.01**	**30%**
OAK BAY			
Windsor	11.68	16.24	139%
Humber *(This is catchment has combined sewers. It overflows during most moderate to large storm events but the overflow volumes aren't measured.)*	2.40	4.29	177% [1]
Rutland *(This is catchment has combined sewers. It overflows during most moderate to large storm events but the overflow volumes aren't measured.)*	1.48	5.92	400% [1]
Currie Net *(Flows won't be suitable for comparing to the bylaw allocations until the treatment plant conveyance system upgrades are complete in late 2022.)*	3.88	n/a	>125%
Currie Lift Station	6.48	12.29	190%
Harling Point PS	0.79	1.86	236%
Total *(Flows won't be suitable for comparing to the bylaw allocations until the treatment plant conveyance system upgrades are complete in late 2022.)*	26.48	**n/a**	**>175%**
SAANICH			
Marigold PS	52.76	35.32	67%
City Boundary	23.52	10.97	47%
Harriet	13.08	9.37	72%
Townley	2.44	1.97	81%
Haultain	2.27	1.14	50%
Arbutus	28.31	20.95	74%
Haro - UVic	3.17	0.81	26%
Penrhyn LS	3.73	2.99	80%

Allocation Point	Allocated Peak Daily Flow (ML/day)	Peak 24 Hr. Flow for a 5-yr Storm	
		ML/day	% of Allocated Capacity
Total	**131.56**	**83.52**	**63%**
VICTORIA			
Cecelia	12.57	14.76	117%
Chapman & Gorge *(Flows are based on a correlation with an adjacent catchment. Plans are in place to install a meter)*	1.40	4.98	356%
Selkirk *(Flows are based on a correlation with an adjacent catchment. Plans are in place to install a meter)*	1.11	0.39	35%
Langford - Vic West	0.77	1.32	171%
Hereward	7.65	6.52	85%
Sea Terrace *(The flume surcharges during large storms. Because of this, the Peak 24hr flows are based on a correlation with an adjacent catchment. Options are being explored to address this issue.)*	1.32	1.50	114%
Trent Net	29.32	43.06	147%
Hollywood	2.16	7.43	344%
Olive	92.24	63.00	68%
Clover Net *(The catchment is not suitable for metering due to small size and multiple connections to the CRD system. As a result, the flows are based on a calculation.)*	6.01	7.68	128%
Total	**153.19**	**150.64**	**98%**
VIEW ROYAL			
Craigflower PS *(Flows for this catchment are substantially impacted by the Parson's mag meter, which is being replaced in 2022 to improve accuracy during storm events.)*	14.16	7.10	50%
Shoreline Trunk	0.55	0.50	91%
Total	**14.16**	**7.1**	**50%**
ESQUIMALT NATION			
Esquimalt Nation *(Flows are calculated. Plans are in place to install a meter in late 2022)*	**0.28**	**0.35**	**126%**
SONGHEES NATION			
Songhees Nation	2.36	2.49	106%
Maplebank	0.04	0.005	13%
Total	**2.52**	**3.09**	**106%**

**Cells highlighted in grey signify metering locations identified for future improvement.*

7. SUMMARY

The purpose of this report is to provide an update on work related to I&I in the core area from 2021 to mid-2022. The work supports commitments located in Section 5 of the CALWMP, which addresses the *Management of Infiltration and Inflow and Control of Wastewater Overflows.* The report included:

- summary of special projects carried out by the core area I&I program
- I&I related updates from each of the core area municipalities
- current I&I rates
- comparisons of wet weather flows to the sewer flow allocations in Bylaw No. 4304
- summary of overflow events from 2020 and mid-2021
- status of efforts to address I&I from private property

Appendix A:
Core Area LWMP Commitments Related to I&I

CAPITAL REGIONAL DISTRICT
CORE AREA LIQUID WASTE MANAGEMENT PLAN
(Consolidated Version incorporating all applicable amendments, February 2019)

SECTION 5
MANAGEMENT OF INFILTRATION AND INFLOW AND CONTROL OF WASTEWATER OVERFLOWS

GOAL

Condition 17(1)(a) of Schedule 1 of the Municipal Sewage Regulation (MSR) requires that if infiltration and inflow (I&I) causes daily flows to be greater than 2 times the average dry weather flow (ADWF), the discharger must address "how I&I can be reduced as part of a Liquid Waste Management Plan" and condition 17(2) outlines the treatment and discharge requirements for such flows.

The goal of the I&I program is therefore to comply with this requirement of the MSR by developing and implementing a strategy aimed at reducing the amount of rainwater and groundwater entering the core area's sanitary sewer system from both the publicly owned and privately owned parts of the system in order to reduce and eventually eliminate overflows from the system.

How the Capital Regional District (CRD) proposes to substantially meet the requirements of Condition 17(2) is addressed in Sections 4 and 6 and in the draft operational certificate in Section 12.

COMMITMENTS

The CRD and the participating municipalities commit to the following actions to reduce I&I sufficiently to reduce maximum daily wet weather flows to less than four times the average dry weather flow by 2030:

1. Continue flow monitoring in each municipality to further refine priority areas for remediation.

2. Develop, by the end of 2011, and submit to the Ministry of Environment, comprehensive inflow and infiltration management plans for the core area that will:
   a) Identify and evaluate options and opportunities that promote the minimization of groundwater and rainwater I&I into municipal sanitary sewer systems, including I&I originating from service laterals (private and public sections of sewer connections).
   b) Identify needed changes to legislation and legal authority to enable options and strategies.
   c) Identify opportunities for the inspection of private sewers connected to municipal sewers:
      (i) as part of the municipal process in evaluating and issuing renovation and building permits for serviced properties; and/or
      (ii) at the time of property transfer; and/or
      (iii) targeted inspections.
   d) Require the repair or replacement of private sewers that have cross-connections between storm sewers and sanitary sewer or are identified as being in poor condition.

3. Update, by the end of 2011, and enforce sewer use bylaws to prohibit the construction of rainwater and groundwater connections to sanitary sewers.

4. Implement the overflow reduction plans contained in the sanitary sewer overflow management plan, which was submitted to the Ministry of Environment in June 2008. These plans are summarized as follows:

Table 5.1
Prioritized Order of CRD Overflow Reduction Plan
(Updated based on current information)

Priority No.	O/F Name	Action Plan	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Monterey Avenue MH0130	Complete and commission Trent pump station	2008 (Complete)	$500,000
2.	Macaulay Point Pump Station	Complete installation of standby power	2008 (Complete)	$800,000
3.	Harling Pump Station	Install a screen on the overflow pipe	2008 (Complete)	$10,000
4.	Shoreline Drive MH0340	Commence with capacity deficiency study and identify upgrade options	2010	$50,000
5.	Penrhyn Lift Station	Investigate pump and genset capacity	2010	$600,000
6.	Humber Combined Sewers	Oak Bay plans to separate the sewers in the Uplands area	2015	To be determined (Oak Bay cost)
7.	Rutland Combined Sewers	Oak Bay plans to separate the sewers in the Uplands area	2015	To be determined (Oak Bay cost)
8.	Head Street MH0040	Twin the NWT from Macaulay Point to MH0055	2015	$20,000,000
9.	Sea Terrace MH0055	Twin the NWT from Macaulay Point to MH0055	2015	as above
10.	Broom Road	Extend Trent forcemain down to Clover Point	2017	as above

Table 5.2
Prioritized Order of Colwood Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	SCADA Upgrade	Upgrade the SCADA system to collect flow data from all pump stations.	2008 (Complete)	$10,000
2.	CCTV Inspection	Continue to inspect all new sewers that are installed to ensure they are well constructed	Annually	$15,000
3.	Sewer System Maintenance	Continue to clean all mains and manholes, and repair as necessary.	Annually	$50,000
4.	Lift Station Maintenance	Continue to maintain all lift station components to ensure that they run efficiently.	Annually	$72,500

Table 5.3
Prioritized Order of Esquimalt Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Sewer Relining	Relining and repairs to sewer mains rated poor and poorest	Completed	n/a
2.	Combination Manhole Separation	• 148 manholes remain to be separated • 29 manholes to be separated in 2008 • Five manholes separated per year from 2009 to 2025	2025	$950,000
3.	Grafton Pump Station Upgrade	New electrical power supply, kiosk and controls	2008 (Complete)	$38,000
4.	Grafton Pump Station Upgrade	Pump replacement	2012	$40,000
5.	Sewer Main Replacement	Replacement of undersize sewer main on Craigflower Road between Tillicum Road and Lampson Street	2009 (Complete)	$250,000
6.	Municipal Wide Smoke and Dye Testing	Smoke and dye testing underway to identify cross connections in attempts to reduce I&I in the future. The full scope of the project has not yet been determined.	2010	unknown

Table 5.4
Prioritized Order of Langford Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Sewer Master Plan Upgrades	Continue with infrastructure upgrades as identified in the Sewer Master Plan.	Ongoing	$0.2-0.5 Million
2.	CCTV Inspection	Continue to video inspect all new sewers that are installed to ensure that they are well constructed.	Annually	$15,000
3.	Manhole Inspection	Continue to visually inspect manholes to ensure that they do not leak.	Annually	$15,000
4.	Pump Station Maintenance	Continue to maintain all pump station components to ensure that they run efficiently.	Annually	$200,000
5.	Sewer System Maintenance	Continue to keep the sewers clean and free from defects.	Annually	$25,000

Table 5.5
Prioritized Order of Oak Bay Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1a.	Uplands Sewer Separation Humber Catchment	Construction of new storm sewer	To be confirmed by December 31/2019	$5,285,000
1b.	Uplands Sewer Separation Rutland Catchment	Construction of new storm sewer	To be confirmed by December 31/2019	$9,815,000
1c.	Uplands sanitary sewer pipeline rehabilitation	Rehabilitation of the former combined sewer pipeline to address infiltration	To be confirmed by December 31/2019	$3,000,000
2.	Oak Bay Inflow and Infiltration Rehabilitation Project	Continue with phased rehabilitation projects in various catchments	Annually	$500,000
3.	CCTV Inspection	Video inspection of sewer mains	Annually	$25,000
4.	Sewer System Maintenance Program	Maintenance to keep sewers clean and free from defects.	Annually	$240,000

Table 5.6
Prioritized Order of Saanich Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Dysart Pump Station	Complete construction of the new Dysart pump station.	2008 (Complete)	$2,500,000 (est.)
2.	The following pump stations will be upgraded: Vantreight Lift Station Murray #1 Pump Station Murray #2 Pump Station Arundel Pump Station Glenwood Pump Station Ashley Pump Station Dunkirk Pump Station Colquitz Pump Station Gorge Pump Station	Rebuild pump station and add a new standby generator.	2009-2015	$500,000 Annually

Table 5.7
Prioritized Order of Victoria Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	James Bay I&I Pilot Project	Commence with the rehabilitation of sewer mains, laterals and manholes in James Bay.	2010	$3,000,000
2.	Hydraulic Model	Continue to complete a hydraulic model of the City's entire sanitary sewer collection system.	2009	$100,000
3.	Overflow Elimination	Investigate, monitor and abandon, if possible, existing known overflow locations.	2010	$100,000
4.	Combined Manhole Separation	Investigate, monitor and initiate a program to separate combined manholes.	2015	$400,000

Table 5.8
Prioritized Order of View Royal Overflow Reduction Plan

Item No.	Work Name	Description	Estimated Year of Completion	Estimated Cost ($2008) to Complete
1.	Upgrade Pump Stations	Upgrade pump stations where required to improve pump performance, provide standby power and collect better data.	2017	$140,000
2.	CCTV Inspection	Continue to video inspect all new sewers that are installed to ensure that they are well constructed.	Annually	$20,000
3.	Manhole Inspection	Continue to visually inspect manholes to ensure that they do not leak.	Annually	$5,000
4.	Pump Station Maintenance	Continue to maintain all pump station components to ensure that they run efficiently.	Annually	$120,000
5.	Sewer System Maintenance	Continue to keep the sewers clean and free from defects.	Annually	$40,000

APPENDIX C

Excerpt from the Capital Regional District Core Area Liquid Waste Management Plan – Sanitary Sewer Overflow Management Plan, June 2008.

Appendix B:

EXCEUTIVE SUMMARY: CORE AREA I&I MANAGEMENT PLAN: 2017 UPDATE

Capital Regional District

Core Area Inflow & Infiltration Management Plan

2017 Update

KERR WOOD LEIDAL
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CORE AREA INFLOW & INFILTRATION MANAGEMENT PLAN

EXECUTIVE SUMMARY

Purpose

The purpose of the plan is to guide the Capital Regional District (CRD) and its municipal partners towards Inflow and Infiltration (I&I) reduction in a responsible, cost effective, integrated and well-planned manner. The primary objective of the plan is to reduce overflows and I&I to less than four times average dry weather flow (4xADWF), based on a five year return period, at Clover Point and the Core Area Wastewater Treatment Plant at McLoughlin Point by 2031.

Background

The core area municipalities are actively managing inflow and infiltration (I&I), a term that describes rainwater and groundwater that mistakenly gets into the sanitary sewer system. Inflow refers to rainwater that enters the sewer through plumbing cross connections and infiltration refers to groundwater that seeps into the sewer through cracks, faulty joints, etc. A certain amount of I&I is unavoidable and is accounted for in routine sewer design. However, too much I&I results in excessive sewer flows which can lead to:

- leaking sewers and overflows that can contaminate the environment and create public health concerns;
- backing up of sewage into buildings and homes that can destroy belongings and require expensive restoration;
- increasing operation and maintenance costs to convey and treat the increased flows; and
- consuming sewer capacity which could require expensive premature upgrades to the system.

The content of the Core Area I&I Management Plan is organized in the following sections: 1) Overview; 2) Overflows; 3) Asset Management; 4) Climate Change; 5) Public Property I&I; 6) Private Property I&I; 7 to 17) Municipal Plans; and 18) Monitoring & Verification.

Regulatory Context

The core area wastewater system is governed by the Core Area Liquid Waste Management Plan (LWMP). This plan was first approved by the Ministry of Environment in 2003. Since that time, there have been a number of amendments to the plan, the most recent being Amendment No. 11 (approved in 2016).

Section 5 of the plan relates to I&I and overflows and includes the following commitments:

> *The CRD and the participating municipalities commit to the following actions to reduce I&I sufficiently to reduce maximum daily wet weather flows to less than four times the average dry weather flow by 2030:*
>
> 1. *Continue flow monitoring in each municipality to further refine priority areas for remediation.*
>
> 2. *Develop, by the end of 2011, and submit to the Ministry of Environment, comprehensive inflow and infiltration management plans for the core area that will:*
>   - *Identify and evaluate options and opportunities that promote the minimization of groundwater and rainwater I&I into municipal sanitary sewers, including I&I originating from service laterals (private and public sections of sewer connections)*
>   - *Identify needed changes to legislation and legal authority to enable options and strategies*
>   - *Identify opportunities for the inspection of private sewers connected to municipal sewers:*
>   i. *as part of the municipal process in evaluating and issuing renovation and building permits for serviced properties; and/or*

ii. *at the time of property transfer, and/or*
iii. *targeted inspections*

- *Require the repair or replacement of private sewers that have cross-connections between storm sewers and sanitary sewers or are identified as being in poor condition.*

3. *Update by the end of 2011, and enforce sewer use bylaws to prohibit the construction of rainwater and groundwater connections to sanitary sewers.*

4. *Implement the overflow reduction plans contained in the sanitary sewer overflow management plan, which was submitted to the Ministry of Environment in June 2008.*

Overflows

In 2014, the CRD submitted an updated core area overflow management plan to the Province. The plan documents the CRD's overflow related commitments and summarizes the significant work carried out related to overflows.

Asset Management

Asset management programs for sewer collection systems generally focus on the planned replacement of infrastructure based on remaining service life. Municipalities need to demonstrate that they are following the Asset Management BC Framework to qualify for federal gas tax funding.

Climate Change

Over the next five years, the CRD will carry out actions supporting a vulnerability assessment of CRD sewer infrastructure due to climate change. The actions include updating the core area sewer model, running the sewer model using climate change scenarios, and providing recommendations based on the results.

Public Property Inflow and Infiltration

I&I and overflow quantification helps municipalities to understand the condition and/or performance of their sewer systems. Quantified measurements can be compared to benchmarking standards and allow municipalities to track I&I performance. The most useful quantification methods are repeatable and follow a standardized approach. Examples of I&I quantification methods proposed in this plan include: statistical analysis of sewer flow data to calculate I&I rates, quantifying overflows based on given storm events, ranking structural integrity of sewer pipes based on closed circuit television (CCTV) inspections, counting cross-connections through smoke testing, documenting manhole condition and calibrating system performance using hydraulic models.

The public property I&I reduction plans are consistent with the systematic approach noted in the Infraguide for "Infiltration/Inflow Control/Reduction for Wastewater Collection Systems". Infraguide was a partnership between the Federation of Canadian Municipalities, the National Resource Council and Infrastructure Canada. It created best practice reports for municipal infrastructure. The guide proposes that I&I reduction programs be divided into the following three phases:

- Phase 1 - involves flow monitoring and data collection. The data is used to identify catchments that should be targeted for sewer investigation work.
- Phase 2 - involves sewer investigation work to identify specific sources of I&I. The data is used to create rehabilitation plans and to prioritize I&I rehabilitation work.
- Phase 3 - involves sewer rehabilitation work. The rehabilitation work is based on investigation data from Phase 2. If investigation data is not yet available, then archetype I&I rehabilitation programs should be used.

Archetype I&I rehabilitation programs were developed to provide a framework under which any given sewer catchment can be evaluated and related to an actionable plan to move forward with I&I assessments and

sewer rehabilitation. These programs are to be used as planning tools. They should be interpreted from a strategic planning level and are suitable for establishing long-range budgets and for steering the development of targeted I&I reduction programs.

Private Property Inflow and Infiltration

The I&I Management Plan (2012) contained a five-year plan for implementing a common private property I&I approach for the core area. The plan was to consult with stakeholders and the public from 2012 to 2014, recommend an approach in 2015 and implement that approach in 2016. Significant effort was made to come up with a common approach. By 2014, it was clear that a common approach wasn't appropriate as the core area municipalities have different I&I rates, different issues and require different solutions. Three of the core area municipalities have older sewers and elevated I&I and they would benefit from strong programs to reduce I&I. The other four municipalities have newer sewers and have low I&I. These municipalities would prefer to focus on I&I prevention activities. The I&I Subcommittee agreed that each municipality should implement their own custom approach to suit their needs and should draw on the significant research and support that the CRD has provided.

In late 2014, the CRD Board directed that a sample model bylaw related to the inspection of private sewer laterals connected to municipal sewers be prepared. The sample bylaw was built using past I&I Subcommittee feedback and content from the Pinna Report (2014) which documented the best I&I related language from existing Canadian and American bylaws. It underwent legal review and I&I Subcommittee review for general acceptability. The sample model bylaw was presented to the Core Area Liquid Waste Management Committee on May 13, 2015. The Core Area Liquid Waste Management Committee recommended that the sample bylaw be discussed with the I&I Subcommittee to determine how best to move it forward. The I&I Subcommittee decided that it would be best to incorporate the powers from the sample model bylaw into the existing municipal sewer use bylaws. Subsequently, a gap analysis was carried out comparing the powers from existing municipal sewer bylaws to the draft sample model bylaw and presented to the member municipalities through the I&I Subcommittee.

The next steps for addressing private property I&I include:

- assisting municipalities with the further development of private property I&I reduction plans;
- supporting the implementation of the powers from the sample model bylaw for private property I&I into existing or new municipal sewer bylaws;
- developing common public education materials for use by key industry stakeholders (i.e. plumbers, realtors and home owners);
- updating the general education approach to focus on homeowner protection (i.e. basement flooding) and environmental protection and how I&I plays an integral role; and
- continued collaboration with Metro Vancouver and the National Water and Wastewater Benchmarking Initiative's I&I Task Force.

Municipal Inflow and Infiltration Plans

Each of the core area municipalities has participated in the development of their own individual municipal I&I plans. The municipal plans are organized into eight sections:

1. *Overview*
2. *Catchments* - A list and map of the long-term flow monitoring catchments that will form the basis for evaluation of I&I rates and I&I management planning
3. *Inflow & Infiltration Data* – Summary of historical data collected, current data collected, summary of I&I analyses results, and flow data analyses
4. *Sewer Infrastructure Maintenance & Capital Work* – summary of routine sewer work, notable work completed between 2012 and 2015, and notable work planned for 2016 to 2020
5. *Asset Management* – high level municipal tools, approaches, etc.
6. *Bylaws* – Contains a comparison of the key powers suggested by the CRD Private Property I&I Model Bylaw to those found in each of the municipality's existing sewer bylaws

7. *Budget* – Summary I&I budget related information
8. *Summary* - A high level summary and a graph showing projected peak wet-weather flow (PWWF) relative to 4xADWF for the entire municipality from 2011 to 2031

Monitoring and Verification

Monitoring and verification of I&I Management Plan objectives will be achieved by using the following metrics:

1. Comparison of peak wet weather flow (PWWF) with 4xADWF at Clover Point and the proposed wastewater treatment plant. This will include graphs comparing projected PWWF and ADWF verses actual rates recorded over time.
2. Flow monitoring of all catchments to track I&I rates paying extra attention to measuring flows before and after targeted I&I reduction work to verify results.
3. Tracking overflows by location, frequency, duration and receiving environment sensitivity rating to monitor trends and verify results.
4. Completion of detailed and specific I&I management strategies for each catchment to replace the archetype plans.
5. Reporting of efforts and costs applied towards I&I management on a regular basis.

The CRD will continue to provide annual reports on the I&I program to the Core Area Liquid Waste Management Committee. Every second year the I&I analyses results will be updated, as is the current practice, and an I&I benchmarking template will be filled out for each of the core municipalities. The benchmarking template is currently in development and will include a number of performance measure criteria to help gauge the level of effort each municipality is applying to I&I management.

Forecasted Inflow and Infiltration Reduction

Additional work will be needed to meet the LWMP commitment of reducing wet weather flows below 4xADWF at Clover Point and the McLoughlin Point Treatment Plant by 2031. However, the gap between 4xADWF and peak wet-weather flow (PWWF) is decreasing, which is significant as it takes a substantial investment of time and resources to reverse the natural trend of I&I increasing with sewer age.

Colwood, Langford, Saanich and View Royal already meet the 4xADWF performance target. This is largely due to having young sewers built with modern materials and good installation practices. These municipalities will need to focus on I&I prevention in order to continue to meet the performance target.

Esquimalt, Oak Bay, and Victoria have older sewers which tend to have elevated I&I rates. If we extrapolate out current I&I rates, it is evident that these municipalities will need to focus on I&I reduction to meet their commitments not to exceed the 4xADWF performance target. This will require increased focus and funding on I&I reduction to achieve their reduction targets. Financial support (i.e. grants) from senior government would help to accelerate the I&I reductions. It is worth noting that:

- Esquimalt rehabilitated all of its sewers and manholes that required structural repairs in the early 2000's. It has also separated almost all of its combined manholes. Esquimalt's next steps for addressing I&I will involve actions related to I&I from sewer laterals and stormwater sewer upgrades.
- Oak Bay's I&I reduction work focused on developing a plan for the separation of the combined sewers in the Uplands area. Oak Bay finalized the separation plan in 2017. This was Oak Bay's highest I&I related priority and was required as part of a LWMP commitment. Oak Bay also completed the significant task of collecting sewer flow data for each of its outstanding catchments using portable meters. Oak Bay's next steps for I&I reduction will be to implement the Uplands' separation project, to complete the collection of sewer camera inspection data for the municipality and to update its sewer master plan based on the results of the camera inspections.
- Victoria has collected sewer flow data for its outstanding catchments, and has also performed camera inspections and smoke testing throughout the entire municipality. The data will be analyzed and actions put into Victoria's sewer master plan. Updating a sewer master plan is a substantial project. Victoria

had to delay the update of its sewer master plan until the location of the core area treatment plant was finalized because some of the locations considered for the plant would have resulted in dramatic changes to the plan. Work on the sewer master plan commenced in late 2016 after the regional treatment plant location was finalized.

The CRD is committed to assisting individual municipalities in the development of suitable private property I&I initiatives. Such initiatives could accelerate a municipality towards meeting its performance targets as it is estimated that 50% of I&I enters the sewer system on private property. Currently, there are no significant private property I&I initiatives in the core area; however, the research needed to develop such commitments is complete.

In addition, it is anticipated that significant progress will be made through the continuation and further development of I&I related education, stakeholder engagement, regulatory mechanisms, permit requirements, time of home sale options and through targeted pilot programs.

Key Future Actions

The next steps for addressing private property I&I include:

- supporting the implementation of the powers from the sample model bylaw for private property I&I into existing sewer municipal bylaws or into a new bylaw;
- assisting municipalities with the development and implementation of municipality specific private property I&I reduction plans;
- developing common public education materials for use by key industry stakeholders (i.e. plumbers, realtors and home owners);
- updating the general education approach to focus on homeowner protection (i.e. basement flooding) and environmental protection and how I&I plays an integral role; and
- continued collaboration with Metro Vancouver and the National Water and Wastewater Benchmarking Initiative's I&I Task Force.

The next steps for addressing public property I&I include:

- identifying "semi-combined" sewers in the core area and developing plans to address them;
- taking leadership on I&I benchmarking and taking action to introduce nationally;
- updating the core area sewer model, running the sewer model using climate change scenarios, and providing recommendations based on the results; and
- ongoing I&I metering, analyses and program development.

Conclusion

The Ministry of Environment reviewed and approved Amendment No. 11 of the Core Area LWMP. The LWMP included four commitments related to I&I and overflow management which are fulfilled by the I&I Management Plan.

The plan is purposeful and guided by a number of federal, provincial, regional and municipal regulatory documents and best practices. It provides the framework for how I&I can be quantified and establishes priority programs and approaches for each municipality and the CRD to follow. A strategy has been developed for moving the issue of private property I&I forward and the whole program will be monitored, verified and reported out using standard metrics and templates.

All core area municipalities assisted in the preparation of the plan and the specific actions and programs were developed based on current CRD and municipal funding levels for I&I and sewer service budgets. Modelling the results of implementing this plan show that the goal of reducing I&I to 4xADWF at Clover Point and the wastewater treatment plant is achievable but will require additional effort.

Appendix C:

PRIVATE PROPERTY I&I WORK PRIOR TO 2021

Summary of Private Property I&I Actions to Date in the CRD

Timeline	Action
Ongoing	• CRD: - review case studies of jurisdictions taking steps to deal with private property I&I - meet with various experts and share information - work with and share information with Metro Vancouver, which is also working to establish programs to address private property I&I - are members of the National Water and Wastewater Benchmarking Initiatives I&I Task Force - provide I&I education to the public • Two municipalities within the core area (Oak Bay and Esquimalt) require that laterals be inspected and fixed if required, when applications are made for major building permits. • Each of the core area municipalities have sewer bylaws or council policies that relate to private property I&I. • The CRD is working with other jurisdictions regarding private property I&I approaches. For example, the CRD shares information and routinely interacts with Metro Vancouver. The CRD is also part of the National Water and Waste Water Benchmarking Initiatives I&I Task Force, whose members come from municipal engineering departments from across Canada including: Vancouver, Calgary, Regina, Toronto, and Halifax. The CRD has an active role on the I&I task force and has made presentations regarding private property I&I and has shared I&I video's and educational graphics.
2020 to mid-2022	Commissioned a report summarizing downspout disconnection programs and best practices from around Canada. In summary, many parts of Canada allow downspouts to be disconnected so that their flows discharge to the ground away from buildings. Even the insurance industry has documents showing when this can be appropriate. The purpose of this project was to summarize how and when this is currently done in Canada. Included are a number of municipal examples. The results will be used to see if downspout disconnections could be a tool for addressing roof drains found to be cross-connected to the sanitary sewer.
2019 to 2020	The CRD has developed the following items to support the updated I&I education approach: • a brochure and banner that fully aligns with the Generally Accepted Principles document, • updated website content to align with the new approach, • attendance at a list of key regional events to interface with the public, including annual home show events, municipal events and key stakeholder events, and • a slideshow for presenting to realtors.

Timeline	Action
2018 to 2019	The educational approach for addressing private property I&I was updated. The approach has the same desired outcomes as the existing approach: to promote the inspection and maintenance of sewer laterals. However, the approach focuses on preventing basement flooding which is more relevant to homeowners. The central document for the approach is the "Generally Accepted Principles" document, which: • has full acceptance from the key stakeholder groups, • aligns the various stakeholder groups on the topic, • is designed to answer questions that the public may have on the issue in a clearly communicated fashion, • establishes relationships with the various I&I related stakeholders, • was developed in partnership with over 20 key stakeholder groups (local, provincial and national). Through consensus, the focus was extended to all private property underground pipes, including foundation drains and stormwater laterals, and • can be used by stakeholder to educate the public. In late 2018, the CRD completed a report documenting how each of the key stakeholder groups preferred to be engaged on the I&I topic. The report also documented the level of outreach effort deemed appropriate for each of these groups.
2017	The following is a list of private property I&I work carried out in 2017 and the first half of 2018, details of which are located in Section 2: • completed a background report to better understand I&I-related stakeholders, • a report showing how to identify semi-combined sewers using GIS, • collected additional private property I&I models bylaws from across Canada, and • Enforcement Approach for Addressing Cross Connections, as presented by the City of Burnaby to the Core Area I&I Subcommittee.
2016	• In general, the I&I Subcommittee agreed that the powers from the sample model bylaw should be incorporated into existing municipal sewer bylaws. To support this, the CRD retained consultants, Pinna Sustainability Inc., to compare the powers in the sample model bylaw to the powers in each municipality's existing sewer bylaws, and a gap analysis was completed. Based on the results, recommendations were made for updating each of the municipal sewer bylaws using language from the sample model bylaw. One municipality noted that they may include parts of the sample model bylaw as part of a new municipal bylaw. • On February 11, 2016 the CRD presented to the National Water and Wastewater Benchmarking Initiatives I&I Task Force on the topic of "Implementation of a Private Property I&I Management Program". The CRD is considered a frontrunner in Canadian municipalities regarding private property I&I efforts, and staff shared the CRD's experiences and plans for moving forward.

Timeline	Action
2015	• In late 2014, the Core Area Liquid Waste Management Committee (CALWMC) asked the CRD to prepare a sample model bylaw related to private property I&I. The sample bylaw was built using past I&I Subcommittee feedback and the best parts of existing bylaws from across Canada and the US, as documented in the report by Pinna Sustainability Inc. in 2014. The draft bylaw was reviewed by a lawyer and by the I&I Subcommittee for general acceptability. The sample model bylaw was prepared and presented to the CALWMC on May 13, 2015. The committee recommended the sample bylaw be discussed with the I&I Subcommittee to determine how best to move it forward. The I&I Subcommittee decided it would be best to incorporate the powers from the sample model bylaw into the existing municipal sewer use bylaws. One municipality (Esquimalt) may customize the sample model bylaw into a stand-alone bylaw suitable for Esquimalt.
2014	• On May 22, 2014, the I&I Subcommittee unanimously recommended that each municipality be able to customize their approach for meeting agreed-upon targets. This could involve a model bylaw that could be altered, as required, to meet the needs of individual municipalities. Overall, it was understood that municipalities with elevated I&I need a different approach than municipalities with low I&I. • In 2014, the CRD commissioned a study by Pinna Sustainability Inc. to prepare a memo entitled Update on Private Property I&I Programs. (Staff from Pinna wrote the original "Stantec" report in 2010.) It contains supplementary research for the Stantec Report (2010). Notably it: - summarizes effective "drivers" for private property I&I programs, - details private property I&I programs from across Canada by province, - contains updates on private property I&I programs from the US, - documents potential problems related to implementing private property I&I programs and includes North American examples, and - summarizes "good practices" that should apply to all private property I&I programs. For each "good practice" there is example bylaw language taken from existing Canadian sewer bylaws. • In late 2014, the CALWMC asked the I&I program staff to make a presentation to it in early 2015 and to include a working "draft" model bylaw in the presentation.
2013	• Staff shortlisted private property I&I options and refined the options. • The I&I Subcommittee reviewed the shortlist and provided feedback on multiple occasions. • Options were discussed with representatives from stakeholder groups (i.e., real estate, building association, building inspection and insurance industry, etc.)
2012	• Staff prepared private property I&I specific education materials related to the program options noted in the Stantec report, including: - handouts summarizing each of the program option categories, - a detailed comparison table of the options, and - a reference guide covering frequently asked questions. • In June 2012, CRD staff hosted a workshop focused on private property I&I for elected representatives. The purpose of the meeting was to present background information, options for moving forward, and to open dialogue on the topic. New ideas were discussed and those who were present endorsed the implementation of the consultation portion of the private property I&I plan.

Timeline	Action
	• On November 30, 2012, CRD staff put on a workshop for members of the Victoria Real Estate Board. The workshop was a collaborative effort between the Core Area I&I Program, Onsite Program (i.e., septic systems) and Cross Connection Program. The purpose of the workshop was to provide education and to promote the use of infrastructure inspection in the real estate industry.
2011	• CRD staff provided an overview of the 2010 Stantec report to elected representatives and recommended a full workshop in 2012. • CRD staff initiated an I&I-related educational program that included new educational materials and education outreach events including: an I&I brochure for residents, a comprehensive website, a survey used in 2012 to 2014, and educational videos. Public education regarding I&I will now be ongoing.

2010	• CRD staff commissioned a report, completed by Stantec Inc., showing potential management options for addressing private property I&I. The report included a summary of private property I&I programs used throughout North America, costs/effectiveness of these programs, and legal options for implementing programs in the region. The programs were generally a hybrid of one or more of the following categories:
	
	1. Education-based approaches:
	  • Brochures and websites
	  • Sewer lateral certificate programs
	  • Real estate disclosure forms
	2. Incentive-based approaches:
	  • Grants or rebates for inspection, repair or replacement
	  • Deferred payment program (low or no-interest loan)
	  • Property tax exemption
	3. Enforcement-based approaches:
	  • Time of sale requirement to obtain a sewer lateral certificate before transfer of title
	  • Fines on monthly utility bills for non-compliance
	  • Termination of water or sewer service for non-compliance
	4. Targeted inspection approaches:
	  • Agency identifies problem connections through investigation work (i.e. smoke testing)
	  • Agency may fund and/or undertake work to repair identified problems (i.e. with tax money)
	  • Alternatively, agency may employ incentive or enforcement mechanisms to have property owners repair identified problems (home owner pays potentially with municipal incentive.)
	
	• A workshop was held with municipal and regional staff to initiate discussion about options for implementing private property I&I programs, objectives, and potential barriers. It was agreed that the key objectives for a private property I&I program would be to: protect the environment, create system capacity, minimize costs, increase ownership responsibility and awareness, and minimize liability issues. A summary of this workshop is located in the Stantec report.

APPENDIX D

I&I EDUCATION WORK PRIOR TO 2021

Summary of CRD I&I Education Efforts to Date

Action	Description / Timeline
2020 to 2022	Private Property I&I: As a result of COVID-19, a number of planned education actions had to be put on hold. Efforts will resume in late 2022. Public Property I&I: IWS and the I&I program continue to produce monthly sewer use reports for each of the core area municipalities and First Nations.
2019 and 2020	**Private Property I&I** On January 23, the CRD had a booth at the 2020 Vision Victoria Real Estate Board conference and debuted the new I&I education approach to key stakeholders. The reception to the approach was exceptional. Of key significance: • Many realtors visited the booth and were interested in both the brochures and the detailed GAP document. In general, they noted that the materials were both useful and relevant to them. • Five realtor offices invited the CRD to present at their "Lunch n Learns" or "Coffee Talks", which realtor offices typically have each month. It is believed that the CRD could schedule similar talks for most real estate offices in the region as they are always looking for relevant content for these talks. • Tony Joe, local radio personality, invited the CRD to have an extended interview related to the I&I education approach on "The Whole Home Show with Tony Joe", a radio show on CFAX 1070 that focusses on real estate issues. It is a great sign that Tony Joe sees the value in the updated education approach because not only is he a realtor, he is a past president of the Victoria Real Estate Board and an Instructor for the British Columbia Real Estate Association. As a result of COVID-19, a number of planned education actions had to be put on hold. To move things forward, efforts will be made to target the key stakeholder groups (i.e. plumbers, home inspectors, realtors) potentially through targeted video's, webinars, etc.
	Public Property I&I IWS and the core area I&I program worked together to develop monthly wastewater flow reports for the core area municipalities and First Nations.
2018 and 2019	Developed an updated education approach making it more relevant to home owners and related stakeholders, as summarized in Section 2.2. The rollout of the updated approach was initiated in the fourth quarter of 2019.

2011 to Present	I&I was added to CRD outreach events where I&I materials were displayed along with those other CRD programs. In general, I&I was “featured” at four key events (e.g. home shows) per year and the materials made available upon request at an additional 10 events. From talking to CRD outreach staff, attending outreach events and talking to stakeholder groups, it is clear that I&I knowledge is low with the general public. Most people have little interest in the topic and say that they will deal with issues if they come up.
2010	The CRD I&I program, in collaboration with the core area municipalities, created a brochure, two sets of videos to help explain I&I, and developed an I&I website. This information is valuable when staff are providing notification to neighborhoods of upcoming video inspection, smoke testing, sewer rehabilitation or other work related to I&I management. The overall approach was consistent with other municipalities around North America.

APPENDIX E

REPORT DOCUMENTING PRIVATE PROPERTY I&I PROGRAMS FROM ACROSS NORTH AMERICA

2022 Update on Private Property I&I Programs

Supplementary research for the 2014 report entitled Private Property Inflow & Infiltration (I&I) Management Options for the ***CRD Core Area***

April 2022

Pinna Sustainability

Memo Contents

1 Scope and Purpose of this Memo

This report is an update to two previous reports commissioned by the Capital Regional District to identify Private Property Inflow & Infiltration (I&I) Management Options for the CRD Core Area ("2014 Report" & "2011 Report"). The 2011 Report included a review of the approaches employed by other jurisdictions in the management of private property I&I (PPI&I), and a review of the legal authority and considerations for adopting these approaches in the CRD context. Then, the 2014 Report highlighted a number of municipalities across Canada and the US that have continued to address private property I&I through various means. This memo serves to supplement the 2014 Report by providing an update that summarizes:

- The key drivers for municipalities that have implemented private property I&I programs.
- Of the programs originally reviewed, the programs that are most relevant to the CRD context, and their key drivers.
- The state of private property I&I programs in Canada, and in particular, a province-by-province summary of activity.
- A high-level review of the prevalence, type and key drivers for private property I&I programs in the United States (US), and in particular, a summary of activity in Washington State.
- A list of good practices being employed in other jurisdictions for managing private property I&I.
- Specific examples of sewer bylaws in Canada that address good practices for managing private property I&I.
- An understanding of how CRD compares relative to other jurisdictions with comparable contexts.

The updated information in intended to support the CRD as it embarks on further discussions among staff and elected officials in determining which approach is most suitable to its context. Appendix A provides an updated version of the table included in Appendix A of the 2011 and 2014 Report(s).

2 2022: Summary of Findings

Research conducted in 2022, including a desktop review and interviews, gleaned the following key findings:

- Most programs identified in 2014 are still in place in 2022. Where programs are no longer running, reasons for de-activation include: the lack of financial resources to continue to support the program, the impacts of the COVID-19 pandemic, and in one case, a program was cancelled for reasons unknown.
- Several jurisdictions highlighted in Appendix A have new programs in place (6 total) where all but one of them is an incentive-based approach. The City of Windsor has adopted a Mandatory Downspout Disconnection Program in targeted areas.
- A few jurisdictions have indicated that the only change to their program includes an increase in the percent or total dollar amount of rebates given. This is to reflect the realities of cost differentials between 2014 and 2022.

- One jurisdiction (Costa Mesa CA) changed their program to be proactive rather than reactive, and now has a CCTV program that they hope residents will participate in every 5 years.
- Due to the COVID-19 pandemic, several jurisdictions are no longer collecting late fees and / or penalties – to lessen the financial hardships already being experienced by residents. Further, the pandemic has shifted some outreach where fewer door-to-door visits are conducted.

The primary drivers of PPI&I programs continue to be those noted next, however, a few jurisdictions have pointed to specific extreme weather events that have triggered ongoing PPI&I work and / or have motivated residents to act by using existing programs.

3 Private Property I&I Program Drivers

As identified in the 2011 Report, BC municipalities have the legal authority to implement numerous types of programs to address inflow and infiltration from private property. To assist with identifying the most appropriate approach(es) for CRD member municipalities, this report seeks to clarify the reasons programs are being implemented in other regions (i.e. what is driving those regions to act) in relation to the types of approaches that are being employed.

Sewer systems in the CRD are “separated” – that is, the sewage is conveyed in a separate network of pipes than the storm water. The only exception is the “combined” sewers in the Uplands area of Oak Bay where the same pipes convey both sewage and storm water. Communities with combined systems have a different set of priorities and drivers, and tend to focus on ways to divert rainwater from the system altogether (e.g. by disconnecting downspouts from the collection system), or ways to minimize damage (e.g. by installing backflow prevention valves). These combined programs are generally not very applicable to the CRD context, so this research focuses on programs that are targeted at separated systems.

Based on the research conducted, it is estimated that less than 5% (and likely closer to 1%) of US municipalities with separated sewers have I&I programs specifically for addressing private property. In Canada there are very few such programs.

The primary drivers for PPI&I programs focused on areas with separated sewers typically fall into one or more of the following:

1. **Senior government requirements**: In numerous municipalities throughout the US, the EPA and/or State authorities have ordered sewer agencies to take action to reduce sewer overflows into fresh water in order to bring them into compliance with the *Clean Water Act*. In many locations, these orders specifically require action to be taken on private as well as public property. This is also the case in a selection of Canadian municipalities that have been ordered to comply with Federal *Fisheries Act* requirements.
2. **Basement backups or flooding**: Many communities across Canada and the US have identified the need to reduce basement backups and flooding that cause damage and

health concerns for private property. Primarily these programs relate to municipalities with combined sewers and focus on disconnecting downspouts from the sanitary sewer system, and/or removing illegal cross connections (when a storm water pipe is connected to a sanitary sewer).

3. **System capacity**: Communities are experiencing system capacity issues, where urban densification and/or new development puts strain on an existing sewer system. This can result in sewage overflows at specific locations during rainfall events. In some places, regional sewer authorities set capacity limits or costs for exceeding certain flow allotments, and this drives municipalities to develop PPI&I programs.
4. **Infrastructure maintenance and treatment costs**: A few municipalities cited that they developed their programs in a proactive manner, as part of long-term maintenance planning and/or to reduce treatment costs. More typically, this driver is a secondary reason or benefit for implementing a program.
5. **Climate change:** Since 2014, extreme weather events, including storms that lead to flooding have been noted in communities in both Canada and the US as contributing to the need for private property I&I programs.

Implementing private property I&I programs can be resource intensive and politically challenging, particularly when significant costs and/or burden are borne by property owners to fix a problem they were not even aware of. The first three drivers listed above are strong enough to support significant PPI&I programs. The fourth driver is weaker and by itself generally is not strong enough to maintain the political support needed for a significant I&I program targeting private property. The fifth driver is new to the report since 2014, and will likely continue to influence the need and desire for PPI&I programs, as the climate continues to change and communities across North America experience an increase in extreme weather events, including heavy precipitation and flooding.

The following table illustrates examples of programs in relation to the primary drivers identified.

Program driver	Examples of programs implemented
1 – Senior government requirements	An ordinance requiring a lateral be inspected and fixed at the point of sale of a property is highly effective, while also placing significant onus on the property owner at a time when they would not normally be undertaking that type of work. Of the over 20 point of sale programs identified across the US, all but two communities are under an order or decree with the EPA to take action to reduce sewage overflows. Other communities under federal orders decided to have the agency undertake the repairs, rather than requiring the property owner to do the work (e.g. Westlake OH and Fort Erie ON), or have insurance programs requiring all property owners participate.
2 – Basement backups or flooding	Many programs driven by a desire to reduce basement backups or flooding have insurance programs in place where an annual fee is added to utility bills and claims are made if a backup occurs. Other regions undertake testing then serve notice to property owners to fix problems identified (e.g. Halifax NS, Kingston ON). Numerous regions provide voluntary incentive programs to install backflow valves or disconnect downspouts to alleviate this flooding.

	One point of sale program was found that was driven by the need to reduce basement backs or flooding (Rock River IL).
3 – System capacity	There are a number of communities in the US that are not under agreements with the EPA, but are facing limits on system capacity. Programs in these areas include one point of sale program (Golden Valley MN), and several with an ordinance requiring inspection and repair of laterals at the time of major renovations (e.g. Lakeport CA, Santa Barbara CA and Ukiah CA). This approach is less onerous for the property owner because they are already engaging in a significant renovation project. One point of sale program was also found that was driven by limitations for new development (Golden Valley MN). At a regional scale where there are system capacity concerns, some regional agencies have set targets for each member municipality, then monitor wet weather flows to see if the targets are being met. If not, communities must respond by creating I&I management plans, increasing spending on I&I reduction efforts, or face surcharges. The result has been municipal programs that include grants for private sewer lateral replacements, targeted inspections followed by orders to do work where needed, and/or point of sale programs (Metropolitan Council of Environmental Services MN, Metropolitan Sewerage District WI).
4 – Infrastructure maintenance and treatment costs	Where the programs are in place in a more proactive manner, the typical form of program is a voluntary approach providing education, rebates, and in some cases, a requirement to inspect and repair laterals during major renovations. Examples include Tacoma WA (requiring education at time of sale), Costa Mesa CA and Brantford ON (incentives for repairs), and District of North Vancouver BC (requiring inspection and repair at time of renovation).
5 – Climate change	Several communities (Windsor ON, Westlake OH, Eagan MN, and Naperville IL) pointed to specific extreme weather events (i.e. heavy rains / flooding) that led to an increase in uptake of existing program offerings. MMSD reported that severe storms (2008 through to 2010) caused thousands of basement backups resulting in the announcement of a regional Private Property I/! (PPII) reduction program and the development of a comprehensive PPII policy.

4 Private Property I&I Programs – Canada

4.1 Drivers for Programs in Canada

Two Canadian municipal private property I&I programs were identified in the 2011 Report: the Town of Fort Erie Extraneous Flow Program, and the City of Thunder Bay Downspout Program. Each of these programs was formed in response to drivers that are not directly applicable to the CRD context. In Fort Erie, the program developed in response to a *Remedial Action Plan* created by Environment Canada and the Province of Ontario that was put into place to protect the Great Lakes from sewer overflows (driver #1 – senior government requirements). Some financial support for the program was also provided by Environment Canada. In Thunder Bay, the PPI&I program focuses on separating combined sewers by disconnecting downspouts.

Additional research was conducted to ascertain how many other communities in Canada have programs or approaches for addressing private property I&I. The research indicates that most of these programs are aimed at reducing basement flooding. The following table summarizes the

findings, including a summary of the drivers for the programs, and whether the program focuses on inflow sources (cross connections or combined sewers), or infiltration (leaky laterals). This table has not been updated since 2014.

Province	Program summary and drivers
Newfoundland	None identified.
Prince Edward Island	One program (Charlottetown) focuses on inflow removal in a combined system.
Nova Scotia	One program (Halifax Water) targets removal of improper rainwater connections into the separated system. Focus is on ensuring downspouts connect to the storm water system, and removing cross-connections.
New Brunswick	One program (Moncton) provides rebates for installing backwater valves to prevent basement flooding.
Quebec	One pilot project to disconnect downspouts (Quebec City) from a combined sewer system.
Ontario	Over a dozen programs, and almost all are driven by reducing basement flooding predominately in areas with combined sewers. Some are related to federal requirements to improve Great Lakes water quality. One community cites long-term infrastructure maintenance as the driver (Brantford) and one cites reducing costs for homeowners to do repairs as the driver (Windsor). Several provide rebates for disconnecting downspouts, or for redirecting storm water out of the sewer system. Two provide rebates for fixing sewer laterals (Brantford and Windsor). One provides financing for sewer lateral repairs (Cornwall). One regional I&I reduction strategy that identifies the need to improve private property sewer maintenance, and a commitment to identify an appropriate approach (York).
Manitoba	Provincial grant program currently provides funding to 22 municipalities to provide rebates for installing backwater valves to prevent basement flooding. Winnipeg still has 30% combined sewers.
Saskatchewan	Two programs (Saskatoon and Humboldt) provide rebates for installing backwater valves to prevent flooding. Separated systems in Saskatoon and Regina.
Alberta	One program (Edmonton) for flood prevention on a largely combined system. Also a private insurance program for basement backups. No program for Calgary, which has a separated system.
British Columbia	Two bylaws requiring lateral inspections / repair during major renovations or re-development (North Vancouver and Surrey). On a very small scale, municipalities have completed targeted I&I removal projects to remove cross-connections and repair laterals on private property. Metro Vancouver and CRD have identified policy and legal options for managing private property I&I.

4.2 Summary of Program Activity by Province

The following provides more detail about the programs identified that address private property inflow or infiltration in some form, organized by province. Where programs have elements that may be of interest to the CRD were identified, these were incorporated into the table in Appendix A (and are marked with an asterisk * below). The summary provided in Section 4.2 has not been updated since 2014. Appendix A was updated in 2022.

Newfoundland & Labrador: The Province undertook a study in 2012 to identify location and frequency of CSOs, SSOs and potential solutions, province-wide, in response to the proposed WSER (legislation for Municipal Wastewater Effluent, under the Federal *Fisheries Act*, enacted 2012). No community was identified that had any reference to a private inflow and/or infiltration program (though Mount Pearl has a successful cross connection control project).

Prince Edward Island: The City of Charlottetown was the only community identified with private property program, and it focuses on the removal of inflow sources.

- Charlottetown: Inflow reduction education campaign. The primary purpose is to reduce the numerous illegal connections of inflow identified. Concurrently, the City is working to separate their sewer system.

Nova Scotia: The Province is developing a wastewater standard to address the objectives of the WSER, including an approach to overflows. At a community scale, Halifax has been working to reduce inflow and infiltration since 1999. The utility Halifax Water formed in 2007 and has had a private side program for I&I reduction since 2008. No other communities were identified that have a private property inflow and/or infiltration program in Nova Scotia.

- Halifax Water*: Stormwater Inflow Reduction (SIR) program in place several years with an exclusive focus on private property I&I. The program includes: targeted inspection of private I&I sources through smoke, dye, and CCTV testing; notices to owners where repairs are needed; and follow up notices if work is not completed. A bylaw is in place to enable various forms of enforcement (shutting off water service, issuing tickets, placing property liens). The program previously included CCTV inspections of laterals from the inside of the dwelling, though this was onerous to conduct. The focus of the program is currently only on inflow sources.

New Brunswick: All municipalities are required to develop long-term plans to reduce combined sewer overflows and reduce overflows from infiltration by January 1, 2016. One existing private property program was identified in Moncton.

- Moncton: Backwater valve incentive program ($500 towards installation) to reduce basement flooding. City has both separated and combined sewers.

Quebec: One program was identified in Quebec with respect to private property inflow and infiltration (note: web searches were conducted in English only). This program focused on the reduction of basement flooding.

- Quebec City: Required downspout disconnections for one neighbourhood, funded by the City (launched 2005). Program results: 25% uptake on first round; 60% of remaining on second round; five more rounds, including warnings of $300 fine for not complying, and reached 100% compliance by early 2008. City has primarily combined sewers.

Ontario: Numerous programs were identified in municipalities and/or regions across Ontario, and four of these have been added to the table in Appendix A (as indicated by an asterisk*). Over a dozen programs were identified that addressed private property I&I in some form, and some of these are regional and cover numerous municipalities. Generally the programs are focused on reduction of inflow, and cite the reduction of basement flooding as the primary driver for having a program. The most comprehensive strategy identified for managing I&I was the York region.

- York Region* (Newmarket, Richmond Hill, Vaughan, Markham, and 5 others): Comprehensive I&I strategy addresses public and private sources. Planned and tendered a pilot project to conduct inspections and repairs for 3,000 private laterals to determine most cost-effective method of reducing I&I. After tendering, the Region changed the scope of the project to only focus on the public portion of the lateral due to uncertainties about the legal implications should any damage to private property occur during the project. The strategy also identifies the need to address private property I&I through one or more of the following: increased education, incorporating lateral information into GIS, developing region-wide standards for private side inspections, and investigating long-term program options (including time-of-sale certification of laterals and subsidy programs) – though these have not been implemented to date.
- Brantford*: Grants to replace ageing sewer laterals (50% up to $1,500) started in 2014. City also took back ownership of lateral from property to main effective 2014.
- Windsor*: Grants to replace ageing sewer laterals (up to $2,000 once every 20 years).
- Kingston*: Grant program to reduce basement flooding, and stronger bylaw language adopted in 2012, including enforcement measures if private sewer laterals are not properly maintained.
- Cornwall: Sewer Lateral Replacement Financing Program.
- Niagara Falls: Grants for disconnecting foundation drains (100%), and a free service to inspect the condition of a private lateral upon request. Driven by Federal and Provincial requirements in relation to protection of the Great Lakes basin.
- Port Colbourne: New *Sewer Use Bylaw* supporting an Extraneous Flow Reduction Program enabling the City to undertake inspections of private laterals to identify need for repairs, and to provide grants for some or all of the repair work. Driven by Federal and Provincial requirements in relation to protection of the Great Lakes basin. Combined system.
- Hamilton: Proposed insurance program where residents voluntarily pay a monthly fee for sewer lateral insurance. Generally considered a reactive approach as laterals are fixed after a backup or problem becomes evident.
- Region of Waterloo: Storm sewer inspection program using video to identify areas that require rehabilitation. All storm sewers to be inspected and flushed over five years.
- Several other municipalities: Downspout and foundation drain disconnection programs, including grants to assist with the costs of disconnecting, are quite common across Ontario. Other municipalities include with these programs include Toronto, Ottawa, Halton Region, Region of Peel, Brantford, London, Durham Region, Greater Sudbury, St. Catharines, Vaughan, Welland and Cornwall.

Manitoba: Grant program that provides funding for installation of backwater valves and sump pits is provided to 22 municipalities across Manitoba, and is jointly funded by the two levels of government. Significant focus province-wide is on reducing flooding risks.

- Winnipeg: The City is an early adopter of a bylaw requiring backwater valve installation (1979). City also has a grant program to reduce basement flooding, including backwater valve and sump pit installation rebates. 30% of the city still has combined sewers.

Saskatchewan: Two programs were identified in Saskatchewan, and they focus on reducing inflow. A program was previously available for Prince Albert but no current reference found for this. The focus of these programs is reducing flooding risks.

- Saskatoon: Grant program to reduce basement flooding for backflow preventer installation, foundation drain disconnection, and sump pump installation. Program had general public resistance and slow uptake. All homes built 1965 to 2004 have foundation drains connected to the sanitary system.
- Humboldt: Storm Water Rebate Program is similar to the Saskatoon program and focuses on flood prevention.

Alberta: One private property inflow reduction program was found in Edmonton. In 2011, EPCOR Utilities announced a joint marketing agreement for service line warranties with HomeServe. This is a voluntary insurance program.

- Edmonton: Grant program to reduce basement flooding in place since 1991. City has combined sewers.

British Columbia: Two municipalities in BC require the rehabilitation or replacement of sewer laterals at the time of major renovations and re-developments (e.g. City of Surrey and District of North Vancouver) and some municipalities have "rodding lists" (e.g. City of Vancouver and District of North Vancouver) to perform regular clearing of laterals on the public side.

- District of North Vancouver: all building permits of value greater than $150,000 with connections over 30 years old must demonstrate the lateral meets MMCD or equivalent standards. Also, since the 2011 Report, the District of North Vancouver undertook a project to reduce I&I from private properties in Lynn Creek. Metro Vancouver undertook a study of how to implement a private sewer lateral certification program at the time of property sale, but have not yet taken steps to implement this.
- City of Surrey: all applications for a service connection with a building permit of value greater than $100,000 or where a parcel is being redeveloped must demonstrate their lateral is in good condition (if under 30 years old), or replace it (if over 30 years old). All no-corrode, asbestos cement or clay service pipes of any age or condition must be replaced.
- Metro Vancouver and CRD: both regional districts have reports (including the 2011 Report) that identify the policy options and legal authority for municipalities to develop and implement programs to address private property I&I. Metro Vancouver also has a Sample Bylaw for private sewer laterals.
- Some municipalities have undertaken work on private property laterals to get them into better condition as part of targeted I&I reduction projects (e.g. James Bay in Victoria, Lynn Creek in North Vancouver)

In summary, the vast majority of communities in Canada with private property programs are driven by the need to reduce basement flooding, and a couple of programs are in relation to senior government requirements. The more proactive programs identified that apply to separated sewer systems were in Brantford Ontario – a rebate program for repairing a private lateral, and in North Vancouver and Surrey – bylaw requirements to inspect and/or fix private laterals at the time of renovation or re-development.

5 Private Property I&I Programs – US

5.1 Drivers for Programs in the US

Twelve programs from the US were reviewed in the 2011 Report. This memo clarifies what were the key driving forces for developing the programs (see updates for each program in Appendix A, including a new column "Primary drivers for the program"). The majority of the examples presented in the 2011 Report were driven by senior government requirements (driver #1) because the EPA had issued administrative orders or consent decrees due to violations of the Federal *Clean Water Act*. The others were related to capacity concerns (driver #3) as follows:

- **Senior government requirements** (EPA): McMinnville OR, Berkeley CA, Brentwood and Glendale MO, Austin TX, Miami-Dade FL
- **Capacity** (reduction of sanitary sewer overflows): Santa Barbara CA, Westlake OH, Costa Mesa CA, Naperville IL
- **Regional surcharges** to municipalities for wet weather flows: Eagan and Golden Valley MN (note – these regional surcharges are driven by desire to reduce spills and increase capacity)

This list highlights the primary drivers, although in most cases communities cite numerous drivers for taking action. There are, however, useful examples from communities that are not facing US EPA orders (e.g. Costa Mesa CA, Santa Barbara CA, Metropolitan Council MN communities). Note that all US examples in the 2011 Report have fully separated sewer systems, or where there are combined systems, the focus of the private property program has been on areas with separated systems.

5.2 Summary of Program Types and Drivers by State

In 2014, a high-level scan of programs in place across the US identified upwards of 100 communities with some form of private property I&I program. Without a more in-depth study a more precise estimate is not possible, however the overall number is likely in the hundreds of programs, and not likely to be as high as thousands of programs. For context, that is less than 5% of municipalities, and more likely close to 1%.

In 2014, PPI&I programs were found in 21 states. California municipalities appear to have the most number and types of programs (e.g. required education, renovation ordinance, point of sale ordinance, agency undertaking the work on private property, rebate programs, loan programs). Very little activity was found in the Pacific Northwest other than a required education program in Tacoma, a number of pilot studies in King County, and loan programs for low-income households.

The results of the scan are summarized by state with a brief indication of the type and driver for the programs:

Alabama: 1 EPA order found – agency fixes laterals in examples found

California: Several EPA orders – most have point of sale programs
Non-EPA cities – some have ordinance requirements for renovations (but not for

point of sale), rebates, “required education” (information is provided during real estate transactions on property reports)

Colorado: Basement backup prevention

Florida: EPA order for Miami-Dade – program required property owners to fix problems identified

Illinois: Mostly downspout/foundation drain disconnection programs
Some programs where City does the work to fix laterals on private property

Indiana: Mostly downspout/foundation drain disconnection programs
2 insurance programs (where property owner pays monthly fee, then insurance covers repair/replacement costs if problem found)

Kansas: 1 rebate program
Some downspout/foundation drain disconnection programs

Kentucky: 1 rebate program
1 downspout/foundation drain disconnection program
1 program where the agency fixes private laterals

Michigan: Several programs where the agency fixes private laterals

Minnesota: EPA orders with point of sale ordinances
MCES also has regional requirements related to capacity – 1 city in MCES has a point of sale program due to capacity
1 agency requires property owners to undertake fixes, but agency pays 50%

Missouri: EPA order for St Louis County
Numerous insurance programs

Ohio: EPA orders – 1 agency fixes the private laterals; 1 has a point of sale ordinance
Non-EPA cities have downspout disconnect programs

Oregon: EPA order for McMinnville and city requires property owners to fix problems identified

Pennsylvania: EPA orders – several have point of sale ordinances and/or city inspects and requires property owners to fix laterals

South Carolina: 1 rebate program
1 city that fixes private laterals

Tennessee: 1 city that fixes private laterals

Texas: EPA order for Austin – city requires property owners to fix problems
Dallas also requires property owners fix problems, no EPA order found
2 low income programs
Backflow preventer program

Virginia: 1 Region with municipal flow commitments
1 downspout disconnection program

Washington: Loan and low income programs
King County pilot studies (where County fixed laterals to assess cost effectiveness
Tacoma has a required education ordinance for point of sale, but no requirement to inspect or do work

Wisconsin: Education and loan programs

Wyoming: 1 insurance program

5.3 Washington State Approaches

Of particular interest to CRD are the approaches undertaken by their neighbours in the Pacific Northwest.

King County in Washington State is engaged in a long-term program, in collaboration with local wastewater agencies, to reduce I&I when cost effective to do so in the separated sewer systems.

In 2014, this program had been entirely agency-led and had not put any onus on property owners, other than to obtain their permission to complete the rehabilitation projects. All work and costs were borne by the County. I&I reduction projects involved the rehabilitation of public and private sewers in select basins where expected reductions are deemed to be cost effective (because they will avoid the cost of future storage and diversion needs).

In 2015, the Metropolitan Water Pollution Abatement Advisory Committee (MWPAAC) I&I Task Force was created to formulate ideas for I&I programs that could benefit the regional wastewater system by looking at long-term solutions to significantly reduce and remove I&I from the sewer system as a whole.

The first phase of this work (2017-2019), which has been completed, was a planning phase and aimed to explore different concepts to reduce I&I programmatically and with a focus on private side sewers. Concepts included region-wide side sewer standards and inspection training, interagency coordination to identify and manage I&I, side sewer inspection and repair programs, and side sewer grant/loan programs. This planning phase resulted in three programs being recommended by MWPAAC for further definition and consideration, they are:

1. Regional sewer and side sewer standards
2. A regional inspector training and certificate program, and
3. A private side sewer inspection program with financial assistance

As of 2022, planning has led to the definition of two program options. The regional best management practices were recommended by MWPAAC for voluntary implementation by component agencies (largely community education) while the training and certificate program was not recommended. The third program listed above was not completed because it is being considered as part of a broader sewer system planning effort.

No programs were found for the City of Seattle, or other municipalities in King County.

The City of Tacoma attempted to proactively implement a time of sale program without a strong driver such as an EPA order. The program lost political support just prior to implementation. Further details are provided in Section 5.2, which highlights some problems communities have faced when implementing these programs.

The result was that, effective 2010, Tacoma realtors are required to provide the City's information package on sewer laterals to both buyers and sellers prior to closing of a property. The City also provides the package to any property owners who request a building permit. The package recommends conducting a sewer lateral inspection prior to completing the purchase or

renovation on any home more than 25 years old. The City has levied a few fines against realtors who did not hand out the package, and the homes later encountered sewer problems. Anecdotal information from City staff suggests that there has been an increase in the number of sewer lateral inspections being conducted during real estate transactions. The City has also made information about the condition of sewer laterals available on their property search website, along with all other permit information, and includes age and condition of the lateral where available. City staff continues to review options to further develop programs for I&I removal from private property.

Since 2014, little has changed at the City of Tacoma, however, a conversation with staff at the City revealed that although the realtor program is still occurring, there are few ways to enforce it, and therefore no clear way to know if the program is being implemented. The City did report an increase in residents that are having sewer issues and coming to the City for support, which may be as a result of more frequent wet weather events or turnover of homes in an active real estate market.

6 Example Problems Related to PPI&I Approaches

6.1 Inadequacy of Education Alone

It has been found that education alone is not effective for reducing PPI&I. Some communities that originally opted to pursue purely educational approaches are now finding that it is time to re-evaluate options for further addressing private property I&I.

For example, a 2014 staff report from Laguna Beach City in California states that the City's 10-year awareness program has been ineffective, and it is now seeking to update the program. The program involved educating owners about lateral inspection and maintenance, and encouraging voluntary action. In 2022, the City is implementing a Private Sewer Lateral Repair Program where the City offers an incentive to encourage and assist homeowners with the repair or replacement of their sewer lateral line. The City of Laguna Beach will reimburse up to 50% of the homeowner's cost to repair or replace a private sewer lateral, up to a maximum of $1,600 per residential parcel.

6.2 Loss of Political Support

The City of Tacoma proactively updated their Municipal code to directly address private property sewer laterals (called "side sewers" in Tacoma). This program was originally designed to be more prescriptive by requiring a "Certification of Inspection" be obtained from the City prior to completing a home sale. The intent of the original program was to ensure prospective homeowners understood the current state of the sewer lateral prior to completing the purchase. The City developed the original program based on two years of consultation with the real estate industry and other stakeholders. However, shortly before the ordinance was to come into effect Council directed municipal staff to significantly reduce the requirements of the adopted PPI&I ordinance in response to pressure from real estate agents. No changes to this program have been made since 2014.

6.3 Liability Fears Related to Working on Private Property

The Regional Municipality of York engaged a consultant to conduct a condition assessment, detailed design, contract administration and site inspection services for about 3,000 private property sewer laterals throughout the region (for a value of 1.06 million dollars) in the fall of 2013. However, during early project planning, the regional municipality's legal department became concerned about the potential liabilities associated with working on private property. The project scope was then changed to only include the inspection and rehabilitation of the service lateral (from the main to the property line). The region is currently considering other avenues for evaluating and rehabilitating private sewer laterals, as these have been identified as an important part of their comprehensive I&I reduction strategy.

7 Good Practices for Addressing PP I&I

This section outlines a collection of good practices for addressing PPI&I. It is based on the research conducted for the previous sections of this report and a review of best practice research conducted in other regions.

7.1 Clear Vision, Mission Statement, Goals and Scope

Establishing a well-defined vision, mission statement, goals and scope will support the development of the program, and provide structure at decision-making points. This includes having a strong understanding and agreement on the drivers of the program, and buy in from stakeholders and local government / agencies. The scope can be adjusted over time to meet the needs of the program and jurisdiction.

7.2 Bylaws Pertaining to Private Sewer Laterals

A good practice identified by numerous agencies is to first conduct a review and update of existing bylaws to ensure they are explicit about several important aspects of sewer lateral maintenance. The 2011 Report outlines the options available to municipalities in CRD for managing private sewer laterals, and also provides a sample bylaw that was developed for Metro Vancouver municipalities (attached as an appendix to the 2011 Report).

Appendix B contains sections from Canadian municipal bylaws relating to PPI&I. It demonstrates how PPI&I approaches can be implemented through bylaws and is organized by the following key elements:

- **Responsibility of owner** – to clearly state property owner responsibilities in maintaining laterals
- **Cleanouts required** – to assist with future testing and access, some municipalities require cleanouts be added under certain trigger conditions
- **Entry and testing** – to state the legal authority for the municipality to enter private property to conduct testing, and to undertake work; this section usually identifies part or all of the process to be followed (e.g. type of communication, amount of advance warning provided)
- **Require fix of defects** – to state the legal authority for the municipality to require property owners to fix defects; this section usually identifies the circumstances that will trigger this requirement

- **Require inspection for renovation or new construction** – a special condition currently found in two bylaws stating laterals must be tested and/or fixed when undertaking major renovation or new construction
- **Fees, recovering costs** – to state the authority for municipality to do the work then recover the costs from the property owner
- **Financial assistance, monetary incentive** – to identify the purpose and authority to provide financial assistance for fixing laterals; note that many grant programs don't explicitly identify this in their bylaws
- **Enforcements, penalties** – to clearly state the enforcement approach and penalties that may ensue for non-compliance

This summary of key elements of a sewer lateral bylaw is not exhaustive (see the 2011 Report for a more extensive list and description). It does highlight the need for clearly stating the municipal authority to enter onto property, test, inspect, require fixes, charge fees and enforce penalties for non-compliance.

7.3 Testing Private Property I&I

With respect to entry and testing, no Canadian bylaws reviewed provided details of the method of testing or inspection that would be conducted (though this is present in several US ordinances reviewed). Several municipalities in Canada do have testing programs primarily employing smoke testing to ascertain whether inflow sources are illegally connected to the sanitary sewer system. Municipalities that have undertaken smoke testing for this purpose have outlined their testing policies and procedures on their website. These procedures include providing notice to property owners with dates and times of upcoming smoke testing, providing notice to emergency services (fire, police) of the location, dates and times of smoke testing, and providing answers to Frequently Asked Questions with the notice and on their websites.

Examples of the notices and/or procedures for conducting smoke testing programs include:

- London ON: Report from staff to Council Committee outlining the procedures to be followed and an example public notice to be provided to property owners.
- Markham ON: Website provides overview of purpose, links to sewer bylaw and requirements being tested, maps of program areas to be checked, links to Council Minutes relating to the program, other educational information, and a rebate program to assist with disconnecting downspouts and/or installing rain barrels.
- Halifax NS: Written notice of smoke testing is provided to properties in advance of testing, police and fire is notified each day prior to testing.
- Regional District of Nanaimo BC: RDN notice of smoke testing listing specific times and dates that testing will be conducted in specified locations for the purpose of identifying cross connections.

Examples and links of notices / procedures conducted since 2014 can be found in Appendix C.

7.4 Standards, Guidelines and Policies

In addition to reviewing and updating bylaws, many communities also review and produce or update standards for construction of private sewers, guidelines for executing private property rehabilitation, and policies that ensure standards and guidelines are applied consistently.

The region of King County developed a comprehensive set of Standards, Guidelines, Procedures and Policies for use in long-term I&I control (2004). The document addresses both public and private infrastructure, and is based on the first five years of experience in I&I control projects. The 15 policies are designed to support the application of standards and guidelines in I&I control projects, and address the issues of: funding, public education, access to private property, inspection, permitting, liability, and storm water drainage. The County plans to review and update the document as needed following the completion of larger scale projects, which have just come to completion.

The Region of York is developing region-wide standard procedures for private side inspections, including notification materials and consent/ waivers. They plan to use a standard ROE (Right of Entry) form across the region, to be signed by the property owner.

For agencies that issue a sewer lateral certificate of compliance, more recent programs are distinguishing between watertight laterals (which receive a 25-year certificate) and laterals in good condition (which receive a 10-year certificate). To receive a 25-year certificate, laterals must pass a hydrostatic pressure test. 10-year certificates are issued to laterals that pass a CCTV inspection.

In 2018, the CSA Group published Z800-18- Guideline on Basement Flood Protection and Risk Reduction to provide guidance on making homes safer and more resilient against flood-related events. The guideline, a response to the effects of the changing climate has the goal of helping people “feel safer in their homes through flood protection and avoid the high costs associated with repairs”. In addition to providing measures that can be taken in existing, new, rebuilt and renovated houses under the National Building Code of Canada (NBCC) Part 9, the guideline also serves as the basis for the curriculum of a new training course for home inspectors.

7.5 Communications and Education

Education alone will not result in noticeable changes in I&I; however, all agencies agree it is essential to have a strong focus on this when implementing any program. Effective campaigns in Canadian communities have occurred in conjunction with targeted programs that have strong regulatory backing cited in the communications material.

In Halifax, the utility (Halifax Water) contacts property owners requiring them to take action on their improperly connected downspouts or cross-connections when smoke testing reveals problems. The program initially had an uptake rate of approximately 40% of property owners that responded to Halifax Water's communications. This rate increased to 90% uptake last year after improvements were made in the communications methods, including:

- Improvements in customer care, including longer hours of availability (to 8pm) and email communication,
- Increased staff,
- Virtual open houses where residents are asked to be proactive, and
- Addition of door-to-door knocking when staff is already out in a neighbourhood.

Other communities such as Tacoma have taken advantage of natural times to communicate with property owners and provide education about I&I – at the time of property transfer (through realtors) and at the time of major renovation (through the City building permit department).

Lateral certificates are another tool used to educate the public on their responsibility to maintain their private property laterals. In general, lateral certificates certify compliance for a period of time (e.g. 10 or 20 years). The City of Lakeport CA has a voluntary certification program for this purpose.

7.6 Checkpoints for Long-term Maintenance

Communities under EPA orders to reduce inflow and infiltration are typically required to put into place ordinances that ensure private laterals will be inspected and rehabilitated at regular checkpoints on an ongoing basis, in addition to taking immediate actions to reduce sewer overflows. This demonstrates a good practice for long-term maintenance, which is also being implemented by some communities more proactively. Checkpoints (or triggers) for inspection are typically one or more of the following:

- When a property is re-developed
- When obtaining a building or plumbing permit exceeding a particular value
- At a particular age of lateral (e.g. laterals 25 years old)
- When a property changes use (e.g. from residential to commercial)
- Time of sale of property, name change on municipal / utility account (not common in proactive programs)
- When work is being conducted in the area on community roads / laterals

These are typically designed to try to align with commitments to regular inspection on the public infrastructure. The use of the age of lateral checkpoint is more common with commercial properties. York Region, Halifax Water and Metro Vancouver are investigating options to put a longer-term checkpoint into place. Both Halifax Water and Metro Vancouver have had preliminary discussions with the real estate industry regarding the option to include the condition of the sewer lateral on property disclosure statements.

7.7 Data Collection and Management, Including Defined Performance Measures

Developing data collection approaches, and defined performance measures that align with the vision of a program will help ensure the sustainability of the program. In addition to the tracking information noted next, communities should develop approaches to track program information, including, the number of laterals inspected / repaired on an annual basis and the cost of implementation to the community.

Communities are tracking information about the condition of private laterals and incorporating the data into broader sewer information systems. For example:

- The City of Kingston used a GIS overlay of the location of flooding complaints to target their program efforts towards those catchments.
- The City of Tacoma publishes known information about private sewer laterals along with permit information for all properties in the city, publicly accessible through a web-based interface.

- The Region of York plans to develop an inventory through a review of historic plumbing records, combined with all new inspections conducted to better understand the state of the private system.
- Many communities are monitoring I&I rates before and after rehabilitation work.

These good practices are being demonstrated in various programs throughout Canada and the US. To date, no region in Canada has put in place a comprehensive program that incorporates all of these elements.

7.8 Program Management, Sufficient Staffing, and Acceptable Technologies

Communities implementing I&I programs should have strong program management processes in place, and knowledgeable staff to spearhead the program. In most cases, jurisdictions involved in this review had one person who was the lead on the I&I programs, and could ensure its effective delivery. Prior to implementation, a decision about who manages the program should be determined, including whether it is internal or external (i.e. a consultant) and if it is internal, choosing an individual to champion the program.

Appropriate practices and technologies relevant to the type of I&I program that will be implemented also need to be identified. These might include written policies and procedures, technical specifications, approved methods and materials, and inspection criteria. Further, appropriate and efficient tracking mechanisms should be adopted such as databases and websites.

Appendix A – Survey of I&I Programs in Other Jurisdictions – Updated 2022

Key findings and updates to Appendix A (2022):

- Six new programs in place:
  - Basement Flooding Grant (Brantford ON)
  - Mandatory Downspout Disconnection (City of Windsor)
  - Sewer Lateral Repair Program (Brentwood, MO)
  - Sewer Inspection Rebate Program (Costa Mesa, CA)
  - Sewer Lateral Inspection Program (Santa Barbara, CA)
  - Sanitary Sewer Backflow Prevention Device Program (Naperville, IL)
- Four programs no longer running:
  - Due to COVID-19 Pandemic (City of Kingston)
  - Lack of funding (Santa Barbara, CA)
  - Lack of enforcement / no political well (Miami-Dade, FL)
  - Reasons unknown (Golden Valley, MN)
- Sewer rates for residents remain the same regardless of age of home – some communities charge different rates based on home type (i.e. house / condo / townhome).
- Where testing of private laterals occurs during routine testing on the public side, the following measures are put in place to eliminate liability:
  - Written permission is required from the property owner (Miami Dade)
  - Property owner is notified of requirement for inspection to occur (Santa Barbara)
  - Private property testing is support by an ordinance or bylaw (Town of Fort Erie, Halifax, Santa Barbara)
- Drivers remain the same, no indication that political will is causing any programs to be cancelled or delayed. Extreme weather events / adaptation to climate change has emerged as a driver since 2014.
- Rebates including total dollar amounts and percentages have increased slightly in some communities to reflect the realities of increased costs.
- Several communities have put a hold on penalties due to COVID-19 pandemic and financial hardships already being experienced by residents.

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
CANADA						
Town of Fort Erie, ON **Population 30,000** Program for separated system	Incentive Approach	**Grants to Property owners** for the costs of repairs made to reduce extraneous flow. 100% reimbursement to a maximum of: ○ $100 for the removal of roof leaders from the sanitary sewer ○ $500 for the removal of existing sump pump connections from the sanitary sewer ○ $2,500 for the removal of foundation drains connections from the sanitary sewer ○ $1,500 for the repair or replacement of a leaking private sewer lateral ○ $1,000 for the installation of an approved backflow prevention device	History of overflows to environment: in 1987 the Niagara River was designated an Area of Concern in the Great Lakes Basin by the International Joint Commission. In response, Remedial Action Plan created by Environment Canada and Province of Ontario. Snowmelt events have led to loading and trucking sewage out of overloaded pump stations.	90% inspections now complete. Residential: 24% infrastructure failures found in inspections Public: < 5% infrastructure failures Over 3 years the Town reduced extraneous flow from about 60% to about 40%. Now working to reduce from 40% to 20%.	Costs: 1. Crescent Park: Overall cost $211,743 to date. Approx $850/lateral, includes public side inspections. 2. Outside of Ward 3: Overall cost: 221,516 to date. Approx $990/lateral, includes public side inspections. Funding: ○ Annual budget deliberations ○ Federal funding (2007 $130,000; 2008 $80,000) ○ Regional funding	Extraneous Flow Reduction Subsidy Program By-Law 68-06 Being a By-Law to Regulate the Management of a System of Sewer Works and Drainage Works (3.8.5)
	Targeted Inspection Approach	**Inspection Requirements from Municipality** to customers to arrange for in-home inspections to complete a video of all private side sanitary sewer laterals. Program targets inspections to most flood-prone areas.				
	Regulatory Approach	**Sewer Bylaw** specifies: ○ Owner must allow access to building or premises for inspection, maintenance, repair ○ If problem identified, owner is notified to fix. Owner will pay costs incurred directly, or it will be added to the tax roll for the property. If a lateral is found to be non-compliant, the Town may terminate water service or				

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
		perform the necessary repairs if the owner does not after sufficient notice. The Town may then recover the full cost of the work from the owner through municipal taxes.				
City of Thunder Bay, ON **Population 110,000** Program for combined system	Incentive Approach	2020 Residential Drainage Rebate Program**:** ○ Targets areas that experienced sewage-flooded basements during heavy rainfall events, particularly in older residential/commercial neighbourhoods where downspout connections to the sanitary sewer (instead of storm sewers) were most common. ○ The City contracted with a private not-for-profit organization, EcoSuperior Environmental Programs, to aid property owners: • Sump Pump - 50% of the invoiced cost up to a maximum of $1,500.00 including labour, materials, permit and taxes • Backflow Prevention Valve - 50% of the invoiced cost up to a maximum of $1,750.00 including labour, materials, permit and taxes • Disconnect Weeping Tile - 100% up to a maximum of $500.00 including labour, materials, permit and taxes • Installation of new Storm Sewer Connection - 50% of the invoiced cost to a maximum of $1,500.00 including labour, materials, permit and taxes • Rain Barrel Program was introduced as one alternative to redirect downspouts. The City offered 45-gallon rain barrels with a $20 discount, available only to city residents with a water account	Alleviating basement flooding: reduce inflow and infiltration with significant focus on reducing inflow sources. Prior to the program, 70 100 basements would flood several times per year. Information provided in 2022 indicates that uptake of the program has slowed in recent years – this may be in part due to the pandemic, and it could also be as a result of the fact that many homes have already completed upgrades.	Information from the 2014 report indicated that, in total, 786 properties were identified, 64% of which complied and disconnected their downspouts from the sanitary sewer. Those properties not able to disconnect (for various reasons), are being dealt with as road/ infrastructure upgrades occur. Estimated savings of $980,000 from reduction of inflow and infiltration from 2000 to 2006. In 2021, 27 applications for the Drainage Rebate program were received. In total, there have been 800 applications to the program since it began.	Property owner pays. Estimated savings of $17,000/year which would have historically been paid out in overtime to deal with rainstorm events (based on 2 events per year). Estimated cost savings from reduced insurance claims is approximately $60,000/year.	Melissa Davidson / melissa@ecosuperior.org Lindsay Menard / lindsay.menard@thunderbay.ca
City of Brantford, ON **Population 98,000** Separated system	Incentive Approach	**Private Sanitary Sewer Lateral Replacement Grant Program**: In 2014 the City began offering a grant of 50% up to $1,500 to replace an ageing sewer lateral. The intention is to proactively prevent backups and to benefit overall I&I reduction. Note that the City also took back ownership of the laterals from the property line to the main effective 2014. This is the only grant program for laterals in Canada found that applies where the property owner is only responsible for the lateral to the property line. **Basement Flooding Prevention Grant:** Provides up to $2000 to help lower the risk of flooding, eligible work includes; disconnecting downspouts, disconnection of weeping tiles from sewer and reconnection to sump pump, and installation of a backwater valve. Only available to homeowners in North-East Flood Remediation Study Area.	Proactive program to prevent sewer backups into homes, and to benefit the overall I&I reduction goals of the City.		Since the Program was established in 2014, $435,000 in grant funding has been provided for a total of 333 grants. Staff are recommending $50,000 to be approved to allow this successful Grant Program to continue in 2019.	Staff report – Funding for Private Sanitary Sewer Lateral Replacement Grant Program Basement Flooding Prevention
City of Kingston, ON **Population 123,000**	Incentive Approach (inflow)	As of winter 2022, this program has been suspended: **Preventative Plumbing Program**: to reduce basement flooding: provide a grant to disconnect downspouts, sumps, weeping tiles. ○ Grant program does not cover lateral repairs, but will cover a video inspection of lateral. ○ Program manager actively identifies catchments with high flooding, sends letters to property owners, then goes door-to-door. Where external visual inspection is not enough, a CCTV is offered to determine if any illegal connections.	Reduce risk of sewage backup to homes and secondary driver is reducing strain on whole system, particularly by eliminating illegal connections.	Since the program began in 2012, $1,610,000 in financial assistance has helped 1,050 Kingston homeowners, including with the removal of 163 illegal connections to the sanitary system [statement from 2018].		Bylaw 2008-192
	Regulatory Approach (laterals)	**Bylaw** for maintenance of laterals: ○ Updated bylaw in 2012 to include enforcement option for City to disconnect water for not repairing structural defects within 30 days of written notice. ○ As of 2014, City has new enforcement tool to issue tickets ($200) for non-compliance.				

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
City of Windsor, ON **Population 233,800** Separated and Combined system	Incentive Approach	Grant program for replacement of old sewer laterals. ○ Grants to replace sewer laterals that are over 20 years old and in disrepair ($2000, $4000 or 50% on arterial/collector roads). ○ City created a pre-qualified list of private drain connection contractors that are eligible for the grant. ○ City also has an "Eeling program" where the City conducts clean-outs up to 3 times in a 24-month period for free, as long as the clean-out is for City tree roots.	Property owner is responsible for the sewer lateral up to the main. This program assists owners with rehabilitation costs, and with free eeling related to City tree roots.	Properties per year that obtain the rebates: 2018: 110 2019: 79 2020: 85 2021: 72 Approximately 700 to 1,100 properties per year participate in the Eeling program to remove tree roots from laterals.		Bylaw 4921 for Servicing of Private Sewer Connections By-law 26-2008
	Regulatory Approach	Mandatory downspout disconnection program for certain areas. Exemptions will be made on a case-by-case basis.	Due to recent flooding			
Halifax Water, NS **Population 414,800** Separated, except in some older parts (program applies to separated)	Regulatory Approach: Mandatory Inspection Program	**Private Property Inspection Program**: The Stormwater Inflow Reduction (SIR) program includes smoke, dye and CCTV testing of private laterals to identify sources of inflow, or significant infiltration if found. ○ Where repairs needed, notices given to owners to fix; follow up notices given if work not completed. ○ Bylaw in place that enables various forms of enforcement: may shut off water, issue tickets, or put liens on properties (where funds are owing). ○ Program targets both residential and ICI; tends to focus more heavily on ICI. Target properties chosen each year by evaluating multiple criteria in a matrix. ○ Future plans: investigating options for point-of-sale requirements or other trigger (e.g. age of home/lateral); have had early discussions with realtor association regarding property disclosure forms.	Reducing overflows, system capacity and, later, in response to WSER (legislation for Municipal Wastewater Effluent, under the Federal Fisheries Act, enacted 2012).	Uptake significantly increased over the years, likely due to improvements in customer service and communication. Employed enforcement measure of shutting off water once (for a cross-connection, and only after years of discussion). Incident received a lot of media, and has likely led to increased uptake, particularly with ICI customers.	Funding: Utility operating budget	Halifax Regional Municipality Charter, sections 13, 61, 64, 79 Patricia Isnor / 902-483-8187
Regional Municipality of York, ON **Population 1.11 million** Separated system	Comprehensive I&I Strategy and Pilot Projects	In 2014, York Region was planning to conduct pilot studies to test effectiveness of specific rehabilitation techniques and methods, then will determine best management approaches moving forward. ○ Municipal programs: some local programs funded by developers in exchange for allocation of new units of development. In 2018, York Region launched a private-side I&I reduction pilot project in partnership with the local municipalities in two study areas. 63% of residents in the pilot study areas engaged with the Region and its representatives, resulting in 42% of residents signing up to participate in property inspections.	Sanitary sewers located on private properties make up more than 50% of York Region wastewater conveyance system in length. Experience in other municipalities has indicated that I&I sources on the private side can contribute 60%-80% of I&I in a wastewater system.	With information gathered in the pilot study, the Region is committed to support local municipalities in the development and implementation of new private-side programs, through a toolkit consisting of: • Standardized materials and messaging across the Region as education and outreach is critical to drive citizen participation • Program models that can be customized for program planning and initiation • Analysis of results through Region's flow monitoring program • Administrative processes and applications	2014 Budget: Estimated private side remediation program budget of $10 million for Phase 2 (inspecting and re-lining ~3,000 private sewer laterals)	2021 York Region Inflow and Infiltration Reduction Strategy Update
USA						
City of Lakeport, CA **Population 4,900** Separated system	Regulatory Approach: Inspection with Permits and Certificate Program	**Requirement for Certificate with Permit**: Ordinance requires private laterals be cleaned, inspected and tested for I&I by the owner at predetermined events – including when applying for a building or plumbing permit. 25-year certificate for watertight laterals, 10-year certificate for CCTV tested. Option to fine a noncompliance fee.	Reducing overflows to fresh water lake. No EPA order.			Ordinance 872 (2008)
City of Glendale, MO **Population 6,000**	Targeted Approach	**Refuse Bill (insurance program)** – added $7 to quarterly bill and saved in a separate fund for a Sewer Lateral Repair Program (1997). ○ Assistance for residents who have to pay for sanitary sewer lateral repairs between its connection with the sewer main and the house connection.	Regional: St Louis City began a sewer lateral insurance program in 1989. Most municipalities in the County followed, including Glendale	2,600 households and average around 90 applications per year, of that about 80% require repair.	Funding: Refuse bill every three months Property owner's annual contribution	tjones@glendalemo.org Sewer Lateral Repair

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
Separated system		○ The program <u>does not pay</u> for the cost of sewer cleaning to remove tree roots or buildups, rather that is the responsibility of the property owner/resident. ○ The program <u>pays</u> for point-of-break repairs, which means that the portion of the pipe that is defective is repaired. ○ Residents will be reimbursed up to $3000/year. If a problem is found, the CCTV video inspection will be paid for by the program.	in 1997. Note: The EPA issued orders to the regional sewer agency in 1994 due to CSOs and in 2007 due to continued overflows and basement backups; though it's unclear the level of contribution from Glendale.		is $50/year that is billed quarterly in increments on the City's sanitation bill ($12.50/quarter). $112,500 is collected annually as part of this program.	<u>Program</u>
City of Brentwood, MO **Population 8,000** Combined & separated systems	Incentive Approach	**<u>Sewer Lateral Repair Program:</u>** effective January 1, 2020 ○ For non-emergency repairs, property owner is responsible to obtain a minimum of three quotes ○ Intended to assist property owners who have continuous sewer blockages and no sanitary sewer service. Not to be used to satisfy a home sale contingency. Repair cost limit up to $3,500 remains – repairs above the $3,500 are the responsibility of the owner. **<u>(Program no longer running): Reimbursement to 100% (insurance program)</u>** – when a blockage or sinkhole is noticed by the property owner, the owner must call the Sewer Hotline, the City sends a company out to check the problem and if there is a problem, the City will pay to have it fixed. Residents are reimbursed up to 100%.	US EPA issued a CSO control policy in 1994 (applies to combined areas only – includes St Louis City). St Louis City began a sewer lateral insurance program in 1989. Most municipalities in the County followed, including Brentwood in 1997. In 2007, EPA issued MSD (the regional sewer agency) an Administrative Order due to continued overflows and basement backups.		2014 Information: Funding: $120,000 is collected annually as part of this program. Property owner's annual contribution is $28/year. In 2010, voters agreed to raise this to $50/year.	<u>Sewer Lateral Repair Program</u>
City of Golden Valley, MN **Population 21,600** Program for separated system	Incentive Approach	**<u>[No longer running, not able to find reason why] Grant Program:</u>** ○ 2008 - Grants for lesser of $1,000 or 50% of the actual cost for separation. ○ 2009 - Grant for lesser of $2,000 or 50% of the actual repair cost. ○ Both programs ended May 2009 (no more funds).	City had been receiving surcharges from MCES, but since implementation of Point-of-Sale Program, the City is no longer receiving the surcharges.	57% properties have reached compliance More than 90% of the homes that are inspected need some kind of repair. Staff with the City review the real estate listings to ensure that all the homes for sale, have been inspected. Real estate agents and title companies now know about the program and support the City in making residents aware of the requirements. Review by outside consultant concluded that efforts in Golden Valley were successful in reducing the 10-year peak hour flow by 24%.	Costs: 2008 – 6 residents received a total of $2,982.75 from the foundation drain separation program. 2009 – 56 residents received a total of $82,745.38 from the service lateral grant program. Funding: Incentive funds from regional authority (MCES) grant program. Property owners pay required inspection fees: $250 residential, $750 non-residential.	City Code Chapter 3, Section 3.31
	Regulatory Approach	**<u>Point-of-Sale Program (Jan 2007):</u>** ○ Requires all properties to pass a sanitary sewer inspection and obtain a certificate before selling, advertising for sale, or transferring title. ○ Failure to comply may result in monthly utility bill charges ($500-$1,000) and possible loss of water service.				
	Targeted Approach	**<u>Private Property Inspections</u>** ○ Free inspections are conducted when the City is doing work in the area, and then homeowners can choose if they want to do the repairs at that time, or not.				
City of McMinnville, OR **Population 34,000** Program for separated system	Incentive Approach	Programs have not been updated since 2014 – currently looking into whether they should increase 10% up to amount, and the fine of $50/month. **<u>Monetary Incentive</u>**: part of the private sewer lateral replacement program. ○ Reimbursed 10% of their construction cost up to a maximum of $250. ○ To be eligible, property owners must construct an acceptable lateral replacement within the 90-day grace period. **<u>Interest Program</u>**: property owners who may have trouble finding financial assistance through banks or other lending agencies. ○ Interest shall accrue on the balance due at the prime interest rate plus 3.5%. It is important to note that this is not a "low interest" loan.	US EPA: City has been directed by EPA and the Oregon Department of Environmental Quality (DEQ) to control the overflow of untreated sewage into the Yamhill River, which occurs frequently during the rainy season.	In 2019, there was about 300 laterals inspections with approx. 100/150 of those needing repair.	Property owner pays to replace defective private sewer laterals.	Josh Adelman Josh.Adelman@mcminnvilleoregon.gov
	Regulatory Approach	**<u>Repair Enforcement with Financial Penalty</u>** ○ Problem laterals are identified by the City and property owners informed of responsibilities by letter. 90 days to repair/replace lateral or fine of $50/month. ○ Non-compliance accumulates and lien is placed on the property. ○ Properties will not be randomly selected for evaluation. The properties evaluated will usually be part of a comprehensive pipeline repair project where City pipes are				

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
		repaired first.				
City of Westlake, OH **Population 34,000** Program for separated system	Education	Information brochure providing information on sanitary sewer back-ups, and storm water infiltration.	After a major rain event in 2008, Engineering Department created a Mitigating Wet or Flood Basements Brochure			Mitigating Wet or Flooded Basement Brochure
	Targeted Approach	**Rehabilitation Program** undertaken in 8 basins. ○ Started in 1992 by only public side rehab, but still had flooding. Decided private side must also be rehabilitated. ○ 2014: completed 8 basins in total since 1992.	Flooding of streets and yards during intense rainfall events and surcharging of sanitary sewers within basements. Westlake has joint treatment with City of Rocky River, which received an Administrative Order from the EPA in 2009; unclear level of contribution from Westlake.	1992 – inspected, re-grouted and fixed as needed private laterals where dye in sewer. 2001 – re-lined private laterals. I&I was 80% reduced in the area. 2004 – re-lined private laterals, as well as manhole sealing and tight seal at mainline/ lateral interface. I&I was 95% reduced in area. Complaints reduced or non-existent. 2007 – similar to above. Complaints reduced, no flow data yet available. 2014 – 816 homes inspected; 417 repaired.	Costs: 1992 – $338,000 and only $5,000 under property owner responsibility. Funding: 1992 - property owners paid private portion. 2001-2007 - City decided to fund all private property costs in future projects because the private portion was estimated to be approx 1.5% of the project cost. Total Costs (up to 2014): $2.3 million (3.3 million "total")	
City of Eagan, MN **Population 67,400** Program for separated system	Incentive Approach	**Inspection Program:** ○ City pays 50% of required repairs. ○ Property owner may elect to have all or part of their portion levied as a special assessment against the property over 5 years at 4% interest. ○ Utility staff inspect for I&I sources when installing a water meter.	Regional surcharges from MCES if peak flows are not reduced (see MCES below). Focus is on disconnecting improperly connected sump pumps and drainage systems. A significant rainfall event resulted in excessive peak flow allocations to the regional collection system and treatment plant owned and operated by MCES. The addition of I&I into the sanitary sewer system was straining the City's equipment and infrastructure, resulting in higher sewer rates.	The City was able to inspect 99% of the private properties in less than five years. The inspections found that 5% of local properties had one or more factors contributing I&I to the sanitary sewer system: 850 repairs were made. Since the inception of the program, the City has seen a decrease of nearly 10% in wastewater being sent to its wastewater treatment facility - saving hundreds of thousands of dollars each year. The City also reduced sewer rates for its customers.	The City pays for inspections done by the company the City contracted with. If a homeowner chooses to have a plumber of their choice do the inspection they are responsible for the cost of the inspection.	City Code Section 3.40 to add Subdivision 10 City of Eagan Program Documents
	Regulatory Approach	**Monthly Fines on Utility Bills:** ○ Fines for non-compliance - a utility surcharge of $150 per month (single family residential) or $500 per month (non-single family residential). ○ City inspects properties in identified neighbourhoods. ○ Required inspections followed by Corrective Work Order / Compliance Certificate.				
	Education	**Public I&I Education Program:** ○ Education program before starting the private inspections. ○ Included newsletter articles, public meetings and spots on ETV (Eagan's TV stations).				
City of Berkeley, CA **Population 103,000** Program for separated system	Regulatory Approach	**Sewer Lateral Certificate** - prior to selling a property – including condominiums and other developments with shared laterals – are required to obtain a Sewer Lateral Certificate (SLC) under the following conditions: 1. By close of escrow for the transfer or sale of property (with some exceptions), unless a 6-month extension is granted prior to closing; OR 2. When obtaining a Building Permit for construction or remodel value over $60,000; OR 3. When the City finds that the private sewer lateral may be a public nuisance; OR 4. When a property owner elects to repair or replace their private sewer lateral. *In 2007, 250 properties had closed escrow without obtaining a Sewer Lateral Certificate (SLC). Subsequently, the property owners were issued a Notice of Violation and corrective action is required to fulfill the requirements of BMC 17.24. By end of 2007, 53% of these complied. Enforcement proceeding with remainder.*	US EPA order to East Bay MUD. It is estimated that half of the water that enters the City's sewer during wet weather comes from private property sewer lines, downspouts and yard area drains. Bylaw is for protecting the water quality of creeks, watersheds and the San Francisco Bay.	First year (Oct 2006 – Oct 2007): 1,251 applicants. 84% of properties issued certificates upon submittal and remaining issued deficiency notices. ○ 65% property transfer trigger ○ 14% major renovation trigger ○ 21% voluntary or unidentified After 1st year 80% of laterals were out of compliance. At current rate, will take 30 years to complete all work. .	As of January 1, 2022, the fee for private sewer lateral inspections will be $190. As of January 1, 2022, the fee for a private sewer lateral certificate will be collected in the amount of $150 as authorized by City Council Resolution 63, 262-N.S. The City offers a loan program to assist Berkeley low-income property owners to comply with BMC 17.24 requirements for private sewer laterals – this loan programs comes with several conditions	Berkeley Municipal Code, Chapter 17.24
City of Costa	Incentive	**No longer running: Sewer Lateral Assistance Program (up to 2017)**	The program was changed from the	Between 60-75 applications per year since	$150,000 per year in grants; $50,000	Resolution No.

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
Mesa, CA **Population 116,500** Program for separated system	Approach	Rebate 50% up to $1,250 for inspection, repair or replacement of lateral. *Recommendations* o Public Outreach Program was successful o Public readily gave permission for entry o Lateral renewal program was cost effective o Proposed to expand program to all 500 critical basins with excessive RDII 2014: SLAP program is still in place **New since 2017: Sewer Inspection Rebate Program:** The Costa Mesa Sanitary District (CMSD) is offering rebates to eligible residents who perform a closed-circuit television (CCTV) video of their sewer lateral or install a clean-out. Homeowners may participate every five years and are only eligible for one rebate payment (CCTV or cleanout installation). CCTV from a ground level clean-out to CMSD main = up to $200.00 CCTV from a roof vent or toilet flange to CMSD main = up to $250.00 Installation of a ground level clean-out (requires permit) = up to $500.00	SLAP to the SIRP because SLAP was retroactive, and SIRP is proactive which supports property owners in doing a CCTV on their laterals every 5 years. To prevent sewer backups and spills. "Sewer spills cause very expensive damage to the interior of a house and the environment, particularly the beaches."	2018.	per year for staff costs No new information on project costs since 2014 report.	2007-742
City of Naperville, IL **Population 147,500** Program for separated system	Incentive Approach	**Sanitary Sewer Backflow Prevention Device Program:** Allows residents and business property owners to install the backflow prevention device of their choice, with the City reimbursing 50% of the cost.	Heavy rainfall events, and storm water causing backups in basement dwellings and businesses.	After significant rain event in 2017, approximately 80% of houses took advantage of the program.	Approximately $20,000 - $50,000 per year.	Chris Myers 630 420 6682
	Targeted Approach	**Targeted Program:** o Private lateral rehabilitation in high priority sewer basins (10 targeted areas). o Areas are selected by the following criteria: 1. Customer service calls; 2. Rain events; 3. Flow monitoring; and 4. Maintenance schedule.	Capacity: Flood situations force lids off of manholes leading to the combining of storm and sanitary flows, and to treatment plant being over capacity.		$2 million for sewer rehabilitation $4 million for the entire program Capital Budget	
City of Tacoma, WA **Population 212,000** Separated system	Incentive Approach	**Residential Sewer Conservation Loan:** The first of its kind Washington, covers up to 90 percent of side sewer repair or replacement costs. The loan features an interest rate at two percent below the prime rate (with a min of 4%) on loan amounts between $1,000 and $10,000. The loan is secured through a security interest (lien) on the project property. Side sewer repair or replacement must be for an existing structure. Applicants must apply for the loan before the side sewer replacement or repair is complete. Late fees waived and payment deferment plans have been made available during the COVID-19 pandemic.	Environmental compliance Effort to prevent back up into the sanitary systems. Opportunity to switch from septic to sewer when appropriate.		$500,000 in 2001 which was sufficient funds – currently the program is very sustainable with those receiving loans being required to begin payback within a month (and up to 10 years).	Stephanie Seivert sseivert@cityoftacoma.org Tacoma Municipal Code Chapter 12.08.720
	Regulatory Requirement for Education	**Required Education Program** Starting in 2010, real estate professionals are required to provide a side sewer educational flyer to buyers and sellers they are representing prior to the closing of a property. The City also provides the flyer to all permit applicants. The flyer recommends property owners locate and determine the condition of a side sewer.	Proactive program to complement public side efforts to reduce I&I.	No formal tracking of program impacts. Anecdotal information indicates that in the last few years (2019 and on) more new homeowners are contacting the City to participate in the loan program – coordinator of program(s) wonders if the real estate agents are no longer giving out the flyers. No real way to enforce the program.	Minimal	
City of Santa Barbara, CA **Population 420,000** Program for	Incentive Approach	**No longer running, due to lack of funds: Grant Program:** o $150 for inspection; Up to $2,000 or 50% for repair; permit fees waived o Low-interest loans for those needing financial assistance.	Spill prevention / reduction of sewage spills into storm drains *(no reference to EPA order found)*. Recent (2012) settlement with Channel keepers re: Clean Water Act will require the City to spend an additional $4.5 million over the next	Inspections: 1306 (residential), 313 (commercial), 29 (condo) from Jan 2007 to Feb 2010 o 930 residential laterals repaired over same period o 983 certificates issued over same period	Far more expensive than anticipated (> $600K in first year – 3 times more than estimated). Since January 2007, total program cost of $2,470,000: o < 1% ($7,600) for lateral	Municipal Code Chapter 14.46
	Regulatory Approach	**Not currently running, due to COVID-19: Enforcement Program:** o City identifies problem laterals & provides notices requiring repair. o City notifies property owner & required to fix or $150 penalty & referral to attorney's				

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
separated system		office for enforcement. ○ Commercial properties required to inspect every 10 years.	5 years to improve its sewage system, reduce sewage spills; with a focus on those with highest risk of leaking into storm drains.	Over 95% have reach compliance	inspections only ○ 73% ($1,800,000) for lateral repair incentives ○ 11% ($270,000) for waived permit fees charged to our section. Does not include any additional costs of resources, marketing or legal fees. Capital Program Funding.	
	Education	**Certificate Program:** ○ Zoning Information Report (ZIR) at time of sale indicates if Certificate obtained & advises buyer of responsibility.				
		Sewer Lateral Inspection Program: ○ Property owners are responsible for maintaining the sewer lateral, or sewer pipe, that connects their house or building to the public sewer main. ○ Required to hire a City Certified CCTV Inspector ○ May receive notice from the City to indicate that requirement of inspection. Trigger for this include: defect identified through City sewer line, a Private Lateral Sewer Discharge originated on the property, application for a construction building permit.	The goal of the SLIP in 2022 is to eliminate private sewer spills in the city.	Program just started in July 2021 – so far about 30 homes have participated.		Sewer Lateral Inspection Program
City of Austin, TX **Population 950,800** Program for separated system	Incentive Approach & Regulatory Approach	**Financing (loan) Program** available with a minimum amount of $1000, and a maximum amount of $3000. ○ Available to homeowners of detached, single family dwellings or owner-occupied duplex with an active Utility account. ○ Prior to construction, the lateral must have been inspected – final installation must be inspected and approved by the Utility. ○ Utility buys down interest rate on the loan. ○ The Housing & Planning Department provides free replacement or repair of these lines for eligible Austin Water customers of a single-family home or duplex whose household income is 100% or less than the area Median Family Income (MFI). **Fines for Non-Compliance:** ○ City identifies with inspection and sends letter requiring fix within 120 days. Fine up to $500 per offense (each day non-compliant is a separate offence).	US EPA Administrative Order requiring City to take measures to prevent sewage overflows (1999). Also cite desire to reduce costs.	Private Lateral Grant Program started in 2013 and to date there have been just over 200 private lateral replacements completed in this grant program. No monitoring but have noticed an anecdotal change in areas where City grant program has been implemented.	Annual cost for the Private Lateral Grant Program is about $180,000 with total costs to date approximately at $1,000,000.	Ordinance No. 20070125-007 Greg Kirton
Milwaukee Metropolitan Sewerage District (MMSD), WI **Population 1.1 million** Primarily separated system (~6% combined)	Regional Targets and Required Compliance Plans Approach	**Regional I&I Targets (Limits)** and Community Compliance Requirements: ○ Made long-term peak wet weather management plan that sets standards for expected flows at each "metershed", then identifies if standard is exceeded, and requires offending municipality to create a plan that will bring it into compliance. Within 1.5 years, 8 municipalities had been notified of non-compliance and were creating flow reduction plans. ○ In 1998 MMSD adopted rules that municipalities must develop and implement an I&I management plan; and must enforce prohibited connection ordinances. ○ Region created a Policy Document for I&I funds clearly establishing the rational for private property I&I work, and what is eligible for funding. ○ Region has also aggressively pursued education program with respect to basement backups, including website and video.	Historically has had settlement with EPA/DNR for SSOs (early 2000s). Created a 2010 Facility Plan, then later a 2020 Facility Plan to reduce SSOs. Federal grant provided for private property efforts. Severe storms (2008 through to 2010) causing thousands of basement backups resulted in MMSD announcing a regional Private Property I/! (PPII) reduction program and developed a comprehensive PPII policy.		Program was authorized with an expected total budget through 2020 of $62 million.	MMSD 2020 Facilities Plan Private Property I&I Policy Documents and Work Plan
King County, WA **Population 1.5 million** Separated systems except in some parts of Seattle	Agency led Inspection and Rehabilitation Projects	**Rehabilitation Projects where Cost Effective**: Started Regional I&I Control Program in 2000 – now in place 22 years. ○ Completed several pilot projects and assessed cost effectiveness ○ Evaluate projects on a case-by-case basis to determine cost effectiveness ○ Developed standards, guidelines and policies for lateral inspection and remediation ○ Found that basins with I&I less than 3 gallons per minute per property were not good candidates (too many properties would have to be rehabilitated to achieve target reductions In March 2022, King County published several updates and resources on their website, including a Side Sewer Best Management Practices (BMP) Toolkit, a Know Your Sewer System card, and 2 technical reports: Final Regional Best Management Practices	King County and City of Seattle agreement to upgrade combined sewers under settlement with US EPA in 2013.	Data collected indicates large percentage of I&I originates from private property. Recently completed larger scale I&I control project (Skyway) that tested assumptions from the smaller pilot projects. Found the I&I reductions were much lower than predicted, but still significant.	6-year control study of 10 pilot projects cost $41 million. Combined funding from King County and local agencies.	Executive's Recommended Regional I&I Control Program (2005) Task 600 Private Side Sewer Program Identification and Relevance

Jurisdiction	Program Approach	Program Description	Primary Driver(s) for Program	Program Impacts	Program Costs and Source of Funding	References
		Development and Final Inspector Training and Certification Program Development.				to the King County Wastewater Service Area
Miami-Dade County, FL **Population 2.4 million** Program for separated system	Regulatory Approach & Targeted Approach	**Enforcement Program:** ○ Identified private property defects through smoke testing and property owners were required to make repairs to their laterals as required by Miami Dade County Ordinance. ○ The County simply the property owners and they made repairs to the system. ○ Subsequent re-smokes of the area verified if the repairs were completed. *Insurance Issues: minor property damages usually the result of testing and or repair crew equipment that have inadvertently encroached on private property and damaged easement and ROW areas.* **Comprehensive Lateral Pilot Program (began in 2004)**: $13 million dollar project designed to determine if a private lateral testing and inspection program was a viable solution to the reduction of peak flow. Update from 2006: • Public outreach was conducted to receive permission from property owners – approximately 96% agreed to have their sewer inspected (about 70% of total responses) • Private side laterals which failed were televised and smoke tested to prove to the property owner that they were defective Update from 2022: • Program is no longer running, as the County has no way to enforce the program and the political will to fund it is not there.	Series of US EPA Consent Decrees (1994/5 and 2013) in relation to sewer spills. 2013 Consent Decree requires substantial repair of 3 WTPs and sewer system at an estimated cost of $1.6 billion (Miami-Dade County Clean Water Act Settlement).	Enforcement Program was 85% effective. Average of over 700 lateral replacements per year. Average daily flow: 116 MGD's in total reduction (over a 14 year period). CLIP: Inspected 6,749 laterals. 85% effective in repairing laterals (repaired / replaced over 1200 laterals). Estimated cost to pump and treat $8,645/GPM. Estimated cost for mainline inspection/repair $362/GPM (23 times more cost-effective than pump and treat). Estimated cost for lateral inspection/repair $2,308/GPM (about 3.7 times more cost effective than pump and treat). Total Program $1,011/GPM removed.	Both programs funded by combination of: Bond Funds, Capital Revenue Funds, and O&M Funds. Overall cost of the enforcement program is now over $400 million dollars. Cost of the 43 basin CLIP program approx. $13 million: ○ $4m - mainline inspection/ repair ○ $4m - lateral inspection ○ $4.5m - lateral repair ○ $0.5m - admin costs NOTE: lateral inspection / repair includes public side upper lateral Funding: $1 million dollar grant for the implementation of the CLIP program.	
Metropolitan Council of Environmental Services (MCES), MN (Twin Cities) **Population 3 million +** Program for separated system	Regional Targets and Surcharge Approach	**Regional Surcharge**: MCES continuously monitors volumes of wastewater from municipal systems, and requires the municipalities to reduce peak flows to the regional collection system, or charges them. ○ 1993 – 2003 MCES provided grants to communities to reduce I&I, but not sufficient ○ In 2006 instituted surcharge for clear water; communities that have I&I reduction plans can opt out of the surcharge in order to make investments in I&I reduction (must match or exceed surcharge) ○ In 2014, a significant wet period followed by a storm, resulted in 46 communities exceeding I&I goal peak flows, resulting in each having to develop a work plan that required completion in 4 years. ○ MCES is now working to promote more efforts by communities on private property I&I ○ Eligible private property I&I mitigation activities included sewer lateral repair or replacement and / or disconnection of foundation drains. Property owners can apply for reimbursement by MCES of actual costs (up to $2,000) for qualifying repairs of sewer laterals.	History of working to improve water quality in the Mississippi has led to implementation of more proactive approaches. Capacity concerns in certain locations (e.g. Golden Valley). Also SSOs, private property spills, using up capacity for future growth.		I&I reduction is funded by communities with amounts equivalent or exceeding avoided surcharges. 2013 received $1,000,000 in grants for local I&I reduction programs. In recent years, grant funding administered by MCES for private property I&I mitigation activities has been limited to $900,000 per year.	Water Resources Management Policy Plan

Appendix B – Bylaw Examples (Canadian)

Responsibility of Owner

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 2 – (6) to (9) – Required Maintenance Standard

Town of Fort Erie Bylaw 68-06:

3.8.2 Every owner shall maintain their private sewer lateral or private sewage collection system and private drainage lateral or private drainage or storm water management systems, including appurtenances connected thereto, in good working order and condition, and adequately protected from blockage and freezing. Private sewer laterals and private sewage collection systems shall be maintained free from drainage and storm water inflow and infiltration.

Halifax Water Rules and Regulations for Water, Wastewater and Stormwater Services:

64.(1) The Commission may from time to time undertake testing or inspections to identify and locate connections that convey stormwater into a wastewater facility.
(2) No person shall, without the prior written approval of the Commission connect, cause to be connected, or allow to remain connected to a wastewater facility or plumbing installation, any piping fixtures, sump pumps, downspouts, fittings appliances or like equipment or device in a manner which allows or may allow stormwater to ingress or flow into a wastewater facility.
(3) The Commission may direct a person to discharge stormwater to a stormwater system, a surface area or watercourse.
(6) The Commission may determine, in its discretion, that this Section does not apply to existing premises connected to an existing combined sewer system or to new premises intended to be connected to a combined sewer system, provided that those premises are not serviced or able to be serviced by a separate stormwater system.

Cleanouts Required

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 2 – (10) to (12) – Cleanouts Required [optional]

Town of Fort Erie Bylaw 68-06:

3.8.4 Inspection tees shall be installed in all private sewer laterals at the expense of the Owner as specified in Appendix "1" attached hereto, and shall be maintained in good order and accessible at all times, and free from drainage water inflow and ground water infiltration.

Entry and Testing

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 2 – (14) to (17) – Entry and Testing by City

City of Kingston Sewer bylaw 2008-192:

14.1 Inspection powers

The Operating Authority or any person designated by it as inspector for purposes of this by-law may, at reasonable times enter onto any land on which the City supplies sewer services for the following purposes:

a) to inspect, repair, alter, or disconnect the sewer lateral or storm sewer lateral, machinery, equipment and other works used to supply sewer services to the building or land;

b) to inspect, install, repair, replace or alter any related metering equipment;

c) to inspect the discharge of any matter into the sewage system of the City or into any other sewage system the contents of which ultimately empty into the municipal sewage system and may conduct tests, measure flow and take samples for this purpose; or

d) to investigate or determine if this by-law, an order, or condition to any permit or agreement is being complied with.

14.4 Entry on land – notice requirements

Whenever an inspector exercises a power of entry pursuant to this By-law, the inspector shall:

a) provide reasonable notice of the proposed entry to the occupier of the land by personal service or prepaid mail or by posting the notice on the land in a conspicuous place for three consecutive days prior to entry;

b) where the proposed entry is an inspection to determine compliance with this By-law the inspector must provide reasonable notice by means of personal service only;

c) in so far as is practicable, restore the land to its original condition where any damage is caused by the inspection; and

d) provide compensation for any damage caused and not remedied.

Halifax Water Rules and Regulations for Water, Wastewater and Stormwater Services:

61.(3) The Commission may require a wastewater or stormwater service connection to be inspected and brought into compliance with these regulations.

64.(1) The Commission may from time to time undertake testing or inspections to identify and locate connections that convey stormwater into a wastewater facility.

Town of Fort Erie Bylaw 68-06:

3.8.7 Every Owner shall, at all reasonable times and upon reasonable notice given and request made, allow and provide access to their building or premises to the Engineer for the purpose of conducting a compliance inspection and taking corrective action, and/or to carry out work, all as permitted under this Schedule, the Ontario Building Code, or the Municipal Act 2001.

3.9.1 The Engineer and/or Chief Building Official or any person duly authorized by the Corporation shall be allowed access to a building or premises, at all reasonable times, and upon reasonable notice given and request made to the Owner, Operator or Customer, for the purpose of inspecting, maintaining, repairing, disconnecting or reinstalling a sewer service connection or drainage service connection as permitted by this Schedule or by the Ontario Building Code or by the Municipal Act 2001.

City of Brantford Sewer System Regulation – Use:

ARTICLE 11 POWER OF ENTRY AND INSPECTION

11.1 The City may enter upon any part of a property at any reasonable time, to inspect the discharge of any substance into the sewage works or storm sewers and may conduct tests and take samples of the discharge.

11.2 The City's power of entry described in subsection 11.1 may be exercised by an employee, officer or agent of the City, including a municipal by-law enforcement officer.

11.5 When entering a property in accordance with articles 11 and 12 of this by-law the person exercising the power of entry shall provide identification to any person requesting identification during the course of the inspection and,

a) may be accompanied by a person or persons under his or her direction; and

b) shall not enter or remain in any room or place actually used as a dwelling unless one of the conditions set out in section 437 of the Municipal Act, 2001 are met.

11.6 When entering a property in accordance with articles 11 and 12 of this by-law the exercise of such powers shall be limited to reasonable times, unless an emergency situation requires otherwise.

11.7 For the purposes of an inspection to determine compliance with this by-law or any order issued under this by-law or to otherwise enforce this by-law a municipal by-law enforcement officer may,

a) access any drain pipe, interceptor, maintenance access hole, catch-basin or other discharge point connecting, directly or indirectly, to the sewage works or storm sewers, including by making or requiring necessary excavations;

b) make and record observations, such as by taking photographs, notes, video recordings and sound recordings;

c) require the production for inspection of documents or things relevant to the inspection;

d) require information from any person concerning a matter related to the inspection;

e) alone or in conjunction with a person possessing special or expert knowledge make examinations or take tests, samples or photographs necessary for the purposes of the inspection.

f) inspect and remove documents or things relevant to the inspection for the purpose of making copies or extracts; and

g) do such other things that are reasonably necessary for an enforcement officer to effectively carry out the inspection.

11.8 A demand by a municipal by-law enforcement officer to respond to reasonable inquiries under subsection 11.7 (e) or to produce documents under subsection 11.7 (f) may be made by telephone, letter or e-mail and such demand shall be deemed to be made in the course of an inspection.

11.9 No person shall refuse or neglect to give, produce or deliver any access, information, document or other thing that is requested by a municipal by-law enforcement officer carrying out an inspection.

11.10 No person shall hinder or obstruct or attempt to hinder or obstruct the City, its municipal by-law enforcement officers, employees or agents from carrying out any powers or duties under this by-law.

Require Fix of Defect

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 3 – (18) to (20) – Certificate Required – Identified Defect

City of Kingston Sewer bylaw 2008-192:

3.2 Maintenance of sewer lateral – Owner

Every Owner of a property to which sewer service is provided shall be responsible for the maintenance, repair, and replacement of the sewer lateral from the building to the property line. Any and all structural defects of a sewer lateral shall be repaired by the Owner of the property being serviced. Should the City become aware of any such structural defect, and upon written notification to the Owner, the said structural defect is not repaired within thirty (30) days of the date of the notification or within such time as the Operating Authority may deem necessary, then the City may turn off the municipal water supply to the property. If the City is ordered to restore the water supply, then the City may repair the structural defect in the sewer lateral pipe at the Owners expense. In so doing the City of Kingston shall only reinstate the property to a safe condition and all final restoration shall be the Owners responsibility. The City of Kingston shall not be held responsible for any damages to the Owners property arising from such work such as damage to root systems or other landscaping features located along the sewer lateral. If flushing or rodding of a sewer lateral is required to remove an obstruction located anywhere between the building and the sewer lateral stub, the Owner or occupier shall be solely responsible for the cost of removing the obstruction.

Town of Fort Erie Bylaw 68-06:

3.8.5 Should a leakage occur from a private sewer lateral or private sewage collection system, or from a sewage holding tank, or from a septic tank system or any other private sewage treatment system; the Owner shall be bound to take corrective action and to complete the repairs of the said leakage, at the Owner's expense, within seven (7) calendar days after being duly notified by the Corporation of such leak detected. In the event of non-compliance with this provision by the Owner, the Corporation may at its sole discretion exercised by the Engineer, discontinue the supply of water from the Water Works until the Owner has made the necessary repairs. All repairs are to be inspected and approved by the Chief Building Official prior to backfill.

City of Brantford Sewer System Regulation – Use:

ARTICLE 12 ORDERS

12.1 Where the General Manager has reason to believe that a contravention of this by-law has occurred, the General Manager may issue and serve an order requiring the person who has contravened the by-law or who has caused or permitted the contravention or the owner or occupier of the property on which contravention of the by-law occurred to discontinue the contravening activity.

12.2 Where the General Manager has reason to believe that a contravention of this by-law has occurred, the General Manager may make an order requiring the person who has contravened the by-law or who has caused or permitted the contravention or the owner or occupier of the property on which contravention of the by-law occurred to do work to correct the contravention.

12.3 Where a person is issued an order described under sections 12.1 and 12.2 and in the opinion of the City fails to do a matter or thing required by the order by the date specified in the order, the City may cause the matter or thing set out in the order to be done at the person's expense.

12.4 For the purpose of doing any matter or thing under section 12.3, employees of the City and any contractor, consultant or other person authorized by the City may enter upon the property referred to in the order at any reasonable time.

Require Inspection for Construction, Renovation or New Connection

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 3 – (21) to (23) – Certificate Required – Construction, Renovation or New Construction

District of North Vancouver bylaw 6656:

14. Re-Use of Existing Sewer Connections

All building permits of value greater than $150,000 will require a new sewer (sanitary) connection unless:

(a) the existing connection(s) is less than 30 years old;

(b) a current video inspection meeting MMCD or equivalent standards is undertaken by a qualified inspector and provided to the District; and

(c) the video inspection establishes to the satisfaction of the Director that the connection(s) is in good condition with no defects.

City of Surrey bylaw 16611, 2008:

39. When an application for a service connection accompanies a building permit with the construction value greater than $100,000 or where a parcel is being redeveloped, the following shall apply to the service connection and the building sanitary sewer:

(a) if the service connection and building sanitary sewer is less than 30 years old, the owner must provide a video inspection and recommendation for the City to review. The owner shall repair or replace the connection if the City determines that the connection is not adequate for service or has excessive damage;

(b) if either the service connection or the building sanitary sewer is 30 years old or older, a replacement or new service is required;

(c) all no-corrode, asbestos cement or clay service pipes of any age or condition shall be replaced;

(d) any shared service connections and building sanitary sewer shall be replaced; and

(e) all costs associated with the above are the responsibility of the owner.

The General Manager, Engineering may waive part of the above requirements if the General Manager, Engineering deems the cost of the replacement excessive.

Fees, Recovering Costs

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 5 – (51) – Fees

Town of Fort Erie Bylaw 68-06:

3.9 Compliance Inspections and Corrective Actions

3.9.2 Any costs incurred by the Corporation in conducting inspections and subsequent reporting or in effecting any corrective action, shall be payable to the Corporation by such Owner, Operator or Customer; and if not paid, the costs shall be added to the tax roll for

the property and collected in the same manner and with the same priority as municipal taxes.

Financial Assistance, Monetary Incentive

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 5 – (52) to (63) – Financial Assistance and/or Monetary Incentive for Voluntary Inspection and Repairs

City of Brantford Program (not in the bylaw – text from website):

Private Sanitary Sewer Lateral Replacement Grant Program
This is a financial assistance program for homeowners to help offset costs for the replacement of old sanitary sewer laterals on private property. This incentive program is being offered in the interest of helping homeowners prevent or reduce the occurrence of sewer blockages.

City of Windsor bylaw 4921 (n.b. the owner is responsible for the lateral to the main):

PART B – SEWER CONNECTION REPLACEMENT POLICY
1.REPLACEMENT
The City will provide a sewer replacement rebate for a complete sewer replacement calculated as follows:
1. Where there is a fronting Public Sewer that can be used in a complete sewer replacement, the City will provide a rebate being the lesser of the following:

(i) The amount set out in the City's Schedule of Fees, as amended from time to time. It is the intention of this provision that the City's Schedule of Fees will be the relevant rate,
(ii) Fifty Per Cent (50%) of the total cost of the complete replacement,
(iii) The unit cost (being the total cost divided by the total length) multiplied by the length of the replacement on the public highway.

Enforcement, Penalties

Sample Bylaw, Metro Vancouver (2011 Report, Appendix H):

PART 6 – (64) to (74) – Failure to Comply – Offence and Penalties

Halifax Water Rules and Regulations for Water, Wastewater and Stormwater Services:

Offences
79. Where the Commission believes that a person has contravened any provision of these regulations, it may commence proceedings by issuing a Summary Offence Ticket in accordance with the Nova Scotia Summary Proceedings Act.
Suspension or Refusal of Service
13.(3) In the event of a violation of these Regulations by a person or Customer, including liabilities and obligations owed to the Commission by any Customer under a private contract for services entered into between the Commission and such Customer, the Commission may refuse or immediately suspend service to such Customer, and may continue such refusal or suspension until the violation has been cured.

Town of Fort Erie Bylaw 68-06:

3.9 Compliance Inspections and Corrective Actions

3.9.3 Should any Owner or Operator or Customer of a service connection refuse entry to any authorized officer, inspector, employee or Agent of the Corporation for the purposes of any compliance inspection, maintenance, repair, disconnection or reinstallation and/or other corrective action, under the provisions of this Schedule or the Ontario Building Code, or the Municipal Act, 2001; the Corporation may, at its sole discretion exercised by the Engineer, on the provision of seven (7) calendar days notice, discontinue the supply of water to the Owner or Operator or Customer of the service connection until such required inspection and corrective action or required work has been completed to the satisfaction of the Corporation.

Appendix C – References and Links

All references in Appendix C have been updated in 2022.

Examples of smoke testing notices and procedures for Canadian municipalities:

City of Sarnia: Sanitary sewer smoke testing

City of Thunder Bay: Sewer smoke tests

Regional District of Nanaimo: Sewer Line Smoke Testing

Region of Peel: Sanitary sewer smoke testing

Township of Guelph: Sanitary Sewer Smoke Testing

Canadian references and links:

City of Brandon: 2021 Flood Protection Subsidy Program

City of Brantford: Water, Wastewater and Stormwater Master Servicing Plan Update – 2051 Amendment

City of Brantford: Private Sanitary Sewer Lateral Replacement

City of Cornwall: Sewers and Sewer Laterals

City of Charlottetown: Inflow Reduction Program

City of Halifax: Water By-Law

City of Halifax: Stormwater Inflow & Infiltration

City of Kingston: Grant program

City of Kingston: By-Law NO. 2008-192

City of Moncton: Backwater Valve Incentive Program

City of Windsor: Eeling Program

City of Windsor: By-Law Number 9-2019

Halton Region: Enhanced Basement Flooding Prevention Subsidy Program

Newfoundland & Labrador: Final Report Study on Identification and Characteristics of Sewer Overflows in Newfoundland and Labrador.

Niagara Falls: Avoiding Sewer Backups

Town of Fort Erie: By-Law NO. 68-06

York Region: Inflow / Infiltration Reduction Strategy: Industry Best in Class Review

York Region: Inflow / Infiltration Reduction Strategy

Kesik, T. (2015). Best Practices Guide: Management of inflow and infiltration in new urban developments. Institute for Catastrophic Loss Reduction. Available at: https://www.researchgate.net/publication/280558457_Best_Practices_Guide_Management_of_Inflow_and_Infiltration_in_New_Urban_Developments

Kovacs, P., Guilbault, S., & Sandink, D. (2014). Cities adapt to extreme rainfall; Celebrating local leadership. Institute for Catastrophic Loss Reduction. Avalable at: http://www.iclr.org/images/CITIES_ADAPT_DIGITAL_VERSION.compressed.pdf

Sandink, D. (2013). Urban flooding in Canada; Lot-side risk reduction through voluntary retrofit programs, code interpretation and by-laws. Available at: http://www.iclr.org/images/Urban_Flooding_in_Canada_-_ICLR_-_2013.pdf

US References and Links:

City of Berkeley, CA: Sanitary Sewer Program

City of Costa Mesa, CA: Sewer Inspection Rebate Program

City of Des Peres, MO: Lateral insurance program

City of Florissant, MO: Sewer Lateral Insurance Program

City of Glendale, MO: Sewer Lateral Repair Program

City of Laguna Beach, CA: Staff report

City of Portland, OR: Waste Discharge Permit

City of Portlan, OR: Private Sewer Connections – Article

City of Tacoma, WA: Required realtor package

City of Westlake, OH: Lessons learned during sewer rehabilitation on public and private property

King County, WA: http://www.kingcounty.gov/environment/wastewater/II.aspx

Milwaukee Metropolitan Sewerage District (MMSD): Municipal PP I&I Resource Page

San Francisco Public Utilities Commission, CA: Sewer Lateral Program Financial Plan