REGIONAL DISTRICT OF NANAIMO

2021 Annual Report

Greater Nanaimo Pollution Control Centre

February 2022

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

ISO 14001 Certified by PwC

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details of Certificate # **PwC-ISO14001:415** at http://www.rdn.bc.ca/

www.rdn.bc.ca

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 Climate Change Strategy in 2020. The authorized treatment works include a screening facility; grit and skimmings removal systems; primary sedimentation tanks; secondary treatment bioreactors; secondary clarifiers; sludge digestion systems; sludge dewatering facility; reuse of digester gas for fueling boilers; a cogeneration system which produces electricity for treatment operations and sells excess electricity back to BC Hydro; an outfall extending 2 km 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 2021. The summary of 2021 monitoring data at GNPCC is as follows:

Summary of Compliance	Permit	2021	Permit Exceedances
Maximum Daily Flow	80,870 m^3/day	90,730 m^3/day	2
Average Daily Flow	40,950 m^3/day	32,112 m^3/day	
Average Daily BOD_5	130 mg/L	5.32 mg/L	0
Average Daily TSS	130 mg/L	7.09 mg/L	1

- **Flow –** The total flow discharged from GNPCC in 2021 was 11,720,726 m^3, at an average daily flow of 32,112 m^3/day. GNPCC had two maximum daily flow non-compliances.
- **5-day Carbonaceous Biochemical Oxygen Demand** – The influent and effluent average 5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) concentration for 2021 was 246 mg/L and 5.32 mg/L, respectively. The average removal efficiency in 2021 was 97.8%. There were no $cBOD_5$ non-compliances in 2021.
- **Total Suspended Solids** – The influent and effluent average Total Suspended Solids (TSS) concentration in 2021 was 420 mg/L and 7.09 mg/L, respectively. The average TSS removal efficiency in 2021 was approximately 98.0 %. There was one TSS non-compliance in 2021.
- **General parameters, metals, volatile and semi-volatile compounds** – 2021 results were all consistent with historical data. Several parameters showed reductions after commissioning of the secondary process.
- **Biosolids** – The biosolids generated by the GNPCC in 2021 met the standards for Class B biosolids given in Schedules 3 and 4 of the Organic Matter Recycling Regulation. Biosolids are currently being land applied in a Forest Fertilization Program and used in a Soil Fabrication Program used in landfill closure.

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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. Treated effluent from GNPCC is discharged to the Salish Sea. Operation of the treatment plant is regulated by the Ministry of Environment and Climate Change Strategy (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 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.

Since 2009, GNPCC has been operating with Chemically Enhanced Primary Treatment (CEPT). In 2009, two gravity thickeners were added to the treatment process. In September 2012, the cogeneration system came online and began producing electricity. The electricity generated by cogeneration is sold to BC Hydro. A third digester and fourth sedimentation tank were added in 2013. In 2016, the RDN commissioned the replacement of the marine and land sections of the outfall from GNPCC.

In 2017, construction began on the Secondary Treatment Upgrade Project. Construction achieved substantial completion in 2020. In October 2020, the secondary treatment process commenced operation.

This report was written by RDN staff as a requirement of the Environmental Management Permit No. PE00338 and summarizes and interprets GNPCC monitoring data for 2021.

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 GNPCC is located at 4600 Hammond Bay Road on the corner of McGuffie Road. Walley Creek runs in front of the treatment facility parallel to Hammond Bay Road.

The surrounding neighbourhood is predominately a single and multifamily residential area. There are approximately 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 2021.

3) Permit Requirements

3.1 Minor Permit Amendment

On September 12, 2019, the Permit was amended to include a screenings facility, secondary treatment bioreactors and secondary clarifiers among the authorized treatment works. On December 11, 2020, the Permit was amended to capture the commissioning of secondary treatment at GNPCC.

3.2 Authorized Discharges

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

- 40,950 m^3/day for average annual flow
- 80,870 m^3/day for maximum daily flow.

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.

3.3 Monitoring Requirements

The Permit monitoring requirements are summarized in Table 1. Quarterly reports were submitted to the BC Ministry of the Environment and Climate Change Strategy (MOECCS) in 2021, reporting all required test results.

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*", 23rd Edition, American Public Health Association, 2017.

An automatic sampler was used to withdraw effluent samples on a flow-proportioned basis over a 24-hour period. The effluent composite sampler was functional over the entire period.

3.4 Operational Certificate

The RDN's approved Liquid Waste Management Plan (LWMP) includes a draft Operational Certificate for GNPCC. The Draft Operational Certificate may be superseded by a Registration under the Municipal Wastewater Regulation (MWR), pending approval (see Section 3.5, below).

3.5 MWR Registration

In 2019, the RDN applied to the BC Ministry of the Environment and Climate Change Strategy to register GNPCC under MWR. As of December 17, 2019, the application is in the Review and Decision Phase.

3.6 Receiving Environment Monitoring

In 2021, the Receiving Environment Monitoring program was under review and did not include a field program.

3.7 Outfall Inspection

The Permit requires that the outfall for GNPCC be inspected every 5 years. The marine outfall for GNPCC was replaced in 2016.

In 2017, the outfall was inspected by Remote Operated Vehicle (ROV) a year following construction by SeaVeyors Environmental and Marine Services and was found to be in good condition. The outfall is scheduled for inspection in 2022.

4) Flow Monitoring

Flow was measured in 2021 by a Parshall Flume. Flow measurements are totalized by GNPCC's SCADA system.

4.1 2021 Flows

Daily flow monitoring data for GNPCC in 2021 is presented in Appendix B. The total flow discharged from GNPCC in 2021 was 11,720,796 m^3, at an average daily flow of 32,112 m^3/day. Higher daily flows recorded in January, November, and December were associated with seasonal patterns of rainfall.

BC Ferries vessels, which began daily discharge to the GNPCC collection system at the end of 2011, have continued to show no substantial impact on flow.

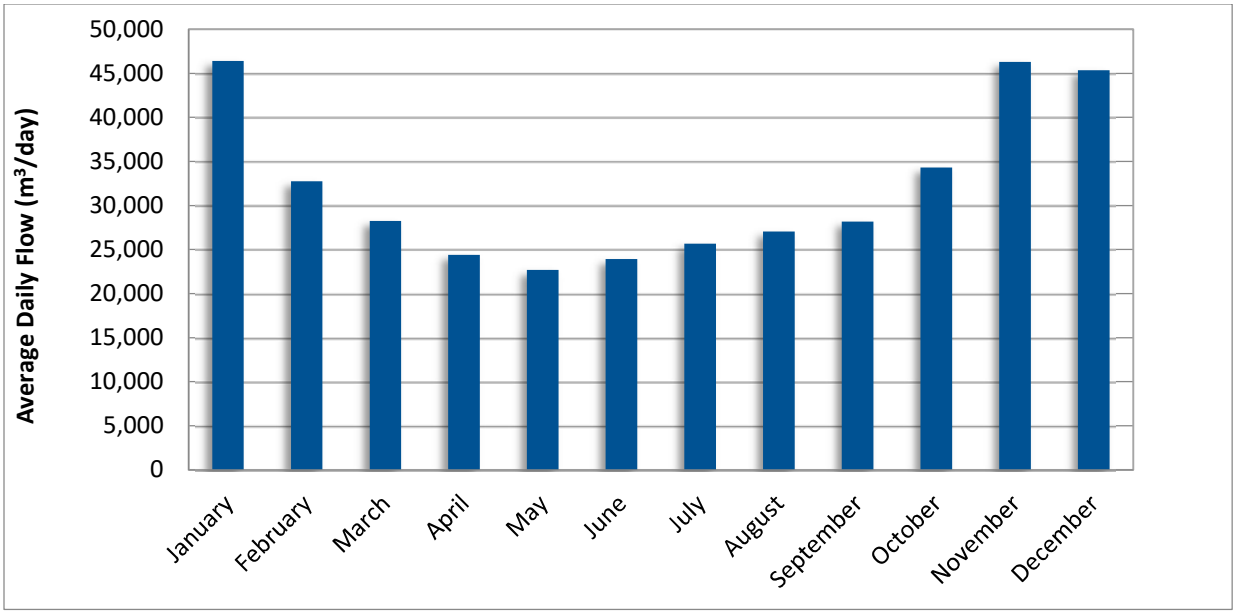
GNPCC had two maximum daily flow non-conformances in 2021 which both occurred during storm events. These non-conformances are believed to be attributed to inflow and infiltration (I&I) entering into the sanitary collection system. As part of the LWMP process, the RDN is working collaboratively with the City of Nanaimo to reduce I&I in the sanitary sewer collection system.

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

Table 2. 2021 Summary of Flows from GNPCC

2021	Average Daily Flow (m^3/day)	Total Flow (m^3)	Maximum Flow (m^3/day)	Minimum Flow (m^3/day)	Non-Compliances (Max daily flow)
January	46,396	1,438,287	90,730	28,889	2
February	32,755	917,137	41,460	27,056	0
March	28,234	875,267	33,094	25,453	0
April	24,380	731,409	25,605	22,188	0
May	22,695	703,554	24,456	20,849	0
June	23,922	717,672	26,841	19,559	0
July	25,675	795,921	30,035	23,021	0
August	27,033	838,015	31,536	21,550	0
September	28,174	845,207	36,072	21,879	0
October	34,313	1,063,706	43,843	24,832	0
November	46,308	1,389,245	61,002	35,756	0
December	45,335	1,405,376	65,431	35,090	0
Average	**32,112**				
Total		**11,720,796**			**2**
Maximum			**90,730**		
Minimum				**19,559**	

Figure 1. 2021 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:

- Readings prior to December 2014 were measured using by a Parshall Flume.
- Flow was measured from December 2014 to January 2018 by an ISCO LaserFlow meter on an interim basis after the old Parshall Flume was removed from service. It is believed that the LaserFlow meter was reading high in terms of average daily flows.
- 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)	Non-Conformances (Max daily flow)
2012	33,029	12,086,600	74,600	0
2013	28,381	10,328,600	79,200	0
2014	31,753	11,589,771	88,300	1
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

Figure 2. Historical Flows from GNPCC

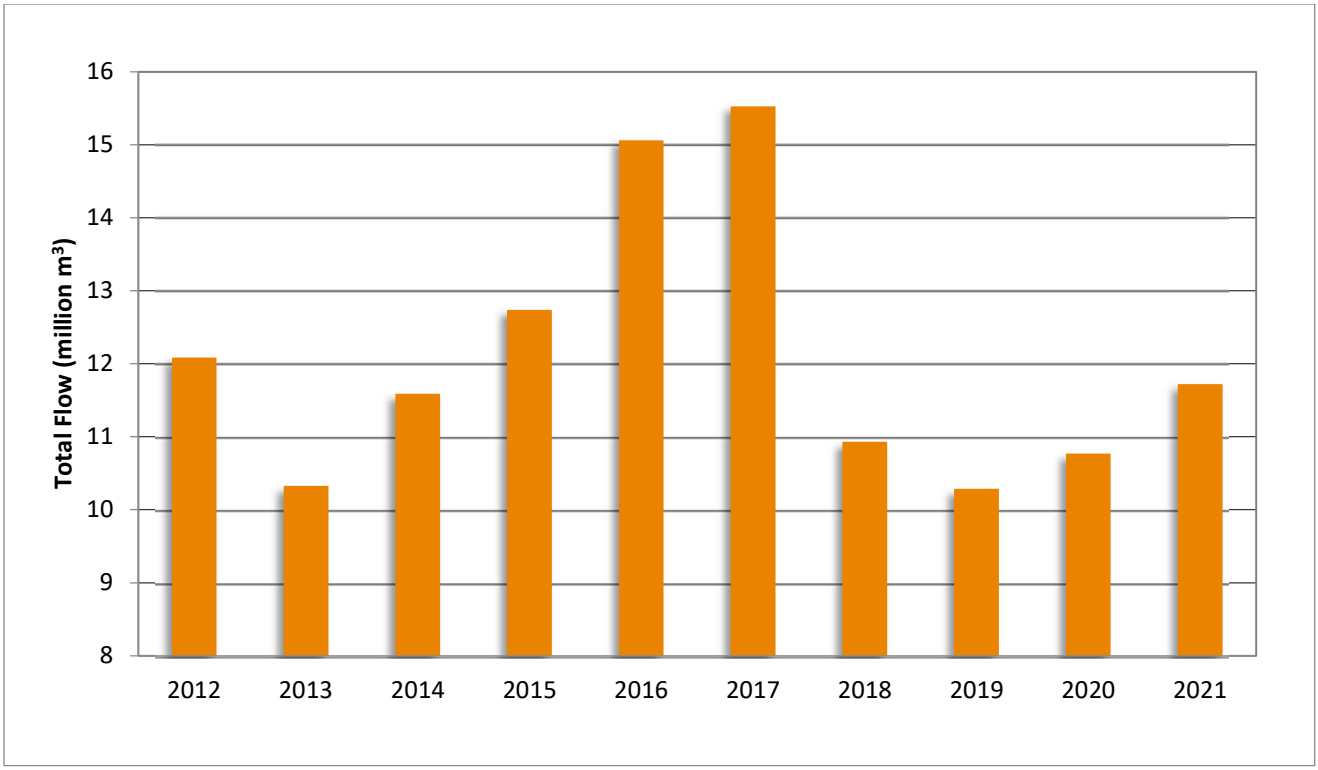
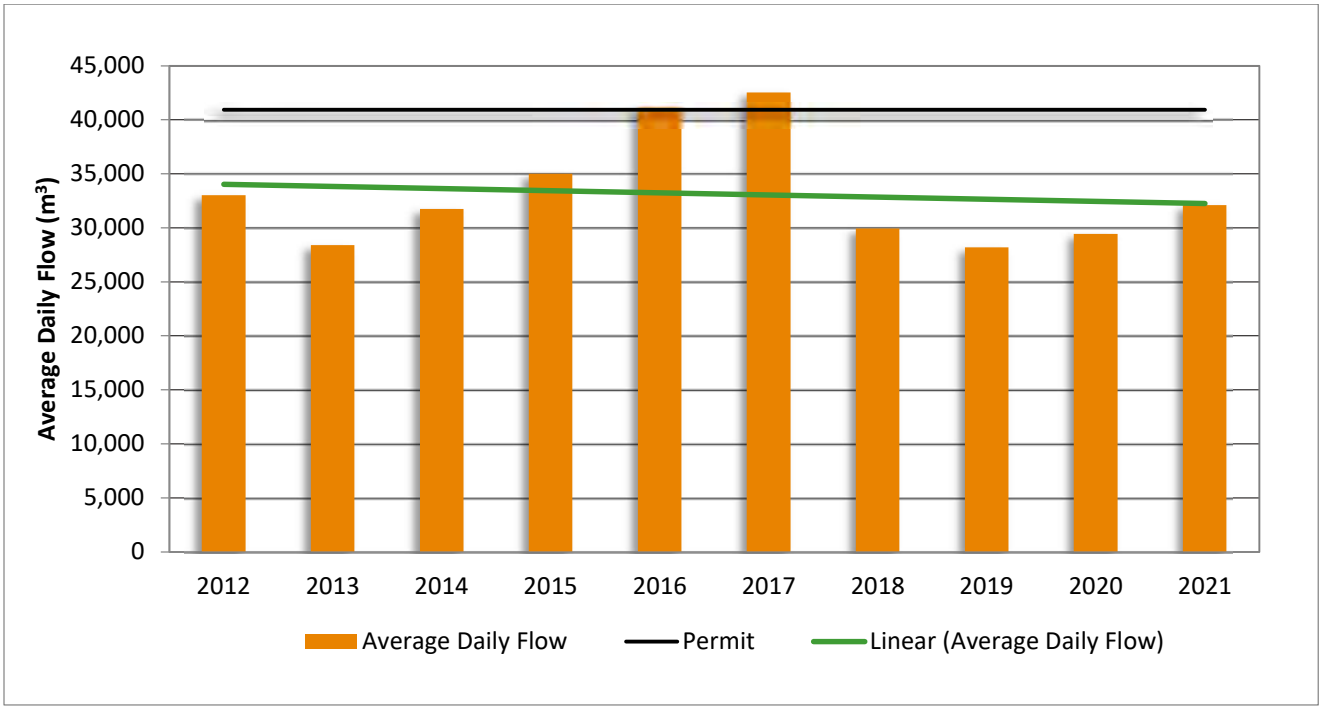


Figure 3. Historical Trends: Average Daily Flow by Year



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.

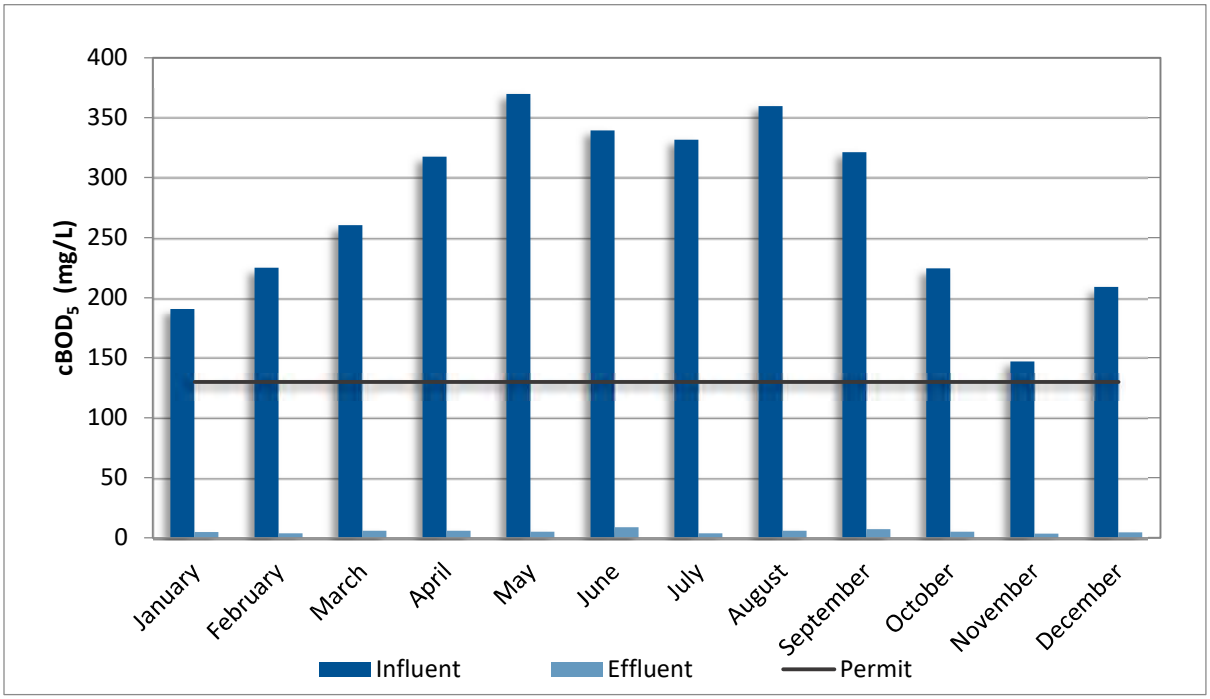
The Permit requires $cBOD_5$ testing of the effluent once per day and establishes the maximum permitted concentration at 130 mg/L (Appendix A). The average influent and effluent $cBOD_5$ concentration for 2021 was 246 mg/L and 5.32 mg/L, respectively. The average $cBOD_5$ removal efficiency was 97.8%. Appendix B contains the daily $cBOD_5$ test results. There were no $cBOD_5$ permit non-compliances in 2021.

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

Table 4: 2021 Influent & Effluent $cBOD_5$ Concentrations

2021	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Non-Compliances (Max permitted concentration)
	Influent	Effluent		
January	191	4.75	97.3%	0
February	225	3.79	98.3%	0
March	260	5.92	98.0%	0
April	318	5.83	98.1%	0
May	370	5.05	98.6%	0
June	339	8.70	96.9%	0
July	332	3.69	98.9%	0
August	360	5.77	98.7%	0
September	321	7.23	97.5%	0
October	224	5.11	98.0%	0
November	147	3.54	97.4%	0
December	209	4.60	97.3%	0
Average	**246**	**5.32**	**97.8%**	
Total				**0**

Figure 4. 2021 Influent & Effluent Monthly Average $cBOD_5$ Concentration



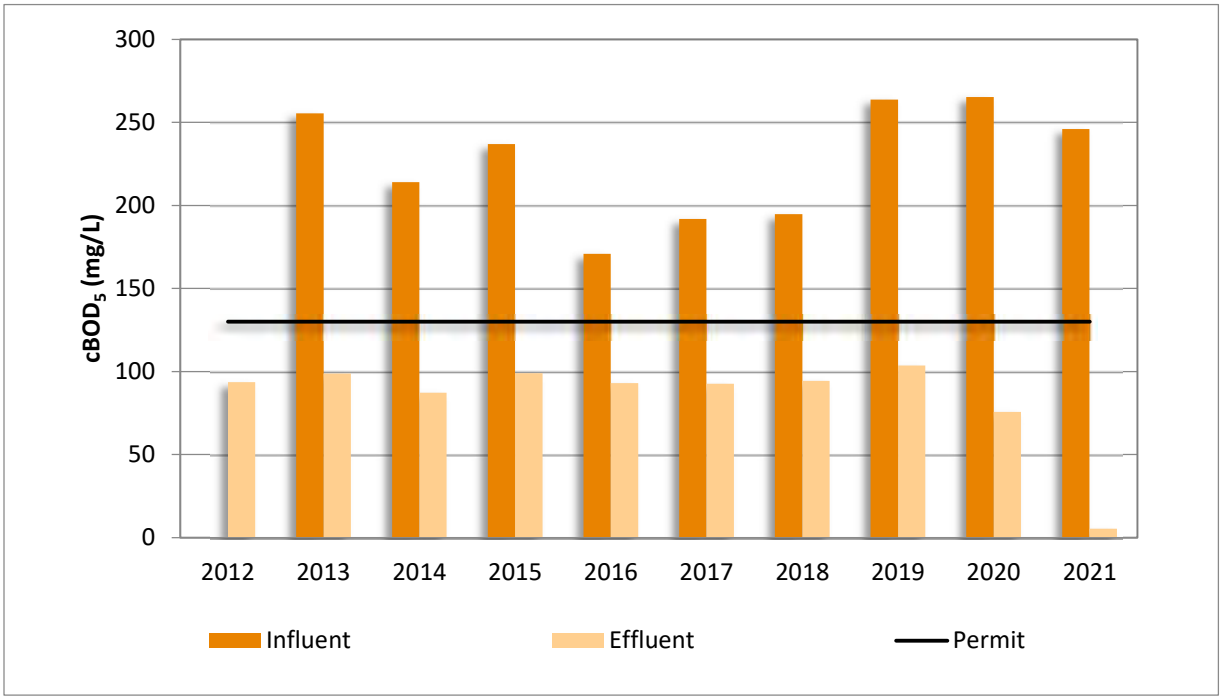
5.1.1 Historical Trends

Historical influent & effluent $cBOD_5$ concentrations, reduction efficiencies and the number non-compliances reported over the past ten years are summarised in the Table 5 and graphed in Figure 5. The addition of the secondary process since September 2020 has resulted in increased $cBOD_5$ removal.

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

Year	Average $cBOD_5$ (mg/L)		Average % Reduction in $cBOD_5$	Non-Compliances
	Influent	Effluent		
2012	ND	93.6	ND	9
2013	255	98.7	62.2%	13
2014	214	87.2	56.8%	5
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

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



5.2 Total Suspended Solids

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

The Permit requires daily TSS testing of the effluent, with a maximum permitted concentration of 130 mg/L (See Appendix A). The influent and effluent average TSS concentration in 2021 was 420 mg/L and 7.09 mg/L, respectively. The average TSS removal efficiency in 2021 was 98.0%. Appendix B contains the daily TSS results. Results are summarized in Table 6 and graphed in Figure 6.

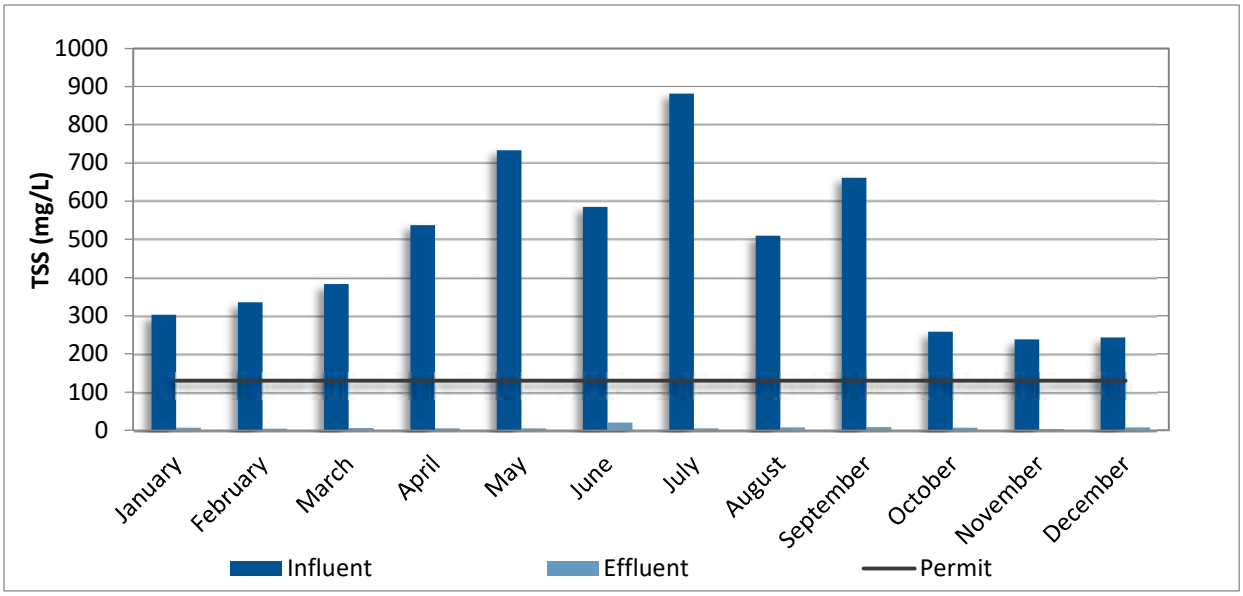
The addition of the secondary process since September 2020 has resulted in increased TSS removal.

There was one TSS non-compliances from GNPCC in 2021. On June 27, a high TSS result of 132 mg/L was attributed to a high Sludge Volume Index (SVI), one clarifier being out of service, and excessive hot weather which contributed to a biological change in nitrate levels. This resulted in solids (floating sludge) overflowing the secondary clarifier weir.

Table 6: 2021 Influent & Effluent TSS Concentrations

2021	Average TSS (mg/L)		Average % Reduction in TSS	Non-Compliances
	Influent	Effluent		
January	303	6.58	97.4%	0
February	335	4.25	98.8%	0
March	383	6.25	98.3%	0
April	537	5.05	99.1%	0
May	734	5.13	99.3%	0
June	585	20.1	95.5%	1
July	882	5.23	99.4%	0
August	510	7.11	98.6%	0
September	661	8.62	98.2%	0
October	258	6.54	96.6%	0
November	238	3.50	98.5%	0
December	243	7.17	96.2%	0
Average	**420**	**7.09**	**98.0%**	
Total				**1**

Figure 6. 2021 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 reported over the past ten years are summarised in Table 7 and graphed in Figure 7. 2021 data are consistent with historical data.

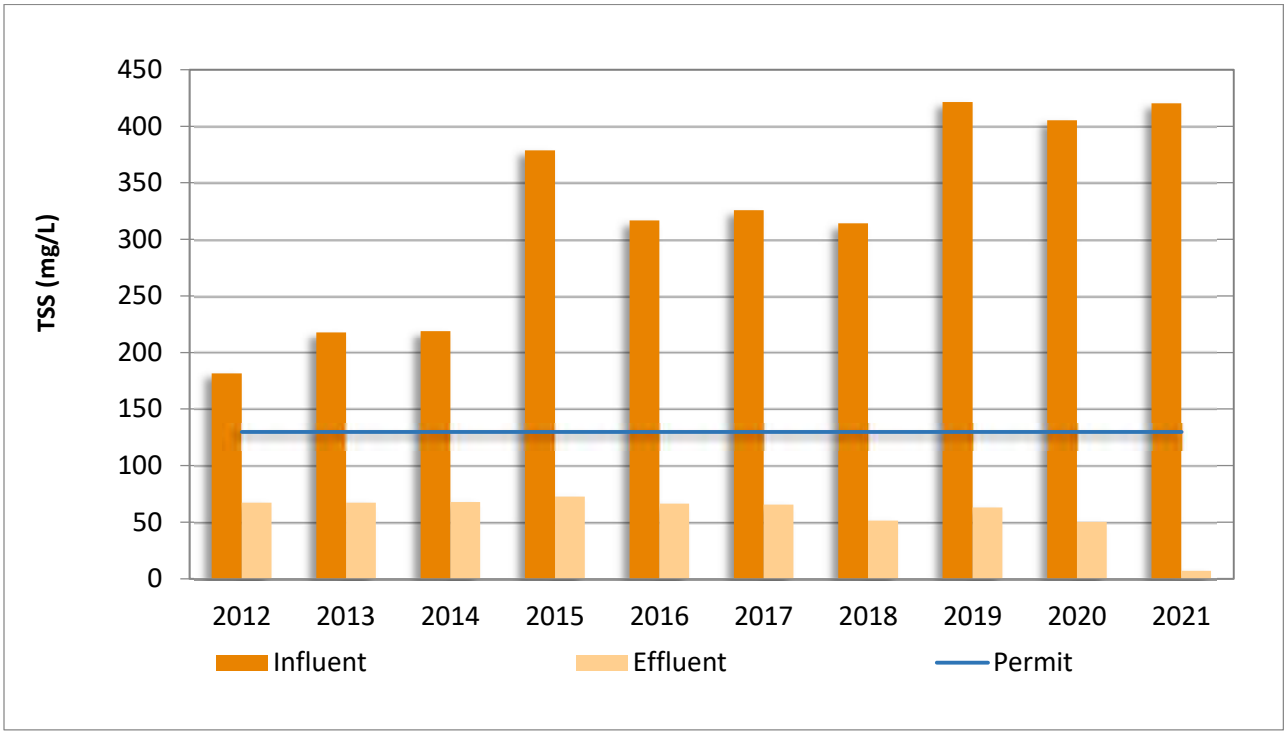
August 2011 to July 2013 and May to December 2014 influent data were less representative due to the grab sampling method. The influent TSS concentrations were higher after 2015 due to the composite sampling method. The composite sampling method would yield higher results due to the inclusion in the composite of higher concentrated night flows.

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

Table 7: Historical Trends: Influent & Effluent TSS

Year	Average TSS (mg/L)		Average % Reduction in TSS	Non-Compliances
	Influent	Effluent		
2012	181	67.3	61.1%	0
2013	218	67.2	67.6%	0
2014	219	67.8	67.9%	1
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

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 and is monitored along with toxicity to determine 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 2021 Ammonia testing results for each month. Appendix B contains weekly test results. The average ammonia nitrogen concentration in the effluent for 2021 was 19.1 mg/L.

The following trends were observed in the monthly Ammonia results. Results were lower in November and December due to inflow and infiltration. Ammonia results also decreased after September 2020 due to ammonia nitrification in the secondary wastewater treatment process.

Table 8: 2021 Effluent Ammonia Nitrogen Concentrations

2021	Effluent Ammonia Nitrogen (mg/L)
January	16.8
February	24.2
March	21.0
April	19.7
May	18.9
June	27.5
July	21.3
August	13.3
September	20.2
October	21.2
November	12.2
December	13.9
AVERAGE	**19.1**

*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 weekly test results.

Table 9: 2021 Un-ionized Ammonia Results

2021	Un-ionized Ammonia (mg/L)
January	0.063
February	0.101
March	0.081
April	0.061
May	0.058
June	0.161
July	0.130
August	0.049
September	0.105
October	0.123
November	0.038
December	0.044
AVERAGE	**0.082**

The Permit requires the toxicity of the effluent to be tested quarterly. Toxicity testing is conducted by an external laboratory (see Appendix D for test reports) based on %survival of rainbow trout in undiluted effluent. Table 10 contains the LC50 Toxicity testing results. The average LC_{50} toxicity of the effluent was non acutely toxic with >100% survival of rainbow trout as determined in 4 tests.

The effluent has consistently tested non-acutely toxic since the addition of a secondary treatment process in September 2020.

Table 10: 2021 LC_{50} Toxicity Results

2021	Effluent LC_{50} Toxicity (%)
March	100
June	100
September	100
December	100
Average	**100**
test organisms = rainbow trout	

5.3.1 Historical Trends

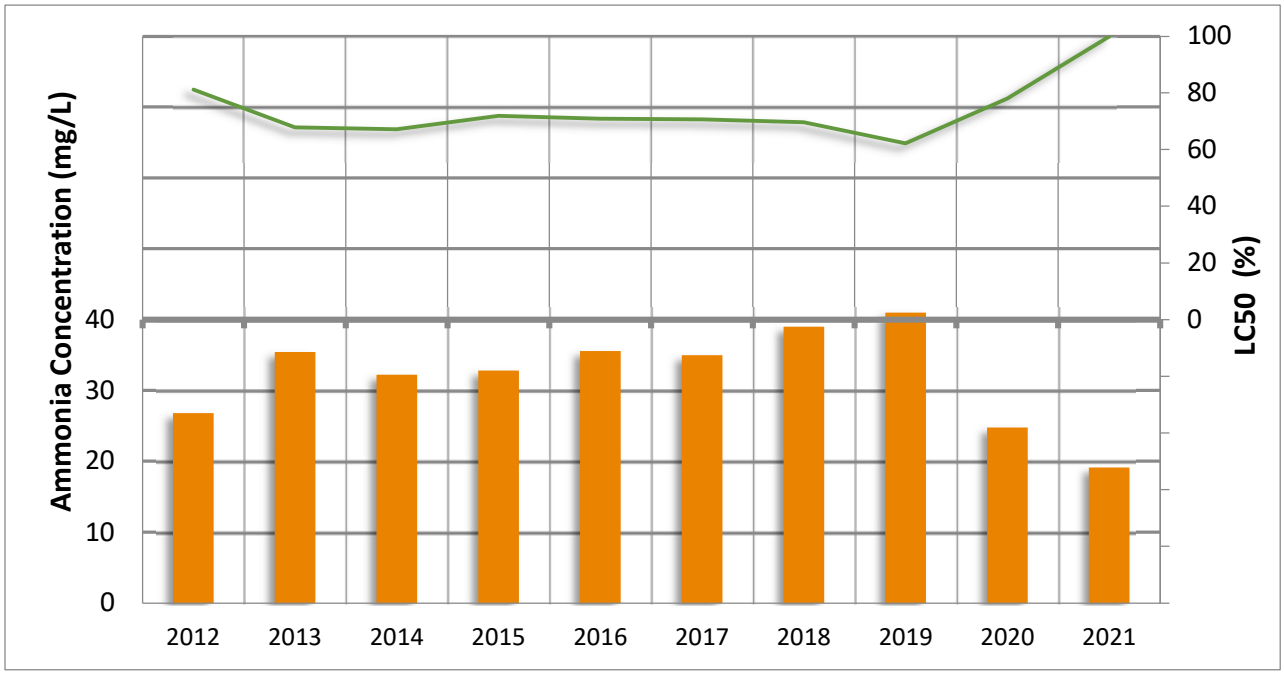
Historical average ammonia nitrogen and toxicity results for effluent reported over the past ten years are summarised in Table 11 and graphed in Figure 8.

2021 ammonia results 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 LC50 (%)
2012	26.8	>81.1
2013	35.4	67.8
2014	32.2	67.2
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

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



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5.4 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	Dissolved 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). The average concentrations of the general parameters reported over the past ten years are summarised in Table 12.

Decreases in pH, alkalinity, oil and grease, and Total Kjedahl Nitrogen were observed in 2021 in comparison to previous years due to the secondary treatment process.

Table 12: Historical Trends: Effluent General Parameters

Parameter	Units	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
pH	-	7.56	7.36	7.16	7.17	7.63	7.29	7.22	7.22	7.51	7.17
Total Alkalinity	mg/L	133	172	176	133	153	153	128	214	157	107
Dissolved Chloride	mg/L	131	183	277	158	165	150	133	220	104	200
Total Kjeldahl Nitrogen	mg/L	34.5	48.0	28.6	36.5	45.6	37.3	40.4	45.7	35.7	13.24
Total Oil and Grease	mg/L	7.5	16.2	35.0	19.5	8.1	7.9	4.9	14.8	<9.6	<1.0
Dissolved Sulphate	mg/L	43	60	67	46	52	48	53	70	42	39
Dissolved Sulphide (total)	mg/L	0.0447	0.1528	<0.05	0.08	0.059	0.082	0.064	0.100	0.053	0.013
Total Cyanide	mg/L	0.0092	0.0080	0.0060	0.0040	0.0017	0.0015	<0.0050	0.0058	<1.86	0.00177
Dissolved Fluoride	mg/L	0.044	0.094	0.100	0.105	0.051	0.043	0.037	0.109	<0.085	<0.056
Total Organic Carbon	mg/L	41	52	63	64	33	47	33	35	25	32
Total Phosphorus	µg/L	2,745	2,140	3,500	2,415	2,845	3,125	2,770	2,680	2,510	2,550

5.5 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 13 and 14.

The Total Aluminum concentration after October 2020 due to the discontinuation of Chemically Enhanced Primary Treatment (CEPT) and the use Aluminum Sulphate in the wastewater treatment process.

Table 13: Historical Trends: Effluent Total Metal Concentrations

Total Metals	Units	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Aluminum	µg/L	2,645	2,850	2,095	2,160	2,260	2,980	2,780	3,110	1,770	14
Arsenic	µg/L	0.60	1.79	0.85	0.70	1.06	0.50	0.49	0.76	0.44	0.49
Chromium	µg/L	3.80	3.60	3.65	0.88	1.35	2.00	2.25	3.27	<1.9	0.39
Lead	µg/L	1.9	1.6	1.7	1.4	1.1	1.1	0.9	1.9	<0.74	<0.22
Mercury	µg/L	<0.2	0.026	0.02	<0.02	<0.016	<0.017	<0.032	<0.012	<0.015	<0.020
Molybdenum	µg/L	1	2.2	1	0.95	<1.1	<1.0	1.1	1.515	1.9	<1.3
Selenium	µg/L	<.08	1.95	1.3	<0.7	0.31	0.27	0.34	<0.40	<0.31	0.12
Silver	µg/L	0.34	0.27	0.14	0.065	0.077	0.076	0.132	0.120	<0.049	<0.020
Tin	µg/L	<5	<5	1.08	0.80	<5.0	<5.0	<5.0	3.20	<2.9	<5.0
Zinc	µg/L	43	50	42	53.5	48.6	51.7	45.25	117.5	75.5	31.1

Table 14: Historical Trends: Effluent Dissolved Metal Concentrations

Dissolved Metals	Units	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Barium	µg/L	5.2	7.39	8.5	62.7	208.5	235.0	246.0	174.4	<4.4	5.1
Boron	µg/L	175	180	192	161	184.5	217.5	240	178.5	178.5	184
Cadmium	µg/L	0.06	0.06	0.075	<0.03	0.067	0.0635	0.0355	0.0825	0.0475	<0.017
Cobalt	µg/L	0	<0.5	0.52	0.51	<0.50	0.42	0.45	0.64	0.61	0.39
Copper	µg/L	38.4	54	66	24.15	44	10.6	8.67	11.00	7.96	8.69
Iron	µg/L	782	711.5	2480	449	426.5	346	418	306	194	91.3
Manganese	µg/L	68.8	72.4	91.5	79.0	80.1	68.3	72.9	85.5	39.1	36.2
Nickel	µg/L	2.2	2.35	2.6	2.3	1.95	1.85	2.25	3.675	3.28	1.4

5.6 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	PCB's	Toluene
Dichloromethane	Tetrachloroethylene	Total Phenols
Di-n-butyl phthalate		

Samples of the effluent are tested in June and December of each 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 15. 2021 data are consistent with historical data.

Table 15: Historical Trends: Effluent Semi Volatile and Volatile Compounds

Parameter	Units	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Benzene	µg/L	<0.4	<0.5	<0.5	<0.5	<0.40	<0.52	<0.40	<0.5	<0.5	<0.40
Di(2-ethylhexyl)phthalate	µg/L	3.3	4.5	1.7	1.6	<10	<7.0	<5.2	<6.3	<2.4	<6.0
Chloroform	µg/L	5.4	3.9	3.5	1.5	2.75	4	3.25	4.0	2.8	2.5
Dichlorobromomethane	µg/L	0	<1.0	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dichloromethane	µg/L	0	<2	<1	<1	<2.0	<2.0	<2.0	<2.5	<2.5	<2.0
Di-N-Butyl Phthalate	µg/L	9.5	<1	<0.2	0.52	<10	<6.0	<5.0	<6.3	<1	<6.0
Ethylbenzene	µg/L	<0.4	<0.5	<0.5	<0.5	<0.40	<0.40	<0.40	<0.70	<0.70	<0.40
Methyl Chloride	µg/L	0	<1.0	<1	<1	<1.0	<1.0	<1.0	<6.2	<4.5	<1.0
PCB's	µg/L	<0.1	<0.1	<0.010	<0.009	<0.28	<0.53	<0.15	<0.050	<0.050	<0.050
Tetrachloroethylene	µg/L	<0.5	<1.0	<1	<1	<0.50	<0.50	<0.50	<0.075	<0.80	<0.50
Toluene	µg/L	0.6	0.8	0.9	<0.7	<0.52	<0.64	0.54	1.545	<0.80	<0.40
Total Phenols	mg/L	0.028	0.058	0.020	0.015	0.024	0.032	0.044	0.020	0.497	<0.0027
1,1, 1-Trichloroethane	µg/L	<0.5	<0.75	<1	<1	<0.50	<0.50	<0.50	<0.075	<0.75	<0.50
1,1, 2-Trichloroethane	µg/L	<0.5	<0.75	<1	<1	<0.50	<0.50	<0.50	<1.0	<0.75	<0.50
Trichloroethylene	µg/L	<0.5	<1.0	<1	<1	<0.50	<0.50	<0.50	<0.075	<075	<0.50
Naphthalene	µg/L	1.2	<0.7	<0.06	0.07	<0.10	<0.10	<0.10	<2.6	<2.6	<0.10

6) Biosolids

6.1 Biosolids Production

GNPCC produces Class B Biosolids. The average monthly production of biosolids in 2021 is summarized in Table 16 and graphed in Figure 9. Monthly Biosolids production increased after October 2020 with the secondary treatment process.

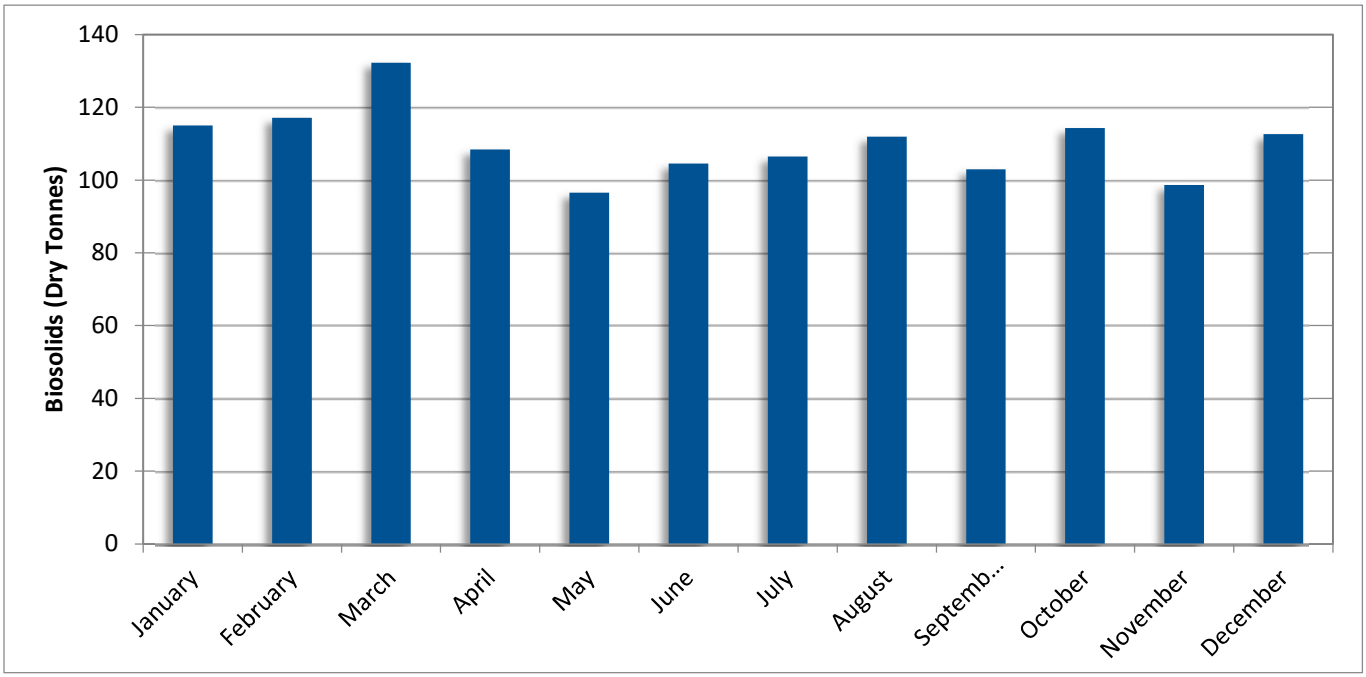
Percentage Solids (%) of the centrifuged biosolids decreased after October with secondary treatment. This trend is due to the consistency of the secondary sludge which retains moisture and tends to be more difficult to dewater. The RDN will continue to optimize the dewatering process in 2022.

Table 16: 2021 Biosolids Production

2021	Trucked Biosolids (Dry Tonnes)	Trucked Biosolids (Wet Tonnes)	% Solids (Pressed Solids)
January	115.0	596.97	19.3%
February	117.1	593.45	19.7%
March	132.3	606.72	21.8%
April	108.4	526.12	20.6%
May	96.5	456.81	21.1%
June	104.5	495.46	21.1%
July	106.5	504.00	21.1%
August	111.9	517.85	21.6%
September	102.9	481.22	21.4%
October	114.3	526.80	21.7%
November	98.6	457.77	21.6%
December	112.7	508.66	22.2%
Average	**110.1**	**522.65**	**21.1%**
Total	**1,323.3**	**6,271.8**	

Note: Bold numbers reflect months % Solids was not determined by the laboratory. Dry trucked biosolids was determined using annual average % Solids.

Figure 9. 2021 Monthly Biosolids Production (Trucked Dry Tonnes)



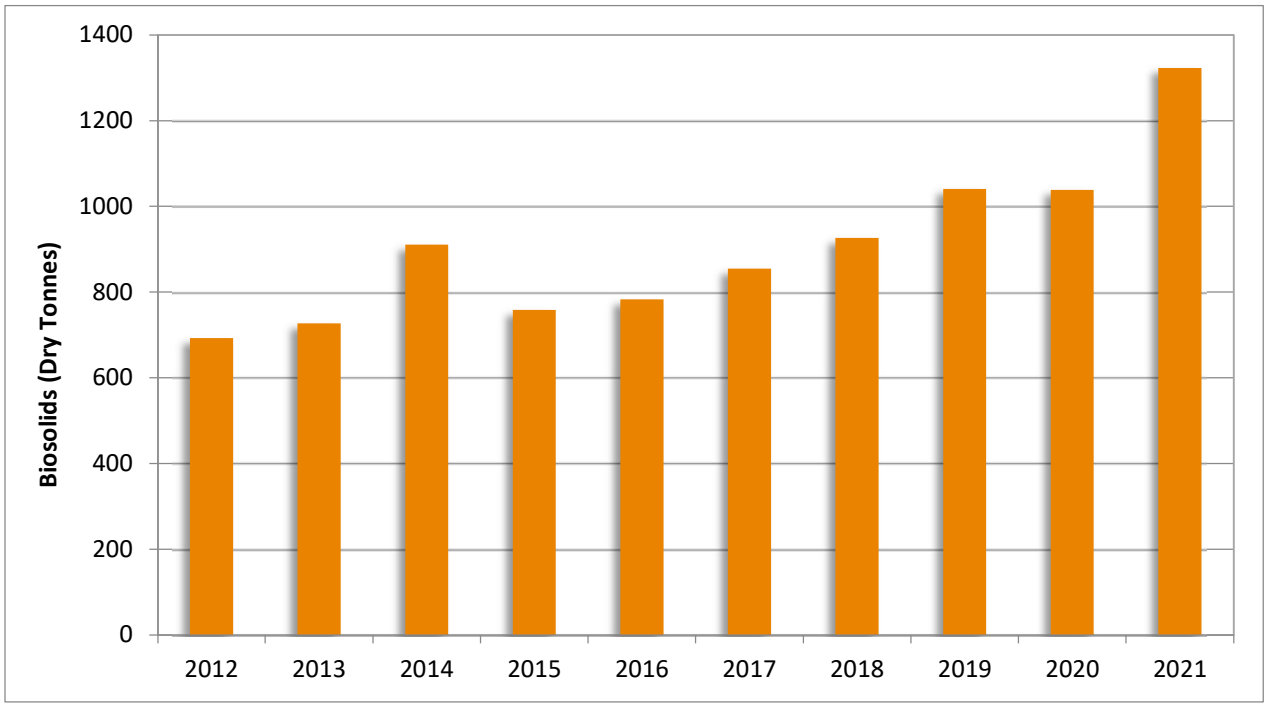
6.1.1 Historical Trends

Historical average polymer usage, total trucked solids (wet tonnes and dry tonnes) and yearly average percent solids reported for biosolids produced over previous years are summarized in Table 17 and graphed in Figure 10. Biosolids production and polymer use increased after October 2020 when the secondary process was in operation.

Table 17: Historical Trends: Biosolids Production

Year	Polymer Usage (Kg/year)	Trucked Biosolids (Dry Tonnes/year)	Trucked Biosolids (Wet Tonnes/year)	% Solids (Average Pressed Solids)
2012	6,550.0	692.30	2,611.00	26.5%
2013	10,525.0	727.00	2,764.20	26.0%
2014	9,741.7	910.82	3,544.47	25.7%
2015	8,816.7	758.28	3,087.21	24.6%
2016	10,537.5	783.34	3,094.13	25.3%
2017	10,800.0	854.86	3,337.46	25.6%
2018	12,925.0	926.13	3,657.78	25.3%
2019	18,422.2	1,040.48	4,337.13	24.0%
2020	22,429.1	1,038.66	4,360.87	23.8%
2021	42,379.7	1,323.26	6,271.83	21.1%

Figure 10. 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 18.

Nine samples were taken in 2021 to monitor biosolids quality in the secondary upgrade (see Appendix D for test reports). 2021 data are consistent with historical data. All 2021 samples from GNPCC met the Class B regulatory limits for the Organic Matter Recycling Regulations (OMRR).

Table 18: Historical Trends: Biosolids General Parameters

Parameter	Units	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	OMRR Limit (Class B)
Total Solids	%	27	25.5	25.9	24.7	32.7	26.1	27.5	24.5	23.1	21.6	-
Volatile Solids	%	70.1	68.2	65.1	69.3	67.275	64.05	64.575	67.9	70	74.4	-
Moisture	%	73.0	73.8	74.1	75	75	75	73	76	76	78	-
Total Kjeldahl Nitrogen	% dry weight	4.80	4.84	4.71	6.90	8.23	9.33	5.23	5.31	5.40	7.03	-
Potassium	µg/g	853	1,006	-	-	892	1,010	985	891	920	925	-
PCB's	µg/g	0	<0.5	<2.6	<0.05	<12	<15	<4.4	<8.5	<4.1	<1.6	-
Arsenic	µg/g	2.4	3.1	3.3	3.2	3.2	3.4	2.8	2.4	2.7	2.49	75
Cadmium	µg/g	2.54	2.58	2.67	2.17	2.62	2.43	1.73	2.10	1.98	1.31	20
Chromium	µg/g	29.4	36.3	49.8	33.8	26.4	30.6	34.5	29.1	30.9	32.0	1,060
Cobalt	µg/g	2.48	2.52	3.00	3.43	3.27	3.84	3.39	2.86	2.68	3.12	150
Copper	µg/g	651	839	980	1095	797	618	525	457	478	559	2,200
Iron	µg/g	18,600	15,600	-	-	30,000	38,700	35,100	28,000	31,000	42,100	-
Lead	µg/g	35	32	37	34	33	32	29	24	23	23.7	500
Mercury	µg/g	3.15	2.86	1.89	1.46	1.80	1.55	1.76	1.29	1.47	0.889	15
Molybdenum	µg/g	5.48	6.74	6.58	6.78	6.63	7.46	6.55	6.09	6.37	7.76	20
Nickel	µg/g	13.6	15.2	16.8	17.2	16.3	18.4	18.0	16.1	15.3	13.9	180
Phosphorus	µg/g	21,375	20,163	29,150	26,700	24,800	29,500	30,000	23,500	27,500	23700	-
Selenium	µg/g	3.94	4.90	3.90	4.95	4.32	4.96	4.50	3.65	3.93	4.76	14
Zinc	µg/g	846	964	903	991	972	1,050	980	824	871	912	1,850

6.3 Fecal Coliforms

Nine discrete samples of biosolids were sent to an external laboratory in 2021 for fecal coliform analysis (see Appendix D for test reports). The geometric mean of the biosolids fecal coliform results in 2021 was 3,700 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 2021 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 reporting (see Appendix H).

A reduction in fecal coliform levels has been observed since the commission of the secondary treatment process. 2021 fecal coliform analysis are summarised in Table 19.

Table 19: 2021 Biosolids Fecal Coliforms Concentrations

2021	Fecal Coliforms (MPN / g dry)	External Laboratory
17-Feb-21	860	Bureau Veritas
03-Mar-21	7,600	Bureau Veritas
19-May-21	3,700	Bureau Veritas
10-Jun-21	32,000	Bureau Veritas
31-Aug-21	520	Bureau Veritas
08-Sep-21	11,000	Bureau Veritas
20-Oct-21	780	Bureau Veritas
17-Nov-21	2,300	Bureau Veritas
08-Dec-21	15,000	Bureau Veritas
Geometric Mean	**3,700**	

6.4 Stabilization and Dewatering

Biosolids at GNPCC are stabilized by anaerobic digesters. The sludge collected from the bottom of the sedimentation tanks is pumped via gravity thickeners and heat exchangers to two digesters. The 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 resulting in 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 20 and 21.

Table 20: Stabilization Process Data

Stabilization Process		
Total Mass of Sludge Delivered for Stabilization	2,522	Tonnes (dry)
% Volatile Solids in Sludge Feed	71.1	%
Mass of Biosolids Remaining after Stabilization	1753.9	Tonnes (dry)

Table 21: Dewatering Process Data

Dewatering Process		
Volume of Biosolids delivered for dewatering	108,294	m^3
% solids in biosolids dewatering feed	1.62	%
% solids in dewatered biosolids	21.1	%
Polymer dosage to aid dewatering	0.391	kg/m^3

6.5 Biosolids Management

In 2021, RDN biosolids from GNPCC were beneficially managed in two programs:

- Forest Fertilization
- Soil Fabrication.

6.5.1 Forest Fertilization

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

The biosolids were land applied in a forest fertilization project managed by SYLVIS Environmental. The SYLVIS Environmental 2021 Biosolids Management Summary, attached in Appendix H (Section 3), provides a summary and interpretation of the effects of biosolids discharges on the receiving environment.

6.5.2 Soil Fabrication

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

More details of the soil fabrication program are provided in the 2021 Biosolids Management Summary, completed by SYLVIS Environmental attached in Appendix H.

6.5.3 Excellence in Biosolids Award

In 2019, the Regional District of Nanaimo won the Northwest Biosolids 'Excellence in Biosolids' Award for the second time. This award 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

A by-product of the anaerobic sludge digestion process is biogas which consists mostly of methane gas. Gas production is recorded daily at GNPCC. The average daily biogas production rate in 2021 was 4,491 m^3/day. The total volume produced in 2021 was approximately 1,639,123 m^3. Of the total produced, 466,849 m^3 (28.48% of total production) was used as fuel for the boilers to heat operations and wastewater treatment process water and for cogeneration. The remaining 1,172,274 m^3 (71.52% of total production) was wasted (flared).

7.1.1 Historical Trends

Historical biogas production, usage and waste rates reported over previous years are summarized in Tables 22 and 23. Biogas production rates seem to have gradually increased with the exception of 2012, which is lower than other years as use, and flared amounts were based on only 10 months of data collection. The trend towards increased biogas production can be attributed to the installation of Digester #3 after 2013.

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

Table 22: Historical Trends: Biogas Production

Year	Average Daily Biogas Production (m^3/day)	Total Biogas Production (m^3)	Average Daily Biogas WASTED (m^3/day)	Total Biogas WASTED (m^3)	Average Daily Biogas USEAGE (m^3/day)	Biogas Useage COGEN (total)	Biogas Useage BOILER (m^3)	Total Biogas USED TOTAL (m^3)
2012	3,154	946,147	2,188	656,533	965	1,086	289,613	290,699
2013	3,351	1,125,976	2,018	716,486	1,333	36,528	372,962	409,491
2014	3,601	1,297,475	1,834	661,897	1,768	336,477	299,101	635,578
2015	4,040	1,458,586	2,209	797,449	1,831	478,766	182,371	661,137
2016	3,942	1,407,176	2,578	920,357	1,364	191,697	295,122	486,819
2017	4,090	1,492,730	2,471	902,057	1,618	285,450	305,224	590,674
2018	3,950	1,441,721	2,780	1,014,539	1,170	90,601	336,581	427,181
2019	3,746	1,367,432	2,742	1,000,857	1,004	1,765	364,811	366,575
2020	3,976	1,451,406	2,884	1,052,755	1,092	3,231	395,421	398,651
2021	4,491	1,639,123	3,212	1,172,274	1,279	2,254	464,595	466,849

* Represents approximately a 10-month estimate, from March 3 – December 31, 2012.

Table 23: Historical Trends: Percentage Biogas Consumption and Wasting

Year	% Biogas Wasted	% Biogas Used (Boiler)	% Biogas Used (Cogen)
2012	69.39%	30.61%	0.11%
2013	60.22%	33.12%	3.24%
2014	50.92%	23.05%	25.93%
2015	54.67%	12.50%	32.82%
2016	65.40%	20.97%	13.62%
2017	60.43%	20.45%	19.12%
2018	70.37%	23.35%	6.28%
2019	73.19%	26.68%	0.13%
2020	72.53%	27.24%	0.22%
2021	71.52%	28.34%	0.14%

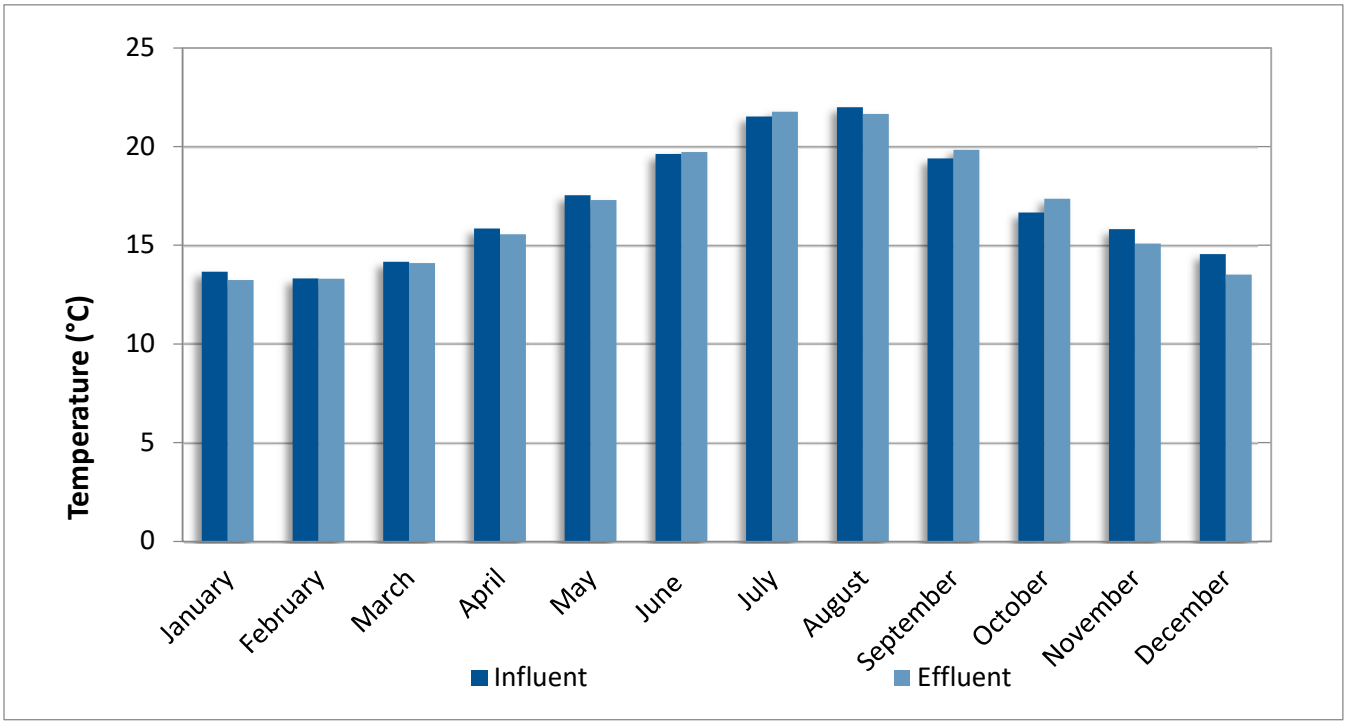
7.2 Temperature

RDN staff conduct temperature testing of the influent and effluent daily. Temperature monitoring data for GNPCC from 2021 is presented in Appendix B. The average temperature data for each month are summarized in Table 24 and graphed in Figure 11.

Table 24: 2021 Influent & Effluent Temperatures

2021	Average Temperature (°C)	
	Influent	Effluent
January	13.7	13.2
February	13.3	13.3
March	14.2	14.1
April	15.8	15.6
May	17.5	17.3
June	19.6	19.7
July	21.5	21.8
August	22.0	21.7
September	19.4	19.8
October	16.7	17.4
November	15.8	15.1
December	14.6	13.5
Average	**16.5**	**16.9**

Figure 11. 2021 Influent & Effluent Monthly Average Temperature



7.2.1 Historical Trends

Historical average temperatures for influent and effluent reported over the past ten years are summarized in Table 25. 2021 data are consistent with historical data.

Table 25: Historical Trends: Influent & Effluent Average Temperature

Year	Average Temperature (°C)	
	Influent	Effluent
2012	15.6	15.6
2013	15.6	15.6
2014	15.3	15.2
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

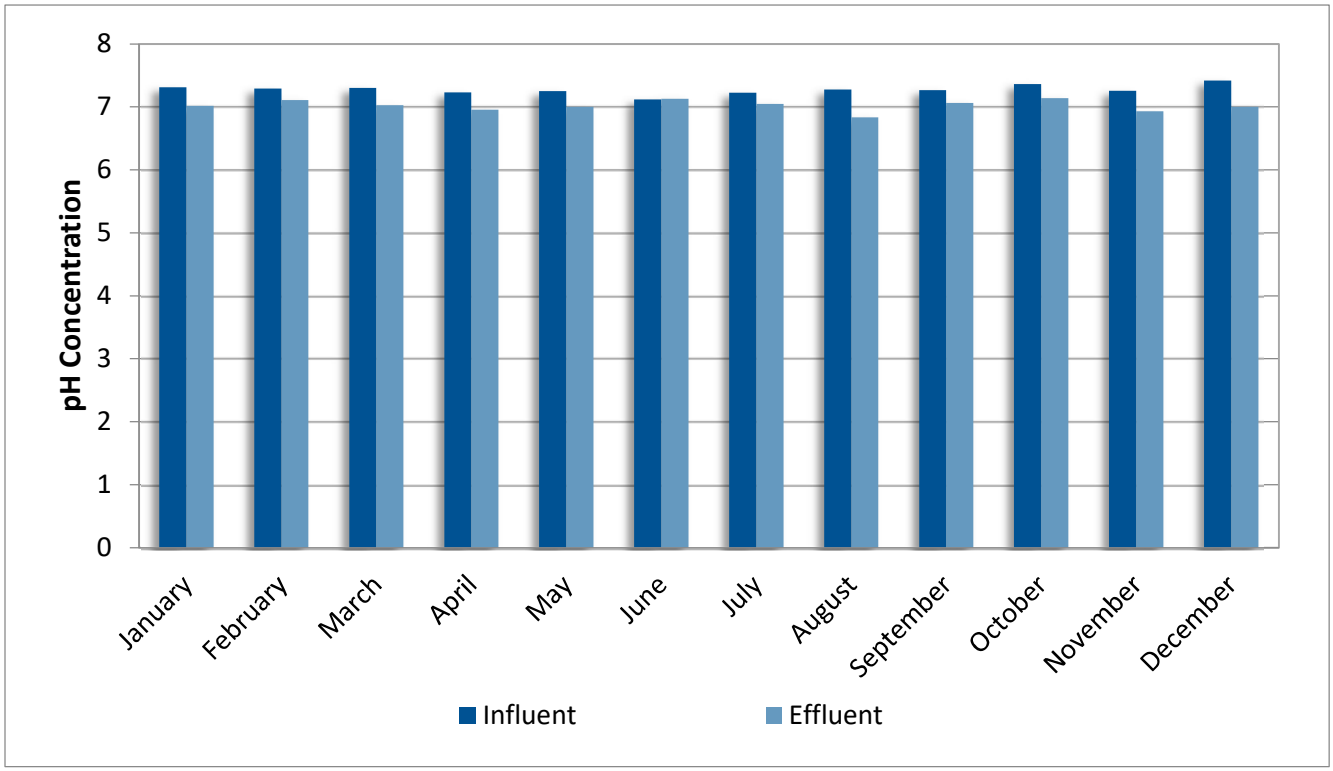
7.3 pH

RDN conducts pH testing of the influent and effluent weekly The pH monitoring data for GNPCC from 2021 is presented in Appendix B. The average pH concentrations for each month are summarized in Table 26 and graphed in Figure 12.

Table 26: 2021 Influent & Effluent Average pH Concentration

2021	Average pH	
	Influent	Effluent
January	7.31	7.02
February	7.29	7.11
March	7.30	7.03
April	7.23	6.95
May	7.25	7.00
June	7.12	7.13
July	7.22	7.05
August	7.27	6.83
September	7.27	7.06
October	7.36	7.14
November	7.26	6.93
December	7.42	7.00
Average	**7.26**	**7.02**

Figure 12. 2021 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 27. 2021 data are consistent with historical data.

Table 27: Historical Trends: Influent & Effluent pH Concentration

Year	Average pH	
	Influent	Effluent
2012	7.20	7.30
2013	7.30	7.20
2014	7.18	7.02
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	7.26	7.02

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 28).

In 2021, the digestion process at GNPCC achieved a 58.8% 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 (less volatile solids) than primary solids.

Table 28: Historical Trends: Sludge Volatile Solids Reduction

Year	Average Solids in Sludge from Primary Tanks (%)	Average Volatile Solids in Sludge from Primary Tanks (%)	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 (%)
2012	N/A*	N/A*	4.3	85.5	2.1	71.0	58.0
2013	N/A*	N/A*	3.9	85.9	1.8	69.1	63.1
2014	N/A*	N/A*	3.5	80.3	1.7	64.6	54.6
2015	N/A*	N/A*	4.7	86.8	1.7	63.7	74.8
2016	N/A*	N/A*	4.6	86.6	1.8	65.1	72.3
2017	N/A*	N/A*	4.6	86.3	1.7	64.4	68.4
2018	N/A*	N/A*	4.4	86.2	1.7	63.1	67.0
2019	N/A*	N/A*	4.1	85.9	1.6	65.7	65.5
2020	N/A*	N/A*	4.0	86.4	1.3	67.3	65.7
2021	N/A*	N/A*	4.1	88.9	1.6	72.7	58.8

8) Resource Consumption

8.1 Chemical Consumption

Table 29 summarizes the consumption and costs of chemicals used in the treatment process and at the pump stations for the Southern Communities in 2021.

The total cost of chemicals purchased at GNPCC in 2021 was consistent to previous years. Zetag 7557 (Dewatering Polymer) increased due to process changes in the secondary upgrade when the thickeners were removed from service. Additionally, more dewatering polymer is required to dewater the secondary sludge in the secondary treatment process. The dewatering polymer was also changed to Wes-Floc 6816 A which is more effective dewatering the secondary sludge.

Aluminum Sulphate and the Superfloc A-1883RS are used in the CEPT process. The use of these chemicals has been discontinued since October when the secondary treatment process was operational.

With the secondary treatment process, dewatering polymer was changed from Zetag 7557 to Wes-Floc 6816 A, and the new thickening polymer used in 2021 was Wes-Floc 7610 A supplied by Waterhouse Environmental.

Table 29: 2021 Chemical Consumption

Chemical	Consumption	Units	Cost	Use
Wes-Floc 6816 A	42,380	kg	$326,666	Dewatering
Wes-Floc 7510 A	19,270	kg	$115,622	DAFT Polymer
Ferrous Chloride	274,793	L	$48,392	Odour Control
Defomer	-	-	$13,087	Defoamer
Odour Control	-	-	$6,628	Odour Control
Other Chemicals	-	-	$873	Various
TOTAL			$511,268	

* Used at Chase River and Departure Bay Pump Stations

8.1.1 Historical Trends

Historical annual costs of chemicals consumed in over previous years are summarized in Table 30. A reduction in ferrous chloride consumption occurred in 2010-2011 due to issues with availability and delivery of this product. Ferric chloride was used temporarily in 2011 to bridge the gap until ferrous chloride procurement issues got resolved.

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 and Wes-Floc 6510 A was used as the thickening polymer.

Table 30: Historical Trends: Chemical Consumption

Year	Dewatering Polymer	Zetag 3940	Kemira Superfloc A-1883RS	DAFT Polymer	Ferrous Chloride	Kemira PAX XL6**	Aluminum Sulphate	Secondary Polymer	Defoamer	Odour Control	Other	Total Cost
2012	$59,147	$30,734	$20,748		$35,358	-	$254,611					$400,598
2013	$86,831	-	$45,596		$31,451	$50,690	$269,185					$483,753
2014	$80,369	-	$41,323		$36,978	-	$328,853					$487,522
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

8.2 Electrical Consumption

Historical annual electrical consumption and costs are summarized in Table 31 and graphed in Figure 13. In general, electrical consumption increases in years where there are major construction projects. Additionally, although not directly measured, the increased reliance on mechanical mixing in the digesters accounts for increases in electrical consumption in recent years, the pumps that do this mixing use substantial electricity.

Due to a connection issue that prevented BC Hydro from reading GNPCC's electrical meter in the secondary upgrade, the RDN last received an invoice from BC Hydro February 2020. Electrical consumption and cost in 2020 and 2021 cannot therefore be determined until this data is provided by BC Hydro.

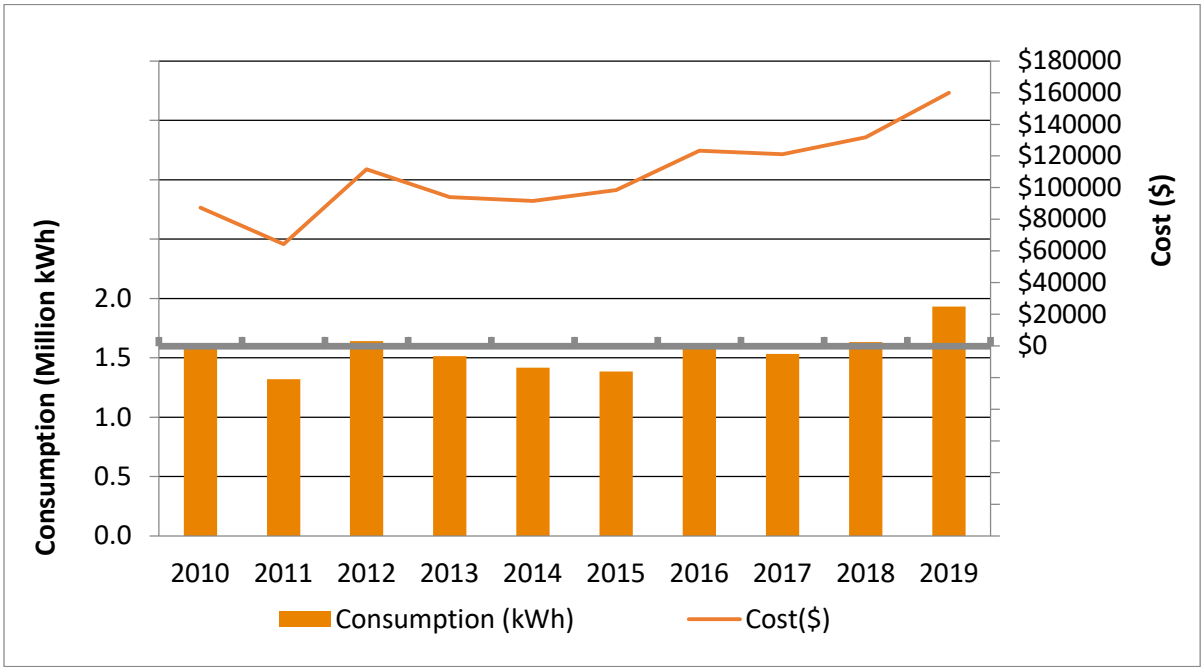
Electricity consumption at GNPCC likely has increased however due to the bioreactors and process equipment installed in the secondary upgrade. The increase is difficult to estimate however as there has been no electrical consumption data from the new process equipment installed in the upgrade (including the blowers which typically have high electricity use). The increase in electricity use was mitigated by the installation of turbo-blowers which are more efficient assisted by a BC Hydro energy efficiency grant.

Table 31: Historical Trends: GNPCC Electrical Consumption

Year	Consumption (kWh)	Cost ($)
2012	1,640,700	$111,636
2013	1,513,800	$94,031
2014	1,416,600	$91,633
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	ND	ND
2021	ND	ND

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

Figure 13. Historical Trends: GNPCC Electrical Consumption and Costs (Treatment Plant Only)



8.3 Water Consumption

The estimated water consumption at GNPCC for 2021 was estimated to be 118,810 m^3. Water consumption increased from 2018 to 2020 due to the secondary treatment upgrade. In 2020, water consumption was substantially higher than usual due to the filling of tanks during commissioning of secondary treatment. In 2021, water consumption increased due to use in the new secondary facility.

Historical treatment plant water consumption (pump stations excluded) is summarized in Table 32.

Table 32: Historical Trends: GNPCC Water Consumption

Year	Water Consumption (m^3)
2012	35,421
2013	43,604
2014	53,914
2015	35,061
2016	35,994
2017	64,871
2018	70,852
2019	77,738
2020	105,500
2021	118,810

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 gas 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 was offline since 2019 because the system's gas skid was inoperable, and operator resources were taken up by the secondary upgrade. The RDN communicated with BC Hydro in May 2019 that the cogeneration facility would not be operated until after the upgrade is completed to optimize resources. The RDN is currently in discussions with BC Hydro about restarting and recommissioning the system.

Table 33 contains a summary of the energy generated by the cogeneration unit and the revenue obtained from selling this electricity to BC Hydro.

Table 33: Historical Cogeneration Unit Electricity Production and Revenue Generated

Year	Eligible Energy (MWh)	Revenue ($) excluding GST/HST
Sept to Dec 2012	48.6	$5,826
2013	144.5	$15,672
2014	499.9	$54,926
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
Total	**2,246**	**$236,880**

10) Odour

There were ten odour complaints received in 2021 for GNPCC. See Appendix E for individual incident reports. Table 34 summarizes the number of odour concerns received by month in 2021.

Table 34: 2021 Odour Complaints

2021	Odour Concerns	
	GNPCC	Pump Stations and Interceptor
January	0	0
February	0	0
March	0	0
April	0	0
May	0	0
June	1	1
July	3	2
August	2	1
September	0	0
October	0	0
November	0	0
December	0	0
Total	**6**	**4**

In 2021, GNPCC operations received ten odour concerns in total (see summary below):

Six were from locations near GNPCC:

- A concern received in June was attributed to odours arising in the headworks area. A corrective active was identified to install an odour modifier station in the headworks.
- A concern received in July was attributed to the grit tank foul air system not running.
- Two odour concerns from in July and August were attributed to regular bioreactor function.
- Staff were unable to attribute a cause to the second odour complaint in August.

Four were from locations near Wellington Pump Station and the Nanaimo Interceptor:

- Three concerns received in June and July at Wellington Pump Station were attributed to the function of the wet well exhaust fan.
- A concern in August arose due to a sewer vent at the end of Departure Bay forcemain. Ferrous chloride at Departure Bay Pump Station was increased to reduce odours. Staff also decided to purchase and install an activated carbon filter for the vent.

10.1 Historical Trends

The total number of odour complaints reported over the past ten years are summarized in Table 35.

Table 35: Historical Trends: GNPCC and Pump Stations – Number of Odour Complaints

Year	Odour Complaints
2012	3
2013	2
2014	8
2015	9
2016	6
2017	11
2018	6
2019	6
2020	8
2021	10

10.2 Odour Episode

An odour episode is a disruption in the regular operation of the treatment plant that may cause odour. The other concerns were due to regular function however improvements

Four odour episodes were identified from the odour complaint records:

- The grit tank foul air not functioning in July resulting in an odour concern.

The other concerns received were attributed to the regular function of the wastewater system however improvements to odour control systems were recommended as corrective actions.

Several of the plant processes resulting in odour concerns have recently been installed in the secondary upgrade and optimizations with the odour control systems on these new processes are ongoing.

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 2021 was 2,715,223 Imperial gallons (12,344 m^3).

Please note this volume does not include sludge from the Duke Point Pollution Control Centre wastewater treatment process which undergoes further treatment at GNPCC.

11.1 Historical Trends

The volumes of septage and pump & haul discharged previous years are summarized in Table 36 and graphed in Figure 14.

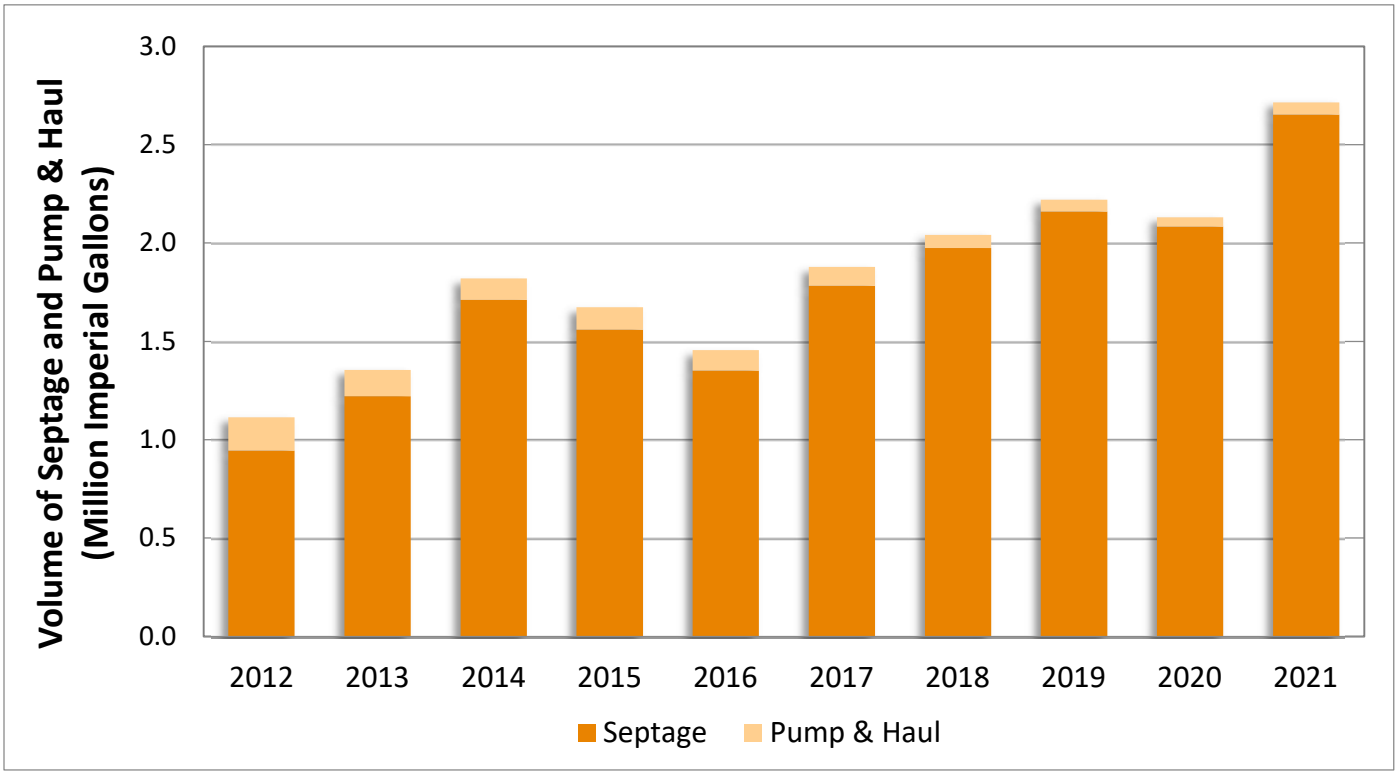
Pump & Haul has shown a decreasing trend while septage has shown an increasing trend. The reason for this trend is uncertain.

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 track 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 & haul discharged at CRPS.

Table 36: Historical Trends: Septage and Pump & Haul discharged at CRPS

Year	Total Gallons of Septage Discharged at CRPS	Total Gallons of Pump & Haul Discharged at CRPS	Combined Total (imperial gallons)	Combined Total (m^3)
2012	945,175	168,512	1,113,687	5,063
2013	1,221,527	133,080	1,354,607	6,158
2014	1,711,490	108,560	1,820,050	8,274
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

Figure 14. Annual Volume of Septage and Pump & Haul Discharged at CRPS (GNPCC)



11.2 Septage Testing

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

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

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

The random septage sampling program did not occur in 2021, however. Sampling safety issues and bylaw limit review will need to be resolved before this program is resumed.

12) Contributory Population and Remaining Plant Capacity

The estimated population serviced in 2021 was 104,273 with a projected annual growth rate of approximately 1.95%. The population figure incorporates the 2021 Census data. In 2021, the average daily flow was 32,112 m^3/day and the maximum daily flow was 90,730 m^3/day.

The capacity of GNPCC has increased with the installation of a Digester #3 and Sedimentation Tank #4 in 2013. The secondary treatment upgrade will also increase plant capacity. 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 2021, ten environmental incidents were recorded:

- On Sept 16, a small spill occurred into the excavation area of the Departure Bay Forcemain repair after removal of backfill. The flow was stopped at Departure Bay Pump and a clamp was installed to stop the spill. The old pipe has since been replaced as part the project.
- On October 29, November 3(x2), 14, 15, and 16, overflows occurred at constructed overflow points near Brechin Road and the Millstone siphon due to record high precipitation and reduced pumping capacity through Departure Bay Pump Station due to repair project was in construction for this force main near Planta Road. On November 14 and 15, an unprecedented atmospheric river event contributed heavily to this situation and created many other issues around the province. Berms were placed at the ocean engineered overflow points. Small spills also occurred at manholes near Departure Bay pump Station, the Rail Yard (manhole 19), and near Chase River Pump Station on November 14 and 15. The forcemain repair project has since been completed and pumping capacity has returned to regular levels.
- On November 20 and 25, small spills occurred during pressure tests at excavation sites at Chinook Road and at the Meadow Land standpipe on the Departure Bay force main. Repairs were completed on sections of the pipe where leaks were identified.

Appendix F contains additional details about these environmental incidents.

14) Facility Upgrades and Major Projects

14.1 Upgrades and Repairs Completed in 2021

- Departure Bay Forcemain Repair (near Planta Road)
- Chase River Septage Card Replacement
- Chemical Dosing Pumps
- GNPCC Bioreactor ML Recycle Pump
- GNPCC Digester #2 Gas Blower Pressure Relief Valves (x2)
- GNPCC Basement Backflow Preventer
- Departure Bay Pump Rebuild (Spare).

14.2 Studies and Projects Completed in 2021

- Contaminants of Emerging Concern Study (ongoing)
- Partnered with UVic and Pani Energy as part of a Covid monitoring project
- GNPCC Parshall Flume Dye Test
- DBPS Wet Well Coring to assess concrete
- Foreshore Erosion Study
- North Shore Hydraulic Modelling Study
- Departure Bay Forcemain Upgrade Pre-Design Study.

14.3 Upgrades and Repairs Planned for 2022

- Wellington North Shore Interceptor manhole replacements
- GNPCC Headworks and RAS area washroom addition
- Rotostrainer and process hot water loop replacement
- Wellington Pump Station Ionizer System
- Centrifuge #1 Rotating Assembly Rebuild
- GNPCC Headworks Access Platform.

14.4 Studies and Projects Planned for 2022

- Contaminants of Emerging Concern Study
- Wellington Pump Station Ventilation and Capacity Increase Engineering Design

- VIU Odour Monitoring
- Receiving Environment Monitoring Review
- Cogeneration System Recommissioning
- Basement MCC Replacement Study
- ISO14001:2015 Surveillance Audit.

15) Resource Recovery

15.1 Biosolids Reuse

Since 1999, RDN biosolids have been beneficially used in agriculture, landfill closures, mine reclamation, and forest fertilization. Biosolids management in 2021 is discussed in Section 6.5.

15.2 Effluent Reuse

GNPCC can reuse effluent in operational processes for diluting polymer, which decreases the demand for potable water from the community's supply. In 2021, effluent was used as process water. Potable water was used as wash down water due to the disinfection capacity of the effluent reuse system.

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 waste oils, paints and paint thinners.

15.4 Cogeneration

Cogeneration is discussed in Section 9.

16) Education Programs

16.1 Source Control

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

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

Wastewater Services promotes the Medications Return Program at public open houses and SepticSmart workshops.

16.2 Water Conservation

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

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

16.3 Open House

The RDN did not schedule an Open House at GNPCC in 2021 as a public safety measure during construction of the Secondary Treatment Upgrade Project and due to COVID-19 restrictions on gatherings. Open Houses are typically scheduled every year to provide the public with an opportunity to tour the facilities, learn about recent upgrades, browse informative posters, and display material, and forward questions and concerns to staff directly.

16.4 SepticSmart

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

No SepticSmart workshops were held in 2021 due to COVID-19 restrictions on gatherings.

In 2014, the RDN launched the Septic Maintenance Rebate program to: 1) make it easier for residents to manage septic system maintenance, 2) promote long-term maintenance habits, and 3) maximize the longevity of existing onsite systems. The SepticSmart rebate program was on hold in 2021 due to reduced staffing related to COVID-19. To date, more than $260,000 in rebates have been issued to homeowners towards septic tank repairs and maintenance as part of this program.

16.5 Liquid Waste Management Plan

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

16.6 Website

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

The Get Involved portion of the RDN website is an online public engagement space that hosts outreach information specific to the regional projects. In 2021, the following GNPCC projects were highlighted on the Get Involved page:

- GNPCC Secondary Treatment Upgrade Project
- Chase River Pump Station and Haliburton Street Sanitary Sewer Forcemain Upgrades
- Departure Bay Forcemain Upgrade.

17) Conclusions

Table 37 and conclusions were drawn from the 2021 GNPCC permit monitoring data:

Table 37: GNPCC Summary of Compliance

Summary of Compliance	Permit	2021	Exceedances
Maximum Daily Flow	80,870 m^3/day	90,730 m^3/day	2
Average Daily Flow	40,950 m^3/day	32,112 m^3/day	
Average Daily $cBOD_5$	130 mg/L	5.32 mg/L	0
Average Daily TSS	130 mg/L	7.09 mg/L	1

17.1 Flows

Daily flow monitoring data for GNPCC for 2021 are presented in Appendix B. The total flow discharged from GNPCC in 2021 was 11,720,796 m^3, at an average annual flow of 32,112 m^3/day. There were two maximum daily flow non-compliances. Details of the non-compliances are reported in Section 4.1 of this report and in Appendix C.

17.2 Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)

The influent and effluent average $cBOD_5$ concentration for 2021 was 246 mg/L and 5.32 mg/L, respectively. The average removal efficiency was 97.8%. There were no $cBOD_5$ non-compliances in 2021, where the maximum permitted $cBOD_5$ concentration was exceeded.

17.3 Total Suspended Solids (TSS)

The influent and effluent average TSS concentration was 420 mg/L and 7.09 mg/L, respectively. The average TSS removal efficiency in 2021 was approximately 98.0%.

There was one TSS non-compliance in 2021, where the maximum permitted TSS concentration was exceeded. Details of this non-compliance are reported in Section 5.2 of this report and in Appendix C.

17.4 Ammonia Nitrogen and Toxicity

The average ammonia nitrogen concentration in the effluent for 2021 was 19.1 mg/L and the average toxicity (LC_{50}) of the effluent for 2021was determined to be >100% (non-acutely toxic).

2021 effluent ammonia levels were reduced in comparison to results primary treatment due to the ammonia nitrification occurring in the secondary treatment process.

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

Results reported for 2021 for all general parameters, metals, volatile and semi-volatile compounds were all consistent with historical data. Several parameters showed reductions after the secondary wastewater treatment process was commissioned.

17.6 Biosolids Quality

The biosolids generated by the GNPCC in 2021 contained concentrations of metals and fecal coliforms which met the standards for Class B biosolids given in Schedules 3 and 4 of the OMRR. Biosolids are currently being land applied in a Forest Fertilization and a Soil Fabrication program.

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).

. . . 2

ACL 94/5/31
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
to 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

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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.

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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.

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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.

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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.

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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.

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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 Proeedures 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.

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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.

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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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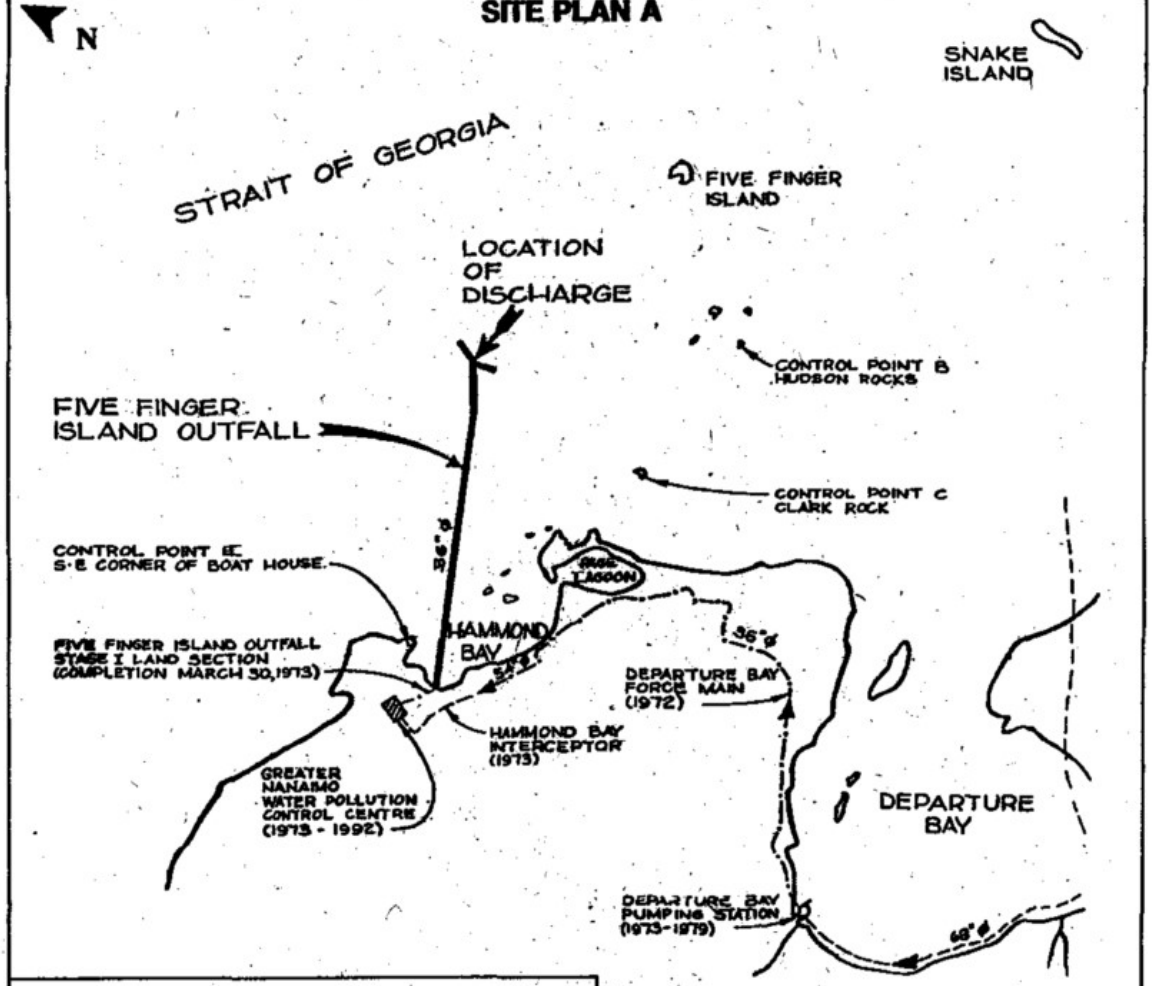
PROVINCE OF
BRITISH COLUMBIA

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)

2021 Total Flows (Cubic Metres)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	90,730	41,460	29,385	24,970	23,066	23,628	23,038	26,505	26,850	30,413	37,443	42,267
2	87,991	38,466	28,632	25,065	23,403	23,900	23,038	27,403	26,419	29,143	42,972	39,842
3	61,923	36,223	28,768	24,901	24,145	23,653	23,021	27,274	21,879	29,310	47,008	38,005
4	62,775	34,532	32,260	24,981	23,011	23,071	23,829	27,118	27,099	26,001	45,872	35,967
5	67,688	32,792	33,094	25,450	23,404	23,232	24,327	27,572	25,981	33,569	44,967	35,090
6	56,418	31,953	31,650	25,191	23,107	24,963	24,058	27,382	27,278	30,353	46,213	39,257
7	45,851	31,540	31,687	25,218	22,370	23,374	24,055	26,777	30,886	26,808	45,352	42,379
8	41,402	30,406	31,363	24,852	22,216	23,315	24,355	26,909	27,152	29,098	44,608	41,224
9	38,464	29,222	29,689	25,130	22,723	25,913	23,756	25,934	26,302	31,438	45,756	38,305
10	38,736	28,469	29,121	24,643	22,703	26,182	23,694	28,740	26,535	28,463	44,519	52,384
11	53,210	28,082	28,904	24,985	22,397	24,704	24,239	28,290	27,187	28,852	44,673	58,758
12	76,010	27,689	28,225	24,566	23,161	24,499	24,578	27,654	27,011	24,832	43,801	50,070
13	61,890	27,056	27,235	25,252	22,413	26,841	25,525	26,908	26,586	31,167	46,402	58,259
14	46,792	28,678	28,944	25,353	21,895	24,667	24,050	26,454	27,236	33,288	50,819	53,763
15	40,253	33,510	27,863	24,193	21,717	25,058	27,049	27,464	26,275	31,007	44,224	53,600
16	37,025	35,249	27,351	22,188	22,647	23,704	27,694	31,536	26,419	41,060	51,947	45,335
17	35,478	35,025	27,420	22,627	22,849	23,741	26,740	27,391	35,244	41,855	55,962	44,170
18	33,276	37,318	26,917	24,026	22,186	23,489	26,933	27,130	28,067	40,630	53,111	65,431
19	32,023	36,970	28,904	23,518	21,987	22,871	25,519	27,574	30,138	33,300	48,315	51,363
20	30,710	35,380	26,813	25,605	21,473	23,922	27,195	21,550	28,267	30,239	43,206	44,895
21	30,104	35,691	27,616	24,139	21,487	24,391	25,629	25,624	27,593	33,780	41,295	42,732
22	29,156	34,047	26,899	22,838	20,849	24,529	26,998	26,351	22,659	33,195	40,880	55,200
23	28,889	32,614	26,879	23,355	21,309	23,602	26,918	26,524	27,492	35,326	38,217	50,656
24	36,068	31,947	26,805	23,991	23,621	23,877	26,439	26,383	26,853	39,994	35,756	53,000
25	40,563	31,925	26,406	25,276	22,852	23,521	27,091	26,649	26,568	41,712	46,951	45,789
26	37,374	30,910	25,571	24,812	23,446	22,035	30,035	26,786	32,974	41,104	41,443	41,444
27	42,067	29,580	25,730	23,534	23,722	23,385	27,586	26,128	32,230	40,831	59,529	39,452
28	41,116	30,403	27,634	23,912	22,287	19,559	27,126	25,915	29,356	43,843	61,002	38,233
29	37,996		26,519	23,674	22,559	24,587	27,337	26,476	36,072	42,065	50,771	36,853
30	37,114		25,453	23,164	24,456	23,459	27,314	30,233	34,599	41,187	46,231	36,181
31	39,195		25,530		24,093		26,755	27,381		39,843		35,472
Total:	**1,438,287**	**917,137**	**875,267**	**731,409**	**703,554**	**717,672**	**795,921**	**838,015**	**845,207**	**1,063,706**	**1,389,245**	**1,405,376**
Average:	**46,396**	**32,755**	**28,234**	**24,380**	**22,695**	**23,922**	**25,675**	**27,033**	**28,174**	**34,313**	**46,308**	**45,335**
Minimum:	**28,889**	**27,056**	**25,453**	**22,188**	**20,849**	**19,559**	**23,021**	**21,550**	**21,879**	**24,832**	**35,756**	**35,090**
Maximum:	**90,730**	**41,460**	**33,094**	**25,605**	**24,456**	**26,841**	**30,035**	**31,536**	**36,072**	**43,843**	**61,002**	**65,431**
Non compliance (max flow)	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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

2021 Influent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)

Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1						471						
2		160	250		391						172	
3								320			87	
4					341		352				86	
5	124			318							98	
6						334	328				108	
7		221	231						344		118	226
8											120	
9		238	243		393						95	
10	192										114	
11				275			349	399			128	
12	126									314	141	
13				338		290	319				138	
14			258						289		76	192
15						286					136	
16		262	280		369						210	
17	224										258	
18				307							144	
19	252									313	178	
20				NR		344	310				186	
21		230	261						380		194	
22						354						
23		233	300								230	
24	252				350							
25				322								
26	212									147		
27				345		302						
28		230							272	191		
29						333				NR		
30					374					151	216	
31	142									230		
Average:	**191**	**225**	**260**	**318**	**370**	**339**	**332**	**360**	**321**	**224**	**147**	**209**

2021 Effluent 5-day Biochemical Oxygen Demand (BOD_5) (mg/L)

Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	13.40	2.78	3.60	8.19	5.87	6.88	3.60	4.01	6.39	6.55	4.95	2.42
2	9.00	2.84	3.52	4.61	5.56	5.95	3.07	4.73	5.71	5.97	4.55	3.15
3	4.19	3.64	4.18	5.43	5.50	4.29	3.24	4.82	3.99	5.65	3.36	4.93
4	3.60	5.18	3.19	5.13	5.11	3.78	3.89	3.38	3.91	5.05	3.36	4.37
5	5.70	4.63	3.48	5.34	3.84	3.36	3.20	6.17	4.61	6.95	3.28	4.61
6	3.01	3.70	3.37	5.22	4.29	4.80	3.34	2.64	5.57	5.11	3.16	5.19
7	3.54	3.69	3.33	5.28	4.38	5.79	2.46	2.94	6.45	5.03	3.06	6.81
8	3.53	4.52	3.45	4.91	4.27	5.09	2.06	7.29	6.71	5.75	3.16	4.69
9	4.16	4.05	3.76	6.77	4.27	4.03	2.47	7.06	7.05	6.16	3.20	4.92
10	4.85	4.07	3.73	5.51	4.98	4.54	2.74	7.11	8.48	6.23	3.28	6.04
11	4.27	4.29	3.18	6.05	4.44	4.87	4.03	4.46	10.50	6.14	3.06	2.99
12	6.05	3.49	3.71	5.57	4.50	5.81	3.51	4.96	8.53	4.90	3.16	4.43
13	5.97	3.81	4.36	6.19	3.75	4.85	3.27	4.75	8.38	4.67	2.84	5.05
14	4.81	4.80	4.72	5.95	4.83	5.07	3.15	2.48	7.19	5.45	3.36	4.77
15	4.27	4.35	6.13	6.21	4.73	4.27	3.09	6.59	5.30	6.10	3.42	3.81
16	4.69	4.90	5.55	4.56	5.50	4.57	2.77	5.93	6.87	5.56	3.20	3.72
17	4.13	3.60	6.65	7.15	6.51	NR	3.97	6.77	7.91	4.65	6.77	4.08
18	4.22	3.67	6.23	8.27	4.93	4.37	6.17	7.91	4.63	4.82	3.42	4.23
19	4.95	2.54	6.58	7.83	5.60	3.70	4.80	8.23	5.27	4.82	3.02	3.75
20	4.36	2.72	6.63	5.64	6.73	3.32	3.35	8.36	6.41	4.55	2.98	3.11
21	6.63	3.38	6.81	8.79	4.54	4.79	4.42	7.28	7.70	4.93	2.80	4.00
22	4.44	3.61	5.42	5.95	3.89	12.30	3.12	7.00	9.59	6.01	3.37	4.40
23	3.39	3.80	9.31	5.19	1.98	14.20	3.08	6.49	6.26	5.77	3.65	4.78
24	4.13	3.39	7.92	4.84	4.19	22.40	3.94	7.63	9.01	4.91	3.57	4.57
25	4.61	3.26	8.33	4.64	4.54	31.80	6.42	5.53	8.27	4.55	4.60	5.66
26	4.49	3.28	8.33	5.63	6.25	24.40	5.42	4.96	10.80	3.90	3.09	4.83
27	3.76	4.08	9.71	5.78	6.39	38.50	5.24	5.40	8.20	3.90	4.50	5.25
28	3.50	3.92	11.70	4.50	4.03	4.62	3.33	6.28	9.59	4.39	3.34	5.28
29	3.14		9.94	4.74	5.37	4.71	3.79	5.47	10.10	3.03	3.09	5.41
30	3.54		8.77	4.96	7.31	5.33	3.33	6.06	7.49	4.01	3.52	5.16
31	2.80		8.01		8.44		4.21	6.08		2.93		6.10
Average	**4.75**	**3.79**	**5.92**	**5.83**	**5.05**	**8.70**	**3.69**	**5.77**	**7.23**	**5.11**	**3.54**	**4.60**
Non compliance	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Non-compliant days are highlighted yellow,
GNPCC Maximum BOD_5: 130 mg/L

2021 Influent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1						597					630	
2		254	350		870						220	
3								503			106	
4					525		1350				88	
5	172			702							98	
6						511	1120				106	
7		328	422						480		137	254
8						462					141	
9		294	326		686						158	
10	418										138	
11				455			708	573			136	
12	186									467	140	
13				490		618	771				150	
14			358						390		101	213
15						662					241	
16		300	378		780						447	
17	302							453			474	
18				530							198	
19	344									640	252	
20				493		698	460				254	
21		362	406						1380		278	263
22						600						
23		368	438								668	
24	384				620							
25				668								
26	254									117		
27				420		462						
28		438	382						393	108		
29						654				98		
30					920					158	308	
31	360									220		
Average:	**303**	**335**	**383**	**537**	**734**	**585**	**882**	**510**	**661**	**258**	**238**	**243**

2021 Effluent Total Suspended Solids (TSS) (mg/L)												
Day	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	14.30	3.25	3.80	8.66	4.50	5.4	4.67	4.34	10.8	6.50	4.66	4.00
2	10.80	3.66	3.84	5.00	5.40	4.8	5.50	4.70	9.2	6.67	4.66	6.00
3	4.88	4.34	4.50	5.34	5.70	4.0	7.16	5.66	6.5	5.90	2.33	6.67
4	3.88	5.66	3.66	3.50	4.00	4.5	5.60	5.50	7.0	5.10	0.00	6.50
5	5.50	4.84	5.83	5.25	4.17	4.5	5.20	4.50	5.4	8.50	2.34	7.20
6	4.84	4.00	4.16	6.00	4.16	5.2	5.10	5.16	6.2	5.50	2.16	7.30
7	4.33	3.62	3.70	4.50	3.83	5.1	3.33	6.34	7.5	5.80	2.60	11.00
8	5.00	4.20	3.60	3.83	4.67	5.5	4.34	6.60	9.2	6.10	0.00	6.66
9	6.67	5.34	3.67	6.33	6.00	6.5	4.34	7.30	10.3	6.20	1.80	7.34
10	6.25	4.00	3.84	5.17	3.90	7.3	3.16	7.50	10.0	6.00	2.16	8.50
11	7.25	5.67	3.33	4.40	7.00	8.2	4.40	5.00	11.0	7.10	2.84	7.16
12	9.50	5.83	3.50	4.60	5.50	7.3	4.80	5.16	11.6	6.66	3.84	7.00
13	9.50	4.84	5.16	3.90	6.34	5.9	3.70	4.66	9.0	7.50	2.33	7.20
14	6.83	5.84	5.30	4.33	5.84	5.1	5.50	5.67	7.3	8.66	2.70	7.00
15	8.66	4.25	4.40	6.00	4.66	5.6	4.60	7.00	6.3	9.67	2.10	7.16
16	8.00	3.33	4.50	4.16	4.20	5.6	6.00	7.50	6.0	8.00	3	6.67
17	7.38	3.16	5.17	4.50	4.20		7.83	10.50	7.3	6.60	4.50	5.16
18	7.38	3.33	5.34	6.60	6.34	3.7	5.30	11.70	5.2	5.40	4.34	4.83
19	7.66	3.84	5.34	6.70	5.84	5.2	4.80	11.30	6.0	6.50	3.00	5.16
20	6.00	2.67	6.50	4.66	6.00	3.4	4.50	13.40	5.8	6.84	3.66	5.50
21	6.50	3.70	6.80	8.33	4.83	3.5	5.67	9.85	7.7	7.17	3.50	
22	6.00	3.20	6.16	4.83	3.84	34.2	4.84	10.40	8.8	7.50	3.80	6.50
23	4.50	3.70	9.00	4.16	2.84	48.4	6.00	8.16	10.0	8.16	3.90	6.17
24	5.75	3.84	8.50	3.66	4.50	57.0	5.34	10.00	10.0	6.80	5.00	6.84
25	5.50	4.84	9.17	4.50	3.60	101.5	5.84	5.33	9.3	5.60	6.67	10.60
26	9.84	3.33	9.34	4.20	5.10	89.6	5.50	5.50	13.0	6.34	4.50	12.20
27	4.84	5.33	11.00	4.34	5.20	132	9.00	5.50	10.4	5.84	7.66	8.50
28	4.66	5.30	15.00	5.66	6.34	5.3	4.84	5.00	12.50	6.17	5.80	7.33
29	4.83		10.34	4.33	6.00	4.6	4.84	4.70	10.30	5.16	4.00	8.00
30	3.84		10.80	4.16	7.20	3.8	6.34	7.60	9.00	4.67	5.70	6.66
31	3.12		8.50		7.30		4.00	9.00		4.00		8.16
Average:	**6.58**	**4.25**	**6.25**	**5.05**	**5.13**	**20.1**	**5.23**	**7.11**	**8.62**	**6.54**	**3.50**	**7.17**
Non-Compliance	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**

Non-compliant days are highlighted yellow.
GNPCC Maximum TSS: 130 mg/L

2021 Influent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1		12.7	13.8						19.6		16.7	15.6
2						19.7					16.9	
3		13.8	14.4		16.1						15.8	
4								22.6			16.9	
5					17.4		21.2				17.2	
6	16.8			15.3							16.2	
7						18.2	21.2				16.4	
8		13.5	14.7						21.0		15.2	15.2
9						17.9					16.7	
10		13.3	14.0		17.2						15.5	
11	13.4										16.9	
12				14.8			22.3	21.9			16.2	
13	12.6									16.7	15.9	
14				15.9		19.0	21.7				15.3	
15			14.2						19.1		16.0	13.7
16						18.5					14.6	
17		13.3	13.8		17.7						14.5	
18	13.7							21.5			14.9	
19				16.1							15.8	
20	13.5									16.8	15.3	
21				16.0		20.0	21.2				15.8	
22		13.4	13.6						19.8		14.7	13.7
23						19.7						
24		13.2	14.8								14.5	
25	12.3				17.4							
26				16.8								
27	13.3									17.2		
28				16.0		22.6						
29									17.5	17.1		
30						21.0				16.0		
31					19.4					16.2		
Average	**13.7**	**13.3**	**14.2**	**15.8**	**17.5**	**19.6**	**21.5**	**22.0**	**19.4**	**16.7**	**15.8**	**14.6**

2021 Effluent Temperature												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	13.2	13.4	14.1	15.2	16.8	20.1	21.2	22.2	19.5	18.3	15.5	15.5
2	13.1	13.2	13.8	15.8	16.5	20.0	20.7	22.2	21.1	18.5	16.8	14.9
3	12.1	13.8	14.0	14.5	16.6	19.9	20.6	22.8	20.5	18.5	16.1	14.5
4	13.9	13.8	14.2	13.8	17.0	18.2	20.7	22.8	20.4	18.8	16.4	13.7
5	13.0	13.6	14.1	14.4	16.6	17.8	21.9	22.4	20.0	18.8	16.3	14.1
6	13.4	13.4	14.3	15.0	17.0	17.6	21.8	22.2	21.1	17.7	15.4	13.8
7	13.3	13.7	13.2	14.6	16.6	18.6	21.8	21.2	21.3	18.0	15.3	14.8
8	14.1	13.1	13.6	14.2	16.6	19.0	20.7	21.0	20.8	17.9	15.0	14.7
9	14.0	12.8	14.1	14.5	16.4	18.0	22.2	21.0	21.1	18.5	15.1	14.5
10	13.8	12.7	13.8	13.8	16.7	17.7	21.6	22.8	21.0	18.4	15.0	14.3
11	14.0	13.5	14.0	14.2	17.6	18.2	21.9	22.8	20.0	18.0	14.8	14.3
12	14.1	13.8	14.3	14.8	16.6	18.1	22.6	22.0	19.9	17.8	15.7	13.2
13	12.8	11.7	14.4	14.9	17.3	18.5	22.3	23.5	20.9	16.2	15.5	14.7
14	12.8	12.2	13.9	15.3	18.3	19.4	22.0	22.2	19.6	17.4	15.6	13.4
15	13.5	13.3	13.6	16.0	17.2	19.2	22.4	22.3	19.1	17.5	14.7	13.6
16	8.5	13.2	14.1	16.7	18.2	18.9	21.4	22.4	19.0	17.9	13.6	13.8
17	13.8	12.7	13.8	16.3	18.2	20.0	21.2	22.0	18.7	17.7	14.2	13.5
18	13.7	14.2	14.1	16.2	17.3	20.0	21.4	21.8	19.8	16.8	13.6	13.0
19	13.4	13.5	14.4	17.0	15.8	19.2	22.4	22.2	19.2	17.4	13.8	13.4
20	13.7	12.7	14.0	16.6	16.9	19.9	22.3	21.4	19.5	17.1	15.6	12.7
21	14.3	13.7	14.2	15.8	17.6	20.8	21.3	21.1	19.4	16.8	15.2	13.7
22	13.1	13.6	13.5	15.9	17.6	20.8	21.3	20.4	19.5	16.9	14.7	13.4
23	13.3	13.7	14.3	16.1	17.3	19.6	21.4	20.9	20.0	17.0	14.8	13.1
24	13.6	12.8	14.3	16.3	17.7	20.6	21.7	20.6	19.7	17.1	14.7	13.2
25	12.8	12.8	14.2	16.0	17.8	20.9	22.4	20.7	19.1	16.8	13.9	12.6
26	13.0	13.9	14.6	16.8	17.7	21.4	22.8	20.8	19.0	17.0	15.1	11.3
27	12.7	13.7	14.3	16.8	17.9	21.6	22.0	21.5	19.0	16.1	15.0	11.2
28	12.9	13.9	14.1	16.0	17.7	23.0	21.8	20.8	19.5	16.4	15.2	12.5
29	13.6		14.4	16.7	17.5	23.0	22.6	20.8	18.3	15.6	15.0	12.8
30	13.2		14.0	16.4	17.5	21.8	22.1	20.6	19.4	15.7	15.1	12.6
31	13.5		15.4		19.4		22.2	20.0		15.3		12.3
Average	**13.2**	**13.3**	**14.1**	**15.6**	**17.3**	**19.7**	**21.8**	**21.7**	**19.8**	**17.4**	**15.1**	**13.5**

2021 Influent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1		7.22	7.19						7.24		6.62	7.43
2						7.09					7.19	
3		7.18	7.15		7.10						7.29	
4								7.11			7.29	
5					7.23		7.16				7.25	
6	7.27			7.16							7.33	
7						7.15	7.33				7.21	
8		7.21	7.81						7.28		7.18	7.46
9						7.27					7.11	
10		7.23	7.24		7.42						7.21	
11	7.39										7.20	
12				7.29			7.28	7.27			7.17	
13	7.33									7.88	7.14	
14				7.13		7.07	7.20				7.17	
15			7.34						7.14		7.22	7.39
16						7.11					7.71	
17		7.31	7.28		7.14						7.05	
18	7.13							7.44			7.50	
19				7.27							7.45	
20	7.27									7.45	7.42	
21				7.22		6.98	7.15				7.47	
22		7.44	7.18						7.41		7.38	7.39
23						7.16						
24		7.43	7.21								7.32	
25	7.44				7.30							
26				7.09								
27	7.36									7.19		
28				7.46		7.18						
29									7.26	7.39		
30						7.03				7.18		
31					7.30					7.07		
Average	**7.31**	**7.29**	**7.30**	**7.23**	**7.25**	**7.12**	**7.22**	**7.27**	**7.27**	**7.36**	**7.26**	**7.42**

2021 Effluent pH												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	6.91	6.98	7.04	6.76	6.98	6.98	7.38	6.70	7.20	7.11	6.94	6.88
2	6.95	7.04	7.10	6.82	6.98	6.98	7.28	6.64	7.31	7.11	6.95	6.82
3	6.99	7.02	7.22	6.91	6.93	6.95	7.26	6.64	7.37	7.22	7.07	6.98
4	6.97	7.10	7.18	6.82	7.06	7.04	7.49	6.66	7.32	7.12	6.93	7.13
5	6.92	7.07	7.12	6.74	7.00	7.09	7.22	6.71	7.37	7.38	6.89	7.08
6	6.96	6.99	7.09	6.88	6.97	7.18	7.23	6.76	7.20	7.32	6.92	6.98
7	6.98	7.01	7.28	6.79	7.01	7.12	7.30	6.81	7.16	7.24	6.91	6.97
8	7.05	7.10	7.22	6.95	6.97	7.07	7.30	6.80	7.10	7.40	6.86	6.99
9	7.00	7.12	7.12	7.00	7.01	7.18	7.30	6.64	7.12	7.42	6.83	7.00
10	6.98	7.12	7.08	7.05	7.00	7.11	7.34	6.57	7.10	7.40	6.70	6.91
11	7.08	7.08	7.10	7.15	6.82	7.10	7.39	6.57	7.16	7.33	6.90	7.01
12	6.99	7.05	7.10	6.96	6.95	7.25	7.14	6.74	7.14	7.20	6.82	6.99
13	7.00	7.09	7.07	7.01	6.90	7.17	7.19	6.72	7.00	7.32	6.83	6.97
14	6.91	7.13	7.11	6.91	6.97	7.06	7.24	6.69	6.98	7.14	6.81	6.94
15	6.93	7.03	7.11	6.93	7.01	7.08	7.16	6.76	7.11	7.21	6.60	7.00
16	7.58	7.12	6.98	6.90	6.97	6.98	7.18	6.78	6.97	7.15	6.42	6.96
17	6.99	7.09	7.01	6.75	6.98	7.08	7.14	6.76	7.02	7.04	7.00	6.96
18	7.01	7.09	6.98	6.84	7.02	7.06	7.11	6.73	6.97	7.16	7.17	7.06
19	6.93	7.06	6.96	7.00	7.05	7.10	6.97	6.87	6.91	7.21	7.08	7.07
20	7.05	7.11	6.96	7.02	7.05	7.25	6.81	6.90	6.94	7.19	7.00	7.01
21	6.88	7.16	6.97	6.99	6.99	7.00	6.76	7.01	6.90	7.20	7.07	6.94
22	7.02	7.30	7.02	7.01	7.02	7.02	6.73	6.99	6.88	7.21	7.04	7.01
23	7.01	7.26	6.93	7.01	7.03	7.03	6.72	7.05	6.86	7.01	7.04	7.00
24	6.95	7.30	6.89	6.95	7.09	7.16	6.67	6.99	6.97	6.82	6.99	7.02
25	7.18	7.23	6.95	7.05	7.00	7.26	6.56	6.96	6.93	6.98	7.13	7.04
26	7.12	7.11	6.88	7.06	7.02	7.32	6.66	6.95	6.96	6.75	6.98	7.01
27	7.03	7.15	7.01	7.14	7.00	7.33	6.74	7.06	6.89	6.77	6.98	7.04
28	7.11	7.15	6.91	7.13	6.97	7.38	6.85	7.10	6.89	6.99	7.07	7.02
29	7.01		6.88	7.04	7.04	7.23	6.88	7.08	7.18	7.01	6.95	7.05
30	7.02		6.81	7.05	7.07	7.28	6.80	7.17	6.92	6.87	6.98	7.09
31	6.97		6.77		7.12		6.68	7.02		7.05		7.07
Average	**7.02**	**7.11**	**7.03**	**6.95**	**7.00**	**7.13**	**7.05**	**6.83**	**7.06**	**7.14**	**6.93**	**7.00**

2021 Effluent Ammonia (Total N as mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	11.7	20.2	27.0	20.1	22.0	20.8	35.4	7.6	32.8	18.4	17.5	11.0
2	11.0	18.8	26.4	17.2	20.4	19.0	35.3		32.4	19.4	19.7	12.2
3	11.5	20.7	26.9	16.0	19.4	21.0	39.0	8.6	30.8		13.4	
4	12.6	23.0	26.8	17.2	20.0	22.6		7.7	33.7		10.2	
5	13.3	19.5	25.6	17.6	16.3	23.8		7.2		26.7	10.3	
6	12.6	21.3	23.3	17.8	16.9		33.6	8.8		29.5	10.8	
7	13.7	23.2	23.7	17.6	21.4		32.0	9.4	27.8	31.8		15.8
8	15.1	21.6	22.5	18.6	21.0	23.9	33.7			33.1	9.3	14.4
9	16.8	23.1	22.0	21.4	20.9	25.7	34.1			32.8	9.8	12.4
10	16.4	25.0	23.2	20.0	18.1	27.0	30.6	7.3	23.8		7.2	
11	16.8	25.2	25.0	20.6	15.9	27.1		5.8			7.8	
12	12.8	25.6	23.2	19.2	17.0	29.8		6.5		25.9	8.3	11.8
13	11.1	26.0	23.2	19.8	18.2		30.1	8.0		25.4	9.2	
14	12.4	28.8	23.5	20.0	18.2			8.6	17.9	27.8		12.4
15	14.1	26.6	21.4	19.9	18.1	26.1	26.1	10.3	18.2	26.6		13.1
16	15.9	25.0	20.7	17.5		28.0	26.4	13.3		27.2	3.5	12.4
17	17.3	25.1	21.1	18.3			24.0	12.9			13.6	13.4
18	17.0	25.0	20.6	16.3	19.0	26.2		11.6			13.8	16.0
19	18.8	23.6	20.8	16.8	19.8	28.2		14.2	13.0	22.4		12.8
20	20.7	24.2	17.7	21.0	18.7		13.2	13.8	13.0	20.4		11.4
21	22.0	24.2	18.8	21.8	19.4		12.2	12.8	11.6	18.7		11.6
22	21.2	22.6	16.8	22.1	18.6	25.9		12.7	11.0	17.0		16.0
23	22.2	23.6	15.6	20.0	18.9	27.4	10.0	14.3	13.2	14.9	14.9	12.9
24	22.8	25.6	16.8	23.8		26.0	8.4	13.0			16.0	13.3
25	20.7	25.9	18.2	23.7		31.0	8.8	17.8	9.9		17.3	11.4
26	18.8	26.8	15.3	22.5	20.0	39.4	9.4	19.7		8.5	15.2	13.4
27	21.8	28.6	15.9	22.2			9.7	19.6		9.1	15.8	16.8
28	18.1	27.8	18.6	22.2	16.8		11.4	20.9	17.7	12.6		17.0
29	19.6		16.6	18.8	17.7	38.6	10.6	26.2		10.8		15.5
30	20.5		15.9	21.8		40.3	8.7	27.6	16.0	13.1		17.1
31	20.1		18.9				6.6	25.8		15.5		18.6
Average	**16.8**	**24.2**	**21.0**	**19.7**	**18.9**	**27.5**	**21.3**	**13.3**	**20.2**	**21.2**	**12.2**	**13.9**

2021 Un-ionized Ammonia (Total N as mg/L)												
Day	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1	0.037	0.07	0.170	0.064	0.070	0.071	0.283	0.013	0.194	0.063	0.0440	0.024
2	0.035	0.070	0.120	0.040	0.082	0.051	0.282		0.280	0.097	0.085	0.039
3	0.037	0.083	0.130	0.027	0.078	0.057	0.332	0.018	0.228		0.050	
4	0.040	0.0690	0.140	0.055	0.064	0.061		0.020	0.200		0.044	
5	0.045	0.0720	0.095	0.053	0.044	0.081		0.019		0.182	0.023	
6	0.043	0.0724	0.093	0.034	0.068		0.269	0.0190		0.150	0.037	
7	0.059	0.090	0.100	0.040	0.079		0.272	0.021	0.142	0.321		0.063
8	0.060	0.093	0.097	0.043	0.057	0.081	0.286			0.220	0.025	0.058
9	0.072	0.099	0.110	0.058	0.056	0.110	0.290			0.554	0.028	0.031
10	0.066	0.120	0.086	0.060	0.078	0.138	0.208	0.022	0.100		0.016	
11	0.057	0.120	0.100	0.062	0.035	0.150		0.011			0.018	
12	0.041	0.110	0.093	0.044	0.029	0.140		0.013		0.130	0.022	0.047
13	0.030	0.110	0.093	0.050	0.049		0.178	0.012		0.100	0.020	
14	0.042	0.120	0.110	0.054	0.046			0.023	0.077	0.150		0.040
15	0.045	0.120	0.100	0.050	0.040	0.140	0.133	0.031	0.058	0.140		0.042
16	0.054	0.092	0.077	0.030		0.143	0.120	0.036		0.120	0.004	0.031
17	0.069	0.130	0.063	0.037			0.110	0.056			0.046	0.034
18	0.068	0.092	0.082	0.041	0.048	0.168		0.039			0.019	0.054
19	0.081	0.071	0.062	0.042	0.067	0.152		0.048	0.038	0.150		0.041
20	0.089	0.110	0.053	0.052	0.054		0.034	0.051	0.035	0.110		0.028
21	0.0950	0.110	0.070	0.065	0.052		0.021	0.035	0.031	0.075		0.029
22	0.1100	0.110	0.054	0.088	0.063	0.104		0.051	0.037	0.054		0.054
23	0.0890	0.110	0.036	0.064	0.061	0.186	0.019	0.084	0.049	0.030	0.060	0.041
24	0.110	0.110	0.050	0.095		0.166	0.013	0.035			0.048	0.043
25	0.083	0.096	0.055	0.130		0.211	0.014	0.066	0.027		0.074	0.026
26	0.051	0.140	0.034	0.120	0.068	0.335	0.014	0.073		0.014	0.038	0.040
27	0.081	0.110	0.030	0.089			0.022	0.073		0.021	0.0540	0.054
28	0.054	0.130	0.060	0.089	0.045		0.037	0.077	0.113	0.032		0.054
29	0.072		0.042	0.081	0.048	0.413	0.028	0.089		0.027		0.057
30	0.066		0.032	0.087		0.431	0.017	0.221	0.075	0.044		0.063
31	0.068		0.064				0.012	0.130		0.050		0.069
Average	**0.063**	**0.101**	**0.081**	**0.061**	**0.058**	**0.161**	**0.130**	**0.049**	**0.105**	**0.123**	**0.038**	**0.044**

Note: Effluent grab sample result used prior to September 10th. Effluent composite sample used after September 10th (after commissioning of secondary process).

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 FLOW (2)				
January 1, 2021	On 2021 January 1 the GNPCC effluent flow was 90,730 m3, which exceeds the permit limit of 80,870 m3.	GNPCC Chief Operator was notified	Infiltration from rainfall event.	Rainfall (atmospheric river) combined with snowpack caused high inflow and infiltration to the GNPCC. Plant operation was optimized to handle the added "diluted" flow, and the CON is working on updating their wastewater collection system to reduce I&I.
January 2, 2021	On 2021 January 2 the GNPCC effluent flow was 87,991 m3, which exceeds the permit limit of 80,870 m3.	GNPCC Chief Operator was notified	Infiltration during rainfall event.	Rainfall (atmospheric river) combined with snowpack caused high inflow and infiltration to the GNPCC. Plant operation was optimized to handle the added "diluted" flow, and the CON is working on updating their wastewater collection system to reduce I&I.
GNPCC TSS(1)				
28-Jun-21	The 2021 June 27 final effluent composite TSS was 132 mg/L which exceeds the MOE permit limit of 130 mg/L	GNPCC Chief Operator was notified.	Poor settling sludge caused solids to be washed over the weirs overnight.	High SVIs, having one clarifier out of service, and excessive hot weather contributed to a biological change in nitrate levels. This caused solids (floating sludge) to overflow the clarifier weir. Operations worked with AECOM to get a better understanding of proper nitrate levels and pH requirements to turn the WWTP around, and additional early warning parameters have been placed into Watertrax to warn operations of possible variances in pH and nitrate levels.

GNPCC SAMPLING (1)				
17-Jun-21	The GNPCC final effluent composite sampler was not started and no composite sample was collected for 2021 June 17. GNPCC's MOE permit states that a final effluent composite cBOD and TSS are required daily.	GNPCC Chief Operator was notified of the non-conformance. The Senior Laboratory Technician confirmed that the final effluent composite sampler was operating normally. This confirmed the suspicion that it was not turned on the previous day. The previous day's sampler was notified of the error. The GNPCC lab will analyze the final effluent grab (June 18/21 @ 08:45) for cBOD and TSS to show that the risk of the missing composite sample being outside of permit regulations is negligible.	Operator error (not turning sampler on and missing the check during afternoon rounds).	Operator error was determined as the effluent sampler was not turned back on after morning rounds sample collection and was also not checked on afternoon rounds. The NEW staff member was updated as to the morning and afternoon rounds procedures and updated on the importance of ensuring the sampler is always operational.

Appendix D – External Laboratory Test Results

2021 GNPCC EFFLUENT								
Parameter	Units	16-Mar-21	08-Jun-21	08-Jun-21	13-Sep-21	13-Dec-21	14-Dec-21	Year End
pH*	pH units	7.0	7.37	7.1	7.2	-	7.1	7.2
Survival Rate (Rainbow Trout)*	%	100	-	100	100	-	100	100
Alkalinity (total, as CaCO3)	mg/L	-	120	-	-	93	-	107
Dissolved Chloride	mg/L	-	170	-	-	230	-	200
Total Kjeldahl Nitrogen / TKN	mg/L	-	19.5	-	-	6.98	-	13.2
Oil and Grease (total)	mg/L	-	<1.0	-	-	<1.0	-	<1.0
Dissolved Sulphate	mg/L	-	41	-	-	37	-	39
Nitrate (as N)	mg/L	-	2.40	-	-	4.26	-	3.33
Nitrite (as N)	mg/L	-	4.00	-	-	0.191	-	2.10
Sulphide (total)	mg/L	-	0.015	-	-	0.010	-	0.013
Cyanide (total)	mg/L	-	0.00215	-	-	0.00139	-	0.00177
Fluoride	mg/L	-	0.061	-	-	<0.050	-	<0.056
Total Organic Carbon / TOC	mg/L	-	57	-	-	6.6	-	32
Phosphorus (total)	mg/L	-	3.4	-	-	1.7	-	2.6
Total Phenols	mg/L	-	0.0039	-	-	<0.0015	-	<0.0027
Polychlorinated Biphenyls / PCBs	ug/L	-	<0.050	-	-	<0.050	-	<0.050
METALS Scan by ICP								
Aluminum (total)	ug/L	-	9.8	-	-	19.0	-	14.4
Arsenic (total)	ug/L	-	0.55	-	-	0.43	-	0.49
Barium (dissolved)	ug/L	-	2.8	-	-	7.3	-	5.1
Boron (dissolved)	ug/L	-	206	-	-	161	-	180
Cadmium (dissolved)	ug/L	-	<0.010	-	-	0.023	-	<0.017
Chromium (total)	ug/L	-	<1.0	-	-	<1.0	-	<1.0
Cobalt (dissolved)	ug/L	-	0.53	-	-	0.25	-	0.39
Copper (dissolved)	ug/L	-	8.15	-	-	9.23	-	8.69
Iron (dissolved)	ug/L	-	130	-	-	52.6	-	90.0
Lead (total)	ug/L	-	<0.20	-	-	0.23	-	<0.22
Manganese (dissolved)	ug/L	-	65.1	-	-	7.3	-	40
Mercury (total)	ug/L	-	<0.038	-	-	<0.0019	-	<0.020
Selenium (total)	ug/L	-	0.13	-	-	0.10	-	0.12
Molybdenum (total)	ug/L	-	1.6	-	-	<1.0	-	<1.3
Nickel (dissolved)	ug/L	-	1.4	-	-	1.3	-	1.4
Silver (total)	ug/L	-	<0.020	-	-	<0.020	-	<0.020
Tin (total)	ug/L	-	<5.0	-	-	<5.0	-	<5.0
Zinc (total)	ug/L	-	27.7	-	-	34.4	-	30.0
VOC Scan								
Chloroform	ug/L	-	3.2	-	-	1.8	-	2.5
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	-	<10	-	-	<2.0	-	<6.0
Di-n-Butylphthalate	ug/L	-	<10	-	-	<2.0	-	<6.0

2021 GNPCC INFLUENT		
Parameter	Unit	08-Jun-21
pH	pH Units	6.98
Alkalinity (total, as CaCO3)	mg/L	<1.0
Chloride	mg/L	160
Total Kjeldahl Nitrogen / TKN	mg/L	61.5
Oil and Grease (total)	mg/L	48
Sulphate	mg/L	33
Fluoride	mg/L	0.088
Nirate (as N)	mg/L	<0.020
Nitrite (as N)	mg/L	<0.0050
Total Organic Carbon / TOC	mg/L	44
Phosphorus (total)	mg/L	8.7
Sulphide (total)	mg/L	0.47
Cyanide (total)	mg/L	0.00266
Polychlorinated Biphenyls / PCBs	ug/L	<5.0
Total Phenols*	mg/L	0.056
METALS Scan by ICP		
Aluminum (total)	ug/L	593
Arsenic (total)	ug/L	1.10
Barium (dissolved)	ug/L	5.6
Boron (dissolved)	ug/L	202
Cadmium (dissolved)	ug/L	0.033
Chromium (total)	ug/L	4.1
Cobalt (dissolved)	ug/L	0.47
Copper (dissolved)	ug/L	30.1
Iron (dissolved)	ug/L	1,440
Lead (total)	ug/L	5.24
Manganese (dissolved)	ug/L	59.2
Mercury (total)	ug/L	<0.038
Molybdenum (total)	ug/L	2.7
Nickel (dissolved)	ug/L	2.2
Selenium (total)	ug/L	0.61
Silver (total)	ug/L	0.403
Tin (total)	ug/L	<5.0
Zinc (total)	ug/L	202
VOC Scan		
Chloroform	ug/L	4.5
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	1.4
Ethylbenzene	ug/L	<0.40
Naphthalene	ug/L	<0.10
Phthalate Esters		
Di(2-ethylhexyl)phthalate	ug/L	<100
Di-n-Butylphthalate	ug/L	<40

2021 GNPCC BIOSOLIDS													OMRR Regulatory Limits (Class B Biosolids)
Parameter	Unit	17-Feb-21	03-Mar-21	19-May-21	10-Jun-21	12-Aug-21	31-Aug-21	08-Sep-21	20-Oct-21	17-Nov-21	08-Dec-21	Average *	
Fecal coliforms nw (dry weight) (MPN / PA)	MPN/g	860	7,600	3,700	32,000	-	520	11,000	780	2,300	15,000	**3,700**	**2,000,000**
Percent Moisture	%	80	78	79	78	78	79	78	78	79	77	**78**	**-**
Total Solids	%	19.7	22.3	21.2	21.8	21.9	-	21.6	-	-	22.7	**21.6**	**-**
Volatile Solids	%	74.5	75.4	75.7	73.0	74.8	-	73.7	-	-	73.7	**74.4**	**-**
Total Kjeldahl Nitrogen / TKN	%	6.40	7.10	6.70	7.00	9.30	-	5.90	-	-	6.80	**7.03**	**-**
Phosphorus nw (total)	mg/kg	26,000	26,300	22,400	23,300	22,800	-	26,000	-	-	19,300	**23,700**	**-**
Polychlorinated Biphenyls / PCBs nw	mg/kg	<0.05	<0.50	<0.50	<1.0	<0.05	-	<4.6	-	-	<4.4	**<1.6**	**-**
Arsenic nw (total)	mg/kg	2.76	2.75	2.32	2.31	2.23	-	2.13	-	-	2.96	**2.49**	**75**
Cadmium nw (total)	mg/kg	1.41	1.32	0.414	1.57	1.39	-	1.42	-	-	1.63	**1.31**	**20**
Chromium nw (total)	mg/kg	36.2	36.7	29.7	30.8	30.7	-	30.7	-	-	29.2	**32.0**	**1,060**
Cobalt nw (total)	mg/kg	4.01	3.64	2.69	2.85	2.60	-	2.61	-	-	3.41	**3.12**	**150**
Copper nw (total)	mg/kg	477	492	503	601	637	-	631	-	-	569	**559**	**2,200**
Iron nw (total)	mg/kg	45,400	44,400	38,300	39,300	41,800	-	50,100	-	-	35700	**42,100**	**-**
Lead nw (total)	mg/kg	22.7	21.0	21.4	24.0	22.7	-	23.8	-	-	30.2	**23.7**	**500**
Mercury nw (total)	mg/kg	0.710	0.66	0.920	0.872	0.805	-	0.878	-	-	1.38	**0.889**	**15**
Molybdenum nw (total)	mg/kg	6.38	6.47	7.24	8.42	7.98	-	8.59	-	-	9.24	**7.76**	**20**
Nickel nw (total)	mg/kg	13.5	13.2	11.6	14.2	14.0	-	13.5	-	-	17.2	**13.9**	**180**
Potassium nw (total)	mg/kg	1010	905	927	949	908	-	893	-	-	882	**925**	**-**
Selenium nw (total)	mg/kg	4.53	4.57	4.59	4.91	4.82	-	4.87	-	-	5.06	**4.76**	**14**
Zinc nw (total)	mg/kg	828	804	896	970	1,030	-	957	-	-	896	**912**	**1,850**

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

Appendix E – Odour Complaint Reports

Odour Complaints

Date of Occurrence	Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Conclusion for this Environmental Incident
Incident Type: GNPCC - Odour (x6)					
6/8/2021	GNPCC	On June 5, 2021 a neighbor of GNPCC, emailed in regarding an odour concern. The citizen, [redacted] of [redacted] Hammond Bay Road resides in the lower strata yard adjacent to the GNPCC facility. The concern was relayed to GNPCC staff on June 7, 2021 at 9:00am at which time it was investigated.	NA	NA	Incident was handled very well by staff. One corrective action identified. Installation of odour modifier station in headworks area.
7/6/2021	GNPCC	On July 6/21 at around 10:00pm [redacted] noticed an odour at her home on McGuffie Rd. [redacted] contacted [redacted] via email to notify him, and operations investigated the GNPCC facility for odours on the morning of July 6/21.			Odour complaint was handled well by staff. The fact that the grit tank foul air fan was not running may have contributed to odours in the area.
7/10/2021	GNPCC	On July 10/21 at 5:38pm [redacted] from McGuffie Rd ([redacted]) notified [redacted] that there was odour at GNPCC.			Good follow up by staff to try to identify and mitigate any possible odours from site. As no odours were detected during the investigation, it is hard to identify any possible location of where the odour was coming from.
7/28/2021	GNPCC	Strong sewer and "fragrance" smell causing headaches and nausea. Lived in house ([redacted] Hammond Bay Rd.) since July 17th. Started noticing odours on 23rd and smells have been present frequently since.		Checked all Odour Control System components for proper operation. Good. Checked Southeast corner of plant for odours. "Bioreactor" smell present, this could be "fragrance" that neighbour is smelling. Checked for smell at [redacted] Hammond Bay back yard deck at 7:30am July 29th. No odours were detected. Cleaned up floating sludge in WAS boxes and SC stilling wells.	It is believed that the odour detected was the smell from the normal operation of the Bioreactors. The resident from 4240 Hammond Bay Rd. has been invited to tour the site to possibly identify the source of the odour detected at residence.
8/4/2021	Neck Point parking lot and trails	[redacted] is smelling "bad/toxic chemical" odours in Neck Point Park on morning walks. Very noticeable at Neck Pt. parking lot and through most of the interior trails 6 - 730am. 1-3 mornings out of the 5 to 6 mornings per week that they walk. Starting to feel nausea/sick due to the "chemical" smell. "does not smell like sewage"		Called [redacted] and discussed odour complaint. Checked Neck Point park at 830am and detected no odours. I believe they are most likely smelling the bioreactors or the odour is originating from somewhere other than GNPCC. [redacted] will be taking note when he smells it again and will be calling to let us know.	Staff were unable to identify the source of the odour that [redacted] had called in about. Staff will continue to monitor from time to time the Neck Point area for odours and to the possibility of the ability to smell the bioreactors in that area on occasion.

Date of Occurrence	Location	Incident Description	Extent of damage (if applicable)	Preventative Measures Identified	Conclusion for this Environmental Incident
8/12/2021	Morningside beach -------> 4240 Hammond Bay rd.	Complaint was made online through a webform submission. " Smelling sewage all the way from our house ([redacted] Hammond Bay) down to the waterfront at Morningside Park (smell was even stronger down there)."		Tide was relatively high at 9:30 pm so beach smell can be eliminated as a cause. Investigated area at SE end of plant. Walked trails between tennis courts and [redacted] Hammond Bay. Followed all the way to Morningside Park. Unable to detect "sewage" odors. Talked to several people in the area and none have smelled anything recently. Called [redacted] and left message regarding findings. Left call back # and offered facility tour if she would like so we could maybe pinpoint what exactly she is smelling.	As staff and other members of the public were not able to detect any odours during the onsite investigation and plant was operating normally, it makes it very difficult for staff to identify what the source of the odur was and any corrective actions that could be taken.
Incident Type: Nanaimo Pump Stations (3)					
6/28/2021	Wellington Pump Station	On June 27, 2021 [redacted], neighbour to WPS, left a message that there was some odour coming from WPS. Callers address [redacted] Fillinger Cr. The message was received the following day June 28, 2021.			Number of odurs were detected in the area that could be attributed to the station and low tide odours. The fact that the wet well exhaust fan was left running would have contributed to the odours in the area. Staff have been reminded to not run the fan unless needed for maintenance work in wet well.
7/15/2021	WPS	On July 15/21 [redacted], the neighbor to WPS, emailed RS to say there was odour coming from the station the previous evening.			The odour event occurred due to planned maintenance at the station that required the wet well fan to be temporarily turned on for safety reasons. The ionizer has now been fixed and is in service to help reduce further odour issues.
7/29/2021	Wellington Pump Station	"Sewer" smell present and quite strong. Complaint is from neighbour that lives directly beside the Wellington Pump Station.		Had [redacted] go to WPS to investigate. No smell was detected at 15:35. Shut off all ventilation fans at the station to hopefully stop wetwell air from being forced out of the station.	As no odour was detected by staff when investigating, it is hard to identify the issue. The wet well fan was shut off as a proactive action to hopefully reduce any odours that may of been coming from the pump station during a time when the wind was very calm.
Incident Type: Nanaimo Interceptor (1)					
8/5/2021	3888 Gulfview Drive	On August 5th at around 3pm [redacted] reported a sewer smell coming from the sewer pipeline and sewer “chimney” in his backyard at 3888 Gulfview Drive. [redacted] contacted [redacted] in the utilities department where his concern was directed to the WW staff at GNPCC.		[redacted] increased the Ferrous Chloride dosage at DBPS in an attempt to mitigate the influent odours.	It was found that some sewer odours were being detected at this sewer vent. The Ferrous Chloride dosage was increased at DBPS to help reduce some of the odour levels. It was also decided to purchase and install an odour control activated carbon filter on this sewer vent.

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
Interceptor Spill (x9)								
September 16, 2021	Sept 16, 2021 DBFM Spill (DGIR 212231)	2	Kite Way	On Sept 16/21 at 0930hrs [redacted] from Herold Engineering called [redacted] from Kite Way to notify the RDN that there was a small hole in the DBFM causing a spill into the excavation area. Windley contracting had been excavating a trench on Kite Way beside the existing FM, in preparation to lay the new HDPE replacement FM. Removing the backfill around the existing FM caused a 1" hole to open up on the underside of the pipe, and approximately 2m3 of untreated wastewater spilled into the excavation.		[redacted] immediately turned off the pumps at DBPS, and the leak stopped flowing around 0950hrs. [redacted] and [redacted] brought the RDN's 36" repair clamp to Kite Way, and Windley was able to pump out the excavation to an adjacent sewage manhole, and utilized the clamp to repair the FM line. [redacted] notified EMBC at 1103hrs of the incident, and was given DGIR# 212231.		A follow up meeting was held on October 4th to investigate and review this incident and to complete the "End of Spill Report" The end of spill report was sent to the MOE on Oct. 13th and a confirmation receipt received on Oct. 15th. There were no corrective actions found as this leak happened on the old force main pipe during the construction of the new force main. The old pipe has now been replaced.

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
October 28, 2021	Brechin Millstone Spill Oct 28 2021	11168	Brechin Millstone Overflows	October 28, 2021 (EMBC DGIR # 212905) 0630hrs DBPS wetwell 19.1ft and has held level throughout the evening. 0700hrs Rains accumulating and wetwell level rising quickly. 0942hrs Ultrasonic high level sensor called out to GNPCC (24.5ft). 0950hrs [redacted] called [redacted] and [redacted] to check Brechin overflow. 1010hrs Zach and Jeff confirmed a spill at Brechin, wetwell @ 26.5ft, two pumps operating at 330lps, tide was high so spill rate was difficult to estimate, perhaps 20lps. 1020hrs [redacted] to Brechin to post "Sewage Spill Warning Signage". 1020hrs [redacted] Notified EMBC (DGIR # 212905), estimated 20lps due to high tides. 1042hrs DBPS wetwell max height 27.9ft (ultrasonic level sensor now submerged). 1145hrs [redacted] and [redacted] checked Millstone Syphon overflow, and as they were on-site the Syphon chamber started to overflow. 1206hrs [redacted] notified EMBC that the Millstone Syphon overflow had started to spill at around 10 to 20 LPS. EMBC has added this event as an update to DGIR# 212905. 1225hrs Operations posting "Sewage Spill Warning Signage" at the location. • Operations checking overflow points every hour to confirm if spill is still active 1645hrs [redacted] checked overflow locations, no access to shore and no noticeable waste on shore. Plumes are visual at both locations. 1745hrs [redacted] updated reported flows to EMBC for Brechin 200lps, Millstone 100lps. • Operations checking overflow points every hour to confirm if spill is still active October 29, 2021 0245hrs Millstone overflow spill stopped. 0300hrs Brechin overflow spill stopped. 0300hrs DBPS wetwell at 27.4ft. 0530hrs Tide low enough at Brechin and [redacted] and [redacted] cleaned up what they could on beach 0545hrs [redacted] checked rail yard overflow – No access, and then checked Millstone and Brechin. No visible debris at overflow locations and pictures take. 0600hrs Operations still checking overflow points and monitoring DBPS, and clean-up of debris on shoreline. 0642hrs [redacted] back at office, and notified EMBC that the spills had stopped at both locations. Also mentioned			Monitored spill overflow points 24hr/day and posted sewage spill signage PROPOSED ACTIONS TO BE TAKEN TO ADDRESS SPILL/COMMENTS Install barrier wall at Brechin along with a spill containment berm, cleanup any material from beach front and shoreline, closed Brechin boat ramp on the South side.	

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
				that the estimated spilled volumes are being calculated and will be reported on the “End of Spill Report”. 0730hrs [redacted] meeting Windley at Brechin to close South boat ramp and install signage (attached). • Operations will continue to monitor DBPS wetwell and Brechin overflow, in case the morning flow rush results in another spill. Additional “larger” signage was posted as well. 1030hrs Started to spill at Brechin overflow again at 100lps, [redacted] is also going to check on the Millstone. 1035hrs [redacted] notified EMBC (EMBC said they would use the same DGIR # 212905). 1047hrs Spilling at Syphon around 100lps, and have re-notified EMBC of this location as well. Note: [redacted] and [redacted] were able to visually check the rail yard overflow, and there is definitely no indication of a spill there. Note: TELUS Security is notifying GNPCC operations every 30min of an active high-level alarm in the Millstone Syphon chamber. This provides information that the level in the interceptor is still high enough to overflow at Brechin and likely still overflowing at the Millstone. Operations are still confirming an active overflow at each location is by visual inspection, as controls cannot confirm this for us. 1153hrs [redacted] and [redacted] checked Brechin, still spilling around 75-100lps. 1205hrs [redacted] and [redacted] checked Millstone, still spilling around 75-100lps. 1315hrs [redacted] stationed at the Millstone Syphon overflow and is checking the syphon chamber every 15min to confirm if the spill is still active. [redacted] is also driving to the Brechin overflow every 30min to check on the spill activity at this location. 1430hrs [redacted] back for a break. 1515hrs [redacted] back on-site monitoring the Brechin and Millstone overflows. 2115hrs [redacted] Still spilling at Brechin and Millstone overflows 2315hrs [redacted] Spill stopped at Millstone overflow 2340hrs [redacted]				

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
November 3, 2021	Nov 3/21 Millstone Overflow	1	Millstone Overflow	DGIR# 213000 Millstone Overflow November 3, 2021 0510hrs Started to spill at Millstone, EMBC notified November 5, 2021 0400hrs Stopped spilling 0715hrs Started spilling November 6, 2021 0345hrs Stopped spilling 1545hrs Started spilling November 7, 2021 0100hrs Stopped spilling 1130hrs Spill started November 8, 2021 0300hrs Stopped spilling 0915hrs Started spilling November 9, 2021 0015hrs Stopped spilling 0600hrs Started spilling November 10, 2021 0450hrs Stopped spilling 0720hrs Started spilling November 11, 2021 0030hrs Stopped spilling 1330hrs Started spilling November 12, 2021 0230hrs Stopped spilling 1100hrs Started spilling 2300hrs Stopped spilling November 13, 2021 1715hrs Started spilling November 17, 2021 0400hrs Stopped spilling End of Spill reported to EMBC November 17, 2021 at 0520hrs (Volume TBD)		Spill warning signage posted in area, 24hr emergency monitoring of spill site		
November 3, 2021	Nov 3/21 Brechin Overflow	1	Brechin Overflow	DGIR# 212999 Brechin Overflow November 3, 2021 0250hrs Started to spill at Brechin, EMBC notified November 6, 2021 0345hrs Stopped spilling 1545hrs Started spilling November 7, 2021 0215hrs Stopped spilling 1130hrs Spill started November 8, 2021 0300hrs Stopped spilling 0915hrs Started spilling November 9, 2021 0015hrs Stopped spilling 0330hrs Started spilling November 11, 2021 0230hrs Stopped spilling 1330hrs Started spilling November 12, 2021 0230hrs Stopped spilling 1100hrs Started spilling November 13, 2021 0100hrs Stopped spilling 1630hrs Started spilling November 17, 2021 0400hrs Stopped spilling End of Spill reported to EMBC November 17, 2021 at 0520hrs (Volume TBD)		Spill warning signage posted in area, 24hr emergency monitoring of spill site		
November 14, 2021	Nov 14/21 DBPS Manhole #1	200	DBPS Manhole #1	DGIR# 213168 DBPS Manhole #1 Spill November 14, 2021 1500hrs Started spilling EMBC notified November 16, 2021 1200hrs Stopped spilling End of Spill reported to EMBC November 17, 2021 at 0520hrs (200L)		Spill warning signage posted in area, 24hr emergency monitoring of spill site	Atmospheric river event, and DBFM work	

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
November 15, 2021	Nov 15/21 Rail Yard Overflow (DGIR 213199)	1	Rail Yard Overflow	DGIR# 213199 Rail Yard Overflow November 15, 2021 0840hrs Started spilling EMBC notified November 17, 2021 0400hrs Stopped spilling End of Spill reported to EMBC November 17, 2021 at 0520hrs (Volume TBD)		24hr emergency monitoring of spill site	Atmospheric river event, and DBFM work	
November 16, 2021	Nov 16/21 Ship Yard Manhole #19 (DGIR 213298)	200	Ship Yard Manhole #19	DGIR# 213298 Ship Yard Manhole #19 Spill November 16, 2021 1330hrs Started spilling EMBC notified 1430hrs Stopped spilling End of Spill reported to EMBC November 17, 2021 at 0520hrs (200L)		24hr emergency monitoring of spill site	Atmospheric river event, and DBFM work, Knappett performed ground remediation of area	

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
November 20, 2021	Nov 20/21 DBFM Spill Hammond Bay Chinook	1000	DBFM Hammond Bay Chinook Road	The upgraded DBFM was being pressure tested on the early morning of Nov 20/21. The 36" pipe had been initially filled with potable water and then topped up with domestic wastewater from the DBPS pumps. During this pressure test a leak was detected at the end of the pipe by Hammond/Chinook road, which leaked water into the excavation site. An estimated 1000L was spilled into the excavation, which was pumped out to a near sanitary manhole. The spill occurred between 0235hrs - 0320hrs and EMBC was notified.	Hole in pipe was repaired using a rubber gasket and clamp that Windley had onsite. Road area was cleaned up as well.	Shut down DBPS pump immediately to decrease pressure, and stop the spill.	It is noted that the pipe section at the spill location was filled with potable water for 40mins prior to adding wastewater from the pump station. The 1000L (1m3) spilled from the 36" pipe would have been potable water at this point, and there would have been very little chance of wastewater reaching the spill location.	Investigation date: Dec 6, 2021 [redacted] and contractors were at the site. [redacted] and [redacted] were at DBPS. Leak developed from something very small to something larger in a small amount of time, as pressure increased. Water sprayed into the excavation, onto the road and into the forested area at the intersection. Stopped pumps at DBPS right away. We opened a valve on the bypass line, to which a pump was connected for draining the line. Made best efforts to contain water from going to the adjacent properties using a tarp and construction fencing, and from here pumped into sanitary manhole once the spill started. Some water went down the street, and into a storm catch basin at HB Rd and Lagoon Rd. EI form completed and filed. End-of-Spill investigation

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
								completed Nov 23 and reviewed. Things went fairly well with respect to response, as people knew what they're doing. It may have been better to let it spray into the forested area, as this would have reduced the amount of water going down the road. The pipe has been temporarily fixed with neoprene against the pipe, then a metal covering with straps to hold it together. An intern fix is scheduled, and was developed by AECOM. It consists of more permanent engineered fabricated clamps (same idea: metal shell with gasket that goes over the pipe). Long term fix is to replace that section of pipe within the next few years. Currently, there is a study going on to determine the best solution for the force main and it will be complete some time in 2022. During initial construction, pass hole was used to run welding cables through inside the pipe to facilitate welding of joints, and then it was

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
								capped. The leak occurred when the cap separated from the pipe due to age and pressure. These pass holes could be at every joint or every 2 to 3 joints. The material cover on the pipe is to be maintained until the section of the pipe is replaced. This section of the pipe could not be inspected using the SmartBall technology because of transition from force main to gravity line, and so it became known as the "unknown section" of the pipe. SmartBall technology works best in full pipe situations, which this is not. No corrective actions are required as the spill response (as per procedure) was quick and effective, and the DBFM will be replaced, with a current expected completion date in 2027 (approx.), which may be moved.
November 25, 2021	Nov 25/20 Meadow Lane Stand Pipe (DGIR# 213437)	200	Meadow Lane Stand Pipe	Performing a four pump flow test on DBFM, to test for upcoming storm events and spilled out of Meadow Lane stand pipe due to changes in newly upgraded force main pipe. Spill was contained in excavation site and soaked into ground quickly.		Stand pipe isolation valve was closed quickly to stop the spill	Spill contained and soaked into ground, EMBC notified (DGIR# 213437), stand pipe to be permanently taken out of service and flanged off, installed a new 4" air relief valve	

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
							at Meadow Lane.	
Pump Station Spill (x1)								
November 15, 2021	Nov 15/21 CRPS Overflow	1	1	DGIR# 213197 CRPS Overflow November 15, 2021 0810hrs Started spilling EMBC notified 1300hrs Stopped spilling End of Spill reported to EMBC November 15, 2021 at 1300hrs (Volume TBD)		24hr emergency monitoring of spill site	Atmospheric river event, and DBFM work	

Appendix G – 2021 Biosolids Management Summary and Compliance Report

Regional District of Nanaimo

2021 Biosolids Management Summary and Compliance Report

February 2022

Prepared for:

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1 PROGRAM OVERVIEW

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

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

In 2021, RDN biosolids were managed at three sites in the Nanaimo area: private forest lands on Weigles Road ("TimberWest Properties") and off Nanaimo River Road ("Blackjack") both managed by Mosaic Forest Management, and at the Nanaimo Forest Products Harmac Mill (Harmac).

At the TimberWest Properties biosolids were used in a forest fertilization and reclamation program. RDN biosolids have been managed at this site since 2003. The objectives of biosolids forest fertilization were to increase soil quality and tree growth; and for reclamation to return application trails to productive forest and habitat.

In 2021, management of RDN biosolids by SYLVIS began at the new Blackjack site, which will be used for a long-term forest fertilization program. The new site, Blackjack, is on private forest lands managed by Mosaic Forest Management on Nanaimo River Road in Nanaimo, BC. Delivery of RDN biosolids began to Blackjack in December 2021. The objectives of biosolids forest fertilization at Blackjack are to increase soil quality and tree growth and in reclamation to return cut trails to productive forest.

RDN biosolids were also managed in soil fabrication projects at Harmac. Biosolids managed at Harmac were used to fabricate reclamation growing medium (RGM) for use in landfill closure and biosolids growing medium (BGM) for distribution. The Harmac site can also serve as a contingency site for management of RDN biosolids during periods of inclement weather when management at the TimberWest Properties or Blackjack sites is not possible.

A total of 7,571 wet tonnes (wt) of RDN biosolids were produced in 2021: 6,272 wt from the GNPCC and 1,299 wt from the FCPCC. Of the 7,571 wt produced, 5,060 wt (67% of annual production in 2021) were delivered to the TimberWest Properties, 317 wt (4%) were delivered to Blackjack, and 2,194 wt (29%) were delivered to Harmac (Table 3).

2 REGULATORY AUTHORIZATION

RDN biosolids were managed at the TimberWest Properties under the *2021 TimberWest Properties (Weigles Road) Forest Fertilization Land Application Plan* (SYLVIS Documents # 1339-20), Authorization #110596, valid February 7, 2021 to August 4, 2021) and *2021 TimberWest Properties (Weigles Road) Reclamation & Forest Fertilization Land Application Plan* (SYLVIS Document #1439-21, Authorization #110825, valid August 5, 2021 to August 4, 2022).

RDN biosolids were delivered to Blackjack starting in mid-December 2021, under site Authorization #110732, valid May 16, 2021 to May 15, 2022). A Land Application Plan will be finalized prior to commencement of applications at Blackjack.

Biosolids used to fabricate RGM at Harmac were managed under the *Nanaimo Forest Products – Harmac Mill Reclamation Growing Medium Land Application Plan* (SYLVIS Document # 1341-20, Authorization #110574). Class A biosolids used in production of BGM were managed according to regulatory requirements in the *Organic Matter Recycling Regulation* (OMRR) and do not require a land application plan (LAP).

3 REPORT OBJECTIVES

This report summarizes the RDN's biosolids management program. It also contains a Qualified Professional Certification of Compliance for the two 2021 biosolids LAPs for the TimberWest Properties as required under *Organic Matter Recycling Regulation* (OMRR) section 5 (3). A Qualified Professional Certification of Compliance will be issued after the term of the LAP for Blackjack for 2021 as applications have not begun as of the date of writing.

While a terse summary of management of RDN biosolids at Harmac is provided in this report, a detailed discussion of the regulatory details of the RGM LAP is not included here. A separate compliance report for this project (*Nanaimo Forest Products – Harmac Mill Residuals Growing Medium Land Application Plan 2021 (Authorization #110574) Qualified Professional Certification of Compliance,* SYLVIS Document #1483-22) has been provided to Harmac.

No certification of compliance is required for BGM production.

4 2021 BIOSOLIDS MANAGEMENT

This document contains information on the management of 2021 RDN biosolids including a summary of contractual requirements for the forest fertilization and reclamation programs (Table 1 and Table 2), a biosolids program management summary (Table 3, Figure 1, Figure 2, and Figure 3), a biosolids quality summary (Table 4), a summary of historical management (Table 5), a map of areas applied in 2021 at the TimberWest Properties (Figure 4), and photographs from the biosolids management projects (Photographs 1 to 3).

4.1 BIOSOLIDS MANAGEMENT SUMMARY

In 2021, the majority of RDN biosolids were managed at the TimberWest Properties on Weigles Road in Nanaimo, BC. All contractual tasks relating to biosolids quality monitoring, biosolids delivery coordination, biosolids beneficial use, site safety, environmental monitoring, public engagement, reporting, coordination with the Nanaimo Mountain Bike Club, and adherence to the conditions of site use under the RDN land-use agreement with TimberWest were completed for 2021 (Table 1).

RDN biosolids were first delivered to the new site, Blackjack, on Nanaimo River Road in mid-December 2021. Contractual tasks relating to biosolids quality monitoring, biosolids delivery coordination, site safety, environmental monitoring, and reporting were completed for 2021 (Table 2).

RDN biosolids delivered to Harmac were managed under contract by Harmac, with SYLVIS providing qualified professional oversight for production of reclamation growing medium (RGM) for use in landfill reclamation and biosolids growing medium (BGM) for distribution.

4.2 BIOSOLIDS PROGRAM TRANSPORTATION SUMMARY

In 2021, 5,060 wt of RDN biosolids (0 wt from FCPCC; 5,060 wt from GNPCC) were transported by DBL Disposal to the TimberWest Properties (Table 3). Monthly tonnage delivered to this site in 2021 is shown in Figure 1.

In 2021, 317 wt of RDN biosolids (0 wt from FCPCC; 317 wt from GNPCC) were transported by DBL Disposal to Blackjack (Table 3). Monthly tonnage delivered to this site in 2021 is shown in Figure 2.

In 2021, 2,194 wt of RDN biosolids (1,299 wt from FCPCC; 895 wt from GNPCC) were transported by DBL Disposal to Harmac (Table 3). Monthly tonnage delivered to this site in 2021 is shown in Figure 3.

Total RDN biosolids production in 2021 (7,571 wt) was above the five-year average annual production of 5,668 wt due to implementation of secondary treatment at the GNPCC (Table 5).

4.3 BIOSOLIDS STORAGE

Four storage areas exist at the TimberWest Properties and one large storage area exists at Blackjack, each consisting of an asphalt base with lock blocks delineating three sides of the stockpiles (Photograph 1 and 3). All five storage areas were utilized for biosolids stockpiling in 2021. 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.

Harmac does not cover the stored biosolids as biosolids are typically quickly incorporated into a fabricated soil medium (BGM or RGM). Details of RGM storage are discussed in the Harmac Compliance Report. BGM is not subject to regulatory storage requirements in the OMRR.

4.4 2021 PRE-APPLICATION MEASURES

At the TimberWest Properties, site inspections were carried out by a SYLVIS Qualified Professional or designate prior to biosolids 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 of biosolids application. Groundwater depth was assessed using a soil auger or visually in road cuts and was confirmed to be in excess of 1 metre (m) prior to commencing biosolids applications.

No applications occurred at Blackjack in 2021; site inspections will be carried out by a SYLVIS Qualified Professional or designate prior to biosolids fertilization and reclamation in 2022.

At Harmac, a site inspection was carried out prior to initiating soil fabrication operations to confirm the suitability of the storage facility, mixing methodology, and soil storage area. Landfill areas to

be reclaimed using RGM were assessed prior to applications to ensure suitability for applications. Details of site inspections for the RGM project are detailed in the Harmac Compliance Report.

At Harmac, currently stockpiled BGM is primarily the product of Class A biosolids deliveries starting in October 2021, with a small amount of previously mixed and certified BGM remaining to be distributed.

4.5 BIOSOLIDS LAND APPLICATION

In 2021, 4,426 wt of RDN biosolids (0 wt from FCPCC; 4,426 wt from GNPCC) were applied as a fertilizer and soil amendment to the TimberWest Properties (Table 3, Figure 1). Biosolids were land-applied to 74 hectares (ha) of forested lands for forest fertilization and reclamation at the TimberWest Properties at application rates specific to the individual fertilization units based on their history of previous biosolids land applications. Across the site, the biosolids application rate was an average of 12.3 dt/ha which does not exceed the application rate specified in the LAP (20 dry tonnes per ha). At the end of 2021, 800 wt (0 wt from FCPCC; 800 wt from GNPCC) remained in storage facilities at the TimberWest Properties in preparation for fertilization in 2022 (Table 3).

Biosolids were land-applied using a side-discharge spreader equipped with a hydraulic fan which propels the biosolids up to 30 m into forest stands. All biosolids applications adhered to a 30-m setback distance from permanent water features and identified ephemeral water features. Biosolids land applications were completed every 2-4 weeks throughout 2021 except during periods of extreme weather (i.e., snowfall, heavy rainfall) or when the ground was snow-covered; land application operations were suspended during these times. For example, biosolids land applications did not occur in January and February of 2021 when periods of snowfall or snow cover occurred.

No applications occurred at Blackjack in 2021.

Biosolids incorporated into RGM were land-applied at the Harmac landfill as a topsoil cover during landfill closure operations. In 2021, 4,200 m^3 RGM containing approximately 1,140 wt of biosolids were used in landfill closure (Table 3, Figure 3). Volumes of RGM produced and land-applied at Harmac are detailed in the Harmac Compliance Report.

BGM containing RDN Class A biosolids was distributed offsite.

4.6 BIOSOLIDS QUALITY

Biosolids quality was characterized throughout 2021 to ensure that it met quality requirements for trace element concentrations, foreign matter, and pathogen reduction set forth in the OMRR. A total of six composite samples, each composed of eight equal-volume subsamples, were collected by SYLVIS from the FCPCC and the GNPCC. The biosolids were analyzed for physical parameters, nutrients, and trace elements (Table 4). All RDN biosolids samples collected in 2021 met the respective OMRR Class A and B criteria for trace elements.

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

In 2021, 427 dry tonnes (dt) of biosolids were produced by the FCPCC. For Class A biosolids each individual sample must meet the Class A criterion of 1,000 most probable number per gram (MPN/g). There was no scope for biosolids sampling at the FCPCC in the latter third of the year and therefore five fecal samples were collected in 2021. The fecal coliform density of the last seven samples collected by SYLVIS in 2020 and 2021 was <10 MPN/g in all samples (Table 4).

In 2021, 1,286 dt of biosolids were produced by the GNPCC, requiring two sets of fecal coliforms samples. For Class B biosolids the geometric mean of each set must meet the Class B criterion of 2,000,000 MPN/g. SYLVIS collected 14 samples, the geometric mean of the sampling sets was 33,600 MPN/g (Table 4).

Though it did not occur in 2021, deliveries of FCPCC and GNPCC biosolids could co-occur into the same storage areas at the TimberWest Properties and/or Blackjack sites in cases when Class A deliveries cannot occur to Harmac. Biosolids would be mixed prior to land application, and both would be managed as a Class B product.

4.7 SOIL MONITORING

Ongoing soil monitoring was carried out at the TimberWest Properties throughout 2021. Soil samples, each composed of 10 sub-samples from the top 0-15 cm at random varying distances from the roadside, were collected by SYLVIS. On average, soil trace element concentrations remain below 75% of applicable OMRR soil criteria for this site. Further details on soil sampling and nutrient concentrations can be found in the LAP.

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

4.8 REGULATORY COMPLIANCE

Biosolids management activities at the TimberWest Properties were carried out under Authorizations #110596 and #110825, and in accordance with the LAP applicable at the time of applications (SYLVIS Document #1339-20 and #1439-21). All regulatory requirements of the OMRR and specifications of the LAP were met including the requirements for rainy season storage, agronomic application rate, groundwater level during application, water feature buffers, biosolids quality, pre-application and predicted post-application soil concentration limits, and signage. A Declaration of Land Application Compliance of biosolids applications at the TimberWest Properties along Weigles Road is provided in Appendix Four.

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

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

The objectives of biosolids forest fertilization at the TimberWest Properties are to increase soil quality and tree growth while remaining compliant with the OMRR. Biosolids fertilization has generally increased surface horizon organic matter content and available nutrients (e.g., phosphorus). These enriched soils store more carbon and enable accelerated tree growth, which has been documented at this site and other biosolids forest fertilization sites. Trace element

concentrations in the soil have increased as a result of additions from biosolids. It has been observed[1] at this site that deer browse of trees is increased in biosolids-fertilized areas, underlining a finding from many biosolids sites that increases in vegetation biomass can lead to increases in animal populations that consume or inhabit the vegetation. The objectives of reclamation activities at the TimberWest Properties were to return application trails to productive vegetation and establish wildlife habitat.

Biosolids forest fertilization at Blackjack has the same objectives as those at the TimberWest Properties. The Blackjack site will benefit from the addition of organic matter and available nutrients resulting in increased carbon storage and accelerated tree growth.

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

6 CONCLUSION

RDN biosolids were managed at the Weigles Road TimberWest Properties, Blackjack, and at Harmac in 2021. 5,060 wt (67% of annual production in 2021) were delivered to the TimberWest Properties, 317 wt (4%) were delivered to Blackjack, and 2,194 wt (29%) were delivered to Harmac.

All biosolids land application activities at the TimberWest Properties occurred as specified in the current LAP and according to management requirements under the OMRR. Soil quality data remain below 75% of applicable OMRR soil criteria for this site.

The TimberWest Properties have accepted over 51,000 wt of biosolids since 2007 (Table 5). SYLVIS looks forward to continuing this productive relationship and providing biosolids management services and support to the RDN throughout 2022 and beyond at the new site, Blackjack.

[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.

APPENDIX ONE – TABLES

Table 1: Summary of SYLVIS 2021 deliverables as outlined in the RDN-SYLVIS 2017-2021 and 2021-2022 extension contracts for biosolids management at the TimberWest Properties.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality was monitored throughout 2021 through the collection of six full suite samples and 14 fecal coliform samples. Increased sampling occurred in 2021 compared to previous years at GNPCC due to implementation of secondary treatment leading to increased production.
Biosolids Quantity	5,060 tonnes of RDN biosolids were transported to the TimberWest Properties by DBL Disposal in 2021. 4,426 tonnes of biosolids were land-applied in 2021. 800 tonnes remained stored at the TimberWest Properties at the end of 2021.
Biosolids Transportation and Delivery Coordination	SYLVIS coordinated biosolids deliveries to the TimberWest Properties with DBL Disposal throughout 2021.
Access Maintenance	SYLVIS conducted road maintenance and snow removal on internal roads at the TimberWest Properties in 2021.
Contingency	2,194 tonnes of RDN biosolids were sent to the Harmac contingency site in 2021, in part for contingency during snowy road conditions and in part to fulfill RDN's contract with Harmac.
Storage of Biosolids	Biosolids were stored in four storage facilities at the TimberWest Properties and covered with tarps from October 1 to March 31 as per OMRR requirements.
Invoicing	Biosolids were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2021.
Site Safety	No safety incidents occurred at the TimberWest Properties in 2021. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2021.
Public and Media Relations	No open houses were held in 2021 due to COVID-19.
Complaints Management	There were no complaints received about the biosolids forest fertilization program at the TimberWest Properties in 2021.
Annual Reporting	This summary report fulfills the regulatory requirement for written certification under OMRR Section 5(3).
Storage Facility Management	SYLVIS managed storage facilities throughout 2021. Containment walls at the storage facilities were enhanced in 2021.
Application Planning	SYLVIS mapped, planned, and notified all fertilized areas in 2021.
Nanaimo Mountain Bike Club Land Use Coordination	An application map for use by site recreational users was produced in 2021.

Table 1 (continued): Summary of SYLVIS 2021 deliverables as outlined in the RDN-SYLVIS 2017-2021 and 2021-2022 extension contracts for biosolids management at the TimberWest Properties.

Task or Activity	Description
Biosolids Beneficial Use	Biosolids were managed under the 2021 Land Application Plans applicable at the time of applications (SYLVIS Document #1339-20 and #1439-21) and ENV Authorizations #110596 and #110825. 4,426 tonnes of biosolids were land-applied to 74 ha of forest under this authorization in 2021.
Record-Keeping	SYLVIS kept detailed records of all fertilization activities and environmental monitoring in 2021.
Environmental Monitoring	Soil sampling to measure pre- and post- application nutrient and trace elements concentrations was completed in 2021. Scope for water sampling was removed in consultation with the RDN due to the transition to a new long-term management site (Blackjack).
TimberWest Rules	SYLVIS maintained its BC Forest SAFE accreditation in 2021.
Construction	No works were constructed by SYLVIS at the TimberWest Properties in 2021.
Fires	SYLVIS followed a fire prevention protocol throughout 2021.
Hazardous Substance	No hazardous substances were introduced by SYLVIS to the TimberWest Properties in 2021.
Condition of TimberWest Lands	SYLVIS maintained the condition of the TimberWest Properties in 2021.
Equipment Storage	Except for temporary storage of heavy equipment during fertilization activities, SYLVIS did not store any equipment at the TimberWest Properties in 2021.

Table 2: Summary of SYLVIS 2021 deliverables as outlined in the Mosaic-SYLVIS 2021-2026 Agreement for biosolids management at Blackjack.

Task or Activity	Description
Biosolids Quality	RDN biosolids quality was monitored throughout 2021 through the collection of six full suite samples and 14 fecal coliform samples. Increased sampling occurred at GNPCC due to increased production.
Biosolids Quantity	317 tonnes of RDN biosolids were transported to the Blackjack site by DBL Disposal in 2021. 0 tonnes of biosolids were land-applied in 2021. 317 tonnes remained stored at the Blackjack site at the end of 2021.
Biosolids Transportation and Delivery Coordination	SYLVIS provided biosolids deliveries to the Blackjack site through DBL Disposal in December 2021.
Contingency	A Contingency Plan was written for the 2021-2026 biosolids management contract and the following contingency sites were developed for use in 2021: TimberWest Properties, Harmac, Hamm Road, 155-A Pit, Haslam Pit and Old Nanaimo River Camp. No deliveries were required to contingency sites in 2021.
Invoicing	Biosolids deliveries were invoiced on a monthly basis.
Environmental Incidents	No environmental incidents occurred in 2021.
Site Safety	No safety incidents occurred at the Blackjack site in 2021. SYLVIS maintained COR and BC Forest SAFE safety accreditations in 2021.
Odour Management Plan	An Odour Management Plan was written and followed in 2021.
Communications Plan	A Communications Plan was written and followed in 2021.
Public and Media Relations	No open houses were held in 2021 as the site was not active.
Complaints Management	There were no complaints received about the biosolids forest fertilization program at the Blackjack site in 2021.
Annual Reporting	This summary report fulfills the regulatory requirement for written certification under OMRR Section 5(3).
Biosolids Beneficial Use	No applications occurred at the Blackjack site in 2021.
Record-Keeping	SYLVIS kept detailed records of all stockpile related activities and environmental monitoring in 2021.
Environmental Monitoring	Soil sampling to measure pre-application nutrient and trace elements concentrations was completed in 2021.

Table 3: Regional District of Nanaimo biosolids management summary - 2021.

Site	TimberWest Properties			Blackjack			Harmac BGM[a]		Harmac RGM[b]			Total
WWTP	GNPCC	FCPCC	Subtotal	GNPCC	FCPCC	Subtotal	FCPCC	Subtotal	GNPCC	FCPCC	Subtotal	
Class	B	A		B	A		A		B	A		
Carry-over from 2020	166	0	**166**	0	0	**0**	1,007	**1,007**	1,189	369	**1,558**	**2,731**
Delivered	5,060	0	**5,060**	317	0	**317**	1,299	**1,299**	895	0	**895**	**7,571**
Applied or removed from site	4,426	0	**4,426**	0	0	**0**	998	**998**	771	369	**1,140**	**6,564**
Carry-over to 2022	800	0	**800**	317	0	**317**	1,308	**1,308[c]**	1,312	0	**1,313[d]**	**3,421**

Note: All values in units of wet tonnes.

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

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

c FCPCC Class A biosolids as a component of BGM remained stored at the Harmac site at the end of 2021.

d GNPCC Class B biosolids as a component of RGM remained stored at the Harmac site at the end of 2021. This value represents biosolids which have been incorporated into the RGM but which have not yet been land-applied.

Table 4: Regional District of Nanaimo biosolids quality summary - 2021.

Parameter	FCPCC	GNPCC	Regulatory Criteria		Units
	Class A	Class B	Class A[b]	Class B[c]	
# of samples	**2**	**4**	**-**	**-**	
Available Nutrients, Physical Properties, Acidity					
Total Nitrogen - TKN	49,700	54,675	-	-	µg/g
Ammonia + Ammonium- N (available)	3,020	5,998	-	-	µg/g
Nitrate - N	2	2	-	-	µg/g
Phosphorus (available)	230	1,425	-	-	µg/g
Potassium (available)	689	872	-	-	µg/g
Organic Matter	65.1	65.6	-	-	%
Total Solids	32.9	20.5	-	-	%
pH	7.1	7.0	-	-	pH
Electrical Conductivity	6.9	4.6	-	-	dS/m
Trace Elements					
Arsenic	2.6	2.8	75	75	µg/g
Cadmium	1.3	1.3	20	20	µg/g
Chromium	35	31	-	1,060	µg/g
Cobalt	2.0	3.2	150	150	µg/g
Copper	565	518	-	2,200	µg/g
Lead	12	21	500	500	µg/g
Mercury	0.64	0.60	5	15	µg/g
Molybdenum	5.0	8.0	20	20	µg/g
Nickel	11	13	180	180	µg/g
Selenium	3.3	5.0	14	14	µg/g
Zinc	985	928	1,850	1,850	µg/g
Microbiological Analysis - Fecal Coliforms					
Fecal Coliforms	10[d]	33,600[e]	1,000	2,000,000	MPN/g

Note: All analyses based on dry weight.

a Weighted average is based on GNPCC production of 83% and FCPCC production of 17% of total 2021 biosolids production.

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

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

d Value is the maximum of seven samples collected by SYLVIS.

e Value is the geometric mean of 14 samples collected by SYLVIS.

Table 5: Historical management of Regional District of Nanaimo biosolids at the TimberWest Properties, Harmac Landfill, and Blackjack from 2007 to 2021.

Year	TimberWest Properties	Harmac	Blackjack	Total Production
2007	1,150 wt	-	-	1,150 wt
2008	3,350 wt	-	-	3,350 wt
2009	3,000 wt	-	-	3,000 wt
2010	1,560 wt	-	-	1,560 wt
2011	1,350 wt	-	-	1,350 wt
2012	1,280 wt	-	-	1,280 wt
2013	3,930 wt	-	-	3,930 wt
2014	4,812 wt	-	-	4,812 wt
2015	4,383 wt	-	-	4,383 wt
2016	4,263 wt	-	-	4,263 wt
2017	3,662 wt	797 wt	-	4,459 wt
2018	4,802 wt	164 wt	-	4,966 wt
2019	4,871 wt	719 wt	-	5,590 wt
2020	3,773 wt	1,850 wt	-	5,623 wt
2021	5,060 wt	2,194 wt	317 wt	7,571 wt
Total	**51,246 wt**	**5,724 wt**	**317 wt**	57,287 wt

APPENDIX TWO – FIGURES

Figure 1: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered and applied at the TimberWest Properties by month in 2021.

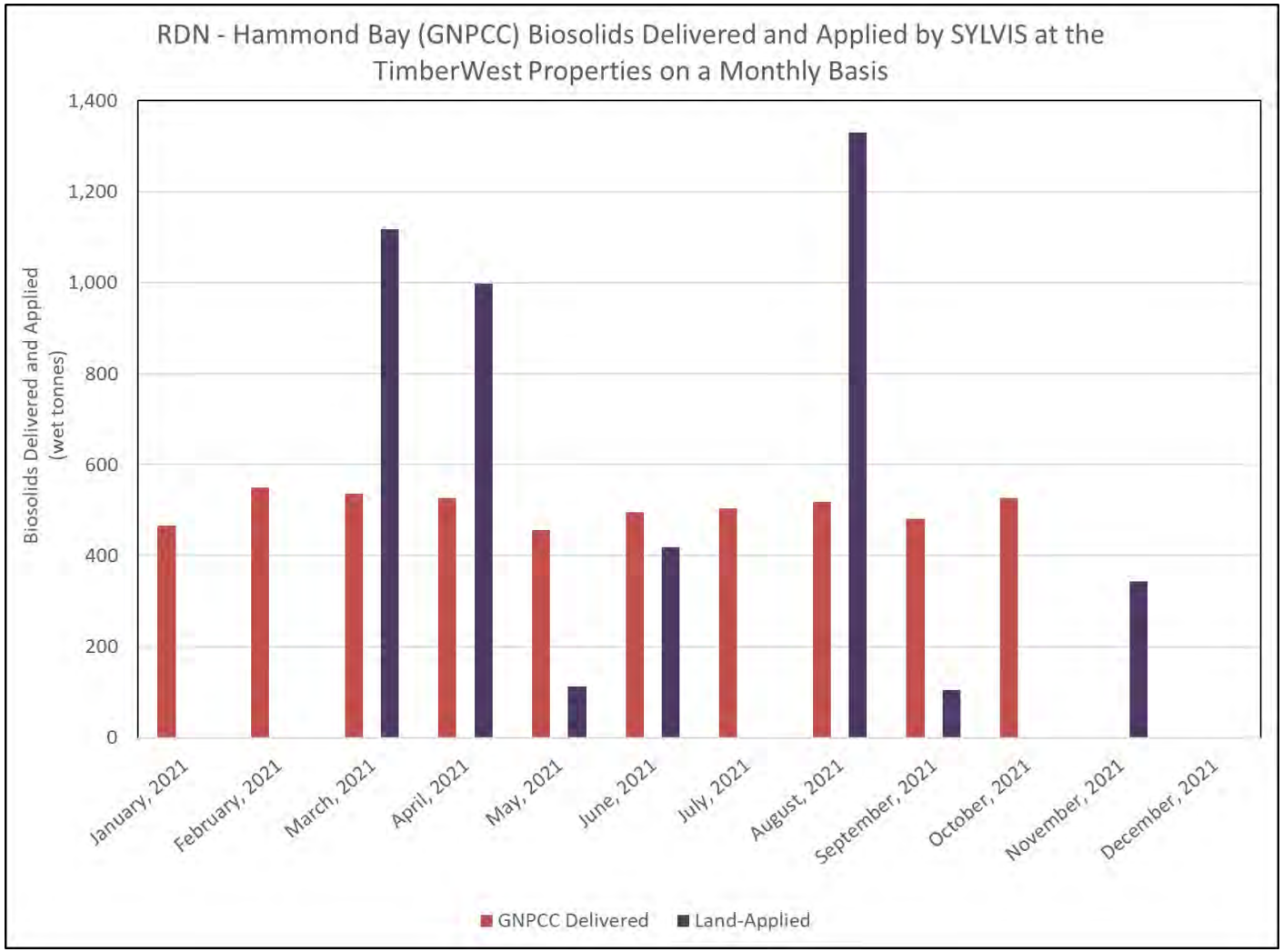


Figure 2: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) dewatered biosolids delivered to Blackjack by month in 2021.

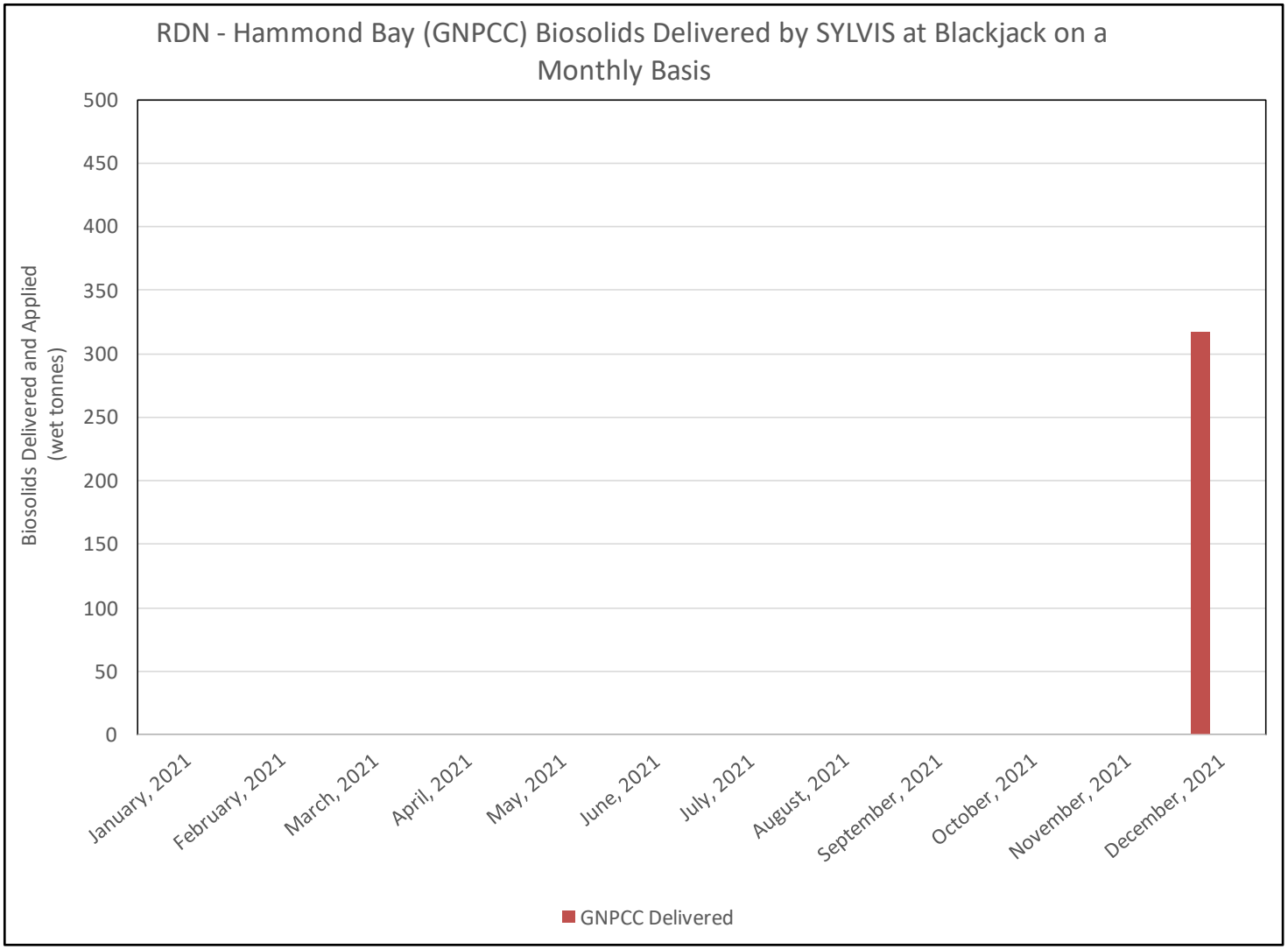


Figure 3: Tonnage of Regional District of Nanaimo – Greater Nanaimo Pollution Control Centre (GNPCC) and French Creek Pollution Control Centre (FCPCC) dewatered biosolids delivered to Harmac by month in 2021.

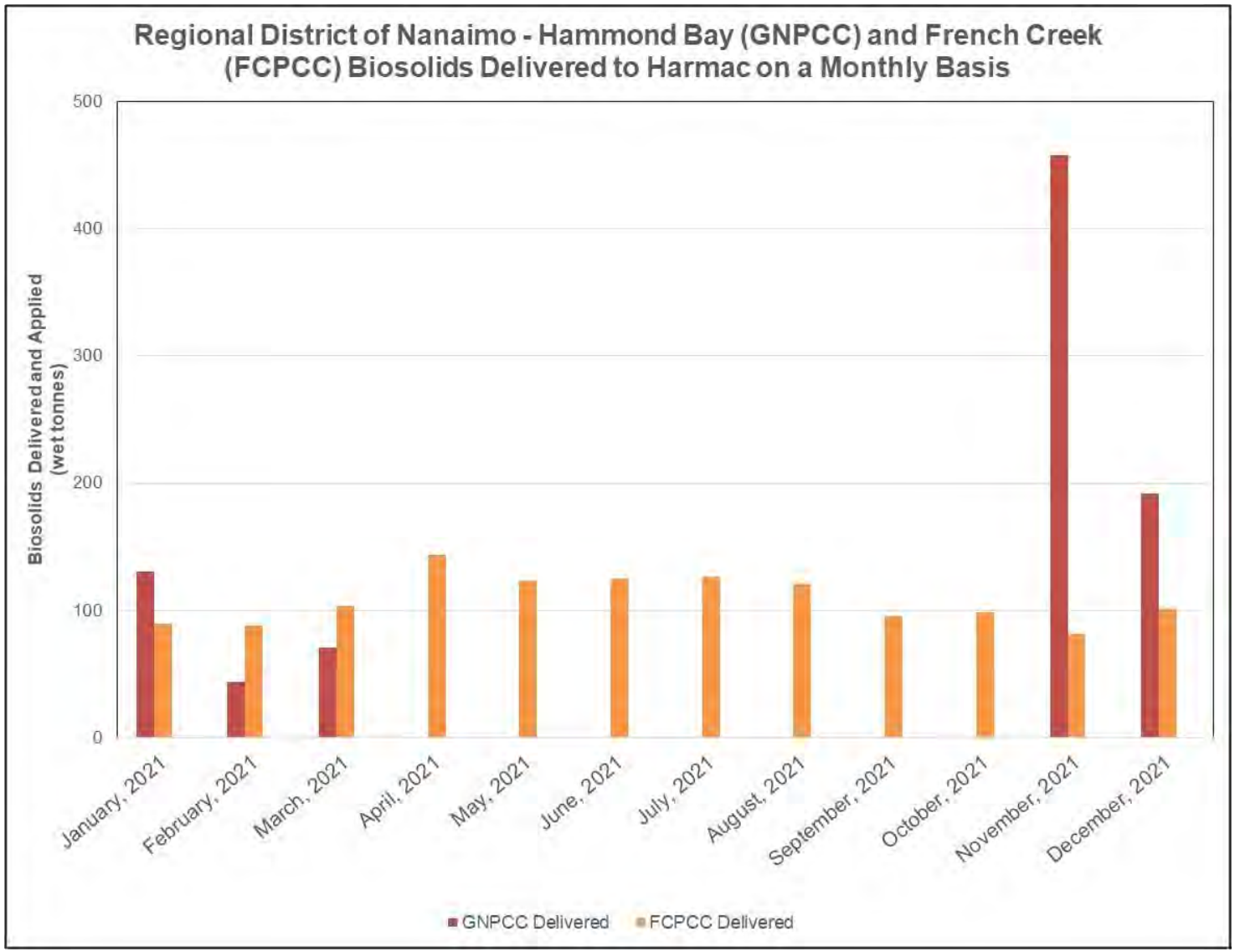
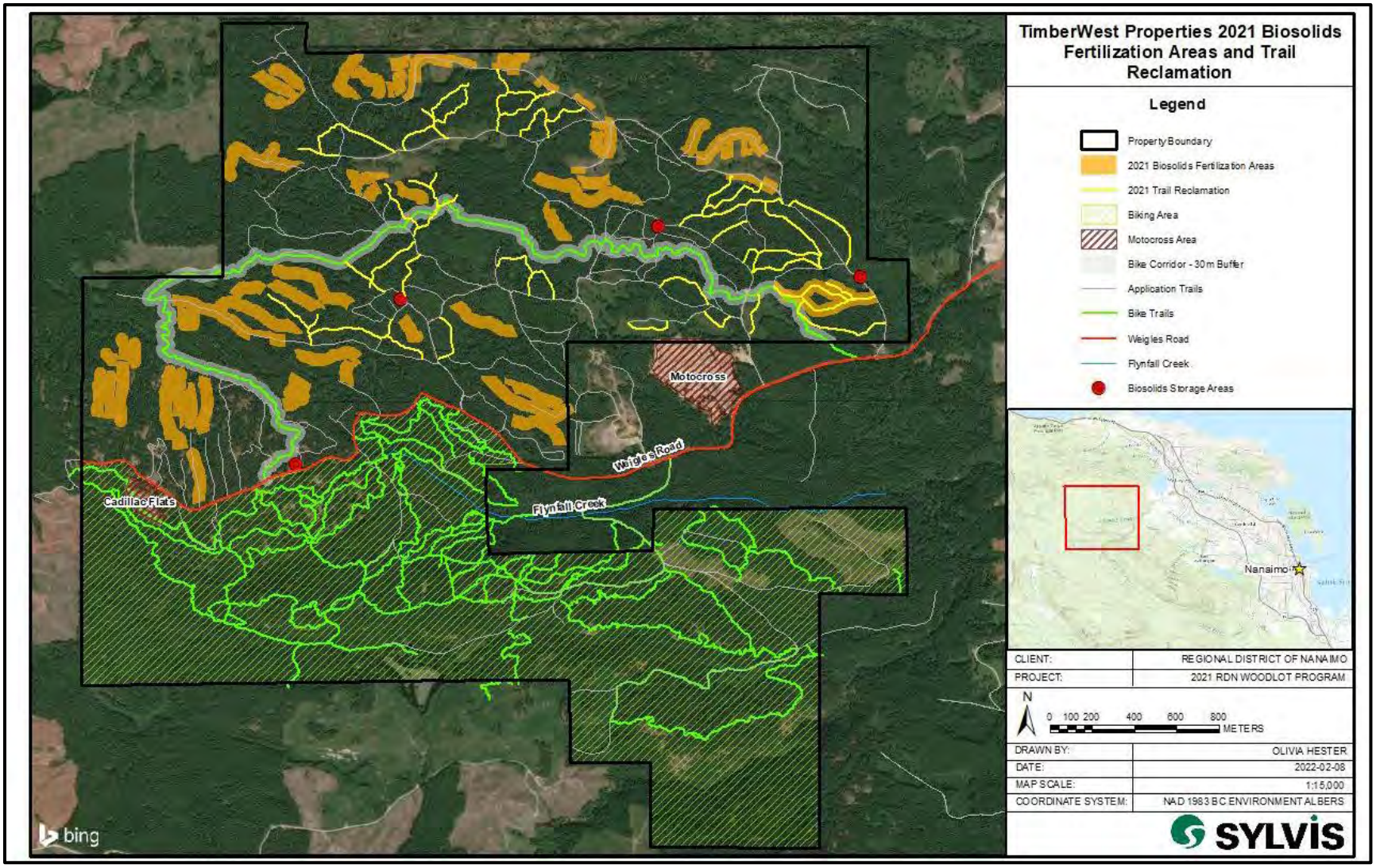


Figure 4: TimberWest Properties application areas fertilized with Regional District of Nanaimo biosolids in 2021.



APPENDIX THREE – PHOTOGRAPHS

Photograph 1: RDN biosolids are stockpiled in storage areas at the TimberWest Properties.
(September 2021)

Photograph 2: Trail reclamation using biosolids at the TimberWest Properties.
(November 2021)

Photograph 3: Stockpile at Blackjack constructed using concrete lock blocks.
(November 2021)

APPENDIX FOUR – DECLARATION OF LAND APPLICATION COMPLIANCE

DECLARATION OF LAND APPLICATION COMPLIANCE AT THE TIMBERWEST PROPERTIES

I, Christian Evans, PAg, confirm by signature and seal below that, to the best of my knowledge, biosolids were land applied at the TimberWest properties according to the information contained in the *2021 TimberWest Properties Forest Fertilization Land Application Plan*, (SYLVIS Documents #1339-20, Authorization #110596) and *2021 TimberWest Properties Reclamation and Forest Fertilization Land Application Plan*, (SYLVIS Document #1439-21, Authorization #110825). These applications are considered a beneficial use of the resource and to the best of my knowledge were completed in accordance with the *Organic Matter Recycling Regulation*.

This certification is valid only if it bears the original signature and seal of the author.

Professional Seal

Signature: _____

Date: February 16th, 2022

BRITISH COLUMBIA INSTITUTE OF AGROLOGISTS
2095
Christian Evans
P.Ag.

Appendix H – GNPCC Annual Status Form (ASF)

Annual Status Form

AUTHORIZATION NUMBER: 338

AUTHORIZATION TYPE: Effluent, Permit

LEGAL AUTHORIZATION HOLDER NAME: Regional District of Nanaimo

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

AUTHORIZED PERSON SIGNATURE: Adrian Limpus

SIGNATURE DATE: February 28, 2022

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.

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
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) m3/d to a maximum of 40,950 m3/d; Maximum Daily - 80,870 m3/d.	No	GNPCC had two non-compliances of the maximum daily flow permit limit of 80,870 m3/day in 2021 (January 1, 2021 90,730 m3/day, and January 2, 2021 87,991 m3/day). Both of these non-compliances occurred during storm events. These non-conformances are believed to be 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 to reduce I&I in the sanitary sewer collection system.
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) m3/d to a maximum of 40,950 m3/d; Maximum Daily - 80,870 m3/day.	Yes	The average daily discharge for the facility to be 32,112 m3/day for 2021 which was below the maximum allowable average annual discharge of 40,950 m3/d.
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	No	There were no BOD non-compliances in 2021 .The annual report also identifies a TSS non-compliance result of 132 mg/L of on June 27th. More information on the TSS permit non-compliance, the immediate resolution, suspected cause or solution, and investigation results can be found in Appendix C of the 2021 GNPCC Annual Report.
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 2,030m from mean low water to a minimum depth of 70m below mean low water, diffusers,	Yes	The authorized works are described as per the September 8, 2019 permit amendment.
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 which prevented the continuing operation of the approved method of pollution control during the inspection period; therefore, compliance with this requirement was not applicable.
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.	ND	There were no discharges of effluent which had bypassed the designated treatment works.

Authorized Person Initial: AL

Date: Feb 25/22

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
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 2021. Secondary treatment was commissioned in October 2020. The RDN notified the BC Ministry of the Environment of this change as part of the permit amendment process.
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.
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 2020 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 and a Soil Fabrication program. The Annual Report also includes the 2021 Biosolids Management Summary from SYLVIS Environmental which includes a summary and interpretation of the effects of biosolids discharges on the receiving environment (Appendix H Section 5)
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	On June 09, 2017 an outfall inspection was conducted and described in the Condition Inspection Report - Five Fingers Outfall prepared by SeaVeyors Environmental and Marine Services Ltd, and submitted to the Ministry on February 06, 2019. 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". Another ROV inspection of the outfalls is planed in 2022.
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 22, 2023.

Authorized Person Initial: AL

Date: Feb 25/22

CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
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.
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	A Parshall Flume flow meter was installed on January 2018 (replacing an ISCO Laserflow meter). Quarterly data reports submitted by the RDN include daily records of effluent volume discharged over the preceding 24-hour period.
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".	Yes	GNPCC is performing daily composite analysis for 5-Day Biochemical Oxygen Demand (cBOD5) and Total Suspended Solids (TSS), weekly composite sampling for Ammonia and quarterly grab samples for Toxicity(LC50). Comprehensive analysis of composite samples for all the remaining contaminants listed inthis section were conducted once every six months (June 8 2021 and December 13, 2021) as required by this section. Results are presented in Appendix D of the 2021 GNPCC Annual Report.
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	9 representative samples of treated biosolids were taken in 2021 which is of higher frequency than the quarterly sampling required in the permit. Samples were sent to Bureau Veritas for analysis which is an accredited lab. Results are presented in Section 6.2 of the GNPCC Annual Report and Appendix D.

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CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
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 and is undertaking a Receiving Environment Monitoring program review in 2021. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020.
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 2021 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.
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 LC50 96-hour test (bioassay) . Samples were taken quarterly in 2021 and sent to Bureau Veritas which is an accredited lab. Toxicity test results are included as Appendix D in the Annual Report.

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CONDITION NUMBER	CONDITION DESCRIPTION	COMPLIANT? (Yes/No/ND)	ACTION TAKEN
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 2021 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 2021 Annual Report was submitted to the Ministry on February 28, 2022 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 Annual Report contains Executive Summary of the receiving environment monitoring program and biosolids discharge report in Appendix G and H respectively. The RDN submitted the 2020 REM report to the Ministry on December 17, 2020.
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.
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.

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