2021 Year End Report: Port Carling Wastewater Treatment Plant (WWTP)

Environmental Compliance Approval: # 4174-AG8T75

Engineering and Public Works Department

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Introduction

The Port Carling Wastewater Treatment Plant (WWTP), which services the community of Port Carling, is owned and operated by the District Municipality of Muskoka. The plant is located at 140 Medora Street, Port Carling, and was commissioned in 2015. It currently services 381 customers.

The Plant operates under the MOE Certificate of Approval (Sewage) #4174-AG8T75 issued February 18, 2009 and MOE Certificate of Approval (Air) #0571-67WJB7 December 1 2016. Under the terms of the Certificate of Approval, the plant is permitted to treat an average daily flow of 926 meters cubed per day, and a peak flow of 3800 meters cubed per day. Additionally, effluent limit criteria are as follows:

Table 1 Effluent Limit Criteria

Effluent Parameter	**Concentration**
CBOD	10 mg/L
Total Suspended Solids	10 mg/L
Total Phosphorous	0.30 mg/L
Total Ammonia Nitrogen Summer (May 15 to September 30)	1.10 mg/L
Total Ammonia Nitrogen Winter (October 01 to May 14)	5.40 mg/L
E. coli	80 CFU/mL
pH	6.0-9.0 inclusive at all times

The facility process consists of grit removal and screening facilities, an activated sludge based secondary treatment process using membrane filters for solids separation, followed by disinfection with ultraviolet radiation. Chemical addition includes an alkalinity adjustment feed system, a sodium hypochlorite and citric acid system for membrane cleaning and a coagulant system using poly-aluminum chloride for phosphorous removal.

Treated effluent from the plant is discharged through a 300 millimeters effluent outfall line and is discharged to Indian River.

Waste sludge from the plant process is digested aerobically at the plant and periodically hauled off site for disposal.

All pumping stations and treatment control systems use SCADA (Supervisor Control And Data Acquisition), in combination with Data Highway Plus, and programmable logic controllers.

General Information

A review of the District of Muskoka infrastructure needs is conducted annually by the Director of Water and Sewer Services, Area Manager and Chief Operator, and recommendations for maintenance, rehabilitation and renewal programs are considered.

Efforts to eliminate the discharge of untreated or partially treated wastewater to receiving waters are being accomplished by a long term financial commitment to correct excessive infiltration into the wastewater collection system by means of sewer main rehabilitation / replacement, manhole rehabilitation and pumping station rehabilitation programs.

The treatment facility is capable of effective operation during emergencies; maintenance shut downs, and power failures. This is achieved through such measures as preventive maintenance of duty /

standby units, the duplication of major treatment components, the provision of standby power sources and extensive use of the SCADA systems. All pumping stations and treatment control systems use SCADA (Supervisor control and Data Acquisition), in combination with Data Highway Plus, and programmable logic controllers.

All operators are qualified to operate the systems efficiently and effectively in order to achieve the highest level of treatment at all times. A commitment to provide Operator training and certification is being sustained.

Regulatory sampling is carried out to meet the requirements outlined in the ECA, and additional in house operational sampling beyond these regulatory requirements is being performed on a routine basis. These efforts have resulted in an effective treatment process which ensures that effluent discharges consistently meet effluent objectives and are environmentally safe. All final effluent sample results for the MBR facilities met their effluent limits.

All data in this report is a compilation of test results received from SGS Canada and their accredited laboratory, Lakefield Research. All in-plant sampling, analysis and recording of results conforms, in order of precedence, to the following 3 standards: Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works", Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" and the American Water Works Association/Water Environment Federation (AWWA/WEF) publication "Standard Methods for the Examination of Water and Wastewater".

Executive Summary

In all respects, test results of the treated effluent for the parameters of CBOD5, suspended solids, ammonia, total phosphorous, and E. Coli are in compliance with the limits outlined in the ECA regarding monthly allowable concentrations and total effluent loading throughout the entire 2021.

Overall, the plant treatment processes performed satisfactorily and are deemed to be adequate. All sample test results of the final effluent were within levels outlined in the plant ECA (#4174-AG8T75).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 926 meters cubed per day. The actual average daily flow for the 2021 was 557 meters cubed per day, however, the 3 year average was 551 meters cubed per day which represents 59.5% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

There were no plant operational problems in 2021.

Summary of Maintenance

There were no significant plant upgrades on major infrastructure in 2021.

All equipment information at this plant is entered into a computer database. From this information, a scheduled preventive maintenance program has been established. The maintenance program includes (and not limited to):

- Monthly testing of emergency testing (under load) of the standby generators.
- Annual servicing of emergency standby generators.
- Annual replacement of U.V. bulbs.

- Annual calibration of flow metering devices.
- Annual cleaning of all sewage pumping stations.
- Marine inspection of effluent outfall and diffuser completed in 2017. (5-year cycle)

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 59.5% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets and plant bypasses. As a result, there is no need for improvements to the existing works.

Evaluation Summary of Proposed Work Requiring Approval under OWRA

Since the treatment facility is operating satisfactorily there is no anticipated works requiring an ECA amendment for 2022.

Interpretation of Analytical Results

All sample results for Raw Sewage and Final Effluent are reported in this section. Other tables in this report include Chemical Usage, Biosolids Quality, and Biosolids Quantity.

Raw Sewage

The information reported in the Raw Sewage sample results summary table consists of test results of analysis conducted on composite samples of the plant influent flow as required by the plant ECA. Samples are sent for analysis to Lakefield Research, as well as analysis conducted on site using Standard Methods or equivalent. Weekly analysis has been performed and reported as specified under the terms outline in the ECA.

Influent Analysis

Table 2 Influent Analysis

Influent Parameter	Minimum	4 Week Average Maximum	Annual Average	Average loading kg/day
BOD5 (mg/L)	33	367	148	80
Suspended Solids (mg/L)	19	410	155	82.4
Total Phosphorus (mg/L)	0.57	5.27	2.50	1.33
Ammonia (mg/L)	4.6	28.7	15.93	8.56
pH	7.04	7.75	7.44	N/A

Effluent Analysis

The information reported in the Final Effluent sample results summary table 3 consists of test results of analysis conducted on final effluent composite samples. Bacteriological samples, however, consisted of grab samples. Weekly analysis has been performed and reported as specified under the terms outlined in the ECA.

Effluent Objective Analysis

Objectives were achieved for the majority of all sampling parameters with the exception of Nitrate-Nitrogen. Monthly Average Concentration was in exceedance of 10mg/L in January (11.60 milligrams/Liter) and February (13.3 milligrams/Liter) and Max Loading was in exceedance of 9.26 kilograms per day in March (11.57 kilograms per day). Colder temperatures along with oversized blowers (difficult to manage) appear to be the challenge in meeting this objective throughout winter months.

Final Effluent Analysis Summary

All final effluent samples tested for CBOD5, suspended solids, ammonia, E. Coli, and total phosphorous were below non-compliance limits outlined in the ECA.

Table 3 Final Effluent Analysis Summary

Parameter	Minimum	4 Week Average Maximum	Annual Average	Average Loading kg/day
COBD5 (mg/L)	<2	2.75	2.1	1.16
Suspended Solids (mg/L)	<2	2.25	2.1	1.16
Total Phosphorus (mg/L)	<0.03	0.05	0.032	0.04
Ammonia (mg/L)	<0.10	0.18	0.11	0.06
Nitrate (mg/L)	<0.06	13.85	6.39	3.36
E. Coli (#/100 mL)	0.00	0.00	0.00	N/A
pH	6.98	7.66 (max)	7.34	N/A

Average daily flow comparisons by day of week ensure ECA requirements for scheduled sampling are taken at a time, and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored. Average daily flow rates by day of the week compare the flow to the average daily flow for the entire year. This data is used to determine if a particular day of the week is best to ensure samples are taken to meet the requirements of scheduled monitoring sections of the ECA's. Sampling plans are reviewed and updated yearly based on the previous yearly flow data.

Final Effluent Sampling Summary

All samples were collected following the frequency and methods required by the facility approval. For the coming year, 2022, no changes to the sampling plan are being considered at this time.

Biosolids Generation

The quality and volume of biosolids hauled from the facility for disposal is outlined in the table provided. Dewatered biosolids from the plant was hauled to an approved landfill site. Private contractors were used by the District of Muskoka to transfer all material for disposal in 2021, and will continue to do so in 2022. It is not anticipated that there will be a significant increase in the total volume of biosolids produced in 2022.

Summary of Complaints received throughout the reporting period

There were no complaints received in the reporting period.

Port Carling Wastewater Collection Summary

New Sewer Services:

A total of three (3) new customers connected to existing Municipal services in 2021.

New Sewer Mains:
There were no new sewer mains installed in Port Carling in 2021.

Sewer Main Replacements:
No sewer main replacement occurred in 2021.

Low Pressure Sewer Breaks:
There were no low pressure sewer breaks in 2021.

Sewer Force Main Breaks:
There were no sewer forcemain breaks in 2021.

Sewer Force Main Replacement
No sewer forcemain replacement occurred in 2021.

Main Line Sewer Blockage
There were no main line sewer blockages in 2021.

Sewer Lateral Blockage
There were no sewer lateral blockages in 2021.

Service Low Pressure Sewer Blockages:
There were no low pressure sewer blockages in 2021.

Frozen Sewer Force Mains:
No frozen forcemain in 2021.

Frozen Sewer Service Laterals:
No sewer service laterals froze in 2021.

Sewage Pump Stations:
All sewage pump stations were cleaned with the use of high pressure equipment and debris vacuumed out and disposed of at an approved disposal site.

Sewer Flushing/Video:
Approximately 2,300 meters of various size sanitary sewer mains were flushed and video inspected in 2021.

Sewer Locates:
Operations staff addressed 123 Ontario OneCall locate requests for Port Carling in 2021.

Table 4 Effluent Flow Summary - 2021

Month	Plant Total Monthly (m^3)	Average Day Flow (m^3/d)	Maximum Day Flow (m^3/d)	Minimum Day Flow (m^3/d)
January	13,507	436	590	368
February	9,967	356	436	296
March	22,579	728	1,209	356
April	18,693	623	979	461
May	18,511	597	922	408
June	14,116	471	737	379
July	22,387	722	1,388	524
August	15,603	503	676	428
September	16,799	560	1,330	334
October	16,660	537	683	408
November	15,289	510	657	283
December	19,082	616	944	442

Total Flow: 203,195m3
Average Day: 557m3
Maximum Day: 1,388m3
Minimum Day: 283m3

Table 5 Influent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample

Sample Date	Sample Identification Number	BOD5 mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-01-21	CA13036	88	13.6	0.19	1.80	88
May-03-21	CA12069	147	25.6	<0.06	3.01	145
Aug-03-21	CA13130	109	35.9	<0.06	5.98	363
Nov-01-21	CA13058	413	24.2	<0.06	6.58	200
Yearly Average		189.3	24.8	0.1	4.3	199.0
Maximum		413.0	35.9	0.2	6.6	363.0
Minimum		88.0	13.6	0.06	1.8	88.0

Table 6 Chemical Usage Summary: SternPac

Month	Average Dosage mg/L	Total kg (dry)
January	42.2	454.5
February	40.8	332.3
March	42.2	782.4
April	42.2	650.6
May	42.2	558.5
June	42.2	490.4
July	42.2	798.1
August	42.2	565.9
September	42.2	602.5
October	42.2	592.8
November	42.2	530.0
December	42.2	663.0
Average	42.1	585.1

Total Yearly Kilograms: 7,021kg

Table 7 Chemical Usage Summary: Sodium Hydroxide

Month	Average Dosage mg/L	Total kg (dry)
January	90.4	761.8
February	105.2	651.7
March	79.0	1,036.8
April	64.9	782.0
May	89.5	929.9
June	80.1	727.1
July	50.8	787.5
August	63.1	666.5
September	53.2	560.4
October	35.5	391.4
November	53.9	540.1
December	30.3	365.8
Average	66.3	683.4

Total Yearly Kilograms: 8,201kg

Table 8 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 1

Sample Date	Sample Identification Number	CBOD5 mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-01-21	CA13036	<2	7.94	<0.03	<2
May-03-21	CA12069	3	7.99	<0.03	<2
Aug-03-21	CA13129	<2	7.90	<0.03	3
Nov-01-21	CA13058	<2	8.00	<0.03	<2
Yearly Average		2.25	7.96	0.03	2.25
Maximum		3	8	0.03	3
Minimum		2	7.94	0.03	2

Table 9 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L
Feb-01-21	CA13036	<0.5	13	<0.03	<0.1
May-03-21	CA12069	<0.5	9.1	<0.03	<0.1
Aug-03-21	CA13129	0.5	0.68	0.03	<0.1
Nov-01-21	CA13058	<0.5	5	<0.03	<0.1
Yearly Average		0.5	7.0	0.03	0.1
Maximum		0.5	13.0	0.03	0.1
Minimum		0.5	0.7	0.03	0.1

Table 10 Effluent Loading and Concentration Summary 2021: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.87	1.18
February	2.00	0.71	0.87
March	2.00	1.46	2.42
April	2.00	1.25	1.96
May	2.20	1.31	2.03
June	2.00	0.94	1.47
July	2.00	1.44	2.78
August	2.00	1.01	1.35
September	2.80	1.57	3.72
October	2.00	1.07	1.37
November	2.00	1.02	1.31
December	2.00	1.23	1.90
Average Monthly	2.08	1.16	1.86
Effluent Objective	5.00		4.63
Non-Compliance	10.00		9.26

Table 11 Effluent Loading and Concentration Summary 2021: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.29	0.98	1.33
February	2.00	0.71	0.87
March	2.00	1.46	2.42
April	2.00	1.25	1.96
May	2.00	1.19	1.84
June	2.25	1.06	1.66
July	2.00	1.44	2.78
August	2.40	1.21	1.62
September	2.00	1.12	2.66
October	2.00	1.07	1.37
November	2.00	1.02	1.31
December	2.25	1.39	2.14
Average Monthly	2.10	1.16	1.83
Effluent Objective	5.00		4.63
Non-Compliance	10.00		9.26

Table 12 Effluent Loading and Concentration Summary 2021: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.06	0.09
June	0.10	0.05	0.07
July	0.10	0.07	0.14
August	0.16	0.08	0.11
September	0.10	0.06	0.13
Average Monthly	0.11	0.06	0.11
Effluent Objective	0.80		0.74
Non-Compliance	1.10		1.02

Table 13 Effluent Loading and Concentration Summary 2021: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.10	0.04	0.06
February	0.10	0.04	0.04
March	0.10	0.07	0.12
April	0.10	0.06	0.10
October	0.10	0.05	0.07
November	0.10	0.05	0.07
December	0.10	0.06	0.09
Average Monthly	0.10	0.05	0.08
Effluent Objective	4.00		3.70
Non-Compliance	5.40		5.00

Table 14 Effluent Loading and Concentration Summary 2021: Fecal Coliform

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0.00	0.00
February	0.00	0.00
March	0.00	0.00
April	0.00	0.00
May	0.00	0.00
June	0.00	0.00
July	0.00	0.00
August	0.00	0.00
September	0.00	0.00
October	0.00	0.00
November	0.00	0.00
December	0.00	0.00
Average Monthly	0.00	0.00
Effluent Objective	2.20	
Non-Compliance	80.0	

Table 15 Effluent Loading and Concentration Summary 2021: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.01	0.02
February	0.04	0.12	0.15
March	0.04	0.03	0.04
April	0.03	0.02	0.03
May	0.03	0.02	0.03
June	0.03	0.01	0.02
July	0.03	0.02	0.04
August	0.03	0.02	0.02
September	0.03	0.17	0.04
October	0.04	0.02	0.03
November	0.03	0.02	0.02
December	0.03	0.02	0.03
Average Monthly	0.03	0.04	0.04
Effluent Objective	0.10		0.09
Non-Compliance	0.30		0.28

Table 16 Liquid Sludge Production Summary 2021

Month	Hauler	Liquid Volume m^3	Cake Weight kg	Destination
January		0.0		
February	ROHES	509.0		ROHES
March		0.0		
April		0.0		
May		0.0		
June	ROHES	409.0		ROHES
July		0.0		
August	ROHES	422.5		ROHES
September		0.0		
October	ROHES	514.0		ROHES
November		0.0		
December		0.0		

Yearly Total Volume: 1,855m3
Yearly Average Volume: 155m3
Maximum Volume: 514m3
Minimum Volume: 0m3

Table 17 Sludge Quality Analysis 2021

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb-01-21	May-03-21	Aug-03-21	Nov-01-21
Sample ID	CA13041	CA12070	CA13130	CA13059
Nitrate	12	5.4	1.6	0.8
Mercury	0.006	0.002	0.007	0.002
Chromium	0.37	0.19	0.27	0.15
Cobalt	0.03	0.02	<0.01	0.01
Copper	11	3.3	4.8	3.4
Lead	0.3	0.1	0.2	0.1
Molybdenum	0.08	<0.05	0.06	0.05
Nickel	0.24	0.11	0.16	0.12
Selenium	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.1	<0.1	<0.1	<0.1
Zinc	12	5	8.0	6
Cadmium	0.021	0.006	0.011	0.009
Ammonia+ Ammonium	5.2	3	23.4	<1
Total Kjeldahl Nitrogen	416	310	604	276
Total Phosphorus	273	180	290	150
Total Solids	14200	9390	14600	6450
Volitile Solids				
Nitrite	0.9	0.4	1.1	<0.2
Potassium	43	23	35	34
Total Suspended Solids	12	5.4	1.6	0.8

Certification of Reports

I certify that the information in this document and all attachments are correct, accurate, and complete to the best of my knowledge

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