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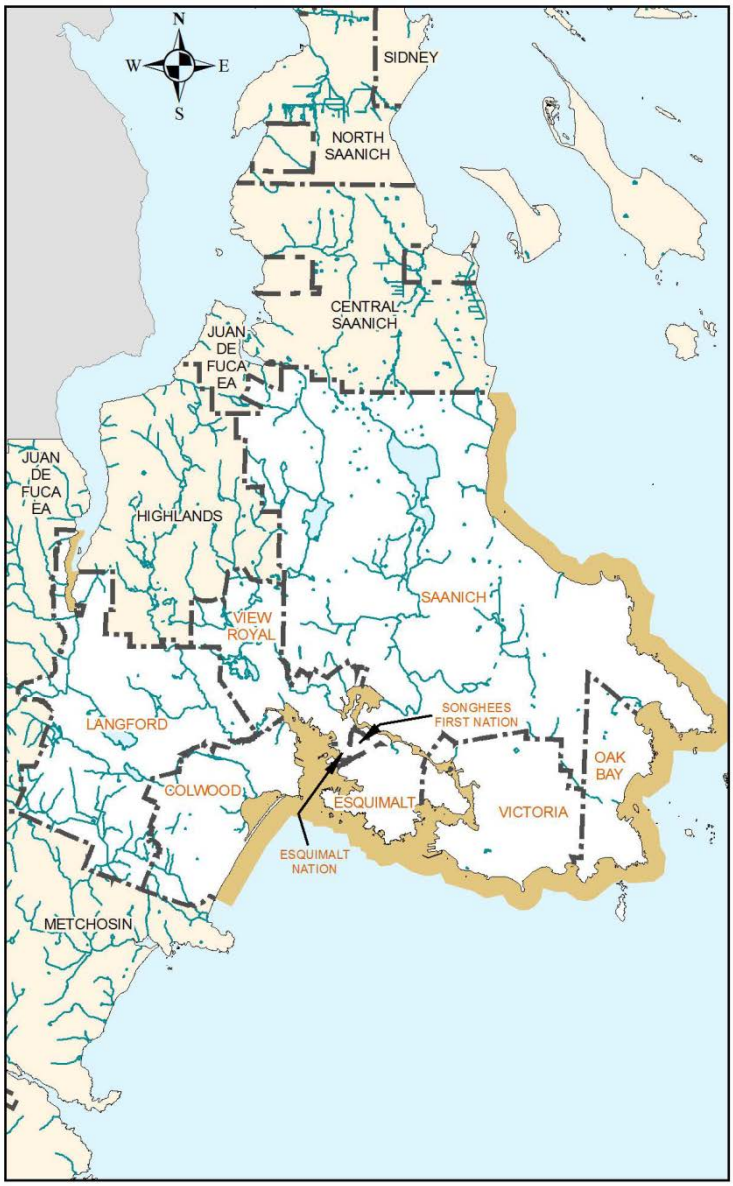
Core Area Stormwater Quality

2017 Annual Report

Parks & Environmental Services | Environmental Protection

Including the jurisdictions of:

City of Colwood
Township of Esquimalt
City of Langford
District of Oak Bay
District of Saanich
City of Victoria
Town of View Royal
Esquimalt First Nation
Songhees First Nation
Department of National Defence



Prepared by
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CORE AREA STORMWATER QUALITY PROGRAM
2017 ANNUAL REPORT

1.0 INTRODUCTION

The Capital Regional District (CRD) plans, promotes and coordinates stormwater quality initiatives. In the core area, this work is guided by the Core Area Liquid Waste Management Plan (LWMP) and done in consultation with the municipalities, First Nations, and community groups with the goal of protecting human health and the environment. The program works to identify and reduce contamination in stormwater, creeks and the ocean through monitoring, assessment, collaboration and education.

Program staff monitor stormwater, creeks and the ocean to identify contamination and impacts from stormwater due to various land use practices through bacterial and chemical sampling. The program assesses stormwater discharges and creeks in the core area and assigns priority ratings for mitigative action to be undertaken by the appropriate jurisdiction(s). Where contamination is found, CRD staff conduct investigations and work with municipal staff to find and eliminate the source.

This report summarizes the results of work completed by the program in 2017. Water and sediment quality data, including details about how the discharges were rated for public health and environmental concern and sampling locations, are available in the *Core Area Stormwater Quality Program 2017 Supplemental Data* on the CRD website (https://www.crd.bc.ca).

2.0 RESULTS AND DISCUSSION

2.1 Stormwater Discharge Evaluations

The program evaluates water and/or sediment quality in approximately 550 core area stormwater discharges from the coastline between the Colwood-Metchosin border in the west and the Saanich-Central Saanich border in the east, including Esquimalt Lagoon, Esquimalt and Victoria harbours, the Gorge, Portage Inlet and the City of Langford coastline along Saanich Inlet.

2.1.1 Public Health – *E. coli*

Each year, CRD staff collect water samples from a selection of stormwater discharges for measurement of bacteria levels. The extent of bacterial contamination, and the potential for members of the public to contact the discharge flow, is used to rate each discharge for public health concern. This allows jurisdictions to undertake remedial measures where they will have the most benefit. Appendix G contains detailed information about the CRD public health concern rating system.

In 2017, the CRD assessed 167 stormwater discharges for *E.coli* concentrations in the winter and the summer. Ninety-six of the discharges (58%) had 1 or more *E.coli* counts greater than 200 colony forming units (CFU)/100 mL), a level of contamination that indicates sources of sewage or animal waste with potential to cause adverse effects for public health from primary recreational activities (e.g., swimming, diving). However, many of these discharges have low flows or are located where there is little risk of contact. Considering the potential for public contact, CRD staff assigned the following public health concern ratings:

- 66 low ratings,
- 70 moderate ratings, and
- <u>31 high ratings</u> (Table B, Figures A and B).

Bacterial stormwater data and the public health concern ratings for each discharge can be found in appendices B and C, respectively.

There were 31 high-rated discharges in 2016 as well; however, many of these were different discharges, due to repair of some sources, identification of new sources and fluctuations in bacterial levels. The changes in discharge ratings from 2016 to 2017 are as follows:

- 8 of the previously high-rated discharges were assigned a lower rating,
- 1 previously high-rated discharge was not rated, as it was not accessible, and
- 9 previously low- or moderate-rated discharges were assigned a high rating (5 of these are newly-identified highs).

Improvements in stormwater quality have resulted in a decline in the number of high-rated discharges in recent years (Table A) despite the ongoing addition of new sources of contamination that come up as infrastructure ages and new developments or renovations create the potential for stormwater-sewage cross-connections.

In 2007, the number of high-rated discharges increased to 41, prompting municipal and CRD Integrated Watershed Management Program (IWMP) staff to concentrate efforts on decreasing bacterial concentrations in these discharges. In 2017, 17 of the 41 discharges were still high-rated, a 59% reduction in this subset since 2007.

2.1.2 Environment – Chemical Contaminants

CRD staff also rate stormwater discharges for environmental concern based on the level of metals and organic contaminants measured in sediment collected within the stormwater collection system (i.e., pipes, manholes, ditches and creeks) relative to marine sediment quality guidelines for protection of aquatic life. Discharges are sampled annually until the rating and contaminant(s) are confirmed. Once confirmed, a high rating results in an investigation to locate the sources of contamination. Appendix G contains detailed information about the CRD chemical contaminant rating system.

In 2017, the CRD collected 31 sediment samples (23 at the discharge and 8 upstream). Stormwater discharge sediment data and ratings can be found in Appendix E. Contaminant ratings for the 23 stormwater flows sampled at the point of discharge are as follows:

- 9 were assigned a low environmental concern rating,
- 8 were assigned a moderate rating, and
- 6 were assigned a high rating.(Table C, figures A and B)

Staff make recommendations for corrective action to find and eliminate sources of chemical contamination when the rating remains high for 2 years and the parameter(s) of concern are determined. Two discharges rated high in 2017 are not on the action list, as the contaminants have not been confirmed. In 2017, CRD recommends 18 discharges for corrective action in the core area (Table C and figures A and B).

The number of discharges recommended for action was reduced from 20 in 2016 to 18 in 2017. The CRD removed 3 discharges from the action list and added 1. Discharge (873A) was removed due to lower contaminant levels, while discharges 613A and 767 were removed as previous samples were marine-influenced, therefore, observed contamination may not have been originating from the land. Staff will continue to sample these discharges upstream of marine influence. Elevated mercury levels were confirmed in discharge 614 and it was recommended for action. City of Victoria staff removed contaminated sediment from an upstream catch basin in 2018 and CRD will continue to monitor the discharge.

Many discharges recommended for action have been a concern for more than 5 years. Sources of contaminants in stormwater sediment can be complex to find and eliminate, as sediment is not always present when sampling and contaminant levels fluctuate. In addition, non-point sources (e.g., from roadways, parking lots) and transient point sources (e.g., spills) exist. In some cases, sediment can remain for a long time, therefore, samples can reflect past practices that are no longer occurring.

Source control education has increased awareness of products used on commercial and private sites and contaminant levels leaving their properties. As well, the use and maintenance of stormwater rehabilitation units continues to increase. The CRD and municipalities will continue to work together to identify and eliminate potential sources of contamination for these discharges.

Table A. Number of Discharges with a High Public Health Concern Rating from 1993 to 2017

Area	1993	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2011	2012	2013	2014	2015	2016	2017
Colwood	0	2	2	1	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0
View Royal	1	0	0	0	0	0	0	0	0	1	0	1	2	1	1	1	0	0	0	0	0
Esquimalt	12	10	9	9	9	6	6	5	5	5	5	7	7	8	7	7	8	7	5	6	6
Esquimalt private[1]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	1	0	2
DND	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saanich	6	2	1	2	1	0	2	2	1	0	4	1	1	2	2	3	4	5	5	6	4
Saanich private[1]	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0	0	0	0	0	0
Victoria	22	17	12	10	9	11	13	9	8	13	14	14	15	15	20	17	13	12	14	11	11
Victoria private[1]	*	*	*	*	*	*	*	*	*	*	*	2	3	5	3	1	1	2	2	2	2
Oak Bay	8	7	3	4	3	4	5	6	8	6	5	9	9	10	9	9	7	9	8	6	6
Langford	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**49**	**38**	**28**	**28**	**23**	**22**	**27**	**22**	**23**	**26**	**28**	**34**	**37**	**41**	**43**	**38**	**33**	**36**	**35**	**31**	**31**

Notes:

[1] Discharges that are not part of the municipal infrastructure are not under municipal jurisdiction and are separated out from the municipal totals.

* Private discharges included in the municipal totals.

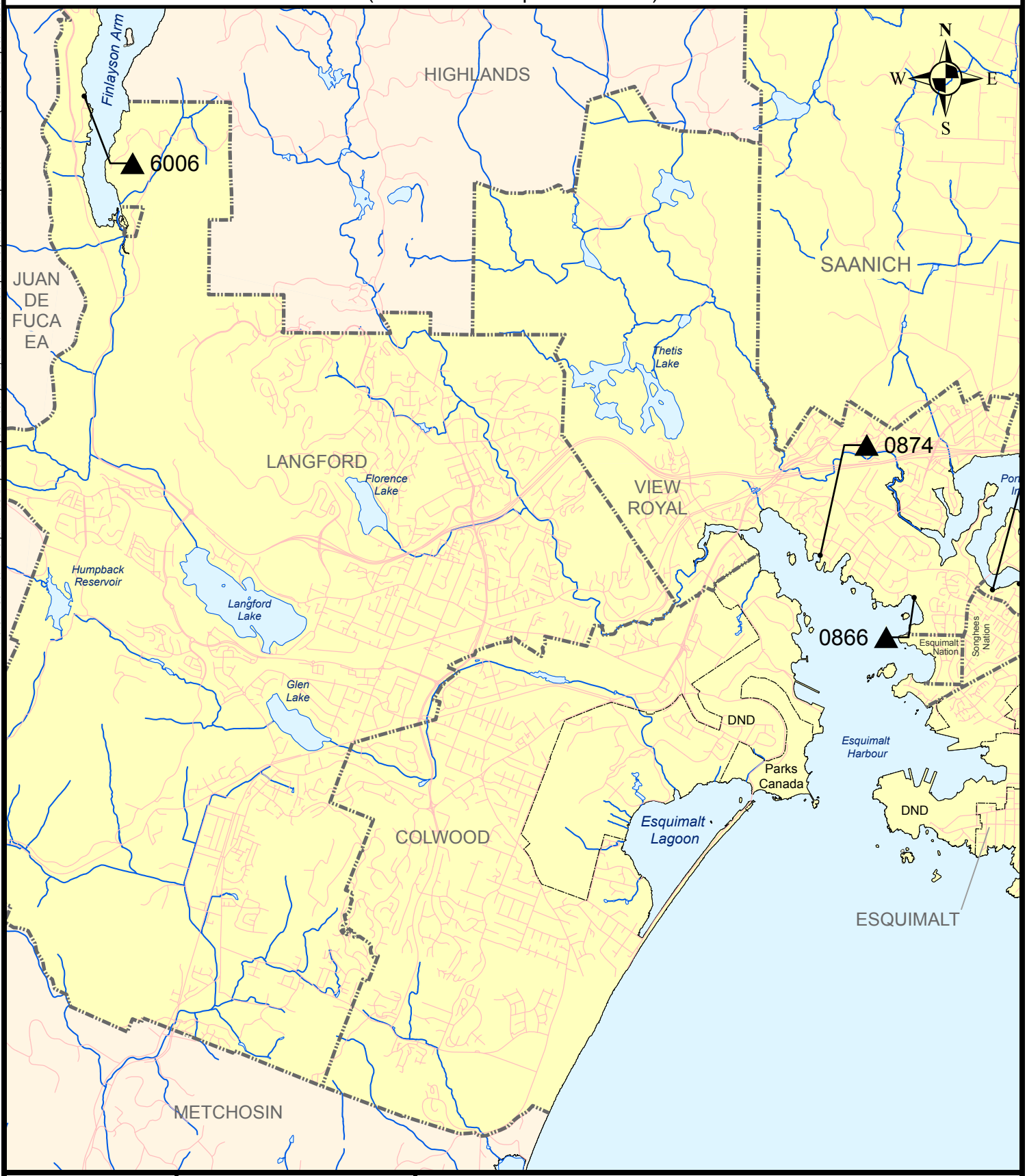
Table B. Discharges Rated High for Public Health Concern in 2017

Jurisdiction	CRD Discharge Number
City of Colwood	---
Township of Esquimalt	726, 727, 744B, 780, 805, 806
Township of Esquimalt – private[1]	736A, 749A
City of Langford	---
District of Oak Bay	245, 310A, 318, 319, 320, 322
District of Saanich	503, 505, 559, 653
City of Victoria	214, 216, 222, 229, 230, 611, 613, 619, 622, 758A, 777A
City of Victoria – private[1]	645A, 649
Town of View Royal	---
Esquimalt First Nation	---
Songhees First Nation	---
DND	---

Notes:

[1] Discharges that are not part of the municipal infrastructure are not under municipal jurisdiction

Figure A - Core Area 2017
Stormwater Discharges Requiring Action for Public Health and Environmental Concerns (Metchosin to Esquimalt Border)



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Kilometres
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Projection: UTM ZONE 10N NAD 83

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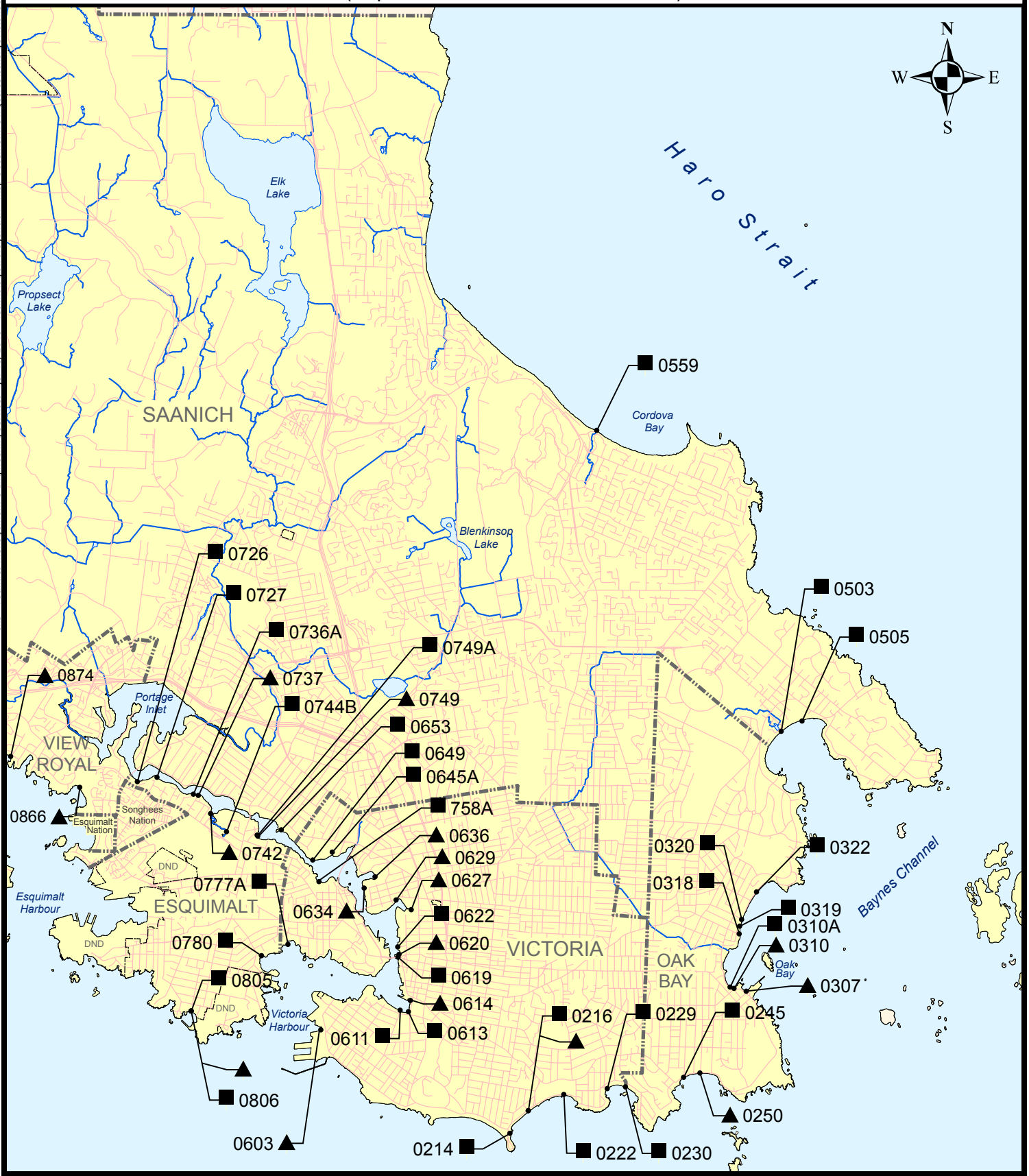
Discharges Requiring Action
- High Public Health Rating
- High Environmental Rating and/or Recommended for Action

- Municipal Boundaries
- DND Boundaries
- Streams and Rivers
- Roads
- Stormwater Monitoring Area

CRD - Facilities Management & Engineering Services - Jul 18, 2018 - Technologist: srulliancich - Map Document: SWQCoreDischargeColwoodConcern2017.mxd

Figure B - Core Area 2017

Stormwater Discharges Requiring Action for Public Health and Environmental Concerns
(Esquimalt to Central Saanich Border)



CRD - Facilities Management & Engineering Services - Jul 18, 2018 - Technologist: srujiancich - Map Document: SWQCoreDischargeVictoriaConcern2017.mxd

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Discharges Requiring Action

- ■ High Public Health Rating
- ▲ High Environmental Rating and/or Recommended for Action

- Municipal Boundaries
- DND Boundaries
- Streams and Rivers
- Roads
- Stormwater Monitoring Area

Table C. Discharges Recommended for Action Due to Elevated Chemical Contaminant Levels

Jurisdiction	Discharges Recommended for Corrective Action	Total
City of Colwood	-	0
Township of Esquimalt	737, 742, 749, 806	4
Township of Esquimalt – private[1]	-	0
City of Langford	6006	1
District of Oak Bay	250, 307, 310	3
District of Saanich	-	0
District of Saanich – private[1]	-	-
City of Victoria	216, 603, 614, 620, 627, 629, 634, 636	8
City of Victoria – private[1]	-	0
Town of View Royal	866, 874	2
DND	-	0
Total		**18**

Notes:

[1] Discharges that drain from private property do not fall under municipal jurisdiction.

[2] Other discharges were assigned high ratings in 2017 (306, 505) but further testing must be done to confirm the results.

3.0 SOURCE INVESTIGATIONS

The program conducted source investigations in the catchment areas of 17 stormwater discharges for bacterial contaminant sampling and 4 discharges for chemical contaminant sampling.

3.1 Bacterial Investigations

In 2017, staff conducted source investigations in 17 stormwater discharge catchment areas. Esquimalt and CRD staff identified a cross-connection in the Gorge Creek catchment and it was repaired shortly afterwards. CRD staff narrowed down a source of bacteria in Plumper Bay and is working with Songhees First Nation and the First Nations Health Authority to determine the source and facilitate repairs. CRD staff have narrowed down 3 additional sources, but the results need to be confirmed. Investigations are ongoing in 13 discharges, due to presence of multiple sources, lower fecal coliform counts or lack of flows to sample in 2017. The status of bacterial investigations completed by CRD staff in 2017 is summarized in Table D.

Table D. 2017 Summary of Stormwater Fecal Coliform Source Investigations by IWMP staff

Discharge	Municipality	BST Results	Sampling Events	Status
222	Victoria	Human, ruminants, dog, general	1	Ongoing
229	Victoria	Human, ruminant, general	1	Ongoing
244	Oak Bay	Human, ruminant, general, potential dog	1	Ongoing
307	Oak Bay	Human, ruminant, dog, general	1	Ongoing
316	Oak Bay	Not tested	1	Ongoing
505	Saanich	Human, ruminant animal, general (2015)	1	Ongoing, counts low upstream in 2017; Saanich **repaired** a cross-connection in 2015.
559	Saanich	Human, dog, general	1	Ongoing; Douglas Creek
629	Victoria	Ruminants and general	1	Ongoing, CRD narrowed down 1 source but needs confirmation.
634	Victoria	Ruminants, dog, gull, general, potential human	1	Ongoing
636	Victoria	Human, ruminants, dog, gull general	1	Ongoing, CRD is narrowing down 2 sources flowing into a manhole at Hillside Avenue and Bridge Street, but needs confirmation.
690D-11		Not tested	1	Ongoing
742	Esquimalt	Human and general	1	Ongoing
744	Esquimalt	Human, ruminants, general	1	Source found with Esquimalt staff and **repaired**; other sources exist.
736A	Esquimalt	Human and ruminant animal	4	Ongoing, another source exists; CRD dye-tested all properties in the strata; source unknown. CRD identified a cross-connection and it was **repaired** in 2016.
Plumper Bay 865C 865D 865AB	Esquimalt First Nation and Songhees First Nation	865C: gull and general 865D: bacteria too low at time of testing 865AB: human and general 2 marine samples; counts too low in 1 and dog, gull and general in another	4	Source **narrowed**, others sources may exist. CRD will continue monitoring once source is repaired.

Notes:
BST = Bacterial Source Tracking; genetic analysis to determine the source of stormwater bacteria
General bacteria are those for which a specific marker is not available; for example, there is no marker for ducks

3.2 Chemical Contaminant Investigations

In 2017, IWMP staff conducted chemical contaminant source investigations in sediment from 4 discharge catchment areas. Results from 2 of these discharges confirmed the location of sources of previously found contamination and results have been shared with municipal staff. In 2017, Oak Bay removed contaminated sediment from 2 manholes with sources of contamination and staff will continue to monitor this discharge. Overall, CRD staff have narrowed down sources in 10 of the 18 catchments on the action list and continue to work with municipal staff on eliminating or lessening these sources.

4.0 MARINE SURFACE WATER MONITORING

In 2018, CRD staff will conduct water sampling in Esquimalt Lagoon, Esquimalt and Victoria harbours, and the Gorge and Portage Inlet for bacteria, metals and dissolved oxygen levels to see if water quality has changed over time (the last sampling event was in 2011 and 2012) and to compare these values with the BC Ministry of Environment and Climate Change Strategy (MOE) draft site-specific water quality objectives for these waters.

5.0 MAJOR WATERCOURSE MONITORING

CRD staff continued to monitor Bee, Bowker, Cecelia, Colquitz, Colwood, Craigflower, Douglas, Hospital, Noble, Selleck and Tod creeks, and Mill Stream in 2017 to provide information about watershed health.

Each year, staff collect water quality data twice at the discharge of each creek, providing a snapshot of creek health in the wet and dry seasons but conduct more comprehensive watershed health assessments in 2-3 core area watercourses with the goal to assess each watercourse in this manner every 5 years.

In 2017, Colquitz, Colwood and Tod creeks were assessed more extensively, including measuring water quality 5 times in 30 days in summer and fall at various locations in the watershed and undertaking a health assessment of the benthic invertebrate animals living in the creeks. Additional water quality parameters, including metals, were measured as well. Sampling 5 times in 30 days allows for comparison to British Columbia water quality guidelines.

5.1 Water Quality Data

Colquitz Creek water quality data indicated that aluminum, copper, iron, zinc, phosphorus, and suspended solids were at concentrations that could result in adverse effects on aquatic life. Bacteria were also elevated indicating sewage presence in the creek. Water quality was particularly poor when samples were taken while it was raining.

Water quality in Colwood Creek was good at the mouth of the creek, but poorer upstream in 2017. With the exception of phosphorus and *E.coli*, no water quality parameters exceeded water quality guidelines for protection of aquatic life at the mouth. A number of water quality parameters were outside guidelines just downstream of Sooke Road, at Hagel Road and just downstream of Glen Lake, including metals (copper, chromium, iron and zinc), dissolved oxygen, turbidity and suspended solids, phosphorus, pH and *E.coli*. Exceedances of guidelines coincided with heavy rainfall. In addition, poor site water management on a construction site just downstream of Glen Lake impacted water quality for approximately 3 weeks in the fall.

Extensive sampling in Tod Creek indicated that the mouth of the creek was healthy (with very few exceedances of water quality guidelines), but upstream sites, particularly near Farmington Road, were unlikely to be able to support aquatic life. Dissolved oxygen levels were below guidelines for protection of aquatic life (averages were 1.4 and 3.5 mg/L in summer and fall). Staff also measured elevated phosphorus, turbidity, iron and zinc.

CRD data indicate that the water quality parameters of most concern in core area creeks are bacteria, phosphorus, turbidity and metals. Some sites also experience low dissolved oxygen and elevated temperature in the summers. This is consistent with what is seen throughout the region wherever there is

increased human presence. The draft Vancouver Island phosphorus objective was exceeded in all CRD creeks due to human and animal presence in these watersheds.

Overall, creek water quality was similar to last year: poor in Bowker and Cecelia creeks; moderate in Bee, Colquitz, Colwood, Douglas, Hospital, Noble and Selleck creeks; and good in Craigflower Creek, Mill Stream and Goldstream River. Before 2017, CRD only monitored the mouth of Tod Creek as part of the Saanich Peninsula sampling program and found water quality to be generally good. Extensive sampling in 2017 confirmed that the creek mouth is still healthy, but identified poor water quality upstream.

Water quality is important in these creeks, but hydrological changes and physical alteration are also a concern. Therefore, benthic invertebrate community data and hydrological data are also collected.

5.2 Benthic Invertebrate Community Data

Benthic invertebrates live in or on the bottom of streams and are good indicators of stream health. Their community composition reflects the overall condition of the aquatic environment and depends on water and sediment quality, as well as hydrology.

CRD data indicate that the benthic invertebrate communities in Colwood Creek and Mill Stream (at the discharge) are healthy based on their similarity to invertebrate communities in minimally-impacted Vancouver Island creeks. Benthic invertebrate community data from downstream locations in Bee, Bowker, Cecelia and Colquitz creeks, and at Treanor Road in Mill Stream, indicate that these communities are not healthy and it is recommended that upstream activities impacting the watershed be identified and managed.

The Hilsenhoff Biotic Index indicates the amount of organic and nutrient pollution in a stream based on species distribution and their tolerance to such pollution. Mill Steam was deemed “Very Good” with slight organic pollution probable. Colwood, Colquitz (downstream of Elk Lake), Craigflower, Douglas, Mill Stream (at Treanor Road) and Tod creeks were deemed “Good” with some organic pollution likely; Colquitz, Bee and Cecelia creeks were deemed “Fair” with fairly substantial pollution likely; and Bowker was deemed “Fairly Poor” with substantial pollution likely. A slight degradation of the Hilsenhoff Biotic Index in Colwood Creek in 2012 (4.38) compared to 2017 (4.80), suggests that pollution may be increasing in the creek and further study is warranted.

6.0 SPECIAL PROJECTS AND OTHER ACTIVITIES

CRD staff are involved with a number of special projects and activities to improve stormwater quality in the region and promote healthy, livable watersheds and their receiving environments. Some initiatives that were carried out to reduce stormwater pollution and related activities included:

- Implementing an integrated watershed management approach to work in partnership with municipalities and the community to protect watersheds as regional assets rather than working at the individual local government scale.
- Coordinating a Community Integrated Watershed Management Group to allow CRD staff and other watershed stewards to communicate with each other about watershed activities, ideas and research.
- Promoting stormwater source control through development of model bylaws, codes of practice, best management practices, educational outreach and technical assistance.
- Assisting the MOE in the development of water quality objectives in core area harbours and streams.
- Overseeing initiatives to improve and protect the environmental quality of core area watersheds and harbours, in cooperation with community and municipal groups through the Esquimalt Lagoon Stewardship Initiative, Gorge Waterway Initiative and Bowker Creek Initiative.
- Participating in community outreach events and hosting educational workshops.

7.0 2018 PROGRAM

The program will continue to work with municipal partners, First Nations and community groups to achieve LWMP goals to identify stormwater discharges of public health and environmental concern and investigate the sources of contamination. Staff will continue to collaborate with Island Health on public beach safety through sampling, communication and assistance in developing public notice messaging.

8.0 CONCLUSIONS

In 2017, CRD staff assessed water and sediment quality in stormwater discharges and creeks to identify and reduce contamination, assess watershed health and develop priority ratings to allow the appropriate jurisdictions to deal with contamination of most concern to public health and the environment. In 2017, the majority of stormwater discharges were assigned low or moderate ratings for public health and environmental concerns.

CRD and municipal staff efforts have resulted in a decrease in the number of high-rated discharges over time. In 2017, 31 stormwater discharges are high-rated for public health concern, a decrease from 43 in 2011. However, as improvements to stormwater quality have been made, new contaminant sources come up as infrastructure ages and development and renovations create the potential for stormwater-sewage cross connections. Eight of the 2016 high-rated discharges received a lower rating in 2017, yet, 5 new high-rated discharges were discovered.

Six stormwater discharges received high environmental concern ratings in 2017. Four of these and 14 others have been previously rated high for environmental concern and are recommended for corrective action. CRD staff have narrowed down sources in 10 of the 18 stormwater catchments, however, sources can be complex to find and eliminate. Many of these discharges have been of high concern for more than 5 years.

CRD staff assess watershed health in 12 creeks (through water quality and flow measurements and benthic invertebrate community assessment). In 2017, Tod, Colwood and Colquitz creeks were intensively sampled. CRD data indicate bacteria, phosphorus, turbidity and metals are the parameters of most concern in CRD creeks. Overall, creek water quality was similar to last year: poor in Bowker and Cecelia creeks; moderate in Bee, Colquitz, Colwood, Douglas, Hospital, Noble and Selleck creeks; and good in Craigflower Creek, Mill Stream and Goldstream River.

In 2018, staff will continue to work together with CRD municipalities, First Nations and others to identify and reduce bacteria and contaminant levels in stormwater discharges, creeks and the marine receiving environment.