Saanich Peninsula Treatment Plant

Wastewater and Marine Environment Program 2019 Report

Capital Regional District | Parks & Environmental Services, Environmental Protection

Prepared by:
Marine Programs

Capital Regional District
625 Fisgard Street, Victoria, BC V8W 2S6
T: 250.360.3000 F: 250.360.3079
www.crd.bc.ca

October 2020

SAANICH PENINSULA TREATMENT PLANT
WASTEWATER AND MARINE ENVIRONMENT PROGRAM
2019 REPORT

EXECUTIVE SUMMARY

The Capital Regional District (CRD) has been operating the Saanich Peninsula Treatment Plant (SPTP) since February 2000. The treatment plant serves North Saanich, Central Saanich and the Town of Sidney, as well as the Victoria International Airport, the Institute of Ocean Sciences and the Tseycum and Pauquachin First Nations communities. It is a conventional secondary level wastewater treatment plant, which has periodically produced Class A biosolids. The treatment plant discharges un-disinfected secondary effluent into the marine receiving environment (Bazan Bay) through an outfall located approximately 1,580 metres (m) from the shoreline at a depth of 30 m. Residual solids left over from the treatment process are currently disposed of at the Hartland landfill. The CRD undertakes monitoring to meet provincial and federal regulatory requirements, as well as to assess the impacts of the outfall on the marine environment and human health. Information is often used to inform the CRD's Regional Source Control Program (RSCP) and treatment plant operations. This monitoring is stipulated by the BC Ministry of Environment and Climate Change Strategy (ENV) through the Municipal Wastewater Regulation under the *Environmental Management Act* and the federal Wastewater Systems Effluent Regulations under the *Fisheries Act*.

As part of the Saanich Peninsula Liquid Waste Management Plan (LWMP), the CRD committed to develop a long-term monitoring program. CRD Parks & Environmental Services staff reviewed the pre-discharge monitoring data (1998-2000), in conjunction with the post-discharge monitoring results (2000-2003), and developed the long-term monitoring program, in consultation with the Marine Monitoring Advisory Group. This program has been in place since 2004. In collaboration with ENV, the CRD conducted a more recent review of the program, in 2011 and 2012, to determine whether revisions were necessary to satisfy changing regulatory monitoring expectations. Some minor changes were made and implemented in January 2013.

The 2019 Wastewater and Marine Environment Program consisted of the following components:

- daily, weekly and monthly analysis of wastewater for federal and provincial compliance monitoring and treatment plant performance parameters, and quarterly analysis for priority substances
- quarterly wastewater toxicity testing
- monthly analysis of sludge for fecal coliforms and metals
- a biannual surface monitoring program, consisting of five sampling days within a 30-day period, once each in summer and winter

WASTEWATER MONITORING

Compliance Monitoring and Treatment Plant Performance

The CRD conducted wastewater monitoring on a regular basis to profile the chemical and physical constituents of influent and effluent, determine concentrations relative to provincial and federal regulatory limits, and assess treatment plant performance. Parameters monitored for regulatory compliance were below the applicable effluent regulatory limits. Influent and effluent quality was within expected ranges and met all treatment plant operating objectives.

Priority Substances

In addition to the compliance and treatment plant performance monitoring, over 500 substances were analyzed in the SPTP influent and effluent on a quarterly basis. These substances were monitored to more comprehensively assess potential risks of the wastewater discharge to organisms living in the marine environment around the outfall.

Approximately 45% of substances were detected in 50% or more of the samples, and included most of the conventional variables, metals (both total and dissolved), some organics, and high resolution parameters. Most frequently detected substances were below BC and Canadian Water Quality Guidelines (WQG), even in undiluted effluent. Only bacterial indicators, weak acid dissociable cyanide, copper, zinc, and high-resolution total polychlorinated biphenyls exceeded guidelines in undiluted effluent, prior to discharge to the marine receiving environment.

WQG must be met outside of the initial dilution zone (IDZ) (i.e., an area with a radius of approximately 100 m around the outfall), so in order to predict levels at the edge of the IDZ, estimated minimum initial dilution factors were applied to all substance concentrations. All substances were predicted to be below WQG after the application of this dilution factor, including those substances that were above guidelines in undiluted effluent, with the exception of bacterial indicators. As such, impacts of these discharged substances to aquatic life are likely minimal. Surface water monitoring was undertaken to assess the human health and shellfish impacts of the effluent bacteriological exceedances (see Surface Water Monitoring section below).

Toxicity Testing

In 2019, all toxicity tests passed with no mortality. In addition, no survival or reproductive impairments were observed for any of the test species during the chronic toxicity testing conducted using SPTP effluent.

BIOSOLIDS MONITORING

No biosolids were produced at the SPTP in 2019. All sludge generated at the facility was disposed of at the Hartland Landfill. The CRD monitored the sludge in 2019 to inform the CRD's RSCP, and all regulated parameters were below Class A biosolids limits.

SURFACE WATER MONITORING

Bacteriology

Surface water (1 m depth) fecal coliform and enterococci concentrations were low at all stations, with geometric means of 2 CFU/100 mL or less. IDZ stations also had low bacteriology concentrations, with geometric means of 3 CFU/100 mL or less, well below BC and Health Canada recreational and shellfish guidelines. There were no elevated geometric mean fecal coliform or enterococci concentrations observed at any station, on any sampling date, and no samples that exceeded the Health Canada enterococci single sample guideline of 70 CFU/100 mL.

Overall, results indicate that adverse health effects from recreational primary contact activities and shellfish harvesting are not expected. However, an area of approximately 17.65 km^2 around the outfall is closed for shellfish harvesting, as standard Fisheries and Oceans Canada procedure near industrial and sanitary wastewater outfalls. Shellfish closures have a minimum radius around an outfall of 300 m, but closure areas are usually larger near bigger urban centres, such as for the SPTP outfall, where there are other potential sources of bacterial contamination (e.g., stormwater discharges, marinas, septic systems, sewage pumps), in addition to the wastewater outfall.

An assessment has been undertaken to evaluate the need for disinfection at the SPTP. Based on the results of this review, disinfection is not recommended at this time.

Extended Monitoring

WQG exceedances were observed for boron in the water column surrounding the SPTP outfall, at all stations and sampling events, including at the reference station. These exceedances are expected, as boron is naturally occurring in the environment at higher levels. The CRD will continue to monitor metals in waters around the outfall and the reference station, to assess environmental significance.

Nutrients

There were some seasonal patterns in the nutrient results, which were consistent between the reference and the IDZ stations. Results were within the ranges measured in previous years and those of the pre- and post-discharge assessment programs. As was observed in previous monitoring years, high variability, both spatially and temporally, was evident in the data. Fluctuations in nutrient concentrations are attributed to natural variation in the monitoring areas. Overall, there was no evidence of an effect on nutrient concentrations in the receiving environment from the SPTP discharge.

SEAFLOOR

Seafloor monitoring (i.e., benthic community structure and sediment chemistry) was last conducted in 2016. This component is conducted every four years, since before the plant commenced discharging in 2000. The next sampling event is planned for 2020.

OVERALL ASSESSMENT

Based on tests used to monitor effluent quality and surface water in 2019, no significant adverse effects from the SPTP discharge on the receiving environment are expected. Results were similar to previous years. Influent and effluent quality was within expected ranges and met all regulatory limits and operating certificate compliance requirements on all sampling dates. All substances, with the exception of bacterial indicators, for which there are BC or Canadian WQG, met these guidelines when the estimated minimum initial environmental dilution of the effluent was factored in, indicating that the predicted levels of substances in the environment were not likely to be at concentrations of concern to aquatic life. Surface water fecal coliform and enterococci data indicated that adverse health effects on recreational activities or shellfish consumers were low or not expected. Boron exceeded WQG at every station and sampling depth, including at the reference station, a common occurrence, as the natural concentrations of boron are above WQG in the Salish Sea. ENV is working on updating the boron guideline. Surface water nutrient concentrations were within ranges measured in previous monitoring programs and showed no detectable effect from the discharge.

SAANICH PENINSULA TREATMENT PLANT
WASTEWATER AND MARINE ENVIRONMENT PROGRAM
2019 REPORT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

SAANICH PENINSULA TREATMENT PLANT
WASTEWATER AND MARINE ENVIRONMENT PROGRAM
2019 REPORT

1.0 BACKGROUND

The Saanich Peninsula Treatment Plant (SPTP) started operations in February 2000. This Capital Regional District (CRD) treatment plant serves North Saanich, Central Saanich and the Town of Sidney, as well as the Victoria International Airport, the Institute of Ocean Sciences and Tseycum and Pauquachin First Nations communities. It is a conventional secondary level wastewater treatment plant, which has periodically produced Class A biosolids. The treatment facility discharges undisinfected secondary-treated effluent into the marine receiving environment (Bazan Bay) through an outfall located approximately 1,580 m from the shoreline at a depth of 30 m. Residual sludge from the treatment process is currently disposed of at the Hartland Landfill. The Wastewater and Marine Environment Program (WMEP) includes regular monitoring, as stipulated by the BC Ministry of Environment and Climate Change Strategy (ENV), through the Municipal Wastewater Regulation under the *Environmental Management Act* and the federal Wastewater Systems Effluent Regulations (WSER) under the *Fisheries Act*. The facility operates under a Provincial Operational Certificate (#ME-15445), and the Saanich Peninsula Liquid Waste Management Plan (LWMP) (CRD, 2009a).

The Saanich Peninsula LWMP committed the CRD to carry out a pre- and post-discharge assessment program and to develop a long-term monitoring program. The pre-discharge program was conducted from October 1998 to January 2000. The post-discharge program was initiated in February 2000 (when treatment plant operation began) and completed in February 2001. The results presented in Aquametrix Research Ltd. (2000, 2001a and 2001b) guided the development of the long-term monitoring program in consultation with the Marine Monitoring Advisory Group (MMAG). The MMAG consists of university and government scientists with expertise in the fields of marine biology, chemistry, toxicology, oceanography and public health. This independent group reviews CRD marine monitoring and assessment programs and makes appropriate recommendations.

Upon MMAG review of the post-discharge assessment program, the group determined that additional data were needed before a long-term program could be defined. Therefore, an interim WMEP was developed by CRD staff working with the MMAG. This interim program was conducted from 2001-2003 (CRD, 2002, 2003 and 2004) and included additional receiving environment nutrient monitoring for a two-year period (2002-2003). It was also during this time that a Technical Water Quality Review Panel (TWQRP) determined that a disinfection step during the treatment process was unnecessary to meet human health recreation guidelines.

After a review of the 2002 and 2003 nutrient data, the MMAG recommended that the extensive nutrient monitoring be discontinued. Instead, the MMAG proposed that monthly monitoring of nutrients at one station directly above the outfall terminus, and one reference station be incorporated into the regular program. The group also recommended the addition of a plan with two conditions that could precipitate the re-evaluation of the need for a comprehensive nutrient monitoring program (detailed in Section 5.2.1). CRD staff incorporated these two conditions into the long-term monitoring program, which was finalized and first included in the 2003 annual report. The long-term SPTP WMEP was implemented in 2004, following submission to the ENV, as required under the LWMP. Monitoring is also undertaken to satisfy requirements of the federal WSER, which came into effect in 2013.

A review of the SPTP WMEP was conducted in 2011-2012 in partnership with ENV. As a result of this review, new aspects of the SPTP WMEP include annual wastewater toxicity testing, and changes to the surface water sampling program intended to align the program more closely with the water quality guidelines (WQG) requiring the collection of five samples in 30 days, plus initial dilution zone (IDZ) (i.e., an area with a radius of approximately 100 m around the outfall) stations in an attempt to capture the wastewater plume. This revised program was implemented in January 2013 and is summarized in Table 2.1.

In addition, the initial TWQRP suggested a number of conditions that would prompt a reevaluation of the need for disinfection at the SPTP, one of which was 10 years of plant operation. This reevaluation was initiated in 2011 with the MMAG receiving formal delegation to undertake the review. In 2015, the MMAG confirmed that disinfection continues to be unnecessary to meet recreational water quality guidelines around the outfall, and requested that the CRD continue to assess the potential benefits of disinfection to nearby shellfish resources in consultation with First Nation and other shellfish stakeholders. In January 2020, staff advised the Saanich Peninsula Wastewater Commission that installation of disinfection at the SPTP does not appear to present any significant benefit to nearby shellfish resources, as the ongoing surface water bacteriological monitoring indicates that levels around the outfall are well below thresholds to protect shellfish harvesting. Staff therefore recommend that disinfection not be installed at this time. Staff continue to meet with W̱SÁNEĆ First Nations and other shellfish stakeholders to assess potential future disinfection need, as well as to identify other areas on the Saanich Peninsula where shellfish harvesting could be restored but are outside the influence of the SPTP.

2.0 INTRODUCTION

The objectives of the SPTP WMEP are to:

- Comply with federal and provincial regulations.
- Assess the effects of the wastewater discharge on the marine environment and the potential for human health risks (related to the presence of bacteria in surface water).
- Determine waste loads to the marine receiving environment.
- Monitor influent, effluent and biosolids quality (both as part of regulatory requirements and to optimize treatment plant performance).
- Supply information to the CRD's Regional Source Control Program (RSCP) and treatment plant operators.
- Provide scientific guidance to wastewater managers regarding the use of the marine environment for the disposal of municipal wastewater.

This report presents the results of the 2019 SPTP WMEP in one integrated report. The components of the current WMEP are presented in Table 2.1. These components, the parameters that are measured for each, and the sampling frequency were determined based on regulatory requirements (i.e., for compliance monitoring), a review of the pre- and post-discharge assessment programs, similar monitoring and assessment programs, and recommendations of the MMAG. The following sections present summaries of the methods used for sample collection and processing, and for data analysis of each component of the 2019 WMEP. Detailed information can be found in any technical reports and independent consultant reports referred to in the individual sections. Methods were selected for each of these components, based on internationally recognized standards, and sampling and analytical protocols.

Outfall and reference stations for the sea surface and seafloor components of the WMEP were chosen by the MMAG, following recommendations by the consultant (Aquametrix) that conducted the pre- and post-discharge monitoring program. The reference station was chosen because oceanographic computer modelling indicated it would be far enough away from the plume effects, while being at a similar depth to the outfall stations.

Table 2.1 SPTP Wastewater and Marine Environment Program Components, Parameters, Frequency and Stations

Component	Parameter	Frequency and Stations
Wastewater Monitoring	compliance monitoring (CBOD, FC, flow, unionized NH_3, pH, pH @ 15°C, TSS)[1]	daily to twice per month at the influent and effluent sampling points[2] federal – every two weeks provincial – monthly
	treatment plant performance (ALK, CBOD, COD, COND, Cl, NH_3, NO_2, NO_3, BOD, TDP, TKN, TP, TSS)[1]	twice per week to monthly[3] at the influent and effluent sampling points
	influent and effluent priority substances[4]	quarterly[5] at the influent and effluent sampling points
	chronic toxicity testing	annually at the effluent sampling point (*Ceriodaphnia dubia* survival and reproduction, Rainbow trout embryo-alevin survival and development, echinoderm (*Strongylocentrotus)* fertilization, 7 day Pacific topsmelt survival and growth)
	acute toxicity testing	quarterly at the effluent sampling point (Rainbow trout 96-hour LC50, *Daphnia magna* 48-hour LC50)
Biosolids/Sludge Monitoring	metals, moisture, FC[1]	monthly (when biosolids were produced) from the biosolids conveyor belt (i.e., before dropping into shipping bin). Currently dewatered sludge is monitored monthly for informational purposes.
Surface Water Monitoring	indicator bacteria (FC, ENT)[1]	10 times a year (5-in-30 samples collected in the winter and in the summer) at 19 stations (14 outfall stations, four IDZ stations and one reference station)
	nutrients (NH_3, NO_2, NO_3, TDP, TKN, TP), COND, salinity, pH, temperature and TOC[1]	10 times a year (5-in-30 samples collected in the winter and in the summer) at five stations (four IDZ stations and one reference station)
	metals	twice yearly (winter and summer) at five stations (four IDZ stations and one reference station)
Seafloor	particle size analysis, TOC[1], AVS[1] and sediment chemistry[4]	every four years at two stations[6] (one outfall terminus station and one reference station)
	benthic community structure (including TA, TR, SDI)[7]	

Notes:

1 ALK - alkalinity, AVS - acid volatile sulphide, CBOD - carbonaceous biochemical oxygen demand, COD - chemical oxygen demand, COND - conductivity, Cl - chloride, FC - fecal coliforms, ENT - enterococci, NH3 - ammonia, NO_3- nitrate, NO_2 -nitrite, BOD - biochemical oxygen demand, TDP - total dissolved phosphorus, TKN - total Kjeldahl nitrogen, TOC - total organic carbon, TP - total phosphorus, TSS - total suspended solids

2 Frequency is listed in Appendix A

3 Frequency depends on the operation of the facility and what the operators need to optimize treatment plant performance

4 All parameters are listed in Appendix A

5 January, April, July and October and additional Q+ sampling conducted one day before and one day after a quarterly sampling event

6 Conducted in 2016. Next time will be 2020, 2024, etc.

7 TA - total abundance, TR - taxa richness, SDI - Swartz Dominance index

3.0 WASTEWATER MONITORING

3.1 Introduction

The CRD conducts wastewater monitoring on a regular basis at the SPTP to assess compliance with the operational certificate under the LWMP and the federal WSER, to assess treatment plant performance and to profile the physical and chemical constituents of treated wastewater before it is released to the marine receiving environment. These data provide an indication of which components may be of concern in the receiving environment and can be used to direct the efforts of the WMEP and the RSCP.

Wastewater monitoring at the SPTP consists of quarterly composite analyses for all priority substances, supplemented by additional "quarterly plus" composite sampling occurring one day before and one day after the quarterly sampling events. The "quarterly plus" monitoring program is intended to increase the precision of the quarterly sampling events for key substances of interest (Appendix A) and eliminate the difficulties associated with statistically comparing grab to composite results. In 2019, "quarterly plus" samples were collected in January and July.

The list of parameters was adapted from the US Environmental Protection Agency (US EPA) National Recommended Water Quality Criteria; Priority Toxic Pollutants list (US EPA, 2002). The CRD reviews its list on a periodic basis to determine the need to delete or add substances depending on new developments in terms of analytical techniques, potential presence in wastewaters and potential effects on human health and the receiving environment, alignment with the Vancouver Aquarium's Pollution Tracker parameters, and upon ENV review. Influent is analyzed for the same comprehensive list of substances.

An additional review of the SPTP monitoring program was conducted, in collaboration with ENV in 2011/2012, and annual acute and chronic toxicity testing were added to the wastewater monitoring component starting in 2013 (Table 2.1). The federal WSER monitoring and reporting requirements also came into effect in 2013.

Detailed statistical trend analyses are undertaken every three-five years to quantitatively assess temporal trends in concentrations and loadings of wastewater parameters. In 2012, Golder Associates (Golder, 2013) updated the previous trend assessment to include the 2009-2011 results, expanding the total SPTP dataset from 2000-2011. Results of this assessment were presented in the 2011 annual report (CRD, 2012). The most recent trend assessment was completed in 2017 (Golder, 2019) and included the next three years of wastewater data (2012-2015). Results were included in the 2016 annual report (CRD, 2017).

3.2 Methods

Information on wastewater sampling and analytical methods is presented below and in any independent consultants' reports referenced in the individual sections. Sampling and analytical methods used for each of these components were based on recognized standards and protocols (APHA, 1992; BC MWLAP, 2003). Samples were either collected as composites (i.e., over a 24-hour period) or individual grabs (i.e., discrete one-time) depending on the parameters that were being analyzed.

3.2.1 Compliance Monitoring and Treatment Plant Performance

The CRD operators and sampling technicians regularly monitor effluent quality and flow, as required by the ENV operational certificate under the SPTP LWMP and federal regulations. Table 3.1 presents parameters, effluent regulatory limits, frequency and sampling methods used to assess compliance.

Influent and effluent samples were also collected periodically to assess the efficiency of the treatment plant processes (see Table 2.1 for a list of parameters and monitoring frequency). Flow was measured continuously with a Supervisory Control and Data Acquisition (SCADA) system.

Operators and technicians collected composite influent and effluent samples using on-site automated ISCO™ samplers (http://www.isco.com). Influent samples were collected from a sampling point situated where the wastewater had entered the treatment plant and been screened, but prior to transfer to the settling tanks (i.e., before primary treatment). Effluent samples were collected from a sampling port situated where the treated effluent was ready for discharge to the marine receiving environment. Sub-samples (consisting of 400 mL) were collected every 30 minutes and composited into one sample representing the 24-hour period. Grab samples (i.e., one-time discrete samples) were collected for the analysis of two time-sensitive parameters not suited to composite sampling: fecal coliforms and pH.

Parameters required by federal regulations were analyzed at CALA (Canadian Association for Laboratory Accreditation) certified labs. Laboratory analyses were conducted at the SPTP laboratory, Bureau Veritas Canada Inc. (Burnaby, BC) and SGS AXYS Analytical Services (Sidney, BC).

Table 3.1 SPTP Effluent Compliance Monitoring Parameters, Regulatory Limits, Frequency and Sampling Methods

Parameter	Effluent Regulatory Limit	Required Frequency of Monitoring[4]	Sampling Method
CBOD	provincial – 45 mg/L maximum federal – 25 mg/L average	provincial – 2x per week federal – 2x per month	24-hr FC
TSS[1]	provincial – 45 mg/L maximum federal – 25 mg/L average	provincial – 2x per week federal – 2x per month	24-hr FC
flow[1]	22,033 m^3/day (average daily)[2] 56,000 m^3/day (maximum daily)	continuously	SCADA3
pH[1]	6-9	2x per week	grab
ammonia[1], pH @15°C	provincial – required, but no limit federal – unionized 1.25 mg/L maximum	provincial – monthly federal – 2x per month	24-hr FC
fecal coliforms	required, but no limit	provincial – monthly federal – 2x per month	grab
total residual chlorine	federal – 0.02 mg/L average	only when used as part of the treatment process[5]	grab

Notes:

[1] parameters which are also analyzed in influent

[2] limit determined on an annual basis = (12,200 m^3/d * $(1.0316^{\text{calendar year—1999}})$)

[3] SCADA system

[4] as described in the operating certificate or the federal WSER

[5] chlorine was not used as part of the SPTP treatment process in 2019. As such, total residual chlorine was not monitored.
CBOD = carbonaceous biochemical oxygen demand; TSS = total suspended solids; FC = fecal coliforms

3.2.2 Priority Substances

CRD technicians collected influent and effluent samples, as done with compliance parameters, with the following adaptations:

- Sampling equipment (i.e., hoses, sieves and carboys) was cleaned thoroughly prior to use by an external private laboratory (SGS AXYS Analytical Services), following trace cleaning procedures, including triple rinses with solvents, acids and distilled water.

- The CRD WMEP automated ISCO™ samplers (different from the on-site SPTP automated ISCO™ samplers used by the operators for the compliance and treatment plant performance monitoring) were used to collect influent and effluent composite samples. Two different samplers were used: one for influent and one for effluent. Sub-samples (consisting of 400 mL) were collected every 30 minutes and composited into one sample representing the 24-hour period.

- Composite samples were collected into a fluorinated, pre-cleaned 20-L carboy and continuously and thoroughly mixed before and during sample splitting to ensure sample homogeneity.

- Grab samples were collected using the ISCO™ sampler manual pumping setting (i.e., at the end of each composite sample interval) and transferred into appropriate sample bottles on site.

The sampling technician immediately dispatched the samples to qualified laboratories (i.e., Canadian Association for Laboratory Accreditation proficient and certified) to conduct chemical analyses. The SPTP laboratory conducted analyses for most conventional parameters (e.g., BOD, CBOD, fecal coliforms, chloride, sulphate, nitrate, nitrite, conductivity, TKN, TSS, COD, ammonia, pH and alkalinity); Bureau Veritas (Burnaby, BC) conducted analyses for the federally-regulated parameters (i.e., pH @ 15°C, unionized ammonia, TSS, CBOD) and priority substances; and SGS AXYS Analytical Services conducted analyses for high-resolution parameters. Laboratory and CRD staff chose analytical methods to ensure that method detection limits (MDL) were low enough for comparisons to ENV approved (BCMoE&CCS, 2019) and working (BCMoE&CCS, 2017) Water Quality Guidelines (WQG) and the Canadian Council of Ministers of the Environment (CCME 2003) *Canadian WQG for the Protection of Aquatic Life*.

Wastewater was analyzed for a comprehensive list of priority substances that included conventional variables (included for the assessment of potential effects on the marine receiving environment and for comparison to the compliance treatment plant performance results), metals, halogenated compounds, polycyclic aromatic hydrocarbons (PAH), polybrominated diphenyl ethers (PBDE), polychlorinated biphenyls (PCB), pesticides, pharmaceuticals and personal care products (PPCP), nonylphenols and fluorinated compounds (PFOS/PFOA) (Appendix A).

3.2.3 Toxicity Testing

Acute toxicity testing refers to the assessment of adverse effects of a substance resulting from either a single exposure or from multiple exposures to a substance in a short period of time (usually less than 24 hours). Acute toxicity testing was conducted by Nautilus Environmental (Burnaby, BC) on a quarterly basis using effluent collected from the SPTP in January, April, July and October of 2019. Tests consisted of a 96-hour rainbow trout survival, and a 48-hour *Daphnia magna* survival. Results are reported as the organism mortality in each test concentration for the time allocation of each test (i.e., 48 or 96 hours).

Chronic toxicity testing refers to the assessment of adverse health effects from repeated exposures, often at lower levels, to a substance over a longer period of time (weeks or years). Chronic toxicity results are reported as either the LC50, which is the concentration at which 50% of the test organisms die during the test period, or as the EC50 or EC25, which are the concentrations at which a negative impact is observed on 50% or 25%, respectively, of the organisms in the specified test period (e.g., decreased fertilization or growth). Chronic toxicity testing was conducted by Nautilus using effluent collected from the SPTP in November and December of 2019. Tests consisted of a seven-day *Oncorhynchus mykiss* (Rainbow Trout) embryo-alevin, a seven-day *Atherinops affinis* (Topsmelt) survival and growth, a six-day *Ceriodaphnia* survival and reproduction, and an echinoid fertilization test.

DATA QUALITY ASSESSMENT

The CRD and laboratory staff followed a rigorous quality assessment/quality control (QA/QC) procedure for both field sampling procedures and laboratory analyses. Within each analytical batch that was analyzed quarterly [i.e., four batches in 2019 that included samples from other CRD wastewater treatment plants (e.g., Clover and Macaulay points outfalls)], one sample was randomly chosen for laboratory triplicate analysis, one sample was randomly chosen for field triplicate analysis, and one sample for a matrix spike. Both Bureau Veritas and SGS AXYS Analytical also conducted internal QA/QC analysis, including method analyte spikes, method blanks and standard reference materials.

DATA ANALYSIS

Percent frequencies of detection were determined for each substance by adding the number of times the compound was detected, dividing it by the total number of samples collected in the year and multiplying it by 100. A frequency of greater than 50% was selected as a percentage above which meaningful statistical analyses could be conducted. For non-detectable results (i.e., less than the MDL), a value of half the MDL was used for calculating the substance mean concentrations. For those substances detected greater than 50% of the time in the effluent, predictions of substance concentrations in the receiving environment were made by dividing maximum substance concentrations in effluent by the estimated minimum initial dilution factor of 153:1 (Hayco, 2005). The estimated minimum initial dilution factor was determined by a receiving environment dye study undertaken between December 7-9, 2004, and was determined to occur within approximately 50 m south of the outfall at a depth of 24.4 m at slack tide (Hayco 2005). Predicted environmental concentrations, as well as the original sample concentrations (i.e., without the initial dilution factor), were compared to:

- ENV approved (BCMoE&CCS, 2019) and working (BCMoE&CCS, 2017) WQG,
- CCME *Canadian Water Quality Guidelines for the Protection of Aquatic Lif*e (CCME, 2003), and
- Health Canada guidelines for the protection of human health (Health Canada, 2012).

These comparisons give an indication of the potential for receiving environment effects.

Annual loadings were determined by first calculating the quarterly loadings (January, April, July and October), averaging these values and multiplying by the number of days in a year (365). Quarterly loadings were calculated by averaging the total flow over the two sampling days and multiplying the average flow by the concentration of each substance measured that quarter. Loadings were calculated only for substances detected in >50% of sampling events.

Substances for which minimum initial dilution and loading calculations were not appropriate were noted as n/a (not applicable). For example, pH, conductivity and hardness do not lend themselves to these types of calculations (e.g., pH is a discrete measurement and calculating a loading over time is not appropriate).

3.3 Results and Discussion

3.3.1 Compliance Monitoring and Treatment Plant Performance

Flow data are presented in Appendix B1. Flow measurements indicate that the mean daily flow in 2019 was similar to that in 2018 (9,143 m^3/d in 2019 versus 9,571 m^3/d in 2018). There were no exceedances of the permitted average or maximum daily allowable flow in 2019. Figure 3.1 presents the SPTP flows from 2011-2019 indicating that flows are not increasing significantly over time. Provincial wastewater compliance monitoring and treatment plant performance monitoring results are summarized in Table 3.2. Federal wastewater compliance parameters are summarized in Table 3.3. The complete raw data sets are presented in appendices B2 (influent) and B3 (effluent).

All effluent results were below provincial and federal regulatory limits in 2019.

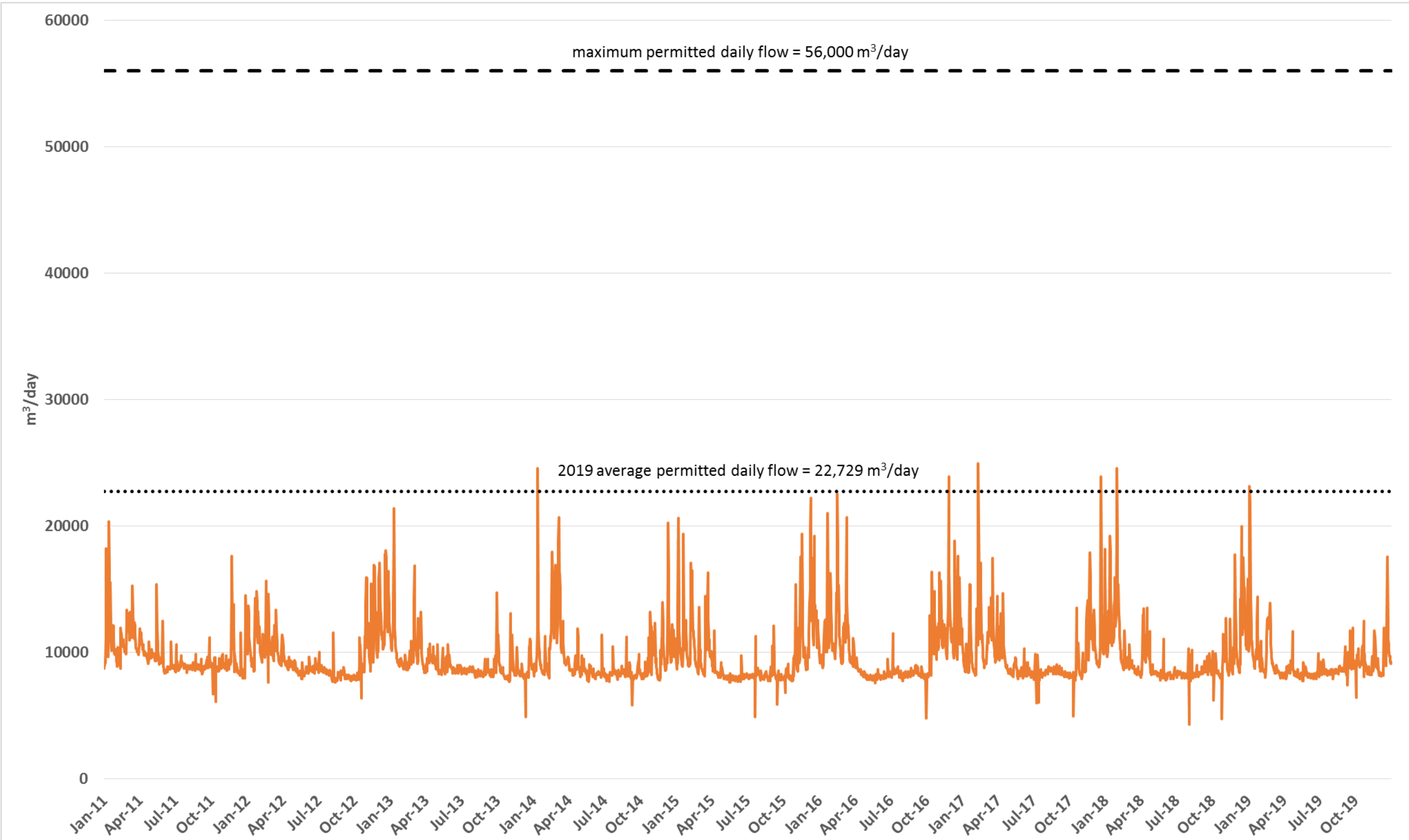


Figure 3.1 SPWTP Effluent flows from 2011-2019

Table 3.2 SPTP 2019 Provincial Compliance Monitoring and Treatment Plant Performance Results

Parameter and Unit	Effluent Regulatory Limit	Influent				Effluent			
		n	Mean	Min	Max	*n*	Mean	Min	Max
CBOD (mg/L O_2)	45 maximum	3	243	180	310	135	6.14	2	18
TSS (mg/L)	45 maximum	51	202	92	348	74	11.2	3.3	25
flow (m^3/d)	22,729 average daily 56,000 maximum daily	---	---	---	---	365	9,143	6,444	23,148
pH (pH units)	6-9	89	7.42	6.8	7.81	96	14.0	5.6	671
NH_3 (mg/L N)	required but no limit	43	43.9	0.11	94.4	29	1.9	0.025	6.8
fecal coliform (CFU/100 mL)	required but no limit	7	9,857,143	3,900,000	27,000,000	50	110,772	100	2,400,000
alkalinity (mg/L)	*	19	121	1	320	19	17.1	1	46
chloride (mg/L)	*	10	78.8	57	114	10	79	60	133
COD (mg/L O_2)	*	79	520	96.6	875	56	54.7	27	86
BOD (mg/L O_2)	*	54	248	50	360	109	18.3	5.4	200
conductivity (µS/cm)	*	35	752	573	913	42	509	7.54	654
nitrate (mg/L N)	*	24	0.09	0.019	0.47	44	14.1	0.25	107.5
nitrite (mg/L N)	*	29	0.06	0.002	0.53	49	5.24	0.011	99.9
TKN (mg/L N)	*	23	51	20	104.2	21	3.07	0.2	11.2
TDP (mg/L P)	*	3	4.28	3.53	4.80	3	4.12	3.82	4.64
TP (mg/L P)	*	7	6.26	5.12	7.87	7	2.79	0.41	4.53

Notes:

CBOD = carbonaceous biochemical oxygen demand, COD = chemical oxygen demand, FC = fecal coliforms, NH_3 = ammonia, BOD = biochemical oxygen demand, TDP = total dissolved phosphorus, TKN = total Kjeldahl nitrogen, TP = total phosphorus, TSS = total suspended solids

Average daily flows [limit determined on an annual basis = (12,200 m^3/d * ($1.0316^{\text{calendar year -1999}}$)]

* measured to assess treatment plant performance

Table 3.3 Saanich Peninsula Treatment Plant Federal Wastewater Compliance Results 2019

Saanich Peninsula Treatment Plant Secondary Effluent				
	CBOD (mg/L)	**Unionized ammonia (mg/L N)**	**pH @ 15° C**	**TSS (mg/L)**
Federal Limit	**25 average**	**1.25 max**	**---**	**25 average**
	n=125	N=26	N=26	N=74
January	6.19	<0.0005	6.55	11.6
February	6.11	<0.0005	6.42	9.57
March	6.44	---	---	11.9
April	7.81	0.0009	6.42	11.7
May	11.0	0.0024	6.5	17.0
June	7.6	0.0037	6.51	14
July	5.95	0.0044	6.61	14.3
August	5.78	0.0043	6.59	16.0
September	4.56	0.0014	6.22	13.6
October	3.99	0.0015	6.51	10.7
November	2.17	<0.0005	6.37	5.65
December	3.49	<0.0005	6.60	7.40

--- indicates parameter erroneously not analyzed

3.3.2 Priority Substances

Over 500 priority substances were analyzed in the SPTP influent and effluent, including high-resolution substances on a quarterly basis. Approximately 45% of these were detected in effluent in at least 50% of the samples, and are listed in Table 3.4. These include most of the conventional variables (TSS, BOD, CBOD, nutrients, etc.), metals (total and dissolved), some organics and high-resolution parameters.

Influent and effluent concentrations for all priority substances detected are presented in Appendix B4. Table 3.4 presents annual mean, minimum and maximum effluent concentrations, and loadings of the substances detected in 50% or more of sampling events. The 1:153 estimated minimum initial dilution factor (Hayco, 2005) was applied to the maximum concentrations and the resulting concentrations were then compared to the ENV approved (BCMoE&CCS, 2019) and working (BCMoE&CCS, 2017) WQG, the CCME *Water Quality Guidelines for the Protection of Aquatic Life* (CCME, 2003), and the Health Canada *Guidelines for Canadian Recreational Water Quality* (Health Canada, 2012) to assess predicted environmental concentrations. It should be noted that not all substances (e.g., alkalinity, conductivity, hardness and pH) discharged to the marine receiving environment could be assessed by extrapolating effluent concentrations using predicted minimum initial dilution. These parameters are not suitable for effluent dilution calculations (e.g., pH of 7.0 cannot be divided by estimated minimum initial dilution of 1:153).

The maximum concentrations of most parameters were below guidelines in undiluted effluent (i.e., prior to discharge). Parameters not meeting WQG in undiluted effluent (maximum concentrations) included: bacterial indicators, weak acid dissociable (WAD) cyanide, copper, zinc and high resolution total PCB (Table 3.4); these exceedances have also been observed in previous years. All results were below WQG after application of the estimated minimum initial dilution factor (i.e., the maximum predicted concentration in the environment), with the exception of bacterial indicators. Effluent concentrations have consistently been below WQG from 2000-2019, after estimated minimum initial dilution has been applied (CRD, 2002-2020). However, in some previous years, estimated environmental concentrations were predicted using mean effluent concentrations, rather than maximum concentrations, as has been done since 2010. CRD staff will continue to monitor effluent to determine whether exceedances of BC WQG are changing in frequency over time.

3.3.3 Toxicity Testing

Table 3.5 presents the results from the 2019 acute toxicity testing. There was no mortality observed for either acute toxicity test (Rainbow trout or *Daphnia*) in any of the samples (January, April, July and October). Table 3.6 presents the results from the 2019 chronic toxicity testing indicating no impact on survival for Rainbow trout, survival or growth for Topsmelt, survival or reproduction for *Ceriodaphnia*, or echinoid fertilization when exposed to 100% effluent.

Table 3.4 Annual Concentrations and Loadings of Frequently Detected Substances (≥50% of the time) in SPTP Effluent, 2019

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
Alkalinity	TOT	mg/L asCaCO3	1	100%	25.67	38	18	0.25	92,339	92	
BOD	TOT	mg/L as O2	5	100%	14.23	18	9.7	0.12	---	---	
COD	TOT	mg/L as O2	1	100%	57	62	47	0.41	---	---	
Enterococci	TOT	CFU/100 mL	10,000	100%	5,200	15,000	900	100	26,959,489	26,959	20a, 35d, 70d
Fecal Coliforms	TOT	CFU/100 mL	1	100%	32,740	130,000	2,900	850	165,598,711	165,599	200a
Hardness (As Caco3)	DIS	mg/L	0.5	100%	76.8	80	72.8	0.523	268,981	269	
Hardness (As Caco3)	TOT	mg/L	0.5	100%	77.3	80.3	73.4	0.525	271,826	272	
N - NH_3 (As N)	TOT	mg/L	0.75	100%	1.91	4.7	0.051	0.031	---	---	19.7a
N - NO_2 (As N)	DIS	mg/L	0.005	100%	2.22	5.31	0.025	0.03471	6,457	6	
N - NO_3 (As N)	DIS	mg/L	0.005	100%	14.7	16.2	13.4	0.1059	51,778	52	
N - NO_3 + NO_2 (As N)	TOT	mg/L	0.005	100%	16.7	18.1	14.7	0.1183	58,168	58	
N - TKN (As N)	TOT	mg/L	0.005	67%	2.07	3.7	0.2	0.02418	7,403	7	
P - PO_4 - Ortho (As P)	DIS	mg/L	0.03	100%	2.30	4	0.12	0.0261	8,348	8	
P - PO_4 - Total (As P)	DIS	µg/L	100	100%	4,117	4,640	3,820	30	17,220	17	
P - PO_4 - Total (As P)	TOT	µg/L	100	100%	2,792	4,530	411	30	8,663	9	
pH	TOT	pH	1	100%	6.6	7.1	5.6	0.05	---	---	
pH	TOT	pH	1	100%	7.28	7.73	6.86	0.05	---	---	
pH @ 15°C	TOT	pH	1	100%	6.45	6.61	6.22	0.04	---	---	7.0-8.7a
Specific Conductivity - 25°C	TOT	µS/cm	500	100%	477	506	450	3	---	---	
Sulfide	TOT	mg/L	0.009	71%	0.0247	0.05	0.0048	0.00033	86	0.09	
Temperature	TOT	°C	17	100%	14.6	21.4	9.7	0.1	---	---	
TOC	TOT	mg/L	10	75%	10.8	11	10	0.1	37,527	38	
TSS	TOT	mg/L	4	100%	8.7	9	8	0.06	30,594	31	
SAD Cyanide	TOT	mg/L	0.0005	63%	0.0035	0.005	0.00157	0.000033	12	0.01	
WAD Cyanide	TOT	mg/L	0.0005	63%	0.0014	0.0020	0.001	0.000013	5	0.01	0.001a
Metals (total)											
Aluminum	TOT	µg/L	3	100%	28.7	58.3	18.3	0.38	94	0.09	
Antimony	TOT	µg/L	0.02	100%	0.2406	0.264	0.201	0.0017	0.8	0.001	
Arsenic	TOT	µg/L	0.02	100%	0.2443	0.297	0.213	0.0019	0.9	0.001	12.5a
Barium	TOT	µg/L	0.05	100%	7.91	9.22	6.71	0.0603	27	0.027	
Cadmium	TOT	µg/L	0.005	100%	0.0553	0.0898	0.022	0.00059	0.2	0.0002	0.12b
Calcium	TOT	mg/L	0.25	100%	19.9	22.3	16.7	0.146	72,332	72	
Chromium	TOT	µg/L	0.1	100%	0.591	0.73	0.28	0.005	2	0.002	
Chromium Vi	TOT	mg/L	0.001	100%	0.0065	0.013	0.001	0.00008	14	0.01	
Cobalt	TOT	µg/L	0.01	100%	0.2346	0.277	0.197	0.0018	0.8	0.001	
Copper	TOT	µg/L	0.1	100%	22.2	39.9	6.03	0.261	72	0.07	3a
Iron	TOT	µg/L	5	100%	102.9	127	58.3	0.83	337	0.34	

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
Lead	TOT	µg/L	0.02	100%	0.605	0.876	0.332	0.0057	2	0.002	140a
Magnesium	TOT	mg/L	0.25	100%	6.88	8	5.54	0.052	24,511	25	
Manganese	TOT	µg/L	0.1	100%	36.84	53.2	30.2	0.348	133	0.13	100b
Molybdenum	TOT	µg/L	0.05	100%	0.893	1.41	0.585	0.0092	4	0.004	
Nickel	TOT	µg/L	0.1	100%	1.91	2.49	1.61	0.016	7	0.01	8.3b
Potassium	TOT	mg/L	0.25	100%	14.7	16.8	11.3	0.11	49,504	50	
Selenium	TOT	µg/L	0.04	100%	0.185	0.24	0.139	0.0016	0.6	0.001	
Silver	TOT	µg/L	0.01	88%	0.019	0.033	0.01	0.0002	0.1	0.0001	3.0a, 7.5c
Sodium	TOT	mg/L	0.25	100%	50.8	51.3	50.2	0.335	212,356	212	
Tin	TOT	µg/L	0.2	100%	0.516	0.86	0.37	0.006	2	0.002	
Zinc	TOT	µg/L	1	100%	41.3	59.8	28.8	0.39	145	0.15	55a
Metals (dissolved)											
Aluminum	DIS	µg/L	0.5	100%	13.33	15.2	11.3	0.099	47	0.05	
Antimony	DIS	µg/L	0.02	100%	0.229	0.263	0.203	0.0017	0.8	0.001	
Arsenic	DIS	µg/L	0.02	100%	0.234	0.297	0.202	0.0019	0.8	0.001	
Barium	DIS	µg/L	0.02	100%	7.46	8.62	6.27	0.0563	26	0.03	
Cadmium	DIS	µg/L	0.005	100%	0.0431	0.0716	0.0161	0.00047	0.2	0.0002	
Calcium	DIS	mg/L	0.05	100%	19.5	22.4	16.7	0.1464	67,860	68	
Chromium	DIS	µg/L	0.1	100%	0.511	0.69	0.3	0.005	1.7	0.002	
Cobalt	DIS	µg/L	0.005	100%	0.211	0.239	0.199	0.00156	0.8	0.001	
Copper	DIS	µg/L	0.05	100%	16.8	27.7	4.14	0.181	56	0.06	
Iron	DIS	µg/L	1	100%	74.6	98.6	49.8	0.64	251	0.25	
Lead	DIS	µg/L	0.005	100%	0.456	0.509	0.276	0.00333	1	0.001	
Magnesium	DIS	mg/L	0.05	100%	6.80	7.87	5.75	0.0514	24,183	24	
Manganese	DIS	µg/L	0.05	100%	33.2	51.1	24.6	0.334	121	0.12	
Molybdenum	DIS	µg/L	0.05	100%	0.904	1.47	0.547	0.0096	4	0.004	
Nickel	DIS	µg/L	0.02	100%	1.84	2.41	1.61	0.0158	7	0.007	
Potassium	DIS	mg/L	0.05	100%	14.5	16.7	11.3	0.1092	48,920	49	
Selenium	DIS	µg/L	0.04	100%	0.1724	0.199	0.138	0.0013	0.6	0.001	
Silver	DIS	µg/L	0.005	88%	0.0076	0.0101	0.005	0.00007	0.0	0.00003	
Tin	DIS	µg/L	0.2	100%	0.454	0.56	0.31	0.004	1.5	0.001	
Zinc	DIS	µg/L	0.1	100%	37.8	46.4	28	0.303	134	0.13	
Metals (Other)											
Monobutyltin	TOT	µg/L	0.001	75%	0.0083	0.016	0.001	0.0001	0.03	0.00003	
Monobutyltin Trichloride	TOT	µg/L	0.005	100%	0.015	0.026	0.004	0.00017	0.05	0.0001	
Phenolic Compounds											
Total Phenols	TOT	mg/L	0.0075	100%	0.0082	0.0099	0.0063	0.00006	29	0.03	

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
PAH											
Phenanthrene	TOT	µg/L	0.01	75%	0.0168	0.02	0.01	0.0001	0.1	0.0001	
Total LMW-PAH	TOT	µg/L	0.05	75%	0.505	1.9	0.03	0.0124	1.7	0.002	
Total PAH	TOT	µg/L	0.05	75%	0.5115	1.9	0.03	0.0124	2	0.002	
Trichloromethane	TOT	µg/L	4	100%	1.8	1.8	1.8	0.01	8	0.01	
Chloroform	TOT	µg/L	1	100%	1.33	1.6	1.1	0.01	4	0.004	
1,4-Dioxane	TOT	µg/L	0.171	100%	0.688	0.93	0.53	0.006	2	0.002	
Chlorine	DIS	mg/L	4	100%	68.5	76	61	0.5	228	0.2	
High Resolution Parameters											
PAH											
1-methylphenanthrene	TOT	ng/L	0.875	100%	1.32	1.68	0.806	0.011	0.005	0.000005	
2,3,5-trimethylnaphthalene	TOT	ng/L	0.28	100%	3.14	4.79	2	0.031	0.01	0.00001	
2,6-dimethylnaphthalene	TOT	ng/L	0.481	100%	1.29	1.53	1.07	0.01	0.004	0.000004	
2-Methylnaphthalene	TOT	ng/L	0.257	100%	6.44	12.2	3.6	0.08	0.02	0.00002	1,000a
Acenaphthene	TOT	ng/L	0.355	100%	7.71	9.44	4.83	0.062	0.03	0.00003	6,000a
Acenaphthylene	TOT	ng/L	0.433	100%	0.581	0.785	0.364	0.005	0.002	0.000002	
Anthracene	TOT	ng/L	1.68	75%	0.59	0.84	0.37	0.01	0.002	0.000002	
Benz[a]anthracene	TOT	ng/L	0.327	100%	0.395	0.488	0.307	0.003	0.001	0.000001	
Benzo[a]pyrene	TOT	ng/L	0.773	100%	0.27	0.337	0.203	0.002	0.001	0.000001	10a
Benzo[b]fluoranthene	TOT	ng/L	0.591	100%	0.36	0.525	0.274	0.003	0.001	0.000001	
Benzo[e]pyrene	TOT	ng/L	0.712	100%	0.37	0.473	0.294	0.003	0.001	0.000001	
Benzo[ghi]perylene	TOT	ng/L	2.55	100%	0.4	0.54	0.32	0.004s	0.001	0.000001	
Benzo[J,K]Fluoranthenes	TOT	ng/L	0.742	100%	0.305	0.335	0.255	0.002	0.001	0.000001	
Chrysene	TOT	ng/L	0.285	100%	0.939	1.15	0.652	0.008	0.003	0.000003	100a
Dibenzothiophene	TOT	ng/L	0.311	100%	1.78	2.26	1.5	0.015	0.01	0.00001	
Fluoranthene	TOT	ng/L	0.58	100%	6.27	8.11	3.93	0.053	0.02	0.00002	
Fluorene	TOT	ng/L	0.172	100%	5.24	6.72	3.57	0.044	0.02	0.00002	12,000a
Indeno[1,2,3-cd]pyrene	TOT	ng/L	2.29	100%	0.35	0.41	0.27	0.003	0.001	0.000001	
Naphthalene	TOT	ng/L	0.591	100%	10.8	17	6.79	0.111	0.04	0.00004	1,000a
Pentachlorobenzene	TOT	ng/L	0.0212	67%	0.036	0.049	0.0222	0.0003	0.0001	0.0000001	
Phenanthrene	TOT	ng/L	1.68	100%	15.1	18.4	12.5	0.12	0.05	0.0001	
Pyrene	TOT	ng/L	0.937	100%	4.66	5.5	4.1	0.036	0.02	0.00002	
Nonylphenols											
4-Nonylphenol Diethoxylates	TOT	ng/L	54.1	100%	251	368	17.9	2.4	0.8	0.001	
4-Nonylphenol Monoethoxylates	TOT	ng/L	25.9	100%	526	848	105	5.5	1.8	0.002	
Np	TOT	ng/L	12.1	100%	140	266	75.7	1.7	0.5	0.001	700b

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
Pesticides											
1,2-dichlorobenzene	TOT	ng/L	0.5	100%	1.02	1.79	0.253	0.012	0.003	0.000003	
1,3-dichlorobenzene	TOT	ng/L	0.5	100%	15.9	27.6	4.21	0.18	0.064	0.0001	
1,4-dichlorobenzene	TOT	ng/L	0.171	100%	259	462	56.1	3.02	1.06	0.001	
4,4-DDE	TOT	ng/L	0.0425	100%	0.099	0.123	0.06	0.0008	0.0004	0.0000004	
Beta-Endosulfan	TOT	ng/L	0.108	100%	0.893	1.16	0.626	0.008	0.0034	0.000003	
Dieldrin	TOT	ng/L	0.106	100%	0.443	0.728	0.158	0.005	0.0018	0.000002	
Hch, Gamma	TOT	ng/L	0.113	100%	0.187	0.232	0.159	0.002	0.0006	0.000001	
Hexachlorobenzene	TOT	ng/L	0.0212	100%	0.057	0.077	0.032	0.0005	0.0002	0.0000002	
Hexachlorobutadiene	TOT	ng/L	0.0117	100%	0.326	0.479	0.173	0.0031	0.0011	0.000001	
Hydrochlorothiazide	TOT	ng/L	20	100%	738	1580	297	10.3	2.8	0.003	
PPCP											
Furosemide	TOT	ng/L	39.5	100%	2,500	3,090	1,830	20.2	8.9	0.009	
Gemfibrozil	TOT	ng/L	1.5	100%	120	198	40.2	1.29	0.4	0.0004	
Ibuprofen	TOT	ng/L	21.8	75%	166	243	58.2	1.6	0.6	0.001	
Naproxen	TOT	ng/L	10.2	100%	278	728	96.1	4.8	0.9	0.001	
Triclosan	TOT	ng/L	60.2	100%	160	229	76	1.5	0.6	0.001	
Warfarin	TOT	ng/L	3.32	100%	9.29	11.5	7.5	0.08	0.03	0.00003	
PBDE											
PBDE 17/25	TOT	pg/L	0.779	100%	24.5	35.1	16.9	0.229	0.0001	0.0000001	
PBDE 28/33	TOT	pg/L	1.21	100%	50.9	71.4	40.3	0.47	0.0002	0.0000002	
PBDE 37	TOT	pg/L	0.691	100%	3.76	6.81	1.82	0.045	0.00001	0.00000001	
PBDE 47	TOT	pg/L	0.519	100%	3,098	5,680	1840	37.12	0.01	0.00001	
PBDE 49	TOT	pg/L	0.519	100%	64.5	104	41.8	0.68	0.0002	0.0000002	
PBDE 51	TOT	pg/L	0.519	100%	8.35	12.1	5.13	0.079	0.00003	0.00000003	
PBDE 66	TOT	pg/L	0.523	100%	51.9	94.8	29.2	0.62	0.0002	0.0000002	
PBDE 71	TOT	pg/L	0.519	100%	12.0	26.2	2.87	0.171	0.00004	0.00000004	
PBDE 75	TOT	pg/L	0.523	100%	3.52	4.62	1.81	0.03	0.00001	0.00000001	
PBDE 79	TOT	pg/L	0.571	100%	26.1	50.9	4.07	0.333	0.00009	0.0000001	
PBDE 85	TOT	pg/L	6.34	100%	119	254	61.6	1.66	0.0004	0.0000004	
PBDE 99	TOT	pg/L	5.76	100%	2,968	5,860	1,620	38.3	0.01	0.00001	
PBDE 100	TOT	pg/L	6.44	100%	584	1,130	327	7.39	0.002	0.000002	
PBDE 138/166	TOT	pg/L	9.49	100%	31.4	57.1	11.5	0.37	0.0001	0.0000001	
PBDE 140	TOT	pg/L	3.19	100%	11.9	21.9	4.94	0.14	0.00004	0.00000004	
PBDE 153	TOT	pg/L	3.51	100%	263	515	133	3.37	0.0009	0.000001	
PBDE 154	TOT	pg/L	5.54	100%	193	350	112	2.29	0.0007	0.000001	
PBDE 155	TOT	pg/L	2.34	100%	16.9	32.6	9.03	0.21	0.0001	0.0000001	
PBDE 183	TOT	pg/L	4.49	100%	28.5	42.2	20.9	0.28	0.0001	0.0000001	
PBDE 203	TOT	pg/L	39.7	100%	22.4	30.2	12.8	0.2	0.0001	0.0000001	

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
PBDE 206	TOT	pg/L	3.94	100%	230	357	127	2.33	0.001	0.000001	
PBDE 207	TOT	pg/L	3.24	100%	268	458	145	2.99	0.001	0.000001	
PBDE 208	TOT	pg/L	4.17	100%	158	241	74	1.58	0.001	0.000001	
PBDE 209	TOT	pg/L	83.6	100%	3,065	5,830	1,890	38.1	0.011	0.00001	
PCB											
PCB 1	TOT	pg/L	0.713	100%	5.75	8.04	2.95	0.053	0.00002	0.00000002	
PCB 2	TOT	pg/L	0.851	100%	2.31	3.81	1.39	0.025	0.00001	0.00000001	
PCB 3	TOT	pg/L	0.648	100%	8.65	16.5	4.12	0.108	0.00003	0.00000003	
PCB 6	TOT	pg/L	0.648	75%	3.72	4.5	2.7	0.029	0.00001	0.00000001	
PCB 8	TOT	pg/L	0.648	100%	9.90	11.8	8.54	0.077	0.00004	0.00000004	
PCB 11	TOT	pg/L	0.76	100%	62.9	89.2	45.3	0.583	0.0002	0.0000002	
PCB 15	TOT	pg/L	0.95	100%	6.57	8.28	4.77	0.054	0.00002	0.00000002	
PCB 16	TOT	pg/L	0.713	100%	5.77	7.71	4.78	0.05	0.00002	0.00000002	
PCB 17	TOT	pg/L	0.648	100%	5.62	7.49	3.98	0.049	0.00002	0.00000002	
PCB 18/30	TOT	pg/L	0.654	100%	14.6	23.1	9.97	0.151	0.00005	0.0000001	
PCB 19	TOT	pg/L	0.654	75%	2.62	4.61	1.63	0.03	0.00001	0.00000001	
PCB 20/28	TOT	pg/L	0.648	100%	16.6	19.5	11.5	0.127	0.00006	0.0000001	
PCB 21/33	TOT	pg/L	0.648	100%	7.60	8.89	6.06	0.058	0.00003	0.00000003	
PCB 22	TOT	pg/L	0.654	100%	6.61	7.64	4.77	0.05	0.00002	0.00000002	
PCB 25	TOT	pg/L	0.654	75%	1.68	2.36	1.22	0.015	0.00001	0.00000001	
PCB 26/29	TOT	pg/L	0.654	100%	3.18	3.96	2.06	0.026	0.00001	0.00000001	
PCB 31	TOT	pg/L	0.654	100%	14.6	18.3	10.3	0.12	0.00005	0.0000001	
PCB 32	TOT	pg/L	0.648	100%	3.94	5.09	2.73	0.033	0.00001	0.00000001	
PCB 35	TOT	pg/L	0.846	75%	1.59	2.16	1.23	0.014	0.00001	0.00000001	
PCB 37	TOT	pg/L	0.648	100%	4.25	5.26	3.5	0.034	0.00001	0.00000001	
PCB 40/41/71	TOT	pg/L	0.713	100%	6.46	11.2	4.43	0.073	0.00002	0.00000002	
PCB 42	TOT	pg/L	0.648	100%	3.01	5.13	1.78	0.034	0.00001	0.00000001	
PCB 44/47/65	TOT	pg/L	0.713	100%	21.0	37.5	13.2	0.245	0.00007	0.0000001	
PCB 45/51	TOT	pg/L	0.713	100%	3.44	5.12	2.12	0.033	0.00001	0.00000001	
PCB 48	TOT	pg/L	0.713	100%	2.43	3.26	1.93	0.021	0.00001	0.00000001	
PCB 49/69	TOT	pg/L	0.648	100%	7.65	13.4	4.91	0.088	0.00003	0.00000003	
PCB 50/53	TOT	pg/L	0.713	100%	2.15	3.06	1.76	0.02	0.00001	0.00000001	
PCB 52	TOT	pg/L	0.648	100%	21.3	38.1	15	0.249	0.00007	0.0000001	
PCB 56	TOT	pg/L	1.06	100%	5.35	11.2	2.84	0.07	0.00002	0.00000002	
PCB 60	TOT	pg/L	1.07	100%	2.97	5.74	1.38	0.04	0.00001	0.00000001	
PCB 61/70/74/76	TOT	pg/L	0.933	100%	27.7	64.9	12.1	0.424	0.00009	0.0000001	
PCB 64	TOT	pg/L	0.713	100%	6.91	13.6	4.2	0.089	0.00002	0.00000002	
PCB 66	TOT	pg/L	1.85	100%	10.2	22.3	5.35	0.15	0.00003	0.00000003	
PCB 77	TOT	pg/L	1.01	75%	1.54	1.81	0.9	0.01	0.00001	0.00000001	40a

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
PCB 82	TOT	pg/L	1.43	75%	3.97	8.18	2.21	0.05	0.00001	0.00000001	
PCB 83/99	TOT	pg/L	1.26	100%	17.6	43.8	7.53	0.29	0.00006	0.0000001	
PCB 84	TOT	pg/L	1.47	100%	10.6	27.1	3.28	0.18	0.00004	0.00000004	
PCB 85/116/117	TOT	pg/L	0.759	75%	5.82	13.3	2.11	0.087	0.00002	0.00000002	
PCB 86/87/97/108/119/125	TOT	pg/L	1.27	100%	25.2	60.7	12.1	0.4	0.00008	0.0000001	
PCB 88/91	TOT	pg/L	1.32	75%	4.06	9.19	1.49	0.06	0.00001	0.00000001	
PCB 90/101/113	TOT	pg/L	1.02	100%	33.9	88.6	15.2	0.58	0.0001	0.0000001	
PCB 92	TOT	pg/L	1.42	100%	5.58	13.3	2.93	0.09	0.00002	0.00000002	
PCB 93/95/98/100/102	TOT	pg/L	1.05	100%	32.6	79.1	12.6	0.52	0.0001	0.0000001	
PCB 105	TOT	pg/L	2.71	100%	7.29	14.9	4.1	0.1	0.00002	0.00000002	90a
PCB 110/115	TOT	pg/L	0.961	100%	36.2	93.3	13.3	0.61	0.0001	0.0000001	
PCB 118	TOT	pg/L	1.64	100%	20.2	43.9	11.2	0.29	0.00007	0.0000001	
PCB 128/166	TOT	pg/L	1.68	75%	3.41	7.96	1.58	0.05	0.00001	0.00000001	
PCB 129/138/160/163	TOT	pg/L	1.37	100%	29.0	72.6	13.5	0.47	0.0001	0.0000001	
PCB 132	TOT	pg/L	1.57	100%	9.08	25.4	2.44	0.17	0.00003	0.00000003	
PCB 135/151/154	TOT	pg/L	0.648	100%	13.01	31.5	4.71	0.206	0.00004	0.00000004	
PCB 136	TOT	pg/L	0.713	100%	4.75	13.3	1.38	0.087	0.00002	0.00000002	
PCB 141	TOT	pg/L	1.41	100%	5.97	16.3	2.47	0.11	0.00002	0.00000002	
PCB 144	TOT	pg/L	0.648	75%	2.09	5.43	0.651	0.035	0.00001	0.00000001	
PCB 146	TOT	pg/L	1.28	100%	4.61	11.6	2.13	0.08	0.00002	0.00000002	
PCB 147/149	TOT	pg/L	1.28	100%	15.4	19.8	10.9	0.13	---	---	
PCB 153/168	TOT	pg/L	1.19	100%	29.2	72.2	13.6	0.47	0.0001	0.0000001	
PCB 155	TOT	pg/L	0.713	75%	2.16	3.5	0.99	0.023	0.00001	0.00000001	
PCB 156/157	TOT	pg/L	1.7	75%	4.26	8.06	2.25	0.05	0.00001	0.00000001	
PCB 158	TOT	pg/L	1.07	75%	2.63	7.22	0.92	0.05	0.00001	0.00000001	
PCB 170	TOT	pg/L	0.988	100%	8.52	24.1	2.55	0.158	0.00003	0.00000003	
PCB 174	TOT	pg/L	0.815	100%	6.82	20	1.91	0.131	0.00002	0.00000002	
PCB 177	TOT	pg/L	0.654	100%	4.45	13.8	1.18	0.09	0.00001	0.00000001	
PCB 179	TOT	pg/L	0.713	75%	3.21	9.4	0.65	0.061	0.00001	0.00000001	
PCB 180/193	TOT	pg/L	0.654	100%	21.9	60.3	8.44	0.394	0.00007	0.0000001	
PCB 183/185	TOT	pg/L	0.791	75%	5.25	16	0.651	0.105	0.00002	0.00000002	
PCB 184	TOT	pg/L	0.713	100%	2.65	3.72	1.59	0.024	0.00001	0.00000001	
PCB 187	TOT	pg/L	0.713	100%	10.3	27.4	4.25	0.179	0.00003	0.00000003	
PCB 194	TOT	pg/L	0.648	100%	3.95	9.62	1.96	0.063	0.00001	0.00000001	
PCB 195	TOT	pg/L	0.67	75%	1.74	4.58	0.67	0.03	0.00001	0.00000001	
PCB 196	TOT	pg/L	0.713	75%	2.37	7.19	0.65	0.047	0.00001	0.00000001	
PCB 198/199	TOT	pg/L	0.713	100%	3.86	10.1	1.5	0.066	0.00001	0.00000001	
PCB 202	TOT	pg/L	0.654	75%	2.07	4.61	0.65	0.03	0.00001	0.00000001	
PCB 209	TOT	pg/L	0.648	75%	1.93	2.86	0.65	0.019	0.00001	0.00000001	

Table 3.4, continued

Parameter Name	State Code	Unit Code	Detection Limit	% Freq	Average Concentration	Max	Min	Max diluted (1:153)	Average Eff Load kg/year	Average Eff Load (tonne/year)	WQG
PCBs Total	TOT	pg/L	0.063	100%	562	1,140	308	7.451	0.002	0.000002	100a
Total Dichloro Biphenyls	TOT	pg/L	345	100%	83	107	54	1.9	0.0003	0.0000003	
Total Heptachloro Biphenyls	TOT	pg/L	200	100%	31	55	18	0.36	0.0001	0.0000001	
Total Hexachloro Biphenyls	TOT	pg/L	500	100%	114	284	48	1.9	0.0004	0.0000004	
Total Octachloro Biphenyls	TOT	pg/L	100	100%	5	6	4	0.04	0.00002	0.00000002	
Total Pentachloro Biphenyls	TOT	pg/L	62	100%	174	461	62.5	3	0.0006	0.000001	
Total Tetrachloro Biphenyls	TOT	pg/L	85	100%	104	198	52.6	1.3	0.0004	0.0000004	
Total Trichloro Biphenyls	TOT	pg/L	48	100%	57.5	86.6	26.9	0.6	0.0002	0.0000002	
Fluorinated Compounds											
PFBA	TOT	ng/L	0.983	100%	7.65	10.6	2.8	0.069	0.025	0.00003	
PFDA	TOT	ng/L	0.983	67%	1.21	1.58	0.957	0.01	0.004	0.000004	
PFHpA	TOT	ng/L	1.01	100%	2.38	3.11	1.65	0.02	0.008	0.00001	
PFHxA	TOT	ng/L	1.01	100%	9.99	12.1	7.88	0.08	0.033	0.00003	
PFHxS	TOT	ng/L	1.97	100%	5.31	6.83	4.33	0.04	0.018	0.00002	
PFOA	TOT	ng/L	0.983	100%	7.39	9.29	6.35	0.061	0.024	0.00002	
PFOS	TOT	ng/L	1.97	100%	3.84	4.27	3.42	0.03	0.013	0.00001	
PFPeA	TOT	ng/L	1.01	100%	9.11	12.9	4.23	0.08	0.03	0.00003	

Notes:
[1] As determined by Hayco (2005)
n/a=not applicable
ND=not detected
--- parameter does not lend itself to calculating loading, e.g. pH
a=BC Approved Water Quality Guideline
b=BC Working Water Quality Guideline
c=CCME Water Quality Guideline for the protection of Aquatic Life
d=Health Canada Guidelines for Recreational Water Quality
Shaded cells indicate an exceedance of one or more of the guidelines
*concentrations are incorporated into compliance monitoring mean values presented in Table 3.2 and Table 3.3
^loadings for NH_3 and TSS were calculated using available daily/weekly data rather than quarterly data only, in order to increase accuracy
Shaded cells indicate an exceedance of CCME and/or BC WQG. Note that this table does not include the results of the compliance and treatment plant performance monitoring, as discussed in Section 3.3.1 and presented in Table 3.2.

Table 3.5 2019 Acute Toxicity Results

Wastewater Concentration	Rainbow trout LC50 96-hour (*Onchorhynchus mykiss)*				*Daphnia magna* LC50 48-hour			
%vol/vol	mortality # (96-hr)				mortality # (48-hr)			
	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
0	0	0	0	0	0	0	0	0
6.25	0	0	0	0	0	0	0	0
12.5	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0

Table 3.6 2019 Chronic Toxicity Results

Test	Endpoint (%v/v)	
	EC50 or IC50	EC25/IC25
Rainbow Trout (*Onchorhynchus mykiss*) Embryo/Alevin Test		
• survival	>100	>100
• normal alevins	>100	>100
7-day Topsmelt (*Atherinops affinis*) survival and growth test		
• survival	>100	---
• growth	>100	>100
6-day *Ceriodaphnia* test		
• survival	>100	---
• reproduction	>100	>100
Echinoid fertilization (*Strongylocentrotus purpuratus*)	>100	>100

Notes:
*EC50 = observable effect in 50% of the test organisms, EC25 = observable effect in 25% of the test organisms, LC50= lethal effect in 50% of the test organisms
-- not tested

3.4 Overall Assessment

Overall, the 2019 wastewater monitoring results were generally consistent with previous years. The SPTP effluent met all flow, TSS, CBOD and unionized ammonia requirements stipulated under the provincial operational certificate and federal WSER, indicating that wastewaters, from an operational perspective, were as expected. In addition, because all priority substances met applicable WQG in the marine receiving environment (following the application of estimated minimum initial dilution factors), with the exception of bacteriological indicators, it is not likely that significant effects on aquatic life will occur, as a result of the substances being discharged. The use of an estimated minimum initial dilution factor allows for a conservative (i.e., protective) estimate of potential effects, because the predicted average initial factors are actually much higher in the marine receiving environments around the outfall (Hayco, 2005). Direct risk to human health and shellfish harvesting, as a result of the bacteriological indicator exceedances in effluent, was assessed via surface water and water column monitoring in the receiving environment (see Section 5.0).

4.0 BIOSOLIDS MONITORING

4.1 Introduction

In the SPTP LWMP, the CRD and its partner municipalities on the Saanich Peninsula made a commitment to implement a biosolids management plan, based on the following specific commitments:

- Pursue an effective and diversified program for the beneficial use of Class A biosolids that incorporates an economically viable and long-term solution.
- Mitigate nuisances associated with the production and application of biosolids, including odour, noise, truck traffic and dust.
- Manage biosolids to ensure that detrimental effects to public health and the environment are avoided.

The SPTP can produce Class A biosolids, in accordance with the pathogen reduction and vector attraction reduction processes in the ENV (BC MoE, 2002) *Organic Matter Recycling Regulations* (BC OMRR). These regulations define process and quality criteria for biosolids production and establish land application and distribution requirements. The regulations are set to protect human and environmental health.

In 2008, the CRD developed the PenGrow program to produce a soil enhancer product from the Class A biosolids. Biosolids were an end product of the sewage treatment process and were produced when solids (i.e., sludge) were treated. The product was cured and stored at the CRD's Hartland Landfill and the PenGrow program was intermittently in production until early 2011.

In July 2011, the PenGrow program was put on hold following CRD Board motions that "[ended] the production, storage and distribution of biosolids for land application at all CRD facilities and parks", including Hartland Landfill, and indicated the region "does not support the application of biosolids on farmland in the CRD under any circumstances." CRD staff are currently investigating a number of longer-term beneficial use options for the biosolid and sludge. Until alternative non-land application markets for the biosolids can be developed and implemented, no more PenGrow will be produced and all sludge will be disposed of as controlled waste at the Hartland Landfill. The SPTP generated 4,025 of dewatered sludge in 2019.

Detailed statistical trend analyses are undertaken every three to five years to quantitatively assess temporal trends in concentrations and loadings of wastewater parameters. In 2012, Golder Associates (Golder, 2013) updated the previous trend assessment to include the 2009-2011 results, expanding the total SPTP dataset from 2000-2011. Results of this assessment were presented in the 2011 annual report (CRD, 2012). The most recent trend assessment was completed in 2017 (Golder, 2019) and included the next three years of biosolids data (2012-2015). Results were included in the 2016 report (CRD, 2017).

Starting in 2013, the CRD commenced monitoring the sludge in order to help inform the RSCP on the partitioning behaviour of some wastewater contaminants between the solid and liquid phases of the treatment processes. Metals were of primary interest, as they fall under the RSCP's regulatory regime.

4.2 Methods

Sludge was produced at the SPTP and analyzed for similar parameters as previous years (Table 4.1). In 2019, sludge was collected once each month, except for February and September when field replicate samples were collected.

4.3 Results and Discussion

In 2019, 27 parameters were monitored in the SPTP sludge. For those parameters that are BC OMRR regulated, all results were far below the Class A biosolids limit (Table 4.1), similar to previous years.

Table 4.1 SPTP Sludge Monitoring, 2019

Parameter	Units	Class A Biosolids Limit (mg/kg)	Jan	Feb FR1	Feb FR2	Mar	Apr	May	Jun	Jul	Aug	Sep FR1	Sep FR2	Oct	Nov	Dec	Average
Regulated Parameters																	
Arsenic	mg/kg dry	75	0.9	0.75	0.76	0.78	0.79	0.5	0.54	0.88	0.6	<0.3	<0.58	0.94	0.63	0.51	0.64
Cadmium	mg/kg dry	20	0.58	0.935	0.911	0.771	0.645	0.68	0.936	1.09	0.626	0.312	0.261	1.09	1.05	0.444	0.738
Chromium	mg/kg dry	1,060	6.1	6.2	5.9	7.1	5.9	4.5	4.9	6.9	4.7	2.7	3.3	6.4	6.2	4.3	5.36
Cobalt	mg/kg dry	151	0.91	0.7	0.69	0.77	0.58	0.5	0.6	0.91	0.73	0.34	0.43	0.92	0.82	0.61	0.679
Copper	mg/kg dry	757	322	307	305	308	259	244	227	254	198	101	105	231	166	136	226
Lead	mg/kg dry	505	8.1	6.05	5.82	6.87	6.13	5.45	4.82	9.3	5.39	1.68	1.5	11.7	6.43	5.28	6.04
Mercury	mg/kg dry	5	0.17	0.195	0.241	0.228	0.175	0.191	0.178	0.263	0.168	0.072	0.082	0.423	0.265	0.15	0.200
Molybdenum	mg/kg dry	20	3.02	2.92	2.9	2.94	2.23	1.96	2.25	2.77	2.33	0.95	1.5	3.4	2.62	1.87	2.40
Nickel	mg/kg dry	181	5.97	5.24	5.21	5.4	6.14	3.44	4.13	6.33	4.33	2.25	2.62	5.48	5.1	5.58	4.80
Selenium	mg/kg dry	14	1.9	1.61	1.63	1.77	1.33	1.26	1.2	1.69	1.22	<0.2	0.5	1.88	1.56	1.07	1.34
Thallium	mg/kg dry	5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.19	<0.1	<0.17	<0.1	0.06
Vanadium	mg/kg dry	656	4.5	3.4	3.4	3.9	2.5	1.4	2	3.3	1.8	<1	<1.9	2.6	2.7	2.1	2.5
Zinc	mg/kg dry	1,868	195	220	220	214	170	177	217	274	252	135	151	342	222	145	210
Unregulated Parameters																	
pH	pH	n/a	5.58	5.57	5.52	5.59	6.11	5.34	5.6	5.83	5.61	5.95	6.52	5.56	6.95	6.02	5.84
WAD Cyanide	mg/kg dry	n/a	0.72	0.64	0.6	<4.89	<4.45	<3.76	<7.12	<4.62	<0.45	<0.42	<0.42	0.55	<4.14	<3.26	1.38
Aluminum	mg/kg dry	n/a	1,650	1,320	1,370	1,220	842	638	703	1,000	699	351	462	1,050	943	722	926
Antimony	mg/kg dry	n/a	0.65	0.58	0.6	0.66	0.61	0.56	0.64	0.77	0.59	0.37	0.54	1.07	0.67	0.49	0.63
Barium	mg/kg dry	n/a	31.4	36.5	36.5	41.2	38	28.3	42.5	42.1	31.1	15.3	17.5	45	39.1	22.2	33.3
Beryllium	mg/kg dry	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.19	<0.1	<0.17	<0.1	0.12
Bismuth	mg/kg dry	n/a	14.3	9.28	9.25	11.2	8.46	8.58	7.82	12.4	8.94	2.88	2.8	13.5	12.7	8.21	9.31
Boron	mg/kg dry	n/a	10.7	6.6	6.8	8.4	6.9	4.1	3.8	5.8	4.8	<2	<3.8	4.8	7.7	8.3	5.83
Calcium	mg/kg dry	n/a	4,810	4,730	4,650	5,250	3,770	4,030	3,480	5,410	4,630	1,660	2,160	5,920	4,790	3,450	4,196
Iron	mg/kg dry	n/a	2,140	2,010	2,020	2,010	1,770	1,070	1,150	2,280	1,450	654	938	1,910	1,750	1,280	1,602
Lithium	mg/kg dry	n/a	0.82	0.7	0.69	0.45	0.42	0.3	0.25	0.51	0.22	0.14	<0.19	0.46	0.5	0.35	0.422
Magnesium	mg/kg dry	n/a	1,440	1,340	1,320	1,500	1,040	1,250	1,660	4,830	3,670	1,760	3,080	2,680	2,740	2,570	2,206
Manganese	mg/kg dry	n/a	64.9	50	52	42.8	45.8	25.9	29.7	42.3	32	16.8	25.1	45.1	48.7	35.4	39.8
Phosphorus	mg/kg dry	n/a	7,020	7,320	7,380	7,840	5,470	6,560	8,550	18,700	14,600	8,160	12,800	12,900	13,000	9,480	9,984
Potassium	mg/kg dry	n/a	1,900	1,870	1,910	2,410	1,520	1,980	2,740	6,260	4,360	3,030	4,450	3,670	4,230	3,340	3,119
Silver	mg/kg dry	n/a	0.77	0.61	0.64	0.7	0.59	0.59	0.62	0.82	0.74	0.35	0.56	1.34	0.67	0.58	0.684
Sodium	mg/kg dry	n/a	273	304	297	282	221	148	247	401	283	172	232	284	317	267	266

Table 4.1, continued

Parameter	Units	Class A Biosolids Limit (mg/kg)	Jan	Feb FR1	Feb FR2	Mar	Apr	May	Jun	Jul	Aug	Sep FR1	Sep FR2	Oct	Nov	Dec	Average
Strontium	mg/kg dry	n/a	15.8	14.3	13.7	15.2	10.7	15.6	17.2	22.4	18	7.28	10.9	21.3	16.1	11.9	15.0
Sulfur	mg/kg dry	n/a	4010	4000	3470	3260	2030	3380	3080	3690	2650	1930	3050	4370	2820	2700	3174
Tellurium	mg/kg dry	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.19	<0.1	<0.17	<0.1	0.09
Thorium	mg/kg dry	n/a	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.96	<0.5	<0.86	<0.5	0.28
Tin	mg/kg dry	n/a	6.42	5.85	5.83	7.9	5.47	5.1	6.61	7.03	5.77	2.64	3.25	7.58	7.11	5.18	5.84
Titanium	mg/kg dry	n/a	11.6	29.5	29.8	32.4	33	8.4	16.7	21.1	29	3	2.1	11.9	33.2	16.4	19.9
Tungsten	mg/kg dry	n/a	0.32	0.23	0.25	0.31	0.24	0.25	0.29	0.4	0.29	<0.2	<0.38	0.41	<0.34	<0.2	0.25
Uranium	mg/kg dry	n/a	0.438	0.287	0.297	0.375	0.214	0.204	0.184	0.276	0.181	0.075	<0.096	0.275	0.254	0.192	0.236
Zirconium	mg/kg dry	n/a	<2	<2	<2	<2	2.2	<2	<2	2.6	4.7	<2	<3.8	<2	<3.4	<2	1.58

Notes:
+ Average of two replicates
*From Organic Matter Recycling Regulation (B.C. Reg. 18/2002, Schedule 4 Section 3, February 28, 2019) which references Trade Memorandum T-4-93 'Safety Guidelines for Fertilizers and Supplements' (Sept 1997) and contains maximum acceptable metal concentrations based on annual application rates (mg metal/kg product) 4400 kg/ha –yr.
FR1 and FR2 indicate two samples (field replicates) collected that month as part of QA/QC protocols

4.4 Overall Assessment

No biosolids were produced at the SPTP in 2019. It is unknown if or when production will recommence. However, the sludge monitoring data collected to inform the RSCP showed that all OMRR regulated parameters continue to be far below Class A biosolids limits. The sludge will continue to be disposed of as controlled waste at the Hartland landfill until their long term fate is determined.

5.0 SURFACE WATER MONITORING

Surface water monitoring is undertaken to assess human health and environmental impacts of the SPTP outfall. In addition, the results are used to verify the environmental concentrations of parameters that are predicted using wastewater concentration data and the 1:153 minimum initial dilution factor determined during the 2004 dye study (Hayco, 2005) (discussed in Section 3.0).

5.1 Bacteriology and Extended Analyses

5.1.1 Introduction

The CRD conducts surface water monitoring for bacteriological indicators adjacent to the SPTP wastewater discharge to assess the potential for human health risk for those participating in recreational activities (e.g., swimmers, kayakers) at the surface near the outfall (see Appendix C1 for site coordinates). In addition, monitoring data are used to assess potential risks to shellfish harvesting in the vicinity of the SPTP outfall, although there is no commitment in the LWMP to meet this standard outside of shellfish growing areas. Finally, surface waters are monitored to ensure that the outfall diffuser is functioning as expected and a minimum initial dilution of 153:1 is being achieved.

A review of the SPTP WMEP was conducted in 2011/2012, in partnership with ENV, including the surface water component. As a result of the review, the surface water sampling program was revised. Beginning in 2013, the fecal coliform sampling was switched from monthly to biannual, 5-in-30 sampling (Table 2.1) in order to align more closely with the ENV fecal coliform guideline, based on the geometric mean of five samples collected in 30 days not exceeding 200 CFU/100 mL. In addition, enterococci were analyzed along with fecal coliforms, as they are a more persistent tracer of human waste in the marine environment, with a more direct correlation with adverse human health impacts. Metal and conventional parameter concentrations were also added as extended analyses to the surface water monitoring program (Appendix C2) to confirm environmental concentrations that were previously only predicted by using wastewater data (Section 3.0) and applied minimum initial dilution factors. Beginning in 2017, depth composite sampling at the outfall and reference station was switched to top/middle/bottom discreet sampling, in order to align with other CRD outfall sampling programs, and the extended analyses were added to the reference station to provide comparison to results previously collected at the outfall IDZ stations only.

A TWQRP was formed in 1999 and included representatives from the Capital Health Region, Environment Canada and the CRD Environmental Services Department (now known as Parks & Environmental Services Department). The chair of the MMAG (at the time) attended meetings as a technical advisor to the panel. The TWQRP reviewed the pre- and post-discharge assessment fecal coliform results and determined that there was no need to disinfect the effluent to meet the primary contact human recreation guideline (ENV, 2006). The data were consistently below the value of 200 CFU/100 mL and did not show any patterns of exceedances. However, the panel thought that there might be different situations in the future that would warrant a re-evaluation of the need for effluent disinfection, including any of the following scenarios:

1. The SPTP flows reach an average daily flow of 15,000 m^3/d (which represents 82% of the capacity of the plant).
2. The MMAG recommends disinfection based on an effect noted in the on-going monitoring of the receiving environment.

3. There is a significant degradation in effluent quality, as measured by fecal coliform in the discharge relative to June 2000 to June 2001 period (i.e., significant defined as a 10-fold increase in the annual mean over a period of one year).
4. The date is no later than 2011 (i.e., 10 years since the SPTP started operation).

In 2011, the CRD resurrected the TWQRP, following 10 years of operation. The MMAG was delegated as the TWQRP and in 2015, this advisory group confirmed that disinfection continues to be unnecessary to meet recreational water quality guidelines around the outfall. However, they requested that the CRD continue to assess the potential benefits of disinfection to nearby shellfish resources in consultation with First Nation and other shellfish stakeholders. In January 2020, staff advised the Saanich Peninsula Wastewater Commission that installation of disinfection at the SPTP is unlikely to present any significant benefit to nearby shellfish resources, as the ongoing surface water bacteriological monitoring indicates that levels around the outfall are well below thresholds to protect shellfish harvesting. Staff therefore recommend that disinfection not be installed at this time. Staff continue to meet with W̱SÁNEĆ First Nations and other shellfish stakeholders to assess potential future disinfection need, as well as to identify other areas on the Saanich Peninsula where shellfish harvesting could be restored but are outside the influence of the SPTP.

5.1.2 Methods

The CRD sampling technicians sampled surface water over two sampling periods in 2019 ("winter", i.e., January/February 2019 and "summer", i.e., June/July 2019) using a 5-m research vessel positioned by global positioning system.

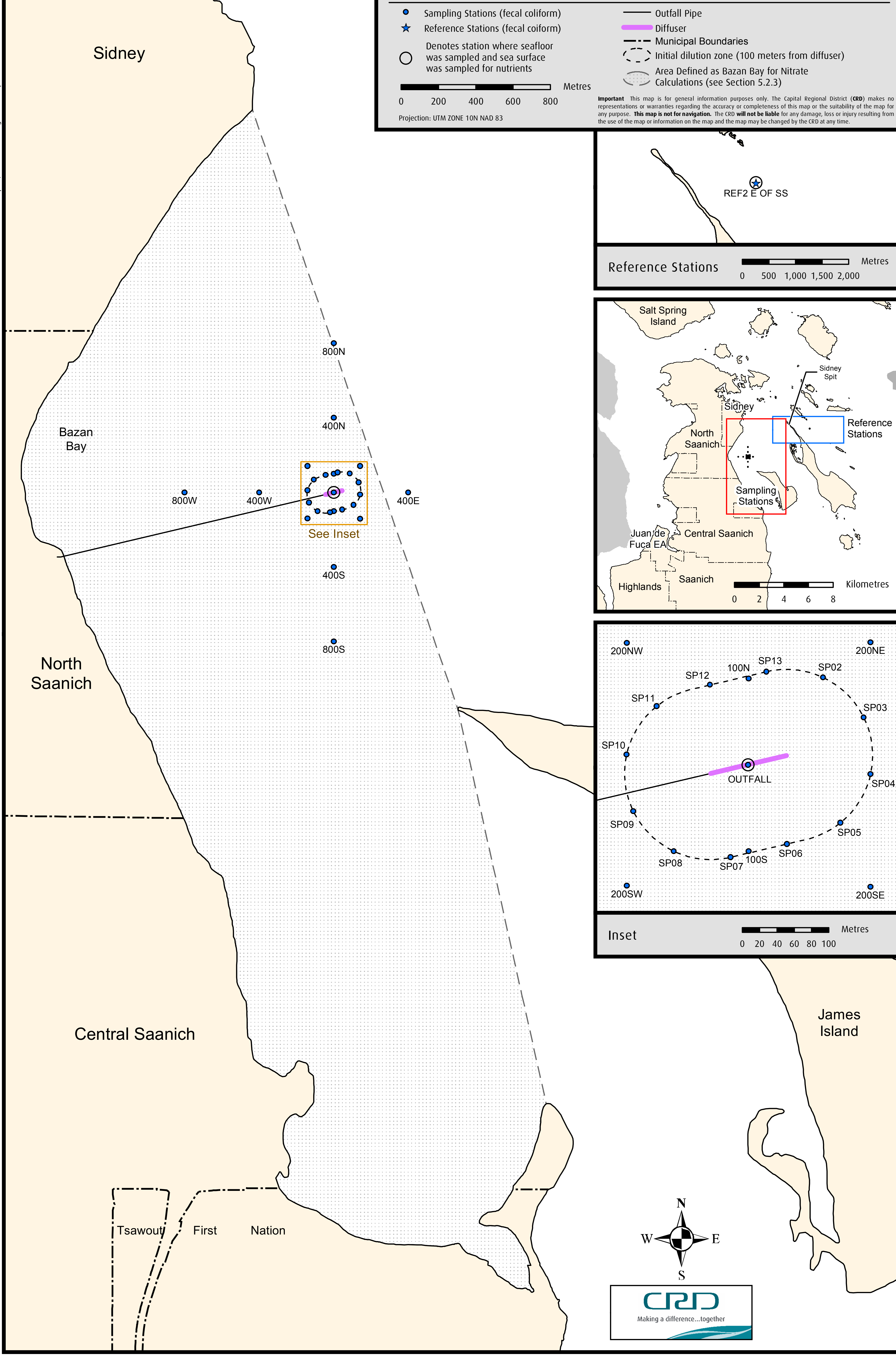
Each sampling period consisted of five individual sampling days occurring over a 30-day period ("5-in-30"). Nineteen stations at different distances from the outfall terminus were sampled. Sampling stations consisted of 14 outfall stations, one reference station located near Sidney Island, and four variable stations located at the edge of the IDZ (Figure 5.1). Station codes describe the distance from the outfall terminus in metres with compass direction (i.e., 100N = 100 m north of the outfall). The variable IDZ stations were selected at the time of sampling based on a computer model prediction (Lorax, 2018) of what depth and direction the effluent plume would most likely be trapped, due to tides, current flow and direction. See Appendix C1 for a list of stations and coordinates.

Surface samples were collected at a depth of 1 m using a sampling pole. Sterile wide-mouth bottles were placed in the pole holder with the lid removed, submerged to collection depth, brought to the surface, and then excess water poured off before the lid was screwed on tightly. In addition, at the reference station and at each of the IDZ stations, a Niskin bottle was used to collect a sample from each of three depths; surface (1 m below the water's surface), middle (i.e., where the plume was modelled to be) and bottom (1 m off the bottom of the ocean floor).

Surface water samples were then analyzed by Bureau Veritas Laboratories Inc. (Burnaby, BC) for various parameters, depending on the sampling site and the sampling day. A larger list of parameters, including metals, was analyzed on a single day of each five-day sampling series and results compared to applicable BC WQG. See Appendix C2 for the list of surface water parameters and the analytical frequency for each.

Bacteriology results were averaged as geomeans and compared to the ENV guideline of 200 CFU/100 mL for fecal coliforms and 35 CFU/100 mL for enterococci (BCMoE&CCS, 2019) and the Health Canada guidelines of a geomean limit of 35 CFU/100 mL for enterococci and a single sample maximum of 70 CFU/100 mL for enterococci (Health Canada, 2012). In addition, results were compared to Canadian Shellfish Sanitation Program (CSSP) guidelines for shellfish harvesting, which require that the geomean of fecal coliform results not exceed 14 CFU/100 mL and not more than 10% of the samples exceed 43 CFU/100 mL (CSSP, 2019).

Figure 5.1 - Saanich Peninsula Treatment Plant Outfall Sampling and Reference Locations



5.1.3 Results and Discussion

Bacteriology

Results show that all stations had very low concentrations of fecal coliforms and enterococci for both the summer and winter 5-in-30 sampling programs (Figure 5.2, Table 5.1, Table 5.2, Table 5.3 and Table 5.4). Figure 5.2 utilizes the maximum value detected for each sampling depth on each sampling event for the calculated geomeans. No single sample or geomean was over the respective human recreation or shellfish harvesting guidelines, with a maximum geomean of 2 CFU/100 mL recorded for both fecal coliforms and enterococci at the surface water (1 m depth) stations throughout the water column (Table 5.1 and Table 5.2). The IDZ stations had a maximum geomean of 3 CFU/100 mL for fecal coliform in the winter and 1 CFU/100 mL for fecal coliform in the summer and enterococci in the summer and winter (Table 5.2, Table 5.3 and Table 5.4).

All surface water fecal coliform concentrations were well below the conservatively predicted environmental concentration of 850 CFU/100 mL, after the minimal initial dilution (1:153) (Hayco, 2005) was applied to the maximum effluent fecal coliform concentration of 130,000 CFU/100 mL (Table 3.4). Similar observations were made for enterococci, where surface water results were well below the 100 CFU/100 mL that was predicted using the maximum effluent enterococci concentration of 15,000 CFU/100 mL and the 153:1 dilution factor.

These results are generally consistent with previous years and previous studies (CRD, 2002-2018), including Island Health's Health Protection and Environment Services routine beach sampling program that involves monitoring the nearshore environment in Bazan Bay during summer months, focusing on waters that are most commonly used for recreation.

Overall, the bacteriological sampling results, and previous dye study results (Hayco, 2005), indicate that the plume was predominantly trapped below the surface and that adverse health effects from recreational primary contact activities or the consumption of shellfish are not likely. There were no enterococci or fecal coliform geomean results or single sample results that exceeded the BC or Health Canada guidelines for the protection of human health, or the CSSP guidelines for shellfish harvesting.

As a conservative measure by the federal government, an area of approximately 17.65 km^2 around the outfall is closed for shellfish harvesting, as standard Fisheries and Oceans Canada procedure near industrial and sanitary wastewater outfalls. Shellfish closures have a minimum radius around an outfall of 300 m, but this closure was expanded in December of 2015, due to proximity to an urban centre where there are other potential sources of bacterial contamination (e.g., stormwater outfalls, marinas, septic systems, sewage pumps). This conservative protection area would also ensure shellfish consumer safety in a flood situation where the treatment plant or conveyance system pump stations were overwhelmed.

Metals

The extended suite of parameters was analyzed at the four IDZ sites and a reference site on one day of sampling for each round of 5-in-30 sampling. Results are detailed in Appendix C2. For those parameters that were detected and had relevant BC and CCME WQG, only boron had WQG exceedances. Boron exceeded WQG at every station and every sampling event, including the reference station. This is a common occurrence, as the natural concentrations of boron are above WQG in the Salish Sea. ENV is working on updating the boron guideline.

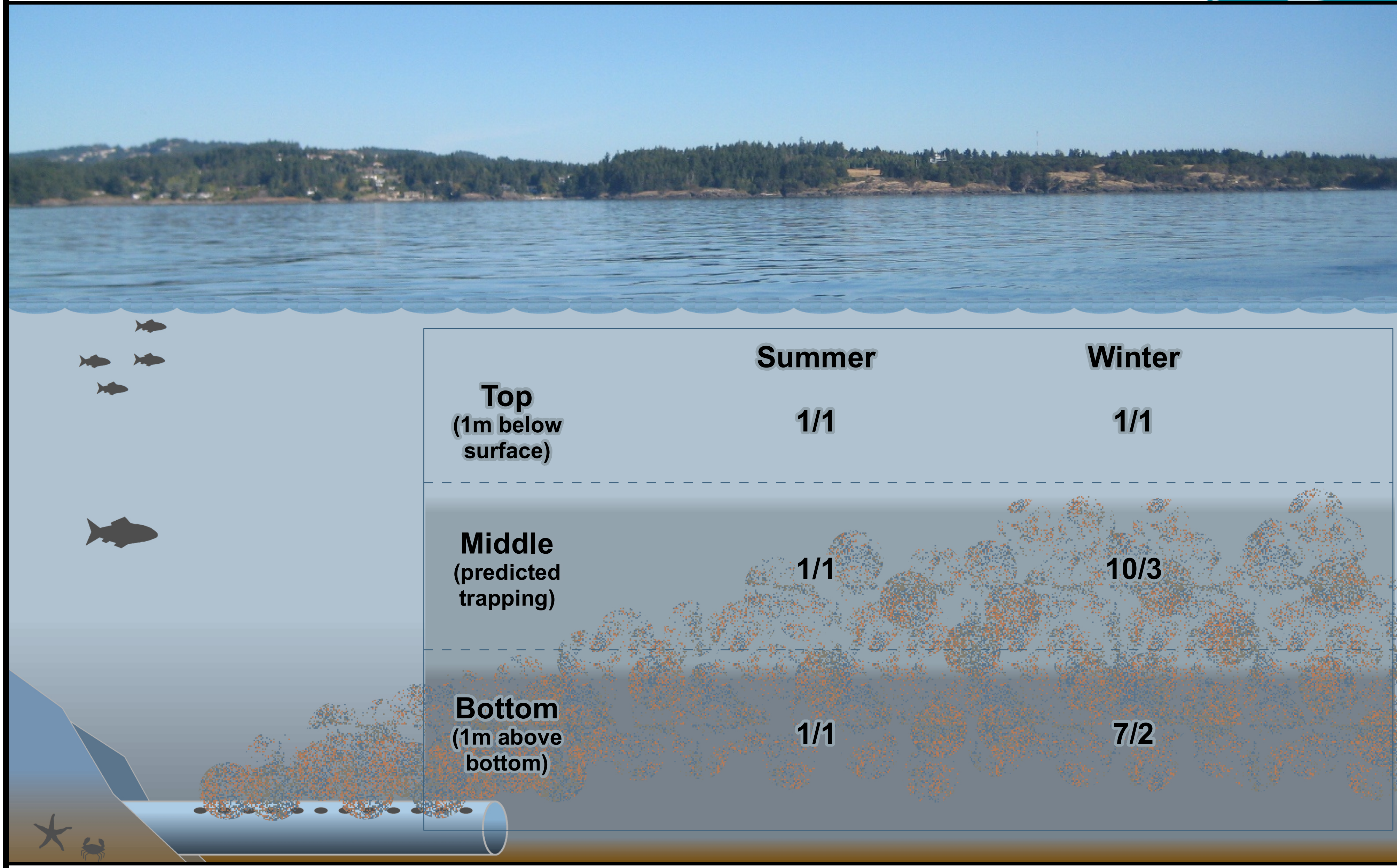
5.1.4 Overall Assessment

Overall, the 2019 bacteriology results indicated that the outfall plume was predominantly trapped below the ocean surface and the diffuser was working as expected during the sampling events. In addition, the potential for human exposure to high bacterial concentrations from the wastewater discharge was low around the outfalls, as demonstrated by geometric mean results that were below thresholds used to assess potential human health risks in surface waters. Effects on shellfish consumers was also not expected. Most extended analyses monitoring parameters were either non-detect or well below applicable WQG, with the exception of boron, which exceeded WQG at every station and sampling event, including the reference station, The CRD will continue to monitor metals in waters around the outfall to assess environmental significance.

CRD
Making a difference...together

Saanich Peninsula Waste Water Treatment Plant Water Column Sampling

Fecal Coliform and Enterococci Results - 2019 (5 in 30)



	Summer	Winter
Top (1m below surface)	1/1	1/1
Middle (predicted trapping)	1/1	10/3
Bottom (1m above bottom)	1/1	7/2

Fecal Coliform — **10/41** — Enterococci

Saanich Peninsula Waste Water Treatment Plant IDZ station geometric means of fecal coliform and enterococci counts CFU/100mL (maximum concentrations).

Notes:

Each value is the geometric mean of each maximum value detected at each sampling event (i.e. n=5)
Sampled 5 times in 30 days during each season.

Geometric mean count shown in red if fecal count exceeds 200 CFU/100mL or enterococci count exceeds 20 CFU/100mL.

Table 5.1 SPTP Surface Sites 5 Sampling Events in 30 Days Fecal Coliform 2019

	Fecals	Winter						Summer					
		1	2	3	4	5	GeoMean	1	2	3	4	5	GeoMean
Outfall Sites	Outfall	<1	<1	3	1	35	2	1	<1	15	<1	<1	1
	100N	<1	<1	<1	<1	<1	1	1	<1	<1	<1	<1	1
	100S	1	1	1	<1	<1	1	3	<1	8	<1	<1	1
	200NE	<1	1	<1	<1	<1	1	1	<1	<1	<1	<1	1
	200NW	<1	3	1	1	4	1	4	<1	<1	<1	2	1
	200SE	<1	1	1	<1	2	1	1	<1	<1	<1	<1	1
	200SW	<1	1	<1	<1	<1	1	1	3	1	<1	<1	1
	400E	2	<1	<1	2	1	1	<1	<1	1	<1	<1	1
	400N	<1	<1	<1	<1	1	1	1	<1	1	<1	1	1
	400S	<1	<1	<1	<1	<1	1	1	<1	1	<1	<1	1
	400W	2	<1	1	1	<1	1	1	1	<1	1	<1	1
	800N	2	<1	<1	<1	1	1	1	<1	1	<1	<1	1
	800S	<1	1	<1	1	<1	1	<1	<1	<1	<1	<1	1
	800W	1	<1	1	2	<1	1	3	<1	<1	1	<1	1
Reference Site	Reference 2	3	2	<1	1	<1	1	<1	1	<1	<1	1	1

Notes:
Shaded cells exceed BC Approved WQG = 200 CFU/100 mL (geometric mean over 5 samples)
<1 replaced with 0.5 for Geomean calculation

Table 5.2 SPTP Surface Sites 5 Sampling Events in 30 Days Enterococci 2019

	Enterococci	Winter						Summer					
		1	2	3	4	5	GeoMean	1	2	3	4	5	GeoMean
Outfall Sites	Outfall	1	1	1	<1	18	2	<1	<1	5	<1	<1	1
	100N	<1	<1	<1	<1	<1	1	2	<1	<1	<1	<1	1
	100S	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	200NE	<1	<1	<1	1	<1	1	<1	<1	<1	<1	<1	1
	200NW	<1	<1	<1	<1	3	1	<1	<1	<1	<1	<1	1
	200SE	<1	1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	200SW	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	1	1
	400E	<1	<1	<1	1	<1	1	<1	<1	<1	<1	<1	1
	400N	1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	400S	3	<1	<1	<1	<1	1	<1	<1	1	<1	<1	1
	400W	<1	1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	800N	1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	800S	<1	2	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	800W	<1	<1	<1	<1	<1	1	<1	<1	<1	1	<1	1
Reference Site	Reference 2	<1	1	<1	<1	<1	1	<1	<1	1	<1	<1	1

Notes:
Shaded cells exceed BC Approved WQG = 20 CFU/100 mL (geometric mean over 5 samples)
<1 replaced with 0.5 for Geomean calculation

Table 5.3 SPTP IDZ Sites 5 Sampling Events in 30 Days Fecal Coliform 2019

Fecals		Winter						Summer					
CFU/100 mL		Day 1	Day 2	Day 3	Day 4	Day 5	GeoMean	Day 1	Day 2	Day 3	Day 4	Day 5	Geomean
Station 1	Top	1	1	1	<1	<1	1	<1	<1	<1	<1	4	1
	Middle	1	16	6	2	<1	2	<1	<1	<1	1	6	1
	Bottom	16	14	1	4	<1	3	<1	1	<1	3	2	1
Station 2	Top	1	<1	<1	4	<1	1	5	<1	<1	<1	2	1
	Middle	1	1	<1	<1	1	1	<1	<1	<1	<1	5	1
	Bottom	<1	1	2	<1	<1	1	1	1	<1	<1	1	1
Station 3	Top	<1	1	<1	7	<1	1	4	<1	<1	1	<1	1
	Middle	19	1	<1	1	<1	1	<1	<1	<1	<1	2	1
	Bottom	2	<1	<1	<1	<1	1	<1	<1	<1	1	<1	1
Station 4	Top	1	<1	<1	5	<1	1	2	<1	<1	1	2	1
	Middle	1	<1	<1	1	28	1	1	<1	2	1	2	1
	Bottom	<1	<1	14	<1	1	1	1	---	<1	1	<1	1
Reference 2	Top	3	2	<1	1	<1	1	<1	1	<1	<1	1	1
	Middle	<1	<1	1	<1	<1	1	<1	<1	<1	<1	<1	1
	Bottom	1	<1	<1	<1	<1	1	1	<1	1	<1	1	1

Notes:
Shaded cells exceed BC Approved WQG = 200 CFU/100 mL (geometric mean over 5 samples)
<1 replaced with 0.5 for Geomean calculation
--- indicates incomplete sampling due to adverse weather conditions

Table 5.4 SPTP IDZ Sites 5 Sampling Events in 30 Days Enterococci 2019

Enterococci		Winter						Summer					
CFU/100 mL		Day 1	Day 2	Day 3	Day 4	Day 5	GeoMean	Day 1	Day 2	Day 3	Day 4	Day 5	Geomean
Station 1	Top	1	<1	1	<1	1	1	<1	<1	<1	<1	1	1
	Middle	1	9	<1	<1	<1	1	<1	<1	<1	<1	2	1
	Bottom	8	6	<1	<1	<1	1	1	<1	<1	<1	<1	1
Station 2	Top	<1	1	<1	1	<1	1	<1	<1	<1	<1	1	1
	Middle	1	3	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	Bottom	1	<1	<1	1	<1	1	1	<1	<1	<1	<1	1
Station 3	Top	<1	<1	<1	<1	<1	1	2	<1	<1	<1	<1	1
	Middle	9	<1	<1	<1	<1	1	<1	1	<1	<1	1	1
	Bottom	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	1
Station 4	Top	<1	<1	<1	3	<1	1	<1	<1	1	<1	<1	1
	Middle	3	<1	<1	<1	7	1	<1	<1	<1	<1	1	1
	Bottom	<1	1	3	<1	<1	1	<1	---	<1	<1	<1	1
Reference 2	Top	<1	1	<1	<1	<1	1	<1	<1	1	<1	<1	1
	Middle	<1	2	<1	<1	<1	1	<1	<1	<1	<1	<1	1
	Bottom	<1	<1	<1	<1	<1	1	<1	<1	1	<1	<1	1

Notes:
Shaded cells exceed BC Approved WQG = 20 CFU/100 mL (geometric mean over 5 samples)
<1 replaced with 0.5 for Geomean calculation
--- indicates incomplete sampling due to adverse weather conditions

5.2 Nutrients

5.2.1 Introduction

The primary objectives of the SPTP nutrient monitoring program are to assess the concentration of nutrients in the receiving waters in the vicinity of the outfall and to ensure that nutrients from the SPTP are not at levels that could cause enrichment/eutrophication of marine waters. A secondary objective of the nutrient monitoring is, therefore, to monitor the natural variability of nutrients in Bazan Bay marine waters. The pre- and post-discharge assessment program (Aquametrix, 2000, 2001a), and the subsequent receiving environment monitoring programs (CRD, 2002-2020), have shown a large seasonal variability in nutrient concentrations in the vicinity of Bazan Bay.

In 2004, the MMAG reviewed the nutrient data collected in the pre- and post-discharge assessment programs and the subsequent monitoring from 2001-2003. The group determined that monthly monitoring at a station directly above the outfall terminus and a reference station was sufficient to meet the above objectives. However, recognizing that increasing flows to the treatment facility have the potential to cause effects on receiving environment nutrient levels, a plan with conditions that could precipitate the re-evaluation of the need for a comprehensive nutrient monitoring program was developed. If the following conditions are met, a re-evaluation will be undertaken:

1. The SPTP flows reach a mean daily flow of 15,000 m^3/d (which represents 82% of the SPTP capacity); or
2. The MMAG recommends re-evaluation, based on an effect noted in the ongoing monitoring of wastewater or the receiving environment; or
3. There is a significant degradation in effluent quality, as measured by total nitrogen loading [significant defined as a doubling of the mean annual total nitrogen (i.e., TKN + NOx) loading, as compared to the mean loading from 2001 to 2003]; or
4. No later than 2014 (i.e., 10 years since the nutrient monitoring program commenced).

As it is now past 2014, the TWQRP mentioned in Section 5.1.1, is tasked with assessing the nutrient monitoring program, following their reassessment of the need for disinfection.

Following a 2011-2012 collaborative review of the SPTP surface water monitoring program, a decision was made to shift from monthly monitoring of two surface water stations to a biannual "5 times in 30 days" monitoring. In this program, two surface stations (outfall and reference) plus four IDZ stations were sampled at three depths each for nutrients once in each 5-in-30 sampling event (Table 2.1). This program began in January 2013. In 2017, the depth integrated stations at Outfall and Reference were dropped, and instead the four IDZ sites, plus the reference site, were sampled for nutrients at three depths each on all five sampling days.

5.2.2 Methods

The CRD sampling technicians collected samples at four IDZ stations located around the outfall terminus and at the reference station east of Sidney Spit (Figure 5.1), in conjunction with the 5-in-30 biannual bacteriological sampling program (Table 5.1). The four IDZ sites were chosen on each sampling day, based on tide and current modelling to predict the most likely depth and direction of the plume (Lorax, 2018). At each of the stations, samples were collected at surface (1 m below the water's surface), middle (i.e., where the plume was modelled to be) and bottom (1 m off the bottom of the ocean floor) using a Niskin bottle.

The suite of parameters selected for monitoring in the marine receiving environment reflects the suite of nutrients in the SPTP wastewater monitoring program. Both programs monitor ammonia, total Kjeldahl nitrogen (TKN), nitrate, nitrite, total phosphorus, conductivity, pH, salinity and total organic carbon. While some parameters may not be relevant in the marine receiving environment (e.g., ammonia is measured in wastewater, but is primarily found in the ammonium form in marine waters), they are still monitored to allow for direct comparison of the two sets of results. This suite of nutrients has also been monitored since before the SPTP commenced discharging into Bazan Bay, as part of the pre-discharge monitoring program.

5.2.3 Results and Discussion

The potential effects of the SPTP discharge on nutrient concentrations in the marine receiving environment were assessed by qualitatively comparing the 2019 IDZ and reference station data. Data are presented in Appendix C3.

The 2019 mean concentrations of nutrients, and other measured parameters (i.e., ammonia, TKN, nitrite, nitrate, total phosphorus, dissolved phosphorus), exhibited no consistent (qualitative) differences between outfall and reference stations (Appendix C4). The average concentrations of nutrients in 2019 were also within the ranges measured during the pre- and post-discharge studies (Aquametrix Research Ltd., 2000 and 2001a), and were consistent with recent monitoring years and the concentrations expected in Juan de Fuca Strait. The average surface water results for nitrate were between 0.22 and 0.36 mg/L N at the reference station and 0.20 to 0.36 mg/L N at the IDZ stations. For comparison, ambient nitrate concentrations in the Juan de Fuca Strait area are typically on the order of 0.140-0.420 mg/L N (Lewis, 1974 and 1978, as cited in Harrison *et al*., 1994).

Figure 5.3 and Figure 5.4 present 2013-2019 nitrate and total nitrogen results from the reference area and outfall monitoring stations, compared to the Mackas and Harrison (1997) study of background concentrations in the area. The comparison indicates that the monitoring results are well within background concentrations.

Similar to previous years (CRD, 2002-2020), nutrient concentrations in 2019 exhibited high natural spatial and temporal variability, which is typical of the Strait of Georgia and the Juan de Fuca and Haro straits (Mackas and Harrison, 1997). Nutrient concentrations are expected to vary, due to seasonal physiochemical and biological cycles in marine waters. From autumn through spring, surface-layer nitrogen concentrations are generally high in the Strait of Georgia and Juan de Fuca and Haro straits because of reduced stratification, sustained tidal and wind mixing and low phytoplankton productivity. In summer, nitrogen concentrations are much lower, coinciding with low salinity and high temperatures influenced by surface water from the Fraser River freshet (Mackas and Harrison, 1997). Ammonia values show a seasonal variation, with total nitrogen and nitrate (Figure 5.3 and Figure 5.4, Appendix C3) lower in the summer and higher in the winter and TKN and nitrite (Appendix C3) higher in the summer and lower in the winter.

Nutrient monitoring results from 2002-2019 have shown no indication of potential for anthropogenic eutrophication. Mackas and Harrison (1997) indicate that the potential for eutrophication of the Strait of Georgia and Juan de Fuca and Haro straits is low for two reasons: first, high ambient nitrate and ammonia concentrations make total primary productivity relatively insensitive to moderate changes; second, the exchange of water by currents is rapid, and water entering the Strait of Georgia and Juan de Fuca Strait carries naturally high nutrient concentrations. Natural nitrogen inputs into the straits from estuarine circulation are estimated to be an order of magnitude higher than all anthropogenic and atmospheric inputs combined (Mackas and Harrison, 1997). SPTP outfall loadings of nitrogen-based nutrients to Bazan Bay were approximately 65 tonnes N/year in 2019 (Table 3.4; loadings of nitrate+nitrite+TKN, since TKN=organic N+ammonia); whereas, the net natural nitrogen input to the Juan de Fuca Strait/Strait of Georgia/Puget Sound estuarine system totals approximately 400-600 tonnes N/day (i.e., 146,000-219,000 tonnes N/year) (Mackas and Harrison, 1997).

Finally, Bazan Bay naturally contains 15-46 tonnes of nitrate alone, if one uses the typical ambient nitrate concentrations in the Juan de Fuca Strait area (0.140-0.420 mg/L N; Lewis 1974, 1978, as cited in Harrison *et al.*, 1994) and an assumed volume of 110,105,000 m^3 (volume calculated for the area enclosed by Sidney to James Island to Cordova Spit; Figure 5.1). Bazan Bay is also well flushed, as is evidenced by the fact that the 2019 surface water nitrate concentrations (Appendix C3) remained within the ambient Juan de Fuca nitrate concentrations, even though the SPTP outfall discharged approximately 52 tonnes of nitrate in 2019 (Table 3.4). Overall, the 2019 surface water data showed no evidence of any significant effect of the SPTP discharge on nutrients in the Bazan Bay receiving environment.

The conditions that could trigger the re-evaluation of the need for a comprehensive nutrient monitoring program (Section 5.2.1) were not applied to the 2019 data, as none of the triggers were met. Regardless, the program review with ENV has led to a revised SPTP WMEP, including the surface water monitoring program, which began in 2013. The nutrient component will soon be reviewed by the TWQRP as the review of the need for disinfection has been completed, as per Trigger #4, Section 5.2.1.

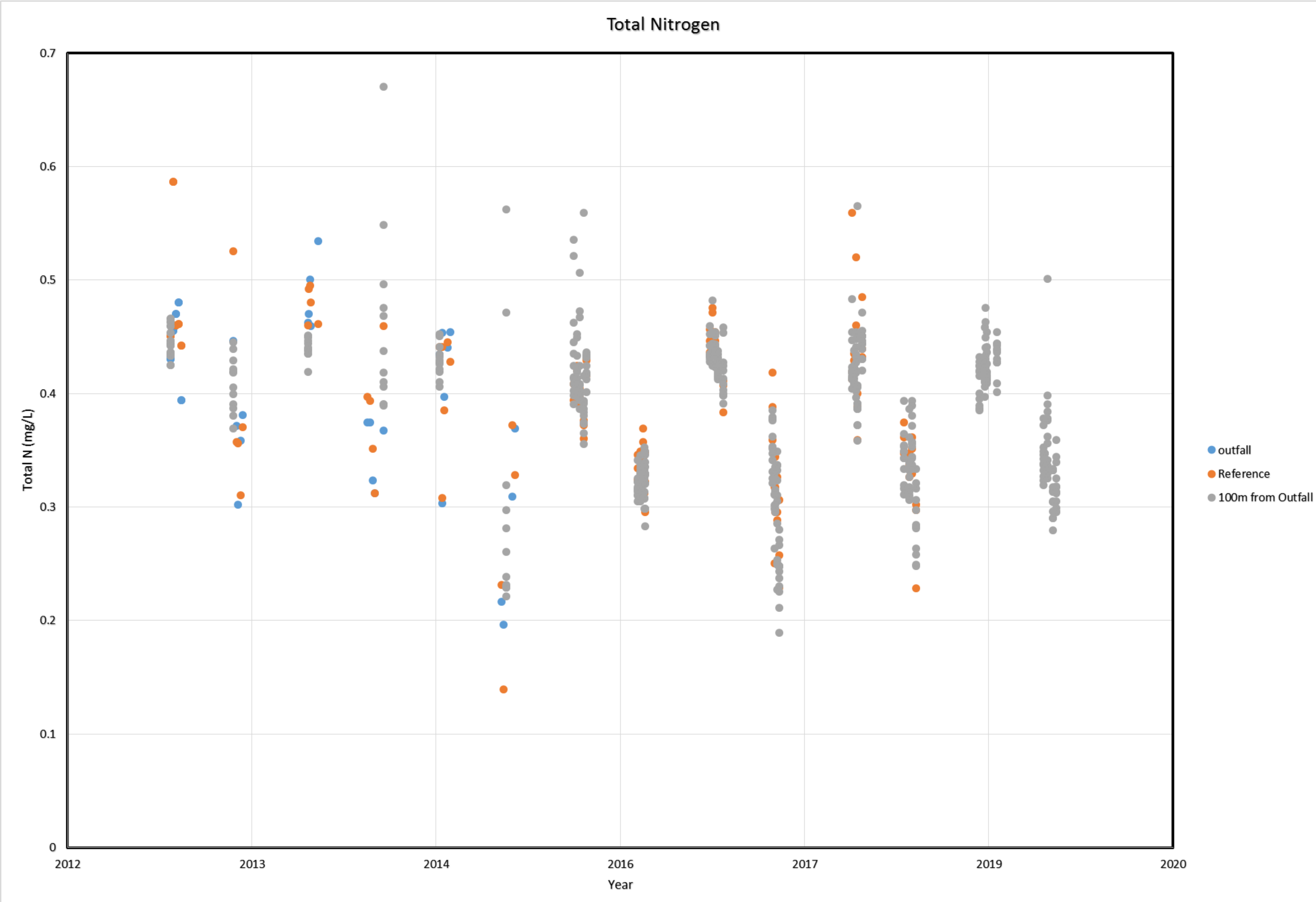


Figure 5.3 SPWTP Nitrate Sampling Results 2013-2019

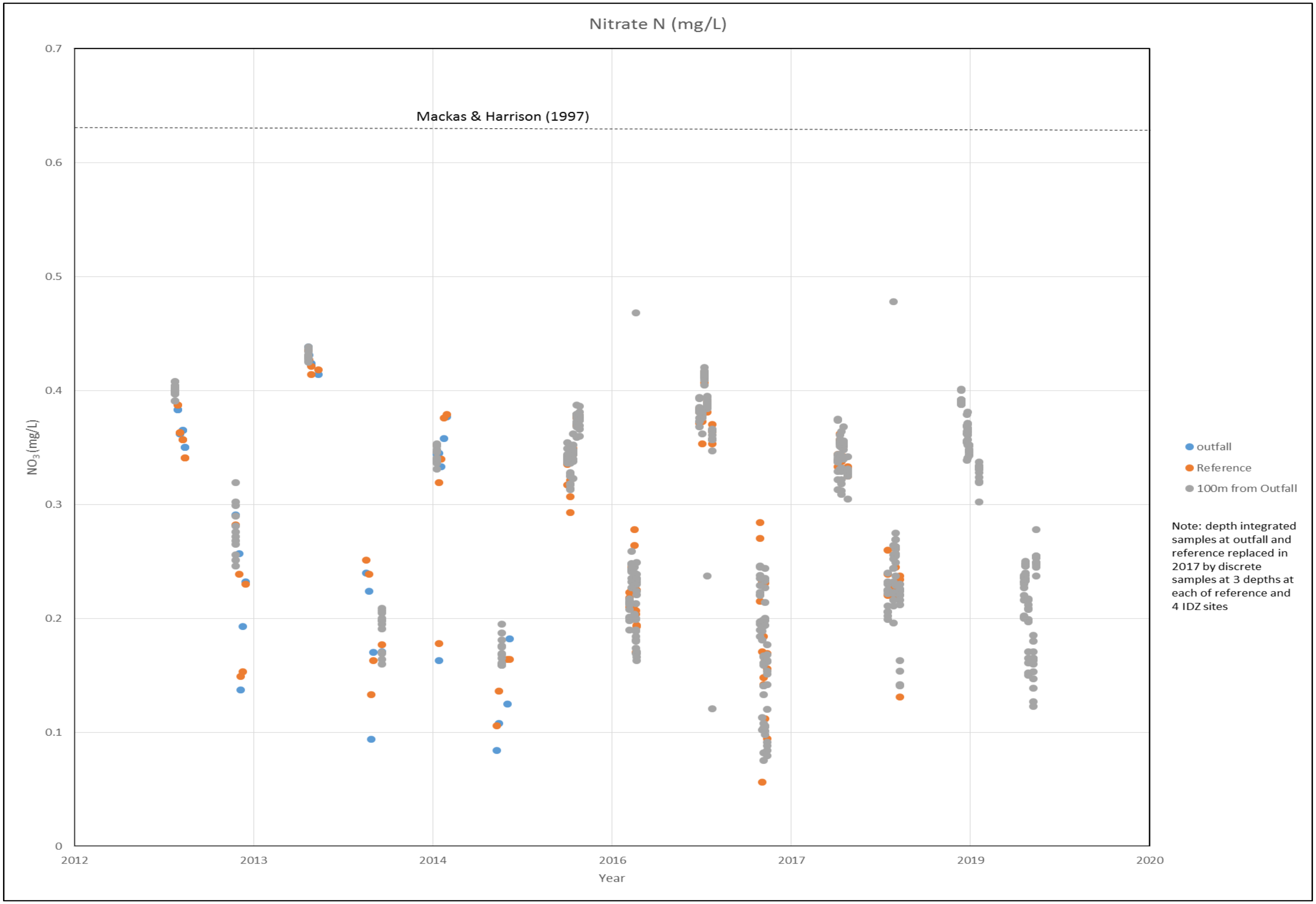


Figure 5.4 SPWTP Total Nitrogen Sampling Results 2013-2019

5.2.4 Overall Assessment

Overall, the 2019 nutrient results were consistent with previous years and there was no evidence of an effect on nutrient concentrations in the receiving environment from the SPTP discharge. There were no qualitative differences between the reference and IDZ stations, and results were within the ranges measured in previous years and ambient measurements throughout Juan de Fuca Strait and the Strait of Georgia.

6.0 SEAFLOOR MONITORING

The WMEP monitors the effects of the SPTP wastewater discharge on the seafloor at the end of the outfall once every four years. The last round of seafloor sampling was in 2016, with the next round scheduled for 2020.

7.0 OVERALL CONCLUSIONS

Overall, the results of the WMEP monitoring conducted in 2019 did not indicate any significant negative effects from the SPTP discharge on the Bazan Bay receiving environment.

The CRD conducted wastewater monitoring on a regular basis to profile the chemical and physical constituents of influent and effluent. Influent and effluent quality was within expected ranges and met provincial and federal compliance requirements and treatment plant operational objectives. All priority substances, for which there are BC and Canadian WQG, met these guidelines after estimated minimum initial dilution of the effluent was factored in, with the exception of bacteriological indicators. This indicates that the substances measured in the effluent were not likely at concentrations high enough to be of concern to aquatic life after discharge to the marine environment.

Effluent toxicity testing resulted in no acute mortality of test subjects, and no impairment to survival and reproductive endpoints.

No biosolids were generated in 2019, but monitoring of dewatered sludge was undertaken to inform the RSCP. Monitoring results of the SPTP sludge showed that all BC OMRR regulated parameters were far below Class A biosolids limits.

Surface water monitoring was used to assess the human and environmental effects of the SPTP discharge and to confirm the minimum initial dilution factor of 1:153 determined during the 2004 dye study. Results from 2019 showed that most stations had very low concentrations of fecal coliforms and enterococci, even though environmental concentrations were predicted to be higher, based on effluent bacterial concentrations and the 1:153 dilution factor. Bacterial station geometric means were 3 or less CFU/100 mL for all stations and depths in 2019, indicating adverse health effects from recreational primary contact activities or shellfish consumption were not expected.

Boron exceeded WQG at all IDZ stations, as well as at the reference station, and is naturally found at high levels in Bazan Bay.

There was some seasonality (winter vs. summer sampling events) observed in nutrient concentrations in 2019, but these were consistent between the outfall IDZ stations and the reference station. As was observed in previous monitoring years, high temporal and spatial variation was evident in the data. Monitoring results were within the ranges measured in previous monitoring years and in ambient samples collected throughout the Strait of Juan de Fuca and the Strait of Georgia. Overall, there was no evidence of nutrient enrichment in the receiving environment resulting from the SPTP discharge.

8.0 REFERENCES

APHA (American Public Health Association) (1992). Standard Methods for the Examination of Water and Wastewater. 21st Edition. APHA Press.

Aquametrix Research Ltd. (2000). Pre-Discharge Marine Assessment Program for the Saanich Peninsula Treatment Plant Wastewater Outfall. Prepared for the Capital Regional District, Scientific Programs, Victoria, BC.

Aquametrix Research Ltd. (2001a). Post-Discharge Marine Assessment Program for the Saanich Peninsula Treatment Plant Wastewater Outfall. Water Column Results – Final Report. Prepared for the Capital Regional District, Scientific Programs, Victoria, BC.

Aquametrix Research Ltd. (2001b). Post-Discharge Marine Assessment Program for the Saanich Peninsula Wastewater Outfall. Oceanography and the Physical Environment. Results. Prepared for Capital Regional District.

BC MOE (British Columbia Ministry of Environment) (2002). Environmental Management Act and Health Act, Organic Matter Recycling Regulation. Queens Printer, Victoria, BC.

BCMoE&CCS (2017) British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch, British Columbia Ministry of Environment & Climate Change Strategy, Victoria, BC, Canada.

BCMoE&CCS (2019) British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. Water Protection & Sustainability Branch, British Columbia Ministry of Environment & Climate Change Strategy, Victoria, BC, Canada.

BC MWLAP (British Columbia Ministry of Water, Land and Air Protection) (2003). British Columbia Field Sampling Manual For Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples. Prepared and published by Water, Air and Climate Change Branch, Ministry of Water, Land and Air Protection, Province of British Columbia.

CCME (2003) Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Tables 2002 update, In Canadian Environmental Quality Guidelines. Canadian Council for Ministers of the Environment, Winnipeg, MB, Canada.

CRD (2002). Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2000/2001 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2003). Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2002 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2004). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2003 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2005). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2004 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2006). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2005 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2007). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2006 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2008). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2007 Annual Report. Prepared by the Capital Regional District, Marine Programs, Environmental Services department.

CRD (2009a) Saanich Peninsula Liquid Waste Management Plan, Consolidated Version. Originally published October 1996, Amended and Consolidated October 2009. Prepared by the Capital Regional District

CRD (2009b). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2008 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2010). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2009 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2011). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2010 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2012). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2011 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2013). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2012 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2014). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2013 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2015). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2014 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2016). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2015 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2017). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2016 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2018). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2017 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CRD (2020). CRD Saanich Peninsula Treatment Plant Wastewater and Marine Environment Program – 2018 Annual Report. Prepared by the Capital Regional District, Environmental Services department, Victoria, BC, Canada.

CSSP (Canadian Shellfish Sanitation Program) (2019) Canadian Shellfish Sanitation Program – Manual of Operations. https://www.inspection.gc.ca/food/food-specific-requirements-and-guidance/fish/canadian-shellfish-sanitation-program/eng/1527251566006/1527251566942. Accessed online December 18, 2019.

Golder (2007). Saanich Peninsula Wastewater Monitoring Program Review. Prepared for the Capital Regional District, Scientific Programs, Victoria, BC.

Golder (2009). Updated Guidance Manual for Assessment and Analysis of WMEP Data. Prepared for the Capital Regional District Scientific Programs Division, Victoria, BC.

Golder (2013) 2011 Trend Assessment for Substances in Macaulay Point and Clover Point Wastewater and the Saanich Peninsula Wastewater and Biosolids. Final Report prepared for the Capital Regional District Scientific Programs Division, Victoria, BC.

Golder (2019) 2017 Trend Assessment for Substances in Macaulay Point and Clover Point Wastewater, Saanich Peninsula Wastewater and Biosolids, and Ganges Wastewater and Mixed Liquor. Draft Report prepared for the Capital Regional District Scientific Programs Division, Victoria, BC.

Harrison, P.J., Mackas, D.L., Frost, B.W., MacDonald, R.W. and Crecelius, E.A. (1994) An Assessment of Nutrients, Plankton and Some Pollutants in the Water Column of Juan de Fuca Strait, Strait of Georgia and Puget Sound and their Transboundary Transport. Proceedings of the BC/Washington Symposium on the marine Environments January 13 and 14, 1994.

Hatfield (2005). Saanich Peninsula Wastewater Treatment Plant Data Analysis. Prepared for the Capital Regional District, Scientific Programs, Victoria, BC.

Hayco (2005). Saanich Peninsula Wastewater Treatment Plant Outfall Diffuser Evaluation. Prepared for the Capital Regional District, Scientific Programs, Victoria, BC.

Health Canada (2012) Guidelines for Canadian Recreational Water Quality Third Edition. Published by authority of the Minister of Health. 161 pp.

Lewis, A. G. (1974). Monthly nutrient and chlorophyll values for Juan de Fuca Strait, June–December 1973. Institute of Oceanography Data Report 40, University of British Columbia, 17 pp.

Lewis, A. G. (1978). Concentrations of nutrients and chlorophyll on a cross-channel transect in Juan de Fuca Strait, British Columbia. Journal of the Fisheries Research Board of Canada. 35:305–314.

Lorax Environmental (2018). Wastewater Discharge and Dispersion Model. Prepared for Capital Regional District, Scientific Programs, Victoria, BC.

Mackas, D.L, and P.J. Harrison (1997). Nitrogenous Nutrient Sources and Sinks in the Juan de Fuca Strait/Strait of Georgia/Puget Sound Estuarine System: Assessing the Potential for Eutrophication. Estuarine, Coastal and Shelf Science. 44:1-21.

US EPA (2002). National Recommended Water Quality Criteria, Priority Toxic Pollutants List. Environmental Protection Agency.

APPENDIX A

Parameter List for Saanich Peninsula Wastewater and Marine Environment Program

Appendix A Parameter List for the Saanich Peninsula Wastewater and Marine Environment Program in 2019

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
CONVENTIONAL VARIABLES				
alkalinity	(1 time/month)	√		
biochemical oxygen demand	(influent - weekly; effluent -3 times/week)	√		
carbonaceous biochemical oxygen demand	(3 times/week)	√		
chemical oxygen demand	(weekly)	√		
chloride	(1 time/month)	√		
conductivity	(4-5 times/month)	√		√
cyanide (strong acid dissociable)		√		
cyanide (weak acid dissociable)		√		
fecal coliform	(weekly)	√	√	√
enterococci			√	√
hardness (as $CaCO_3$)		√		
hardness (as $CaCO_3$), dissolved		√		
ammonia	(2-3 times/month)	√	√	√
total Kjeldahl nitrogen	(2-3 times/month)	√	√	√
nitrate	(2-3 times/month)	√	√	√
nitrite	(2-3 times/month)	√	√	√
nitrogen, total		√	√	√
oil & grease, mineral		√		
oil & grease, total		√		
organic carbon, total		√	√	√
pH	(daily)	√	√	√
phosphate, dissolved	(1 time/month)		√	√
phosphate, total	(1 time/month)		√	√
salinity		√		√
sulphate		√		√
sulphide		√		√
suspended solids, total	(daily)	√		√
temperature		√		√

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
METALS TOTAL		√		
aluminum		√	√	
antimony		√	√	
arsenic		√	√	
barium		√	√	
beryllium		√	√	
bismuth			√	
cadmium		√	√	
calcium		√	√	
chromium		√	√	
chromium VI		√	√	
cobalt		√	√	
copper		√	√	
iron		√	√	
lead		√	√	
lithium			√	
magnesium		√	√	
manganese		√	√	
mercury		√	√	
molybdenum		√	√	
nickel		√	√	
phosphorus		√	√	
potassium		√	√	
selenium		√	√	
silver		√	√	
sodium			√	
strontium			√	
thallium		√	√	
tin		√	√	
titanium			√	

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
vanadium			√	
zinc		√	√	
METALS - OTHER				
dibutyltin		√		
dibutyltin dichloride		√		
monobutyltin		√		
monobutyltin trichloride		√		
tributyltin		√		
tributyltin chloride		√		
methyl mercury		√		
METALS DISSOLVED				
aluminum		√		
antimony		√		
arsenic		√		
barium		√		
beryllium		√		
cadmium		√		
calcium		√		
chromium		√		
cobalt		√		
copper		√		
iron		√		
lead		√		
magnesium		√		
manganese		√		
mercury		√		
molybdenum		√		
nickel		√		
phosphorus		√		
potassium		√		
selenium		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
silver		√		
thallium		√		
tin		√		
zinc		√		
ALDEHYDES				
acrolein		√		
PHENOLIC COMPOUNDS				
total phenols		√		
2-chlorophenol		√		
2,4 & 2,5 -dichlorophenol		√		
2,4,6-trichlorophenol		√		
4-chloro-3-methylphenol		√		
pentachlorophenol		√		
2,4-dimethylphenol		√		
2,4-dinitrophenol		√		
2-methyl-4,6-dinitrophenol		√		
2-nitrophenol		√		
4-nitrophenol		√		
phenol		√		
2,4-DDD		√		
ORGANOCHLORINE PESTICIDES				
2,4-DDE		√		
2,4-DDT		√		
4,4-DDD		√		
4,4-DDE		√		
4,4-DDT		√		
aldrin		√		
alpha-chlordane		√		
alpha-endosulfan		√		
alpha-HCH		√		
beta-endosulfan		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
beta-HCH		√		
chlordane		√		
delta-HCH		√		
dieldrin		√		
endosulfan sulphate		√		
endrin		√		
endrin aldehyde		√		
gamma-chlordane		√		
gamma-HCH		√		
heptachlor		√		
heptachlor epoxide		√		
methoxyclor		√		
mirex		√		
octachlorostyrene		√		
total endosulfan		√		
toxaphene		√		
POLYCYCLIC AROMATIC HYDROCARBONS				
2-chloronaphthalene		√		
2-methylnaphthalene		√		
acenaphthene		√		
acenaphthylene		√		
anthracene		√		
benzo(a)anthracene		√		
benzo(a)pyrene		√		
benzo(b)fluoranthene		√		
benzo(g,h,i)perylene		√		
benzo(k)fluoranthene		√		
chrysene		√		
dibenzo(a,h)anthracene		√		
fluoranthene		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2^{nd}-5^{th} day
fluorene		√		
indeno(1,2,3-c,d)pyrene		√		
naphthalene		√		
phenanthrene		√		
pyrene		√		
total high molecular weight – PAH		√		
total low molecular weight – PAH		√		
total PAH		√		
SEMIVOLATILE ORGANICS				
bis(2-ethylhexyl)phthalate		√		
butylbenzyl phthalate		√		
diethyl phthalate		√		
dimethyl phthalate		√		
di-n-butyl phthalate		√		
di-n-octyl phthalate		√		
MISCELLANEOUS SEMIVOLATILE ORGANICS				
1,2,4-trichlorobenzene		√		
1,2-diphenylhydrazine		√		
2,4-dinitrotoluene		√		
2,6-dinitrotoluene		√		
3,3-dichlorobenzidine		√		
4-bromophenyl phenyl ether		√		
4-chlorophenyl phenyl ether		√		
benzidine		√		
bis(2-chloroethoxy)methane		√		
bis(2-chloroethyl)ether		√		
bis(2-chloroisopropyl)ether		√		
hexachlorobenzene		√		
hexachlorobutadiene		√		
hexachlorocyclopentadiene		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
hexachloroethane		√		
isophorone		√		
nitrobenzene		√		
N-nitrosodimethylamine		√		
N-nitrosodi-n-propylamine		√		
N-nitrosodiphenylamine		√		
VOLATILE ORGANICS				
Monocyclic Aromatic Hydrocarbons				
1,2-dichlorobenzene		√		
1,3-dichlorobenzene		√		
1,4-dichlorobenzene		√		
benzene		√		
chlorobenzene		√		
ethylbenzene		√		
styrene		√		
toluene		√		
m & p xylenes		√		
o-xylene		√		
xylenes		√		
Aliphatic				
acrylonitrile		√		
methyl tertiary butyl ether		√		
Chlorinated Aliphatic				
1,1,1,2-tetrachloroethane		√		
1,1,1-trichloroethane		√		
1,1,2,2-tetrachloroethane		√		
1,1,2-trichloroethane		√		
1,1-dichloroethane		√		
1,1-dichloroethene		√		
1,2-dichloroethane		√		
1,2-dichloropropane		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
2-chloroethylvinyl ether		√		
bromomethane		√		
chloroethane		√		
chloroethene		√		
chloromethane		√		
cis-1,2-dichloroethene		√		
cis-1,3-dichloropropene		√		
dibromoethane		√		
dibromomethane		√		
dichloromethane		√		
tetrabromomethane		√		
tetrachloroethene		√		
tetrachloromethane		√		
trans-1,2-dichloroethene		√		
trans-1,3-dichloropropene		√		
trichloroethene		√		
trichlorofluoromethane		√		
Trihalomethanes				
bromodichloromethane		√		
bromoform		√		
chlorodibromomethane		√		
tribromomethane		√		
trichloromethane		√		
Ketones				
4-methyl-2 pentanone		√		
dimethyl ketone		√		
endrin ketone		√		
methyl ethyl ketone		√		
TERPENES				
alpha-terpineol		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
TOXICITY				
acute toxicity	(quarterly using effluent)	√		
chronic toxicity	(annually using effluent)	√		
HIGH RESOLUTION ANALYSES				
Nonylphenols				
4-Nonylphenols		√		
4-Nonylphenol monoethoxylates		√		
4-Nonylphenol diethoxylates		√		
Octylphenol		√		
PAHs				
Naphthalene		√		
Acenaphthylene		√		
Acenaphthene		√		
Fluorene		√		
Phenanthrene		√		
Anthracene		√		
Fluoranthene		√		
Pyrene		√		
Benz[a]anthracene		√		
Chrysene		√		
Benzo[b]fluoranthene		√		
Benzo[j,k]fluoranthenes		√		
Benzo[e]pyrene		√		
Benzo[a]pyrene		√		
Perylene		√		
Dibenz[a,h]anthracene		√		
Indeno[1,2,3-cd]pyrene		√		
Benzo[ghi]perylene		√		
2-Methylnaphthalene		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2^{nd}-5^{th} day
2,6-Dimethylnaphthalene		√		
2,3,5-Trimethylnaphthalene		√		
1-Methylphenanthrene		√		
Dibenzothiophene		√		
PBDEs		√		
PCBs		√		
Pesticides				
1,3-Dichlorobenzene		√		
1,4-Dichlorobenzene		√		
1,2-Dichlorobenzene		√		
1,3,5-Trichlorobenzene		√		
1,2,4-Trichlorobenzene		√		
1,2,3-Trichlorobenzene		√		
1,2,4,5-/1,2,3,5-Tetrachlorobenzene		√		
1,2,3,4-Tetrachlorobenzene		√		
Pentachlorobenzene		√		
Hexachlorobutadiene		√		
Hexachlorobenzene		√		
HCH, alpha		√		
HCH, beta		√		
HCH, gamma		√		
Heptachlor		√		
Aldrin		√		
Octachlorostyrene		√		
Chlordane, oxy-		√		
Chlordane, gamma (trans)		√		
Chlordane, alpha (cis)		√		
Nonachlor, trans-		√		
Nonachlor, cis-		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2nd-5th day
2,4'-DDD		√		
4,4'-DDD		√		
2,4'-DDE		√		
4,4'-DDE		√		
2,4'-DDT		√		
4,4'-DDT		√		
Mirex		√		
HCH, delta		√		
Heptachlor Epoxide		√		
alpha-Endosulphan		√		
Dieldrin		√		
Endrin		√		
beta-Endosulphan		√		
Endosulphan Sulphate		√		
Endrin Aldehyde		√		
Endrin Ketone		√		
Methoxychlor		√		
PPCPs				
Bisphenol A		√		
Furosemide		√		
Gemfibrozil		√		
Glipizide		√		
Glyburide		√		
2-Hydroxy-ibuprofen		√		
Ibuprofen		√		
Naproxen		√		
Triclocarban		√		
Triclosan		√		
Warfarin		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling frequency	Sampled quarterly (one day before and one day after quarterly)*	5 samples in 30 days (summer and winter) 1st day	5 samples in 30 days (summer and winter) 2^{nd}-5^{th} day
Fluorinated Compounds				
PFBA		√		
PFBS		√		
PFDA		√		
PFDoA		√		
PFHpA		√		
PFHxA		√		
PFHxS		√		
PFNA		√		
PFOA		√		
PFOS		√		
PFOSA		√		
PFPeA		√		
PFUnA		√		

APPENDIX B

Wastewater Monitoring

Appendix B1 Saanich Peninsula Treatment Plant Effluent Flow (m^3) in 2019

Appendix B2 Compliance and Treatment Plant Performance Influent Results

Appendix B3 Compliance and Treatment Plant Performance Effluent Results

Appendix B4 Influent and Effluent Priority Substance Concentrations 2019

Appendix B1 Saanich Peninsula Treatment Plant Effluent Flow (m^3) in 2019

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	11,133	8,509	9,619	8,173	8,138	8,129	8,056	8,527	8,497	9,052	8,284	8,153
2	10,071	10,900	9,254	8,162	8,186	8,012	8,395	8,490	8,665	8,814	8,434	8,447
3	10,726	9,725	9,101	8,051	8,258	8,345	9,283	8,648	9,273	6,444	8,331	8,357
4	23,148	9,508	9,175	8,433	8,123	8,296	8,687	8,110	9,333	8,772	8,869	8,120
5	21,925	9,053	8,991	8,123	8,084	8,136	8,633	7,917	10,444	9,794	8,548	8,151
6	14,175	8,741	8,795	8,005	8,335	8,092	8,432	8,489	8,733	9,373	8,244	8,118
7	14,232	8,724	8,559	7,889	8,679	8,179	8,249	8,546	8,390	9,482	8,215	8,163
8	11,989	8,505	8,572	8,135	8,033	8,287	8,612	8,403	8,182	10,294	8,256	8,312
9	10,995	8,568	8,423	8,907	8,110	7,976	8,625	8,648	8,680	9,396	8,315	8,370
10	10,735	8,455	8,339	8,910	8,139	8,294	8,596	8,513	8,685	9,207	8,382	8,197
11	10,573	8,519	8,325	8,354	8,005	8,303	9,432	8,359	7,424	9,054	8,234	8,174
12	9,777	8,171	8,836	8,724	7,923	8,262	8,954	8,647	9,315	8,817	8,544	8,751
13	9,522	8,031	8,982	8,518	8,152	8,222	8,605	8,658	10,037	9,000	9,682	11,954
14	9,473	8,712	8,690	8,988	8,304	8,073	8,285	8,647	8,839	9,046	8,696	11,200
15	9,158	8,808	8,616	8,956	8,406	8,035	8,334	8,529	8,790	9,240	8,520	9,792
16	8,906	10,213	8,529	8,621	8,355	7,885	8,668	8,600	9,985	8,969	8,814	9,502
17	8,720	11,182	8,392	8,442	8,256	8,115	8,499	8,506	9,164	9,844	8,811	9,163
18	9,240	12,628	8,554	8,341	8,095	8,352	8,664	8,293	11,722	10,210	11,733	8,913
19	9,620	12,781	8,468	9,366	7,710	8,085	8,466	8,427	9,575	10,543	11,647	9,604
20	10,208	12,556	8,474	9,305	7,721	8,205	8,419	8,714	8,997	9,759	11,180	12,458
21	10,240	12,735	8,248	8,644	9,189	8,077	8,192	8,877	8,767	10,035	10,034	17,582
22	9,501	11,903	8,187	8,692	8,887	8,077	8,328	8,930	8,670	12,510	9,367	16,909
23	12,496	12,686	8,130	9,162	8,373	7,890	8,546	8,674	9,954	8,050	8,988	12,269
24	14,404	12,733	7,939	11,662	8,337	8,296	8,454	8,660	11,950	9,874	8,819	11,022
25	11,291	13,892	8,207	8,755	8,166	8,423	8,371	8,478	9,573	9,374	9,072	10,636
26	10,279	12,075	8,412	8,516	8,883	8,250	8,512	8,559	9,025	9,121	8,813	10,043
27	9,627	10,617	8,201	8,304	8,740	8,157	8,367	8,775	8,742	8,936	8,692	9,727
28	9,463	9,843	8,410	8,192	8,619	9,935	8,242	8,541	9,341	9,007	9,514	9,691
29	9,332	---	8,125	8,473	8,462	8,674	8,350	8,642	9,058	8,869	8,503	9,188
30	8,844	---	8,176	8,501	8,155	8,326	8,655	8,501	9,302	8,517	8,225	9,263
31	8,778	---	7,966	---	8,212	---	8,500	8,579	---	8,533	---	9,116
TOTAL Flow (m3/day)	348,581	288,773	264,695	259,304	257,035	247,388	264,411	264,887	277,112	287,936	269,766	307,345
Average	11,245	10,313	8,539	8,643	8,291	8,246	8,529	8,545	9,237	9,288	8,992	9,914
Maximum	23,148	13,892	9,619	11,662	9,189	9,935	9,432	8,930	11,950	12,510	11,733	17,582
Minimum	8,720	8,031	7,939	7,889	7,710	7,885	8,056	7,917	7,424	6,444	8,215	8,118
n	31	28	31	30	31	30	31	31	30	31	30	31
											Annual Average	9,143

Appendix B2 Compliance and Treatment Plant Performance Influent Results 2019

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH^3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
2-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	212
3-Jan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	198
4-Jan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	92
4-Jan	---	111	---	---	216	---	---	---	---	---	---	---	---	---	---
7-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	130
8-Jan	---	---	---	---	---	---	---	---	---	---	34	---	7.5	---	162
8-Jan	---	---	---	57	---	---	23	---	0.15	0.37	---	---	7.7	---	---
9-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	200
10-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	186
11-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	200
11-Jan	---	226	---	---	612	---	---	---	---	---	---	---	---	---	---
14-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	198
15-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	214
15-Jan	---	288	240	67	693	4,000,000	36	0.03	<0.005	<0.02	55	5	7.6	6.5	254
16-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	246
16-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
16-Jan	---	---	---	---	---	3,900,000	53	---	<0.002	---	---	4	7.4	---	---
17-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	222
17-Jan	---	---	---	---	---	3,900,000	56	---	<0.002	---	---	5	7.4	---	---
18-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	232
18-Jan	---	276	---	---	534	---	---	---	---	---	---	---	---	---	---
21-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	200
22-Jan	---	---	---	---	---	---	29	---	0.53	0.30	50	---	7.4	---	---
22-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	248
23-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	172
24-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	170
25-Jan	---	214	---	---	509	---	---	---	---	---	---	---	---	---	---
25-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	188
28-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	194
29-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	240
30-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	210
31-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	250
1-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	222
1-Feb	---	255	---	---	620	---	---	---	---	---	---	---	---	---	---
4-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	190
5-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	208
5-Feb	---	---	---	---	---	---	33	---	0.36	0.06	54	---	7.6	---	---

Appendix B2, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH^3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
6-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	164
7-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	184
8-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	124
8-Feb	---	216	---	---	462	---	---	---	---	---	---	---	---	---	---
11-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	174
12-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	202
13-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.6	---	182
14-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	310
15-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	228
15-Feb	---	298	---	---	593	---	---	---	---	---	---	---	---	---	---
18-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	156
19-Feb	---	---	---	114	---	---	23	---	0.17	0.32	36	---	7.5	---	---
19-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	202
20-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	212
21-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
21-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	162
22-Feb	---	204	---	---	495	---	---	---	---	---	---	---	---	---	---
22-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	176
25-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	166
26-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	214
27-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	184
28-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	208
1-Mar	---	268	---	---	603	---	---	---	---	---	---	---	---	---	---
1-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	226
4-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	206
5-Mar	---	---	---	---	---	---	33	---	0.35	0.47	---	---	7.5	---	---
5-Mar	---	---	---	---	---	---	---	---	---	---	49	---	---	---	192
6-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	220
7-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.4	---	230
8-Mar	---	296	---	---	632	---	---	---	---	---	---	---	---	---	---
8-Mar	---	---	---	---	---	---	---	---	---	---	---	---	---	---	250
13-Mar	189	---	---	---	---	---	---	---	---	---	---	---	7.4	---	---
15-Mar	---	284	---	---	624	---	---	---	---	---	---	---	---	---	---
19-Mar	---	---	---	---	---	---	35	---	0.18	0.17	56	---	7.5	---	---
22-Mar	---	314	---	---	589	---	---	---	---	---	---	---	---	---	---
29-Mar	---	303	---	---	661	---	---	---	---	---	---	---	---	---	---
10-Apr	203	239	---	---	631	7,200,000	---	---	---	---	55	---	7.2	---	---

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH^3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
3-May	---	322	---	---	688	---	---	---	---	---	---	---	---	---	---
7-May	---	---	---	---	---	---	36	---	0.01	0.02	59	---	7.6	---	---
10-May	---	330	---	---	601	---	---	---	---	---	---	---	---	---	---
15-May	---	---	---	77	---	---	---	---	---	---	---	---	7.6	---	---
17-May	---	280	---	---	610	---	---	---	---	---	---	---	---	---	---
21-May	---	---	---	---	---	---	34	---	<0.005	<0.02	52	---	7.4	---	---
24-May	---	330	---	---	306	---	---	---	---	---	---	---	---	---	---
31-May	---	340	---	---	689	---	---	---	---	---	---	---	---	---	---
4-Jun	---	---	---	---	---	---	42	---	<0.005	<0.02	50	---	7.8	---	---
7-Jun	---	320	---	---	463	---	---	---	---	---	---	---	---	---	---
14-Jun	---	310	---	---	521	---	---	---	---	---	---	---	---	---	---
18-Jun	---	---	---	---	---	---	43	---	<0.005	<0.02	52	---	7.6	---	---
21-Jun	---	320	---	---	372	---	---	---	---	---	---	---	---	---	---
28-Jun	---	270	---	---	415	---	---	---	---	---	---	---	---	---	---
6-Jul	---	300	---	---	359	---	---	---	---	---	---	---	---	---	---
9-Jul	---	---	---	---	---	---	43	---	<0.005	<0.02	53	---	7.6	---	---
12-Jul	---	290	---	---	628	---	---	---	---	---	---	---	---	---	---
16-Jul	---	---	---	---	---	13,000,000	36	---	<0.002	---	---	---	7.3	---	---
17-Jul	---	---	---	70	---	---	---	---	---	---	---	---	7.7	---	---
17-Jul	---	---	310	---	---	---	44	0.10	<0.005	<0.02	---	---	7.4	6.9	348
18-Jul	---	---	---	---	---	10,000,000	39	---	0.00	---	---	---	7.4	---	---
19-Jul	---	360	---	---	508	---	---	---	---	---	---	---	---	---	---
23-Jul	---	---	---	---	---	---	41	---	<0.005	<0.02	56	---	7.6	---	---
26-Jul	---	310	---	---	471	---	---	---	---	---	---	---	---	---	---
2-Aug	---	310	---	---	562	---	---	---	---	---	---	---	---	---	---
6-Aug	---	---	---	---	---	---	38	---	<0.005	<0.02	---	---	7.6	---	---
9-Aug	---	210	---	---	618	---	---	---	---	---	---	---	---	---	---
13-Aug	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
16-Aug	---	260	---	---	598	---	---	---	---	---	---	---	---	---	---
20-Aug	---	---	---	68	---	---	43	---	<0.005	<0.02	57	---	7.3	---	---
23-Aug	---	200	---	---	698	---	---	---	---	---	---	---	---	---	---
30-Aug	---	230	---	---	537	---	---	---	---	---	---	---	---	---	---
6-Sep	---	270	---	---	622	---	---	---	---	---	---	---	---	---	---
10-Sep	---	---	---	---	---	---	36	---	<0.005	<0.02	47	---	7.6	---	---
13-Sep	---	---	---	---	364	---	---	---	---	---	---	---	---	---	---
19-Sep	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
20-Sep	---	220	---	---	434	---	---	---	---	---	---	---	---	---	---

Appendix B2, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH³	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
24-Sep	---	---	---	63	---	---	31	---	<0.005	<0.02	42	---	7.5	---	---
27-Sep	---	240	---	---	540	---	---	---	---	---	---	---	---	---	---
4-Oct	---	270	---	---	563	---	---	---	---	---	---	---	---	---	---
8-Oct	---	---	---	---	---	---	33	---	<0.005	<0.02	34	---	7.6	---	---
11-Oct	---	220	---	---	557	---	---	---	---	---	---	---	---	---	---
15-Oct	---	---	---	81	---	---	40	---	<0.005	<0.02	45	---	7.2	---	---
18-Oct	---	140	---	---	371	---	---	---	---	---	---	---	---	---	---
23-Oct	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
23-Oct	---	190	180	---	483	27,000,000	---	0.06	---	---	36	---	7.0	6.8	119
25-Oct	---	220	---	---	549	---	---	---	---	---	---	---	---	---	---
1-Nov	---	120	---	---	564	---	---	---	---	---	---	---	---	---	---
5-Nov	---	---	---	---	---	---	---	---	<0.005	---	42	---	7.4	---	---
8-Nov	---	250	---	---	576	---	---	---	---	---	---	---	---	---	---
12-Nov	---	---	---	110	---	---	38	---	0	---	---	---	7.4	---	---
15-Nov	---	230	---	---	408	---	---	---	---	---	---	---	---	---	---
20-Nov	---	---	---	---	408	---	---	---	---	---	---	---	7.5	---	---
22-Nov	---	210	---	---	341	---	---	---	---	---	---	---	---	---	---
29-Nov	---	200	---	---	449	---	---	---	---	---	---	---	---	---	---
3-Dec	---	---	---	---	---	---	71	---	<0.005	---	51	---	7.1	---	---
6-Dec	---	140	---	---	461	---	---	---	---	---	---	---	---	---	---
11-Dec	---	---	---	---	---	---	---	---	---	---	---	---	7.5	---	---
13-Dec	---	50	---	---	294	---	---	---	---	---	---	---	---	---	---
17-Dec	---	---	---	81	---	---	35	---	<0.005	---	40	---	7.5	---	---
20-Dec	---	---	---	---	455	---	---	---	---	---	---	---	---	---	---
27-Dec	---	200	---	---	518	---	---	---	---	---	---	---	---	---	---
Mean	196	250	243	79	521	9,857,143	39	0.06	0.06	0.09	48	4.3	7.4	6.8	202
Min	189	50	180	57	216	3,900,000	22.8	0.03	<0.002	<0.02	34	3.5	7.0	6.5	92
Max	203	360	310	114	698	27,000,000	71	0.10	0.53	0.47	59	4.8	7.8	6.9	348
n	2	49	3	10	52	7	27	3	28	20	23	3	76	3	51

Notes: ALK-alkalinity, BOD-total biochemical oxygen demand, COD-chemical oxygen demand, CL-chloride, COND-conductivity, NH3-ammonia, UNION NH3-unionized ammonia
NO3-nitrate, NO2-nitrite, TDP-total dissolved phosphorus, TP-total phosphorous, TKN-total Kjeldahl nitrogen, CBOD- carbonaceous biochemical oxygen demand, TRC-total residual chlorine

Appendix B3 Compliance and Treatment Plant Performance Effluent Results 2019

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
2-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.2	---	8.0
3-Jan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12.4
3-Jan	---	11.0	7.4	---	---	---	---	---	---	---	---	---	---	---	---
4-Jan	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5.6
4-Jan	---	13.0	7.6	---	51	---	---	---	---	---	---	---	---	---	---
7-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	9.6
8-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	13.2
8-Jan	---	---	7.0	60	---	25,000	0.033	<0.0005	0.019	11.0	2.4	2.5	7.2	6.9	14.0
9-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.7	---	14.4
10-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	12.4
10-Jan	---	11.0	6.0	---	---	---	---	---	---	---	---	---	---	---	---
11-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	11.6
11-Jan	---	8.0	6.2	---	51	---	---	---	---	---	---	---	---	---	---
14-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	9.2
15-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	14.4
15-Jan	---	15.0	<5	72	62	15,500	0.051	<0.0005	0.025	16.2	2.3	3.9	6.9	6.2	9.0
16-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	16.8
16-Jan	---	---	---	---	---	10,200	---	---	---	---	---	---	7.2	---	---
16-Jan	---	---	---	---	---	11,000	0.052	---	0.035	---	---	4.4	6.9	---	---
17-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	13.6
17-Jan	---	14.0	7.2	---	---	---	---	---	---	---	---	---	---	---	---
17-Jan	---	---	---	---	---	22,000	0.060	---	0.046	---	---	4.6	7.1	---	---
18-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	12.0
18-Jan	---	9.2	8.3	---	64	---	---	---	---	---	---	---	---	---	---
21-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	11.6
22-Jan	---	---	7.0	---	---	6,800	0.052	<0.0005	0.040	12.0	2.3	---	7.2	6.6	13.0
22-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	11.2
23-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	15.2
24-Jan	---	9.3	5.0	---	---	---	---	---	---	---	---	---	---	---	---
24-Jan	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	8.8
25-Jan	---	7.9	5.5	---	65	---	---	---	---	---	---	---	---	---	---
25-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.2	---	8.8
28-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	9.2
29-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	12.0
30-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	12.0
31-Jan	---	11.0	4.6	---	---	---	---	---	---	---	---	---	---	---	---
31-Jan	---	---	---	---	---	---	---	---	---	---	---	---	7.2	---	12.4

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
1-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	9.2
1-Feb	---	8.7	6.6	---	54	---	---	---	---	---	---	---	---	---	---
4-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	11.2
5-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	9.6
5-Feb	---	---	<5	---	---	5,500	0.034	<0.0005	---	12.7	2.1	3.4	6.7	6.1	10.0
6-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	15.6
7-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	11.6
7-Feb	---	19.0	13.0	---	---	---	---	---	---	---	---	---	---	---	---
8-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	10.0
8-Feb	---	12.0	8.0	---	53	---	---	---	---	---	---	---	---	---	---
11-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	7.2
12-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	21.6
13-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	6.4
14-Feb	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	11.6
14-Feb	---	9.6	5.0	---	---	---	---	---	---	---	---	---	---	---	---
15-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	8.0
15-Feb	---	8.7	5.5	---	50	---	---	---	---	---	---	---	---	---	---
18-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	7.6
19-Feb	---	---	7.0	133	---	6,800	0.025	<0.0005	---	12.2	2.0	---	7.2	6.7	9.0
19-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	8.8
20-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6.4
21-Feb	---	8.6	4.6	---	---	---	---	---	---	---	---	---	7.3	---	---
21-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	5.6
22-Feb	---	7.9	4.3	---	60	---	---	---	---	---	---	---	---	---	---
22-Feb	---	---	---	---	---	---	---	---	---	---	---	---	---	---	7.6
25-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.0	---	6.0
26-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.2	---	9.6
27-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.3	---	8.4
28-Feb	---	10.0	4.6	---	---	---	---	---	---	---	---	---	---	---	---
28-Feb	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	9.6
1-Mar	---	10.0	4.8	---	43	---	---	---	---	---	---	---	---	---	---
1-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	10.4
4-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	10.8
5-Mar	---	---	---	---	---	32,000	---	---	0.030	13.4	2.3	3.8	7.2	---	---
5-Mar	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12.8
6-Mar	---	---	---	---	---	---	---	---	---	---	---	---	7.1	---	13.2
7-Mar	---	12.0	5.9	---	---	---	---	---	---	---	---	---	---	---	---
7-Mar	---	---	---	---	---	---	---	---	---	---	---	---	6.9	---	11.6
8-Mar	---	9.6	6.2	---	59	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
8-Mar	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12.4
13-Mar	24	---	---	---	---	82,000	---	---	---	---	---	---	7.1	---	---
14-Mar	---	11.0	6.4	---	---	---	---	---	---	---	---	---	---	---	---
15-Mar	---	8.2	6.8	---	44	---	---	---	---	---	---	---	---	---	---
19-Mar	---	---	---	---	---	5,100	---	---	0.028	12.8	---	---	7.1	---	---
21-Mar	---	14.0	6.7	---	---	---	---	---	---	---	---	---	---	---	---
22-Mar	---	12.0	7.6	---	57	---	---	---	---	---	---	---	---	---	---
28-Mar	---	12.0	7.3	---	---	---	---	---	---	---	---	---	---	---	---
29-Mar	---	9.4	6.3	---	59	---	---	---	---	---	---	---	---	---	---
2-Apr	---	---	10.0	---	---	120,000	0.055	<0.0005	0.049	10.7	---	---	6.9	6.5	13.0
4-Apr	---	19.0	8.4	---	---	---	---	---	---	---	---	---	---	---	---
5-Apr	---	17.0	11.0	---	68	---	---	---	---	---	---	---	---	---	---
10-Apr	---	---	---	---	---	34,000	---	---	---	---	---	---	6.9	---	---
10-Apr	18	18.0	<5	---	62	40,000	1.70	0.001	2.03	15.5	---	---	6.5	6.4	9.0
11-Apr	---	18.0	7.4	---	---	---	---	---	---	---	---	---	---	---	---
12-Apr	---	16.0	7.3	---	59	---	---	---	---	---	---	---	---	---	---
16-Apr	---	---	10.0	---	---	32,000	1.70	0.001	1.79	15.1	---	---	7.1	6.4	13.0
17-Apr	---	21.0	7.9	---	---	---	---	---	---	---	---	---	---	---	---
18-Apr	---	19.0	6.4	---	58	---	---	---	---	---	---	---	---	---	---
25-Apr	---	17.0	7.2	---	---	---	---	---	---	---	---	---	---	---	---
26-Apr	---	17.0	7.8	---	68	---	---	---	---	---	---	---	---	---	---
2-May	---	24.0	8.7	---	---	---	---	---	---	---	---	---	---	---	---
3-May	---	20.0	8.6	---	75	---	---	---	---	---	---	---	---	---	---
7-May	---	---	18.0	---	---	290,000	3.00	0.002	4.95	10.7	---	4.3	7.1	6.5	25.0
9-May	---	49.0	15.0	---	---	---	---	---	---	---	---	---	---	---	---
10-May	---	48.0	13.0	---	86	---	---	---	---	---	---	---	---	---	---
15-May	---	---	---	86	---	640,000	---	---	---	---	---	---	7.1	---	---
16-May	---	32.0	11.0	---	---	---	---	---	---	---	---	---	---	---	---
17-May	---	29.0	13.0	---	70	---	---	---	---	---	---	---	---	---	---
21-May	---	---	13.0	---	---	310,000	3.10	0.003	4.35	12.0	---	---	7.2	6.5	9.0
23-May	---	24.0	8.0	---	---	---	---	---	---	---	---	---	---	---	---
24-May	---	19.0	7.0	---	49	---	---	---	---	---	---	---	---	---	---
30-May	---	27.0	9.0	---	---	---	---	---	---	---	---	---	---	---	---
31-May	---	23.0	8.0	---	49	---	---	---	---	---	---	---	---	---	---
4-Jun	---	---	11.0	---	---	20,000	1.80	0.002	3.53	14.3	---	3.3	7.3	6.6	14.0
6-Jun	---	22.0	7.0	---	---	---	---	---	---	---	---	---	---	---	---
7-Jun	---	21.0	<5	---	53	---	---	---	---	---	---	---	---	---	---
13-Jun	---	29.0	9.0	---	---	---	---	---	---	---	---	---	---	---	---
14-Jun	---	30.0	11.0	---	79	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
18-Jun	---	---	11.0	---	---	24,000	6.80	0.006	1.63	16.1	---	---	7.2	6.5	14.0
20-Jun	---	20.0	7.0	---	---	---	---	---	---	---	---	---	---	---	---
21-Jun	---	16.0	8.0	---	67	---	---	---	---	---	---	---	---	---	---
27-Jun	---	31.0	7.0	---	---	---	---	---	---	---	---	---	---	---	---
28-Jun	---	24.0	<5	---	59	---	---	---	---	---	---	---	---	---	---
5-Jul	---	22.0	6.0	---	---	---	---	---	---	---	---	---	---	---	---
6-Jul	---	20.0	6.0	---	55	---	---	---	---	---	---	---	---	---	---
9-Jul	---	---	6.0	---	---	22,000	5.00	0.008	1.43	13.7	---	2.2	7.0	6.8	16.0
11-Jul	---	20.0	<5	---	---	---	---	---	---	---	---	---	---	---	---
12-Jul	---	21.0	<5	---	61	---	---	---	---	---	---	---	---	---	---
16-Jul	---	---	---	---	---	7,800	4.70	---	5.31	---	---	2.6	7.1	---	---
17-Jul	---	---	---	68	---	6,800	---	---	---	---	---	---	7.3	---	---
17-Jul	---	---	<5	---	---	---	2.90	0.003	4.73	13.4	---	1.9	7.0	6.6	8.0
18-Jul	---	29.0	9.0	---	---	---	---	---	---	---	---	---	---	---	---
18-Jul	---	---	---	---	---	2,900	3.90	---	4.54	---	---	1.8	7.1	---	---
19-Jul	---	32.0	10.0	---	52	---	---	---	---	---	---	---	---	---	---
23-Jul	---	---	8.0	---	---	1,300	2.50	0.002	2.19	15.7	---	---	7.1	6.4	19.0
25-Jul	---	24.0	6.0	---	---	---	---	---	---	---	---	---	---	---	---
26-Jul	---	29.0	7.0	---	58	---	---	---	---	---	---	---	---	---	---
1-Aug	---	31.0	7.0	---	---	---	---	---	---	---	---	---	---	---	---
2-Aug	---	32.0	7.0	---	64	---	---	---	---	---	---	---	---	---	---
6-Aug	---	---	<5	---	---	10,000	3.30	0.006	3.81	12.9	---	1.6	7.3	6.8	16.0
8-Aug	---	20.0	6.2	---	---	---	---	---	---	---	---	---	---	---	---
9-Aug	---	26.0	5.1	---	66	---	---	---	---	---	---	---	---	---	---
13-Aug	---	---	---	---	---	80,000	---	---	---	---	---	---	7.0	---	---
15-Aug	---	18.0	4.0	---	---	---	---	---	---	---	---	---	---	---	---
16-Aug	---	19.0	5.0	---	74	---	---	---	---	---	---	---	---	---	---
20-Aug	---	---	9.0	68	---	9,100	3.80	0.002	3.43	15.0	---	---	6.8	6.3	16.0
22-Aug	---	23.0	7.9	---	---	---	---	---	---	---	---	---	---	---	---
23-Aug	---	25.0	5.0	---	36	---	---	---	---	---	---	---	---	---	---
29-Aug	---	15.0	7.7	---	---	---	---	---	---	---	---	---	---	---	---
30-Aug	---	13.0	2.9	---	65	---	---	---	---	---	---	---	---	---	---
5-Sep	---	26.0	4.9	---	---	---	---	---	---	---	---	---	---	---	---
6-Sep	---	21.0	5.0	---	63	---	---	---	---	---	---	---	---	---	---
10-Sep	---	---	6.3	---	---	46,000	3.10	0.002	1.95	18.0	---	0.7	7.1	6.2	16.8
13-Sep	---	---	---	---	55	---	---	---	---	---	---	---	---	---	---
19-Sep	---	8.3	3.3	---	---	---	---	---	---	---	---	---	---	---	---
19-Sep	---	---	---	---	---	5,400	---	---	---	---	---	---	7.6	---	---
20-Sep	---	14.0	3.7	---	35	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
24-Sep	---	---	4.5	66	---	8,600	2.80	0.001	2.78	11.2	---	---	7.2	6.2	10.4
26-Sep	---	11.0	3.8	---	---	---	---	---	---	---	---	---	---	---	---
27-Sep	---	12.0	5.0	---	46	---	---	---	---	---	---	---	---	---	---
3-Oct	---	30.0	13.0	---	---	---	---	---	---	---	---	---	---	---	---
4-Oct	---	16.0	4.8	---	51	---	---	---	---	---	---	---	---	---	---
8-Oct	---	---	2.6	---	---	23,000	1.10	0.001	2.76	14.4	---	1.7	7.3	6.3	12.0
9-Oct	---	12.0	4.0	---	---	---	---	---	---	---	---	---	---	---	---
11-Oct	---	15.0	3.6	---	52	---	---	---	---	---	---	---	---	---	---
15-Oct	---	---	4.1	73	---	<100	3.20	0.004	2.23	14.2	---	---	7.0	6.6	11.3
17-Oct	---	19.0	2.3	---	---	---	---	---	---	---	---	---	---	---	---
18-Oct	---	18.0	5.5	---	56	---	---	---	---	---	---	---	---	---	---
23-Oct	---	---	---	---	---	110,000	---	---	---	---	---	---	7.0	---	---
23-Oct	---	9.7	3.1	---	47	130,000	---	<0.0005	---	---	---	---	7.0	6.6	8.8
24-Oct	---	6.8	<2	---	---	---	---	---	---	---	---	---	---	---	---
25-Oct	---	8.3	<2	---	40	---	---	---	---	---	---	---	---	---	---
31-Oct	---	9.0	2.9	---	---	---	---	---	---	---	---	---	---	---	---
1-Nov	---	200.0	---	---	44	---	---	---	---	---	---	---	---	---	---
5-Nov	---	---	5.5	---	---	390,000	0.089	<0.0005	0.088	16.5	---	2.9	7.2	6.3	3.3
7-Nov	---	9.6	2.8	---	---	---	---	---	---	---	---	---	---	---	---
8-Nov	---	9.1	3.6	---	45	---	---	---	---	---	---	---	---	---	---
12-Nov	---	---	<2	82	---	12,000	0.075	<0.0005	0.109	17.9	---	---	6.9	6.5	8.0
14-Nov	---	14.0	<2	---	---	---	---	---	---	---	---	---	---	---	---
15-Nov	---	13.0	<2	---	42	---	---	---	---	---	---	---	---	---	---
20-Nov	---	---	---	---	---	12,000	---	---	---	---	---	---	7.2	---	---
21-Nov	---	6.0	2.7	---	---	---	---	---	---	---	---	---	---	---	---
22-Nov	---	5.4	<2	---	27	---	---	---	---	---	---	---	---	---	---
28-Nov	---	6.3	2.1	---	---	---	---	---	---	---	---	---	---	---	---
29-Nov	---	5.8	<2	---	29	---	---	---	---	---	---	---	---	---	---
3-Dec	---	---	2.0	---	---	5,300	0.088	<0.0005	0.012	16.1	---	3.2	6.9	6.6	4.8
5-Dec	---	6.2	2.7	---	---	---	---	---	---	---	---	---	---	---	---
6-Dec	---	6.3	2.6	---	33	---	---	---	---	---	---	---	---	---	---
11-Dec	---	---	---	---	---	40,000	---	---	---	---	---	---	6.9	---	---
12-Dec	---	7.5	3.4	---	---	---	---	---	---	---	---	---	---	---	---
13-Dec	---	7.5	3.6	---	66	---	---	---	---	---	---	---	---	---	---
17-Dec	---	---	3.3	82	---	2,400,000	0.066	<0.0005	0.012	15.2	---	---	7.2	6.6	10.0
20-Dec	---	---	---	---	33	---	---	---	---	---	---	---	---	---	---
26-Dec	---	19.0	6.3	---	---	---	---	---	---	---	---	---	---	---	---
27-Dec	---	8.9	4.0	---	30	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2019	ALK	BOD	CBOD	CL	COD	FC	NH_3	UNION NH_3	NO_2	NO_3	TKN	PO_4	PH	PH@15	TSS
Mean	21	18.7	6.1	79.0	54.5	123,272	1.9	0.0018	1.9	14.0	2.2	2.9	15.5	6.5	11.2
Min	18	5.4	<2	60.0	27.0	50.0	0.03	<0.0005	0.012	10.7	2.0	0.7	6.5	6.1	3.3
Max	24	200	18.0	133	86.0	2,400,000	6.8	0.0081	5.3	18.0	2.4	4.6	671	6.9	25.0
n	2	103	125	10	55	41	29	26	29	27	6	17	79	26	74

Notes: ALK-alkalinity, BOD-total biochemical oxygen demand, COD-chemical oxygen demand, CL-chloride, COND-conductivity, NH3-ammonia, union NH3-unionized ammonia,
NO3-nitrate, NO2-nitrite, TDP-total dissolved phosphorus, TP-total phosphorous, TKN-total Kjeldahl nitrogen, CBOD- carbonaceous biochemical oxygen demand, UN NH3-unionized ammonia, TRC-total residual chlorine

Appendix B4 Influent and Effluent Priority Substance Concentrations 2019

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
Conventionals																		
Alkalinity	TOT	mg/L asCaCO3	197	21	---	---	---	---	203	18	---	---	---	---	---	---	190	38
BOD	TOT	mg/L as O2	288	15	---	---	---	---	239	18	---	---	---	---	---	---	190	9.7
CBOD	TOT	mg/L as O2	240	<5	---	---	---	---	---	<5	---	---	310	<5	---	---	180	3.1
COD	TOT	mg/L as O2	693	62	---	---	---	---	631	62	---	---	---	---	---	---	483	47
Enterococci	TOT	CFU/100 mL	820,000	3,900	680,000	3,500	630,000	4,900	---	11,000	1,400,000	1,400	810,000	900	2,700,000	1,000	1,100,000	15,000
Fecal Coliforms	TOT	CFU/100 mL	4,000,000	15,500	3,900,000	11,000	3,900,000	22,000	7,200,000	40,000	13,000,000	7,800	---	---	10,000,000	2,900	27,000,000	130,000
Hardness (As Caco3)	DIS	mg/L	65.6	72.8	62.8	72.8	66.2	77	---	75	74.4	77.9	80.4	79.5	79.8	80	80	79.1
Hardness (As Caco3)	TOT	mg/L	72.5	73.4	70.9	79.5	78.1	77.3	---	75.5	83.1	78	94.3	79.3	89.7	75.4	95.3	80.3
N - Nh3 (As N)	TOT	mg/L	36	0.051	53	0.052	56	0.06	---	1.7	36	4.7	44	2.9	39	3.9	---	---
N - Nh3 (As N)- Unionized	TOT	mg/L	0.034	<0.0005	---	---	---	---	---	0.0012	---	---	0.097	0.0033	---	---	0.061	<0.0005
N - No2 (As N)	DIS	mg/L	<0.005	0.0254	<0.002	0.0348	<0.002	0.0455	---	2.03	<0.002	5.31	<0.005	4.73	0.0028	4.54	<0.005	1.08
N - No3 (As N)	DIS	mg/L	<0.02	16.2	---	---	---	---	---	15.5	---	---	<0.02	13.4	---	---	<0.02	13.6
N - No3 + No2 (As N)	TOT	mg/L	<0.02	16.3	---	---	---	---	---	17.5	---	---	<0.02	18.1	---	---	<0.02	14.7
N - Tkn (As N)	TOT	mg/L	54.9	2.3	---	---	---	---	55.2	3.7	---	---	---	---	---	---	35.9	<0.2
Oil & Grease, Mineral	TOT	mg/L	<2	<2	2.1	<2	<2	<2	---	2.2	<2	<2	<2	<2	2.5	<2	2	<2
Oil & grease, total	TOT	mg/L	6.2	<1	4.9	<1	6.1	<1	---	5.9	32	<1	4.3	<1	22	<1	13	<1
P - Po4 - Ortho (As P)	DIS	mg/L	3.41	4	---	---	---	---	---	3.77	---	---	3.8	1.3	---	---	2.5	0.12
P - Po4 - Total (As P)	DIS	µg/L	4,500	3,820	3,530	3,890	4,800	4,640	---	---	---	---	---	---	---	---	---	---
P - Po4 - Total (As P)	TOT	µg/L	5,290	3,910	5,560	4,440	5,770	4,530	---	---	7,210	2,610	6,970	1,880	7,870	1,760	5,120	411
pH	TOT	pH	7.38	7.14	7.74	7.04	7.67	7.36	7.52	7.07	7.64	7.49	7.81	7.52	7.79	7.73	7.07	6.86
pH @ 15°C	TOT	pH	6.54	6.22	---	---	---	---	---	6.4	---	---	6.91	6.61	---	---	6.83	6.58
SAD Cyanide	TOT	mg/L	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	---	0.00241	0.0021	0.00297	0.001	0.00335	0.00228	0.00157	0.00184	0.00264
Specific Conductivity - 25°C	TOT	µS/cm	677	474	---	---	---	---	721	506	---	---	---	---	---	---	690	450
Sulfide	TOT	mg/L	0.666	<0.05	0.285	0.0192	0.082	<0.05	---	0.016	4.5	0.011	2.5	0.0048	2.1	0.022	---	---
Temperature	TOT	°C	12.3	11.8	9.8	9.9	12.8	9.9	12.6	9.7	16.3	18.3	18.3	18.9	19.3	21.4	16.9	16.7
TOC	TOT	mg/L	42	<10	---	---	---	---	---	11	---	---	54	11	---	---	32	11
TSS	TOT	mg/L	254	9	---	---	---	---	---	9	---	---	348	8	---	---	119	8.8
WAD Cyanide	TOT	mg/L	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	---	0.00191	0.00089	0.00104	0.00085	0.00197	0.00129	0.0013	0.00091	0.00189
Metals - Total																		
Aluminum	TOT	µg/L	219	33.2	292	58.3	250	34.9	---	21.3	335	22.4	239	22.1	322	19.3	222	18.3
Antimony	TOT	µg/L	0.197	0.225	0.395	0.259	0.19	0.201	---	0.23	0.425	0.262	0.148	0.227	0.459	0.257	0.192	0.264
Arsenic	TOT	µg/L	0.346	0.213	0.407	0.246	0.365	0.223	---	0.245	0.481	0.251	0.388	0.251	0.477	0.228	0.452	0.297
Barium	TOT	µg/L	14.6	6.71	15.4	7.63	20.5	7.23	---	7.76	23.5	8.56	19.8	9.22	20.4	8.27	14.7	7.88
Beryllium	TOT	µg/L	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01
Cadmium	TOT	µg/L	0.264	0.0736	0.379	0.084	0.204	0.0615	---	0.039	0.192	0.022	0.164	0.0291	0.416	0.0434	0.156	0.0898
Calcium	TOT	mg/L	16.9	16.7	16.9	18.6	18.5	17.8	---	---	22.8	21.3	25.9	22.3	24.3	21	24.8	21.6
Chromium	TOT	µg/L	1.08	0.58	1.77	0.73	1.63	0.56	---	0.72	1.8	0.59	1.6	0.68	1.54	0.59	0.89	0.28
Chromium III	TOT	mg/L	---	---	---	---	---	---	---	<0.001	0.0018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium Vi	TOT	mg/L	---	---	---	---	---	---	---	0.0019	<0.001	0.013	0.0025	0.0083	0.0019	0.0083	<0.001	0.001
Cobalt	TOT	µg/L	0.361	0.231	0.42	0.277	0.393	0.249	---	0.273	0.476	0.221	0.441	0.229	0.501	0.197	0.379	0.2
Copper	TOT	µg/L	113	31.8	115	39.9	113	34	---	22.5	93.1	15.8	69.9	14.3	95.1	13.3	43	6.03
Iron	TOT	µg/L	411	88.3	516	127	335	96.6	---	107	619	119	465	112	579	115	413	58.3
Lead	TOT	µg/L	1.95	0.613	2.29	0.719	2.76	0.695	---	0.526	3.72	0.564	2.69	0.876	2.93	0.513	6.52	0.332
Magnesium	TOT	mg/L	7.34	7.68	6.98	8	7.76	7.99	---	7.65	6.37	6.03	7.18	5.76	7.05	5.54	8.07	6.4
Manganese	TOT	µg/L	40	32.7	39.8	31.7	45.5	35.9	---	53.2	45.6	36.4	47.5	38.7	50.5	35.9	45	30.2
Mercury	TOT	µg/L	0.0146	0.0022	0.0072	<0.002	0.0066	<0.002	---	0.0028	0.009	<0.002	<0.02	0.0036	0.084	0.059	0.0046	<0.002
Molybdenum	TOT	µg/L	0.964	0.806	1.29	0.9	0.854	0.997	---	1.07	1.3	0.585	0.605	0.738	1.41	0.64	1.36	1.41
Nickel	TOT	µg/L	2.55	1.73	2.75	2.05	2.99	1.76	---	2.49	3.54	1.78	2.98	1.99	4.16	1.83	2.82	1.61
Potassium	TOT	mg/L	14.3	14.4	13.9	14.1	15.5	14.9	---	14.8	17.3	15.8	18.3	16.8	18.2	15.5	14.7	11.3
Selenium	TOT	µg/L	0.247	0.17	0.388	0.184	0.292	0.181	---	0.17	0.51	0.24	0.276	0.199	0.529	0.2	0.282	0.139
Silver	TOT	µg/L	0.031	0.018	0.238	0.033	0.032	0.012	---	0.017	0.233	0.021	0.046	0.019	0.131	0.018	<0.01	<0.01
Sodium	TOT	mg/L	46.2	50.2	42.9	50.8	47.4	51.3	---	---	---	---	---	---	---	---	---	---

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
Thallium	TOT	µg/L	0.0059	<0.002	0.008	<0.004	0.0068	<0.002	---	<0.002	0.0086	0.0036	0.0064	<0.002	0.0097	<0.002	0.0045	<0.002
Tin	TOT	µg/L	0.99	0.38	1.86	0.46	1.12	0.37	---	0.47	1.33	0.59	0.96	0.86	1.32	0.48	---	---
Zinc	TOT	µg/L	93.3	46.6	104	59.8	120	47.8	---	47.4	138	32.6	125	35.3	147	28.8	88.5	32.1
Metals - Dissolved																		
Aluminum	DIS	µg/L	28.2	15	29.3	15.2	28.1	12.1	---	15.2	30.4	11.8	27.1	14	25	11.3	25.3	12
Antimony	DIS	µg/L	0.175	0.206	0.214	0.226	0.167	0.203	---	0.232	0.222	0.245	0.21	0.221	0.208	0.237	0.22	0.263
Arsenic	DIS	µg/L	0.267	0.202	0.299	0.209	0.275	0.203	---	0.212	0.332	0.25	0.345	0.255	0.344	0.244	0.4	0.297
Barium	DIS	µg/L	8.12	6.27	6.26	6.33	7.8	6.87	---	7.47	7.57	8.08	8.81	8.62	8.12	8.44	7.13	7.62
Beryllium	DIS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	DIS	µg/L	0.0297	0.0572	0.0336	0.0558	0.0302	0.0564	---	0.036	0.0369	0.0161	0.0348	0.0178	0.0438	0.0336	0.0232	0.0716
Calcium	DIS	mg/L	14.4	16.7	14.4	17.1	14.6	17.9	---	17.5	19.4	21.3	21.3	22.4	20.8	22	20.1	21.3
Chromium	DIS	µg/L	0.5	0.42	0.71	0.42	0.56	0.46	---	0.69	0.7	0.56	0.77	0.62	0.6	0.62	0.42	0.3
Cobalt	DIS	µg/L	0.198	0.208	0.228	0.209	0.207	0.218	---	0.239	0.242	0.199	0.23	0.206	0.23	0.201	0.225	0.207
Copper	DIS	µg/L	53.8	25.3	60.9	25.9	57.4	27.7	---	21.3	41.4	10.6	37	9.94	38	9.79	22.6	4.14
Iron	DIS	µg/L	255	55.9	186	52	215	56.7	---	91.4	212	95.3	214	98.6	167	97.3	176	49.8
Lead	DIS	µg/L	0.723	0.5	0.808	0.504	0.822	0.509	---	0.442	0.88	0.473	0.811	0.493	0.813	0.449	0.53	0.276
Magnesium	DIS	mg/L	7.18	7.53	6.54	7.31	7.24	7.87	---	7.63	6.32	6.01	6.6	5.75	6.8	6.05	7.22	6.28
Manganese	DIS	µg/L	32.6	24.6	25.5	25.2	30.3	26.7	---	51.1	28.5	34.6	31.3	37.9	30	36.8	30.4	28.6
Mercury	DIS	µg/L	0.0039	<0.002	<0.002	<0.002	<0.002	<0.002	---	0.0022	0.0053	0.0023	<0.002	0.0062	0.0059	0.0029	<0.002	<0.002
Molybdenum	DIS	µg/L	0.725	0.797	0.937	0.748	0.735	1.05	---	1.25	0.494	0.547	5.51	0.712	0.538	0.654	1.61	1.47
Nickel	DIS	µg/L	2	1.61	1.8	1.62	1.98	1.71	---	2.41	2.27	1.72	2.08	2.09	2.26	1.88	1.93	1.66
Potassium	DIS	mg/L	14.2	14.2	13.3	12.7	14.7	14.6	---	14.7	17.3	15.8	17.7	16.7	17.7	16.2	13.1	11.3
Selenium	DIS	µg/L	0.145	0.163	0.277	0.156	0.295	0.17	---	0.17	1.13	0.191	0.174	0.199	0.483	0.192	0.205	0.138
Silver	DIS	µg/L	0.029	0.0063	0.0356	0.0076	0.0305	0.0051	---	0.01	0.0413	0.0072	0.039	0.0098	0.0356	0.0101	0.0333	<0.005
Thallium	DIS	µg/L	<0.002	<0.002	0.0043	<0.002	0.0036	0.0024	---	<0.002	0.0077	0.0034	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Tin	DIS	µg/L	0.67	0.43	0.73	0.45	0.77	0.4	---	0.41	0.76	0.54	0.73	0.56	0.78	0.53	0.59	0.31
Zinc	DIS	µg/L	13.3	44.4	32.7	46.4	16.5	44.6	---	45.8	26.1	30.5	19.1	32.4	21.1	28	23.9	30
Metals - Other																		
Dibutyltin	TOT	µg/L	0.004	<0.001	---	---	---	---	0.003	<0.001	---	---	<0.001	<0.001	---	---	0.004	<0.001
Dibutyltin Dichloride	TOT	µg/L	0.007	0.002	---	---	---	---	0.003	<0.001	---	---	<0.001	<0.001	---	---	0.005	<0.001
Methyl Mercury	TOT	ng/L	0.736	<0.05	---	---	---	---	0.636	0.097	---	---	0.817	0.054	---	---	0.787	0.039
Monobutyltin	TOT	µg/L	0.011	<0.001	---	---	---	---	0.005	0.003	---	---	0.008	0.013	---	---	0.01	0.016
Monobutyltin Trichloride	TOT	µg/L	0.017	0.01	---	---	---	---	0.008	0.004	---	---	0.012	0.02	---	---	0.0115	0.026
Tributyltin	TOT	µg/L	0.001	<0.001	---	---	---	---	<0.001	<0.001	---	---	<0.001	<0.001	---	---	0.003	<0.001
Tributyltin Chloride	TOT	µg/L	---	---	---	---	---	---	<0.001	<0.001	---	---	<0.001	<0.001	---	---	0.004	<0.001
Aldehydes																		
Acrolein	TOT	µg/L	<3	<3	---	---	---	---	---	<3	---	---	<3	<3	---	---	<3	<3
Total Phenols	TOT	mg/L	0.1	0.0099	---	---	---	---	---	0.0099	---	---	0.086	0.0063	---	---	0.054	0.0067
Chlorinated Phenolics																		
2,4,6-trichlorophenol	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.1
2,4 + 2,5-Dichlorophenol	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.1
2-Chlorophenol	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.1
4-Chloro-3-Methylphenol	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<0.2
Pentachlorophenol	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.1
Non-Chlorinated Phenolics			---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2,4-dimethylphenol	TOT	µg/L	<2.5	<2.5	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
2,4-dinitrophenol	TOT	µg/L	<6.5	<6.5	---	---	---	---	---	<6.5	---	---	<6.5	<6.5	---	---	<6.5	<1.3
2-Methyl-4,6-Dinitrophenol	TOT	µg/L	<2.5	<2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2-Nitrophenol	TOT	µg/L	<2.5	<2.5	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
4-Nitrophenol	TOT	µg/L	<3.3	<2.5	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
Phenol	TOT	µg/L	15.5	<2.5	---	---	---	---	---	<2.5	---	---	38.4	<2.5	---	---	10.3	<0.5
4,6-dinitro-2-methylphenol	TOT	µg/L	---	---	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
Polycyclic Aromatic Hydrocarbons (PAH)																		
2-Chloronaphthalene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
2-Methylnaphthalene	TOT	µg/L	0.036	<0.01	---	---	---	---	---	<0.01	---	---	0.059	<0.01	---	---	0.02	<0.01
Acenaphthene	TOT	µg/L	0.031	<0.01	---	---	---	---	---	<0.01	---	---	0.019	<0.01	---	---	0.094	<0.01
Acenaphthylene	TOT	µg/L	<0.01	<0.01	---	---	---	---	---	<0.01	---	---	0.053	<0.01	---	---	<0.01	<0.01

Appendix B4, cont'd

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
Anthracene	TOT	µg/L	<0.01	<0.01	---	---	---	---	---	<0.01	---	---	<0.01	<0.01	---	---	0.023	<0.01
Benzo(A)Anthracene	TOT	µg/L	<0.01	<0.01	---	---	---	---	---	<0.01	---	---	0.012	<0.01	---	---	<0.01	<0.01
Benzo(A)Pyrene	TOT	µg/L	<0.005	<0.005	---	---	---	---	---	<0.005	---	---	<0.005	<0.005	---	---	0.0063	<0.005
Benzo(B)Fluoranthene	TOT	µg/L	0.018	<0.01	---	---	---	---	---	<0.01	---	---	0.012	<0.01	---	---	0.015	<0.01
Benzo(B)Fluoranthene + Benzo(J)Fluoranthene	TOT	µg/L	0.018	<0.01	---	---	---	---	---	<0.01	---	---	0.012	<0.01	---	---	0.034	<0.01
Benzo(G,H,I)Perylene	TOT	µg/L	<0.02	<0.02	---	---	---	---	---	<0.02	---	---	<0.02	<0.02	---	---	<0.02	<0.02
Benzo(K)Fluoranthene	TOT	µg/L	<0.01	<0.01	---	---	---	---	---	<0.01	---	---	<0.01	<0.01	---	---	0.012	<0.01
Chrysene	TOT	µg/L	<0.01	<0.01	---	---	---	---	---	<0.01	---	---	0.098	<0.01	---	---	0.023	<0.01
Dibenzo(A,H)Anthracene	TOT	µg/L	<0.02	<0.02	---	---	---	---	---	<0.02	---	---	<0.02	<0.02	---	---	<0.02	<0.02
Fluoranthene	TOT	µg/L	0.066	0.026	---	---	---	---	---	0.023	---	---	0.018	<0.01	---	---	0.026	<0.01
Fluorene	TOT	µg/L	0.033	<0.01	---	---	---	---	---	<0.01	---	---	0.027	<0.01	---	---	0.021	<0.01
Indeno(1,2,3-C,D)Pyrene	TOT	µg/L	<0.02	<0.02	---	---	---	---	---	<0.02	---	---	<0.02	<0.02	---	---	<0.02	<0.02
Naphthalene	TOT	µg/L	0.067	0.02	---	---	---	---	---	<0.01	---	---	0.052	<0.01	---	---	0.064	<0.01
Phenanthrene	TOT	µg/L	0.12	0.02	---	---	---	---	---	<0.01	---	---	0.069	0.02	---	---	0.1	0.017
Pyrene	TOT	µg/L	0.053	<0.01	---	---	---	---	---	<0.01	---	---	0.013	<0.01	---	---	0.091	0.017
Styrene	TOT	µg/L	0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Total HMW-PAH	TOT	µg/L	0.14	0.026	---	---	---	---	---	0.023	---	---	0.15	<0.02	---	---	0.19	<0.02
Total LMW-PAH	TOT	µg/L	0.32	0.04	---	---	---	---	---	<0.05	---	---	0.3	0.03	---	---	0.34	1.9
Total PAH	TOT	µg/L	0.46	0.066	---	---	---	---	---	<0.05	---	---	0.45	0.03	---	---	0.53	1.9
Semivolatile Organics																		
3,3-dichlorobenzidine	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.1
Bis(2-Ethylhexyl)Phthalate	TOT	µg/L	7.3	<5	---	---	---	---	---	<5	---	---	<5	<5	---	---	<5	<1
Butylbenzyl Phthalate	TOT	µg/L	<2.5	<2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
N-Butylbenzyl Phthalate	TOT	µg/L	---	---	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
Diethyl Phthalate	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	0.37	---	---	1.28	<0.25	---	---	2.36	0.627
Dimethyl Phthalate	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Di-N-Butyl Phthalate	TOT	µg/L	<2.5	<2.5	---	---	---	---	---	<2.5	---	---	<2.5	<2.5	---	---	<2.5	<0.5
Di-N-Octyl Phthalate	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
1,2,4-trichlorobenzene	TOT	µg/L	<0.2	<0.2	---	---	---	---	---	<0.2	---	---	<0.2	<0.2	---	---	<0.2	<0.04
1,2-diphenylhydrazine	TOT	µg/L	<0.05	<0.05	---	---	---	---	---	<0.05	---	---	<0.05	<0.05	---	---	<0.05	0.013
2,4-dinitrotoluene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
2,6-dinitrotoluene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
4-Bromophenyl Phenyl Ether	TOT	µg/L	<0.05	<0.05	---	---	---	---	---	<0.05	---	---	<0.05	<0.05	---	---	<0.05	<0.01
4-Chlorophenyl Phenyl Ether	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Bis(2-Chloroethoxy)Methane	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Bis(2-Chloroethyl)Ether	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Bis(2-Chloroisopropyl)Ether	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Hexachlorobutadiene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Hexachlorocyclopentadiene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Hexachloroethane	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Isophorone	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
Nitrobenzene	TOT	µg/L	<0.25	<0.25	---	---	---	---	---	<0.25	---	---	<0.25	<0.25	---	---	<0.25	<0.05
N-Nitrosodiphenylamine	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<0.2
N-Nitrosodimethylamine	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<0.2
N-Nitrosodi-N-Propylamine	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	---	---
Volatile Organic Compounds																		
1,1,1,2-Tetrachloroethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,1,1-trichloroethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,1,2,2-tetrachloroethane	TOT	µg/L	---	---	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,1,2-trichloroethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,1-dichloroethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,1-dichloroethene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,2-dibromoethane	TOT	µg/L	<0.2	<0.2	---	---	---	---	---	<0.2	---	---	<0.2	<0.2	---	---	<0.2	<0.2
1,2-dichlorobenzene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,2-dichloroethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,2-dichloropropane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5

Appendix B4, cont'd

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
1,3-dichlorobenzene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,4-dichlorobenzene	TOT	µg/L	4.4	0.78	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
1,4-Dioxane	TOT	µg/L	<4	0.53	---	---	---	---	---	0.7	---	---	<0.52	0.93	---	---	0.43	0.59
4-Methyl-2-Pentanone	TOT	µg/L	<10	<10	---	---	---	---	---	<10	---	---	<10	<10	---	---	<10	<10
Acrylonitrile	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Alpha-Terpineol	TOT	µg/L	---	---	---	---	---	---	---	<5	---	---	<5	<5	---	---	6.4	<1
Benzene	TOT	µg/L	<0.4	<0.4	---	---	---	---	---	0.47	---	---	<0.4	<0.4	---	---	<0.4	<0.4
Bromodichloromethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Bromoform	TOT	µg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1	<1
Bromomethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Carbon Tetrachloride	TOT	µg/L	---	---	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Chlorine	DIS	mg/L	---	---	---	---	---	---	70	76	---	---	---	---	---	---	61	61
Chlorobenzene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Chlorodibromomethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Chloroethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Chloroethene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	TOT	µg/L	---	---	---	---	---	---	---	1.6	---	---	3	1.3	---	---	2.3	1.1
Chloromethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Cis-1,2-Dichloroethene	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
cis-1,3-dichloropropene	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Dibromomethane	TOT	µg/L	<0.9	<0.9	---	---	---	---	---	<0.9	---	---	<0.9	<0.9	---	---	<0.9	<0.9
Dichlorodifluoromethane	TOT	µg/L	<2	<2	---	---	---	---	---	<2	---	---	<2	<2	---	---	<2	<2
Dichloromethane	TOT	µg/L	<2	<2	---	---	---	---	---	<2	---	---	<2	<2	---	---	5.2	2.5
Dimethyl Ketone	TOT	µg/L	63	<15	---	---	---	---	---	<15	---	---	83	<15	---	---	62	<15
Ethylbenzene	TOT	µg/L	<0.4	<0.4	---	---	---	---	---	<0.4	---	---	<0.4	<0.4	---	---	<0.4	<0.4
Methyl Ethyl Ketone	TOT	µg/L	<50	<50	---	---	---	---	---	<50	---	---	<50	<50	---	---	<50	<50
Methyl Tertiary Butyl Ether	TOT	µg/L	<4	<4	---	---	---	---	---	<4	---	---	<4	<4	---	---	<4	<4
Oxy-Chlordane	TOT	µg/L	<0.4	<0.4	---	---	---	---	---	<0.4	---	---	<0.4	<0.4	---	---	<0.4	<0.4
Tetrabromomethane	TOT	µg/L	<50	<50	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrabromomethane	TOT	µg/L	---	---	---	---	---	---	---	<50	---	---	<50	<50	---	---	<50	<50
Tetrachloroethene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Tetrachloromethane	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	TOT	µg/L	0.72	<0.4	---	---	---	---	---	<0.4	---	---	2.2	0.65	---	---	1.3	0.86
Trans-1,2-Dichloroethene	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
trans-1,3-dichloropropene	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	<1	<1
Tribromomethane	TOT	µg/L	<1	<1	---	---	---	---	---	<1	---	---	<1	<1	---	---	---	---
Trichloroethene	TOT	µg/L	<0.5	<0.5	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Trichlorofluoromethane	TOT	µg/L	<4	<4	---	---	---	---	---	<4	---	---	<4	<4	---	---	<4	<4
Trichloromethane	TOT	µg/L	3.1	1.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Vinyl Chloride	TOT	µg/L	---	---	---	---	---	---	---	<0.5	---	---	<0.5	<0.5	---	---	<0.5	<0.5
Xylenes	TOT	µg/L	<0.4	<0.4	---	---	---	---	---	<0.4	---	---	<0.4	<0.4	---	---	<0.4	<0.4
m & p Xylenes	TOT	µg/L	<0.4	<0.4	---	---	---	---	---	<0.4	---	---	<0.4	<0.4	---	---	<0.4	<0.4
High Resolution Parameters																		
Polycyclic Aromatic Hydrocarbons (PAH)																		
1-methylphenanthrene	TOT	ng/L	20.8	1.68	---	---	---	---	15.5	0.806	---	---	13.1	1.5	---	---	16.1	1.29
2,3,5-trimethylnaphthalene	TOT	ng/L	45.1	4.79	---	---	---	---	26.1	2	---	---	13.4	2.32	---	---	28	3.44
2,6-dimethylnaphthalene	TOT	ng/L	21.5	1.19	---	---	---	---	10.3	1.35	---	---	13.8	1.53	---	---	37.7	1.07
2-Methylnaphthalene	TOT	ng/L	20.1	3.6	---	---	---	---	17.7	6.16	---	---	35.1	12.2	---	---	32.6	3.79
Acenaphthene	TOT	ng/L	41.9	8.07	---	---	---	---	27.3	4.83	---	---	31.9	9.44	---	---	80.2	8.49
Acenaphthylene	TOT	ng/L	1.97	0.688	---	---	---	---	1.18	0.487	---	---	2.01	0.785	---	---	0.89	0.364
Anthracene	TOT	ng/L	5.78	0.374	---	---	---	---	5.37	0.424	---	---	7.87	0.715	---	---	6.09	<0.839
Benz[a]anthracene	TOT	ng/L	6.66	0.488	---	---	---	---	6.95	0.307	---	---	8.61	0.412	---	---	4.7	0.372
Benzo[a]pyrene	TOT	ng/L	4.84	0.331	---	---	---	---	5.17	0.203	---	---	6.38	0.337	---	---	3.14	0.21
Benzo[b]fluoranthene	TOT	ng/L	5.23	0.525	---	---	---	---	6.97	0.274	---	---	7.2	0.312	---	---	4.21	0.327
Benzo[e]pyrene	TOT	ng/L	4.99	0.473	---	---	---	---	5.98	0.294	---	---	6.03	0.339	---	---	3.38	0.373
Benzo[ghi]perylene	TOT	ng/L	5.34	0.537	---	---	---	---	6.31	0.32	---	---	7.5	0.419	---	---	3.3	0.339
Benzo[J,K]Fluoranthenes	TOT	ng/L	5.33	0.308	---	---	---	---	5.22	0.255	---	---	6.93	0.335	---	---	3.56	0.322

			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
Parameter			**Influent Q+**	**Effluent Q+**	**Influent Quarterly**	**Effluent Quarterly**	**Influent Q+**	**Effluent Q+**	**Influent Quarterly**	**Effluent Quarterly**	**Influent Q+**	**Effluent Q+**	**Influent Quarterly**	**Effluent Quarterly**	**Influent Q+**	**Effluent Q+**	**Influent Quarterly**	**Effluent Quarterly**
Chrysene	TOT	ng/L	11.1	0.965	---	---	---	---	11.6	0.652	---	---	13.4	1.15	---	---	9.23	0.989
Dibenz[a,h]anthracene	TOT	ng/L	0.917	<0.186	---	---	---	---	1.17	<0.262	---	---	1.43	<0.287	---	---	<2.39	<0.205
Dibenzothiophene	TOT	ng/L	13.2	1.5	---	---	---	---	11.8	1.65	---	---	16.6	1.69	---	---	29.1	2.26
Fluoranthene	TOT	ng/L	46.4	5.51	---	---	---	---	41.2	3.93	---	---	56.9	7.51	---	---	72.8	8.11
Fluorene	TOT	ng/L	23	3.57	---	---	---	---	26.3	4.98	---	---	32.3	5.69	---	---	55	6.72
Indeno[1,2,3-cd]pyrene	TOT	ng/L	3.76	0.378	---	---	---	---	4.46	0.265	---	---	6.02	0.412	---	---	4.6	0.341
Naphthalene	TOT	ng/L	72	6.79	---	---	---	---	49.3	12.4	---	---	75.3	17	---	---	104	7.04
Octachlorostyrene	TOT	ng/L	---	<0.123	---	---	---	---	0.008	<0.0054	---	---	<0.0022	<0.002	---	---	---	---
Pentachlorobenzene	TOT	ng/L	---	0.037	---	---	---	---	0.118	0.049	---	---	0.081	<0.0222	---	---	---	---
Perylene	TOT	ng/L	1.33	0.483	---	---	---	---	1.29	<0.181	---	---	1.67	0.174	---	---	1.54	<0.15
Phenanthrene	TOT	ng/L	136	13.8	---	---	---	---	113	12.5	---	---	155	18.4	---	---	266	15.8
Pyrene	TOT	ng/L	39.8	4.1	---	---	---	---	39.7	4.37	---	---	40.7	5.5	---	---	---	---
Nonylphenols																		
4-n-Octylphenol	TOT	ng/L	<3.99	<1.77	---	---	---	---	---	---	---	---	17.1	9.32	---	---	<2.34	<2.57
4-Nonylphenol Diethoxylates	TOT	ng/L	900	17.9	---	---	---	---	---	---	---	---	574	367	---	---	1,670	368
4-Nonylphenol Monoethoxylates	TOT	ng/L	3,050	105	---	---	---	---	---	---	---	---	7,500	626	---	---	6,650	848
Np	TOT	ng/L	2,130	266	---	---	---	---	---	---	---	---	2,250	75.7	---	---	1,340	76.7
Pesticides																		
1,2,3,4-tetrachlorobenzene	TOT	ng/L	---	<0.205	---	---	---	---	<0.682	<0.227	---	---	<0.212	---	---	---	---	---
1,2,3-trichlorobenzene	TOT	ng/L	---	<0.205	---	---	---	---	<0.854	<0.227	---	---	<0.212	---	---	---	---	---
1,2,4,5-/1,2,3,5-tetrachlorobenzene	TOT	ng/L	---	<0.205	---	---	---	---	<0.682	<0.227	---	---	<0.212	---	---	---	---	---
1,2,4-trichlorobenzene	TOT	ng/L	---	<0.205	---	---	---	---	<0.851	<0.227	---	---	<0.212	---	---	---	---	---
1,2-dichlorobenzene	TOT	ng/L	---	0.253	---	---	---	---	---	1.79	---	---	---	---	---	---	---	---
1,3,5-trichlorobenzene	TOT	ng/L	---	<0.205	---	---	---	---	<0.786	<0.227	---	---	<0.212	---	---	---	---	---
1,3-dichlorobenzene	TOT	ng/L	---	27.6	---	---	---	---	---	4.21	---	---	---	---	---	---	---	---
1,4-dichlorobenzene	TOT	ng/L	---	462	---	---	---	---	---	56.1	---	---	---	---	---	---	---	---
2,4-DDD	TOT	ng/L	---	<0.0962	---	---	---	---	0.114	<0.0723	---	---	0.203	<0.0445	---	---	---	---
2,4-DDE	TOT	ng/L	---	<0.0411	---	---	---	---	<0.0455	<0.0453	---	---	<0.0423	<0.0445	---	---	---	---
2,4-DDT	TOT	ng/L	---	<0.134	---	---	---	---	<0.997	<0.17	---	---	<0.124	0.065	---	---	---	---
44DDD	TOT	ng/L	---	<0.13	---	---	---	---	0.12	<0.0917	---	---	0.106	<0.0445	---	---	---	---
4,4-DDE	TOT	ng/L	---	0.113	---	---	---	---	0.867	0.123	---	---	0.787	0.06	---	---	---	---
4,4-DDT	TOT	ng/L	---	<0.176	---	---	---	---	<1.1	0.215	---	---	0.197	<0.0589	---	---	---	---
Aldrin	TOT	ng/L	---	<0.102	---	---	---	---	<0.182	<0.0453	---	---	<0.0423	<0.0445	---	---	---	---
Alpha Chlordane	TOT	ng/L	---	<0.135	---	---	---	---	0.173	<0.0453	---	---	0.185	<0.0445	---	---	---	---
Alpha-Endosulfan	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	0.265	0.3	---	---	---	---
Alpha-Hch Or Alpha-Bhc	TOT	ng/L	---	<0.0791	---	---	---	---	<0.0455	<0.0487	---	---	<0.0772	<0.0749	---	---	---	---
Beta-Endosulfan	TOT	ng/L	---	1.16	---	---	---	---	---	---	---	---	0.606	0.626	---	---	---	---
Beta-Hch Or Beta-Bhc	TOT	ng/L	---	<0.112	---	---	---	---	0.249	0.132	---	---	<0.189	<0.166	---	---	---	---
Cis-Nonachlor	TOT	ng/L	---	<0.629	---	---	---	---	0.066	0.1	---	---	<0.0423	<0.0445	---	---	---	---
Delta-Hch Or Delta-Bhc	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	<0.106	<0.111	---	---	---	---
Dieldrin	TOT	ng/L	---	0.728	---	---	---	---	---	---	---	---	0.788	0.158	---	---	---	---
Endosulfan Sulfate	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	<0.106	<0.111	---	---	---	---
Endrin	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	<0.106	<0.111	---	---	---	---
Endrin Aldehyde	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	<0.106	<0.111	---	---	---	---
Endrin Ketone	TOT	ng/L	---	<0.537	---	---	---	---	---	---	---	---	<0.106	<0.111	---	---	---	---
Hch, Gamma	TOT	ng/L	---	0.159	---	---	---	---	0.178	0.169	---	---	0.341	0.232	---	---	---	---
Heptachlor	TOT	ng/L	---	<0.136	---	---	---	---	0.107	0.051	---	---	0.043	<0.0445	---	---	---	---
Heptachlor Epoxide	TOT	ng/L	---	<0.513	---	---	---	---	---	---	---	---	0.138	<0.111	---	---	---	---
Hexachlorobenzene	TOT	ng/L	---	0.077	---	---	---	---	0.191	0.063	---	---	0.194	0.032	---	---	---	---
Hexachlorobutadiene	TOT	ng/L	---	0.173	---	---	---	---	<0.723	0.479	---	---	0.25	---	---	---	---	---
Hydrochlorothiazide	TOT	ng/L	1,360	1,580	---	---	---	---	546	519	---	---	566	556	---	---	367	297
Methoxyclor	TOT	ng/L	---	<1.03	---	---	---	---	---	---	---	---	0.378	<0.222	---	---	---	---
MIREX	TOT	ng/L	---	<0.0881	---	---	---	---	<0.0455	<0.0453	---	---	<0.0423	<0.0445	---	---	---	---
Oxy-Chlordane	TOT	ng/L	---	<0.37	---	---	---	---	<0.564	<0.0453	---	---	0.073	<0.0445	---	---	---	---
Trans-Chlordane	TOT	ng/L	---	<0.127	---	---	---	---	0.21	<0.0453	---	---	0.228	<0.0445	---	---	---	---
Trans-Nonachlor	TOT	ng/L	---	<0.151	---	---	---	---	0.177	<0.0453	---	---	0.123	<0.0445	---	---	---	---

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
Pharmaceuticals and Personal Care Products (PPCP)																		
2-hydroxy-Ibuprofen	TOT	ng/L	127,000	<236	---	---	---	---	66,000	<323	---	---	64,500	1,270	---	---	54,500	431
Bisphenol A	TOT	ng/L	<494	<492	---	---	---	---	<1160	<501	---	---	<528	<526	---	---	<502	<503
Furosemide	TOT	ng/L	3,470	3,080	---	---	---	---	2,240	1,830	---	---	1,580	3,090	---	---	2,360	2,000
Gemfibrozil	TOT	ng/L	251	40.2	---	---	---	---	211	184	---	---	208	198	---	---	52.3	55.9
Glipizide	TOT	ng/L	<5.93	<5.9	---	---	---	---	<6.5	<6.01	---	---	<6.33	<6.31	---	---	<6.02	<6.04
Glyburide	TOT	ng/L	<2.96	3.72	---	---	---	---	<2.85	<3.01	---	---	4.26	4.91	---	---	3.57	<3.02
Ibuprofen	TOT	ng/L	51,300	<148	---	---	---	---	13,300	243	---	---	18,600	214	---	---	17,000	58
Naproxen	TOT	ng/L	10,400	187	---	---	---	---	10,400	728	---	---	16,500	96	---	---	11,300	99
Triclocarban	TOT	ng/L	12	<2.95	---	---	---	---	16.2	<3.62	---	---	17.3	<3.16	---	---	10.4	<3.02
Triclosan	TOT	ng/L	436	229	---	---	---	---	436	180	---	---	460	154	---	---	245	76
Warfarin	TOT	ng/L	4.66	10.4	---	---	---	---	9.93	7.76	---	---	8.66	11.5	---	---	7.63	7.5
Polybrominated Diphenyl Ethers																		
PBDE 7	TOT	pg/L	---	<1.31	---	---	---	---	2.42	<3.67	---	---	2.66	<5.88	---	---	2.35	1.84
PBDE 10	TOT	pg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PBDE 15	TOT	pg/L	---	2.41	---	---	---	---	22.9	<2.07	---	---	25.4	<3.13	---	---	17.6	1.9
PBDE 30	TOT	pg/L	---	<1.31	---	---	---	---	1.85	<4.64	---	---	<1.74	<1.41	---	---	1.39	<0.646
PBDE 32	TOT	pg/L	---	<1.31	---	---	---	---	<1.44	<3.69	---	---	<1.35	<1.41	---	---	1.02	<0.52
PBDE 35	TOT	pg/L	---	<1.31	---	---	---	---	7.39	<3.26	---	---	12.8	3.19	---	---	4.82	0.569
PBDE 37	TOT	pg/L	---	2.39	---	---	---	---	11.5	6.81	---	---	13.7	1.82	---	---	11.7	4.03
PBDE 47	TOT	pg/L	---	2,740	---	---	---	---	27,700	2,130	---	---	29,500	5,680	---	---	23,900	1,840
PBDE 49	TOT	pg/L	---	60.9	---	---	---	---	617	51.4	---	---	633	104	---	---	464	41.8
PBDE 51	TOT	pg/L	---	9.09	---	---	---	---	72.3	7.08	---	---	78.3	12.1	---	---	64	5.13
PBDE 66	TOT	pg/L	---	36.8	---	---	---	---	440	46.9	---	---	645	94.8	---	---	309	29.2
PBDE 71	TOT	pg/L	---	12.7	---	---	---	---	54.7	2.87	---	---	87.7	26.2	---	---	55.3	6.16
PBDE 75	TOT	pg/L	---	4.62	---	---	---	---	34.1	1.81	---	---	45.4	4.54	---	---	26.4	3.1
PBDE 77	TOT	pg/L	---	2.76	---	---	---	---	<1.44	<1.43	---	---	<1.35	<1.41	---	---	0.947	<0.52
PBDE 79	TOT	pg/L	---	4.07	---	---	---	---	89.1	50.9	---	---	90.6	36.3	---	---	58.4	13.2
PBDE 85	TOT	pg/L	---	86.1	---	---	---	---	1,050	75.3	---	---	1,330	254	---	---	894	61.6
PBDE 99	TOT	pg/L	---	2,430	---	---	---	---	27,700	1,960	---	---	30,600	5,860	---	---	24,700	1,620
PBDE 100	TOT	pg/L	---	477	---	---	---	---	5,630	403	---	---	6,050	1,130	---	---	4,880	327
PBDE 105	TOT	pg/L	---	<11.2	---	---	---	---	<33.2	<15.4	---	---	<44.3	<46.8	---	---	<19.3	<3.69
PBDE 116	TOT	pg/L	---	<13.8	---	---	---	---	<41.3	<18.2	---	---	<57.7	<61.5	---	---	<24	<4.47
PBDE 126	TOT	pg/L	---	<6.12	---	---	---	---	31.6	<8.72	---	---	<22.8	<28.6	---	---	20.9	2.15
PBDE 128	TOT	pg/L	---	<4.63	---	---	---	---	<59.5	<10.9	---	---	<20.5	3.96	---	---	<35.2	<7.48
PBDE 140	TOT	pg/L	---	9.46	---	---	---	---	81.5	11.4	---	---	106	21.9	---	---	76.9	4.94
PBDE 153	TOT	pg/L	---	203	---	---	---	---	2,450	202	---	---	2,710	515	---	---	1,950	133
PBDE 154	TOT	pg/L	---	169	---	---	---	---	1,730	141	---	---	1,990	350	---	---	1,440	112
PBDE 155	TOT	pg/L	---	10.9	---	---	---	---	168	14.9	---	---	199	32.6	---	---	157	9.03
PBDE 181	TOT	pg/L	---	<2.14	---	---	---	---	<19.8	<1.43	---	---	<5.24	2.34	---	---	<16.1	1.23
PBDE 183	TOT	pg/L	---	27.2	---	---	---	---	271	23.8	---	---	481	42.2	---	---	233	20.9
PBDE 190	TOT	pg/L	---	<3.47	---	---	---	---	<33.5	3.9	---	---	<8.62	<1.41	---	---	<27.7	1.96
PBDE 203	TOT	pg/L	---	21.6	---	---	---	---	152	24.9	---	---	347	30.2	---	---	270	12.8
PBDE 206	TOT	pg/L	---	171	---	---	---	---	2,610	357	---	---	6,010	265	---	---	4,010	127
PBDE 207	TOT	pg/L	---	145	---	---	---	---	2,410	458	---	---	6,740	320	---	---	6,200	150
PBDE 208	TOT	pg/L	---	74	---	---	---	---	1,210	241	---	---	3,710	224	---	---	3,540	91
PBDE 209	TOT	pg/L	---	2,310	---	---	---	---	38,800	5,830	---	---	68,100	1,890	---	---	74,500	2,230
PBDE 119/120	TOT	pg/L	---	8.58	---	---	---	---	106	<11.1	---	---	78.4	<40.1	---	---	65.5	5.66
PBDE 12/13	TOT	pg/L	---	<1.31	---	---	---	---	4.63	<2.42	---	---	4.86	<3.75	---	---	3.02	0.613
PBDE 138/166	TOT	pg/L	---	17.7	---	---	---	---	176	39.3	---	---	317	57.1	---	---	91.1	11.5
PBDE 17/25	TOT	pg/L	---	24.3	---	---	---	---	162	21.6	---	---	196	35.1	---	---	143	16.9
PBDE 28/33	TOT	pg/L	---	49.5	---	---	---	---	454	42.5	---	---	553	71.4	---	---	429	40.3
PBDE 8/11	TOT	pg/L	---	<1.31	---	---	---	---	4.72	<2.77	---	---	4.38	<4.35	---	---	3.69	<0.52
Polychlorinated Biphenyl (PCB)																		
PCB 1	TOT	pg/L	---	2.95	---	---	---	---	11.6	6.25	---	---	9.48	8.04	---	---	16.4	---
PCB 2	TOT	pg/L	---	1.39	---	---	---	---	5.32	1.74	---	---	6.12	3.81	---	---	6.69	---
PCB 3	TOT	pg/L	---	4.12	---	---	---	---	13.7	4.81	---	---	12.8	9.17	---	---	18.9	16.5

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
PCB 4	TOT	pg/L	---	5.3	---	---	---	---	21	<7.26	---	---	15.6	7.38	---	---	16.1	<7.03
PCB 5	TOT	pg/L	---	<1.63	---	---	---	---	<3.64	<4.14	---	---	1.83	<3.25	---	---	1.7	<3.07
PCB 6	TOT	pg/L	---	4.5	---	---	---	---	20.2	<3.71	---	---	21	3.97	---	---	16.6	2.7
PCB 7	TOT	pg/L	---	<1.47	---	---	---	---	4.58	<3.81	---	---	3.99	<3.1	---	---	5.01	6.95
PCB 8	TOT	pg/L	---	11.8	---	---	---	---	59.3	8.67	---	---	62.4	10.6	---	---	51.6	8.54
PCB 9	TOT	pg/L	---	1.6	---	---	---	---	4.24	<3.7	---	---	4.39	<2.92	---	---	4.52	<2.61
PCB 10	TOT	pg/L	---	<1.47	---	---	---	---	<3.39	<3.86	---	---	<1.18	<2.92	---	---	0.814	<2.54
PCB 11	TOT	pg/L	---	50	---	---	---	---	360	45.3	---	---	490	89.2	---	---	383	66.9
PCB 14	TOT	pg/L	---	<1.51	---	---	---	---	<3.26	<3.7	---	---	<1.25	<3.1	---	---	<0.864	<2.9
PCB 15	TOT	pg/L	---	5.96	---	---	---	---	32.7	4.77	---	---	27.2	7.27	---	---	31	8.28
PCB 16	TOT	pg/L	---	7.71	---	---	---	---	36.1	4.78	---	---	40.9	5.77	---	---	30.9	4.81
PCB 17	TOT	pg/L	---	7.49	---	---	---	---	32.6	3.98	---	---	37.9	6.25	---	---	28.3	4.76
PCB 19	TOT	pg/L	---	2.23	---	---	---	---	7.97	<1.63	---	---	9.24	4.61	---	---	7.03	2.01
PCB 22	TOT	pg/L	---	6.66	---	---	---	---	49.6	4.77	---	---	58.3	7.64	---	---	48.1	7.36
PCB 23	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<0.78	<1.48	---	---	<0.654	<0.808
PCB 24	TOT	pg/L	---	<0.654	---	---	---	---	0.991	<0.978	---	---	1.16	<0.963	---	---	0.753	<0.651
PCB 25	TOT	pg/L	---	1.91	---	---	---	---	7.94	1.22	---	---	9.65	<1.22	---	---	7.83	2.36
PCB 27	TOT	pg/L	---	0.98	---	---	---	---	4.73	1.01	---	---	5	<0.908	---	---	4.6	<0.651
PCB 31	TOT	pg/L	---	15.4	---	---	---	---	106	10.3	---	---	133	18.3	---	---	108	14.5
PCB 32	TOT	pg/L	---	4.67	---	---	---	---	19.8	2.73	---	---	26.7	5.09	---	---	20.9	3.25
PCB 34	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<0.752	<1.43	---	---	<0.654	0.974
PCB 35	TOT	pg/L	---	1.52	---	---	---	---	13.7	1.23	---	---	16.5	<1.43	---	---	14.4	2.16
PCB 36	TOT	pg/L	---	<0.654	---	---	---	---	2.88	<0.715	---	---	2.75	<1.29	---	---	2.91	<0.831
PCB 37	TOT	pg/L	---	3.5	---	---	---	---	33.7	3.75	---	---	31.6	5.26	---	---	25.9	4.5
PCB 38	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<0.72	<1.37	---	---	<0.654	<0.863
PCB 39	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<.44	1	---	<.<<	0.863	1
PCB 42	TOT	pg/L	---	1.78	---	---	---	---	26.5	2.84	---	---	31	5.13	---	---	22.7	2.3
PCB 43	TOT	pg/L	---	<0.654	---	---	---	---	4.28	0.857	---	---	5.73	<1.77	---	---	2.6	<0.768
PCB 46	TOT	pg/L	---	<0.654	---	---	---	---	6.24	<0.715	---	---	8.62	<1.61	---	---	4.89	0.903
PCB 48	TOT	pg/L	---	2.17	---	---	---	---	22.3	2.34	---	---	27.9	3.26	---	---	19.8	1.93
PCB 52	TOT	pg/L	---	16	---	---	---	---	175	16.2	---	---	243	38.1	---	---	159	15
PCB 54	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<0.674	<1.34	---	---	<0.654	<0.855
PCB 55	TOT	pg/L	---	<0.654	---	---	---	---	2.21	<0.715	---	---	2.89	<1.91	---	---	1.64	<2.05
PCB 56	TOT	pg/L	---	2.84	---	---	---	---	49.3	3.45	---	---	58.7	11.2	---	---	43.4	3.89
PCB 57	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<1.2	<1.82	---	---	<1.28	<1.81
PCB 58	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<1.35	<2.05	---	---	<1.3	<1.83
PCB 60	TOT	pg/L	---	1.38	---	---	---	---	30.8	2.13	---	---	34.6	5.74	---	---	27	2.64
PCB 63	TOT	pg/L	---	<0.654	---	---	---	---	4.43	<0.715	---	---	4.69	<1.77	---	---	---	---
PCB 64	TOT	pg/L	---	4.2	---	---	---	---	48.9	4.51	---	---	62.1	13.6	---	---	40.7	5.34
PCB 66	TOT	pg/L	---	5.35	---	---	---	---	90.9	6.71	---	---	107	22.3	---	---	78.3	6.33
PCB 67	TOT	pg/L	---	<0.654	---	---	---	---	2.95	<0.715	---	---	2.97	<1.74	---	---	2.43	<1.57
PCB 68	TOT	pg/L	---	1.01	---	---	---	---	14.2	1.64	---	---	16	<1.8	---	---	11.6	<1.7
PCB 72	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<1.14	<1.74	---	---	<1.2	<1.69
PCB 73	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	1.03	<1.04	---	---	<0.654	<0.651
PCB 77	TOT	pg/L	---	0.899	---	---	---	---	10.1	1.78	---	---	9.18	1.67	---	---	7.24	<1.81
PCB 78	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<1.24	<1.89	---	---	<1.59	<2.23
PCB 79	TOT	pg/L	---	<0.654	---	---	---	---	2.45	<0.715	---	---	2.29	<1.53	---	---	2.06	<1.78
PCB 80	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<1.12	<1.7	---	---	<1.33	<1.87
PCB 81	TOT	pg/L	---	<0.654	---	---	---	---	1.32	<0.715	---	---	<1.07	<1.51	---	---	<1.42	<1.77
PCB 82	TOT	pg/L	---	2.73	---	---	---	---	21.9	<2.77	---	---	27.3	8.18	---	---	13.7	2.21
PCB 84	TOT	pg/L	---	4.84	---	---	---	---	52.9	7	---	---	69.7	27.1	---	---	42.3	3.28
PCB 89	TOT	pg/L	---	<1.4	---	---	---	---	<1.06	<2.59	---	---	<2.85	<5.24	---	---	1.42	<0.918
PCB 92	TOT	pg/L	---	3.03	---	---	---	---	34.2	3.06	---	---	45.6	13.3	---	---	28.4	2.93
PCB 94	TOT	pg/L	---	<1.4	---	---	---	---	<1.08	<2.71	---	---	<2.92	<5.38	---	---	<0.828	<0.873
PCB 96	TOT	pg/L	---	<0.654	---	---	---	---	1.09	<1.39	---	---	1.48	<1.64	---	---	1.08	<0.651
PCB 103	TOT	pg/L	---	<1.16	---	---	---	---	3.02	<2.17	---	---	2.85	<4.45	---	---	1.32	<0.708
PCB 104	TOT	pg/L	---	<0.654	---	---	---	---	1.59	1.07	---	---	<0.893	<2.18	---	---	<0.654	<0.651

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
PCB 105	TOT	pg/L	---	4.8	---	---	---	---	54.4	5.35	---	---	51.6	14.9	---	---	37.6	4.1
PCB 106	TOT	pg/L	---	<0.675	---	---	---	---	<0.898	<2.25	---	---	3.07	<3.27	---	---	<1.13	<1.7
PCB 109	TOT	pg/L	---	0.837	---	---	---	---	9.65	<2.18	---	---	9.42	<3.41	---	---	5.75	<1.67
PCB 111	TOT	pg/L	---	<0.996	---	---	---	---	<0.721	<1.89	---	---	<2.07	<3.81	---	---	<0.691	<0.728
PCB 112	TOT	pg/L	---	<0.959	---	---	---	---	<0.721	<1.79	---	---	<2.06	<3.79	---	---	<0.654	<0.651
PCB 114	TOT	pg/L	---	<0.691	---	---	---	---	4.83	<0.926	---	---	5.03	<2.93	---	---	2.46	<1.62
PCB 118	TOT	pg/L	---	12.6	---	---	---	---	145	13.2	---	---	148	43.9	---	---	95.7	11.2
PCB 120	TOT	pg/L	---	<0.94	---	---	---	---	<0.721	<1.81	---	---	<1.96	<3.61	---	---	<0.66	<0.695
PCB 121	TOT	pg/L	---	<1.02	---	---	---	---	2.46	<1.92	---	---	2.81	<3.83	---	---	<0.654	<0.651
PCB 122	TOT	pg/L	---	<0.75	---	---	---	---	1.39	<2.36	---	---	<3	<3.76	---	---	<1.31	<1.97
PCB 123	TOT	pg/L	---	<0.654	---	---	---	---	9.21	<2.42	---	---	6.41	<2.92	---	---	5.55	<1.69
PCB 126	TOT	pg/L	---	<0.71	---	---	---	---	<0.983	<0.963	---	---	<2.86	<3.34	---	---	<1.29	<1.85
PCB 127	TOT	pg/L	---	<0.709	---	---	---	---	<0.888	<2.35	---	---	<2.79	<3.5	---	---	<1.42	<2.13
PCB 130	TOT	pg/L	---	0.935	---	---	---	---	10.9	1.27	---	---	12.4	<9.57	---	---	4.81	<1.44
PCB 131	TOT	pg/L	---	<0.654	---	---	---	---	2.84	<0.715	---	---	<5.26	<9.04	---	---	1.77	<1.28
PCB 132	TOT	pg/L	---	4.87	---	---	---	---	65.8	2.44	---	---	76	25.4	---	---	32.7	3.59
PCB 133	TOT	pg/L	---	<0.654	---	---	---	---	4.86	<0.715	---	---	<5.05	<8.68	---	---	1.62	<1.25
PCB 136	TOT	pg/L	---	1.38	---	---	---	---	33.1	2.24	---	---	35.6	13.3	---	---	15	2.07
PCB 137	TOT	pg/L	---	0.907	---	---	---	---	10.7	1.01	---	---	15.1	<9.59	---	---	7	<1.41
PCB 141	TOT	pg/L	---	2.56	---	---	---	---	34.9	2.47	---	---	43.9	16.3	---	---	22.8	2.54
PCB 142	TOT	pg/L	---	<0.654	---	---	---	---	<1.58	<0.715	---	---	<5.23	<8.99	---	---	<1.51	<1.3
PCB 144	TOT	pg/L	---	1.49	---	---	---	---	11.7	0.769	---	---	12.8	5.43	---	---	6.14	<0.651
PCB 145	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<3.75	<3.7	---	---	<0.654	<0.651
PCB 146	TOT	pg/L	---	2.43	---	---	---	---	24.7	2.13	---	---	32.3	11.6	---	---	23.6	2.28
PCB 148	TOT	pg/L	---	<0.654	---	---	---	---	2.34	<0.715	---	---	<4.78	<4.71	---	---	<0.654	<0.651
PCB 150	TOT	pg/L	---	<0.654	---	---	---	---	2.7	<0.715	---	---	<3.61	<3.56	---	---	0.718	<0.651
PCB 152	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<3.33	<3.28	---	---	<0.654	<0.651
PCB 155	TOT	pg/L	---	1.81	---	---	---	---	17.1	2.33	---	---	19.7	<3.5	---	---	13.2	0.988
PCB 158	TOT	pg/L	---	1.18	---	---	---	---	16.9	1.18	---	---	20.9	7.22	---	---	10	<0.922
PCB 159	TOT	pg/L	---	<0.654	---	---	---	---	1.49	<0.715	---	---	<3.89	<6.69	---	---	1.24	<1.06
PCB 161	TOT	pg/L	---	<0.654	---	---	---	---	<1.06	<0.715	---	---	<3.9	<6.7	---	---	<1.04	<0.9
PCB 162	TOT	pg/L	---	<0.654	---	---	---	---	<1.02	<0.715	---	---	<3.89	<6.68	---	---	<1.2	<1.04
PCB 164	TOT	pg/L	---	<0.654	---	---	---	---	10.8	0.848	---	---	13.6	<6.18	---	---	6.29	<0.971
PCB 165	TOT	pg/L	---	<0.654	---	---	---	---	<1.22	<0.715	---	---	<4.27	<7.34	---	---	<1.24	<1.07
PCB 167	TOT	pg/L	---	0.725	---	---	---	---	7.98	<0.715	---	---	8.61	<6.26	---	---	4.94	<1.1
PCB 169	TOT	pg/L	---	<0.654	---	---	---	---	<1.04	<0.715	---	---	<4.24	<7.01	---	---	<0.388	<0.257
PCB 170	TOT	pg/L	---	3.58	---	---	---	---	48.1	3.86	---	---	59.5	24.1	---	---	35.1	2.55
PCB 172	TOT	pg/L	---	<0.654	---	---	---	---	8.04	<0.715	---	---	9.86	<5.28	---	---	6.91	<0.651
PCB 174	TOT	pg/L	---	2.87	---	---	---	---	32.8	2.48	---	---	51	20	---	---	23.3	1.91
PCB 175	TOT	pg/L	---	<0.654	---	---	---	---	1.72	<0.715	---	---	3.47	<4.78	---	---	0.83	<0.651
PCB 176	TOT	pg/L	---	<0.654	---	---	---	---	6.98	0.803	---	---	8.09	<3.63	---	---	3.73	<0.651
PCB 177	TOT	pg/L	---	1.49	---	---	---	---	17.6	1.34	---	---	29.5	13.8	---	---	11.8	1.18
PCB 178	TOT	pg/L	---	0.87	---	---	---	---	13.9	<0.715	---	---	19	<5.02	---	---	7.23	1.22
PCB 179	TOT	pg/L	---	1.28	---	---	---	---	22.5	1.51	---	---	32.7	9.4	---	---	7.39	<0.651
PCB 181	TOT	pg/L	---	<0.654	---	---	---	---	0.751	<0.715	---	---	<3.53	<5.09	---	---	<0.654	<0.651
PCB 182	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<3.26	<4.71	---	---	0.8	<0.651
PCB 184	TOT	pg/L	---	2.51	---	---	---	---	39.6	2.76	---	---	54.5	3.72	---	---	23.3	1.59
PCB 186	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<2.65	<3.83	---	---	<0.654	<0.651
PCB 187	TOT	pg/L	---	4.29	---	---	---	---	74.5	5.22	---	---	89.9	27.4	---	---	39.5	4.25
PCB 188	TOT	pg/L	---	<0.654	---	---	---	---	1.16	0.822	---	---	<2.38	<3.71	---	---	<0.654	<0.651
PCB 189	TOT	pg/L	---	0.95	---	---	---	---	2.51	<0.776	---	---	<5.32	<5.46	---	---	<0.654	<0.651
PCB 190	TOT	pg/L	---	<0.654	---	---	---	---	8.89	<0.715	---	---	12.6	5.03	---	---	6.48	0.744
PCB 191	TOT	pg/L	---	<0.654	---	---	---	---	1.81	1.05	---	---	3.36	<4.08	---	---	1.35	<0.651
PCB 192	TOT	pg/L	---	<0.654	---	---	---	---	<0.721	<0.715	---	---	<3.1	<4.48	---	---	<0.654	<0.651
PCB 194	TOT	pg/L	---	1.96	---	---	---	---	29	1.96	---	---	33.1	9.62	---	---	23.1	2.26
PCB 195	TOT	pg/L	---	0.685	---	---	---	---	7.93	1.01	---	---	10.6	4.58	---	---	6.4	<0.665
PCB 196	TOT	pg/L	---	0.778	---	---	---	---	14.3	0.861	---	---	13.8	7.19	---	---	8.9	<0.651

Parameter			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
PCB 201	TOT	pg/L	---	<0.654	---	---	---	---	3.44	<0.715	---	---	6.28	<1.85	---	---	1.78	<0.651
PCB 202	TOT	pg/L	---	<0.654	---	---	---	---	12.4	2.26	---	---	12.7	4.61	---	---	10.3	0.738
PCB 203	TOT	pg/L	---	1.34	---	---	---	---	24	<0.715	---	---	19	5.93	---	---	13.1	<0.651
PCB 204	TOT	pg/L	---	<0.654	---	---	---	---	1.59	<0.715	---	---	2.34	<1.91	---	---	1.11	<0.651
PCB 205	TOT	pg/L	---	<0.654	---	---	---	---	1.59	<0.715	---	---	<2.61	<2.66	---	---	<0.654	<0.651
PCB 206	TOT	pg/L	---	<1.4	---	---	---	---	17.9	<3.29	---	---	17.9	<5.14	---	---	20.1	<2.52
PCB 207	TOT	pg/L	---	<0.993	---	---	---	---	2.37	<2.41	---	---	<3.04	<3.57	---	---	<2.49	<2.19
PCB 208	TOT	pg/L	---	<1.24	---	---	---	---	6.29	<2.53	---	---	4.49	<3.98	---	---	9.14	<2.68
PCB 209	TOT	pg/L	---	2.03	---	---	---	---	11.7	2.16	---	---	14.1	2.86	---	---	18.1	<0.651
PCB 156157	TOT	pg/L	---	2.25	---	---	---	---	29.8	4.05	---	---	28.5	<8.06	---	---	19.7	2.68
PCB 107/124	TOT	pg/L	---	1.19	---	---	---	---	5.66	<2.42	---	---	8.03	<3.59	---	---	4.84	<1.75
PCB 110/115	TOT	pg/L	---	23.7	---	---	---	---	188	13.3	---	---	231	93.3	---	---	143	14.3
PCB 12/13	TOT	pg/L	---	1.65	---	---	---	---	12	<3.79	---	---	15.5	<3.29	---	---	13.3	4.27
PCB 128/166	TOT	pg/L	---	1.8	---	---	---	---	21.7	1.58	---	---	23.2	<7.96	---	---	16.2	2.29
PCB 129/138/160/163	TOT	pg/L	---	14.9	---	---	---	---	202	15.1	---	---	256	72.6	---	---	134	13.5
PCB 134/143	TOT	pg/L	---	1.53	---	---	---	---	11.7	1.46	---	---	14.6	<9.5	---	---	4.79	<1.24
PCB 135/151/154	TOT	pg/L	---	9.48	---	---	---	---	56.7	4.71	---	---	85.7	31.5	---	---	46	6.33
PCB 139/140	TOT	pg/L	---	0.805	---	---	---	---	6.18	<2.65	---	---	5.39	<8.13	---	---	2.98	<1.11
PCB 147/149	TOT	pg/L	---	19.8	---	---	---	---	159	10.9	---	---	---	---	---	---	---	---
PCB 153/168	TOT	pg/L	---	13.6	---	---	---	---	207	14.9	---	---	245	72.2	---	---	138	16
PCB 171/173	TOT	pg/L	---	1.34	---	---	---	---	11.2	<0.715	---	---	16.8	7.88	---	---	7.27	<0.651
PCB 18/30	TOT	pg/L	---	23.1	---	---	---	---	62.6	9.97	---	---	80	14.3	---	---	58.6	11
PCB 180/193	TOT	pg/L	---	10	---	---	---	---	144	8.88	---	---	182	60.3	---	---	102	8.44
PCB 183/185	TOT	pg/L	---	1.71	---	---	---	---	35.9	2.63	---	---	46.8	16	---	---	22	<0.651
PCB 197/200	TOT	pg/L	---	<0.654	---	---	---	---	5.83	<0.715	---	---	5.91	2.08	---	---	3.45	<0.651
PCB 198/199	TOT	pg/L	---	1.5	---	---	---	---	39.5	1.61	---	---	43	10.1	---	---	22.2	2.21
PCB 20/28	TOT	pg/L	---	18	---	---	---	---	115	11.5	---	---	138	19.5	---	---	114	17.5
PCB 21/33	TOT	pg/L	---	8.14	---	---	---	---	73.8	6.06	---	---	85.8	7.32	---	---	73.7	8.89
PCB 26/29	TOT	pg/L	---	2.86	---	---	---	---	19.3	2.06	---	---	22.4	3.96	---	---	18.2	3.83
PCB 40/41/71	TOT	pg/L	---	4.43	---	---	---	---	57.8	4.94	---	---	73.5	11.2	---	---	49.1	5.28
PCB 44/47/65	TOT	pg/L	---	13.2	---	---	---	---	173	16.5	---	---	222	37.5	---	---	150	16.9
PCB 45/51	TOT	pg/L	---	2.12	---	---	---	---	29.9	3.22	---	---	39.8	5.12	---	---	26.4	3.28
PCB 49/69	TOT	pg/L	---	4.91	---	---	---	---	63.3	5.42	---	---	85.5	13.4	---	---	53.1	6.87
PCB 50/53	TOT	pg/L	---	1.76	---	---	---	---	13.5	2.02	---	---	19	3.06	---	---	11.4	1.77
PCB 59/62/75	TOT	pg/L	---	<0.654	---	---	---	---	8.96	0.978	---	---	11.7	<1.05	---	---	6.88	<0.651
PCB 61/70/74/76	TOT	pg/L	---	12.1	---	---	---	---	223	16	---	---	282	64.9	---	---	204	17.6
PCB 83/99	TOT	pg/L	---	8.68	---	---	---	---	118	10.4	---	---	132	43.8	---	---	84	7.53
PCB 85/116/117	TOT	pg/L	---	4.14	---	---	---	---	31.4	<2.11	---	---	40	13.3	---	---	23.2	3.73
PCB 86/87/97/108/119/125	TOT	pg/L	---	12.1	---	---	---	---	131	14.9	---	---	165	60.7	---	---	99.9	13.2
PCB 88/91	TOT	pg/L	---	3.08	---	---	---	---	24.2	<2.48	---	---	35.1	9.19	---	---	21.6	1.49
PCB 90/101/113	TOT	pg/L	---	15.4	---	---	---	---	197	15.2	---	---	263	88.6	---	---	156	16.2
PCB 93/95/98/100/102	TOT	pg/L	---	20.4	---	---	---	---	172	18.3	---	---	238	79.1	---	---	157	12.6
PCB Total	TOT	pg/L	---	403	---	---	---	---	4,760	308	---	---	5,710	1,140	---	---	3,950	396
Total Dichloro Biphenyls	TOT	pg/L	---	73.9	---	---	---	---	502	54	---	---	632	107	---	---	524	97.6
Decachloro Biphenyl	TOT	pg/L	---	---	---	---	---	---	NDR	---	---	---	14.1	---	---	---	18.1	---
Total Heptachloro Biphenyls	TOT	pg/L	---	20	---	---	---	---	399	---	---	---	594	54.5	---	---	290	18
Total Hexachloro Biphenyls	TOT	pg/L	---	72.6	---	---	---	---	889	51.4	---	---	927	284	---	---	601	48.4
Total Monochloro Biphenyls	TOT	pg/L	---	---	---	---	---	---	---	---	---	---	28.4	---	---	---	23.1	---
Total Nonachloro Biphenyls	TOT	pg/L	---	---	---	---	---	---	26.6	---	---	---	---	---	---	---	29.2	---
Total Octachloro Biphenyls	TOT	pg/L	---	4.15	---	---	---	---	109	---	---	---	48.9	5.93	---	---	81.1	---
Total Pentachloro Biphenyls	TOT	pg/L	---	88.6	---	---	---	---	1,200	62.5	---	---	1,460	461	---	---	906	83
Total Tetrachloro Biphenyls	TOT	pg/L	---	52.6	---	---	---	---	1,030	85.1	---	---	1,340	198	---	---	925	80.7
Total Trichloro Biphenyls	TOT	pg/L	---	86.6	---	---	---	---	578	48.6	---	---	667	26.9	---	---	558	68
Fluorinated Compounds																		
PFBA	TOT	ng/L	---	---	---	---	---	---	4.43	10.6	---	---	4.22	2.8	---	---	10.4	9.55
PFBS	TOT	ng/L	---	---	---	---	---	---	<1.98	<2	---	---	<2.03	<1.92	---	---	4.75	5.05
PFDA	TOT	ng/L	---	---	---	---	---	---	<0.99	1.1	---	---	<1.02	1.58	---	---	<0.983	<0.957

Appendix B4, cont'd

			Jan 14 2019		Jan 15 2019		Jan 16 2019		Apr 09 2019		Jul 15 2019		Jul 16 2019		Jul 17 2019		Oct 22 2019	
Parameter			Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly	Influent Q+	Effluent Q+	Influent Quarterly	Effluent Quarterly
PFDoA	TOT	ng/L	---	---	---	---	---	---	<0.99	<0.998	---	---	<1.02	<0.961	---	---	<0.983	<0.957
PFHpA	TOT	ng/L	---	---	---	---	---	---	1.52	2.37	---	---	1.35	1.65	---	---	<2.95	3.11
PFHxA	TOT	ng/L	---	---	---	---	---	---	3.81	9.99	---	---	4.27	7.88	---	---	8.22	12.1
PFHxS	TOT	ng/L	---	---	---	---	---	---	4.32	4.77	---	---	2.71	4.33	---	---	5.97	6.83
PFNA	TOT	ng/L	---	---	---	---	---	---	<0.99	<0.998	---	---	<1.02	0.979	---	---	<0.983	<0.957
PFOA	TOT	ng/L	---	---	---	---	---	---	2.6	6.35	---	---	2.93	6.53	---	---	4.53	9.29
PFOS	TOT	ng/L	---	---	---	---	---	---	10.3	3.83	---	---	<2.03	3.42	---	---	8.05	4.27
PFOSA	TOT	ng/L	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PFPeA	TOT	ng/L	---	---	---	---	---	---	3.24	10.2	---	---	3.57	4.23	---	---	7.65	12.9
PFUnA	TOT	ng/L	---	---	---	---	---	---	<0.99	<0.998	---	---	<1.02	<0.961	---	---	<0.983	<0.957

--- data not available

APPENDIX C

Surface Water Nutrient Monitoring

Appendix C1 SPTP Surface Water Stations

Appendix C2 SPTP IDZ Sites Extended Sampling Results (1st day of sampling)

Appendix C3 Surface Water IDZ Nutrient Monitoring Results

Appendix C1 SPTP Surface Water Stations

		Latitude	Longitude
Surface Water Stations	Outfall	48°37.3978	-123°23.1511'
	100N	48°37.4302	-123°23.1511'
	100S	48°37.3654	-123°23.1506'
	200NE	48°37.4440	-123°23.8221'
	200NW	48°37.4433	-123°23.2202'
	200SE	48°37.3522	-123°23.8160'
	200SW	48°37.3522	-123°23.2195'
	400E	48°37.3983	-123°22.5556'
	400N	48°37.5274	-123°23.1518'
	400S	48°37.2682	-123°23.1500'
	400W	48°37.3972	-123°23.3462'
	800N	48°38.5701	-123°23.1529'
	800S	48°37.1391	-123°23.1488'
	800W	48°37.3965	-123°23.5417'
	Reference 2	48°38.5496	-123°19.1139'
IDZ Stations	SP02	48°37.7179	-123°23.1816'
	SP03	48°37.6930	-123°23.1431'
	SP04	48°37.6576	-123°23.1365'
	SP05	48°37.6272	-123°23.1647'
	SP06	48°37.6137	-123°23.2149'
	SP07	48°37.6052	-123°23.2682'
	SP08	48°37.6088	-123°23.3218'
	SP09	48°37.6337	-123°23.3602'
	SP10	48°37.6691	-123°23.3668'
	SP11	48°37.6995	-123°23.3386'
	SP12	48°37.7130	-123°23.2884'
	SP13	48°37.7215	-123°23.2351'

Appendix C2 SPTP IDZ Sites Extended Sampling Results (one sampling day each season) 2019

		Aluminum (mg/L)		Antimony (mg/L)		Arsenic (mg/L)		Barium (mg/L)		Beryllium (mg/L)		Boron (mg/L)		Cadmium (mg/L)		Chromium (mg/L)		Cobalt (mg/L)		Copper (mg/L)		Iron (mg/L)		Lead (mg/L)		Magnesium (mg/L)		Manganese (mg/L)	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
WQ Guidelines						0.0125 mg/L *+#						1.2 mg/L		0.00012 mg/L (max) *						0.002 mg/L (mean of 5 samples) or 0.14 mg/L (max) *									
Station 1	Top	0.044	0.033	<0.0005	<0.0005	0.0019	0.0022	0.0085	0.0081	<0.001	<0.001	4.18	3.75	0.00007	0.00007	<0.0005	0.0015	0.00003	0.00003	0.0007	0.0003	0.032	0.019	0.00004	0.00002	1,140	1,100	---	0.0028
	Middle	0.044	0.043	<0.0005	<0.0005	0.0017	0.0021	0.0083	0.0086	<0.001	<0.001	4.11	3.92	0.00007	0.00007	<0.0005	0.0017	0.00003	0.00003	0.0004	0.0003	0.030	0.026	0.00005	0.00002	1,130	1,130	---	0.0029
	Bottom	0.040	0.037	<0.0005	<0.0005	0.0018	0.0021	0.0083	0.0082	<0.001	<0.001	3.96	3.74	0.00008	0.00007	0.0006	0.0018	0.00003	0.00004	0.0004	0.0003	0.039	0.025	0.00003	0.00001	1,120	1,090	---	0.0028
Station 2	Top	0.052	0.032	<0.0005	<0.0005	0.0017	0.0020	0.0080	0.0082	<0.001	<0.001	3.59	3.71	0.00007	0.00007	0.00064	0.0017	0.00003	0.00003	0.0004	0.0003	0.029	0.016	0.00003	0.00004	1,040	1,060	---	0.0028
	Middle	0.081	0.038	<0.0005	<0.0005	0.0019	0.0020	0.0085	0.0082	<0.001	<0.001	3.88	3.84	0.00007	0.00007	<0.0005	0.0018	0.00003	0.00003	0.0004	0.0003	0.029	0.025	0.00003	0.00002	1,120	1,110	---	0.0029
	Bottom	0.070	0.099	<0.0005	<0.0005	0.0017	0.0020	0.0083	0.0081	<0.001	<0.001	3.84	3.73	0.00007	0.00007	<0.0005	0.0018	0.00003	0.00003	0.0007	0.0003	0.030	0.025	0.00005	0.00004	1,110	1,110	---	0.0028
Station 3	Top	0.062	0.026	<0.0005	<0.0005	0.0019	0.0018	0.0085	0.0090	<0.001	<0.001	3.92	3.71	0.00007	0.00008	<0.0005	0.0013	0.00003	0.00003	0.0003	0.0003	0.030	0.015	0.00003	0.00002	1,130	1,090	---	0.0028
	Middle	0.056	0.035	<0.0005	<0.0005	0.0017	0.0021	0.0083	0.0082	<0.001	<0.001	3.97	3.71	0.00007	0.00007	<0.0005	0.0021	0.00003	0.00004	0.0003	0.0004	0.028	0.026	0.00002	0.00003	1,130	1,090	---	0.0029
	Bottom	0.054	0.036	<0.0005	<0.0005	0.0016	0.0019	0.0084	0.0081	<0.001	<0.001	4.03	3.69	0.00007	0.00007	<0.0005	0.0013	0.00003	0.00004	0.0007	0.0003	0.032	0.026	0.00005	0.00001	1,140	1,100	---	0.0029
Station 4	Top	0.049	0.031	<0.0005	<0.0005	0.0017	0.0021	0.0083	0.0082	<0.001	<0.001	3.98	3.66	0.00007	0.00007	<0.0005	0.0020	0.00003	0.00003	0.0007	0.0003	0.029	0.021	0.00005	0.00002	1,110	1,060	---	0.0028
	Middle	0.047	0.033	<0.0005	<0.0005	0.0017	0.0021	0.0082	0.0080	<0.001	<0.001	4.06	3.67	0.00007	0.00007	<0.0005	0.0020	0.00003	0.00003	0.0004	0.0003	0.030	0.021	0.00004	0.00002	1,110	1,090	---	0.0028
	Bottom	0.044	0.041	<0.0005	<0.0005	0.0019	0.0019	0.0086	0.0081	<0.001	<0.001	3.97	3.81	0.00007	0.00007	<0.0005	0.0018	0.00003	0.00004	0.0004	0.0003	0.030	0.031	0.00004	0.00002	1,120	1,120	---	0.0029
Reference 2	Top	0.036	0.031	<0.0005	<0.0005	0.0016	0.0018	0.0084	0.0080	<0.001	<0.001	3.97	3.62	0.00007	0.00008	<0.0005	0.0019	0.00003	0.00003	0.0006	0.0003	0.026	0.018	0.00007	0.00004	1,100	1,080	---	0.0028
	Middle	0.036	0.038	<0.0005	<0.0005	0.0016	0.0016	0.0083	0.0083	<0.001	<0.001	3.96	3.64	0.00007	0.00008	<0.0005	0.0014	0.00003	0.00003	0.0004	0.0003	0.033	0.025	0.00004	0.00002	1,100	1,080	---	0.0030
	Bottom	0.033	0.030	<0.0005	<0.0005	0.0017	0.0014	0.0094	0.0082	<0.001	<0.001	3.95	3.75	0.00008	0.00008	<0.0005	0.0015	0.00003	0.00004	0.0006	0.0003	0.030	0.026	0.00045	0.00003	1,110	1,100	---	0.0029
Average IDZ Stations	Top	0.052	0.010	<0.0005	<0.0005	2019.0000	0.0020	0.0083	0.0084	<0.001	<0.001	3.92	3.71	0.00007	0.00007	0.0004	0.0016	0.00003	0.00003	0.0006	0.0003	0.030	0.018	0.00003	0.00002	1,105	1,078	---	0.0028
	Middle	0.057	0.037	<0.0005	<0.0005	0.0017	0.0021	0.0083	0.0083	<0.001	<0.001	4.01	3.79	0.00007	0.00007	<0.0005	0.0019	0.00003	0.00003	0.0004	0.0003	0.029	0.025	0.00004	0.00002	1,123	1,105	---	0.0029
	Bottom	0.052	0.053	<0.0005	<0.0005	0.0018	0.0020	0.0084	0.0081	<0.001	<0.001	3.95	3.74	0.00007	0.00007	0.0003	0.0017	0.00003	0.00004	0.0005	0.0003	0.033	0.027	0.00004	0.00002	1,123	1,105	---	0.0029

Notes:
Shaded cells indicate exceedance to BC WQG (see Appendix C2)

Appendix C2, cont'd

		Mercury (mg/L)		Molybdenum (mg/L)		Nickel (mg/L)		Potassium (mg/L)		Selenium (mg/L)		Silicon (mg/L)		Silver (mg/L)		Strontium (mg/L)		Thallium (mg/L)		Tin (mg/L)		Titanium (mg/L)		Uranium (mg/L)		Zinc (mg/L)	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
WQ Guidelines		0.00002 mg/L *				0.0071 mg/L *				0.002 mg/L *				0.0015 mg/L (mean of 5 samples) or 0.003 mg/L (max) *												0.01 mg/L (mean of 5 samples) *	
Station 1	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	356	328	<0.0005	<0.0005	2.00	1.11	<0.00005	<0.00005	9.04	7.19	<0.0001	<0.0001	<0.0001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0012	0.0005
	Middle	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	352	340	<0.0005	<0.0005	1.82	1.23	<0.00005	<0.00005	8.87	7.55	<0.0001	<0.0001	0.004	<0.001	<0.01	<0.01	0.0027	0.0029	0.0008	0.0004
	Bottom	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	347	333	<0.0005	<0.0005	1.95	1.06	<0.00005	<0.00005	8.80	7.43	<0.0001	<0.0001	<0.0001	<0.001	<0.01	<0.01	0.0026	0.0028	0.0018	0.0004
Station 2	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	326	322	<0.0005	<0.0005	1.69	1.13	0.00007	<0.00005	8.02	7.14	0.0002	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0012	0.0005
	Middle	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	351	336	<0.0005	<0.0005	1.77	1.24	<0.00005	<0.00005	8.82	7.49	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0028	0.0008	0.0004
	Bottom	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	347	334	<0.0005	0.0010	1.73	1.08	<0.00005	<0.00005	8.72	7.31	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0027	0.0011	0.0004
Station 3	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	350	330	<0.0005	<0.0005	1.78	1.22	<0.00005	<0.00005	8.86	7.24	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0028	0.0008	0.0006
	Middle	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	351	330	<0.0005	<0.0005	2.06	1.05	<0.00005	<0.00005	8.89	7.36	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0027	0.0007	0.0005
	Bottom	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	356	331	<0.0005	<0.0005	2.07	1.08	<0.00005	<0.00005	8.93	7.29	<0.0001	<0.0001	0.003	<0.001	<0.01	<0.01	0.0027	0.0028	0.0013	0.0004
Station 4	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	350	323	<0.0005	<0.0005	1.89	1.14	<0.00005	<0.00005	8.89	7.40	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0028	0.0023	0.0005
	Middle	<0.000002	<0.000002	0.010	0.010	0.0006	0.0004	342	330	<0.0005	0.0010	1.74	1.04	<0.00005	<0.00005	8.75	7.30	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0011	0.0008
	Bottom	<0.000002	<0.000002	0.010	0.011	0.0004	0.0004	346	332	<0.0005	<0.0005	1.85	1.18	<0.00005	<0.00005	8.99	7.37	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0012	0.0004
Reference 2	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	348	325	<0.0005	<0.0005	1.94	1.12	<0.00005	<0.00005	8.92	7.19	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0014	0.0020
	Middle	<0.000002	<0.000002	0.010	0.018	0.0004	0.0004	348	327	<0.0005	<0.0005	1.86	1.12	<0.00005	<0.00005	8.92	7.27	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0027	0.0015	0.0013
	Bottom	<0.00002	<0.000002	0.010	0.010	0.0004	0.0004	347	335	<0.0005	<0.0005	1.92	1.12	<0.00005	<0.00005	8.77	7.37	<0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0026	0.0028	0.0038	0.0006
Average IDZ Stations	Top	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	346	326	<0.0005	<0.0005	1.84	1.15	<0.00005	<0.00005	8.70	7.24	0.0001	<0.0001	<0.001	<0.001	<0.01	<0.01	0.0027	0.0028	0.0014	0.0030
	Middle	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	349	334	<0.0005	0.0004	1.85	0.63	<0.00005	<0.00005	8.83	7.43	<0.0001	<0.0001	0.001	<0.001	<0.01	<0.01	0.0027	0.0028	0.0009	0.0030
	Bottom	<0.000002	<0.000002	0.010	0.010	0.0004	0.0004	349	333	<0.0005	0.0004	1.90	1.10	<0.00005	<0.00005	8.86	7.35	<0.0001	<0.0001	0.001	<0.001	<0.01	<0.01	0.0027	0.0027	0.0013	0.0030

Notes:
* = BC Approved Water Quality Guideline
+ = BC Working Water Quality Guideline
# = CCME Water Quality Guideline for the Protection of Aquatic Life

Appendix C3 SPTP IDZ Sites Nutrient Monitoring Results (1st to 5th day of sampling) 2019

NH3 mg/L – 2019							
	BC Approved WQG = 23-33 mg/L N (average over 5 samples) or 3.4 - 5.0 mg/L N (maximum)						
		Winter					Average
Reference	Top	0.37	0.08	0.03	<0.025	0.06	0.11
	Middle	0.23	0.05	<0.025	<0.025	0.06	0.07
	Bottom	0.38	0.05	0.05	0.03	0.05	0.11
Station 1	Top	0.82	0.06	0.05	<0.025	0.07	0.20
	Middle	0.37	0.06	<0.025	0.05	0.06	0.11
	Bottom	0.37	0.07	<0.025	0.04	0.05	0.11
Station 2	Top	0.40	0.05	0.03	<0.025	0.04	0.11
	Middle	0.39	0.07	<0.025	<0.025	0.05	0.11
	Bottom	0.39	0.06	0.05	<0.025	0.08	0.12
Station 3	Top	0.39	0.07	<0.025	0.04	0.07	0.12
	Middle	0.30	0.06	0.04	0.04	0.04	0.10
	Bottom	0.47	0.06	<0.025	<0.025	0.08	0.13
Station 4	Top	0.38	0.04	0.04	<0.025	0.06	0.11
	Middle	0.35	0.08	0.03	0.04	0.05	0.11
	Bottom	0.42	0.10	0.04	0.04	0.09	0.14
		Summer					Average
Reference	Top	0.09	0.08	0.17	0.19	0.17	0.14
	Middle	0.08	0.08	0.15	0.07	0.26	0.13
	Bottom	0.09	0.09	0.09	0.09	0.29	0.13
Station 1	Top	0.08	0.10	0.13	0.09	0.12	0.10
	Middle	0.08	0.06	0.08	0.05	0.26	0.11
	Bottom	0.08	0.06	0.10	0.13	0.17	0.11
Station 2	Top	0.06	0.07	0.09	0.15	0.08	0.09
	Middle	0.10	0.11	0.05	0.09	0.04	0.08
	Bottom	0.10	0.11	0.39	0.12	<0.025	0.15
Station 3	Top	0.09	0.10	0.09	0.15	0.27	0.14
	Middle	0.09	0.09	0.28	0.28	0.11	0.17
	Bottom	0.10	0.05	0.12	0.07	0.46	0.16
Station 4	Top	0.08	0.09	0.16	0.08	<0.025	0.09
	Middle	0.09	0.09	0.22	0.20	<0.025	0.12
	Bottom	0.08	---	0.05	0.15	<0.025	0.07

Notes:

WQG calculated from BC Approved Water Quality Guidelines Summary Report, Table 26E (long-term/average) and Table 26F (short-term acute/maximum). Values used for calculations are 30ppt salinity, 10°C, and pH of 8

--- sample result not available

Appendix C3, cont'd

PO_4 Phosphate Total mg/L – 2019							
		Winter					Average
Reference	Top	0.07	0.05	0.05	0.05	0.07	0.06
	Middle	0.07	0.05	0.04	0.04	0.07	0.05
	Bottom	0.07	0.05	0.03	0.05	0.07	0.06
Station 1	Top	0.07	0.04	0.05	0.04	0.07	0.05
	Middle	0.08	0.04	0.04	0.04	0.07	0.05
	Bottom	0.08	0.03	0.04	0.04	0.07	0.05
Station 2	Top	0.07	0.04	0.04	0.05	0.07	0.05
	Middle	0.07	0.03	0.04	0.04	0.06	0.05
	Bottom	0.07	0.04	0.04	0.04	0.07	0.05
Station 3	Top	0.07	0.04	0.04	0.04	0.07	0.05
	Middle	0.08	0.04	0.04	0.03	0.07	0.05
	Bottom	0.07	0.03	0.04	0.05	0.07	0.05
Station 4	Top	0.07	0.05	0.04	0.04	0.07	0.05
	Middle	0.07	0.05	0.04	0.04	0.07	0.05
	Bottom	0.07	0.05	0.04	0.04	0.07	0.06
		Summer					Average
Reference	Top	0.03	0.03	0.03	0.03	0.05	0.03
	Middle	0.03	0.05	0.04	0.03	0.04	0.04
	Bottom	0.04	0.03	0.03	0.04	0.05	0.04
Station 1	Top	0.03	0.04	0.04	0.03	0.05	0.04
	Middle	0.04	0.04	0.03	0.04	0.05	0.04
	Bottom	0.03	0.03	0.04	0.03	0.04	0.03
Station 2	Top	0.03	0.04	0.03	0.04	0.04	0.04
	Middle	0.03	0.03	0.04	0.03	0.04	0.04
	Bottom	0.04	0.03	0.03	0.03	0.05	0.03
Station 3	Top	0.04	0.03	0.03	0.03	0.05	0.03
	Middle	0.03	0.04	0.04	0.03	0.04	0.04
	Bottom	0.03	0.03	0.02	0.03	0.05	0.03
Station 4	Top	0.04	0.04	0.03	0.04	0.04	0.04
	Middle	0.03	0.03	0.03	0.03	0.04	0.04
	Bottom	0.03	---	0.03	0.04	0.05	0.04

--- sample result not available

Appendix C3, continued

TSS mg/L – 2019							
		Winter					**Average**
Reference	Top	4.0	2.0	<2	<2	4.0	2.4
	Middle	7.0	4.0	<2	<2	4.0	3.4
	Bottom	5.0	5.0	<2	7.0	4.0	4.4
Station 1	Top	5.0	10.0	2.0	<2	7.0	5.0
	Middle	4.0	8.0	<2	3.0	7.0	4.6
	Bottom	3.0	4.0	<2	2.0	7.0	3.4
Station 2	Top	2.0	3.0	<2	<2	4.0	2.2
	Middle	4.0	6.0	2.0	3.0	4.0	3.8
	Bottom	6.0	4.0	2.0	4.0	5.0	4.2
Station 3	Top	2.0	2.0	<2	5.0	7.0	3.4
	Middle	4.0	3.0	<2	4.0	7.0	3.8
	Bottom	5.0	4.0	2.0	4.0	5.0	4.0
Station 4	Top	4.0	3.0	<2	4.0	4.0	3.2
	Middle	3.0	3.0	<2	2.0	6.0	3.0
	Bottom	4.0	6.0	2.0	3.0	6.0	4.2
		Summer					**Average**
Reference	Top	10.0	6.0	7.0	3.0	8.0	6.8
	Middle	5.0	6.0	7.0	5.0	5.0	5.6
	Bottom	6.0	6.0	7.0	5.0	5.0	5.8
Station 1	Top	7.0	6.0	6.0	11.0	3.0	6.6
	Middle	8.0	6.0	9.0	6.0	3.0	6.4
	Bottom	9.0	7.0	8.0	8.0	10.0	8.4
Station 2	Top	8.0	6.0	6.0	18.0	7.0	9.0
	Middle	8.0	6.0	6.0	10.0	4.0	6.8
	Bottom	10.0	7.0	6.0	8.0	6.0	7.4
Station 3	Top	9.0	4.0	5.0	7.0	10.0	7.0
	Middle	7.0	9.0	6.0	4.0	3.0	5.8
	Bottom	8.0	9.0	7.0	14.0	5.0	8.6
Station 4	Top	7.0	6.0	8.0	11.0	4.0	7.2
	Middle	7.0	10.0	6.0	7.0	8.0	7.6
	Bottom	5.0	---	6.0	4.0	5.0	5.0

--- sample result not available

Appendix C3, cont'd

TKN mg/L – 2019							
		Winter					**Average**
Reference	Top	<0.02	0.03	0.10	0.07	0.10	0.06
	Middle	0.02	0.06	0.09	0.09	0.10	0.07
	Bottom	0.04	0.08	0.09	0.06	0.09	0.07
Station 1	Top	<0.02	0.04	0.06	0.08	0.11	0.06
	Middle	0.03	0.05	0.08	0.07	0.08	0.06
	Bottom	0.02	0.06	0.06	0.07	0.08	0.06
Station 2	Top	<0.02	0.05	0.06	0.08	0.11	0.06
	Middle	0.03	0.07	0.10	0.06	0.11	0.07
	Bottom	0.03	0.06	0.08	0.07	0.11	0.07
Station 3	Top	0.04	0.06	0.06	0.11	0.12	0.08
	Middle	0.03	0.03	0.06	0.06	0.14	0.06
	Bottom	0.03	0.05	0.06	0.07	0.09	0.06
Station 4	Top	<0.02	0.07	0.11	0.06	0.10	0.07
	Middle	<0.02	0.09	0.10	0.09	0.10	0.08
	Bottom	<0.02	0.04	0.04	0.07	0.12	0.06
		Summer					**Average**
Reference	Top	0.11	0.10	0.21	0.14	0.08	0.13
	Middle	0.10	0.07	0.14	0.12	0.10	0.11
	Bottom	0.13	0.08	0.16	0.13	<0.02	0.10
Station 1	Top	0.13	0.09	0.17	0.16	0.05	0.12
	Middle	0.12	0.08	0.15	0.16	0.06	0.11
	Bottom	0.15	0.09	0.24	0.15	0.09	0.14
Station 2	Top	0.12	0.10	0.13	0.15	0.08	0.12
	Middle	0.10	0.10	0.18	0.14	0.07	0.12
	Bottom	0.11	0.09	0.35	0.14	0.11	0.16
Station 3	Top	0.11	0.09	0.16	0.17	0.05	0.12
	Middle	0.10	0.09	0.12	0.15	0.06	0.10
	Bottom	0.10	0.08	0.19	0.15	0.06	0.12
Station 4	Top	0.12	0.10	0.14	0.15	0.05	0.11
	Middle	0.11	0.10	0.17	0.14	0.04	0.11
	Bottom	0.14	---	0.18	0.15	0.07	0.13

--- sample result not available

Appendix C3, continued

Sulphate mg/L – 2019							
		Winter					Average
Reference	Top	2,430	2,280	2,060	1,840	2,110	2,144
	Middle	2,160	1,890	1,800	1,800	1,820	1,894
	Bottom	2,440	2,310	2,010	2,230	2,290	2,256
Station 1	Top	2,500	1,750	1,590	2,390	2,370	2,120
	Middle	2,370	2,390	1,990	2,220	2,310	2,256
	Bottom	2,220	2,480	2,020	1,970	2,260	2,190
Station 2	Top	2,410	2,330	1,960	2,480	2,290	2,294
	Middle	2,340	2,270	1,840	1,860	1,820	2,026
	Bottom	2,530	2,260	601	2,300	2,460	2,030
Station 3	Top	2,450	2,300	1,830	1,480	1,950	2,002
	Middle	2,230	2,250	1,980	2,190	2,340	2,198
	Bottom	2,450	2,190	1,880	1,990	2,350	2,172
Station 4	Top	2,140	2,390	1,380	2,190	2,250	2,070
	Middle	2,410	2,250	1,520	2,150	2,130	2,092
	Bottom	2,540	2,080	2,160	2,010	2,190	2,196
		Summer					Average
Reference	Top	2,350	2,100	2,060	1,990	2,260	2,152
	Middle	2,320	2,000	1,980	2,110	2,260	2,134
	Bottom	2,350	2,200	1,890	1,860	2,240	2,108
Station 1	Top	2,400	2,100	2,440	2,060	2,250	2,250
	Middle	2,390	2,100	2,520	1,920	2,310	2,248
	Bottom	1,820	2,100	2,260	2,080	2,350	2,122
Station 2	Top	2,300	2,100	2,320	2,000	2,270	2,198
	Middle	2,350	2,100	2,370	2,070	2,250	2,228
	Bottom	2,360	2,100	2,060	1,990	2,230	2,148
Station 3	Top	2,360	2,100	2,640	2,090	2,290	2,296
	Middle	2,300	2,000	2,160	2,340	2,230	2,206
	Bottom	2,340	2,000	2,370	2,060	2,340	2,222
Station 4	Top	2,360	2,100	2,540	2,140	2,300	2,288
	Middle	2,360	2,000	2,490	2,210	2,240	2,260
	Bottom	2,370	---	2,270	2,320	2,320	2,320

--- sample result not available

Appendix C3, cont'd

Nitrate Nitrogen mg/L – 2019							
	BC Approved WQG = 3.7 mg/L (average over 5 samples)						
		Winter					Average
Reference	Top	0.39	0.37	0.37	0.35	0.33	0.36
	Middle	0.39	0.37	0.36	0.35	0.33	0.36
	Bottom	0.39	0.36	0.37	0.35	0.33	0.36
Station 1	Top	0.39	0.37	0.36	0.35	0.33	0.36
	Middle	0.39	0.38	0.37	0.35	0.32	0.36
	Bottom	0.40	0.35	0.37	0.35	0.33	0.36
Station 2	Top	0.39	0.36	0.37	0.35	0.33	0.36
	Middle	0.39	0.36	0.34	0.35	0.33	0.35
	Bottom	0.39	0.36	0.35	0.35	0.32	0.35
Station 3	Top	0.39	0.36	0.36	0.34	0.33	0.36
	Middle	0.40	0.37	0.36	0.35	0.30	0.36
	Bottom	0.39	0.36	0.36	0.34	0.33	0.36
Station 4	Top	0.39	0.34	0.36	0.35	0.33	0.36
	Middle	0.39	0.37	0.37	0.35	0.34	0.36
	Bottom	0.39	0.36	0.38	0.35	0.32	0.36
		Summer					Average
Reference	Top	0.19	0.23	0.21	0.20	0.26	0.22
	Middle	0.23	0.26	0.21	0.20	0.25	0.23
	Bottom	0.23	0.28	0.20	0.19	0.27	0.23
Station 1	Top	0.22	0.24	0.21	0.14	0.25	0.21
	Middle	0.22	0.25	0.17	0.17	0.28	0.22
	Bottom	0.23	0.25	0.15	0.18	0.26	0.21
Station 2	Top	0.20	0.23	0.21	0.16	0.24	0.21
	Middle	0.24	0.25	0.20	0.16	0.25	0.22
	Bottom	0.23	0.24	0.15	0.15	0.25	0.20
Station 3	Top	0.20	0.23	0.21	0.12	0.26	0.21
	Middle	0.23	0.25	0.20	0.15	0.26	0.22
	Bottom	0.23	0.25	0.17	0.17	0.25	0.21
Station 4	Top	0.20	0.25	0.22	0.13	0.25	0.21
	Middle	0.24	0.24	0.22	0.19	0.25	0.23
	Bottom	0.24	---	0.16	0.17	0.25	0.20

--- sample result not available

Appendix C3, continued

Nitrite Nitrogen mg/L - 2019							
	BC Approved WQG = 3.7 mg/L (average over 5 samples)						
		Winter					Average
Reference	Top	0.002	<0.002	<0.002	<0.002	<0.002	0.001
	Middle	<0.002	<0.002	0.002	<0.002	<0.002	0.001
	Bottom	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Station 1	Top	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Middle	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Bottom	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Station 2	Top	<0.002	0.002	<0.002	<0.002	<0.002	0.001
	Middle	<0.002	0.002	<0.002	<0.002	<0.002	0.001
	Bottom	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Station 3	Top	<0.002	0.003	<0.002	<0.002	<0.002	0.001
	Middle	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Bottom	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Station 4	Top	<0.002	0.003	<0.002	<0.002	<0.002	0.001
	Middle	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
	Bottom	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
		Summer					Average
Reference	Top	<0.002	0.006	<0.002	<0.002	<0.002	0.002
	Middle	0.003	0.004	<0.002	<0.002	0.004	0.003
	Bottom	0.003	0.004	0.002	<0.002	0.002	0.003
Station 1	Top	0.003	0.004	<0.002	<0.002	0.003	0.002
	Middle	0.003	0.005	<0.002	0.003	0.003	0.003
	Bottom	<0.002	0.004	0.004	0.003	<0.002	0.003
Station 2	Top	0.003	0.004	0.002	<0.002	<0.002	0.002
	Middle	0.003	0.005	0.007	<0.002	0.005	0.004
	Bottom	0.002	0.005	0.004	<0.002	0.002	0.003
Station 3	Top	0.002	0.004	<0.002	<0.002	0.002	0.002
	Middle	0.003	0.005	0.003	0.002	<0.002	0.003
	Bottom	0.002	0.005	<0.002	<0.002	0.002	0.002
Station 4	Top	0.003	0.005	0.002	<0.002	<0.002	0.002
	Middle	0.002	0.004	0.007	0.003	0.004	0.004
	Bottom	0.003	---	0.002	0.002	0.003	0.002

--- sample result not available

Appendix C3, cont'd

Salinity – 2019							
		Winter					Average
Reference	Top	30.5	30.2	29.9	30.0	31.6	30.4
	Middle	30.8	30.5	29.9	30.6	31.3	30.6
	Bottom	30.4	30.5	30.3	30.4	31.2	30.6
Station 1	Top	30.5	30.4	30.2	30.3	31.2	30.5
	Middle	30.6	30.4	30.3	30.1	30.9	30.5
	Bottom	30.7	30.1	30.1	30.2	31.2	30.5
Station 2	Top	29.6	30.3	30.1	30.4	31.1	30.3
	Middle	30.6	30.4	30.4	30.4	31.5	30.7
	Bottom	30.7	30.5	30.4	30.5	31.2	30.7
Station 3	Top	30.4	30.2	30.1	30.1	31.2	30.4
	Middle	30.8	30.5	30.2	30.1	30.9	30.5
	Bottom	30.8	30.5	30.3	30.3	31.2	30.6
Station 4	Top	30.3	30.2	30.3	30.1	31.2	30.4
	Middle	30.6	30.2	30.1	29.9	31.9	30.5
	Bottom	30.7	30.5	29.9	30.9	31.1	30.6
		Summer					Average
Reference	Top	31.0	30.9	30.4	29.7	29.9	30.4
	Middle	31.2	31.2	30.3	29.7	29.9	30.5
	Bottom	31.3	31.7	30.4	29.7	30.2	30.7
Station 1	Top	31.2	30.9	30.5	30.2	30.1	30.6
	Middle	31.2	31.1	30.4	30.2	30.2	30.6
	Bottom	31.3	31.2	30.4	30.2	30.2	30.7
Station 2	Top	31.0	30.9	30.5	30.2	30.1	30.5
	Middle	31.2	31.2	30.4	30.2	30.2	30.6
	Bottom	31.0	31.2	30.4	30.2	30.3	30.6
Station 3	Top	30.9	31.0	30.4	30.2	30.1	30.5
	Middle	31.2	31.1	30.6	30.2	30.3	30.7
	Bottom	31.3	31.1	30.3	30.1	30.3	30.6
Station 4	Top	31.0	31.1	30.6	30.2	30.1	30.6
	Middle	31.3	31.0	30.4	30.3	30.2	30.6
	Bottom	31.2	---	30.4	30.2	30.2	30.5

--- sample result not available

Appendix C3, continued

N Nitrogen Total mg/L – 2019							
		Winter					**Average**
Reference	Top	0.408	0.398	0.466	0.416	0.431	0.424
	Middle	0.407	0.428	0.452	0.439	0.434	0.432
	Bottom	0.428	0.438	0.459	0.408	0.419	0.430
Station 1	Top	0.400	0.413	0.419	0.426	0.442	0.420
	Middle	0.424	0.429	0.449	0.419	0.401	0.424
	Bottom	0.424	0.412	0.433	0.415	0.409	0.419
Station 2	Top	0.389	0.410	0.424	0.436	0.444	0.421
	Middle	0.419	0.426	0.440	0.409	0.436	0.426
	Bottom	0.415	0.424	0.430	0.412	0.430	0.422
Station 3	Top	0.428	0.415	0.419	0.454	0.454	0.434
	Middle	0.432	0.397	0.425	0.411	0.438	0.421
	Bottom	0.420	0.414	0.418	0.418	0.427	0.419
Station 4	Top	0.387	0.410	0.475	0.414	0.427	0.423
	Middle	0.395	0.458	0.463	0.441	0.439	0.439
	Bottom	0.385	0.406	0.423	0.415	0.444	0.415
		Summer					**Average**
Reference	Top	0.297	0.338	0.415	0.339	0.341	0.346
	Middle	0.333	0.338	0.347	0.316	0.358	0.338
	Bottom	0.357	0.369	0.363	0.322	0.301	0.342
Station 1	Top	0.352	0.331	0.378	0.296	0.296	0.331
	Middle	0.337	0.333	0.329	0.332	0.344	0.335
	Bottom	0.378	0.343	0.390	0.333	0.339	0.357
Station 2	Top	0.327	0.333	0.336	0.314	0.318	0.326
	Middle	0.342	0.347	0.384	0.304	0.325	0.340
	Bottom	0.346	0.333	0.501	0.290	0.359	0.366
Station 3	Top	0.319	0.325	0.376	0.290	0.305	0.323
	Middle	0.332	0.342	0.325	0.305	0.312	0.323
	Bottom	0.338	0.333	0.356	0.317	0.313	0.331
Station 4	Top	0.323	0.347	0.362	0.279	0.299	0.322
	Middle	0.349	0.340	0.398	0.332	0.295	0.343
	Bottom	0.372	---	0.341	0.313	0.317	0.336

--- sample result not available

Appendix C3, cont'd

Sulfide mg/L – 2019							
		Winter					Average
Reference	Top	0.002	<0.05	<0.05	<0.01	0.01	0.013
	Middle	<0.0019	<0.05	<0.05	<0.01	0.01	0.013
	Bottom	<0.0019	<0.05	<0.05	<0.01	0.01	0.012
Station 1	Top	0.01	<0.005	<0.005	<0.01	0.00	0.004
	Middle	0.00	<0.005	<0.005	<0.01	0.01	0.004
	Bottom	<0.0019	<0.005	<0.05	<0.01	0.03	0.012
Station 2	Top	0.16	<0.005	<0.05	<0.01	0.00	0.039
	Middle	<0.0019	<0.005	<0.05	<0.01	0.00	0.008
	Bottom	0.00	<0.005	<0.05	<0.01	0.00	0.008
Station 3	Top	<0.0019	<0.005	<0.05	<0.01	0.00	0.008
	Middle	0.01	<0.005	<0.05	<0.01	0.00	0.009
	Bottom	0.00	<0.05	<0.05	<0.01	0.01	0.013
Station 4	Top	0.00	<0.05	<0.05	<0.01	0.00	0.013
	Middle	0.01	<0.05	<0.05	<0.01	0.00	0.014
	Bottom	0.01	<0.05	<0.05	<0.01	0.00	0.014
		Summer					Average
Reference	Top	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Middle	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Bottom	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
Station 1	Top	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Middle	<0.0019	<0.0019	<0.0019	<0.0018	0.06	0.013
	Bottom	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
Station 2	Top	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Middle	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Bottom	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
Station 3	Top	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Middle	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Bottom	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
Station 4	Top	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Middle	<0.0019	<0.0019	<0.0019	<0.0018	<0.0018	0.001
	Bottom	<0.0019	---	<0.0019	<0.0018	<0.0018	0.001

--- sample result not available

Appendix C3, continued

Total Organic Carbon mg/L – 2019							
		Winter					**Average**
Reference	Top	93	87	77	75	76	82
	Middle	92	91	81	81	76	84
	Bottom	51	270	80	88	63	110
Station 1	Top	80	200	80	86	64	102
	Middle	46	220	79	76	79	100
	Bottom	92	210	83	86	73	109
Station 2	Top	69	240	68	71	74	104
	Middle	57	260	77	87	84	113
	Bottom	61	260	65	89	84	112
Station 3	Top	62	68	79	78	75	72
	Middle	62	83	84	65	71	73
	Bottom	90	230	75	76	81	110
Station 4	Top	58	270	79	87	79	115
	Middle	80	83	85	91	84	85
	Bottom	86	89	85	91	75	85
		Summer					**Average**
Reference	Top	82	73	80	77	66	76
	Middle	81	74	77	87	65	77
	Bottom	91	74	79	80	77	80
Station 1	Top	74	70	81	25	69	64
	Middle	79	77	88	99	60	81
	Bottom	82	71	83	86	71	79
Station 2	Top	87	68	100	90	72	83
	Middle	81	77	91	110	69	86
	Bottom	79	3	80	78	65	61
Station 3	Top	77	69	77	83	67	75
	Middle	75	62	70	84	64	71
	Bottom	78	77	78	88	72	79
Station 4	Top	86	61	79	98	70	79
	Middle	83	69	70	89	76	77
	Bottom	76	---	85	100	71	83

--- sample result not available