REGIONAL DISTRICT OF NANAIMO

2024 Annual Report

Greater Nanaimo Pollution Control Centre

February 2025

Submitted to the Ministry of Environment and Parks
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Executive Summary

The Regional District of Nanaimo (RDN) owns and operates the Greater Nanaimo Pollution Control Centre (GNPCC), located at 4600 Hammond Bay Road in Nanaimo. GNPCC provides secondary treatment using Modified Ludzack-Ettinger (MLE) activated sludge process. In 2017, construction began on the Secondary Treatment Upgrade Project. Construction achieved substantial completion in September 2020. Treated effluent from GNPCC is discharged to the Strait of Georgia.

Operation of GNPCC is regulated by Environmental Management Permit No. PE00338, most recently amended by the BC Ministry of Environment and Parks in 2020. The authorized treatment works include a screening facility; grit and scum removal systems; primary sedimentation tanks; secondary treatment bioreactors; secondary clarifiers; sludge thickening systems, sludge digestion systems; sludge dewatering facility; an outfall extending 2,030 m out from mean low water to a maximum depth of 70 m below mean low water; a diffuser; and related appurtenances.

This report was written by RDN staff as a permit requirement and summarizes and interprets the GNPCC monitoring data for 2024. The summary of 2024 monitoring data at GNPCC is as follows:

Summary of Compliance	Permit	2024	Permit Exceedances
Maximum Daily Flow	80,870 m^3/day	84,271 m^3/day	1
Average Daily Flow	40,950 m^3/day	35,239 m^3/day	0
Average Daily $cBOD_5$	130 mg/L	8.65 mg/L	0
Average Daily TSS	130 mg/L	9.98 mg/L	0

- **Flow** – The total flow discharged from GNPCC in 2024 was 12,897,453 m^3, at an average daily flow of 35,239 m^3/day. GNPCC had one maximum daily flow permit exceedance.
- **5-day Carbonaceous Biochemical Oxygen Demand** – The influent and effluent average 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) concentration for 2024 was 295 mg/L and 8.65 mg/L, respectively. The average removal efficiency in 2024 was 96.9%.

  There was one $cBOD_5$ sampling non-compliance because no effluent composite sample was taken on July 26th. Appendix C contains additional information on this non-compliance.
- **Total Suspended Solids** – The influent and effluent average Total Suspended Solids (TSS) concentration in 2024 was 556 mg/L and 9.98 mg/L, respectively. The average TSS removal efficiency in 2024 was 97.8 %.

  There was one TSS sampling non-compliance because no effluent composite sample was taken on July 26th. Appendix C contains additional information on this non-compliance.
- **Ammonia and Toxicity** – The average ammonia nitrogen concentration in the effluent for 2024 was 20.4 mg/L and the average toxicity (LC_{50}) of the effluent for 2024 was 98.6%.
- **General parameters, metals, volatile and semi-volatile compounds** – results from this reporting year were consistent with historical data.
- **Biosolids** – Biosolids generated by GNPCC in 2024 met the standards for Class B biosolids in Schedules 3 and 4 of the Organic Matter Recycling Regulation. GNPCC biosolids are currently land applied in a Forest Fertilization Program.

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1) Introduction

The Regional District of Nanaimo (RDN) owns and operates the Greater Nanaimo Pollution Control Centre (GNPCC) located at 4600 Hammond Bay Road in Nanaimo. GNPCC provides secondary treatment using Modified Ludzack-Ettinger (MLE) activated sludge process. Treated effluent from GNPCC is discharged to the Strait of Georgia. Operation of the treatment plant is regulated by the Ministry of Environment and Parks (ENV) under Environmental Management Permit No. PE00338 (the Permit), issued on April 15, 1970, and most recently amended on December 11, 2020 (see Appendix A). The RDN has been in discussion with ENV about establishing an Operational Certificate at GNPCC.

The authorized treatment works include a screenings facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors, secondary clarifiers, sludge thickening systems, sludge digestion systems, sludge dewatering facility, and outfall extending 2,030 m from mean low water to a minimum depth of 70 m, diffusers, and related appurtenances.

Notable upgrades over the years include:

- From 2009 until the commissioning of secondary treatment, GNPCC operated with Chemically Enhanced Primary Treatment (CEPT).
- In 2009, two gravity thickeners were added to the treatment process.
- In September 2012, a cogeneration system was installed. It produced electricity from 2012 to mid-2018, which was sold to BC Hydro.
- A third digester and fourth sedimentation tank were added in 2013.
- In 2016, the RDN commissioned a new outfall for GNPCC.
- In October 2020, the secondary treatment process commenced operation.

This report was written by RDN staff as a permit requirement to summarize and interpret the 2024 GNPCC monitoring data.

1.1 Environmental Management System

The RDN's Wastewater Services department's Environmental Management System is ISO 14001:2015 certified. ISO 14001 is an international Environmental Management System 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 neighbourhood surrounding GNPCC is predominately a single- and multi-family residential area. There are about 1,000 residential properties within a 1 km radius of the treatment facility. Ecole Hammond Bay School is also nearby. Neck Point Park borders the property to the northeast. There were no significant changes to the layout of the neighbourhood in 2024. Walley Creek runs in front of the treatment facility parallel to Hammond Bay Road.

3) Permit Requirements

3.1 Authorized Discharges

Section 1.1.1 of the Permit states the following daily effluent discharge limits:

- Average annual flow: 40,950 m^3/day
- Maximum daily flow: 80,870 m^3/day.

Section 1.1.2 of the Permit states that the characteristics of the discharge shall not exceed:

- 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$): 130 mg/L
- Total Suspended Solids (TSS): 130 mg/L.

3.2 Monitoring Requirements

Table 1 summarizes the Permit monitoring requirements. Quarterly reports were submitted to ENV.

Table 1. Monitoring Requirements by Permit Subsection Number

3.1.1 Flow Measurement A flow-measuring device must be provided and maintained to record, once per day, the effluent volume discharged over the preceding 24-hour period.
3.1.2 Sampling and Analysis Suitable sampling facilities must be installed and maintained to obtain composite samples and analyses of the effluent.
3.2 Biosolids Monitoring A sample of the treated biosolids must be obtained once every quarter for chemical analysis.
3.3 Monitoring of the Receiving Environment The receiving environment in the vicinity of the treatment plant outfall shall be monitored, and the monitoring program is subject to approval by the Regional Waste Manager.
3.4.1 Sampling and Analytical Procedures Sampling and flow measurement shall be carried out in accordance with the procedures described in the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air Emission, Water, Wastewater, Sediment and Biological Samples (2013 Edition)*, or by suitable alternative procedures authorized by the Regional Waste Manager. Analyses are to be carried out in accordance with procedures described in the *British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment, Biological Materials and Discrete Air Samples (2020)*, or by suitable alternative procedures authorized by the Regional Waste Manager.
3.4.2 Toxicity Toxicity analyses for effluent are conducted by an external laboratory.

Additional methodologies used for the analyses are described in the "*Standard Methods for the Examination of Water and Wastewater*," 24th Edition, American Public Health Association, 2023.

An automatic sampler was used to withdraw flow-proportioned effluent samples over a 24-hour period.

3.3 Outfall Inspection

The Permit requires inspection of the GNPCC outfall every 5 years. The outfall was last inspected by GreatPacific Consulting Ltd. in November 2022 and was reported to be in good condition. The outfall inspection report was submitted to ENV. The next inspection is scheduled for 2027.

4) Flow Monitoring

Flow was measured in 2024 by a Parshall Flume and totalized by GNPCC's SCADA system.

4.1 2024 Flows

Daily flow monitoring data for GNPCC in 2024 is presented in Appendix B. The total flow discharged from GNPCC in 2024 was 12,897,453 m^3, at an average daily flow of 35,239 m^3/day. Higher daily flows recorded in January and December were associated with seasonal patterns of rainfall.

The Average Dry Weather Flow (ADWF) for 2024 was 27,926 m^3/day based on average daily flow in July, the month with the lowest total precipitation. The precipitation data from 2024 was obtained from the Nanaimo City Works Yard weather station (see Environment and Climate Change Canada).

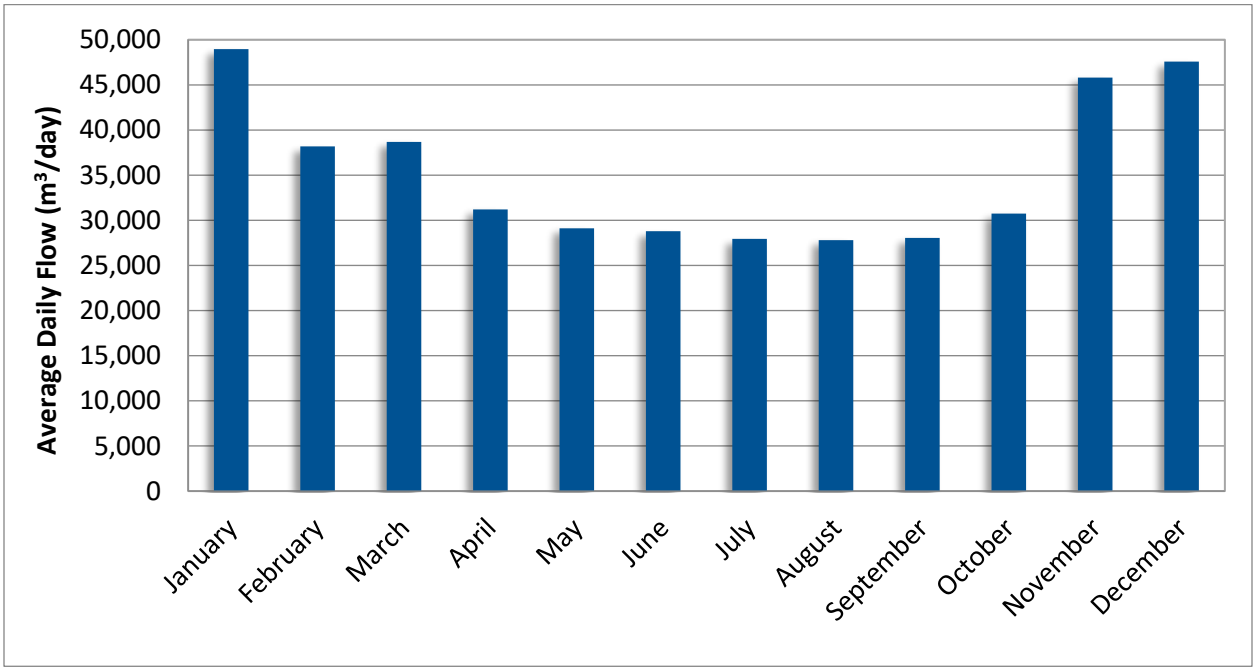
GNPCC had one maximum daily flow non-conformance in 2024 which occurred on December 26 during a high precipitation event. The non-conformance is attributed to inflow and infiltration (I&I) entering the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo and the District of Lantzville to reduce I&I in the sanitary sewer collection system.

Appendix C contains more information on the flow non-conformance. Flows are summarized in Table 2 and graphed in Figure 1.

Table 2. 2024 Summary of Flows from GNPCC

Month	Average Daily Flow (m^3/day)	Total Flow (m^3)	Maximum Flow (m^3/day)	Minimum Flow (m^3/day)	Permit Exceedances (Max daily flow)	Total Monthly Precipitation (mm)
January	48,960	1,517,774	73,206	28,242	0	277.5
February	38,196	1,107,670	54,558	32,220	0	91.0
March	38,693	1,199,481	51,200	32,100	0	129.0
April	31,203	936,076	37,483	28,233	0	57.8
May	29,092	901,848	33,036	26,848	0	49.2
June	28,800	863,993	34,547	24,316	0	59.6
July	27,926	865,717	32,247	26,575	0	12.8
August	27,800	861,802	29,992	26,225	0	37.8
September	28,057	841,714	32,415	20,322	0	41.6
October	30,724	952,450	43,562	23,021	0	136.4
November	45,818	1,374,533	73,800	33,926	0	215.0
December	47,561	1,474,395	84,271	31,082	1	252.8
Average	**35,239**					**1,361**
Total		**12,897,453**			**1**	
Maximum			**84,271**			
Minimum				**20,322**		

Figure 1. 2024 Average Daily Flow Per Month



4.1.1 Historical Trends

Flow data reported over the past ten years are summarised in Table 3 and graphed in Figures 2 and 3. Note, flow measurement techniques have varied over the years:

- Prior to December 2014, flows were recorded with a Parshall Flume.
- Flow from December 2014 to January 2018 was measured by an ISCO LaserFlow meter. It is believed that the LaserFlow meter was reading high.
- Flows after January 2018 were measured using a new Parshall Flume.

Table 3. Historical Trends: GNPCC Flows

Year	Average Daily Flow (m^3/day)	Total Flow (m^3)	Maximum Flow (m^3/day)	Permit Exceedances (Max daily flow)
2015	34,991	12,736,880	105,400	2
2016	41,151	15,061,083	96,700	6
2017	42,535	15,525,250	133,200	3
2018	29,945	10,930,000	91,100	2
2019	28,189	10,289,016	102,400	1
2020	29,426	10,769,976	92,213	2
2021	32,112	11,720,796	90,730	2
2022	32,290	11,785,797	104,451	4
2023	33,547	12,244,604	95,897	2
2024	35,239	12,897,453	84,271	1

Figure 2. Historical Flows from GNPCC

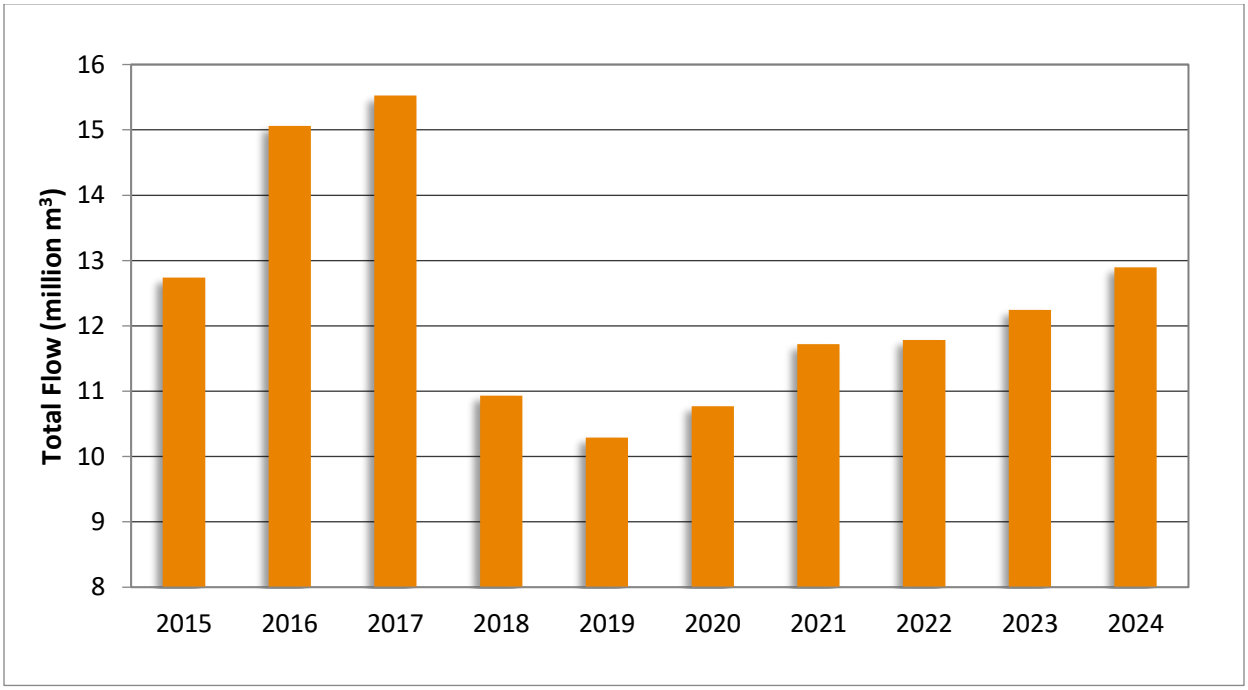
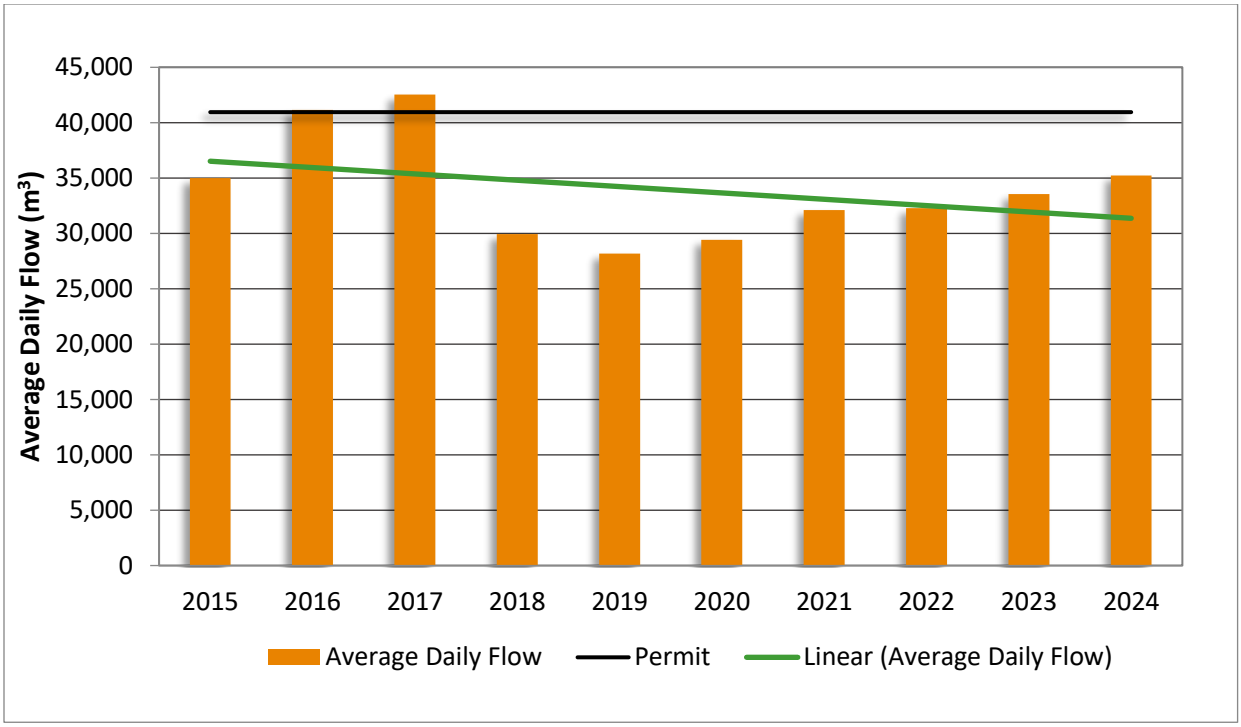


Figure 3. Historical Trends: Average Daily Flow by Year



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 $cBOD_5$ testing of the effluent once per day and establishes the maximum permitted concentration at 130 mg/L. The average influent and effluent $cBOD_5$ concentration for 2024 was 295 mg/L and 8.65 mg/L, respectively. The average $cBOD_5$ removal efficiency was 96.9%. Appendix B contains the daily $cBOD_5$ test results.

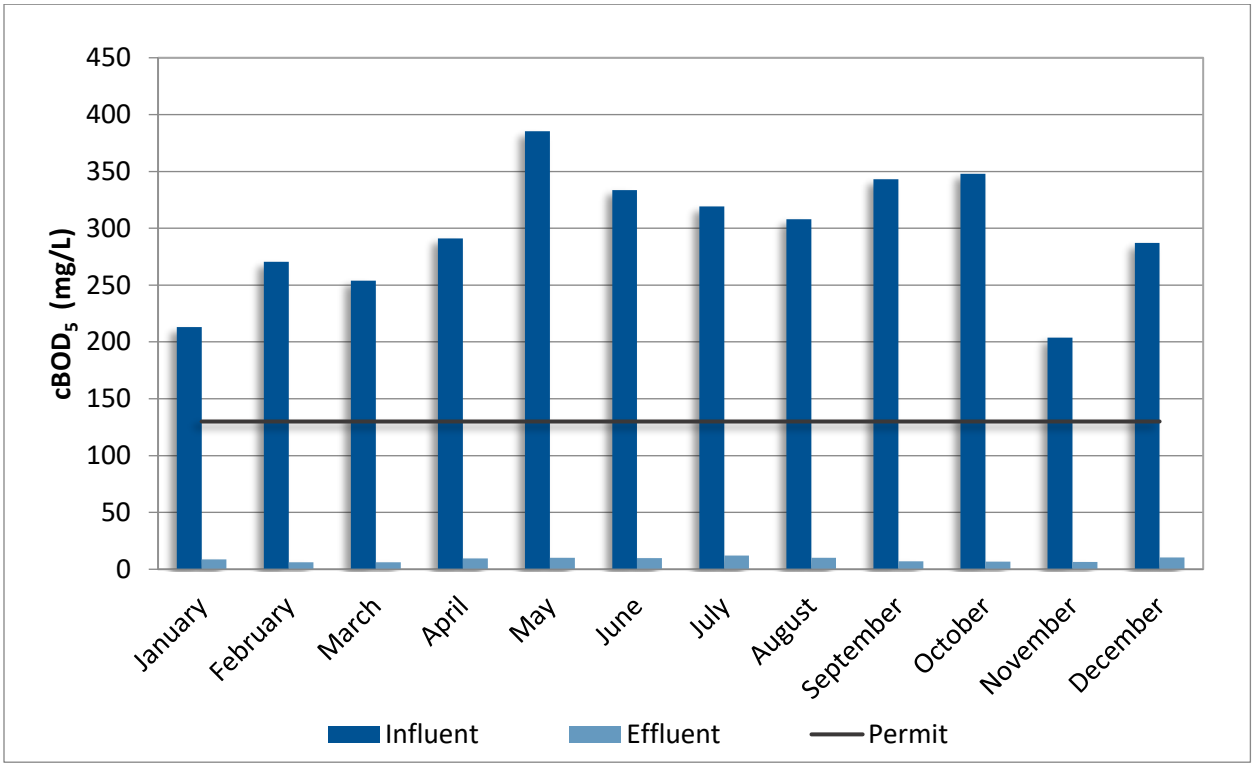
There was one sampling $cBOD_5$ non-compliance in 2024. No sample was taken on July 26th due to the final effluent sampler not being turned on after collection of the previous day's sample. Appendix C contains additional information on this non-compliance.

Monthly averages are summarized Table 4 and graphed in Figure 4.

Table 4. 2024 Influent & Effluent $cBOD_5$ Concentrations

Month	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Permit Exceedances
	Influent	Effluent		
January	213	8.64	95.8%	0
February	271	6.24	97.5%	0
March	254	6.22	97.4%	0
April	291	9.63	96.2%	0
May	386	10.2	97.3%	0
June	334	9.84	96.7%	0
July	319	12.1	96.2%	0
August	308	10.1	96.3%	0
September	343	7.13	97.5%	0
October	348	6.82	97.9%	0
November	204	6.32	96.7%	0
December	287	10.4	98.1%	0
Average	**295**	**8.65**	**96.9%**	
Total				**0**

Figure 4. 2024 Influent & Effluent Monthly Average $cBOD_5$ Concentration



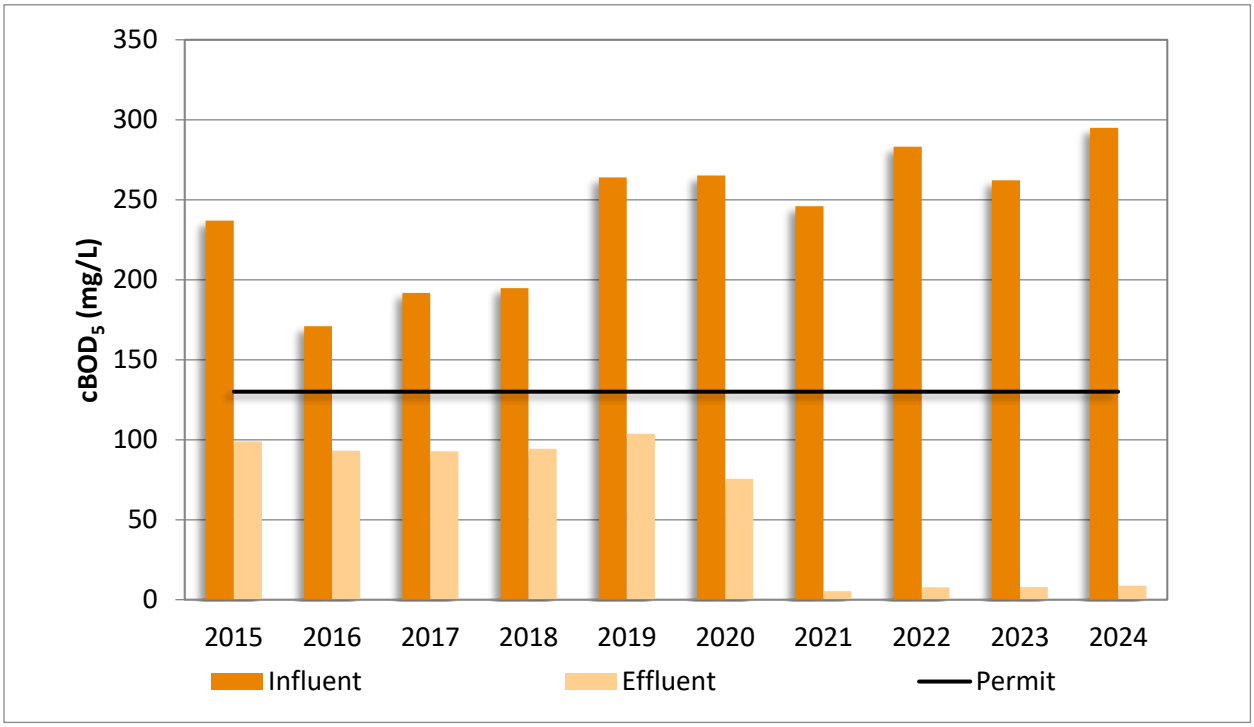
5.1.1 Historical Trends

Historical influent and effluent $cBOD_5$ concentrations, reduction efficiencies and number non-compliances over the past ten years are summarised in Table 5 and graphed in Figure 5. The removal of $cBOD_5$ increased after October 2020 with the addition of secondary treatment.

Table 5. Historical Trends: Influent & Effluent $cBOD_5$ Concentrations

Year	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Permit Exceedances
	Influent	Effluent		
2015	237	99.0	55.0%	15
2016	171	93.0	44.9%	3
2017	192	92.6	49.2%	7
2018	195	94.3	48.2%	3
2019	264	103.7	57.3%	4
2020	265	75.5	63.5%	11
2021	246	5.32	97.8%	0
2022	283	7.69	97.1%	0
2023	262	7.97	96.7%	0
2024	295	8.65	96.9%	0

Figure 5. Historical Trends: Influent & Effluent Yearly Average $cBOD_5$ Concentration



5.2 Total Suspended Solids

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

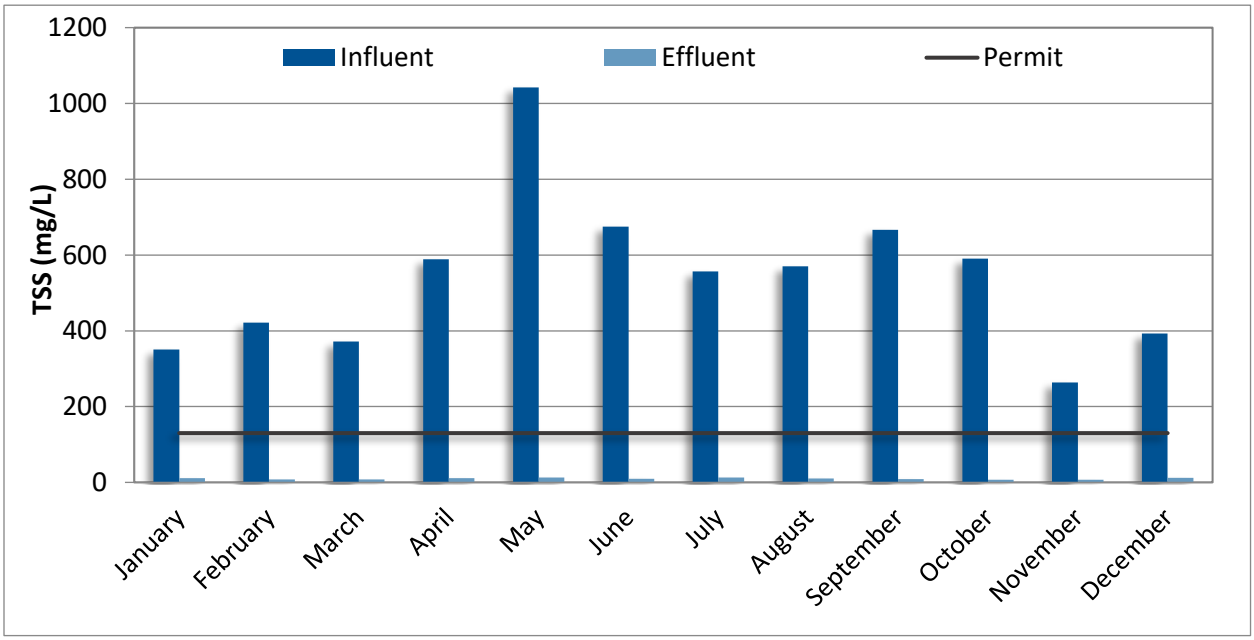
The Permit requires daily TSS testing of the effluent, with a maximum permitted concentration of 130 mg/L. Influent and effluent average TSS concentrations in 2024 were 556 mg/L and 9.98 mg/L, respectively. The average TSS removal efficiency in 2024 was 97.8%. Appendix B contains the daily TSS results. Results are summarized in Table 6 and graphed in Figure 6.

There was one sampling TSS non-compliance in 2024. No sample was taken on July 26th because the final effluent sampler was not turned on after collecting the previous day's sample. Appendix C contains additional information on this non-compliance.

Table 6. 2024 Influent & Effluent TSS Concentrations

Month	Average TSS (mg/L)		Average % Reduction in TSS	Permit Exceedances
	Influent	Effluent		
January	350	11.2	96.9%	0
February	422	8.05	97.8%	0
March	372	7.69	97.6%	0
April	588	11.4	97.7%	0
May	1042	13.2	98.4%	0
June	675	9.88	98.2%	0
July	556	13.1	97.8%	0
August	570	10.5	98.2%	0
September	667	8.34	98.4%	0
October	591	6.97	98.6%	0
November	264	7.05	97.2%	0
December	393	12.3	98.1%	0
Average	**556**	**9.98**	**97.8%**	
Total				**0**

Figure 6. 2024 Influent & Effluent Monthly Average TSS



5.2.1 Historical Trends

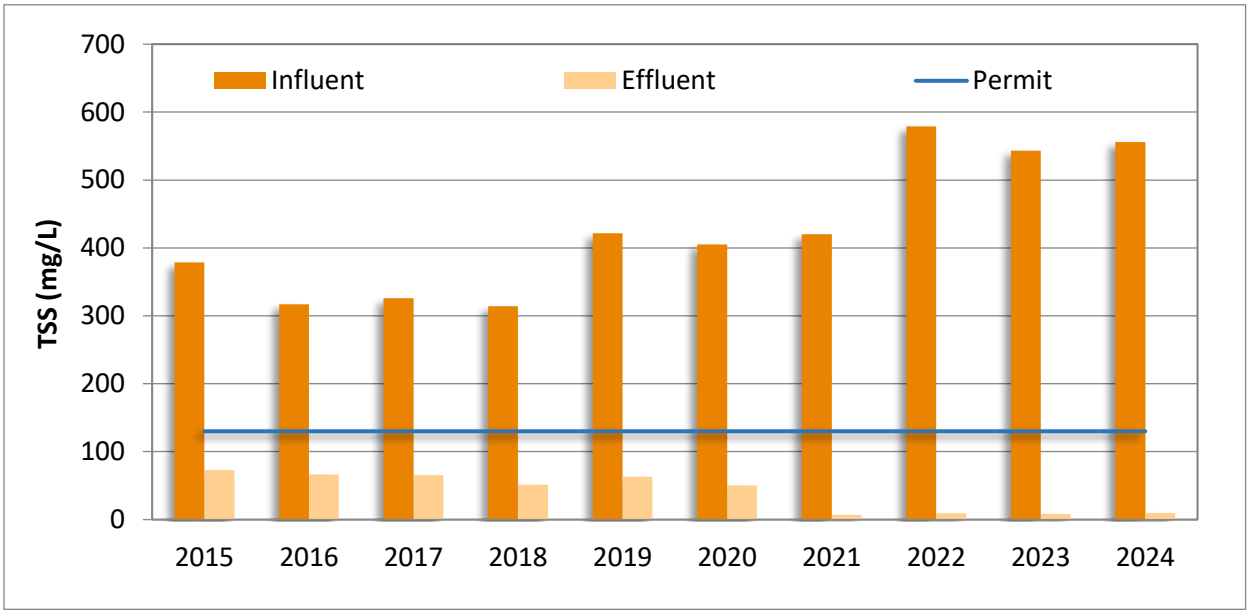
Historical influent and effluent average TSS concentration, reduction efficiencies and the number of non-compliances over the past ten years are summarised in Table 7 and graphed in Figure 7. Data from 2024 are consistent with historical values.

Effluent TSS results decreased after the secondary treatment was operational in October 2020.

Table 7. Historical Trends: Influent & Effluent TSS

Year	Average TSS (mg/L)		Average % Reduction in TSS	Permit Exceedances
	Influent	Effluent		
2015	379	72.8	79.1%	1
2016	317	66.4	77.8%	0
2017	326	65.5	78.6%	0
2018	314	51.3	82.1%	0
2019	421	63.0	82.8%	0
2020	405	50.2	83.3%	1
2021	420	7.09	98.0%	1
2022	579	9.28	98.0%	0
2023	543	8.52	98.1%	0
2024	556	9.98	97.8%	0

Figure 7. Historical Trends: Influent & Effluent Yearly Average TSS



5.3 Ammonia and Toxicity

Ammonia is one of the typical constituents found in domestic wastewater. Ammonia can be harmful to both freshwater and marine fish. Ammonia and toxicity are monitored to measure potential impacts to the receiving environment.

Toxicity testing, or a bioassay, is used to determine the strength of a material by studying the reaction of a living organism exposed to it. The accepted method used to determine the toxicity of water and wastewater is called an LC_{50} 96-hour test. This means the lethal concentration at which 50% of test organisms die within 96 hours. The result is given as a percentage, referring to the amount of effluent, in relation to dilution water, used in the test. A toxicity result of 100% is not acutely toxic. The lower the toxicity result (expressed as a percentage), the more toxic the effluent.

Ammonia testing is completed internally at the GNPCC lab on composite samples from the effluent. Table 8 contains the average of the 2024 Ammonia testing results for each month. Appendix B contains daily test results. The average ammonia nitrogen concentration in the effluent for 2024 was 20.4 mg/L.

Table 8. 2024 Effluent Ammonia Nitrogen Concentrations

Month	Effluent Ammonia Nitrogen (mg/L)*
January	20.4
February	22.7
March	15.1
April	20.0
May	18.7
June	16.8
July	18.2
August	27.1
September	33.1
October	19.6
November	17.9
December	15.6
AVERAGE	**20.4**

*Total as N

The GNPCC laboratory conducts daily testing of un-ionized ammonia levels to exceed the requirements of its Wastewater Systems Effluent Regulations (WSER) transitional authorization. Un-ionized ammonia levels were lower than the WSER limit of 1.25 mg N/L. Table 9 contains the average monthly un-ionized ammonia testing results. Appendix B contains the daily test results.

Table 9. 2024 Un-ionized Ammonia Results

Month	Un-ionized Ammonia (mg/L)*
January	0.064
February	0.093
March	0.036
April	0.074
May	0.063
June	0.046
July	0.055
August	0.188
September	0.219
October	0.074
November	0.069
December	0.054
AVERAGE	**0.086**

*Total as N

The Permit requires the effluent be tested quarterly for toxicity. Toxicity testing is conducted by an external laboratory (see Appendix D for test reports) based on per cent survival of rainbow trout in undiluted effluent. Table 10 contains the LC_{50} Toxicity testing results. The average LC_{50} toxicity of the effluent was non acutely toxic with 98.6% survival of rainbow trout as determined in 6 tests.

Table 10. 2024 LC_{50} Toxicity Results

Date	Effluent LC_{50} Toxicity (%)
12-Mar-24	>100
21-May-24	>100
26-Sep-24	91.6
09-Oct-24	>100
22-Oct-24	>100
30-Oct-24	>100
Average	**98.6**
test organisms = rainbow trout	

The LC_{50} toxicity of the effluent on September 26, 2024, was acutely lethal with a result of 91.6%. Leading up to the time of sampling, the facility process had been upset. The process returned to its normal operating parameters shortly thereafter. An additional three subsequent non-acutely lethal LC_{50} tests were completed after the process returned to normal to confirm the effluent was not acutely toxic.

This non-conformance was reported to Environment and Climate Change Canada. An investigation was completed on this WSER non-conformance. More information can be found in Appendix C.

5.3.1 Historical Trends

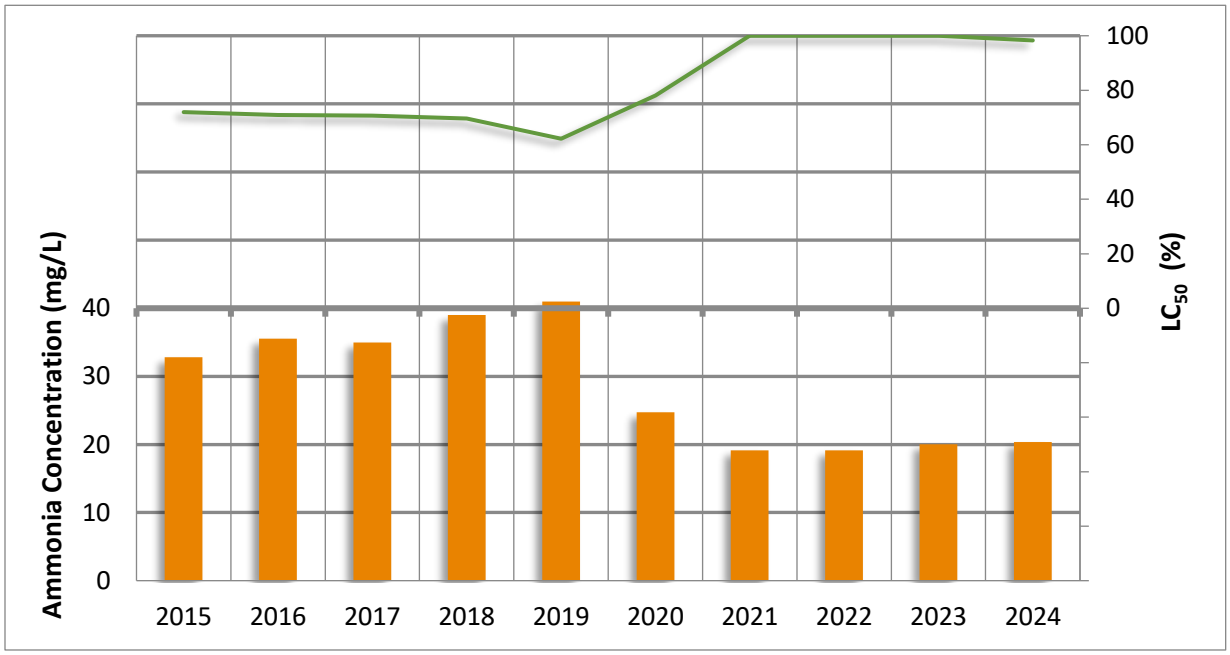
Historical average ammonia nitrogen and toxicity results for effluent reported over the past ten years are summarised in Table 11 and graphed in Figure 8.

Ammonia results since 2021 are lower than historical values due to ammonia nitrification occurring in the secondary treatment process. Results after October 2020 reflect the secondary process in operation.

Table 11. Historical Trends: Effluent Average Ammonia Nitrogen Concentrations and LC_{50} Toxicity

Year	Effluent Average Ammonia (mg/L)	Effluent Average LC_{50} (%)
2015	32.8	71.9
2016	35.5	70.9
2017	35.0	70.7
2018	39.0	69.7
2019	41.0	62.2
2020	24.7	78.0
2021	19.1	>100
2022	19.1	>100
2023	20.0	>100
2024	20.4	98.6

Figure 8. Historical Trends: Effluent Yearly Average Ammonia Nitrogen and LC_{50} Toxicity



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5.4 Alkalinity and Total Phosphorous

Total Phosphorous and Alkalinity were tested by the internal laboratory starting in 2022. In previous years, these parameters were tested by an external laboratory.

Monthly average results for 2024 are shown in Table 12 and Figure 9 and 10. No testing for total phosphorous was completed in October and December due to laboratory staffing levels and method validation being completed prior to the end of the year.

Table 12. Effluent Total Phosphorous and Alkalinity Results

Month	Total Phosphorous (mg/L)	Average Alkalinity (mg/L)
January	3.64	108
February	4.07	116
March	4.20	82.6
April	4.86	106
May	5.41	96.1
June	4.27	78.1
July	5.90	89.1
August	4.79	137
September	4.35	154
October	-	109
November	2.30	104
December	-	98.6
Average	**4.50**	**106**

Figure 9. Effluent Monthly Total Phosphorous Results

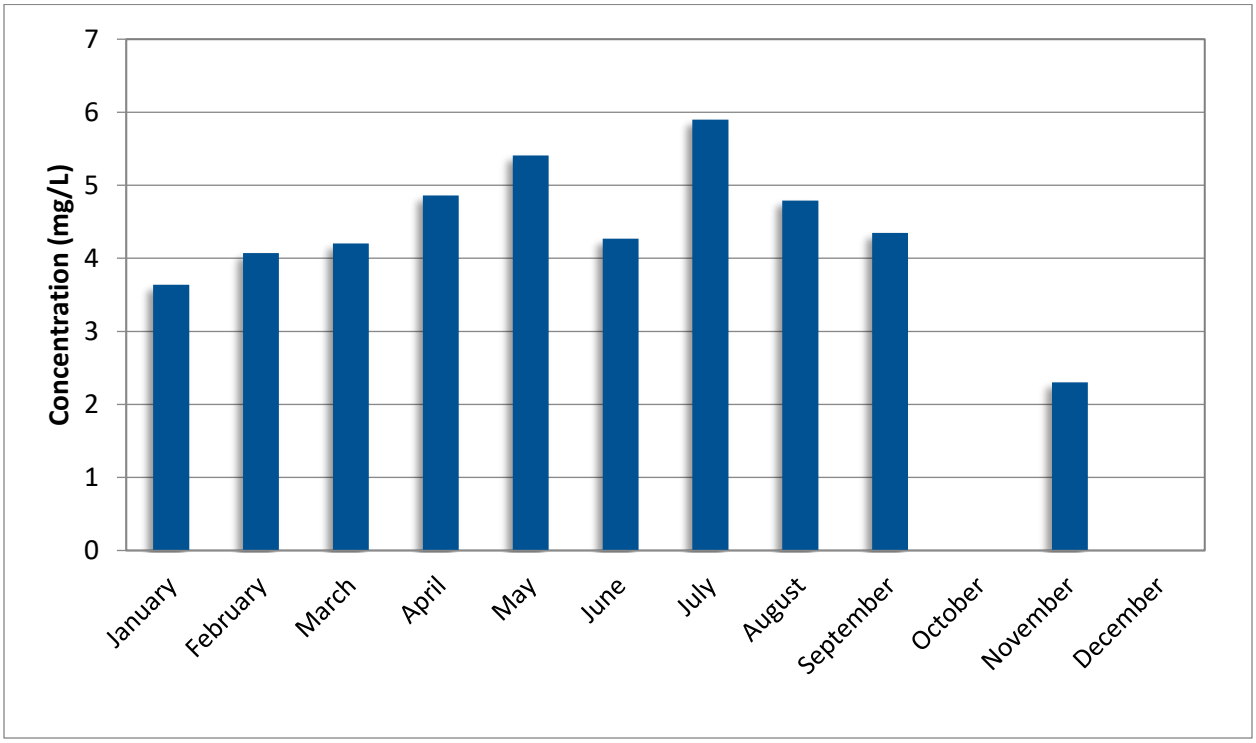
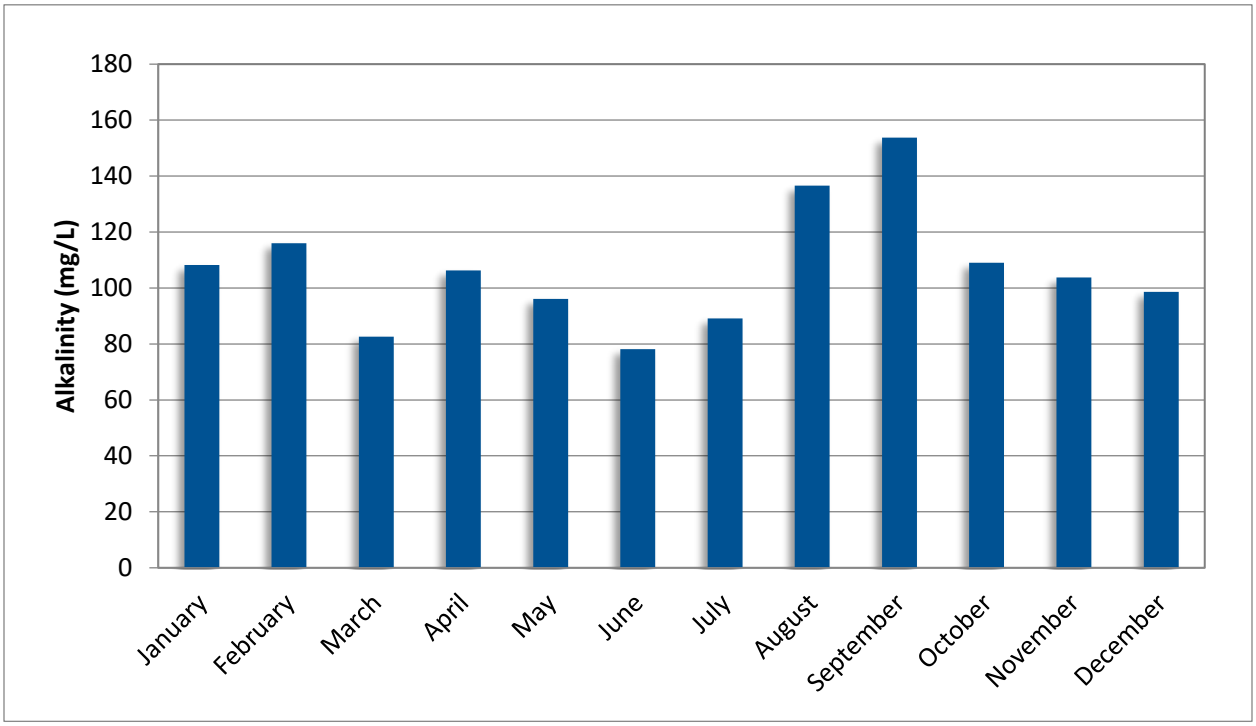


Figure 10. Effluent Monthly Alkalinity Results



5.5 Other General Parameters

The Permit requires testing of the effluent for the following parameters every six months:

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

Samples of the effluent are tested in June and December of each year by an external laboratory (see Appendix D for test results). Historical trends of the general parameters reported over the past ten years are summarised in Table 13.

Decreases in pH, alkalinity, oil and grease, and Total Kjeldahl Nitrogen were observed after 2020 due to the secondary treatment process. Total Alkalinity, pH, and Total Phosphorous are tested by the internal laboratory. Prior to 2022, these parameters were tested by an external lab.

Table 13. Historical Trends: Effluent General Parameters

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022*	2023*	2024*
pH	-	7.17	7.63	7.29	7.22	7.22	7.51	7.17	6.96	7.24	7.25
Total Alkalinity	mg/L	133	153	153	128	214	157	107	206	100	106
Dissolved Chloride	mg/L	158	165	150	133	220	104	200	150	145	181
Total Kjeldahl Nitrogen	mg/L	36.5	45.6	37.3	40.4	45.7	35.7	13.2	18.9	15.0	13.9
Total Oil and Grease	mg/L	19.5	8.1	7.9	4.9	14.8	<9.6	<1.0	<1.0	<1.3	<1.0
Dissolved Sulphate	mg/L	46	52	48	53	70	42	39	35	34	38
Dissolved Sulphide (total)	mg/L	0.08	0.059	0.082	0.064	0.100	0.053	0.013	0.022	<0.012	0.0082
Total Cyanide	mg/L	0.0040	0.0017	0.0015	<0.0050	0.0058	<1.86	0.0018	0.0015	0.0016	0.00157
Dissolved Fluoride	mg/L	0.105	0.051	0.043	0.037	0.109	<0.085	<0.056	<0.053	<0.052	<0.050
Total Organic Carbon	mg/L	64	33	47	33	35	25	32	15	16	15
Total Phosphorus	µg/L	2,415	2,845	3,125	2,770	2,680	2,510	2,550	3,847	4,146	4,500

*Results reflect average annual internal laboratory results starting in 2022. Prior to 2022, Alkalinity and Total Phosphorous determined by external laboratory testing.

5.6 Metals

The Permit requires testing of the effluent for the following metals every six months:

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)		

Samples of the effluent are tested in June and December of each year by an external laboratory (see Appendix D for test reports). The average concentrations of the metals reported over the past ten years are summarised in Tables 14 and 15.

The Total Aluminum concentration went down after October 2020 with the discontinuation of Aluminum Sulphate and the Chemically Enhanced Primary Treatment (CEPT) process.

Table 14. Historical Trends: Effluent Total Metal Concentrations

Total Metals	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Aluminum	µg/L	2,160	2,260	2,980	2,780	3,110	1,770	14.4	16.1	19.4	17.7
Arsenic	µg/L	0.70	1.06	0.50	0.49	0.76	0.44	0.49	0.47	0.44	0.41
Chromium	µg/L	0.88	1.35	2.00	2.25	3.27	<1.9	0.39	<1.2	<1.0	<1.0
Lead	µg/L	1.4	1.1	1.1	0.9	1.9	<0.74	<0.22	<0.29	0.3	0.23
Mercury	µg/L	<0.02	<0.016	<0.017	<0.032	<0.012	<0.015	<0.020	<0.027	<0.029	0.0026
Molybdenum	µg/L	0.95	<1.1	<1.0	1.1	1.515	1.9	<1.3	<1.5	<1.0	<1.0
Selenium	µg/L	<0.7	0.31	0.27	0.34	<0.40	<0.31	0.12	0.15	0.15	0.13
Silver	µg/L	0.065	0.077	0.076	0.132	0.120	<0.049	<0.020	<0.024	<0.020	<0.020
Tin	µg/L	0.80	<5.0	<5.0	<5.0	3.20	<2.9	<5.0	<5.0	<5.0	<5.0
Zinc	µg/L	53.5	48.6	51.7	45.25	117.5	75.5	31.1	30.6	32.1	26.3

Table 12. Historical Trends: Effluent Dissolved Metal Concentrations

Dissolved Metals	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Barium	µg/L	62.7	208.5	235.0	246.0	174.4	<4.4	5.1	3.6	4.6	33.0
Boron	µg/L	161	184.5	217.5	240	178.5	178.5	183.5	203.5	218	233
Cadmium	µg/L	<0.03	0.067	0.0635	0.0355	0.0825	0.0475	<0.017	<0.014	<0.080	<0.016
Cobalt	µg/L	0.51	<0.50	0.42	0.45	0.64	0.61	0.39	0.54	0.35	0.50
Copper	µg/L	24.15	44	10.6	8.67	11.00	7.96	8.69	14.0	12.3	5.8
Iron	µg/L	449	427	346	418	306	194	91	126	90	80.7
Manganese	µg/L	79.0	80.1	68.3	72.9	85.5	39.1	36.2	55.9	32.7	40.2
Nickel	µg/L	2.3	2.0	1.9	2.3	3.7	3.3	1.4	2.0	2.1	1.8

5.7 Volatile and Semi-Volatile Compounds

The Permit requires effluent be tested for these volatile and semi-volatile compounds every six months:

Benzene	Ethylbenzene	1,1,1-Trichloroethane
Di(2-ethylhexyl) phthalate	Methyl chloride	1,1,2-Trichloroethane
Chloroform	Napthalene	Trichloroethylene
Dichlorobromoethane	PCBs	Toluene
Dichloromethane	Tetrachloroethylene	Total Phenols
Di-n-butyl phthalate		

Samples of the effluent are tested in June and December by an external laboratory (see Appendix D for test reports). The average concentrations of the volatile and semi-volatile compounds reported over the past ten years are summarised in Table 16. 2024 data are consistent with historical data.

Table 16. Historical Trends: Effluent Semi Volatile and Volatile Compounds

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Benzene	µg/L	<0.5	<0.40	<0.52	<0.40	<0.5	<0.5	<0.40	<0.40	<0.40	<0.40
Di(2-ethylhexyl)phthalate	µg/L	1.6	<10	<7.0	<5.2	<6.3	<2.4	<6.0	<2.0	<2.0	<6.0
Chloroform	µg/L	1.5	2.75	4	3.25	4.0	2.8	2.5	2.9	3.2	2.2
Dichlorobromomethane	µg/L	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichloromethane	µg/L	<1	<2.0	<2.0	<2.0	<2.5	<2.5	<2.0	<2.0	<1.8	<2.0
Di-N-Butyl Phthalate	µg/L	0.52	<10	<6.0	<5.0	<6.3	<1	<6.0	<2.0	<2.0	<8.0
Ethylbenzene	µg/L	<0.5	<0.40	<0.40	<0.40	<0.70	<0.70	<0.40	<0.40	<0.40	<0.40
Methyl Chloride	µg/L	<1	<1.0	<1.0	<1.0	<6.2	<4.5	<1.0	<1.0	<1.0	<1.0
PCBs	µg/L	<0.009	<0.28	<0.53	<0.15	<0.050	<0.050	<0.050	<0.050	<0.50	<0.050
Tetrachloroethylene	µg/L	<1	<0.50	<0.50	<0.50	<0.075	<0.80	<0.50	<0.50	<0.50	<0.50
Toluene	µg/L	<0.7	<0.52	<0.64	0.54	1.545	<0.80	<0.40	<0.40	<0.40	<0.40
Total Phenols	mg/L	0.015	0.024	0.032	0.044	0.020	0.497	<0.0027	<0.0015	<0.0016	0.0114
1,1, 1-Trichloroethane	µg/L	<1	<0.50	<0.50	<0.50	<0.075	<0.75	<0.50	<0.50	<0.50	<0.50
1,1, 2-Trichloroethane	µg/L	<1	<0.50	<0.50	<0.50	<1.0	<0.75	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	µg/L	<1	<0.50	<0.50	<0.50	<0.075	<075	<0.50	<0.50	<0.50	<0.50
Naphthalene	µg/L	0.07	<0.10	<0.10	<0.10	<2.6	<2.6	<0.10	<0.10	<0.10	<0.10

6) Biosolids

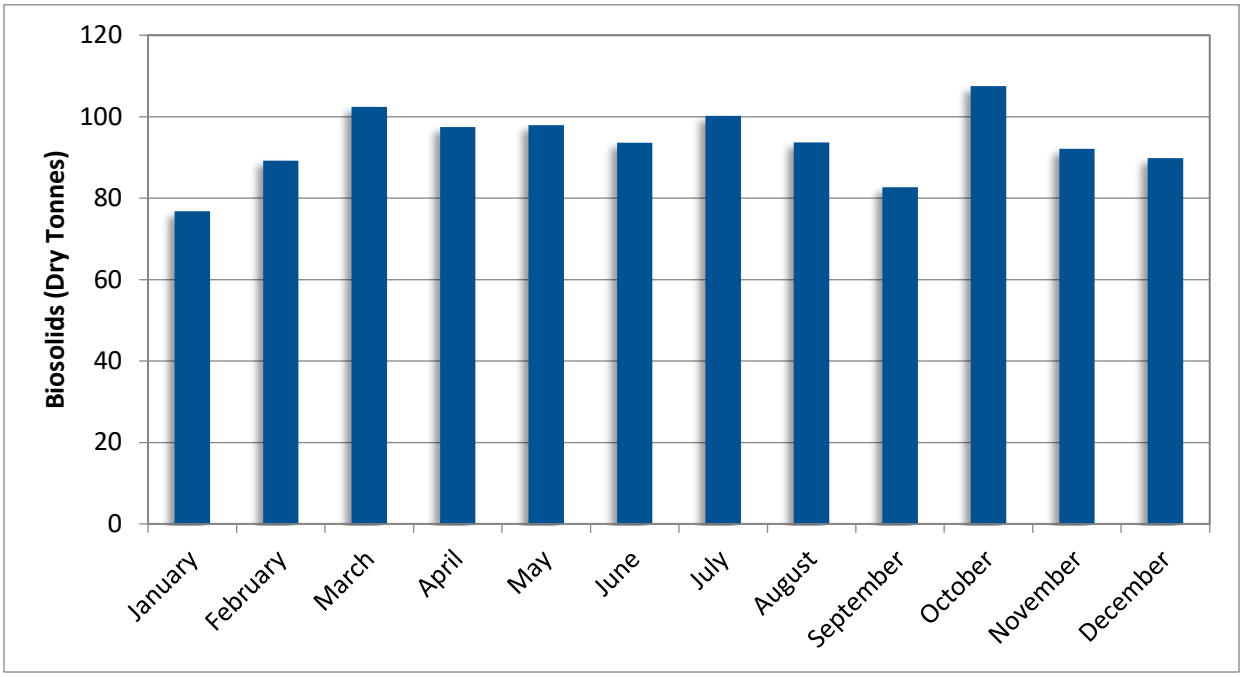
6.1 Biosolids Production

GNPCC produces Class B Biosolids. The average monthly production of biosolids in 2024 is summarized in Table 17 and graphed in Figure 11.

Table 13. 2024 Biosolids Production

Month	Trucked Biosolids (Dry Tonnes)	Trucked Biosolids (Wet Tonnes)	% Solids (Pressed Solids)
January	76.8	416.60	18.4%
February	89.2	468.87	19.0%
March	102.4	550.54	18.6%
April	97.4	510.20	19.1%
May	97.9	526.27	18.6%
June	93.6	464.64	20.2%
July	100.2	486.29	20.6%
August	93.7	442.71	21.2%
September	82.7	427.27	19.4%
October	107.5	520.72	20.7%
November	92.1	458.37	20.1%
December	89.8	454.67	19.8%
Average	**93.6**	**477.26**	**19.5%**
Total	**1,115.6**	**5,727.2**	

Figure 11. 2024 Monthly Biosolids Production (Trucked Dry Tonnes)



6.1.1 Historical Trends

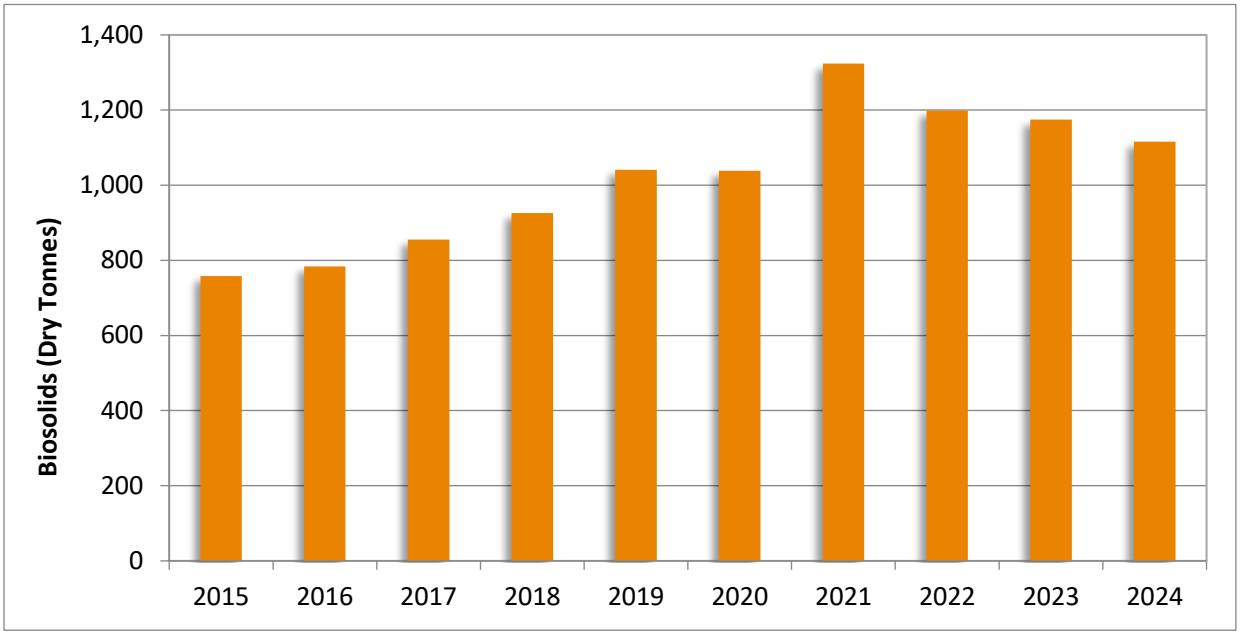
Historical average polymer use, total trucked solids (wet tonnes and dry tonnes) and yearly average percent solids reported for biosolids produced over previous years are shown in Table 18 and Figure 12. Biosolids production and polymer use increased after October 2020 with the secondary process.

Monthly biosolids production increased after October 2020 with the secondary treatment process. Percent solids decreased after secondary treatment. This trend is due to the consistency of the secondary sludge which retains moisture and tends to be more difficult to dewater.

Table 14. Historical Trends: Biosolids Production

Year	Polymer Use (Kg/year)	Trucked Biosolids (Dry Tonnes/year)	Trucked Biosolids (Wet Tonnes/year)	% Solids (Average Pressed Solids)
2015	8,817	758	3,087	24.6%
2016	10,538	783	3,094	25.3%
2017	10,800	855	3,337	25.6%
2018	12,925	926	3,658	25.3%
2019	18,422	1,040	4,337	24.0%
2020	22,429	1,039	4,361	23.8%
2021	42,380	1,323	6,272	21.1%
2022	40,408	1,199	5,897	20.3%
2023	49,044	1,174	5,716	20.5%
2024	49,553	1,116	5,727	19.5%

Figure 12. Historical Trends: Biosolids Production per Year (Trucked Dry Tonnes)



6.2 Biosolids Analysis

The Permit requires quarterly testing of the biosolids for the following parameters:

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

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

Samples of the biosolids are typically tested quarterly by an external laboratory. Average concentrations of these parameters reported in previous years are summarised in Table 19.

2024 data are consistent with historical data.

All 2024 samples from GNPCC met the Class B regulatory limits for metals in the Organic Matter Recycling Regulation (OMRR).

Table 19. Historical Trends: Biosolids General Parameters

Parameter	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	OMRR Limit (Class B)
Total Solids	%	24.7	32.7	26.1	27.5	24.5	23.1	21.6	20.3	21.0	19.9	-
Volatile Solids	%	69.3	67.275	64.05	64.575	67.9	70	74.4	76.775	77.65	78.4	-
Moisture	%	75	75	75	73	76	76	78	80	79	80	-
Total Kjeldahl Nitrogen	% dry weight	6.90	8.23	9.33	5.23	5.31	5.40	7.03	7.98	6.93	6.83	-
Phosphorus	µg/g	26,700	24,800	29,500	30,000	23,500	27,500	23,700	18,700	18,200	15,000	-
PCBs	µg/g	<0.05	<12	<15	<4.4	<8.5	<4.1	<1.6	<2.7	<3.2	<1.5	
Arsenic	µg/g	3.15	3.21	3.36	2.80	2.44	2.70	2.49	2.26	2.33	2.24	**75**
Cadmium	µg/g	2.17	2.62	2.43	1.73	2.10	1.98	1.31	1.52	1.52	1.28	**20**
Chromium	µg/g	33.8	26.4	30.6	34.5	29.1	30.9	32.0	23.2	25.0	21.5	**1,060**
Cobalt	µg/g	3.43	3.27	3.84	3.39	2.86	2.68	3.12	2.87	3.40	2.99	**150**
Copper	µg/g	1095	797	618	525	457	478	559	575	653	613	**2,200**
Iron	µg/g	-	30,000	38,700	35,100	28,000	31,000	42,100	28,500	25,600	19,600	-
Lead	µg/g	34	33	32	29	24	23	24	25	26	26.3	**500**
Mercury	µg/g	1.46	1.80	1.55	1.76	1.29	1.47	0.889	0.801	0.856	0.809	**15**
Molybdenum	µg/g	6.78	6.63	7.46	6.55	6.09	6.37	7.76	7.57	8.06	7.44	**20**
Nickel	µg/g	17.2	16.3	18.4	18.0	16.1	15.3	13.9	12.0	14.2	13.7	**180**
Potassium	µg/g	-	892	1,010	985	891	920	925	927	870	843	-
Selenium	µg/g	4.95	4.32	4.96	4.50	3.65	3.93	4.76	5.01	5.48	5.81	**14**
Zinc	µg/g	991	972	1,050	980	824	871	912	928	972	905	**1,850**

6.3 Fecal Coliforms

Twelve discrete samples of biosolids were sent to Bureau Veritas in 2024 for fecal coliform analysis (see Appendix D for test reports). The geometric mean of the biosolids fecal coliform results in 2024 was 15,000 MPN/g dry biosolids. For Class B biosolids, OMRR requires a fecal coliform level of <2,000,000 MPN per gram of total solids (dry weight basis) to be met for the geometric mean of seven discrete samples, once per year or every 1,000 tonnes of dry weight, whichever comes first. Biosolids from GNPCC in 2024 met these requirements.

Note, sampling in this report was conducted by the RDN to meet permit conditions. SYLVIS Environmental conducts a separate sampling program which is used for the Land Application Plan to meet OMRR requirements (see Appendix G).

There has been a reduction in fecal coliform levels since commissioning secondary treatment. Fecal coliform results for 2024 are summarised in Table 20.

Table 20. 2024 Biosolids Fecal Coliforms Concentrations

Date	Fecal Coliforms (MPN/g dry)
25-Jan-24	26,000
15-Feb-24	11,000
13-Mar-24	7,000
10-Apr-24	17,000
8-May-24	180,000
19-Jun-24	16,000
18-Jul-24	260,000
14-Aug-24	23,000
17-Sep-24	3,800
15-Oct-24	2,900
28-Nov-24	6,800
16-Dec-24	2,500
Geometric Mean	**15,000**

6.4 Stabilization and Dewatering

GNPCC biosolids are stabilized by anaerobic digestion. Sludge collected from the sedimentation tanks is pumped via gravity thickeners and heat exchangers to three digesters. Sludge is held in the tanks during which time it is decomposed and stabilized by biological processes. Once digested, the stabilized sludge is dewatered through a centrifuge, producing biosolids with a moist soil-like consistency. Pathogen reduction is achieved in the anaerobic digesters to create Class B biosolids (according to parameters identifies in OMRR). Stabilization and dewatering process data are presented in Tables 21 and 22.

Table 21. 2024 Stabilization Process Data

Total Mass of Sludge Delivered for Stabilization	2,860 Tonnes (dry)
% of TSS as VSS in Sludge Feed	78.5 %
Mass of Biosolids Remaining after Stabilization	1648.3 Tonnes (dry)

Table 22. 2024 Dewatering Process Data

Volume of Biosolids delivered for dewatering	95,875 m^3
% solids in biosolids dewatering feed	1.72 %
Average Volatile Solids Reduction	59.59 %
% solids in dewatered biosolids	19.5 %
Polymer dosage to aid dewatering	0.517 kg/m^3

6.5 Biosolids Management

In 2024, GNPCC Class B biosolids were land applied in a Forest Fertilization Program. Forest fertilization occurs on private forested managed by Mosaic Forest Management (Mosaic). The program is located southwest of Nanaimo and the project is managed by SYLVIS Environmental (SYLVIS). SYLVIS's 2024 Biosolids Management Summary Report, attached in Appendix G, provides a summary and interpretation of the effects of biosolids applications on the receiving environment (Section 4).

6.5.1 Excellence in Biosolids Award

In 2019, the RDN won the Northwest Biosolids *Excellence in Biosolids Award* for the second time. This award 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 Biogas Production

Biogas, which consists mostly of methane gas, is a byproduct of the anaerobic sludge digestion. Gas production is recorded daily at GNPCC. The average daily biogas production rate in 2024 was 4,875 m^3/day. The total volume produced in 2024 was approximately 1,779,266 m^3. Of the total produced, 412,003 m^3 (23.0% of total production) was used as fuel for the boilers to heat operations and wastewater treatment process water and for cogeneration. The remaining 1,367,263 m^3 (76.8 % of total production) was wasted (flared).

7.1.1 Historical Trends

Historical biogas production, use and waste rates are summarized in Tables 23 and 24.

The cogeneration system was commissioned in mid-2012. Refer to Cogeneration section for details on the Cogeneration Facility project. The cogeneration system has been mostly offline since mid-2018 although servicing was completed in 2022.

Table 23. Historical Trends: Biogas Production

Year	Total Biogas Production (m^3)	Total Biogas Wasted (m^3)	Biogas Use Cogen (total)	Biogas Use Boiler (m^3)	Total Biogas Used Total (m^3)
2015	1,458,586	797,449	478,766	182,371	661,137
2016	1,407,176	920,357	191,697	295,122	486,819
2017	1,492,730	902,057	285,450	305,224	590,674
2018	1,441,721	1,014,539	90,601	336,581	427,181
2019	1,367,432	1,000,857	1,765	364,811	366,575
2020	1,451,406	1,052,755	3,231	395,421	398,651
2021	1,639,123	1,172,274	2,254	464,595	466,849
2022	1,646,897	1,183,649	11,118	452,131	463,249
2023	1,708,832	1,289,667	6,056	413,109	419,165
2024	1,779,266	1,367,263	2,058	409,945	412,003

Table 24. Historical Trends: Percentage Biogas Consumption and Wasting

Year	% Biogas Wasted	% Biogas Used (Boiler)	% Biogas Used (Cogen)
2015	54.7%	12.5%	32.8%
2016	65.4%	21.0%	13.6%
2017	60.4%	20.4%	19.1%
2018	70.4%	23.3%	6.3%
2019	73.2%	26.7%	0.1%
2020	72.5%	27.2%	0.2%
2021	71.5%	28.3%	0.1%
2022	71.9%	27.5%	0.7%
2023	75.5%	24.2%	0.4%
2024	76.8%	23.0%	0.1%

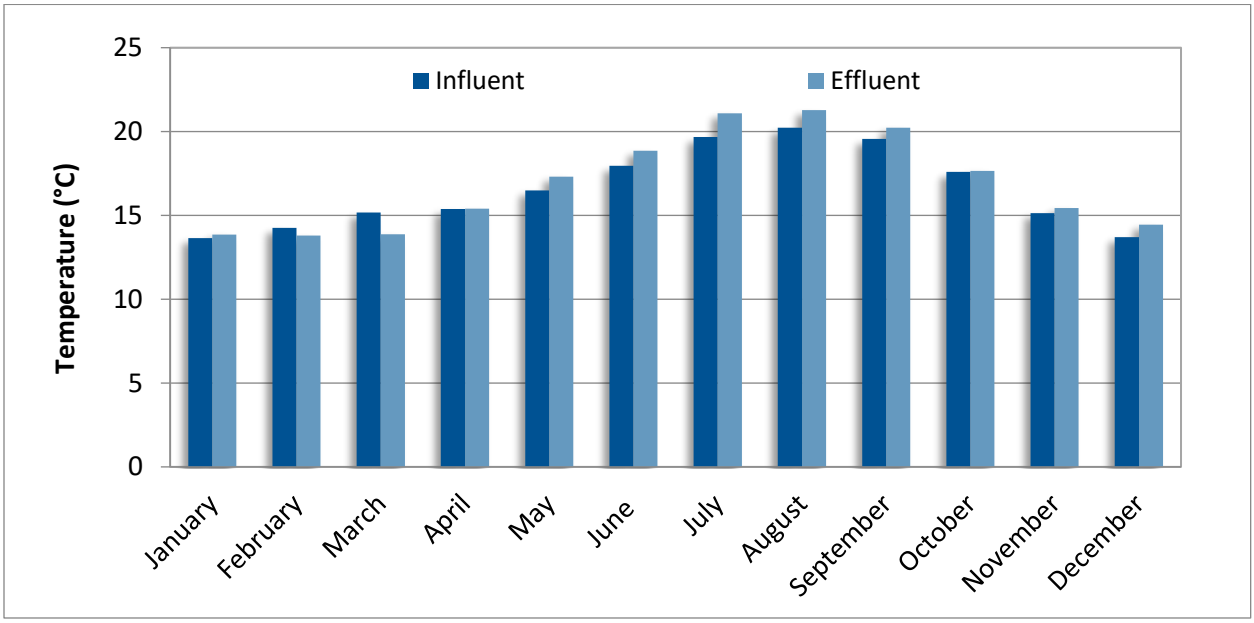
7.2 Temperature

RDN staff test the temperature of the influent and effluent daily. Results from 2024 are presented in Appendix B. The average temperature data for each month are summarized in Table 25 and Figure 13.

Table 25. 2024 Influent & Effluent Temperatures

Month	Average Temperature (°C)	
	Influent	Effluent
January	13.6	13.9
February	14.3	13.8
March	15.2	13.9
April	15.4	15.4
May	16.5	17.3
June	18.0	18.9
July	19.7	21.1
August	20.2	21.3
September	19.6	20.2
October	17.6	17.7
November	15.1	15.4
December	13.7	14.4
Average	**16.3**	**16.8**

Figure 9. 2024 Influent & Effluent Monthly Average Temperature



7.2.1 Historical Trends

Historical average temperatures for influent and effluent over the past ten years are summarized in Table 26. Data from 2024 are consistent with historical data.

Table 15. Historical Trends: Influent & Effluent Average Temperature

Year	Average Temperature (°C)	
	Influent	Effluent
2015	16.5	16.3
2016	16.5	16.0
2017	15.7	15.3
2018	15.7	15.7
2019	15.7	15.8
2020	15.5	15.7
2021	16.5	16.9
2022	16.7	16.9
2023	17.2	17.2
2024	16.3	16.8

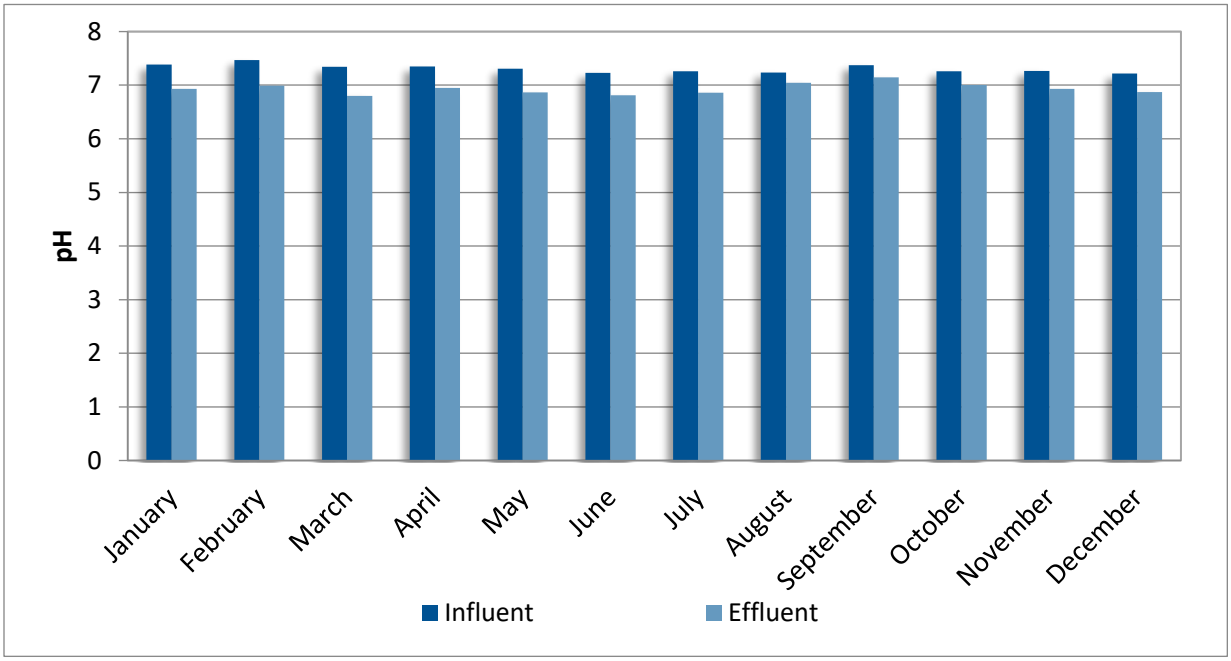
7.3 pH

Laboratory staff conduct pH testing on grab samples of the influent weekly, and the effluent daily. The pH monitoring data for GNPCC from 2024 is presented in Appendix B. The average pH concentrations for each month are summarized in Table 27 and Figure 14.

Table 16. 2024 Influent & Effluent Average pH Concentration

Month	Average pH	
	Influent	Effluent
January	7.38	6.93
February	7.47	6.99
March	7.34	6.80
April	7.35	6.95
May	7.31	6.86
June	7.23	6.81
July	7.26	6.86
August	7.24	7.04
September	7.37	7.14
October	7.26	7.00
November	7.26	6.93
December	7.22	6.87
Average	**7.33**	**6.93**

Figure 10. 2024 Influent & Effluent Monthly Average pH Concentration



7.3.1 Historical Trends

Historical average influent and effluent pH concentration reported over the past ten years are summarized in Table 28. Data from 2024 are consistent with historical data.

Table 17. Historical Trends: Influent & Effluent pH Concentration

Year	Average pH	
	Influent	Effluent
2015	7.18	7.04
2016	7.30	7.18
2017	7.30	7.16
2018	7.25	7.08
2019	7.28	7.09
2020	7.38	7.13
2021	7.42	7.00
2022	7.32	7.01
2023	7.32	6.96
2024	7.33	6.93

7.4 Volatile Solids in the Thickeners and Digesters

The construction and commissioning of two gravity thickeners at GNPCC was completed in 2008. Prior to the addition of the gravity thickeners, sludge was held in the primary sedimentation tanks to thicken to approximately 3-4%, with the aid of alum sulphate (coagulant). From there the sludge was conveyed to the digesters for stabilization.

With the addition of the gravity thickeners, the sludge from the primary sedimentation tanks is conveyed to the gravity thickeners at a lower percent solid and thickened to approximately 5% solids before conveyance to the digesters for stabilization. There are several advantages to this; sludge is held in the primary sedimentation tanks for less time; less chemicals are required in the sedimentation tanks to keep the sludge coagulated; it maintains the effluent total suspended solids within permitted limits for discharge; and the higher percent solids reduces the volume loading on the digesters.

The average total solids and volatile solids in the sludge from the thickeners and the digesters as well as the average percent volatile solids reduction are summarized in Table 28. The volatile solids reduction increased after 2015 due to Digester #3 functioning well and thickened primary sludge entering the digesters in a stable solids level (refer to Table 29).

In 2024, the digestion process at GNPCC achieved a 59.6% reduction in volatile solids. This is a slight reduction to previous years due to increased sludge loading from the secondary process. Secondary sludge is also more difficult to breakdown (fewer volatile solids) than primary solids.

Table 18. Historical Trends: Sludge Volatile Solids Reduction

Year	Average Solids in Sludge from Thickeners (%)	Average Volatile Solids in Sludge from Thickeners (%)	Average Solids in Digested Sludge (%)	Average Volatile Solids in Digested Sludge (%)	Average Reduction in Volatile Solids in Digesters (%)
2015	4.7	86.8	1.7	63.7	74.8
2016	4.6	86.6	1.8	65.1	72.3
2017	4.6	86.3	1.7	64.4	68.4
2018	4.4	86.2	1.7	63.1	67.0
2019	4.1	85.9	1.6	65.7	65.5
2020	4.0	86.4	1.3	67.3	65.7
2021	4.1	88.9	1.6	72.7	58.8
2022	4.3	90.4	1.6	75.1	61.5
2023	4.6	90.7	1.6	76.2	60.9
2024	4.9	90.2	1.7	77.6	59.6

8) Resource Consumption

8.1 Chemical Consumption

Table 30 summarizes the consumption and costs of chemicals used in the treatment process and at the pump stations for the Southern Communities in 2024.

The total cost of chemicals purchased at GNPCC in 2024 was lower than 2023. Pricing for many chemicals increased in 2020-2023 due to ongoing market trends and supply chain issues. In 2024, prices decreased due to the establishment of long term supply agreements for polymers via an RFP process.

The dewatering polymer increased in consumption after secondary treatment to dewater the secondary sludge in the secondary treatment process. The dewatering polymer was initially changed from Zetag 7557 to Wes-Floc 6816 A which is more effective dewatering the secondary sludge. Following an RFP

process, the dissolved air flotation thickening (DAFT) polymer used was Wes-Floc 7510 A supplied by Alumichem Canada Ltd.

In 2023, GNPCC conducted dewatering polymer trials in an RFP process. The dewatering polymer was then switched from Wes-Floc 6816 A to Wes-Floc 6614 A in December 2023.

Table 30. 2024 Chemical Consumption

Chemical 2024	Consumption	Units	Cost	Use
Wes-Floc 6614 A	49,553	kg	$354,301	Dewatering Polymer
Wes-Floc 7510 A	21,766	kg	$134,516	DAFT Polymer
Ferrous Chloride*	135,876	kg	$85,466	Odour Control
Defoamer	-	-	$16,770	Defoamer
Odour Control			$6,673	Odour Control
Other Chemicals	-	-	$22,718	Other Chemicals
TOTAL			**$620,444**	

* Used at Chase River Pump Station

8.1.1 Historical Trends

Historical annual costs of chemicals consumed in previous years are summarized in Table 31.

The use of Aluminum Sulphate and Superfloc A-1883 has been discontinued since October 2020 with the secondary treatment process. Dewatering polymer was changed from Zetag 7557 to Wes-Floc 6816 A after completion of secondary treatment to treat secondary sludge. Dewatering polymer was then switched to Wes-Floc 6614 A in December 2023. Wes-Floc 7510 A was used as the thickening polymer.

Table 19. Historical Trends: Chemical Consumption

Year	Dewatering Polymer	Kemira Superfloc A-1883RS	DAFT Polymer	Ferrous Chloride	Aluminum Sulphate	Secondary Polymer	Defoamer	Odour Control	Other	Total Cost
2015	$72,738	$17,521		$58,562	$243,620					$392,440
2016	$86,934	$18,616		$58,346	$271,384					$435,280
2017	$89,100	$25,906		$51,131	$279,749					$445,887
2018	$106,631	$39,421		$52,163	$320,279					$518,494
2019	$146,456	$40,180		$66,054	$394,943				$8,660	$656,293
2020	$178,311	$27,664		$50,978	$316,817	$27,332	$7,448	$2,065	$4,696	$615,311
2021	$326,666	-	$115,622	$48,392	-	-	$13,087	$6,628	$873	$511,268
2022	$349,169	-	$106,292	$52,389	-	-	$10,618		$24,500	$542,968
2023	$451,434	-	$106,518	$100,336	-	-	$10,618		$24,500	$693,406
2024	$354,301	-	$134,516	$85,466	-	-	$22,718	$6,673	$16,770	$620,444

8.2 Electrical Consumption

Historical annual electrical consumption and costs are summarized in Table 32 and graphed in Figure 15. In general, electrical consumption increases during major construction projects. Also, while not directly measured, the increased reliance on mechanical mixing in the digesters resulted in a greater electrical consumption in recent years, as the mixing pumps use a substantial amount of electricity.

A connection issue prevented BC Hydro from reading GNPCC's electrical meter during the secondary upgrade and the RDN did not receive invoices in 2020 and part of 2021. Electrical consumption and cost were estimated based on metered consumption data from BC Hydro from July 22, 2021, to present.

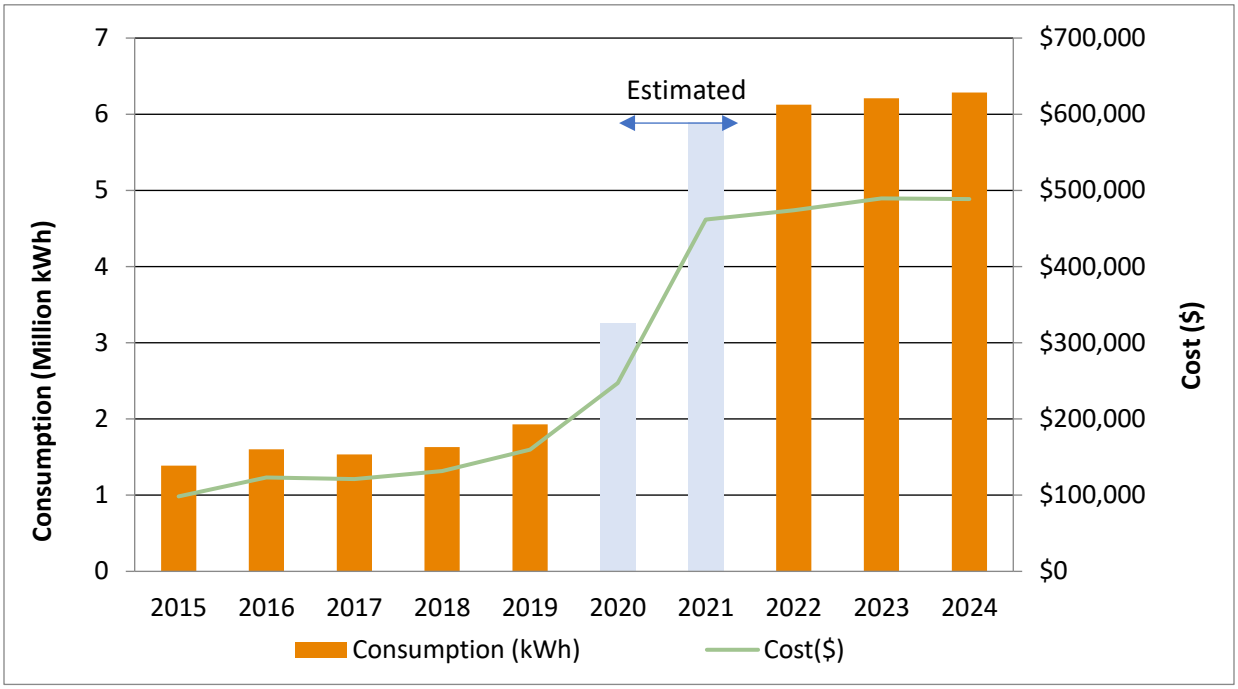
Electricity consumption at GNPCC increased after the bioreactors and process equipment were installed in 2020 for the secondary upgrade. Increased electricity use was offset by installing turbo-blowers. The blowers are more efficient and were purchased with assistance from a BC Hydro energy efficiency grant.

Table 20. Historical Trends: GNPCC Electrical Consumption

Year	Consumption (kWh)	Cost ($)**
2015	1,386,000	$98,382
2016	1,602,000	$123,425
2017	1,533,600	$121,043
2018	1,631,700	$131,851
2019	1,931,400	$159,954
2020*	3,252,043	$247,216
2021*	5,893,329	$461,730
2022	6,127,665	$473,888
2023	6,209,011	$489,531
2024	6,285,600	$488,671

Note: Electrical consumption at the treatment plant only (pump stations are excluded).
* No electricity invoices were received for 2020. 2021 use was metered after July 22, 2021. Annual consumption and cost were estimated for both 2020 and 2021.
** Excluding tax.

Figure 11. Historical Trends: GNPCC Electrical Consumption and Costs (Treatment Plant Only)



8.3 Water Consumption

The estimated water consumption at GNPCC for 2024 was estimated to be 67,777 m³. Water consumption increased in 2020 and early-2021 due to the commission of secondary treatment and filling of tanks due to commissioning of the secondary treatment process. The lower water consumption in 2024 was due optimization of the dewatering process and a new dewatering polymer.

Historical treatment plant water consumption (pump stations excluded) is summarized in Table 33.

Table 21. Historical Trends: GNPCC Water Consumption

Year	Water Consumption (m³)
2015	35,061
2016	35,994
2017	64,871
2018	70,852
2019	77,738
2020	105,500
2021	118,810
2022	93,706
2023	111,281
2024	67,777

9) Cogeneration

In 2005, Wastewater Services applied to the Federation of Canadian Municipalities (FCM) for a Green Municipal Fund grant to install a cogeneration system at GNPCC. A cogeneration system would convert wasted digester biogas into electricity to be used in treatment plant operations. It is estimated that a cogeneration system using 100% of wasted gas could produce enough electricity to satisfy 90-100% of the present electrical requirements of the plant. A cogeneration system would eliminate the emissions currently flared to the environment and result in electrical cost savings to GNPCC. FCM awarded Wastewater Services this grant in the summer of 2006. This grant money was only to be used for a field test, and not the full-scale implementation of a cogeneration system. Thus, Wastewater Services applied for another grant under the Gas Tax Program Incentive Fund to install a full-scale, permanent cogeneration system, including the construction of a cogeneration building to house the associated generators. The grant was awarded in July 2008.

Construction of the GNPCC Cogeneration Facility was commissioned in September 2012, producing methane gas to run the generator. All cogenerated electricity is sold to BC Hydro. The cogeneration system has generated a total of 2,246 MWhr of electricity with a total revenue of $236,880.

The cogeneration system was offline since mid-2018 because the system's gas skid was inoperable, operator resources were taken up by the secondary upgrade, and due to the need for repairs to safely operate the system. The cogeneration system was run between June 15 and 20 in 2022 for a recommissioning test.

Table 34 contains a summary of the energy generated by the cogeneration unit and the revenue obtained from selling this electricity to BC Hydro.

Table 22. Historical Cogeneration Unit Electricity Production and Revenue Generated

Year	Eligible Energy (MWh)	Revenue ($) excluding tax
2015	732.5	$72,399
2016	236.2	$24,044
2017	448.5	$50,429
2018	135.5	$13,583
2019	0.0	$0
2020	0.0	$0
2021	0.0	$0
2022	0.0	$0
2023	0.0	$0
2024	0.0	$0

10) Odour

Two odour concerns were received in 2024 for GNPCC, pump stations, and interceptor. See Appendix E for individual incident reports. Table 35 quantifies the monthly odour concerns received in 2024.

Table 23. 2024 Odour Concerns

Month	Odour Concerns	
	GNPCC	Pump Stations and Interceptor
January	0	0
February	0	0
March	0	0
April	0	0
May	0	0
June	0	0
July	1	0
August	1	0
September	0	0
October	0	0
November	0	0
December	0	0
Total	**2**	**0**

In 2024, GNPCC operations received two odour concerns in total. More information on these odour concerns can be found in Appendix E.

10.1 Historical Trends

The number of odour concerns reported in the past ten years are summarized in Table 36.

Table 24. Historical Trends: GNPCC and Pump Stations – Number of Odour Concerns

Year	Odour Concerns
2015	9
2016	6
2017	11
2018	6
2019	6
2020	8
2021	10
2022	6
2023	3
2024	2

10.2 Odour Episode

An odour episode is a disruption in the regular operation of the treatment plant or operations that may cause odour. One odour episode was identified in the records for 2024 associated with maintenance on the secondary clarifiers.

11) Septage Receiving

Septage and pump and haul are received at the Chase River Pump Station (CRPS) Septage Receiving Site. The total combined volume of Septage and pump and haul discharged in 2024 was 2,805,714 Imperial gallons (13,166 m^3).

This volume does not include sludge from the Duke Point Pollution Control Centre (DPPCC) wastewater treatment process which undergoes further treatment at GNPCC. This volume is reported in the 2024 DPPCC Annual Report.

11.1 Historical Trends

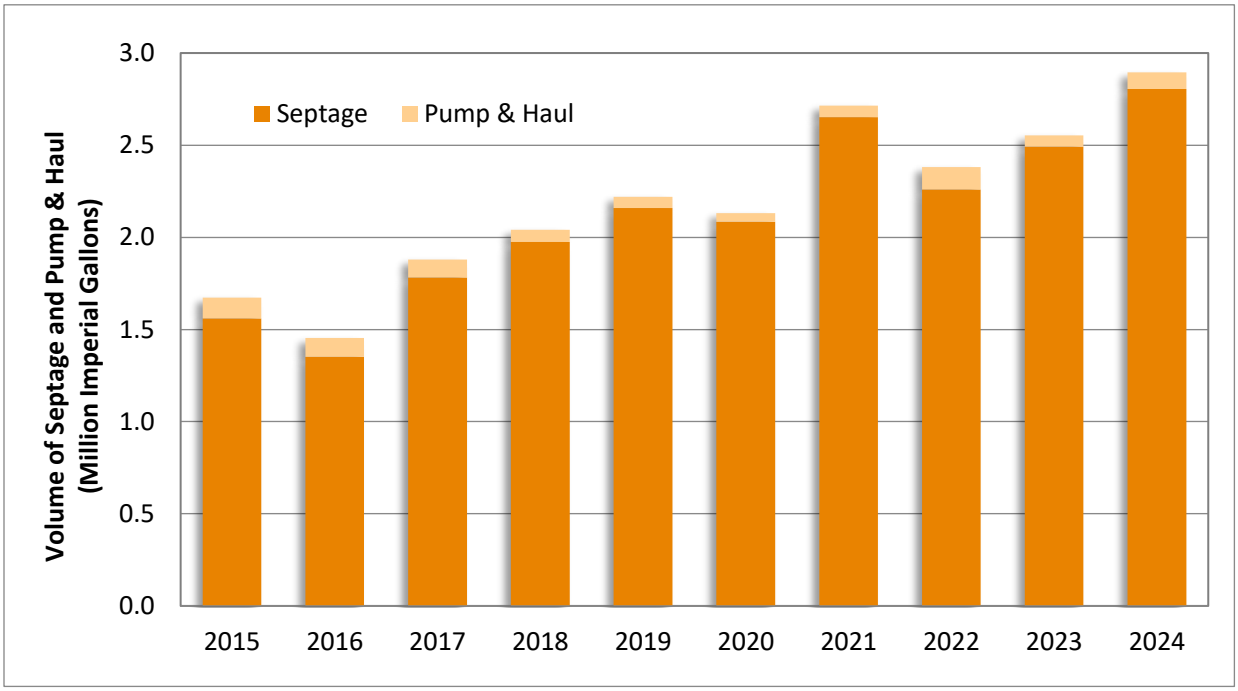
The volumes of septage and pump and haul discharged in previous years are summarized in Table 37 and graphed in Figure 16.

At Chase River Pump Station, several policies were implemented over the last several years to improve tracking of septage deliveries including locking out the rock trap, and auditing pump and haul and reduced loads. It is worth noting that there has been a large amount of annual variability in the amount of septage and pump and haul discharged at CRPS.

Table 37. Historical Trends: Septage and Pump & Haul discharged at Chase River Pump Station

Year	Septage (Imperial gallons)	Pump & Haul (Imperial gallons)	Combined Total (Imperial gallons)	Combined Total (m^3)
2015	1,560,351	112,584	1,672,935	7,605
2016	1,351,493	103,382	1,454,875	6,614
2017	1,782,232	96,982	1,879,214	8,543
2018	1,974,861	66,036	2,040,897	9,278
2019	2,159,556	60,480	2,220,036	10,092
2020	2,084,085	46,637	2,130,722	9,686
2021	2,652,432	62,791	2,715,223	12,344
2022	2,259,010	122,408	2,381,418	10,826
2023	2,492,843	59,618	2,552,461	11,604
2024	2,805,714	90,373	2,896,087	13,166

Figure 12. Annual Volume of Septage and Pump & Haul Discharged at CRPS (GNPCC)



12) Contributory Population and Remaining Plant Capacity

The estimated population serviced in 2024 was 108,300 with a projected annual growth rate of approximately 1.97%, based on 2021 Census data. In 2024, the average daily flow was 35,239 m^3/day and the maximum daily flow was 84,271 m^3/day.

The capacity of GNPCC increased when Digester #3 and Sedimentation Tank #4 were installed in 2013 and during the secondary treatment upgrade in 2020. The design capacity of the secondary upgrade was an average annual flow of 46,000 m^3/day and a maximum daily flow of 126,000 m^3/day. The secondary upgrade was designed to provide treatment for service population of 120,000.

The RDN 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.

13) Environmental Incidents

Records are maintained regarding any environmental incidents that are associated with the RDN's wastewater infrastructure and treatment facilities.

In 2024, there were two environmental incidents related to biogas releases from the digester. More information on these incidents can be found in Appendix F.

- On January 9, GNPCC operations started up Digester #2 gas mixing system to test the mixing process. Gas pressure fluctuations were noticed on SCADA. On further investigation, it was then noticed that the PRV vent bypassed biogas into atmosphere for about 40 minutes. Operations then turned off the gas mixing system and locked out the gas blowers to stop the venting. ENV was notified and an End of Spill report completed and sent off.
- On March 8, there was a biogas release on Digester #1 due to a valve being left open during the commissioning of the new gas mixing system. This resulted in water in the condensate trap to empty and caused the condensate trap to release biogas from its top vent. ENV was notified and an End of Spill report completed and sent off. The RDN has since engaged Associated Engineering to assist with optimizing the GNPCC Digester/Biogas process.

14) Upgrades and Major Projects

14.1 Upgrades and Repairs Completed in 2024

- Nanaimo Northshore manhole repairs
- Centrifuge #1 Rotating Assembly Rebuild
- Basement MCC Replacement Upgrade
- Wellington Pump Station Upgrade (ongoing).

14.2 Studies and Projects Completed in 2024

- Departure Bay Pump Station and Forcemain Project – Detailed Design
- Grit Piping Design
- VIU Odour Monitoring Study
- ISO14001:2015 Surveillance Audit.

14.3 Upgrades and Repairs Planned for 2025

- Digester 2 Pump Replacement
- Chase River Flygt Pump Replacement
- Departure Bay Pump Station and Force main Project – IPD Design Validation
- Wellington Pump Station Upgrade (ongoing).

14.4 Studies and Projects Planned for 2025

- ISO 17025 lab certification audit
- Development Cost Charge (DCC) Study
- VIU Odour Monitoring Program
- Basement Ventilation Study
- Geotechnical Assessment of the GNPCC Rock Face.

15) Resource Recovery

15.1 Biosolids Reuse

Since 1999, RDN biosolids have been beneficially used in agriculture, landfill closures, mine reclamation, soil fabrication, and forest fertilization. GNPCC biosolids management in 2024 is discussed in Section 6.5.

15.2 Effluent Reuse

GNPCC reuses final effluent in operational processes for secondary clarifier sprayers, influent plate screen wash water, grit classifier wash water, and sludge thickener sprayers, which decreases the demand for potable water from the community's supply.

15.3 Solid Waste Recycling

Wastewater Services has a general recycling program at the treatment plant, initiated as part of the department's ISO 14001 Environmental Management System, and continues to recycle metals, cardboard, plastics, waste oils, paints, and paint thinners.

16) Education Programs

16.1 Source Control

Source Control Bylaw No. 1730 regulates the discharge of waste into any sewer or drain connected to an RDN sewage facility, including discharges to municipal collection systems. The bylaw provides a process for issuing Waste Discharge Permits and a fee structure based on waste strength and volume. The Bylaw also lists prohibited waste items and has provisions for fees and enforcement.

Trucked Liquid Waste Rates and Regulations Bylaw No. 1732 includes source control provisions including a schedule of prohibited wastes and a schedule of restricted wastes. It also includes enforcement tools.

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 approved a Water Conservation Plan in 2020. This plan was completed in collaboration with member municipalities.

16.3 Open House

Open houses are occasionally offered at GNPCC to provide the public with opportunities to tour the facilities, learn about recent upgrades, browse information, and ask questions. The RDN held an open house at GNPCC on April 20, 2024. This open house saw unprecedented attendance.

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. More information on the SepticSmart Program is available at: https://www.rdn.bc.ca/septicsmart.

The SepticSmart program includes an information package, annual workshops and a rebate program. Two SepticSmart workshops were held in 2024. To date, the SepticSmart rebate program has issued more than $400,000 in rebates to homeowners to help with septic tank repairs and maintenance.

16.5 Liquid Waste Management Plan

The RDN Liquid Waste Management Plan (LWMP) is a long-range 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 Minister of the Environment approved the RDN's LWMP in October 2014. An LWMP annual report will be submitted under separate cover in June.

In December 2023, the RDN submitted a request to the Province of BC for an LWMP Amendment. The LWMP Amendment makes a commitment to upgrade NBPCC to secondary treatment by 2040.

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 RDN webpage is an online public engagement space that hosts outreach information specific to the regional projects. In 2024, the following GNPCC projects were highlighted:

- Departure Bay Pump Station and Forcemain Project
- Wellington Pump Station Upgrade
- Liquid Waste Management Plan Amendment.

Appendix A – Waste Management Permit No. PE00338 & Amendments

Province of
British Columbia

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment

Vancouver Island Region
Environmental Protection
2569 Kenworth Road
Nanaimo, British Columbia
V9T 4P7
Telephone: (604) 751-3100
Fax: (604) 755-2473

REGISTERED MAIL

Date: JUN 0 2 1994

File: PE00338

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

Dear Permittee:

Enclosed is a copy of amended Permit No. PE00338 issued under the provisions of the Waste Management Act. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The Ministry of Environment, Lands and Parks has established the policy that secondary treatment is the minimum level of treatment required for municipal sewage discharges to surface waters. This policy will apply to existing discharges with no or primary treatment, in stages, taking into account the assimilative capacity of the receiving environment, the ability to finance the upgraded sewage treatment facilities, population growth and public input to the waste planning process. Liquid Waste Management Plans (LWMPs) may be used to determine the schedule for upgrading to secondary treatment. The Regional District of Nanaimo has indicated its intention to develop a LWMP for School District 68. Please note the requirements of Section 4.1 of the Permit and, if necessary, contact this office for further discussion on this matter.

Section 3.3 of the Permit requires the Permittee to undertake a receiving environment monitoring program. L.J. Erickson, P.Bio., of this office should be consulted during development of the program.

Section 1.1.1 of the permit specifies average and maximum discharge rates which correspond to the present population served and the design capacity of the treatment works. Section 4.4 of the Permit states that the Permittee may be required to undertake an infiltration and inflow control program.

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.

The Permittee shall ensure that any discharge under this Permit meets the requirements of other regulatory agencies including, but not restricted to, Environment Canada and the Department of Fisheries and Oceans (Canada).

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01-Jun-94

An annual Permit fee will be determined according to the Waste Management Permit Fees Regulation.

This Permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days.

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 751-3100). Plans, data, and reports pertinent to the Permit are to be submitted to the Environmental Protection office at this address.

Yours truly,

G.E. Oldham, P.Eng.
Regional Waste Manager
Vancouver Island Region

Enclosure

ACL 94/5/31
01-6-94

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
2569 Kenworth Road
Nanaimo
British Columbia, V9T 4P7
Telephone: (604) 751-3100

MINISTRY OF ENVIRONMENT,
LANDS AND PARKS

PERMIT
PE00338

Under the Provisions of the Waste Management Act

Regional District of Nanaimo

6300 Hammond Bay Road

PO Box 40

Lantzville, British Columbia

V0R 2H0

is authorized to discharge effluent from a municipal sewage treatment plant located in Nanaimo, British Columbia to the Strait of Georgia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

1. AUTHORIZED DISCHARGES

1.1 The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008.

1.1.1 The rate at which effluent may be discharged is:

Average - $27{,}730 \times (1.0417)^{(\text{calendar year} - 1994)}$ m^3/d
to a maximum of 40,950 m^3/d

Maximum Daily - 80,870 m^3/d

1.1.2 The characteristics of the discharge shall not exceed:

5-Day Biochemical Oxygen Demand - 130 mg/L
Total Suspended Solids - 130 mg/L

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

Date issued: April 15, 1970
Amendment Date: JUN 02 1994
(most recent)
Page: 1 of 9

PERMIT NO. : PE00338

10-5-94

1.1.3 The works authorized are a headworks channel, screening facilities, grit and scum removal facilities, primary sedimentation facilities, sludge digestion facilities, sludge dewatering facilities, an outfall extending 2,030 m from mean low water to a minimum depth of 70 m below mean low water, diffuser, and related appurtenances approximately located as shown on the attached Site Plan A.

1.1.4 The works authorized must be complete and in operation on and from the date of this amended Permit.

1.1.5 The location of the works authorized, excepting the outfall and diffuser, is Lot 1, Plan 26263, District Lot 51, Wellington Land District.

1.1.6 The location of the point of discharge is the Strait of Georgia approximately as shown on the attached Site Plan A.

2. GENERAL REQUIREMENTS

2.1 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.

2.2 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.

2.3 Bypasses

The discharge of effluent which has bypassed the designated treatment works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.

2.4 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.

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

2.5 Posting of Outfall

The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the consent of the Regional Waste Manager.

2.6 Disinfection

Although disinfection of the effluent 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 will also be required.

2.7 Sludge Wasting and Disposal

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

2.8 Outfall Inspection

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

2.9 Facility Classification

The Permittee shall classify the wastewater treatment facility authorized in Section 1 (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 October 31, 1994.

2.10 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.

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

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01-6-94

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) 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.

3. MONITORING AND REPORTING REQUIREMENTS

3.1 Discharge Monitoring

3.1.1 Flow Measurement

Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over the preceding 24-hour period.

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

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3.1.2 Sampling and Analysis

The Permittee shall install, provide, and maintain suitable sampling facilities and obtain composite samples and analyses of the effluent as follows:

Contaminant	Frequency
5-Day Biochemical Oxygen Demand	Daily
Total Suspended Solids	Daily
Ammonia Nitrogen	Quarterly
Toxicity	Quarterly

The following contaminants at a frequency of once every six months:

pH,	Cyanide (total),	Tetrachloroethylene,
Alkalinity,	Fluoride (dissolved),	Trichloroethane,
Chloride,	Iron (dissolved),	Trichloroethylene,
Nitrogen (total kjeldahl),	Lead (total),	
Oil and Grease,	Manganese(dissolved),	Benzene,
Phosphorous (total),	Mercury (total),	Ethylbenzene,
Sulphate (dissolved),	Molybdenum (total),	Toluene,
Sulphide (dissolved),	Nickel (dissolved),	
	Selenium (total),	Phenols,
Aluminum (total),	Silver (total),	Total Organic Carbon,
Arsenic (total),	Tin (total),	
Barium (dissolved),	Zinc (total),	2-EthylHexyl Phthalate,
Boron (dissolved),		Di-N-Butyl Phthalate,
Cadmium (dissolved),	Chloroform,	
Chromium (total),	Dichlorobromo-methane,	Naphthalene,
Cobalt (dissolved),	Dichloromethane,	
Copper (dissolved),	Methylene Chloride,	Polychlorinated Biphenyls.

Samples shall be composited in proportion to effluent flow over 24 hours. All sampling facilities, locations, techniques and equipment require the consent of the Regional Waste Manager.

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

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3.2 Biosolids Monitoring

The Permittee shall obtain a representative sample of the treated biosolids once every quarter and obtain analyses of the sample for the following:

Total Solids,	Arsenic,	Molybdenum,
Moisture,	Cadmium,	Nickel,
Volatile Suspended	Chromium,	Phosphorous,
Solids,	Cobalt,	Selenium,
Polychlorinated	Copper,	Zinc.
Biphenyls,	Lead,	
Total Kjeldahl Nitrogen,	Mercury,	

3.3 Monitoring of the Receiving Environment

The Permittee shall monitor the receiving water quality and carry out chemical, physical and biological studies on the receiving environment as required by the Regional Waste Manager.

The Permittee shall submit a proposed receiving environment monitoring program to the Regional Waste Manager by October 31, 1994 for approval. The program should be established in consultation with the Regional Waste Manager. Based on the results of this monitoring program, the receiving environment monitoring requirements may be extended or altered by the Regional Waste Manager. The approved program shall commence by January 1, 1995.

3.4 Monitoring Procedures

3.4.1 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, or by suitable alternative procedures as authorized by the Regional Waste Manager.

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, or by suitable alternative procedures as authorized by the Regional Waste Manager.

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

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Copies of the above manuals are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $20.00 and $70.00 respectively, and are also available for inspection at all Environmental Protection offices.

Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

3.4.2 Toxicity

Analyses for determining the toxicity of liquid effluents to fish shall be carried out in accordance with the procedures described in the "Provincial Guidelines and Laboratory Proceedures for Measuring Acute Lethal Toxicity of Liquid Effluents to Fish" November 1982. The Regional Waste Manager will advise the Permittee which method of measurement for expressing lethal toxicity shall be used. The method of sampling and the method of bioassay will be determined by the Regional Waste Manager.

Copies of the above manual are available from the Environmental Protection Division, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $5.00, and are also available for inspection at all Environmental Protection offices.

3.5 Reporting

Maintain data of analyses and flow measurements, collected under Sections 3.1 through 3.3, for inspection and every quarter submit the data, suitably tabulated in a machine readable format, for entry in the Ministry of Environment, Lands and Parks computer database, to the Regional Waste Manager for the previous quarter. All reports shall be submitted within 31 days of the end of each quarter. The first report is to be submitted by October 31, 1994. Based on the results of the monitoring program, the Permittee monitoring requirements may be extended or altered by the Regional Waste Manager.

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

3.6 Annual Report

The Permittee shall submit an annual report which shall include a summary and interpretation of the data submitted under Section 3.5, an interpretation of the effects of the effluent and biosolids discharges on the receiving environment, and a summary of treatment plant operations, for the preceding calendar year. In addition, the Regional Waste Manager may require that the annual report include summaries and progress reports of the matters identified in Sections 4.2 through 4.8, and any 5Rs (Reduce, Reuse, Recycle, Recover, Residual) activities, for the preceding calendar year. The annual report shall be submitted within 60 days of the end of each calendar year and shall be made available by the Regional District of Nanaimo to the public upon request. The first annual report shall be submitted by February 28, 1995.

4. ADDITIONAL REQUIREMENTS

4.1 Liquid Waste Management Plan

The Regional District of Nanaimo has indicated its intention to develop a Liquid Waste Management Plan for School District 68. Accordingly, the Permittee shall submit a proposed schedule for the development of a Liquid Waste Management Plan to the Regional Waste Manager by October 31, 1994 for approval. The Plan shall be developed in accordance with ministry guidelines and shall include, but not be limited to, a schedule to upgrade the discharge to secondary treatment, an infiltration and inflow control program, a source control program, a stormwater management program, a biosolids management program, and an odour control program. All aspects of the Plan shall be to the satisfaction of the Regional Waste Manager.

4.2 Effluent Upgrading

The Permittee may be required to submit a schedule, for upgrading of the discharge to secondary treatment, to the Regional Waste Manager for approval. 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 and/or upgrade the discharge to secondary treatment.

4.3 Land Requirements

The Permittee shall secure and hold in reserve sufficient land to allow for future expansion and upgrading of the sewage treatment facilities to secondary treatment.

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

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4.4 Infiltration and Inflow Control Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement an identification, remediation, and control program to reduce the quantity of infiltration and inflow into the sewage collection system.

4.5 Source Control Program

The Permittee may be required to implement a source control program and/or develop a sewer use bylaw to control the quantity and quality of wastes discharged into the sewer system.

4.6 Stormwater Management Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement a stormwater management program.

4.7 Biosolids Management Program

The Permittee may be required to develop, submit to the Regional Waste Manager for approval, and implement a biosolids management program.

4.8 Odour

Should objectionable odours attributable to the operation of the treatment plant occur, the Regional Waste Manager may require steps to be taken or works to be provided to reduce the odours to acceptable levels.

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

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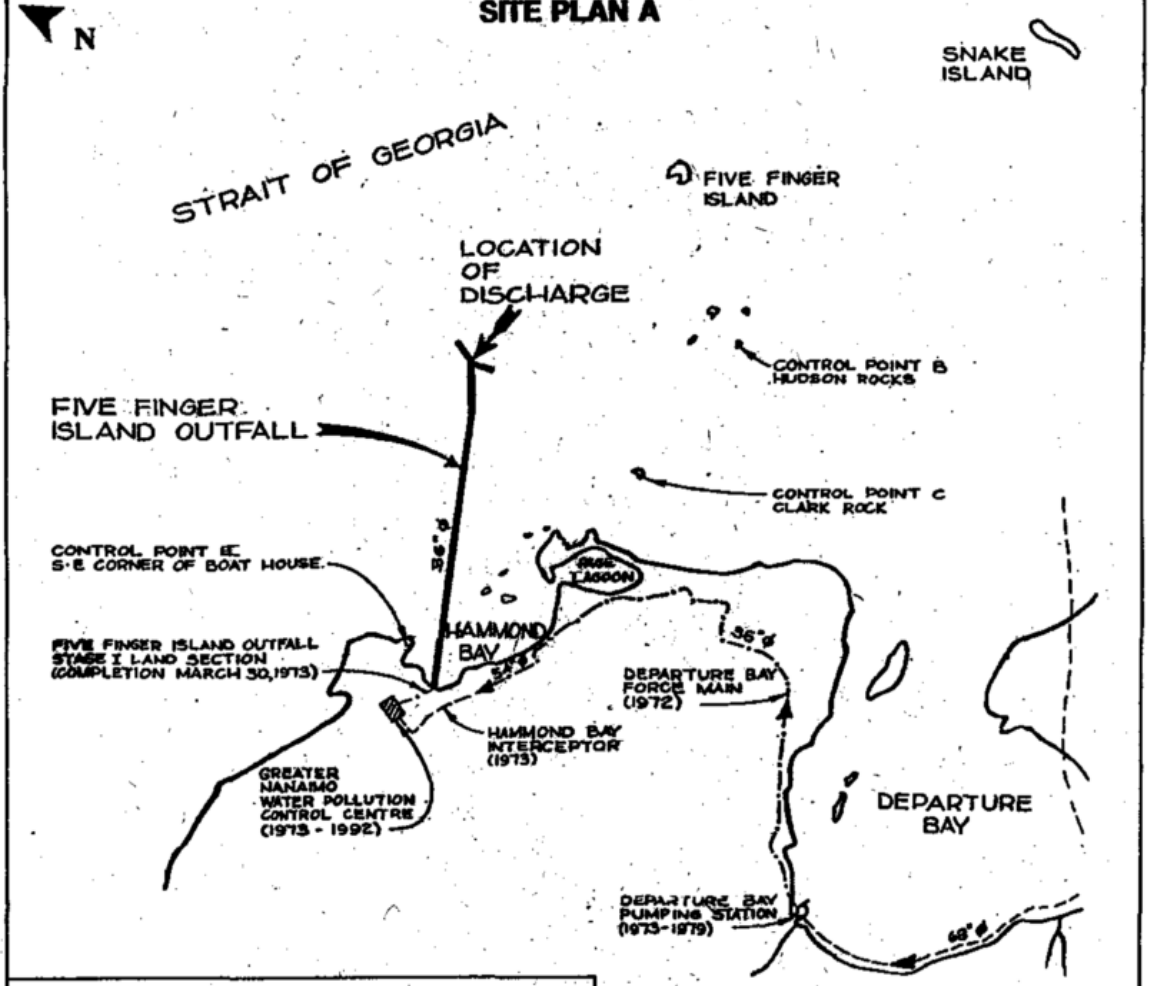
PROVINCE OF
BRITISH COLUMBIA

Environmental Protection

SITE PLAN A



Location Map

Scale: 1:36,000

Permit No.: PE00338

Date: JUN 0 2 1994

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

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Province of
British Columbia

MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment

Vancouver Island Region
Environmental Protection
2569 Kenworth Road
Nanaimo, British Columbia
V9T 4P7
Telephone: (604) 751-3100
Fax: (604) 755-2473

Date: AUG 11 1994

File: PE00338

REGISTERED MAIL

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

ATTENTION: W. R. Colclough, AScT
Director of Operational Services

Dear W. R. Colclough:

Re: Notice of Correction to Waste Management Permit No. PE00338, presently in the name of Regional District of Nanaimo

Further to recent related correspondence, we provide the following:

1. Section 1.1.1 of the permit has been corrected to specify a maximum daily effluent discharge rate of 80 870 m^3/day which corresponds to the maximum day design capacity of the treatment works.

   Please remove and destroy the original page in your permit package and replace it with the revised version enclosed.

2. Pursuant to Section 2.8 of the permit, your request to conduct video inspection of the outfall in lieu of dye testing is approved.

3. Your concerns regarding Sections 4.4 and 4.6 of the permit are noted. It is expected that a Liquid Waste Management Plan for School District 68 would address these items.

   Infiltration and inflow into the sewer collection system is a serious concern, and we remain supportive of efforts to address it.

. . . 2

Thank you for meeting with us. We understand that you have chosen not to proceed with your appeal, dated June 22, 1994, of the subject permit.

If you have any questions regarding the above, please contact A. C. Leuschen, Environmental Protection Officer, at 751-3100.

Yours truly,

G. E. Oldham, P.Eng.
Regional Waste Manager
Vancouver Island Region

GEO/acl/mg

encl.

BRITISH COLUMBIA

September 12, 2019

Tracking Number: 385715
Authorization Number: 338

REGIONAL DISTRICT OF NANAIMO
6300 HAMMOND BAY RD.
NANAIMO, BC V9T 6N2

Dear REGIONAL DISTRICT OF NANAIMO,

Re: Your application for an amendment to a Permit under the Environmental Management Act

Pursuant to Section 14(4) of the *Environmental Management* Act, Permit 338 is hereby amended as follows:

Adding the following to **Section 1.1.3**:

"After September 8, 2019, the works authorized are screening facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors, secondary clarifiers, sludge thickening systems, sludge digestion systems, sludge dewatering facility, an outfall extending 2,030m from mean low water to a minimum depth of 70m below mean low water, diffusers, and related appurtenances approximately located as shown in the attached Site Plan A."

All other terms and conditions of Permit 338 remain in effect.

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 rests with the permittee. This permit is issued pursuant to the provisions of the Environmental Management Act to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties,and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the Environmental Management Act. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Ministry of Environment and Climate Change Strategy

Environmental Protection Division 2080-A Labieux Rd Nanaimo, B.C. V9T 6J9

Authorizations - South Region
Telephone: (250) 751-3100
Facsimile: (250) 751-3103

Administration of this permit will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Plans, data and reports pertinent to the permit are to be submitted by email or electronic transfer to the Director, designated Officer, or as further instructed.

Yours truly,

Bryan Vroom
for Director, Environmental Management Act

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

2024 Total Flows (Cubic Metres)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	36,925	54,558	41,913	34,281	30,939	28,670	27,730	27,805	27,408	29,057	39,999	34,280
2	28,242	47,592	45,734	33,271	29,785	34,547	32,247	27,169	29,070	23,021	38,891	33,441
3	37,490	43,944	51,200	32,544	29,617	31,354	28,729	26,225	28,477	27,845	36,814	32,711
4	36,364	41,305	49,211	32,209	29,118	31,818	28,039	26,370	20,322	27,642	47,914	31,409
5	45,396	38,743	43,220	31,102	30,896	29,911	27,642	27,655	28,383	27,354	38,155	31,596
6	45,980	36,909	40,166	30,741	29,734	29,847	27,117	27,444	27,824	28,267	34,925	32,710
7	42,165	35,877	38,029	31,467	28,874	29,416	27,573	27,948	27,409	27,585	33,926	32,891
8	66,754	34,398	41,107	32,029	28,840	28,253	28,079	27,437	28,366	27,058	36,086	33,699
9	73,206	33,753	41,704	30,799	28,866	29,041	27,794	27,889	26,953	27,868	39,231	32,557
10	53,835	35,155	41,985	30,209	28,272	28,990	27,880	26,609	28,865	27,556	45,614	31,705
11	45,057	41,517	45,770	30,689	28,574	29,919	27,663	27,766	28,258	27,174	53,724	31,932
12	39,527	40,125	44,405	30,432	29,107	28,426	27,687	27,361	27,564	27,017	52,153	31,082
13	38,036	37,370	39,976	29,617	29,099	28,046	27,064	27,344	29,347	27,153	73,800	39,679
14	36,522	36,077	37,735	30,246	28,816	28,334	27,380	27,734	27,833	28,388	56,768	55,337
15	35,321	36,077	36,402	29,939	28,254	28,470	28,222	27,681	28,894	27,424	45,836	46,702
16	34,402	33,886	34,918	28,984	28,586	28,612	27,999	27,356	27,982	27,560	47,693	47,763
17	33,224	32,777	34,428	28,862	27,475	28,771	28,103	28,062	28,162	27,684	44,785	73,968
18	33,550	32,220	33,999	28,719	27,081	28,292	27,550	28,689	27,622	34,752	41,666	79,805
19	38,988	33,362	33,086	28,233	26,848	28,308	27,628	29,105	27,704	39,576	52,499	62,983
20	40,729	32,875	32,858	28,324	28,639	28,131	27,005	28,356	27,219	43,562	67,021	55,706
21	52,894	36,046	32,100	29,407	33,036	27,984	28,242	28,165	26,848	34,717	49,907	50,870
22	67,572	39,042	32,827	28,616	29,620	27,707	28,071	28,119	28,996	32,747	58,130	56,905
23	54,474	36,440	34,988	30,628	28,344	27,778	27,466	28,235	28,464	30,869	56,957	54,710
24	65,862	35,197	34,193	29,655	30,104	28,601	28,193	27,725	28,133	30,331	51,481	47,700
25	56,811	33,593	34,161	34,563	29,035	28,436	26,929	27,399	32,415	32,277	45,217	60,708
26	54,758	34,275	34,649	37,483	30,443	24,316	27,450	29,908	30,425	34,915	40,970	84,271
27	68,494	35,339	42,411	32,914	29,248	28,395	27,673	27,704	28,296	37,940	38,267	59,608
28	72,225	53,641	39,473	32,279	29,260	27,934	28,634	26,956	28,047	34,830	36,664	62,727
29	64,801	45,577	37,303	36,103	28,829	28,014	29,254	29,992	27,883	32,505	35,131	51,217
30	55,329		35,714	31,731	28,170	27,672	28,099	28,222	28,545	33,477	34,309	47,949
31	62,841		33,816		28,339		26,575	27,372		34,299		45,774
Total:	**1,517,774**	**1,107,670**	**1,199,481**	**936,076**	**901,848**	**863,993**	**865,717**	**861,802**	**841,714**	**952,450**	**1,374,533**	**1,474,395**
Average:	**48,960**	**38,196**	**38,693**	**31,203**	**29,092**	**28,800**	**27,926**	**27,800**	**28,057**	**30,724**	**45,818**	**47,561**
Minimum:	**28,242**	**32,220**	**32,100**	**28,233**	**26,848**	**24,316**	**26,575**	**26,225**	**20,322**	**23,021**	**33,926**	**31,082**
Maximum:	**73,206**	**54,558**	**51,200**	**37,483**	**33,036**	**34,547**	**32,247**	**29,992**	**32,415**	**43,562**	**73,800**	**84,271**
Permit Exceedance (max flow)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**

Non-compliant days are highlighted in yellow.
Maximum daily flow: 80,870 m^3/day

2024 Influent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)												
Day	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1										346		
2	282			214			283					
3									362			316
4						357						
5			216								200	
6		270						318				
7					356							
8							334			338		
9	135			338								
10												258
11						333						
12			228								201	
13		182						298				
14					344							
15										469		
16	356			360			312					
17									333			< 100
18						398						
19			303								215	
20		302										
21					350							
22										270		
23	158			256			328					
24									334			
25						246						
26			268								199	
27		328										
28					492							
29										316		
30	134			287			339					
31												
Average:	**213**	**271**	**254**	**291**	**386**	**334**	**319**	**308**	**343**	**348**	**204**	**287**

Non-compliant days are highlighted yellow,

2024 Effluent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	11.6	6.51	4.85	7.57	12.3	9.51	6.66	9.19	8.39	6.67	8.98	5.17
2	11.2	6.64	6.83	7.45	11.4	11.2	9.37	9.04	9.29	10.2	8.47	5.28
3	10.5	5.33	9.01	8.37	8.89	8.49	10.8	9.42	10.8	9.28	8.70	5.58
4	8.28	6.08	6.82	10.1	14.9	10.2	12.5	8.03	11.1	7.12	9.25	5.27
5	8.89	6.33	7.08	10.9	13.7	7.89	10.9	9.77	8.67	6.45	8.25	4.39
6	9.33	5.19	6.19	7.49	10.4	10.1	8.99	10.4	11.8	5.49	6.50	5.48
7	9.53	6.24	6.41	11.2	11.8	8.99	12.6	10.7	7.02	7.64	5.50	4.92
8	8.71	4.68	6.48	11.5	9.73	5.53	16.3	10.2	8.50	8.40	7.66	5.50
9	7.38	5.04	6.43	14.6	10.3	8.45	18.0	10.2	10.0	9.35	7.72	5.13
10	5.60	5.91	6.45	11.9	9.47	8.87	13.6	11.6	6.65	8.81	7.17	5.50
11	5.49	6.83	6.23	7.10	8.61	11.2	11.7	12.0	5.28	6.68	6.52	8.28
12	6.58	6.91	6.33	12.6	11.0	8.91	12.5	11.0	4.12	5.55	7.28	10.3
13	5.44	6.98	5.54	13.6	9.03	12.8	12.7	12.2	5.68	5.36	6.18	9.02
14	5.81	6.91	5.32	10.1	9.87	11.7	13.0	11.0	5.49	5.79	5.37	5.91
15	6.60	6.81	6.16	12.4	8.41	11.3	13.4	11.6	6.29	7.34	5.21	6.94
16	8.18	6.87	5.29	9.89	9.42	13.0	12.2	12.6	5.89	6.12	5.36	5.66
17	6.11	7.03	6.24	7.02	8.09	12.5	15.6	12.6	6.97	4.19	5.19	9.39
18	6.60	6.37	6.73	9.33	10.5	13.8	10.0	11.3	8.53	4.16	5.76	24.9
19	5.75	6.26	7.73	7.93	11.3	10.9	11.1	10.4	6.67	4.58	5.94	34.4
20	6.29	7.07	4.18	7.71	11.0	10.8	11.6	9.18	6.60	5.13	6.34	5.44
21	5.55	5.87	7.75	7.88	10.0	11.7	12.9	9.52	5.08	5.02	6.71	10.8
22	5.07	6.44	7.65	6.52	9.51	8.68	14.9	10.1	6.70	4.50	6.90	23.0
23	6.68	6.28	5.52	8.78	9.19	10.4	12.1	10.4	7.71	5.49	5.08	6.04
24	11.0	4.36	6.59	9.99	8.06	8.81	14.6	11.3	8.05	6.16	5.06	7.56
25	5.36	6.54	5.45	8.16	9.32	9.00	12.4	11.7	5.66	7.78	4.82	10.9
26	5.85	7.03	5.08	7.43	9.97	10.3	NT	10.6	5.50	7.26	5.54	35.0
27	24.8	6.85	5.88	8.83	10.7	8.72	11.9	9.47	4.98	7.84	5.23	17.3
28	13.1	7.06	5.03	8.93	9.40	8.15	11.0	8.71	4.99	7.96	4.77	22.8
29	10.6	4.52	5.72	9.13	8.82	6.13	11.5	6.47	5.57	8.98	4.60	7.38
30	6.59		5.35	14.4	9.94	7.28	10.6	7.85	5.78	8.16	3.66	2.76
31	19.5		6.41		10.4		8.54	5.87		8.04		5.16
Average	**8.64**	**6.24**	**6.22**	**9.63**	**10.18**	**9.84**	**12.13**	**10.14**	**7.13**	**6.82**	**6.32**	**10.36**
Permit Exceedance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Quarterly Average (for WSER)	**7.05**			**9.89**			**9.80**			**7.85**		

GNPCC Maximum BOD_5: 130 mg/L
Non-compliant days are highlighted in yellow.
NT – No testing competed.

2024 Influent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	450			447			380			797		
2	430			430		1940	550					
3			245			837			550			553
4		500	300			817						
5		217	347		843						260	
6		440			563			680				
7	253			337	737		483					
8	243			433			530			823		
9	147			453		780						
10			270			483	627		563			363
11		573	293			430						
12		340	260		467						287	
13		300			2580			447				
14	502			710	910							
15	383			797						683		
16	563			557		557	527					
17			317			647			603			263
18		313	470			623						
19		497	867		763						300	
20		603			1590			517				
21	335				603							
22	150			473						317		
23	230			420		397	647					
24			383	503		437			950			
25		393	360			440						
26		383	360		813						207	
27		500			1340			637				
28	520			590	1300							
29	350			667						333		
30	350			1420		387	707					
31			363									
Average:	**350**	**422**	**372**	**588**	**1042**	**675**	**556**	**570**	**667**	**591**	**264**	**393**

2024 Effluent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	8.20	7.34	7.88	10.40	16.0	10.40	5.55	7.50	12.4	6.12	10.3	6.90
2	8.70	6.84	7.86	13.0	15.4	13.40	8.50	7.00	11.4	15.6	10.8	6.00
3	7.60	7.34	13.70	13.5	20.0	9.60	9.50	8.33	12.0	13.6	9.98	3.80
4	7.90	7.00	8.60	12.3	27.2	9.00	11.2	7.20	10.2	8.30	11.1	4.70
5	7.86	8.00	7.20	14.5	19.8	9.00	12.6	6.20	9.60	4.40	10.3	3.30
6	6.00	6.75	6.20	9.40	20.0	8.80	6.67	8.20	9.40	5.80	10.6	5.30
7	6.70	5.38	7.60	13.3	13.8	8.20	13.6	8.40	7.20	6.00	9.72	5.20
8	6.10	6.00	8.34	12.5	11.4	7.20	15.6	9.80	9.60	6.12	10.3	5.12
9	5.90	5.40	7.66	12.2	9.71	8.00	23.6	10.4	11.2	7.00	7.71	5.50
10	4.00	5.88	7.17	12.0	14.4	9.30	19.2	8.33	9.60	7.43	7.00	5.40
11	4.30	8.38	6.17	10.8	10.6	10.1	18.6	9.34	7.00	6.60	7.00	5.70
12	6.30	7.88	5.50	14.2	12.0	12.9	17.6	7.00	6.80	4.57	6.72	8.25
13	5.25	9.12	4.66	12.4	12.6	15.4	18.0	7.57	4.80	6.57	6.57	10.15
14	5.00	8.75	5.67	12.7	11.7	10.5	14.8	7.57	6.12	5.57	6.40	7.25
15	4.70	9.50	5.86	15.8	10.0	6.33	16.2	9.14	5.50	7.12	7.38	6.75
16	6.20	8.80	3.75	13.0	9.83	11.8	16.0	10.4	6.50	6.25	6.40	6.62
17	5.00	7.80	6.67	7.00	15.0	12.2	11.0	9.14	7.88	4.25	6.28	9.38
18	5.88	6.40	7.50	7.00	14.0	15.6	11.8	10.4	7.40	3.50	6.25	26.6
19	4.00	8.75	11.2	7.86	15.4	14.6	11.8	12.0	8.38	4.80	7.38	29.5
20	5.30	10.16	8.50	11.6	15.0	12.4	14.8	9.8	8.40	4.75	6.70	9.72
21	5.75	9.00	11.0	8.57	10.6	11.7	14.6	12.0	7.70	5.12	8.38	18.5
22	4.60	7.38	9.00	7.83	10.8	4.33	16.6	14.4	9.28	4.25	5.25	51.0
23	6.30	8.12	6.50	8.86	11.4	10.50	12.6	12.6	13.2	5.12	4.80	13.2
24	13.2	11.2	8.00	10.4	8.40	9.98	13.0	14.0	13.0	5.75	3.88	10.8
25	5.40	10.2	7.28	9.42	10.0	9.80	14.8	18.2	8.57	7.42	3.88	18.0
26	6.00	10.6	6.62	9.42	10.6	12.1	NT	19.6	4.57	8.00	4.80	31.6
27	52.0	8.84	7.86	12.0	11.0	6.70	11.6	15.0	5.60	8.38	4.60	14.6
28	63.4	11.0	7.00	10.3	9.40	6.00	10.0	12.2	4.50	7.88	3.90	27.3
29	20.0	5.60	8.14	13.4	10.4	4.50	8.6	11.6	5.88	9.62	4.60	10.4
30	7.12		10.68	15.0	11.5	6.00	6.8	10.0	6.38	9.98	2.57	7.50
31	42.0		8.50		12.5		7.8	12.0		10.30		7.00
Average:	**11.2**	**8.05**	**7.69**	**11.4**	**13.2**	**9.88**	**13.1**	**10.5**	**8.34**	**6.97**	**7.05**	**12.3**
Permit Exceedance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Quarterly Average (for WSER)	**8.99**			**11.5**			**10.6**			**8.79**		

Non-compliant days are highlighted yellow.
GNPCC Maximum TSS: 130 mg/L
NT- No testing completed.

2024 Influent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1					14.9		19.0					
2	15.3			15.0			18.7			18.4		
3	14.0			14.4		18.1	18.8					
4			15.4			17.0			20.5			
5		13.6	14.7			16.9						
6		14.6	13.3		17.3						16.5	
7		13.3			15.4			20.8				
8	12.9			17.1	15.6		21.0					
9	12.9			15.4			19.6			18.2		
10	13.5			14.6		18.2						
11			14.8			17.7	18.3		20.0			
12		15.5	15.5			16.8						
13		13.4	13.1		16.2						14.6	
14		13.6			17.0			20.8				
15	14.1			16.7	17.2							
16	13.8			14.4						18.1		
17	13.2					18.9	21.0					
18			18.7			17.1			20.0			13.7
19		13.2	16.4			17.8						
20		15.7	14.5		17.5						14.3	
21		14.3			17.3			19.7				
22	14.9				16.6							
23	14.0			15.0						17.0		
24	12.5			15.3		19.6	20.2					
25			16.1	15.1		18.8			17.7			
26		15.1	15.5			18.5						
27		14.5	14.1		16.4							
28		14.2			16.4			19.6				
29	12.1			16.8	16.6							
30	12.9			14.7						16.3		
31	14.8						20.5					
Average	**13.6**	**14.3**	**15.2**	**15.4**	**16.5**	**18.0**	**19.7**	**20.2**	**19.6**	**17.6**	**15.1**	**13.7**

2024 Effluent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	14.6	14.6	12.5	14.7	15.8	18.2	20.2	21.5		18.8	16.2	
2	14.8	13.2	12.8	14.6	16.8		19.8	21.8	21.4	18.4	16.1	14.8
3	15.0	13.2	12.1	14.5	16.5	18.0	20.0	22.1	21.2	18.6		14.8
4	14.8	12.8	14.2	14.4	17.4	18.2	20.0		20.9	18.4	16.8	15.0
5	14.4	13.6	12.8	14.1		17.8	21.6	22.1	21.6	18.5	15.5	15.6
6	15.0	13.4	13.0	14.8	17.5	17.9	21.1	20.8	21.7		15.8	15.5
7	14.6	13.7	12.0	14.6	16.7	18.5		21.6	21.9	18.2	16.3	15.1
8	13.6	13.2	12.8	17.0	16.1	19.2	21.8	22.0		19.0	16.0	
9	13.4	13.2	13.4	15.3	17.2		21.4	22.6	20.3	18.4**	16.6	17.6
10	13.2	13.8	12.6	15.4	17.4	18.4	21.7	22.2	20.2	17.8		15.5
11	14.3	13.3	14.8	15.2	18.6	18.9	21.0		20.6	17.5	16.1	15.1
12	13.3	15.9	13.5	14.6		18.0	20.9	21.4	20.8	17.8	16.1	15.0
13	12.7	13.4	13.3	15.5	17.2	18.5	21.6	21.4	20.2		15.6	15.6
14	13.9	13.8	13.2	15.2	17.6	18.2		21.5	20.2	18.2	15.0	14.2
15	14.4	13.6	13.4	16.8	18.0	17.9	21.0	21.9	19.7	18.6	14.7	
16	13.8	12.9	13.4	15.0	17.5		21.4	21.6	19.8	17.8	15.6	13.2
17	13.0	14.1	13.3	14.9	17.2	19.1	22.2	21.8	20.3	17.4		14.2
18	14.0	13.2	17.2	15.3	17.0	18.4	21.6		20.0	17.1	15.6	12.6
19	14.3	13.4	15.8	15.5		19.2	21.6	21.4	19.7	17.9	15.4	13.2
20	13.7	15.8	14.8	15.8	18.0	19.6	21.8	21.2	19.1		14.7	14.6
21	13.6	14.4	14.3		17.9	20.0		20.9	19.8	17.2	14.6	14.4
22	14.4	15.0	14.6	16.6	17.8	19.9	21.3	20.8	19.7	13.6**	14.6	
23	13.2	14.8	14.8	16.2	18.2		21.3	21.1	20.2	16.4	15.0	14.1
24	13.4	14.0	13.7	15.5	16.8	19.7	20.8	20.9	20.6	16.4		13.8
25	13.2	13.3	15.9	15.3	17.2	20.2	20.8	21.0	19.9	16.1	16.2	13.8
26	13.2	14.9	15.8	15.6		20.0	21.0	20.2	19.3	17.6	14.3	13.8
27	12.8	13.5	14.2	15.9	17.6	19.2	21.0	20.1	19.5		14.4	13.4
28	13.0	13.4	14.2		17.5	18.8		19.8	18.4	17.3	14.8	13.8
29	13.4	12.9	14.0	17.2	16.8	19.6	20.5	20.2		16.5	14.6	
30	13.3		14.2	15.5	17.2		20.6	20.8	19.0	17.9	14.6	13.2
31	15.1		13.6		17.8		21.4	21.3		16.0		13.6
Average	**13.9**	**13.8**	**13.9**	**15.4**	**17.3**	**18.9**	**21.1**	**21.3**	**20.2**	**17.7**	**15.4**	**14.4**

2024 Influent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1					7.28		7.23					
2	7.59			7.36			7.38			7.32		
3	7.34			7.41		7.11	7.28					
4			7.40			7.25			7.31			
5		7.72	7.47			7.28						
6		7.90	7.39		7.34						7.18	
7		7.48			7.44			7.17				
8	7.37			7.35	7.37		7.09					
9	7.33			7.31			7.29			7.29		
10	7.36			7.48		7.30						
11			7.28			7.30	7.30		7.30			NT
12		7.17	7.41			7.17						
13		7.47	7.44		7.30						7.32	
14		7.61			7.39			7.24				
15	7.27			7.34	7.32							
16	7.41			7.24						7.18		
17	7.39			NT		7.31	7.29					
18			7.07			7.22			7.22			7.22
19		7.33	7.13			7.29						
20		7.19	7.28		7.21						7.29	
21		7.45			7.36			7.28				
22	7.33				7.31							
23	7.43			7.37						7.21		
24	7.30			7.36		7.10	7.23					
25			7.39	7.23		7.05			7.66			
26		7.37	7.38			7.34						
27		7.44	7.45		7.24						NT	
28		7.48			7.27			7.26				
29	7.39			7.38	7.16							
30	7.43			7.35						7.29		
31	7.42						7.26					
Average	**7.38**	**7.47**	**7.34**	**7.35**	**7.31**	**7.23**	**7.26**	**7.24**	**7.37**	**7.26**	**7.26**	**7.22**

2024 Effluent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	7.00	6.94	6.78	6.98	6.59	6.90	6.76	6.81		6.98	7.00	
2	7.00	6.95	6.79	7.01	6.56		6.80	6.84	6.98	7.00	6.99	7.04
3	6.96	7.00	6.78	7.11	6.76	6.84	6.58	6.87	6.93	7.06		7.05
4	7.02	7.04	6.82	7.05	6.77	6.80	6.78		7.06	7.00	6.90	7.04
5	6.85	7.07	6.84	7.07		6.82	6.75	6.68	6.96	6.91	6.85	6.94
6	7.06	7.10	6.76	7.02	6.86	6.71	6.76	6.82	6.92		6.85	6.98
7	6.86	7.10	6.80	7.10	6.88	6.82		6.78	6.90	6.96	6.83	6.99
8	6.85	7.18	6.72	7.15	6.92	6.84	6.82	6.80		6.90	6.89	
9	6.96	7.12	6.65	7.09	6.84		6.88	6.74	7.14	7.10	6.94	6.93
10	6.90	7.18	6.80	7.00	6.88	6.82	6.89	6.68	7.24	6.99		6.94
11	6.88	7.12	6.74	6.98	6.91	6.76	6.94		7.22	6.97	6.88	6.88
12	6.96	7.04	6.74	6.96		6.84	6.86	6.74	7.28	6.98	6.78	6.92
13	6.87	7.07	6.64	6.88	6.92	6.72	6.90	6.76	7.26		6.86	6.97
14	6.90	7.03	6.52	6.84	6.84	6.77		6.80	7.28	6.96	6.84	6.90
15	6.91	7.00	6.59	6.90	6.90	6.92	6.88	6.96	7.22	7.08	6.72	
16	6.90	6.97	6.70	6.84	6.90		6.86	6.99	7.18	7.00	6.80	6.86
17	6.92	7.02	6.84	6.88	6.84	6.88	6.82	7.02	7.26	6.98		6.81
18	6.85	7.40	6.86	6.84	6.86	6.85	6.90		7.30	6.96	6.86	7.02
19	6.89	6.94	6.80	6.94		6.82	6.86	7.22	7.23	6.96	6.96	6.80
20	6.88	6.92	6.83	7.00	6.96	6.81	6.82	7.31	7.22		6.98	6.58
21	6.83	6.88	6.88		7.00	6.78		7.34	7.13	6.90	6.92	6.74
22	6.89	6.82	6.84	6.94	7.00	6.76	7.02	7.36	7.16	7.02	7.00	
23	6.96	6.80	6.74	6.89	7.04		7.03	7.36	7.18	7.01	6.91	6.80
24	6.92	6.80	6.85	6.97	6.97	6.78	6.92	7.34	7.27	7.02		6.80
25	6.98	6.76	6.94	6.95	6.92	6.81	6.92	7.36	7.26	7.13	6.97	6.78
26	6.99	6.80	6.91	6.86		6.74	6.94	7.28	7.14**	7.02	7.03	6.89
27	6.99	6.89	6.90	6.83	6.80	6.86	6.89	7.20	7.14		7.12	6.58
28	6.98	6.82	6.90		6.78	6.76		7.30	7.06	7.02	7.09	6.78
29	7.00	6.93	6.94	6.80	6.88	6.92	6.90	7.42		6.98	7.12	
30	6.94		6.90	6.76	6.88		6.85	7.26	6.96	7.05	7.12	6.78
31	7.02		6.98		6.88		6.86	7.19		7.06		6.84
Average	**6.93**	**6.99**	**6.80**	**6.95**	**6.86**	**6.81**	**6.86**	**7.04**	**7.14**	**7.00**	**6.93**	**6.87**

2024 Effluent Ammonia (Total N as mg/L)												
Day	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
1	22.9	20.6	15.1	19.6	13.2	19.0	17.9	18.3	NT	17.7	20.5	23.5
2	23.8	18.5	12.8	23.4	16.3	19.0	16.5	19.2	24.4	18.6	17.5	23.6
3	23.8	20.8	14.4	26.6	15.0	14.0	12.0	16.6	22.7	18.0	16.6	25.0
4	23.4	27.0	12.4	28.2	16.5	16.4	16.0	14.1	20.0	16.9	15.3	22.4
5	25.8	23.6	11.9	25.4	19.8	16.8	14.7	14.6	22.0	14.5	15.6	22.8
6	20.6	29.2	13.2	24.8	19.3	17.6	14.5	13.2	19.4	17.2	15.2	22.8
7	19.5	28.3	14.6	27.3	21.4	17.6	16.4	13.7	24.1	17.3	16.1	18.9
8	20.7	29.2	12.0	22.6	21.9	16.0	14.6	13.4	24.5	16.9	16.9	17.1
9	13.8	30.0	12.1	22.4	22.0	17.2	17.2	14.8	30.3	16.3	15.3	16.3
10	15.0	32.6	13.1	20.9	20.4	14.7	19.8	13.0	35.4	19.3	13.8	15.6
11	18.6	29.6	12.8	21.2	17.9	16.6	21.4	15.8	41.0	20.8	13.6	17.0
12	23.6	25.2	11.3	20.0	20.4	16.6	21.2	15.6	41.4	16.4	13.4	17.4
13	20.6	23.8	9.5	19.0	20.6	16.2	19.8	15.4	43.8	15.7	11.8	17.4
14	21.6	24.7	11.4	18.4	20.8	17.6	18.3	18.0	35.9	20.2	10.0	13.5
15	21.6	26.2	11.8	18.4	17.8	16.7	19.4	22.2	41.6	20.6	13.8	12.4
16	18.3	22.2	13.4	16.3	16.8	15.5	19.2	19.8	42.4	21.0	15.9	14.8
17	23.8	22.6	16.1	18.0	16.6	17.0	20.5	24.0	43.2	22.2	15.0	11.6
18	25.1	23.6	12.4	18.7	18.0	16.0	14.4	27.8	40.3	24.2	19.5	12.2
19	25.8	22.4	13.7	21.2	20.0	16.7	16.7	33.4	43.4	20.9	21.2	15.5
20	21.6	19.2	15.6	21.4	22.2	16.2	17.5	37.2	40.1	19.7	16.4	9.9
21	22.2	20.8	18.5	0.0	20.2	15.4	21.6	43.4	41.1	16.9	18.6	13.3
22	17.5	20.1	19.2	20.4	22.0	18.3	23.6	48.0	42.3	21.2	22.1	13.8
23	17.4	19.1	17.0	21.8	20.8	18.8	21.6	44.2	36.4	24.9	13.6	11.8
24	19.0	17.3	20.2	20.9	19.1	15.5	19.7	44.2	37.2	23.6	20.6	10.2
25	16.4	16.6	19.8	20.6	16.5	18.4	19.2	46.9	39.3	24.6	19.4	12.0
26	19.8	15.0	18.4	18.3	16.9	17.3	NT	38.9	31.2	22.1	24.5	12.4
27	19.6	17.2	20.1	16.3	15.0	18.2	18.8	43.4	27.2	19.9	24.2	13.2
28	16.9	17.2	18.7	16.5	14.3	17.3	17.4	43.4	25.3	18.8	26.1	11.7
29	16.8	15.0	19.0	16.4	18.4	15.4	19.0	42.2	23.2	19.8	28.6	9.6
30	18.4		19.2	13.6	20.2	14.6	18.3	39.0	20.5	23.2	25.3	12.4
31	19.0		17.9		19.3		19.4	NT		NT		13.0
Average	**20.4**	**22.7**	**15.1**	**20.0**	**18.7**	**16.8**	**18.2**	**27.1**	**33.1**	**19.6**	**17.9**	**15.6**

** Tested by both the Hach TNT and ISE methodology in 2024.
NT- No test completed

2024 Un-ionized Ammonia (Total N as mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	0.073	0.066	0.033	0.063	0.032	0.0646	0.0609	0.062	NT	0.060	0.0700	0.130
2	0.095	0.074	0.028	0.100	0.033	0.0646	0.0346	0.056	0.105	0.080	0.070	0.120
3	0.069	0.089	0.037	0.110	0.045	0.0448	0.0240	0.042	0.091	0.067	0.056	0.140
4	0.075	0.150	0.036	0.120	0.040	0.0476	0.0416	0.037	0.080	0.046	0.052	0.121
5	0.083	0.139	0.024	0.130	0.063	0.0437	0.0470	0.038	0.081	0.046	0.042	0.107
6	0.047	0.150	0.026	0.099	0.062	0.0458	0.0218	0.0356	0.062	0.064	0.041	0.098
7	0.045	0.190	0.032	0.218	0.068	0.0563	0.0410	0.037	0.053	0.047	0.052	0.089
8	0.048	0.180	0.020	0.097	0.070	0.0480	0.0380	0.040	0.115	0.046	0.049	0.080
9	0.036	0.160	0.011	0.000	0.088	0.0636	0.0464	0.030	0.224	0.055	0.035	0.060
10	0.041	0.160	0.025	0.090	0.065	0.0397	0.0574	0.027	0.262	0.062	0.037	0.042
11	0.041	0.151	0.020	0.085	0.034	0.0480	0.0685	0.051	0.328	0.071	0.035	0.049
12	0.076	0.100	0.022	0.086	0.069	0.0360	0.0721	0.047	0.280	0.000	0.050	0.056
13	0.054	0.112	0.014	0.051	0.082	0.0373	0.0594	0.040	0.300	0.046	0.034	0.047
14	0.069	0.099	0.015	0.059	0.077	0.0510	0.0494	0.061	0.305	0.069	0.020	0.022
15	0.069	0.100	0.019	0.050	0.052	0.0284	0.0660	0.089	0.387	0.089	0.037	0.029
16	0.049	0.089	0.021	0.044	0.054	0.0465	0.0518	0.085	0.360	0.071	0.046	0.039
17	0.076	0.072	0.040	0.049	0.048	0.0460	0.0656	0.122	0.367	0.076	0.077	0.022
18	0.085	0.076	0.032	0.050	0.067	0.0416	0.0389	0.164	0.343	0.090	0.084	0.035
19	0.070	0.083	0.032	0.072	0.080	0.0434	0.0451	0.267	0.278	0.067	0.114	0.047
20	0.043	0.052	0.039	0.073	0.076	0.0437	0.0455	0.298	0.220	0.079	0.061	0.021
21	0.058	0.067	0.037		0.069	0.0416	0.0691	0.438	0.304	0.073	0.069	0.021
22	0.056	0.064	0.061	0.051	0.112	0.031	0.0944	0.485	0.288	0.091	0.095	0.036
23	0.051	0.038	0.042	0.094	0.106	0.045	0.0864	0.380	0.291	0.120	0.050	0.031
24	0.082	0.035	0.059	0.071	0.065	0.042	0.0630	0.410	0.250	0.094	0.122	0.024
25	0.044	0.038	0.073	0.066	0.048	0.042	0.0560	0.399	0.334	0.110	0.083	0.032
26	0.067	0.030	0.053	0.059	0.049	0.055		0.420	0.200	0.113	0.130	0.036
27	0.073	0.045	0.058	0.049	0.048	0.036	0.0510	0.370	0.150	0.101	0.1140	0.036
28	0.068	0.046	0.050	0.053	0.042	0.059	0.0644	0.470	0.130	0.081	0.140	0.023
29	0.062	0.040	0.057	0.036	0.074	NT	0.0608	0.390	0.100	0.093	0.140	0.020
30	0.099		0.048	0.026	0.081	0.034	0.0677	0.265	0.070	0.100	0.056	0.034
31	0.082		0.061		0.056		0.0660			NT		0.035
Average	**0.064**	**0.093**	**0.036**	**0.074**	**0.063**	**0.046**	**0.055**	**0.188**	**0.219**	**0.074**	**0.069**	**0.054**

** Tested by both the Hach TNT and ISE methodology in 2024.
NT – No test completed.

Appendix C – Permit Non-Conformance Reports

Permit Non-Conformances

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
GNPCC LAB (BOD/TSS) x2				
July 26, 2024	The final effluent composite sampler was not turned-on on July 26,2024 and as a result there was no final effluent composite sample to run on July 27, 2024	Superintendent, Chief operator, Senior operators, weekend crew, Process Engineer and the Senior Lab Tech and lab staff were all notified via email. A grab sample for the final effluent was taken and ran for all routine tests that are usually performed on the composite sample. The autosampler was also checked which confirmed the machine is in good working condition and it was just not turned on the day before.		Discussed situation with employees who were on staff the day that the non-con occurred. The operator collecting samples that day was a new employee(student). They did not turn the sampler back on after collecting the sample. On afternoon rounds the same employee initialed the check sheet but did not make sure that the sampler was on and taking samples. In a morning crew talk the importance of making sure that the sampler is turned on after collecting the sample was discussed. Also discussed the importance of ensuring that the sampler is running AND successfully taking samples BEFORE initialing the check sheet. Experienced staff who are showing new employees how to check the sampler need to ensure it is running and taking samples effectively and making sure the new employee understands this and that having a daily composite sample for testing is regulated permit requirement.

Date of Non-compliance	Describe the Issue	What was the Immediate Resolution?	Describe the Suspected Cause or Solution	Investigation Results
GNPCC WSER (LC50) x1				
September 26, 2024	The Regional District of Nanaimo (RDN) routinely monitors the acute lethality (Rainbow Trout LC50) of effluent from Greater Nanaimo Pollution Control Centre (GNPCC) at 4600 Hammond Bay Road in Nanaimo, BC. Test results received from Bureau Veritas on October 9, 2024, reported that the sample taken on September 26, 2024 was acutely lethal.	Leading up to the time of sampling, the facility process had been upset. Changes to plant operations had been made, but the corrections had not taken full effect (the process is now operating normally.) At the time of sampling, coinciding samples for TSS and cBOD were in compliance with WSER.		Based on this result, and in accordance with WSER, GNPCC will repeat acute lethality testing every two weeks, with at least seven days between tests, until three consecutive samples are determined not to be acutely lethal. The RDN will also complete internal investigation of the event.
GNPCC FLOW x1				
December 26, 2024	On December 26, 2024, the effluent flow recorded from GNPCC was 84,281 which exceeded the permitted maximum daily flow of 80,870 m3/day	.	This flow result occurred during a high flow event was attributed to inflow and infiltration into the collection system.	The non-conformance is attributed to inflow and infiltration (I&I) entering the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo and the District of Lantzville to reduce I&I in the sanitary sewer collection system.

Appendix D – External Laboratory Results

2024 GNPCC EFFLUENT										
Parameter	Units	12-Mar-24	21-May-24	16-Jun-24	26-Sep-24	09-Oct-24	22-Oct-24	30-Oct-24	15-Dec-24	Year End
pH*	pH units	6.8	6.8	-	7.3	7.0	7.2	7.3	-	7.1
Survival Rate (Rainbow Trout)*	%	<100%	>100%	-	91.60%	>100%	>100%	>100%	-	98.6
Dissolved Chloride	mg/L	-	-	270	-	-	-	-	91	181
Total Kjeldahl Nitrogen / TKN	mg/L	-	-	17.7	-	-	-	-	10	14
Total Nitrogen	mg/L	-	-	30.2	-	-	-	-	15.4	22.8
Oil and Grease (total)	mg/L	-	-	<1.0	-	-	-	-	<1.0	<1.0
Dissolved Sulphate	mg/L	-	-	51	-	-	-	-	25	38
Nitrate (as N)	mg/L	-	-	10.5	-	-	-	-	-	10.5
Nitrite (as N)	mg/L	-	-	2.08	-	-	-	-	-	2.08
Nitrate+Nitrite (as N)	mg/L	-	-	12.5	-	-	-	-	5.28	8.89
Sulphide (total)	mg/L	-	-	0.0078	-	-	-	-	0.0086	0.0082
Cyanide (total)	mg/L	-	-	0.00191	-	-	-	-	0.00122	0.00157
Fluoride (dissolved)	mg/L	-	-	<0.050	-	-	-	-	<0.050	<0.050
Total Organic Carbon / TOC	mg/L	-	-	17	-	-	-	-	12	15
Total Phenols	mg/L	-	-	0.0018	-	-	-	-	0.0021	0.0020
Polychlorinated Biphenyls / PCBs	ug/L	-	-	<0.050	-	-	-	-	<0.050	<0.050
METALS Scan by ICP										
Aluminum (total)	ug/L	-	-	14.1	-	-	-	-	21.3	17.7
Arsenic (total)	ug/L	-	-	0.42	-	-	-	-	0.39	0.41
Barium (dissolved)	ug/L	-	-	15.4	-	-	-	-	50.5	33.0
Boron (dissolved)	ug/L	-	-	284	-	-	-	-	172	228
Cadmium (dissolved)	ug/L	-	-	<0.010	-	-	-	-	0.022	0.016
Chromium (total)	ug/L	-	-	<1.0	-	-	-	-	<1.0	<1.0
Cobalt (dissolved)	ug/L	-	-	0.48	-	-	-	-	0.52	0.50
Copper (dissolved)	ug/L	-	-	4.53	-	-	-	-	7.14	5.84
Iron (dissolved)	ug/L	-	-	115	-	-	-	-	46.4	80.7
Lead (total)	ug/L	-	-	0.26	-	-	-	-	0.20	0.23
Manganese (dissolved)	ug/L	-	-	61.3	-	-	-	-	19.1	40.2
Mercury (total)	ug/L	-	-	0.0030	-	-	-	-	0.0022	0.0026
Selenium (total)	ug/L	-	-	0.16	-	-	-	-	0.10	0.13
Molybdenum (total)	ug/L	-	-	<0.10	-	-	-	-	<0.10	<0.10
Nickel (dissolved)	ug/L	-	-	2.0	-	-	-	-	1.5	1.8
Silver (total)	ug/L	-	-	<0.020	-	-	-	-	<0.020	<0.020
Tin (total)	ug/L	-	-	<5.0	-	-	-	-	<5.0	#DIV/0!
Zinc (total)	ug/L	-	-	26.2	-	-	-	-	26.3	26.3
VOC Scan										
Chloroform	ug/L	-	-	2.9	-	-	-	-	1.5	2.2
Dichloromethane	ug/L	-	-	<2.0	-	-	-	-	<2.0	<2.0
Chloromethane	ug/L	-	-	<1.0	-	-	-	-	<1.0	<1.0
Tetrachloroethylene	ug/L	-	-	<0.50	-	-	-	-	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	-	-	<0.50	-	-	-	-	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	-	-	<0.50	-	-	-	-	<0.50	<0.50
Trichloroethylene	ug/L	-	-	<0.50	-	-	-	-	<0.50	<0.50
Benzene	ug/L	-	-	<0.40	-	-	-	-	<0.40	<0.40
Ethylbenzene	ug/L	-	-	<0.40	-	-	-	-	<0.40	<0.40
Toluene	ug/L	-	-	<0.40	-	-	-	-	<0.40	<0.40
Naphthalene	ug/L	-	-	<0.10	-	-	-	-	<0.10	<0.10
Phthalate Esters										
Di(2-ethylhexyl)phthalate	ug/L	-	-	<8.0	-	-	-	-	<4.0	<6.0
Di-n-Butylphthalate	ug/L	-	-	<8.0	-	-	-	-	<4.0	<6.0

2024 GNPCC INFLUENT		
Parameter	Unit	16-Jun-24
pH	pH Units	-
Alkalinity (total, as CaCO3)	mg/L	-
Ammonia	mg/L	-
Dissolved Chloride	mg/L	280
Total Kjeldahl Nitrogen / TKN	mg/L	49.5
Oil and Grease (total)	mg/L	39
Sulphate	mg/L	49
Dissolved Fluoride	mg/L	<0.050
Nirate (plus Nitrite) (N)	mg/L	0.26
Total Organic Carbon / TOC	mg/L	92
Phosphorus (total)	mg/L	-
Sulphide (total)	mg/L	0.32
Strong Acid Dissoc. Cyanide	mg/L	0.00110
Polychlorinated Biphenyls / PCBs	ug/L	<0.50
Total Phenols*	mg/L	0.043
METALS Scan by ICP		
Aluminum (total)	ug/L	287
Arsenic (total)	ug/L	0.62
Barium (dissolved)	ug/L	36.1
Boron (dissolved)	ug/L	301
Cadmium (dissolved)	ug/L	0.032
Chromium (total)	ug/L	3.0
Cobalt (dissolved)	ug/L	0.41
Copper (dissolved)	ug/L	12.1
Iron (dissolved)	ug/L	907
Lead (total)	ug/L	3.48
Manganese (dissolved)	ug/L	57.6
Mercury (total)	ug/L	0.0442
Molybdenum (total)	ug/L	1.7
Nickel (dissolved)	ug/L	2.1
Selenium (total)	ug/L	0.54
Silver (total)	ug/L	0.247
Tin (total)	ug/L	<5.0
Zinc (total)	ug/L	130
VOC Scan		
Chloroform	ug/L	5.3
Dichloromethane	ug/L	<2.0
Chloromethane	ug/L	<1.0
Tetrachloroethylene	ug/L	<0.50
1,1,1-Trichloroethane	ug/L	<0.50
1,1,2-Trichloroethane	ug/L	<0.50
Trichloroethylene	ug/L	<0.50
Benzene	ug/L	<0.40
Toluene	ug/L	0.72
Ethylbenzene	ug/L	<0.40
Naphthalene	ug/L	<0.10
Phthalate Esters		
Di(2-ethylhexyl)phthalate	ug/L	<32
Di-n-Butylphthalate	ug/L	<13

2024 GNPCC BIOSOLIDS															OMRR Regulatory Limits (Class B Biosolids)
Parameter	Unit	25-Jan-24	15-Feb-24	13-Mar-24	10-Apr-24	08-May-24	19-Jun-24	18-Jul-24	14-Aug-24	17-Sep-24	15-Oct-24	28-Nov-24	16-Dec-24	Average *	
Fecal coliforms nw (dry weight) (MPN / PA)	MPN/g	26,000	11,000	7,000	17,000	180,000	16,000	260,000	23,000	3,800	2,900	6,800	2,500	**15,000**	**2,000,000**
Percent Moisture	%	81	81	81	81	82	79	79	78	80	79	81	80	**80**	-
Total Solids	%	-	-	18.6	-	-	20.7	-	-	20.3	-	-	19.9	**19.9**	-
Volatile Solids	%	-	-	80.2	-	-	77.9	-	-	77.6	-	-	77.9	**78.4**	-
Total Kjeldahl Nitrogen / TKN	%	-	-	8.20	-	-	5.60			6.30			7.20	**6.83**	-
Phosphorus nw (total)	mg/kg	-	-	12,400	-	-	14,700	-	-	18,000	-	-	14,800	**15,000**	-
Polychlorinated Biphenyls / PCBs nw	mg/kg	-	-	<0.50	-	-	<4.8	-	-	<0.049	-	-	<0.50	**<1.5**	-
Arsenic nw (total)	mg/kg	-	-	2.13	-	-	2.30	-	-	2.20	-	-	2.33	**2.24**	**75**
Cadmium nw (total)	mg/kg	-	-	1.29	-	-	1.53	-	-	0.996	-	-	1.29	**1.28**	**20**
Chromium nw (total)	mg/kg	-	-	18	-	-	20.2	-	-	24.5	-	-	23.3	**21.5**	**1,060**
Cobalt nw (total)	mg/kg	-	-	3.11	-	-	2.74	-	-	2.73	-	-	3.37	**2.99**	**150**
Copper nw (total)	mg/kg	-	-	567	-	-	590	-	-	732	-	-	561	**613**	**2,200**
Iron nw (total)	mg/kg	-	-	10,100	-	-	19,200	-	-	28,500	-	-	20,400	**19,600**	-
Lead nw (total)	mg/kg	-	-	22.8	-	-	22.9	-	-	25.2	-	-	34.1	**26.3**	**500**
Mercury nw (total)	mg/kg	-	-	0.655	-	-	0.926	-	-	0.871	-	-	0.782	**0.809**	**15**
Molybdenum nw (total)	mg/kg	-	-	6.9	-	-	8.18	-	-	6.61	-	-	8.05	**7.44**	**20**
Nickel nw (total)	mg/kg	-	-	13.6	-	-	12.8	-	-	13.2	-	-	15.2	**13.7**	**180**
Potassium nw (total)	mg/kg	-	-	969	-	-	766	-	-	761	-	-	876	**843**	-
Selenium nw (total)	mg/kg	-	-	5.36	-	-	6.42	-	-	5.87	-	-	5.59	**5.81**	**14**
Zinc nw (total)	mg/kg	-	-	765	-	-	960	-	-	1,050	-	-	843	**905**	**1,850**

* Note – Geometric Mean presented in this column for Fecal coliforms nw (dry weight) (MPN / PA)

Appendix E – Odour Concern Reports

Odour Complaints

Date of Occurrence	Location	Incident Description	Preventative Measures Identified	Notes	Conclusion for this Environmental Incident
3-Jul-24	GNPCC	Neighbour living at [redacted] Hammond Bay Rd (just SE of GNPCC) was experiencing "very strong" "raw sewage smell" at 9am this morning. Called her at 11:50am she said that the odours had dissipated. Will follow up with [redacted] tomorrow after investigation and actions taken today	Investigated Southeast perimeter of plant. Odours present around Secondary Clarifier #2; tank is being cleaned out for inspection and maintenance. This is the main source of the odour. Sed Tank #4 is also emitting some odours due to take down and clean up. Sed tank #4 channel was flushed and cleaned out and HTH was added to the channel and sump to mitigate any lingering odours. Hosing, pumping, and cleanup of Secondary Clarifier #2 will continue until tomorrow when Pipe Eye will be coming in to vac up any remaining odour causing solids and complete the cleaning. This should take care of the odours.	I will follow up with [redacted] tomorrow afternoon to confirm that the odours have been eliminated.	Odor source confirmed due to maintenance activities, and proper action was taken.
3-Aug-24	GNPCC	Foul odours released every evening starting at approximately 9pm, including today, August 3. This is in the area of the treatment facility and reaches to Laguna Way, Nanaimo. No phone number or address given on webform submission, just email [redacted]) "Location of odour Greater Nanaimo Pollution Control Centre Description Foul odours released every evening starting at approximately 9pm, including today, August 3. This is in the area of the treatment facility and reaches to Laguna Way, Nanaimo."	None	Investigated around area mentioned, unable to pinpoint source of "foul odours". emailed complainant on Tuesday to let them know the complaint was received and that I would like to ask some questions regarding details associated with the odours that were experienced. As of the time of this report the complainant had not responded to the email or called the plant.	Action taken was good for this incident, possible Sed/Grit tank construction activities and warm weather may have contributed

Appendix F – Environmental Incident Reports

Environmental Incidents:

Date of Occurrence	Incident Title	Quantity of Material Spilled	Accident Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Notes	Conclusion for this Environmental Incident
GNPCC Spill (x2)								
January 9, 2024	GNPCC Biogas Release Digester #2 (Jan 9, 2024)	65 m3	GNPCC	On Jan 9/24 at 0914hrs, Operations at GNPCC started up the Digester #2 gas mixing system to test out the gas mixing process of Digester #2. As gas mixing functioned, it was noticed on SCADA that gas pressures started to fluctuate. It was then noticed by Operations that the PRV vent started to bypass biogas into the atmosphere at 0955hrs. The biogas vented straight up into the air without incident.	N/A	At 1006hrs Operations turned off the Digester #2 gas mixing system and locked out the gas blowers to prevent operation. The biogas venting stopped immediately, and gas pressures returned to normal. EMBC was notified by [redacted] at 14:32hrs with this information (DGIR# 240096).	Jan 9/24 - 1455hrs received call from: [redacted] Ministry of Env (Env. Emergency Response Officer) [redacted], called to discuss biogas/methane release. I gave [redacted] the below information, and he was pleased with my response. • Discussed a previous planned release of biogas in 2019, for a project, in which 150m3 - 300m3 of biogas was released over a one-hour period. • Ministry could not approve the scheduled release but helped in managing the release. Prior notice to residents was issued. • Mentioned I checked venting index for time, which was Fair. Env. Canada Venting index from 0700-1600 hours: CNTRL VAN ISLD 44/FAIR 42 208 14/POOR 32	Actions followed for incident were appropriate, and End of Spill report has been completed and sent off.

Date of Occurrence	Incident Title	Quantity of Material Spilled	Accident Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Notes	Conclusion for this Environmental Incident
March 8, 2024	Digester #1 Biogas Release - Gas Blower Commissioning	10,000 L	GNPCC	On March 8/24 at 1000hrs there was a biogas release on Dig #1 due to a 1" valve being left open during the commissioning of the new gas mixing system. The flow from the 1" valve on the MPG line increased when the new blower was started for Dig #1, and this caused the water in the condensate trap to empty, causing the condensate trap to release biogas from it's top 1" vent.	N/A	[redacted] noticed the release and immediately contacted [redacted] who was able to have the blower stopped immediately and closed the 1" ball valve to assist in stopping the biogas release. The 1" valve is locked closed as it is to be "normally closed".	The biogas spill did not impact any of the surrounding area, and workers in the area were notified. [redacted] was wearing a 4-gas monitor at the time of the release, which did not alarm to indicate a high level of methane in the surrounding area. As the initial volume was thought to be minimal and not reportable, the event was not reported to EMBC. After gathering further information on estimated volumes and biogas weights, the event was called into EMBC on March 12/24 at 1225hrs.	Incident was investigated thoroughly with RDN Health & Safety, and RDN WWS Southern Communities has engaged Associated Engineering to assist with GNPCC Digester/Biogas process. Opportunities to prevent this from occurring again have been discussed with staff and CPD group. Tags ordered to tag all biogas valving.

Appendix G – 2024 Biosolids Management Summary Report

Regional District of Nanaimo

2024 Biosolids Management Summary Report

February 2025

Prepared for:

Regional District of Nanaimo
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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

This report provides a summary management of GNPCC biosolids. In 2024, GNPCC biosolids were managed at one site in the Nanaimo area: private forest lands off Nanaimo River Road (Blackjack) managed by Mosaic Forest Management (Mosaic).

At Blackjack, Class B GNPCC biosolids were used by SYLVIS in a forest fertilization program. The objectives of biosolids forest fertilization were to increase soil quality and tree growth. Since the GNPCC biosolids management program was transitioned to Blackjack in 2021, over 16,700 wet tonnes (wt) have been managed at this site through forest fertilization and reclamation.

A total of 5,727 wt of biosolids were produced from the GNPCC in 2024, all of which were delivered to Blackjack (Table 1, Appendix One). Total GNPCC biosolids production in 2024 was consistent with the five-year average annual production, since the implementation of secondary treatment operations at the GNPCC has stabilized (Table 1, Appendix One).

2 REGULATORY AUTHORIZATION

RDN biosolids were managed at Blackjack under the *2023 Blackjack – Forest Fertilization & Restoration Land Application Plan* (SYLVIS document #1602-23) associated with Authorization #111628 valid April 23, 2023 to April 22, 2024 and under the *2024 Blackjack – Forest Fertilization & Reclamation Land Application Plan* (SYLVIS document #1701-24) associated with Authorization #112120 valid April 22, 2024 to April 21, 2025.

3 2024 BIOSOLIDS MANAGEMENT

3.1 BIOSOLIDS MANAGEMENT SUMMARY

In 2024, all GNPCC biosolids were managed at Blackjack on Nanaimo River Road in Nanaimo, British Columbia (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 2024 are summarized in Table 3 (Appendix One).

3.2 BIOSOLIDS TRANSPORTATION

Biosolids produced at GNPCC are scaled at the plant and tonnages are provided by the RDN. In 2024, all biosolids produced at the GNPCC (5,727 wt) were transported by DBL Disposal to Blackjack (Table 1 and Table 2, Appendix One). Monthly tonnage delivered to this site in 2024 is shown in Figure 1 (Appendix One).

3.3 BIOSOLIDS STORAGE

Two storage sites were used at Blackjack in 2024. The majority of biosolids were stored at the main stockpile, consisting of an asphalt base with lock blocks delineating the three sides of the stockpile (Photograph 1, Appendix Three). All other biosolids delivered to Blackjack in 2024 were stored at the Old Jump Main stockpile, in the new application area south of Nanaimo Lakes. 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. At the end of 2024, 120 wt remained in storage site at Blackjack in preparation for fertilization in 2025 (Table 2, Appendix One).

3.4 2024 PRE-APPLICATION MEASURES

At Blackjack, site inspections were carried out by a SYLVIS Qualified Professional or designate prior to biosolids forest fertilization. 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 for biosolids applications. 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.

3.5 BIOSOLIDS LAND APPLICATION

Biosolids (5,807 wt) were land-applied to 61.2 hectares (ha) of forested lands for forest fertilization (Figure 2 and Figure 3, Appendix Two). Biosolids were land-applied in forested areas using a side-discharge spreader equipped with a hydraulic fan which propels the biosolids up to 30 m into forest stands (Photograph 1, Appendix Three). Forest fertilization biosolids applications occurred throughout 2024 except during periods of extreme weather (i.e., snowfall, heavy rainfall, heat waves), during bud break in the late spring, or when the ground was snow-covered. All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features.

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 18.6 dry tonnes per ha (dt/ha) which does not exceed the lower of the maximum agronomic application rates specified in the LAPs for forest fertilization (32 dry tonnes per ha).

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 annually or for every 1,000 dry tonnes of biosolids applied, whichever comes first. Biosolids quality was characterized throughout 2024 to ensure biosolids met quality requirements for trace element concentrations, foreign matter, and pathogen reduction set forth in the OMRR.

In 2024, 1,138 dt of biosolids were produced by the GNPCC. Three composite samples, each composed of eight equal-volume subsamples, were collected by SYLVIS at the GNPCC. Composite samples were analyzed for physical parameters, nutrients, and trace elements (Table

4, Appendix One). All RDN biosolids samples collected in 2024 met the OMRR Class B criteria for trace elements concentrations.

SYLVIS collected 14 fecal samples from the GNPCC, the geometric mean of the sampling sets was 13,300 MPN/g (Table 4), meeting OMRR Class B criterion of 2,000,000 MPN/g.

3.7 SOIL MONITORING

Soil monitoring was conducted prior to applications in forest fertilization areas at Blackjack in 2024. Soil samples, each comprised of 15 sub-samples, were collected from the top 15 cm of soil by SYLVIS (Photograph 3, Appendix Three). 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.

3.8 REGULATORY COMPLIANCE

A Qualified Professional Certification was provided to Mosaic for biosolids applied at Blackjack under Authorization #111628. Authorization #112120 remains active until April 21, 2025; a Qualified Professional Certification will be authored upon completion of the Authorization term.

3.9 CARBON ACCOUNTING RELATED TO BIOSOLIDS MANAGEMENT

The management of 5,727 wt GNPCC biosolids at Blackjack in 2024 resulted in -1,390 t/CO2e of net emissions (emissions and emissions removals), of which transport represents +58 t CO2e GHG emissions.

This carbon emissions estimate considers biosolids transport, biosolids storage, land application, soil carbon sequestration, and soil nitrous oxide emissions. 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 RECEIVING ENVIRONMENT

The objectives of biosolids forest fertilization at Blackjack are to increase soil quality and tree growth while remaining compliant with the OMRR. Biosolids fertilization has increased organic matter content and available nutrients in the surface horizon. These enriched soils store more carbon and enable accelerated tree growth, which has been documented at this site and other biosolids forest fertilization sites. It has been observed[1] at the previous TimberWest Properties site on Doumont Road that deer browsing of trees is increased in biosolids-fertilized areas. Other biosolids fertilization sites in BC have documented similar results with improved wildlife habitat from biosolids applications on grasslands[2].

[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.
[2] Meineke, J., Doyle, F. I., Oukil, L., & Hodges, K. E. (2023). Small mammal responses to biosolids on grazed rangelands in British Columbia. *Restoration Ecology*, e14063.

Water sampling upstream and downstream of biosolids applications were completed by SYLVIS in April and November 2024. No adverse impacts from biosolids were seen; data can be provided upon request.

5 CONCLUSION

RDN's GNPCC biosolids were managed at Blackjack in 2024; 5,727 wt were delivered and 5,807 wt were applied onsite (Table 2). All biosolids land application activities at Blackjack occurred as specified in the applicable LAPs and according to management requirements included in the OMRR. Since transitioning the biosolids management program to Blackjack in 2021, over 16,700 wt of GNPCC biosolids have been managed onsite while being set up to become a successful long-term management site.

SYLVIS looks forward to continuing this productive relationship and providing biosolids management services and support to the RDN throughout 2025.

APPENDIX ONE – TABLES

Table 1: Historical management of Regional District of Nanaimo's Greater Nanaimo Pollution Control Centre biosolids at the TimberWest Properties and Blackjack from 2014 to 2024.

Year	TimberWest Properties	Blackjack	Total Production
2014	3,506 wt	-	3,506 wt
2015	3,087 wt	-	3,087 wt
2016	3,074 wt	-	3,074 wt
2017	2,686 wt	-	2,686 wt
2018	3,550 wt	-	3,550 wt
2019	3,776 wt	-	3,776 wt
2020	3,653 wt	-	3,653 wt
2021	5,060 wt	317 wt	5,377 wt
2022	802 wt	5,095 wt	5,897 wt
2023	-	5,717 wt	5,717 wt
2024	-	5,727 wt	5,727 wt
Total	**29,195 wt**	**16,856 wt**	**46,051 wt**

Table 2: Regional District of Nanaimo's Greater Nanaimo Pollution Control Centre Class B biosolids management summary - 2024.

Site	**Blackjack** (wt)
Storage from 2023	200
Delivered	5,727
Land Applied	5,807
Storage to 2025	120

Table 3: Summary of SYLVIS 2024 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 2024 through the collection of three full suite samples and 14 fecal coliform samples.
Biosolids Quantity	5,727 tonnes of RDN biosolids were transported to the Blackjack site by DBL Disposal in 2024. 5,807 tonnes of biosolids were land-applied in 2024. 120 tonnes remained stored at Blackjack at the end of 2024.
Biosolids Transportation & Delivery Coordination	The RDN coordinated biosolids deliveries with DBL and SYLVIS throughout 2024.
Contingency Plan & Management	A Contingency Plan was written for the 2021-2026 biosolids management contract and the following contingency sites were available for use in 2024: TimberWest Properties, Harmac, Hamm Road, 155-A Pit, and Haslam Pit. No contingency management was required in 2024.
Storage of Biosolids	Biosolids were stored at the Central Sort and Old Jump Main storage sites at Blackjack and covered with tarps from October 1 to March 31 as per OMRR requirements.
Invoicing	Biosolids deliveries were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2024.
Site Safety	No safety incidents occurred at Blackjack in 2024. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2024.
Complaints Management	There were no complaints received about the biosolids forest fertilization program in 2024.
Odour Management Plan	The program Odour Management Plan was adhered to in 2024.
Communications Plan & Engagement	The program Communications Plan was adhered to in 2024. Two inquiries were received regarding potential impacts to wild game and plant foraging. SYLVIS held one phone discussion and in-person meeting to address questions. First Nations engagement was carried out with the Snuneymuxw First Nation for the Blackjack site through Mosaic during 2024. A meeting was held with a Snuneymuxw First Nation staff member and Mosaic in May 2024 to provide and overview of the project and discuss potential impacts to wild game and plant harvesting (included in the two inquires above).
Annual Reporting	Qualified Professional Certification of Compliance report, fulfilling the regulatory requirement for written certification under OMRR Section 5(3), were provided to the RDN and Mosaic for land applications at Blackjack under Authorization #111628.
Biosolids Beneficial Use	Two biosolids Land Application Plans for Authorizations #111628 and #112120 were submitted to the Ministry of Environment and Climate Change on April 28, 2023 and May 5, 2024 respectively, for Blackjack. 5,807 tonnes of biosolids were land-applied to 61.2 ha of forest.
Review of Biosolids Technology & Management Advancements	A review was completed of emerging biosolids treatment technologies and management strategies across BC and Canada. A summary is provided in Appendix Four.

Table 4: Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre biosolids quality summary - 2024.

Parameter	GNPCC	Regulatory Criteria[a]	Units
Available Nutrients, Physical Properties, Acidity			
Total Nitrogen - TKN	61,292	-	µg/g
Ammonia + Ammonium- N (available)	7,863	-	µg/g
Nitrate - N	7	-	µg/g
Phosphorus (available)	1,433	-	µg/g
Potassium (available)	723	-	µg/g
Organic Matter	70.5	-	%
Total Solids	18.7	-	%
pH	6.8	-	pH
Electrical Conductivity	6.0	-	dS/m
Trace Elements			
Arsenic	2.3	75	µg/g
Cadmium	1.3	20	µg/g
Chromium	26.5	1,060	µg/g
Cobalt	2.8	150	µg/g
Copper	579	2,200	µg/g
Lead	22	500	µg/g
Mercury	0.54	15	µg/g
Molybdenum	7.3	20	µg/g
Nickel	13.8	180	µg/g
Selenium	6.1	14	µg/g
Zinc	885	1,850	µg/g
Microbiological Analysis - Fecal Coliforms			
Fecal Coliforms	13,300[b]	2,000,000	MPN/g

Note: Values are the mean of three composite samples, each composed of eight equal-volume subsamples collected during 2024 by SYLVIS Environmental and analyzed by Element Laboratories. All analyses based on dry weight.

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

b Value is the geometric mean of 14 samples collected by SYLVIS throughout 2024.

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 2024.

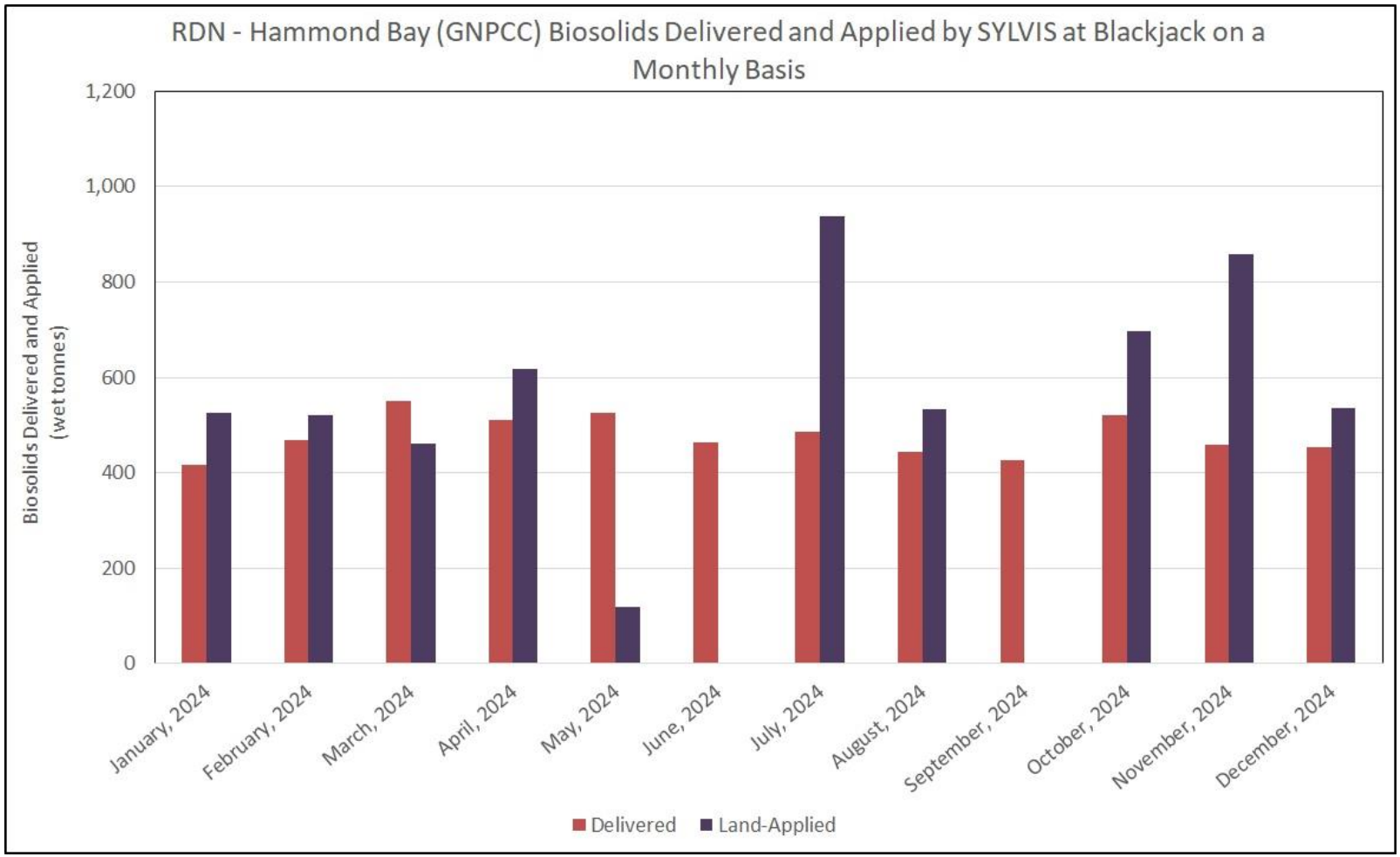


Figure 2: Blackjack application areas north of the lake fertilized with Regional District of Nanaimo biosolids in 2024.

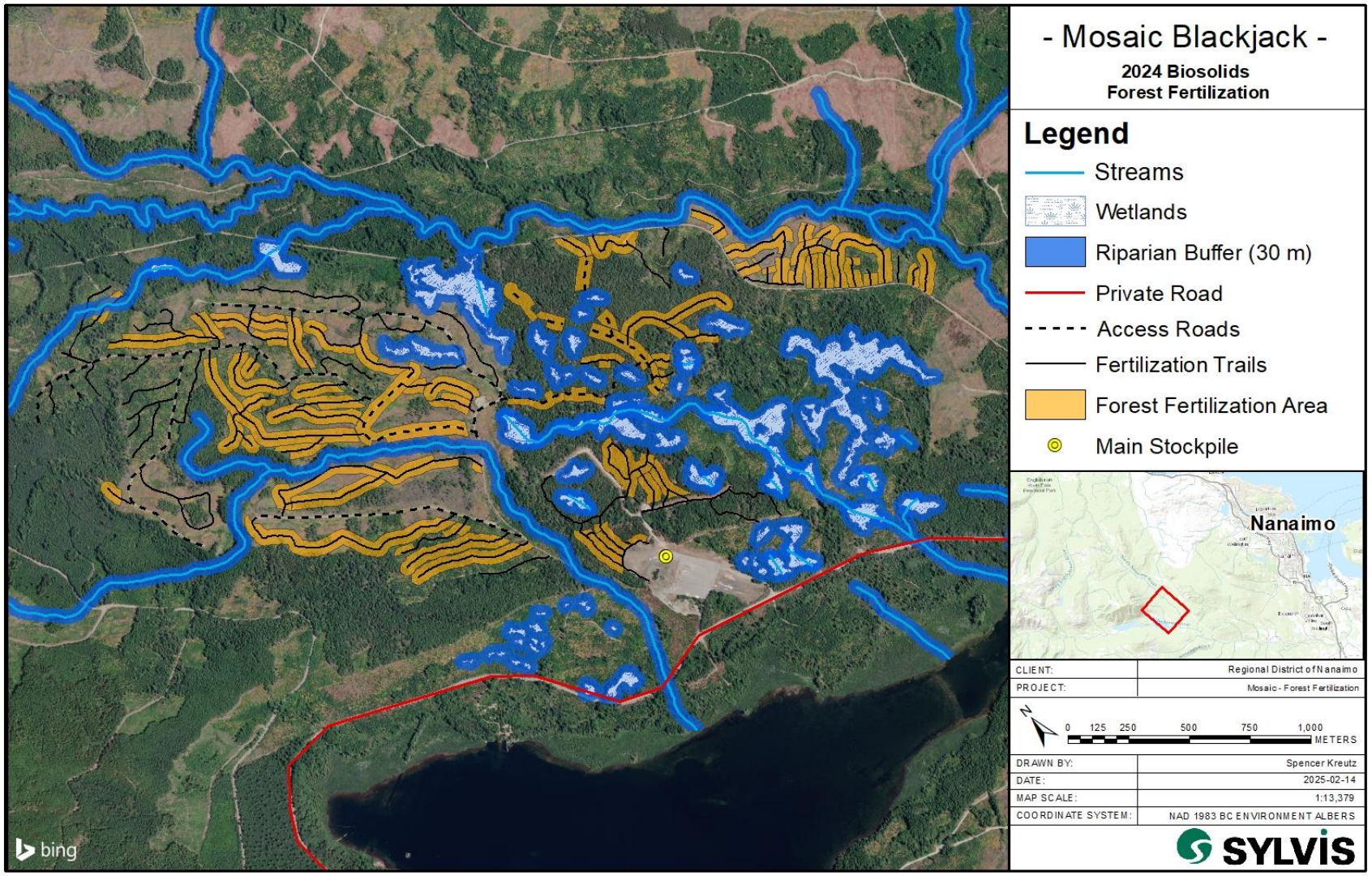
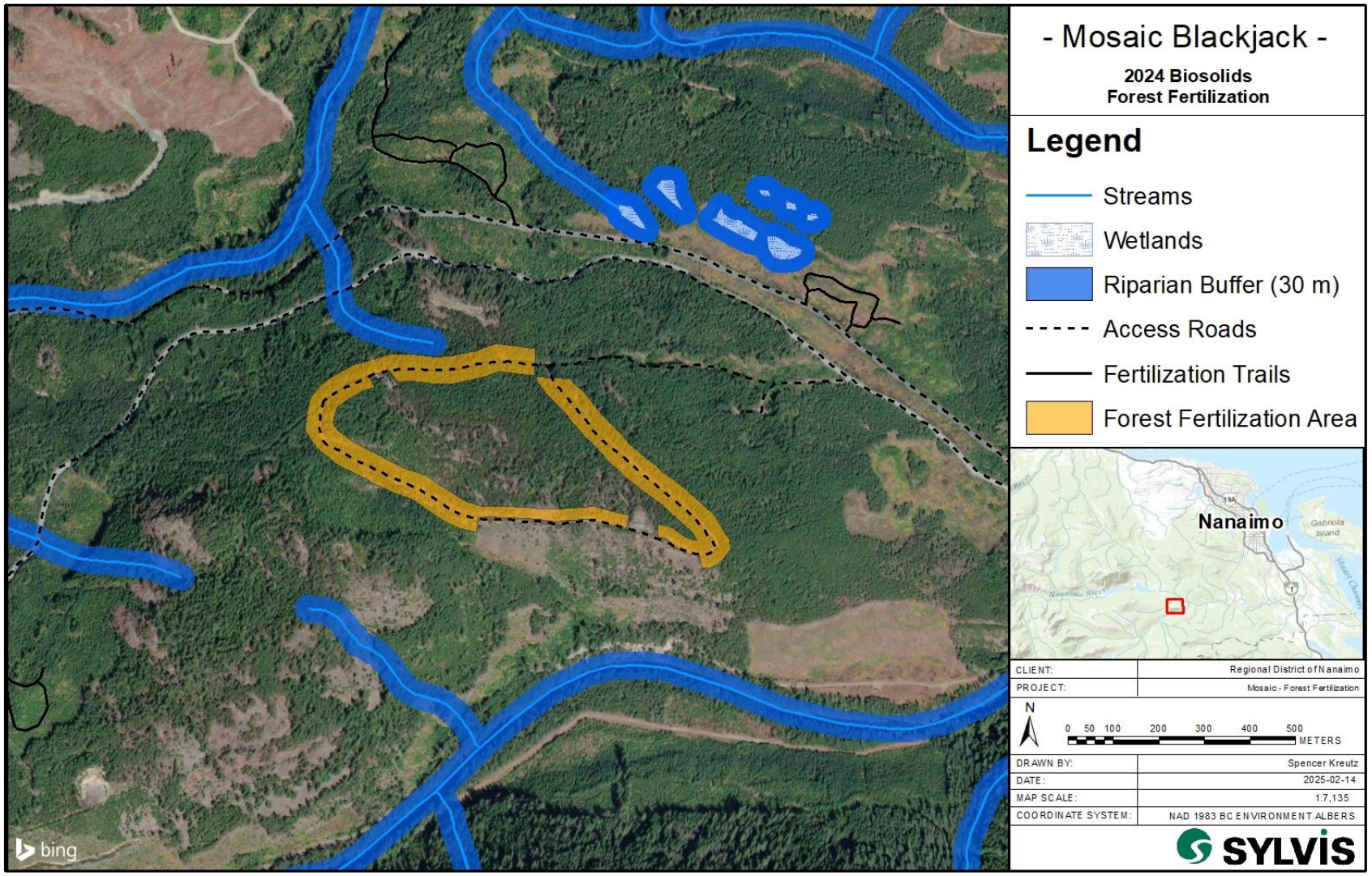


Figure 3: Blackjack application areas south of the lake fertilized with Regional District of Nanaimo biosolids in 2024.



APPENDIX THREE – PHOTOGRAPHS

Photograph 1: Biosolids main storage site at the Blackjack. (July 2024)

Photograph 2: Forest fertilization using biosolids onto a juvenile forest block. (August 2023)

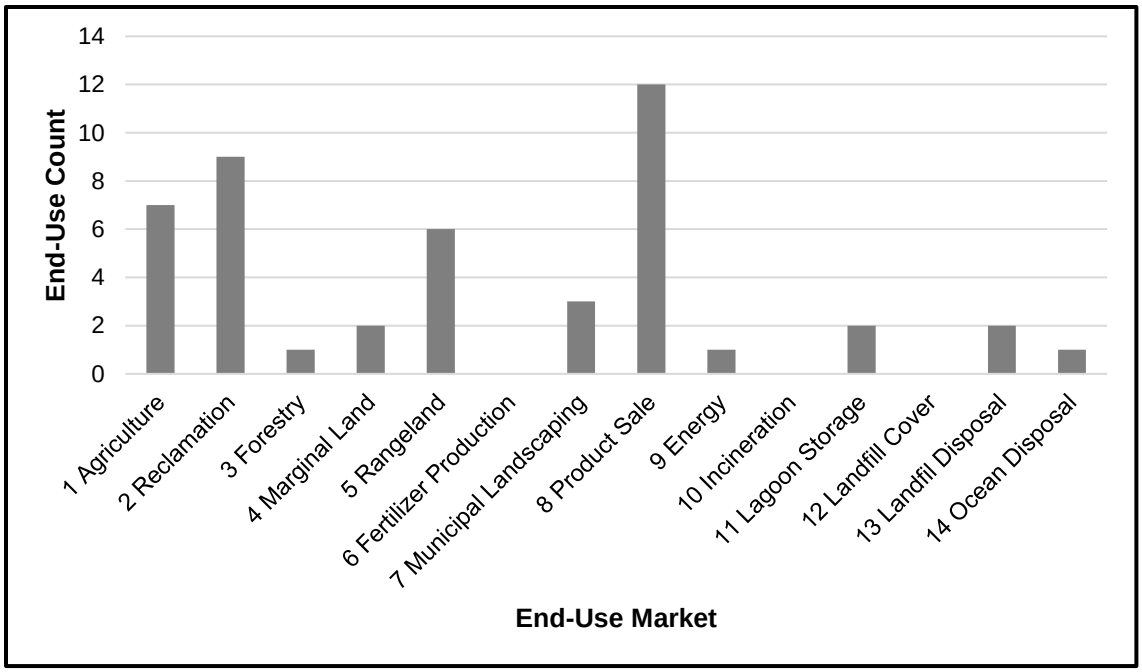
Photograph 3: Soil sampling in mature stand. (June 2024)

APPENDIX FOUR – REVIEW OF BIOSOLIDS TECHNOLOGY IMPROVEMENTS & MANAGEMENT ADVANCEMENTS

The RDN is interested in understanding how biosolids are managed in other jurisdictions across Canada and in keeping up-to-date on emerging treatment technologies. A high-level review of improvements in biosolids processing technologies and management programs across Canada was conducted and is summarized below.

Fourteen biosolids management methods and uses were found across BC and Canada. Biosolids management by 38 municipalities in British Columbia are presented in Figure B 1. Reported values are counts of municipalities and are not based on the tonnage of biosolids managed; if a municipality manages biosolids through multiple methods then each method is presented as an individual result.

Figure B 1: Biosolids products and markets in British Columbia.

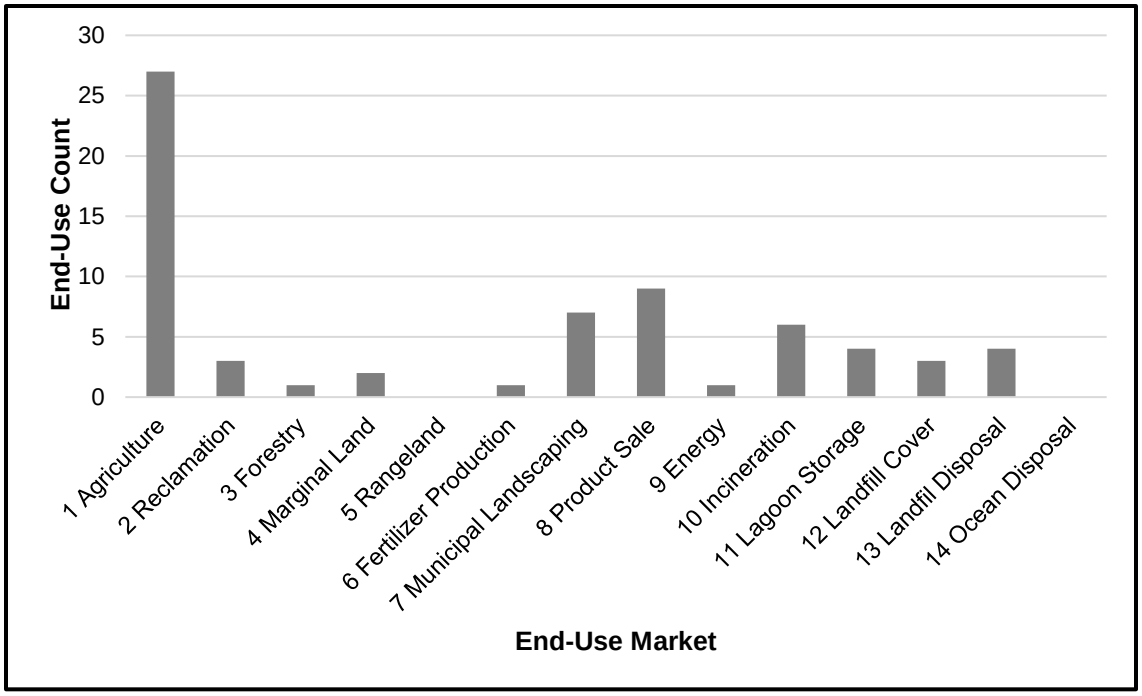


Most BC municipalities are managing biosolids and biosolids-derived products in land application markets (end-use markets 1-8). Numerous small biosolids generators are managed in large composting facilities which produce compost for sale or for use in mine reclamation. The RDN's current management programs using biosolids in forest fertilization is similar to land application processes in other BC jurisdictions, and the distribution of soils fabricated using biosolids (biosolids growing medium, BGM) aligns with many other BC municipalities.

SYLVIS conducted a high-level review and update of biosolids management across the rest of Canada. Basic management information for the most populous city or cities in each province or territory was gathered using information readily available through internet research. Biosolids management by 69 Canadian municipalities outside of BC are presented in Figure B 2. Similar to

the figure above, counts represent municipalities and are not based on tonnage produced; if a municipality manages biosolids through multiple methods then each method has been included as an individual result.

Figure B 2: Biosolids products and markets in Canada outside of British Columbia.



Similar to BC, most municipalities are managing biosolids and biosolids-derived products in land application markets (markets 1-8). According to the limited data gathered, the RDN's forest fertilization project continues to be one of two forest fertilization projects in the country, while the BGM project is one of three similar projects.

Currently there are numerous innovative wastewater solids treatment technologies under development in the world. Many of these technologies can replace digestion at a wastewater treatment plant but can also accept digested biosolids. A selection of these technologies is presented in the following table.

Table A 1: Example innovative wastewater processing technologies.

Technology	Acronym	Product & Value
heat drying	-	dried Class A biosolids
pyrolysis	-	biochar
gasification	-	renewable natural gas (RNG)
hydrothermal liquefaction	HTL	biocrude, hydrochar
super critical water oxidation	SCWO	CO_2, inert ash
thermal hydrolysis	-	Class A biosolids
Advanced Oxidation Processes	AOPs	Biosolids, degradation of organic pollutants and odors

Artificial Intelligence/ Machine Learning	AI	Increased plant efficiency and decreased downtime
Ultraviolet light-emitting diode reactors	UV LED	Disinfection process during treatment process

Some of these technologies have been implemented in Canada, but others have not. A non-exhaustive list of innovative technologies implemented and planned at Canadian sites is presented in the following table.

Table A 2: Canadian examples of innovative wastewater solids processing technologies.

Technology	Location	Feedstock	End-Use Market	Stage
Lystek - thermal hydrolysis	Ontario, Saskatchewan, Manitoba	digested biosolids	agriculture	commissioned & under construction
N-Viro alkaline stabilization	Alberta, Nova Scotia, Prince Edward Island, Ontario	biosolids	agriculture, fertilizer	commissioned
heat drying	Metro Vancouver	biosolids	agriculture, fertilizer	-
hydrothermal liquefaction (HTL)	Metro Vancouver	biosolids	unknown	design
pyrolysis	Ontario, Quebec, CRD	biosolids	syngas, biochar	under development, under consideration
gasification	CRD	biosolids	unknown	potential future option

The Lystek thermal hydrolysis process produces a number of products including a liquid Class A biosolids which is appropriate for use in agricultural regions but is less suited to Vancouver Island. The N-Viro alkaline stabilization process uses a considerable amount of lime to stabilize wastewater solids. Heat drying can reduce the mass of wet biosolids by 90% or more, reducing transport costs, but is expensive to implement and operate. Other thermal conditioning and treatment technologies for biosolids (pyrolysis, gasification, HTL) are less mature and are not currently implemented, even at pilot scale, in Canada though some pilots are planned.

The RDN's current approach of anaerobic digestion and centrifuge-dewatering, while not innovative, is reliable and predictable. RDN's forest fertilization program is relatively uncommon at the national scale and represents an innovative end-use of the RDN's biosolids. RDN's BGM production aligns with the second most common biosolids management use across Canada. The findings of this section are based on limited research and investigation; should the RDN wish to understand more about how its program compares to other biosolids management programs, both in Canada and elsewhere, SYLVIS would be pleased to carry this out under a separate scope of work.

Appendix H – GNPCC Annual Status Form (ASF)

Annual Compliance Status Form

AUTHORIZATION NUMBER: 338

AUTHORIZATION TYPE: Effluent, Permit

LEGAL AUTHORIZATION HOLDER NAME: Regional District of Nanaimo

PERIOD OF COMPLIANCE STATUS ASSESSMENT: 2024-01-01 to 2024-12-31

AUTHORIZED PERSON NAME: Adrian Limpus, Engineering Technologist - Wastewater Services

AUTHORIZED PERSON SIGNATURE: *Adrian Limpus*

SIGNATURE DATE: February 28, 2025

I understand that it is an offense to mislead a government official, and I declare that all of the information presented is accurate and true.
I have been given the authority by the authorization holder to sign this form.

AUTHORIZATION CLAUSE NUMBER	AUTHORIZATION CLAUSE DESCRIPTION	COMPLIANT? (Yes/No/ND)	RATIONALE FOR YOUR COMPLIANCE DETERMINATION	LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT
1.1.1	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.1 The rate at which effluent may be discharged is: Average - 27,730 X (1.0417)(calendar year-1994) m^3/d to a maximum of 40,950 m^3/d; **Maximum Daily - 80,870 m^3/d.**	No	GNPCC had one non-compliance of the maximum daily flow permit limit of 80,870 m^3/day in 2024 (December 26 - 84,271 m^3/day). This non-compliance occurred during high precipiation event. The non-conformance is attributed to inflow and infiltration (I&I) entering into the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo and the District of Lantzville to reduce I&I in the sanitary sewer collection system.	Section 4 - Flow Monitoring , Appendix B - Internal Flow Monitoring and Laboratory Data (Permit Data), and Appendix C - Permit Non-conformance reports.
1.1.1	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.1 The rate at which effluent may be discharged is: **Average - 27,730 X (1.0417)(calendar year-1994) m^3/d to a maximum of 40,950 m^3/d**; Maximum Daily - 80,870 m^3/day.	Yes	The average daily discharge for the facility was 35,239 m^3/day for 2024, which was below the maximum allowable average annual discharge of 40,950 m^3/d.	Section 4 - Flow Monitoring and Appendix B - Internal Flow Monitoring and Laboratory Data (Permit Data)
1.1.2	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.2 The characteristics of the discharge shall not exceed: 5-Day Biochemical Oxygen Demand - Total Suspended Solids - 130 mg/L, 130 mg/L	Yes	There were no BOD or TSS permit excedances in 2024.	Section 5 .1 - Carbonaceous Biochemical Oxygen Demand and Section 5.2 - Total Suspended Solids
1.1.3	The discharge of effluent to which this Section is applicable is from a municipal sewage treatment plant as shown on the attached Site Plan A. The B.C. Environment reference number (S.E.A.M. site number) for this discharge is E100008. 1.1.3 After September 8, 2019, the works authorized are screening facility, grit and scum removal systems, primary sedimentation tanks, secondary treatment bioreactors,secondary clarifiers, sludge thickening systems, sludge digestion systems, sludgedewatering facility, an outfall extending 2,030 m from mean low water to a minimum depth of 70 m below mean low water, diffusers,	Yes	The authorized works are described as per the September 8, 2019 permit amendment.	Section 1 - Introduction
2.1	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.	Yes	On-site operators perform daily inspections and preventative maintenance on the pollution control works. There were no submitted notification reports of any malfunction of the works during the inspection period covered by this report.	
2.2	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.	Yes	There were no reported emergency events or conditions beyond the control of the Permittee to prevent the continuing operation of the approved method of pollution control during the inspection period; therefore, compliance with this requirement was not applicable.	Section 13 - Environmental Incidents
2.3	The discharge of effluent which has bypassed the designated treatment works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.	Yes	No discharged flow bypassed the designated treatment works.	Section 13 - Environmental Incidents

AUTHORIZATION CLAUSE NUMBER	AUTHORIZATION CLAUSE DESCRIPTION	COMPLIANT? (Yes/No/ND)	RATIONALE FOR YOUR COMPLIANCE DETERMINATION	LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT
2.4	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.	Yes	There were no changes to the treatment process in 2024.	Section 1 - Introduction
2.5	The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the consent of the Regional Waste Manager.	Yes	An outfall sign reading "OUTFALL, 2100m LONG, 73 m DEEP" was installed on the shore along the alignment of the outfall line.	See 2022 GNPCC Outfall Inspection Report by GreatPacific Consulting Ltd.
2.7	Sludge wasted from the treatment plant shall be disposed of to a site and in a manner authorized by the Regional Waste Manager.	Yes	Biosolids generated by GNPCC in 2024 met Class B standards for biosolids in Schedule 3 and 4 of the Organic Matter Recycling Regulation (OMRR). Biosolids are currently being land applied in a Forest Fertilization program.	Appendix G - 2024 Biosolids Management Summary from SYLVIS Environmental. Section 4 includes a summary and interpretation of the effects of biosolids discharges on the receiving environment.
2.8	The Permittee shall conduct a dye test on the outfall line (or inspect by another method approved by the Regional Waste Manager) every five years or as may otherwise be required by the Regional Waste Manager.	Yes	In November 2022, an outfall inspection was conducted and described in the Condition Inspection Report - Five Fingers Outfall prepared by Great Pacific Consulting, which was submitted under separate cover to the Ministry. The inspection utilized a Remote Operated Vehicle (ROV) to record all notable features and components as it traveled along the entire exposed marine section of the pipe. A Ministry letter dated August 11, 1994 approves inspection "by another method" wherein Section 2. of the letter states, "Pursuant to Section 2.8 of the permit, your request to conduct video inspection of the outfall line in lieu of dye testing is approved".	Section 3.6 - Outfall Inspection
2.9	The Permittee shall classify the wastewater treatment facility authorized in Section 1 (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 October 31, 1994.	Yes	The Environmental Operators Certification Program (EOCP) database, which has since replaced the BCWWOCPS, confirms that the Facility is classified as a Level IV Municipal Waste Water Treatment (MWWT) system with the following facility details: Facility Number: 8 Classification Number: 103951, expiring on June 19, 2028.	EOCP Database

AUTHORIZATION CLAUSE NUMBER	AUTHORIZATION CLAUSE DESCRIPTION	COMPLIANT? (Yes/No/ND)	RATIONALE FOR YOUR COMPLIANCE DETERMINATION	LOCATION OF SUPPORTING INFORMATION IN ANNUAL REPORT
2.10	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) 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.	Yes	The EOCP database confirms the facility "Has Required Operator" and lists multiple operators of the Facility in employ with the RDN. There are two designated Chief Operators (both certified MWWT IV) listed in good standing and several certified MWWT II and MWWT III operators within the EOCP database, which satisfies the requirements of this section.	EOCP Database
3.1.1	Provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over the preceding 24-hour period.	Yes	Quarterly data reports from flow measured from a Parshall Flume were submitted by the RDN include daily records of effluent volume discharged over the preceding 24-hour period.	Section 4 - Flow Monitoring
3.1.2	The Permittee shall install, provide, and maintain suitable sampling facilities and obtain composite samples and analyses of the effluent as follows: See PDF file "1994_06_02 338 - Section 3.1.2".	No	There was one sampling $cBOD_5$ non-compliance in 2024. No sample was taken on July 26th because the final effluent sampler was not turned on after collectint the previous day's sample. As a result, there was no $cBOD_5$ or TSS result for this day. Appendix C contains additional information on this sampling non-compliance. On other days, daily composite analysis for 5-Day Biochemical Oxygen Demand ($cBOD_5$) and Total Suspended Solids (TSS), weekly composite sampling for Ammonia and quarterly grab samples for Toxicity(LC_{50} were completed). Comprehensive analysis of composite samples for all the remaining contaminants listed inthis section were conducted once every six months (June 16, 2024 and December 15, 2024) as required by this section.	Section 5.1 5-Day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$), 5.2 Total Suspended Solids, Section 5.5 Other General Parameters, and Appendix D - External Laboratory Test Results.
3.2	The Permittee shall obtain a representative sample of the treated biosolids once every quarter and obtain analyses of the sample for the following: Total Solids, Moisture, Volatile Suspended Solids, Polychlorinated Biphenyls, Total Kjeldahl Nitrogen, Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorous, Selenium, Zinc.	Yes	Quarterly sampling of treated biosolids were completed in 2024. Samples were sent to Bureau Veritas for analysis which is an accredited lab.	Section 6.2 - Biosolids Analysis and Appendix D - External Laboratory Test Results

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3.3	The Permittee shall monitor the receiving water quality and carry out chemical, physical and biological studies on the receiving environment as required by the Regional Waste Manager. The Permittee shall submit a proposed receiving environment monitoring program to the Regional Waste Manager by October 31, 1994 for approval. The program should be established in consultation with the Regional Waste Manager. Based on the results of this monitoring program, the receiving environment monitoring requirements may be extended or altered by the Regional Waste Manager. The approved program shall commence by January 1, 1995.	Yes	The RDN Receiving Environment Monitoring Final Report (2017-2019) prepared by G3 Consulting was submitted to the Ministry on December 20, 2019. The RDN completed monitoring in 2020. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020. The REM program is currently under review.	RDN Receiving Environment Monitoring Report was submitted to Ministry in 2020 under separate cover.
3.4	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, or by suitable alternative procedures as authorized by the Regional Waste Manager. 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, or by suitable alternative procedures as authorized by the Regional Waste Manager. Copies of the above manuals are available from the Environmental Protection Division, Ministry of Environment, Lands and Parks, 777 Broughton Street, Victoria, British Columbia, V8V 1X4, at a cost of $20.00 and $70.00 respectively, and are also available for inspection at all Environmental Protection offices. Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.	Yes	Flow was measured in 2024 by a Parshall Flume installed in the secondary upgrade. Flow measurements are totalized by GNPCC's SCADA system. Samples were obtained via automatic (composite) sampler that was used to withdraw effluent samples on a flow-proportioned basis over a 24-hour period which remained functional over the entire period.	Section 4 - Flow Monitoring
3.4.2	Analyses for determining the toxicity of liquid effluents to fish shall be carried out in accordance with the procedures described in the "Provincial Guidelines and Laboratory Procedures for Measuring Acute Lethal Toxicity of Liquid Effluents to Fish" November 1982. The Regional Waste Manager will advise the Permittee which method ofmeasurement for expressing lethal toxicity shall be used. The method of sampling and the method of bioassay will be determined by the Regional Waste Manager.	Yes	Toxicity analysis is carried out as a an LC_{50} 96-hour test (bioassay). Samples were taken quarterly in 2024 and sent to Bureau Veritas which is an accredited lab.	Section 5.3 Ammonia and Toxicity Appendix D in the Annual Report has Toxicity test results.

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3.5	3.5: Maintain data of analyses and flow measurements, collected under Sections 3.1 through 3.3, for inspection and every quarter submit the data, suitably tabulated in a machine readable format, for entry in the Ministry of Environment, Lands and Parks computer database, to the Regional Waste Manager for the previous quarter. All reports shall be submitted within 31 days of the end of each quarter. The first report is to be submitted by October 31, 1994. Based on the results of the monitoring program, the Permittee monitoring requirements may be extended or altered by the Regional Waste Manager.	Yes	Quarterly reports containing data and flow measurements were submitted to the Ministry throughout 2024 via the environmental reporting portal.	
3.6	The Permittee shall submit an annual report which shall include a summary and interpretation of the data submitted under Section 3.5, an interpretation of the effects of the effluent and biosolids discharges on the receiving environment, and a summary of treatment plant operations, for the preceding calendar year. In addition, the Regional Waste Manager may require that the annual report include summaries and progress reports of the matters identified in Sections 4.2 through 4.8, and any 5Rs (Reduce, Reuse, Recycle, Recover, Residual) activities, for the preceding calendar year. The annual report shall be submitted within 60 days of the end of each calendar year and shall be made available by the Regional District of Nanaimo to the public upon request. The first annual report shall be submitted by February 28, 1995.	Yes	The 2024 Annual Report was submitted to the Ministry on February 28, 2025 with the Annual Status Form (ASF) within the required 60 days of the end of each calendar year. The Receiving Environment Monitoring Final Report (2017-2019) was submitted as a separate document on December 20, 2019. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020.	2024 GNPCC Annual Report and Annual Status Form. 2020 REM report submitted to ENV.
4.1	The Regional District of Nanaimo has indicated its intention to develop a Liquid Waste Management Plan. Accordingly, the Permittee shall submit a proposed schedule for the development of a Liquid Waste Management Plan to the Regional Waste Manager by October 31, 1994 for approval. The Plan shall be developed in accordance with ministry guidelines and shall include, but not be limited to, a schedule to upgrade the discharge to secondary treatment, an infiltration and inflow control program, a source control program, a stormwater management program, a biosolids management program, and an odour control program. All aspects of the Plan shall be to the satisfaction of the Regional Waste Manager.	Yes	The Annual Report confirms that the RDN has a Liquid Waste Management Plan (LWMP). A Ministry letter dated October 30, 2014 confirms the Minister approval for an amended LWMP submitted in January 2014.	Section 16.5 Liquid Waste Management Plan
4.2	The Permittee may be required to submit a schedule, for upgrading of the discharge to secondary treatment, to the Regional Waste Manager for approval. 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 and/or upgrade the discharge to secondary treatment.	Yes	Secondary treatment achieved substantial completion in October 2020. A schedule for the upgrading of the discharge to secondary treatment was submitted as part of the approvals required for this project.	Section 1 - Introduction

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