

Gulf Islands and Port Renfrew Wastewater Facilities Environmental Monitoring Program 2023 Report

Capital Regional District | Parks & Environmental Services, Environmental Protection



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**GULF ISLANDS AND PORT RENFREW WASTEWATER FACILITIES
ENVIRONMENTAL MONITORING PROGRAM
2023 REPORT**

EXECUTIVE SUMMARY

This report summarizes the 2023 results of the Wastewater and Marine Environment Program (WMEP) for the wastewater treatment plants (WWTP) operated by the Capital Regional District (CRD) in the Gulf Islands and Port Renfrew. Two of these WWTPs (Ganges and Schooner) discharge ultraviolet disinfected, secondary treated effluent; two WWTPs (Cannon and Port Renfrew) discharge secondary treated effluent; and one (Maliview) discharges secondary treated effluent mixed with fine-screened effluent during high flows. The program includes regular monitoring, as stipulated by the BC Ministry of Environment and Climate Change Strategy (ENV), either through permits or registrations under the Municipal Wastewater Regulation (*Environmental Management Act*). In addition, there are monitoring requirements under the federal Wastewater Systems Effluent Regulations (*WSER*) for the Ganges and Schooner treatment plants, as their average daily flow volumes exceed minimum thresholds.

The CRD also monitors all five WWTP influents and effluents on a monthly basis to assess treatment plant performance and predict risk to aquatic life and human health. Staff also monitor sludge (mixed liquor) from the Ganges WWTP facility and from the Burgoyne Bay waste transfer facility to provide data to assist the CRD's Regional Source Control Program (RSCP). Finally, marine environment surface water monitoring is required every four years for these facilities to assess outfall performance and potential for impacts to human health. Surface water sampling is also required in the event of emergency or planned bypass/overflow.

GANGES WWTP

Final Effluent

The CRD analyzed wastewater influent and effluent for conventional and priority substances, plus effluent for acute toxicity. In 2023, none of the daily effluent flows from the Ganges WWTP exceeded the allowable maximum. Effluent quality met provincial and federal regulatory requirements for all carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS), unionized ammonia, total residual chlorine and fecal coliform bacteria results. Like previous years, concentrations of total residual chlorine (used in washing the membranes) exceeded the permitted level in a number of samples, but this was most likely an artefact of taking the measurements using a relatively insensitive field-based test kit.

Of the 102 priority substances analyzed in effluent, 78 parameters were detected at standard detection limits (conventionals, nutrients, metals, 2-methylnaphthalene, diethyl phthalate, and di-n-butyl phthalate). Effluent concentrations were within similar ranges relative to previous years. Most priority substances in the effluent were below the BC Water Quality Guidelines (BC WQG) before the predicted minimum receiving water dilution of 419:1. Only cyanide weak acid dissociable (WAD), copper and zinc exceeded BC WQG in undiluted effluent. All substances were below BC WQG after the minimum dilution calculation was applied (the predicted concentration of effluent in the marine water column within the initial dilution zone [IDZ, the area up to 100 metres (m) away from the outfall]).

Toxicity Testing

The effluent sample from July 2023 passed the 96-hour Rainbow trout acute toxicity test. This is consistent with previous years. The Daphnia acute toxicity test also passed, consistent with previous testing conducted from 2011-2022.

Sludge (Mixed Liquor)

Ganges WWTP sludge (mixed liquor) met the criteria for BC Organic Matter Recycling Regulations (OMRR) Class A Biosolids in 2023 for all regulated parameters except for copper, which exceeded the criteria in October from one sample out of 10 tested in 2023.

Receiving Water

Routine receiving water monitoring was last conducted at the Ganges WWTP in 2020. Monitoring is scheduled to be repeated next in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. No receiving water monitoring was required in 2023.

Next Steps

Continue to share priority pollutant and sludge (mixed liquor) results with the RSCP.

MALIVIEW WWTP

Wastewater

The Maliview WWTP produces secondary treated effluent when instantaneous flows are equivalent to or less than 60 m³/d. For instantaneous flows equivalent to or greater than 60 m³/d, the plant produces a final effluent that is a blend of secondary treated and fine-screened effluents. As such, there are different regulatory limits for this facility depending on whether the flows are above or below 60 m³/day. The flow-splitting process responds to instantaneous peak flows, rather than daily flows, and bypass events can occur despite total daily flows of less than 60 m³/d. Bypass events occurred, despite flow being less than 60 m³/d on 84% of the days in 2023. Flow also bypassed the secondary treatment process and received screening on days where the total flow was greater than 60 m³/d, but the flow to the secondary treatment process was less than 60 m³/d on 11% of the days. Flows did not exceed the allowable maximum of 250 m³/d for total combined daily flows. Flow to the secondary treatment plant exceeded 60 m³/d on 50% of the days in 2023, resulting in a portion of the effluent bypassing the secondary treatment process of the plant to be treated solely by fine screening.

The combined final effluent exceeded low flow (<60 m³/d) registration limits for TSS and for CBOD in two monthly samples, representing 29% of the low flow sampling events. The combined final effluent did not exceed high flow (>60 m³/d) registration limits in any samples. The remaining wastewater parameters were in compliance.

Toxicity Testing

Effluent from July 2023 failed the 96-hour Rainbow trout acute toxicity test, as in 2021 and 2022. The toxicity test was not ammonia stabilized, which may be considered for future years.

Receiving Water

Routine receiving water monitoring was last conducted at the Maliview WWTP in 2020. Monitoring is scheduled to be repeated next in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. No receiving environment monitoring was required in 2023.

Next Steps

Investigate ways to eliminate regulatory compliance violations. CRD staff and a contracting engineer have developed a detailed design for an upgrade to the facility to increase capacity and treatment reliability. Construction began in 2023 and is expected to be completed in 2024.

SCHOONER WWTP

Wastewater

The Schooner WWTP exceeded regulatory limits for flow one time in 2023, representing 0.3% of the year. All scheduled monthly effluent compliance parameters met regulatory criteria in 2023 during regular flow events. However, while samples were not collected during power outages, it is assumed that the provincial fecal coliform limit was exceeded during these events, as the UV system cannot operate during outages.

Toxicity Testing

Effluent from July 2023 passed the 96-hour Rainbow trout acute toxicity test.

Receiving Water

Routine receiving water monitoring was last conducted at the Schooner WWTP in 2020. Monitoring is scheduled to be repeated next in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. No receiving environment monitoring was required in 2023.

Next Steps

Substantial upgrades to the Schooner WWTP and collection system are required to eliminate regulatory compliance violations for this facility. Facility upgrades began in 2023 and are expected to be completed in 2024.

CANNON WWTP

Wastewater

The Cannon WWTP exceeded regulatory limits for flow five times in 2023, representing 1% of the year. All effluent compliance parameters met regulatory criteria in 2023.

Toxicity Testing

Effluent from July 2023 failed the 96-hour Rainbow trout acute toxicity test, as in 2022. The toxicity test was not ammonia stabilized, which may be considered for future years.

Receiving Water

Routine receiving water monitoring was last conducted at the Cannon WWTP in 2020. Monitoring is scheduled to be repeated next in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. No receiving environment monitoring was required in 2023.

Next Steps

As with the Schooner WWTP, substantial upgrades to the Cannon WWTP collection system are required to eliminate regulatory compliance violations for this facility. Once the Schooner WWTP replacement has been completed (anticipated 2024), the Cannon WWTP will be decommissioned, and all flows will be pumped to the new facility.

PORT RENFREW WWTP

Wastewater

The Port Renfrew WWTP exceeded regulatory limits for flow one time in 2023, representing 0.3% of the year. TSS exceeded permitted limits once in 2023, representing 8% of the monthly samples. All other effluent compliance parameters met regulatory criteria in 2023.

Toxicity Testing

Effluent from July 2023 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which may be considered for future years.

Receiving Water

Routine receiving water monitoring was last conducted at the Port Renfrew WWTP in 2021. Monitoring is scheduled to be repeated next in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. No receiving environment monitoring was required in 2023.

Next Steps

CRD staff and consultants completed a feasibility study in 2015 to improve/increase the treatment plant capacity and ensure ongoing effective operation of the treatment plant and conveyance system into the future. Grant funding will be required in order to complete any upgrades to this system. Updates to the facility asset management plans are underway, and a phased implementation plan is anticipated pending funding.

BURGOYNE BAY WASTE TRANSFER FACILITY

Burgoyne Bay waste transfer facility sludge met the criteria for BC Organic Matter Recycling Regulations (OMRR) Class A Biosolids in 2023 for all regulated parameters except for copper, which exceeded the criteria in January from one sample out of four tested in 2023.

**GULF ISLANDS AND PORT RENFREW WASTEWATER FACILITIES
ENVIRONMENTAL MONITORING PROGRAM
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Terms & Abbreviations

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
COD	Chemical Oxygen Demand
CRD	Capital Regional District
EIR	Environmental Impact Report
ENV	BC Ministry of Environment and Climate Change Strategy
FC	Fecal Coliform
HC	Health Canada
I&I	Inflow and Infiltration
IDZ	Initial Dilution Zone
MWR	Municipal Wastewater Regulation
NH ₃	Ammonia
QA/QC	Quality Assessment/Quality Control
RBC	Rotating Biological Contactor
RSCP	Regional Source Control Program
SAD	Strong Acid Dissociable
TRC	Total residual chlorine
TSS	Total Suspended Solids
UV	Ultraviolet
WAD	Weak acid dissociable (WAD) cyanide
WMEP	Wastewater Marine Environment Program
WQG	Water Quality Guidelines
WSER	Wastewater Systems Effluent Regulations
WWTP	Wastewater Treatment Plant

**GULF ISLANDS AND PORT RENFREW
WASTEWATER AND MARINE ENVIRONMENT PROGRAM
2023 REPORT**

1.0 INTRODUCTION

This report summarizes the 2023 results of the Wastewater and Marine Environment Program (WMEP) for the wastewater treatment plants (WWTP) operated by the Capital Regional District (CRD) in the Gulf Islands and Port Renfrew. Two of these WWTPs (Ganges and Schooner) discharge ultraviolet disinfected, secondary treated effluent; two plants (Cannon and Port Renfrew) discharge undisinfected, secondary treated effluent; and one plant (Maliview) discharges undisinfected, secondary treated effluent combined with fine-screened effluent during high flows. The locations of these five facilities are presented in Figure 1.1. The WMEP includes regular monitoring, as stipulated by the BC Ministry of Environment and Climate Change Strategy (ENV) either through a permit or registrations under the Municipal Wastewater Regulation (MWR)¹. In addition, effective January 1, 2013, new monitoring requirements came into effect under the federal Wastewater Systems Effluent Regulations (WSER) for the Ganges WWTP and Schooner WWTP facilities. The three remaining facilities (Maliview, Cannon and Port Renfrew WWTPs) do not require monitoring under the federal WSER, due to their low volumes of discharge. Monitoring is also conducted to assess treatment plant performance and potential for impacts to the marine environment, aquatic life and human health.

1.1 Wastewater Monitoring

Wastewater monitoring components are summarized in Table 1.1. WWTP-specific regulatory compliance limits for applicable parameters, and associated sampling and analytical methodologies, are discussed in the individual sections of this report.

1.1.1 Compliance and Treatment Plant Performance Monitoring

All wastewater discharges (effluents) were monitored for flow, total suspended solids (TSS), biochemical oxygen demand (BOD), carbonaceous biochemical oxygen demand (CBOD) and fecal coliform (FC) bacteria. All treatment plant influents were monitored for TSS, BOD and FC bacteria. Two plants (Schooner and Ganges) were monitored for additional parameters, such as ammonia (NH₃), pH and total residual chlorine.

1.1.2 Toxicity Testing

Annual toxicity testing is a requirement under the MWR registrations for the Ganges and Schooner WWTPs and was initiated on a voluntary basis for the remaining facilities beginning in 2021. Effluent from each treatment plant was collected in July 2023 and analyzed for toxicity to Rainbow trout (96-h LC50 test). As in previous years, the Ganges sample was also analyzed for toxicity to *Daphnia*.

1.1.3 Priority Substances

Wastewater influent and effluent from the Ganges WWTP were analyzed for a list of priority substances, as stipulated in the MWR registration for this facility. Priority substance results were compared to water quality guidelines (WQG) set to protect aquatic life (BCMoe&CCS, 2017; 2019a). These data were also used to assess the quality of the final effluent and the effectiveness of the CRD's Regional Source Control Program (RSCP).

1.1.4 Ganges Wastewater Treatment Plant Sludge

The Ganges WWTP produces sludge (mixed liquor) with the objective of meeting Class A Biosolids guidelines, in accordance with the pathogen reduction and vector attraction reduction processes in the BC Organic Matter Recycling Regulations (OMRR) (BCMoe&CCS, 2017b). Ganges WWTP sludge (mixed liquor) is a by-product of sewage treatment, which is de-watered prior to monitoring. The intent of this mixed liquor monitoring was originally to assess suitability for land application. However, Ganges WWTP mixed

¹ formerly the Municipal Sewage Regulation of the *Environmental Management Act*

liquor is currently transferred to a septage treatment facility on Vancouver Island and no land application takes place. Mixed liquor sampling (at a reduced frequency) is still of benefit to the RSCP to help assess the effectiveness of their various campaigns by providing partitioning information between the solid and liquid fractions of the treatment process.

1.1.5 Burgoyne Bay Waste Transfer Facility

The Burgoyne Bay waste transfer facility is located on Salt Spring Island and collects septage from Salt Spring Island (Ganges WWTP and Maliview WWTP), Pender Island (Schooner WWTP and Cannon WWTP) and from Saturna Island. Material is then disposed of at GFL Environmental SPL Wastewater Recovery Centre (Langford, BC). Monitoring is undertaken to characterize the septage prior to disposal and to inform the CRD's Regional Source Control Program (RSCP) initiatives. The Burgoyne Bay facility is not designed to produce a biosolids product as defined in the Organic Matter Recycling Regulation (OMRR). However, as a reference point, the results of the analyses performed on the septage are compared to the quality criteria established in Schedule 4 of the OMRR for Class A biosolids.

Figure 1.1 - Ganges, Maliview Estates, Schooner Way, Cannon Crescent and Port Renfrew Outfall Locations

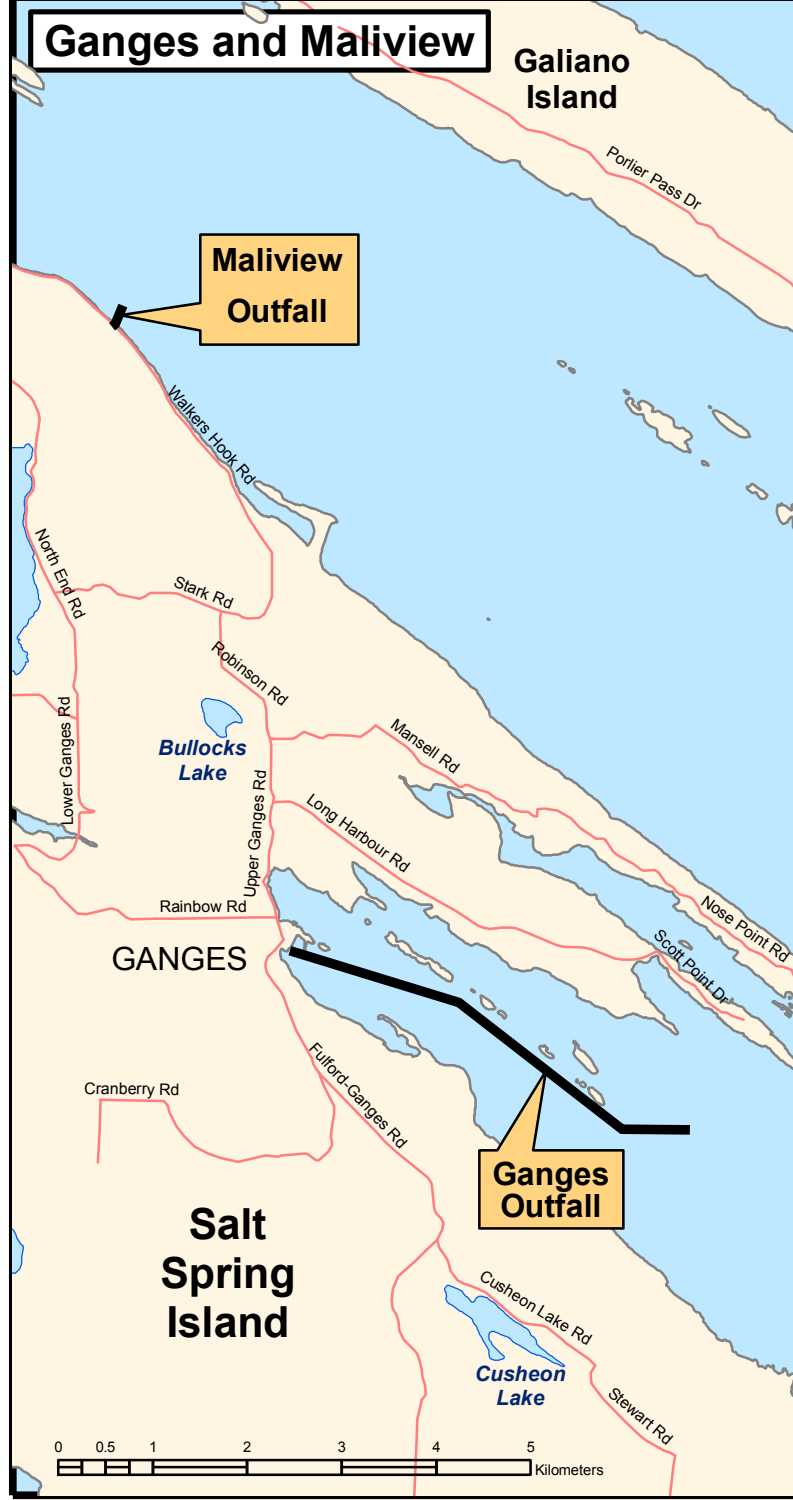


— Outfall Pipe

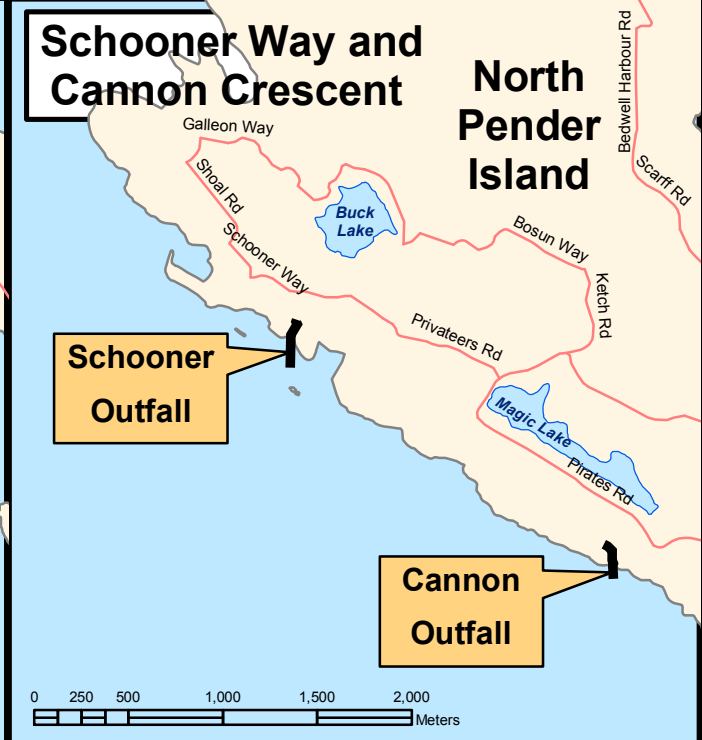


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Technologist: SR
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Ganges and Maliview



Schooner Way and Cannon Crescent



Port Renfrew

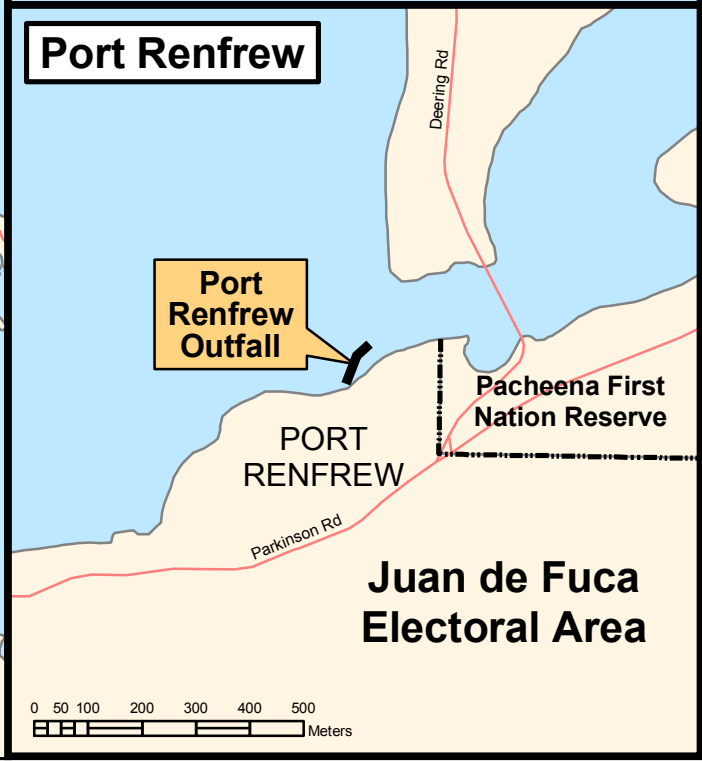


Table 1.1 Summary of 2023 Wastewater and Surface Water Components of the Gulf Islands and Port Renfrew WMEP

Component	Parameter	Frequency and Stations
Wastewater	Flow	Daily: Ganges, Maliview, Schooner, Cannon, Port Renfrew
	Provincial compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, fecal coliform • Disinfected Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month: Ganges, Schooner
	Provincial compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> • Influent: TSS, BOD, fecal coliform • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH • Combined Final Effluent (Secondary + Fine-screened): TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month: Maliview
	Provincial compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> • Influent: TSS, BOD • Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month: Ganges, Maliview, Schooner, Cannon, Port Renfrew
	Federal compliance monitoring: <ul style="list-style-type: none"> • Final Effluent: TSS, CBOD, unionized ammonia @ 15°C, total residual chlorine 	Once per month (reported quarterly): Ganges, Schooner
	Influent and effluent priority substances	Once per year: Ganges
	Effluent toxicity	Once per year: Ganges Harbour (required), Schooner (required), Maliview (voluntary), Cannon (voluntary), Port Renfrew (voluntary)
	Sludge (mixed liquor)	Once per month: Ganges Quarterly: Burgoyne
Receiving Water	Surface water indicator bacteria (fecal coliform and enterococci)	Ganges WWTP five days of sampling in a 30-day period* Maliview WWTP five days of sampling in a 30-day period* Schooner WWTP five days of sampling in a 30-day period* Cannon WWTP five days of sampling in a 30-day period* Port Renfrew WWTP five days of sampling in a 30-day period*

Notes:

*Receiving water sampling was last conducted in 2020, and is next required in 2024, unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer.

1.2 Receiving Water Monitoring

Receiving environment monitoring was not historically undertaken routinely for all five of the small CRD wastewater facilities. In 2010, discussions with ENV led to the requirement for such monitoring, with the inter-year frequency of monitoring dependent on the size of the facility. In addition, intra-year sampling frequency was changed from monthly to five sets of daily samples collected over a 30-day period (5-in-30) to allow for a more direct comparison of bacterial indicators to relevant human health protection criteria. In addition, enterococci are now analyzed as well as fecal coliforms, as enterococci persist longer in the marine environment and have a more direct link to human health impacts.

For the five small facilities that are the subject of this report, the monitoring programs were added and/or revised to comprise a 5-in-30 sampling program once every four years. Emergency sampling is also required after planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter or one day duration in the summer. If the results from a single day of emergency sampling indicate no impact to the receiving environment (i.e., results less than human health guidelines), then no repeat emergency sampling is required for similar events of the same duration or less during that same wet weather season. If impacts are observed during the emergency sampling (i.e., results higher than human health guidelines), then sampling must repeat every few days until all results are below human health guidelines.

Pre-2010 monitoring programs sampled surface water only (0.5 to 1 m below the surface). The receiving water sampling programs now include sampling of near-surface stations at a depth mid-way between the surface and seafloor, in addition to surface samples, at stations at the edge of the initial dilution zone (IDZ). The IDZ is defined as the area 100 m around the outfall and is where BC WQG must be met. In addition to the IDZ sampling stations, surface samples are collected at two stations approximately 200 m up-current and down-current from the outfalls.

The 2023 sampling year represents year three of the current round of this four-year monitoring cycle, and routine receiving environment monitoring was not required for any facilities. The next routine 5-in-30 sampling, as per the four-year cycle, will be required in 2024.

Any 2023 non-routine/emergency receiving environment sampling events are described in subsequent sections.

2.0 METHODOLOGY

2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Influent and effluent samples from all five facilities were collected as grab samples at the frequency noted in Table 1.1.

Laboratory analyses were conducted at the McLoughlin Point WWTP laboratory, the Saanich Peninsula WWTP laboratory or Bureau Veritas Laboratories (BV Labs, Burnaby, BC). All labs are ISO certified as per provincial and federal regulatory requirements. TSS was determined gravimetrically using glass fiber filters dried at 105°C (APHA, 1998). BOD was determined by five-day oxygen depletion at 20°C using an oxygen meter (APHA, 1998). CBOD was determined by five-day oxygen depletion at 20°C with TCMP [2-chloro-6-(trichloro methyl) pyridine] as a nitrification inhibitor and using an oxygen meter (APHA, 1998). Fecal coliforms were enumerated using 0.45 µm membrane filters incubated on mFC medium at 44.5°C for 24 hours (APHA, 1998). Enterococci was determined by membrane-filtration technique, followed by incubation on mEI agar (an enzyme substrate medium) for 24 hours at 41°C. Nitrite was determined by diazotization colourimetry. Nitrate was determined by cadmium reduction, followed by diazotization colourimetry. The concentration of unionized ammonia was calculated using the measured concentration of total ammonia and the pH corrected to 15°C.

Means reported for fecal coliform and enterococci are geometric (logarithmic) means. Means for all other parameters are arithmetic. Mean daily loadings were calculated from mean concentrations and mean daily flows. Annual loadings were calculated from mean concentrations and total annual flows. Values of half the detection limit were used for non-detect results.

TOXICITY TESTING

Effluent toxicity samples for each of the WWTPs were collected by grab sampling. Testing was conducted using standardized and approved protocols by ISO certified Nautilus Environmental (Burnaby, BC). Effluent toxicity was determined using the 96-hour acute toxicity test (EPS 1/RM/13) with juvenile Rainbow trout (*Oncorhynchus mykiss*). Five effluent concentrations plus one control were tested, with 10 test organisms per concentration. The number of organisms surviving over the testing period was recorded.

An additional toxicity test was conducted at the Ganges WWTP only. Effluent toxicity was further assessed using the 48-hour acute toxicity test (EPS 1/RM/14 with 2016 amendments) with <24-hour old neonate *Daphnia magna*. Five effluent concentrations plus one control were tested, with 10 test organisms per concentration. The number of organisms surviving over the testing period was recorded.

PRIORITY SUBSTANCES

At Ganges WWTP, influent and effluent samples were collected as composite samples for priority substance analysis at routine detection limits. The composite samples were collected by an ISCO automated sampler, with 400 mL of wastewater collected every 30 minutes over a 24-hour period. The composite samples were then split into smaller sample bottles for individual analyses and preserved before shipping to BV Labs. An additional grab sample was collected for those parameters not suited for composite collection. Analytical detection limits were chosen to allow for comparison to BC WQG.

SLUDGE

Dewatered sludge (mixed liquor) at Ganges WWTP was sampled monthly and analyzed for 29 metals and moisture content by BV Labs. Results were compared to the BC OMRR (BCMoe&CCS, 2017b) biosolids limits. These regulations stipulate the land uses that are acceptable for the tested biosolids according to the concentrations of a select group of substances. The regulations are set to protect human and environmental health.

Sludge at the Burgoyne Bay waste transfer facility was sampled quarterly and analyzed for 29 metals and moisture content by BV Labs. Results were also compared to the BC OMRR (BCMoe&CCS, 2017b) biosolids limits.

2.2 Receiving Water Monitoring

RECEIVING WATER SURFACE WATER MONITORING

Routine receiving environment sampling was last undertaken in 2020, as agreed upon with ENV, for all facilities except the Port Renfrew WWTP, which was delayed due to staffing issues. Routine receiving environment 5-in-30 sampling at this facility was conducted in 2021 along the shoreline instead of by boat. Routine receiving environment sampling will be conducted next at all five facilities in 2024.

There was no non-routine/emergency receiving environment sampling required in 2023.

3.0 GANGES WWTP

3.1 Introduction

The Ganges WWTP is located on the east side of Salt Spring Island (Figure 1.1). It discharges ultraviolet (UV) disinfected secondary treated effluent into Ganges Harbour through a 4,800 m outfall at a depth of 16 m. Because the average daily flow of this facility exceeds 100 m³/day, both provincial and federal regulatory requirements must be met by this facility. Total residual chlorine must also be measured, but only when chlorine is used when washing the membranes.

The facility is regulated under BC MWR Registration RE-05521, dated April 28, 2005. Provincial and Federal regulatory requirements are described in Table 3.1.

Table 3.1 Ganges WWTP Regulatory Requirements

Parameter	Regulatory Requirement	
	Provincial	Federal
Maximum daily flow	<1,198 m ³ /d	---
CBOD	max 25 mg/L	average 25 mg/L
TSS	max 25 mg/L	average 25 mg/L
Fecal coliform	max 1,000 CFU/100 mL	---
Unionized ammonia @15°C	---	max 1.25 mg/L
Total residual chlorine	---	average 0.02 mg/L
Toxicity test	96-hr Rainbow trout (pass)	---

This registration also has a requirement for receiving water monitoring. Routine monitoring was last required for this facility in 2020 and is next required in 2024 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Ganges Wastewater Treatment Plant WMEP (Table 3.2).

Table 3.2 Ganges Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Provincial compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> Influent: TSS, BOD, fecal coliform Secondary effluent: TSS, fecal coliform Disinfected secondary effluent: TSS, BOD, CBOD, fecal coliform, ammonia, pH 	Once per month
	Effluent toxicity: <ul style="list-style-type: none"> Rainbow trout 96-hour <i>Daphnia magna</i> 48-hour 	Once per year
	Federal compliance monitoring: <ul style="list-style-type: none"> Final effluent: TSS, CBOD, unionized ammonia, total residual chlorine 	Once per month
	Influent and effluent priority substances ¹	Once per year
	Sludge (mixed liquor)	Once per month
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

Notes:

¹All priority substances are listed in Appendix A3

3.2 Results

3.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

In 2023, all daily flows met regulatory limits for the Ganges WWTP (Table 3.3 and Appendix A1).

Compliance and treatment plant monitoring data (Table 3.4, Appendix A2) show that effluent quality was consistent with previous years for all parameters (CRD, 2011 to 2023). There were no exceedances of TSS, following replacement of the old membranes of the treatment plant in 2018. All other compliance parameters also met regulatory limits. Overall, the treatment plant removed >99% of the TSS and >99% of the fecal coliform bacteria from the influent.

Total residual chlorine was measured 12 times in 2023, as part of federal regulations, to monitor levels resulting from chlorine used to clean the treatment plant membranes. Concentrations of total residual chlorine exceeded the permitted level 42% of the time in disinfected secondary effluent. However, this was most likely an artefact, due to measurements taken using a relatively insensitive field-based test kit that has a detection limit the same as the federal guideline of 0.02 mg/L. The reliability of test kit results near the detection limit is low. CRD staff are investigating alternative chlorine test methods for use in the future.

Compliance data was reported to ENV on a monthly basis, with individual environmental impact reports (EIR) issued if there was an incident at the plant. There was one EIR issued at Ganges WWTP in 2023, as a result of partial treatment bypass from high influent flow as a result of heavy rain (December 4).

Table 3.3 Ganges WWTP 2023 Annual Flow Summary

Month	Mean Flow (m ³ /d)	Minimum Flow (m ³ /d)	Maximum Flow (m ³ /d)	Total Flow (m ³)	Number of Samples	Permit Violations (%)
January	456	402	616	14,133	31	0
February	410	360	465	11,480	28	0
March	446	365	577	13,826	31	0
April	418	364	505	12,527	30	0
May	454	373	527	14,079	31	0
June	469	414	532	14,057	30	0
July	467	416	527	14,488	31	0
August	476	423	519	14,754	31	0
September	449	402	503	13,467	30	0
October	463	379	674	14,339	31	0
November	526	453	627	15,777	30	0
December	516	369	744	15,986	31	0
Annual	463	360	744	168,913	365	0

Notes:

Provincially regulated maximum daily flow = 1,198 m³/d

Table 3.4 Ganges WWTP 2023 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring				
	Flow (m ³ /d)	TSS (mg/L)	CBOD (mg/L)	Fecal Coliform (CFU/100 mL)	BOD (mg/L)	Ammonia (mg N/L)	Unionized Ammonia @15 C (mg/L N)	Total Residual Chlorine (mg/L)	pH
Influent									
Regulatory limit	---	---	---	---	---	---	---	---	---
Mean	463	326	---	18,051,685	429	---	---	---	---
Minimum	360	150	---	2,300,000	168	---	---	---	---
Maximum	744	660	---	35,000,000	936	---	---	---	---
Regulatory violations (%)	---	---	---	---	---	---	---	---	---
Number of samples	365	12	---	12	12	---	---	---	---
Secondary effluent									
Regulatory limit									
Mean	---	---	---	---	---	---	1.25	0.02	---
Minimum	463	6	---	10 258	---	---	---	---	---
Maximum	360	1	---	1 400	---	---	---	---	---
Percent reduction (from influent)	744	25	---	27 276	---	---	---	---	---
Regulatory violations	---	98%	---	100%	---	---	---	---	---
Number of samples	365	12	---	11	---	---			---
Disinfected secondary effluent									
Regulatory limit	1,198	25	25	1,000	---	---	1.25	0.02	---
Mean	463	2.1	2.4	96	1.9	6.15	0.0473	0.03	7.4
Minimum	360	<2	<2	<1	<2	0.03	<0.1	0	7.2
Maximum	744	5	5.53	720	5.01	28	0.12	0.09	7.7
Percent reduction (from influent)	---	99	---	100	100	---	---	---	---
Regulatory violations (%)	0	0	0	0	---	---	0	42	---
Number of samples	365	12	12	12	12	12	12	12	12

TOXICITY TESTING

In 2023, disinfected effluent from July passed the 96-hour Rainbow trout acute toxicity test. This is consistent with previous years, with the exception of 2019, when toxicity tests failed as operations staff were adjusting the performance of the upgraded aeration system and were experiencing challenges with ammonia levels. These issues have now been fully resolved.

As in previous years (2012-2022), disinfected effluent from July passed the 48-hour *Daphnia magna* acute toxicity test, corresponding to an LC50 of >100%. The *Daphnia* test is not required but was conducted to maintain consistency with other CRD discharge monitoring programs where toxicity testing is required.

PRIORITY SUBSTANCES

Of the 102 priority substances analyzed in Ganges WWTP effluent (Appendix A3), 78 parameters were detected at standard detection limits, (conventionals, nutrients, metals, 2-methylnaphthalene, diethyl phthalate, and di-n-butyl phthalate). Influent results can also be found in Appendix A3.

In 2023, most priority substance concentrations in the Ganges WWTP effluent were below BC WQG (BCMoe&CCS, 2017a and 2019a) in undiluted effluent, before discharge to the environment (Appendix A3). Only cyanide WAD, copper, and zinc exceeded BC WQG in undiluted effluent. All substances were below BC WQG after the near surface dilution factor of 419:1 was applied. This 419:1 dilution factor was determined by oceanographic modelling and is the predicted dilution factor to occur near the surface at the edge of the outfall IDZ (Seaconsult Marine Research Ltd, 1994).

SLUDGE (MIXED LIQUOR)

Results of sludge (mixed liquor) analysis were compared to BC OMRR Biosolids Class A criteria to assess the quality of the sludge produced at the Ganges WWTP (Appendix A4). This class rating identifies biosolids as the highest quality that can be produced according to ENV requirements. Class A Biosolids can be used in land applications (limits are set to protect human and environmental health) with an approved land application plan. Ganges WWTP mixed liquor is not applied to land but is transferred to a Vancouver Island septage treatment facility for disposal. However, the mixed liquor monitoring results are still valuable information for the RSCP to help assess the success of their codes of practice (e.g., those in place for dental offices).

The 2023 Ganges WWTP sludge (mixed liquor) results for regulated parameters had concentrations well below the criteria for Class A Biosolids, except for copper which exceeded regulatory criteria in October. Historically, mercury levels have been elevated at times in Ganges sludge, but these have declined steadily over time (Figure 3.1).

3.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

There was no routine or emergency receiving water monitoring required in 2023 as the one EIR event (partial treatment bypass) did not exceed one day in the winter. The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2024.

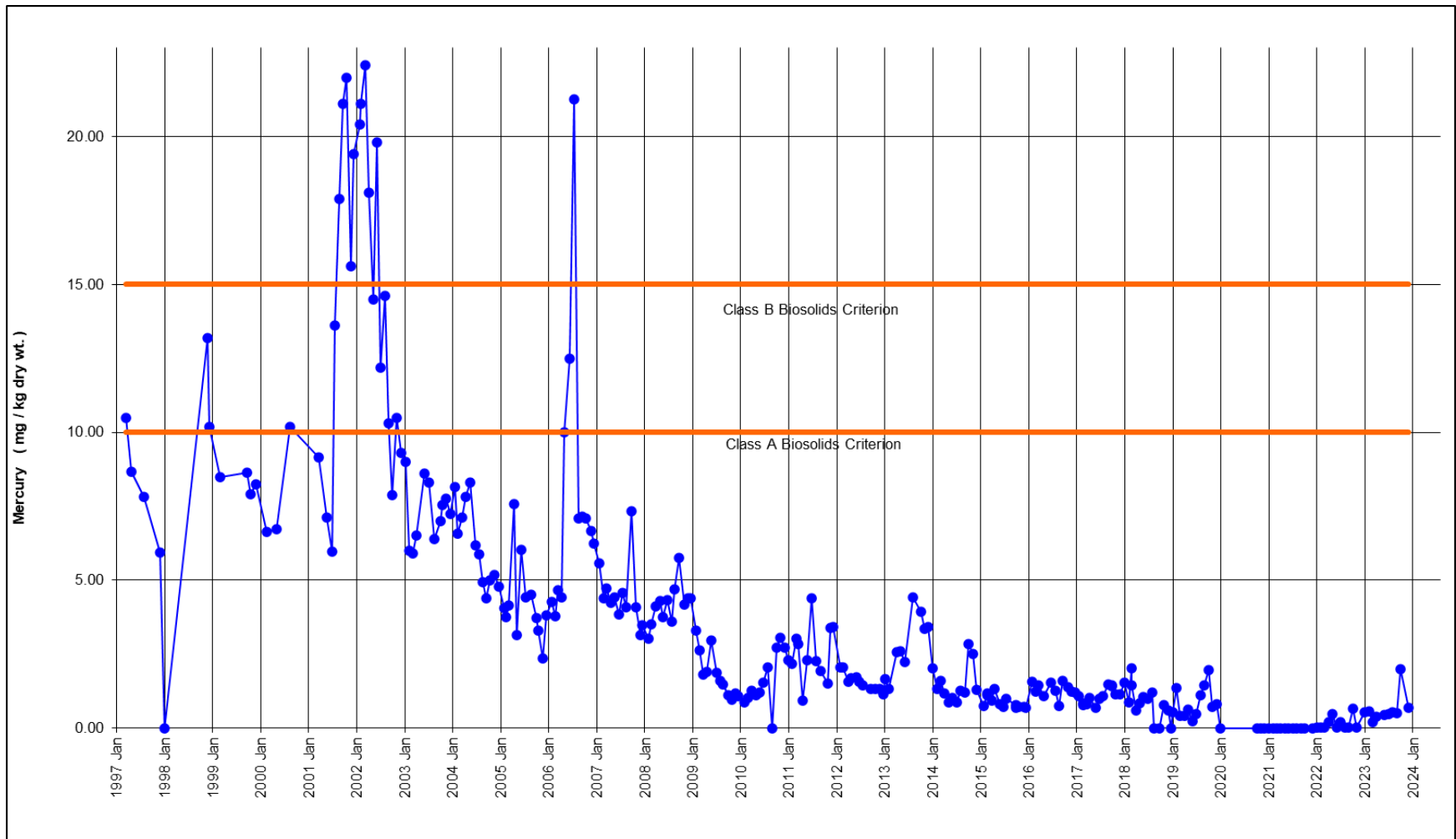


Figure 3.1 Ganges WWTP Mixed Liquor Mercury Levels (1997 to 2023)

3.3 Recommendations

CONTINUE TO SHARE RESULTS WITH THE CRD REGIONAL SOURCE CONTROL PROGRAM

Effluent priority pollutant and sludge (mixed liquor) results are valuable to the RSCP. Effluent priority pollutant monitoring is a requirement of the provincial registration for this facility and must continue, but sludge (mixed liquor) monitoring is not. It is recommended that sludge (mixed liquor) sampling continue to allow the RSCP to assess the effectiveness of their initiatives.

4.0 MALIVIEW WWTP

4.1 Introduction

The Maliview WWTP is located on the east side of Salt Spring Island (Figure 1.1). It discharges treated effluent into Trincomali Channel through a 213 m outfall at a depth of 14 m below sea level. The original primary treatment plant was upgraded to a secondary treatment facility in July 2006.

The facility is registered under BC MWR Registration RE-00242, as amended in June 2007.

Flows up to 60 m³/d receive secondary treatment using the rotating biological contactor (RBC) and flows greater than 60 m³/d (greater than twice the mean daily dry weather flow) receive preliminary treatment using fine screens. Both effluent streams are combined before discharge. Blending effluent streams is an option available under the MWR to deal with high effluent flows. Historically (prior to 2013), monitoring was done separately on the RBC and fine-screened portions of the effluent, and final effluent quality was predicted using a combination of the two effluent quality results and the relative flow volumes. In December 2012, a sampling point was installed that allowed for direct sampling of the combined final effluent quality. As such, the fine-screened effluent sampling point was abandoned in 2013 and replaced with the new combined final effluent sampling point. Compliance requirements are as follows:

Table 4.1 Maliview WWTP Regulatory Requirements

Parameter	Regulatory Requirements	
Maximum daily secondary flow	60 m ³ /d	
Maximum daily fine-screened flow	190 m ³ /d	
Maximum daily total flow	250 m ³ /d	
	Flows up to 60 m ³ /d	Flows over 60 m ³ /d
Maximum CBOD	45 mg/L	130 mg/L
Maximum TSS	45 mg/L	130 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was last required for this facility in 2020 and is next required in 2024 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Maliview Wastewater Treatment Plant WMEP (Table 4.2).

Table 4.2 Maliview Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> Influent: TSS, BOD, fecal coliform Secondary fine-screened effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH Combined final effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month
	Effluent toxicity (voluntary): <ul style="list-style-type: none"> Rainbow trout 96-hour 	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

4.2 Results

4.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data, including exceedances, are summarized for effluent discharged from the fine screens (bypassing the secondary treatment unit) in **Table 4.3**, for the secondary treatment unit in Table 4.4, and for the entire facility in Table 4.5. The complete flow data set is presented in Appendix B1.

The RBC component of the Maliview WWTP was not designed to treat the volume of effluent that it presently receives, particularly when it is rainy and significant inflow and infiltration (I&I) enters the conveyance system. In addition, the process that splits flow between the RBC and the fine screens responds to instantaneous peak flows, rather than total daily flows. This results in frequent fine-screening events on days that the RBC unit is not operating at full capacity, as measured by the total daily flow. Finally, the strength of influent has been steadily increasing in recent years, often exceeding the treatment specifications of the RBC. All these conditions make it challenging for this facility to be in compliance with provincial regulatory limits.

Total effluent flows discharged from the Maliview WWTP did not exceed the permitted allowable maximum of 250 m³/d in 2023. Flow bypassed the secondary treatment process and received fine screening only, despite a secondary flow of less than 60 m³/d, on 307 days (84% of the time). Flow also bypassed the secondary treatment process and received screening on days where the total flow was greater than 60 m³/d, but the flow to the secondary treatment process was less than 60 m³/d on 11% of the days. Flows did not exceed the allowable maximum of 250 m³/d for total combined daily flows. Flow to the secondary treatment plant exceeded 60 m³/d on 50% of the days in 2023, resulting in a portion of the effluent bypassing the secondary treatment process of the plant to be treated solely by fine screening.

CRD staff and a contracting engineer have developed a detailed design for an upgrade to the facility to increase capacity and treatment reliability. Construction began in 2023 and is expected to be completed in 2024. It should also be noted that repairs were made in the summer of 2019 to the upstream conveyance system to reduce I&I. Since these repairs, the frequency and volume of flow limit exceedances have been substantially reduced; wet weather peak flows have been reduced to almost half of previous years, but extreme wet weather still leads to overflows.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were six EIRs issued at Maliview WWTP in 2023, as a result of:

- Power failure and mechanical breakdown (February 28);
- RBC motor drive failure (April 20);
- Toxicity test failure (July 18). As the toxicity sampling is not required by ENV, this EIR was circulated for informational purposes only;
- Effluent quality exceedance (May 15 and October 17); and
- Power failure with inflow overflow to outfall (October 24).

Compliance and treatment plant monitoring data is summarized in Table 4.6 and the complete data set is presented in Appendix B2. The secondary treatment unit removed approximately 88% of the TSS, 91% of fecal coliform and 88% of total BOD. The combined final effluent exceeded low flow (<60 m³/d) limits for TSS and CBOD on two sampling days, representing 29% of the low flow sampling events. The combined final effluent did not exceed high flow limits for TSS or CBOD on any of the sampling days.

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The effluent sample from July 2023 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which may be considered for future years. Once the plant upgrades are completed and treatment is functioning optimally, ammonia stabilization should no longer be required.

Table 4.3 Maliview WWTP 2023 Fine-screened Effluent Flow Summary

Month	Mean Daily Flow (m ³ /d)	Min Daily Flow (m ³ /d)	Max Daily Flow (m ³ /d)*	Total Flow (m ³)
January	72	29	171	2,230
February	49	30	94	1,360
March	24	0	97	731
April	10	1	23	296
May	1	0	11	30
June	0	0	1	1
July	0	0	1	1
August	0	0	1	2
September	0	0	2	3
October	2	0	39	64
November	21	0	57	622
December	32	6	92	978
Annual	17	0	171	6,316

Notes:*Permitted maximum daily flow = 190 m³/d.**Table 4.4 Maliview WWTP 2023 Secondary Effluent Flow Summary**

Month	Mean Daily Flow (m ³ /d)	Min Daily Flow (m ³ /d)	Max Daily Flow (m ³ /d)*	Total Flow (m ³)
January	66	48	107	2,031
February	61	49	67	1,709
March	71	38	124	2,197
April	69	52	113	2,074
May	44	24	69	1,363
June	29	20	36	881
July	27	14	35	835
August	29	15	39	903
September	25	15	34	756
October	33	13	73	1,020
November	61	25	79	1,821
December	67	42	97	2,073
Annual	48	13	124	17,661

Notes:*Provincially regulated maximum daily flow = 60 m³/d.

Table 4.5 Maliview WWTP 2023 Total Effluent Flow Summary

Month	Total Daily Flow				Days TF <60 (2° flow only expected)	Days 2° flow <60, but FS discharged	Days TF >60 (blended flow expected)	Days Exceeded Regulatory Maximum (250 m ³ /d)
	Mean	Min	Max	Total				
January	137	100	231	4,261	0	23	31	0
February	109	91	157	3,057	0	20	28	0
March	94	42	221	2,929	1	26	30	0
April	79	53	136	2,370	1	25	29	0
May	45	24	79	1,393	26	26	4	0
June	29	20	36	882	30	29	0	0
July	27	14	35	836	31	30	0	0
August	29	15	39	905	31	29	0	0
September	25	15	34	758	30	28	0	0
October	35	14	110	1,084	28	26	3	0
November	81	26	120	2,443	2	20	28	0
December	98	52	189	3,051	1	25	30	0
Annual Total	66	14	231	23,966	181	307	183	0

Notes:

Permitted maximum daily total flow = 250 m³/d.

Permitted maximum daily fine-screened flow = 190 m³/d.

Flow splitting threshold (max. flow that can be handled by the RBC secondary treatment process) = 60 m³/d.

FS = fine-screened.

2° = secondary treated flow.

TF = total daily flow (combined FS and 2°).

The flow splitting mechanism responds to instantaneous peak flow, so can get FS flow even when TF <60 m³/day.

Table 4.6 Maliview WWTP 2023 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring					Treatment Plant Performance Monitoring		
	Flow (m ³ /d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	NH ₃ (mg/L N)	pH	
Influent								
Regulatory Limit	250	---	---	---	---	---	---	---
Mean	66	278	400	5,810,556	400	---	---	---
Minimum	14	71	---	980,000	<89	---	---	---
Maximum	231	668	---	50,000,000	1,030	---	---	---
Regulatory Violations (%)	0.0	---	---	---	---	---	---	---
Number of Samples	365	12	---	11	12	---	---	---
Secondary Effluent								
Regulatory Limit	60	45	45	---	---	---	---	---
Mean	48	26	34	304,652	34	33.94	7.5	---
Minimum	13	12	6	19,000	16	0.00	7.2	---
Maximum	124	51	69	5,100,000	77	58.20	7.9	---
Percent Reduction	---	91	91	95	91	---	---	---
Regulatory Violations (%)	38	0	0	---	---	---	---	---
Number of Samples	365	12	12	12	12	12.	12	---
Fine-Screened Effluent¹								
Regulatory Limit	190	---	---	---	---	---	---	---
Mean	17	---	---	---	---	---	---	---
Minimum	0	---	---	---	---	---	---	---
Maximum	171	---	---	---	---	---	---	---
Percent Reduction	---	---	---	---	---	---	---	---
Regulatory Violations (%)	0.0	---	---	---	---	---	---	---
Number of Samples	365	---	---	---	---	---	---	---
Combined Final Effluent²								
Regulatory Limit ³	250	45	130	45	130	---	---	---
Mean	66	41	39	539,029	49	33	7.6	---
Minimum	14	18	18	72,000	26	0	7.3	---
Maximum	231	99	76	5,900,000	99	60	7.9	---
Percent Reduction	---	85	90	91	88	---	---	---
Regulatory Violations (%)	0.0	29	0	29	0	---	---	---
Number of Samples	365	7	5	12	12	11	12	12
Discharged Effluent								
Mean	66	33	36	539,029	49	33.3	7.6	---
Percent Reduction	---	88	---	91	88	---	---	---

Notes: ¹ No fine-screened effluent samples were collected in 2023. See footnote 2.

² Historically, the values for final effluent were calculated using individual secondary and fine-screened effluent quality values along with their relative flow volume proportions. In 2013, the fine-screened effluent sampling point was abandoned and replaced by direct sampling of final combined (secondary + screened) effluent quality via a new combined sampling point that was installed in December 2012.

³ Regulatory limits for TSS and CBOD are dependent upon whether average daily flow is above or below 60 m³/day. Limits are 45 mg/L if flows are below 60 m³/day and 130 mg/L if above 60 m³/day.

4.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

There was no routine or emergency receiving water monitoring required in 2023 as none of the EIR events exceeded three days in the winter or one day in the summer. The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2024.

4.3 Recommendations

INVESTIGATE WAYS TO ELIMINATE REGULATORY COMPLIANCE VIOLATIONS

Substantial upgrades to the Maliview WWTP are required to eliminate all regulatory compliance violations for this facility. Repairs were made in the summer of 2019 to the upstream conveyance system to reduce I&I. Since these repairs, the frequency and volume of flow limit exceedances have been substantially reduced; wet weather peak flows have been reduced to almost half of previous years, but extreme wet weather will still lead to overflows. Staff and consultants have developed a detailed design for a new treatment plant that will resolve flow and effluent quality issues. Construction began in 2023 and should be completed in 2024.

5.0 SCHOONER WWTP

5.1 Introduction

The Schooner WWTP is located on the southwest side of North Pender Island (Figure 1.1). It discharges ultraviolet disinfected secondary treated effluent into Swanson Channel through a 198 m outfall at a depth of 8 m below sea level. Because the average daily flow of this facility exceeds 100 m³/day, both provincial and federal regulatory requirements must be met.

The facility is regulated under BC MWR Registration RE-01693 dated November 15, 2000. Provincial and federal regulatory requirements are described in Table 5.1.

Table 5.1 Schooner WWTP Regulatory Requirements

Parameter	Regulatory Requirement	
	Provincial	Federal
Maximum daily flow	640 m ³ /d	---
CBOD	max 45 mg/L	average 25 mg/L
TSS	max 45 mg/L	average 25 mg/L
Fecal coliform	200 CFU/100 mL	---
Unionized ammonia	---	max 1.25 mg/L
Total residual chlorine	---	average 0.02 mg/L
Toxicity test	96-hr Rainbow trout	---

This registration also has a requirement for receiving water monitoring. Routine monitoring was last required for this facility in 2020 and is next required in 2024 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Schooner Wastewater Treatment Plant WMEP (Table 5.2).

Table 5.2 Schooner Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> Influent: TSS, BOD, fecal coliform Secondary Effluent: TSS, fecal coliform, unionized NH₃, total residual chlorine Disinfected secondary effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH, unionized NH₃ 	Once per month
	Federal compliance monitoring: <ul style="list-style-type: none"> Final Effluent: TSS, CBOD, unionized ammonia, total residual chlorine, pH 	Once per month (reported quarterly)
	Effluent toxicity	Once per year
Surface Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

5.2 Results

5.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data are summarized in Table 5.3 and the complete data set is presented in Appendix C1. In 2023, one total daily flow, representing 0.3% of the year, from the Schooner WWTP exceeded the allowable maximum, consistent with recent years.

Monthly compliance and treatment plant performance monitoring data are summarized in Table 5.4 and the complete data set is presented in Appendix C2. In 2023, all other monthly compliance parameters at the Schooner WWTP were within compliance limits. However, while samples were not collected during the power outages described below, it is assumed that the provincial fecal coliform limit was exceeded during these events, as the UV system cannot operate during power outages. The treatment plant removed approximately 97% of the TSS, >99% of the fecal coliform and 97% of the total BOD it received. Chlorine is not used at this facility, so is not monitored with respect to federal WSER requirements.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were 12 EIRs issued at Schooner WWTP in 2023, as a result of:

- 9 system-wide BC Hydro failures resulting in no UV disinfection for the duration (January 28, February 3, 20, 27, September 28, October 17, 24, November 10, and December 9);
- Sewer line break resulting in sewage spill to ditch (April 6);
- Sewer line break after stump removal (July 11); and
- Flow exceedance following heavy rain event (December 5).

TOXICITY TESTING

As in previous years (2012-2022), the disinfected effluent sample from July 2023 passed the 96-hour Rainbow trout acute toxicity test.

Table 5.3 Schooner WWTP 2023 Effluent Flow Annual Summary

Month	Mean Flow (m³/d)	Min Flow (m³/d)	Max Flow (m³/d)*	Total Flow (m³)	Permit Violations (%)
January	320	223	473	9,918	6
February	326	284	371	9,117	0
March	306	274	397	9,482	0
April	321	274	403	9,638	0
May	208	152	280	6,461	0
June	151	125	170	4,523	0
July	157	127	188	4,855	0
August	161	139	180	5,002	0
September	143	122	172	4,278	0
October	159	125	341	4,936	0
November	211	149	356	6,342	0
December	286	163	794	8,871	3.2
Annual	229	122	794	83,423	0.3

Notes:

*Provincially regulated maximum daily flow = 640 m³/d.

Table 5.4 Schooner WWTP 2023 Compliance Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring				
	Flow (m ³ /d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	Ammonia (mg/L N)	Unionized Ammonia@15 C (mg N/L)	Total Residual Chlorine (mg/L)	pH
Influent									
Regulatory Limit	640	---	---	---	---	---	---	---	---
Mean	229	337	---	6,941,057	214	---	---	---	---
Minimum	122	102	---	2,000,000	95	---	---	---	---
Maximum	794	860	---	42,000,000	428	---	---	---	---
Regulatory violations (%)	0.3	---	---	---	---	---	---	---	---
Number of samples	365	12	---	12	12	---	---	---	---
Secondary Effluent									
Regulatory Limit	---	---	---	---	---	---	---	---	---
Mean	229	14	---	52,340	---	---	---	---	---
Minimum	122	6	---	5,300	---	---	---	---	---
Maximum	794	31	---	950,000	---	---	---	---	---
Percent Reduction	---	96	---	99	---	---	---	---	---
Regulatory violations	---	---	---	---	---	---	---	---	---
Number of samples	365	12	---	12	---	---	---	---	---
Disinfected Secondary Effluent									
Regulatory Limit	640	Max: 45 Avg: 25	Max: 45 Avg: 25	200	---	---	1.25	0.02	---
Mean	229	10	4	24	6	2	0.038	---	6.9
Minimum	122	5	<4	<2	<4	<0.1	<0.01	---	6.3
Maximum	794	21	9	110	12	22	0.002	---	7.4
Percent Reduction	---	97	---	100	97	---	---	---	---
Regulatory violations (%)	27	0	0	0	---	---	0	---	---
Number of samples	365	12	12	12	12	12	3	---	12

Notes:
Data is comprised of routine, monthly sampling results.

5.2.2 Receiving Water Monitoring

There was no routine or emergency receiving water monitoring required in 2023 as none of the EIR events exceeded three days in the winter or one day in the summer. The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2024.

5.3 Recommendations

INVESTIGATE WAYS TO ELIMINATE REGULATORY COMPLIANCE VIOLATIONS

Substantial upgrades to the Schooner WWTP and collection system would be required for this facility to eliminate all regulatory compliance violations. Staff are undertaking upgrades in a phased manner over a five- to seven-year period. Phase 1 included several conveyance system upgrades. Phase 2 has started, with construction of a new Schooner WWTP starting in 2023 with anticipated completion by 2024.

6.0 CANNON WWTP

6.1 Introduction

The Cannon WWTP is located on the southwest side of North Pender Island (Figure 1.1). It discharges undisinfecting secondary effluent into Swanson Channel through a 60 m outfall at a depth of 31 m below sea level.

The facility is regulated under BC MWR Permit PE-00220 dated April 28, 1981. Regulatory requirements are described in Table 6.1.

Table 6.1 Cannon WWTP Regulatory Requirements

Parameter	Regulatory Requirement
Maximum daily flow	68 m ³ /d
Maximum CBOD	45 mg/L
Maximum TSS	60 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was last required for this facility in 2020 and is next required in 2024 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Cannon Wastewater Treatment Plant WMEP (Table 6.2).

Table 6.2 Cannon Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring <ul style="list-style-type: none"> Influent: TSS, CBOD, fecal coliform Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month
	Effluent toxicity (voluntary): <ul style="list-style-type: none"> Rainbow trout 96-hour 	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

6.2 Results

6.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

In 2023, five total daily flows, representing 1.0% of the year, from the Cannon WWTP exceeded the allowable maximum (Table 6.3, Appendix D1). Flow exceedances occurred in January and December. Effluent quality was similar to previous years. Monthly compliance and treatment plant performance monitoring data are summarized in Table 6.4 and the complete data set is presented in Appendix D2. In 2023, all regulatory parameters met compliance limits.

Overall, the treatment plant removed approximately 92% of the TSS, >99% of the fecal coliform, and 93% of the TBOD from the influent.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were six EIRs issued at Cannon WWTP in 2023, as a result of:

- heavy rainfall events resulting in flow exceedance (December 1,4,5,6,10); and
- toxicity test failure (July 18). As the toxicity sampling is not required by ENV, this EIR was circulated for informational purposes only.

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The undisinfected secondary effluent sample from July 2023 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which may be considered for future years. Once the plant upgrades are completed and treatment is functioning optimally, ammonia stabilization should no longer be required.

Table 6.3 Cannon WWTP 2023 Annual Flow Summary

Month	Mean Flow (m ³ /d)	Min Flow (m ³ /d)	Max Flow (m ³ /d)	Total Flow (m ³)	Permit Violations (%)
January	46	14	70	1,424	3
February	36	24	43	1,018	0
March	38	24	50	1,217	0
April	34	15	52	1,014	0
May	26	6	37	800	0
June	27	12	34	817	0
July	30	17	42	940	0
August	30	15	50	938	0
September	24	13	30	734	0
October	28	19	44	864	0
November	47	25	68	1,396	0
December	51	51	113	1,541	13
Annual	35	6	113	12,703	1

Notes:

Provincially regulated maximum daily flow = 68 m³/d.

Table 6.4 Cannon WWTP 2023 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring		
	Flow (m ³ /d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	TBOD (mg/L)	NH ₃ (mg/L N)	pH
Influent							
Regulatory Limit	---	---	---	---	---	---	---
Mean	35	186	---	4,238,464	267	---	---
Minimum	6	15	---	160,000	60	---	---
Maximum	113	880	---	27,000,000	553	---	---
Permit Violations (%)	1	---	---	---	---	---	---
Number of Samples	365	12	---	11	12	---	---
Secondary Effluent							
Regulatory Limit	68	60	45	---	---	---	---
Mean	35	8	6	33,677	13	14	7.4
Minimum	6	3	<4	720	4	1	6.8
Maximum	113	13	10	1,100,000	26	41	7.8
Percent Reduction	---	96	---	99	95	---	---
Permit Violations (%)	1	0	0	---	---	---	---
Number of Samples	365	12	12	12	12	12	12

6.2.2 Receiving Water Monitoring

There was no routine or emergency receiving water monitoring required in 2023 as none of the EIR events exceeded 3 days in the winter or one day in the summer. The next routine receiving water 5-in-30 sampling will be conducted in the fall of 2024.

6.3 Recommendations

INVESTIGATE WAYS TO ELIMINATE REGULATORY COMPLIANCE VIOLATIONS

Substantial upgrades to the Cannon WWTP and collection system would be required for this facility to eliminate all regulatory compliance violations. As noted in Section 5.3, upgrades to the Magic Lake system are being completed in a phased approach. Phase 1 began in 2023 and included upgrades to the conveyance system and the construction of a new Schooner WWTP. Once the new Schooner WWTP has been commissioned (anticipated in 2024), the Cannon WWTP will be decommissioned, and all flows will be pumped to the Schooner WWTP.

7.0 PORT RENFREW WWTP

7.1 Introduction

The Port Renfrew WWTP is located on the southeast corner of Port San Juan on Vancouver Island (Figure 1.1). It discharges undisinfected secondary treated effluent into Port San Juan through an 81 m outfall at a depth of 3 m.

The facility is regulated under BC MWR Permit PE-00312 dated April 15, 1992. Regulatory requirements are described in Table 7.1.

Table 7.1 Port Renfrew WWTP Regulatory Requirements

Parameter	Regulatory Requirement
Maximum daily flow	220 m ³ /d
Maximum CBOD	45 mg/L
Maximum TSS	60 mg/L

This registration also has a requirement for receiving water monitoring. Routine monitoring was last required for this facility in 2020 and is next required in 2024 unless there are planned bypasses, plant failures/overflows or wet weather overflows that exceed three days' duration in the winter and one day duration in the summer which would trigger non-routine or emergency sampling.

The following section reports the results from the Port Renfrew Wastewater Treatment Plant WMEP (Table 7.2).

Table 7.2 Port Renfrew Wastewater Treatment Plant WMEP

Component	Parameter	Frequency
Wastewater	Flow	Daily
	Compliance and treatment plant performance monitoring: <ul style="list-style-type: none"> Influent: TSS, BOD, fecal coliform Secondary Effluent: TSS, BOD, CBOD, fecal coliform, NH₃, pH 	Once per month
	Effluent toxicity (voluntary): <ul style="list-style-type: none"> Rainbow trout 96-hour 	Once per year
Receiving Water	Indicator bacteria (fecal coliform and enterococci)	2024, 2028, 2032

7.2 Results

7.2.1 Wastewater Monitoring

COMPLIANCE AND TREATMENT PLANT PERFORMANCE MONITORING

Flow data are summarized in Table 7.3 and the complete data set is presented in Appendix E1. In 2023, there was one exceedance for daily flows at the Port Renfrew WWTP, representing 0.3% of the year's flow. Average monthly flow was similar to recent years.

Monthly compliance and treatment plant performance monitoring data are summarized in Table 7.4 and the complete data set is presented in Appendix E2. TSS exceeded the permitted value once in 2023, representing 8% of the monthly sampling events. All other compliance parameters were below regulatory limits. The treatment plant removed approximately 89% of the TSS, 96% of the BOD and >99% of the fecal coliforms.

Compliance data was reported to ENV on a monthly basis, with EIRs issued if there was an incident at the plant. There were three EIRs issued at Port Renfrew WWTP in 2023, as a result of:

- Partial blockage in RAS (return activated sludge) line, resulting in TSS exceedance (September 19);
- Overflow due to heavy rain (December 4);
- Toxicity test failure (July 18). As the toxicity sampling is not required by ENV, this EIR was circulated for informational purposes only.

TOXICITY TESTING

Beginning in 2021, toxicity testing was conducted at each of the Gulf Islands/Port Renfrew facilities in order to maintain consistency across the region. The undisinfected secondary effluent sample from July 2023 failed the 96-hour Rainbow trout acute toxicity test. The toxicity test was not ammonia stabilized, which may be considered for future years.

Table 7.3 Port Renfrew WWTP 2023 Flow Summary

Month	Mean Flow (m³/d)	Min Flow (m³/d)	Max Flow (m³/d)*	Total Flow (m³)	Permit Violations (%)
January	63	28	124	1,959	0
February	52	30	122	1,450	0
March	43	20	85	1,318	0
April	57	34	98	1,705	0
May	28	22	36	872	0
June	28	22	34	825	0
July	34	25	43	1,053	0
August	37	30	52	1,149	0
September	31	22	51	915	0
October	51	25	198	1,572	0
November	53	23	148	1,595	0
December	72	36	237	2,223	3
Annual	46	20	237	16,636	0.3

Notes:

Provincially regulated maximum daily flow = 220 m³/d

Table 7.4 Port Renfrew WWTP 2023 Compliance and Treatment Plant Performance Monitoring Annual Summary

Source	Compliance Monitoring				Treatment Plant Performance Monitoring		
	Flow (m ³ /d)	TSS (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	BOD (mg/L)	NH ³ (mg/L N)	pH
Influent							
Regulatory Limit	---	---	---	---	---	---	---
Mean	46	174	---	4,156,130	272	---	---
Minimum	20	37	---	680,000	<89	---	---
Maximum	237	540	---	37,000,000	592	---	---
Permit Violations (%)	0.3	---	---	---	---	---	---
Number of Samples	365	12	---	11	12	---	---
Secondary Effluent							
Regulatory Limit	220	60	45	---	---	---	---
Mean	46	19	6	16,580	12	1.67	6.6
Minimum	20	3	<4	540	3	<0.1	5.1
Maximum	237	73	23	1,300,000	31	8	7.8
Percent Reduction	---	89	---	100	96	---	---
Permit Violations (%)	0.3	8	0	---	---	---	---
Number of Samples	365	12	12	11	12	12	12

7.2.2 Receiving Water Monitoring

RECEIVING WATER BACTERIA INDICATORS

There was no routine or emergency receiving water monitoring required in 2023 as none of the EIR events exceeded three days in the winter or one day in the summer. The next routine receiving water 5-in-30 sampling will be conducted in the summer of 2024.

7.3 Recommendations

MAINTAIN EFFECTIVENESS AND RELIABILITY OF THE TREATMENT PROCESS

Staff and consultants completed a feasibility study in 2015 to improve/increase the treatment plant capacity and ensure ongoing effective operation of the treatment plant and conveyance system into the future. Grant funding will be required in order to complete any upgrades to this system. Updates to the facility asset management plans are underway, and a phased implementation plan is anticipated pending funding.

8.0 BURGOYNE BAY WASTE TRANSFER FACILITY

8.1 Introduction

The Burgoyne Bay waste transfer facility is located on Salt Spring Island and collects septage from Salt Spring Island (Ganges WWTP and Maliview WWTP), Pender Island (Schooner WWTP and Cannon WWTP) and from Saturna Island. Material is then disposed of at GFL Environmental SPL Wastewater Recovery Centre (Langford, BC). Monitoring is undertaken to characterize the septage prior to disposal and to inform the CRD's Regional Source Control Program (RSCP) initiatives. The Burgoyne Bay facility is not designed to produce a biosolids product as defined in the Organic Matter Recycling Regulation (OMRR). However, as a reference point, the results of the analyses performed on the septage are compared to the quality criteria established in Schedule 4 of the OMRR for Class A biosolids.

8.2 Results

The Burgoyne Bay waste transfer facility had one sample in January where copper exceeded the quality criteria for Class A biosolids (Appendix F1). This exceedance currently has no implications for disposal as this comparison is for information purposes only (to assess the end-product quality) and is not intended to characterize the material as a biosolids product. All other results were below the quality criteria for Class A biosolids.

8.3 Recommendations

Continue to characterize the septage collected at the facility in order to inform the RSCP program.

9.0 REFERENCES

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APPENDIX A

GANGES WWTP

Appendix A1 Ganges WWTP Effluent Flow 2023 (m³/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	407	444	470	373	373	497	494	489	474	416	486	499
2	432	433	543	372	415	473	426	503	465	447	562	571
3	434	401	492	364	402	469	416	475	480	445	594	489
4	461	408	577	435	428	491	449	467	425	448	594	575
5	454	375	498	422	465	496	456	480	466	449	577	744
6	436	384	475	466	477	500	465	473	438	421	515	624
7	475	458	472	403	422	445	447	464	456	400	554	607
8	474	424	449	455	402	452	480	481	442	379	486	590
9	435	450	513	422	461	458	425	482	444	380	490	535
10	490	404	460	391	457	481	422	501	449	430	499	618
11	465	407	419	418	481	446	464	455	458	446	583	610
12	558	426	401	424	473	461	498	466	442	450	627	575
13	598	394	521	422	459	466	457	423	436	438	580	545
14	462	414	456	424	441	487	448	455	429	439	556	579
15	461	402	482	445	423	468	453	443	419	423	535	551
16	508	421	462	394	499	434	451	470	445	452	453	477
17	464	376	487	381	448	464	471	519	402	455	504	457
18	616	402	404	431	473	447	490	480	428	459	471	483
19	446	390	418	427	457	474	522	507	415	601	490	482
20	406	360	398	447	452	470	484	500	467	475	482	491
21	450	414	449	423	505	492	456	468	452	433	490	488
22	421	428	436	443	454	467	482	506	442	443	512	465
23	403	406	402	419	449	414	480	513	451	444	507	419
24	436	425	423	418	448	532	465	484	446	464	471	404
25	420	373	423	410	459	457	504	462	477	674	490	369
26	421	396	365	409	486	439	482	473	434	568	491	437
27	402	400	371	505	466	474	478	443	485	562	532	434
28	402	465	382	380	447	468	482	426	503	539	570	447
29	426	---	390	406	481	469	527	486	467	449	537	471
30	425	---	403	398	449	466	472	452	430	463	539	463
31	445	---	385	---	527	---	442	508	---	447	---	487
Min	402	360	365	364	373	414	416	423	402	379	453	369
Max	616	465	577	505	527	532	527	519	503	674	627	744
Mean	456	410	446	418	454	469	467	476	449	463	526	516
Total Flow	14,133	11,480	13,826	12,527	14,079	14,057	14,488	14,754	13,467	14,339	15,777	15,986
Note: shading indicates exceedance of regulatory limit (1,198 m ³).											Annual Min	360
											Annual Max	744
											Annual Mean	463

Appendix A2 Ganges WWTP Compliance and Treatment Plant Performance 2023

Date	Influent			Secondary Effluent (Undisinfected)		Secondary Effluent (Disinfected)							
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH ₃ (mg/L N)	Unionized NH ₃ (mg/L N)	TRC (mg/L)	pH
Regulatory Limit						25		25	1000		1.25	0.02	
January	295	383	7,500,000	0.5	1,400	<2	<4	<4	<1	<0.1	<0.1	0.01	7.2
February	317	443	19,000,000	1	2,656	<2	<4	<4	<1	0.21	<0.1	0.02	7.3
March	660	619	30,000,000	1.5	12,884	<4	<4	4.11	<1	<0.1	<0.1	0.09	7.2
April	150	936	34,000,000	3.5	17,697	<2	5.01	5.53	03	18.6	0.078	---	7.5
May	318	379	2,300,000	7.55	---	<2	<4	<4	720	27.7	0.12	0.06	7.7
June	287	168	20,000,000	12	12,442	<2	<4	<4	21	18	<0.1	---	7.5
July	310	319	35,000,000	24.5	7,842	2.8	<3	<3	38	8.3	0.019	---	7.6
August	388	491	31,000,000	01	18,466	03	<4	<4	40	<0.1	<0.1	0.03	7.3
September	340	491	26,000,000	4.5	27,276	03	<3	<3	330	0.534	<0.1	0.02	7.5
October	178	313	23,000,000	4	4,699	05	<2	<2	01	<0.1	<0.1	0.03	7.5
November	406	390	12,000,000	4.5	1,803	02	<2	03.5	<1	0.031	<0.0005	0.01	7.3
December	258	213	23,000,000	2	5,675	02	<2.38	<2.85	<1	0.041	<0.0005	0.09	7.3
Mean	326	429	18,051,685	5.5	10,258	2.1	1.9	2.4	96	6.1	0.047	0.03	7.4
Min	150	168	2,300,000	1	1,400	<2	<2	<2	<1	<0.1	<0.1	0	7.2
Max	660	936	35,000,000	24.5	27,276	5	5.01	5.53	720	27.7	0.12	0.09	7.7
n	12	12	12	12	11	12	12	12	12	12	12	12	12
Mean Daily Loading	kg/day	kg/day		kg/day		kg/day				kg/day	kg/day	kg/day	
	151	198	---	2.57	---	1.0	---	---	---	2.8	0.02	0.01	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, TRC = total residual chlorine, NH₃ = ammonia
Shading indicates exceedance of regulatory limit, --- no sample.

Appendix A3 Ganges WWTP Priority Substances Analyzed in Influent and Effluent 2023

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
CONVENTIONALS								
alkalinity - Carbonate	mg/L	1	<1	<1	n/d	n/d		
alkalinity - Bicarbonate	mg/L	2.8	220	120	0.286	n/a		
alkalinity - Hydroxide	mg/L	1	<1	<1	n/d	n/d		
alkalinity - Phenolphthalein - Ph 8.3	mg/L	1	<1	<1	n/d	n/d		
alkalinity - Total - Ph 4.5	mg/L	1	180	100	0.239	n/a		
biochemical oxygen demand (BOD)	mg/L	2	340	<2	n/d	n/d		
carbonaceous biochemical oxygen demand (CBOD)	mg/L	2	280	<2	n/d	n/d		
chemical oxygen demand (COD)	mg/L	0.005	852	30	0.072	5,365,500		
chloride	mg/L	1	140	76	0.181	13,592,600		
cyanide-SAD	mg/L	0.0005	0.0079	0.002	0.000005	352		
cyanide-WAD	mg/L	0.0005	0.004	0.001	0.000003	218	0.001	
hardness (as CaCO3 tot)	mg/L	0.5	164.5	40.3	0.10	7,207,655		
oil & grease, mineral	mg/L	2	2.5	<2	n/d	n/d		
oil & grease, total	mg/L	1	29	<1	n/d	n/d		
total organic carbon	mg/L	0.5	120	9.9	0.02	1,770,615		
pH	pH	0	7.3	7.71	n/a	n/a		
pH @ 15° C	pH	0	6.48	6.92	n/a	n/a		
conductivity	µS/cm	0.005	920	530	1.3	n/a		
sulfide	mg/L	0.002	0.22	0.025	0.00006	4,471		
sulphate	mg/L	1	21	19	0.05	3,398,150		
TSS	mg/L	1	280	2.8	0.01	500,780		
BACTERIOLOGY								
Enterococci	CFU/100 mL	1	6,200,000	19	0.05	n/a	35 geomean / 70 single sample	35 geomean / 70 single sample

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
Fecal Coliforms	CFU/100 mL	1	12,000,000	31	0.07	n/a		
NUTRIENTS								
N - NH3 (as N)	mg/L	0.05	35	8.3	0.020	1,484,455	19.7	
N - Nh3 (As N)- Unionized	mg/L	0.05	0.03	0.019	0.00005	3,398		
N - NO2 (as N)	mg/L	0.05	<0.005	0.34	0.0008	60,630		
N - NO3 (as N)	mg/L	0.05	<0.02	0.21	0.001	37,559		
N - NO3 + NO2 (as N)	mg/L	0.05	<0.02	0.55	0.001	98,189		
N - TKN (as N)	mg/L	0.05	47	8	0.02	1,466,570		
N - Total (As N)	mg/L	0.05	94	9	0.02	1,564,938		
P - Po4 - Ortho (As P)	mg/L	0.4	3.8	0.07	0.0002	12,341		
METALS DISSOLVED								
aluminum D	µg/L	0.5	49	23	0.05	4,042		
antimony D	µg/L	0.02	0.46	0.24	0.0006	42.6		
arsenic D	µg/L	0.02	1.16	0.27	0.0006	48.3		
barium D	µg/L	0.02	23	8.13	0.02	1,454		
beryllium D	µg/L	0.01	<0.01	<0.01	n/d	n/d		
bismuth D	µg/L	0.005	0.403	0.147	0.0004	26.3		
boron D	µg/L	10	840	261	0.62	46,680		
cadmium D	µg/L	0.005	0.03	0.01	0.00003	1.90		
calcium D	mg/L	0.05	26	14	0.03	2,486,015		
chromium D	µg/L	0.1	0.6	0.31	0.001	55.4		
cobalt D	µg/L	0.005	0.16	0.10	0.0002	18.2		
copper D	µg/L	0.1	55	3.81	0.01	681		
iron D	µg/L	5	657	57.2	0.14	10,230		
lead D	µg/L	0.02	0.70	0.21	0.0005	38.1		
lithium D	µg/L	0.5	13.20	5.30	0.013	948		
magnesium D	mg/L	0.05	5.5	3.7	0.01	661,745		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
manganese D	mg/L	0.1	88	44	0.11	7,941		
mercury D	µg/L	0.038	<0.038	<0.038	n/d	n/d		
molybdenum D	µg/L	0.05	0.42	<0.05	n/d	n/d		
nickel D	µg/L	0.05	4.79	1.01	0.002	181		
phosphorus D	µg/L	5	11,310	141	0.34	25,218		
potassium D	mg/L	0.05	19	16	0.04	2,933,140		
selenium D	µg/L	0.04	3.44	0.22	0.0005	39.7		
Silicon D	µg/L	0.005	2,040	2,070	4.94	370,220		
silver D	µg/L	0.005	0.26	0.0074	0.00002	1.32		
Sodium D	mg/L	0.05	87.1	62.9	0.15	11,249,665		
Strontium D	µg/L	0.05	89.8	62.7	0.15	11213.9		
sulfur D	mg/L	3	43.4	7.8	0.019	1,395,030		
thallium D	µg/L	0.002	<0.002	<0.002	n/d	n/d		
tin D	µg/L	0.2	0.72	0.44	0.001	78.7		
titanium D	µg/L	0.5	1.31	<0.5	n/d	n/d		
Uranium D	µg/L	0.002	0.02	0.002	0.000005	0.4		
Vanadium D	µg/L	0.2	0.43	0.20	0.0005	35.8		
zinc D	µg/L	0.1	15.70	47.4	0.113	8,477		
zirconium D	µg/L	0.1	0.39	<0.1	n/d	n/d		
METALS - TOTAL								
aluminum	µg/L	3	217	23	0.05	4,042		
antimony	µg/L	0.02	0.55	0.21	0.0005	37.9		
arsenic	µg/L	0.02	0.6	0.21	0.0005	36.8	12.5	12.5
barium	µg/L	0.05	20	6.79	0.02	1,214		
beryllium	µg/L	0.01	<0.01	<0.01	n/d	n/d	100	
cadmium	µg/L	0.005	0.1	0.01	0.0000	1.68119	0.12	0.12
calcium	mg/L	0.25	24	11	0.03	1,985,235		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
chromium	µg/L	1	1.5	0.29	0.0007	51.9		
cobalt	µg/L	0.01	0.294	0.09	0.0002	16.5		
copper	µg/L	0.1	67.3	3.4	0.01	599	<2 (lt), 3 (st)	
iron	µg/L	5	536	62	0.15	11,124		
lead	µg/L	0.02	2	0.19	0.0005	34.7	≤2 (lt), 140 (st)	
magnesium	mg/L	0.25	4.7	3.1	0.007	547,281		
manganese	µg/L	0.1	49.7	36.9	0.09	6,600		
mercury	µg/L	0.0019	<0.038	<0.0019	n/d	n/d		0.16
molybdenum	µg/L	0.05	0.9	0.10	0.0002	17.2		
nickel	µg/L	0.05	2.95	1.1	0.003	197	8.3	
phosphorus	µg/L	2.5	6080	152	0.36	27,185		
potassium	mg/L	0.25	16	13	0.03	2,378,705		
selenium	µg/L	0.04	0.4	0.07	0.0002	11.6	2	
silver	µg/L	0.01	1.5	0.01	0.00002	1.79	1.5 (lt), 3 (st)	7.5
thallium	µg/L	0.002	0.01	<0.002	n/d	n/d		
tin	µg/L	0.2	1.2	0.36	0.001	64.4		
zinc	µg/L	1	120	38.8	0.09	6,939	10 (lt), 55 (st)	
METALS - OTHER								
chromium III	mg/L	0.005	<0.005	<0.005	n/d	n/d	56	
Chromium VI	mg/L	0.005	<0.005	<0.005	n/d	n/d		
dibutyltin dichloride	µg/L	0.001	0.01	<0.001	n/d	n/d		
methyl mercury	ng/L	0.05	0.11	<0.05	n/d	n/d		
monobutyltin trichloride	µg/L	0.001	0.03	0.01	0.00003	2.50		
tributyltin chloride	µg/L	0.001	<0.001	<0.001	n/d	n/d		
ALDEHYDES								
acrolein	µg/L	2.8	<2.8	<2.8	n/d	n/d		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
CHLORINATED PHENOLICS								
2,4 + 2,5 dichlorophenol	µg/L	0.5	<0.5	<0.5	n/d	n/d		
2-chlorophenol	µg/L	0.5	<0.5	<0.5	n/d	n/d		
2,4,6-trichlorophenol	µg/L	0.5	<0.5	<0.5	n/d	n/d		
4-chloro-3-methylphenol	µg/L	1	<1	<1	n/d	n/d		
pentachlorophenol	µg/L	0.5	<0.5	<0.5	n/d	n/d		
PHENOLIC COMPOUNDS								
total phenols	mg/L	0.0015	0.03	<0.0015	n/d	n/d		
NON-CHLORINATED PHENOLICS								
2,4-dimethylphenol	µg/L	2.5	<2.5	<2.5	n/d	n/d		
2,4-dinitrophenol	µg/L	6.5	<6.5	<6.5	n/d	n/d		
2-methyl-4,6-dinitrophenol	µg/L	2.5	<2.5	<2.5	n/d	n/d		
2-nitrophenol	µg/L	2.5	<2.5	<2.5	n/d	n/d		
4-nitrophenol	µg/L	2.5	<2.5	<2.5	n/d	n/d		
phenol	µg/L	2.5	9.7	<2.5	n/d	n/d		
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)								
2-chloronaphthalene	µg/L	0.25	<0.25	<0.25	n/d	n/d		
2-methylnaphthalene	µg/L	0.01	0.014	0.01	0.00002	1.79	0.0202	
acenaphthene	µg/L	0.01	0.011	<0.01	n/d	n/d	6	
acenaphthylene	µg/L	0.01	<0.01	<0.01	n/d	n/d		
anthracene	µg/L	0.01	<0.01	<0.01	n/d	n/d		
benzo[a]anthracene	µg/L	0.01	<0.01	<0.01	n/d	n/d		
benzo[a]pyrene	µg/L	0.005	0.29	<0.005	n/d	n/d	0.01	
benzo[b]fluoranthene	µg/L	0.01	<0.01	<0.01	n/d	n/d		
benzo(b)fluoranthene + benzo(j)fluoranthene	µg/L	0.4	<0.01	<0.01	n/d	n/d		
benzo[ghi]perylene	µg/L	0.02	<0.02	<0.02	n/d	n/d		
benzo(k)fluoranthene	µg/L	0.01	<0.01	<0.01	n/d	n/d		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
chrysene	µg/L	0.01	<0.01	<0.01	n/d	n/d	0.1	
dibenzo(a,h)anthracene	µg/L	0.02	<0.02	<0.02	n/d	n/d		
fluoranthene	µg/L	0.01	0.03	<0.01	n/d	n/d		
fluorene	µg/L	0.01	0.012	<0.01	n/d	n/d	12	
indeno(1,2,3-c,d)pyrene	µg/L	0.02	<0.02	<0.02	n/d	n/d		
naphthalene	µg/L	0.01	<0.01	<0.01	n/d	n/d	1	1.4
phenanthrene	µg/L	0.01	0.03	<0.01	n/d	n/d		
pyrene	µg/L	0.01	0.02	<0.01	n/d	n/d		
PAH-high molecular weight	µg/L	0.02	0.33	<0.02	n/d	n/d		
PAH-low molecular weight	µg/L	0.01	0.07	<0.01	n/d	n/d		
Total PAH	µg/L	0.02	0.4	<0.02	n/d	n/d		
SEMIVOLATILE ORGANICS								
bis(2-ethylhexyl)phthalate	µg/L	5	11.4	<5	n/d	n/d		
butylbenzyl phthalate	µg/L	2.5	<2.5	<2.5	n/d	n/d		
diethyl phthalate	µg/L	15	3.16	0.25	0.0006	44.7		
dimethyl phthalate	µg/L	0.25	<0.25	<0.25	n/d	n/d		
di-n-butyl phthalate	µg/L	2.5	26.3	10.1	0.0241	1,806		
di-n-octyl phthalate	µg/L	0.25	<0.25	<0.25	n/d	n/d		
MISC SEMIVOLATILE ORGANICS								
bis(2-chloroethoxy)methane	µg/L	0.25	<0.25	<0.25	n/d	n/d		
bis(2-chloroethyl)ether	µg/L	0.25	<0.25	<0.25	n/d	n/d		
bis(2-chloroisopropyl)ether	µg/L	0.25	<0.25	<0.25	n/d	n/d		
hexachlorobutadiene	µg/L	0.25	<0.25	<0.25	n/d	n/d		
hexachlorocyclopentadiene	µg/L	0.25	<0.25	<0.25	n/d	n/d		
hexachloroethane	µg/L	0.25	<0.25	<0.25	n/d	n/d		
isophorone	µg/L	0.25	<0.25	<0.25	n/d	n/d		
nitrobenzene	µg/L	0.025	<0.25	<0.25	n/d	n/d		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
N-nitrosodimethylamine	µg/L	1	<1	<1	n/d	n/d		
N-nitrosodi-n-propylamine	µg/L	1	<1	<1	n/d	n/d		
VOLATILE ORGANIC COMPOUNDS								
MONOCYCLIC AROMATIC HYDROCARBONS								
1,2,4-trichlorobenzene	µg/L	0.2	<0.2	<0.2	n/d	n/d		5.4
1,2-dichlorobenzene	µg/L	0.5	<0.5	<0.5	n/d	n/d		42
1,2-diphenylhydrazine	µg/L	0.05	<0.05	<0.05	n/d	n/d		
1,3-dichlorobenzene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,4-dichlorobenzene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
2,6-dinitrotoluene	µg/L	0.25	<0.25	<0.25	n/d	n/d		
3,3-dichlorobenzidine	µg/L	0.5	<0.5	<0.5	n/d	n/d		
4-bromophenyl phenyl ether	µg/L	0.05	<0.05	<0.05	n/d	n/d		
4-chlorophenyl phenyl ether	µg/L	0.25	<0.25	<0.25	n/d	n/d		
benzene	µg/L	0.4	<0.4	<0.4	n/d	n/d	110	110
ethylbenzene	µg/L	0.4	<0.4	<0.4	n/d	n/d	250	25
m & p xylenes	µg/L	0.4	<0.4	<0.4	n/d	n/d		
o-xylene	µg/L	0.4	<0.4	<0.4	n/d	n/d		
styrene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
toluene	µg/L	0.4	1.5	<0.4	n/d	n/d		215
xylenes	µg/L	0.4	<0.4	<0.4	n/d	n/d		
CHLORINATED ALIPHATIC								
1,1,1,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,1,1-trichloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,1,2,2-tetrachloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,1,2-trichloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,1-dichloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,1-dichloroethene	µg/L	0.5	<0.5	<0.5	n/d	n/d		

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
1,2-dichloroethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
1,4-dioxane	µg/L	0.37	<0.81	<0.37	n/d	n/d		
2,4-dinitrotoluene	µg/L	6.5	<0.25	<0.25	n/d	n/d		
alpha-terpineol	µg/L	5	20.9	<5	n/d	n/d		
bromomethane	µg/L	1	<1	<1	n/d	n/d		
chlorobenzene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
chlorodibromomethane	µg/L	1	<1	<1	n/d	n/d		
chloroethane	µg/L	1	<1	<1	n/d	n/d		
chloroethene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
chloromethane	µg/L	1	<1	<1	n/d	n/d		
ALIPHATIC								
1,2-dibromoethane	µg/L	0.2	<0.2	<0.2	n/d	n/d		
1,2-dichloropropane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
acrylonitrile	µg/L	2.8	<1	<1	n/d	n/d		
cis-1,2-dichloroethene	µg/L	1	<1	<1	n/d	n/d		
cis-1,3-dichloropropene	µg/L	1	<1	<1	n/d	n/d		
dibromomethane	µg/L	2	<2	<2	n/d	n/d		
methyl tertiary butyl ether	µg/L	4	<4	<4	n/d	n/d	440	5,000
tetrabromomethane	µg/L	50	<50	<50	n/d	n/d		
tetrachloroethene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
tetrachloromethane	µg/L	0.5	<0.5	<0.5	n/d	n/d		
trans-1,2-dichloroethene	µg/L	1	<1	<1	n/d	n/d		
trans-1,3-dichloropropene	µg/L	1	<1	<1	n/d	n/d		
trichloroethene	µg/L	0.5	<0.5	<0.5	n/d	n/d		
trichlorofluoromethane	µg/L	4	<4	<4	n/d	n/d		
trichloromethane	µg/L	1	25	<1.2	n/d	n/d		

Appendix A3, continued

Parameter	Units	MDL	Ganges Influent	Ganges Effluent	Effluent Diluted	Loading (kg/year)	BC WQG	CCME / HC WQG
TRIHALOMETHANES								
bromodichloromethane	µg/L	1	2	<1	n/d	n/d		
dichlorodifluoromethane	µg/L	2	<2	<2	n/d	n/d		
tribromomethane	µg/L	1	<1	<1	n/d	n/d		
KETONES								
4-Methyl-2-Pentanone	µg/L	10	<10	<10	n/d	n/d		
dimethyl ketone	µg/L	15	38	<15	n/d	n/d		
methyl ethyl ketone	µg/L	50	<50	<50	n/d	n/d		

Notes:

Shading indicates WQG exceedance; *dilution calculated from maximum concentration.

BC WQG = British Columbia Water Quality Guidelines, CCME WQG = Canadian Council of Ministers of the Environment Water Quality Guidelines, HC = Health Canada WQG

(lt) = long term, (st) = short term

NM indicates not measured; ND indicates non detect; --- value not available.

Appendix A4 Ganges WWTP Sludge (Mixed Liquor) Concentrations 2023

Regulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Metals															
arsenic	75	10	2.11	<0.3	<94	1.7	---	1.66	1.92	2.11	1.9	3.9	---	1.64	6.41
cadmium	20	10	0.605	<0.85	<16	0.74	---	0.66	0.70	0.61	0.67	1.70	---	0.60	0.73
chromium	1,060	10	7.3	<7.09	<31	8.38	---	6.8	7.1	7.3	6.6	17.1	---	7.30	8.69
cobalt	151	10	1.3	<1.54	<63	1.2	---	1.1	1.2	1.3	1.3	4	---	1.50	4.93
copper	757	10	334	166	730	490	---	410	383	334	413	898	---	538	470
lead	505	10	8.6	<6.5	<94	8.6	---	7.6	8.7	8.6	9.1	19.8	---	9.40	13.1
mercury	5	10	0.53	0.56	0.2	0.39	---	0.46	0.47	0.53	0.51	1.98	---	0.68	0.63
molybdenum	20	10	3	>3.2	<63	2.9	---	3	3.2	3	3.6	6.8	---	3.20	6.69
nickel	181	10	8.7	<5.35	<63	9.1	---	8.7	9.2	8.7	9.6	24	---	11.3	12.3
selenium	14	10	2	<1	<310	1.93	---	2.1	2.1	2	2.2	4.4	---	1.89	3.46
thallium	5	10	<0.05	<0.05	<0.05	<0.05	---	<0.05	<0.05	<0.05	<0.05	<0.05	---	<0.05	0.03
vanadium	656	10	3.3	<1	<31	3.2	---	2.2	2.1	3.3	1.8	4.8	---	3.00	3.97
zinc	1,868	10	325	297	411	286	---	320	360	325	367	700	---	286	368
Unregulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Conventionals															
moisture	n/a	10	100	99	99	99	---	99	98	100	100	99	---	99	109
Metals															
aluminum	n/a	10	1,570	1,703	1,410	1,520	---	1,160	1,890	1,570	1,380	3,120	---	3,780	1,910
antimony	n/a	10	0.900	<0.5	<160	0.700	---	0.900	1.000	0.900	1.000	2.000	---	0.90	0.91
barium	n/a	10	61.0	49.0	54.0	46.0	---	47.0	45.0	61.0	50.0	161	---	61.00	63.5
beryllium	n/a	10	<0.2	<0.2	<9.4	<0.2	---	<0.2	<0.2	<0.2	<0.2	<0.2	---	<0.2	0.53
bismuth	n/a	10	15.4	<15.1	160.0	11.7	---	13.2	14.4	15.4	15.6	32.6	---	14.60	32.5
boron	n/a	10	24.0	12.0	<31	25.0	---	20.0	29.0	24.0	46.0	103.0	---	28.00	32.7
calcium	n/a	10	7,730	6,670	12,600	9,480	---	8,370	9,460	7,730	9,270	22,000	---	10,100	10,341
iron	n/a	10	3,250	3,325	3,420	3,420	---	2,810	3,060	3,250	3,400	7,920	---	3,890	3,775
lithium	n/a	10	1.50	<0.9	<63	1.50	---	1.20	1.30	1.50	1.30	3.60	---	1.80	4.57
magnesium	n/a	10	5,040	3,210	5,440	4,620	---	5,300	5,970	5,040	7,320	10,700	---	4,240	5,688
manganese	n/a	10	97	59	148	120	---	99	109	97	115	540	---	172	156

Appendix A4, continued

Unregulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
potassium	n/a	10	12,000	8,950	16,700	12,400	---	14,800	15,000	12,000	13,300	24,200	---	8,710	13,806
silver	n/a	10	<0.1	<1.1	<31	2.00	---	4.00	5.00	4.00	6.00	15.00	---	6.00	6.39
sodium	n/a	10	5,030	585	7,570	5,720	---	6,210	6,420	5,030	8,560	19,660	---	8,860	7,365
strontium	n/a	10	42.0	39.0	53.0	41.0	---	34.0	42.0	42.0	45.0	112.0	---	60.00	51.0
sulphur	n/a	10	40	33	4,800	---	---	---	---	---	---	---	---	---	1,624
tin	n/a	10	13.00	<3	<94	13.00	---	14.00	15.00	13.00	16.00	35.00	---	15.00	18.25
titanium	n/a	10	31	<50	<16	22	---	16	19	31	14	43	---	22	23
zirconium	n/a	10	2	<2	<63	1	---	2	3	2	1	5	---	4	5.25

Notes:

Shading indicates exceedance of regulatory limit.

--- sample was not collected.

* From Organic Matter Recycling Regulation (B.C. Reg. 18/2002, Schedule 4 Section 3, February 28, 2019) which references Trade Memorandum T-4-93 'Safety Guidelines for Fertilizers and Supplements' (Sept 1997) and contains maximum acceptable metal concentrations based on annual application rates (mg metal/kg product) 4400 kg/ha –yr.

APPENDIX B

MALIVIEW WWTP

Appendix B1 Maliview WWTP Effluent Flow 2023 (m³/day)

Day	Jan			Feb			Mar			Apr			May			Jun			Jul			Aug			Sep			Oct			Nov			Dec						
	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C	F S	Sec	T C							
1	111	70	180	37	67	104	41	44	85	2	69	71	11	69	79	0	35	35	0	31	31	0	15	15	0	26	26	0	24	24	3	67	69	6	58	64				
2	80	64	143	63	60	123	45	54	99	3	75	78	4	56	60	0	32	32	0	24	24	0	26	26	0	29	29	0	23	23	0	26	26	7	58	64				
3	69	64	133	53	62	115	58	51	108	5	70	75	5	61	66	0	34	34	0	32	32	1	27	27	0	32	32	0	36	36	32	50	82	33	67	100				
4	57	64	121	55	65	120	38	65	103	1	52	53	2	64	66	0	27	27	0	35	35	0	27	27	0	34	34	0	29	29	15	61	76	19	44	62				
5	48	107	154	48	67	115	46	73	119	3	70	73	0	58	58	0	30	30	0	15	15	0	28	28	0	32	32	0	26	26	41	79	120	92	97	189				
6	47	72	119	58	66	124	41	72	112	3	69	72	4	60	63	0	21	21	0	28	28	0	25	25	2	28	30	0	26	26	25	79	104	83	75	157				
7	37	71	108	45	49	94	51	57	108	4	60	64	1	56	57	0	26	26	0	23	23	0	26	26	0	25	25	0	27	27	17	73	90	45	72	116				
8	61	67	128	94	59	153	97	124	221	8	66	74	3	56	58	0	28	28	0	31	31	0	26	26	0	26	26	0	27	27	16	71	87	29	67	95				
9	98	67	165	74	63	137	36	107	143	9	69	78	0	55	55	0	24	24	0	27	27	0	30	30	0	26	26	0	22	22	13	67	79	26	74	99				
10	77	63	140	69	62	131	21	71	92	13	76	89	0	53	53	0	32	32	0	30	30	0	31	31	0	25	25	0	26	26	17	65	81	51	77	128				
11	78	74	152	60	57	116	26	74	100	13	73	86	2	47	48	0	36	36	0	28	28	0	32	32	0	29	29	0	27	27	17	59	76	85	77	162				
12	65	67	132	60	58	117	14	73	86	13	73	86	0	56	56	0	36	36	0	27	27	1	33	34	0	15	15	0	29	29	57	63	119	46	76	122				
13	170	61	231	58	61	119	21	72	93	8	73	81	0	55	55	0	33	33	0	27	27	0	27	27	1	22	23	0	22	22	49	64	113	38	72	110				
14	171	56	227	49	56	105	30	72	102	8	72	80	0	41	41	0	31	31	0	31	31	0	27	27	0	26	26	0	25	25	46	67	113	31	72	103				
15	116	56	172	41	66	107	21	72	93	7	72	79	0	41	41	0	31	31	0	35	35	0	23	23	0	23	23	0	25	25	33	64	97	24	64	88				
16	91	58	149	37	63	100	15	69	84	8	65	72	0	38	38	0	26	26	0	23	23	0	28	28	0	24	24	0	31	31	24	61	85	42	63	104				
17	107	54	160	39	59	97	16	72	88	10	70	80	0	34	34	0	29	29	0	29	29	0	36	36	0	24	24	0	24	24	22	64	86	33	68	101				
18	77	64	141	40	64	104	13	72	85	6	59	65	0	34	34	0	29	29	0	14	14	0	32	32	0	31	31	0	27	27	17	60	76	29	69	98				
19	61	69	130	45	62	107	14	72	86	7	70	77	0	36	36	0	31	31	0	24	24	0	30	30	0	26	26	7	71	78	26	59	84	26	49	74				
20	49	79	128	40	61	101	12	69	81	5	70	75	0	39	39	0	20	20	0	26	26	0	30	30	0	24	24	0	73	73	17	60	77	26	64	89				
21	51	66	117	45	63	108	9	61	69	11	74	85	0	30	30	0	31	31	0	22	22	0	35	35	0	26	26	0	49	49	12	25	37	23	65	88				
22	73	53	125	30	49	79	13	70	83	12	72	84	0	43	43	1	25	26	0	23	23	0	29	29	0	20	20	0	35	35	16	59	75	25	69	93				
23	83	54	137	35	61	96	11	65	76	21	73	94	0	36	36	0	30	30	0	29	29	0	30	30	0	22	22	0	35	35	16	59	75	26	69	95				
24	63	48	110	35	64	98	10	71	80	21	79	99	0	36	36	0	30	30	0	25	25	0	36	36	0	21	21	0	19	19	15	63	78	18	67	85				
25	48	67	115	33	63	96	8	69	77	23	113	136	0	24	24	0	29	29	0	31	31	0	34	34	0	25	25	1	13	14	17	61	78	17	67	83				
26	51	71	121	33	60	93	4	38	42	21	63	83	0	36	36	0	27	27	0	25	25	0	39	39	0	15	15	39	71	110	15	63	78	13	69	81				
27	49	60	108	40	64	104	0	87	87	17	58	75	0	34	34	0	34	34	0	33	33	0	33	33	0	28	28	6	50	55	14	59	73	19	67	85				
28	46	64	110	49	64	112	16	87	103	17	54	70	0	32	32	0	33	33	0	27	27	0	35	35	0	30	30	6	40	46	12	59	71	18	64	82				
29	37	67	104	---	---	---	4	77	81	14	59	73	0	30	30	0	26	26	1	27	28	0	21	21	0	27	27	5	36	40	15	60	75	11	42	52				
30	37	70	107	---	---	---	4	69	73	11	62	72	0	31	31	0	34	34	0	28	28	0	31	31	0	22	22	2	18	20	10	60	70	24	80	104				
31	29	71	100	---	---	---	3	75	78	---	---	---	0	29	29	---	---	---	0	30	30	0	29	29	---	---	---	0	40	40	---	---	---	23	60	83				
Min	29	48	100	30	49	79	0	38	42	1	52	53	0	24	24	0	20	20	0	14	14	0	15	15	0	15	15	0	13	14	0	25	26	6	42	52				
Max	171	107	231	94	67	153	97	124	221	23	113	136	11	69	79	1	36	36	1	35	35	1	39	39	2	34	34	39	73	110	57	79	120	92	97	189				
Mean	72	66	137	49	61	110	24	71	94	10	69	79	1	44	45	0	29	29	0	27	27	0	29	29	0	25	25	2	33	35	21	61	81	32	67	98				
Total Flows	2,230	2,031	4,261	1,360	1,709	3,069	731	2,197	2,929	296	2,074	2,370	30	1,363	1,393	1	881	882	1	835	836	2	903	905	3	756	758	64	1,020	1,084	622	1,821	2,443	978	2,073	3,051				
																													Annual Min			0			13			14		
																													Annual Max			171			124			231		
																													Annual Mean			17			48			66		

Notes:
 F-S: Fine-screened; Sec: Secondary; T-C: Total combined.
 Shading indicates exceedance of regulatory limit (250m³/day T-C).

Appendix B2 Maliview WWTP Compliance and Treatment Plant Performance 2023

Date	Influent			Secondary Effluent (Undisinfected)						Secondary Effluent Final Combined (secondary + screened)							
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH ₃ (mg/L N)	pH	TSS (mg/L)	TSS Applicable Limit (mg/L)	BOD (mg/L)	CBOD (mg/L)	CBOD Applicable Limit (mg/L)	FC (CFU/100 mL)	Ammonia (mg/L N)	pH
January	71	169	1,500,000	12	16	6	19,000	20	7.3	99	130	99	76	130	72,000	7	7.3
February	82	259	6,100,000	15	20	14	63,000	13	7.2	18	130	27	18	130	75,000	12	7.3
March	220	284	5,600,000	22	21	27	120,000	18	7.4	19	130	28	25	130	120,000	18	7.4
April	330	1030	5,300,000	14	57	41	62,000	19	7.6	28	130	43	36	130	95,000	20	7.4
May	475	478	7,100,000	51	77	69	1,900,000	49	7.6	51	45	75	67	45	2,300,000	50	7.6
June	174	150	7,300,000	44	62	48	5,100,000	54	7.8	42	45	61	40	45	5,900,000	55	7.8
July	668	548	50,000,000	24	25	27	540,000	58	7.9	26	45	26	22	45	650,000	60	7.9
August	190	356	24,000,000	33	37	32	710,000	55	7.6	35	45	41	28	45	710,000	54	7.6
September	188	355	14,000,000	26	27	46	1,000,000	56	7.5	34	45	49	41	45	1,700,000	50	7.8
October	545	651	---	32	52	51	2,300,000	49	7.6	51	45	59	58	45	2,000,000	50	7.6
November	310	480	1,100,000	13	17	20	300,000	18	7.4	42	45	32	25	45	540,000	18	7.5
December	86	89	980,000	20	17	10	28,000	0	7.4	49	130	50	35	130	850,000	0	7.8
Mean	278	404	5,810,556	26	34	28	304,652	34	7.5	41	0	49	39	0	539,029	33	7.6
Min	71	89	980,000	12	16	6	19,000	0	7.2	18	0	26	18	0	72,000	0	7.3
Max	668	1030	50,000,000	51	77	69	5,100,000	58	7.9	99	0	99	76	0	5,900,000	60	7.9
n	12	12	11	12	12	12	12	12	12	12	0	12	12	0	12	12	12
Mean Daily Loading	kg/day			kg/day				kg/day	---	kg/day	---			---		kg/day	---
	18	---	---	1.2	---	---	---	1.6	---	2.7	---	---	---	---	---	2.1	---

Notes:

TSS and CBOD shading indicates exceedance of the applicable regulatory limit.

FC = Fecal Coliforms, TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, TRC = total residual chlorine, NH₃ = ammonia

TSS/CBOD secondary effluent (disinfected limit) = 45 mg/L when flow ≤60, and = 130 mg/L when flow >60.

APPENDIX C

SCHOONER WWTP

Appendix C1 Schooner WWTP Effluent Flow 2023 (m³/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	473	317	370	304	280	170	158	168	155	137	159	163
2	416	317	397	315	258	151	188	168	171	155	149	312
3	373	302	344	326	265	148	174	163	172	151	356	252
4	325	308	330	403	248	165	176	169	166	144	222	538
5	295	326	323	340	257	160	150	173	168	148	343	794
6	276	308	314	337	240	154	137	175	147	132	265	449
7	223	352	293	375	260	150	133	169	142	129	228	329
8	270	349	288	370	250	149	167	166	143	144	211	279
9	313	350	292	390	220	130	151	177	146	152	182	374
10	302	347	280	367	226	125	160	158	130	175	190	519
11	259	339	275	365	210	145	157	152	135	136	200	394
12	260	343	285	355	219	160	127	157	139	136	344	316
13	333	339	354	315	208	153	160	161	137	155	297	283
14	351	371	318	326	197	138	146	180	129	125	289	262
15	338	332	338	323	211	145	152	166	139	133	236	237
16	316	322	308	328	191	138	156	154	140	137	206	231
17	332	333	309	333	191	138	163	165	139	149	189	235
18	322	328	308	294	173	161	144	160	146	148	174	244
19	315	354	308	300	184	148	153	147	136	214	177	220
20	301	339	304	301	180	163	164	157	136	165	195	220
21	285	328	302	295	215	144	137	164	144	150	164	190
22	343	291	277	291	195	145	153	153	145	151	187	200
23	354	302	276	304	200	141	154	139	122	151	185	199
24	336	305	285	301	173	153	177	146	139	135	172	201
25	341	292	295	287	171	154	164	150	139	252	172	190
26	319	310	299	280	171	166	146	150	123	341	178	191
27	316	329	288	274	188	162	160	161	141	180	170	204
28	318	284	274	280	173	150	161	168	129	154	186	189
29	307	---	283	279	188	151	156	165	153	152	162	203
30	297	---	278	280	167	166	163	162	127	160	154	223
31	309	---	287	---	152	---	168	159	---	145	---	230
Min	223	284	274	274	152	125	127	139	122	125	149	163
Max	473	371	397	403	280	170	188	180	172	341	356	794
Mean	320	326	306	321	208	151	157	161	143	159	211	286
Total Flows	9,918	9,117	9,482	9,638	6,461	4,523	4,855	5,002	4,278	4,936	6,342	8,871

Notes: shading indicates exceedance of regulatory limit (640 m³/day).

Annual Min	122
Annual Max	794
Annual Mean	229

Appendix C2 Schooner WWTP Compliance and Treatment Plant Performance 2023

Date	Influent			Secondary Effluent		Secondary Effluent Disinfected						
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH ₃ (mg/L N)	pH	Unionized NH ₃ (mg/L)
Regulatory Limit						45 max / 25 mean		45 max / 25 mean	200			1.25
January	193	95	2,800,000	10	28,000	9	4.72	<4	14	<0.1	7.0	<0.1
February	178	242	6,200,000	19	950,000	18	12	9.31	110	1.15	7.1	<0.1
March	160	125	7,500,000	31	57,000	21	6.83	6.62	61	<0.1	6.9	<0.1
April	190	287	2,000,000	8	21,000	9	11.7	8.81	<2	1.48	7.0	0.002
May	212	120	5,600,000	14	100,000	8	6.58	<4	13	1.48	6.9	<0.1
June	210	134	5,800,000	12	37,000	12	<4	<4	3	0.15	6.6	<0.1
July	705	428	36,000,000	6	190,000	5	4.16	<3	22	0.516	7.1	<0.1
August	860	249	42,000,000	20	53,000	7	4.82	<3	9	22.3	7.4	<0.1
September	540	275	2,300,000	10	5,300	8	3.44	<3	8	<0.1	6.3	<0.1
October	414	139	7,900,000	9	23,000	8	6	3.37	26	<0.1	6.4	<0.1
November	102	120	6,900,000	8	37,000	5	3.6	2.9	3	0.16	6.6	0.0006
December	280	352	7,800,000	16	79,000	7	3.95	3.23	17	0.21	7.0	0.001
Mean	337	214	6,941,057	14	52,340	10	6	4	24	2	6.9	0.038
Min	102	95	2,000,000	6	5,300	5	<4	<4	<2	<0.1	6.3	<0.01
Max	860	428	42,000,000	31	950,000	21	12	9	110	22	7.4	0.002
n	12	12	12	12	12	12	12	12	12	12.0	12	12
Mean Daily Loading	kg/day 77	---	---	kg/day 3.1	---	kg/day 2.2	---	---	---	kg/day 0.5	---	kg/day 0.009

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, TRC = total residual chlorine, NH₃ = ammonia
--- data not collected.
Shading indicates exceedance of regulatory limit.

APPENDIX D

CANNON WWTP

Appendix D1 Cannon WWTP Effluent Flow 2023 (m³/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	70	42	49	37	35	25	34	27	27	29	26	36
2	64	37	48	40	27	29	34	31	18	27	25	64
3	57	31	42	33	19	16	38	31	30	31	62	55
4	47	34	43	52	29	29	32	18	30	26	48	81
5	46	37	44	47	29	29	31	43	28	31	63	113
6	42	34	39	40	32	29	30	50	27	26	51	72
7	27	43	36	40	29	21	31	48	23	19	44	62
8	45	40	36	43	34	31	19	48	25	31	40	37
9	55	41	34	43	27	26	36	37	28	32	40	61
10	50	37	35	38	27	12	36	28	29	31	31	74
11	47	38	38	37	16	31	37	27	30	24	37	64
12	37	39	42	21	27	30	42	16	26	26	67	58
13	58	38	50	37	26	28	28	28	27	25	64	54
14	58	33	46	30	25	27	31	31	25	19	62	48
15	55	35	29	31	29	28	17	28	13	30	50	47
16	50	34	39	34	28	27	32	24	21	26	68	47
17	51	37	37	30	25	26	33	28	21	28	41	45
18	43	41	40	29	25	29	30	15	26	26	42	35
19	44	40	42	24	26	30	28	31	24	19	41	38
20	39	36	38	30	13	28	28	30	22	28	43	35
21	38	35	37	15	32	27	27	31	22	28	37	33
22	50	36	24	31	36	31	17	26	23	30	45	42
23	55	31	34	36	37	15	31	28	22	30	55	42
24	47	32	36	31	27	32	36	29	22	22	55	45
25	46	33	35	30	24	29	36	29	25	33	43	43
26	41	39	37	32	21	31	30	28	22	44	55	41
27	41	24	33	30	6	30	32	29	24	26	51	42
28	31	41	34	32	13	28	18	33	24	33	34	40
29	36	---	35	28	33	30	30	30	22	32	34	28
30	14	---	32	35	26	24	29	29	26	28	32	46
31	40	---	36	---	27	---	34	27	---	27	---	49
Min	14	24	24	15	6	12	17	15	13	19	25	28
Max	70	43	50	52	37	32	42	50	30	44	68	113
Mean	46	36	38	34	26	27	31	30	24	28	46	51
Total Flows	1,424	1,018	1,180	1,016	810	808	947	938	732	867	1,386	1,577
											Annual Min	6
											Annual Max	113
											Annual Mean	35

Notes: shading indicates exceedance of regulatory limit (68 m³/day).

Appendix D2 Cannon WWTP Compliance and Treatment Plan Performance 2023

Date	Influent			Secondary Effluent (Undisinfected)					
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH ₃ (mg/L N)	pH
Regulatory Limit				60		45			
January	107	154	7,500,000	10	11	6.2	10,000	1.56	6.8
February	146	368	---	8	23	9.64	430,000	14.5	7.5
March	81	239	7,800,000	12	18	9.01	32,000	16.2	7.3
April	96	468	3,400,000	4	15	8.88	180,000	9.31	7.3
May	102	225	4,600,000	12	4	<4	28,000	0.822	7.2
June	880	292	27,000,000	8	16	<4	69,000	9.64	7.4
July	104	181	10,000,000	7	14	8.29	72,000	36.7	7.8
August	140	373	8,800,000	13	26	9.63	1,100,000	41.4	7.5
September	134	221	5,000,000	3	7	3.54	2,600	18.2	7.6
October	384	553	7,600,000	7	15	4.69	12,000	17.7	7.7
November	15	66	600,000	3	5	2.8	720	0.62	7.0
December	37	60	160,000	4	8	5.18	25,000	3.3	7.1
Mean	186	267	4,238,464	8	13	6.3	33,677	14.2	7.4
Min	15	60	160,000	3	4	2.8	720	0.6	6.8
Max	880	553	27,000,000	13	26	9.64	1,100,000	41.4	7.8
N	12	12	11	12	12	12	12	12.0	12
Mean Daily Loading	kg/day			kg/day				kg/day	
	6.5	---	---	0.3	---	---	---	0.5	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, NH₃ = ammonia
Shading indicates exceedance of regulatory limit, --- no sample

APPENDIX E

PORT RENFREW WWTP

Appendix E1 Port Renfrew WWTP Effluent Flow 2023 (m³/day)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	80	30	44	55	31	25	39	33	30	34	25	48
2	51	31	85	55	33	23	36	36	35	39	97	99
3	46	34	71	41	32	29	36	32	35	38	62	82
4	36	57	69	36	32	31	28	38	37	34	106	157
5	37	48	55	36	34	31	25	46	30	29	86	237
6	45	51	43	57	36	29	30	42	28	30	80	134
7	55	122	35	75	34	27	28	45	27	39	70	92
8	68	59	20	56	31	22	33	41	24	39	50	60
9	74	57	56	98	27	23	33	52	30	37	43	91
10	77	62	29	70	27	34	36	48	25	39	77	93
11	56	52	34	60	22	29	34	48	26	48	148	68
12	112	48	36	46	23	32	36	38	23	41	101	50
13	123	53	50	38	31	33	34	39	26	32	80	43
14	105	41	50	34	27	23	34	40	25	38	52	52
15	80	36	47	43	27	23	42	36	22	51	36	59
16	124	43	36	71	24	27	41	33	29	74	45	52
17	109	57	34	62	27	23	32	35	32	73	27	48
18	119	79	36	76	24	30	30	36	28	198	32	40
19	79	68	34	74	25	27	29	40	23	140	43	50
20	52	76	34	65	32	26	34	38	24	84	34	59
21	45	64	35	72	36	27	29	37	24	61	36	40
22	47	48	32	67	34	25	32	31	25	43	43	47
23	38	39	36	83	25	29	31	33	41	34	32	36
24	57	42	48	77	23	32	42	32	32	49	31	45
25	44	36	41	59	23	27	38	30	30	61	29	70
26	40	35	45	50	23	25	43	32	34	41	32	68
27	34	43	34	43	25	23	30	39	41	34	25	52
28	34	38	41	38	30	29	39	31	51	30	25	62
29	36	---	36	38	29	29	32	30	39	30	27	62
30	29	---	29	36	23	32	36	30	39	25	23	59
31	28	---	47	---	23	---	34	30	---	27	---	68
Min	28	30	20	34	22	22	25	30	22	25	23	36
Max	124	122	85	98	36	34	43	52	51	198	148	237
Mean	63	52	43	57	28	28	34	37	31	51	53	72
Total Flows	1,959	1,450	1,318	1,705	872	825	1,053	1,149	915	1,572	1,595	2,223

Notes:
Shading indicates exceedance of regulatory limit (220 m³/day).

Annual Min	20
Annual Max	237
Annual Mean	46

Appendix E2 Port Renfrew WWTP Compliance and Treatment Plant Performance 2023

Date	Influent			Secondary Effluent					
	TSS (mg/L)	BOD (mg/L)	FC (CFU/100 mL)	TSS (mg/L)	BOD (mg/L)	CBOD (mg/L)	FC (CFU/100 mL)	NH ₃ (mg/L N)	pH
Regulatory Limit				60		45			
January	69	---105	2,900,000	4	6	<4	1700	<0.1	6.5
February	105	0226	6,100,000	28	31	23.1	1300000	01.97	6.9
March	350	0263	3,300,000	4	5	04	21000	<0.1	6.4
April	150	0429	37,000,000	14	16	12.4	14000	<0.1	6.5
May	155	0228	9,100,000	16	18	4.44	6000	00.294	7.0
June	184	0258	---	6	6	<4	---	00.46	6.1
July	87	0214	11,000,000	40	27	4	33000	02.25	6.0
August	158	0592	830,000	4	6	<4	9500	08.24	7.1
September	540	0441	14,000,000	73	15	11.1	290000	05.47	5.1
October	196	0270	870,000	18	8	3.77	17000	00.282	6.6
November	54	0190	4,300,000	3	3	2.4	8000	00.84	7.8
December	37	<89.4	680,000	14	6	4	540	00.026	7.7
Mean	174	272	4,156,130	19	12	6	16,580	1.7	6.6
Min	37	<89	680,000	3	3	<4	540	<0.1	5.1
Max	540	592	37,000,000	73	31	23	1,300,000	8.2	7.8
N	12	12	11	12	12	12	11	12.0	12
Mean Daily Loading	kg/day			kg/day				kg/day	
	8	---	---	0.5	---	---	---	0.08	---

Notes:
TSS = total suspended solids, BOD = biochemical oxygen demand, CBOD = carbonaceous biochemical oxygen demand, FC = fecal coliforms, NH₃ = ammonia
--- data not calculated.
Shading indicates regulatory exceedance.

APPENDIX F

BURGOYNE BAY WASTE TRANSFER FACILITY

Appendix F1 Burgoyne Bay Waste Transfer Facility Septage Concentrations 2023

Regulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Apr	Jul	Oct	Mean
Metals							
arsenic	75	4	<27	3.14	5.54	3.99	6.54
cadmium	20	4	<4.5	1.61	1.82	1.59	1.82
chromium	1,060	4	10.8	10.8	13.8	12.6	12.00
cobalt	151	4	<18	1.25	2.19	1.69	3.53
copper	757	4	1,110	471	460	448	622
lead	505	4	<27	12.8	14.9	16.7	14.5
mercury	5	4	0.318	0.398	0.474	1.02	0.55
molybdenum	20	4	<18	7.04	4.76	3.59	6.10
nickel	181	4	50	11.1	14.1	14.2	22.4
selenium	14	4	<91	2.5	3.36	1.61	13.24
thallium	5	4	<0.05	0.051	<0.05	<0.05	0.03
vanadium	656	4	10.7	5.1	7.2	4.6	6.90
zinc	1,868	4	652	727	762	502	661
Unregulated Parameters (mg/kg dry)	Class A Biosolids Limit (mg/kg dry)*	# of samples	Jan	Apr	Jul	Oct	Mean
Conventionals							
moisture	n/a	4	99	97	99	98	98
Metals							
aluminum	n/a	4	11,200	9,810	13,900	4,650	9,890
antimony	n/a	4	<45	1.15	2.15	1.3	6.78
barium	n/a	4	59.6	95	92.6	67.9	78.8
beryllium	n/a	4	<2.7	<0.2	<0.2	<0.2	0.41
bismuth	n/a	4	<45	12.2	20.7	15.5	17.7
boron	n/a	4	34.8	36.8	29.7	28.8	32.5
calcium	n/a	4	15,500	13,500	14,000	11,600	13,650
iron	n/a	4	3,060	2,800	4,730	3,500	3,523
lithium	n/a	4	<18	1.74	2.51	1.67	3.73
magnesium	n/a	4	3,600	2,890	3,120	2,280	2,973
manganese	n/a	4	169	122	172	106	142
potassium	n/a	4	8,890	6,640	5,170	3,440	6,035
silver	n/a	4	<9.1	2.22	10.5	3.73	5.25
sodium	n/a	4	8,860	7,930	4,750	4,390	6,483
strontium	n/a	4	55	63.7	50.4	41.4	52.6
sulfur	n/a	4	<27	18.1	20	18.3	17.48
tin	n/a	4	14.7	43.2	66	47.1	43
titanium	n/a	4	<18	5.66	8.54	1.13	6.08
zirconium	n/a	4	11,200	9,810	13,900	4,650	9,890

Notes:

Shading indicates exceedance of regulatory limit.

--- sample was not collected.

* From Organic Matter Recycling Regulation (B.C. Reg. 18/2002, Schedule 4 Section 3, February 28, 2019) which references Trade Memorandum T-4-93 'Safety Guidelines for Fertilizers and Supplements' (Sept 1997) and contains maximum acceptable metal concentrations based on annual application rates (mg metal/kg product) 4400 kg/ha –yr.