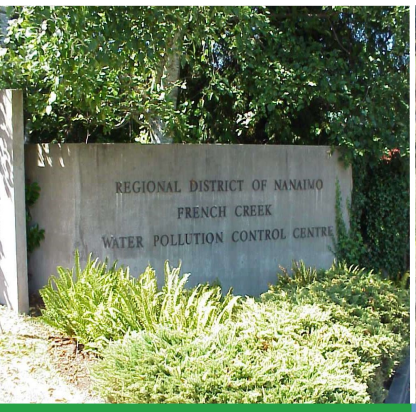
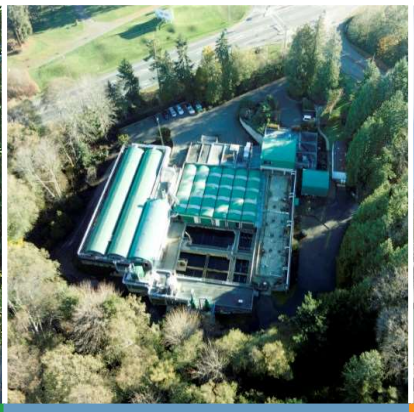
REGIONAL DISTRICT OF NANAIMO





2022 Annual Report

French Creek Pollution Control Centre

February 2023

Submitted to the Ministry of Environment and Climate Change Strategy
envauthorizationsreporting@gov.bc.ca

ISO 14001 Certified by PwC
Certification by PricewaterhouseCoopers LLP (Canada):
details of Certificate # **PwC-ISO14001:415** at http://www.rdn.bc.ca/

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Executive Summary

The Regional District of Nanaimo (RDN) owns and operates the French Creek Pollution Control Centre (FCPCC) located at 957 Lee Road in Parksville. FCPCC provides secondary treatment. Treated effluent is discharged to the Strait of Georgia.

Operation of FCPCC is regulated by Environmental Management Permit No. PE-4200 issued by the Ministry of Environment and Climate Change Strategy. The authorized treatment works include a septage receiving facility; mechanical screens; grit tanks; primary clarifiers; biological reactors; secondary clarifiers; trickling filer; thermophilic aerobic digesters; biosolids thickening and dewatering facilities; odour control facilities; an outfall extending approximately 2 km from shore to a depth of 61 m below mean low water; an effluent pumping station and pipeline to convey effluent to the storage ponds at the Morningstar Golf Course; standby power; and related appurtenances.

This report was written by RDN staff as a permit requirement. This report summarizes and interprets the FCPCC monitoring data for 2022.

The summary of 2022 monitoring data at FCPCC is as follows:

Summary of Compliance	Permit	2022	Non-compliances
Maximum Daily Flow (Outfall)	16,000 m^3/day	18,580.1 m^3/day	2
Average Daily Flow	-	10,493.7 m^3/day	
Average Daily $cBOD_5$ (Outfall)	45 mg/L	20.6 mg/L	0
Average Daily TSS (Outfall)	60 mg/L	20.5 mg/L	0

Effluent was not discharged to Morningstar Golf Course in 2022.

- **Flow** – The total volume of effluent discharged to the outfall and Morningstar Golf Course from French Creek Pollution Control Centre in 2022 was 3,830,187.6 m^3/day, at an average daily flow of 10,493.7 m^3/day.

  The maximum daily flow was 18,580.1 m^3/day. In 2022, there were two maximum daily flow exceedances.

  Effluent was not discharged to Morningstar Golf Course in 2022.

- **5-day Carbonaceous Biochemical Oxygen Demand** – The influent and effluent average 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) concentration for 2022 was 187 mg/L and 20.6 mg/L, respectively. The average removal efficiency in 2022 was 88.8%.

  There were no $cBOD_5$ non-compliances in 2022 where the maximum permitted $cBOD_5$ concentration was exceeded.

- **Total Suspended Solids** – The influent and effluent average Total Suspended Solids (TSS) concentration in 2022 was 304 mg/L and 20.5 mg/L, respectively. The average TSS removal efficiency in 2022 was approximately 92.8%.

  There were no TSS permit non-compliances in 2022.

- **General parameters, metals, volatile and semi-volatile compounds** – 2022 results were all consistent with historical data. Only one sample is taken per year so limited conclusions can be made on trending of the parameters.
- **Biosolids** –The biosolids generated by FCPCC met the standards for Class A biosolids given in Schedules 3 and 4 of OMRR based on sampling for the Land Application Plan completed by SYLVIS Environmental (Appendix G).

  In the RDN sampling program, biosolids met Class A standards for metals. Nine samples were taken for fecal coliforms. One sample had a high fecal coliform result. The high result is believed to be due to sampling methodology. Appendix C contains additional information on this non-conformance.

Table of Contents

1) Introduction

The Regional District of Nanaimo (RDN) owns and operates the French Creek Pollution Control Centre (FCPCC) located at 957 Lee Rd, Parksville, British Columbia. Treated effluent from FCPCC is discharged to the Strait of Georgia. A small portion of FCPCC treated effluent is pumped in some years to storage lagoons at the Morningstar Golf Course, which is located adjacent to the treatment facility. The treated effluent is used by the golf course to supplement irrigation water.

Operation of the treatment plant is regulated by the Ministry of Environment and Climate Change Strategy under Environmental Management Permit No. PE-4200 (the Permit), issued on January 16, 1976 and amended most recently on July 10, 1990 (see Appendix A).

The authorized works include a septage receiving facility; mechanical screens; grit tanks; primary clarifiers; biological reactors; secondary clarifiers; thermophilic aerobic digesters; biosolids thickening and dewatering facilities; odour control facilities; an outfall extending approximately 2 km from shore to a depth of 61 m below mean low water; an effluent pumping station and pipeline to convey effluent to the storage ponds at the Morningstar Golf Course; standby power; and related appurtenances.

The FCPCC was constructed in 1977 as an activated sludge treatment plant cable of serving a population of 12,000 people. In December 1996, a trickling filter was added to the process and an expansion undertaken to accommodate the increasing population of the area. The expansion, completed in 1997, doubled the plant's capacity and significantly improved the quality of its effluent and biosolids. The plant now uses trickling filter and solid contact tank technology. Further work was done to address odour problems associated with the plant's initial design.

Future upgrades and expansion are planned in the FCPCC Expansion and Odour Upgrade project which the RDN plans to issue to tender in early 2024.

This report was written by RDN staff as a permit requirement to summarize and interpret the 2022 FCPCC monitoring data.

1.1 Environmental Management System

The RDN's Wastewater Services department's Environmental Management System (EMS) is certified to the ISO 14001:2015 standard. ISO 14001 is an international EMS standard based on a model of continual improvement. The overall aim of ISO 14001 is to support environmental protection and prevent pollution in balance with socio-economic needs. Visit www.rdn.bc.ca/environmental-management-system for more information.

2) Site Description and Neighborhood

The FCPCC is located at 957 Lee Road between Parksville and Qualicum Beach. The septage receiving area is accessed via a second driveway, located further away from Hwy 19A on Lee Road. The site is approximately 9 acres in size and is surrounded by relatively dense coniferous and deciduous trees.

A single-family residential subdivision is located directly to the south of the plant, condominiums to the southwest, and another single-family subdivision to the west. A campground, marina, pub, and restaurant are located across Hwy 19A to the north.

There were no significant changes to the layout of the neighbourhood in 2022. Phase I of French Creek Estates, to the north of the FCPCC, was constructed several years ago. Further phases are proposed in the next fifteen years.

The undeveloped areas around the plant are zoned for high-density residential use, except for the land directly across the highway, which is zoned CMQ6. This zoning allows for the following uses: residential, hotel, resort condominium, neighborhood pub, office, personal service use, public assembly use, recreation facility, restaurant, or retail store.

3) Permit Requirements

3.1 Authorized Discharges

Section 1.1 of the Permit states the maximum daily effluent discharge to the outfall is:

- 16,000 m^3/day maximum daily flow.

Section 1.2 of the Permit stipulates that the characteristics of the discharge shall not exceed:

- 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$): 45 mg/L
- Total Suspended Solids (TSS): 60 mg/L.

Appendix 02 of the Permit states the maximum daily effluent discharge to Morningstar Golf Course is:

- 1,370 m^3/day.

And that the discharge shall not exceed:

- 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$): 20 mg/L
- Total Suspended Solids (TSS): 30 mg/L.

From 2014 to 2018, no treated effluent flows were discharged to Morningstar Golf Course. Discharge to Morningstar Golf Course resumed in 2019.

3.2 Monitoring Requirements

The Permit monitoring requirements are summarized in Table 1. Monthly reports were submitted to the Ministry of Environment and Climate Change Strategy in 2022, reporting all required test results.

Table 1. Monitoring Requirements by Permit Subsection Number

Appendix C-1 A. Sampling and Analyses A suitable sampling facility shall be installed, and a grab sample of the effluent shall be obtained once a day. The sample shall be analyzed daily for TSS and weekly for $cBOD_5$. Once per year a composite sample, over an eight-hour period shall be collected and analyzed for metals, volatile organics, phenolics, organochlorine pesticides, acid extractable herbicides, anions, and inorganics.
Appendix C-1 B. Flow Measurement A flow measuring device must be provided and maintained to record, once per day, the effluent volume discharged over a 24-hour period.
Appendix B-1 E. Outfall Inspection An inspection of the outfall line is conducted once every five years, using an underwater camera.
Appendix C-1 C. Sampling and Analytical Procedures Sampling and flow measurement shall be carried out in accordance with the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Sediment and Biological Samples (2013 Edition).* Analyses are to be carried out in accordance with the *British Columbia Environmental Laboratory Manual: For the Analysis of Water, Wastewater, Sediment, Biological Materials and Discrete Ambient Air Samples (2020)*, or by suitable alternative procedures as authorized by the Regional Waste Manager.
Appendix C-2 E. Reporting The Permitee shall maintain records of analyses and flow measurements for inspection and once per month submit the data, suitably tabulated, to the Regional Waste Manager for the previous month's monitoring.

The 2022 monitoring program adhered to all sampling, analytical, flow measurements, and reporting requirements specified in the Permit.

3.3 Operational Certificate

The RDN's approved Liquid Waste Management Plan (LWMP) includes a draft Operational Certificate for FCPCC.

3.4 Outfall Inspection

FCPCC's outfall was inspected by Remote Operated Vehicle (ROV) in 2017 by SeaVeyors Marine and Environmental. The inspection noted that the outfall pipe was in fair condition. The diffuser section of the outfall was replaced in 2013. No major leaks were identified in the ROV inspection. However, a small leak was identified from the clamp between the old outfall pipe and the replacement diffuser section. A follow up inspection of the diffusers was done in 2019 by ITB Subsea. The RDN retained GreatPacific to

review the ROV videos and provide recommendations in terms of next steps. GreatPacific concluded the small leak from the clamp located approximately 60 m deep and 2 km offshore did not impact the performance of the diffusers. GreatPacific did not recommend a repair due to the expense of addressing the leak and concluded there was no significant risk of the leak to human health or the environment.

The outfall was inspected again in November 2022 by GreatPacific Consulting Ltd. GreatPacific noted the small leak at the diffuser connection did not intensify since 2019. However, another small leak of treated effluent was found at the Flange #3 location. The leak is described as "a diffuse, constant stream of effluent from the west side of the crown. The rate of leakage at this flange was estimated to be much less than that of one of the 25 diffuser ports. GreatPacific noted that it is unlikely that the leak is resulting in imminent risk to environment or human health.

The RDN increased the frequency of inspection and monitoring by underwater Remote Operated Vehicle (ROV) to a 3-year interval to ensure the small leaks of treated effluent at the Flange #3 and diffuser clamp location do not intensify.

4) Flow Monitoring

4.1 Treatment Plant Flow

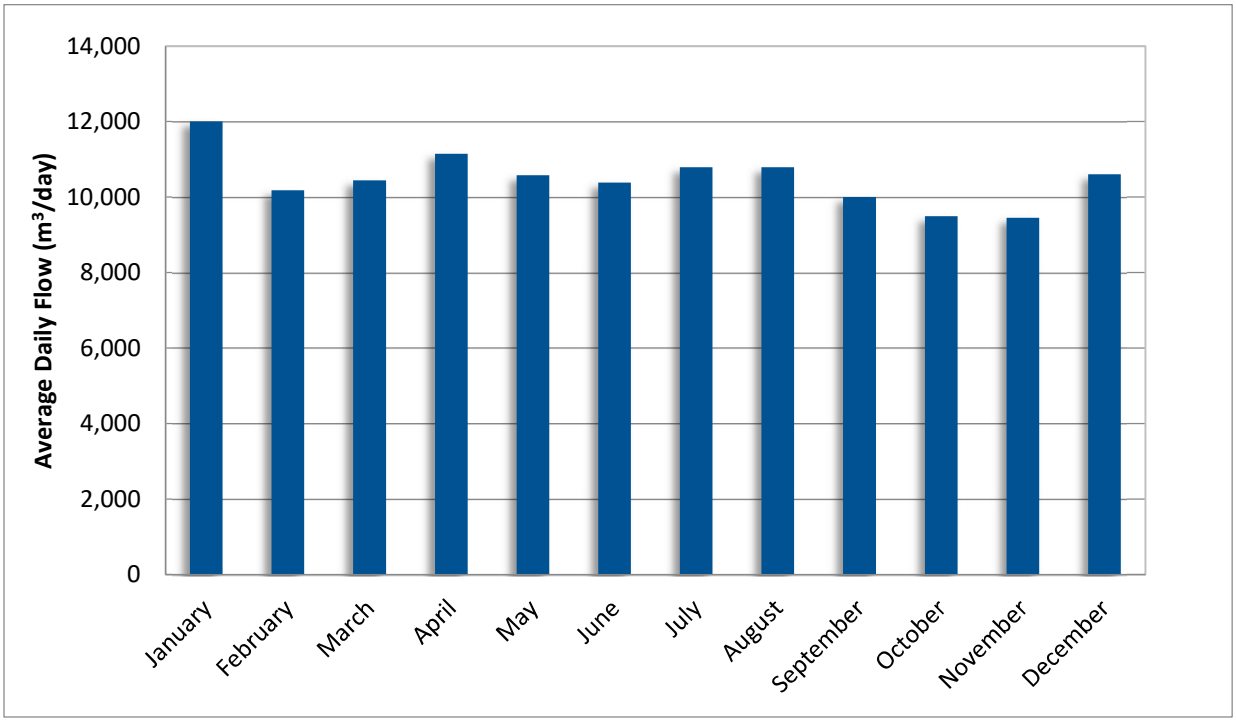
Daily flow monitoring data for FCPCC in 2022 are presented in Appendix B. Results are summarised in Table 2 and graphed in Figure 1. The combined flow of effluent discharged from the outfall in 2022 was 3,830,187.6 m^3, at an average daily flow of 10,493.7 m^3/day.

Table 2. 2022 Treatment Plant Flow

2022	Combined Average Daily Flow (m^3/day)	Combined Total Flow (m^3)	Combined Maximum Flow (m^3/day)	Combined Minimum Flow (m^3/day)	Total Monthly Precipitation (mm)*
January	12,002.5	372,077.0	18,580.1	9,892.4	116.8
February	10,179.2	285,016.7	11,614.8	9,204.1	39.9
March	10,445.5	323,809.6	11,622.3	9,753.3	41.3
April	11,149.0	334,469.5	13,595.9	10,259.1	105.1
May	10,576.5	327,870.2	11,386.5	10,040.4	59.8
June	10,382.1	311,463.1	10,922.0	9,778.5	40.1
July	10,786.7	334,388.2	11,637.7	10,242.7	35.4
August	10,788.2	334,435.0	11,430.0	10,336.1	0.7
September	9,999.0	299,970.4	10,616.1	9,538.0	2.1
October	9,495.3	294,354.2	10,008.8	9,045.0	20.7
November	9,450.6	283,518.0	10,231.2	8,960.7	52.8
December	10,607.0	328,815.7	16,408.1	9,106.0	126.0
Average	**10,493.7**				
Total		**3,830,187.6**			**640.7**
Maximum			**18,580.1**		
Minimum				**8,960.7**	

* Source: Qualicum Beach Airport weather station (see Environment Canada)

Figure 1. Monthly Average Daily Treatment Plant Flow



4.2 Historical Trends

Historical combined, outfall, and Morningstar flow data reported for previous years are summarised in Tables 3 to 5 and graphed in Figure 2. The discharge to Morningstar Golf Course over the past 10 years has been variable based on demand from the golf course.

In 2015, the RDN repaired a large source of infiltration of sea water on the Qualicum Beach interceptor line. Repairs to manholes to prevent infiltration on the Qualicum Beach interceptor line have also been conducted in 2018, 2019 and 2022.

Table 3. Historical Trends: Combined Discharge

Year	Combined Average Daily Flow (m^3/day)	Combined Total Flow (m^3)	Combined Max Daily Flow (m^3/day)
2013	10,267.8	3,760,942.2	12,909.0
2014	11,063.9	4,038,338.7	18,983.0
2015	10,713.7	3,910,516.8	15,962.5
2016	10,457.4	3,827,402.4	17,935.2
2017	10,588.5	3,864,816.0	16,275.6
2018	10,356.0	3,779,923.6	19,908.0
2019	9,859.0	3,598,527.4	16,420.3
2020	9,920.3	3,630,815.1	18,439.9
2021	10,511.5	3,836,715.7	25,903.3
2022	10,493.7	3,830,187.6	18,580.1

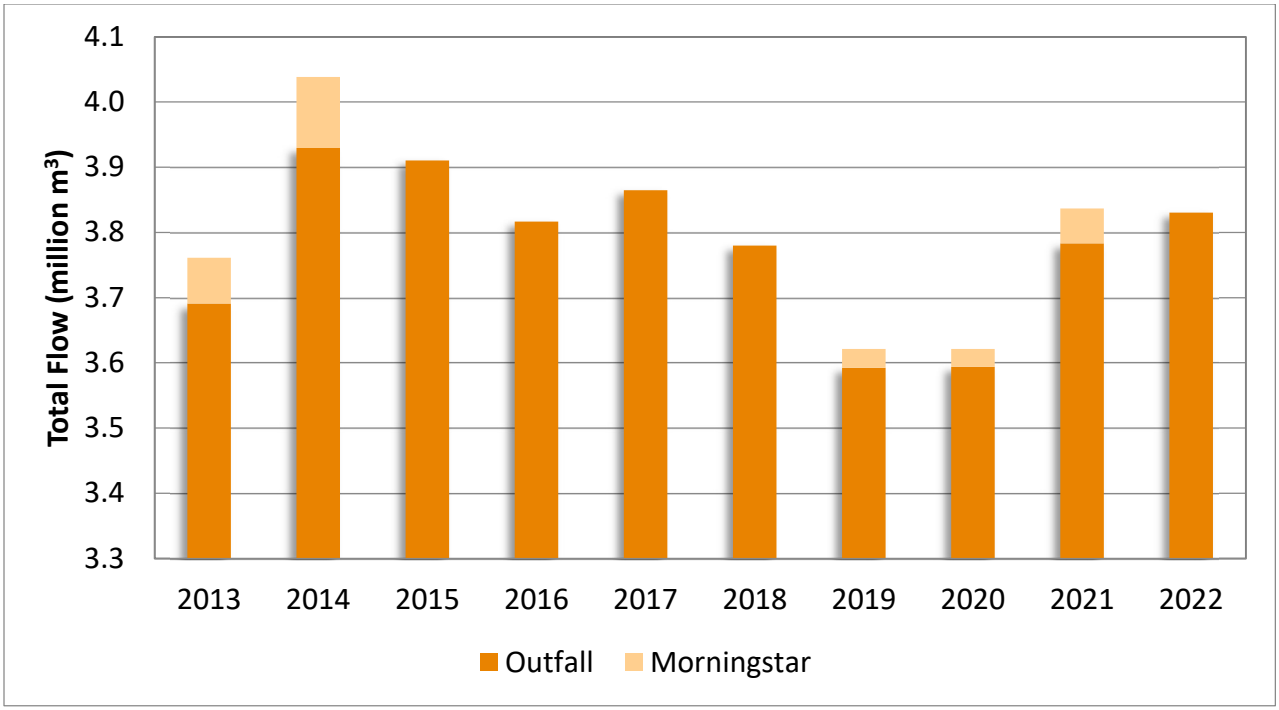
Table 4. Historical Trends: Outfall Discharge

Year	Outfall Average Daily Flow (m^3/day)	Outfall Total Flow (m^3)	Non-conformances (Outfall max daily flow)
2013	10,105.8	3,690,769	0
2014	10,765.4	3,929,361	4
2015	10,713.7	3,910,517	0
2016	10,457.1	3,816,837	2
2017	10,588.5	3,864,816	2
2018	10,356.0	3,779,924	3
2019	9,842.4	3,592,469	1
2020	9,846.1	3,593,821	1
2021	10,364.8	3,783,166	3
2022	10,493.7	3,830,188	2

Table 5. Historical Trends: Morningstar Discharge

Year	Morningstar Total Flow (m^3)	Non-conformances (Morningstar max daily flow)
2013	70,172.9	0
2014	108,977.6	0
2015	0.0	0
2016	0.0	0
2017	0.0	0
2018	0.0	0
2019	28,623.6	0
2020	27,271.2	0
2021	53,549.8	0
2022	0.0	0

Figure 2. Historical Trends: Combined Total Yearly Flow



Note: The flow calculation used from 2012 -2013 was determined to be incorrect resulting in higher than actual total effluent flow for days effluent was discharged to Morningstar Golf Course. The calculation was corrected in the tables after 2014. The BC Ministry of Environment and Climate Change Strategy should contact the RDN if it would like the 2012 – 2013 flow summaries updated.

5) Effluent Monitoring

5.1 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

Five-day carbonaceous biochemical oxygen demand ($cBOD_5$) is a measure of the quantity of oxygen consumed by microorganisms to break down organic matter in water in which the contribution from nitrogenous bacteria has been suppressed. A high $cBOD_5$ means less oxygen is available to support aquatic life. Thus, high $cBOD_5$ levels result in the contamination of the receiving environment.

The Permit requires testing the effluent for $cBOD_5$ weekly, with a maximum permitted concentration of 45 mg/L for discharge to the outfall, and 20 mg/L for discharge to Morningstar Golf Course. The average influent and effluent $cBOD_5$ concentration for 2022 was 187 mg/L and 20.6 mg/L, respectively. The average $cBOD_5$ removal efficiency was 88.8%. Results are summarized Table 6 and graphed in Figure 3. Appendix B contains the daily $cBOD_5$ results.

In 2022, effluent was also tested each week for $cBOD_5$ in a separate sampling program at the ISO17025:2017 certified lab at Greater Nanaimo Pollution Control Centre (GNPCC) to meet the Wastewater Systems Effluent Regulations (WSER) requirements for quarterly average $cBOD_5$ results.

The 2022 Quarter 1 FCPCC Effluent average $cBOD_5$ was 25.4 mg/L which exceeded the Wastewater System Effluent Regulation (WSER) limit of 25 mg/L. An investigation found that the Trickling Filter was

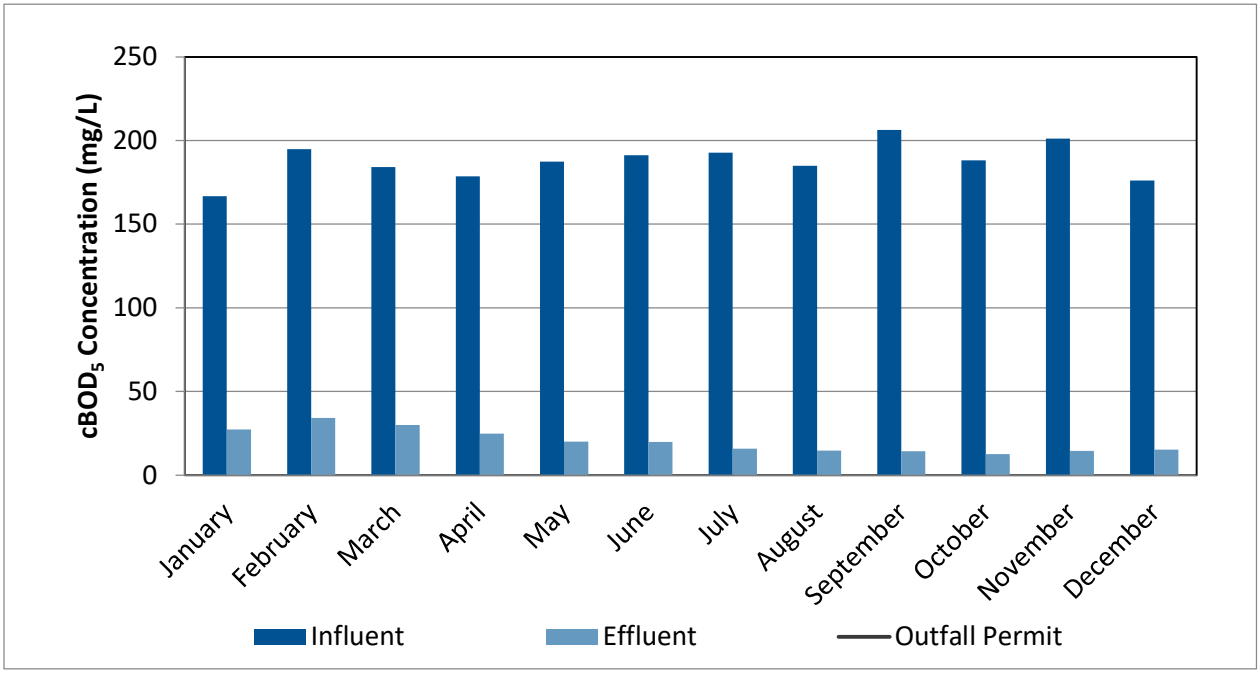
not distributing water evenly over the media and that distribution pipes in the trickling filer needed to be replaced. Replacing these pipes would promote even growth of organisms and result in a greater BOD reduction. The piping was replaced in 2022. Since then, average $cBOD_5$ results have decreased. Appendix C for additional information on the WSER non-conformance investigation for this issue.

Table 6. 2022 Influent & Effluent $cBOD_5$ Concentrations

2022	Influent Average $cBOD_5$ (mg/L)	Outfall Effluent Average $cBOD_5$ (mg/L)	Average % Reduction in $cBOD_5$ (%)	Non-Compliances $cBOD_5$ >45 mg/L (Outfall)
January	167	27.2	83.5	0
February	195	34.1	82.4	0
March	184	30.0	83.7	0
April	179	24.8	85.9	0
May	187	20.0	89.2	0
June	191	19.9	89.6	0
July	193	15.9	91.5	0
August	185	14.7	91.9	0
September	206	14.4	93.0	0
October	188	12.6	93.4	0
November	201	14.4	92.8	0
December	176	15.3	90.5	0
Average	**187**	**20.6**	**88.8**	
Total				**0**

* % Reduction only determined when the influent and effluent $cBOD_5$ testing was done on the same day

Figure 3. 2022 Influent & Effluent Monthly Average $cBOD_5$ Concentration



5.1.1 Historical Trends

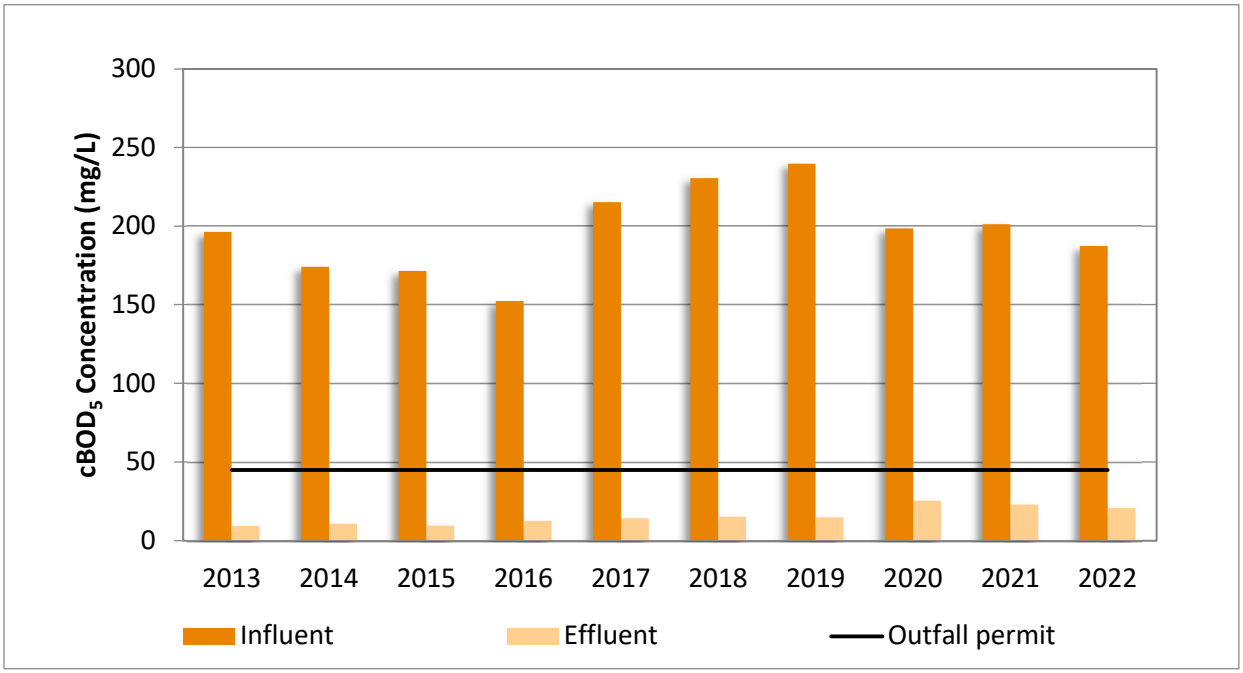
Historical influent and effluent average $cBOD_5$ concentrations, reduction efficiencies and the number of outfall and Morningstar Golf Course $cBOD_5$ non-compliances reported over the past 10 years are summarised in the Table 7 and graphed in Figure 4. 2022 data are consistent with previous years.

Table 7. Historical Trends: Influent & Effluent $cBOD_5$ Concentrations

Year	Influent Average $cBOD_5$ (mg/L)	Outfall Effluent Average $cBOD_5$ (mg/L)	Average % Reduction in $cBOD_5$	Non-Compliances (Outfall)	Non-Compliances (Morningstar)
2013	196	9.3	95.2	0	0
2014	174	11	93.3	0	0
2015	172	9.3	94.0	0	-
2016	152	12.5	91.4	0	-
2017	215	14.0	93.6	0	-
2018	230	15.1	93.0	2	-
2019	240	14.7	93.7	0	0
2020	198	25.3	88.8	19	0
2021	201	22.8	88.1	1	0
2022	187	20.6	88.8	0	-

* Percent reduction from 2014 to 2017 was determined from the influent and effluent $cBOD_5$ results from testing done on the same day. Before 2014, percent reduction was determined from the monthly average influent and effluent $cBOD_5$ levels.

Figure 4. Historical Trends: Influent & Effluent Yearly Average $cBOD_5$ Concentration



5.2 Total Suspended Solids

Total suspended solids (TSS) are solids within wastewater that can be captured on a fine filter paper. They are visible in water and decrease water clarity. High concentrations of TSS can cause many problems for aquatic life.

The Permit requires testing of the effluent daily, with a maximum permitted concentration of 60 mg/L for discharge to the outfall, and 30 mg/L for discharge to Morningstar Golf Course (see Appendix B for test data). The pump sending effluent to Morningstar Golf Course is controlled by a TSS probe. The pump turns off the probe hits the 30 mg/L Morningstar TSS permit limit.

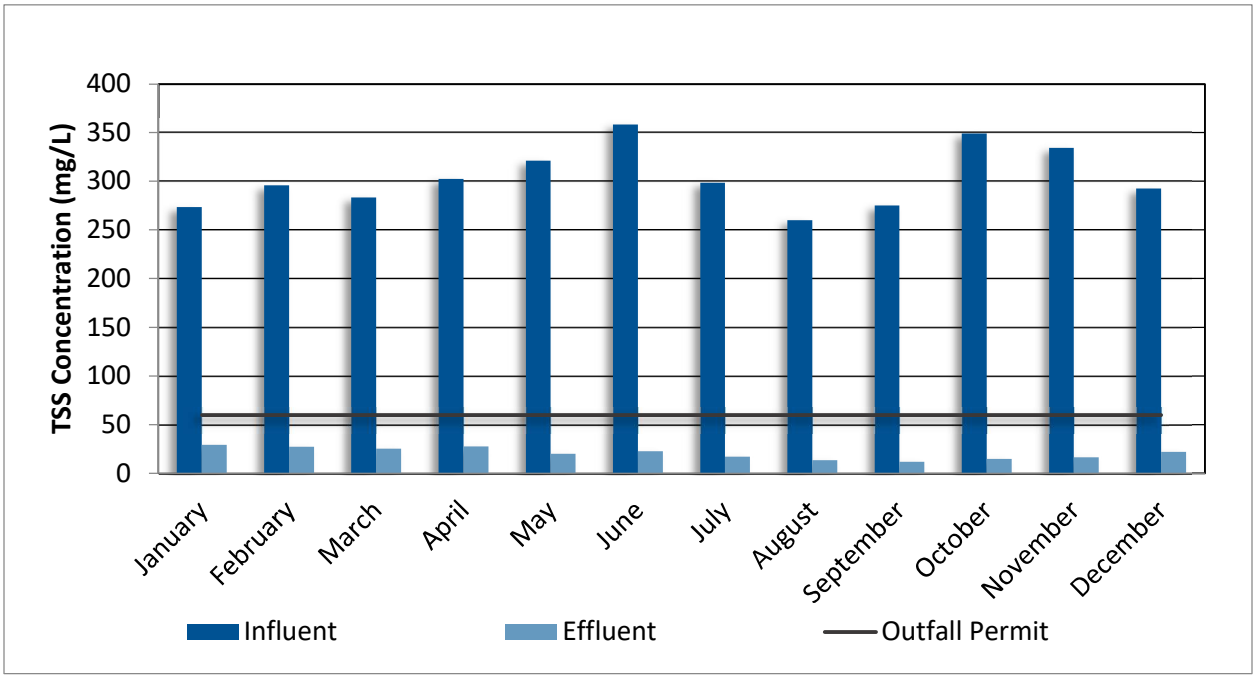
The average TSS concentration for influent and outfall effluent was 304 mg/L and 20.5 mg/L, respectively. The average TSS removal efficiency in 2022 was approximately 92.8%. Table 8 and Figure 5 present the average monthly TSS levels for the influent and effluent in 2022.

The RDN is undertaking an expansion of FCPCC which will allow the wastewater treatment process to treat higher maximum daily flows more efficiently.

Table 8. 2022 Influent & Effluent TSS Concentrations

2022	Influent Average TSS (mg/L)	Outfall Effluent Average TSS (mg/L)	Average % Reduction in TSS	Outfall Permit (mg/L)	Non-Compliances (Outfall) TSS > 60 mg/L
January	273	29.1	88.7	60	0
February	296	27.1	90.6	60	0
March	283	25.2	90.9	60	0
April	302	27.4	90.6	60	0
May	321	20.0	93.6	60	0
June	358	22.5	93.5	60	0
July	298	17.1	93.7	60	0
August	260	13.4	94.5	60	0
September	275	11.6	95.6	60	0
October	349	14.9	95.4	60	0
November	334	16.4	95.0	60	0
December	292	21.9	91.5	60	0
Average	**304**	**20.5**	**92.8**		
Total					**0**

Figure 5. 2022 Influent & Effluent Monthly Average TSS Concentration



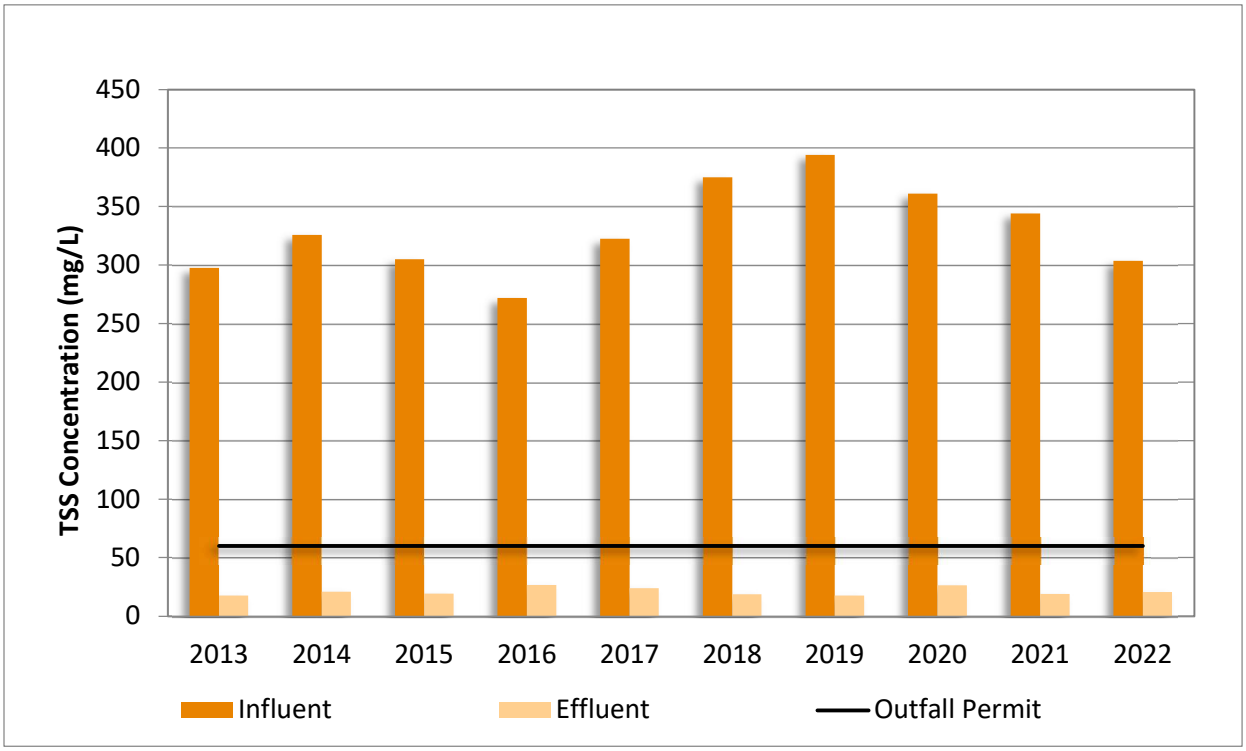
5.2.1 Historical Trends

Historical average TSS concentration in the influent and effluent, reduction efficiencies and the number of outfall and Morningstar Golf Course TSS non-compliances reported over the past 10 years are summarised in Table 9 and graphed in Figure 6. 2022 data are consistent with previous years.

Table 9. Historical Trends: Influent & Effluent TSS Concentration

Year	Influent Average TSS (mg/L)	Effluent Average TSS (mg/L)	Average % Reduction in TSS	Non-Compliances (Outfall)	Non-Compliances (Morningstar)
2013	298	17.7	94.0%	2	2
2014	326	20.7	93.2%	2	1
2015	305	19.3	93.1%	1	-
2016	272	26.6	90.1%	24	-
2017	322	23.8	92.4%	15	-
2018	375	18.8	94.5%	1	-
2019	394	17.6	95.2%	0	0
2020	361	26.2	92.3%	30	1
2021	344	18.9	94.0%	0	0
2022	304	20.5	92.8%	0	-

Figure 6. Historical Trends: Influent & Effluent Yearly Average TSS Concentration



5.3 Other General Parameters

The Permit requires annual testing of the effluent for the following parameters:

Alkalinity	Dissolved Sulphate	pH	Total Phosphorus
Chloride	Dissolved Sulphide	Total Cyanide	Total Organic Carbon
Dissolved Fluoride	Oil and Grease	Total Kjeldahl Nitrogen	

A sample of the effluent is tested in September of each year by an external laboratory. In 2022, operators sampled on September 15 (see Appendix D for test results). Results of these general parameters reported over previous years are summarized in Table 10.

Results reported for 2022 for general parameters were consistent with previous years. Only one sample is taken per year so limited conclusions can be made on trending of the parameters. Dissolved chloride and sulphate in the effluent has progressively increased until 2014 but showed a decrease after 2015. Other parameters remain consistent with historical data.

Table 3. Historical Trends: Effluent General Parameters

General Parameter	Units	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
pH	mg/L	7.64	7.07	7.45	7.81	8.17	7.81	7.77	7.71	7.94	7.98
Total Alkalinity	mg/L	169	149	188	160	202	217	238	250	220	-
Dissolved Chloride	mg/L	3,200	3,460	1,830	1,500	1,600	1,400	1,920	1,400	1,700	1,700
Total Kjeldahl Nitrogen	mg/L	17.6	10	21	22.5	31.4	35.9	36.2	37.2	41.2*	32.3
Total Oil and Grease	mg/L	<1.0	<1.0	1	<1.0	<1.0	<1.0	<2.0	<1.0	12	<1.0
Dissolved Sulphate	mg/L	416	463	266	220	248	172	270	200	250	230
Dissolved Sulphide	mg/L	0.0441	<0.01	0.02	0.0551	0.0568	0.068	0.039	0.040	0.038	0.023
Total Cyanide	mg/L	0.00222	0.003	0.002	0.00238	0.00218	<0.0050	0.00440	0.00250	<0.0050	0.00227
Dissolved Fluoride	mg/L	0.21	0.17	0.04	0.110	0.130	0.130	<1.00	0.13	0.14	0.16
Total Organic Carbon	mg/L	10.1	12.6	16.2	15.8	18.1	21	19	34	22	33
Total Phosphorus	µg/L	3,450	2,050	2,650	2,780	2,130	3,740	2,410	4,000	2,100	2,300

5.4 Metals

The Permit requires annual testing of the effluent for the following metals:

Aluminum (total)	Chromium (total)	Manganese (dissolved)	Selenium (total)
Arsenic (total)	Cobalt (dissolved)	Mercury (total)	Silver (total)
Barium (dissolved)	Copper (dissolved)	Molybdenum (total)	Tin (total)
Boron (dissolved)	Iron (Dissolved)	Nickel (dissolved)	Zinc (total)
Cadmium (dissolved)	Lead (total)		

A composite sample of the effluent is collected over a 24-hour period in September (a low flow month) each year and is tested by an external laboratory. In 2022, metals were sampled on September 15 (see Appendix D). Historic metals results are summarized in Tables 11 and 12. All parameters were consistent with previous years.

Table 11. Historical Trends: Effluent Total Metal Concentrations

Total Metals	Units	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Aluminum	µg/L	57	35	40	97.6	92	30	42.3	80	41	36
Arsenic	µg/L	0.77	1	0.6	1.2	0.7	0.67	0.72	0.64	0.72	0.60
Chromium	µg/L	<2.0	<0.5	<0.5	9.7	<5.0	<5.0	1.26	<5.0	<5.0	<5.0
Lead	µg/L	0.27	0.18	0.2	0.36	<1.0	<1.0	0.32	<1.0	<1.0	<1.0
Mercury	µg/L	<0.20	<0.01	<0.0025	<0.010	<0.010	0.0040	<0.010	0.0030	0.068	<0.019
Molybdenum	µg/L	2	2.5	1.4	1.4	<5.0	<5.0	1.98	<5.0	<5.0	<5.0
Selenium	µg/L	<0.80	21.2	<0.5	0.28	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver	µg/L	<0.1	<0.02	0.03	0.027	<0.10	<0.10	<0.050	<0.10	<0.10	<0.10
Tin	µg/L	<5.0	NT*	0.38	<5.0	<25	<25	0.56	<25	<25	<25
Zinc	µg/L	49	42	29	37.2	<25	<25	24.9	34	<25	31

NT – Not Tested

Table 4. Historical Trends: Effluent Dissolved Metal Concentrations

Dissolved Metals	Units	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Barium	µg/L	4.5	4.8	3.8	22.7	7.3	<5.0	<5.0	3.3	78.7	<5.0
Boron	µg/L	773	647	510	469	570	490	635	470	550	560
Cadmium	µg/L	<0.10	<0.01	0.02	0.024	<0.050	<0.050	0.033	<0.020	<0.050	<0.050
Cobalt	µg/L	<0.50	0.43	0.44	<0.50	<1.0	<1.0	1.67	0.47	<1.0	<1.0
Copper	µg/L	3.2	2.3	11.6	17.6	14.1	10.8	11.7	17.1	23.0	6.7
Iron	µg/L	171	357	523	354	146	286	442	807	169	375
Manganese	µg/L	97.9	96	100	92.2	96	83.2	123	96	110	117
Nickel	µg/L	2.1	2.5	2.9	2.3	<5.0	<5.0	7.0	3.4	<5.0	<5.0

5.5 Volatile and Semi-Volatile Compounds

The Permit requires annual testing of effluent for the following volatile and semi-volatile compounds:

Benzene	Dichloromethane	1,1-1 Trichloroethane
Chloroform	Di-n-butyl phthalate	1,1-2 Trichloroethane
Chloromethane	Ethylbenzene	Trichloroethylene
Di(2-ethylhexyl)phthalate	PCBs	Toluene
Dichlorobromomethane	Tetrachloroethylene	Total Phenols

A composite sample of the effluent is collected over a 24-hour period in September (a low flow month) each year and is tested by an external laboratory. In 2022, volatiles were sampled on September 15 (refer to Appendix D for test results). The historical average concentration of the volatile and semi-volatile compounds is summarised in Table 13. 2022 data are consistent with previous years.

Table 5. Historical Trends: Effluent Semi Volatile and Volatile Compounds

Volatile and Semi-Volatile Compounds	Units	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Benzene	µg/L	<0.40	<0.5	<0.5	<0.40	<0.40	1.0	<0.5	<0.40	<0.40	<0.40
Chloroform	µg/L	<1.0	<1.0	<1	<1.0	1.5	1.2	<1.0	1.4	1.2	1.2
Chloromethane	µg/L	<1.0	2	<1	<1.0	<1.0	<1.0	NT	<1.0	<1.0	<1.0
Dichlorobromomethane	µg/L	<1.0	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichloromethane	µg/L	<1.0	<1	<1	<2.0	<2.0	<2.0	<3.0	<2.0	<1.0	<2.0
Ethylbenzene	µg/L	<0.40	<0.5	<0.5	<1.0	<0.40	<0.40	<1.0	<0.40	<0.40	<0.40
Tetrachloroethylene	µg/L	<0.50	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Toluene	µg/L	<0.40	<0.5	<0.5	<0.40	<0.40	1.7	<1.0	<0.40	<0.40	<0.40
Total Phenols	mg/L	0.044(1)	0.005	0.010	0.005	0.016	0.025	0.0087	0.0082	0.0033	0.0039
1,1,1-Trichloroethane	µg/L	<0.50	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	µg/L	<0.50	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Trichloroethylene	µg/L	<0.50	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50
Di(2-ethylhexyl)phthalate	µg/L	2.1	0.23	<0.20	<2.0	<2.0	<2.0	<1.0	<8.0	<2.0	<2.0
Di-N-Butyl Phthalate	µg/L	<1.0	<0.2	<0.2	<2.0	<2.0	<0.80	<1.0	<8.0	<2.0	<2.0
PCB's	µg/L	<0.10	<0.01	<0.009	<0.050	<0.050	<0.050	<0.050	<0.050	<0.056	<0.056

6) Biosolids

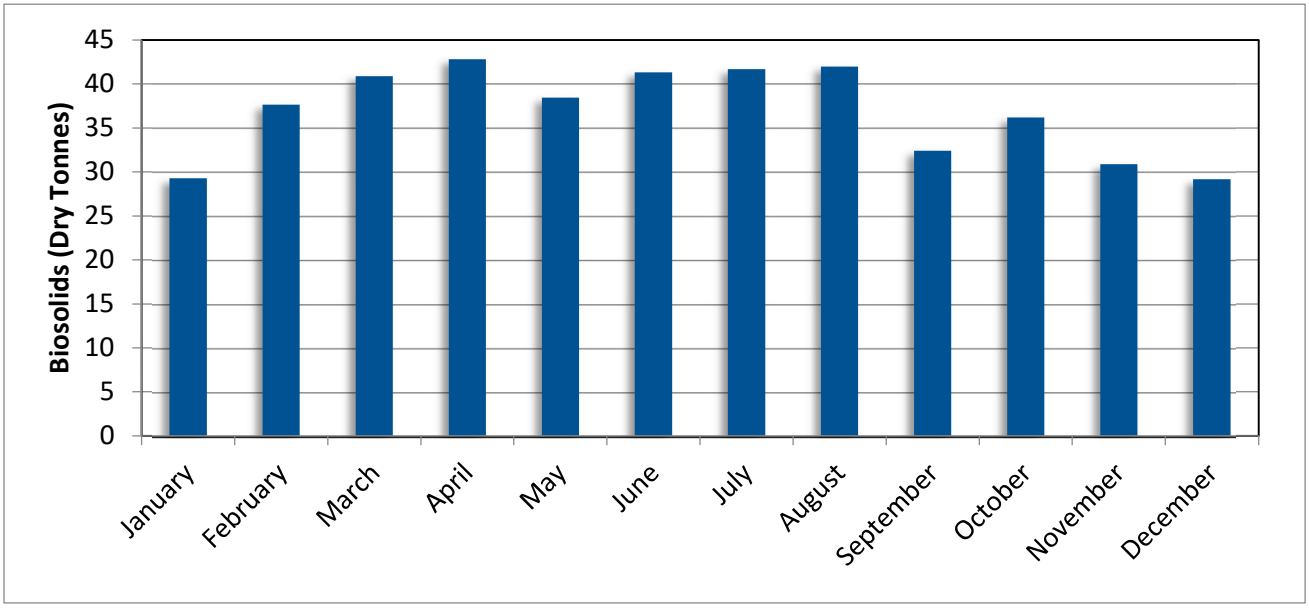
6.1 Biosolids Production

FCPCC produces Class A biosolids. The average monthly production of biosolids in 2022 is summarized in Table 14 and graphed in Figure 7.

Table 6. 2022 Biosolids Production

2022	Trucked Biosolids (Dry Tonnes)	Trucked Biosolids (Wet Tonnes)	% Solids (Dewatered)
January	29.29	88.8	33.0
February	37.6	110.8	34.0
March	40.9	115.0	35.6
April	42.8	116.9	36.6
May	38.5	114.4	33.6
June	41.3	119.8	34.5
July	41.7	118.3	35.3
August	42.0	122.9	34.2
September	32.4	100.9	33.4
October	36.2	108.2	33.5
November	30.9	91.4	33.8
December	29.2	83.6	34.9
Average	**37.0**	**107.6**	**34.4**
Total	**444**	**1,291**	

Figure 7. 2022 Monthly Biosolids Production (Trucked Dry Tonnes)



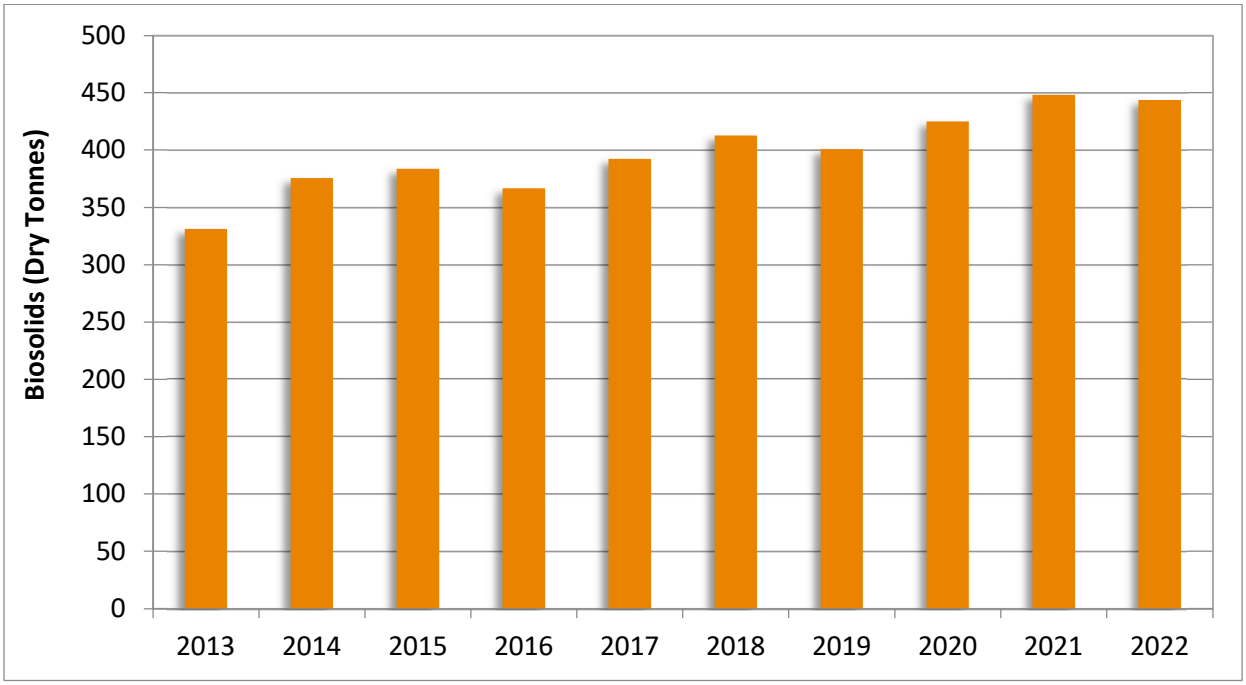
6.1.1 Historical Trends

Historical average polymer usage, total trucked solids (wet tonnes and dry tonnes) and yearly average percent solids reported for biosolids are summarized in Table 15 and graphed in Figure 8. Biosolids production has been trending at a consistent level with a gradual increase over time.

Table 7. Historical Trends: Biosolids Production

Year	Polymer Usage (Kg/year)	Trucked Biosolids (Dry Tonnes/year)	Trucked Biosolids (Wet Tonnes/year)	% Solids (Average Pressed Solids)
2013	6,000	331	1,067.15	31.0
2014	5,402	376	1,236.15	30.3
2015	6,566	384	1,298.93	29.5
2016	5,867	367	1,188.66	30.8
2017	4,860	392	1,260.32	31.1
2018	5,610	413	1,286.52	32.1
2019	5,481	401	1,255.85	31.9
2020	6,383	425	1,280.71	33.2
2021	4,815	448	1,299.19	34.5
2022	5,108	444	1,291.03	34.4

Figure 8. Historical Trends: Biosolids Production per Year (Trucked Dry Tonnes)



6.3 Biosolids Analysis

The Organic Matter Recycling Regulation (OMRR) requires that sampling for quality criteria must be taken once per year or from every 1,000 tonnes dry weight, whichever occurs first. Sampling to meet requirements of the Land Application Plan is conducted by SYLVIS.

The 2022 Biosolids Management Summary and Compliance report shows the results of the sampling done by SYLVIS (see Appendix G Table 6).

The RDN also conducts a program to test FCPCC biosolids for quality criteria. Testing for the following parameters is conducted twice a year by an external laboratory.

Total Solids	Chromium*	Molybdenum*
Volatile Suspended Solids	Cobalt*	Nickel*
Moisture	Copper*	Phosphorus
Total Kjeldahl Nitrogen	Iron	Potassium
Arsenic*	Lead*	Selenium*
Cadmium*	Mercury*	Zinc*

*Monitoring required by the Organic Matter Recycling Regulation (OMRR).

Biosolids were tested in January and July 2022 (see Appendix D for test reports). The average concentration of these parameters, reported over previous years, is summarised in Table 16. 2022 metal concentrations were consistent with previous years' data.

All FCPCC biosolids samples in 2022 met the OMRR Class A regulatory limits for metals.

Table 8.: Historical Trends: Biosolids General Parameters

Parameter	Units	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Class A	Class B
Total Solids	%	29.5	29.0	25.5	26.6	29.8	30.8	31.5	32.4	33.7	35.7	-	-
Volatile Solids	%	48	74.4	76.9	75.75	70.2	72.9	71.5	74.35	72.45	76.5	-	-
Moisture	%	69	70.9	74.5	69.65	69	69.5	68.5	67.8	66	64.5	-	-
Total Kjeldahl Nitrogen	% dry weight	4.65	2.85	4.875	4.97	5.7	5.7	6.6	3.86	5.5	4.35	-	-
Arsenic	µg/g	32.02	2.8	2.1	2.8	2.8	2.7	3.3	2.1	2.3	2.1	75	75
Cadmium	µg/g	2.2	2.1	1.9	1.9	2.1	1.4	2.1	1.8	1.6	1.3	20	20
Chromium	µg/g	25.65	25.85	19.5	24.5	27.3	27.9	37.9	35.1	37.1	26.0	-	1,060
Cobalt	µg/g	1.9	2.0	1.6	3.0	4.9	2.9	2.5	2.0	2.5	2.1	150	150
Copper	µg/g	854	832	733	702.5	807	637	798	620	602.5	532	-	2,200
Iron	µg/g	31,950	30,950	ND	ND	ND	41,400	48,800	37,900	43,800	37,200	-	-
Lead	µg/g	22.85	21.7	15.4	19.2	18.75	21.8	19.3	14.3	13.1	13.5	500	500
Mercury	µg/g	2.13	1.86	1.50	1.60	0.99	0.66	0.80	1.07	0.82	1.21	5	15
Molybdenum	µg/g	5.9	5.7	5.4	5.4	4.7	3.6	4.6	4.9	6.3	5.1	20	20
Nickel	µg/g	12.55	12.15	10.25	12.5	11.7	10.47	14.15	12.95	13.35	10.5	180	180
Phosphorus	µg/g	20,000	21,800	16,900	17,900	25,750	22,800	28,600	21,300	23,850	20,100	-	-
Potassium	µg/g	791	993	ND	ND	ND	727.5	964.5	759.5	986.5	777	-	-
Selenium	µg/g	5.2	5.1	4.0	3.9	4.4	3.1	4.2	3.2	3.0	2.8	14	14
Zinc	µg/g	1120	1035	880	954.5	1175	890	1,250	1,080	1,110	918	1,850	1,850

ND – Not determined

6.4 Fecal Coliforms

OMRR requires 7 representative samples for fecal coliforms to be taken every 1,000 tonnes dry weight or once per year, whichever occurs first. The level of fecal coliforms in each Class A sample must be <1000 MPN per gram of total solids (dry weight basis).

Regulatory sampling for the OMRR is based on a separate fecal coliform sampling program done by SYLVIS (see Appendix G Table 6).

Eight samples completed by SYLVIS met Class A limits of <1000 MPN per gram of total solids. The geometric mean from the fecal coliform sampling by SYLVIS was <10 MPN per gram of total solids (see Appendix G Table 6).

The RDN also conducts its own fecal coliform sampling program. In 2022, the RDN sent nine representative samples of biosolids to an external laboratory for fecal coliform analysis (see test reports in Appendix D). Eight of the laboratory samples met Class A limits.

One of the samples had a high fecal coliform level at 3,300 MPN/g. The high result on July 18 was believed to be due to a sampling issue. An investigation into this non-conformance was performed (please refer to Appendix C).

The geometric mean fecal coliform concentration of the biosolids from the RDN sampling in 2022 was <43 MPN/g (dry weight) and is summarized in Table 17.

Table 9. 2022 Biosolids Fecal Coliforms Concentrations

FCPCC Biosolids	
Parameter	**Fecal Coliforms**
Unit	**MPN / g dry**
25-Jan-22	<20
16-Mar-22	<20
12-Apr-22	130
30-May-22	<20
18-Jul-22	3,300
24-Aug-22	<20
28-Sep-22	<20
17-Oct-22	<20
28-Nov-22	<20
Geometric Mean	**<43**

6.5 Stabilization and Dewatering

Biosolids at FCPCC are stabilized using autothermal thermophilic aerobic digesters (ATADs). The ATADs consist of 4 digesters and 3 cooling storage cells which treat sludge collected from the bottom of the sedimentation tanks. Sludge is held in the tanks for 10 to 12 days at 45 to 65°C, during which time it is decomposed and stabilized by biological processes. Once digested, the stabilized sludge is dewatered through a centrifuge, resulting in biosolids with a moist, soil-like consistency. Significant pathogen reduction is achieved in the ATAD tanks, which create Class A biosolids (defined according to OMRR parameters). Stabilization and dewatering process data are presented in Tables 18 and 19.

Volatile Solids Reduction was determined using sampling points from the sludge entering and existing the ATADs. In previous years, Volatile Solids Reduction was determined from samples in ATAD 3 and ATAD 6. Average Volatile Solids Reduction for 2022 is presented below.

Table 18. Stabilization Process Data

Stabilization Process		
Total Mass of Sludge Delivered for Stabilization	104,025	Tonnes (dry)
% of TSS as VSS in Sludge Feed	86.2	%
Mass of Biosolids Remaining after Stabilization	663.9	Tonnes (dry)

Table 109. Dewatering Process Data

Dewatering Process		
Volume of Biosolids delivered for dewatering	16,916	m^3
Volatile Solids Reduction	45.86	%
% Solids in biosolids dewatering feed	3.93	%
% Solids in dewatered biosolids	34.4	%
Polymer dosage to aid dewatering	0.403	kg/m^3

6.6 Biosolids Management

In 2022, RDN biosolids were beneficially managed in two programs:

- Forest Fertilization
- Soil and Biosolids Growing Medium (BGM) Fabrication.

6.6.1 Forest Fertilization

Forest fertilization occurs on private forested land located northwest of Nanaimo. The land is owned by TimberWest and managed by Mosaic Forest Management (Mosaic). The area is also used by the public for recreational activities. The Forest Fertilization Program operates under agreement and in partnership with Mosaic and the Nanaimo Mountain Bike Club.

The biosolids were land applied in a forest fertilization project managed by SYLVIS Environmental. The SYLVIS Environmental 2022 Biosolids Management Summary, attached in Appendix G, provides a summary and interpretation of the effects of biosolids discharges on the receiving environment.

6.6.2 Soil and Biosolids Growth Medium (BGM) Fabrication

Soil fabrication operates in partnership with Harmac Pacific (Harmac). At the Harmac kraft mill site in Nanaimo, RDN biosolids, Harmac wood waste, and mineral soil are blended to fabricate soil for cover material for the Harmac landfill during its landfill closure activities.

In 2022, FCPCC Class A biosolids were used in Biosolids Growth Medium (BGM) fabrication.

More details of the soil fabrication program are provided in the 2022 Biosolids Management Summary and Compliance Report, completed by SYLVIS Environmental attached in Appendix G.

6.6.3 Excellence in Biosolids Award

In 2019, the Regional District of Nanaimo won the Northwest Biosolids 'Excellence in Biosolids' Award for the second time. This award presented by Northwest Biosolids recognizes significant contributions to the development and implementation of cost-effective and environmentally beneficial biosolids management practices. The RDN won this award previously in 2013.

7) Process Control Monitoring

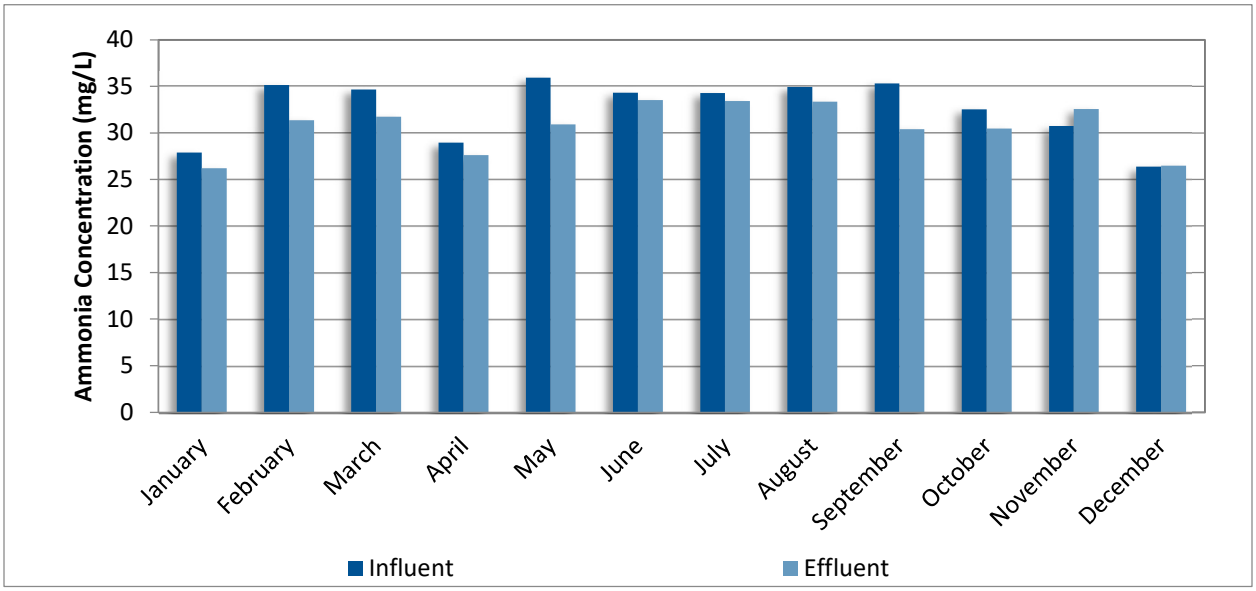
7.1 Ammonia

Ammonia is one of the typical constituents of domestic wastewater. Ammonia can be toxic to fish (freshwater and marine) and so is monitored to determine potential impacts to the receiving environment. Wastewater Services' staff test ammonia in the influent and effluent weekly. The average ammonia concentration in 2022 in the influent and effluent was 32.5 mg/L and 30.6 mg/L, respectively. Appendix B contains the weekly Ammonia test data for FCPCC for 2022. Results are summarized in Table 20 and Figure 9.

Table 11. 2022 Influent & Effluent Ammonia Concentration

2022	Influent Average Ammonia (mg/L)	Effluent Average Ammonia (mg/L)	% Reduction
January	27.9	26.2	6.0%
February	35.1	31.4	10.7%
March	34.7	31.7	8.4%
April	29.0	27.6	4.7%
May	35.9	30.9	14.0%
June	34.3	33.5	2.3%
July	34.3	33.4	2.5%
August	34.9	33.4	4.5%
September	35.3	30.4	14.0%
October	32.5	30.5	6.4%
November	30.8	32.6	-5.9%
December	26.4	26.5	-0.3%
Average	**32.5**	**30.6**	**5.6%**

Figure 9. 2022 Influent & Effluent Monthly Average Ammonia Concentration



7.2 Nitrate, Nitrite, Alkalinity

Wastewater Services' staff conduct weekly testing of the effluent for nitrate, nitrite, and alkalinity. The average monthly concentration is summarized in Table 21 and graphed in Figures 10 and 11.

Table 21. Effluent Nitrate, Nitrite, and Alkalinity

2022	Effluent Average Nitrate (NO_3) (mg/L)	Effluent Average Nitrite (NO_2) (mg/L)	Effluent Average Alkalinity (mg/L)
January	1.16	0.437	174
February	0.638	0.439	199
March	0.693	0.292	220
April	1.39	0.455	184
May	1.66	0.713	200
June	1.38	0.562	216
July	1.73	0.710	222
August	1.24	1.311	206
September	1.43	1.238	195
October	1.89	1.342	236
November	1.11	1.100	235
December	1.85	1.326	212
Average	**1.35**	**0.805**	**206**

Figure 2. 2022 Effluent Nitrate and Nitrite Monthly Average Concentration

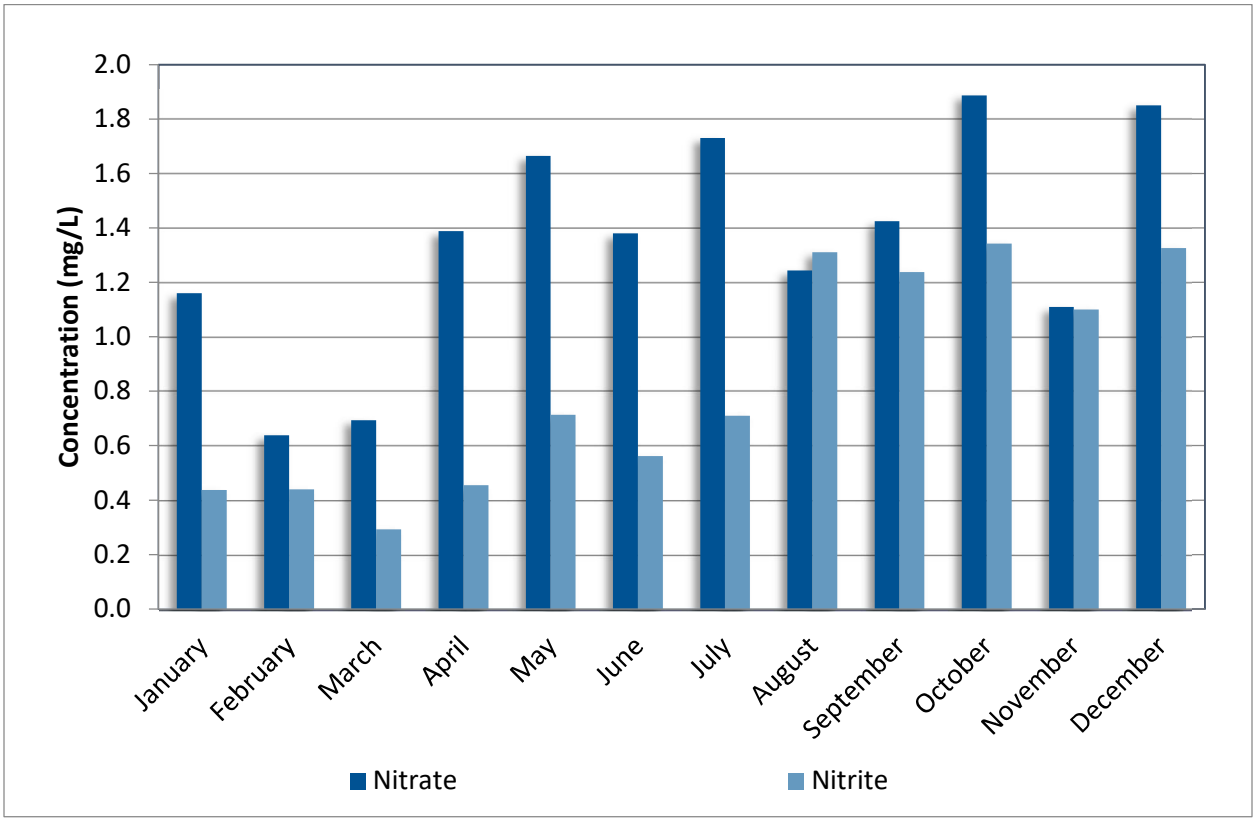
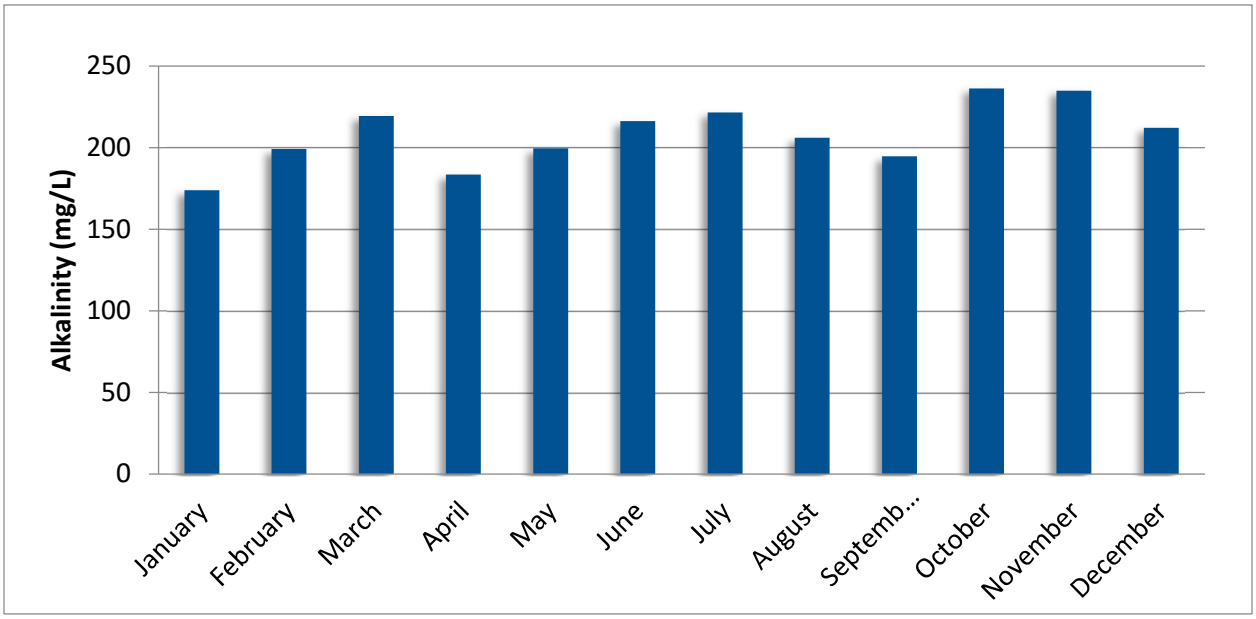


Figure 3. 2022 Effluent Alkalinity Monthly Average



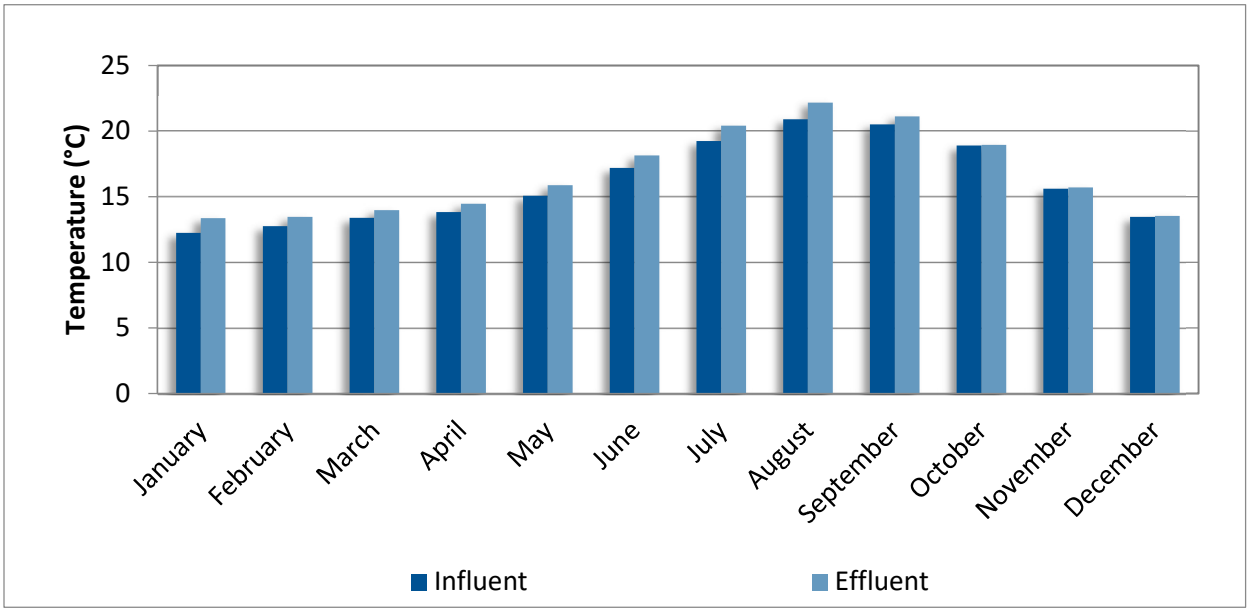
7.3 Temperature

Wastewater Services' staff monitor the temperature of the influent and effluent daily. Temperature data for 2022 is presented in Appendix B. The average temperature for each month is summarized in Table 22 and graphed in Figure 12.

Table 12. 2022 Influent & Effluent Temperatures

2022	Average Temperature (°C)	
	Influent	Effluent
January	12.2	13.4
February	12.8	13.4
March	13.4	14.0
April	13.8	14.5
May	15.1	15.9
June	17.2	18.2
July	19.2	20.4
August	20.9	22.2
September	20.5	21.1
October	18.9	18.9
November	15.6	15.7
December	13.4	13.5
Average	**16.1**	**16.8**

Figure 4. 2022 Influent & Effluent Monthly Average Temperature



7.3.1 Historical Trends

Historical influent and effluent average temperatures reported over previous years are summarized in Table 23. 2022 data are consistent with historical data.

Table 13. Historical Trends: Influent & Effluent Average Temperature

Year	Average Temperature (°C)	
	Influent	Effluent
2013	16.9	17.2
2014	16.6	17.2
2015	16.9	17.4
2016	16.7	17.2
2017	16.1	16.6
2018	16.3	16.9
2019	16.1	16.6
2020	16.0	16.5
2021	16.7	16.9
2022	16.1	16.8

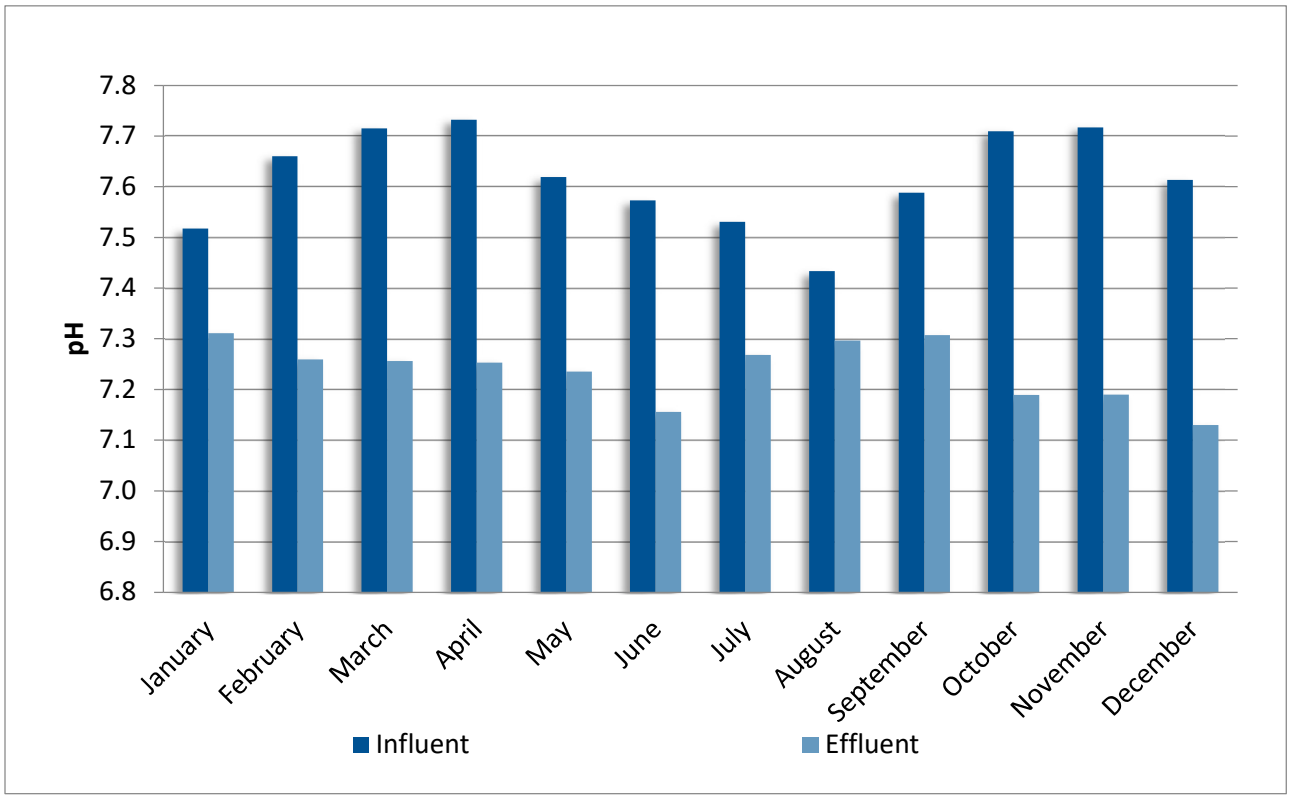
7.4 pH

Wastewater Services' staff monitor the pH of grab samples of the influent and effluent daily. The pH data for FCPCC for 2022 is presented in Appendix B, the average monthly pH data are summarized in Table 24 and Figure 13.

Table 14. 2022 Influent & Effluent Average pH

2022	Average pH	
	Influent	Effluent
January	7.52	7.31
February	7.66	7.26
March	7.72	7.26
April	7.73	7.25
May	7.62	7.24
June	7.57	7.16
July	7.53	7.27
August	7.43	7.30
September	7.59	7.31
October	7.71	7.19
November	7.72	7.19
December	7.61	7.13
Average	**7.62**	**7.24**

Figure 5. 2022 Influent & Effluent Monthly Average pH



7.4.1 Historical Trends

Historical average influent and effluent pH values reported previous years are summarized in Table 25. 2022 data are consistent with historical data.

Table 15. Historical Trends: Influent & Effluent pH

Year	Average pH	
	Influent	Effluent
2013	7.60	7.00
2014	7.52	6.90
2015	7.79	7.07
2016	7.84	7.22
2017	7.68	7.35
2018	7.67	7.35
2019	7.72	7.34
2020	7.59	7.30
2021	7.61	7.31
2022	7.62	7.24

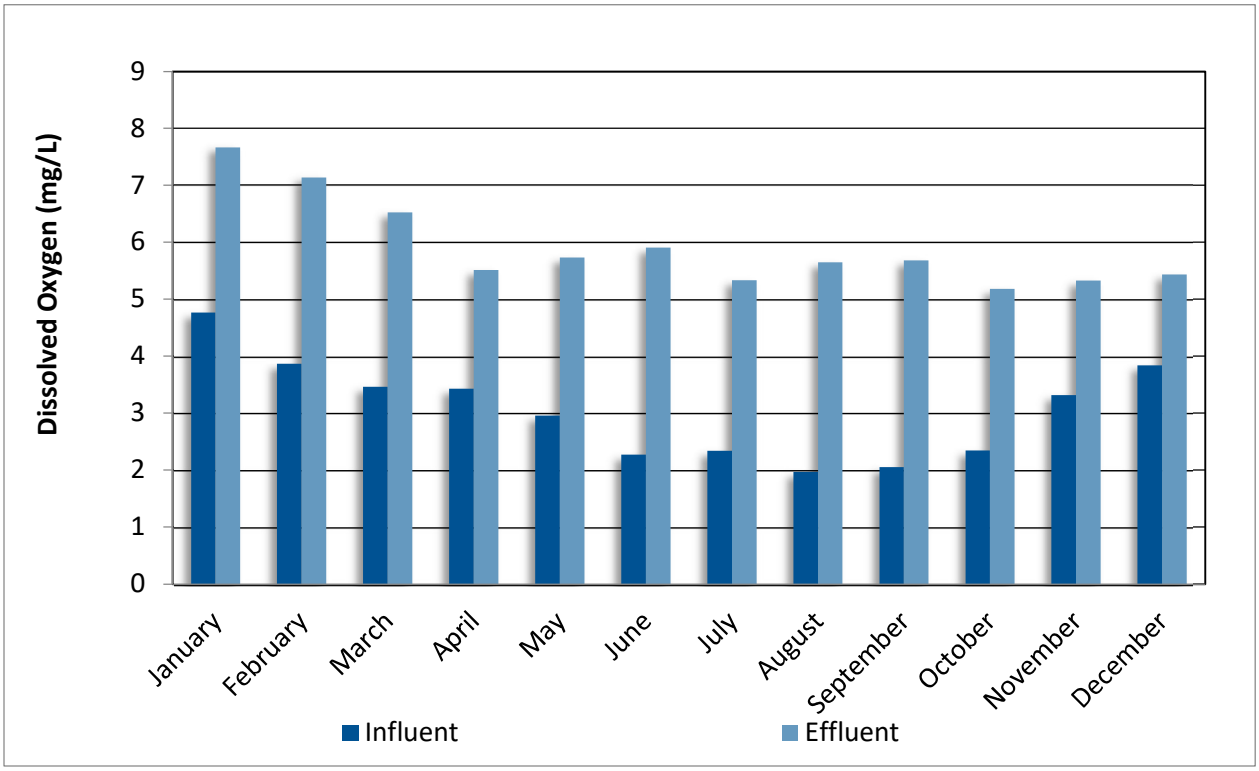
7.5 Dissolved Oxygen

Wastewater Services' staff measure dissolved oxygen (DO) of the influent and effluent daily. The average monthly DO concentrations are summarized in Table 26 and graphed in Figure 14.

Table 16. 2022 Influent & Effluent Dissolved Oxygen Concentration

2022	Average Dissolved Oxygen (mg/L)	
	Influent	Effluent
January	4.77	7.66
February	3.87	7.14
March	3.46	6.53
April	3.43	5.51
May	2.96	5.73
June	2.27	5.91
July	2.34	5.33
August	1.97	5.65
September	2.05	5.68
October	2.34	5.18
November	3.32	5.33
December	3.84	5.43
Average	**3.05**	**5.92**

Figure 6. 2022 Influent & Effluent Average Dissolved Oxygen Concentration



7.5.1 Historical Trends

Historical influent and effluent average DO concentration are summarized in Table 27. 2022 data are consistent with historical data.

Table 17. Historical Trends: Influent & Effluent Dissolved Oxygen Concentration

Year	Average Dissolved Oxygen (mg/L)	
	Influent	Effluent
2013	2.80	4.80
2014	3.04	4.71
2015	3.26	5.11
2016	2.62	4.25
2017	3.44	4.91
2018	3.45	5.01
2019	3.08	5.20
2020	3.36	5.51
2021	2.99	5.32
2022	3.05	5.92

8) Resource Consumption

8.1 Chemical Consumption

Table 28 summarizes the cost of chemicals used in the treatment process (treatment plant only) in 2022.

Table 28. 2022 Chemical Consumption

Chemical	FCPCC Usage (%)	Consumption	Units	Cost ($)	Use
Dry Polymer (W-Hydrofloc 1622)	100%	5,108	Kg	$45,050	Dewatering
Liquid Polymer (ClearFloc CE405)	100%	3,744	Kg	$25,824	Thickening
Caustic Soda	100%	7,979	Kg	$8,091	Odour Control
Ferrous Chloride	100%	172,899	L	$52,306	Odour Control
Sodium Hypochloride	100%	44,175	L	$42,408	Odour Control
Defoamer (Univam KemFoamX)	100%	810	kg	$4,026	Defoamer
Actizyme	100%	-	-	$4,463	Secondary Treatment
Total				**$182,168**	

8.1.2 Historical Trends

Annual costs of chemicals consumed in over the last ten years are summarised in Table 29.

Table 29. Historical Trends: Chemical Consumption

Year	Dewatering Polymer	Thickening Polymer	Secondary Treatment Polymer	Caustic Soda	Ferrous Chloride	Sodium Hypochlorite	De-Odorizer	De-Foamer	Hydrogen Peroxide	Actizyme	Total
2013	$46,380	$28,153	$2,080	$7,379	$5,850	$16,605	$8,724	$14,160	-	-	**$129,330**
2014	$41,760	$17,785	$6,034	$9,630	$8,606	$11,190	$1,935	$2,410	-	-	**$99,350**
2015	$42,680	$14,978	$3,375	$7,241	$9,021	$12,348	$1,820	$5,146	-	-	**$96,608**
2016	$38,137	$13,627	$9,563	$7,260	$13,015	$10,149	$0	$0	-	-	**$91,752**
2017	$31,592	$16,288	$15,754	$393	$15,976	$11,673	$2,018	$2,759	-	-	**$96,453**
2018	$36,467	$21,980	$133	$1,726	$20,798	$15,899	$1,995	$1,576	-	-	**$100,574**
2019	$35,628	$28,071	-	$2,060	$19,974	$34,576	-	-	$1,862	-	**$122,172**
2020	$41,488	$27,510	-	$879	$20,696	$24,608	-	-	$3,724	-	**$118,905**
2021	$32,982	$25,279	-	$7,469	$23,765	$32,923	-	$3,991	-	-	**$126,409**
2022	$45,050	$25,824	-	$8,091	$52,306	$42,408	-	$4,026	-	$4,463	**$182,168**

Note: Cost provided for the chemicals does not include taxes. ND – Not determined.

1. Data missing prior to 2013 due to secondary polymer being used only infrequently during maintenance procedures, 2013 data based on estimate.
2. In 2014, operators discontinued adding ferrous chloride to Hall Road pump station. It is only added to the process at FCPCC and at Bay Avenue pump station. Due to a corrosion of the ferrous chloride tank at Bay Avenue pump station, ferrous was only used at FCPCC after 2017.
3. Ferric chloride was used as a replacement product for ferrous chloride when ferrous chloride was in short supply in 2010. $1,799 was spent on ferric chloride in 2010.

8.2 Electrical Consumption

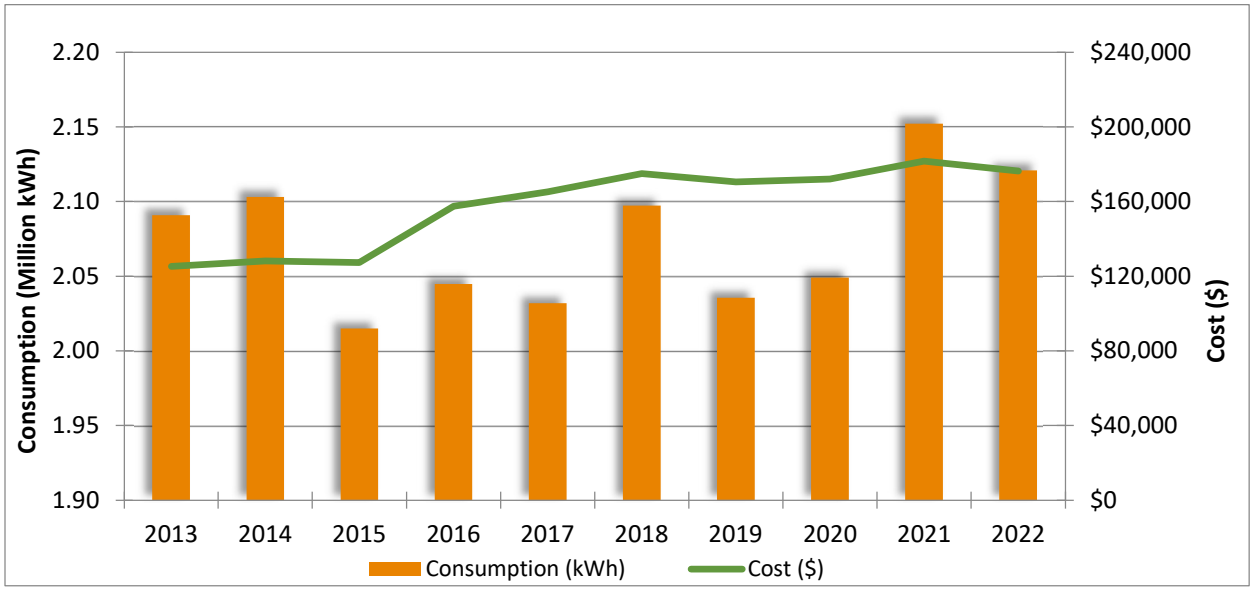
Historical annual electrical consumption and costs are summarised in Table 30 and graphed in Figure 15. Note: this section reports electrical consumption at the treatment plant only (pump stations are excluded). The cost of electricity excludes federal and provincial taxes. Electrical costs have increased due to rate recalculations from BC Hydro.

Table 30. Historical Trends: FCPCC Electrical Consumption

Year	Consumption (kWh)	Cost ($)
2013	2,090,880	$125,379
2014	2,103,120	$128,146
2015	2,014,928	$127,321
2016	2,044,800	$157,473
2017	2,031,840	$165,277
2018	2,097,360	$174,964
2019	2,035,440	$170,450
2020	2,048,974	$172,096
2021	2,152,216	$181,784
2022	2,120,888	$176,288

Note: Electrical consumption at the treatment plant only (pump stations are excluded). Electricity costs do not include tax.

Figure 7. Historical Trends: FCPCC Electrical Consumption and Costs (Treatment Plant Only)



8.3 Water Consumption

Water consumption at FCPCC for 2022 was estimated at 2,324 m^3 using water invoices. Table 31 contains the water consumption records over the last eight years. There have been considerable decreases in water consumption since 2012 due to proactive water monitoring and increased use of reclaimed water in treatment processes. Water use has declined to a new technology to pressurize the seals on pumps using air pressure and water as opposed to constant water flow. Note: this is water consumption at the treatment plant only (pump stations are excluded).

Table 18. Historical Trends: FCPCC Water Consumption

Year	Consumption (m^3)
2013	9,496
2014	8,539
2015	5,109
2016	4,575
2017	2,013
2018	4,894
2019	6,160
2020	4,815
2021	4,356
2022	2,324

*2014 Water Consumption obtained from WaterTrax records.
All other years were from invoices

9) Odour

Odours at the FCPCC were a significant concern prior to 2000, and considerable progress has been made in reducing odours at the FCPCC facility. The odour control system at FCPCC now includes two bioscrubbers, one chemical scrubber, and one biofilter.

RDN staff will continue to monitor the effectiveness of odour control initiatives to ensure the impacts to neighborhoods adjacent to the plant are minimized. The RDN acknowledges the assistance and input from residents in addressing air quality issues around the FCPCC.

9.1 Operational Procedures

Wastewater that enters FCPCC comes mainly from domestic sources. Tourism in the summer months substantially increases the flows to the treatment plant, as well as results in more solids. Winter flows are higher, but the solids concentration is lower during this time. TSS and $cBOD_5$ are measured in the influent and effluent to determine the strength of the wastewater. A higher strength of wastewater in the summer appears to correlate to a higher level of odours throughout the treatment plant.

Influent and effluent temperatures increase during the summer months, thereby also increasing odours. Increased temperature releases additional gas and vapour into the atmosphere causing odours. As a result, there is an increase in odour complaints in the summer.

The FCPCC staff have a schedule of routine duties that have an impact on odours. In 2013, the air flow through the trickling filters was reversed to avoid stripping odorous compounds and improve odour conditions at the plant. In 2016, FCPCC installed a new ultraviolet system on the stack which vents trickling filter air to reduce odours. In 2020, the media for the bio-filters was replaced. In 2022, repairs were made to the trickling filter piping which have significantly reduced the number of odour concerns.

9.2 Odour Records

The most common sources of odours at wastewater treatment plants are ammonia and hydrogen sulphide gases. At FCPCC, more odour reports are typically received in the summer months due to septage dumping (septic trucks) and higher temperatures resulting in increased biological activity. The concentration of hydrogen sulphide gas in the influent also increases in the summer months.

Odour reports received at FCPCC are routinely recorded on a form and entered into the department's Environmental Management System. The location of the complainant, time of day, weather conditions, and current activities at the plant are noted along with the report. Through this system, the Operations Superintendent is notified of all complaints within 24 hours.

In previous years, many of the odour complaints were mistaken as odours from FCPCC but were due to odours from herring roe. Herring spawn along the beaches near FCPCC in the spring and the rotting of these eggs later in the season produces strong odours near the treatment plant. There were no issues with roe in 2022.

The number of odour concerns decreased after 2021 to previous years. This is likely related to replacement of the media in the biofilters at FCPCC in 2020 and the trickling filter piping repair in 2022.

Appendix E contains further information on the 7 odour records which were received in 2022.

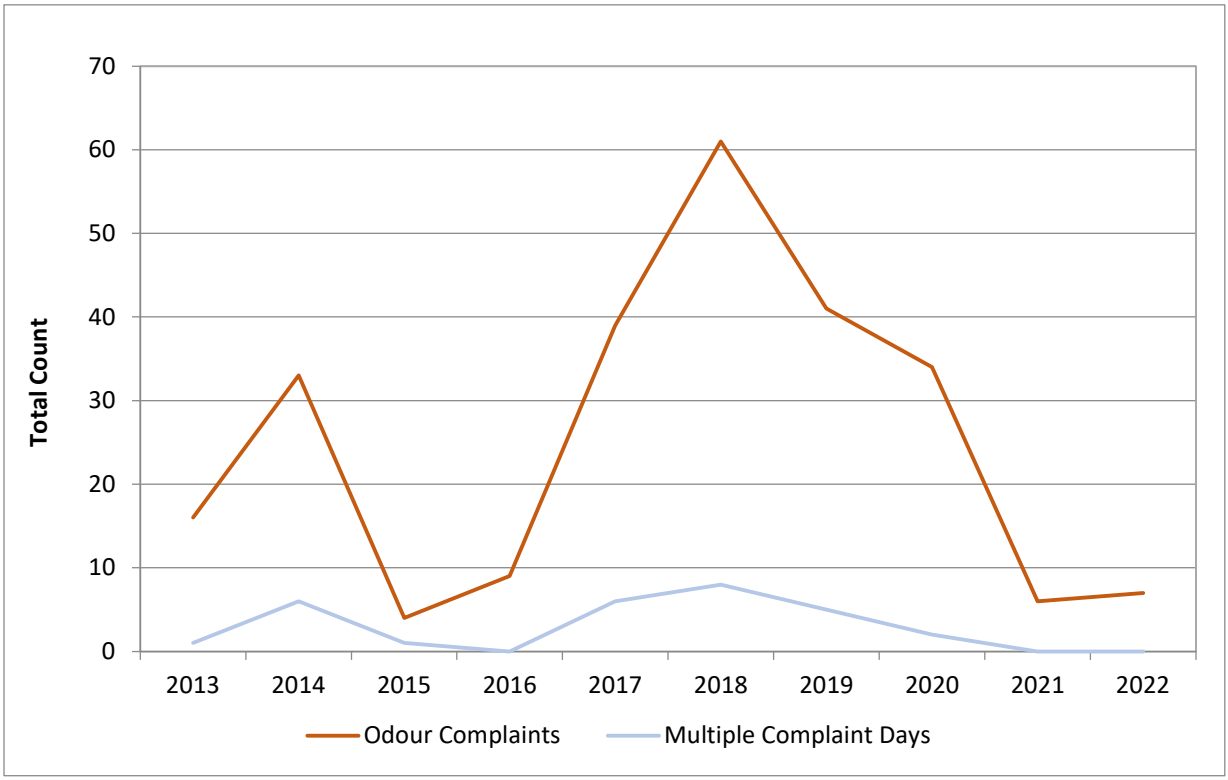
9.2.1 Historical Trends

The odour concern records over the last 10 years are summarized in Table 32 and graphed in Figure 16.

Table 19. Historical Trends: FCPCC - Number of Odour Complaints

Year	Odour Complaints	Multiple Complaint Days
2013	16	1
2014	33	6
2015	4	1
2016	9	0
2017	39	6
2018	61	8
2019	41	5
2020	34	2
2021	6	0
2022	7	0

Figure 8. Historical Trends: FCPCC Odour Complaints



9.3 Odour Episodes

An odour episode is any disruption in the regular operation of the treatment plant that may cause odour.

- Three odour concerns were attributed to work which occurring on the Trickling Filer where old was removed from site and windows and side doors were open.
- Two odour concerns were attributed to replacement of the biofilter media in the dewatering building.

9.4 Future Plans

RDN staff will continue to monitor the effectiveness of odour control initiatives to ensure that the impacts on adjacent neighborhoods are minimized.

The RDN has been working in partnership with Vancouver Island University (VIU) researchers to identify, locate, and monitor sources of odours near FCPCC. Monitoring at FCPCC was ongoing in 2022 and identified several odour control systems at FCPCC which could be made more efficient. The design of the expansion project will incorporate the monitoring results.

The RDN is also finalizing Detailed Design of the FCPCC Expansion and Odour Control Upgrade. The project will include significant odour control upgrades at the existing plant and the expansion site. The RDN is also in the process of establishing a long-term agreement with VIU.

10) Septage Receiving

The total combined volume of Septage and Pump & Haul discharged in 2022 was 2,557,827 Imperial gallons (11,628 m^3). This volume does not include discharge of NBPCC sludge to FCPCC. These volumes are tabulated in the 2022 NBPCC Annual Report.

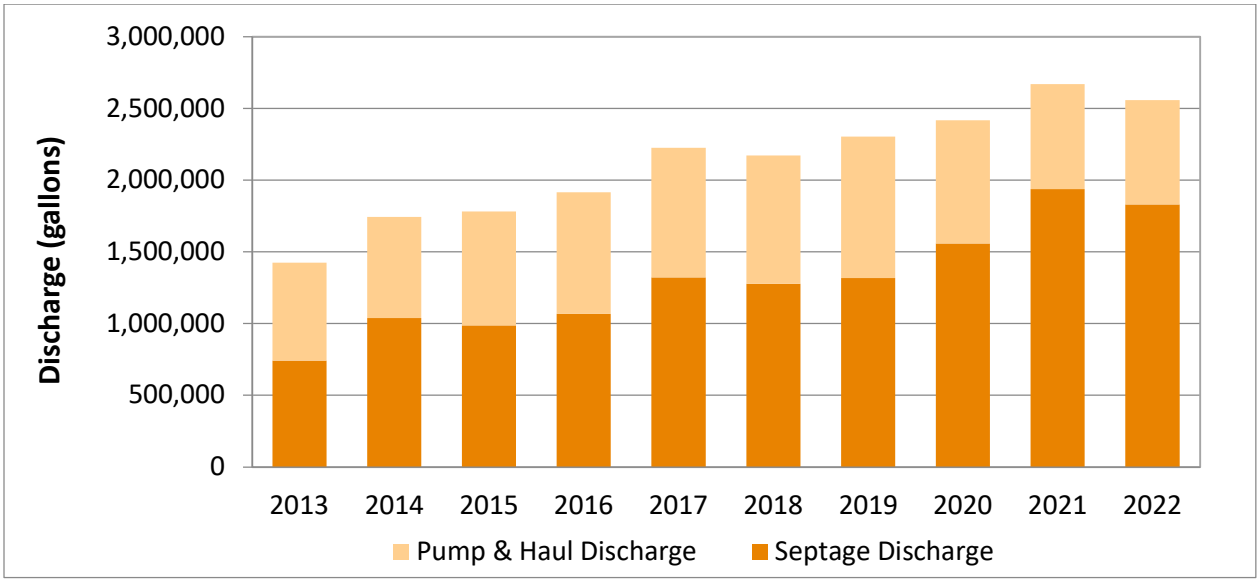
10.1 Historical Trends

The volumes of Septage and Pump & Haul waste discharged over the past ten years are summarised in Table 33 and graphed in Figure 17. The volume received has shown an increasing trend since 2013. This is likely related to better tracking of volumes discharged due to the installation of a septage meter.

Table 20. Historical Trends: Septage and Pump & Haul Discharged at FCPCC

Year	Total Gallons of Septage Discharged at FCPCC	Total Gallons of Pump & Haul Discharged at FCPCC	Combined Total (Imperial Gallons)	Combined Total (m^3/year)
2013	741,016	682,894	1,423,910	6,473
2014	1,039,564	703,950	1,743,514	7,926
2015	986,594	795,197	1,781,791	8,100
2016	1,067,458	847,500	1,914,958	8,706
2017	1,320,987	903,700	2,224,687	10,114
2018	1,277,508	893,594	2,171,102	9,870
2019	1,318,518	984,713	2,303,231	10,471
2020	1,559,241	859,025	2,418,266	10,994
2021	1,938,308	729,999	2,668,307	12,130
2022	1,831,525	726,302	2,557,827	11,628

Figure 9. Historical Trends: Annual Septage and Pump & Haul Waste Discharged at FCPCC



10.2 Septage Testing

Septage used to be tested quarterly for a series of parameters. In December 2013, the monitoring program discontinued because:

- Sampling of septage is not required for any regulatory authorities as it enters the main waste stream where the final effluent is tested before being discharged to the receiving environment.
- Sufficient historical data created a reference and determined that septage had a negligible impact on overall effluent quality.
- A random sampling program that targets haulers directly may better detect the discharge of unauthorized waste.

In 2019, the RDN implemented a new sampling protocol for testing of septage discharged by haulers at FCPCC. One hauler per quarter was randomly selected, their discharge was tested for a variety of parameters, and results were compared to the Trucked Liquid Waste Rates and Regulations Bylaw No. 1732.

The random septage sampling program has not occurred since 2020, however. Sampling safety issues and bylaw limit review will need to be resolved before this program is resumed.

11) Contributory Population and Remaining Plant Capacity

The current FCPCC plant operating capacity is designed for an average daily flow of 12,000 m^3/day, with a maximum daily flow capacity of 18,360 m^3/day. Wastewater Services continues to install new equipment and upgrade existing technology to ensure the future carrying capacity of the treatment plant is adequate and permit levels are not exceeded.

In 2022, the combined average daily flow from FCPCC was 10,493.7 m^3/day with a maximum daily discharge of 18,580.1 m^3/day. The estimated population serviced in 2022 was 28,926 with a projected annual growth rate of approximately 1.39 %.

The LWMP states that FCPCC will likely need to be expanded between 2018 and 2025. In 2017, the RDN commissioned a preliminary design study to evaluate expansion options for FCPCC. The detailed design study for the FCPCC Stage 4 expansion and Odour Control Upgrades was ongoing in 2022. The RDN is planning to issue the project to tender in early 2024.

12) Environmental Incidents

As part of the RDN's ISO 14001 Environmental Management System certification, records are maintained regarding any environmental incidents that are associated with the RDN's wastewater infrastructure and treatment facilities including spills, leaks, and fires.

In 2022, there were no environmental incidents related to spills, leaks, or fires from the treatment plant, gravity sewer interceptor and force mains conveying wastewater to FCPCC.

13) Conditional Management Plan

On May 1, 2012, a Conditional Management Plan (CMP) for FCPCC came into effect. A CMP is an agreement between Canadian Food Inspection Agency, Environment Canada, Fisheries and Oceans Canada, the British Columbia Ministry of Environment, and the RDN.
The original CMP was renewed several times. The current agreement expires January 31, 2025.
The key objectives of the agreement are as follows:

- Provides enhanced management of shellfish harvesting in the Conditionally Classified Harvest Areas adjacent to the FCPCC.
- Outlines the roles and responsibilities of the signatories in the event of a discharge of wastewater into the marine environment from the collection system pump stations that carry wastewater to FCPCC.

No closures or re-openings occurred in 2022. Please refer to Appendix F the 2022 CMP Annual Report.

14) Facility Upgrades & Major Projects

14.1 Upgrades and Repairs Completed in 2022

- ATAD Cleaning
- Centrifuge #1 Rotating Assembly
- Hall Road pump replacement
- Lee Road Genset Installation
- Trickling Filter Piping Repair

14.2 Studies and Projects Completed in 2022

- Lee Road and Hall Road Operator Platform Replacement Design (ongoing)
- FCPCC Stage 4 Expansion and Odour Control Upgrade Detailed Design (ongoing)
- Bay Ave Pump Station Upgrade Construction
- Reclaimed water study
- Partnership with UVic and Pani Energy as part of a Covid-19 monitoring project.
- Contaminants of Emerging Concern Study
- Qualicum Beach manhole repairs

14.3 Upgrades and Repairs Planned for 2023

- Bay Avenue Pump Station Replacement.
- Lee Road and Hall Road Operator Platform Replacement

14.4 Studies and Projects Planned for 2023

- FCPCC Stage 4 Expansion and Odour Control Upgrade Detailed Design (ongoing). The tendering of this project is planned for 2024
- Bay Ave Pump Station Upgrade Construction (to be completed)
- ISO 14001:2015 Surveillance Audit.

15) Resource Recovery

15.1 Biosolids Reuse

Since 1999, RDN biosolids have been beneficially used in agriculture, landfill closures, mine reclamation, and forest fertilization. Biosolids management in 2022 is discussed in Section 6.5.

15.2 Effluent Reuse

The reuse of effluent in operational processes at FCPCC has decreased the plant's demand for potable water from the community's supply. Effluent was reused to irrigate Morningstar Golf Course in 2022.

15.3 Solid Waste Recycling

Wastewater Services has a general recycling program at the treatment plant, initiated as part of the department's Environmental Management System, and continues to recycle waste oils, paints and paint thinners.

16) Education Programs

16.1 Source Control

In November 2015, the Board approved the new Source Control Bylaw No. 1730 which replaces the old Bylaw No. 1225. This bylaw regulates the discharge of waste into any sewer or drain connected to a sewage facility operated by the RDN. The new bylaw provides a process for issuing Waste Discharge Permits and a new fee structure based on waste strength and volume. The bylaw applies to discharges in municipal collection systems. The Bylaw also contains new prohibited waste items and new provisions for fees and enforcement.

In January 2017, the RDN Board adopted the new Trucked Liquid Waste Rates and Regulations Bylaw No. 1732 which replaces Bylaw Nos. 988, 1218, and 1224. Bylaw No. 1732 introduced more source control provisions including an expanded schedule of prohibited wastes and a new a schedule of restricted wastes. It also introduced more enforcement tools.

Wastewater Services has also been active in promoting the Medications Return Program at public events, including open houses and SepticSmart workshops (see: medicationsreturn.ca).

16.2 Water Conservation

The RDN has a water conservation and outreach program called Team WaterSmart for municipalities in the region and electoral areas.

The RDN's Board also recently approved a new Water Conservation Plan in 2020. This plan was completed in collaboration with water conservation planning work done by the City of Parksville, Town of Qualicum Beach, and other member municipalities.

16.3 Open House

Open houses provide the public with an opportunity to tour the facilities, learn about recent upgrades, browse informative posters, and display material, and forward questions and concerns to staff directly. There were no open houses in 2022. However, the public were invited to two public information sessions on September 20, 2022, for the Expansion and Odour Control Upgrade Project.

16.4 SepticSmart

SepticSmart is and RDN educational program that provides information on septic system operation and maintenance. It aims to prolong the life of functioning systems in the region. The SepticSmart program includes an information package, annual workshops and a rebate program. More information on the SepticSmart Program is available at: https://www.rdn.bc.ca/septicsmart.

No SepticSmart workshops were held in 2022.

In 2014, the RDN launched the Septic Maintenance Rebate program to: 1) make it easier for residents to manage septic system maintenance, 2) promote long-term maintenance habits, and 3) maximize the longevity of existing onsite systems. The SepticSmart rebate program was offered in 2022. To date, more than $300,000 in rebates have been issued to homeowners towards septic tank repairs and maintenance as part of this program.

16.5 Liquid Waste Management Plan

The RDN Liquid Waste Management Plan (LWMP) is a 20-year plan to support sustainable wastewater management in the region. This plan authorizes the RDN to find community-driven and cost-effective solutions to protect public health and achieve a standard level of wastewater treatment over a reasonable timeframe. The BC Ministry of the Environment and Climate Change Strategy approved the RDN's LWMP in October 2014. An annual report on LWMP implementation will also be submitted under separate cover in June.

16.6 Website

The RDN's Wastewater Services department website www.rdn.bc.ca/wastewater-services is regularly updated and provides education material related to wastewater treatment, environmental management, pollution prevention and septic system maintenance (the SepticSmart program).

The Get Involved portion of the RDN website is an online public engagement space that hosts outreach information specific to the regional projects. In 2022, the following FCPCC projects were highlighted on the Get Involved page:

- FCPCC Expansion and Odour Control Upgrade Project

- Bay Avenue Pump Station Replacement.

17) Conclusions

Table 34 summarizes the 2022 permit monitoring data for FCPCC.

Table 21. FCPCC Summary of Compliance

Summary of Compliance	Permit	2022	Non-compliances
Maximum Daily Flow (Outfall)	16,000 m^3/day	18,580.1 m^3/day	2
Average Daily Flow	-	10,493.7 m^3/day	
Average Daily $cBOD_5$ (Outfall)	45 mg/L	20.6 mg/L	0
Average Daily TSS (Outfall)	60 mg/L	20.5 mg/L	0

17.1 Flows

The average daily flow discharged in 2022 was 10,494 m^3/day. The total annual flow was 3,830,188 m^3. The highest daily outfall flow was 18,580.1 m^3/day. There were 2 flow non-compliances in 2022.

From June to September, no effluent was discharged to lagoons on Morningstar Golf Course for irrigation. The Morningstar Golf Course effluent reuse program resumed in 2019-2021 but discontinued in 2022. The maximum permitted flow of that can be discharged to the lagoons is 1,370 m^3/day.

17.2 Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

The average $cBOD_5$ concentration for influent and outfall effluent was 187 mg/L and 20.6 mg/L, respectively. The average $cBOD_5$ removal efficiency in 2022 was approximately 88.8%. There was no BOD non-compliance from the outfall effluent in 2022.

17.3 Total Suspended Solids (TSS)

The average TSS concentration for influent and outfall effluent was 304 mg/L and 20.5 mg/L, respectively. The average TSS removal efficiency in 2022 was approximately 92.8%.There were no TSS permit non-compliances in 2022 for the effluent to the outfall.

17.4 General Parameters, Metals, Volatile and Semi-Volatile Compounds

Results reported for 2022 for all general parameters, metals, volatile and semi-volatile compounds were consistent with previous years. Note, only one sample is taken per year so limited conclusions can be made on trending of the parameters.

17.5 Biosolids Quality

The biosolids generated by FCPCC met the standards for Class A biosolids given in Schedules 3 and 4 of OMRR based on sampling for the Land Application Plan completed by SYLVIS Environmental (Appendix G). In the RDN sampling program, biosolids met Class A standards for metals. Nine samples were taken for fecal coliforms. One sample had a high fecal coliform result. This result is believed to be due to sampling methodology. Appendix C contains additional information on this non-conformance.

Appendix A – Waste Management Permit No. PE-4200 & Amendments

Province of
British Columbia

Ministry of
Environment

Vancouver Island Region
Regional Headquarters
2569 Kenworth Road
Nanaimo
British Columbia
V9T 4P7
Telephone: (604) 758-3951

JUL 10 1990

REGISTERED MAIL

File: PE-4200

Regional District of Nanaimo
6300 Hammond Bay Road
Lantzville, British Columbia
V0R 2H0

Gentlemen:

LETTER OF TRANSMITTAL

Enclosed is a copy of amended Permit No. PE-4200, issued under the provisions of the Waste Management Act, in the name of Regional District of Nanaimo. Your attention is respectfully directed to the terms and conditions outlined in the Permit. An annual fee for Permit No. PE-4200 will be determined on the basis of your industrial code and capacity in accordance with the Waste Management Fees Regulation.

The administration of this Permit will be carried out by staff from our Regional Office located at 2569 Kenworth Road, Nanaimo, British Columbia, V9T 4P7 (telephone 758-3951). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

You will note that values have been expressed in the International System of Units (SI). These units are to be used in submitting monitoring results and any other information in connection with this Permit.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

Yours very truly,

G. E. Oldham, P. Eng.
Regional Waste Manager

805.90 Enclosure
28.5.90
DAB 09/06/90

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MINISTRY OF ENVIRONMENT

PERMIT

Under the Provisions of the Waste Management Act

REGIONAL DISTRICT OF NANAIMO
6300 Hammond Bay Road
Lantzville, British Columbia
V0R 2H0

is hereby authorized to discharge effluent from a municipal sewage system located within the Regional District of Nanaimo to the Strait of Georgia and to storage lagoons at the Morningstar Golf Course near Parksville, British Columbia

This permit has been issued under the terms and conditions prescribed in the attached Appendices

01, 02, A-1, A-2, B-1, B-2, C-1 and C-2

Regional Waste Manager
Permit No. PE-4200

Date issued: January 16, 1976
Date amended: JUL 10 1990
28.05.90
20.5.90
09/04/91

ENV 2093

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX 01

to Permit No. PE-4200

(Effluent)

(a) The discharge of effluent to which this appendix is applicable is from a municipal sewage system servicing the Parksville and Qualicum Beach area as shown on the attached Appendix A-1.

(b) The maximum rate at which effluent may be discharged is 16 000 m^3/d.

(c) The characteristics of the effluent shall be equivalent to or better than:
5-day Biochemical Oxygen Demand - 45 mg/L
Total Suspended Solids - 60 mg/L.

(d) The works authorized are screening, degritting and ancilliary facilities, a secondary treatment plant, sludge digestion and dewatering facilities and an outfall with diffuser extending 2440 m from mean low water to a depth of 61 m below mean low water and related appurtenances approximately located as shown on the attached Appendix A-1.

(e) The location of the facilities from which the effluent originates and to which this appendix is appurtenant is Lot 2, Plan 2570, District Lot 28, Nanoose District.

(f) The location of the point of discharge and to which this appendix is appurtenant is the Strait of Georgia off the mouth of French Creek.

(g) Those works authorized must be completed and in operation on and from the date of this appendix.

Date issued: January 16, 1976

Date amended: JUL 10 1990

28.05.90

28.5.90

PAB 03/04/90

Regional Waste Manager

ENV. 2096 W-817

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX 02

to Permit No. PE-4200

(Effluent)

(a) The discharge of effluent to which this appendix is applicable is from a municipal sewage treatment facility as shown on the attached Appendix A-2.

(b) The maximum rate at which effluent may be discharged is 1 370 m^3/d.

(c) The characteristics of the effluent shall be equivalent to or better than:
5-day Biochemical Oxygen Demand - 20 mg/L;
Total Suspended Solids - 30 mg/L.

(d) The works authorized are a secondary sewage treatment plant, a pump station and pipeline, and related appurtenances approximately located as shown on the attached Appendix A-2.

(e) The location of the facilities from which the effluent originates and to which this appendix is appurtenant is Lot 2, Plan 2570, District Lot 28, Nanoose District.

(f) The location of the point of discharge and to which this appendix is appurtenant is a pipeline to storage lagoons (authorized works under Waste Management Permit No. PE-8195) situated on the northern half of District Lot 83, Nanoose Land District.

(g) Those works authorized must be completed and in operation on and from the date of this appendix.

Date issued: JUL 10 1990

Date amended: 28.05.90

28.5.90

09/04/92

Regional Waste Manager

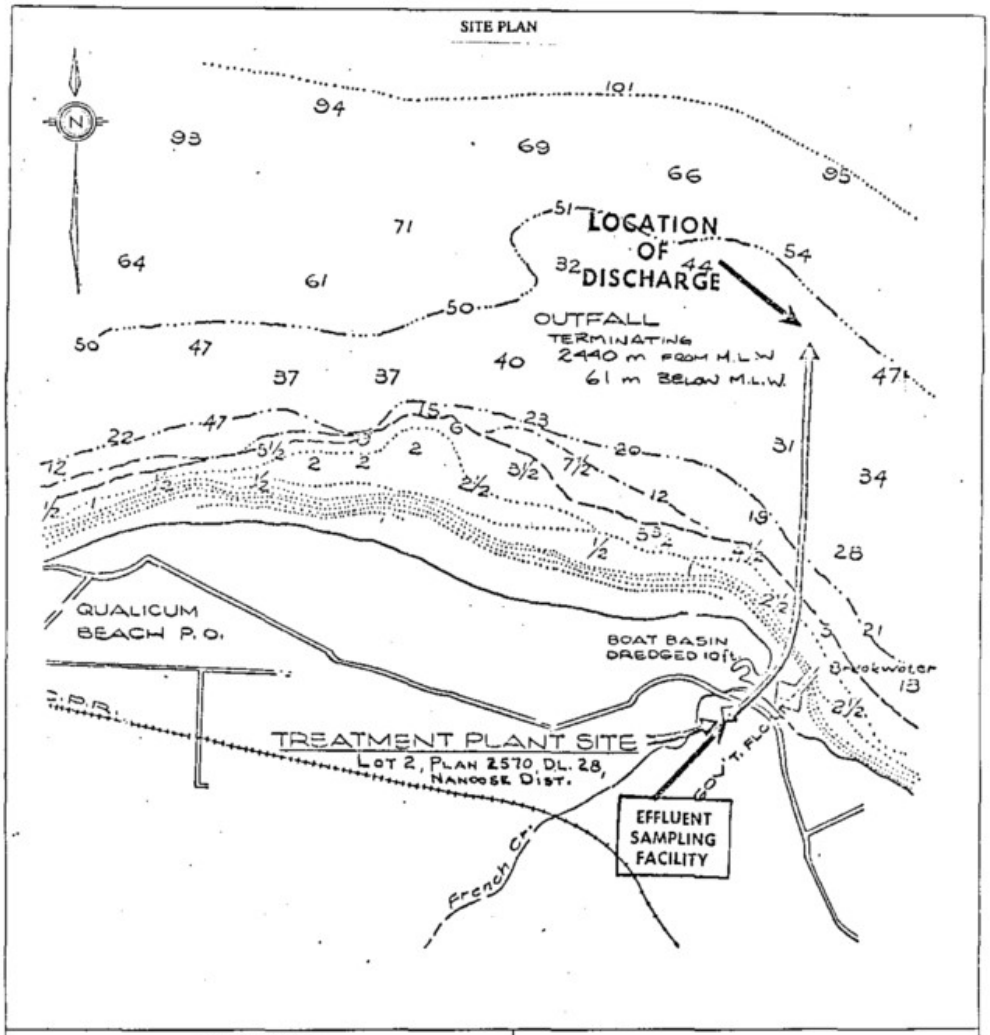
ENV. 2096 W&H7

Province of British Columbia

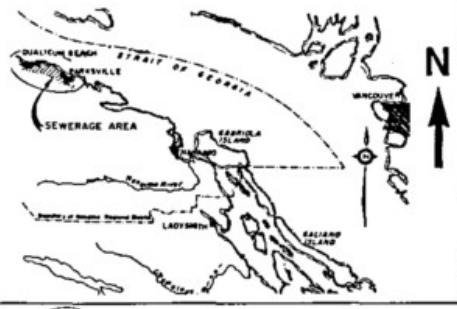
Ministry of Environment

WASTE MANAGEMENT

SITE PLAN



LOCATION MAP



Regional District of Nanaimo
(Name of applicant(s))

(Date) (Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

Date Issued JUL 10 1990 Regional Waste Manager

Date Amended

Appendix A-1 to Permit No. PE-4200

Approval No.

ENV 1987

28.05.90

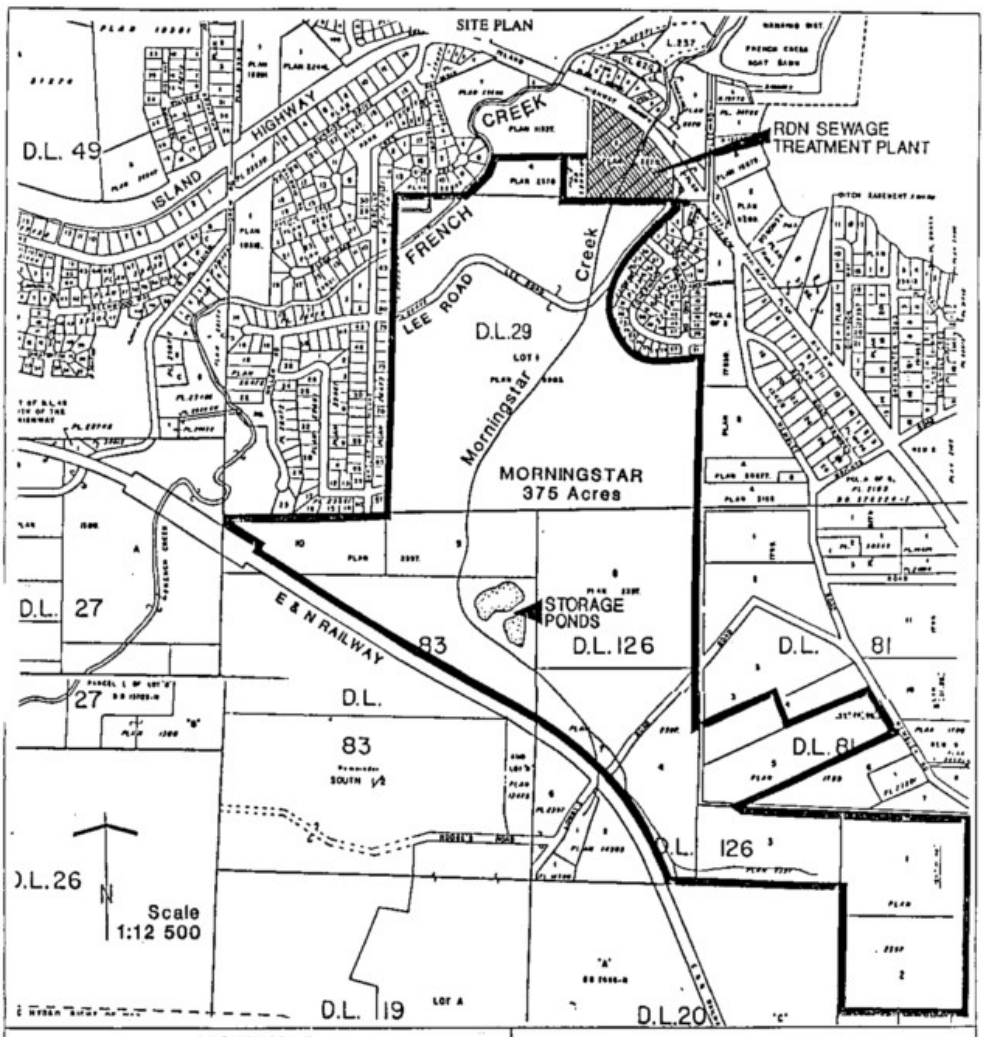
28.5.90

RMS 09/04/90

Province of British Columbia

Ministry of Environment

WASTE MANAGEMENT



LOCATION MAP

Regional District of Nanaimo
(Name of applicant(s))

(Date) (Signature of applicant(s) or agent)

(FOR OFFICE USE ONLY)

JUL 10 1990
Date Issued

Regional Waste Manager

Date Amended

Appendix A-2 to Permit No. PE-4200

Approval No.

ENV 1987 08.05.90

28.5.90

RAS 09/06/90

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX B-1

to Permit No. PE-4200

A. MAINTENANCE OF WORKS

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. Notify the Regional Waste Manager of any malfunction of these works.

B. EMERGENCY PROCEDURES

In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

C. BYPASSES

The discharge of effluent which has bypassed the authorized works is prohibited unless the approval of the Director or the Regional Waste Manager is obtained and confirmed in writing.

D. PROCESS MODIFICATIONS

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

E. OUTFALL INSPECTION

The Permittee shall conduct a dye test on the outfall line authorized in Appendix 01 (or inspect by another method approved by the Regional Waste Manager) once every five years or as may otherwise be required by the Regional Waste Manager.

F. DISINFECTION

Although disinfection of the effluent discharge authorized by Appendix 01 is not required at this time, suitable provisions should be made to include disinfection facilities in the future. If disinfection is by chlorination, dechlorination facilities may also be required.

Date issued: JUL 10 1990

Date amended: _____

_____

_____

Regional Waste Manager

2805.90

28.5.90

RAB 07/06/90

ENV. 2096 WASTE

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX B-2

to Permit No. PE-4200

G. SLUDGE WASTING AND DISPOSAL

Sludge wasted from the treatment plant shall be disposed of to a site and in a manner approved by the Regional Waste Manager.

H. EFFLUENT UPGRADING

Based on receiving environment monitoring data and/or other information obtained in connection with this discharge, the Permittee may be required to provide additional treatment facilities.

Date issued: JUL 10 1990

Date amended: _____

28.05.90

~~RA~~ 28.5.90

~~RAB~~ 09/06/90

Regional Waste Manager

ENV. 2096 W-817

MINISTRY OF ENVIRONMENT
WASTE MANAGEMENT BRANCH

APPENDIX C-1

to Permit No. PE-4200

A. SAMPLING AND ANALYSIS

The Permittee shall install a suitable sampling facility and obtain a grab sample of the effluent once every day. The sample shall be analyzed on a daily basis for Total Suspended Solids and on a weekly basis for 5-day Biochemical Oxygen Demand.

Once per year a composite sample, over an eight-hour period, shall be taken during a low flow period in July or August and analyzed for parameters such as metals, volatile organics, phenolics, organochlorine pesticides, acid extractable herbicides, anions, and inorganics. The Regional Waste Manager shall advise the Permittee in writing of the specific parameters to be analyzed.

B. FLOW MEASUREMENT

For the discharge authorized by Appendix 01, provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over a 24-hour period.

C. SAMPLING AND ANALYTICAL PROCEDURES

Sampling and flow measurement shall be carried out in accordance with the procedures described in "Field Criteria for Sampling Effluents and Receiving Waters", April 1989.

Analyses are to be carried out in accordance with procedures described in "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials, (1976 edition including updates)", April 1989.

Copies of the above manuals are available from the Data Standards Group, Ministry of Environment, 3800 Wesbrook Mall, Vancouver, British Columbia, V6S 2L9, at a cost of $20.00 and $70.00, respectively, and are also available for inspection at all Waste Management offices.

Date issued: JUL 10 1990

Date amended: _____

_____

_____

Regional Waste Manager

DAA 06/07/90

V. 2096 WBB 4.7.90

04.07.90

MINISTRY OF ENVIRONMENT

WASTE MANAGEMENT BRANCH

APPENDIX C-2

to Permit No. PE-4200

D. RECEIVING ENVIRONMENT MONITORING

At the discretion of the Regional Waste Manager, the Permittee may be required to conduct a receiving environment monitoring program for the discharge authorized by Appendix 01. The program shall be established in consultation with the Regional Waste Manager, who will advise the Permittee in writing of the program requirements.

E. REPORTING

Maintain data of analyses and flow measurements for inspection and once per month submit the data, suitably tabulated, to the Regional Waste Manager for the previous month's monitoring. The first report is to be submitted by September 30, 1990.

Date issued: JUL 10 1990

Date amended: _____

_____

_____

Regional Waste Manager

ENV. 2096 w617 Paris 05/07/90 4.7.90 09.07.90

Province of
British Columbia
Ministry of
Environment,
Lands and Parks

BC Environment

Environmental Protection Division
777 Broughton Street
Victoria
British Columbia
V8V 1X5

COPY

Telephone: (604) 387-9974
Facsimile: (604) 356-9836

File: PE-4200

June 17, 1993

Regional District of Nanaimo
6300 Hammond Bay Road
Lantzville, British Columbia
V0R 2H0

Dear Permittee:

Re: Notification of Amendment to Permit No. PE-4200

Please note that Permit No. PE-4200, issued under the provisions of the Waste Management Act, in the name of Regional District of Nanaimo is amended by adding to Appendix B-2 the following clauses:

(h) FACILITY CLASSIFICATION

The Permittee shall classify the wastewater treatment facility authorized in part (d) of Appendix No. 01 (the facility) and the classification shall be maintained with the "British Columbia Water and Wastewater Operators Certification Program Society" (BCWWOCPS). The Permittee shall submit an application to classify the facility to BCWWOCPS by **August 1, 1993**. Although the facility may have already been voluntarily classified previously, an application for classification must be submitted by the above date.

(i) OPERATOR CERTIFICATION

If the facility is classified by the BCWWOCPS (the Program) at Level II or higher, the Permittee shall ensure that all operators of the facility shall be certified by the Program to a Class I level, at a minimum, by **December 1, 1994**.

Operators in Training:

The Permittee shall ensure that all operators in training (OIT) working at the facility classified by the BCWWOCPS at Level II or higher shall be required to successfully pass an OIT examination within three (3)

../2

months of commencement of employment at the facility. The OIT certificate shall be valid for fifteen (15) months from the date of issue. Prior to the expiry date of the OIT certificate, but not sooner than twelve (12) months from the date when the OIT commenced facility operation, the OIT shall successfully complete a Class I certification examination in order to continue to operate at the facility.

Chief Operator: Level II or higher

If the facility is classified by the BCWWOCPS at Level II or higher, the Permittee shall designate at least one operator to be the "Chief Operator" of the facility by **December 1, 1996**. The "Chief Operator" shall be certified at a Class II level, at a minimum.

After **December 1, 1996**, no person shall have "Direct Responsible Charge", as defined by the BCWWOCPS, of a municipal wastewater treatment facility classified at Level II or higher unless they possess a valid operator's certificate not more than one level below the classification level of the facility.

Chief Operator: Level III and IV

If the facility is classified by the BCWWOCPS at Level III, the Permittee shall designate a "Chief Operator", certified at a Class III level by **December 1, 1998**.

If the facility is classified by the BCWWOCPS at Level IV, the Permittee shall designate a "Chief Operator", certified at a Class IV level by **December 1, 1998**.

All other terms and conditions of Permit No. PE-4200 remain in full force and effect. If you have any questions regarding this amendment please contact John Finnie at 751-3183.

Yours truly,

R.J. Driedger,
Deputy Director of Waste Management

cc: Ted Oldham
BCWWOCPS

DB
AGL
BMM

August 24, 1994

File: PE-4200

Regional District of Nanaimo
6300 Hammond Bay Rd
PO Box 40
Lantzville BC V0R 2H0

ATTENTION: Mike Donnelly
Manager of Operations

Dear Mike Donnelly:

Re: Monitoring of French Creek
Pollution Control Centre Effluent

As outlined in Appendix C-1 to Permit PE-4200, the Regional District of Nanaimo is required to obtain a composite sample of the effluent once per year during July or August and have the sample analyzed for several parameters. The exact parameters were listed in our letter to you dated July 17, 1990 (copy enclosed). Our records indicate that the Regional District last sampled for these specific parameters on July 16, 1992.

Environmental Protection staff have reviewed the results of your July, 1992 sampling. Since the analysis shows that the levels meet the ministry's 1994 Approved and Working Criteria for Water Quality, we advise you that repeating this sampling procedure is not necessary at this time, although it may be required in the future.

If you have any questions or concerns, please contact Al Leuschen, P. Eng., or Bernie MacKay of this office at 751-3100.

Yours truly,

J. O. Finnie, P.Eng.
Head, Municipal & Environmental
Safety Sections
Environmental Protection
DB/dpc
monitor.db
Enclosure

94.08.25

Appendix B – Internal Flow Monitoring and Laboratory Raw Data (Permit Data)

2022 Outfall Flows (Cubic Metres)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	12,627.6	10,208.6	11,622.3	10,409.9	10,668.6	10,160.3	10,471.5	10,950.4	10,616.1	9,743.3	9,379.8	9,532.1
2	18,580.1	10,230.4	11,196.3	10,259.1	10,813.9	10,058.9	10,584.5	10,943.9	10,389.7	9,730.8	9,200.4	9,564.8
3	15,453.0	10,179.4	10,914.5	12,166.5	10,928.0	10,367.1	10,825.3	10,602.5	10,503.0	10,008.8	9,862.2	9,580.3
4	13,402.8	10,219.7	10,507.0	11,786.3	10,579.3	10,429.8	11,637.7	10,783.7	10,130.7	9,503.4	9,681.9	9,491.8
5	12,419.3	10,233.2	10,557.4	11,068.0	11,092.6	10,361.4	10,725.5	10,962.7	10,373.3	9,486.6	9,636.5	9,696.3
6	12,163.8	10,099.3	10,213.6	10,641.8	10,899.3	10,316.5	10,669.4	10,825.1	10,304.1	9,446.1	10,231.2	9,429.4
7	13,522.1	10,093.8	10,385.4	10,655.0	10,758.7	10,023.7	10,738.2	10,749.6	10,235.6	9,523.3	9,845.3	9,636.8
8	11,943.5	9,806.7	9,874.2	10,498.8	10,394.2	10,922.0	10,327.0	11,056.9	10,055.1	9,691.6	9,668.2	9,846.5
9	11,695.3	9,980.1	9,985.3	11,263.1	10,446.2	9,778.5	10,699.5	11,162.7	10,053.1	9,776.8	9,662.0	10,676.6
10	12,887.7	9,924.7	9,871.4	13,595.9	10,175.4	10,454.9	10,444.5	10,937.9	10,033.9	9,684.8	9,301.4	10,983.2
11	13,442.4	9,806.0	9,927.2	12,320.4	10,302.1	10,239.1	10,870.3	11,107.3	10,031.8	9,860.6	9,538.6	10,179.2
12	15,992.9	9,960.3	10,090.8	11,408.2	11,188.7	10,666.0	10,843.6	10,945.5	10,332.7	9,514.8	9,842.0	9,631.1
13	13,085.7	10,020.7	10,202.9	11,380.4	10,752.4	10,410.7	10,725.9	10,725.6	10,189.2	9,045.0	9,386.5	9,625.7
14	12,185.7	10,334.4	10,591.9	10,934.2	10,822.2	10,658.8	10,959.3	10,682.8	10,127.8	9,424.0	9,444.6	9,260.3
15	11,745.9	9,747.1	10,316.6	10,892.8	11,386.5	10,587.4	10,922.1	10,959.4	9,841.3	9,495.0	9,104.4	9,106.0
16	11,424.8	9,792.5	10,168.6	10,955.3	10,873.9	10,756.5	10,894.8	10,918.9	9,834.5	9,489.7	8,960.7	9,115.8
17	11,193.2	9,904.8	10,820.0	10,976.7	10,736.0	10,638.6	10,654.1	10,764.8	9,929.7	9,349.2	9,013.0	9,536.8
18	10,968.5	9,967.6	9,753.3	12,416.6	10,791.9	10,490.0	11,048.2	10,889.5	9,923.2	9,208.8	9,022.1	9,273.3
19	11,286.3	10,139.2	10,330.1	11,459.7	10,751.5	10,472.9	10,720.0	10,767.0	9,837.3	9,343.2	9,167.4	9,302.6
20	11,208.6	10,257.4	10,348.9	11,249.7	10,607.5	10,371.6	11,238.8	10,605.9	9,770.9	9,214.3	9,192.5	9,282.6
21	10,723.6	10,360.4	10,608.7	11,579.0	10,530.3	10,220.0	10,725.2	10,659.9	9,814.9	9,302.0	9,219.9	9,362.2
22	10,809.2	9,835.8	10,329.7	10,925.8	10,513.6	10,556.2	10,242.7	11,430.0	9,800.9	9,269.6	9,330.6	9,521.7
23	10,602.5	10,072.7	10,206.7	11,070.4	10,648.0	9,945.5	10,437.8	10,833.2	9,664.1	9,232.5	9,450.5	10,758.0
24	10,381.2	9,204.1	10,311.7	10,807.4	10,088.2	10,078.4	10,380.4	10,888.8	9,874.4	9,592.3	9,292.1	13,984.4
25	9,892.4	10,172.2	10,421.3	10,800.8	10,221.2	10,310.2	10,944.4	10,587.4	9,669.6	9,402.8	9,446.8	13,032.0
26	10,074.1	11,244.9	10,668.5	10,601.9	10,180.4	10,320.4	10,657.2	10,580.1	9,781.4	9,324.9	9,658.9	14,636.7
27	10,024.7	11,614.8	11,170.2	10,392.2	10,377.6	10,441.3	11,045.1	10,456.3	9,768.8	9,951.2	9,599.8	16,408.1
28	10,199.4	11,605.9	11,035.2	10,347.5	10,040.4	10,564.5	11,154.6	10,454.0	9,781.2	9,532.0	9,452.9	12,834.6
29	10,403.5		10,728.7	10,791.4	10,068.5	10,420.4	11,055.8	10,502.1	9,764.1	9,346.5	9,421.0	12,256.2
30	11,052.0		10,300.5	10,814.7	10,066.1	10,441.5	10,950.9	10,365.0	9,538.0	9,528.6	9,504.8	11,888.3
31	10,685.2		10,350.7		10,167.0		10,793.9	10,336.1		9,331.7		11,382.3
Total:	**372,077**	**285,017**	**323,810**	**334,470**	**327,870**	**311,463**	**334,388**	**334,435**	**299,970**	**294,354**	**283,518**	**328,816**
Average:	**12,002**	**10,179**	**10,445**	**11,149**	**10,576**	**10,382**	**10,787**	**10,788**	**9,999**	**9,495**	**9,451**	**10,607**
Minimum:	**9,892**	**9,204**	**9,753**	**10,259**	**10,040**	**9,779**	**10,243**	**10,336**	**9,538**	**9,045**	**8,961**	**9,106**
Maximum:	**18,580**	**11,615**	**11,622**	**13,596**	**11,387**	**10,922**	**11,638**	**11,430**	**10,616**	**10,009**	**10,231**	**16,408**
Non compliance (max flow)	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Maximum permitted daily flow: 16,000 cubic metres/day

2022 Influent 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) (mg/L)												
Day	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1		175	184		155				290			169
2						169		149		182		
3		180	190		163		149				214	
4								148				211
5				184	188	175	164					
6	149	190	173						222	200	226	188
7				218		204	189	171				
8		194	181		NR				212		167	199
9	158					162		175				
10		176	182	118	202		154					
11	171							151	215	202		143
12					196	173	202					
13	165	191	188							195	181	185
14						171	NR	158				
15		189	176		158				186		203	162
16	158					178		193		182		
17		181	169		222		NR				235	
18	188							235		188		192
19				214	205	210	NR					
20	136		204						164	234	212	
21				162		184	254	187				
22		237	186						226		163	225
23	155					208		192		173		
24		211	204	161	188		214				249	
25	189							239	178	192		
26				167	190	250	156					
27	201		170						163	154	162	96
28		218		205		210	252	221				
29			158		192							167
30	163		213							168		
31					190							
Average	**167**	**195**	**184**	**179**	**187**	**191**	**193**	**185**	**206**	**188**	**201**	**176**

2022 Effluent 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) (mg/L)

Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1		27.2	32.4		21.0				19.8			17.3
2						13.9		15.7		11.0		
3		32.3	31.1		20.7		14.1				15.2	
4								17.6				12.8
5				28.3	24.8	21.5	20.8					
6	32.2	33.7	25.4						15.4	13.3	15.5	15.1
7				28.9		17.8	16.9	11.0				
8		42.4	28.8		NR				19.2		15.2	13.8
9	26.5					25.1		19.9				
10		37.8	37.1	21.5	26.0		13.1					
11	27.4							13.2	10.9	13.5		10.1
12					21.4	14.9	18.5					
13	29.9	29.4	25.3							13.3	10.5	16.0
14						16.0	NR	10.0				
15		33.3	32.1		16.3				13.1		17.2	9.8
16	22.8					14.6		13.7		10.8		
17		34.7	26.7		20.3		NR				14.4	
18	28.7							15.3		13.7		14.1
19				27.8	21.3	13.6	NR					
20	24.6		29.6						13.1	14.9	14.6	
21				22.4		19.3	20.9	11.1				
22		42.7	30.6						14.0		11.8	16.7
23	26.2					20.9		14.3				
24		31.1	34.3	23.0	NR		10.5				15.7	
25	29.8							16.8	11.3	12.5		
26				23.3	15.5	31.3	14.2					
27	27.0		26.0						12.4	12.0	13.9	24.3
28		30.9		23.1		30.5	13.8	18.0				
29			29.1		13.5							18.3
30	24.4		31.0							10.5		
31					19.4	19.4						
Average	**27.2**	**34.1**	**30.0**	**24.8**	**20.0**	**19.9**	**15.9**	**14.7**	**14.4**	**12.6**	**14.4**	**15.3**
Noncompliance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

FCPCC Outfall Maximum $cBOD_5$: 45 mg/L

2022 Influent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	250	251	209	423	273	421	205	188	408	259	282	324
2	190	414	268	229	327	325	211	235	292	291	270	294
3	171	279	413	227	324	354	214	240	177	326	382	241
4	207	216	218	329	359	293	252	206	280	502	279	223
5	238	310	290	271	282	365	201	245	237	720	415	322
6	257	243	235	308	222	296	270	204	281	351	235	353
7	349	300	286	295	240	441	312	159	228	568	269	377
8	200	251	286	239	260	566	205	258	233	189	295	275
9	300	400	357	290	366	355	233	280	312	212	388	251
10	258	351	317	229	324	437	221	254	279	257	237	251
11	304	286	263	217	309	230	364	210	248	275	405	220
12	251	260	246	226	399	398	331	201	228	344	283	232
13	278	244	253	310	259	275	266	118	204	339	296	259
14	205	352	406	306	403	289	333	175	263	333	435	281
15	227	250	304	264	252	285	525	297	236	386	437	219
16	263	392	299	268	244	313	290	372	290	278	417	319
17	289	266	311	284	377	356	288	324	275	277	282	894
18	463	299	223	331	370	768	496	347	255	405	471	264
19	340	267	261	285	353	295	317	288	314	581	306	263
20	260	254	271	360	287	357	397	265	319	451	286	261
21	286	314	398	329	254	360	376	232	143	348	300	399
22	331	259	273	295	343	360	254	282	391	267	308	274
23	270	402	254	493	293	456	282	330	295	263	298	350
24	344	283	245	283	281	302	394	363	303	471	321	242
25	342	311	258	299	463	293	334	308	286	284	399	253
26	271	275	252	336	329	281	216	392	319	269	391	106
27	259	270	255	313	398	326	171	223	255	292	229	158
28	264	288	279	436	338	361	310	249	282	351	286	344
29	278		289	315	337	338	373	267	377	274	480	332
30	218		272	284	329	256	327	281	244	255	342	231
31	315		297		362		285	262		399		253
Average:	**273**	**296**	**283**	**302**	**321**	**358**	**298**	**260**	**275**	**349**	**334**	**292**

2022 Effluent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	37.6	24.4	25.6	29.0	20.0	23.0	19.0	9.8	14.6	12.6	12.0	18.2
2	37.6	29.6	22.0	27.8	20.2	23.2	24.8	12.2	10.6	14	10.8	16.2
3	40.4	27.8	20.6	29.6	22.2	10.8	20.0	11.2	13.2	17	14.4	14.2
4	39.2	35.0	19.2	42.2	21.4	13.6	27.4	13.8	11.4	13.6	11.6	13.6
5	33.4	27.8	26.8	28.0	18.8	24.8	24.0	15.2	11.0	15	15.2	17.2
6	35.4	22.8	14.4	21.0	18.6	25.0	20.4	14.6	10.6	15.0	13.4	17.4
7	40.6	36.0	22.0	23.8	20.8	33.6	19.2	12.8	13.4	12.4	13.8	17.0
8	25.0	43.6	21.6	24.0	18.4	36.2	20.4	15.2	12.4	14.4	17.0	15.8
9	22.4	36.0	20.6	24.0	17.6	32.0	19.2	19.4	13.6	13.8	18.6	17.8
10	33.6	32.6	32.0	30.6	19.8	25.0	19.6	14.8	11.8	11.6	18.2	22.6
11	30.6	37.4	26.4	32.2	25.6	16.6	21.0	10.4	8.8	16.2	18.0	15.0
12	50.2	34.8	22.8	33.0	21.8	16.2	19.0	12.2	14.0	17.6	22.6	17.6
13	35.2	19.6	22.4	23.6	20.4	19.8	15.0	15.4	12.6	16.4	14.2	25.4
14	31.0	26.0	34.2	24.8	19.6	19.8	14.2	11.2	11.0	18.6	17.2	23.0
15	26.6	28.4	38.6	24.6	15.4	17.8	13.4	13.8	10.2	16	23.6	18.8
16	27.0	19.4	39.4	32.2	16.8	17.8	12.6	13.6	10.6	13	25.8	22.0
17	26.4	20.4	31.2	25.4	18.8	16.6	11.0	15.0	12.2	17	18.6	25.4
18	25.0	20.8	30.0	24.6	18.8	17.4	18.4	17.0	10.4	15.0	17.0	22.6
19	28.4	20.8	41.1	35.8	24.8	16.2	17.0	16.0	9.8	16.8	19.4	30.0
20	20.4	19.0	18.0	32.2	18.8	27.4	20.2	17.0	12.2	15.0	13.6	25.5
21	21.0	13.6	27.8	25.8	20.8	21.6	18.2	11.8	12.6	24.0	14.0	12.6
22	22.8	22.0	21.8	25.8	14.8	28.0	15.4	15.8	12.8	12.5	12.8	19.4
23	19.6	25.6	20.4	32.0	17.2	26.8	12.2	15.4	11.8	10.6	11.4	19.0
24	23.4	16.8	24.4	21.8	21.2	21.8	10.8	11.8	11.6	16.6	12.4	42.5
25	23.6	33.2	27.8	26.4	17.8	25.6	15.4	8.8	12.0	13.4	15.0	27.0
26	21.4	36.0	23.8	28.4	17.8	18.8	13.8	9.6	10.4	16.4	16.0	20.0
27	22.2	28.8	21.0	22.8	20.8	25.0	15.6	13.4	11.4	14.6	12.2	33.4
28	27.8	21.8	24.0	24.0	21.2	35.4	13.6	11.0	11.0	12.2	14.4	26.4
29	26.8		24.0	24.8	19.2	22.8	14.4	13.0	12	11.8	32.0	24.8
30	22.2		14.2	22.2	25.0	16.6	14.4	13.4	9.4	12.8	18.2	24.4
31	26.8		24.6		25.4		11.8	12.2		14.2		35.6
Average:	**29.1**	**27.1**	**25.2**	**27.4**	**20.0**	**22.5**	**17.1**	**13.4**	**11.6**	**14.9**	**16.4**	**21.9**
Non-Compliance	0	0	0	0	0	0	0	0	0	0	0	0

FCPCC Outfall Maximum TSS: 60 mg/L
Days highlighted in yellow were days in which TSS exceed levels in the outfall permit.

2022 Influent Ammonia (NH_3) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Sample 1	19.9	35.8	36.1	26.1	31.9	34.4	35.2	35.6	35.5	34.2	28.0	25.4
Sample 2	25.8	39.3	33.2	27.2	38.2	34.0	36.8	36.0	35.3	31.8	33.5	27.3
Sample 3	31.0	35.5		29.9	34.6	32.4	28.8	34.1	34.7	31.6		31.4
Sample 4	32.2	29.9		32.6	38.1	36.5	36.3	31.8	35.8			26.4
Sample 5	30.5				36.8			37.2				21.4
Sample 6												
Average	**27.9**	**35.1**	**34.7**	**29.0**	**35.9**	**34.3**	**34.3**	**34.9**	**35.3**	**32.5**	**30.8**	**26.4**

2022 Effluent Ammonia (NH_3) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Sample 1	14.9	30.0	28.9	27.8	25.7	29.0	28.9	33.8	32.3	30.3	31.2	26.2
Sample 2	20.1	36.0	37.1	28.1	30.4	37.4	33.1	29.0	30.2	34.8	31.2	27.7
Sample 3	22.2	30.3	30.9	21.5	30.4	30.2	29.6	36.2	29.3	29.6	32.8	27.8
Sample 4	29.9	39.8	29.0	28.1	37.5	34.5	34.1	30.5	32.0	28.1	37.9	27.0
Sample 5	24.0	31.0	29.4	30.2	27.5	33.6	33.0	36.3	28.4	29.3	33.0	28.3
Sample 6	30.1	29.6	35.1	25.9	31.9	39.2	38.4	30.2	27.8	34.4	29.2	22.1
Sample 7	28.1	24.9		26.4	31.4	30.7	33.5	37.5	31.8	28.7		26.2
Sample 8	33.2	29.3		32.8	32.0	33.6	39.3	30.5	31.3	28.4		
Sample 9	27.7				27.4		30.9	36.2				
Sample 10	32.0				34.8							
Average	**26.2**	**31.4**	**31.7**	**27.6**	**30.9**	**33.5**	**33.4**	**33.4**	**30.4**	**30.5**	**32.6**	**26.5**
% reduction	**6.0%**	**10.7%**	**8.4%**	**4.7%**	**14.0%**	**2.3%**	**2.5%**	**4.5%**	**14.0%**	**6.4%**	**-5.9%**	**-0.3%**

*Regular Ammonia testing is not required for permit; regular testing is completed internally and has historically been reported in this section of the Annual Report.

**Results include internal laboratory testing done at FCPCC (Hach TNT method) and testing done at certified laboratory (Hach TNT and ISE methodology).

2022 Influent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	12.8	12.1	12.9	13.5	13.5	16.3	18.3	20.1	21.7	19.1	17.4	13.7
2	10.5	12.2	12.4	13.9	14.2	16.7	18.5	20.4	21.1	19.8	17.3	15.1
3	10.9	11.9	13.2	12.5	15.2	16.5	18.7	20.4	21.4	20.4	17.0	14.0
4	11.6	12.0	13.4	13.5	14.3	16.5	18.3	20.4	20.6	20.1	17.9	13.8
5	11.7	12.2	13.1	13.7	14.1	17.0	18.7	20.5	20.9	19.5	16.2	12.6
6	11.4	13.7	12.8	14.1	14.2	16.6	18.1	20.8	21.6	19.3	15.9	13.9
7	12.5	14.5	13.6	13.9	14.0	16.4	18.8	20.6	20.5	19.4	16.2	13.9
8	12.4	12.7	13.4	13.8	13.6	16.9	19.6	21.4	20.6	18.9	15.9	14.4
9	13.1	12.5	13.1	13.7	14.3	16.8	19.4	21.2	20.5	19.7	16.0	13.6
10	12.0	13.7	12.8	12.8	15.9	17.0	18.1	20.8	20.9	18.6	16.4	14.6
11	12.8	13.9	13.5	13.9	15.2	17.4	18.8	21.3	20.2	20.0	14.7	13.1
12	12.3	12.0	13.7	13.8	14.4	16.1	19.1	20.8	21.1	19.5	14.7	13.8
13	12.4	12.1	13.6	13.9	14.9	16.7	18.8	20.8	20.4	18.9	14.7	12.2
14	12.3	12.7	13.2	14.4	14.3	16.9	19.1	20.8	20.2	18.4	17.2	13.7
15	11.2	12.7	13.7	13.9	13.9	17.1	19.2	20.7	20.3	19.5	15.7	14.0
16	12.0	12.7	13.3	13.6	14.8	17.7	19.0	20.6	20.2	18.9	17.2	14.1
17	12.5	12.5	13.4	12.9	15.3	17.0	18.9	21.7	20.9	18.5	15.7	13.6
18	12.3	12.9	13.3	13.2	15.9	17.5	19.3	21.6	20.6	19.5	15.8	14.9
19	12.4	13.6	12.5	14.7	16.1	17.5	19.4	20.7	20.3	19.2	15.1	13.5
20	12.8	12.0	13.6	13.8	14.7	17.7	19.5	21.3	19.9	18.6	14.9	13.2
21	12.1	13.3	13.4	13.6	15.2	17.6	19.4	20.7	20.7	18.6	14.8	13.0
22	12.2	12.8	14.1	14.2	15.7	17.5	19.6	20.9	20.5	18.7	15.4	13.5
23	11.4	12.7	14.2	14.0	15.1	16.9	20.3	21.0	19.7	17.6	14.4	12.7
24	12.6	12.6	13.4	13.3	16.4	17.1	19.9	21.0	20.0	17.7	14.6	12.5
25	13.6	12.7	14.7	14.6	16.1	17.9	19.7	20.8	19.3	18.9	14.8	12.2
26	13.1	12.9	13.1	14.6	16.2	17.1	20.2	20.8	20.7	18.8	15.6	12.0
27	12.4	12.4	12.4	13.9	16.1	17.7	19.9	21.4	20.7	19.0	14.5	12.9
28	13.3	13.0	13.6	14.5	16.0	18.3	19.0	20.9	19.6	17.4	14.4	12.9
29	13.0		13.8	14.9	15.8	18.5	20.1	21.1	20.6	18.8	14.2	13.2
30	11.5		13.8	13.6	16.1	18.4	20.4	21.0	19.6	17.3	13.1	13.5
31	12.1		13.5		15.8		20.2	21.5		17.4		12.7
Average:	**12.2**	**12.8**	**13.4**	**13.8**	**15.1**	**17.2**	**19.2**	**20.9**	**20.5**	**18.9**	**15.6**	**13.4**
Minimum:	**10.5**	**11.9**	**12.4**	**12.5**	**13.5**	**16.1**	**18.1**	**20.1**	**19.3**	**17.3**	**13.1**	**12.0**
Maximum:	**13.6**	**14.5**	**14.7**	**14.9**	**16.4**	**18.5**	**20.4**	**21.7**	**21.7**	**20.4**	**17.9**	**15.1**

2022 Effluent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	12.4	13.3	13.7	14.5	15.3	17.2	19.5	21.5	22.4	19.9	18.1	13.0
2	12.3	13.3	13.8	14.6	15.4	17.7	19.7	22.2	22.6	20.5	17.4	13.4
3	12.0	13.3	13.5	14.6	15.8	17.7	20.0	22.1	22.1	20.1	17.0	13.7
4	12.6	13.5	13.8	14.2	15.1	17.4	19.3	21.6	21.9	20.0	16.2	13.8
5	12.7	12.9	13.3	14.5	15.4	17.6	19.5	22.0	21.2	19.6	16.8	13.4
6	12.8	13.3	13.5	14.1	14.8	17.1	19.9	21.3	20.9	19.6	16.6	14.0
7	12.9	13.5	13.8	14.5	14.8	17.9	20.0	21.5	21.6	19.8	15.8	14.0
8	12.8	13.5	14.2	15.4	15.0	17.8	19.9	21.5	21.3	19.9	15.6	13.8
9	13.5	13.9	13.7	14.6	15.1	17.9	20.2	21.8	21.8	20.0	14.9	13.7
10	13.5	13.8	13.4	13.3	15.9	17.8	19.8	22.6	20.9	20.0	15.6	13.7
11	13.6	13.9	13.7	13.6	15.4	18.0	19.9	22.3	20.9	19.4	16.0	14.4
12	13.7	12.5	13.6	14.2	15.6	17.5	20.5	21.8	21.2	19.0	15.9	13.7
13	13.4	13.2	13.7	14.2	15.3	17.4	20.2	21.9	22.0	19.2	16.2	13.2
14	13.5	13.7	14.1	14.0	15.0	17.8	20.6	21.6	21.5	19.2	15.9	14.0
15	13.1	13.8	14.0	14.2	15.7	17.8	20.2	22.1	21.6	19.1	15.7	13.7
16	13.6	13.7	13.6	13.9	15.5	18.0	20.1	23.2	20.9	18.9	15.6	13.6
17	13.8	13.4	14.4	14.2	15.7	17.8	19.9	21.9	20.5	18.7	15.6	14.2
18	14.2	14.0	14.0	14.8	15.6	18.3	20.0	22.2	20.3	19.2	15.3	13.7
19	14.9	14.0	14.1	14.5	15.7	18.3	19.9	22.6	20.0	18.7	15.4	12.7
20	14.1	13.5	13.9	15.3	15.8	18.4	20.3	22.2	20.8	18.3	15.2	12.7
21	13.6	13.5	13.8	14.6	15.7	18.8	20.4	22.1	20.3	18.6	15.3	12.3
22	14.5	13.0	14.2	14.5	16.4	18.6	20.7	22.0	20.7	18.9	15.5	12.3
23	13.5	13.2	14.6	14.7	16.6	18.3	20.0	23.1	21.0	17.5	15.6	13.2
24	13.6	13.4	13.8	15.0	16.8	18.3	20.2	22.8	20.6	17.6	15.5	13.3
25	13.6	12.8	14.1	13.5	16.8	18.4	20.6	22.8	20.4	17.9	15.1	13.8
26	13.3	13.2	13.8	15.2	16.9	18.7	22.2	22.4	20.1	17.5	15.7	13.8
27	13.5	13.3	14.3	14.3	16.8	19.1	21.7	22.0	20.4	17.8	15.1	13.6
28	13.3	14.0	14.5	14.9	17.0	**19.6**	22.4	21.7	21.7	17.9	14.2	13.1
29	13.1		14.7	14.6	17.4	19.6	21.8	22.8	21.6	18.2	13.5	13.5
30	13.4		14.6	15.2	16.8	19.7	21.7	22.6	20.0	18.3	14.4	13.6
31	13.3		14.6		17.1		21.6	22.8		18.1		14.6
Average:	**13.4**	**13.4**	**14.0**	**14.5**	**15.9**	**18.2**	**20.4**	**22.2**	**21.1**	**18.9**	**15.7**	**13.5**
Minimum:	**12.0**	**12.5**	**13.3**	**13.3**	**14.8**	**17.1**	**19.3**	**21.3**	**20.0**	**17.5**	**13.5**	**12.3**
Maximum:	**14.9**	**14.0**	**14.7**	**15.4**	**17.4**	**19.7**	**22.4**	**23.2**	**22.6**	**20.5**	**18.1**	**14.6**

2022 Influent pH

Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	7.76	7.41	7.86	7.77	7.21	6.98	7.45	7.43	7.49	7.51	7.89	7.66
2	7.48	7.31	7.57	7.59	7.48	7.99	7.62	6.98	7.49	7.86	7.71	8.01
3	7.47	7.49	7.44	7.36	7.25	6.84	7.36	7.48	7.62	7.52	7.71	7.83
4	7.51	7.52	7.87	7.72	7.56	7.81	7.35	7.52	7.56	7.38	8.22	7.65
5	7.36	7.56	7.51	7.55	7.38	7.87	7.71	7.53	7.85	7.34	7.78	7.69
6	7.50	7.53	7.66	8.00	7.42	7.35	7.39	7.96	7.52	7.45	7.92	8.05
7	7.66	7.84	8.00	7.64	7.49	7.47	7.80	7.75	7.41	7.27	7.96	7.47
8	7.91	7.51	8.05	7.66	7.43	7.60	7.91	7.37	7.68	7.53	7.90	7.75
9	7.56	7.33	7.82	7.53	7.52	7.79	5.87	7.32	7.46	8.01	7.99	7.36
10	7.53	7.86	7.88	7.83	7.83	8.03	7.33	7.19	7.83	7.39	7.92	7.82
11	7.49	7.60	8.21	7.93	7.56	7.88	7.34	6.46	7.40	7.90	7.39	7.40
12	7.38	7.37	7.67	7.92	7.47	7.13	7.48	6.93	7.89	8.08	7.38	7.52
13	7.55	7.66	7.62	7.73	7.94	7.30	7.91	7.09	7.40	7.94	7.34	7.42
14	7.43	7.59	7.49	8.01	7.42	8.00	7.95	7.86	7.30	7.59	8.11	7.39
15	7.42	7.62	7.80	7.85	7.50	7.99	7.98	7.11	7.43	8.19	7.90	7.57
16	7.29	7.57	7.99	8.11	7.48	8.02	7.44	7.29	7.53	7.80	8.02	7.49
17	7.56	7.55	7.76	7.16	7.95	7.31	7.55	7.15	7.90	7.52	7.54	7.38
18	7.41	7.65	7.68	7.62	7.95	7.63	7.83	7.87	7.86	7.89	8.10	7.92
19	7.48	8.13	7.62	7.84	8.19	7.45	7.56	7.53	7.92	7.77	7.77	7.67
20	7.62	7.63	8.00	7.68	7.34	7.40	7.77	7.83	7.56	7.66	7.46	7.67
21	7.54	7.70	7.74	7.77	7.97	7.82	7.96	7.36	7.87	7.65	7.42	7.67
22	7.48	7.73	7.61	7.93	7.55	6.76	8.01	7.82	7.60	7.80	7.65	7.64
23	7.41	8.02	7.57	7.60	7.55	7.38	7.78	7.37	7.30	7.99	7.46	7.78
24	7.43	7.82	7.59	7.43	8.06	7.64	7.63	6.95	7.82	7.50	7.54	7.27
25	7.66	7.85	7.61	8.02	6.95	7.66	7.28	7.50	7.53	7.94	7.51	7.55
26	7.64	8.12	7.69	8.07	7.96	7.50	7.63	7.49	7.83	7.96	7.86	7.89
27	7.54	7.64	7.43	7.38	7.78	7.19	6.82	7.72	7.84	7.82	7.55	7.34
28	7.40	7.88	7.73	8.10	7.97	7.88	6.98	7.76	7.59	7.46	7.54	7.51
29	7.56		7.80	7.64	7.60	7.78	7.86	7.54	6.95	8.07	7.60	7.67
30	7.42		7.80	7.53	7.99	7.74	7.29	7.53	7.21	7.53	7.38	7.63
31	7.60		7.10		7.45		7.53	7.74		7.68		7.34
Average:	**7.52**	**7.66**	**7.72**	**7.73**	**7.62**	**7.57**	**7.53**	**7.43**	**7.59**	**7.71**	**7.72**	**7.61**
Minimum:	**7.29**	**7.31**	**7.10**	**7.16**	**6.95**	**6.76**	**5.87**	**6.46**	**6.95**	**7.27**	**7.34**	**7.27**
Maximum:	**7.91**	**8.13**	**8.21**	**8.11**	**8.19**	**8.03**	**8.01**	**7.96**	**7.92**	**8.19**	**8.22**	**8.05**

2022 Effluent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	7.31	7.27	7.18	7.24	7.27	7.31	7.23	7.39	7.15	7.10	7.08	7.16
2	7.36	7.26	7.16	7.32	7.20	7.26	7.39	7.17	7.39	7.30	7.22	7.19
3	7.33	7.30	7.17	7.36	7.19	7.29	7.38	7.42	7.04	7.09	7.19	7.12
4	7.27	7.29	7.22	7.18	7.31	7.13	7.19	7.41	7.33	7.21	7.22	7.58
5	7.28	7.69	7.33	7.24	7.22	7.30	7.11	7.30	7.42	7.24	7.21	7.26
6	7.32	7.28	7.18	7.28	7.32	7.13	7.09	7.27	7.17	7.23	7.46	7.22
7	7.35	7.23	7.22	7.29	7.33	7.07	7.51	7.01	7.18	7.11	7.13	7.18
8	7.31	7.22	7.22	7.27	7.19	6.93	7.34	7.19	7.23	7.31	7.14	7.11
9	7.33	7.23	7.24	7.31	7.21	7.08	7.25	7.23	7.45	7.23	7.12	7.08
10	7.40	7.24	7.21	7.29	7.24	7.05	7.39	7.36	7.09	7.28	7.25	7.18
11	7.30	7.26	7.34	7.22	7.25	6.89	7.00	7.26	7.25	7.19	7.18	7.11
12	7.27	7.34	7.36	7.20	7.23	6.94	7.23	7.27	7.40	7.16	7.16	7.04
13	7.31	7.09	7.34	7.10	7.31	7.16	7.24	7.32	7.27	7.16	7.18	7.13
14	7.32	7.24	7.19	7.22	7.31	7.14	7.50	7.37	7.34	7.20	7.10	7.06
15	7.27	7.24	7.25	7.24	7.34	7.06	7.19	7.55	7.44	7.35	7.18	7.04
16	7.21	7.24	7.27	7.23	7.20	7.13	7.20	7.26	7.25	7.35	7.15	7.11
17	7.32	7.21	7.27	7.30	7.20	7.08	7.18	7.19	7.21	7.27	7.16	7.20
18	7.37	7.25	7.30	7.31	7.24	7.28	7.32	7.13	7.24	7.15	7.18	7.22
19	7.41	7.19	7.26	7.18	7.20	7.35	6.99	7.12	7.29	7.04	7.21	7.00
20	7.30	7.30	7.33	7.23	7.31	7.12	7.23	7.23	7.51	7.21	7.32	7.13
21	7.34	7.26	7.32	7.32	7.05	7.06	7.51	7.35	7.56	7.16	7.27	7.12
22	7.26	7.19	7.30	7.26	7.20	7.32	7.43	7.19	7.37	7.12	7.19	7.05
23	7.35	7.28	7.01	7.31	7.20	7.17	7.05	7.33	7.45	7.17	7.19	7.24
24	7.28	7.25	7.32	7.26	7.24	7.11	7.23	7.31	7.16	7.26	7.20	7.02
25	7.29	7.22	7.28	7.33	7.27	7.40	7.30	7.51	7.23	7.14	7.28	7.04
26	7.14	7.18	7.29	7.23	7.25	7.49	7.31	7.34	7.32	7.18	7.05	7.44
27	7.34	7.30	7.29	7.17	7.27	7.13	7.36	7.11	7.30	7.01	7.18	6.86
28	7.31	7.21	7.29	7.25	6.86	7.16	7.28	7.20	7.52	7.29	7.24	6.93
29	7.36		7.30	7.18	7.36	7.03	7.17	7.59	7.50	7.13	7.18	7.02
30	7.34		7.24	7.27	7.28	7.11	7.39	7.33	7.15	7.14	7.08	7.07
31	7.30		7.26		7.24		7.32	7.49		7.08		7.12
Average:	**7.31**	**7.26**	**7.26**	**7.25**	**7.24**	**7.16**	**7.27**	**7.30**	**7.31**	**7.19**	**7.19**	**7.13**
Minimum:	**7.14**	**7.09**	**7.01**	**7.10**	**6.86**	**6.89**	**6.99**	**7.01**	**7.04**	**7.01**	**7.05**	**6.86**
Maximum:	**7.41**	**7.69**	**7.36**	**7.36**	**7.36**	**7.49**	**7.51**	**7.59**	**7.56**	**7.35**	**7.46**	**7.58**

Appendix C – Permit Non-Conformance Report

Permit Non-Compliances:

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
FCPCC Flow (x2)				
January 2, 2022	On 2022 January 2 the FCPCC flow was 18,580.1 m3, which exceeded the permit allowance of 16,000 m3.	The FCPCC Chief Operator was notified and FCPCC lab tech documented flow volumes at different pump stations.	Infiltration from significant snow melt.	Heavy rain fall resulted in a flow permit exceedance at FCPCC. We exceeded the permit by 900L. Historian reported the flow for that day as 15,997m3. The NCR approver has comments to add. I have nothing else to add to this investigation. The Town of Qualicum has their system and the City of Parksville has their system. The RDN has a system in French Creek. The people at this site have no control or input into the maintenance or monitoring of their collection systems. No we don't do any before during or after to identify problem areas since the collection systems that are feeding the interceptor are not ours. No we have no plans to fix I & I that is caused during heavy rain events because those are not our assets. The high flow during rain events has nothing to do with I & I directly into the interceptor. Using a conductivity probe during high rain events will not be helpful. Since the water is mostly rain water, it will have low conductivity. I believe I have documented things that could be done by others to help. Who looks at these recommendations? Have any of them been implemented?
December 27, 2022	Heavy rainfall and wet weather conditions led to a Flow Exceedance FCPCC Permit. Permit allows a flow of 16,000m3/d; on December 27 2022 flow read 16,408.1m3. Rainfall (mm) Dec 21 2022 - 0 Dec 22 2022 - 0 Dec 23 2022 - 7.4 Dec 24 2022 - 1.3 Dec 25 2022 - 13.5 Dec 26 2022 - 10.9 Dec 27 2022 - 0.3 FCPCC Flow (MLD) Dec 21 2022 - 9.362 Dec 22 2022 - 9.521 Dec 23 2022 - 10.758 Dec 24 2022 - 13.984	Communicated to Chief Operator	Prolonged wet weather conditions in addition to king tides and snow melt created high flows through FCPCC.	Wet weather conditions have considerably increased over the years along with higher rates of inflow and infiltration associated with aging infrastructure. One aspect for being out of compliance was the fact that the Permit was not updated to incorporate the change in process capacity of the plant following the stage IIB and stage III upgrades which substantially increased the capacity to 17,935 m3/day. RDN will apply for an amendment in permit following the issuance of the Operational Certificate for GNPCC.

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
	Dec 25 2022 - 13.032 Dec 26 2022 - 14.636 Dec 27 2022 - 16.408 Hall Rd (MLD) Dec 21 2022 - 1.98 Dec 22 2022 - 1.99 Dec 23 2022 - 2.06 Dec 24 2022 - 2.25 Dec 25 2022 - 2.70 Dec 26 2022 - 2.64 Dec 27 2022 - 3.00 Lee Rd (MLD) Dec 21 2022 - 4.08 Dec 22 2022 - 4.07 Dec 23 2022 - 4.06 Dec 24 2022 - 4.59 Dec 25 2022 - 5.38 Dec 26 2022 - 5.22 Dec 27 2022 - 5.77 Ocean Place (MLD) Dec 21 2022 - 4.990 Dec 22 2022 - 5.004 Dec 23 2022 - 5.108 Dec 24 2022 - 7.617 Dec 25 2022 - 6.282 Dec 26 2022 - 7.817 Dec 27 2022 - 9.607 Johnson Rd (MLD) Dec 21 2022 - 3.021 Dec 22 2022 - 3.043 Dec 23 2022 - 3.187 Dec 24 2022 - 4.077 Dec 25 2022 - 3.740 Dec 26 2022 - 4.382 Dec 27 2022 - 5.145			
FCPCC LAB / FECAL COLIFORM(x1)				
July 18, 2022	The 2022 July 18 FCPCC ATAD 6 fecal coliform result was 3,300 MPN/G (dry weight) which exceeds the OMRR class A fecal coliform limit of 1,000 MPN/g (dry weight)	The WWS Operations Sup't and acting FCPCC Chief Operator were notified immediately.	A review of the FCPCC solids data did not show any unusual results around the time that the sample was collected. This may mean that there was an issue related to bottle/sampling contamination. The sampling point for fecal coliform sample collection should also be investigated (ATAD 6 vs. ATAD Out).	The investigation showed that the fecal coliform exceedance was likely due to contamination from sampling (sample bottle) or an improper sample site being used for the analysis in question. Operational data was normal during the time of the exceedance, thus it was deemed unlikely the issue stemmed from a problem in the digestion process.

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
FCPCC VOLATILE SOLIDS REDUCTION (x1)				
April 19, 2022	On 2022 April 19 the calculated FCPCC volatile solids reduction was 34.6% which is below the OMRR minimum of 38%.	Data entry and calculations were double checked. The FCPCC chief operator and Sylvis were notified.		Sylvis uses an average to calculate the VSR. If FCPCC records 4 X VSR in a row that are below 38% then Sylvis would like to know about it and that should be considered a non-conformance. Consider updating the procedure to 4 X VSR in a row below 38% for reporting to Sylvis. No corrective actions.
FCPCC WSER BOD (x1)				
2022 Q1 (Jan to March)	The 2022 Q1 FCPCC effluent average was 25.4 mg/L, which exceeds the WSER limit of 25 mg/L.	WWS Sup't and FCPCC Chief Operator were notified of the exceedance.		It was found that the TF is not distributing water evenly over the TF media. The distribution pipes are beyond repair and need to be replaced. Once the pipes are replaced water will again be distributed evenly over the media surface. This will promote even growth of organisms and will result in a greater BOD reduction.

Appendix D – External Laboratory Test Results

FCPCC INFLUENT & EFFLUENT (ANNUAL) –September 15, 2022			
Parameter	Unit	Influent	Effluent
AMMONIA NITROGEN	mg/L	32	34
pH	pH Units	7.49	7.98
ALKALINITY	mg/L	NT	NT
DISSOLVED CHLORIDE	mg/L	1,600	1,700
TOTAL KJELDAHL NITROGEN	mg/L	NT	NT
TOTAL NITROGEN	mg/L	43.1	32.1
OIL AND GREASE	mg/L	26	<1.0
SULPHATE (D)	mg/L	210	230
SULPHIDE (T)	mg/L	0,43	0.023
CYANIDE (T)	mg/L	0.00124	0.00227
FLUORIDE (D)	mg/L	0.15	0.16
TOTAL PHENOLS	mg/L	0.028	0.0039
TOTAL ORGANIC CARBON	mg/L	40	33
PHOSPHOROUS (T)	µg/L	5,600	2,300
METALS			
Parameter	Unit	Influent	Effluent
ALUMINUM (T)	µg/L	1,710	36
ARSENIC (T)	µg/L	0.87	0.60
BARIUM (D)	µg/L	7.0	<5.0
BORON (D)	µg/L	540	560
CADMIUM (D)	µg/L	<0.050	<0.050
CHROMIUM (T)	µg/L	<5.0	<5.0
COBALT (D)	µg/L	<1.0	<1.0
COPPER (D)	µg/L	12.1	6.1
IRON (D)	µg/L	877	375
LEAD (T)	µg/L	2.1	<1.0
MANGANESE (D)	µg/L	75.1	117
MERCURY (T)	µg/L	<0.019	<0.019
MOLYBDENUM (T)	µg/L	<5.0	<5.0
NICKEL (D)	µg/L	<5.0	<5.0
SELENIUM (T)	µg/L	<0.50	<0.50
SILVER (T)	µg/L	0.49	<0.10
TIN (T)	µg/L	<25	<25
ZINC (T)	µg/L	1,580	31
VOLATILE ORGANIC COMPOUNDS, PCBs, and PHTHALATES			
Parameter	Unit	Influent	Effluent
BENZENE	µg/L	<0.40	<0.40
CHLOROFORM	µg/L	1.8	1.2
CHLOROMETHANE	µg/L	<1.0	<1.0
DICHLOROBROMOMETHANE	µg/L	<1.0	<1.0
DICHLOROMETHANE	µg/L	<2.0	<2.0
ETHYLBENZENE	µg/L	<0.40	<0.40
TETRACHLOROETHYLENE	µg/L	<0.50	<0.50
TOLUENE	µg/L	<0.40	<0.40
1,1,1-TRICHLOROETHANE	µg/L	<0.50	<0.50
1,1,2-TRICHLOROETHANE	µg/L	<0.50	<0.50
TRICHLOROETHYLENE	µg/L	<0.50	<0.50
DI(2-ETHYLHEXYL)PHTHALATE	µg/L	<100	<10
DI-N-BUTYLPHTHALATE	µg/L	<100	<10
NAPHTHALENE	µg/L	<0.10	<0.10
PCB'S	µg/L	<0.50	<0.050

NT - Not Tested

FCPCC Biosolids				
Parameter	Unit	24-Jan	18-Jul	Average
TOTAL SOLIDS	%	35.5	35.8	**35.7**
VOLATILE SOLIDS	%	75.2	77.8	**76.5**
MOISTURE	%	65	64	**65**
TOTAL KJELDAHL NITROGEN	% dry wt.	4.8	3.90	**4.35**
ARSENIC (T)	µg/g	1.97	2.13	**2.05**
CADMIUM (T)	µg/g	1.27	1.38	**1.33**
CHROMIUM (T)	µg/g	27.2	24.8	**26.0**
COBALT (T)	µg/g	2.61	1.65	**2.13**
COPPER (T)	µg/g	501	562	**532**
IRON (T)	µg/g	37,300	37,100	**37,200**
LEAD (T)	µg/g	13.5	13.4	**13.5**
MERCURY (T)	µg/g	1.47	0.942	**1.21**
MOLYBDENUM (T)	µg/g	6.32	3.96	**5.14**
NICKEL (T)	µg/g	11.9	9.07	**10.5**
PHOSPHOROUS (T)	µg/g	19,300	20,900	**20,100**
POTASSIUM (T)	µg/g	866	687	**777**
SELENIUM (T)	µg/g	2.80	2.88	**2.84**
ZINC (T)	µg/g	816	1,020	**918**

FCPCC Biosolids	
Parameter	Fecal Coliforms
Unit	MPN / g dry
25-Jan-22	<20
16-Mar-22	<20
12-Apr-22	130
30-May-22	<20
18-Jul-22	3,300
24-Aug-22	<20
28-Sep-22	<20
17-Oct-22	<20
28-Nov-22	<20
Average	**<43**

Note: Fecal coliform samples for FCPCC biosolids were taken from ATAD 6

Appendix E – Odour Complaint Reports

Odour Concerns

Date of Occurrence	Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Conclusion for this Incident
Incident Type: FCPCC - Odour (x7)					
3/15/2022	FCPCC	Call from [redacted] Imperial Drive French Creek. [redacted]. [redacted] called to report a sour smell. His property is located [redacted] to our Dewatering building. Wind was 5km/hr from the SE. Overcast sky.			It is believed due to the description of the odour that possibly due to the day being overcast that the smell of the Biofilter was being held low and not dissipating and was then detected by the resident. Since the investigating operator was unable to detect any odours at the address we are unable to positively know the source of the odour.
6/27/2022	FCPCC	Smell detected between 16:00 and 17:00 by community member		Trickling filter windows open to ventilate space for contractor performing work on piping. Closing windows at end of work day may help suppress odours.	Odour is believed to be due to the Trickling filter windows and part of the wall being left open during this time as the TF work was being done. The TF has been closed up again and the old piping materials from the trickling filter have been removed from site.
6/30/2022	FCPCC	Email odour submission complaining "smell is so bad can't open windows or sit in backyard this morning.		Ensured all plant doors, window and hatches are closed - 1 TF window open, checked all odour control systems are functioning	It is believed that the odour may be closely related to the Trickling filter work that has been occurring on site. Windows and the side door on the TF are been opened to provide the contractor access to the Trickling filter.
7/25/2022	FCPCC	[redacted] called to complain about odors noticed at intersection of Lee Rd & Hwy 19A. Said was bad today but worse last week and real bad two weeks ago.		Informed him of ongoing odor control upgrade and of TF construction that occurred 2 weeks ago.	It is believed that the odours at that time were from the top layer of the Bio-filter being roto tilled as the biofilter layers being compressed.

Date of Occurrence	Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Conclusion for this Incident
8/23/2022	FCPCC	resident who lives nearby complaining of on going odour from the wastewater plant.	resident claims friends and family will no longer visit them concerned the air around their house is contaminated.	inspection of odour control systems.	Operations of the plant have been normal with no identifiable odour causing issues. One item that is being looked at to try and reduce odours to neighbors is to replace the media in the Dewatering building Bio filter.
9/30/2022	[redacted] Glenhale Cres.	Called to complain about odors that were noticed starting at 8:10am.		Checked odor control systems and plant operation - all normal. All windows, doors, and hatches are closed. Stat holiday so nothing being worked on.	As there was only basic operations at the plant this day and no abnormal activities were occurring this day, it is difficult to determine the possible source of the odour that was detected at this residence around a kilometer away. No other complaints were received.
10/5/2022	FCPCC	Caller left message saying smells odor that gets worse as you drive toward the treatment plant.		Checked odor control and plant systems - all normal.	A possible source of the plant odours on this day could of been the Trickling filter that was having some work done to it.

Appendix F – Conditional Management Plan 2022 Annual Report

REGIONAL DISTRICT OF NANAIMO

January 13, 2023 File: 2240-20-CMP

Elysha Gordon
Resource Management Biologist
Fisheries and Oceans Canada
VIA EMAIL: Elysha.Gordon@dfo-mpo.gc.ca

Dear Ms. Gordon,

Re: 2022 Annual Report
French Creek Pollution Control Centre – Conditional Management Plan

The Regional District of Nanaimo (RDN) has a Conditional Management Plan (CMP) for two pump stations associated with the French Creek Pollution Control Centre (FCPCC) near Parksville, BC:

- Hall Road Pump Station, 300 Hall Road
- Bay Avenue Pump Station, 385 Bay Avenue.

The original CMP was established in 2012 and has been renewed several times. The current agreement expires on January 31, 2025.

According to the agreement, the RDN shall report CMP activities annually. This letter summarizes CMP activities from January 1, 2022, to December 31, 2022. It also lists notable upgrades and activities at FCPCC and suggests proposed changes, if any, to future versions of the CMP.

CMP Activities

There were no trigger events from January 1, 2022, to December 31, 2022.

FCPCC Upgrades and Activities

Notable upgrades and activities at FCPCC in 2022 include:

- Continued construction on the Bay Avenue Pump Station Upgrade. Estimated completion date is spring 2023.
- Completed a value engineering review of engineering design for the FCPCC Expansion and Odour Control Upgrade Project. This was done to respond to escalating project costs.
- Began follow-up studies on two options chosen to add value to the FCPCC Expansion and Odour Control Upgrade Project. Study completion is scheduled for spring 2023.
- Replaced trickling filter piping and spray nozzles.

Proposed CMP Changes

The RDN recommends the following changes to Appendix D of the CMP:

- FCPCC Chief Operator is:

  Ian Lundman
  Tel: 250-248-5794 ext. 6315
  Cell: 250-751-5580
  ilundman@rdn.bc.ca

- Acting Operations Superintendent is:

  Rob Skwarczynski
  Tel: 250-758-1157
  Cell: 250-816-2767
  Rskwarczynski@rdn.bc.ca

If you have any questions regarding this annual report, please do not hesitate to contact me at 250-390-6575 or snorum@rdn.bc.ca.

Sincerely,

Shelley Norum
Wastewater Program Coordinator
T: 250-390-6575 | Email: snroum@rdn.bc.ca

Appendix G – 2022 Biosolids Management Summary and Compliance Report

Regional District of Nanaimo

2022 Biosolids Management Summary and Compliance Report

February 2023

Prepared for:

Regional District of Nanaimo
6300 Hammond Bay Road
Nanaimo, BC
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Prepared by:

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SYLVIS DOCUMENT #1596-23

SYLVIS

TABLE OF CONTENTS

APPENDIX ONE – TABLES

APPENDIX TWO – FIGURES

APPENDIX THREE – PHOTOGRAPHS

1 PROGRAM OVERVIEW

The Regional District of Nanaimo (RDN) operates two wastewater treatment plants that produce municipal biosolids:

1. Greater Nanaimo Pollution Control Centre (GNPCC) - Class B biosolids
2. French Creek Pollution Control Centre (FCPCC) - Class A biosolids

In 2022, RDN biosolids were managed at three sites in the Nanaimo area: private forest lands off Nanaimo River Road ("Blackjack") and on Weigles Road ("TimberWest Properties") both managed by Mosaic Forest Management (Mosaic), and at the Nanaimo Forest Products Harmac Mill (Harmac).

At the TimberWest Properties, Class B GNPCC biosolids were used by SYLVIS in a forest fertilization program. RDN biosolids have been managed at this site since 2003. The objectives of biosolids forest fertilization were to increase soil quality and tree growth. 2022 was the final year of operations at the TimberWest Properties, the biosolids management program was transitioned to the new Blackjack site in 2022.

At Blackjack, Class B GNPCC biosolids were used by SYLVIS in a forest fertilization and reclamation program. The objectives of biosolids forest fertilization were to increase soil quality and tree growth, and for reclamation to return application trails to productive forest and habitat.

RDN biosolids were also managed in soil fabrication projects at the Harmac Nanaimo Pulp Mill. Class A FCPCC biosolids were managed by Harmac in a biosolids growing medium (BGM) under supervision of SYLVIS. While no Class B / GNPCC biosolids were delivered to the Harmac site in 2022, reclamation growing medium (RGM) containing Class B biosolids which were delivered in 2021 were used in landfill closure.

A total of 7,188 wet tonnes (wt) of RDN biosolids were produced in 2022: 5,897 wt from the GNPCC and 1,291 wt from the FCPCC (Table 1). Of the 7,188 wt produced, 5,095 wt (71% of annual production in 2022) were delivered to Blackjack, 802 wt (11%) were delivered to the TimberWest Properties, and 1,291 wt (18%) were delivered to Harmac (Table 2). Total RDN biosolids production in 2022 is greater than the five-year average annual production though consistent with the increased production following the implementation of secondary treatment operations at the GNPCC (Table 1).

2 REGULATORY AUTHORIZATION

RDN biosolids were managed at Blackjack under the *2021 Blackjack – Forest Fertilization Land Application Plan* (SYLVIS Document #1516-22) associated with Authorization #110732 valid May 16, 2021 to April 23, 2022 and under the *2022 Blackjack – Forest Fertilization & Reclamation Land Application Plan* (SYLVIS document #1525-22) associated with Authorization #111152 valid April 24, 2022 to April 23, 2023.

RDN biosolids were managed at the TimberWest Properties under the *2021 TimberWest Properties (Weigles Road) Reclamation & Forest Fertilization Land Application Plan* (SYLVIS

Document #1439-21) associated with Authorization #110825 valid August 5, 2021 to August 4, 2022.

GNPCC biosolids used to fabricate RGM at Harmac were managed under the *2022 Nanaimo Forest Products Harmac Mill - Reclamation Growing Medium for Landfill Closure Land Application Plan* (SYLVIS Document # 1463-21) associated with Authorization #111016. Class A FCPCC biosolids used in production of BGM were managed according to regulatory requirements in the Organic Matter Recycling Regulation (OMRR) and do not require a land application plan (LAP) or Authorization.

3 2022 BIOSOLIDS MANAGEMENT

This document contains information on the management of RDN biosolids in 2022 including a summary of contractual requirements for the forest fertilization and reclamation programs (Table 3, Table 4, Table 5), a biosolids program management summary (Table 2, Figure 1, Figure 2, and Figure 3), a biosolids quality summary (Table 6), a summary of historical management (Table 2), a map of areas applied in 2022 at Blackjack (Figure 4) and the TimberWest Properties (Figure 5) and, and photographs from the biosolids management projects (Photographs 1 to 3).

3.1 BIOSOLIDS MANAGEMENT SUMMARY

RDN biosolids were managed at the TimberWest Properties on Weigles Road in Nanaimo, BC for a portion of 2022 to complete the 2021-2022 extension contract between the RDN and SYLVIS as well as contingency management under the 2021-2026 contract. Contractual tasks completed under the 2021-2022 extension contact relating to biosolids quality monitoring, biosolids delivery coordination, biosolids beneficial use, site safety, environmental monitoring, public engagement, reporting, coordination with the Nanaimo Mountain Bike Club, and adherence to the conditions of site use under the RDN land-use agreement with TimberWest in 2022 are summarized in Table 3. The biosolids management program was transitioned from the TimberWest Properties to Blackjack in 2022. The TimberWest Properties remain available as a contingency storage site.

In 2022, the majority of GNPCC biosolids were managed at Blackjack, on Nanaimo River Road in Nanaimo, BC. Contractual tasks under the 2021-2026 contract relating to biosolids quality monitoring, biosolids delivery coordination, site safety, environmental monitoring, public engagement, First Nations communications, sustainability activities, and reporting were completed in 2022 are summarized in Table 4.

RDN biosolids delivered to Harmac were managed by Harmac for production and use of reclamation growing medium (RGM) in landfill closure and production of biosolids growing medium (BGM) (Table 5). SYLVIS provided qualified professional oversight under contract to the RDN.

3.2 BIOSOLIDS TRANSPORTATION

In 2022, 5,095 wt of RDN biosolids (all from GNPCC) were transported by DBL Disposal to Blackjack (Table 2). Monthly tonnage delivered to this site in 2022 is shown in Figure 1.

In 2022, 802 wt of RDN biosolids (all from from GNPCC) were transported by DBL Disposal to the TimberWest Properties (Table 2). Monthly tonnage delivered to this site in 2022 is shown in Figure 2.

In 2022, 1,291 wt of RDN biosolids (all from FCPCC) were transported by DBL Disposal to Harmac (Table 2). Monthly tonnage delivered to this site in 2022 is shown in Figure 3.

3.3 BIOSOLIDS STORAGE

One large storage area exists at Blackjack and four storage areas exist at the TimberWest Properties and each consisting of an asphalt base with lock blocks delineating three sides of the stockpiles (Photograph 1 and 2). All five storage areas were utilized for biosolids stockpiling in 2022. Biosolids storage conformed to OMRR requirements for Vancouver Island where biosolids are required to be covered from October 1 to March 31 of every year. Following the transition of the biosolids management program from TimberWest Properties to Blackjack, one TimberWest Properties storage facility was decommissioned by Mosaic. Three remain available for contingency storage.

Harmac is not required to cover the stored biosolids when biosolids are incorporated into a fabricated soil medium (BGM or RGM) within 2 weeks of deliveries. Details of RGM storage are discussed in the Harmac Compliance Report. BGM is not subject to regulatory storage requirements in the OMRR.

3.4 2022 PRE-APPLICATION MEASURES

At Blackjack and the TimberWest Properties, site inspections were carried out by a SYLVIS Qualified Professional or designate prior to biosolids forest fertilization and reclamation. During site inspections, water features and other sensitive site features were identified, mapped, and appropriate setback distances were determined. Pre-application soil samples were collected in order to determine an appropriate agronomic rate of biosolids application. Groundwater depth was assessed using a soil auger or visually in road cuts and was confirmed to be in excess of 1 metre (m) prior to commencing biosolids applications.

At Harmac, a site inspection was carried out prior to initiating soil fabrication operations to confirm the suitability of the storage facility, mixing methodology, and soil storage area. Landfill areas to be reclaimed using RGM were assessed prior to applications to ensure suitability for applications. Details of site inspections for the RGM project are detailed in the Harmac Compliance Report. Currently stockpiled BGM and pre-BGM (material that has not undergone final mixing or certification by SYLVIS) is the product of Class A biosolids deliveries starting in June 2022.

3.5 BIOSOLIDS LAND APPLICATION

In 2022, 5,262 wt of RDN biosolids (all from GNPCC) were applied as a fertilizer and soil amendment at Blackjack (Table 2, Figure 1, Figure 4). Biosolids were land-applied to 51 hectares (ha) of forested lands for forest fertilization. Application rates were specific to the individual fertilization units based on pre-application soil sampling and nutrient requirements of the trees, understory vegetation, and soils. The biosolids application rate for forested land averaged 20.6 dry tonnes per ha (dt/ha) which does not exceed the maximum application rate specified in the

LAP for forest land (38 dry tonnes per ha). 2.8 hectares of disturbed land were applied with biosolids for reclamation at Blackjack. The average application rate for reclamation was 50.7 dt/ha which does not exceed the maximum application rate specified in the LAP for reclamation (52 dt/ha). At the end of 2022, 150 wt (all from GNPCC) remained in storage facilities at Blackjack in preparation for fertilization in 2023 (Table 4).

In 2022, 1,602 wt of RDN biosolids (all from GNPCC) were applied as a fertilizer and soil amendment to the TimberWest Properties (Table 2, Figure 2, Figure 5). Biosolids were land-applied to 33 hectares (ha) of forested lands for forest fertilization at the TimberWest Properties at application rates specific to the individual fertilization units based on their history of previous biosolids land applications. Across the site, the biosolids application rate was an average of 9.9 dt/ha which does not exceed the maximum application rate specified in the LAP (23 dt/ha). At the end of 2022, no biosolids remained in storage facilities at the TimberWest Properties (Table 2).

Biosolids were land-applied in forested and reclamation areas using a side-discharge spreader equipped with a hydraulic fan which propels the biosolids up to 30 m into forest stands or across a reclamation area. All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features. Biosolids land applications occurred throughout 2022 except during periods of extreme weather (i.e., snowfall, heavy rainfall, heat waves) or when the ground was snow-covered; land application operations were suspended during these times. For example, biosolids land applications did not occur in weeks of November and December when periods of snowfall or snow cover occurred.

Biosolids incorporated into RGM were land-applied at the Harmac landfill as a topsoil cover during landfill closure operations. In 2022, 5,107 m^3 RGM containing approximately 1,386 wt of biosolids were used as landfill closure on 1.8 ha of land (Table 2, Figure 3). Volumes of RGM produced and land-applied at Harmac are detailed in the Harmac Compliance Report.

In May 2022 approximately 3,000 m^3 of BGM containing 640 tonnes of RDN FCPCC biosolids was distributed offsite, as indicated by Harmac staff. As of the data of this report, approximately 8,500 m^3 of BGM and loosely mixed soil remain on site comprised of approximately 1,850 tonnes of FCPCC biosolids.

3.6 BIOSOLIDS QUALITY

The OMRR requires that a set of seven discrete samples be collected for fecal coliform analysis and one sample for trace elements for every 1,000 dry tonnes of biosolids or annually, whichever comes first.

Biosolids quality was characterized throughout 2022 to ensure biosolids met quality requirements for trace element concentrations, foreign matter, and pathogen reduction set forth in the OMRR.

In 2022, 440 dry tonnes (dt) of biosolids were produced by the FCPCC and 1,205 dt by the GNPCC. Three composite samples, each composed of eight equal-volume subsamples, were collected by SYLVIS at each the FCPCC and the GNPCC for a total of six samples. Composite samples were analyzed for physical parameters, nutrients, and trace elements (Table 6). All RDN biosolids samples collected in 2022 met the respective OMRR Class A and B criteria for trace elements.

The fecal coliform density of the eight samples collected by SYLVIS from the FCPCC in 2022 was <10 MPN/g in all samples (Table 6). For Class A biosolids each individual sample must meet the Class A criterion of 1,000 most probable number per gram (MPN/g).

SYLVIS collected 19 fecal samples from the GNPCC, the geometric mean of the sampling sets was 88,300 MPN/g (Table 6). For Class B biosolids the geometric mean of each set must meet the Class B criterion of 2,000,000 MPN/g.

3.7 SOIL MONITORING

Soil monitoring was conducted in potential reclamation areas at Blackjack in 2022. Soil samples, each comprised of 10 sub-samples from the top 0-30 cm, were collected by SYLVIS. Soil trace element concentrations were below applicable OMRR soil criteria for this site. Further details on soil sampling and nutrient concentrations can be found in the LAP.

RGM quality at Harmac is discussed in the Harmac Compliance Report.

3.8 REGULATORY COMPLIANCE

Biosolids management activities at Blackjack were carried out under Authorizations #110732 and #111152, and in accordance with the LAP applicable at the time of applications (SYLVIS Documents #1516-22 and #1525-22).

Biosolids management activities at the TimberWest Properties were carried out under Authorization #110825, and in accordance with the LAP applicable at the time of applications (SYLVIS Document #1439-21).

Regulatory requirements of the OMRR and specifications of the LAP were met including the requirements for rainy season storage, groundwater level during application, water feature buffers, biosolids quality, agronomic application rates, pre-application and predicted post-application soil concentration limits, and signage with the exception of the agronomic application rate for reclamation applications. Declarations of Land Application Compliance was provided to the RDN for biosolids applied at the TimberWest Properties and to Mosaic for biosolids applied at Blackjack.

Details of regulatory compliance of biosolids land applications as part of RGM at Harmac are detailed in the Harmac Compliance Report.

3.9 CARBON ACCOUNTING RELATED TO BIOSOLIDS MANAGEMENT

+55 t CO2e of GHG emissions are asserted for transport of GNPCC biosolids to the Woodlot and Blackjack during 2022 under the 2021-2022 extension and the 2021-2026 contracts, while the management of 6,864 bt GNPCC biosolids at these sites in 2022 resulted in -1,662 t/CO2e of net emissions (emissions and emissions removals).

This carbon emissions estimate does not include transport of biosolids delivered in 2021 that were stored for applications in 2022 at the TimberWest Properties or Blackjack as this was presented in the 2021 report. This carbon emissions estimate considers biosolids storage, land application, and soil carbon sequestration; carbon sequestration related to tree growth is accounted for

separately by Mosaic and vehicle (i.e., pickup truck) emissions related to project operations are accounted for externally by SYLVIS.

4 SUMMARY AND INTERPRETATION OF THE EFFECTS OF BIOSOLIDS DISCHARGES ON THE RECEIVING ENVIRONMENT

The objectives of biosolids forest fertilization at the TimberWest Properties are to increase soil quality and tree growth while remaining compliant with the OMRR. Biosolids fertilization has increased surface horizon organic matter content and available nutrients (e.g., phosphorus). These enriched soils store more carbon and enable accelerated tree growth, which has been documented at this site and other biosolids forest fertilization sites. Trace element concentrations in the soil have increased as a result of additions from biosolids. It has been observed[1] at this site that deer browse of trees is increased in biosolids-fertilized areas, underlining a finding from many biosolids sites that increases in vegetation biomass can lead to increases in animal populations that consume or inhabit the vegetation.

The objectives of biosolids forest fertilization at Blackjack were similar to those at the TimberWest Properties. In addition, the objectives of reclamation activities at Blackjack were to return disturbed lands, including landings and camps, to productive forest.

Confirmation of beneficial use of the RDN's biosolids is provided in the Qualified Professional Certification of Compliance reports following the completion of an Authorization and on monthly invoices sent to the RDN.

The fabrication of growing media (BGM and RGM) at Harmac produces a material that can be used for landfill closure (RGM) or in projects on and off site that require topsoil (BGM). These growing media provide a fertile substrate upon which vegetation can grow to achieve site objectives such as protection of underlying landfill layers or site restoration. Like other organic amendments, their use sequesters carbon in the soil and eliminates the need to import soil from other sites.

5 REVIEW OF BIOSOLIDS TECHNOLOGY IMPROVEMENTS & ALTERNATIVE MANAGEMENT

The RDN requested a review of advancements in biosolids technologies and Canadian biosolids management. Below are the updates during 2022:

<u>Advancements in Canadian Biosolids Policy and Technology</u>

- Biochar carbon quantification methodology:
    - Verra's Verified Carbon Standard Program developed a methodology for quantifying carbon emission reductions from the production (pyrolysis, gasification, biomass boilers) and use of biochar, which includes biosolids as a feedstock. This lays the groundwork for acquisition of verifiable carbon credits from biosolids thermal treatment processes.

[1] Danjou, B. 2014. Effect of Biosolid on Vegetation Development Within Two Douglas-fir Plantations: Third Year Progress Report - DRAFT. Vancouver Island University, Nanaimo, B.C.

- Renewable natural gas expansion:
    - Net Zero Waste Abbotsford's organic waste composting facility plans to add anaerobic digestion and biogas production capacity to the facility – the biogas will be sold to FortisBC.
- Composting facility expansion:
    - TransAqua looks to expand its Moncton biosolids composting operation.
- Wastewater treatment plant upgrade:
    - Anaergia was contracted to upgrade a Petawawa, ON, wastewater treatment plant to accept organics with biosolids and produce biogas, which will fuel a combined heat and power system to power the treatment plant.
- Biosolids dewatering facility:
    - Construction of the new Iona WWTP dewatering facility was completed. This is one of the first steps in the Iona plant upgrades that will eventually produce dried biosolids pellets.
- Treatment plant upgrade:
    - The City of Winnipeg received funding towards the Phase 2 upgrade of its largest sewage treatment plant which will allow it to produce biosolids.
- Decentralized wastewater treatment and biosolids production:
    - Proteus Waters is bringing its decentralized wastewater treatment solution to Canada, capable of serving 250 people per day (2-4 sea-cans) to 3,500 people per day (10-15 sea-cans). The technology uses a membrane bioreactor to produce clean water and biosolids that can be converted into fertilizer or biodiesel.

Changes to Canadian Biosolids Management Programs

- Site-greening initiative on biosolids-amended marginal land:
    - Algoma steel partnered with Sault College, planting trees in a wind berm along the St. Mary's River on land where biosolids had been previously applied.
- Guelph Biosolids Master Plan:
    - The City of Guelph, ON, developed a new Biosolids Master Plan, emphasizing consideration of new technologies to manage biogas and recover energy (combined heat and power) and enhanced filtration (disk filters) to improve tertiary treatment (phosphorus removal) capacity (currently, sand filtration is used).

6 CONCLUSION

RDN biosolids were managed at Blackjack, TimberWest Properties, and at Harmac in 2022. 5,095 wt (71% of annual production in 2022) were delivered to Blackjack, 802 wt (18%) were delivered to TimberWest Properties, and 1,291 wt (11%) were delivered to Harmac (Table 2).

All biosolids land application activities at the TimberWest Properties occurred as specified in the applicable LAP and according to management requirements under the OMRR. The TimberWest Properties accepted over 52,000 wt of biosolids from 2007 to 2022 (Table 1). The biosolids management program was transitioned to Blackjack in 2022. In its first full year as a beneficial use site, over 5,000 wt of biosolids were managed at Blackjack as per the applicable LAPs and the site is being set up to become a successful long-term management site. Biosolids management at Harmac was completed through the fabrication of RGM and BGM.

SYLVIS looks forward to continuing this productive relationship and providing biosolids management services and support to the RDN throughout 2023.

APPENDIX ONE – TABLES

Table 1: Historical management of Regional District of Nanaimo biosolids at the TimberWest Properties, Harmac Landfill, and Blackjack from 2013 to 2022.

Year	TimberWest Properties	Harmac	Blackjack	Total Production
2013	3,930 wt	-	-	3,930 wt
2014	4,812 wt	-	-	4,812 wt
2015	4,383 wt	-	-	4,383 wt
2016	4,263 wt	-	-	4,263 wt
2017	3,662 wt	797 wt	-	4,459 wt
2018	4,802 wt	164 wt	-	4,966 wt
2019	4,871 wt	719 wt	-	5,590 wt
2020	3,773 wt	1,850 wt	-	5,623 wt
2021	5,060 wt	2,194 wt	317 wt	7,571 wt
2022	802 wt	1,291 wt	5,095 wt	7,188 wt
Total	52,048 wt	7,015 wt	5,412 wt	64,475 wt

Table 2: Regional District of Nanaimo biosolids management summary - 2022.

Site	TimberWest Properties	Blackjack	Harmac BGM[a]	Harmac RGM[b]	Total
WWTP	GNPCC	GNPCC	FCPCC	GNPCC	
Class	B	B	A	B	
Storage from 2021	800	317	1,308	1,312[d]	**3,737**
Delivered	802	5,095	1,291	0	**7,188**
Land applied at site	1,602	5,262	0	1,386[d]	**8,250**
Distributed offsite	0	0	640	0	**640**
Storage to 2023	0	150	1,959[c]	0	**2,109**

Note: All values in units of wet tonnes.

a FCPCC biosolids are used at the Nanaimo Forest Products Harmac Mill as a feedstock in the production of a biosolids growing medium (BGM). No GNPCC biosolids were used to produce BGM.

b GNPCC biosolids are used at the Nanaimo Forest Products Harmac Mill as a feedstock in the production of a reclamation growing medium (RGM) used for landfill closure.

c FCPCC Class A biosolids as a component of BGM remained stored at the Harmac site at the end of 2022.

d Tonnages are estimates based on soil volumes managed since 2017, leading to a difference of 74 wt which is indicative of the variability of the estimation and not indicative of material left on site. All RGM and Class B biosolids were land applied as of the end of 2022.

Table 3: Summary of SYLVIS 2022 deliverables as outlined in the RDN-SYLVIS 2021-2022 extension contract for GNPCC biosolids management.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality monitoring was completed through the 2021-2026 contract detailed in Table 4 below.
Biosolids Quantity	No biosolids were delivered in 2022 under this contract. 800 tonnes of biosolids remaining onsite at the end of 2021 were land-applied in 2022. No biosolids remained stored at the TimberWest Properties at the end of 2022.
Biosolids Transportation and Delivery Coordination	No biosolids were delivered in 2022 under this contract.
Access Maintenance	Road quality status was monitored, no road maintenance on internal roads at the TimberWest Properties was required in 2022.
Contingency	No contingency biosolids management was required under this contract.
Storage of Biosolids	Biosolids were stored in four storage facilities at the TimberWest Properties and covered with tarps from October 1st to March 31st as per OMRR requirements. SYLVIS managed storage facilities throughout 2022. No repairs were completed on storage facilities in 2022 and decommissioning work was not required when the program was completed at TimberWest Properties.
Invoicing	Biosolids were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2022 at the biosolids management site (TimberWest Properties).
Site Safety	No near-miss or safety incidents occurred at the biosolids management site (TimberWest Properties) in 2022. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2022.
Complaints Management	There were no complaints received about the biosolids forest fertilization program at the TimberWest Properties in 2022.
Annual Reporting	A Qualified Professional Certification of Compliance report, fulfilling the regulatory requirement for written certification under OMRR Section 5(3), was provided to the RDN for land applications at the TimberWest Properties.
Application Planning	SYLVIS mapped, planned, and notified all fertilized areas in 2022.
Nanaimo Mountain Bike Club Land Use Coordination	The Nanaimo Mountain Bike Club was notified of the completion of the biosolids management program at the TimberWest Properties.
Biosolids Beneficial Use	A Land Application Plan (Authorization #110207) was submitted on August 05, 2021. Under this contract 800 wt biosolids were land applied to fertilize forests (16.5 ha) to increase tree growth, soil development, and understory growth.

Table 3 (continued): Summary of SYLVIS 2022 deliverables as outlined in the RDN-SYLVIS 2021-2022 extension contract for GNPCC biosolids management.

Record-Keeping	SYLVIS kept detailed records of all fertilization activities and environmental monitoring in 2022.
TimberWest Rules	SYLVIS maintained its BC Forest SAFE accreditation in 2022.
Construction	No works were constructed by SYLVIS at the TimberWest Properties in 2022. It was agreed upon between Mosaic and the RDN that constructed works were not required to be removed from the TimberWest Properties and ownership was transferred to Mosaic following completion of the program at the site.
Fires	SYLVIS followed a fire prevention protocol throughout 2022.
Hazardous Substance	No hazardous substances were introduced by SYLVIS to the TimberWest Properties in 2022.
Condition of TimberWest Lands	SYLVIS maintained the condition of the TimberWest Properties in 2022.
Equipment Storage	Except for temporary storage of heavy equipment during fertilization activities, SYLVIS did not store any equipment at the TimberWest Properties in 2022.

Table 4: Summary of SYLVIS 2022 deliverables as outlined in the RDN-SYLVIS 2021-2026 Agreement for GNPCC biosolids management.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality was monitored throughout 2022 through the collection of three full suite samples and 19 fecal coliform samples.
Biosolids Quantity	317 tonnes of GNPCC biosolids were delivered in December 2021with the intent of applications in spring 2022. 5,095 tonnes of GNPCC biosolids were transported to the Blackjack site by DBL Disposal in 2022. 5,262 tonnes of GNPCC biosolids were land-applied in 2022. 150 tonnes of GNPCC biosolids remained stored at Blackjack at the end of 2022. 802 tonnes of GNPCC biosolids were delivered and applied at the TimberWest Properties in March and April 2022.
Biosolids Transportation and Delivery Coordination	The RDN coordinated biosolids deliveries with DBL and SYLVIS throughout 2022.
Contingency Plan and Management	A Contingency Plan was written for the 2021-2026 biosolids management contract and the following contingency sites were available for use in 2022: TimberWest Properties, Harmac, Hamm Road, 155-A Pit, and Haslam Pit. 802 tonnes of GNPCC biosolids were delivered and applied at the TimberWest Properties in March and April under the existing site authorization. No biosolids remain stockpiled onsite.
Storage of Biosolids	Biosolids were stored at the main storage area at Blackjack and covered with tarps from October 1st to March 31st as per OMRR requirements. During contingency management at the TimberWest Properties, biosolids were stored in two storage facilities at the TimberWest Properties and covered with tarps until March 31st as per OMRR requirements
Invoicing	Biosolids deliveries were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2022.
Site Safety	No safety incidents occurred at active management sites (Blackjack and TimberWest Properties) in 2022. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2022.
Complaints Management	There were no complaints received about the biosolids forest fertilization program in 2022.
Odour Management Plan	The program Odour Management Plan was adhered to in 2022.

Table 4 (continued): Summary of SYLVIS 2021 deliverables as outlined in the RDN-SYLVIS 2021-2026 Agreement for GNPCC biosolids management.

Task or Activity	Description
Communications Plan & Engagement	The program Communications Plan was adhered to in 2022. Four inquires were received from the public regarding biosolids quality, the program timeline for transitioning the biosolids management program from the TimberWest Properties to Blackjack, application rates and illegal dumping at the TimberWest Properties, and potential impacts to wild game and plant harvesting. The RDN was included on all stakeholder responses. First Nations engagement was carried out with the Snuneymuxw First Nation for the Blackjack site through Mosaic during 2022. No questions or concerns were raised by the Snuneymuxw First Nation or other First Nations in 2022.
Annual Reporting	Qualified Professional Certification of Compliance reports, fulfilling the regulatory requirement for written certification under OMRR Section 5(3), were provided to the RDN for land applications at the TimberWest Properties and to Mosaic for land applications at Blackjack.
Biosolids Beneficial Use	Two biosolids Land Application Plans for Authorizations #110732 and #111152 were submitted on April 22, 2022 and May 6, 2022 for Blackjack. 5,262 tonnes of biosolids were land-applied to 51 ha of forest and 2.8 ha of disturbed land. Under this contract, 802 wt biosolids were land applied to fertilize forests (16.5 ha) at the TimberWest Properties under the existing Authorization and LAP to increase tree growth, soil development, and understory growth.

Table 5: Summary of SYLVIS 2022 deliverables as outlined in the RDN-SYLVIS 2022 contract for BGM and RGM production using FCPCC biosolids.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality monitoring was completed throughout 2022. FCPCC biosolids continued to meet OMRR Class A criteria.
Biosolids Quantity	1,291 tonnes of RDN FCPCC Class A biosolids were transported to the Harmac site by DBL Disposal in 2022 for use as a feedstock in BGM production. 640 tonnes of biosolids (as a component of BGM) were removed from the site in 2022. ~1,850 tonnes (as a component of BGM) remained stored at the Harmac site at the end of 2022.
	No GNPCC biosolids were transported to the Harmac site in 2022. 1,386 tonnes of biosolids (as a component of RGM) were land-applied in 2022. All Class B biosolids and RGM were used in 2022 and none remained in storage at the end of 2022.
BGM Certification	BGM quality certification was issued by SYLVIS for the batch of BGM including deliveries up to May 2022.
Annual Reporting	The Harmac Compliance Report fulfills the regulatory requirement for written certification under OMRR Section 5(3).

Table 6: Regional District of Nanaimo biosolids quality summary - 2022.

Parameter	FCPCC	GNPCC	Regulatory Criteria		Units
	Class A	Class B	Class A[a]	Class B[b]	
# of samples	**3**	**3**	**-**	**-**	
Available Nutrients, Physical Properties, Acidity					
Total Nitrogen - TKN	45,894	59,997	-	-	µg/g
Ammonia + Ammonium- N (available)	2,797	5,100	-	-	µg/g
Nitrate - N	4	6	-	-	µg/g
Phosphorus (available)	563	1,287	-	-	µg/g
Potassium (available)	718	757	-	-	µg/g
Organic Matter	65.0	66.0	-	-	%
Total Solids	34.1	20.4	-	-	%
pH	6.6	6.9	-	-	pH
Electrical Conductivity	5.3	2.3	-	-	dS/m
Trace Elements					
Arsenic	1.2	2.4	75	75	µg/g
Cadmium	1.5	1.4	20	20	µg/g
Chromium	40	37	-	1,060	µg/g
Cobalt	2.0	2.9	150	150	µg/g
Copper	603	587	-	2,200	µg/g
Lead	15	24	500	500	µg/g
Mercury	0.58	0.55	5	15	µg/g
Molybdenum	4.6	8.3	20	20	µg/g
Nickel	11	15	180	180	µg/g
Selenium	1.4	2.3	14	14	µg/g
Zinc	1080	867	1,850	1,850	µg/g
Microbiological Analysis - Fecal Coliforms					
Fecal Coliforms	10[c]	88,300[d]	1,000	2,000,000	MPN/g

Note: All analyses based on dry weight.

a Class A trace element criteria specified in Trade Memorandum T-4-93, Standards for Metals in Fertilizers and Supplements as of August 2017, and microbiological criteria specified in Schedule 3 of the BC *Organic Matter Recycling Regulation*.

b Class B trace element criteria specified in Schedule 4 and microbiological criteria in Schedule 3 of the BC *Organic Matter Recycling Regulation*.

c Value is the maximum of eight samples collected by SYLVIS throughout 2022.

d Value is the geometric mean of 19 samples collected by SYLVIS throughout 2022.

APPENDIX TWO – FIGURES

Figure 1: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered and applied at Blackjack by month in 2022.

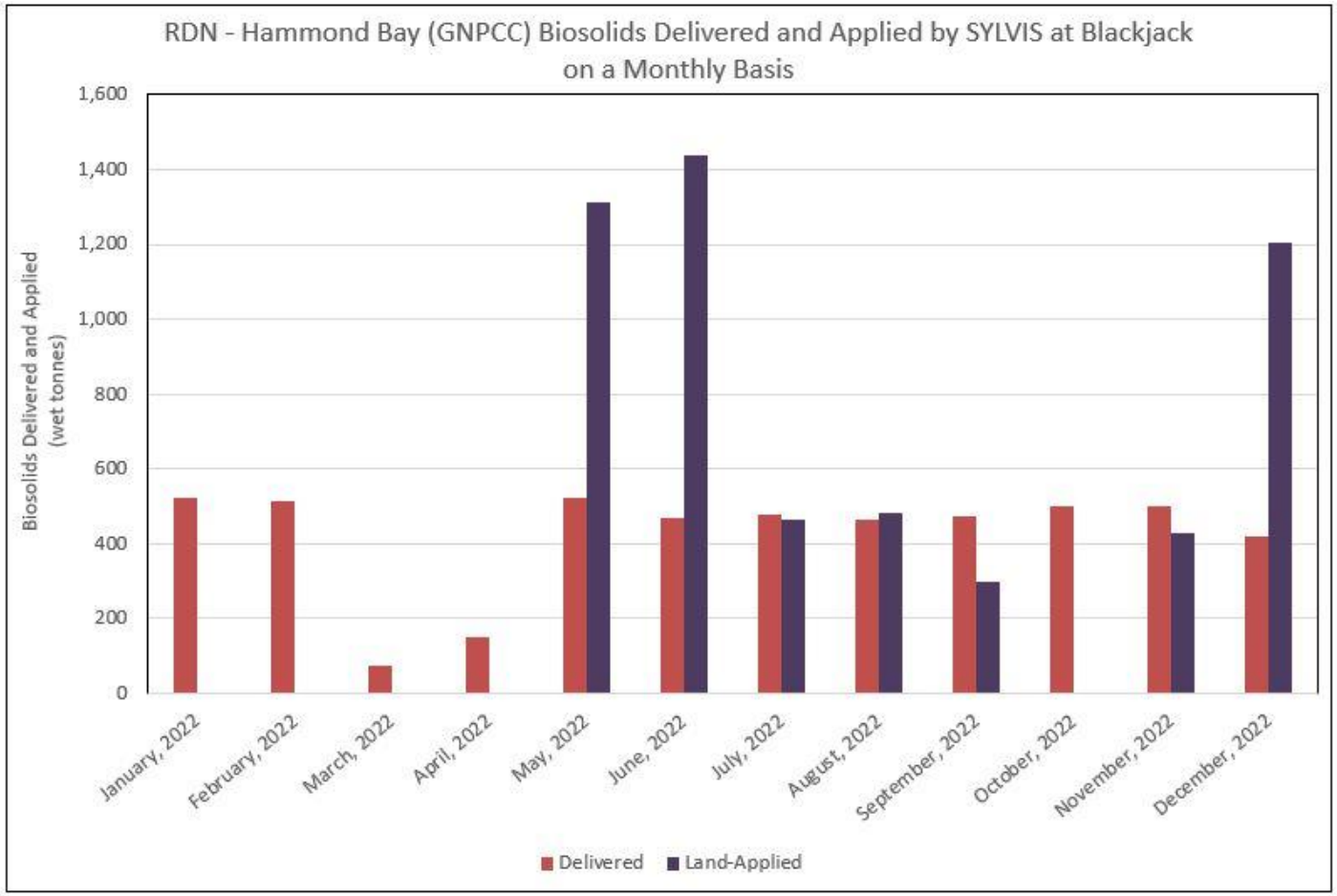
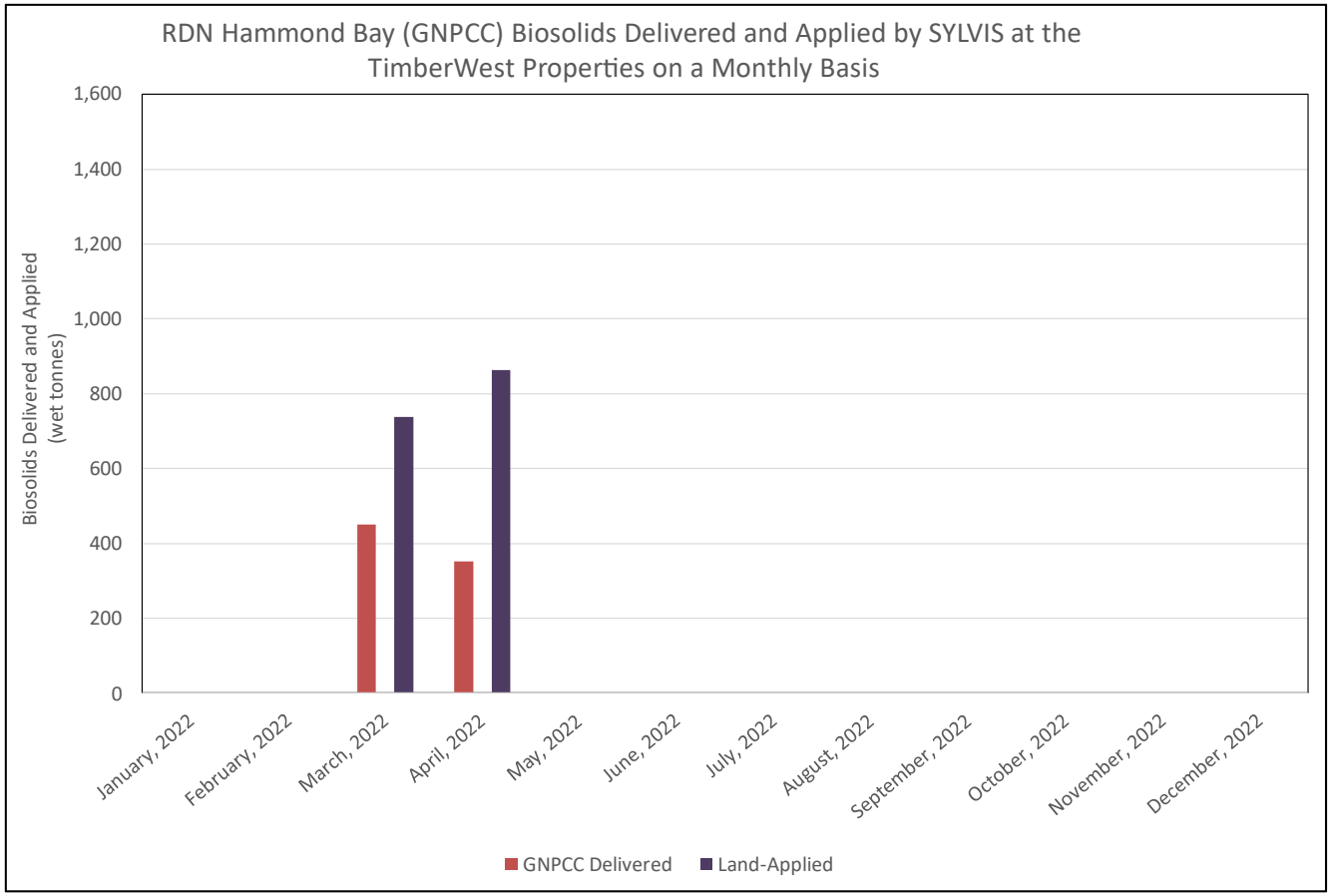
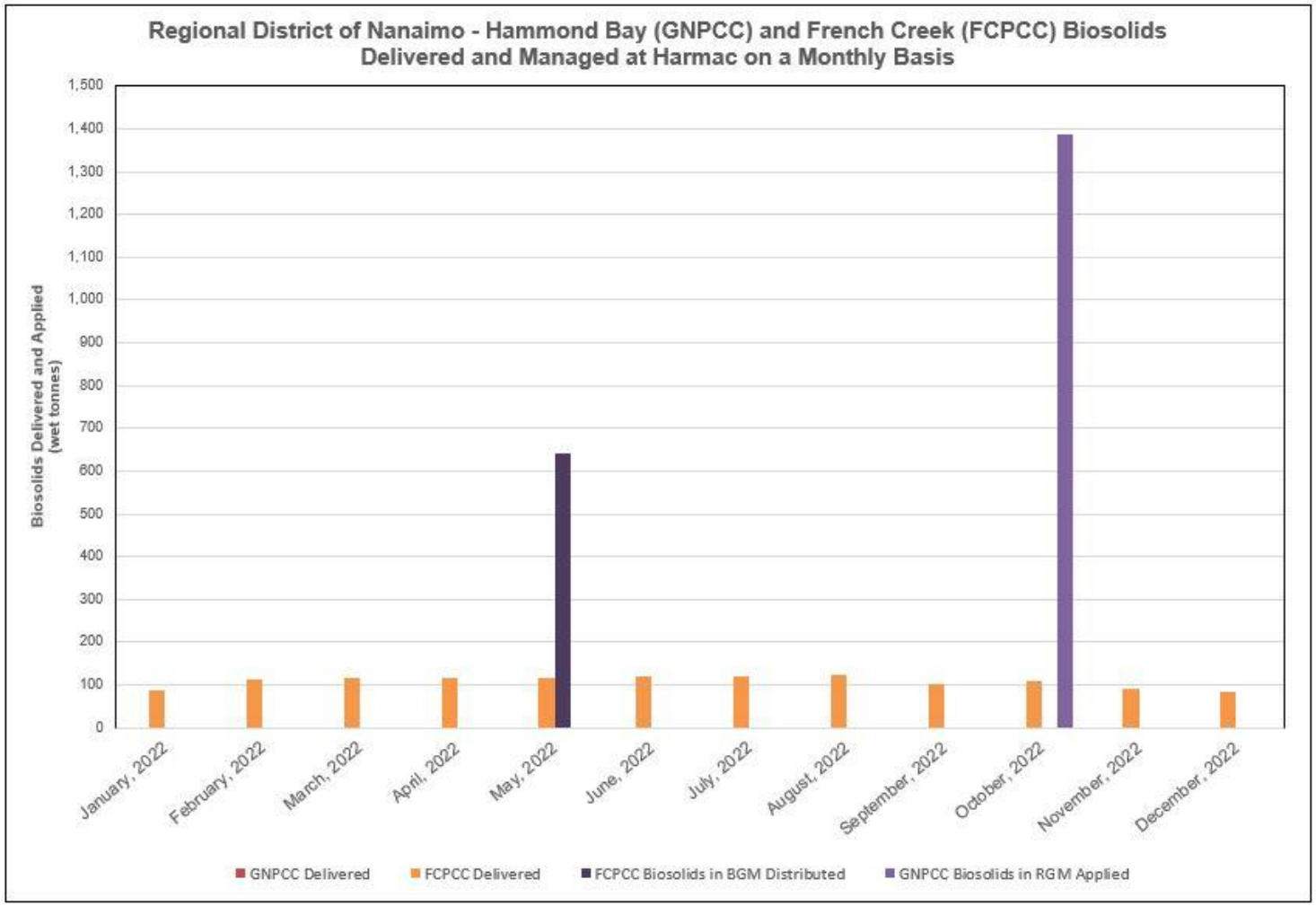


Figure 2: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered and applied at the TimberWest Properties by month in 2022.



Note: 800 tonnes of GNPCC biosolids were stored from 2021 in anticipation of 2022 forest fertilization applications.

Figure 3: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) and French Creek Pollution Control Centre (FCPCC) dewatered biosolids delivered and managed at Harmac by month in 2022.



Note: The tonnages of biosolids applied/distributed are based on the volume of BGM and RGM distributed as indicated by Harmac.

Figure 4: Blackjack application areas fertilized with Regional District of Nanaimo biosolids in 2022.

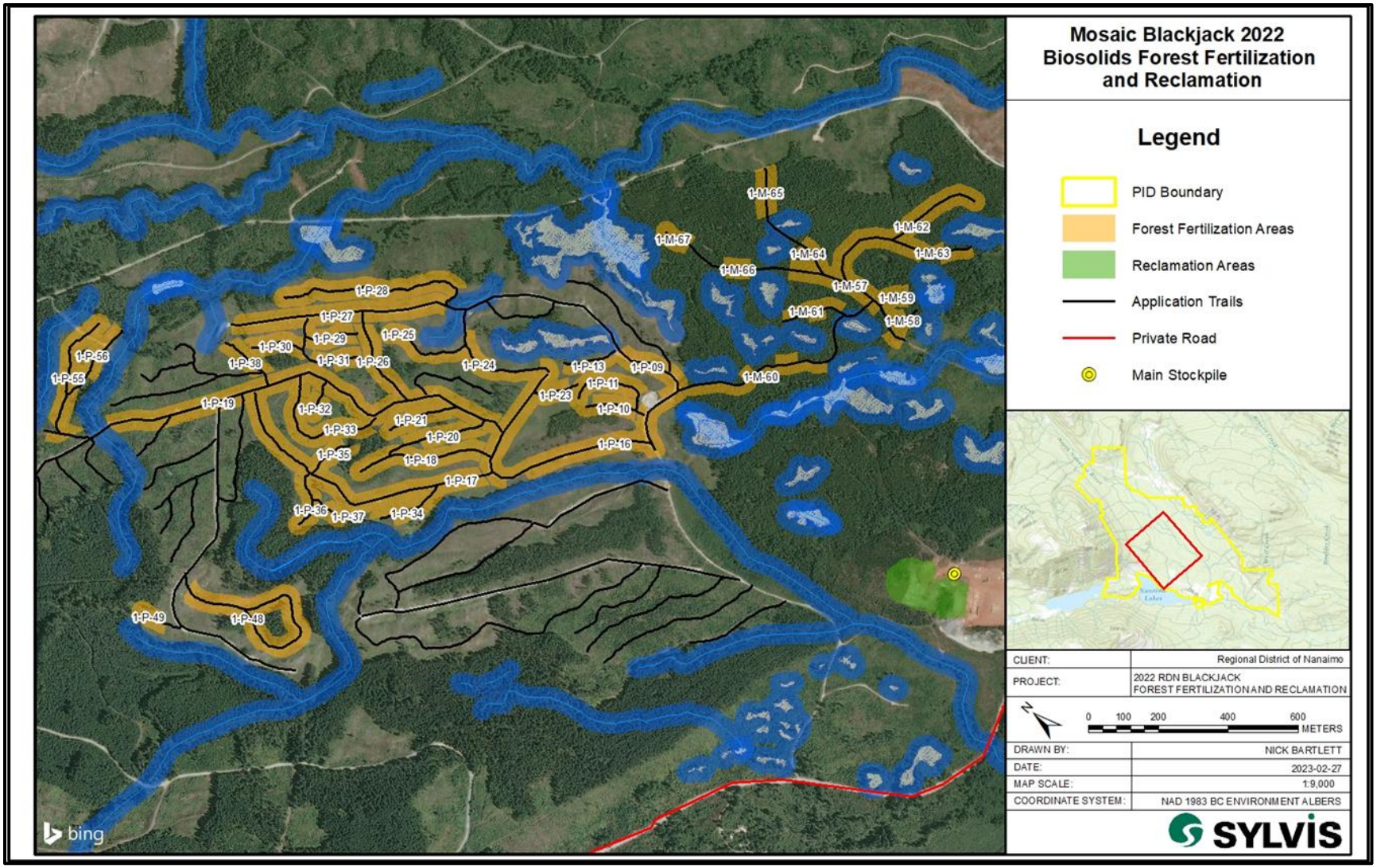
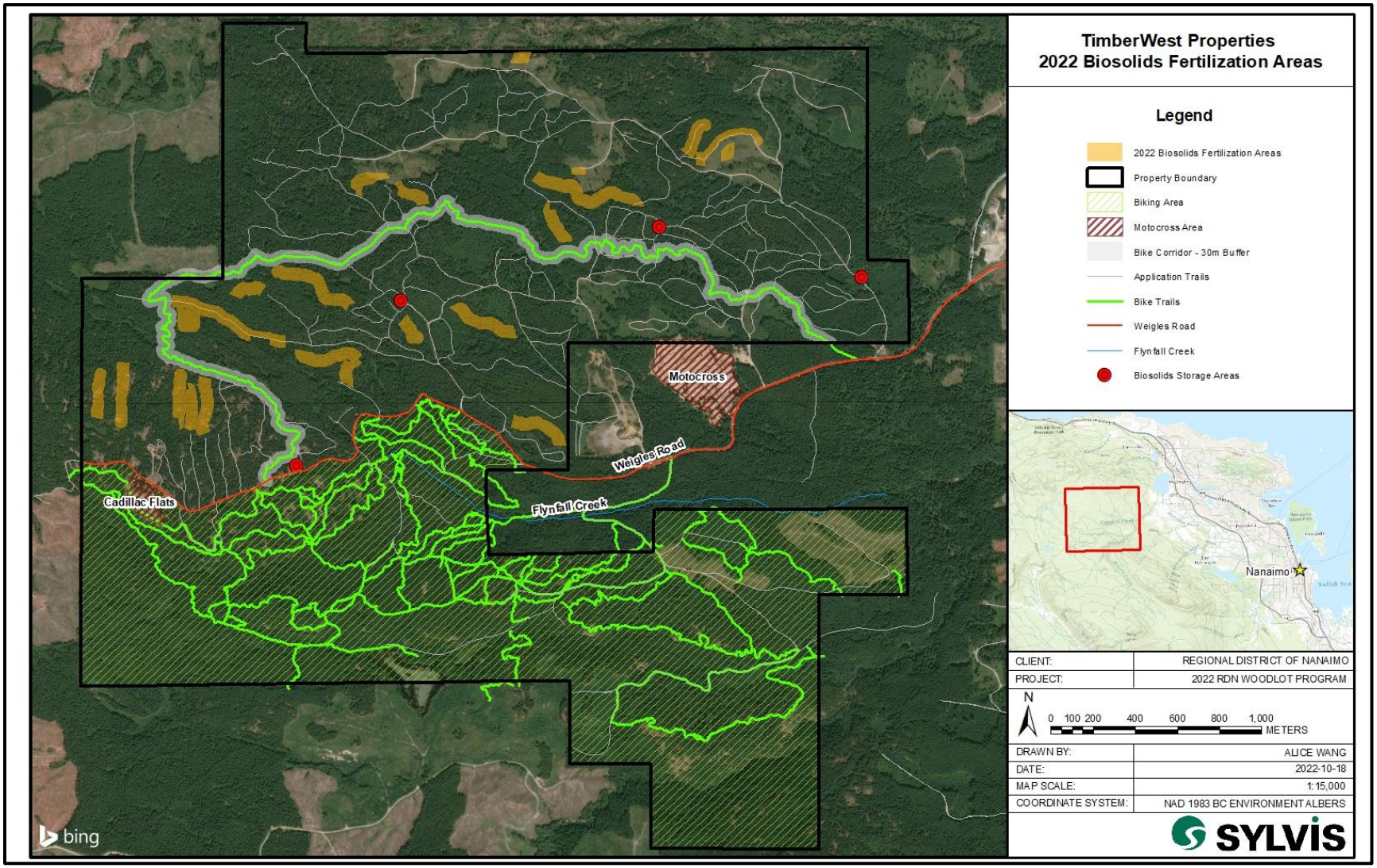


Figure 5: TimberWest Properties application areas fertilized with Regional District of Nanaimo biosolids in 2022.



APPENDIX THREE – PHOTOGRAPHS

Photograph 1: Storage area at the TimberWest Properties following completion of biosolids program. (June 2022)

Photograph 2: Main biosolids storage area at Blackjack. (September 2022)

Photograph 3: Forest fertilization using biosolids onto a mature forest block.
(July 2022)

REGIONAL DISTRICT OF NANAIMO

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