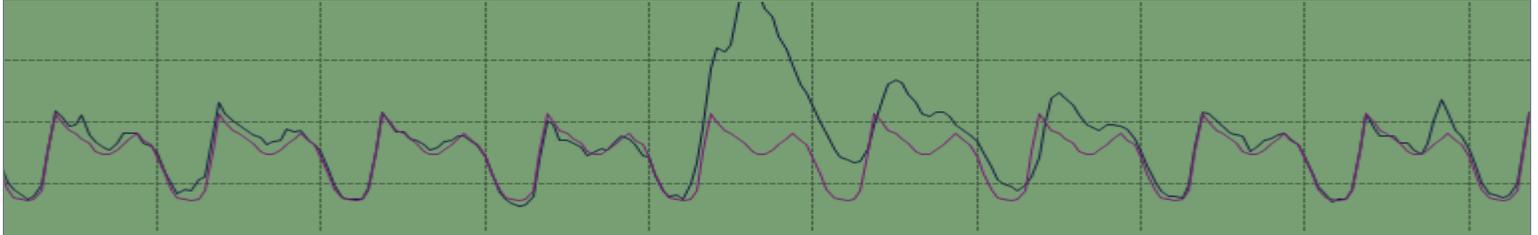


Core Area Inflow & Infiltration Program

Progress Report October 2008 - March 2010



The purpose of the Core Area Inflow and Infiltration Program is to work with the Core Area and West Shore municipalities to reduce the amount of rain and groundwater entering the sanitary sewer system in order to prevent overflows and minimize conveyance and treatment costs.

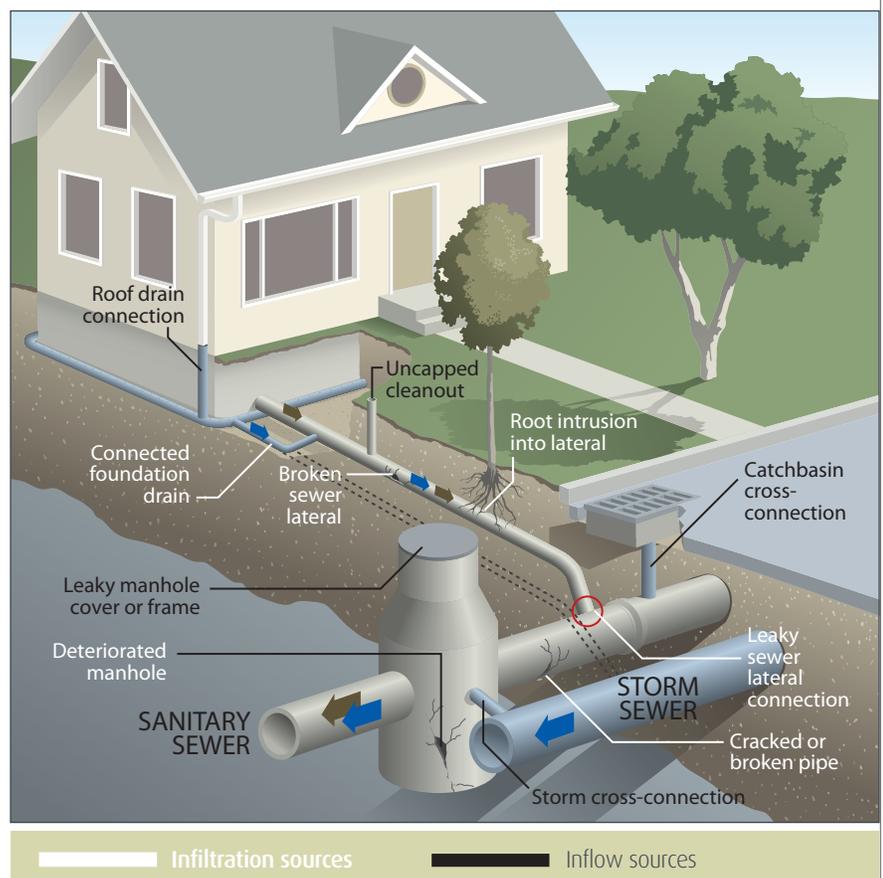
What is Inflow and Infiltration?

Inflow and infiltration (I&I) refers to rainwater and groundwater that enters the sanitary sewer through a variety of defects as shown in the picture to the right.

Inflow sources allow rainwater to enter the sanitary sewer through improper plumbing such as roof drain connections, catchbasin cross connections and holes in manhole covers.

Infiltration sources allow groundwater to seep into the sanitary sewer through cracks or bad joints in sewer pipes and manholes.

A certain amount of I&I is unavoidable and is accounted for in routine sewer design. However, when I&I exceeds design allowances, sewer capacity is consumed and may result in overflows, risks to health, damage to the environment and increased conveyance treatment and disposal costs.



Making a difference...together



Measuring sewer flow

Flow Monitoring

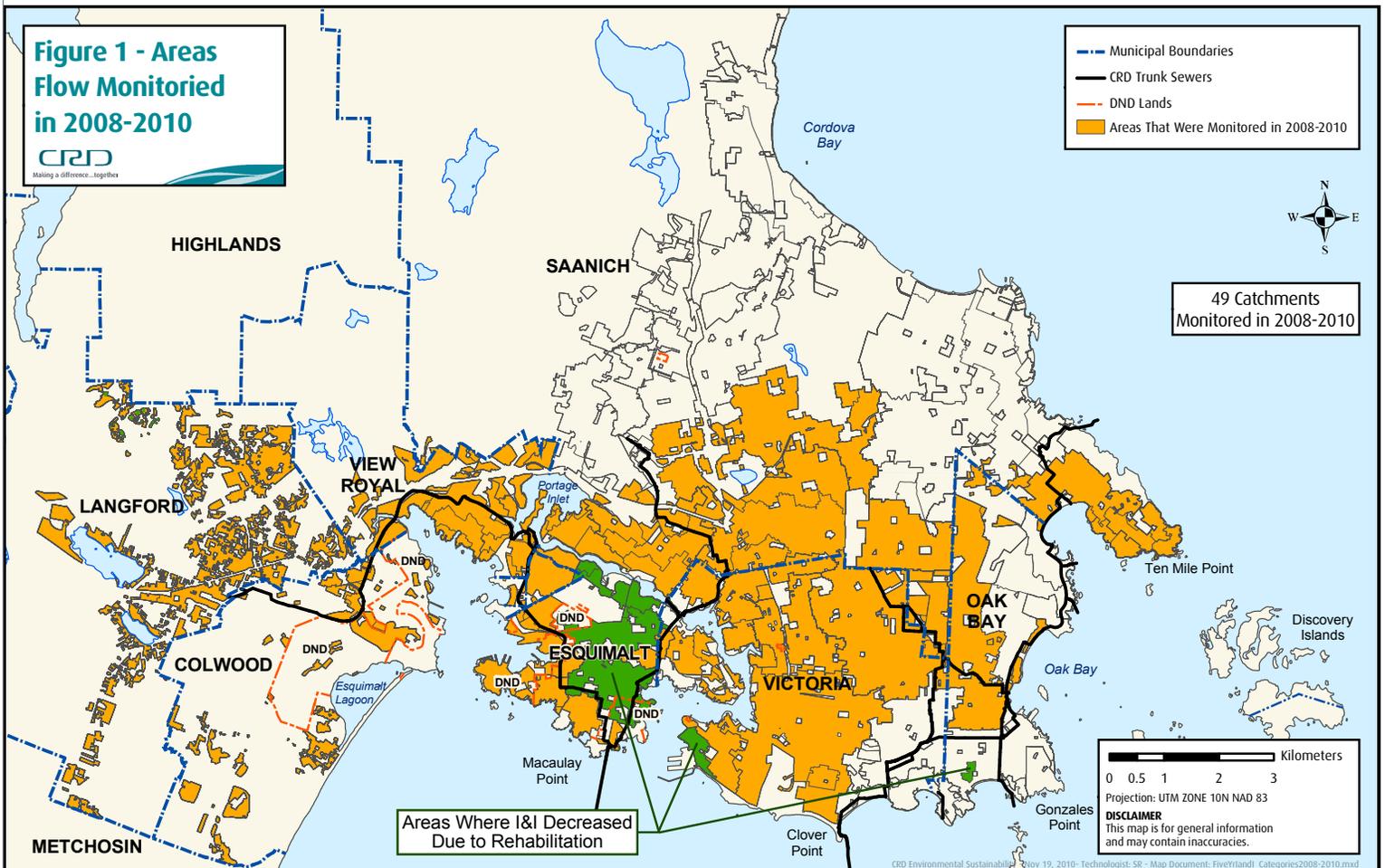
From October 2008 to March 2010, flow monitoring data was collected and analyzed for 49 catchments – the largest quantity of sites ever analyzed at any one time in the Core Area. Of the 49 sites, 15 were new locations and 34 were repeat locations. Upon analysis of the 34 repeat locations, the I&I rates went down at 35% of the sites, remained the same at 56% of the sites and increased at 9% of the sites.

Figure 1 provides an overview map showing which areas decreased due to rehabilitation work that has been completed, particularly in Esquimalt, James Bay, and a small catchment in Oak Bay.

Flow Monitoring Results

Figure 2 is a map summarizing the I&I results for all the areas flow was monitored over the past 10 years. The recent I&I results are documented in the Core Area Inflow and Infiltration Analysis Report for 2008-2010 which has been discussed at the I&I subcommittee and submitted to each municipality for their records.

Efforts are being made to increase the number of permanent flow monitoring locations within each municipality so that inflow and infiltration (I&I) data for those catchments can be tracked long-term.



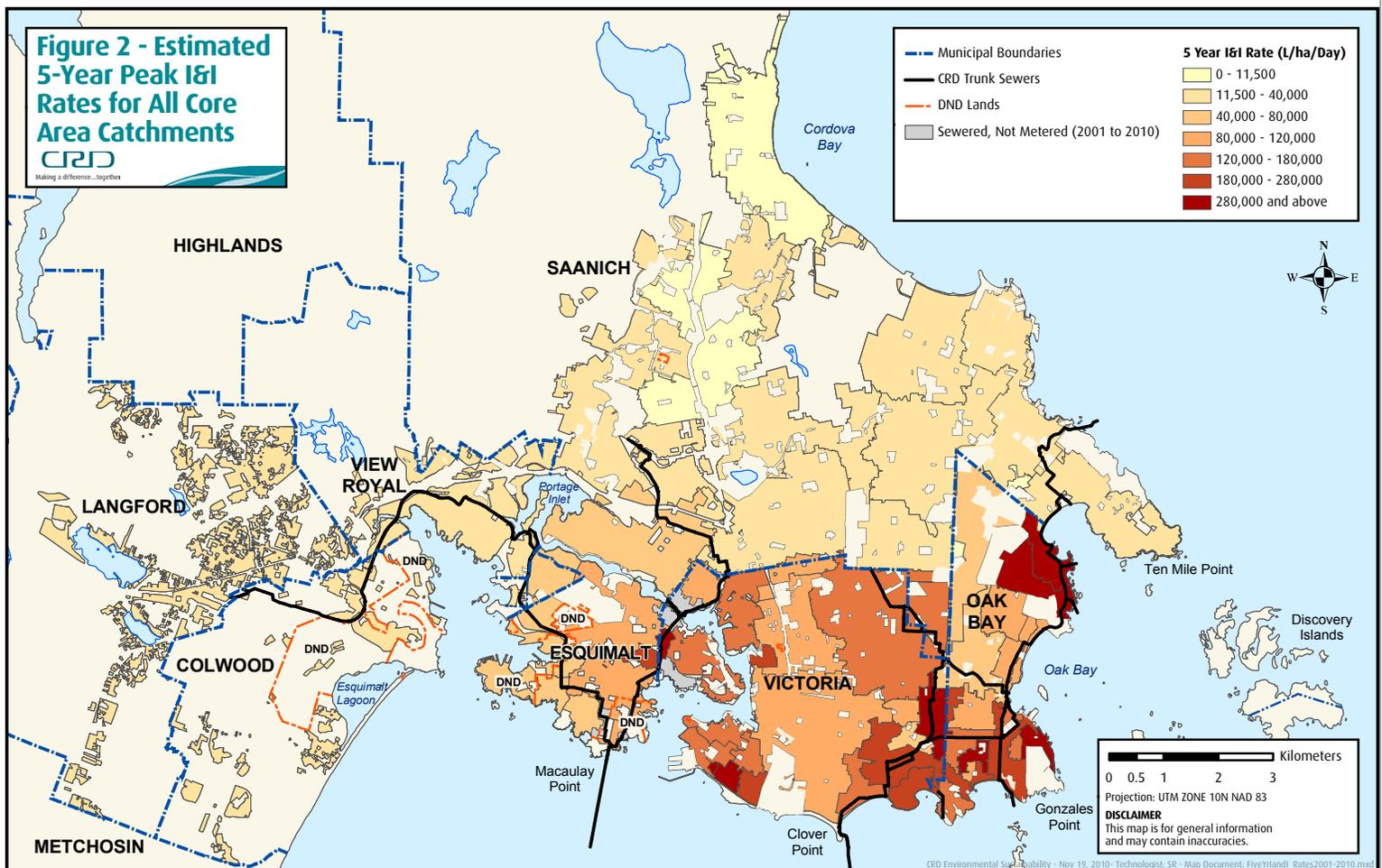
Inflow and Infiltration Rates

TABLE 1: Summary of Core Area Municipal Peak Five-Year I&I Rates

In Table 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. This table provides a performance measure benchmark for each municipality to track overall I&I trends, but should be interpreted with caution as it summarizes a vast amount of data into single municipal averages. For instance, one very high I&I sub-area could skew the overall municipal average, or one year of erratic weather and/or flow data could lead to inaccurate conclusions. 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.

Municipality	Estimated Five-Year Peak I&I Rate (L/ha/day)		
	2005/06	2006/08	2008/10
Colwood	40-45,000	40-45,000	40-45,000
including DND			
excluding DND	18-22,000	18-22,000	18-22,000
Esquimalt	95-110,000	100-115,000	85-90,000
excluding DND			
DND only	75-80,000	75-80,000	75-80,000
Langford	17-22,000	17-22,000	17-22,000
Oak Bay	110-120,000	110-120,000	110-120,000
Uplands	> 400,000	> 400,000	> 400,000
Saanich	18-22,000	18-22,000	18-22,000
Victoria	150-160,000	145-150,000	145-150,000
View Royal	18-22,000	20-25,000	20-25,000
First Nations	50-55,000	50-55,000	55-60,000

The five-year peak I&I rate for a new sewer is typically in the range of 10–20,000 L/ha/day.



Summary of I&I Accomplishments and/or Initiatives by each Core Area participant for this Report Period



Trent Pump Station

CRD

The entire length of the northwest trunk-northern (NWT-N) and east coast interceptor (ECI) gravity sewer systems have been video-inspected, cleaned, and spot-repaired where needed. Trent Pump Station was commissioned in 2008 and has successfully eliminated overflows into Bowker Creek.

Colwood

Colwood's sewers are relatively new and service only a small portion of the city. Most of the city's properties are on septic systems. Colwood focuses their efforts on inspection, maintenance and monitoring sewer flows. A few years ago, aging sewers in DND's Belmont Park catchment were rehabilitated resulting in about a 40% I&I reduction.



Maintenance crew entering sewer

Esquimalt

The \$6.75 million capital sewer upgrade program in Esquimalt is now complete, which included relining about 12 km of sewer mains, construction of 68 new manholes and upgrading of all 11 pump stations with new controls. Although this work was primarily targeted at fixing structural defects, I&I has also been reduced for the whole municipality by approximately 15%. I&I within specific rehabilitated areas has been reduced by about 50% (ie. the Head Street catchment area). In 2009, Esquimalt smoke tested its entire sewer system and is working to correct deficiencies. Esquimalt is embarking on a multi-year program to separate common manholes for the sanitary and storm collection systems. This program is scheduled to be concluded in 2015.



Smoke testing sewers to identify cross connections

Langford

Langford is a relatively young municipality and, therefore, I&I is not much of a problem. In 2008, five new pump stations were constructed or upgraded and approximately 12 km of new mains were installed. A

pilot rehabilitation area was completed a couple of years ago in the old Phelps subdivision, which resulted in an approximate 30% I&I reduction.

Oak Bay

A multi-year I&I reduction plan for a small catchment in the Windsor area has completed its third phase; sealing the mainline sewers (the previous phases included sealing manhole lids and manhole barrels). The final phase is to seal the private property laterals. Oak Bay has retained a consultant to measure the flows after each phase with the goal of determining the cost effectiveness of each type of upgrade.

Saanich

The I&I rates in Saanich are low and generally fall within traditional design allowances; Saanich is continuing to replace its older asbestos cement mains and service connections by about 1,000 metres and 100 laterals, respectively, per year. Flow monitoring will continue to track any potential I&I reduction resulting from this work. A couple of years ago, Saanich also commissioned its new Dysart Pump Station to eliminate overflows into Colquitz Creek.

Victoria

The City of Victoria has completed a \$3 million James Bay I&I reduction pilot project which studied differing approaches to I&I rehabilitation using a variety of trenchless technologies. Their consultant is currently finalizing the results from this work. Victoria is now preparing plans to rehabilitate some old sewers in the Fairfield area.

View Royal

A consultant has been retained by View Royal to assist with analyzing their pump station flow data to identify potential I&I areas of concern. View Royal has also upgraded its Midwood, View Royal, and Norquay Pump Stations to improve efficiency and redundancy to prevent potential overflows.



New manhole installation



Trenchless technology reduces the need to disturb roads, sidewalks or lawns when replacing or repairing sewers



Midwood Pump Station upgrades

Sanitary Sewer Overflows

Sanitary sewer overflows are releases of raw sewage into storm drains and/or local waterways. The majority of overflows are caused from excessive I&I during moderate to heavy rain when large volumes of rainwater leak into the sanitary sewer, exceeding its capacity and resulting in overflows.

The CRD monitors overflows at all of its facilities and is working with the municipalities to reduce and eventually eliminate overflows that occur during storm events that are less than a five-year intensity. Overflow sites are being prioritized for corrective action based on sensitivity of the receiving environment at each overflow point.

Significant accomplishments have already been achieved to eliminate overflows into “high” and “moderate” sensitive receiving environments. For example, since Trent Pump Station was commissioned in November 2008, overflows into Bowker Creek have been eliminated, whereas in previous years there were about 10 per year.

The graph below provides a yearly summary of the number of overflow hours into high, moderate, and low receiving environments along with the total annual rainfall. The number of overflows do tend to rise and fall in relation to the amount of rainfall, but the goal is to reduce the amount of overflows over time regardless of the rainfall levels. This requires an investment in rehabilitating old infrastructure to reduce I&I.

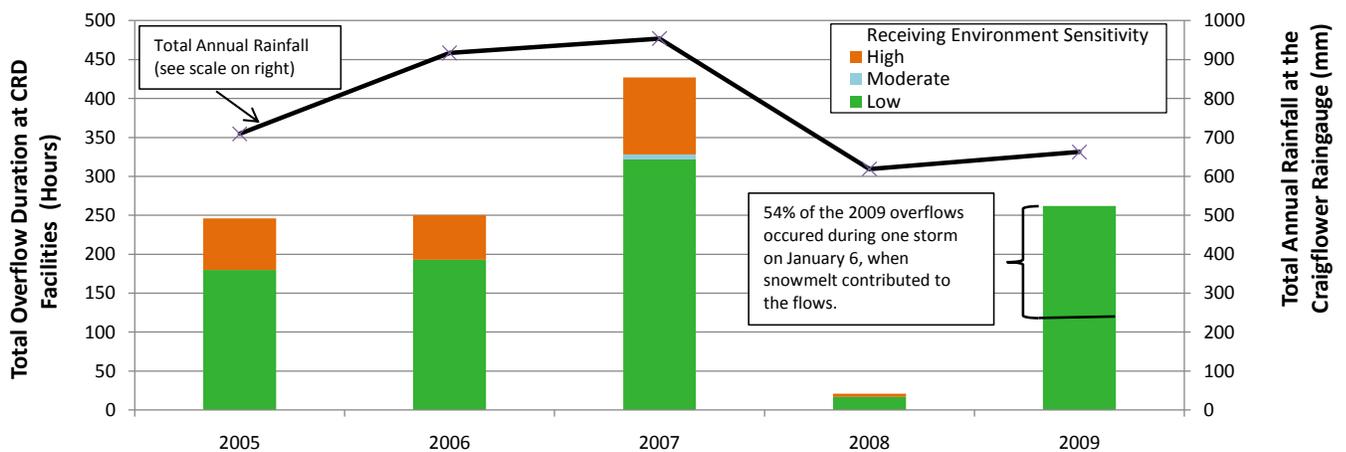


Sewage overflowing from manhole during a large storm



Clover Point Pump Station

Graphical Comparison of Rainfall vs. Overflows



For context: there are 525,600 hours in one year (500 hours of overflow ≈ 0.10%)

How the I&I Program Aligns with the Regional Strategic Priorities

The Inflow and infiltration program supports the following commitments as defined in the 2009-2011 CRD Strategic Plan:

- Ongoing reliable sewer service for the community
- Cost effective sewer repairs. (I&I programs help prioritize sewer repairs. It is much less expensive and disruptive to fix sewers before they collapse/fail).
- Compliance with regulations related to sewer overflows
- Dedication to sustainable infrastructure

The I&I Program provides technical services for:

- Municipalities and First Nations
- Sewer system design, maintenance and repair
- Treatment plant planning
- CRD programs such as Source Control, and Stormwater, Harbours and Watersheds

Did you know?

There are over 2100 km of sewer pipe in the Core Area of the CRD. Put end to end, this is long enough to go from Victoria to Winnipeg. 40% of this length is privately owned connections to the municipal sewer system.



Sewer cleaning



Broken pipe that needs replacing



Manhole repairs

Next Steps - 2010/2011

The main focus areas for the I&I program in 2010/2011 includes:

- Completing an I&I Management Plan and submitting it to the Province by the end of 2011
- Developing a private property I&I plan to be included as part of the I&I Management Plan
- Conducting outreach activities to increase awareness and receive feedback. Outreach will initially target residents of the Core Area and other key stakeholders
- Determining permanent flow monitoring catchment areas for ongoing tracking of I&I rates
- Ongoing monitoring of overflows and investigating options to measure overflow volumes
- Reviewing flow monitoring and rain gauge equipment to continually improve data quality and accuracy
- Working more closely with municipalities, other CRD programs, and wastewater treatment planning

