

2020 Year End Report: Bracebridge Clean Water Plant (CWP)



Environmental Compliance Approval: # 6222-AFGSNY

Engineering and Public Works Department

70 Pine Street, Bracebridge, Ontario P1L 1N3

Phone: 705-645-6764

Toll-Free: 1-800-281-3483

Fax: 705-645-7599

Email: publicworks@muskoka.on.ca

Website: www.muskoka.on.ca

Introduction

The Bracebridge Clean Water Plant (CWP), which services the Town of Bracebridge, is owned and operated by the District Municipality of Muskoka. The plant is located at 1000 Lagoon Lane, and was commissioned in 2011. It services a population of approximately 7,000 people.

The treatment facility consists of 60 acres of facultative lagoons and a membrane bio-reactor (MBR) treatment plant. The first two lagoons were constructed in 1959. They were 23 acres in size. By 1976, additional capacity was required to meet the needs of the town. At that time, an additional 37 acres of lagoon were constructed, bringing the total to 60 acres.

In 1983, an extended aeration treatment plant was commissioned to provide additional capacity for the growing town.

During the 2010-11, a new membrane filtration (MBR) plant was constructed to replace the extended aeration facility. Alum is used as the coagulant and disinfection is by ultra-violet lights. The final effluent is discharged to the Muskoka River by way of a diffuser.

The Plant operates under the MOE Environmental Compliance Approval (Sewage) # 3237-BDGQDG, issued July, 2019. Under the terms of the Approval, the plant is permitted to treat an average daily flow of 8,000 m³/day peak flow rating of 18,000 m³/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	0.4 mg/l
Total Ammonia Nitrogen Summer (May 15 to September 30)	5.0 mg/l
Total Ammonia Nitrogen Winter (October 01 to May 14)	10.0 mg/L
E. coli	80 counts/100ml (Monthly Geometric Mean Density)

The membrane equipment, with the latter performing the critical solids/liquid separation function that is traditionally accomplished using secondary clarifiers as in most other Muskoka wastewater treatment plants.

MBRs rely upon membrane equipment for liquids/solids separation prior to discharge of the effluent. The membrane equipment installed at the Lagoon Lane WWTP is an immersed system, i.e. a system that is designed for installation within membrane tanks, which utilizes hollow fibre membranes.

Waste sludge from the MBR process is sent to one of the three primary facultative lagoons.

General Information

A review of the District of Muskoka's 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 Certificate of Approval regarding monthly allowable concentrations and total effluent loading throughout the entire year.

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 (#3237-BDGQDG).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 8,000 m³/day. The actual average daily flow for the year was 3,925 m³/day, however, the 3-year average is 3,772 m³/day, which represents 47% 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 2020.

Summary of Maintenance

- There were significant plant upgrades in 2020 with the demolition of the circa 1983 plant to permit construction of a new headworks facility. Construction of the headworks will continue through 2021 and include new raw sewage screening, grit removal, flow measurement and pumping facilities.

- All equipment information at this plant is entered into a computer database. From this information, a scheduled preventive maintenance programme has been established. The maintenance programme 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 47% 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.

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)	54	423.5	180	706
Suspended Solids (mg/L)	114	945	251	983
Total Phosphorus (mg/L)	2.53	7.3	4.37	17.15
Ammonia (mg/L)	22.80	48.2	33.97	133.32

Effluent Analysis

The information reported in the Final Effluent sample results summary tables 14-19 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

The effluent objectives were met during all sample periods with the exception of pH for the week of February 18th. During the third week of February the final effluent alkalinity dropped to an average of 44 mg/L and the pH was less than the objective of 6.5 however there was no impact upon effluent quality during this week. For the final week of February both alkalinity and pH slowly increased and by March alkalinity was back in the 100 mg/L range consistently.

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	3.0	2.11	7.80
Suspended Solids (mg/L)	2	3.0	2.10	7.77
Total Phosphorus (mg/L)	0.03	0.13	0.05	0.20
Ammonia (mg/L)	0.1	0.58	0.23	0.85
E. Coli (#/100 mL)	0	1.19	0.07	N/A
pH	6.24 - Min	7.83 - Max	7.57	N/A

Final Effluent Sampling Summary

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. Tuesday was the sample day for 2020 as indicated in the flow chart:

Table 4 Average Influent Flow by Day of the Week

Day	2020 Average Flow by Day	% of ADFR
Monday	3903.67	99%
Tuesday	3992.14	101%
Wednesday	3903.13	99%
Thursday	3908.40	99%
Friday	4038.72	102%
Saturday	3939.15	100%
Sunday	3908.25	99%
Average Daily Flow Rate (ADFR)	3941.92	

For 2021 the sample collection day will be Wednesday.

Biosolids Generation

The quality and volume of biosolids both generated and hauled from the facility for disposal is outlined in the table provided. Waste activated sludge is pumped from the Bracebridge CWP to the Lagoon Cell #3. The lagoon provides storage and stabilization for the waste activated sludge.

In 2020, stabilized biosolids in Plant Lagoon Cell #3 were mixed and equalized throughout the cell with the Region of Huronia Environmental Services equipment.

It is not anticipated that there will be a significant increase in the total volume of biosolids produced in 2021.

Co-Treatment Flow Summary

The treatment plant has the capability to co-treat additional wastes through the Septage Receiving Facility, which located on site at the Septage Lagoons. Septage and holding tank waste are hauled in by vacuum trucks, and dumped into the receiving cell, which is then blended into the plant influent flow. In addition, leachate from the District owned Rosewarne Landfill are trucked to the Septage Receiving Facility on a scheduled basis.

The plant ECA (Sewage) #3237-BDGQDG, states that the average quantity of partially treated septage lagoon effluent shall not exceed 180 m³ per day. The highest monthly average for partially treated septage lagoon effluent was 157.6 m³ per day in March 2020 with no problems observed by this volume.

In 2020, 6,796 m³ of hauled septage was received at Lagoon Lane septage lagoon and an additional 23,016 m³ of District Rosewarne Landfill leachate was hauled for disposal. There was transfer of wastewater from the treatment lagoons 1 and 2 to the MBR plant in the summer of 2020. All septage, leachate and wastewater disposed of into the Lagoon Lane septage lagoon was processed through the lagoon system and the supernatant from septage lagoon cell #3 was pumped to the MBR plant. Septage cell #3 transfers are summarized in the following table:

Table 5 Septage Cell 3 Transfer Summary

Month	Minimum Daily Flow (m ³)	Maximum Daily Flow (m ³)	Total Monthly Flow (m ³)
January	20.28	212.46	4,265
February	22.65	104.99	1,209
March	50.96	297.34	4,884
April	22.65	203.72	2,447
May	22.10	135.09	1,264
June	22.64	159.49	2,149
July	65.09	384.84	4,284
August	22.65	384.84	3,288
September	22.64	327.75	3,058
October	0.00	310.26	3,092
November	0.00	278.90	2,510
December	0.00	219.17	1,090

Summary of Complaints received throughout the reporting period

There were no complaints received in the reporting period.

Bracebridge Wastewater Collection Summary

New Sewer Services

A total of 84 customers connected to existing sewer laterals in 2020.

New Sewer Mains

A total of 650 meters of 250 mm gravity sewer was installed in 2020 as well as 11 new Manholes in the Clearbrook Subdivision.

Sewer Main Replacements

There were no Sewer Main replacements in 2020.

Low Pressure Sewer Breaks

There were no low pressure sewer breaks in 2020.

Sewer Force Main Breaks

There were no sewer force main breaks in 2020.

Sewer Force Main Replacement

There were no Sewer Force Main replacements in 2020.

Main Line Sewer Blockage

There was one Major Sewer Main Blockage in 2020.

Sewer Lateral Blockage

The District of Muskoka had 4 sewer lateral issues in 2020 for residential customers, all of which were excavated and repaired.

Low Pressure Sewer Blockages

No low pressure sewer blockages in 2020.

Frozen Sewer Force Mains

There were no frozen sewers Mains in 2020.

Frozen Sewer Service Laterals

No sewer service laterals froze in 2020.

Frozen Low Pressure Sewer Services

No low pressure sewer services froze in 2020.

Sewer Flushing/Video

Approximately of 10,000m of sewer main was flushed and video inspected in 2020.

Sewer locates

The District, either in-house or with contracted staff, completed 999 buried utility locate requests in 2020 to comply with Ontario OneCall requests.

Table 6 Effluent Flow Summary - 2020

Month	Plant Total Monthly (m ³)	Average Day Flow (m ³ /d)	Maximum Day Flow (m ³ /d)	Minimum Day Flow (m ³ /d)	Lagoons Monthly Flow (m ³)	Facility Total Monthly Flow (m ³)
January	122,499	3,952	5,687	3,208	0	122,499
February	84,734	2,922	3,988	2,562	0	84,734
March	153,788	4,961	7,534	2,744	0	153,788
April	170,765	5,692	8,426	1,753	0	170,765
May	105,193	3,393	4,146	2,964	0	105,193
June	103,443	3,448	7,174	2,422	0	103,443
July	104,309	3,365	5,322	778	0	104,309
August	93,868	3,028	3,359	2,531	0	93,868
September	85,893	2,863	4,735	2,216	0	85,893
October	112,912	3,642	5,683	2,781	0	112,912
November	103,578	3,453	4,454	2,669	0	103,578
December	108,699	3,506	4,850	2,809	0	108,699

Total Flow: 1,349,680 m³
 Average Day: 3,698 m³
 Maximum Day: 8,426 m³
 Minimum Day: 778 m³

Table 7 Influent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 1

Sample Date	BOD5 mg/L	Alkalinity (Total as CaCO3) mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
Feb 11	302	199	6.73	6.3	373
May 5	132	180	6.86	2.65	191
Aug 11	148	230	7.11	4.24	148
Nov 3	112	202	7.36	3.02	139
Yearly Average	173.5	202.8	7.0	4.1	212.8
Maximum	302.0	230.0	7.4	6.3	373.0
Minimum	112.0	180.0	6.7	2.7	139.0

Table 8 Influent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample Part 2

Sample Date	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L
Feb 11	45.0	0.06	0.03	20.7
May 5	24.0	0.06	0.03	17.0
Aug 11	34.0	0.06	0.06	25.5
Nov 3	30.4	0.06	0.03	26.7
Yearly Average	33.4	0.1	0.0	22.5
Maximum	45.0	0.1	0.1	26.7
Minimum	24.0	0.1	0.0	17.0

Table 9 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	36.3	5,437.6
February	42.4	4,453.5
March	28.4	5,227.5
April	26.9	5,505.0
May	37.6	4,907.4
June	43.5	5,587.9
July	35.0	4,462.3
August	33.1	3,797.5
September	44.3	4,627.5
October	33.5	4,520.6
November	38.1	4,828.5
December	33.9	4,572.6
Average	36.1	4827.3

Total Yearly Kilograms: 57,928

Table 10 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	18.0	800.0
February	18.0	600.0
March	30.0	1,500.0
April	18.0	900.0
May	15.0	550.0
June	15.0	550.0
July	15.0	100.0
August	0.0	0.0
September	0.0	0.0
October	0.0	0.0
November	15.0	550.0
December	15.0	550.0
Average	13.3	508.3

Total Yearly Kilograms: 6,000 kg

Table 11 Chemical Usage Summary: Sodium Hypochlorite

Month	Average Dosage mg/L	Total litres
January	748.0	107.7
February	619.4	89.2
March	709.6	102.2
April	571.0	82.2
May	236.0	34.0
June	4,361.0	628.0
July	604.0	87.0
August	1,075.0	154.8
September	1,760.0	253.4
October	1,681.0	242.1
November	2,228.0	320.8
December	0.0	0.0
Average	1,327	175.1

Total Yearly Litres: 2,101 L

Table 12 Chemical Usage Summary: Citric Acid

Month	Average Dosage L	Total Litres
January	644.0	798.6
February	495.0	613.8
March	473.0	586.5
April	210.0	260.4
May	94.0	116.6
June	1,052.0	1,304.5
July	552.0	684.5
August	657.0	814.7
September	446.0	553.0
October	578.0	716.7
November	714.0	885.4
December	0.0	0.0
Average	537.7	611

Total Yearly Litres: 7,335

Table 13 Effluent Quarterly Analysis Summary – Weekly 24 Hour Composite Sample

Sample Date	CBOD5 mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L
Feb 11	2	7.25	0.09	2	1	18.40	0.04	0.3
May 5	2	7.64	0.04	2	0.9	8.13	0.03	0.1
Aug 11	2	7.73	0.03	2	0.7	1.18	0.03	0.1
Nov 3	2	7.13	0.07	2	2.3	21.80	0.03	0.1
Yearly Average	2	7.44	0.06	2	1.2	12.38	0.03	0.2
Maximum	2	7.73	0.09	2	2.3	21.80	0.04	0.3
Minimum	2	7.13	0.03	2	0.7	1.18	0.03	0.1

Table 14 Effluent Loading and Concentration Summary 2020: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	7.90	11.37
February	2.25	6.57	8.97
March	2.00	9.92	15.07
April	3.00	17.08	25.28
May	2.00	6.79	8.29
June	2.00	6.90	14.35
July	2.00	6.73	10.64
August	2.00	6.06	6.72
September	2.00	5.73	9.47
October	2.00	7.28	11.37
November	2.00	6.91	8.91
December	2.00	7.01	9.70
Average Monthly	2.10	7.91	11.68
Effluent Objective	5 mg/L		
Non-Compliance	10 mg/L		

Table 15 Effluent Loading and Concentration Summary 2020: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	7.90	11.37
February	2.00	5.84	7.98
March	2.00	9.92	15.07
April	2.00	11.38	16.85
May	2.00	6.79	8.29
June	2.00	6.90	14.35
July	2.25	7.57	11.97
August	2.00	6.06	6.72
September	2.00	5.73	9.47
October	3.00	10.93	17.05
November	2.00	6.91	8.91
December	2.00	7.01	9.70
Average Monthly	2.10	7.74	11.48
Effluent Objective	5 mg/L		
Non-Compliance	10 mg/L		

Table 16 Effluent Loading and Concentration Summary 2020: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.34	0.41
June	0.14	0.48	1.00
July	0.10	0.34	0.53
August	0.10	0.30	0.34
September	0.36	1.03	1.70
Average Monthly	0.16	0.50	0.80
Effluent Objective	2.0 mg/L		
Non-Compliance	5.0 mg/L		

Table 17 Effluent Loading and Concentration Summary 2020: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.14	0.55	0.80
February	0.18	0.53	0.72
March	0.44	2.18	3.31
April	0.10	0.57	0.84
October	0.48	1.75	2.73
November	0.10	0.35	0.45
December	0.48	1.68	2.33
Average Monthly	0.27	1.09	1.60
Effluent Objective	2.0 mg/L		
Non-Compliance	10.0 mg/L		

Table 18 Effluent Loading and Concentration Summary 2020: E.Coli

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0.00	2.00
February	0.00	0.00
March	0.00	2.00
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	2.00
October	0.00	0.00
November	0.00	2.00
December	0.00	2.00
Average Monthly	0.00	0.83
Effluent Objective	<2	
Non-Compliance	80.00	

Table 19 Effluent Loading and Concentration Summary 2020: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.05	0.20	0.28
February	0.10	0.29	0.40
March	0.07	0.35	0.53
April	0.05	0.28	0.42
May	0.11	0.37	0.46
June	0.06	0.21	0.43
July	0.04	0.13	0.21
August	0.03	0.09	0.10
September	0.03	0.09	0.14
October	0.05	0.18	0.28
November	0.05	0.17	0.22
December	0.04	0.14	0.19
Average Monthly	0.06	0.21	0.31
Effluent Objective	0.3 mg/L		
Non-Compliance	0.4 mg/L		

Table 20 Liquid Sludge Production Summary 2020

Month	Hauler	Shipped to: Location	Shipped to: Volume (m³)
January	Pumped	Sludge Lagoon Cell 3	3258.4
February	Pumped	Sludge Lagoon Cell 3	1870.7
March	Pumped	Sludge Lagoon Cell 3	2690.5
April	Pumped	Sludge Lagoon Cell 3	2739.5
May	Pumped	Sludge Lagoon Cell 3	2859.7
June	Pumped	Sludge Lagoon Cell 3	3937.6
July	Pumped	Sludge Lagoon Cell 3	3563.1
August	Pumped	Sludge Lagoon Cell 3	2998.0
September	Pumped	Sludge Lagoon Cell 3	3204.8
October	Pumped	Sludge Lagoon Cell 3	2552.4
November	Pumped	Sludge Lagoon Cell 3	2741.0
December	Pumped	Sludge Lagoon Cell 3	2780.3

Yearly Total Volume: 35,196 m³
 Yearly Average Volume: 2,933 m³
 Maximum Volume: 3,938 m³
 Minimum Volume: 1,871 m³

Table 21 Sludge Quality Analysis 2020

Parameter Sampled (mg/L)	First Quarter (Feb 11)	Second Quarter (May 5)	Third Quarter (Aug 11)	Fourth Quarter (Nov 3)
Sample ID	BRA-40 WAS	BRA-40 WAS	BRA-40 WAS	BRA-40 WAS
Nitrate	1	1.2	0.8	4
Mercury	0.002	0.001	0.002	0.005
Chromium	0.09	0.01	0.1	0.09
Cobalt	0.01	<0.01	0.01	0.01
Copper	2	1.6	2.3	2.1
Lead	<0.1	<0.1	<0.1	<0.1
Molybdenum	<0.05	<0.05	<0.05	<0.05
Nickel	0.05	0.04	0.05	<0.04
Selenium	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.1	<0.1	<0.1	<0.1
Zinc	1	1	2	1
Cadmium	<0.005	<0.005	<0.005	<0.005
Ammonia+ Ammonium	10.4	18	3.9	4.8
Total Kjeldahl Nitrogen	440	461	330	304
Total Phosphorus	210	140	170	160
Total Solids	6360	7260	6850	6050
Volitile Solids	4530	5310	4680	4250
Nitrite	0.8	1.6	<0.2	0.5
Potassium	40	22	44	39
Total Suspended Solids	6330	6600	5580	5360

Bracebridge 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

Marcus Firman, C.E.T.
Director, Water and Wastewater Services

Mark Pringle, C.E.T.
Manager of Water and Wastewater Operations