

INTRODUCTION

The Capital Regional District (CRD), in cooperation with municipalities, First Nations and community groups, works to identify and reduce contamination in stormwater, creeks and the ocean. CRD staff accomplish this through environmental monitoring, assessment, collaboration and education. The work meets Liquid Waste Management Plan (LWMP) commitments, addresses public concerns, monitors watershed health and prioritizes areas of concern for CRD's municipal partners and others.

As part of this work, CRD staff monitor stormwater discharges and creeks to identify contamination and impacts from stormwater, due to various land use practices. Staff assess approximately 300 stormwater discharges on the Saanich Peninsula and assign priority ratings for mitigative action by the appropriate jurisdiction.

This report summarizes the results of work completed in 2018. Staff conducted routine monitoring, assessed creek health in Tén Tén Creek, and conducted marine and upstream sampling in Brentwood Bay with a focus on identifying sources of contamination in 2018. Data, sampling locations and details about how the discharges are rated for public health and environmental concern are available in Appendices A through G.

Regulatory Background

The CRD created the stormwater quality monitoring service to meet commitments in the Saanich Peninsula Liquid Waste Management Plan (SPLWMP, CRD, 1996). CRD commitments regarding stormwater quality and management are to:

1. *plan, promote and co-ordinate a program for management of stormwater quality and surface water resources in cooperation with the participating municipalities, communities and local governments to:*
 - a. *limit the impacts of stormwater runoff on the environment and public health and well being*
 - b. *protect freshwater and near-shore marine ecosystems and resources*
2. *promote education about water quality issues and to develop educational material*

Municipalities have authority over stormwater under the *Community Charter*. In the LWMP, participating municipalities make the following commitments:

1. *to act on priorities within their jurisdiction to protect stormwater quality, the physical environment and aquatic habitat, and to reduce the levels of contaminants in stormwater discharges to accepted government standards in watercourses and near-shore marine areas*
2. *to use resources available to municipal governments to achieve these reductions*
3. *to amend bylaws, as necessary, to ensure that new development takes place in accordance with appropriate best management practices*

PUBLIC HEALTH

Public Health Concern Ratings

Staff prioritize stormwater discharges annually to meet LWMP commitments and support local governments in directing funds to where they will have the greatest benefit. Staff prioritize discharges through public health concern ratings based on the level of bacteria in the discharge and the potential for public contact.

Staff evaluated 90 stormwater discharges in 2018 and **identified eight high-rated discharges for public health concern** (Table A; Figure A). Twenty-five discharges were assigned a moderate public health concern rating, and the remaining 57 were assigned a low rating. A summary of the ratings is in Appendix C.

Figure A presents high-rated discharges on the Saanich Peninsula, the majority of which are in North Saanich. CRD investigations indicate that malfunctioning on-site sewage treatment systems or agricultural practices are the source of bacteria leading to high ratings in North Saanich. Intermittently elevated bacterial counts in Reay Creek are likely due to birds or other wildlife, but more investigation is required. Two high-rated discharges are in Sidney and investigations indicate that there are multiple sources of sewage infiltrating into the aging stormwater infrastructure. Staff discovered a new high-rated discharge in Brentwood Bay in 2018. The source is unknown but is likely due to damaged infrastructure or a sewage-stormwater cross-connection.

Public Health Concern Rating Methods

Staff collect a water sample from selected discharges in the wet and dry seasons for laboratory analysis of *E.coli*. During the visit, staff record the discharge flow, weather, animal presence, etc. Staff then assign a public health concern rating based on the level of bacteria and the potential for public contact. A summary of the CRD rating system is in Appendix G.

As an example, CRD assigns discharges a high public health concern rating if the *E.coli* counts are over 200 CFU/100 mL on a shoreline used by the public for swimming or diving, or greater than 5,000 CFU/100 mL on a shoreline used by the public for boating (e.g., kayaking or paddle-boarding) close to the shore.

A subset of the roughly 300 discharges are assessed each year, including discharges assigned a high and moderate public health concern rating in the previous year, as well as a selection of the low-rated discharges to monitor for change. Staff attempt to visit low-rated discharges every five years.

Ratings over Time

The number of high-rated discharges increased in 2018, due to the discovery of a new contaminated discharge and measurement of high bacterial counts in a previously high-rated discharge with fluctuating bacterial levels (Table A).

Four of the high-rated discharges have been of concern for a number of years. Contaminant sources are challenging to find, difficult to repair, or are the result of agricultural practices. Two of the discharges (3118 and 3078A) drain areas that use on-site sewage treatment, and investigations over many years, indicate multiple sources. Tseycum Creek (3095) has been rated high for more than 10 years, due to agricultural practices upstream. The fourth discharge is in Sidney (447) where there are multiple small sources, likely due to damaged infrastructure. CRD staff continue to make source identification a priority in 2019.

Table A. Number of Discharges Rated High for Public Health Concern over Time

Jurisdiction	Number of Discharges Rated High														
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Central Saanich	2	0	1	1	1	1	2	2	1	1	1	0	0	1	
North Saanich	10	7	2	5	5	6	4	4	4	3	3	3	4	4	
Sidney	3	4	6	5	5	4	5	4	5	6	3	2	1	2	
Pauquachin First Nation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tsartlip First Nation	0	0	0	0	0	0	0	1	1	0	0	0	0	0	
Tsawout First Nation	0	1	1	0	1	0	0	1	0	0	0	0	0	0	
Tseycum First Nation	1	0	1	1	1	1	1	1	1	1	1	1	1	1	
Total	16	12	11	12	13	12	12	13	12	11	8	6	6	8	

Near-shore Marine Sampling

Brentwood Bay

Island Health Authority (IHA) posted beach advisories at two locations in Brentwood Bay (adjacent to Clarke Avenue and Stelly's Cross Road) intermittently throughout the summer of 2018, due to elevated bacterial counts (above Health Canada's primary recreation maximum guideline of 70 CFU/100 mL for enterococci). Working with IHA and Central Saanich staff, CRD staff investigated possible stormwater sources and measured the extent of bacterial contamination along the shoreline.

CRD Stormwater Data

Previous CRD data indicated that stormwater discharges along Brentwood Bay typically have low to moderate bacterial counts. Many of the stormwater discharges are dry in summer. A summary of the stormwater discharges of potential concern in Brentwood Bay is in Table B.

Table B. Summary of Stormwater Discharges Investigated as Possible Sources of Contamination in Brentwood Bay in 2018

Stormwater Discharge #	Shoreline Jurisdiction	Comments	Next Steps
3142	Central Saanich	Potential sewer cross-connection	Central Saanich to investigate
3150	Central Saanich	New source of elevated bacteria	CRD to start investigations
3145	Central Saanich	Mostly low bacterial counts but intermittently elevated; dry in summer; elevated counts upstream	CRD to continue investigations
3138A	Central Saanich	Dry in summer and fall	CRD to continue monitoring
3138	Tsartlip First Nation	Low bacterial counts with one exception	CRD to continue monitoring

Marine Sampling

In 2018, CRD staff carried out marine impact sampling in Brentwood Bay to determine the extent of contamination along the shoreline and if stormwater contamination is influencing these areas. Enterococci are measured instead of *E.coli* in the marine environment. Results indicated that in addition to stormwater, there are other factors contributing to summer contamination, as most of the stormwater discharges are dry at this time of year. However, following fall precipitation, elevated bacteria were present throughout Brentwood Bay.

CRD staff collected marine shoreline samples from Stelly's Cross Road to Deamere Road in the fall under different conditions (with and without preceding precipitation) and with variable results:

- all samples collected without previous precipitation had enterococci counts below 70 CFU/100 mL with the exception of one at the end of Keene Way, and
- all samples collected following two days of precipitation had elevated enterococci counts with the exception of the discharge at Keene Way (discharge 3145A), which was marginally below the guideline (69 CFU/100 mL).
- caffeine was detected in four of the 11 marine locations collected following rain. Of the four locations, two were adjacent to storm drains identified as having a cross-connection or failing underground infrastructure (3142 and 3150). Caffeine indicates the potential for human or sewage contamination.

Central Saanich staff are investigating a potential cross-connection at 3142, while CRD staff will continue source investigations at 3150.

In addition, as elevated bacterial counts were measured in seven marine locations without detection of caffeine, there are likely bacteria from wild and/or domestic animals present. Previous investigations conducted by CRD staff identified bacteria from dogs and ruminants in winter in Brentwood Bay and four other frequently used Saanich Peninsula beaches.

CRD Public Shoreline Use Rating Change in Brentwood Bay

In 2018, a resident of the area informed the CRD that swimming occurs in the bay, particularly at the ends of Clarke Road and Keene Way. Following a site visit and further confirmation, CRD changed the public shoreline use rating from moderate to high along this section. A high public shoreline use rating reflects that swimming occurs in the area and means that *E.coli* contamination measured in these discharges will result in a higher prioritization for corrective action in these discharges.

Coles Bay

Staff have assigned a high public health concern rating to stormwater discharge 3118 for a number of years, due to elevated bacteria in stormwater at the end of pipe. Marine sampling indicated enterococci levels in Coles Bay were above Health Canada's primary recreation guidelines (single sample maximum of 70 CFU/100 mL) with particularly high levels (170 to 450 CFU/100 mL) during heavy rainfall. In 2018, CRD staff identified one source and narrowed down two bacterial sources as potentially malfunctioning on-site sewage treatment systems. Staff met with IHA and North Saanich staff to address these sources.

Bacterial Source Investigations

CRD, municipal and IHA staff continue to work together to identify bacterial sources in stormwater discharges of concern so they can be addressed by the appropriate jurisdiction. The sources of contamination include malfunctioning on-site sewage treatment systems, agricultural practices, aging stormwater and sewage infrastructure, sewage-stormwater cross-connections, and wild and domestic animals.

In 2018, CRD staff investigated the catchment areas of 10 stormwater discharges. These investigations resulted in the identification of one malfunctioning on-site sewage system in Coles Bay and one potential sewer-stormwater cross-connection in Brentwood Bay. Staff will continue investigations in many of these stormwater catchments and start investigations in 3150 in 2019.

Table C. Status of 2018 Source Investigations

Stormwater Discharge #	Shoreline Jurisdiction	# of Visits	Status	Next Steps
426	Bazan Bay	1	Inconclusive; bacterial counts low	CRD to continue investigations if counts high again
428	Bazan Bay	1	Inconclusive; bacterial counts low	CRD to continue investigations if counts high again
431	Bazan Bay	1	Inconclusive; bacterial counts low	CRD to continue investigations if counts high again
432	Bazan Bay	1	Inconclusive; bacterial counts low	CRD to continue investigations if counts high again
441 (Reay Creek)	Lochside Drive/ Bazan Bay	1	Inconclusive; bacterial counts low	CRD to continue investigations if counts high again
447	Lochside Drive	2	Inconclusive; bacterial counts low	CRD to continue investigations
3118	Coles Bay	3	Identified one source and narrowed down two sources	IHA to dye-test
3133	Hagan Creek	3	Source identified in 2017; confirmed as still present in 2018	CRD to continue investigations once identified source is under control

Stormwater Discharge #	Shoreline Jurisdiction	# of Visits	Status	Next Steps
3142	Brentwood Bay	1	Narrowed down source to a few houses	Central Saanich to find source
3145	Brentwood Bay	3	Inconclusive; bacterial counts fluctuate; discharge dry in summer	CRD to continue investigations

ENVIRONMENTAL CONCERN

Watercourses

Staff continued to monitor Hagan/Graham, Reay, Tetayut, Tatlow (Chalet), Tén Tén, Tod and Tseycum creeks in 2018, to provide information about creek and 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. In 2018, Tén Tén was more intensively monitored to provide more information about water quality along various portions of the creek influenced by different land uses. Staff measured water quality weekly for four consecutive weeks in fall at various locations in the watershed. Sampling was conducted at four locations show in Appendix A [Figure 28 (mouth of creek) and Figure 42 (upstream sampling locations)].

Tén Tén Creek

In fall of 2018, a number of water quality parameters were outside BC guidelines for protection of aquatic life, indicating that creek health is poor. The parameters of concern include metals (aluminum, arsenic, copper, iron, manganese and zinc), dissolved oxygen, phosphorus, turbidity, suspended solids, nitrate, nitrite and bacteria (*E.coli* and fecal coliforms). The exceedances occurred most frequently and to the greatest extent where the tributary from a nearby farm enters the creek (3104-3). Farm runoff is mainly redirected to a retention pond; however, some runoff is not retained and a dam that directs that runoff to the pond was malfunctioning during the time of sampling. The pond had not risen enough to release water into the creek at the time of sampling, so the efficacy of the retention pond treatment is unknown.

Sediment collected in Tén Tén (discharge and upstream) had elevated metals (arsenic, chromium, copper and zinc) and polycyclic aromatic hydrocarbons (PAH) compared to the Canadian Council of Ministers of the Environment (CCME) freshwater aquatic life interim sediment quality guidelines (ISQG) though chromium and copper were below Vancouver Island background levels.

Changes over Time

The parameters of most concern in Saanich Peninsula creeks are *E.coli*, phosphorus and turbidity, with some creeks also experiencing low dissolved oxygen and elevated metals. Poor water quality is likely the result of land-clearing, agricultural practices and failing on-site sewage treatment systems.

The 2018 data indicated that water quality in Saanich Peninsula creeks is similar to previous years, with the exception of phosphorus (ortho-phosphate) levels. While phosphorus levels are elevated in nearly all urban creeks in the CRD, ortho-phosphate appears to have increased in Tetayut and Reay creeks and decreased in Tén Tén Creek. Staff observed the first increase in 2015 in Tetayut and levels have remained elevated since then, even in winter when levels usually decrease. In addition, staff measured higher levels of ortho-phosphate in Reay Creek in 2018. Staff will conduct further sampling in 2019 to confirm this trend. Finally, in Tén Tén, ortho-phosphate levels are elevated, but the data suggests that they have decreased since 2013.

In 2019, CRD staff will continue to work with municipal staff to locate sources of bacterial and chemical contamination. As part of the overall stormwater education initiative on the Peninsula, staff will also educate property owners about methods to reduce the amount of sediment and phosphorus leaving their properties and ultimately ending up in the creeks.

Chemical Contaminant Sampling

Sediment

The program evaluates sediment from within stormwater discharges (pipes, ditches and streams) for potential environmental impact due to contaminant levels (heavy metals and hydrocarbons).

The program assigns contaminant ratings to stormwater discharges from sediment samples taken at the point of discharge into the marine environment. Ratings are determined by comparing the concentration of each contaminant (eight metals and high and low molecular weight PAH) to sediment quality guidelines protective of marine life. Rating methods are described in Appendix G.

In 2018, two discharges were assigned high ratings (3138 and 3021), while one of these (3138) and two others (441, 3005) are on the list of discharges requiring corrective action, due to multiple high-ratings in previous years and determination of the contaminants. Locations of these discharges are shown in Figure A and Appendix A. See below for more details on these discharges.

2018 Monitoring

In 2018, staff collected 31 sediment samples on the Saanich Peninsula: 17 at the point of discharge (to measure potential contamination to the marine receiving environment), and 14 upstream in stormwater catchments of concern (to determine sources of contamination or measure watershed health).

The CRD assigned high contaminant ratings to two of the 17 discharges assessed: 3138 (Tsartlip boat launch) and 3021 (Blue Heron Creek).

- Discharge 3138 has been a concern for many years and investigations are ongoing to determine if zinc contamination is due to historical or ongoing practices (see below for further details).
- A sediment sample from discharge 3021 displayed elevated lead in 2005; however, concentrations were lower in subsequent years. In 2018, CRD staff measured levels of lead that exceed the CRD marine guideline by 10 times in the creek. Arsenic, cadmium, mercury and zinc are also elevated above the CCME freshwater and marine ISQG. Staff will conduct further testing in 2019 to confirm the results and assess possible sources.

Discharges Requiring Corrective Action

Discharge 3138 (Tsartlip Boat launch) and two others: Mermaid Creek (3005) and 441 (Reay Creek) have been a concern for a number of years and are on the list of discharges requiring corrective action. A discussion of the discharges of concern follows:

- Mermaid Creek (discharge 3005) has been of concern, due to elevated metals and PAH, since 2005. CRD staff conducted numerous upstream investigations, however, sediment is difficult to find within the infrastructure. Sampling results indicate that metals from stormwater have impacted the marine receiving environment. CRD staff will continue to work with Sidney to determine sources.
- In Reay Creek (discharge 441; Figure A), sediment concentrations of metals and PAH are at levels that may adversely affect aquatic life. CRD participates on the Reay Creek Technical Working Group, formed in 2015 to address concerns about contamination in the creek. Transport Canada has categorized Reay Creek Pond as a contaminated site with high priority for action and is determining the extent of contamination to identify remedial and risk management options. In 2018, the Town of Sidney hired LGL Limited to conduct a fish habitat assessment on the pond and Thurber Engineering to conduct a Preliminary Geotechnical Options Assessment to assist in determining whether to upgrade or replace the Reay Creek Dam, as it does not meet seismic design standards.

- Discharge 3138 carries flows from Tsartlip land and is a concern, due to elevated zinc concentrations. Aged corrugated pipes are a potential source. In 2018, CRD measured lower zinc levels upstream at Stelly's Cross Road and Tsartlip Drive; however, zinc levels were still elevated. In 2018, Tsartlip started installing a new stormwater pipe along the ditch at Stelly's Cross Road and it is anticipated that this will result in lower levels of zinc at the discharge.

Quality Assurance

The 2018 data met quality assurance/quality control requirements for the program. For bacterial analysis, quality assurance includes yearly establishment of a precision criterion based on a range of Saanich Peninsula stormwater sample triplicates. Staff collect blanks and field splits for 10% of the discharges and marine surface water samples collected. Three of the field splits exceeded the precision criterion; however, the bacterial counts in those samples were low (below 200 CFU/100 mL) and, therefore, not expected to meet the criterion.

Quality assurance for sediment analysis included field duplicates, laboratory triplicates and standard reference materials. Precision and accuracy of the laboratory analysis were estimated from the results of these replicate and standard reference materials samples. A detailed discussion on the quality assurance program is provided in the supplementary data report found on the CRD's website.

Saanich Peninsula Stormwater Source Control Service

The CRD established the Saanich Peninsula Stormwater Source Control Service in 2014 with the goal to prevent the release of contamination into the municipal drainage system through education and guidance, maintenance of catch basins, appropriate business practices, and the proper disposal of waste. Since then, staff have focused on creating a regulatory bylaw and its supporting framework. Regulatory bylaws (Bylaw No. 4168 and amending Bylaw No. 4229) that set out the requirements for discharges to the municipal drainage system were finalized in December 2018. The CRD will be working with municipalities, stakeholders and dischargers to implement the bylaw in 2019.

Staff have collected baseline data in two creeks that drain industrial areas, and sediment sampling continues to identify metal and hydrocarbon contamination from parking lots, roads, spills and business waste. It is anticipated that the stormwater quality program's sampling will be used to assess the performance of the stormwater source control program over the coming years.

Education

CRD data has indicated that poor agricultural practices and malfunctioning on-site sewage systems are the most common sources of bacterial contamination in stormwater. In 2018, CRD conducted a septic savvy workshop in Central Saanich and Willis Point and mailed out educational materials in these two areas. The workshops were well-attended with over 40 attendees in Central Saanich and 25 attendees at Willis Point.

In 2017, the CRD co-sponsored and hosted a keyline plow field day on a farm on the Saanich Peninsula and workshops titled "Farm Water Management Seminar", to address concerns about agricultural runoff into watercourses and the ocean. The project worked with local farmers to increase awareness and develop skills for improved rainwater management on their properties. Results of the field studies can be found on the project website www.crkeyline.ca

In 2019, the CRD will be promoting the Saanich Peninsula Stormwater Bylaw and related best management practices. CRD staff will also be working with the agriculture sector on effective water management (stormwater and potable water). Both components will involve public involvement and education programs.

REFERENCES

CRD, 1996. Saanich Peninsula Liquid Waste Management Plan.

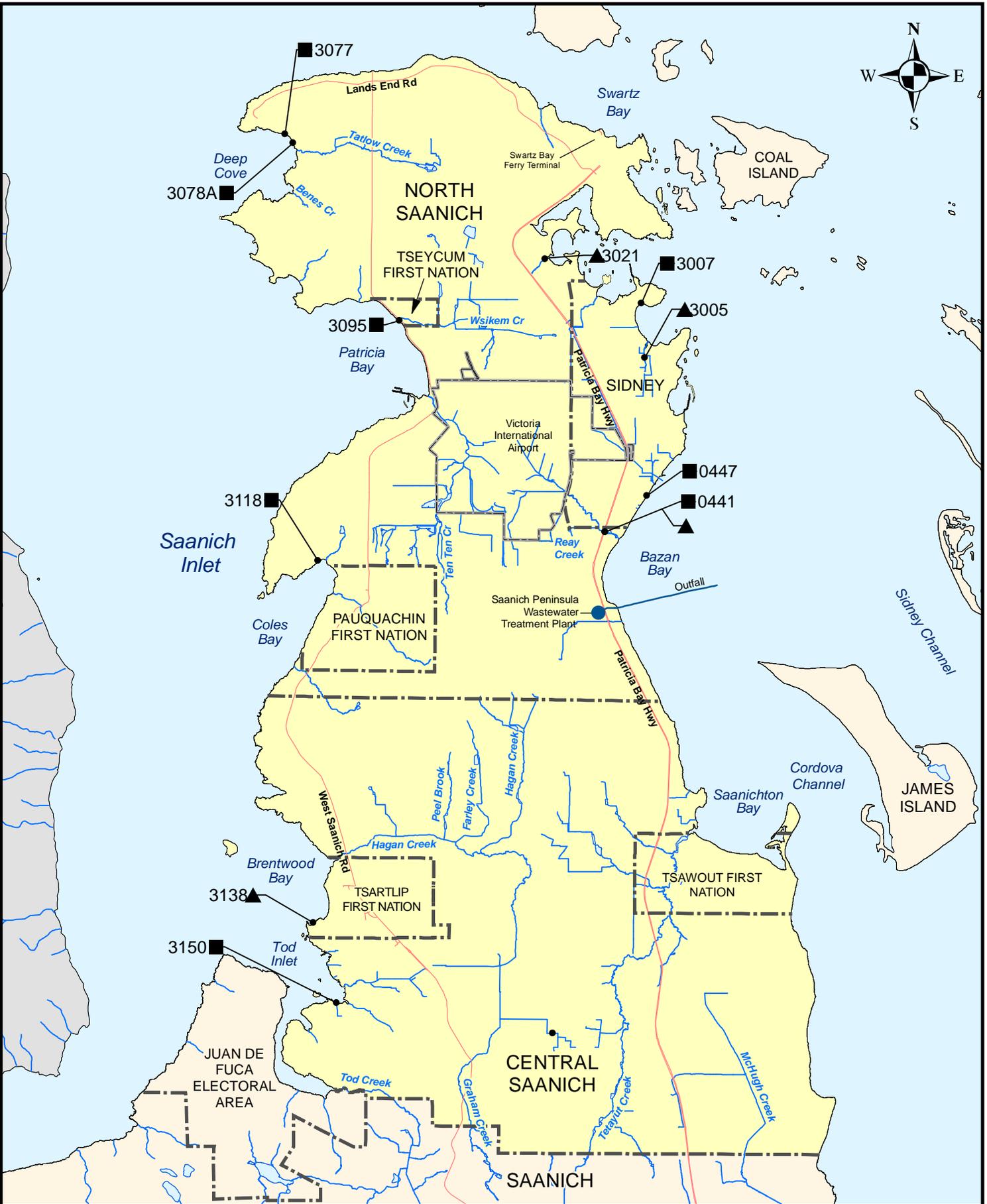


Figure A- Saanich Peninsula - Stormwater Discharges Rated High for Public Health or Environmental Concern

CRD
Making a difference...together

0 0.5 1 2 Kilometres

Projection: UTM ZONE 10N NAD 83

- High Public Health Concern Rating in 2017
- ▲ High Environmental Concern Rating in 2017 or previous years (and recommended for corrective action)
- Sewage Treatment and Outfall
- ~ Significant Ditches, Streams, Rivers, and Storm Drains
- - - Municipal and First Nations Boundary
- Major Roads
- Stormwater Monitoring Area

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