Saanich Peninsula Treatment Plant

Environmental Monitoring Program 2024 Report

Capital Regional District | Parks, Recreation & Environmental Services, Environmental Protection

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SAANICH PENINSULA TREATMENT PLANT
ENVIRONMENTAL MONITORING PROGRAM
2024 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, Tsartlip, and Pauquachin First Nations communities. It is a conventional secondary level wastewater treatment plant (WWTP) 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 Parks (ENV) (formerly BC Ministry of Environment and Climate Change Strategy), through the Municipal Wastewater Regulation under the *Environmental Management Act* and the federal Wastewater Systems Effluent Regulations under the *Fisheries Act*.

Historically, the CRD developed the monitoring program in consultation with the Marine Monitoring Advisory Group (MMAG). Subsequently, the long-term monitoring program was revised in collaboration with ENV, and the regular use of the MMAG has been discontinued.

The 2024 Wastewater and Marine Environment Program consisted of the following components:

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

The Saanich Peninsula Treatment Plant Liquid Waste Management Plan is currently under review. Initial meetings with the Technical Advisory Committee, including municipal engineers, the Institute of Ocean Sciences (Pat Bay, Sidney, BC), airport representatives and First Nations, began in 2024.

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 all 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 600 substances were analyzed in the SPTP influent and effluent on a quarterly basis. These substances were monitored to comprehensively assess potential risks of the wastewater discharge to organisms living in the marine environment around the outfall.

Approximately 46% of substances were detected in more than 50% of the samples, and included most of the conventional parameters, metals, some organics, and high-resolution parameters. Most frequently detected substances were below BC and Canadian Water Quality Guidelines (WQG), even in undiluted effluent. Only enterococci, weak acid dissociable (WAD) cyanide, nitrogen, total and dissolved copper, total and dissolved zinc, and high-resolution total polychlorinated biphenyls exceeded guidelines in undiluted effluent, prior to discharge to the marine receiving environment.

Water quality guidelines must be met outside of the initial dilution zone (IDZ) (an area with a radius of approximately 100 m around the outfall). 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, except for enterococci. 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 2024, all acute toxicity tests passed with no mortality. Chronic toxicity tests showed no impact on Rainbow trout embryo survival and viability, or on *Ceriodaphnia* reproduction.

BIOSOLIDS MONITORING

No biosolids were produced at the SPTP in 2024. All sludge generated at the facility was disposed of at the Hartland Landfill. The CRD monitored the sludge in 2024 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 7 CFU/100 mL or less, 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 a 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.

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. Cadmium also exceeded WQG (BC working water guideline for marine aquatic life) in several samples at both outfall and reference stations, which has not been observed in recent years. The CRD will continue to monitor metals in waters around the outfall and the reference station to assess environmental significance.

Nutrients

Nutrient content in receiving water is analyzed to provide a qualitative comparison between outfall and reference stations. 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 Salish Sea, rather than to an effect from the SPTP discharge.

SEAFLOOR MONITORING

Seafloor monitoring (i.e., sediment chemistry and benthic community structure) was conducted in 2024. This component is conducted every four years, since before the plant commenced discharging in 2000. The next sampling event is planned for 2028. 2024 results indicate that none of the approximately 645 parameters analyzed exceeded applicable sediment quality guidelines at the outfall or the reference stations. This is consistent with previous years.

Benthic community assessment was similar to 2020, with a higher number of individual organisms found at the reference station, but an equivalent number of different species at both outfall and reference stations.

OVERALL ASSESSMENT

Based on tests used to monitor effluent quality and surface water in 2024, all components of the Saanich Peninsula Wastewater Treatment Plant were in compliance. As in previous years, influent and effluent quality was within expected ranges and met regulatory limits and operating certificate compliance requirements on all sampling dates. Only enterococci exceeded WQG after factoring in dilution. All other substances 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 below concentrations of concern to aquatic life. Surface water fecal coliform and enterococci data confirmed that the discharge to the receiving environment was below thresholds set to protect recreational activities and shellfish consumers. As expected, boron exceeded WQG at every station and sampling depth, including at the reference station, as the natural concentrations of boron are above WQG in the Salish Sea. ENV is working on updating the boron guideline. Cadmium also exceeded the guideline in several surface water samples collected at both the outfall and the reference stations, which has not been previously observed. Effluent cadmium concentrations remained low. Staff will continue to monitor and note any ongoing cadmium exceedances. Surface water nutrient concentrations were within ranges measured in previous monitoring programs and showed no detectable effect from the discharge. Sediment chemistry results were all below applicable Sediment Quality Guidelines (SQG).

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Terms & Abbreviations

AET	Apparent Effects Threshold
ALK	Alkalinity
AVS	Acid Volatile Sulphide
BC OMRR	Organic Matter Recycling Regulations
BOD	Biochemical Oxygen Demand
CALA	Canadian Association for Laboratory Accreditation
CBOD	Carbonaceous Biochemical Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
CFU	Colony-forming unit
Cl	Chloride
COD	Chemical Oxygen Demand
COND	Conductivity
CRD	Capital Regional District
CSSP	Canadian Shellfish Sanitation Program
ENT	Enterococci
ENV	BC Ministry of Environment and Parks
FC	Fecal Coliform
IDZ	Initial Dilution Zone
LWMP	Liquid Waste Management Program
MMAG	Marine Monitoring Advisory Group
NH_3	Ammonia
NO_2	Nitrite
NO_3	Nitrate
OMRR	Organic Matter Recycling Regulations
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PDBE	Polybrominated diphenyl ethers
PFBS	Perfluorobutanesulfonic acid
PFHpA	Perfluoroheptanoic acid
PFHxA	Perfluorohexanoic acid
PFHxS	Perfluorohexanesulfonic acid
PFNA	Perfluorononanoic acid
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PFoSA	Perfluorooctanesulfonamide
PFPeA	Perfluoropentanoic acid
pH	potential of Hydrogen
PPCP	Pharmaceuticals and personal care products
PSAMP	Puget Sound Ambient Monitoring Program
Q+	Quarterly Plus
QA/QC	Quality Assessment/Quality Control
RSCP	Regional Source Control Program
SAD	Strong Acid Dissociable
SCADA	Supervisory Control and Data Acquisition
SDI	Swartz Dominance Index
SPTP	Saanich Peninsula Treatment Plant
SQG	Sediment quality guidelines
TA	Total abundance
TDP	Total dissolved phosphorus
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon

TP	Total phosphorus
TR	Taxa richness
TSS	Total Suspended Solids
TWQRP	Technical Water Quality Review Panel
UN NH_3	Unionized Ammonia
US EPA	US Environmental Protection Agency
v/v	Volume per volume
WAD	Weak acid dissociable (WAD) cyanide
WMEP	Wastewater Marine Environment Program
WQG	Water Quality Guidelines
WSER	Wastewater Systems Effluent Regulations
WWTP	Wastewater Treatment Plant

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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, Tsartlip, and Pauquachin First Nations communities. It is a conventional secondary level wastewater treatment plant (WWTP), 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 Parks (ENV) (formerly BC Ministry of Environment and Climate Change Strategy), 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 consisted of university and government scientists with expertise in the fields of marine biology, chemistry, toxicology, oceanography and public health. This independent group historically reviewed CRD marine monitoring and assessment programs and made recommendations.

Subsequently, the long-term monitoring program was revised in collaboration with ENV, and the regular use of the MMAG discontinued. This revised program was implemented in January 2013 and is summarized in Table 2.1.

In addition, the initial Technical Water Quality Review Panel (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 recommended that disinfection not be installed at that 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.

The SPTP LWMP is currently under review. Initial meetings with a Technical Advisory Committee, including municipal engineers, the Institute of Ocean Sciences (Pat Bay, Sidney, BC), airport representatives and First Nations began in 2024 and will continue in 2025.

2.0 INTRODUCTION

The objectives of the SPTP WMEP are to:

- Comply with federal and provincial wastewater 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 sludge quality (both as part of regulatory requirements and to optimize treatment plant performance).
- Supply information to the CRD's 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 2024 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 2024 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, as well as 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 @ 15°C, TSS)[1]	Daily to twice per month at the influent and final 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 final 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, seven-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).
Sludge Monitoring	Metals, moisture, FC[1]	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, NH_3 – 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 and July additional Q+ sampling conducted one day before and one day after the quarterly sampling event.

6 Conducted in 2024. Next time will be 2028, 2032, 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 CRD's RSCP.

Wastewater monitoring at the SPTP consists of quarterly composite analyses for all priority substances, supplemented by additional "quarterly plus" (Q+) composite sampling occurring one day before and one day after the quarterly sampling events in January and July. The Q+ monitoring program is intended to increase the precision of the quarterly sampling events for key substances of interest (Appendix A).

The list of priority substances 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 OceanWise's Pollution Tracker parameters, and upon ENV review. Influent is analyzed for a subset list of substances (Appendix A).

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 wastewater data (2012-2015). Results were included in the 2016 annual report (CRD, 2017). The next trend assessment for the SPTP is planned for the next one to two years.

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 to <6 mm, but prior to transfer to the settling tanks (i.e., before primary treatment). Effluent samples were collected from a sampling port situated where the final effluent is discharged 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 parameters not suited to composite sampling, such as fecal coliforms, pH, oil and grease, and volatile organic compounds. Laboratory analyses including parameters required by WSER were conducted at Bureau Veritas Laboratories Inc. (Burnaby, BC), and by the CRD Water Quality Lab (Victoria, BC), both Canadian Association for Laboratory Accreditation (CALA) certified labs.

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 composite
TSS[1]	provincial – 45 mg/L maximum federal – 25 mg/L average	provincial – 2x per week federal – 2x per month	24-hr composite
flow[1]	26,555 m^3/day (average daily)[2] 56,000 m^3/day (maximum daily)	continuously	SCADA[3]
pH[1]	6-9	2x per week	grab
unionized ammonia[1], pH @ 15°C	provincial – required, but no limit federal –1.25 mg/L maximum	provincial – monthly federal – 2x per month	24-hr composite
fecal coliforms	required, but no limit	provincial – monthly	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 2024. 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, using methods similar to those used for compliance parameters, but 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.

Sampling technicians immediately dispatched the samples to qualified laboratories (i.e., certified by the Canadian Association for Laboratory Accreditation) to conduct chemical analyses. These laboratories included both in-house facilities (Macaulay Point Wastewater Treatment Plant Laboratory, Victoria, B.C.), and external facilities. Bureau Veritas (Burnaby, BC) conducted analyses for conventional parameters including 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 were low enough for comparisons to ENV approved (BCMoE&CCS, 2019) and working (BCMoE&CCS, 2017) WQG and the Canadian Council of Ministers of the Environment (CCME 2003) *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.

Wastewater was analyzed for a comprehensive list of priority substances that included conventional parameters (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, polybrominated diphenyl ethers, polychlorinated biphenyls, pesticides, pharmaceuticals and personal care products, nonylphenols and fluorinated compounds (Appendix A).

DATA QUALITY ASSESSMENT

The CRD and laboratory staff followed rigorous quality assessment/quality control (QA/QC) procedures for both field sampling and laboratory analyses. Within each batch that was analyzed quarterly (i.e., four batches in 2024 that included samples from McLoughlin Point WWTP), 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 method detection limits), one half of the method detection limit 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). This estimated minimum initial dilution factor was determined by a receiving environment dye study undertaken 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 the year. 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 loading calculations (e.g., pH is a discrete measurement and calculating a loading over time is not appropriate).

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. Tests consisted of a 96-hour Rainbow trout LC50 and a 48-hour *Daphnia magna* LC50. The LC50 test measures the lethal concentration that kills 50% of organisms over the test period. Anything less than 100% v/v is a fail.

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 Environmental using effluent collected from the SPTP in November and December. 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.

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 2024 was slightly higher than in 2023 (10,221 m^3/d in 2024 vs 9,459 m^3/d). There were no exceedances of the permitted average or maximum daily allowable flow in 2024.

Figure 3.1 presents the SPTP flows from 2011-2024 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).

In 2024, all SPTP effluent results were below provincial and federal regulatory limits.

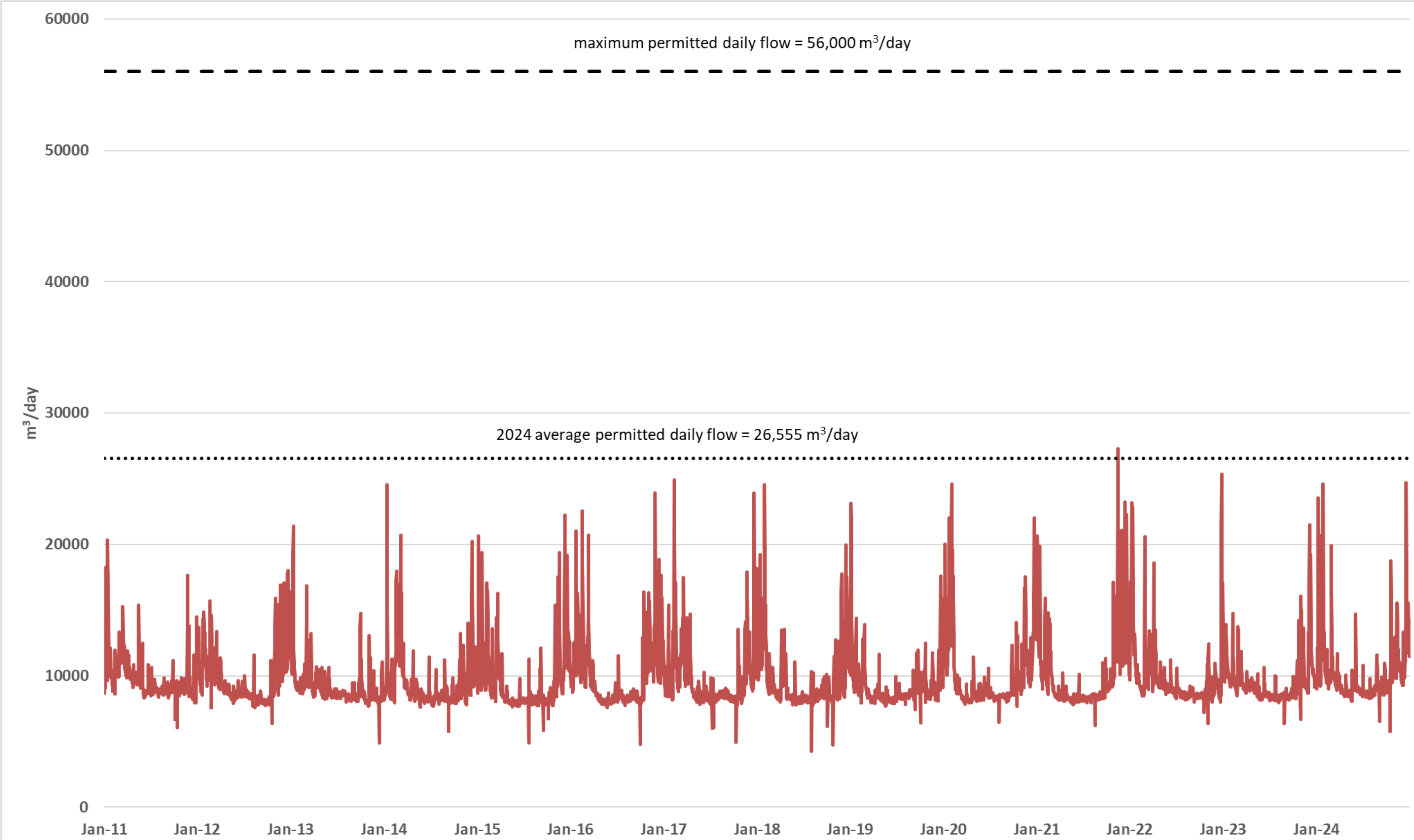


Figure 3.1 SPTP Effluent Flows from 2011-2024

Table 3.2 SPTP 2024 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)	45 maximum	3	310	300	330	107	3	1.06	11.2
TSS (mg/L)	45 maximum	3	310	240	350	26	10	2	23
Flow (m^3/d)	26,555 average daily 56,000 maximum daily	---	---	---	---	366	10,221	5,851	24,690
pH (pH units)	6-9	27	7.33	7	7.65	28	7.09	6.7	7.5
NH_3 (mg/L N)	required, but no limit	28	29.0	1.2	41.1	28	1.6	0.033	7.06
Fecal coliform (CFU/100 mL)	required, but no limit	1	5,600,000	5,600,000	5,600,000	26	60,440	940	500,000
Alkalinity (mg/L)	*	12	215	137	269	13	49	26.7	110
Chloride (mg/L)	*	12	146	90.4	244	12	138	74.4	201
COD (mg/L)	*	54	532	205	731	54	54	25	110
BOD (mg/L)	*	54	247	116	380	98	11	3.35	25.3
Nitrate (mg/L N)	*	27	0.11	0.005	2.01	27	13.4	1.13	16.6
Nitrite (mg/L N)	*	28	0.05	0.0025	1	28	1	0.026	2.33
TKN (mg/L N)	*	27	48.2	20.8	59	25	4	1.24	10
TP (mg/L P)	*	10	6.3	4.89	7.3	10	4	2	7.4

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.
Shaded value indicates exceedance to permitted maximum.

Table 3.3 Saanich Peninsula Treatment Plant Federal Wastewater Compliance Results 2024

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
Number of samples	107	26	28	27
January	2.6	0.05	6.9	6.0
February	2.1	0.05	6.8	5.0
March	1.8	0.05	6.4	2.5
April	2.3	0.03	6.9	11.3
May	4.2	0.05	6.9	11.0
June	3.0	0.03	6.9	9.5
July	6.1	0.02	6.8	14.9
August	2.7	0.05	7.1	11.0
September	2.4	0.05	7.3	8.5
October	2.0	0.03	7.2	4.0
November	6.2	0.05	6.9	15.9
December	3.8	0.05	7.1	9.3

3.3.2 Priority Substances

Over 600 priority substances were analyzed in the SPTP influent and effluent, including high-resolution parameters (Appendix B4). Approximately 46% of these were detected in effluent in greater than 50% of the samples and are listed in Table 3.4. These include most of the conventional variables (TSS, BOD, CBOD, nutrients, etc.), metals, some organics and high-resolution parameters.

Table 3.4 presents annual mean, minimum and maximum effluent concentrations, and loadings of the priority substances detected in greater than 50% 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: enterococci, WAD cyanide, nitrogen, dissolved and total copper, dissolved and total zinc, and total polychlorinated biphenyls (high-res) (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 enterococci. Effluent concentrations have consistently been below WQG from 2000-2024, after estimated minimum initial dilution has been applied (CRD, 2002-2021). 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 2024 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 2024 chronic toxicity testing, which indicated no impact on Rainbow trout embryo survival and viability, or on *Ceriodaphnia* reproduction.

3.4 Overall Assessment

Overall, the 2024 wastewater monitoring results were generally consistent with previous years. There were no exceedances to permitted compliance parameter requirements stipulated under the provincial operational certificate and federal WSER, indicating that from an operational perspective, wastewater quality was 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).

Table 3.4 Annual Concentrations and Loadings of Frequently Detected Substances (>50% of the time) in SPTP Effluent, 2024

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
Conventionals											
Enterococci	TOT	CFU/100 mL	10	100	3,150,180	9,717	82,000	190	536	32,676,569	35d, 70d
Fecal Coliforms	TOT	CFU/100 mL	10	100	7,600,000	60,440	500,000	940	3,268	224,764,316	
Alkalinity - Total - Ph 4.5	TOT	mg/L	1	100	220	34	46	25	0.3	n/a	
Total/SAD Cyanide	TOT	mg/L	0.0005	75	0.002	0.001	0.002	0.001	0.00002	5	
WAD Cyanide	TOT	mg/L	0.0005	75	0.001	0.001	0.002	0.001	0.00001	4	0.001a
Alkalinity - Bicarbonate	TOT	mg/L	1	100	273	42	56	30	0.37	n/a	
Hardness (as CaCO3)	TOT	mg/L	0.5	100	95	92	116	77	0.76	n/a	
Hardness (as CaCO3)	TOT	mg/L	0.5	100	95	92	116	77	0.76	n/a	
Sulphate	DIS	mg/L	1	100	35	39	43	33	0.28	134,869	
N - Nh3 (As N)	TOT	mg/L	0.015	100	29	2	7	0.03	0.05	5,641	19.7
N - No2 (As N)	DIS	mg/L	0.005	100	ND	1	2	0.1	0.02	3,747	
N - No3 (As N)	DIS	mg/L	0.2	100	ND	14	16	12	0.10	48,348	
N - No3 + No2 (As N)	DIS	mg/L	0.2	100	ND	15	16	14	0.10	52,108	
N - Tkn (As N)	TOT	mg/L	0.2	50	56	ND	ND	ND	ND	ND	
N - Total (As N)	TOT	mg/L	0.2	100	55	15	17	13	0.11	53,760	3.7a
Organic Carbon	TOT	mg/L	0.5	100	120	14	19	10	0.12	48,831	
P - Po4 - Ortho (As P)	DIS	mg/L	0.03	100	3.8	3.6	4.3	2.9	0.03	12,217	
BOD	TOT	mg/L	2	100	298	12	24	4.0	0.16	n/a	
CBOD	TOT	mg/L	2	100	278	5.3	6.7	2.8	0.04	n/a	
COD	TOT	mg/L	10	100	607	56	78	34	0.51	n/a	
pH	TOT	pH	0.5	100	7.3	7.1	7.5	6.7	ND	n/a	7.0-8.7b.c
pH @ 15° C	TOT	pH	0.5	100	7.0	6.9	7.5	6.3	ND	n/a	
TSS	TOT	mg/L	1	100	285	5.9	10	2.0	0.07	19,672	
Sulfide	TOT	mg/L	0.0018	100	1.5	0.02	0.03	0.01	0.0002	75	
Chloride-D	DIS	mg/L	5	100	134	125	170	100	1.11	434,764	
Metals Dissolved											
Aluminum	DIS	µg/L	0.5	100	63	11	12	10	0.08	37	
Antimony	DIS	µg/L	0.02	100	0.2	0.3	0.3	0.2	0.002	0.880	
Arsenic	DIS	µg/L	0.02	100	0.3	0.3	0.4	0.2	0.002	0.979	12.5a,c
Barium	DIS	µg/L	0.02	100	9.3	6.1	7.6	5.0	0.05	21	
Bismuth	DIS	µg/L	0.005	100	0.2	0.1	0.2	0.1	0.001	0.484	
Boron	DIS	µg/L	10	100	160	176	215	110	1.41	600	
Cadmium	DIS	µg/L	0.005	100	0.1	0.02	0.02	0.01	0.0002	0.056	0.12b,c
Calcium	DIS	mg/L	0.05	100	19	21	24	18	0.15	73,035	
Chromium	DIS	µg/L	0.1	100	1.0	0.7	1.5	0.3	0.01	2.35	56b,c
Cobalt	DIS	µg/L	0.005	100	0.4	0.3	0.4	0.3	0.002	1.11	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
Copper	DIS	µg/L	0.05	100	22	5.7	7.6	4.1	0.05	20	<2(lt), 3(st)a
Iron	DIS	µg/L	5	100	388	74	84	63	0.55	257	
Lead	DIS	µg/L	0.02	100	0.8	0.3	0.4	0.2	0.003	0.951	<2(lt),140(st)a
Lithium	DIS	µg/L	0.5	100	2.7	2.6	3.4	2.2	0.02	9.1	
Magnesium	DIS	mg/L	0.05	100	11	11	13	9.2	0.08	37,768	
Manganese	DIS	µg/L	0.1	100	28	27	31	23	0.20	94	100b
Molybdenum	DIS	µg/L	0.05	100	3.1	2.5	7.2	0.8	0.05	9.6	
Nickel	DIS	µg/L	0.1	100	2.5	2.1	2.4	1.8	0.02	7.4	8.3b
Phosphorus	DIS	µg/L	5	100	4,955	3,860	5,040	2,770	33	13,233	
Potassium	DIS	mg/L	0.05	100	17	16	18	14	0.12	54,345	
Selenium	DIS	µg/L	0.04	100	0.2	0.2	0.2	0.1	0.001	0.552	2a
Silicon	DIS	µg/L	50	100	3,118	3,283	3,680	2,690	24	11,508	
Silver	DIS	µg/L	0.01	75	0.03	0.01	0.01	0.01	0.0001	0.029	1.5(lt), 3(st)a
Sodium	DIS	mg/L	0.05	100	86	84	111	71	0.73	292,696	
Strontium	DIS	µg/L	0.05	100	93	100	128	78	0.84	348	
Sulfur	DIS	mg/L	3	100	11	13	14	12	0.09	44,344	
Tin	DIS	µg/L	0.2	100	0.8	0.5	0.7	0.4	0.004	1.72	
Uranium	DIS	µg/L	0.002	100	0.03	0.005	0.007	0.002	0.00005	0.018	
Vanadium	DIS	µg/L	0.2	75	0.5	0.3	0.5	0.2	0.003	1.06	
Zinc	DIS	µg/L	1	100	48	42	47	36	0.31	144	10(lt), 55(st)a
Zirconium	DIS	µg/L	0.1	67	0.7	0.1	0.1	0.1	0.001	0.397	
Metals Total											
Aluminum	TOT	µg/L	0.5	100	174	16	18	15	0.11	56	
Antimony	TOT	µg/L	0.02	100	0.2	0.2	0.3	0.2	0.002	0.834	
Arsenic	TOT	µg/L	0.02	100	0.4	0.3	0.3	0.2	0.002	0.898	12.5a,c
Barium	TOT	µg/L	0.02	100	16	6.8	10	4.5	0.06	24	
Cadmium	TOT	µg/L	0.005	100	0.15	0.02	0.02	0.01	0.0002	0.065	0.12b,c
Calcium	TOT	mg/L	0.05	100	21	20	25	16	0.16	68,933	
Chromium	TOT	µg/L	0.1	100	1.9	0.7	1.6	0.3	0.01	2.45	56b,c
Cobalt	TOT	µg/L	0.005	100	0.5	0.3	0.4	0.3	0.002	1.06	
Copper	TOT	µg/L	0.05	100	44	8.0	11.3	4.7	0.07	27	<2(lt), 3(st)a
Iron	TOT	µg/L	5	100	596	89	105	71	0.69	307	
Lead	TOT	µg/L	0.02	100	2.5	0.3	0.4	0.2	0.003	1.04	<2(lt),140(st)a
Magnesium	TOT	mg/L	0.05	100	11	10	13	9.1	0.08	36,100	
Manganese	TOT	µg/L	0.1	100	38	27	33	23	0.22	92	100b
Molybdenum	TOT	µg/L	0.05	100	2.9	2.3	6.5	0.8	0.04	8.7	
Nickel	TOT	µg/L	0.1	100	3.3	5.2	14	1.5	0.09	18	8.3b
Phosphorus	TOT	µg/L	5	100	6,340	3,805	5,010	2,400	33	13,014	
Potassium	TOT	mg/L	0.05	100	17	15	19	12	0.12	51,619	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
Selenium	TOT	µg/L	0.04	100	0.3	0.1	0.2	0.1	0.001	0.471	2a
Silver	TOT	µg/L	0.01	75	0.1	0.02	0.02	0.01	0.0001	0.053	1.5(lt), 3(st)a
Tin	TOT	µg/L	0.2	100	1.1	0.4	0.6	0.3	0.004	1.5	
Zinc	TOT	µg/L	1	100	112	41	49	36	0.32	143	10(lt), 55(st)a
Organic Compounds											
Trichloromethane	TOT	µg/L	1	75	2.9	1.4	1.8	1.0	0.01	4.7	
Phenolics											
Total Phenols	TOT	mg/L	0.0015	100	0.1	0.003	0.003	0.002	0.00002	9.1	
Polycyclic Aromatic Hydrocarbons											
Naphthalene	TOT	ng/L	0.311	75	121	5.6	8.7	4.2	0.06	0.019	1,000a
Phenanthrene	TOT	µg/L	0.01	75	208	11	14	10	0.09	39	
HIGH RESOLUTION PARAMETERS											
Organics											
1,2,3,4-Tetrachlorobenzene	TOT	ng/L	0.1	67	ND	0.1	0.2	0.03	0.001	0.0004	
1,3,5-Trichlorobenzene	TOT	ng/L	0.0111	67	ND	0.1	0.2	0.05	0.001	0.0004	
1,7-Dimethylxanthine	TOT	ng/L	6.14	100	38,167	546	1,440	79	9.4	1.8	
Pentachlorobenzene	TOT	ng/L	0.0021	100	ND	0.05	0.1	0.03	0.001	0.0002	
Perfluorobutanoic acid	TOT	ng/L	1.51	100	14	36	81	5.1	0.53	0.12	
1,2,3-Trichlorobenzene	TOT	ng/L	0.0111	67	ND	0.1	0.2	0.04	0.001	0.0004	
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	TOT	ng/L	0.0111	67	ND	0.1	0.2	0.03	0.001	0.0003	
Hormones & Sterols											
Estrone	TOT	ng/L	3.5	100	54	30	62	11	0.41	0.101	
Nonylphenols											
4-Nonylphenol Diethoxylates	TOT	ng/L	14.5	100	984	221	662	45	4.3	0.74	
4-Nonylphenol Monoethoxylates	TOT	ng/L	24	100	10,443	754	1,980	103	12.9	2.5	
Np	TOT	ng/L	3.35	100	1,048	103	148	29	1.0	0.36	
PAH											
1-Methylphenanthrene	TOT	ng/L	0.18	100	12	0.8	1.0	0.5	0.01	0.003	
2,3,5-trimethylnaphthalene	TOT	ng/L	0.294	100	30	2.5	3.6	0.8	0.02	0.009	
2,6-dimethylnaphthalene	TOT	ng/L	0.464	75	27	1.3	1.6	0.9	0.01	0.004	
Dibenzothiophene	TOT	ng/L	0.137	100	28	1.4	1.8	1.2	0.01	0.005	
Naphthalene	TOT	ng/L	0.311	75	121	5.6	8.7	4.2	0.06	0.02	
Phenanthrene	TOT	µg/L	0.01	75	208	11	14	10	0.09	39	
PBDE											
PBDE 100	TOT	pg/L	1.47	100	ND	252	522	99	3.4	0.0008	
PBDE 119/120	TOT	pg/L	1.12	100	ND	3.3	6.2	2.0	0.04	0.00001	
PBDE 138/166	TOT	pg/L	1.12	100	ND	12	23	3.6	0.15	0.00004	
PBDE 140	TOT	pg/L	1.12	75	ND	3.8	9.3	1.1	0.06	0.00001	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
PBDE 15	TOT	pg/L	1.01	75	ND	2.4	3.7	1.1	0.02	0.00001	
PBDE 153	TOT	pg/L	1.55	100	ND	115	255	41	1.7	0.0004	
PBDE 154	TOT	pg/L	1.55	100	ND	95	217	35	1.4	0.0003	
PBDE 155	TOT	pg/L	1.55	100	ND	7.2	15	3.3	0.10	0.00002	
PBDE 17/25	TOT	pg/L	1.66	100	ND	16	26	13	0.17	0.00006	
PBDE 183	TOT	pg/L	1.55	100	ND	18	32	5.8	0.21	0.00006	
PBDE 203	TOT	pg/L	4.03	75	ND	14	25	5.8	0.16	0.00005	
PBDE 206	TOT	pg/L	22.6	75	ND	147	266	30	1.7	0.00050	
PBDE 207	TOT	pg/L	39.8	75	ND	200	363	56	2.4	0.0007	
PBDE 209	TOT	pg/L	1560	100	ND	1,820	2,920	1,090	19	0.006	
PBDE 28/33	TOT	pg/L	1.9	100	ND	27	52	10	0.34	0.00009	
PBDE 47	TOT	pg/L	1.01	100	ND	1,485	3,130	576	20.5	0.005	
PBDE 49	TOT	pg/L	1.01	100	ND	33	68	13	0.44	0.0001	
PBDE 51	TOT	pg/L	1.01	100	ND	4.7	9.3	2.1	0.06	0.00002	
PBDE 66	TOT	pg/L	1.01	100	ND	25	46	13	0.30	0.00008	
PBDE 7	TOT	pg/L	1.01	100	ND	2.0	2.6	1.8	0.02	0.00001	
PBDE 71	TOT	pg/L	1.01	100	ND	5.3	10	3.2	0.06	0.00002	
PBDE 75	TOT	pg/L	1.01	75	ND	2.3	4.2	1.2	0.03	0.00001	
PBDE 85	TOT	pg/L	1.14	100	ND	45	98	14	0.64	0.0001	
PBDE 99	TOT	pg/L	1.12	100	ND	1,273	2,760	465	18	0.004	
PCB	TOT	pg/L	0.705	100	ND	7.2	14	4.5	0.09	0.00003	
PCB	TOT	pg/L	0.705	100	ND	7.2	14	4.5	0.09	0.00003	
PCB 105	TOT	pg/L	0.37	100	ND	5.5	8.1	3.6	0.05	0.00002	900a
PCB 11	TOT	pg/L	0.294	100	ND	93	148	41	0.97	0.0003	
PCB 110/115	TOT	pg/L	1.04	100	ND	19	34	10	0.22	0.00006	
PCB 114	TOT	pg/L	0.437	75	ND	1.0	1.4	0.8	0.01	0.000003	
PCB 118	TOT	pg/L	0.452	100	ND	13	21	7.2	0.14	0.00004	
PCB 12/13	TOT	pg/L	0.294	100	ND	3.3	5.8	1.1	0.04	0.00001	
PCB 128/166	TOT	pg/L	0.311	100	ND	2.3	3.3	1.2	0.02	0.000008	
PCB 129/138/160/163	TOT	pg/L	0.311	100	ND	17	27	10	0.18	0.00006	
PCB 132	TOT	pg/L	0.294	100	ND	4.4	7.5	2.2	0.05	0.00001	
PCB 135/151/154	TOT	pg/L	0.294	100	ND	4.8	7.7	2.4	0.05	0.00002	
PCB 136	TOT	pg/L	0.294	100	ND	1.9	3.0	0.9	0.02	0.000006	
PCB 14	TOT	pg/L	0.294	75	ND	1.1	1.6	0.7	0.01	0.000004	
PCB 141	TOT	pg/L	0.294	100	ND	2.3	3.8	1.4	0.02	0.000008	
PCB 146	TOT	pg/L	0.311	100	ND	2.4	3.9	0.9	0.03	0.000008	
PCB 147/149	TOT	pg/L	0.294	100	ND	10	17	5.1	0.11	0.00004	
PCB 15	TOT	pg/L	0.294	100	ND	6.4	8.1	3.3	0.05	0.00002	
PCB 152	TOT	pg/L	0.294	75	ND	4.1	5.7	1.3	0.04	0.00001	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
PCB 153/168	TOT	pg/L	0.294	100	ND	16	24	9.3	0.16	0.00005	
PCB 155	TOT	pg/L	0.294	75	ND	1.9	3.0	1.0	0.02	0.000006	
PCB 156157	TOT	pg/L	0.398	100	ND	2.9	4.8	1.0	0.03	0.000010	
PCB 158	TOT	pg/L	0.312	75	ND	1.3	2.2	0.6	0.01	0.000004	
PCB 16	TOT	pg/L	1.27	100	ND	9.3	14	5.8	0.09	0.00003	
PCB 167	TOT	pg/L	0.334	100	ND	1.1	1.6	0.5	0.01	0.000004	
PCB 17	TOT	pg/L	0.294	100	ND	6.3	9.5	3.5	0.06	0.00002	
PCB 170	TOT	pg/L	0.294	100	ND	3.3	4.4	1.8	0.03	0.00001	
PCB 177	TOT	pg/L	0.691	75	ND	1.7	2.5	0.9	0.02	0.000006	
PCB 18/30	TOT	pg/L	0.294	100	ND	21	32	11	0.21	0.00008	
PCB 180/193	TOT	pg/L	0.365	100	ND	8.2	13	5.2	0.09	0.00003	
PCB 183/185	TOT	pg/L	0.311	100	ND	2.5	3.3	1.0	0.02	0.000009	
PCB 184	TOT	pg/L	0.311	75	ND	2.3	4.8	0.9	0.03	0.000008	
PCB 187	TOT	pg/L	0.311	100	ND	4.5	6.0	2.0	0.04	0.00002	
PCB 19	TOT	pg/L	0.294	100	ND	2.2	3.1	1.3	0.02	0.000008	
PCB 194	TOT	pg/L	0.659	75	ND	2.8	3.8	1.0	0.02	0.000010	
PCB 196	TOT	pg/L	0.455	75	ND	1.0	1.2	0.5	0.01	0.000004	
PCB 198/199	TOT	pg/L	0.445	100	ND	2.1	2.7	1.4	0.02	0.000007	
PCB 2	TOT	pg/L	0.499	100	ND	4.5	10	1.6	0.06	0.00002	
PCB 20/28	TOT	pg/L	0.294	100	ND	21	31	13	0.20	0.00007	
PCB 202	TOT	pg/L	0.311	75	ND	1.0	1.7	0.4	0.01	0.000003	
PCB 203	TOT	pg/L	0.311	75	ND	1.2	1.9	0.9	0.01	0.000004	
PCB 208	TOT	pg/L	0.311	75	ND	1.0	1.3	0.6	0.01	0.000004	
PCB 209	TOT	pg/L	0.311	75	ND	1.7	2.2	1.3	0.01	0.000006	
PCB 21/33	TOT	pg/L	0.294	100	ND	10	19	2.3	0.13	0.00003	
PCB 22	TOT	pg/L	0.294	100	ND	9.2	15	3.6	0.10	0.00003	
PCB 25	TOT	pg/L	0.294	100	ND	2.1	2.9	1.3	0.02	0.000007	
PCB 26/29	TOT	pg/L	0.294	100	ND	4.0	6.0	2.7	0.04	0.00001	
PCB 27	TOT	pg/L	0.294	100	ND	1.1	1.4	0.9	0.01	0.000004	
PCB 3	TOT	pg/L	0.432	100	ND	5.8	11	2	0.07	0.00002	
PCB 31	TOT	pg/L	0.294	100	ND	20	33	10	0.22	0.00007	
PCB 32	TOT	pg/L	0.294	100	ND	4.0	5.9	2.1	0.04	0.00001	
PCB 35	TOT	pg/L	0.294	100	ND	2.4	4.2	0.8	0.03	0.000008	
PCB 37	TOT	pg/L	0.294	100	ND	5.2	7.1	2.6	0.05	0.00002	
PCB 4	TOT	pg/L	0.294	100	ND	6.7	8.7	4.3	0.06	0.00002	
PCB 40/41/71	TOT	pg/L	0.294	100	ND	8.0	13	3.4	0.08	0.00003	
PCB 42	TOT	pg/L	3.18	100	ND	4.0	6.6	1.7	0.04	0.00001	
PCB 43	TOT	pg/L	0.294	50	ND	ND	ND	ND	ND	ND	
PCB 44/47/65	TOT	pg/L	0.294	100	ND	92	268	20	1.8	0.0003	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
PCB 46	TOT	pg/L	0.294	75	ND	1.6	3.3	0.5	0.02	0.000005	
PCB 48	TOT	pg/L	0.294	75	ND	3.0	5.1	1.4	0.03	0.00001	
PCB 49/69	TOT	pg/L	0.294	100	ND	11	18	5.1	0.12	0.00004	
PCB 5	TOT	pg/L	0.294	100	ND	1.6	2.4	1.0	0.02	0.000005	
PCB 50/53	TOT	pg/L	0.294	75	ND	2.3	2.9	1.0	0.02	0.000008	
PCB 52	TOT	pg/L	0.294	100	ND	24	43	13	0.28	0.00008	
PCB 56	TOT	pg/L	0.294	100	ND	6.1	10	3.5	0.07	0.00002	
PCB 59/62/75	TOT	pg/L	0.294	75	ND	1.6	2.5	0.8	0.02	0.000006	
PCB 6	TOT	pg/L	0.294	100	ND	4.2	7.4	1.6	0.05	0.00001	
PCB 60	TOT	pg/L	0.294	100	ND	3.5	6.1	2.0	0.04	0.00001	
PCB 61/70/74/76	TOT	pg/L	0.294	100	ND	24	46	9.2	0.30	0.00008	
PCB 64	TOT	pg/L	0.294	100	ND	7.5	12	4.5	0.08	0.00003	
PCB 66	TOT	pg/L	0.296	100	ND	16	31	10	0.20	0.00006	
PCB 68	TOT	pg/L	0.294	100	ND	8.8	27	1.9	0.17	0.00003	
PCB 7	TOT	pg/L	0.294	100	ND	19	50	4.4	0.33	0.00007	
PCB 77	TOT	pg/L	0.325	100	ND	1.5	1.9	0.8	0.01	0.000005	
PCB 8	TOT	pg/L	0.294	100	ND	8	13	2.4	0.08	0.00003	
PCB 82	TOT	pg/L	0.294	100	ND	1.9	3.4	0.8	0.02	0.000007	
PCB 83/99	TOT	pg/L	0.294	100	ND	9.5	15	6.7	0.10	0.00003	
PCB 84	TOT	pg/L	0.294	100	ND	4.2	7.3	2.2	0.05	0.00001	
PCB 85/116/117	TOT	pg/L	0.294	100	ND	3.7	5.9	2.6	0.04	0.00001	
PCB 86/87/97/108/119/125	TOT	pg/L	0.294	100	ND	57	122	12	0.80	0.0002	
PCB 88/91	TOT	pg/L	0.294	100	ND	2.8	4.0	2.0	0.03	0.00001	
PCB 9	TOT	pg/L	0.294	75	ND	4.0	6.0	1.6	0.04	0.00001	
PCB 90/101/113	TOT	pg/L	0.294	100	ND	20	33	16	0.21	0.00007	
PCB 92	TOT	pg/L	0.294	100	ND	3.4	5.3	2.6	0.03	0.00001	
PCB 93/95/98/100/102	TOT	pg/L	0.294	100	ND	15	26	7.6	0.17	0.00005	
PCB174	TOT	pg/L	0.594	75	ND	30	74	2.2	0.48	0.0001	
PCB39	TOT	pg/L	0.311	75	ND	2	4	0.9	0.03	0.000006	
PCB45/51	TOT	pg/L	0.294	100	ND	22	72	3.3	0.47	0.00007	
Dichloro Biphenyls	TOT	pg/L	0.5	100	ND	135	240	50	1.6	0.0005	
Heptachloro Biphenyls	TOT	pg/L	0.5	67	ND	23	39	7.3	0.26	0.00008	
Hexachloro biphenyls	TOT	pg/L	0.5	100	ND	56	114	16	0.75	0.0002	
Octachloro Biphenyls	TOT	pg/L	0.5	100	ND	5.9	11	1.4	0.07	0.00002	
Pentachloro Biphenyls	TOT	pg/L	0.5	100	ND	83	165	30	1.1	0.0003	
Tetrachloro Biphenyls	TOT	pg/L	0.5	100	ND	209	469	64	3.1	0.0007	
Trichloro Biphenyls	TOT	pg/L	0.5	100	ND	88	160	16	1.0	0.0003	
PCB Teq 3	TOT	pg/L	0.5	100	0.3	0.02	0.03	0.001	0.0002	0.00000007	
PCB Teq 4	TOT	pg/L	0.5	100	0.7	0.6	1.0	0.4	0.01	0.000002	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
PCBs Total	TOT	pg/L	0.5	100	ND	600	906	207	5.9	0.002	100a
PCDD											
1,2,3,4,6,7,8-HPCDD	TOT	pg/L	0.246	75	14	0.7	0.9	0.5	0.01	0.000003	
1,2,3,4,6,7,8-HPCDF	TOT	pg/L	0.221	75	1.2	0.3	0.5	0.2	0.004	0.000001	
1,2,3,7,8-PECDF	TOT	pg/L	0.246	75	0.4	0.3	0.5	0.2	0.004	0.000001	
HEPTA-DIOXINS	TOT	pg/L	0.5	75	23	1.1	1.4	0.5	0.01	0.000004	
OCDD	TOT	pg/L	0.246	100	61	3.6	6.1	2.2	0.04	0.00001	
Penta-Furans	TOT	pg/L	0.5	75	0.8	0.3	0.5	0.2	0.004	0.000001	
Pesticides											
2,4-DDD	TOT	ng/L	0.0111	100	ND	0.3	0.5	0.1	0.003	0.001	
2,4-DDT	TOT	ng/L	0.0175	75	ND	0.1	0.1	0.02	0.001	0.0002	
4,4-DDE	TOT	ng/L	0.0424	75	ND	0.1	0.1	0.1	0.001	0.0003	
Aldrin	TOT	ng/L	0.0198	75	ND	0.1	0.1	0.04	0.0005	0.0002	
Dieldrin	TOT	ng/L	0.0044	100	ND	0.1	0.1	0.1	0.001	0.0004	
HCH, Gamma	TOT	ng/L	0.0133	100	ND	0.1	0.1	0.1	0.001	0.0004	
Hexachlorobenzene	TOT	ng/L	0.0652	75	ND	0.1	0.1	0.0	0.001	0.0002	
PFOS	TOT	ng/L	0.378	100	3.4	3.5	5.6	2.0	0.04	0.01	
MeFOSAA	TOT	ng/L	0.388	100	ND	0.5	0.6	0.4	0.004	0.002	
PFBS	TOT	ng/L	0.378	100	1.6	2.2	3.6	1.1	0.02	0.008	
PFDA	TOT	ng/L	0.378	100	0.8	1.1	1.4	0.9	0.01	0.004	
PFHpA	TOT	ng/L	0.388	100	2.2	4.2	10	1.9	0.06	0.01	
PFHxA	TOT	ng/L	0.388	100	5.4	14	24	8.8	0.16	0.05	
PFHxS	TOT	ng/L	0.378	100	3.1	2.9	3.5	2.4	0.02	0.01	
PFNA	TOT	ng/L	0.388	100	ND	1.0	2.0	0.7	0.01	0.004	
PFOA	TOT	ng/L	0.388	100	2.6	7.5	10	5.7	0.07	0.03	
PFOS	TOT	ng/L	0.378	100	3.4	3.5	5.6	2.0	0.04	0.01	
PFPeA	TOT	ng/L	0.776	100	7.6	23	43	11	0.28	0.081	
PPCP											
2-Hydroxy-Ibuprofen	TOT	ng/L	4.77	100	33,900	1,607	3,770	147	24.6	5.2	
Acetaminophen	TOT	ng/L	3.07	100	187,333	8.3	12	5.8	0.08	0.03	
Androstenedione	TOT	ng/L	1.02	100	272	5.2	5.6	4.5	0.04	0.02	
Azithromycin	TOT	ng/L	1.52	100	441	272	340	202	2.2	0.93	
Bisphenol A	TOT	ng/L	6.09	67	120	76	144	9	0.9	0.25	900b
Caffeine	TOT	ng/L	6.09	100	121,200	281	744	45	4.9	0.91	
Carbamazepine	TOT	ng/L	0.305	100	329	342	432	238	2.8	1.2	
Ciprofloxacin	TOT	ng/L	1.65	100	703	325	436	235	2.8	1.1	
Clarithromycin	TOT	ng/L	0.307	100	98	117	165	87	1.1	0.4	
Dehydronifedipine	TOT	ng/L	0.305	100	3.4	10	16	3.8	0.10	0.03	
Diltiazem	TOT	ng/L	0.152	100	468	367	449	272	2.9	1.3	

Table 3.4, continued

Parameter	State	Units	Detection Limit	Frequency (%)	Influent Concentration (avg)	Effluent Concentration (avg)	Max	Min	Max diluted (153)	Average Effluent Load kg/year	WQG
Diphenhydramine	TOT	ng/L	0.614	100	1,347	486	735	253	4.8	1.6	
Enrofloxacin	TOT	ng/L	0.726	33	ND	ND	ND	ND	ND	ND	
Erythromycin-H2O	TOT	ng/L	1.52	100	15	7.6	13	3.5	0.08	0.025	
Flumequine	TOT	ng/L	0.329	0	ND	ND	ND	ND	ND	ND	
Fluoxetine	TOT	ng/L	0.152	100	52	41	47	34	0.31	0.14	
Furosemide	TOT	ng/L	4.06	100	1,240	634	971	347	6.3	2.1	
Gemfibrozil	TOT	ng/L	0.812	100	38	28	61	4.2	0.40	0.09	
Glipizide	TOT	ng/L	0.812	0	ND	ND	ND	ND	ND	ND	
Glyburide	TOT	ng/L	0.812	100	ND	2.2	3.4	1.5	0.02	0.008	
Hydrochlorothiazide	TOT	ng/L	4.09	100	2,310	1,890	2,320	1,360	15.2	6.5	
Ibuprofen	TOT	ng/L	4.77	100	17,867	366	885	22	5.8	1.2	
Lincomycin	TOT	ng/L	0.614	67	ND	1.5	3.2	0.6	0.02	0.005	
Miconazole	TOT	ng/L	0.307	100	8.4	0.7	1.0	0.3	0.01	0.002	
Naproxen	TOT	ng/L	2.03	100	8,693	416	990	70	6.5	1.4	
Ofloxacin	TOT	ng/L	0.614	100	162	32	38	25	0.25	0.11	
Progesterone	TOT	ng/L	0.583	67	32	0.7	1.1	0.4	0.01	0.002	
Roxithromycin	TOT	ng/L	0.154	100	2.8	1.1	2.5	0.3	0.02	0.004	
Sulfamethoxazole	TOT	ng/L	0.659	100	1,820	306	326	272	2.1	1.1	
Sulfanilamide	TOT	ng/L	6.09	100	65	80	87	71	0.6	0.28	
Thiabendazole	TOT	ng/L	0.307	100	31	26	32	17	0.21	0.09	
Triclosan	TOT	ng/L	6.14	67	23	9	12	6	0.08	0.03	
Trimethoprim	TOT	ng/L	0.377	100	392	313	386	228	2.5	1.1	
Tylosin	TOT	ng/L	0.614	100	ND	2	2	1	0.01	0.01	
Warfarin	TOT	ng/L	0.477	100	5	4	5	3	0.03	0.01	

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; lt=long term; st=short term.
*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 one or more 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 2024 Acute Toxicity Results

Wastewater Concentration	Rainbow trout LC50 96-hour (Onchorhynchus mykiss)				Daphnia magna LC50 48-hour			
%v/v	mortality # (96-hr)				mortality # (48-hr)			
	Jan	Apr	Aug	Oct	Jan	Apr	Aug	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 2024 Chronic Toxicity Results

Test	Endpoint (%v/v)	
	EC50 or LC50	EC25 or LC25
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 = Concentration that causes an observable effect in 50% of the test organisms.
EC25 = Concentration that causes an observable effect in 25% of the test organisms.
LC25 = Lethal Concentration to 25% of organisms in the test duration.
LC50 = Lethal Concentration to 50% of organisms in the test duration.
v/v = volume per volume
-- Not tested

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." These restrictions were subsequently relaxed slightly to allow for out of region non-agricultural land application in the short term. CRD staff are currently investigating longer-term beneficial use options for the biosolids and sludge. Until markets for the biosolids can be developed and implemented, all sludge will be disposed of as controlled waste at the Hartland Landfill. The SPTP disposed of 3,687 tonnes of sludge in 2024.

Starting in 2013, the CRD commenced monitoring the sludge 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 on a monthly basis for similar parameters as previous years (Table 4.1).

4.3 Results and Discussion

In 2024, 38 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.

4.4 Overall Assessment

No biosolids were produced at the SPTP in 2024. It is unknown if or when production will recommence. However, the sludge monitoring data collected to inform the CRD's 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 use is determined.

Table 4.1 SPTP Sludge Monitoring, 2024

Parameter	Units	Class A Biosolids Limit (mg/kg)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Regulated Parameters															
Arsenic	mg/kg dry	75	0.93	0.89	1.00	0.62	0.66	0.71	0.90	0.72	0.72	0.74	0.99	0.74	0.78
Cadmium	mg/kg dry	20	0.86	0.59	0.63	0.62	0.81	0.82	1.10	0.58	0.57	0.56	0.65	0.53	0.68
Chromium	mg/kg dry	1,060	6.47	9.29	9	21.1	12.7	8.78	9.58	6.98	6.48	7.48	10.9	12.6	10.7
Cobalt	mg/kg dry	151	1.15	1.2	1.1	0.905	0.76	0.96	1.17	0.89	0.85	0.83	1.08	0.95	0.97
Copper	mg/kg dry	757	193	153	163	155.5	151	171	239	181	175	165	171	141	171
Lead	mg/kg dry	505	6.55	6.12	6.85	5.76	5.67	7.55	8.97	6.95	7.74	5.83	7.29	8.19	6.87
Mercury	mg/kg dry	5	0.22	0.18	0.21	0.16	0.25	0.18	0.21	0.16	0.14	0.17	0.23	0.20	0.19
Molybdenum	mg/kg dry	20	3.67	2.94	3.02	2.76	2.96	3.27	4.38	3.25	4.13	3.96	10.3	3.06	3.84
Nickel	mg/kg dry	181	6.89	6.98	6.08	5.015	4.58	7.43	11.3	5.18	5.43	5.24	6.29	6.9	6.25
Selenium	mg/kg dry	14	2.10	1.85	1.98	2.13	2.29	2.06	2.61	2.21	1.78	2.18	1.87	1.88	2.09
Thallium	mg/kg dry	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium	mg/kg dry	656	5.40	6.70	5.60	3.15	3.00	3.40	3.70	2.25	2.60	2.20	4.40	4.70	3.75
Zinc	mg/kg dry	1,868	223	208	224	231	236	291	430	313	334	347	280	235	278
Unregulated Parameters															
Aluminum	mg/kg	n/a	1,600	1,930	1,650	809	824	949	1,110	755	882	946	1,470	1,140	1,116
Antimony	mg/kg	n/a	0.61	0.6	0.63	0.66	0.61	0.65	1.14	1.02	0.71	0.66	0.98	0.59	0.8
Barium	mg/kg	n/a	44.3	36.5	41.5	42.35	37.6	42.6	54.8	31.4	34.5	32.1	38.5	36.7	39.0
Beryllium	mg/kg	n/a	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bismuth	mg/kg	n/a	14.1	11.9	13.8	11.8	13.2	11.8	17.6	12.5	14.7	13.3	16.6	12.9	13.5
Boron	mg/kg	n/a	10.6	7.2	8	6.75	10.7	8.1	8.4	7.2	9.2	7.5	10.1	7.2	8.2
Calcium	mg/kg	n/a	5,430	5,490	5,750	5,380	4,850	5,440	6,920	4,170	6,030	5,200	5,490	4,820	5,323
Iron	mg/kg	n/a	3,400	3,710	3,540	2,405	2,160	2,350	2,920	1,995	1,950	1,880	3,030	2,510	2,589
Lithium	mg/kg	n/a	0.9	1.06	0.84	0.5	0.64	0.51	0.83	0.5	0.5	0.5	0.72	0.54	0.6
Magnesium	mg/kg	n/a	3,270	2,690	2,770	1,875	1,960	2,420	3,660	3,875	2,170	3,290	2,790	2,140	2,761
Manganese	mg/kg	n/a	45.7	51.6	49.9	33.5	31.5	33.7	48.1	35.3	38.9	36.5	63.7	43.8	41.5
Moisture	%	n/a	76.0	74.0	73.0	69.0	73.0	75.0	67.0	74.5	76.0	76.0	72.0	70.0	72.8
Phosphorus	mg/kg	n/a	13,200	9,930	11,300	8,330	8,710	10,900	15,300	15,100	9,950	14,200	13,100	8,800	11,589
Potassium	mg/kg	n/a	4,230	3,180	3,400	2,510	2,740	3,260	4,620	4,625	2,670	4,490	4,030	2,940	3,559
Silver	mg/kg	n/a	0.86	0.73	0.80	0.76	0.79	0.76	0.95	0.84	0.75	0.82	0.95	0.78	0.81
Sodium	mg/kg	n/a	598	611	496	420.5	495	416	578	482	353	379	374	368	462
Soluble (2:1) pH	pH units	n/a	5.6	5.7	5.6	5.6	6.1	5.4	5.7	5.6	5.6	5.7	5.6	5.6	5.6

Table 4.1, continued

Parameter	Units	Class A Biosolids Limit (mg/kg)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Strontium	mg/kg	n/a	24.4	23.2	22.4	17.1	16.8	20.6	24.4	15.2	18.3	17.5	20.4	18.1	19.3
Tin	mg/kg	n/a	8.3	7.6	8.8	8.9	8.4	8.7	11.4	8.8	9.0	8.6	9.7	8.4	8.9
Titanium	mg/kg dry	n/a	34.0	35.0	34.0	15.8	14.2	16.5	18.3	13.8	15.5	13.5	30.3	23.3	21.0
Total Solids	mg/kg dry	n/a	23.8	25.9	26.8	31.2	26.8	25.5	32.7	25.5	23.9	24.0	28.3	29.6	27.2
Tungsten	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	<0.5	<0.5	<0.5
Uranium	mg/kg dry	n/a	0.582	0.536	0.491	0.318	0.338	0.336	0.366	0.242	0.277	0.269	0.58	0.395	0.4
WAD Cyanide	µg/kg dry	n/a	---	0.34	0.11	0.113	1.4	0.063	0.24	0.060	0.01	0.046	0.047	0.094	0.21
Zirconium	mg/kg dry	n/a	2.8	1.8	2.0	0.9	0.9	0.8	1.0	0.8	2.1	0.7	0.8	0.6	1.2

Notes:
*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) 4,400 kg/ha – yr.
--- Indicates data not available / sample not collected.

5.0 RECEIVING ENVIRONMENT MONITORING

Receiving environment 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 Introduction

The CRD conducts receiving environment monitoring 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 twice yearly, 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 5 samples collected in 30 days not exceeding 200 CFU/100 mL. In addition, enterococci were analysed 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.

5.2 Methods

The CRD sampling technicians sampled surface waters and the water column over two sampling periods ("winter", i.e., January/February 2024 and "summer", i.e., June/July 2024) 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, 2023) 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.

IDZ samples and reference station samples were collected at three depths for each station: "top" (1 m below the surface), "middle" (calculated trapping depth from the computer model prediction), and "bottom" (1 m above the seafloor). An open, set, horizontal Van Dorn sampling bottle was deployed to the appropriate depth and closed using a weighted messenger. The bottle was then pulled back to the surface and decanted into the required sample containers. All samples were stored in coolers with ice until delivery to the analytical laboratory.

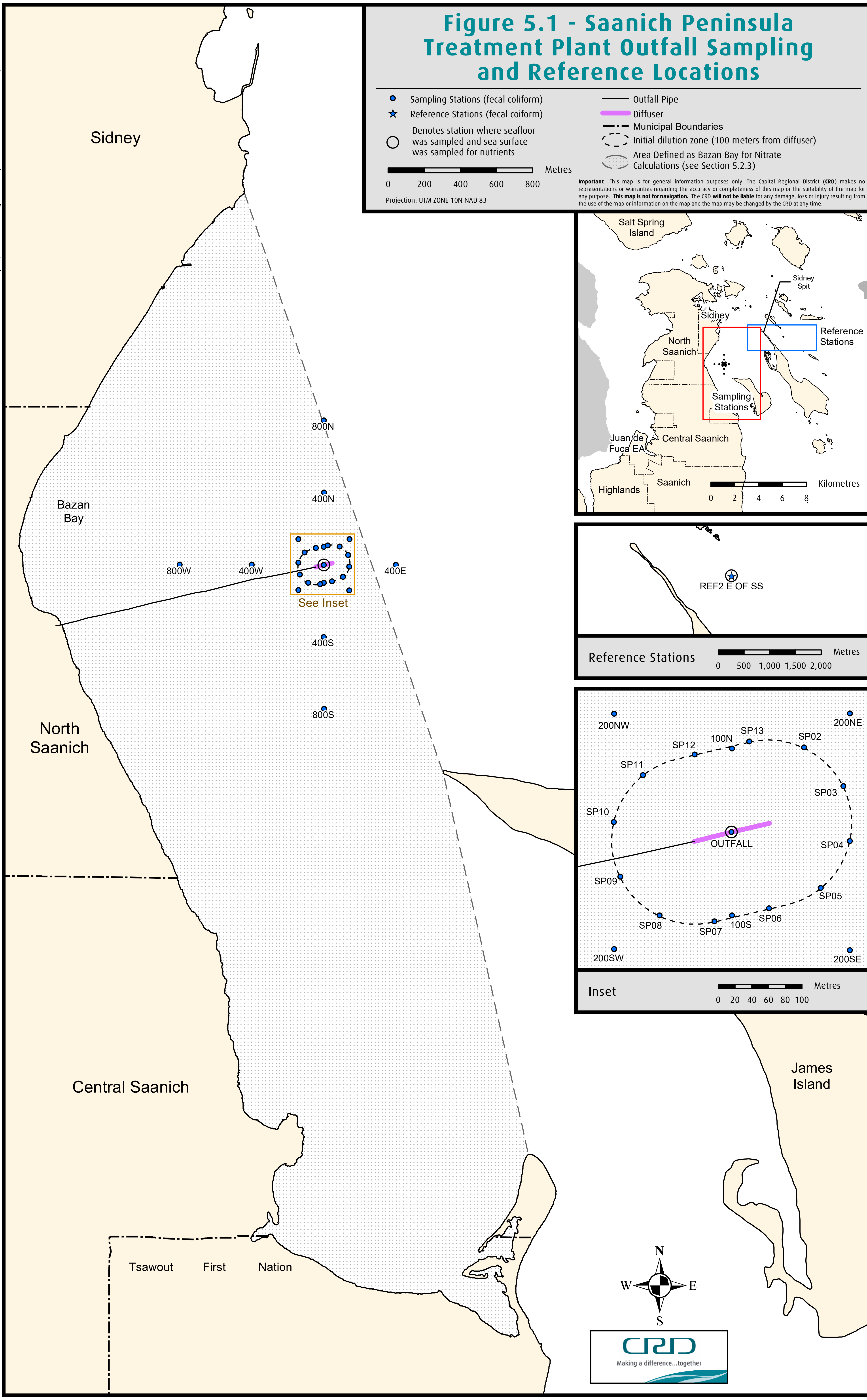
Surface water samples were analyzed by Bureau Veritas Laboratories Inc. (Burnaby, BC) for various parameters, depending on the sampling site and the sampling day. A larger list of parameters, including metals, was analyzed on a single day of each five-day sampling series and results compared to applicable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

Bacteriology results were averaged as geometric means and compared to the provincial and federal enterococci guidelines of 35 CFU/100 mL and to the single sample maximum of 70 CFU/100 mL (BCMoE&CCS, 2019, 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).

IDZ samples were analysed for parameters that reflect 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.

CRD - Parks & Environmental Services - Sep 30, 2014 - Technologist: SR - Map Document: SaanPenSurfaceSampleLocations2013.mxd

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



5.3 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 at the surface water (1 m depth) stations throughout the water column, with a maximum geomean of 2 CFU/100 mL recorded for fecal coliforms and 2 CFU/100mL for enterococci (Table 5.1 and Table 5.2). The IDZ stations had a maximum geomean of 7 CFU/100 mL for fecal coliform and 1 CFU/100 mL for enterococci (Table 5.3 and Table 5.4).

All surface water fecal coliform concentrations were well below the conservatively predicted environmental concentration of 3,268 CFU/100 mL, after the minimal initial dilution (1:153) (Hayco, 2005) was applied to the maximum effluent fecal coliform concentration of 500,000 CFU/100 mL (Table 3.4). Similar observations were made for enterococci, where surface water results were well below the 536 CFU/100 mL that was predicted using the maximum effluent enterococci concentration of 82,000 CFU/100 mL and the 153:1 dilution factor.

These results are generally consistent with previous years and previous studies (CRD, 2002-2023), including Island Health's summer beach sampling program that involves monitoring the nearshore environment in Bazan Bay, targeting beaches 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 Canadian Shellfish Sanitation Program (CSSP) guidelines for shellfish harvesting. The values in Figure 5.2 use the maximum concentrations for each sampling day and depth to build a "worst case" scenario, (e.g., a geomean of 13 CFU/100mL) for summer middle depth fecal coliform.

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 a 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.

Metals

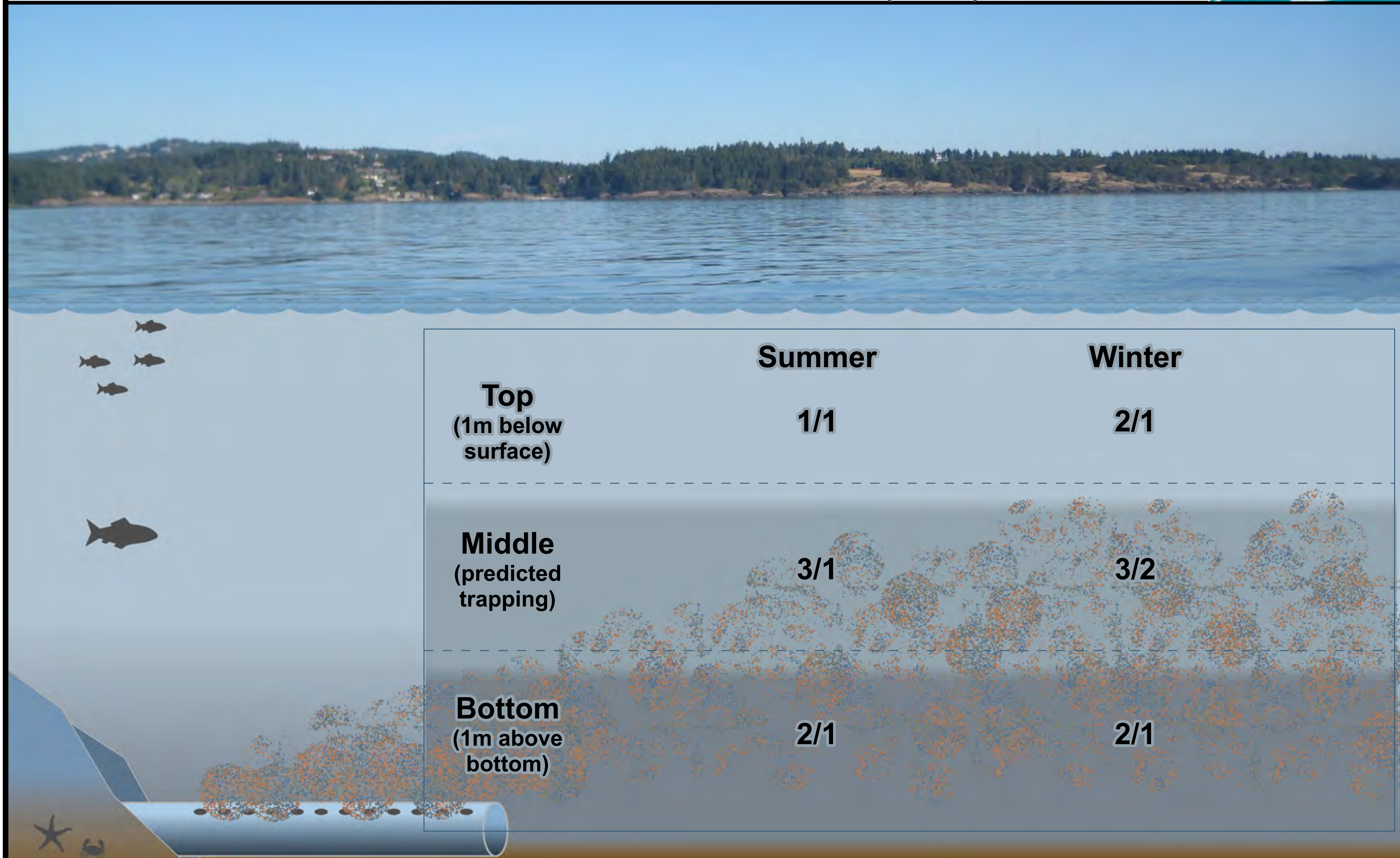
The extended suite of metals was analyzed at the four IDZ sites and a reference site on one day of sampling for each round of 5-in-30 sampling. Results are detailed in Appendix C2. For those parameters that were detected and had relevant BC and CCME WQG, only boron and cadmium had WQG exceedances. Boron 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. Cadmium exceeded guidelines at two surface and one middle depth IDZ samples, as well as at the reference station at all three depths in the winter, and the surface depth in the summer. Cadmium has not exceeded in previous years and will be assessed again in 2025 to see if this was an anomaly or the beginning of a trend. Nickel had exceeded WQG in two samples in 2023, but all results were well below criteria in 2024.

CRD - Parks & Environmental Services - Facilities Management & Engineering Services - Mar 20, 2024 - Technologist: sruliancich - Map Document: SaanPenWaterColumn2023.mxd

Making a difference...together

Figure 5.2 - Saanich Peninsula Waste Water Treatment Plant Water Column Sampling

Fecal Coliform and Enterococci Results (5 in 30)



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

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 2024

Station		Winter Fecal Coliforms (CFU/100mL)						Summer Fecal Coliforms (CFU/100mL)					
		1	2	3	4	5	Geomean	1	2	3	4	5	Geomean
Outfall Sites	Outfall	3	2	<1	<1	8	2	<1	41	<1	<1	<1	1
	100N	2	1	<1	1	<1	1	<1	9	<1	<1	<1	1
	100S	3	4	<1	<1	<1	1	<1	1	<1	<1	<1	1
	200NE	4	1	1	1	<1	1	<1	<1	1	6	<1	1
	200NW	1	<1	3	1	<1	1	<1	<1	<1	1	<1	1
	200SE	2	5	1	2	<1	2	<1	<1	<1	<1	<1	<1
	200SW	2	3	<1	3	<1	1	<1	<1	<1	2	<1	1
	400E	1	1	3	<1	<1	1	<1	<1	<1	1	<1	1
	400N	1	<1	1	3	<1	1	1	1	<1	2	<1	1
	400S	2	4	4	<1	1	2	<1	1	<1	1	<1	1
	400W	1	2	<1	3	<1	1	1	<1	<1	2	<1	1
	800N	5	3	<1	<1	1	1	<1	<1	<1	<1	<1	<1
	800S	4	1	1	1	<1	1	2	<1	1	2	2	1
	800W	<1	2	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 = 200 CFU/100 mL (geometric mean over five samples).
<1 replaced with 0.5 for Geomean calculation.
--- Indicates incomplete sampling due to adverse weather conditions.

Table 5.2 SPTP Surface Sites 5 Sampling Events in 30 Days Enterococci 2024

Station		Winter Enterococci (CFU/100mL)						Summer Enterococci (CFU/100mL)					
		1	2	3	4	5	Geomean	1	2	3	4	5	Geomean
Outfall Sites	Outfall	17	4	<1	<1	1	2	<1	19	<1	<1	<1	1
	100N	10	7	1	1	<1	2	<1	3	<1	<1	<1	1
	100S	17	3	1	1	<1	2	<1	<1	<1	<1	<1	<1
	200NE	24	4	<1	<1	<1	2	1	<1	<1	<1	<1	1
	200NW	<1	5	1	<1	<1	1	<1	<1	<1	<1	<1	<1
	200SE	<1	6	1	<1	<1	1	<1	<1	<1	<1	<1	<1
	200SW	16	1	1	<1	<1	1	<1	<1	<1	<1	<1	<1
	400E	3	4	<1	2	<1	1	15	<1	<1	<1	<1	1
	400N	10	4	<1	1	1	2	<1	<1	<1	<1	<1	<1
	400S	29	4	<1	2	<1	2	<1	<1	<1	<1	<1	<1
	400W	1	4	<1	1	<1	1	<1	<1	<1	<1	<1	<1
	800N	4	1	<1	1	<1	1	<1	<1	<1	<1	<1	<1
	800S	3	7	1	<1	<1	1	<1	<1	<1	<1	<1	<1
	800W	3	2	<1	<1	<1	1	1	3	<1	<1	<1	1
Reference Site	Reference 2	2	<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.

Table 5.3 SPTP IDZ Sites 5 Sampling Events in 30 Days Fecal Coliform 2024

Station		Winter Fecal Coliforms (CFU/100mL)						Summer Fecal Coliforms (CFU/100mL)					
		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	3	3	1	2	<1	2	2	27	<1	2	<1	2
	Middle	1	<1	<1	1	<1	1	82	2	2	3	21	7
	Bottom	6	5	<1	<1	<1	1	5	1	2	1	29	3
Station 2	Top	3	2	<1	3	<1	1	1	<1	1	1	<1	1
	Middle	14	3	<1	2	2	2	<1	9	2	<1	18	2
	Bottom	2	1	<1	1	<1	1	1	<1	1	<1	18	1
Station 3	Top	2	1	1	2	2	2	<1	<1	<1	1	1	1
	Middle	27	<1	1	<1	<1	1	1	<1	2	<1	2	1
	Bottom	6	<1	1	2	1	1	<1	9	<1	1	<1	1
Station 4	Top	6	<1	<1	1	<1	1	5	<1	<1	<1	<1	1
	Middle	1	1	<1	<1	<1	1	1	<1	2	42	2	2
	Bottom	3	<1	<1	1	<1	1	<1	<1	<1	15	3	1
Reference	Top	<1	1	<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	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.
--- Indicates incomplete sampling due to adverse weather conditions.

Table 5.4 SPTP IDZ Sites 5 Sampling Events in 30 Days Enterococci 2024

Station		Winter Enterococci (CFU/100mL)						Summer Enterococci (CFU/100mL)					
		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	8	6	<1	1	<1	2	<1	<1	<1	<1	<1	<1
	Middle	<1	5	<1	<1	<1	1	30	<1	<1	<1	<1	1
	Bottom	1	2	1	<1	<1	1	<1	<1	<1	<1	7	1
Station 2	Top	2	6	1	2	<1	2	<1	<1	<1	1	<1	1
	Middle	7	<1	<1	<1	<1	1	<1	3	<1	<1	<1	1
	Bottom	2	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
Station 3	Top	4	2	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
	Middle	10	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1
	Bottom	2	1	<1	<1	<1	1	<1	5	<1	<1	<1	1
Station 4	Top	2	4	<1	<1	1	1	<1	1	<1	<1	<1	1
	Middle	1	<1	1	<1	<1	1	<1	<1	<1	9	1	1
	Bottom	<1	<1	1	1	<1	1	1	<1	<1	2	<1	1
Reference	Top	2	<1	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 = 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.

Nutrients

The potential effects of the SPTP discharge on nutrient concentrations in the marine receiving environment were assessed by qualitatively comparing the 2024 IDZ and reference station data. Data are presented in Appendix C3.

The 2024 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 C3). The average concentrations of nutrients in 2024 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 result for nitrate was 0.28 mg/L N at the reference station and 0.27 mg/L N at the IDZ stations. For comparison, ambient nitrate concentrations in the Juan de Fuca Strait area are typically in 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 2013-2024 total nitrogen and nitrate results from the reference area and outfall monitoring stations. Comparison of this data to the Mackas and Harrison (1997) study of area background concentrations indicates that the monitoring results are well within background concentrations.

Similar to previous years (CRD, 2002-2023), nutrient concentrations in 2024 exhibited high natural spatial and temporal variability, which is typical of the Salish Sea (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 Salish Sea 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, nitrate and TKN (Figure 5.3 and Figure 5.4, Appendix C3) lower in the summer and higher in the winter and nitrite (Appendix C3) higher in the summer and lower in the winter. However, 2024 values for total nitrogen were generally higher than in previous years. Nitrate results were within the same range as previous years. The total nitrogen values will be noted in future years, to see whether this fluctuation continues.

Despite the increase in total nitrogen values in 2024, nutrient monitoring results from 2002-2024 have shown no indication of potential for anthropogenic eutrophication due to the outfall. Mackas and Harrison (1997) indicate that the potential for eutrophication of the Salish Sea 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 Salish Sea 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 54 tonnes N/year in 2024 (Table 3.4), whereas, the net natural nitrogen input to the Salish Sea 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 2024 surface water nitrate concentrations (Appendix C3) remained within the ambient Juan de Fuca nitrate concentrations. Overall, the 2024 surface water data showed no evidence of any significant effect of the SPTP discharge on nutrients in the Bazan Bay receiving environment.

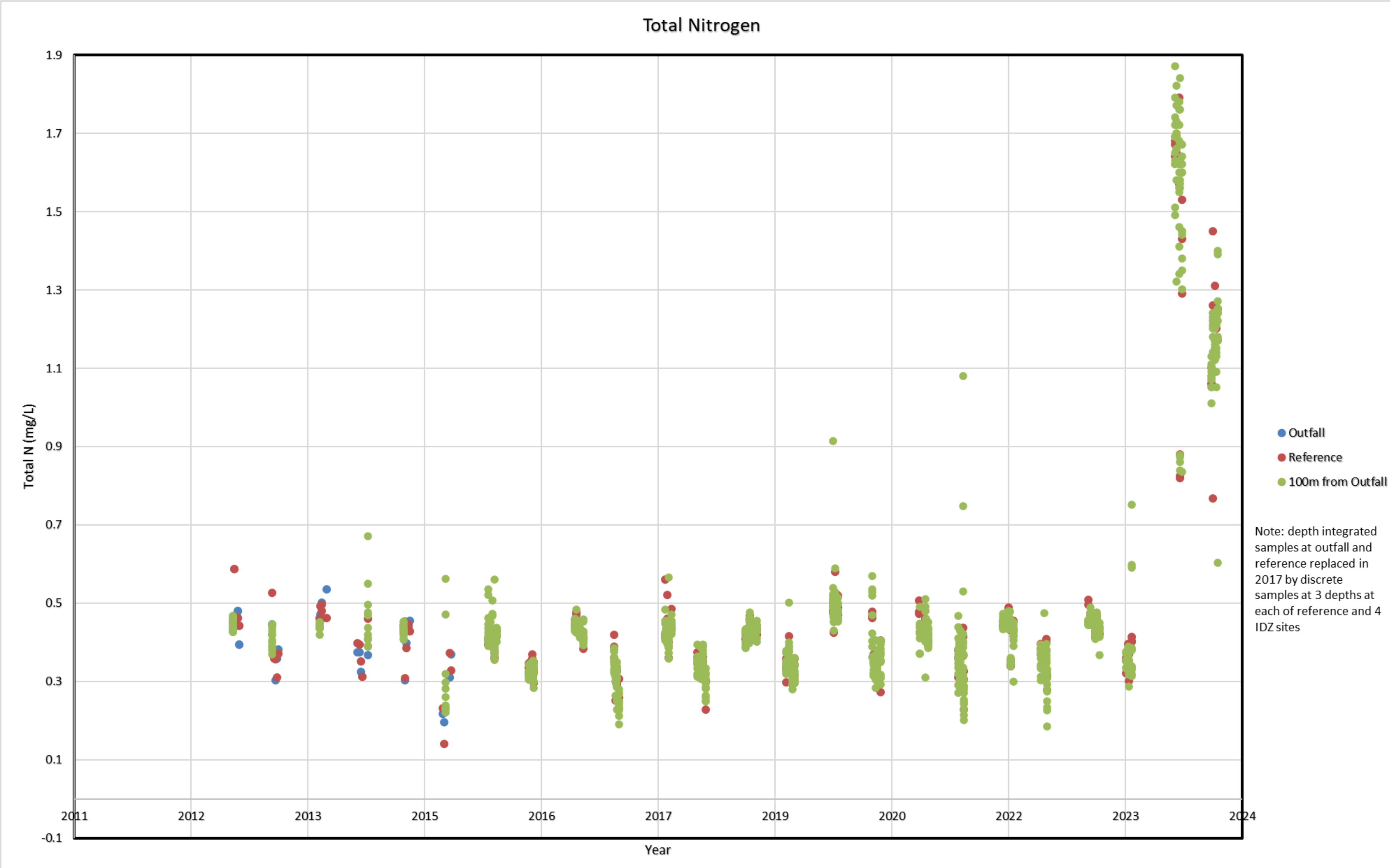


Figure 5.3 SPTP Total Nitrogen Sampling Results 2013-2024

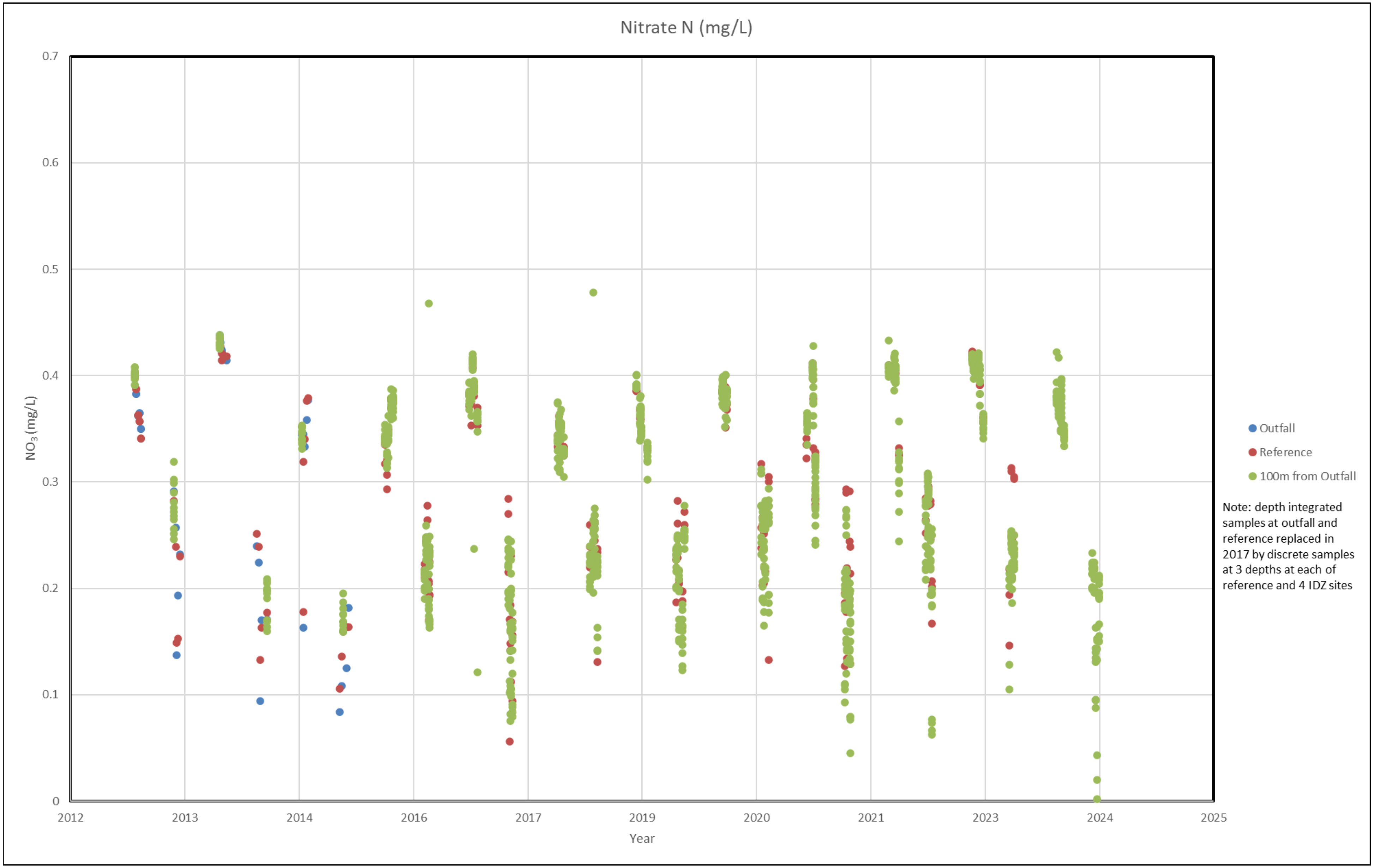


Figure 5.4 SPTP Nitrate Sampling Results 2013-2024

5.4 Overall Assessment

Overall, the 2024 bacteriology results indicated that the outfall plume was predominantly trapped below the ocean surface. 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 were not expected. Most extended analysis monitoring parameters were either non-detect or below applicable WQG, except for boron, which exceeded WQG at every station and sampling event, including the reference station, as well as cadmium in seven samples. The CRD will continue to monitor metals in waters around the outfall to assess environmental significance.

The 2024 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. However, 2024 values for total nitrogen were generally higher than in previous years and will be observed in future years to see whether this fluctuation continues. 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. Seafloor sampling was conducted in 2024 and will next be conducted in 2028. Seafloor health is monitored through collection of sediment at the end of the outfall and at the reference station. These sediments were then analyzed for approximately 645 substances and compared to relevant sediment quality guidelines (SQG), as well as for benthic invertebrate community assessment.

6.1 Sediment Chemistry

6.1.1 Introduction

Sediments are collected for analysis of chemical parameters to assess potential effects related to wastewater discharge. Tools used to assess potential effects include the comparison of data to the reference station, pre-discharge concentrations and SQG.

6.1.2 Methods

Sediment sampling generally followed the Puget Sound Ambient Monitoring Program (PSAMP, 2002) protocols and guidelines. Sampling was conducted using the University of Victoria's 16-m science vessel, the MSV John Strickland, using a 0.1 m^2 stainless steel Van Veen grab sampler. Sediment samples were collected on August 28, 2024, from one station at the outfall and from the Reference 2 station, east of Sidney Spit (Figure 5.1).

Sediments were collected by taking three replicate grabs from each of the two sampling stations and compositing into a single sample per station. Sediment is scooped and mixed with trace cleaned bowls and spoons. Target sampling location coordinates can be found in Appendix C1. Samples were analyzed for approximately 645 parameters, including conventional variables, metals, organic substances and high resolution analyses (Appendix A). This suite of substances was selected in collaboration with the MMAG, the ENV program review, and in alignment with the Vancouver Aquarium Pollution Tracker Program.

Bureau-Veritas (Burnaby, BC) conducted the routine resolution analyses while SGS AXYS Analytical (Victoria, BC) conducted the high-resolution analyses.

Ten percent of the sediment samples were randomly chosen for laboratory triplicate analysis (these samples were batched with sediments from other CRD outfall monitoring programs). The analytical laboratory also conducted internal QA/QC analysis, including method analyte spikes, method blanks and standard reference materials.

Results were compared to multiple SQG, including the Canadian Council of Ministers of the Environment Probable Effects Level (CCME PEL), British Columbia Contaminated Sites Regulation (BC CSR) and the Washington State Department of Ecology (WSDOE) Second Lowest Apparent Effects Threshold (AET), to evaluate the potential receiving environment effects. SQG are frequently used to evaluate the potential for adverse biological effects associated with contamination of sediments as part of monitoring, source control, cleanup and dredging programs. There are a variety of SQG in use in North America today, which can vary considerably in the substances that are included, levels derived for the substances, and methods of derivation. In 2007, Avocet Consulting conducted an evaluation of the reliability of certain marine SQG to determine whether selected SQG should be used for monitoring at the Macaulay and Clover Point outfalls (Avocet, 2007). A detailed description of this review is presented in the 2006 Macaulay and Clover Annual Report (CRD, 2007b).

Based on the results of the reliability analysis, the following SQG were determined to be the most relevant and reliable, specifically for the Macaulay and Clover points results and, therefore, were used in the assessment of sediment quality data in this report: the WSDOE non-carbon normalized 2LAET (WSDOE, 1991), the BC SedQCTCS (BCMWLAP, 2003) and the CCME PEL (CCME, 2003). The reliability analysis looked at the incidences of false positive and false negative predictions based on SQG comparisons to historical Macaulay Point benthic data (Avocet, 2007). All of the SQG sets that were assessed had low observed frequencies (≤1%) of false negative predictions.

DATA QUALITY ASSESSMENT

A rigorous QA/QC assessment procedure was followed for both field sampling procedures and laboratory analyses. Within the analytical batch that was analyzed, one sample was randomly chosen for laboratory triplicate analysis and one sample was randomly chosen for field triplicate analysis. The analytical laboratories also conducted internal QA/QC analyses, including method analyte spikes, method blanks and standard reference materials. Refer to Golder (2017) for detailed descriptions of the QA/QC procedures.

6.1.3 Results and Discussions

In 2024, over 645 substances were analyzed for the composite samples collected at both the outfall and the reference station. Analytical results for all parameters for the 2024 SPTP sediment samples are reported in Appendix D1. Consistent with previous year, in 2024 all parameters were below applicable SQG (Appendix D1). The next round of sediment sampling is scheduled for 2028.

6.2 Benthic Invertebrate Community Assessment

6.2.1 Introduction

Benthic invertebrate communities consist of several different taxa (different kinds of organisms). The types of taxa found at a particular location and the abundance of these organisms partly depend on the physical characteristics of the habitat (e.g., particle size, type of substrate, etc.). Other physical factors that can influence the composition of the community and the number of organisms are temperature, depth, salinity and hydrography. Biological factors that can also influence benthic communities include primary productivity, competition and acclimatization. Benthic communities can change in response to enhanced nutrients, organic matter and contaminants. In marine benthic communities, as the concentration of organic matter in sediment increases, the number of taxa typically decreases while the abundance of organisms increases. Abundance will eventually decline when organic matter begins to overwhelm the community. This pattern is typically observed near wastewater outfalls and involves an increase in abundance and a reduction in the total number of taxa with proximity to the source (Pearson and Rosenberg, 1978).

Measurements of change in benthic communities have been widely used in identifying and monitoring effects from different sources, such as coastal outfalls, chemical contamination of sediments, commercial dredging, oil exploration and introduced species. Potential effects are typically determined through comparisons of exposed stations to reference stations that are outside the exposure area. Community indicators are often used in these assessments. The assessment of the SPTP benthic communities in 2024 included the use of calculated indices, such as the abundance of taxa, the richness of taxa and the community structure of the taxa.

6.2.2 Methods

Benthic sampling generally followed the Puget Sound Ambient Monitoring program (PSAMP, 2002) protocols and guidelines. Sampling was conducted from a 20 m research vessel, the MSV John Strickland, using a 0.1 m^2 stainless steel Van Veen grab sampler, concurrently with the sediment sampling.

Benthic samples were collected in September 2024 from the outfall terminus station and the reference station (Ref 2), east of Sidney Spit (Figure 5.1). These were the same stations used in previous years and the pre-discharge assessment program. Four replicate grabs were taken at each station, sieved in the field to 1.0 mm, preserved in formalin solution and transported to the taxonomic laboratory Biologica Environmental Services, Ltd (Victoria, BC). Benthic invertebrates were sorted, enumerated and identified to the lowest practical taxonomic level using Puget Sound Protocols (PSAMP, 2002). All replicates from each station were analyzed. At least 10% of the submitted samples were re-sorted by another person to ensure that no more than 5% of a given sample was missed by the sorter (i.e., a sample sorting efficiency of 95%). Five percent of all samples were re-identified by a second taxonomist. These quality control measures ensured that all identifications were correct and consistent.

Total abundance and taxa richness were derived and compared to previous years and the pre-discharge data. These indices were used to assess the potential effects of the discharge on benthic organisms. The health of the benthic community at the outfall station relative to the reference station was also assessed by identifying the dominant taxa groups (to phyla or class) at each location.

6.2.3 Results and Discussions

Benthic indices are presented in Figure 6.1 (community structure), Figure 6.2 (taxa richness) and Figure 6.3 (total abundance). The raw benthic results for 2024 are presented in Appendix D2. In 2024, the reference station had a qualitatively higher number of different species (Figure 6.1) and a higher total abundance than the outfall station (Figure 6.3). Taxa richness (Figure 6.2) was equivalent between the two stations.

A typical effect observed near wastewater outfalls involves an increase in abundance of organisms along with a reduction in the total number of taxa due to organic enrichment (Pearson and Rosenberg, 1978). This effect was not observed in 1999, 2004 or 2008, but was qualitatively observed in 2012 (CRD, 2014). In 2020 and in 2024, the community structure at both the outfall and the reference stations were proportionately dominated by the Annelids (marine worms), comprising 45% and 67%, respectively, of the total number of organisms in 2024. The next most common group was Mollusca, comprising 25% of the total number of organisms at the outfall, and 16% of the total number of organisms at the reference station.

Considering that total organic carbon has not increased over time, and sediment quality is not exceeding any available SQG, the probability that the highly treated SPTP effluent is causing any benthic decline is unlikely. Changes in sorting and taxonomy proficiency have likely been the main contributor to increases in taxa richness and abundance from pre-discharge to present, with a new taxonomist in use since 2012. In 2020 and in 2024, total abundance was higher at the reference station, but taxa richness was the same at both outfall and reference stations.

6.3 Benthic Overall Assessment

Overall, the 2024 results indicate that the wastewater discharge likely does not have a negative impact on the benthic species assemblage. While the total number of animals was less at the outfall than the reference station in 2024, the number of different species was the same for the outfall and the reference stations.

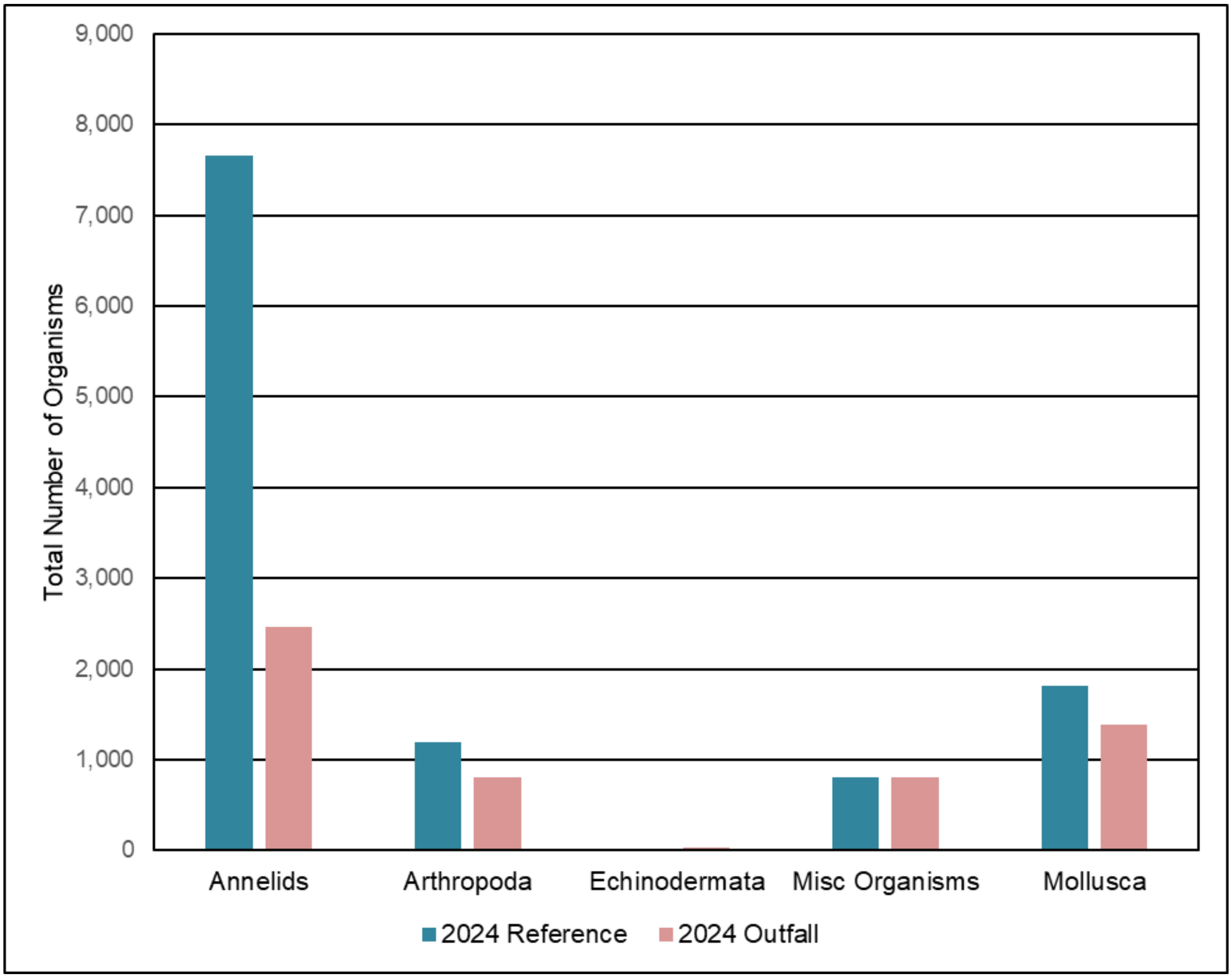


Figure 6.1 SPTP Outfall and Reference Station Benthic Invertebrate Count, 2024

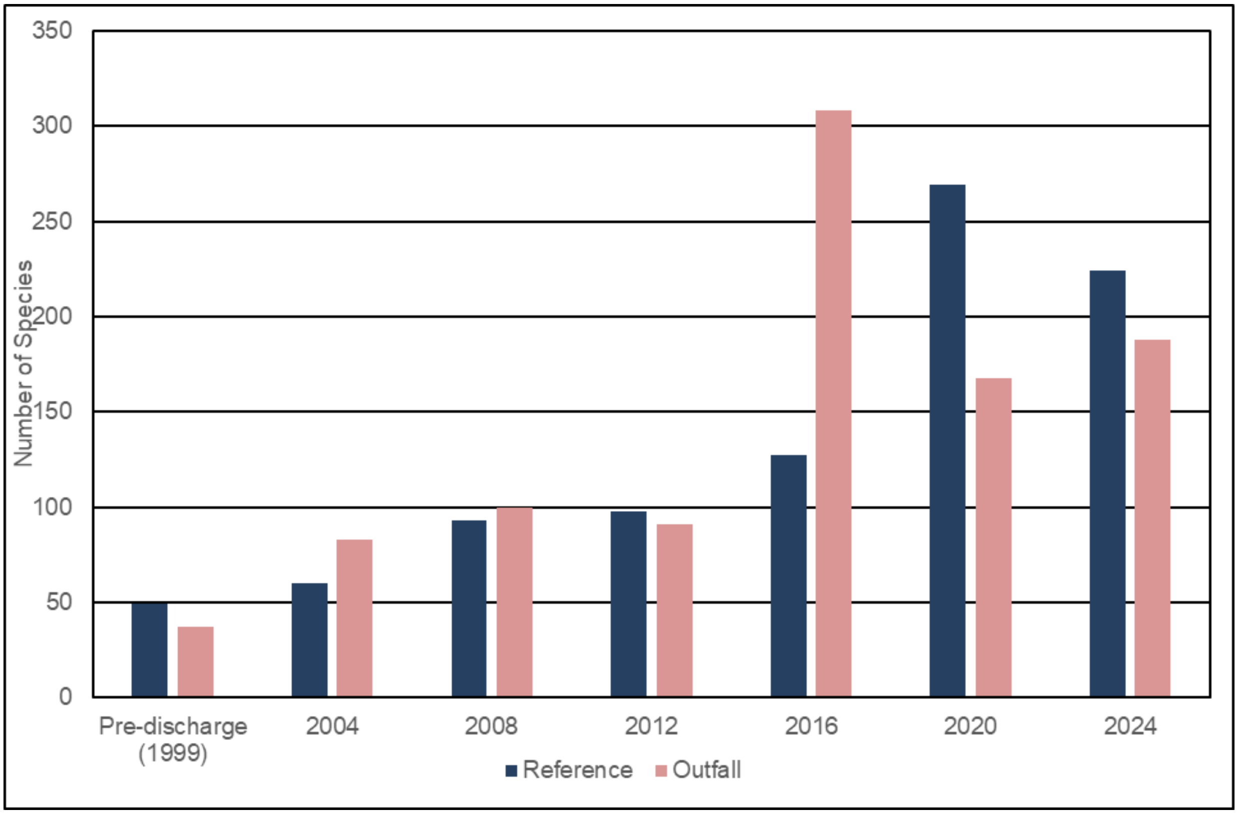


Figure 6.2 SPTP Outfall and Reference Station Taxa Richness, Pre-discharge to 2024

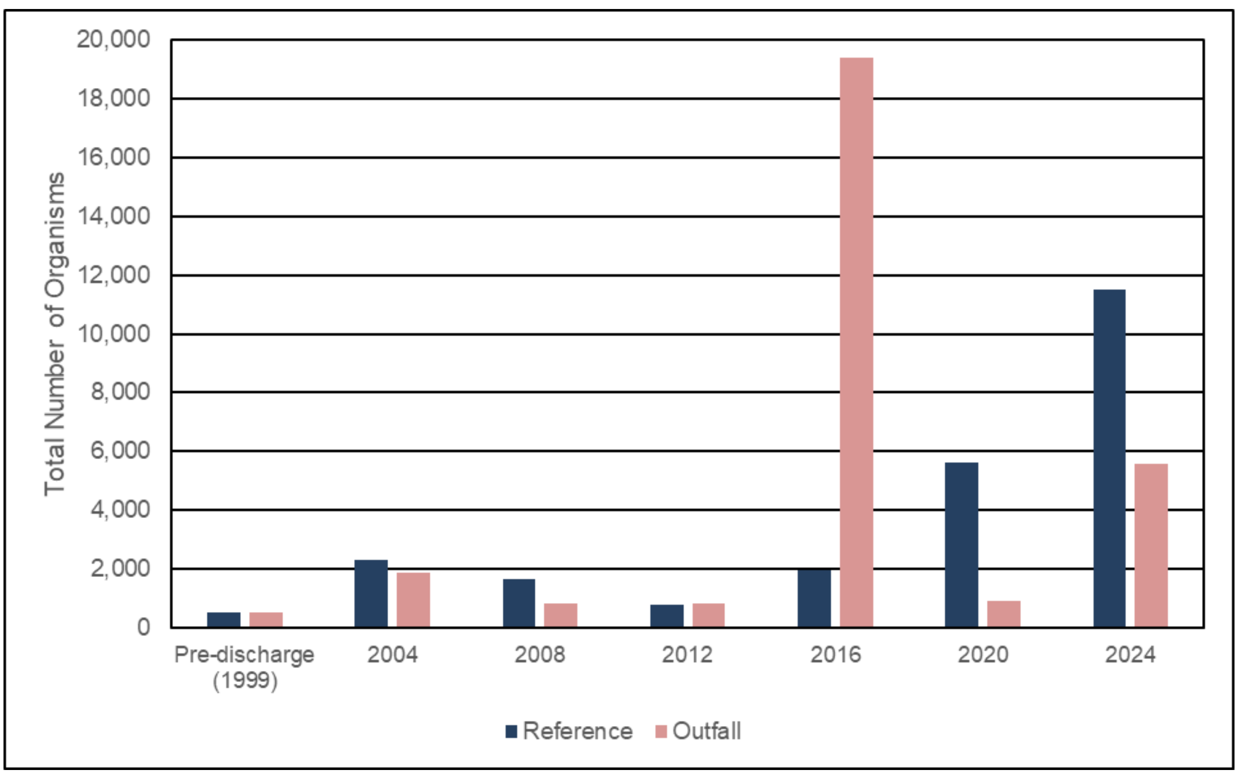


Figure 6.3 SPTP Outfall and Reference Stations Total Abundance, Pre-discharge to 2024

7.0 OVERALL CONCLUSIONS

Overall, the results of the WMEP monitoring conducted in 2024 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, except for 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 toxicity, and no major impairment to survival and reproductive endpoints.

No biosolids were generated in 2024 but monitoring of dewatered sludge was undertaken to inform the CRD's 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 2024 showed that all 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 seven or less CFU/100 mL for all stations and depths in 2024 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 the Salish Sea. Cadmium exceeded guidelines in seven samples and will be assessed again in 2025.

There was some seasonality (winter vs. summer sampling events) observed in nutrient concentrations in 2024, 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 Salish Sea. Overall, there was no evidence of nutrient enrichment in the receiving environment resulting from the SPTP discharge.

Sediment was analyzed for over 645 parameters, with all results below applicable SQG, consistent with previous years.

Benthic community structure and taxa richness were qualitatively higher at the reference station than at the outfall, while total abundance was equivalent between the two stations. Both the outfall and reference stations had benthic invertebrate communities that were representative of those seen elsewhere in the Salish Sea.

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APPENDIX A

Parameter List for the Saanich Peninsula Wastewater and Marine Environment Program 2024

Appendix A Parameter List for the Saanich Peninsula Wastewater and Marine Environment Program 2024

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled 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	minimum twice per week to monthly	√		
biochemical oxygen demand	influent - weekly; effluent - 3 times/week	√		
carbonaceous biochemical oxygen demand	minimum 2 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	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		√	√	
magnesium		√	√	
manganese		√	√	
mercury		√	√	
molybdenum		√	√	
nickel		√	√	
phosphorus		√	√	
potassium		√	√	
selenium		√	√	
silver		√	√	
sodium			√	
thallium		√	√	
tin		√	√	
zinc		√	√	

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
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		√		
silver		√		
thallium		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
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		√		
4,6-dinitro-2-methylphenol		√		
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		√		
beta-HCH		√		
chlordane		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
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		√		
fluorene		√		
indeno(1,2,3-c,d)pyrene		√		
naphthalene		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
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		√		
hexachloroethane		√		
isophorone		√		
nitrobenzene		√		
N-nitrosodimethylamine		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
N-nitrosodi-n-propylamine		√		
N-nitrosodiphenylamine		√		
VOLATILE ORGANICS				
Monocyclic Aromatic Hydrocarbons				
1,2-dichlorobenzene		√		
1,3-dichlorobenzene		√		
1,4-dichlorobenzene		√		
1,2-dibromoethane		√		
1,4-dioxane		√		
benzene		√		
carbon tetrachloride		√		
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		√		
2-chloroethylvinyl ether		√		
bromomethane		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
chloroethane		√		
chloroethene		√		
chloromethane		√		
cis-1,2-dichloroethene		√		
cis-1,3-dichloropropene		√		
dibromoethane		√		
dibromomethane		√		
dichlorodifluoromethane		√		
dichloromethane		√		
tetrabromomethane		√		
tetrachloroethene		√		
tetrachloromethane		√		
trans-1,2-dichloroethene		√		
trans-1,3-dichloropropene		√		
trichloroethene		√		
trichlorofluoromethane		√		
vinyl chloride		√		
Trihalomethanes				
bromodichloromethane		√		
bromoform		√		
chlorodibromomethane		√		
tribromomethane		√		
trichloromethane		√		
Ketones				
4-methyl-2 pentanone		√		
dimethyl ketone		√		
endrin ketone		√		
methyl ethyl ketone		√		
TERPENES				
alpha-terpineol		√		
TOXICITY				
acute toxicity	quarterly	√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
chronic toxicity	annually	√		
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		√		
2,6-Dimethylnaphthalene		√		
2,3,5-Trimethylnaphthalene		√		
1-Methylphenanthrene		√		
Dibenzothiophene		√		
PBDEs		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
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-		√		
2,4'-DDD		√		
4,4'-DDD		√		
2,4'-DDE		√		
4,4'-DDE		√		
2,4'-DDT		√		
4,4'-DDT		√		
Mirex		√		
HCH, delta		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
Heptachlor Epoxide		√		
alpha-Endosulphan		√		
Dieldrin		√		
Endrin		√		
beta-Endosulphan		√		
Endosulphan Sulphate		√		
Endrin Aldehyde		√		
Endrin Ketone		√		
Methoxychlor		√		
PFOS				
Perfluoroheptanoic Acid (PFHpA)		√		
Perfluorohexanoic Acid (PFHxA)		√		
Perfluorononanoic Acid (PFNA)		√		
Perfluorooctane Sulfonamide (PFOSA)		√		
Perfluorooctanesulfonic acid		√		
Perfluorooctanoic acid (PFOA)		√		
Perfluoropentanoic Acid (PFPeA)		√		
PFBS		√		
PFDoA		√		
PFHxS		√		
PFUnA		√		
PCDD				
1,2,3,4,6,7,8-HPCDD		√		
1,2,3,4,6,7,8-HPCDF		√		
1,2,3,4,7,8,9-HPCDF		√		
1,2,3,4,7,8-HXCDD		√		
1,2,3,4,7,8-HXCDF		√		
1,2,3,6,7,8-HXCDD		√		
1,2,3,6,7,8-HXCDF		√		
1,2,3,7,8,9-HXCDD		√		
1,2,3,7,8,9-HXCDF		√		
1,2,3,7,8-PECDD		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
1,2,3,7,8-PECDF		√		
2,3,4,6,7,8-HXCDF		√		
2,3,4,7,8-PECDF		√		
2,3,7,8-TCDD		√		
2,3,7,8-TCDF		√		
OCDD		√		
OCDF		√		
TOTAL HEPTA-DIOXINS		√		
TOTAL HEPTA-FURANS		√		
TOTAL HEXA-DIOXINS		√		
TOTAL HEXA-FURANS		√		
TOTAL PENTA-DIOXINS		√		
TOTAL PENTA-FURANS		√		
TOTAL TETRA-DIOXINS		√		
TOTAL TETRA-FURANS		√		
PPCPs				
2-Hydroxy-Ibuprofen		√		
Acetaminophen		√		
Azithromycin		√		
Bisphenol A		√		
Caffeine		√		
Carbadox		√		
Carbamazepine		√		
Cefotaxime		√		
Ciprofloxacin		√		
Clarithromycin		√		
Clinafloxacin		√		
Cloxacillin		√		
Dehydronifedipine		√		
Digoxigenin		√		
Digoxin		√		
Diltiazem		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
Diphenhydramine		√		
Enrofloxacin		√		
Erythromycin-H2O		√		
Flumequine		√		
Fluoxetine		√		
Furosemide		√		
Gemfibrozil		√		
Glipizide		√		
Glyburide		√		
Hydrochlorothiazide		√		
Ibuprofen		√		
Lincomycin		√		
Lomefloxacin		√		
Miconazole		√		
Naproxen		√		
Norfloxacin		√		
Norgestimate		√		
Ofloxacin		√		
Ormetoprim		√		
Oxacillin		√		
Oxolinic Acid		√		
Penicillin G		√		
Penicillin V		√		
Roxithromycin		√		
Sarafloxacin		√		
Sulfachloropyridazine		√		
Sulfadiazine		√		
Sulfadimethoxine		√		
Sulfamerazine		√		
Sulfamethazine		√		
Sulfamethizole		√		
Sulfamethoxazole		√		

Appendix A, continued

Parameter	Compliance Monitoring and Treatment Plant Performance	Wastewater Priority Substances	Receiving Environment	
	Influent and Effluent - Sampling Frequency	Sampled Quarterly	5 Samples in 30 Days (summer and winter) 1st day	5 Samples in 30 Days (summer and winter) 2nd-5th day
Sulfanilamide		√		
Sulfathiazole		√		
Thiabendazole		√		
Triclocarban		√		
Triclosan		√		
Trimethoprim		√		
Tylosin		√		
Virginiamycin		√		
Warfarin		√		
PFAS		√		

APPENDIX B

Wastewater Monitoring

Appendix B1 Saanich Peninsula Treatment Plant Effluent Flow (m^3) in 2024

Appendix B2 Compliance and Treatment Plant Performance Influent Results 2024

Appendix B3 Compliance and Treatment Plant Performance Effluent Results 2024

Appendix B4 Influent and Effluent Priority Substance Concentrations 2024

Appendix B1 Saanich Peninsula Treatment Plant Effluent Flow (m^3) in 2024

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8,987	11,907	13,268	10,001	8,675	8,977	8,867	8,988	8,945	8,775	11,922	9,691
2	9,687	11,126	11,922	9,553	8,740	10,142	10,811	8,746	9,517	8,699	11,423	9,598
3	9,641	11,458	11,610	9,193	8,624	14,672	9,116	8,313	9,101	8,697	10,957	9,454
4	9,825	10,919	11,373	8,962	8,422	10,315	8,831	8,298	6,539	9,654	12,969	9,278
5	11,063	10,325	10,906	8,784	8,817	9,561	8,814	8,741	8,943	8,721	11,034	9,265
6	12,145	9,990	10,454	8,679	8,846	9,466	8,536	8,643	8,795	8,855	10,394	9,594
7	10,693	10,007	10,152	8,959	8,693	9,077	8,719	8,643	8,521	8,812	9,869	13,309
8	17,505	9,661	10,219	9,296	8,449	8,809	8,792	8,702	8,909	9,285	9,797	12,516
9	23,525	9,563	10,193	9,069	8,622	9,076	8,688	8,653	9,089	9,104	12,989	11,057
10	14,640	9,459	9,909	8,812	8,544	9,204	8,757	8,441	8,728	8,923	11,963	10,384
11	12,061	12,017	9,873	8,872	8,349	8,956	8,776	8,654	8,822	9,069	15,515	10,115
12	10,915	11,010	10,211	8,881	8,704	8,861	8,647	9,018	8,905	8,757	12,883	9,853
13	10,349	10,380	9,695	8,688	8,942	9,043	8,396	8,843	9,724	8,859	15,525	10,196
14	10,126	10,059	9,623	8,961	8,531	8,856	8,733	8,710	9,908	9,517	14,118	11,480
15	9,803	9,588	9,437	8,775	8,696	8,757	8,783	8,866	9,299	9,007	11,952	11,123
16	9,455	9,467	9,264	8,552	8,583	8,982	8,717	8,816	9,125	5,851	11,932	14,812
17	9,207	9,114	9,183	8,588	8,483	9,125	8,842	8,542	8,876	9,092	11,999	18,676
18	9,378	9,009	9,259	8,569	8,126	8,914	8,763	9,276	8,871	10,975	11,337	24,690
19	13,145	9,747	9,187	8,426	8,047	8,831	8,763	9,181	8,895	18,753	10,714	17,693
20	14,377	9,795	9,025	8,431	8,648	8,893	8,360	9,002	8,681	16,361	10,609	15,332
21	17,614	10,452	8,875	8,665	10,409	8,816	8,652	8,834	8,548	12,122	10,365	13,625
22	20,690	10,239	9,205	8,737	9,809	8,566	8,762	8,879	8,818	10,572	11,031	12,996
23	16,527	9,810	11,701	8,439	9,167	8,936	8,531	9,189	9,204	9,970	10,765	13,677
24	15,161	9,682	10,942	8,738	9,350	8,928	8,652	11,593	8,999	9,658	10,717	12,548
25	13,447	9,640	10,324	10,057	8,933	8,851	8,507	9,640	10,974	9,488	10,480	11,750
26	13,123	9,494	9,994	9,664	9,835	9,003	8,527	11,078	10,438	10,358	10,195	15,537
27	20,857	9,914	10,277	9,156	9,309	8,854	8,256	10,558	9,781	11,771	10,158	13,397
28	24,585	19,925	9,951	9,245	9,504	8,714	8,570	9,525	9,020	11,841	9,849	14,293
29	16,027	16,183	9,655	9,026	9,462	8,438	9,791	9,224	8,860	11,139	9,728	12,815
30	13,482	---	9,230	8,703	9,283	8,594	9,364	9,093	9,242	10,597	9,443	12,166
31	13,193	---	9,227	---	9,025	---	8,979	8,864	---	9,919	---	11,509
TOTAL Flow (m3/day)	421,233	309,940	314,144	268,481	275,627	276,217	273,302	281,553	272,077	313,201	342,632	392,429
Average	13,588	10,688	10,134	8,949	8,891	9,207	8,816	9,082	9,069	10,103	11,421	12,659
Maximum	24,585	19,925	13,268	10,057	10,409	14,672	10,811	11,593	10,974	18,753	15,525	24,690
Minimum	8,987	9,009	8,875	8,426	8,047	8,438	8,256	8,298	6,539	5,851	9,443	9,265
n	31	29	31	30	31	30	31	31	30	31	30	31
											Annual Average	**10,221**

Appendix B2 Compliance and Treatment Plant Performance Influent Results 2024

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
4-Jan	---	264	---	---	515	---	---	---	---	---	---	---	---	---	---
9-Jan	---	---	---	---	---	---	15	---	0.25	0.47	27	---	7.2	---	---
11-Jan	---	184	---	---	387	---	---	---	---	---	---	---	---	---	---
16-Jan	---	---	---	---	---	5,600,000	1.40	---	<0.005	---	---	---	7.3	---	---
18-Jan	---	304	---	---	563	---	---	---	---	---	---	---	---	---	---
23-Jan	137	---	---	101	---	---	13	---	0.01	<0.025	21	---	7.4	---	---
25-Jan	---	148	---	---	377	---	---	---	---	---	---	---	---	---	---
1-Feb	---	186	---	---	409	---	---	---	---	---	---	---	---	---	---
6-Feb	---	---	---	---	---	---	29	---	0.02	<0.025	48	5.6	7.3	---	---
8-Feb	---	204	---	---	543	---	---	---	---	---	---	---	---	---	---
15-Feb	---	247	---	---	546	---	---	---	---	---	---	---	---	---	---
20-Feb	187	---	---	244	---	---	35	---	---	---	49	---	7.4	---	---
22-Feb	---	219	---	---	430	---	---	---	---	---	---	---	---	---	---
23-Feb	---	---	---	---	---	---	---	---	<0.005	<0.02	---	---	---	---	---
29-Feb	---	147	---	---	332	---	---	---	---	---	---	---	---	---	---
5-Mar	---	---	---	---	---	---	24	---	0.067	<0.025	39	4.9	7.2	---	---
7-Mar	---	216	---	---	484	---	---	---	---	---	---	---	---	---	---
14-Mar	---	221	---	---	524	---	---	---	---	---	---	---	---	---	---
19-Mar	207	---	---	122	---	---	34	---	<0.01	<0.01	49	---	7.3	---	---
21-Mar	---	241	---	---	557	---	---	---	---	---	---	---	---	---	---
28-Mar	---	228	---	---	524	---	---	---	---	---	---	---	---	---	---
4-Apr	---	294	---	---	641	---	---	---	---	---	---	---	---	---	---
9-Apr	---	---	---	---	---	---	36	---	0.013	<0.025	53	6.4	7.2	---	---
11-Apr	---	238	---	---	590	---	---	---	---	---	---	---	---	---	---
18-Apr	---	280	300	---	731	---	2	0.00	<0.005	<0.02	48	---	7.3	6.8	240
18-Apr	---	276	---	---	538	---	---	---	---	---	---	---	---	---	---
23-Apr	221	---	---	90	---	---	39	---	<0.01	<0.025	59	---	7.3	---	---
25-Apr	---	251	---	---	612	---	---	---	---	---	---	---	---	---	---
2-May	---	273	---	---	664	---	---	---	---	---	---	---	---	---	---
7-May	---	---	---	---	---	---	39	---	0.01	<0.025	59	7.0	7.0	---	---
9-May	---	300	---	---	602	---	---	---	---	---	---	---	---	---	---
16-May	---	286	---	---	631	---	---	---	---	---	---	---	---	---	---
21-May	269	---	---	138	---	---	40	---	<0.01	<0.025	58	---	7.3	---	---
23-May	---	282	---	---	567	---	---	---	---	---	---	---	---	---	---
30-May	---	265	---	---	586	---	---	---	---	---	---	---	---	---	---
4-Jun	---	---	---	---	---	---	31	---	0.01	<0.025	40	4.9	7.3	---	---
6-Jun	---	236	---	---	531	---	---	---	---	---	---	---	---	---	---
13-Jun	---	277	---	---	496	---	---	---	---	---	---	---	---	---	---

Appendix B2, continued

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
18-Jun	250	---	---	141	---	---	38	---	<0.005	0.05	49	---	7.4	---	---
20-Jun	---	208	---	---	635	---	---	---	---	---	---	---	---	---	---
27-Jun	---	189	---	---	667	---	---	---	---	---	---	---	---	---	---
2-Jul	---	310	300	---	528	---	1	0.00	<0.005	<0.02	59	---	7.7	7.0	340
4-Jul	---	313	---	---	696	---	---	---	---	---	---	---	---	---	---
9-Jul	---	---	---	---	---	---	37	---	<0.005	<0.02	52	7.3	7.3	---	---
11-Jul	---	280	---	---	615	---	---	---	---	---	---	---	---	---	---
18-Jul	---	340	---	---	595	---	---	---	---	---	---	---	---	---	---
23-Jul	232	---	---	196	---	---	37	---	0.02	<0.025	53	---	7.4	---	---
25-Jul	---	343	---	---	509	---	---	---	---	---	---	---	---	---	---
31-Jul	---	282	---	---	600	---	---	---	---	---	---	---	---	---	---
6-Aug	---	---	---	---	---	---	41	---	0.01	0.06	53	6.4	---	---	---
8-Aug	---	340	---	---	668	---	---	---	---	---	---	---	---	---	---
15-Aug	---	302	---	---	538	---	---	---	---	---	---	---	---	---	---
20-Aug	249	---	---	157	---	---	38	---	0.01	<0.025	55	---	7.4	---	---
22-Aug	---	227	---	---	535	---	---	---	---	---	---	---	---	---	---
29-Aug	---	232	---	---	517	---	---	---	---	---	---	---	---	---	---
3-Sep	---	---	---	---	---	---	40	---	0.019	<0.025	56	6.6	7.4	---	---
5-Sep	---	290	---	---	590	---	---	---	---	---	---	---	---	---	---
12-Sep	---	326	---	---	683	---	---	---	---	---	---	---	---	---	---
17-Sep	---	---	---	121	---	---	41	---	0.967	2.01	46	---	7.5	---	---
19-Sep	252	228	---	---	577	---	---	---	---	---	---	---	---	---	---
26-Sep	---	204	---	---	493	---	---	---	---	---	---	---	---	---	---
3-Oct	---	262	---	---	512	---	---	---	---	---	---	---	---	---	---
8-Oct	---	---	---	---	---	---	36	---	0.016	<0.025	52	7.0	7.4	---	---
10-Oct	---	194	---	---	519	---	---	---	---	---	---	---	---	---	---
17-Oct	---	380	330	---	581	---	1	0.01	<0.005	<0.02	57	---	7.6	7.1	350
17-Oct	---	220	---	---	504	---	---	---	---	---	---	---	---	---	---
22-Oct	198	---	---	125	---	---	29	---	<0.01	0.02	41	---	7.4	---	---
24-Oct	---	182	---	---	453	---	---	---	---	---	---	---	---	---	---
31-Oct	---	213	---	---	441	---	---	---	---	---	---	---	---	---	---
5-Nov	---	---	---	---	---	---	---	---	<0.01	<0.025	35	---	7.6	---	---
7-Nov	---	223	---	---	431	---	34	---	---	---	---	---	---	---	---
14-Nov	---	153	---	---	308	---	---	---	---	---	---	---	---	---	---
19-Nov	180	---	---	204	---	---	28	---	0.01	<0.025	40	---	7.2	---	---
21-Nov	---	246	---	---	482	---	---	---	---	---	---	---	---	---	---
27-Nov	---	263	---	---	529	---	---	---	---	---	---	---	---	---	---
3-Dec	---	---	---	---	---	---	40	---	<0.01	0.04	55	6.7	7.0	---	---
5-Dec	---	246	---	---	530	---	---	---	---	---	---	---	---	---	---

Appendix B2, continued

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10-Dec	201	---	---	112	---	---	32	---	0.01	<0.025	48	---	7.3	---	---
12-Dec	---	185	---	---	431	---	---	---	---	---	---	---	---	---	---
19-Dec	---	116	---	---	205	---	---	---	---	---	---	---	---	---	---
Mean	215	247	310	146	532	5,600,000	29	0.004	0.054	0.107	48	6.3	7.3	7.0	310
Min	137	116	300	90	205	5,600,000	1.2	0.003	0.003	0.005	21	4.9	7.0	6.8	240
Max	269	380	330	244	731	5,600,000	41	0.01	1.0	2.0	59	7.3	7.7	7.1	350
n	12	54	3	12	54	1	28	3	28	27	27	10	27	3.0	3.0

Notes:
ALK-alkalinity
BOD-total biochemical oxygen demand
COD-chemical oxygen demand
CL-chloride
COND-conductivity
NH_3-ammonia
UNION NH_3-unionized ammonia
NO_3-nitrate
NO_2-nitrite
TDP-total dissolved phosphorus
TP-total phosphorous
TKN-total Kjeldahl nitrogen
CBOD-carbonaceous biochemical oxygen demand
TRC-total residual chlorine
TSS-total suspended solids

Appendix B3 Compliance and Treatment Plant Performance Effluent Results 2024

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TRC	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
permitted max			45										6-9			45
3-Jan	---	11	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
4-Jan	---	10	3.35	---	53	---	---	---	---	---	---	---	---	---	---	---
9-Jan	---	---	---	---	---	3,500	0.88	<0.1	0.41	17	1.82	---	6.8	6.9	0.00	8.0
10-Jan	---	4.9	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
11-Jan	---	5.5	<3	---	25	---	---	---	---	---	---	---	---	---	---	---
16-Jan	---	---	---	---	---	940	0.03	---	0.12	---	---	---	7.0	---	---	---
17-Jan	---	7.1	2.9	---	---	---	---	---	---	---	---	---	---	---	---	---
18-Jan	---	6.6	4.2	---	56	---	---	---	---	---	---	---	---	---	---	---
23-Jan	42	---	---	124	---	22,000	<0.1	---	0.11	11.0	1.2	---	7.2	6.9	0.02	4.0
24-Jan	---	4.4	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
25-Jan	---	8.6	5.2	---	34	---	---	---	---	---	---	---	---	---	---	---
31-Jan	---	5.1	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
1-Feb	---	6.8	<3	---	48	---	---	---	---	---	---	---	---	---	---	---
6-Feb	---	---	---	---	---	1,500	<0.1	<0.1	0.09	15.8	1.9	3.3	7.1	6.8	0.00	7.0
7-Feb	---	6	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
8-Feb	---	6.7	<3	---	53	---	---	---	---	---	---	---	---	---	---	---
14-Feb	---	5.4	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
15-Feb	---	7.5	<3	---	42	---	---	---	---	---	---	---	---	---	---	---
20-Feb	28	---	---	171	---	5,900	<0.1	<0.1	0.26	13.6	2.2	---	6.9	6.8	0.11	3.0
22-Feb	---	6.2	3	---	49	---	---	---	---	---	---	---	---	---	---	---
23-Feb	---	4.0	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
28-Feb	---	5.9	3.9	---	---	---	---	---	---	---	---	---	---	---	---	---
29-Feb	---	5.9	3.1	---	49	---	---	---	---	---	---	---	---	---	---	---
5-Mar	---	---	---	---	---	1,300	<0.1	<0.1	0.07	13.7	1.4	3.4	7.0	6.6	0.06	<2
6-Mar	---	6.5	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
7-Mar	---	4.0	<3	---	55	---	---	---	---	---	---	---	---	---	---	---
13-Mar	---	3.4	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
14-Mar	---	4.3	<3	---	49	---	---	---	---	---	---	---	---	---	---	---
19-Mar	27	---	---	147	---	2,500	<0.1	<0.1	0.14	15.6	1.8	---	6.9	6.3	0.02	4.0
20-Mar	---	5.0	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
21-Mar	---	6.0	<3	---	88	---	---	---	---	---	---	---	---	---	---	---
27-Mar	---	3.7	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
28-Mar	---	9.8	3.6	---	39	---	---	---	---	---	---	---	---	---	---	---
3-Apr	---	5.8	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
4-Apr	---	8.4	<3	---	47	---	---	---	---	---	---	---	---	---	---	---
9-Apr	---	---	---	---	---	7,600	0.62	<0.1	0.38	16.2	2.8	4.9	6.7	7.1	0.18	13.0
10-Apr	---	6.4	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
11-Apr	---	8.1	<3	---	58	---	---	---	---	---	---	---	---	---	---	---
17-Apr	---	10.5	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
18-Apr	---	13.0	6.7	---	78	---	0.05	0	2.07	12.0	<0.2	---	7.0	6.7	---	10.0
18-Apr	---	10.8	3.8	---	46	---	---	---	---	---	---	---	---	---	---	---
23-Apr	31	---	---	74	---	5,100	0.17	<0.1	0.46	13.6	2.3	---	7.1	7.0	0.03	11.0
24-Apr	---	5.6	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
25-Apr	---	7.4	<3	---	51	---	---	---	---	---	---	---	---	---	---	---
1-May	---	4.6	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
2-May	---	7.5	<3	---	57	---	---	---	---	---	---	---	---	---	---	---
7-May	---	---	---	---	---	71,000	<0.1	<0.1	0.25	14.5	2.6	4.6	6.9	6.8	0.03	11.0
8-May	---	9.2	4.6	---	---	---	---	---	---	---	---	---	---	---	---	---
9-May	---	12.0	5.0	---	56	---	---	---	---	---	---	---	---	---	---	---
15-May	---	14.6	6.1	---	---	---	---	---	---	---	---	---	---	---	---	---
16-May	---	14.8	7.7	---	62	---	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TRC	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
permitted max			45										6-9			45
21-May	48	---	---	105	---	42,000	4.41	<0.1	0.47	15.9	6.1	---	7.1	7.1	0.00	11.0
22-May	---	12.6	4.4	---	---	---	---	---	---	---	---	---	---	---	---	---
23-May	---	11.4	3.3	---	61	---	---	---	---	---	---	---	---	---	---	---
29-May	---	12.2	3.3	---	---	---	---	---	---	---	---	---	---	---	---	---
30-May	---	15.4	4.4	---	52	---	---	---	---	---	---	---	---	---	---	---
4-Jun	---	---	---	---	---	20,000	2.21	<0.1	0.83	15.1	3.7	3.5	7.1	7.0	0.02	9.0
5-Jun	---	13.1	4.2	---	---	---	---	---	---	---	---	---	---	---	---	---
6-Jun	---	11.2	4.1	---	45	---	---	---	---	---	---	---	---	---	---	---
12-Jun	---	14.8	3.5	---	---	---	---	---	---	---	---	---	---	---	---	---
12-Jun	---	>16.6	4.8	---	59	---	---	---	---	---	---	---	---	---	---	---
18-Jun	57	---	---	105	---	20,000	2.80	0.005	0.78	13.3	3.0	---	7.2	6.8	0.04	10.0
19-Jun	---	12.9	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
20-Jun	---	4.9	3.2	---	55	---	---	---	---	---	---	---	---	---	---	---
26-Jun	---	15.7	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
27-Jun	---	12.1	<3	---	58	---	---	---	---	---	---	---	---	---	---	---
2-Jul	---	24.0	6.7	---	66	---	0.23	<0.0005	2.33	12.4	2.4	---	7.3	6.7	---	8.8
3-Jul	---	18.5	7.4	---	---	---	---	---	---	---	---	---	---	---	---	---
4-Jul	---	>18.8	6.7	---	85	---	---	---	---	---	---	---	---	---	---	---
9-Jul	---	---	---	---	---	500,000	2.90	0.005	2.33	11.9	4.5	6.2	7.2	6.8	0.00	23.0
10-Jul	---	>20.1	10.3	---	---	---	---	---	---	---	---	---	---	---	---	---
11-Jul	---	>20.2	9.2	---	66	---	---	---	---	---	---	---	---	---	---	---
17-Jul	---	>21.2	6.4	---	---	---	---	---	---	---	---	---	---	---	---	---
18-Jul	---	>21.6	6.4	---	55	---	---	---	---	---	---	---	---	---	---	---
23-Jul	52	---	---	201	---	13,000	2.47	<0.1	1.80	1.1	5.2	---	7.1	7.0	0.02	13.0
24-Jul	---	19.3	5.3	---	---	---	---	---	---	---	---	---	---	---	---	---
25-Jul	---	22.1	4.9	---	51	---	---	---	---	---	---	---	---	---	---	---
30-Jul	---	9.6	<2.12	---	---	---	---	---	---	---	---	---	---	---	---	---
31-Jul	---	9.2	2.7	---	43	---	---	---	---	---	---	---	---	---	---	---
6-Aug	---	---	---	---	---	480,000	4.88	<0.1	0.52	11.2	7.7	2.0	---	6.8	0.07	10.0
7-Aug	---	13.8	3.6	---	---	---	---	---	---	---	---	---	---	---	---	---
8-Aug	---	10.0	4.0	---	62	---	---	---	---	---	---	---	---	---	---	---
14-Aug	---	12.3	<3	---	---	---	---	---	---	---	---	---	7.4	---	---	---
15-Aug	---	17.5	3.2	---	55	---	---	---	---	---	---	---	---	---	---	---
20-Aug	69	---	---	187	---	120,000	7.06	<0.1	0.36	13.3	9.6	---	7.4	7.3	0.04	12.0
21-Aug	---	14.7	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
22-Aug	---	14.3	<3	---	47	---	---	---	---	---	---	---	---	---	---	---
28-Aug	---	13.2	3.3	---	---	---	---	---	---	---	---	---	---	---	---	---
29-Aug	---	15.1	3.3	---	40	---	---	---	---	---	---	---	---	---	---	---
3-Sep	---	---	---	---	---	44,000	6.03	<0.1	0.42	11.4	8.5	7.4	7.4	7.1	0.03	10.0
4-Sep	---	21.9	3.9	---	---	---	---	---	---	---	---	---	---	---	---	---
5-Sep	---	19.9	4.1	---	51	---	---	---	---	---	---	---	---	---	---	---
11-Sep	---	16.8	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
12-Sep	---	18.6	<3	---	46	---	---	---	---	---	---	---	---	---	---	---
17-Sep	---	---	---	131	---	20,000	5.60	<0.1	0.51	8.9	7.8	---	7.5	7.4	0.02	7.0
18-Sep	---	20.6	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
19-Sep	64	20.2	<3	---	46	---	---	---	---	---	---	---	---	---	---	---
25-Sep	---	21.4	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
26-Sep	---	25.3	3.6	---	110	---	---	---	---	---	---	---	---	---	---	---
2-Oct	---	25.0	3.4	---	---	---	---	---	---	---	---	---	---	---	---	---
3-Oct	---	18.8	<3	---	55	---	---	---	---	---	---	---	---	---	---	---
8-Oct	---	---	---	---	---	7,800	2.50	<0.1	0.59	12.4	4.1	4.3	7.2	7.2	0.02	5.0
9-Oct	---	16.2	<3	---	---	---	---	---	---	---	---	---	---	---	---	---

Appendix B3, continued

Date 2024	ALK	BOD	CBOD	CL	COD	FC	NH_3	Unionized NH_3	NO_2	NO_3	TKN	PO_4	pH	pH@15	TRC	TSS
units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
permitted max			45										6-9			45
10-Oct	---	14.2	<3	---	39	---	---	---	---	---	---	---	---	---	---	---
16-Oct	---	17.5	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
17-Oct	---	17.9	<3	---	40	---	---	---	---	---	---	---	---	---	---	---
22-Oct	41	---	---	144	---	26,000	<0.1	<0.1	0.03	14.7	2.6	---	7.1	7.0	0.03	5.0
23-Oct	---	5.4	2.8	---	34	7,200	0.07	0.001	0.07	15.7	<0.2	---	7.1	7.5	---	2.0
23-Oct	---	8.8	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
24-Oct	---	11.0	<3	---	43	---	---	---	---	---	---	---	---	---	---	---
30-Oct	---	6.8	<3	---	---	---	---	---	---	---	---	---	---	---	---	---
31-Oct	---	8.6	3.4	---	53	---	---	---	---	---	---	---	---	---	---	---
5-Nov	110	---	---	---	---	15,000	---	---	0.27	16.1	2.8	---	7.1	6.6	0.02	16.0
6-Nov	---	8.8	3.9	---	---	---	---	---	---	---	---	---	---	---	---	---
7-Nov	---	9.9	4.4	---	87	---	<0.102	<0.102	---	---	---	---	---	6.8	---	---
13-Nov	---	10.6	5.3	---	---	---	---	---	---	---	---	---	---	---	---	---
14-Nov	---	12.1	5.7	---	66	---	---	---	---	---	---	---	---	---	---	---
19-Nov	32	---	---	168	---	5,100	0.11	<0.1	0.12	15.4	2.5	---	7.0	7.1	0.02	15.7
20-Nov	---	14.7	5.4	---	---	---	---	---	---	---	---	---	---	---	---	---
21-Nov	---	<24.1	11.2	---	88	---	---	---	---	---	---	---	---	---	---	---
26-Nov	---	12.1	5.3	---	---	---	---	---	---	---	---	---	---	---	---	---
27-Nov	---	15.0	8.3	---	56	---	---	---	---	---	---	---	---	---	---	---
3-Dec	---	---	---	---	---	20,000	<0.1	<0.1	0.08	14.7	2.5	4.4	6.7	6.8	0.02	11.2
4-Dec	---	11.9	5.8	---	---	---	---	---	---	---	---	---	---	---	---	---
5-Dec	---	11.0	4.6	---	49	---	---	---	---	---	---	---	---	---	---	---
10-Dec	35	---	---	100	---	110,000	<0.1	<0.1	0.06	14.3	1.7	---	7.1	7.3	0.01	7.4
11-Dec	---	7.9	3.7	---	---	---	---	---	---	---	---	---	---	---	---	---
12-Dec	---	7.9	3.5	---	49	---	---	---	---	---	---	---	---	---	---	---
18-Dec	---	8.3	3.5	---	---	---	---	---	---	---	---	---	---	---	---	---
19-Dec	---	6.6	2.4	---	29	---	---	---	---	---	---	---	---	---	---	---
26-Dec	---	---	3.0	---	---	---	---	---	---	---	---	---	---	---	---	---
27-Dec	---	---	3.9	---	---	---	---	---	---	---	---	---	---	---	---	---
Mean	49.0	11.2	3.3	138.1	54	60,440	1.6	0.041	1	13	4	4.4	7.1	6.9	0.03	9.5
Min	26.7	3.4	1.1	74.4	25	940	0.033	0.00025	0.026	1.1	1.2	2.0	6.7	6.3	0	2.0
Max	110	25	11	201	110	500,000	7	0.051	2	17	10	7	8	8	0.18	23
n	13	98	107	12	54	26	28	26	28	27	25	10	28	28	24	26

Notes:
ALK-alkalinity
BOD-total biochemical oxygen demand
COD-chemical oxygen demand
CL-chloride, COND-conductivity
NH_3-ammonia
Union NH_3-unionized ammonia
NO_3-nitrate
NO_2-nitrite
TDP-total dissolved phosphorus
TP-total phosphorus
TKN-total Kjeldahl nitrogen
CBOD- carbonaceous biochemical oxygen demand
UN NH_3-unionized ammonia
TRC-total residual chlorine
TSS-total suspended solids
Shaded value indicates exceedance to permitted maximum.

Appendix B4 Influent and Effluent Priority Substance Concentrations 2024

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Enterococci	TOT	CFU/100 mL	1100000	440	7900000	32000	1400000	6100	3300000	5200
Fecal Coliforms	TOT	CFU/100 mL	5600000	940	---	---	---	---	---	7200
Alkalinity - Total - Ph 4.5	TOT	mg/L	---	---	210	32	220	46	250	34
Chloride	DIS	mg/L	---	---	85	100	150	170	100	120
Total/SAD Cyanide	TOT	mg/L	0.002	0.001	0.002	0.002	0.002	0.002	0.002	<0.0005
WAD Cyanide	TOT	mg/L	0.001	0.001	0.002	0.001	0.001	0.002	0.002	<0.0005
Hardness (as CaCO3)	DIS	mg/L	76.8	92.9	70.2	81.9	90.8	111	82.9	102
Sulphate	DIS	mg/L	---	---	28	33	39	43	27	43
Alkalinity - Bicarbonate	TOT	mg/L	---	---	260	39	270	56	310	41
Alkalinity - Carbonate	TOT	mg/L	---	---	<1	<1	<1	<1	<1	<1
Alkalinity - Hydroxide	TOT	mg/L	---	---	<1	<1	<1	<1	<1	<1
Alkalinity - Phenolphthalein - Ph 8.3	TOT	mg/L	---	---	<1	<1	<1	<1	<1	<1
Hardness (as CaCO3)	TOT	mg/L	86	94.6	73.5	79.7	102	116	100	95.3
N - No2 (As N)	DIS	mg/L	<0.005	0.12	<0.005	2.07	<0.005	2.33	<0.005	0.0675
N - No3 (As N)	DIS	mg/L	---	---	<0.02	12	<0.02	12.4	<0.02	15.7
N - No3 + No2 (As N)	DIS	mg/L	---	---	<0.02	14.1	<0.02	14.7	<0.02	15.8
P - Po4 - Ortho (As P)	DIS	mg/L	---	---	3.9	4.3	3.7	4.1	3.9	2.9
N - Nh3 (As N)	TOT	mg/L	1.4	0.033	1.8	0.052	1.2	0.23	1.4	0.068
N - Nh3 (As N)- Unionized	TOT	mg/L	---	---	0.0032	<0.0005	0.0033	<0.0005	0.005	0.00059
N - Tkn (As N)	TOT	mg/L	---	---	48.4	<0.2	59	2.43	57	<0.2
N - Total (As N)	TOT	mg/L	---	---	48.4	12.7	59	17.1	56.6	15.8
Organic Carbon	TOT	mg/L	---	---	150	16	110	19	130	10
Oil & Grease, Mineral	TOT	mg/L	<2	<2	2.3	<2	5.4	<2	<2	<2
Oil & grease, total	TOT	mg/L	9.4	1	24	<1	42	<1	79	<1
BOD	TOT	mg/L	---	---	290	13	310	24	380	5.4
CBOD	TOT	mg/L	---	---	300	6.7	370	6.7	330	2.8
COD	TOT	mg/L	---	---	731	78	528	66	581	34
pH @ 15° C	NoRs	pH	---	---	6.81	6.67	6.99	6.74	7.1	7.5
pH	TOT	pH	7.25	7.03	7.29	6.98	7.65	7.27	7.61	7.06
TSS	TOT	mg/L	---	---	240	10	340	8.8	350	2
Sulfide	TOT	mg/L	0.018	1.1	0.82	0.013	3.2	0.024	1.7	0.028
Tetrabromomethane	TOT	µg/L	---	---	<50	<50	<50	<50	<50	<50
4-Methyl-2-Pentanone	TOT	µg/L	---	---	<10	<10	<10	<10	<10	<10
Dimethyl Ketone	TOT	µg/L	---	---	77	<15	76	16	45	<15
Endrin Ketone	TOT	ng/L	---	---	---	<0.0185	---	<0.0652	---	<0.0164
Isophorone	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Aluminum	TOT	µg/L	<0.0099	<0.0099	<0.005	<0.0099	<0.005	<0.005	<0.0099	<0.00099
Aluminum-D	DIS	µg/L	0.0256	0.0077	0.0284	0.0047	0.0042	0.0021	0.0187	0.0074
Antimony	TOT	µg/L	---	---	0.002	<0.001	---	---	---	---
Antimony-D	DIS	µg/L	2.25	2.54	2.44	2.63	2.94	3.41	2.42	2.15
Arsenic	TOT	µg/L	---	---	0.002	<0.001	---	---	---	---
Arsenic-D	DIS	µg/L	14.3	13.9	17	17	17.1	18.2	16.7	13.5
Barium	TOT	µg/L	---	---	0.51	<0.05	0.39	<0.05	<0.05	0.054
Barium-D	DIS	µg/L	66.7	81.2	61.9	70.9	88	111	65.6	76.8
Beryllium	TOT	µg/L	---	---	0.003	0.008	---	---	---	---
Beryllium-D	DIS	µg/L	14.6	13.7	16	16.6	19.6	18.7	17.2	12.6
Bismuth-D	DIS	µg/L	5.89	4.86	6.48	5.61	16.3	7.6	8.31	6.35
Boron-D	DIS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Cadmium	TOT	µg/L	---	---	0.004	0.012	---	---	---	---
Cadmium-D	DIS	µg/L	15.8	18.5	14.9	17.6	19.2	23.6	20.3	23.2
Calcium	TOT	mg/L	---	---	<0.001	<0.001	---	---	---	---
Calcium-D	DIS	mg/L	9.03	11.4	8	9.21	10.4	12.5	7.81	10.7
Chromium	TOT	µg/L	---	---	<0.001	<0.001	---	---	---	---
Chromium III	TOT	mg/L	0.0247	0.0242	0.0349	0.0155	0.125	0.0115	0.0329	0.0124
Chromium VI	TOT	mg/L	0.31	0.24	1.01	1.47	1.17	0.68	1.41	0.35
Chromium-D	DIS	µg/L	74.6	94.4	61.1	77.7	92.8	128	93.4	103
Cobalt	TOT	µg/L	0.319	0.306	0.388	0.37	0.472	0.331	0.285	0.274
Cobalt-D	DIS	µg/L	13.6	5.14	16.5	5.79	15.2	9.88	20.8	7.16
Copper	TOT	µg/L	30.2	7.32	29.7	7.62	21.8	4.51	19.5	4.06
Copper-D	DIS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibutyltin	TOT	µg/L	199	62.2	494	81.1	407	83.9	420	62.8
Dibutyltin Dichloride	TOT	µg/L	21.5	26.3	23.1	26.7	35.6	31.3	31.4	23
Iron	TOT	µg/L	0.005	0.0025	0.0084	0.0033	0.0065	<0.0019	0.0075	<0.0019
Iron-D	DIS	µg/L	18.2	18.7	16.4	16.9	21.1	25.1	26.3	21.2
Lead	TOT	µg/L	0.775	2.08	1.37	1.07	0.443	0.787	9.73	7.23
Lead-D	DIS	µg/L	9.86	11.6	7.92	9.09	12	13	8.46	10.3
Lithium-D	DIS	µg/L	0.0028	<0.002	<0.002	<0.002	0.0037	<0.002	<0.002	0.0022
Magnesium	TOT	mg/L	2.79	1.7	2.62	2.42	2.68	2.31	3.23	1.79
Magnesium-D	DIS	mg/L	0.0055	<0.002	0.0054	<0.002	0.0032	<0.002	0.0069	<0.002
Manganese	TOT	µg/L	0.124	0.0077	0.0502	0.0096	0.0057	0.0056	0.0322	<0.005
Manganese-D	DIS	µg/L	0.215	0.218	0.284	0.268	0.214	0.29	0.17	0.253
Mercury	TOT	µg/L	<0.5	<0.5	1.08	<0.5	0.61	<0.5	1.57	0.62
Mercury-D	DIS	µg/L	0.303	0.296	0.384	0.254	0.29	0.263	0.327	0.354
Methyl Mercury	TOT	ng/L	0.32	<0.2	0.68	0.32	0.6	0.22	0.32	0.45

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Molybdenum	TOT	µg/L	36.1	41.8	38.1	46.9	116	35.9	14.8	37.8
Molybdenum-D	DIS	µg/L	163	179	206	215	189	214	134	110
Monobutyltin	TOT	µg/L	0.24	0.12	0.72	0.14	---	---	---	<0.1
Monobutyltin Trichloride	TOT	µg/L	0.156	0.026	0.151	0.0216	0.128	0.0183	0.244	0.012
Nickel	TOT	µg/L	1.01	0.27	1.87	1.61	1.07	0.7	4.02	0.35
Nickel-D	DIS	µg/L	3670	3810	3270	3210	2590	2690	2840	3550
Phosphorus	TOT	µg/L	0.465	0.291	0.511	0.366	0.488	0.35	0.599	0.253
Phosphorus-D	DIS	µg/L	0.328	0.212	0.252	0.268	0.213	0.295	0.245	0.23
Potassium	TOT	mg/L	49.3	8.34	37.3	11.3	45.6	8.81	60.9	4.73
Potassium-D	DIS	mg/L	0.384	0.283	0.379	0.245	0.356	0.258	0.468	0.327
Selenium	TOT	µg/L	537	91.5	1010	105	461	99.5	464	71.4
Selenium-D	DIS	µg/L	23.8	10.7	35.7	11.6	169	11.4	28.8	9.61
Silicon-D	DIS	µg/L	0.186	0.149	0.333	0.202	0.102	0.0911	0.348	0.124
Silver	TOT	µg/L	32.5	25.8	32.9	26.8	43.3	32.9	45.6	23.4
Silver-D	DIS	µg/L	0.557	0.255	0.7	0.389	1.68	0.302	0.43	0.157
Sodium-D	DIS	mg/L	0.63	0.48	1.06	0.55	0.59	0.65	0.86	0.36
Strontium-D	DIS	µg/L	184	19.6	165	16.8	148	17.5	258	15.7
Sulfur-D	DIS	mg/L	1.45	0.321	1.65	0.427	1.52	0.37	5.93	0.172
Thallium	TOT	µg/L	0.041	<0.03	0.0313	0.0037	0.0641	0.0046	0.0952	<0.0019
Thallium-D	DIS	µg/L	2.03	0.43	1	0.47	1.05	0.59	0.89	0.34
Tin	TOT	µg/L	1.33	2.08	1.12	1.03	0.797	0.783	8.64	6.47
Tin-D	DIS	µg/L	3580	3720	4710	5040	5140	4600	5990	3030
Titanium-D	DIS	µg/L	0.241	0.141	0.219	0.172	0.229	0.18	0.165	0.141
Tributyltin	TOT	µg/L	3.83	1.68	3.21	2.49	3.05	2.67	4.88	1.5
Tributyltin Chloride	TOT	µg/L	0.416	0.012	0.034	0.019	0.101	0.017	0.077	<0.01
Uranium-D	DIS	µg/L	10.3	11.9	11.1	12.1	10	13.1	8.2	14
Vanadium-D	DIS	µg/L	6230	3870	6100	5010	7260	4900	7100	2910
Zinc	TOT	µg/L	93.1	42.1	106	48.6	114	39.5	163	36.3
Zinc-D	DIS	µg/L	0.316	0.14	0.258	0.152	0.221	0.145	0.318	0.13
Zirconium-D	DIS	µg/L	<0.0099	<0.0099	<0.005	<0.0099	<0.005	<0.005	<0.0099	<0.00099
1,1,1,2-Tetrachloroethane	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	TOT	µg/L	---	---	<2	<2	<2	<2	<2	<2
Nitrobenzene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	0.38	<0.25	<0.25
N-nitrosodimethylamine	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
N-Nitrosodi-N-Propylamine	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Benzene	TOT	µg/L	---	---	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Ethylbenzene	TOT	µg/L	---	---	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Toluene	TOT	µg/L	---	---	1.1	<0.4	2.6	0.7	1.3	<0.4

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Xylenes	TOT	µg/L	---	---	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,2,3,4-Tetrachlorobenzene	TOT	ng/L	---	---	---	0.059	---	-999	---	0.031
1,3,5-Trichlorobenzene	TOT	ng/L	---	---	---	0.051	---	-999	---	0.045
1,4-Dioxane	TOT	µg/L	---	---	<1.2	0.25	<1	<0.14	<1.6	<0.1
1,7-Dimethylxanthine	TOT	ng/L	---	---	37600	1440	35600	119	41300	79
37CL-2,3,7,8-TCDD	TOT	%Recov	---	---	75.6	71.5	90.4	83.3	76.6	74.2
Acrolein	TOT	µg/L	---	---	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8
Acrylonitrile	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Delta-Hch Or Delta-Bhc	TOT	ng/L	---	---	---	<0.0124	---	<0.0652	---	<0.0235
Dibromomethane	TOT	µg/L	---	---	<2	<2	<2	<2	<0.9	<0.9
N-nitrosodiphenylamine	TOT	µg/L	---	---	---	---	---	---	<1	<1
Pentachlorobenzene	TOT	ng/L	---	---	---	0.077	---	-999	---	0.042
Perfluorobutanoic acid	TOT	ng/L	---	---	6.32	10.4	11.6	47.2	<6.39	5.06
Tetrachloromethane	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trans-Chlordane	TOT	ng/L	---	---	---	0.034	---	<0.0652	---	0.02
Trans-Nonachlor	TOT	ng/L	---	---	---	0.021	---	<0.0652	---	0.015
Tribromomethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Trichloromethane	TOT	µg/L	---	---	3.4	1.5	2.7	1.1	2.5	<1
1,2-diphenylhydrazine	TOT	µg/L	---	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4-dinitrotoluene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2,6-dinitrotoluene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
3,3-dichlorobenzidine	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Bromophenyl Phenyl Ether	TOT	µg/L	---	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4-Chlorophenyl Phenyl Ether	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Hexachlorocyclopentadiene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Hexachloroethane	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Alpha-Terpineol	TOT	µg/L	---	---	13.6	<5	12.1	<5	9.3	<5
1,1,1-trichloroethane	TOT	µg/L	---	---	<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	<0.5
1,1,2-trichloroethane	TOT	µg/L	---	---	<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
1,1-dichloroethene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,3-Trichlorobenzene	TOT	ng/L	---	---	---	0.092	---	-999	---	0.036
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	TOT	ng/L	---	---	---	0.038	---	-999	---	0.027
1,2,4-trichlorobenzene	TOT	µg/L	---	---	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-trichlorobenzene	TOT	ng/L	---	---	---	0.252	---	-999	---	0.104
1,2-dibromoethane	TOT	µg/L	---	---	<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

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
1,2-dichlorobenzene	TOT	ng/L	---	---	---	0.346	---	-999	---	0.306
1,2-dichloroethane	TOT	µg/L	---	---	<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
1,3-dichlorobenzene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-dichlorobenzene	TOT	ng/L	---	---	---	0.228	---	-999	---	0.189
1,4-dichlorobenzene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-dichlorobenzene	TOT	ng/L	---	---	---	23	---	-999	---	10.7
Bromodichloromethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Bromomethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Chlorobenzene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorodibromomethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Chloroethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Chloroethene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Cis-1,2-Dichloroethene	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Cis-1,3-dichloropropene	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Dichloromethane	TOT	µg/L	---	---	---	---	---	---	<2	<2
Hexachlorobutadiene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Hexachlorobutadiene	TOT	ng/L	---	---	---	0.568	---	-999	---	0.103
M & P Xylenes	TOT	µg/L	---	---	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Methyl Ethyl Ketone	TOT	µg/L	---	---	<50	<50	<50	<50	<50	<50
Methyl Tertiary Butyl Ether	TOT	µg/L	---	---	<4	<4	<4	<4	<4	<4
O-Xylene	TOT	µg/L	---	---	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Styrene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trans-1,2-Dichloroethene	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Trans-1,3-Dichloropropene	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Trichloroethene	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	TOT	µg/L	---	---	<4	<4	<4	<4	<4	<4
17 beta-Estradiol 3-benzoate	TOT	ng/L	---	---	<3.2	<0.812	<0.96	<0.878	<2.94	<0.819
Allyl Trenbolone	TOT	ng/L	---	---	<1.71	<0.406	<3.59	<0.439	<1.47	<0.409
Androstenedione	TOT	ng/L	---	---	250	5.48	274	5.64	291	4.48
Androsterone	TOT	ng/L	---	---	-999	<94.8	<86.2	<28.8	<73.4	<38.4
Desogestrel	TOT	ng/L	---	---	<178	<42.2	<92.9	<91.3	<306	<85.2
Mestranol	TOT	ng/L	---	---	<242	<34	<77.9	<22	<191	<20.5
Norethindrone	TOT	ng/L	---	---	<4.44	<1.35	<3	<1.1	<3.67	<1.02
Norgestrel	TOT	ng/L	---	---	<44.6	<2.57	34.4	<1.1	<17.3	<1.04
Progesterone	TOT	ng/L	---	---	12.8	1.06	61.8	0.7	21	<0.409

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Testosterone	TOT	ng/L	---	---	105	<0.521	55	0.53	77.2	<0.409
Total Phenols	TOT	mg/L	---	---	0.058	0.0031	0.063	0.0032	0.05	0.002
2,4 + 2,5 Dichlorophenol	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Tribromophenol	TOT	%	---	---	95	90	133	113	89	84
2-Chlorophenol	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Chloro-3-Methylphenol	TOT	µg/L	---	---	<1	<1	<1	<1	<1	<1
Pentachlorophenol	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol	TOT	µg/L	---	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
2,4-dinitrophenol	TOT	µg/L	---	---	<6.5	<6.5	<6.5	<6.5	7.6	<6.5
2-Methyl-4,6-Dinitrophenol	TOT	µg/L	---	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
2-Nitrophenol	TOT	µg/L	---	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Phenol	TOT	µg/L	---	---	18.8	<2.5	21.6	<2.5	13.2	<2.5
2,4,6-trichlorophenol	TOT	µg/L	---	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Conductivity	TOT	µS/cm	---	---	860	620	1100	960	930	700
17 alpha-Dihydroequilin	TOT	ng/L	---	---	<8.01	<2.03	<3.46	<2.2	<7.34	<2.05
17 alpha-Estradiol	TOT	ng/L	---	---	<32	<8.12	<16.4	<8.78	<29.4	<8.19
17 alpha-Ethinyl-Estradiol	TOT	ng/L	---	---	<20	<5.08	<5.49	<5.49	<18.4	<5.12
17 beta-Estradiol	TOT	ng/L	---	---	20.8	<4.06	12.2	5.28	<14.7	<4.09
Equilenin	TOT	ng/L	---	---	<2.06	<0.585	<0.439	<0.439	<1.47	<0.517
Equilin	TOT	ng/L	---	---	<8.01	<2.03	<2.2	<2.2	<7.34	<2.05
Estriol	TOT	ng/L	---	---	214	<10.5	208	<9.93	268	<9.5
Estrone	TOT	ng/L	---	---	47.3	17.1	48.2	62	65.6	11.4
4-Nitrophenol	TOT	µg/L	---	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
4-n-Octylphenol	TOT	ng/L	---	---	<5.76	1.48	<35.5	<11.9	<5.92	<2.36
4-Nonylphenol Diethoxylates	TOT	ng/L	---	---	637	90.5	1950	662	932	85.6
4-Nonylphenol Monoethoxylates	TOT	ng/L	---	---	3260	349	32300	1980	4550	103
Np	TOT	ng/L	---	---	1820	29.4	626	120	1060	113
1-Methylphenanthrene	TOT	ng/L	---	---	10.7	0.954	13.5	0.845	13.6	0.477
2,3,5-trimethylnaphthalene	TOT	ng/L	---	---	36.4	3.58	43.6	3.53	20.6	0.825
2,6-dimethylnaphthalene	TOT	ng/L	---	---	23.2	1.63	41.9	0.919	16.4	<1.16
2-Chloronaphthalene	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2-Methylnaphthalene	TOT	µg/L	---	---	0.15	<0.01	0.07	<0.01	0.28	<0.01
2-Methylnaphthalene	TOT	ng/L	---	---	35.4	5.28	23.9	1.99	32.2	2.94
Acenaphthene	TOT	µg/L	---	---	0.14	<0.01	0.041	<0.01	0.1	0.011
Acenaphthene	TOT	ng/L	---	---	44.8	7.93	41.6	6.15	103	9.23
Acenaphthylene	TOT	µg/L	---	---	0.21	<0.01	0.011	<0.01	0.015	<0.01
Acenaphthylene	TOT	ng/L	---	---	1.04	0.296	0.764	0.329	0.957	0.285
Anthracene	TOT	µg/L	---	---	<0.01	<0.01	<0.01	<0.01	0.037	<0.01

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Anthracene	TOT	ng/L	---	---	3.3	<0.135	3.3	<0.24	4.65	<0.993
Benzo(B)Fluoranthene + Benzo(J)Fluoranthene	TOT	µg/L	---	---	<0.01	<0.01	<0.01	<0.01	0.051	<0.01
Benzo(K)Fluoranthene	TOT	µg/L	---	---	0.016	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[a]anthracene	TOT	µg/L	---	---	<0.01	<0.01	<0.01	<0.01	0.011	<0.01
Benzo[a]anthracene	TOT	ng/L	---	---	3.7	0.485	4.21	<0.0813	4.91	<0.109
Benzo[a]pyrene	TOT	µg/L	---	---	0.039	<0.005	<0.005	<0.005	0.047	<0.005
Benzo[a]pyrene	TOT	ng/L	---	---	2.25	<0.23	1.83	<0.169	2.93	<0.496
Benzo[b]fluoranthene	TOT	µg/L	---	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo[b]fluoranthene	TOT	ng/L	---	---	2.81	<0.147	3.62	0.505	4.06	<0.213
Benzo[e]pyrene	TOT	ng/L	---	---	2.76	0.302	4.97	<0.159	3.84	<0.506
Benzo[ghi]perylene	TOT	µg/L	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo[ghi]perylene	TOT	ng/L	---	---	3.21	0.223	1.77	<0.245	3.64	<0.277
Benzo[J,K]Fluoranthenes	TOT	ng/L	---	---	2.58	<0.16	2.21	<0.11	3.12	<0.423
Chrysene	TOT	µg/L	---	---	0.021	<0.01	<0.01	<0.01	0.037	<0.01
Chrysene	TOT	ng/L	---	---	7.05	0.758	13.5	0.521	11.4	0.326
dibenzo(a,h)anthracene	TOT	µg/L	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
dibenzo(a,h)anthracene	TOT	ng/L	---	---	<0.31	<0.259	3.57	<0.339	0.579	<0.156
Dibenzothiophene	TOT	ng/L	---	---	22.3	1.49	32.2	1.77	43	1.17
Fluoranthene	TOT	µg/L	---	---	0.036	<0.01	0.05	<0.01	0.12	<0.01
Fluoranthene	TOT	ng/L	---	---	48.1	9.43	56.9	7.58	105	4.79
Fluorene	TOT	µg/L	---	---	0.049	<0.01	<0.01	<0.01	0.31	0.028
Fluorene	TOT	ng/L	---	---	31.7	2.45	35.1	2.29	65.7	<0.297
High Molecular Weight PAH`s	TOT	µg/L	---	---	0.15	<0.02	0.098	<0.02	0.33	<0.02
Indeno(1,2,3-C,D)Pyrene	TOT	µg/L	---	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Indeno(1,2,3-C,D)Pyrene	TOT	ng/L	---	---	2.49	<0.186	5.75	<0.255	2.45	<0.249
Low Molecular Weight PAH`s	TOT	µg/L	---	---	0.82	<0.05	0.37	<0.05	1.2	0.077
Naphthalene	TOT	µg/L	---	---	0.12	<0.01	0.078	0.018	0.13	0.012
Naphthalene	TOT	ng/L	---	---	251	8.66	60.7	4.2	113	5.24
Perylene	TOT	ng/L	---	---	0.66	<0.228	<0.442	<0.169	1.14	<0.564
Phenanthrene	TOT	µg/L	---	---	0.12	<0.01	0.15	0.012	0.31	0.026
Phenanthrene	TOT	ng/L	---	---	157	9.51	194	11	355	13.6
Pyrene	TOT	µg/L	---	---	0.035	<0.01	0.048	<0.01	0.068	<0.01
Pyrene	TOT	ng/L	---	---	27	3.21	32.4	3.51	46.6	2.05
Total PAH	TOT	µg/L	---	---	0.97	<0.05	0.47	<0.05	1.5	0.077
PBDE 10	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 100	TOT	pg/L	---	---	---	522	---	237	---	98.9
PBDE 105	TOT	pg/L	---	---	---	<1.94	---	<1.47	---	<1.47

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PBDE 116	TOT	pg/L	---	---	---	<2.79	---	<1.47	---	6.5
PBDE 119/120	TOT	pg/L	---	---	---	6.24	---	3.14	---	1.99
PBDE 12/13	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 126	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 128	TOT	pg/L	---	---	---	<4.02	---	<2.53	---	<1.68
PBDE 138/166	TOT	pg/L	---	---	---	23.3	---	11.4	---	3.57
PBDE 140	TOT	pg/L	---	---	---	9.3	---	3.58	---	1.14
PBDE 15	TOT	pg/L	---	---	---	3.74	---	2.09	---	<1.12
PBDE 153	TOT	pg/L	---	---	---	255	---	96.3	---	40.7
PBDE 154	TOT	pg/L	---	---	---	217	---	77.3	---	34.6
PBDE 155	TOT	pg/L	---	---	---	14.7	---	6.15	---	3.32
PBDE 17/25	TOT	pg/L	---	---	---	26.3	---	13.1	---	12.9
PBDE 181	TOT	pg/L	---	---	---	<1.69	---	<1.47	---	<1.62
PBDE 183	TOT	pg/L	---	---	---	32.4	---	13.9	---	5.82
PBDE 190	TOT	pg/L	---	---	---	<2.84	---	<2.53	---	<2.9
PBDE 203	TOT	pg/L	---	---	---	24.8	---	14	---	5.78
PBDE 206	TOT	pg/L	---	---	---	164	---	126	---	30.4
PBDE 207	TOT	pg/L	---	---	---	217	---	163	---	55.6
PBDE 208	TOT	pg/L	---	---	---	129	---	105	---	<30.4
PBDE 209	TOT	pg/L	---	---	---	2920	---	1090	---	1280
PBDE 28/33	TOT	pg/L	---	---	---	52.1	---	26.5	---	9.99
PBDE 30	TOT	pg/L	---	---	---	<2.69	---	<1.47	---	<1.12
PBDE 32	TOT	pg/L	---	---	---	<1.96	---	<1.47	---	<1.12
PBDE 35	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 37	TOT	pg/L	---	---	---	1.87	---	<1.47	---	<1.12
PBDE 47	TOT	pg/L	---	---	---	3130	---	1330	---	576
PBDE 49	TOT	pg/L	---	---	---	68	---	29.6	---	12.7
PBDE 51	TOT	pg/L	---	---	---	9.29	---	4.44	---	2.09
PBDE 66	TOT	pg/L	---	---	---	45.8	---	24.7	---	12.9
PBDE 7	TOT	pg/L	---	---	---	1.86	---	1.8	---	1.89
PBDE 71	TOT	pg/L	---	---	---	9.93	---	3.66	---	4.42
PBDE 75	TOT	pg/L	---	---	---	4.19	---	2.04	---	<1.21
PBDE 77	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 79	TOT	pg/L	---	---	---	1.94	---	<1.47	---	4.14
PBDE 8/11	TOT	pg/L	---	---	---	<1.55	---	<1.47	---	<1.12
PBDE 85	TOT	pg/L	---	---	---	97.7	---	41.9	---	13.7
PBDE 99	TOT	pg/L	---	---	---	2760	---	1130	---	465
Decachloro Biphenyl	TOT	pg/L	---	---	---	2.18	---	2	---	<-999

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PCB	TOT	pg/L	---	---	---	4.48	---	5.77	---	4.8
PCB 10	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	0.295
PCB 103	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.554
PCB 104	TOT	pg/L	---	---	---	<0.311	---	0.765	---	<0.273
PCB 105	TOT	pg/L	---	---	---	8.14	---	4.54	---	3.56
PCB 106	TOT	pg/L	---	---	---	<0.311	---	<0.364	---	<0.66
PCB 107	TOT	pg/L	---	---	---	1.68	---	0.636	---	<0.6
PCB 11	TOT	pg/L	---	---	---	106	---	76.3	---	40.5
PCB 110/115	TOT	pg/L	---	---	---	33.6	---	18.3	---	9.71
PCB 111	TOT	pg/L	---	---	---	<0.311	---	3.2	---	1.26
PCB 112	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.443
PCB 114	TOT	pg/L	---	---	---	0.865	---	0.779	---	<0.772
PCB 118	TOT	pg/L	---	---	---	21	---	9.86	---	7.16
PCB 12/13	TOT	pg/L	---	---	---	4.07	---	2.17	---	1.11
PCB 120	TOT	pg/L	---	---	---	<0.311	---	<0.357	---	<0.836
PCB 121	TOT	pg/L	---	---	---	0.323	---	<0.294	---	<0.533
PCB 122	TOT	pg/L	---	---	---	0.36	---	<0.348	---	<0.734
PCB 123	TOT	pg/L	---	---	---	0.375	---	0.483	---	<0.701
PCB 126	TOT	pg/L	---	---	---	<0.311	---	<0.553	---	<1.09
PCB 127	TOT	pg/L	---	---	---	<0.311	---	<0.583	---	<1.01
PCB 128/166	TOT	pg/L	---	---	---	3.33	---	2.39	---	1.16
PCB 129/138/160/163	TOT	pg/L	---	---	---	26.8	---	14.3	---	9.94
PCB 130	TOT	pg/L	---	---	---	1.7	---	0.885	---	<0.589
PCB 131	TOT	pg/L	---	---	---	0.504	---	1.52	---	<0.592
PCB 132	TOT	pg/L	---	---	---	7.5	---	3.61	---	2.22
PCB 133	TOT	pg/L	---	---	---	0.648	---	1.37	---	<0.646
PCB 134/143	TOT	pg/L	---	---	---	1.15	---	0.555	---	<0.584
PCB 135/151/154	TOT	pg/L	---	---	---	7.73	---	4.59	---	2.39
PCB 136	TOT	pg/L	---	---	---	3	---	1.57	---	0.92
PCB 137	TOT	pg/L	---	---	---	1.18	---	0.769	---	<0.633
PCB 139/140	TOT	pg/L	---	---	---	0.756	---	0.508	---	<0.556
PCB 14	TOT	pg/L	---	---	---	1.25	---	0.777	---	0.703
PCB 141	TOT	pg/L	---	---	---	3.78	---	1.87	---	1.39
PCB 142	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.606
PCB 144	TOT	pg/L	---	---	---	1.2	---	0.651	---	<0.517
PCB 145	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.439
PCB 146	TOT	pg/L	---	---	---	3.89	---	2.11	---	0.89
PCB 147/149	TOT	pg/L	---	---	---	17.2	---	7.71	---	5.13

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PCB 148	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.513
PCB 15	TOT	pg/L	---	---	---	7.19	---	8.09	---	3.31
PCB 150	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.459
PCB 152	TOT	pg/L	---	---	---	5.74	---	5.73	---	3.57
PCB 153/168	TOT	pg/L	---	---	---	23.9	---	13.8	---	9.32
PCB 155	TOT	pg/L	---	---	---	3.04	---	2.45	---	0.974
PCB 155L	TOT	%Recov	---	---	---	54.4	---	54	---	50.9
PCB 156157	TOT	pg/L	---	---	---	3.1	---	2.49	---	1.04
PCB 158	TOT	pg/L	---	---	---	2.18	---	1.07	---	<0.591
PCB 159	TOT	pg/L	---	---	---	0.817	---	<0.357	---	3.6
PCB 16	TOT	pg/L	---	---	---	9.56	---	14.2	---	5.75
PCB 161	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.601
PCB 162	TOT	pg/L	---	---	---	0.325	---	<0.331	---	<0.684
PCB 164	TOT	pg/L	---	---	---	1.35	---	1.1	---	<0.492
PCB 165	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.629
PCB 167	TOT	pg/L	---	---	---	0.896	---	0.464	---	1.33
PCB 169	TOT	pg/L	---	---	---	<0.311	---	<0.38	---	<0.915
PCB 17	TOT	pg/L	---	---	---	7.55	---	9.48	---	3.5
PCB 170	TOT	pg/L	---	---	---	4.43	---	2.79	---	1.83
PCB 171/173	TOT	pg/L	---	---	---	1.23	---	0.677	---	<0.656
PCB 172	TOT	pg/L	---	---	---	0.885	---	0.728	---	<0.74
PCB 175	TOT	pg/L	---	---	---	<0.311	---	<0.353	---	<0.698
PCB 176	TOT	pg/L	---	---	---	0.623	---	0.432	---	<0.652
PCB 177	TOT	pg/L	---	---	---	2.24	---	1.23	---	0.89
PCB 178	TOT	pg/L	---	---	---	1.28	---	1	---	<0.771
PCB 179	TOT	pg/L	---	---	---	2.02	---	0.783	---	<0.664
PCB 18/30	TOT	pg/L	---	---	---	22.3	---	20.1	---	31.9
PCB 180/193	TOT	pg/L	---	---	---	13.1	---	7.57	---	5.24
PCB 181	TOT	pg/L	---	---	---	<0.311	---	2.65	---	1.86
PCB 182	TOT	pg/L	---	---	---	<0.311	---	<0.346	---	<0.638
PCB 183/185	TOT	pg/L	---	---	---	2.88	---	2.96	---	0.952
PCB 184	TOT	pg/L	---	---	---	4.75	---	1.98	---	0.939
PCB 186	TOT	pg/L	---	---	---	<0.311	---	<0.312	---	<0.639
PCB 187	TOT	pg/L	---	---	---	5.95	---	4.17	---	2.03
PCB 188	TOT	pg/L	---	---	---	<0.311	---	1.58	---	0.776
PCB 189	TOT	pg/L	---	---	---	<0.311	---	<0.46	---	<1.26
PCB 19	TOT	pg/L	---	---	---	2.06	---	3.08	---	1.29
PCB 190	TOT	pg/L	---	---	---	1.07	---	2.93	---	<0.829

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PCB 191	TOT	pg/L	---	---	---	<0.311	---	<0.421	---	<0.774
PCB 192	TOT	pg/L	---	---	---	<0.311	---	<0.425	---	<0.783
PCB 194	TOT	pg/L	---	---	---	3.81	---	2.96	---	<0.977
PCB 195	TOT	pg/L	---	---	---	0.867	---	<0.588	---	<0.454
PCB 196	TOT	pg/L	---	---	---	1.21	---	1.24	---	<0.46
PCB 197/200	TOT	pg/L	---	---	---	0.691	---	0.409	---	<0.775
PCB 198/199	TOT	pg/L	---	---	---	2.56	---	1.73	---	1.43
PCB 2	TOT	pg/L	---	---	---	1.55	---	3.97	---	2.36
PCB 20/28	TOT	pg/L	---	---	---	30.6	---	22.6	---	12.9
PCB 201	TOT	pg/L	---	---	---	<0.311	---	<0.435	---	<0.752
PCB 202	TOT	pg/L	---	---	---	0.953	---	0.775	---	<0.43
PCB 203	TOT	pg/L	---	---	---	1.86	---	0.978	---	<0.868
PCB 204	TOT	pg/L	---	---	---	<0.311	---	<0.451	---	<0.46
PCB 205	TOT	pg/L	---	---	---	<0.311	---	<0.668	---	<1.18
PCB 206	TOT	pg/L	---	---	---	1.28	---	1.02	---	<1.11
PCB 207	TOT	pg/L	---	---	---	<0.311	---	<0.427	---	<0.566
PCB 208	TOT	pg/L	---	---	---	0.58	---	0.946	---	<1.25
PCB 209	TOT	pg/L	---	---	---	2.18	---	2	---	<1.26
PCB 21/33	TOT	pg/L	---	---	---	19.4	---	6.75	---	2.31
PCB 22	TOT	pg/L	---	---	---	15.3	---	11.3	---	3.55
PCB 23	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	0.842
PCB 24	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.273
PCB 25	TOT	pg/L	---	---	---	2.9	---	2.85	---	1.45
PCB 26/29	TOT	pg/L	---	---	---	6.04	---	4.06	---	2.67
PCB 27	TOT	pg/L	---	---	---	1.39	---	1.07	---	1.13
PCB 3	TOT	pg/L	---	---	---	2.47	---	5.79	---	3.62
PCB 31	TOT	pg/L	---	---	---	32.9	---	21.3	---	9.67
PCB 32	TOT	pg/L	---	---	---	5.85	---	5.16	---	2.12
PCB 34	TOT	pg/L	---	---	---	1.65	---	<0.294	---	11.4
PCB 35	TOT	pg/L	---	---	---	4.24	---	2.86	---	0.781
PCB 36	TOT	pg/L	---	---	---	2.01	---	<0.294	---	<0.404
PCB 37	TOT	pg/L	---	---	---	7.12	---	6.23	---	2.6
PCB 38	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	5.12
PCB 4	TOT	pg/L	---	---	---	6.68	---	7.06	---	4.32
PCB 40/41/71	TOT	pg/L	---	---	---	12.5	---	7.76	---	3.39
PCB 42	TOT	pg/L	---	---	---	6.63	---	3.87	---	1.68
PCB 43	TOT	pg/L	---	---	---	0.959	---	0.414	---	<0.33
PCB 44/47/65	TOT	pg/L	---	---	---	45.9	---	268	---	20.4

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PCB 46	TOT	pg/L	---	---	---	1.21	---	1.42	---	0.457
PCB 48	TOT	pg/L	---	---	---	5.06	---	2.94	---	1.38
PCB 49/69	TOT	pg/L	---	---	---	17.9	---	13.1	---	5.11
PCB 5	TOT	pg/L	---	---	---	1.3	---	0.965	---	1.59
PCB 50/53	TOT	pg/L	---	---	---	2.7	---	2.49	---	1.03
PCB 52	TOT	pg/L	---	---	---	42.9	---	20.6	---	13
PCB 54	TOT	pg/L	---	---	---	<0.311	---	0.6	---	<0.328
PCB 55	TOT	pg/L	---	---	---	0.525	---	0.532	---	<0.499
PCB 56	TOT	pg/L	---	---	---	10	---	5.69	---	3.49
PCB 57	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.465
PCB 58	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.422
PCB 59/62/75	TOT	pg/L	---	---	---	2.46	---	1.07	---	0.828
PCB 6	TOT	pg/L	---	---	---	4.68	---	3.19	---	1.64
PCB 60	TOT	pg/L	---	---	---	6.14	---	3.47	---	1.96
PCB 61/70/74/76	TOT	pg/L	---	---	---	45.7	---	19.3	---	9.24
PCB 63	TOT	pg/L	---	---	---	1.78	---	2.87	---	<0.576
PCB 64	TOT	pg/L	---	---	---	12.3	---	7.15	---	4.54
PCB 66	TOT	pg/L	---	---	---	31.2	---	10.7	---	13.5
PCB 67	TOT	pg/L	---	---	---	0.854	---	0.346	---	<0.481
PCB 68	TOT	pg/L	---	---	---	2.89	---	26.5	---	1.86
PCB 7	TOT	pg/L	---	---	---	4.43	---	8.44	---	11.8
PCB 72	TOT	pg/L	---	---	---	0.369	---	<0.294	---	<0.471
PCB 73	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.306
PCB 77	TOT	pg/L	---	---	---	1.7	---	1.88	---	0.81
PCB 78	TOT	pg/L	---	---	---	<0.311	---	<0.316	---	<0.703
PCB 79	TOT	pg/L	---	---	---	12.5	---	<0.355	---	<0.747
PCB 8	TOT	pg/L	---	---	---	11.3	---	5.33	---	2.36
PCB 80	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.55
PCB 81	TOT	pg/L	---	---	---	<0.311	---	0.529	---	2.8
PCB 82	TOT	pg/L	---	---	---	3.43	---	1.81	---	0.764
PCB 83/99	TOT	pg/L	---	---	---	14.9	---	6.66	---	6.83
PCB 84	TOT	pg/L	---	---	---	7.31	---	4.72	---	2.2
PCB 85/116/117	TOT	pg/L	---	---	---	5.92	---	3.18	---	3.06
PCB 86/87/97/108/119/125	TOT	pg/L	---	---	---	122	---	12.1	---	82.3
PCB 88/91	TOT	pg/L	---	---	---	4	---	2.02	---	2.81
PCB 89	TOT	pg/L	---	---	---	0.523	---	<0.294	---	<0.495
PCB 9	TOT	pg/L	---	---	---	5.83	---	6.01	---	2.7
PCB 90/101/113	TOT	pg/L	---	---	---	32.7	---	15.6	---	16.8

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
PCB 92	TOT	pg/L	---	---	---	5.26	---	2.72	---	2.64
PCB 93/95/98/100/102	TOT	pg/L	---	---	---	25.5	---	14.3	---	7.61
PCB 94	TOT	pg/L	---	---	---	<0.311	---	0.317	---	<0.469
PCB 96	TOT	pg/L	---	---	---	<0.311	---	<0.294	---	<0.273
PCB-108 + 124	TOT	pg/L	---	---	---	0.873	---	<0.359	---	<0.635
PCB174	TOT	pg/L	---	---	---	74	---	2.23	---	41.9
PCB-205L	TOT	%Recov	---	---	---	70.4	---	80.8	---	202
PCB39	TOT	pg/L	---	---	---	1.32	---	3.83	---	0.922
PCB45/51	TOT	pg/L	---	---	---	5.94	---	72.3	---	3.25
Dichloro Biphenyls	TOT	pg/L	---	---	---	143	---	109	---	49.7
Heptachloro Biphenyls	TOT	pg/L	---	---	---	39.4	---	21.9	---	7.27
Hexachloro Biphenyls	TOT	pg/L	---	---	---	114	---	56.6	---	38.1
Monochloro Biphenyls	TOT	pg/L	---	---	---	6.95	---	9.74	---	<-999
Nonachloro Biphenyls	TOT	pg/L	---	---	---	1.28	---	1.97	---	<-999
Octachloro Biphenyls	TOT	pg/L	---	---	---	11.3	---	8.09	---	1.43
Pentachloro Biphenyls	TOT	pg/L	---	---	---	165	---	97.4	---	30.2
Tetrachloro Biphenyls	TOT	pg/L	---	---	---	219	---	469	---	64.3
Trichloro Biphenyls	TOT	pg/L	---	---	---	160	---	131	---	16.3
PCB Teq 3	TOT	pg/L	---	---	0.269	0.0197	0.455	0.0282	0.211	0.0237
PCB Teq 4	TOT	pg/L	---	---	0.591	0.387	0.79	0.435	0.561	0.383
PCBs Total	TOT	pg/L	---	---	---	863	---	906	---	207
1,2,3,4,6,7,8-HPCDD	TOT	pg/L	---	---	12.2	0.73	21.4	0.722	12.3	0.919
1,2,3,4,6,7,8-HPCDF	TOT	pg/L	---	---	1.43	0.237	1.34	0.289	0.932	0.217
1,2,3,4,7,8,9-HPCDF	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
1,2,3,4,7,8-HXCDD	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
1,2,3,4,7,8-HXCDF	TOT	pg/L	---	---	<0.21	<0.221	0.236	<0.246	<0.218	<0.217
1,2,3,6,7,8-HXCDD	TOT	pg/L	---	---	0.731	<0.221	1.08	<0.246	0.584	<0.217
1,2,3,6,7,8-HXCDF	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
1,2,3,7,8,9-HXCDD	TOT	pg/L	---	---	0.324	<0.221	0.406	<0.246	<0.218	<0.217
1,2,3,7,8,9-HXCDF	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
1,2,3,7,8-PECDD	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
1,2,3,7,8-PECDF	TOT	pg/L	---	---	0.36	0.235	0.343	0.355	0.286	0.24
2,3,4,6,7,8-HXCDF	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
2,3,4,7,8-PECDF	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
2,3,7,8-TCDD	TOT	pg/L	---	---	<0.21	<0.221	<0.23	<0.246	<0.218	<0.217
2,3,7,8-TCDF	TOT	pg/L	---	---	0.215	<0.221	0.292	<0.246	<0.218	<0.217
HEPTA-DIOXINS	TOT	pg/L	---	---	21.3	1.38	34.3	1.21	21	1.44
Hepta-Furans	TOT	pg/L	---	---	2.62	<0.221	2.49	0.289	1.83	0.217

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
HEXA-DIOXINS	TOT	pg/L	---	---	5.64	<0.221	8.83	<0.246	4.13	<0.217
HEXA-FURANS	TOT	pg/L	---	---	0.903	<0.221	1.53	<0.246	<0.218	<0.217
OCDD	TOT	pg/L	---	---	59.7	6.12	92.2	2.84	54.9	3.24
OCDF	TOT	pg/L	---	---	1.77	<0.221	2.29	0.283	1.44	0.26
Penta-Dioxins	TOT	pg/L	---	---	1.02	<0.221	2.77	<0.246	0.956	<0.217
Penta-Furans	TOT	pg/L	---	---	0.93	0.235	1.5	0.355	0.286	0.24
Tetra-Dioxins	TOT	pg/L	---	---	0.319	<0.221	1.06	<0.246	0.295	<0.217
Tetra-Furans	TOT	pg/L	---	---	0.413	<0.221	5.79	1	0.269	<0.217
2,4-DDD	TOT	ng/L	---	---	---	0.314	---	0.184	---	0.132
2,4-DDE	TOT	ng/L	---	---	---	0.006	---	<0.0652	---	<0.0111
2,4-DDT	TOT	ng/L	---	---	---	0.019	---	0.134	---	0.044
4,4-DDD	TOT	ng/L	---	---	---	0.035	---	<0.0652	---	0.027
4,4-DDE	TOT	ng/L	---	---	---	0.108	---	<0.0652	---	0.076
4,4-DDT	TOT	ng/L	---	---	---	0.025	---	<0.0652	---	<0.0177
ABHC	TOT	ng/L	---	---	---	0.018	---	<0.0652	---	0.09
Aldrin	TOT	ng/L	---	---	---	0.071	---	0.067	---	0.042
Alpha Chlordane	TOT	ng/L	---	---	---	0.029	---	<0.0652	---	0.013
Alpha-Endosulfan	TOT	ng/L	---	---	---	<0.0091	---	<0.0652	---	0.012
Beta-Endosulfan	TOT	ng/L	---	---	---	<0.032	---	<0.0652	---	<0.0111
Beta-Hch Or Beta-Bhc	TOT	ng/L	---	---	---	0.073	---	<0.0652	---	0.073
Bis(2-Chloroethoxy)Methane	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Bis(2-Chloroethyl)Ether	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Bis(2-Chloroisopropyl)Ether	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Cis-Nonachlor	TOT	ng/L	---	---	---	0.014	---	<0.0652	---	<0.0111
Dieldrin	TOT	ng/L	---	---	---	0.141	---	0.113	---	0.109
Endosulfan Sulfate	TOT	ng/L	---	---	---	0.012	---	<0.0652	---	0.026
Endrin	TOT	ng/L	---	---	---	<0.0281	---	<0.0652	---	<0.024
Endrin Aldehyde	TOT	ng/L	---	---	---	0.322	---	0.145	---	<0.0375
HCH, Gamma	TOT	ng/L	---	---	---	0.136	---	0.11	---	0.067
Heptachlor	TOT	ng/L	---	---	---	<0.0035	---	<0.0652	---	<0.0111
Heptachlor Epoxide	TOT	ng/L	---	---	---	0.024	---	<0.0652	---	0.03
Hexachlorobenzene	TOT	ng/L	---	---	---	0.082	---	<0.0652	---	0.063
Methoxyclor	TOT	ng/L	---	---	---	0.031	---	<0.0652	---	<0.0111
Mirex	TOT	ng/L	---	---	---	<0.0069	---	<0.0652	---	<0.0171
Oxychlordane	TOT	ng/L	---	---	---	0.024	---	<0.0652	---	<0.0111
3:3 FTCA	TOT	ng/L	---	---	<1.86	<1.55	<1.88	<1.82	<6.39	<1.69
4:2 FTS	TOT	ng/L	---	---	<1.86	<1.55	<1.88	<1.82	<6.39	<1.69
5:3 FTCA	TOT	ng/L	---	---	<11.6	<9.69	<11.7	<11.3	<39.9	<10.6

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
6:2 FTS	TOT	ng/L	---	---	<1.67	<1.4	4.71	<1.64	<5.76	<1.53
7:3 FTCA	TOT	ng/L	---	---	<11.6	<9.69	<11.7	<11.3	<39.9	<10.6
8:2 FTS	TOT	ng/L	---	---	<1.58	<1.32	<1.59	<1.54	<5.43	<1.44
ADONA	TOT	ng/L	---	---	<1.86	<1.55	<1.88	<1.82	<6.39	<1.69
HFPO-DA	TOT	ng/L	---	---	<1.86	<1.55	<1.88	<1.82	<6.39	<1.69
MeFOSAA	TOT	ng/L	---	---	<0.464	0.647	---	---	---	---
N-EtFOSA	TOT	ng/L	---	---	<1.3	<1.09	-999	<1.27	<4.47	<1.18
N-EtFOSAA	TOT	ng/L	---	---	0.509	<0.388	0.535	<0.454	<1.6	<0.423
N-EtFOSE	TOT	ng/L	---	---	<4.64	<3.88	<4.69	<4.54	<16	<4.23
NFDHA	TOT	ng/L	---	---	<0.927	<0.776	<0.938	<0.908	<3.19	<0.846
N-MeFOSA	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
NMeFOSAA	TOT	ng/L	---	---	---	---	<0.469	1.86	<1.6	<0.423
N-MeFOSE	TOT	ng/L	---	---	<4.64	<3.88	<4.69	<4.54	<16	<4.23
PFBS	TOT	ng/L	---	---	1.47	1.65	0.967	1.11	<1.6	3.56
PFDA	TOT	ng/L	---	---	0.578	0.939	0.575	1.05	<1.6	0.886
PFDoA	TOT	ng/L	---	---	<0.371	<0.31	<0.375	<0.363	<1.28	<0.339
PFDoS	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFDS	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFEESA	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFHpA	TOT	ng/L	---	---	1.02	1.93	1.49	3.51	<1.6	1.98
PFHpS	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFHxA	TOT	ng/L	---	---	3.86	10.2	4.18	14.5	2.63	8.75
PFHxS	TOT	ng/L	---	---	4.59	2.62	2.46	2.36	1.94	3.54
PFMBA	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFMPA	TOT	ng/L	---	---	<0.927	<0.776	<0.938	<0.908	<3.19	<0.846
PFNA	TOT	ng/L	---	---	<0.464	0.651	0.766	0.683	<1.6	0.758
PFNS	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFOA	TOT	ng/L	---	---	2.12	7.82	2.43	5.67	2.47	6.61
PFOS	TOT	ng/L	---	---	2.98	2.59	3.37	2.01	3.29	5.64
PFOSA	TOT	ng/L	---	---	<0.464	1.22	<0.469	0.525	<1.6	<0.423
PFPeA	TOT	ng/L	---	---	2.8	10.9	4.91	27.3	3.68	12.1
PFPeS	TOT	ng/L	---	---	<0.466	<0.39	0.481	<0.456	<1.6	<0.425
PFTeDA	TOT	ng/L	---	---	<0.464	<0.388	<1.64	<0.454	<1.6	<0.423
PFTrDA	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
PFUnA	TOT	ng/L	---	---	<0.464	<0.388	<0.469	<0.454	<1.6	<0.423
Bis(2-Ethylhexyl)Phthalate	TOT	µg/L	---	---	5.9	<5	10.1	<5	<5	<5
Butylbenzyl Phthalate	TOT	µg/L	---	---	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Diethyl Phthalate	TOT	µg/L	---	---	2.43	<0.25	4.44	0.62	2.12	<0.25

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Dimethyl Phthalate	TOT	µg/L	---	---	<0.25	<0.25	0.4	<0.25	<0.25	<0.25
Di-N-Butyl Phthalate	TOT	µg/L	---	---	<2.5	<2.5	<5	<5	9.2	11.3
Di-N-Octyl Phthalate	TOT	µg/L	---	---	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2-Hydroxy-Ibuprofen	TOT	ng/L	---	---	33600	3770	23300	904	44800	147
Acetaminophen	TOT	ng/L	---	---	235000	7.27	112000	11.7	215000	5.8
Azithromycin	TOT	ng/L	---	---	296	273	249	340	778	202
Bisphenol A	TOT	ng/L	---	---	114	75.8	155	144	91.3	<9.18
Caffeine	TOT	ng/L	---	---	131000	744	99600	55.6	133000	44.7
Carbadox	TOT	ng/L	---	---	<2.4	<0.609	<1.02	<0.659	<2.2	<0.957
Carbamazepine	TOT	ng/L	---	---	348	357	290	432	350	238
Cefotaxime	TOT	ng/L	---	---	<23.8	<6.03	<12.4	<7.58	<35	16.1
Ciprofloxacin	TOT	ng/L	---	---	659	303	659	436	790	235
Clarithromycin	TOT	ng/L	---	---	84.6	98	158	165	50.6	87.1
Clinafloxacin	TOT	ng/L	---	---	<8	<2.3	<5.27	<2.68	<11.8	<4.16
Cloxacillin	TOT	ng/L	---	---	<12	<3.05	<4.32	<3.29	<11	<3.07
D2-Virginiamycin M1	TOT	%Recov	---	---	50.9	112	40.9	106	37.8	51.2
D3-Carbadox	TOT	%Recov	---	---	163	147	123	116	105	108
D3-Digoxigenin	TOT	%Recov	---	---	137	123	117	118	48.6	83.4
D3-Lincomycin	TOT	%Recov	---	---	180	169	195	156	114	129
D3-Ofloxacin	TOT	%Recov	---	---	59.2	54.3	49.9	67.6	60.5	54.6
D5-Miconazole	TOT	%Recov	---	---	78.7	70.1	99.9	62.4	119	43.9
Dehydronifedipine	TOT	ng/L	---	---	2.82	15.6	3.78	10.7	3.7	3.8
Digoxigenin	TOT	ng/L	---	---	<6.01	<1.52	<2.24	<1.65	<5.85	<2.55
Digoxin	TOT	ng/L	---	---	<24	<6.09	<24.2	<6.59	<22	<6.14
Diltiazem	TOT	ng/L	---	---	443	379	438	449	524	272
Diphenhydramine	TOT	ng/L	---	---	1240	735	1240	471	1560	253
Enrofloxacin	TOT	ng/L	---	---	<2.4	<0.726	1.51	2.06	<2.2	<0.614
Erythromycin-H2O	TOT	ng/L	---	---	26.2	12.8	13.3	6.34	<5.51	3.51
Flumequine	TOT	ng/L	---	---	<1.2	<0.305	<0.33	<0.329	<1.1	<0.307
Fluoxetine	TOT	ng/L	---	---	41.9	43.4	58.8	46.7	55.5	34.1
Furosemide	TOT	ng/L	---	---	1130	584	1410	971	1180	347
Gemfibrozil	TOT	ng/L	---	---	39.4	19.8	67.4	61	7.33	4.15
Glipizide	TOT	ng/L	---	---	<3.2	<0.812	<0.799	<0.953	<2.94	<0.819
Glyburide	TOT	ng/L	---	---	<3.2	1.76	2.97	3.43	<2.94	1.52
Hydrochlorothiazide	TOT	ng/L	---	---	2270	1990	2230	2320	2430	1360
Ibuprofen	TOT	ng/L	---	---	18300	885	10400	190	24900	21.8
Lincomycin	TOT	ng/L	---	---	<2.4	0.614	1.84	3.23	<2.2	<0.614
Lomefloxacin	TOT	ng/L	---	---	<2.4	<0.609	<0.659	<0.659	<2.2	<0.614

Appendix B4, continued

Parameter	State	Units	Jan 16 2024		Apr 18 2024		Jul 2 2024		Oct 17 2024	Oct 23 2024
			Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly	Influent Quarterly	Effluent Quarterly
Miconazole	TOT	ng/L	---	---	5.07	1	17	0.774	3.26	0.335
Naproxen	TOT	ng/L	---	---	8830	990	7640	187	9610	69.8
Norfloxacin	TOT	ng/L	---	---	<9.99	<2.03	<11	6.74	10.4	<4.2
Norgestimate	TOT	ng/L	---	---	<6.01	<1.52	<1.65	<1.65	<5.51	<1.54
Ofloxacin	TOT	ng/L	---	---	21.1	24.8	38.3	32.5	427	38.3
Ormetoprim	TOT	ng/L	---	---	<0.601	<0.152	<0.485	<0.165	<0.551	<0.154
Oxacillin	TOT	ng/L	---	---	<6.01	<1.52	<1.65	<1.65	<5.51	<1.54
Oxolinic Acid	TOT	ng/L	---	---	<2.4	<0.609	<0.659	<0.659	<2.2	<0.614
Penicillin G	TOT	ng/L	---	---	12.4	<3.05	<3.3	3.57	<11	<3.07
Penicillin V	TOT	ng/L	---	---	<6.01	<1.89	<1.65	<1.65	<5.51	<3.58
Roxithromycin	TOT	ng/L	---	---	3.25	2.49	<3.75	0.311	1.28	0.489
Sarafloxacin	TOT	ng/L	---	---	<12	<3.05	<3.3	<3.29	<11	<3.07
Sulfachloropyridazine	TOT	ng/L	---	---	<2.4	<0.609	<0.687	<0.659	<2.2	<1.17
Sulfadiazine	TOT	ng/L	---	---	<2.4	<0.609	1.55	<0.659	<2.2	<0.614
Sulfadimethoxine	TOT	ng/L	---	---	<1.2	<0.305	<0.555	<0.329	<1.1	<0.307
Sulfamerazine	TOT	ng/L	---	---	<2.4	<0.609	<0.659	<0.659	<2.2	<0.655
Sulfamethazine	TOT	ng/L	---	---	3.74	<0.609	10.6	<1.21	13	<0.709
Sulfamethizole	TOT	ng/L	---	---	<2.4	<0.609	<0.966	<1.12	<3.97	<0.614
Sulfamethoxazole	TOT	ng/L	---	---	1480	326	2130	319	1850	272
Sulfanilamide	TOT	ng/L	---	---	59.6	87	79	81.5	56.8	71.2
Sulfathiazole	TOT	ng/L	---	---	<6.01	<1.52	<1.87	<1.65	<5.51	<1.54
Thiabendazole	TOT	ng/L	---	---	35	32.1	36.3	27.6	20.7	16.9
Triclocarban	TOT	ng/L	---	---	2.72	0.887	2.33	<0.477	1.98	<0.409
Triclosan	TOT	ng/L	---	---	26.8	8.6	18	11.9	23.9	<6.14
Trimethoprim	TOT	ng/L	---	---	346	325	389	386	441	228
Tylosin	TOT	ng/L	---	---	<2.4	1.79	4.9	1.49	<2.2	1.79
Virginiamycin	TOT	ng/L	---	---	<3.92	<0.803	<9.56	<0.659	<19.7	<1.21
Warfarin	TOT	ng/L	---	---	4.7	3.32	4.28	5.12	5.79	3.2

Notes:
--- not analyzed

APPENDIX C

Surface Water / IDZ Monitoring

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) 2024

		Aluminum (µg/L)		Antimony (µg/L)		Arsenic (µg/L)		Barium (µg/L)		Beryllium (µg/L)		Bismuth (µg/L)		Boron (µg/L)		Cadmium (µg /L)		Calcium (µg/L)		Chromium (µg/L)		Cobalt (µg/L)	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
WQ Guidelines						12.5 µg/L *+#								1200 µg/L *		0.12 µg/L+							
Station 1	Top	17.1	16.6	<0.5	<0.5	1.54	1.34	6.5	7.1	<0.5	<0.5	<0.5	<0.5	3,820	3,600	0.015	0.061	301	314	1.37	<0.5	0.174	<0.05
	Middle	30.1	22.8	<0.5	<0.5	1.58	1.66	7.5	8	<0.5	<0.5	<0.5	<0.5	3,720	3,970	<0.01	0.055	308	334	0.93	0.83	0.132	<0.05
	Bottom	12.2	23	<0.5	<0.5	1.94	1.57	7	7.4	<0.5	<0.5	<0.5	<0.5	3,680	3,980	0.029	0.101	298	346	1.77	<0.5	0.113	<0.05
Station 2	Top	10.7	19.3	<0.5	<0.5	1.93	1.4	6.6	8	<0.5	<0.5	<0.5	<0.5	3,770	3,870	0.044	0.049	308	319	1.13	0.75	0.11	<0.05
	Middle	14	27.7	<0.5	<0.5	1.87	1.64	6.7	7.9	<0.5	<0.5	<0.5	<0.5	3,940	4,280	<0.01	0.066	313	373	0.97	<0.5	0.157	<0.05
	Bottom	11.8	370	<0.5	<0.5	1.35	1.74	6.6	8.6	<0.5	<0.5	<0.5	<0.5	3,710	4,180	0.041	0.018	287	362	0.74	0.56	0.116	0.146
Station 3	Top	33.8	17.4	<0.5	<0.5	1.47	1.84	6.9	7.2	<0.5	<0.5	<0.5	<0.5	3,510	4,040	0.42	0.046	281	356	1.42	<0.5	0.55	<0.05
	Middle	13.1	34.9	<0.5	<0.5	1.04	1.4	7.4	8.4	<0.5	<0.5	<0.5	<0.5	3,700	4,040	<0.01	0.011	293	375	1.38	<0.5	0.085	<0.05
	Bottom	17.3	19.7	<0.5	<0.5	1.24	1.61	6.9	7.9	<0.5	<0.5	<0.5	<0.5	3,890	4,230	<0.01	0.03	303	380	0.84	<0.5	0.093	<0.05
Station 4	Top	10.7	17.2	<0.5	<0.5	1.65	1.66	6.6	7.3	<0.5	<0.5	<0.5	<0.5	3,800	4,280	0.041	0.222	293	363	<0.5	<0.5	0.133	<0.05
	Middle	<5	16.8	<0.5	<0.5	1.66	1.49	7	7.8	<0.5	<0.5	<0.5	<0.5	4,310	4,190	0.139	0.068	324	358	3	<0.5	0.369	<0.05
	Bottom	10.1	21.5	<0.5	<0.5	2.28	1.6	8.5	7.6	<0.5	<0.5	<0.5	<0.5	4,330	4,030	0.092	0.071	327	365	8.88	<0.5	0.358	<0.05
Reference 2	Top	<5	35.2	<0.5	<0.5	1.58	2.15	6.8	8.5	0.61	<0.5	<0.5	<0.5	4,460	4,530	0.156	0.281	322	404	3.57	<0.5	0.525	0.209
	Middle	22.6	19.5	<0.5	<0.5	1.71	1.68	7.4	9.1	0.6	<0.5	<0.5	<0.5	4,180	4,390	0.139	0.073	313	386	3.43	<0.5	0.382	<0.05
	Bottom	82.7	16.1	<0.5	<0.5	1.64	1.79	7.1	8.2	<0.5	<0.5	<0.5	<0.5	4,430	4,230	0.162	0.016	321	372	4.33	<0.5	0.374	<0.05
Average of IDZ Stations	Top	18.1	17.6	<0.5	<0.5	1.65	1.56	6.65	7.40	<0.5	<0.5	<0.5	<0.5	3,725	3,948	0.130	0.095	296	338	1.04	0.38	0.242	<0.05
	Middle	19.1	25.6	<0.5	<0.5	1.54	1.55	7.15	8.03	<0.5	<0.5	<0.5	<0.5	3,918	4,120	0.040	0.050	310	360	1.57	0.40	0.186	<0.05
	Bottom	12.9	108.6	<0.5	<0.5	1.70	1.63	7.25	7.88	<0.5	<0.5	<0.5	<0.5	3,903	4,105	0.042	0.055	304	363	3.06	0.33	0.170	0.06

Notes:
Shaded cells indicate exceedance to BC WQG
* = BC Approved Water Quality Guideline
\+ = BC Working Water Quality Guideline
\# = CCME Water Quality Guideline for the Protection of Aquatic Life

		Copper (µg/L)		Iron (µg/L)		Lead (µg/L)		Lithium (µg/L)		Magnesium (mg/L)		Manganese (µg/L)		Mercury (µg/L)		Molybdenum (µg/L)		Nickel (µg/L)		Potassium (mg/L)	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
WQ Guidelines		2 µg/L (mean of 5 samples) or 140 µg/L (max) *												0.02 (µg/L) *				7.1 µg/L *			
Station 1	Top	<0.5	<0.5	16	<10	0.275	<0.05	121	132	911	1,010	1.54	1.85	<0.0019	<0.0019	8.58	8.82	<0.2	0.58	289	301
	Middle	<0.5	<0.5	29	18	0.25	0.12	120	143	904	1,080	1.94	1.63	<0.0019	<0.0019	8.2	9.22	<0.2	0.44	290	328
	Bottom	<0.5	<0.5	15	20	0.204	<0.05	119	150	919	1,100	1.60	1.97	<0.0019	<0.0019	8.43	9.76	<0.2	0.34	292	328
Station 2	Top	<0.5	<0.5	13	<10	<0.05	<0.05	124	141	950	1,020	1.11	1.44	<0.0019	<0.0019	8.05	9.03	<0.2	0.54	294	311
	Middle	<0.5	1.29	25	19	<0.05	<0.05	123	161	940	1,150	1.71	0.93	<0.0019	<0.0019	8.2	9.58	<0.2	0.26	298	343
	Bottom	<0.5	0.65	18	530	0.067	0.234	111	157	879	1,110	1.32	7.96	<0.0019	0.0104	8.38	9	<0.2	1	279	335
Station 3	Top	<0.5	<0.5	25	<10	0.438	<0.05	110	151	846	1,100	4.11	1.33	<0.0019	<0.0019	7.71	8.99	<0.2	<0.2	270	322
	Middle	<0.5	<0.5	23	19	0.246	0.272	115	154	898	1,150	1.22	1.03	<0.0019	<0.0019	8.16	9.72	<0.2	0.4	291	342
	Bottom	<0.5	<0.5	22	20	0.14	<0.05	117	160	924	1,140	1.43	0.69	<0.0019	<0.0019	8.84	9.42	<0.2	0.44	293	341
Station 4	Top	<0.5	1.19	12	19	<0.05	<0.05	107	159	871	1,100	1.76	0.83	<0.0019	<0.0019	7.65	9.49	<0.2	0.51	282	337
	Middle	<0.5	<0.5	45	21	0.065	<0.05	163	154	1,050	1,100	2.07	0.83	<0.0019	<0.0019	8.01	9.85	0.88	0.39	310	334
	Bottom	<0.5	<0.5	97	26	<0.05	<0.05	164	153	1,100	1,100	2.40	1.09	<0.0019	<0.0019	10	9.52	1.08	<0.2	315	328
Reference 2	Top	<0.5	1.45	36	<10	<0.05	0.668	161	168	1,050	1,230	1.67	1.73	<0.0019	<0.0019	8.28	10.2	1.27	0.71	314	367
	Middle	<0.5	<0.5	55	14	<0.05	<0.05	157	163	1,020	1,180	2.46	0.96	<0.0019	<0.0019	8.6	9.74	1.12	0.47	301	352
	Bottom	<0.5	<0.5	34	10	0.068	<0.05	161	161	1,120	1,160	2.04	0.78	<0.0019	<0.0019	8.27	9.46	1.04	0.49	327	347
Average of IDZ Stations	Top	<0.5	0.49	17	19	0.246	<0.05	116	146	895	1,058	2.13	1.36	<0.0019	<0.0019	8.00	9.08	<0.2	0.43	284	318
	Middle	<0.5	0.51	31	19	0.147	0.111	130	153	948	1,120	1.74	1.11	<0.0019	<0.0019	8.14	9.59	0.30	0.37	297	337
	Bottom	<0.5	0.35	38	149	0.109	0.077	128	155	956	1,113	1.69	2.93	<0.0019	<0.0019	8.91	9.43	0.35	0.59	295	333

Notes:
Shaded cells indicate exceedance to BC WQG
* = BC Approved Water Quality Guideline
+ = BC Working Water Quality Guideline
# = CCME Water Quality Guideline for the Protection of Aquatic Life

Appendix C2, continued

		Selenium (µg/L)		Silicon (µg/L)		Silver (µg/L)		Strontium (µg/L)		Sulfur (mg/L)		Thallium (µg/L)		Tin (µg/L)		Titanium (µg/L)		Vanadium (µg/L)		Zinc (µg/L)	
		Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer
WQ Guidelines		2 µg/L *				1.5 µg/L (mean of 5 samples) or 3 µg/L (max) *														1 µg/L (mean of 5 samples) *	
Station 1	Top	<0.5	<0.5	<1000	<1000	<0.05	<0.05	6,170	5,950	690	716	<0.05	<0.05	<1	<1	<5	<5	<0.5	1.31	<3	<3
	Middle	<0.5	<0.5	<1000	<1000	<0.05	<0.05	6,490	6,420	684	733	<0.05	<0.05	1.1	<1	<5	<5	<0.5	1.86	8.6	<3
	Bottom	<0.5	<0.5	<1000	1030	<0.05	<0.05	6,130	6,640	702	806	<0.05	<0.05	<1	<1	<5	<5	0.88	1.84	<3	<3
Station 2	Top	<0.5	<0.5	<1000	<1000	<0.05	<0.05	6,370	6,140	669	760	<0.05	<0.05	<1	<1	<5	<5	<0.5	1.4	<3	<3
	Middle	<0.5	<0.5	<1000	1080	<0.05	<0.05	6,360	6,990	688	869	<0.05	<0.05	<1	<1	<5	<5	1.36	1.38	<3	<3
	Bottom	<0.5	<0.5	<1000	1660	<0.05	<0.05	6,090	6,840	669	783	<0.05	<0.05	<1	<1	<5	17.3	<0.5	2.63	<3	<3
Station 3	Top	<0.5	<0.5	<1000	<1000	<0.05	<0.05	5,820	6,660	599	812	<0.05	<0.05	<1	<1	<5	<5	<0.5	1.42	3.4	<3
	Middle	<0.5	<0.5	<1000	1110	<0.05	<0.05	6,070	7,110	683	835	<0.05	<0.05	<1	<1	<5	<5	<0.5	1.71	<3	<3
	Bottom	<0.5	<0.5	<1000	1090	<0.05	<0.05	6,390	7,090	652	787	<0.05	<0.05	<1	<1	<5	<5	<0.5	1.63	<3	<3
Station 4	Top	<0.5	<0.5	<1000	1040	<0.05	<0.05	6,190	6,940	664	886	<0.05	<0.05	<1	<1	<5	<5	1.24	1.8	<3	<3
	Middle	<0.5	<0.5	1560	1160	<0.05	<0.05	6,200	6,930	810	818	<0.05	<0.05	<1	<1	<5	<5	2.55	1.68	<3	<3
	Bottom	<0.5	<0.5	1620	1100	<0.05	<0.05	6,450	6,830	767	844	<0.05	<0.05	<1	<1	5.2	<5	3.3	1.51	<3	<3
Reference 2	Top	<0.5	<0.5	1610	1150	<0.05	<0.05	6,140	7,440	827	938	<0.05	<0.05	<1	<1	<5	<5	3.2	2.07	<3	28.7
	Middle	<0.5	<0.5	1430	1170	<0.05	<0.05	6,100	7,230	810	885	<0.05	<0.05	<1	<1	<5	<5	3.46	1.75	<3	<3
	Bottom	<0.5	<0.5	1590	1110	<0.05	<0.05	6,390	7,030	867	886	<0.05	<0.05	<1	<1	<5	<5	4.97	1.42	<3	<3
Average of IDZ Stations	Top	<0.5	<0.5	<1000	635	<0.05	<0.05	6,138	6,423	656	794	<0.05	<0.05	<1	<1	<5	<5	0.50	1.48	2.0	<3
	Middle	<0.5	<0.5	765	963	<0.05	<0.05	6,280	6,863	716	814	<0.05	<0.05	0.5100	<1	<5	<5	1.10	1.66	3.3	<3
	Bottom	<0.5	<0.5	780	1220	<0.05	<0.05	6,265	6,850	698	805	<0.05	<0.05	<1	<1	6.2	6.2	1.17	1.90	1.5	<3

Notes:
Shaded cells indicate exceedance to BC WQG
* = 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 (first to fifth day of sampling) 2024

NH3 mg/L – 2024							
	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	0.026	0.046	0.040	0.053	0.053	0.044
	Middle	0.007	0.052	0.028	0.058	0.044	0.038
	Bottom	0.068	0.054	0.031	0.051	0.070	0.055
Station 1	Top	0.022	0.052	0.036	0.051	0.049	0.042
	Middle	0.019	0.033	0.034	0.057	0.052	0.039
	Bottom	0.020	0.053	0.042	0.061	0.061	0.047
Station 2	Top	0.033	0.046	0.032	0.064	0.050	0.045
	Middle	0.024	0.052	0.032	0.049	0.051	0.042
	Bottom	0.012	0.038	0.036	0.048	0.048	0.036
Station 3	Top	0.020	0.040	0.046	0.054	0.042	0.040
	Middle	0.014	0.037	0.039	0.061	0.050	0.040
	Bottom	0.023	0.039	0.044	0.060	0.043	0.042
Station 4	Top	0.031	0.052	0.042	0.067	0.051	0.049
	Middle	0.015	0.058	0.028	0.044	0.046	0.038
	Bottom	0.057	0.047	0.040	0.055	0.050	0.050
		Summer					Average
Reference	Top	0.110	0.088	0.077	0.130	0.061	0.093
	Middle	0.092	0.085	0.090	0.100	0.070	0.087
	Bottom	0.081	0.110	0.096	0.130	0.069	0.097
Station 1	Top	0.099	0.091	0.110	0.120	0.052	0.094
	Middle	0.094	0.100	0.110	0.140	0.057	0.100
	Bottom	0.083	0.100	0.100	0.130	0.049	0.092
Station 2	Top	0.098	0.099	0.096	0.130	0.068	0.098
	Middle	0.092	0.098	0.093	0.130	0.072	0.097
	Bottom	0.084	0.097	0.100	0.130	0.072	0.097
Station 3	Top	0.082	0.090	0.100	0.100	0.059	0.086
	Middle	0.093	0.100	0.110	0.130	0.058	0.098
	Bottom	0.095	0.110	0.100	0.150	0.066	0.104
Station 4	Top	0.089	0.120	0.120	0.120	0.066	0.103
	Middle	0.100	0.089	0.100	0.150	0.061	0.100
	Bottom	0.085	0.095	0.100	0.140	0.059	0.096

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.
--- indicates sample not collected due to inclement weather

Appendix C3, continued

PO$_4$ Phosphate Total mg/L – 2024							
		Winter					Average
Reference	Top	0.074	0.073	0.073	0.076	0.075	0.074
	Middle	0.075	0.073	0.072	0.078	0.075	0.075
	Bottom	0.075	0.073	0.072	0.074	0.073	0.073
Station 1	Top	0.075	0.073	0.074	0.076	0.077	0.075
	Middle	0.074	0.073	0.072	0.067	0.077	0.073
	Bottom	0.075	0.076	0.073	0.076	0.075	0.075
Station 2	Top	0.076	0.073	0.076	0.074	0.077	0.075
	Middle	0.100	0.073	0.073	0.078	0.075	0.080
	Bottom	0.075	0.073	0.072	0.075	0.075	0.074
Station 3	Top	0.075	0.074	0.076	0.078	0.077	0.076
	Middle	0.075	0.140	0.073	0.170	0.076	0.107
	Bottom	0.075	0.079	0.071	0.076	0.075	0.075
Station 4	Top	0.076	0.073	0.075	0.074	0.076	0.075
	Middle	0.076	0.072	0.074	0.076	0.076	0.075
	Bottom	0.075	0.073	0.073	0.075	0.075	0.074
		Summer					**Average**
Reference	Top	0.060	0.060	0.052	0.039	0.060	0.054
	Middle	0.059	0.065	0.059	0.058	0.069	0.062
	Bottom	0.048	0.065	0.059	0.055	0.068	0.059
Station 1	Top	0.056	0.062	0.049	0.047	0.066	0.056
	Middle	0.060	0.059	0.050	0.067	0.065	0.060
	Bottom	0.057	0.063	0.007	0.069	0.067	0.053
Station 2	Top	0.057	0.062	0.047	0.045	0.063	0.055
	Middle	0.036	0.063	0.047	0.065	0.068	0.056
	Bottom	0.090	0.065	0.049	0.064	0.065	0.067
Station 3	Top	0.057	0.063	0.048	0.038	0.065	0.054
	Middle	0.062	0.063	0.051	0.067	0.066	0.062
	Bottom	0.059	0.068	0.052	0.064	0.067	0.062
Station 4	Top	0.059	0.062	0.057	0.041	0.066	0.057
	Middle	0.060	0.066	0.046	0.067	0.067	0.061
	Bottom	0.062	0.064	0.062	0.069	0.066	0.065

Appendix C3, continued

Total Suspended Solids mg/L – 2024							
		Winter					Average
Reference	Top	<1	8.0	5.2	4.4	4.4	4.5
	Middle	2.4	8.0	4.4	5.2	<1	4.1
	Bottom	2.0	8.8	3.6	6.4	1.6	4.5
Station 1	Top	<1	6.0	3.2	6.4	1.6	3.5
	Middle	1.6	3.2	1.2	3.6	2.8	2.5
	Bottom	2.4	7.6	2.8	4.4	1.6	3.8
Station 2	Top	2.8	2.0	3.6	2.4	4.8	3.1
	Middle	<1	4.0	4.4	4.8	5.2	3.8
	Bottom	<1	3.2	2.4	2.4	4.0	2.5
Station 3	Top	<1	4.0	2.4	5.2	1.6	2.7
	Middle	1.2	3.2	4.4	2.8	2.0	2.7
	Bottom	2.8	1.6	1.6	4.4	2.0	2.5
Station 4	Top	1.6	2.8	1.6	4.4	3.2	2.7
	Middle	3.2	6.4	3.6	7.2	3.2	4.7
	Bottom	1.6	8.0	1.6	4.8	4.8	4.2
		Summer					Average
Reference	Top	2.0	4.8	2.4	2.8	<1	2.5
	Middle	2.0	7.2	2.8	7.6	<1	4.0
	Bottom	1.6	2.8	2.0	3.2	1.2	2.2
Station 1	Top	2.0	2.4	3.2	2.4	<1	2.1
	Middle	<1	1.2	2.8	5.2	2.8	2.5
	Bottom	<1	6.0	2.8	2.0	<1	2.4
Station 2	Top	<1	4.0	2.0	2.0	<1	1.8
	Middle	1.2	2.4	8.0	7.2	2.4	4.2
	Bottom	32.0	4.0	1.2	4.8	<1	8.5
Station 3	Top	3.6	2.0	1.6	1.2	<1	1.8
	Middle	<1	5.6	1.2	4.0	1.6	2.6
	Bottom	2.4	2.0	5.6	2.4	1.2	2.7
Station 4	Top	1.6	1.2	6.0	2.8	<1	2.4
	Middle	2.4	<1	2.4	2.0	7.6	3.0
	Bottom	4.0	1.2	4.4	1.2	2.0	2.6

Appendix C3, continued

TKN mg/L – 2024							
		Winter					**Average**
Reference	Top	1.270	1.290	1.420	0.449	1.080	1.102
	Middle	1.290	1.320	1.210	0.439	1.190	1.090
	Bottom	1.310	1.270	1.210	0.494	0.949	1.047
Station 1	Top	1.360	1.450	1.260	1.200	0.491	1.152
	Middle	1.250	2.090	1.100	1.280	0.970	1.338
	Bottom	1.300	1.350	1.050	1.210	1.050	1.192
Station 2	Top	1.310	1.280	1.200	1.260	1.090	1.228
	Middle	1.270	1.320	1.230	1.190	1.010	1.204
	Bottom	1.350	1.400	1.190	1.460	1.330	1.346
Station 3	Top	1.250	1.290	1.360	1.290	1.250	1.288
	Middle	1.490	0.956	1.430	1.380	1.250	1.301
	Bottom	1.360	1.360	1.200	0.479	1.100	1.100
Station 4	Top	1.130	1.320	0.969	0.482	1.280	1.036
	Middle	1.230	1.280	1.390	0.489	1.100	1.098
	Bottom	1.100	1.210	1.330	0.450	1.300	1.078
		Summer					**Average**
Reference	Top	0.844	1.240	1.020	1.170	1.060	1.067
	Middle	0.851	1.040	1.090	1.050	0.931	0.992
	Bottom	0.811	0.543	0.968	1.060	1.030	0.882
Station 1	Top	0.876	0.941	1.020	1.110	1.030	0.995
	Middle	0.889	0.983	1.020	1.080	1.050	1.004
	Bottom	0.847	0.951	0.997	0.237	1.030	0.812
Station 2	Top	0.847	1.030	1.060	1.060	1.010	1.001
	Middle	0.872	1.010	1.030	1.070	1.030	1.002
	Bottom	0.878	0.992	1.090	0.470	1.020	0.890
Station 3	Top	0.862	0.996	1.080	1.140	0.444	0.904
	Middle	0.859	1.000	1.060	0.934	1.200	1.011
	Bottom	0.836	0.984	0.993	1.070	1.050	0.987
Station 4	Top	0.874	0.988	1.010	1.030	1.220	1.024
	Middle	0.785	0.987	1.060	0.981	0.985	0.960
	Bottom	0.876	1.020	0.999	1.070	1.040	1.001

Appendix C3, continued

Sulphate mg/L – 2024							
		Winter					Average
Reference	Top	2,100	2,400	2,200	2,200	2,300	2,240
	Middle	2,200	2,400	2,200	2,200	2,200	2,240
	Bottom	2,100	2,500	2,200	2,200	2,200	2,240
Station 1	Top	2,100	2,400	2,200	2,200	2,200	2,220
	Middle	2,100	2,500	2,100	2,200	2,200	2,220
	Bottom	2,100	2,400	2,100	2,200	2,200	2,200
Station 2	Top	2,100	2,400	2,200	2,200	2,200	2,220
	Middle	2,100	2,400	2,200	2,300	2,200	2,240
	Bottom	2,100	2,500	2,200	2,200	2,200	2,240
Station 3	Top	2,200	2,400	2,200	2,200	2,200	2,240
	Middle	2,100	2,400	2,200	2,200	2,200	2,220
	Bottom	2,200	2,500	2,200	2,200	2,200	2,260
Station 4	Top	2,100	2,400	2,100	2,200	2,200	2,200
	Middle	2,100	2,400	2,200	2,300	2,200	2,240
	Bottom	2,100	2,400	2,200	2,200	2,200	2,220
		Summer					Average
Reference	Top	2,400	2,300	2,200	2,100	2,100	2,220
	Middle	2,500	2,300	2,200	2,100	2,100	2,240
	Bottom	2,400	2,300	2,200	2,100	1,900	2,180
Station 1	Top	2,300	2,300	2,100	2,100	1,900	2,140
	Middle	2,400	2,300	2,200	2,100	1,700	2,140
	Bottom	2,300	2,400	2,200	2,200	2,000	2,220
Station 2	Top	2,400	2,300	2,100	2,100	2,000	2,180
	Middle	2,400	2,400	2,200	2,200	1,800	2,200
	Bottom	2,400	2,400	2,200	2,100	2,000	2,220
Station 3	Top	2,400	2,300	2,100	2,100	2,100	2,200
	Middle	2,500	2,400	2,200	2,200	2,000	2,260
	Bottom	2,400	2,300	2,200	2,200	2,000	2,220
Station 4	Top	2,400	2,400	2,200	2,100	1,800	2,180
	Middle	2,400	2,300	2,100	2,100	2,200	2,220
	Bottom	2,500	2,300	2,100	2,200	2,200	2,260

Appendix C3, continued

Nitrate Nitrogen mg/L – 2024							
	BC Approved WQG = 3.7 mg/L (average over 5 samples)						
		Winter					Average
Reference	Top	0.380	0.374	0.370	0.375	0.346	0.369
	Middle	0.378	0.369	0.363	0.378	0.335	0.365
	Bottom	0.377	0.371	0.361	0.384	0.343	0.367
Station 1	Top	0.422	0.371	0.357	0.361	0.343	0.371
	Middle	0.375	0.361	0.359	0.355	0.334	0.357
	Bottom	0.385	0.371	0.362	0.360	0.334	0.362
Station 2	Top	0.381	0.373	0.362	0.365	0.348	0.366
	Middle	0.380	0.375	0.367	0.397	0.339	0.372
	Bottom	0.378	0.367	0.359	0.381	0.340	0.365
Station 3	Top	0.380	0.369	0.368	0.374	0.348	0.368
	Middle	0.377	0.364	0.349	0.378	0.350	0.364
	Bottom	0.380	0.364	0.363	0.391	0.345	0.369
Station 4	Top	0.373	0.375	0.374	0.395	0.346	0.373
	Middle	0.394	0.417	0.363	0.370	0.353	0.379
	Bottom	0.384	0.368	0.347	0.386	0.342	0.365
		Summer					Average
Reference	Top	0.216	0.207	0.152	0.034	0.184	0.159
	Middle	0.243	0.215	0.212	0.170	0.235	0.215
	Bottom	0.245	0.219	0.226	0.160	0.216	0.213
Station 1	Top	0.201	0.199	0.095	0.044	0.195	0.147
	Middle	0.233	0.209	0.131	0.151	0.211	0.187
	Bottom	0.222	0.224	0.140	0.156	0.204	0.189
Station 2	Top	0.199	0.196	0.088	0.016	0.150	0.130
	Middle	0.213	0.218	0.130	0.154	0.212	0.185
	Bottom	0.224	0.220	0.127	0.144	0.208	0.185
Station 3	Top	0.200	0.228	0.085	<0.002	0.155	0.134
	Middle	0.213	0.213	0.135	0.153	0.192	0.181
	Bottom	0.214	0.210	0.144	0.133	0.196	0.179
Station 4	Top	0.201	0.200	0.153	0.020	0.166	0.148
	Middle	0.218	0.219	0.095	0.143	0.190	0.173
	Bottom	0.219	0.218	0.163	0.164	0.192	0.191

Appendix C3, continued

Nitrite Nitrogen mg/L – 2024							
		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	0.001
Station 1	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	0.001
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	0.001
Station 3	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	0.001
Station 4	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	0.001
		Summer					Average
Reference	Top	0.005	0.004	0.003	<0.002	0.004	0.003
	Middle	0.005	0.004	0.004	0.003	0.004	0.004
	Bottom	0.005	0.005	0.004	0.003	0.003	0.004
Station 1	Top	0.005	0.004	<0.002	<0.002	0.002	0.003
	Middle	0.007	0.005	0.003	0.003	0.004	0.004
	Bottom	0.005	0.005	0.003	0.003	0.005	0.004
Station 2	Top	0.005	0.004	0.003	<0.002	0.004	0.003
	Middle	0.005	0.005	0.003	0.006	0.005	0.005
	Bottom	0.005	0.005	0.003	0.004	0.005	0.004
Station 3	Top	0.005	0.007	0.002	<0.002	0.004	0.004
	Middle	0.005	0.005	0.003	0.003	0.004	0.004
	Bottom	0.005	0.005	0.003	0.003	0.004	0.004
Station 4	Top	0.005	0.004	0.003	<0.002	0.004	0.003
	Middle	0.005	0.005	0.003	0.003	0.004	0.004
	Bottom	0.005	0.005	0.004	0.004	0.004	0.004

Appendix C3, continued

Salinity – 2024							
		Winter					Average
Reference	Top	30.9	30.9	29.9	30.0	30.4	30.4
	Middle	31.2	31.4	30.2	30.0	30.5	30.7
	Bottom	31.1	31.4	29.8	30.0	30.6	30.6
Station 1	Top	30.9	31.1	29.5	29.8	30.4	30.3
	Middle	30.9	31.2	29.9	30.0	30.3	30.5
	Bottom	31.0	31.1	29.9	30.0	30.4	30.5
Station 2	Top	30.7	30.9	29.6	29.9	30.3	30.3
	Middle	31.1	31.0	29.9	30.1	30.3	30.5
	Bottom	31.0	31.3	30.0	30.1	30.6	30.6
Station 3	Top	30.7	31.1	29.6	29.9	30.3	30.3
	Middle	31.1	31.4	29.9	29.9	30.3	30.5
	Bottom	31.1	31.5	29.8	29.8	30.2	30.5
Station 4	Top	30.8	31.2	29.5	29.9	30.2	30.3
	Middle	31.0	31.4	29.9	30.1	30.4	30.6
	Bottom	20.7	31.4	29.9	30.0	30.1	28.4
		Summer					Average
Reference	Top	30.5	31.1	30.4	28.0	31.5	30.3
	Middle	30.8	30.6	31.0	29.5	32.1	30.8
	Bottom	30.9	31.4	31.1	29.4	31.9	30.9
Station 1	Top	30.3	30.2	30.1	28.1	31.5	30.0
	Middle	30.4	31.2	30.3	29.1	31.6	30.5
	Bottom	30.4	31.3	30.4	29.2	31.8	30.6
Station 2	Top	30.3	31.1	30.1	28.1	31.4	30.2
	Middle	30.4	31.3	30.3	28.8	31.5	30.5
	Bottom	30.5	31.3	30.4	29.0	31.6	30.6
Station 3	Top	30.4	31.1	30.1	27.8	31.6	30.2
	Middle	30.4	31.3	30.5	29.3	31.6	30.6
	Bottom	30.5	31.0	30.4	28.8	31.8	30.5
Station 4	Top	30.4	31.1	30.6	27.9	31.5	30.3
	Middle	30.6	31.0	30.1	29.0	31.8	30.5
	Bottom	30.6	31.3	30.7	29.3	31.6	30.7

Appendix C3, continued

N Nitrogen Total mg/L – 2024							
		Winter					**Average**
Reference	Top	1.640	1.670	1.790	0.824	1.430	1.471
	Middle	1.670	1.690	1.570	0.819	1.530	1.456
	Bottom	1.680	1.650	1.570	0.880	1.290	1.414
Station 1	Top	1.790	1.820	1.620	1.560	0.834	1.525
	Middle	1.620	2.450	1.460	1.630	1.300	1.692
	Bottom	1.690	1.720	1.410	1.570	1.380	1.554
Station 2	Top	1.690	1.660	1.560	1.620	1.440	1.594
	Middle	1.650	1.690	1.600	1.580	1.350	1.574
	Bottom	1.720	1.770	1.550	1.840	1.670	1.710
Station 3	Top	1.630	1.660	1.720	1.670	1.600	1.656
	Middle	1.870	1.320	1.780	1.760	1.600	1.666
	Bottom	1.740	1.730	1.560	0.872	1.450	1.470
Station 4	Top	1.510	1.700	1.340	0.878	1.620	1.410
	Middle	1.620	1.700	1.760	0.860	1.450	1.478
	Bottom	1.490	1.580	1.680	0.838	1.640	1.446
		Summer					**Average**
Reference	Top	1.060	1.450	1.170	1.200	1.250	1.226
	Middle	1.100	1.260	1.310	1.220	1.170	1.212
	Bottom	1.060	0.767	1.200	1.220	1.250	1.099
Station 1	Top	1.080	1.140	1.120	1.150	1.220	1.142
	Middle	1.130	1.200	1.150	1.240	1.270	1.198
	Bottom	1.070	1.180	1.140	0.397	1.240	1.005
Station 2	Top	1.050	1.230	1.150	1.080	1.170	1.136
	Middle	1.090	1.240	1.160	1.230	1.250	1.194
	Bottom	1.110	1.220	1.220	0.618	1.240	1.082
Station 3	Top	1.070	1.230	1.170	1.140	0.602	1.042
	Middle	1.080	1.220	1.200	1.090	1.400	1.198
	Bottom	1.050	1.200	1.140	1.210	1.250	1.170
Station 4	Top	1.080	1.190	1.170	1.050	1.390	1.176
	Middle	1.010	1.210	1.160	1.130	1.180	1.138
	Bottom	1.100	1.240	1.170	1.230	1.240	1.196

Appendix C3, continued

Sulfide mg/L – 2024							
		Winter					Average
Reference	Top	<0.0018	<0.0018	<0.0018	0.004	0.003	0.0019
	Middle	<0.0018	<0.0018	<0.0018	0.004	<0.0018	0.0014
	Bottom	<0.0018	<0.0018	<0.0018	0.003	0.002	0.0015
Station 1	Top	<0.0018	<0.0018	<0.0018	0.004	0.003	0.0018
	Middle	<0.0018	<0.0018	<0.0018	0.006	0.002	0.0022
	Bottom	<0.0018	<0.0018	<0.0018	0.004	<0.0018	0.0016
Station 2	Top	<0.0018	<0.0018	<0.0018	0.008	0.003	0.0027
	Middle	<0.0018	<0.0018	<0.0018	0.006	0.003	0.0022
	Bottom	<0.0018	<0.0018	<0.0018	0.004	0.003	0.0020
Station 3	Top	<0.0018	<0.0018	<0.0018	0.003	0.004	0.0019
	Middle	<0.0018	<0.0018	<0.0018	0.004	0.002	0.0017
	Bottom	<0.0018	<0.0018	<0.0018	0.004	0.003	0.0019
Station 4	Top	<0.0018	<0.0018	<0.0018	0.004	0.002	0.0018
	Middle	<0.0018	<0.0018	<0.0018	0.004	0.002	0.0017
	Bottom	<0.0018	<0.0018	<0.0018	0.003	0.004	0.0019
		Summer					Average
Reference	Top	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
	Middle	<0.0018	<0.0018	0.004	<0.0018	<0.0018	0.0015
	Bottom	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
Station 1	Top	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
	Middle	<0.0018	<0.0018	<0.0018	<0.0018	0.007	0.0021
	Bottom	<0.0018	<0.0018	<0.0018	<0.0018	0.003	0.0014
Station 2	Top	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
	Middle	<0.0018	<0.0018	0.003	<0.0018	<0.0018	0.0013
	Bottom	0.002	<0.0018	<0.0018	<0.0018	<0.0018	0.0011
Station 3	Top	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
	Middle	0.003	<0.0018	0.002	<0.0018	<0.0018	0.0015
	Bottom	<0.0018	<0.0018	<0.0018	<0.0018	<0.0018	0.0009
Station 4	Top	<0.0018	0.003	<0.0018	<0.0018	<0.0018	0.0012
	Middle	<0.0018	<0.0018	<0.0018	0.003	0.003	0.0018
	Bottom	<0.0018	<0.0018	<0.0018	0.002	<0.0018	0.0012

Appendix C3, continued

Total Organic Carbon mg/L – 2024							
		Winter					Average
Reference	Top	1.20	1.10	1.20	1	1.10	1.1
	Middle	1.10	1.10	1.20	1	1.00	1.1
	Bottom	1.10	1.00	1.20	1	1.10	1.1
Station 1	Top	1.10	1.10	1.10	1	1.10	1.1
	Middle	1.20	1.10	1.00	1	1.00	1.1
	Bottom	1.10	1.20	1.00	1	1.20	1.1
Station 2	Top	1.10	1.10	1.10	1	1.00	1.1
	Middle	1.20	1.10	1.00	1	1.10	1.1
	Bottom	1.10	1.10	1.00	1	1.10	1.1
Station 3	Top	1.20	1.10	1.10	1	1.30	1.2
	Middle	1.10	1.20	1.20	1	1.20	1.2
	Bottom	1.10	1.10	1.20	1	1.10	1.1
Station 4	Top	1.10	1.00	1.20	1	1.10	1.2
	Middle	1.10	1.10	1.20	1	1.10	1.1
	Bottom	1.10	1.10	1.10	1	1.20	1.1
		Summer					Average
Reference	Top	1.3	1.10	1.40	3.80	8.20	3.2
	Middle	1.2	1.10	0.99	4.30	6.80	2.9
	Bottom	1.2	1.10	1.10	3.80	7.40	2.9
Station 1	Top	1.3	1.00	1.50	3.80	6.30	2.8
	Middle	1.2	1.10	1.30	4.40	7.20	3.0
	Bottom	1.2	1.10	1.20	2.00	8.30	2.8
Station 2	Top	1.2	1.30	1.50	2.10	8.00	2.8
	Middle	1.2	1.50	1.40	2.00	7.70	2.8
	Bottom	1.3	1.60	1.40	2.20	7.20	2.7
Station 3	Top	1.2	1.30	1.60	2.20	7.10	2.7
	Middle	1.2	1.20	1.30	1.90	7.20	2.6
	Bottom	1.2	1.10	1.30	2.10	7.00	2.5
Station 4	Top	1.3	1.20	1.30	2.80	7.40	2.8
	Middle	1.2	1.00	1.60	3.10	4.70	2.3
	Bottom	1.4	1.10	1.30	3.50	6.60	2.8

Notes:
+data points excluded due to outlier results

APPENDIX D

Seafloor Monitoring

Appendix D1 SPTP Sediment Chemistry Results 2024

Appendix D2 SPTP Benthic Invertebrate Results 2024

Appendix D3 Biologica Marine Benthic Enumeration and Identification Methods

Appendix D1 SPTP Sediment Chemistry Results 2024

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Conventionals							
pH	pH	---	8.03	8.05			
pH @ 15° C	pH	---	---	---			
Soluble (2:1) pH	pH	---	8.12	8.24			
Total/SAD Cyanide		0.02	<0.02	0.023			
C:N	No Units	---	---	---			
Carbon	%	0.05	0.17	0.26			
N - Total (As N)		0.01	<0.01	0.027			
Organic Carbon	%	0.05	0.17	0.24			
CSR VH C6-C10 (Includes Btex)	mg/kg dry	20	<20	<20			
Sulfide	mg/kg dry	0.5	0.7	0.9			
Fecal Coliforms	MPN/g	0.29	<0.26	<0.29			
Particle Size, Clay	%	2	<2	<2			
Particle Size, gravel	%	2	<2	<2			
Particle Size, sand	%	2	98	96			
Particle Size, silt	%	2	2.8	3			
Metals							
Aluminum	mg/kg dry	100	5550	5760			
Antimony	mg/kg dry	0.1	<0.1	0.12			
Arsenic	mg/kg dry	0.2	1.73	2.05	42	50	57
Barium	mg/kg dry	0.1	9.75	12.2			
Beryllium	mg/kg dry	0.2	<0.2	<0.2			
Bismuth	mg/kg dry	0.1	<0.1	<0.1			
Boron	mg/kg dry	1	5.8	7.5			
Cadmium	mg/kg dry	0.05	<0.05	<0.05	4.2	5	5.1
Calcium	mg/kg dry	100	3530	3760			
Chromium	mg/kg dry	0.5	10.8	15.1	160	190	260
Chromium III	mg/kg dry	0.5	11	15			
Chromium VI	mg/kg dry	0.16	<0.08	<0.16			
Cobalt	mg/kg dry	0.1	3.32	3.51			
Copper	mg/kg dry	0.5	5.9	5.7	108	130	390

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Iron	mg/kg dry	100	9740	11400			
Lead	mg/kg dry	0.1	1.79	2.27	112	130	450
Lithium	mg/kg dry	0.5	5.26	6.87			
Magnesium	mg/kg dry	100	3220	3470			
Manganese	mg/kg dry	0.2	124	115			
Mercury	mg/kg dry	0.05	<0.05	<0.05	0.7	0.84	0.41
Molybdenum	mg/kg dry	0.1	0.12	0.22			
Nickel	mg/kg dry	0.5	9.57	11.3			
Phosphorus	mg/kg dry	10	297	358			
Potassium	mg/kg dry	100	569	744			
Selenium	mg/kg dry	0.5	<0.5	<0.5			
Silver	mg/kg dry	0.05	<0.05	<0.05	2.2		6.1
Sodium	mg/kg dry	100	2020	2560			
Strontium	mg/kg dry	0.1	16.5	21.1			
Sulfur	%	0.06	0.1	0.09			
Thallium	mg/kg dry	0.05	0.061	0.173			
Tin	mg/kg dry	0.1	0.17	0.2			
Titanium	mg/kg dry	1	582	539			
Tungsten	mg/kg dry	0.5	<0.5	<0.5			
Uranium	mg/kg dry	0.05	0.164	0.248			
Vanadium	mg/kg dry	1	27.2	29			
Zinc	mg/kg dry	1	18.2	22.4	271	330	410
Zirconium	mg/kg dry	0.5	1.81	2.09			
Organics							
1,1,1,2-Tetrachloroethane	mg/kg dry	0.02	<0.02	<0.02			
Nitrobenzene	µg/g dry	0.1	<0.1	<0.1			
Nitrosodiphenylamine/Diphenylamine	µg/g dry	0.2	<0.2	<0.2			
N-nitrosodimethylamine	ng/g dry	0.2	<0.2	1.7			
N-Nitrosodi-N-Propylamine	ng/g dry	0.2	<0.2	<0.2			
Benzene	mg/kg dry	0.005	<0.005	<0.005			
Ethylbenzene	mg/kg dry	0.01	<0.01	<0.01			
Toluene	mg/kg dry	0.05	<0.05	<0.05			
Xylenes	mg/kg dry	0.04	<0.04	<0.04			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
1,3,5-trimethylbenzene	mg/kg dry	0.2	<0.2	<0.2			
2,4,5,6-Tetrachloro-m-xylene	%	-999	98	81			
Tetrachloromethane	mg/kg dry	0.02	<0.02	<0.02			
Tribromomethane	mg/kg dry	0.05	<0.05	<0.05			
Trichloromethane	mg/kg dry	0.02	<0.02	<0.02			
2,4-dinitrotoluene	µg/g dry	0.1	<0.1	<0.1			
2,6-dinitrotoluene	µg/g dry	0.1	<0.1	<0.1			
3,3-dichlorobenzidine	µg/g dry	0.5	<0.5	<0.5			
4-Bromophenyl Phenyl Ether	µg/g dry	0.1	<0.1	<0.1			
4-Chlorophenyl Phenyl Ether	µg/g dry	0.1	<0.1	<0.1			
Hexachlorocyclopentadiene	µg/g dry	0.5	<0.5	<0.5			
Hexachloroethane	µg/g dry	0.1	<0.1	<0.1			
1,1,1-trichloroethane	mg/kg dry	0.02	<0.02	<0.02			
1,1,2,2-tetrachloroethane	mg/kg dry	0.02	<0.02	<0.02			
1,1,2-trichloroethane	mg/kg dry	0.02	<0.02	<0.02			
1,1-dichloroethane	mg/kg dry	0.025	<0.025	<0.025			
1,1-dichloroethene	mg/kg dry	0.025	<0.025	<0.025			
1,2,3-Trichlorobenzene	mg/kg dry	0.03	<0.03	<0.03			
1,2,4-trichlorobenzene	mg/kg dry	0.03	<0.03	<0.03			0.031
1,2-dibromoethane	mg/kg dry	0.02	<0.02	<0.02			
1,2-dichlorobenzene	mg/kg dry	0.02	<0.02	<0.02			0.035
1,2-dichloroethane	mg/kg dry	0.02	<0.02	<0.02			
1,2-dichloropropane	mg/kg dry	0.02	<0.02	<0.02			
1,3-dichlorobenzene	mg/kg dry	0.02	<0.02	<0.02			
1,4-dichlorobenzene	mg/kg dry	0.02	<0.02	<0.02			0.11
Bromobenzene	mg/kg dry	0.2	<0.2	<0.2			
Bromodichloromethane	mg/kg dry	0.05	<0.05	<0.05			
Bromomethane	mg/kg dry	0.3	<0.3	<0.3			
Chlorobenzene	mg/kg dry	0.02	<0.02	<0.02			
Chlorodibromomethane	mg/kg dry	0.05	<0.05	<0.05			
Chloroethane	mg/kg dry	0.1	<0.1	<0.1			
Chloroethene	mg/kg dry	0.04	<0.04	<0.04			
Chloromethane	mg/kg dry	0.05	<0.05	<0.05			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Cis-1,2-Dichloroethene	mg/kg dry	0.03	<0.03	<0.03			
Cis-1,3-dichloropropene	mg/kg dry	0.02	<0.02	<0.02			
Dichloromethane	mg/kg dry	0.08	<0.08	<0.08			
Hexachlorobutadiene	µg/g dry	0.3	20.3	20.3			
Isopropylbenzene	mg/kg dry	0.2	<0.2	<0.2			
M & P Xylenes	mg/kg dry	0.04	<0.04	<0.04			
Methyl Ethyl Ketone	mg/kg dry	15	<15	<15			
Methyl Tertiary Butyl Ether	mg/kg dry	0.1	<0.1	<0.1			
O-Xylene	mg/kg dry	0.04	<0.04	<0.04			
Styrene	mg/kg dry	0.03	<0.03	<0.03			
Tetrachloroethene	mg/kg dry	0.01	<0.01	<0.01			
Trans-1,2-Dichloroethene	mg/kg dry	0.03	<0.03	<0.03			
Trans-1,3-dichloropropene	mg/kg dry	0.02	<0.02	<0.02			
Trichloroethene	mg/kg dry	0.009	<0.009	<0.009			
Trichlorofluoromethane	mg/kg dry	0.2	<0.2	<0.2			
Phenols							
2,4-Dichlorophenol	µg/g dry	0.1	<0.1	<0.1			
2,5-Dichlorophenol	µg/g dry	0.1	<0.1	<0.1			
2-Chlorophenol	µg/g dry	0.1	<0.1	<0.1			
4-Chloro-3-Methylphenol	µg/g dry	0.1	<0.1	<0.1			
Pentachlorophenol	µg/g dry	0.2	<0.2	<0.2			0.36
2,4-dimethylphenol	µg/g dry	0.1	<0.1	<0.1			0.029
2,4-dinitrophenol	µg/g dry	1	<1	<1			
2-Methyl-4,6-Dinitrophenol	µg/g dry	0.5	<0.5	<0.5			
2-Nitrophenol	µg/g dry	0.5	<0.5	<0.5			
M,P-Cresol	µg/g dry	0.2	<0.2	<0.2			
Phenol	µg/g dry	0.2	<0.2	<0.2	0.1-1		0.42
2,4,6-trichlorophenol	µg/g dry	0.1	<0.1	<0.1			
Nonylphenols							
4-Nitrophenol	µg/g dry	0.5	<0.5	<0.5			
PAH							
2-Chloronaphthalene	µg/g dry	0.1	<0.1	<0.1			
2-Methylnaphthalene	mg/kg dry	0.001	<0.001	<0.001	0.201	0.24	

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Acenaphthene	mg/kg dry	0.0005	<0.0005	<0.0005	0.0889	0.11	0.5
Acenaphthylene	mg/kg dry	0.0005	<0.0005	<0.0005	0.128	0.15	1.3
Anthracene	mg/kg dry	0.001	<0.001	<0.001	0.245	0.29	
Benzo(B)Fluoranthene + Benzo(J)Fluoranthene	mg/kg dry	0.001	<0.001	0.0012			
Benzo(K)Fluoranthene	mg/kg dry	0.001	<0.001	<0.001			
Benzo[a]anthracene	mg/kg dry	0.001	<0.001	<0.001	0.693	0.83	
Benzo[a]pyrene	mg/kg dry	0.001	<0.001	<0.001	0.763	0.92	
Benzo[b]fluoranthene	mg/kg dry	0.001	<0.001	0.0012			
Benzo[ghi]perylene	mg/kg dry	0.002	<0.002	<0.002			0.67
Chrysene	mg/kg dry	0.001	<0.001	0.0015	0.846	1	1.4
dibenzo(a,h)anthracene	mg/kg dry	0.0005	<0.0005	<0.0005	0.135	0.16	0.23
Fluoranthene	mg/kg dry	0.001	<0.001	0.0017	1.494	1.8	1.7
Fluorene	mg/kg dry	0.001	<0.001	<0.001	0.14	0.17	0.54
High Molecular Weight PAH`s	mg/kg dry	0.001	<0.001	0.0049			
Indeno(1,2,3-C,D)Pyrene	mg/kg dry	0.002	<0.002	<0.002			
Low Molecular Weight PAH`s	mg/kg dry	0.001	<0.001	0.0049			
Naphthalene	mg/kg dry	0.001	<0.001	0.0012	0.391	0.47	2.1
Phenanthrene	mg/kg dry	0.001	<0.001	0.0026	0.544	0.65	1.5
Pyrene	mg/kg dry	0.001	<0.001	0.0017	1.398	1.7	2.6
Total PAH	mg/kg dry	0.001	<0.001	0.0098			
PCBs							
PCBs Total	µg/g dry	---	---	---			
Pesticides							
Bis(2-Chloroethoxy)Methane	µg/g dry	0.1	<0.1	<0.1			
Bis(2-Chloroethyl)Ether	µg/g dry	0.2	<0.2	<0.2			
Bis(2-Chloroisopropyl)Ether	µg/g dry	0.1	<0.1	<0.1			
Chlordane	µg/g dry	---	---	---			
DDT + Metabolites	µg/g dry	---	---	---			
Heptachlor + Heptachlor epoxide	µg/g dry	---	---	---	2.74		
Hexachlorobenzene	µg/g dry	0.2	<0.2	<0.2			
Total Endosulfan	µg/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Phthalates							
Bis(2-Ethylhexyl)Phthalate	µg/g dry	0.5	<0.5	<0.5			
Butylbenzyl Phthalate	µg/g dry	0.2	<0.2	<0.2			
Diethyl Phthalate	µg/g dry	0.2	<0.2	<0.2			
Dimethyl Phthalate	µg/g dry	0.2	<0.2	<0.2			
Di-N-Butyl Phthalate	µg/g dry	0.2	<0.2	<0.2			
Di-N-Octyl Phthalate	µg/g dry	0.5	<0.5	<0.5			
4-Methyl-2-Pentanone	mg/kg dry	0.5	<0.5	<0.5			
Dimethyl Ketone	mg/kg dry	5	<5	<5			
Endrin Ketone	µg/g dry	0.002	<0.002	<0.002			
Isophorone	µg/g dry	0.1	<0.1	<0.1			
High Resolution							
Ketones							
Endrin Ketone	ng/g dry	0.0019	<0.0052	<0.0019			
Organics							
1,2,3,4-Tetrachlorobenzene	ng/g dry	0.0033	0.009	0.015			
1,3,5-Trichlorobenzene	ng/g dry	0.003	<0.0037	0.009			
1,7-Dimethylxanthine	ng/g dry	---	---	---			
Delta-Hch Or Delta-Bhc	ng/g dry	0.0014	<0.0021	<0.0014			
Pentachlorobenzene	ng/g dry	0.001	0.005	0.009			
Perfluorobutanoic acid	ng/g dry	0.15	<0.148	<0.15			
Trans-Chlordane	ng/g dry	0.001	<0.0011	<0.001			
Trans-Nonachlor	ng/g dry	0.001	<0.001	0.001			
1,2,3-Trichlorobenzene	ng/g dry	0.0018	0.013	0.274			
1,2,4,5-/1,2,3,5-Tetrachlorobenzene	ng/g dry	0.0032	0.006	0.013			
1,2,4-trichlorobenzene	ng/g dry	0.0019	0.047	0.087			1800
1,2-dichlorobenzene	ng/g dry	0.0014	0.002	0.003			2300
1,3-dichlorobenzene	ng/g dry	0.0016	0.049	0.062			
1,4-dichlorobenzene	ng/g dry	0.0019	0.263	0.555			9000
Hexachlorobutadiene	ng/g dry	0.001	0.016	0.024			
Pharmaceuticals							
17 beta-Estradiol 3-benzoate	ng/g dry	---	---	---			
Allyl Trenbolone	ng/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Androstenedione	ng/g dry	---	---	---			
Androsterone	ng/g dry	---	---	---			
Desogestrel	ng/g dry	---	---	---			
Mestranol	ng/g dry	---	---	---			
Norethindrone	ng/g dry	---	---	---			
Norgestrel	ng/g dry	---	---	---			
Progesterone	ng/g dry	---	---	---			
Testosterone	ng/g dry	---	---	---			
Hormones							
17 alpha-Dihydroequilin	ng/g dry	---	---	---			
17 alpha-Estradiol	ng/g dry	---	---	---			
17 alpha-Ethinyl-Estradiol	ng/g dry	---	---	---			
17 beta-Estradiol	ng/g dry	---	---	---			
Equilenin	ng/g dry	---	---	---			
Equilin	ng/g dry	---	---	---			
Estriol	ng/g dry	---	---	---			
Estrone	ng/g dry	---	---	---			
Nonylphenols							
4-n-Octylphenol	ng/g dry	0.0498	<0.0784	0.097			
4-Nonylphenol Diethoxylates	ng/g dry	0.196	<0.407	<0.196			
4-Nonylphenol Monoethoxylates	ng/g dry	0.391	<0.332	<0.391			
Np	ng/g dry	0.246	0.237	0.873			
PAH							
1-Methylphenanthrene	ng/g dry	0.181	0.94	3.21			
2,3,5-trimethylnaphthalene	ng/g dry	0.178	1.06	5.07			
2,6-dimethylnaphthalene	ng/g dry	0.296	1.96	5.9			
2-Methylnaphthalene	ng/g dry	0.0927	1.53	6.56	201	240	
Acenaphthene	ng/g dry	0.112	<0.111	0.258	88.9	110	57000
Acenaphthylene	ng/g dry	0.0514	<0.0554	0.109	128	150	66000
Anthracene	ng/g dry	0.0384	0.232	0.425	245	290	
Benzo[a]anthracene	ng/g dry	0.0521	0.361	0.806	693	830	
Benzo[a]pyrene	ng/g dry	0.183	0.303	0.739	763	920	
Benzo[b]fluoranthene	ng/g dry	0.14	0.492	1.19			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Benzo[e]pyrene	ng/g dry	0.186	0.378	0.825			
Benzo[ghi]perylene	ng/g dry	0.0713	0.484	1.05			78000
Benzo[J,K]Fluoranthenes	ng/g dry	0.143	0.258	0.684			
Chrysene	ng/g dry	0.0519	0.772	1.83	846	1000	460000
dibenzo(a,h)anthracene	ng/g dry	0.078	0.106	0.18	135	160	33000
Dibenzothiophene	ng/g dry	0.0514	<0.201	0.546			
Fluoranthene	ng/g dry	0.0555	0.987	2.41	1494	1800	1200000
Fluorene	ng/g dry	0.177	0.378	0.983	144	170	79000
Indeno(1,2,3-C,D)Pyrene	ng/g dry	0.0705	0.284	0.677			
Naphthalene	ng/g dry	0.0891	0.716	3	391	470	170000
Perylene	ng/g dry	0.196	2.06	4.39			
Phenanthrene	ng/g dry	0.0383	2.09	6.2	544	650	480000
Pyrene	ng/g dry	0.0541	0.901	2.19	1398	1700	1400000
PBDE							
PBDE 10	pg/g dry	0.123	<0.123	<0.123			
PBDE 100	pg/g dry	0.123	0.811	1.17			
PBDE 105	pg/g dry	0.123	<0.123	<0.123			
PBDE 116	pg/g dry	0.123	<0.133	<0.123			
PBDE 119/120	pg/g dry	0.123	0.227	0.257			
PBDE 12/13	pg/g dry	0.123	<0.123	<0.123			
PBDE 126	pg/g dry	0.123	<0.123	<0.123			
PBDE 128	pg/g dry	0.123	<0.123	<0.123			
PBDE 138/166	pg/g dry	0.123	<0.123	0.15			
PBDE 140	pg/g dry	0.123	<0.123	<0.123			
PBDE 15	pg/g dry	0.123	0.19	0.244			
PBDE 153	pg/g dry	0.123	0.55	1.04			
PBDE 154	pg/g dry	0.123	0.59	0.873			
PBDE 155	pg/g dry	0.123	0.149	0.251			
PBDE 17/25	pg/g dry	0.123	0.457	1.13			
PBDE 181	pg/g dry	0.123	<0.123	<0.123			
PBDE 183	pg/g dry	0.123	0.221	0.158			
PBDE 190	pg/g dry	0.123	<0.123	<0.123			
PBDE 203	pg/g dry	0.136	0.198	0.267			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PBDE 206	pg/g dry	0.326	1.3	1.45			
PBDE 207	pg/g dry	0.468	1.28	2.39			
PBDE 208	pg/g dry	0.482	1.35	1.67			
PBDE 209	pg/g dry	6.23	31.4	42			
PBDE 28/33	pg/g dry	0.123	0.306	0.621			
PBDE 30	pg/g dry	0.123	<0.123	<0.123			
PBDE 32	pg/g dry	0.123	<0.123	<0.123			
PBDE 35	pg/g dry	0.123	<0.123	<0.123			
PBDE 37	pg/g dry	0.123	<0.123	0.141			
PBDE 47	pg/g dry	0.123	4.65	6.86			
PBDE 49	pg/g dry	0.123	0.946	1.4			
PBDE 51	pg/g dry	0.123	0.174	0.277			
PBDE 66	pg/g dry	0.123	0.4	0.737			
PBDE 7	pg/g dry	0.123	<0.123	0.168			
PBDE 71	pg/g dry	0.123	0.159	0.261			
PBDE 75	pg/g dry	0.123	<0.123	<0.123			
PBDE 77	pg/g dry	0.123	<0.123	<0.123			
PBDE 79	pg/g dry	0.123	<0.123	<0.123			
PBDE 8/11	pg/g dry	0.123	<0.123	0.364			
PBDE 85	pg/g dry	0.123	<0.123	<0.123			
PBDE 99	pg/g dry	0.123	2.72	3.97			
PCB							
Decachloro Biphenyl	pg/g dry	-999	0.445	1.41			
PCB 10	pg/g dry	0.0751	<0.331	<0.0751			
PCB 103	pg/g dry	0.0711	<0.116	0.166			
PCB 104	pg/g dry	0.0348	<0.165	0.056			
PCB 105	pg/g dry	0.0885	2.19	5.07			
PCB 106	pg/g dry	0.0912	<0.18	<0.0912			
PCB 107	pg/g dry	0.0992	0.548	1.19			
PCB 11	pg/g dry	0.0786	18.7	21.6			
PCB 110/115	pg/g dry	0.0836	5.3	13.1			
PCB 111	pg/g dry	0.0787	0.175	<0.0787			
PCB 112	pg/g dry	0.0602	<0.0991	<0.0602			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PCB 114	pg/g dry	0.101	<0.186	0.207			
PCB 118	pg/g dry	0.105	4.9	11.2			
PCB 12/13	pg/g dry	0.0788	1.39	1.36			
PCB 120	pg/g dry	0.0965	<0.158	<0.0965			
PCB 121	pg/g dry	0.0713	<0.116	<0.0713			
PCB 122	pg/g dry	0.0887	<0.17	0.15			
PCB 123	pg/g dry	0.0923	<0.176	0.262			
PCB 126	pg/g dry	0.119	<0.223	0.154			
PCB 127	pg/g dry	0.135	<0.266	<0.135			
PCB 128/166	pg/g dry	0.0511	1.15	2.54			
PCB 129/138/160/163	pg/g dry	0.0489	5.58	14.2			
PCB 130	pg/g dry	0.0497	0.465	0.91			
PCB 131	pg/g dry	0.0514	0.149	0.173			
PCB 132	pg/g dry	0.0458	1.2	2.92			
PCB 133	pg/g dry	0.0524	0.238	0.386			
PCB 134/143	pg/g dry	0.0488	<0.133	0.58			
PCB 135/151/154	pg/g dry	0.0498	1.39	3.34			
PCB 136	pg/g dry	0.0483	0.319	0.88			
PCB 137	pg/g dry	0.0535	0.165	0.388			
PCB 139/140	pg/g dry	0.0472	<0.132	0.17			
PCB 14	pg/g dry	0.0783	<0.356	0.418			
PCB 141	pg/g dry	0.0459	0.509	1.15			
PCB 142	pg/g dry	0.048	<0.135	<0.048			
PCB 144	pg/g dry	0.0512	<0.113	0.408			
PCB 145	pg/g dry	0.0464	<0.101	<0.0464			
PCB 146	pg/g dry	0.0495	1.17	2.64			
PCB 147/149	pg/g dry	0.0478	2.37	7.77			
PCB 148	pg/g dry	0.0535	<0.114	<0.0535			
PCB 15	pg/g dry	0.0812	2.17	4.07			
PCB 150	pg/g dry	0.049	<0.105	<0.049			
PCB 152	pg/g dry	0.0474	0.4	0.177			
PCB 153/168	pg/g dry	0.0508	4.64	12.8			
PCB 155	pg/g dry	0.0587	<0.137	0.066			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PCB 156157	pg/g dry	0.0581	0.704	1.26			
PCB 158	pg/g dry	0.0515	0.423	1.06			
PCB 159	pg/g dry	0.06	0.534	0.073			
PCB 16	pg/g dry	0.0519	0.477	0.977			
PCB 161	pg/g dry	0.0503	<0.142	<0.0503			
PCB 162	pg/g dry	0.0552	<0.156	0.059			
PCB 164	pg/g dry	0.0421	0.261	0.632			
PCB 165	pg/g dry	0.0528	<0.146	0.084			
PCB 167	pg/g dry	0.0532	0.277	0.558			
PCB 169	pg/g dry	0.0594	<0.163	<0.0594			
PCB 17	pg/g dry	0.0614	1.68	1.42			
PCB 170	pg/g dry	0.0551	1.11	2.07			
PCB 171/173	pg/g dry	0.0648	0.336	0.857			
PCB 172	pg/g dry	0.0751	<0.185	0.611			
PCB 175	pg/g dry	0.0713	<0.177	0.176			
PCB 176	pg/g dry	0.0689	<0.174	0.262			
PCB 177	pg/g dry	0.0705	1.38	2.2			
PCB 178	pg/g dry	0.0758	0.386	0.908			
PCB 179	pg/g dry	0.0698	0.389	1.15			
PCB 18/30	pg/g dry	0.0629	1.67	2.95			
PCB 180/193	pg/g dry	0.0658	1.93	5.34			
PCB 181	pg/g dry	0.073	<0.181	0.078			
PCB 182	pg/g dry	0.0695	<0.169	<0.0695			
PCB 183/185	pg/g dry	0.0721	0.646	1.84			
PCB 184	pg/g dry	0.0701	<0.177	<0.0701			
PCB 186	pg/g dry	0.064	<0.156	<0.064			
PCB 187	pg/g dry	0.0697	2.03	4.69			
PCB 188	pg/g dry	0.0729	<0.15	<0.0729			
PCB 189	pg/g dry	0.0989	<0.407	<0.0989			
PCB 19	pg/g dry	0.1	1.16	0.526			
PCB 190	pg/g dry	0.0852	<0.214	0.317			
PCB 191	pg/g dry	0.0785	<0.194	0.212			
PCB 192	pg/g dry	0.0751	<0.187	<0.0751			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PCB 194	pg/g dry	0.0975	0.8	1.62			
PCB 195	pg/g dry	0.0949	<0.204	0.491			
PCB 196	pg/g dry	0.108	0.302	0.845			
PCB 197/200	pg/g dry	0.0975	0.423	0.494			
PCB 198/199	pg/g dry	0.104	0.992	1.77			
PCB 2	pg/g dry	0.526	10.3	15.8			
PCB 20/28	pg/g dry	0.0912	6.03	10.7			
PCB 201	pg/g dry	0.106	<0.182	0.261			
PCB 202	pg/g dry	0.106	0.454	0.535			
PCB 203	pg/g dry	0.104	0.402	0.905			
PCB 204	pg/g dry	0.111	<0.185	<0.111			
PCB 205	pg/g dry	0.108	<0.228	<0.108			
PCB 206	pg/g dry	0.0876	0.538	1.24			
PCB 207	pg/g dry	0.0959	<0.241	<0.0959			
PCB 208	pg/g dry	0.0941	<0.235	0.439			
PCB 209	pg/g dry	0.133	0.445	1.41			
PCB 21/33	pg/g dry	0.0833	2.6	4.38			
PCB 22	pg/g dry	0.0872	1.8	2.94			
PCB 23	pg/g dry	0.0846	<0.203	<0.0846			
PCB 24	pg/g dry	0.0667	<0.183	<0.0667			
PCB 25	pg/g dry	0.0947	0.671	1.33			
PCB 26/29	pg/g dry	0.0896	1.04	1.44			
PCB 27	pg/g dry	0.0578	0.221	0.237			
PCB 3	pg/g dry	0.493	<2.18	0.942			
PCB 31	pg/g dry	0.0964	4.93	7.5			
PCB 32	pg/g dry	0.0782	1.11	1.37			
PCB 34	pg/g dry	0.0822	<0.196	<0.0822			
PCB 35	pg/g dry	0.103	0.314	0.58			
PCB 36	pg/g dry	0.0975	<0.241	0.252			
PCB 37	pg/g dry	0.0786	1.46	3.32			
PCB 38	pg/g dry	0.0958	<0.236	0.222			
PCB 4	pg/g dry	0.0861	3.39	1.94			
PCB 40/41/71	pg/g dry	0.0577	1.96	3.57			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PCB 42	pg/g dry	0.064	1.01	2.24			
PCB 43	pg/g dry	0.058	<0.134	0.183			
PCB 44/47/65	pg/g dry	0.0648	4.35	8.66			
PCB 46	pg/g dry	0.0554	0.153	0.3			
PCB 48	pg/g dry	0.0583	0.602	1.08			
PCB 49/69	pg/g dry	0.0705	2.87	5.78			
PCB 5	pg/g dry	0.074	<0.328	0.323			
PCB 50/53	pg/g dry	0.0609	0.267	0.662			
PCB 52	pg/g dry	0.0641	3.7	8.07			
PCB 54	pg/g dry	0.109	<0.349	0.117			
PCB 55	pg/g dry	0.0816	0.308	<0.0816			
PCB 56	pg/g dry	0.084	3.01	5.25			
PCB 57	pg/g dry	0.0852	<0.172	0.091			
PCB 58	pg/g dry	0.0748	<0.149	0.078			
PCB 59/62/75	pg/g dry	0.0698	0.425	0.582			
PCB 6	pg/g dry	0.069	0.838	0.937			
PCB 60	pg/g dry	0.0996	1.54	3.24			
PCB 61/70/74/76	pg/g dry	0.0882	8.67	17.2			
PCB 63	pg/g dry	0.0986	0.262	0.476			
PCB 64	pg/g dry	0.0728	1.96	3.66			
PCB 66	pg/g dry	0.105	7.69	13.7			
PCB 67	pg/g dry	0.0895	<0.185	0.408			
PCB 68	pg/g dry	0.0892	0.273	0.171			
PCB 7	pg/g dry	0.0776	1.47	1.04			
PCB 72	pg/g dry	0.0853	<0.17	0.171			
PCB 73	pg/g dry	0.0556	<0.135	<0.0556			
PCB 77	pg/g dry	0.0844	0.721	1.47			
PCB 78	pg/g dry	0.104	<0.206	<0.104			
PCB 79	pg/g dry	0.116	<0.234	<0.116			
PCB 8	pg/g dry	0.0687	2.54	4.92			
PCB 80	pg/g dry	0.101	<0.203	<0.101			
PCB 81	pg/g dry	0.0837	<0.154	<0.0837			
PCB 82	pg/g dry	0.0646	0.623	1.49			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PCB 83/99	pg/g dry	0.072	2.54	6.67			
PCB 84	pg/g dry	0.0614	0.719	1.84			
PCB 85/116/117	pg/g dry	0.0723	1.45	2.91			
PCB 86/87/97/108/119/125	pg/g dry	0.0659	9.99	15.2			
PCB 88/91	pg/g dry	0.0649	0.472	1.14			
PCB 89	pg/g dry	0.0584	<0.0961	0.063			
PCB 9	pg/g dry	0.0834	2.01	1.16			
PCB 90/101/113	pg/g dry	0.0651	3.89	10.7			
PCB 92	pg/g dry	0.0673	0.632	1.93			
PCB 93/95/98/100/102	pg/g dry	0.0681	2.58	6.19			
PCB 94	pg/g dry	0.0643	<0.105	<0.0643			
PCB 96	pg/g dry	0.0251	<0.103	0.093			
PCB-108 + 124	pg/g dry	0.0923	0.247	0.44			
PCB174	pg/g dry	0.0615	7.33	5.02			
PCB39	pg/g dry	0.114	<0.286	<0.114			
PCB45/51	pg/g dry	0.0595	0.47	0.77			
Dichloro Biphenyls	pg/g dry	---	26.8	34.8			
Heptachloro Biphenyls	pg/g dry	---	5.07	19.5			
Hexachloro Biphenyls	pg/g dry	---	19.2	53.9			
Monochloro Biphenyls	pg/g dry	---	<-999	15.8			
Nonachloro Biphenyls	pg/g dry	---	<-999	1.68			
Octachloro Biphenyls	pg/g dry	---	2.19	6.17			
Pentachloro Biphenyls	pg/g dry	---	21.3	64			
Tetrachloro Biphenyls	pg/g dry	---	31.1	64			
Trichloro Biphenyls	pg/g dry	---	23.5	37.2			
PCB Teq 3	pg/g dry	---	0.093465	0.28551			
PCB Teq 4	pg/g dry	---	0.1307	0.30677			
PCBs Total	pg/g dry	---	130	299	189000		
PCB	pg/g dry	0.661	<1.66	1.86			
PCDD							
1,2,3,4,6,7,8-HPCDD	pg/g dry	0.0246	0.885	2.43			
1,2,3,4,6,7,8-HPCDF	pg/g dry	0.0246	0.21	0.582			
1,2,3,4,7,8,9-HPCDF	pg/g dry	0.0246	<0.0246	0.025			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
1,2,3,4,7,8-HXCDD	pg/g dry	0.0246	<0.0246	0.046			
1,2,3,4,7,8-HXCDF	pg/g dry	0.0246	<0.0246	0.053			
1,2,3,6,7,8-HXCDD	ng/g dry	0.0246	0.199	0.519			
1,2,3,6,7,8-HXCDF	pg/g dry	0.0246	<0.0246	0.034			
1,2,3,7,8,9-HXCDD	pg/g dry	0.0246	0.107	0.32			
1,2,3,7,8,9-HXCDF	pg/g dry	0.0246	<0.0246	<0.0246			
1,2,3,7,8-PECDD	pg/g dry	0.0246	0.039	0.1			
1,2,3,7,8-PECDF	pg/g dry	0.0246	0.031	0.055			
2,3,4,6,7,8-HXCDF	pg/g dry	0.0246	<0.0246	0.035			
2,3,4,7,8-PECDF	pg/g dry	0.0246	<0.0246	0.052			
2,3,7,8-TCDD	pg/g dry	0.0246	<0.0246	0.033			
2,3,7,8-TCDF	pg/g dry	0.0246	0.103	0.253			
HEPTA-DIOXINS	pg/g dry	-999	1.97	5.58			
Hepta-Furans	pg/g dry	-999	0.448	1.31			
HEXA-DIOXINS	pg/g dry	-999	1.55	4.45			
HEXA-FURANS	pg/g dry	-999	0.112	0.704			
OCDD	pg/g dry	0.0246	4.57	12.1			
OCDF	pg/g dry	0.0246	0.348	0.824			
Penta-Dioxins	pg/g dry	---	0.12	0.748			
Penta-Furans	pg/g dry	---	0.161	0.542			
Tetra-Dioxins	pg/g dry	---	0.102	0.266			
Tetra-Furans	pg/g dry	---	0.37	0.887			
Pesticides							
2,4-DDD	ng/g dry	0.001	0.002	0.008			
2,4-DDE	ng/g dry	0.001	<0.001	0.002			
2,4-DDT	ng/g dry	0.008	0.01	0.02			
4,4-DDD	ng/g dry	0.0041	0.006	0.027	7.81a		
4,4-DDE	ng/g dry	0.001	0.012	0.036			
4,4-DDT	ng/g dry	0.0133	<0.0066	<0.0133	4.7a		
ABHC	ng/g dry	0.0015	0.01	0.014			
Aldrin	ng/g dry	0.0025	<0.006	0.007			
Alpha Chlordane	ng/g dry	0.001	<0.0012	0.004			
Alpha-Endosulfan	ng/g dry	0.001	<0.0015	<0.001			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Beta-Endosulfan	ng/g dry	0.0015	<0.0034	<0.0015			
Beta-Hch Or Beta-Bhc	ng/g dry	0.0015	0.004	0.008			
Cis-Nonachlor	ng/g dry	0.0021	<0.0033	<0.0021			
Dieldrin	ng/g dry	0.001	0.004	0.004	4.3		
Endosulfan Sulfate	ng/g dry	0.001	<0.0023	<0.001			
Endrin	ng/g dry	0.0025	<0.008	<0.0025	62.4		
Endrin Aldehyde	ng/g dry	0.0177	<0.0225	0.045			
HCH, Gamma	ng/g dry	0.0012	<0.0021	0.021			
Heptachlor	ng/g dry	0.001	<0.0013	<0.001	2.74		
Heptachlor Epoxide	ng/g dry	0.001	<0.0016	<0.001			
Hexachlorobenzene	ng/g dry	0.001	0.008	0.016			
Methoxyclor	ng/g dry	0.001	<0.0016	0.002			
Mirex	ng/g dry	0.001	<0.001	<0.001			
Oxychlordane	ng/g dry	0.001	<0.0093	<0.001			
PFOS							
3:3 FTCA	ng/g dry	0.15	<0.148	<0.15			
4:2 FTS	ng/g dry	0.15	<0.148	<0.15			
5:3 FTCA	ng/g dry	0.938	<0.926	<0.938			
6:2 FTS	ng/g dry	0.135	<0.134	<0.135			
7:3 FTCA	ng/g dry	0.938	<0.926	<0.938			
8:2 FTS	ng/g dry	0.128	<0.126	<0.128			
ADONA	ng/g dry	0.15	<0.148	<0.15			
HFPO-DA	ng/g dry	0.15	<0.148	<0.15			
N-EtFOSA	ng/g dry	0.105	<0.104	<0.105			
N-EtFOSAA	ng/g dry	0.0375	<0.0371	<0.0375			
N-EtFOSE	ng/g dry	0.375	<0.371	<0.375			
NFDHA	ng/g dry	0.075	<0.0741	<0.075			
N-MeFOSA	ng/g dry	0.0375	<0.0371	<0.0375			
NMeFOSAA	ng/g dry	0.0375	<0.0371	<0.0375			
N-MeFOSE	ng/g dry	0.375	<0.371	<0.375			
PFBS	ng/g dry	0.0375	<0.0371	<0.0375			
PFDA	ng/g dry	0.0375	<0.0371	<0.0375			
PFDoA	ng/g dry	0.03	<0.0296	<0.03			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
PFDoS	ng/g dry	0.0375	<0.0371	<0.0375			
PFDS	ng/g dry	0.0375	<0.0371	<0.0375			
PFEESA	ng/g dry	0.0375	<0.0371	<0.0375			
PFHpA	ng/g dry	0.0375	<0.0371	<0.0375			
PFHpS	ng/g dry	0.0375	<0.0371	<0.0375			
PFHxA	ng/g dry	0.0375	<0.0371	<0.0375			
PFHxS	ng/g dry	0.0431	<0.0426	<0.0431			
PFMBA	ng/g dry	0.0375	<0.0371	<0.0375			
PFMPA	ng/g dry	0.075	<0.0741	<0.075			
PFNA	ng/g dry	0.0375	<0.0371	<0.0375			
PFNS	ng/g dry	0.0375	<0.0371	<0.0375			
PFOA	ng/g dry	0.0375	<0.0371	<0.0375			
PFOS	ng/g dry	0.0375	<0.0371	<0.0375			
PFOSA	ng/g dry	0.0375	<0.0371	<0.0375			
PFPeA	ng/g dry	0.075	<0.0741	<0.075			
PFPeS	ng/g dry	0.0377	<0.0372	<0.0377			
PFTeDA	ng/g dry	0.0375	<0.0371	<0.0375			
PFTrDA	ng/g dry	0.0375	<0.0371	<0.0375			
PFUnA	ng/g dry	0.0375	<0.0371	<0.0375			
PPCP							
2-Hydroxy-Ibuprofen	ng/g dry	4.03	<3.96	<4.03			
Acetaminophen	ng/g dry	---	---	---			
Albuterol	ng/g dry	---	---	---			
Alprazolam	ng/g dry	---	---	---			
Amitriptyline	ng/g dry	---	---	---			
Amlodipine	ng/g dry	---	---	---			
Amphetamine	ng/g dry	---	---	---			
Amsacrine	ng/g dry	---	---	---			
Atenolol	ng/g dry	---	---	---			
Atorvastatin	ng/g dry	---	---	---			
Azathioprine	ng/g dry	---	---	---			
Azithromycin	ng/g dry	---	---	---			
Benzoylecgonine	ng/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Benztropine	ng/g dry	---	---	---			
Betamethasone	ng/g dry	---	---	---			
Bisphenol A	ng/g dry	6.05	<5.95	<6.05			
Busulfan	ng/g dry	---	---	---			
Caffeine	ng/g dry	---	---	---			
Carbadox	ng/g dry	---	---	---			
Carbamazepine	ng/g dry	---	---	---			
Cefotaxime	ng/g dry	---	---	---			
Cimetidine	ng/g dry	---	---	---			
Ciprofloxacin	ng/g dry	---	---	---			
Citalopram	ng/g dry	---	---	---			
Clarithromycin	ng/g dry	---	---	---			
Clinafloxacin	ng/g dry	---	---	---			
Clonidine	ng/g dry	---	---	---			
Clotrimazole	ng/g dry	---	---	---			
Cloxacillin	ng/g dry	---	---	---			
Cocaine	ng/g dry	---	---	---			
Codeine	ng/g dry	---	---	---			
Colchicine	ng/g dry	---	---	---			
Cotinine	ng/g dry	---	---	---			
Cyclophosphamide	ng/g dry	---	---	---			
Daunorubicin	ng/g dry	---	---	---			
Deet	ng/g dry	---	---	---			
Dehydronifedipine	ng/g dry	---	---	---			
Desmethyldiltiazem	ng/g dry	---	---	---			
Diatrizoic acid	ng/g dry	---	---	---			
Diazepam	ng/g dry	---	---	---			
Digoxigenin	ng/g dry	---	---	---			
Digoxin	ng/g dry	---	---	---			
Diltiazem	ng/g dry	---	---	---			
Diphenhydramine	ng/g dry	---	---	---			
Doxorubicin	ng/g dry	---	---	---			
Drospirenone	ng/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Enalapril	ng/g dry	---	---	---			
Enrofloxacin	ng/g dry	---	---	---			
Erythromycin-H2O	ng/g dry	---	---	---			
Etoposide	ng/g dry	---	---	---			
Flumequine	ng/g dry	---	---	---			
Fluocinonide	ng/g dry	---	---	---			
Fluoxetine	ng/g dry	---	---	---			
Fluticasone Propionate	ng/g dry	---	---	---			
Furosemide	ng/g dry	4.03	<3.96	<4.03			
Gemfibrozil	ng/g dry	0.806	<0.793	<0.806			
Glipizide	ng/g dry	0.806	<0.793	<0.806			
Glyburide	ng/g dry	0.806	<0.793	<0.806			
Hydrochlorothiazide	ng/g dry	4.03	<3.96	<4.03			
Hydrocodone	ng/g dry	---	---	---			
Hydrocortisone	ng/g dry	---	---	---			
Ibuprofen	ng/g dry	4.03	<3.96	<4.03			
Lopamidol	ng/g dry	---	---	---			
Lincomycin	ng/g dry	---	---	---			
Lomefloxacin	ng/g dry	---	---	---			
Medroxyprogesterone Acetate	ng/g dry	---	---	---			
Melphalan	ng/g dry	---	---	---			
Meprobamate	ng/g dry	---	---	---			
Metformin	ng/g dry	---	---	---			
Methylprednisolone	ng/g dry	---	---	---			
Metoprolol	ng/g dry	---	---	---			
Metronidazole	ng/g dry	---	---	---			
Miconazole	ng/g dry	---	---	---			
Moxifloxacin	ng/g dry	---	---	---			
Naproxen	ng/g dry	2.02	<1.98	<2.02			
Norfloxacin	ng/g dry	---	---	---			
Norfluoxetine	ng/g dry	---	---	---			
Norgestimate	ng/g dry	---	---	---			
Norverapamil	ng/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Ofloxacin	ng/g dry	---	---	---			
Ormetoprim	ng/g dry	---	---	---			
Oxacillin	ng/g dry	---	---	---			
Oxazepam	ng/g dry	---	---	---			
Oxolinic Acid	ng/g dry	---	---	---			
Oxycodone	ng/g dry	---	---	---			
Paroxetine	ng/g dry	---	---	---			
Penicillin G	ng/g dry	---	---	---			
Penicillin V	ng/g dry	---	---	---			
Prednisolone	ng/g dry	---	---	---			
Prednisone	ng/g dry	---	---	---			
Promethazine	ng/g dry	---	---	---			
Propoxyphene	ng/g dry	---	---	---			
Propranolol	ng/g dry	---	---	---			
Ranitidine	ng/g dry	---	---	---			
Rosuvastatin	ng/g dry	---	---	---			
Roxithromycin	ng/g dry	---	---	---			
Sarafloxacin	ng/g dry	---	---	---			
Sertraline	ng/g dry	---	---	---			
Simvastatin	ng/g dry	---	---	---			
Sulfachloropyridazine	ng/g dry	---	---	---			
Sulfadiazine	ng/g dry	---	---	---			
Sulfadimethoxine	ng/g dry	---	---	---			
Sulfamerazine	ng/g dry	---	---	---			
Sulfamethazine	ng/g dry	---	---	---			
Sulfamethizole	ng/g dry	---	---	---			
Sulfamethoxazole	ng/g dry	---	---	---			
Sulfanilamide	ng/g dry	---	---	---			
Sulfathiazole	ng/g dry	---	---	---			
Tamoxifen	ng/g dry	---	---	---			
Teniposide	ng/g dry	---	---	---			
Theophylline	ng/g dry	---	---	---			
Thiabendazole	ng/g dry	---	---	---			

Appendix D1, continued

Parameter	Units	DL	SPWWTP Outfall	Reference 2	Sediment Screening Criteria		
					CCME PEL[1]	BC CSR Typical[2]	WSDOE 2nd Lowest AET[3]
Trenbolone	ng/g dry	---	---	---			
Trenbolone Acetate	ng/g dry	---	---	---			
Triamterene	ng/g dry	---	---	---			
Triclocarban	ng/g dry	0.403	<0.396	<0.403			
Triclosan	ng/g dry	6.05	<5.95	<6.05			
Trimethoprim	ng/g dry	---	---	---			
Tylosin	ng/g dry	---	---	---			
Valsartan	ng/g dry	---	---	---			
Venlafaxine	ng/g dry	---	---	---			
Verapamil	ng/g dry	---	---	---			
Virginiamycin	ng/g dry	---	---	---			
Warfarin	ng/g dry	0.403	<0.396	<0.403			
Zidovudine	ng/g dry	---	---	---			

Notes:
Shaded cells indicate exceedance to one or more SQG.
1 - Canadian Council of Ministers of the Environment Probable Effects Level (PEL) (CCME, 2002).
2 - BC Contaminated Sites Regulation Typical Contaminated Site Criteria (BCMWLAP, 2003).
3 - Washington State Department of Ecology, second lowest AET (WSDOE, 1991).
Multiple units are presented for analytes, which were reported using several units by the laboratory.

Appendix D2 SPTP Benthic Invertebrate Results 2024

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
ANNELIDA																								
Protodorvillea gracilis							4																	
Lumbrineridae indet.																					4			
Lumbrineris californiensis															4	4	12	4	8	16	4	8		4
Lumbrineris cruzensis															8									
Lumbrineris sp.	4																				8			8
Scoletoma tetraura complex													12		12		4	4	8	4	8	12		
Diopatra ornata							4						12	4	4	9	12	12	4	4		8	8	
Diopatra sp.																					4			
Onuphis elegans				4										4					4	28				
Onuphis elegans	1																							
Onuphis sp.						4												12			44		4	4
Onuphidae indet.			8												8			8			36			8
Pontogenia sp.																							4	
Glycera americana														8	4			4			16			
Glycinde armigera							4	8											4	4				8
Glycinde picta	8	4											4						12	4				
Glycinde sp.															4						4			
Oxydromus pugettensis															4									
Micropodarke dubia																		4						
Microphthalmus sp.										4														
Nephtys caeca	4	4			4																			
Nephtys ferruginea					4		8						12			4	4				8	12	4	
Nephtys sp.			12			4								4	8						12			
Nereis procera																	4			4				
Nereis sp.		4	4																					
Platynereis bicanaliculata		4	4					4						8	4									
Nereididae indet.			4																					
Eteone sp.																		4						
Eulalia quadrioculata							4								4									
Eumida longicornuta																	4							
Eumida sp.			4		4	4		8	16						12			8						
Phyllodoce groenlandica													4											
Phyllodoce hartmanae																					4		4	
Phyllodoce longipes															4									
Phyllodoce sp.									4			4												
Phyllodocidae indet.																								4
Hermundura fauveli																4								
Lepidonotus sp.								4																
Harmothoe imbricata													4											
Polynoinae indet.							4																	
Tenonia priops	4	4												4								12		
Pholoe sp.	4	4																	8		4			

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Pholoides asperus														4	4									
Sthenelais berkeleyi			4														4			4				
Sphaerodoropsis sphaerulifer													12						8			16		
Proceraea sp.				4						4														
Eusyllis blomstrandi							12							4		16			4					
Eusyllis habei							4										4		4					
Exogone dwisula	4	4					8	8					8						16			4		
Exogone lourei	64	40		12	16		176	4		8			32			16			16	8		12		
Sphaerosyllis californiensis							8			4			8			4			4					
Syllis caeca													4			4			4			4	4	
Syllis heterochaeta							4																	
Galathowenia oculata	56	76	4	200	36	4	28						484	372	112	340	460	48	476	396	124	316	364	68
Myriochele olgae	4																							
Owenia fusiformis				20	28	8	8	12	24		4		8	16	36	4	16	32		20	16	16	12	24
Owenia johnsoni	64	40	32																					
Chone magna																		4		4				
Chone sp.															4									
Euchone incolor													20			4						8		
Acromegalomma splendidum												4							1					
Paradialychone sp.																	4						24	
Sabellidae indet.															4									
Circeis armoricana	4			12			4									24	4	12	4					
Dipolydora bidentata							16																	
Dipolydora cardalia				8									4	12		4			4	4		12	4	
Dipolydora socialis		8					8	4				4				20		8	4					
Dipolydora sp.								8	16					4	12						8			12
Paraprionospio alata				4																			4	
Polydora limicola													8			4								
Prionospio sp.																		4						
Prionospio steenstrupi		4		8	4		8			16			4	20		20			8	12		8	8	12
Spio cirrifera													4			12			12			28	8	
Spio filicornis													4											
Spionidae indet. (Polydorid group)											4													
Spiophanes berkeleyorum			16			28			4		4			4	36		8	44		4	64			44
Spiophanes norrisi				4				12	4	20	4	12		8		4	12	32	36	8	24	4	4	12
Spiophanes sp.																	4							
Amage anops																								4
Ampharete labrops										4										4				
Ampharete lineata																4				4	28		4	
Ampharete sp.															4							4		
Ampharete sp. N1 (NAMIT, 2013)																			4	4				
Anobothrus gracilis														8			24	4	4	8	4	8	12	
Ampharetidae indet.			4						8						24			4			8			8
Aphelochaeta sp.							44	4																

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Caulleriella pacifica	4																			4				
Chaetozone acuta							4	4																4
Chaetozone careyi	8	8		4																				
Chaetozone sp.																	4							
Cirratulidae indet.									8															
Kirkegaardia tesselata													4											
Melinna elisabethae																				4				
Melinna sp.																							12	
Cistenides granulata			8												4					8	4			
Amphitrite robusta								4																
Eupolymnia heterobranchia							4																	
Lanassa venusta venusta																				4				
Pista elongata							4							8	4									4
Pista estevanica																								4
Pista wui																								4
Polycirrus californicus complex								8	4						4		4			4				
Polycirrus sp. complex															4		8	4						
Polycirrus sp. V (Banse)																						4		
Proclea sp.																			4					
Terebellidae indet.			4						8						4			4						
Arenicolidae indet.			4																					
Barantolla sp. nr. americana														4										
Capitellidae indet.												4												
Decamastus sp. nr. gracilis													80	8	8	64		4	32	28		28	4	
Mediomastus ambiseta														8		20			4			20		
Mediomastus californiensis	12	4		36	8		20			4			4	8					4					
Mediomastus sp.																				4				
Notomastus hemipodus															4				4					4
Notomastus lineatus			16		4	16	4																	4
Phyllochaetopterus prolifica	4			36			468			12			4			64								
Spiochaetopterus costarum complex																4			4	4				
Magelona longicornis							8						44	40		36	44	20	48	44	36	140	20	4
Euclymene sp. nr. zonalis			4		20				4			4				64	4		32		28			
Euclymeninae indet.	4		4			4		12	4						196			236			164			160
Ophelia limacina	4	4		4	4	4																		
Ophelina acuminata																			4			8		
Armandia brevis		4																4						
Leitoscoloplos pugettensis				4				4					12	4	4	4				8		16	8	
Naineris cf. grubei									4															
Scoloplos armiger									4		16													
Aricidea (Aricidea) minuta				4						8														
Neosabellaria cementarium						4		4	16					4			4							
Scalibregma californicum		4	4	4	8																			
Golfingiidae indet.									4						8					8	12			28

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Thysanocardia nigra													4			4		4				8		
ARTHROPODA																								
Halacaridae indet.										4														
Ammotheidae indet.													4						4			4		
Ampelisca hancocki													4											
Ampelisca pugetica																8								
Ampelisca sp.													4											
Ampeliscidae indet.																		4						
Byblis millsi														4										
Aoroides sp.							16	16						8										
Monocorophium acherusicum	128			28			16			16			16	8		108			84			8		
Monocorophium sp.				4														56			4			
Cheirimedeia sp.	8	24														4								
Protomedeia prudens																64			32			28	36	
Protomedeia sp.								16	8				32	8			48			28				
Ischyrocerus sp. 1 (Biologica)																			4					
Desdimelita desdichada		8						8																
Americhelidium sp.																4								
Prachynella sp.				4																				
Photis brevipes							12																	
Photis sp.								8		8				24		8	12		4					
Podoceropsis sp.								16									8					4	4	
Heterophoxus conlanae				4																				
Heterophoxus ellisi																4			4					
Grandifoxus longirostris							4																	
Parametaphoxus quaylei	4												4			8			4					
Rhepoxynius boreovariatus	4	4											8			36			32			32	12	
Rhepoxynius sp.					4		4	8						28			52	8						
Stenothoidae indet.																			4					
Amphipoda indet.		4							4				4		4			4						
Caprelloidea indet.									12		4				4						8			
Balanus crenatus		4			108	64				8	20			4			8							
Balanus sp.								4	4												4			24
Balanomorpha indet.			4									4						16						
Diastylis abboti	4	8											4			8			4			4		
Diastylis sp.																		8						
Cancridae indet.												1						4						
Mesocrangon munitella					8																			
Oregonia gracilis			4						4									4						
Pagurus sp.					4																			
Pinnotheridae indet.							4																	
Spirontocaris prionota								4																
Grapsoidea indet.																					4			
Idarcturus hedgpethi																4								

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Bopyridae indet.							8																	
Joeropsis sp.										4														
Munnogonium sp.										4														
Pleurogonium sp.																						4		
Euphilomedes carcharodonta	76	16		44	12		12	4		16						16	8		28			12	8	
Euphilomedes producta													8	4					12			4		
Rutiderma lomae	8			8												8			4			16		
Chondrochelia dubia complex		4														16		4						
Tanaidacea indet.																		8						
ECHINODERMATA																								
Phyllophoridae indet.												4					1							
Dendrochirotida indet.			8																					
Amphiodia sp.																		4						
Amphiodia urtica complex					4							4												
Amphioplus sp.												4						4						
Amphipholis sp.		4	4																					
Amphiuridae indet.																					4			
Ophiuroidea indet.						4																		
MISCELLANEOUS																								
Caulibugula sp.													4									4		
Dendrobeania sp.							4																	
Alderina sp.	16			12			8			8			12			4			12			8		
Caberea sp.				4			4																	
Celleporina sp.							4									4								
Conopeum osburni										4														
Celleporella hyalina	20			64			156			68			72			105			72			76		
Microporella sp.	4															4								
Schizoporella sp.										8														
Lagenicella sp.	12			8			12			4			8			8			8			12		
Cheilostomatida indet.										4														
Alcyonidium sp.							4																	
Amathia gracilis							16			12			8			12								
Crisia sp.				4			4			4			4			1								
Tubuliporidae indet.																			4					
Edwardsiidae indet.		4																						
Ptilosarcus gurneyi																		12			32			4
Corynidae indet.										4														
Ectopleura marina	4																							
Aglaophenia sp.	4						8									4			4			4		
Calycella syringa	48			4			16			4						4			4			4		
Campanularia sp.	20			20			28			20			16			8			8			4		
Clytia sp.							8									4								
Obelia sp.																			4					
Halecium sp.																			4					

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Lafoea sp.				4												8			4					
Abietinaria sp.	4									4			8			4						4		
Hydrallmania sp.	4						4			4			4			4			4			4		
Sertularella sp.							4												8					
Sertularia sp.													4			4						4		
Sertulariidae indet.							4									4								
Thuiaria sp.	4																							
Barentsia hildegardae							16			4														
Barentsia parva	4						4						4						12					
Barentsia sp.							8						4			4						4		
Myosoma spinosa													4											
Amphiporus sp.												4												
Paranemertes californica																							4	
Tetrastemmatidae indet.															8								4	
Hoplonemertea indet.														8										
Cephalothrix sp.	12			4																				
Carinoma mutabilis											4													
Tubulanus cingulatus												4												
Tubulanus sp.															8									
Tubulanus sp. A (Biologica)										4							12			4	4	4	8	4
Lineidae indet.		4				4		4						4			8	4		4	4			
Maculaura alaskensis complex										1														
Nemertea indet.															8						8			
Phoronis sp.																4			8					4
Calcarea indet.							4						4											
Cliona sp.										1														
Demospongiae indet.							4												4					
Chelyosoma productum				4																				
Molgulidae indet.												4			4									
Boltenia sp.												4			4									
Styela sp.													4											
Stolidobranchia indet.				4																				
MOLLUSCA																								
Solen sicarius				1							4					1							4	
Clinocardiinae indet.			12						4						4									
Clinocardium nuttallii															1									
Clinocardium nuttallii																	1							
Macoma balthica		4																						
Macoma golikovi					4			2						4										
Macoma sp.		16				24			20					4	16		4	12			8		4	
Macoma yoldiformis		8		8	8		5	8						8		3	8		8	32			8	
Tellina modesta	4	20					1	4			4			12	4		8	4		4				
Tellina nuculoides								4																
Kurtiella tumida	268	8		108			88			28			4			20	4		4			8		

Appendix D2, continued

TAXON	Outfall												Reference											
	Rep 1			Rep 2			Rep 3			Rep 4			Rep 1			Rep 2			Rep 3			Rep 4		
	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J	A	I	J
Lucinoma annulatum															8			8			4			
Parvilucina tenuisculpta					4		4						4	80		8	64		20	44		8	28	4
Axinopsida serricata				8			4						60	132		32	140		28	40		44	48	
Mya sp.																		12			4			
Myidae indet.									4															
Modiolus sp.												4												
Mytilidae indet.			4						4			4						4						
Solamen columbianum				4			4													4				
Nuculana sp.																				4				
Yoldia seminuda																								4
Yoldia sp.																		4						
Yoldiidae indet.																					4			
Acila castrensis			8									4			8			4			4			8
Ennucula tenuis														4			4							
Propeamussiidae indet.																		16						
Compsomyax subdiaphana																				1	4			
Nutricola sp.	8	56		16	40		4	20		16	32		4	32			16		8			12	8	
Saxidomus gigantea																	1							
Lyonsia californica																		12			8			4
Pandora bilirata																			4	4				
Bivalvia indet.																					4			
Trichotropis cancellata									4															
Cryptonatica affinis																					4			
Alvania compacta	160			24			112			36			36			240			28			112		
Mitrella gausapata	4	12		8	4		12			8			12	4		12			12			16	12	
Kurtziella plumbea	4																							
Mangeliidae indet.								4																
Nassarius mendicus													4								4			
Doto sp.			4		4			8	4		4							4						
Dendronotoidea indet.														4										
Nudibranchia indet.						4																		
Margarites pupillus								4						4			4			4				
Trochidae indet.								4	8		4													
Turbonilla sp.	4				4											4								
Odostomia sp.		4					8							4			36			8			12	
Gastropoda indet.				4																			4	
Polyplacophora indet.																		4						
Pulsellum salishorum	4			4									8										4	
Total Number of Organisms by Stage	1,097	432	188	773	348	180	1,506	258	212	390	108	77	1,172	960	637	1,567	1,095	752	1,285	845	796	1,164	720	492
Total Number of Organisms			1,717			1,301			1,976			575			2,769			3,414			2,926			2,376
Organisms per m2			17,170			13,010			19,760			5,750			27,690			34,140			29,260			23,760
Total Number of Taxa			75			59			94			60			101			109			106			81

Appendix D3

Biologica Marine Benthic Enumeration and Identification Methods

biologica

Marine Benthic Enumeration and Identification Methods
Client: Capital Regional District
Project: Saanich Peninsula Wastewater Treatment Plant Monitoring
Protocol: SSAMEX

Sample Inventory

Sample arrival: 9-Sep-24
Number of samples: 8
Number of jars: 9
Field screen size: 1000 µm
Lab screen size: 500 µm
Biologica project number: mb24-055

The chain of custody documents were checked and approved with the client. Samples were transferred from formalin into 70% ethanol and stained with Rose Bengal to aid in sorting. Each sample was provided a unique identification number and placed in the queue for analysis. Refer to Table 1 for inventory information.

Table 1. Inventory of benthic samples received for Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring, 2024.

Client Sample ID	Date Sampled	Biologica Sample ID	Field Screen Size (µm)	Lab Screen Size (µm)	# of Jars
SP-FR1	28-Aug-24	mb24-055-001	1000	500	1
SP-FR2	28-Aug-24	mb24-055-002	1000	500	1
SP-FR3	28-Aug-24	mb24-055-003	1000	500	2
SP-FR4	28-Aug-24	mb24-055-004	1000	500	1
Ref2-FR1	28-Aug-24	mb24-055-005	1000	500	1
Ref2-FR2	28-Aug-24	mb24-055-006	1000	500	1
Ref2-FR3	28-Aug-24	mb24-055-007	1000	500	1
Ref2-FR4	28-Aug-24	mb24-055-008	1000	500	1

Debris Descriptions:

Total sample volume and a description of benthic debris types present were recorded for each sample. Sample volume was measured by allowing the sample debris to fully settle, at which point the sample volume was measured to the nearest 50 mL. Refer to Table 2 for descriptions of sample debris.

Table 2. Debris descriptions for benthic samples processed for the Capital Regional District Saanich Peninsula Wastewater Treatment Monitoring, 2024.

Client Sample ID	Biologica Sample ID	Total Volume (mL)	Debris Description
SP-FR1	mb24-055-001	300	Polychaete tube fragments, granule (0.2-0.4 cm), shell fragments

Client Sample ID	Biologica Sample ID	Total Volume (mL)	Debris Description
SP-FR2	mb24-055-002	275	Polychaete tube fragments, shell fragments, pebble (0.4-6.4 cm), granule (0.2-0.4 cm), ophiuroid arms
SP-FR3	mb24-055-003	700	Polychaete tube fragments, granule (0.2-0.4 cm), shell fragments, organic debris (plants, leaves)
SP-FR4	mb24-055-004	400	Polychaete tube fragments, granule (0.2-0.4 cm), shell fragments
Ref2-FR1	mb24-055-005	300	Polychaete tube fragments, organic debris (plants, leaves), shell fragments, sand (<0.2 cm)
Ref2-FR2	mb24-055-006	375	Organic debris (plants, leaves), polychaete tube fragments, shell debris <0.5 cm, shell fragments
Ref2-FR3	mb24-055-007	275	Polychaete tube fragments, sand (<0.2 cm), shell fragments
Ref2-FR4	mb24-055-008	200	Organic debris (plants, leaves), polychaete tube fragments, shell debris <0.5 cm

Sample Processing

Sorting:

All samples were sorted using dissecting microscopes at 10–40x magnification by trained personnel. All debris in each sample was checked microscopically, including leaves, elutriated gravel, and other large debris. To minimize potential sorter bias, samples were distributed among technicians such that no one person sorted all the replicates of a given sample or station.

Due to large debris volumes and high abundances samples were subsampled using a Caton tray (Caton, 1991). A minimum ¼ split is the recommended acceptable split for marine benthos samples (EEM 2002, 2010, 2012). All samples were subsampled to a ¼ split. Prior to subsampling with a Caton tray, all samples underwent a preliminary whole-sample sort in which all large, unique and rare organisms (>1.0 cm) were removed from the debris. These large organisms were identified and enumerated as a whole count and stored and recorded separately from the rest of the sample. This procedure is meant to increase the detection of rare taxa and capture the abundance of large organisms accurately. Following the preliminary whole sort, all sample debris was then spread evenly over a Caton grid, and ¼ of the sample was randomly selected and removed for microscopic sorting. Refer to Table 3 for subsampling and organisms counted.

Sub-sampling accuracy was assessed by sorting the remaining sample for 10% of all sub-sampled samples and comparing the fractions to one another. One sample was selected for subsampling accuracy analysis. Refer to Table 4 for sub-sampling accuracy results.

Table 3. Summary of benthic samples processed for Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring, 2024.

Client Sample ID	Biologica Sample ID	Subsample	Organisms Counted
SP-FR1	mb24-055-001	1/4	430
		Whole	1
SP-FR2	mb24-055-002	1/4	326
		Whole	1
SP-FR3	mb24-055-003	1/4	493
		Whole	4
SP-FR4	mb24-055-004	1/4	142
		Whole	7
Ref2-FR1	mb24-055-005	1/4	694
		Whole	1
Ref2-FR2	mb24-055-006	1/4	851
		Whole	10
Ref2-FR3	mb24-055-007	1/4	731
		Whole	2
Ref2-FR4	mb24-055-008	1/4	595
		Whole	0

*Organisms counted do not include memo organisms such as copepods, nematodes, or terrestrial insects

Sorting QA/QC:

To ensure sorting efficiency was >95%, whole and/or partial sub-samples were re-sorted. Sorting efficiency was calculated using the following equation (where total count = final total number of organisms in sample):

Sorting efficiency = [1−(# of organisms in spot check or re-sort / total organisms)] x 100
*Total organisms includes the original count and the number found from the re-sort (if applicable)

All samples checked must meet or exceed 95% sorting efficiency. Any samples falling below 95% sorting efficiency are re-sorted in their entirety, and additional checks are undertaken as necessary. For quality assurance, QA re-sorts were performed on 10% of samples. One sample was randomly selected and re-sorted in its entirety. Refer to Table 4 for sorting efficiency results.

Table 4. Summary of sorting QA/QC results for Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring, 2024.

Client Sample ID	Biologica Sample ID	Sorting Efficiency QA: Whole re-sorts	Sub-sampling Accuracy
SP-FR2	mb24-055-002		86.23%
Ref2-FR2	mb24-055-006	99.48%	

Sampling Precision:

Precision was calculated from final identified counts to determine the percent difference in total abundance among replicates (Table 5). Precision was below 20% for the reference site, but above 20% for the outfall site.

Table 5. Results of precision analysis for Capital Regional District Saanich Peninsula Wastewater Treatment Monitoring, 2024.

Site	FR1	FR2	FR3	FR4	mean	SD	SE	est. N	Precision
Reference	695	861	733	595	721.00	109.99	55.00	0.58	7.63%
Outfall	431	327	497	149	351.00	151.76	75.88	4.67	21.62%

Identification:

All organisms were identified using a combination of dissecting (10–40x) and compound (100–1000x) microscopes and standard taxonomic keys (see methodological and taxonomic references) to the level specified by the client: species or LPL (lowest practicable level). All specimens were archived in air-tight glass vials with glycerin and 70% ethanol for long-term storage. Taxonomic data were recorded in Biologica's custom database.

Reference Collection:

Biologica houses a reference collection of all taxa that have been observed in CRD surveys. Taxa are added to this reference collection every sampling period. These may be new taxa and/or new stages. This collection consists of a minimum of one specimen representing each available lowest-level taxon and stage, with five specimens per taxon/stage wherever possible. These specimens were labelled, given a location code, and placed in evaporation-resistant shell dram vials. Approximately 1 mL of glycerin was added to each vial to prevent desiccation.

Identification QA/QC:

For quality assurance of identification, one (5% of total samples) randomly selected bulk samples (Table 6) as well as specimens from the historical reference collection (Table 7) were sent for external verification. Taxa selected from the reference may be new to the project or represent problematic taxa. These taxa were sent to Columbia Science Ltd. for verification.

Table 6. Samples sent for taxonomic bulk external identification QA for Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring, 2024. ***(Verifications in progress)***

Client Sample ID	Ref2-FR4
Date	28-Aug-24
Biologica Sample ID	mb24-055-008
Total Count:	595
Total QA Count:	
Agreement	
Resolution/Enumeration	
Disagreement	
Total	
% Agreement Rate	
Abundance % Agreement	

Table 7. External verification results for referenced taxa for Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring, 2024. *(Verifications in progress)*

Verification Result	**Number**
Agreement	
Resolution/Enumeration	
Disagreement	
Total	13
% Agreement Rate	

Percent Agreement Rate:
100 – [(# incorrect identifications/total abundance of QA sample) x 100]

Abundance Percent Agreement:
100 – [(difference in abundance between samples/total abundance of original sample) x 100]

Biomass:

For the purposes of obtaining estimates of abundance-converted biomass, the mean blotted wet weight biomass of each unique taxon was estimated using specimens from the reference collection. A minimum of one specimen per taxon/stage combination was weighed, with five specimens per taxon/stage weighed whenever possible. Specimens were weighed with an AND analytical balance to the nearest 0.01 mg. For damaged and/or unavailable specimens, estimates from Biologica's biomass database were used.

All large organisms with wet weights of approximately >2 g (megafauna) were weighed individually for each sample. This practice increases the accuracy of biomass estimates of large specimens with wide size ranges. For damaged and/or unavailable specimens, estimates from Biologica's biomass database were used.

Data:

All data were recorded in Biologica's custom database. Results were provided to the Capital Regional District Saanich Peninsula Wastewater Treatment Plant Monitoring project manager in Excel spreadsheets via email.

Database:

Data were imported into a Microsoft Access database by Ecostat Research Ltd. This database includes historical data as well as the current year's data. With the importation, rigorous QA/QC is performed on both the abundance and biomass data to ensure internal consistency among historical data sets.

Both abundance and average per-taxon biomass data are reported in long-format (one record per row) for each corresponding taxon/stage combination. Raw biomass data are not included in the database but are included with the excel data set sent to CRD and Ecostat Research Ltd. Data are available (same-day) from Biologica's archive upon request.

Selected Methodological and Taxonomic References

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