

2023 Year End Report: Gravenhurst Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 7847-ABVPD3

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Introduction

The Gravenhurst Wastewater Treatment Plant (WWTP), which services the Town of Gravenhurst, is owned, and operated by the District Municipality of Muskoka. The plant is located at 1083 Muskoka Beach Road and was commissioned in May 1993. It is capable of servicing a population of 9,500 people.

The Beach Road WWTP receives influent wastewater from a gravity sewer main, which runs underneath Muskoka Beach Road. The majority of the wastewater is from the James St. Sewage Pumping Station that is located on the site of the original Gravenhurst sewage treatment plant in central Gravenhurst. In addition, the collection system contains fourteen other sewage pumping stations. The pumping stations serve residential areas of Gravenhurst as well as customers as diverse as the Taboo Resort and Beaver Creek Correctional Institution. The WWTP also has a septage receiving facility, which processes septic and holding tank wastes that are trucked in.

The Plant operates under the MECP Environmental Compliance Approval (ECA) # 7847-ABVPD3, issued September 9, 2016. Under the terms of the Environmental Compliance Approval, the plant is permitted to treat an average daily flow of 5,165 meters cubed per day, and a peak flow of 13,791 meters cubed per day. Additionally, effluent limit criteria are as follows:

Table 1 Effluent Limit Criteria

Effluent Parameter	Concentration	Total Effluent Loading
CBOD	10 mg/L	51.65 kg/day
Total Suspended Solids	10 mg/L	51.65 kg/day
Total Phosphorous	0.3 mg/L	1.6 kg/day
Total Ammonia Nitrogen Summer (May 15 to September 30)	5 mg/L	51.65 kg/day
Total Ammonia Nitrogen Winter (October 01 to May 14)	10 mg/L	25.8 kg/day
E. coli	100 organisms/100mL for any month	N/A
pH	To be between 6.0 and 9.5 at all times	N/A

The treatment process is conventional activated sludge with tertiary filtration and ultraviolet disinfection before discharge of the effluent to Lake Muskoka. Biosolids from the primary and secondary plant processes are sent to anaerobic digesters. The stabilized biosolids are then dewatered with a centrifuge. The centrifuge cake is hauled off site for disposal at Lystek's Organic Material Recovery Centre in Southgate.

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 shutdowns, 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 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. 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 2023.

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 (#7847ABVPD3).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 5,165 meters cubed per day. The actual average daily flow for 2023 was 3,044 meters cubed per day, however, the 3-year average is 2,883 meters cubed per day, which represents 56% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

On November 13, 2023, it was discovered that the aeration mixing pump in tank 2 had failed causing low dissolved oxygen levels in that tank. Aeration tank 2 was kept in service by increasing the amount of air provided by blower 304. It was in operation in this manner until December 17, 2023, when blower 304 failed. On December 18, 2023, aeration tank 2 was taken out of service and pumped over to aeration tank 1.

Summary of Maintenance

There were no significant plant upgrades on major infrastructure in 2023.

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 2022. (5-year cycle)

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 56% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets and plant bypasses. There are planned major capital upgrades for life-cycle process equipment replacements to occur in 2025 with engineering design work occurring now.

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)	38	327	198	623
Suspended Solids (mg/L)	38	439	281	856
Total Phosphorus (mg/L)	1.14	10.24	3.65	11.22
TKN (mg/L)	0.50	46.6	16.1	48.2

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

None of the monthly average concentrations for the effluent objectives were exceeded in 2023. However, because of the aeration mixing pump failure on November 13, 2023, and blower 304 failure on December 17, 2023, there were single samples that were higher than what is normally experienced for ammonia and CBOD. These values went back to normal quickly once aeration was restored. In addition, in 2023 single sample E. Coli results were high on April 18, July 25, Oct 31, and November 6. The spring and fall PM was completed by Trojan on February 8, 2023 and October 3,4, 2023. Operations increased power to UV bank A from 60% - 84% on November 9/23.

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	2	6.41
Suspended Solids (mg/L)	2	3.25	2	7.11
Total Phosphorus (mg/L)	0.03	0.13	0.05	0.16
Ammonia(mg/L)	0.1	2.88	0.37	1.02
E. Coli (#/100 mL) GEOMEAN	0	44	1.06	N/A
pH	6.98	8.07	7.47	N/A

Final Effluent Sampling Summary

All samples were collected following the frequency and methods required by the facility approval. For the coming year, 2024, no changes to the sampling plan are being considered.

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 is hauled off site for disposal at Lystek’s Organic Material Recovery Centre in Southgate. A contractor was used by the District of Muskoka to transport all material for disposal in 2023 and will continue to do so in 2024. It is not anticipated that there will be a significant increase in the total volume of biosolids produced in 2024.

Biosolids Co-Treatment

The treatment plant has the capability to co-treat additional wastes through the Hauled Waste Receiving Facility, which located on site at headworks of the plant. Septage and holding tank waste are hauled in by vacuum trucks and discharged into the 76 cubic meter tank, which is then blended into the plant influent flow. Biosolids and water treatment sludge generated by smaller municipal treatment facilities may be processed in this fashion as well. Tables summarizing the septage analytical characteristics and monthly loading rates of the hauled wastes that have been co-treated at the plant in 2023 are included in this report.

Co-Treatment Flow Summary

The plant ECA (Sewage) #7847-ABVPD3, issued September 9, 2016, states that the monthly average quantity of septage and holding tank waste being co-treated at the plant shall not exceed 20 meters cubed per day. The certificate further stipulates that the monthly average volume of biosolids being cotreated shall not exceed a monthly average flow of 20 meters cubed

per day, and that volumes of water treatment plant sludges being co-treated shall not exceed a monthly average flow of 20 meters cubed per day as well.

The highest monthly average for septage was 13.7 meters cubed per day in June 2023 with no problems observed by this volume; samples of the septage waste were collected monthly. highest monthly average for biosolids was 0.72 meters cubed per day. This occurred in January 2023. After January 2023 no further plant biosolids were received at the plant. There were no operational issues with the volume and quality of the biosolids hauled in in 2023. Biosolids being hauled in from the local non-municipal wastewater treatment plant (Red Leaves Resort) provided their set of analytical sample results. For 2024, no biosolids from other plants are expected. No water plant sludges were received in 2023.

Summary of Complaints received throughout the reporting period.

There were no complaints received in the reporting period.

Gravenhurst Wastewater Collection Summary 2023

New and replaced Sanitary Sewer:

Total 1195.6m of sewer installed in 2023. There was 625.6m of new 200mm sanitary sewer main constructed on Beechwood Subdivision. 73.8m of 200mm sanitary sewer on Isaac St. James St had 63m. GHSAN0635 replaced to 300mm PVC. Bishop St. Replaced 93m. David St replaced. 340.2m of 200mm PVC.

New Sewer Services:

46 new customers connected to existing municipal services in 2023.

Sewer Lateral Blockages:

8 lateral blockages on the municipal side, Cleared and replaced as needed.

Sewer Pump Stations:

All maintenance was completed for Pump stations in 2023. Caroline SPS was upgraded to having a Generator back up and new PLC pumps and pipe work.

Main Line Sewer Blockages:

There were 4 main line sewer blockages. Mains cleaned and inspected. GHSAN0635 James St replaced.

Sewer Force Mains:

All the low-pressure sewage force mains within the collection system were flushed by field staff through our annual preventive maintenance program. Grace Crt. FM required repair due to a blown off clean out.

Air Release Valves:

All twenty (22) of the air release vacuum valves connected to the sewage force mains in our collection system were removed, cleaned, tested, and reinstalled for the yearly maintenance inspection.

Sewer Flushing and Video Inspections:

Approximately 3932.8 meters of various size sanitary sewer mains were flushed using high pressure equipment. The two 250mm depressed (siphon) sewer mains from our Knister sewage pump station was swabbed from the collection chamber located in the Brydon Bay Road easement, through to the receiving chamber on Brydon Bay Road.

Sewer Rehabilitation:

David St, Bishop St, and Isaac St all had new sanitary sewers installed. New MH for these locations. Winewood Ave E autostables installed. James St relined sewer at 265. Replace sewer lateral at 370 Segwun. And 210 James St replaced lateral with PVC. 181 Phillip St had lateral relined. Roots are the cause of problems.

Locates:

Field staff addressed 862 locate requests for Ontario One Call.

Table 4 Effluent Flow Summary 2023

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	93,735	3,024	4,826	2,238	N/A	93,735
February	74,787	2,671	3,066	1,958	N/A	74,787
March	91,047	2,937	4,073	2,292	N/A	91,047
April	130,621	4,354	7,198	3,552	N/A	130,621
May	110,644	3,569	4,664	2,970	N/A	110,644
June	94,023	3,134	4,375	2,583	N/A	94,023
July	101,245	3,266	4,880	2,734	N/A	101,245
August	86,003	2,774	3,058	2,418	N/A	86,003
September	71,736	2,391	2,588	2,134	N/A	71,736
October	81,984	2,645	3,112	2,231	N/A	81,984
November	77,536	2,585	2,789	2,340	N/A	77,536
December	97,781	3,154	3,925	2,545	N/A	97,781

Total Flow: 1,111,142 m³
 Average Day: 3,044 m³
 Maximum Day: 7,198 m³
 Minimum Day: 1,958 m³

Table 5 Influent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample Part 1

Sample Date	Sample Identification Number	BOD5 mg/L	Total Phosphorus mg/L	Suspended Solids mg/L	Total Kjeldahl Nitrogen mg/L
Feb 07/23	CA12211	283	2.89	285	13.5
May 16/23	CA13560	300	31.2	1100	124.0
Aug 29/23	CA19901	350	2.15	347	12.5
Nov 07/23	CA13317	98	1.73	182	4.5
Yearly Average		258.0	9.5	478.0	38.6
Maximum		350.0	31.2	1100.0	124.0
Minimum		98.0	1.7	182.0	4.5

Table 6 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	91.5	8,580.0
February	114.7	8,580.0
March	94.2	8,580.0
April	65.7	8,580.0
May	77.5	8,580.0
June	91.3	8,580.0
July	84.7	8,580.0
August	99.8	8,580.0
September	119.6	8,580.0
October	104.7	8,580.0
November	110.7	8,580.0
December	87.7	8,580.0

Total Yearly Kilograms: 102,960kg

Table 7 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	85.3	8,000.0
February	120.3	9,000.0
March	76.9	7,000.0
April	76.6	10,000.0
May	81.3	9,000.0
June	95.7	9,000.0
July	128.4	13,000.0
August	127.9	11,000.0
September	125.5	9,000.0
October	134.2	11,000.0
November	141.9	11,000.0
December	102.3	10,000.0

Total Yearly Kilograms: 117,000kg

Table 8 Chemical Usage Summary: Polymer

Month	Average Dosage mg/L	Total kg
January	175.9	100
February	202.7	75
March	198.6	175
April	136.7	125
May	174.3	200
June	217.0	250
July	198.8	175
August	183.0	150
September	221.5	150
October	176.6	175
November	176.2	200
December	175.8	125

Total Yearly kg: 1,900kg

Table 9 Effluent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample Part 1

Sample Date	Sample Identification Number	CBOD5 mg/L	Alkalinity (Total as CaCO3) mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
Feb 07/23	CA12211	2	63	7.84	0.04	2
May 16/23	CA13560	2	58	7.80	0.04	2
Aug 29/23	CA19901	2	77	7.30	0.05	3
Nov 07/23	CA13317	2	85	7.30	0.07	2
Yearly Average		2	71	7.56	0.05	2
Maximum		2	85	7.84	0.07	3
Minimum		2	58	7.30	0.04	2

Table 10 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 07/23	CA12211	2.8	22.8	<0.03	<0.1
May 16/23	CA13560	<0.5	21.5	<0.03	<0.1
Aug 29/23	CA19901	<0.5	26.8	<0.03	<0.1
Nov 07/23	CA13317	1.6	27.7	<0.03	<0.1
Yearly Average		2.2	24.7	0.03	0.1
Maximum		2.8	27.7	0.03	0.1
Minimum		0.5	21.5	0.03	0.1

Table 11 Effluent Loading and Concentration Summary 2023: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	6.05	9.65
February	2.00	5.34	6.13
March	2.00	5.87	8.15
April	2.00	8.71	14.40
May	2.00	7.14	9.33
June	2.00	6.27	8.75
July	2.25	7.35	10.98
August	2.00	5.55	6.12
September	2.00	4.78	5.18
October	2.20	5.82	6.85
November	3.00	7.75	8.37
December	2.00	6.31	7.85
Average Monthly	2.12	6.41	8.48
Effluent Objective	5.00	25.82	
Non-Compliance	10.00	51.65	

Table 12 Effluent Loading and Concentration Summary 2023: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	6.05	9.65
February	2.00	5.34	6.13
March	2.00	5.87	8.15
April	2.25	9.80	16.20
May	2.00	7.14	9.33
June	2.00	6.27	8.75
July	2.75	8.98	13.42
August	3.20	8.88	9.79
September	2.25	5.38	5.82
October	2.20	5.82	6.85
November	2.75	7.11	7.67
December	2.75	8.67	10.79
Average Monthly	2.35	7.11	9.38
Effluent Objective	5.00	25.82	
Non-Compliance	10.00	51.65	

Table 13 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.36	0.47
June	0.10	0.31	0.44
July	0.10	0.33	0.49
August	0.10	0.28	0.31
September	0.10	0.24	0.26
October	0.10	0.26	0.31
Average Monthly	0.10	0.30	0.38
Effluent Objective	1.00	5.16	
Non-Compliance	5.00	25.8	

Table 14 Effluent Loading and Concentration Summary 2023: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.10	0.30	0.48
February	0.10	0.27	0.31
March	0.10	0.29	0.41
April	0.10	0.44	0.72
November	2.90	7.50	8.09
December	0.55	1.73	2.16
Average Monthly	0.64	1.75	2.03
Effluent Objective	1.00	5.16	
Non-Compliance	10.00	51.65	

Table 15 Effluent Loading and Concentration Summary 2023: E.Coli

Month	Geomean (#/100mL)	Maximum Daily (#/100mL)
January	0.00	0.00
February	0.00	0.00
March	4.50	18.00
April	43.25	173.00
May	1.80	4.00
June	0.25	1.00
July	38.25	131.00
August	11.80	57.00
September	1.25	5.00
October	20.80	93.00
November	12.75	49.00
December	0.25	1.00
Average Monthly	11.24	44.33
Effluent Objective	0.00	
Non-Compliance	80.00	

Table 16 Effluent Loading and Concentration Summary 2023: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.09	0.14
February	0.03	0.09	0.10
March	0.03	0.09	0.12
April	0.04	0.17	0.29
May	0.04	0.14	0.18
June	0.06	0.19	0.26
July	0.04	0.13	0.20
August	0.06	0.17	0.18
September	0.06	0.14	0.16
October	0.06	0.16	0.19
November	0.12	0.31	0.33
December	0.06	0.19	0.24
Average Monthly	0.05	0.16	0.20
Effluent Objective	0.30	1.55	
Non-Compliance	0.30	1.55	

Table 17 Dewatered Sludge Production Summary 2023

Month	Hauler	Liquid Volume m³	Cake Weight kg	Destination
January	WESSUC	569	23.51	Lystek
February	WESSUC	370	24.71	Lystek
March	WESSUC	881	49.57	Lystek
April	ROHES	914	81.05	Lystek
May	ROHES	1147	78.63	Lystek
June	ROHES	1152	76.12	Lystek
July	ROHES	880	68.95	Lystek
August	ROHES	820	47.36	Lystek
September	ROHES	677	51.23	Lystek
October	ROHES	991	49.97	Lystek
November	ROHES	1135	74.07	Lystek
December	ROHES	711	48.55	Lystek

Yearly Total tonnes: 673.72
 Yearly Average tonnes: 56.14
 Maximum tonnes: 81.05
 Minimum tonnes: 23.51

Table 18 Sludge Quality Analysis 2023

Parameter Sampled (mg/L)	First Quarter (Feb 07)	Second Quarter (May 23)	Third Quarter (Aug 29)	Fourth Quarter (Nov 7)
Sample ID	CA12212	CA13561	CA19902	CA13316
Nitrate	0.3	0.3	<3	<3
Mercury	0.005	0.006	0.004	0.004
Chromium	0.22	0.37	0.26	0.24
Cobalt	0.03	0.05	0.04	0.03
Copper	7.7	9.6	7.1	7.3
Lead	0.2	0.2	0.2	0.20
Molybdenum	0.13	0.13	0.09	0.08
Nickel	0.2	0.31	0.2	0.18
Selenium	< 0.10	< 0.10	< 0.10	<0.1
Arsenic	< 0.1	< 0.1	< 0.1	<0.1
Zinc	7	8	8	7
Cadmium	0.007	0.11	0.008	0.009
Ammonia+ Ammonium	620	585	596	497
Total Kjeldahl Nitrogen	1260	1270	1360	1100
Total Phosphorus	150	316	376	389
Total Solids	13600	20600	15200	13300
Total Suspended Solids	10300	17700	13000	13200
Nitrite	0.2	0.3	<3	<3
PO4	370	316	156	389

Table 19 Septage Quality and Quantity

Month	BOD5 Mg/L	TSS Mg/L	Total Solids Mg/L	COD Mg/L	TP Mg/L	TKN Mg/L	Volume Septage M ³	Volume Biosolids M ³
January	8290	52100	49200	33000	360	1060	41.75	15.90
February	579	1960	2180	1780	43.3	111	0.00	0.00
March	250	7460	1340	930	16	51.6	76.16	0.00
April	1640	23900	16500	8500	86.6	364	47.16	0.00
May	663	3180	2930	4050	14.8	164	236.08	0.00
June	12300	28600	32100	37600	112	688	300.81	0.00
July	458	1830	3800	4800	36.5	208	199.22	0.00
August	2040	12400	9253	4350	41.1	266	299.31	0.00
September	2940	8280	9950	14500	63	474	267.88	0.00
October	891	2500	2700	4950	24.7	209	226.35	0.00
November	3130	18400	35700	13700	67.2	510	136.21	0.00
December	83	258	390	173	3.8	17.7	23.13	0.00

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.

Michael Currie
Director, Water and Wastewater Services

Kyle Marriott
Chief Operator, Gravenhurst Treatment