

2022 Year End Report: Bala Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 5049-B55KXT

Engineering and Public Works Department

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Introduction

The Bala Wastewater Treatment Plant (WWTP), which services the Town of Bala is owned and operated by the District Municipality of Muskoka. The plant is located at 1007 Tower Road and was commissioned in 1996. It currently services 390 customer accounts.

The Plant operates under the MECP Environmental Compliance Approval (Sewage) # 5049-B55KXT, issued October 31, 2018. Under the terms of the Certificate of Approval, the plant is permitted to treat an average daily flow of 550 meters cubed per day, and a peak flow of 2,036 meters cubed per day. Additionally, effluent limit criteria are as follows:

Table 1 Effluent Limit Criteria

Effluent Parameter	Concentration
CBOD	15 mg/L
Total Suspended Solids	15 mg/L
Total Phosphorous	0.30 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	100 CFU/100mL
pH	6.0-9.5 inclusive at all times

The plant is an extended aeration activated sludge treatment process, consisting of grit removal, postsecondary filtration and Ultra-Violet disinfection. The facility is also equipped with aerobic digesters for bio-solids stabilization prior to final disposal.

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

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 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 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 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 (#5049-B55KXT).

Quantity of Flow Summary

The plant has a daily average flow design capacity of 550 meters cubed per day. The actual average daily flow for 2022 was 330 meters cubed per day, however, the 3-year average is 321 meters cubed per day, which represents 58% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

September 21 while maintenance was being done on the aeration tanks, about 2 cubic meters of mixed liquor was spilled in the parking lot, which was contained and cleaned up.

On November 2 overnight until morning November 3, approximately 132 cubic meters of effluent was not disinfected due to an electrical issue that was intermittent, resulting in repeated UV equipment failure

Summary of Maintenance

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 (but is not limited to)

- Monthly testing of emergency testing (under load) of the standby generators.
- Monthly calibration verification of analytical equipment
- Annual servicing of emergency standby generators.
- Annual calibration of flow metering devices
- Annual calibration verification of analytical equipment by third party
- Annual cleaning of sewage pumping stations.
- Marine inspection of effluent outfall and diffuser completed in 2022. (5-year cycle)

All flow meter and analytical calibration verifications indicated all equipment was within calibration tolerances as required in the ECA.

Evaluation of the Need for Improvement Works

The treatment facility is operating at a plant capacity of 60% and is in compliance with specified effluent parameter criteria. In addition, there has been no significant treatment process upsets and plant bypasses.

Evaluation Summary of Proposed Work Requiring Approval under OWRA

No works performed in 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 E

Influent Analysis

Table 2 Influent Analysis

Influent Parameter	Minimum	4 Week Average Maximum	Annual Average	Average loading kg/day
BOD5 (mg/L)	36	258.8	87.6	28.9
Suspended Solids (mg/L)	34	258.8	144.7	47.8
Total Phosphorus (mg/L)	6.7	8.2	7.6	2.5
TKN (mg/L)	6.0	30.3	17.8	5.9
pH	6.96	8.78 max	7.6	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

Effluent objectives were not met at all times in 2022. In January high flows and low temperatures resulted in poor nitrification performance with a monthly average Ammonia of 3.3 mg/L exceeding the objective of 2.0 mg/L however well within the winter compliance limit of 10.0 mg/L.

The effluent objectives were not met during August for final effluent pH. One event only the effluent pH was measured to be 6.16, in compliance but not meeting the objective. This was during a period of summer temperatures and good process performance of Ammonia removal, consuming alkalinity and resulting in the pH drop, this was corrected through alkalinity addition with sodium carbonate addition.

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)	2.0	2.2	2.0	0.7
Suspended Solids (mg/L)	2.0	4.5	2.6	0.9
Ammonia (mg/L)	0.1	3.3	0.4	0.1
E. Coli (#/100 mL)	0	0.2	0.2	N/A
Total Phosphorus (mg/L)	0.03	0.28	0.06	0.02
pH	6.16	(max)	7.52	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 2023 year, 24-hour composite samples will be collected on Thursday rather than Wednesday of each week as was done in 2022.

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 were hauled by a contractor for disposal in 2022 and will continue to do so in 2023. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2023.

Summary of Complaints received throughout the reporting period.

There were no complaints received in the reporting period.

Bala Wastewater Collection Summary 2022

New or Replaced Sewer Main

There was no new sewer main installed in Bala.

New Sewer Services:

2 new customers connected to existing municipal services in 2022.

Sewer Lateral Blockages:

1 Sewer lateral blockage on Currie Street.

Sewer Pump Stations:

All stations were cleaned by high velocity water pressure. All debris was vacuumed out and hauled to the appropriate landfill site. ARV's in River and Musquash were inspected. River St was cleaned and reinstalled in 2022.

Main Line Sewer Blockages:

Currie Street main line LPS sewer had 3 main line blockages. Repairs, reconstruction, flushing and power jetting were required to clear the blockages. Large rubble back fill and poor pipe construction at time of installation was the cause of the blockages. LPS weekly flushing program initiated to maintain flow of the sewer.

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. Currie Street was flushed weekly for the month of December.

Air Release Valves:

All eleven (11) of the air release vacuum valves connected to the sewage force mains in our collection system had a maintenance inspection.

Sewer Flushing and Video Inspections:

No sewer flushing or video inspections for 2022

Sewer Rehabilitation:

There was no MH rehab in Bala.

Locates:

Field staff addressed 238 locates for Bala Ontario OneCall in 2022.

Table 4 Effluent Flow Summary – 2022

Month	Plant Total Monthly (m³)	Average Day Flow (m³/d)	Maximum Day Flow (m³/d)	Minimum Day Flow (m³/d)
January	9,658	312	445	208
February	6,473	231	319	166
March	14,070	454	931	215
April	16,904	563	735	458
May	11,283	364	498	279
June	10,115	337	463	253
July	8,454	273	379	226
August	8,307	268	334	212
September	6,435	214	297	166
October	9,869	318	598	187
November	8,221	274	425	213
December	10,631	343	654	250

Total Flow: 120,420m³
 Average Day: 330m³
 Maximum Day: 931m³
 Minimum Day: 166m³

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

Sample Date	Sample Identification Number	BOD5 mg/L	Alkalinity (Total as CaCO3) mg/L	Phosphate	Total Phosphorus mg/L	Suspended Solids mg/L
16-Feb-22	CA12652	106	240	0.52	3.39	86
4-May-22	CA14135	62	151	0.19	2.20	94
8-Aug-22	CA13544	76	177	0.64	1.91	89
9-Nov-22	CA13430	49	222	0.13	0.10	44
Yearly Average		73.3	197.5	0.4	1.9	78.3
Maximum		106.0	240.0	0.6	3.4	94.0
Minimum		49.0	151.0	0.1	0.1	44.0

Table 6 Influent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Conductivity mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Chloride mg/L
16-Feb-22	CA12652	732	19.9	0.06	0.03	16.2	80
4-May-22	CA14135	624	10.8	0.06	0.03	8.4	93
8-Aug-22	CA13544	596	21.6	0.06	0.03	14.6	58
9-Nov-22	CA13430	662	12.2	0.1	0.04	10.5	59
Yearly Average		653.5	16.1	0.07	0.03	12.4	72.5
Maximum		732.0	21.6	0.10	0.04	16.2	93.0
Minimum		596.0	10.8	0.06	0.03	8.4	58.0

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	86.2	832.9
February	78.6	508.9
March	66.2	931.1
April	42.9	725.6
May	484.4	5,465.7
June	43.7	441.7
July	85.9	726.1
August	119.9	995.8
September	51.5	331.2
October	51.4	506.8
November	101.0	830.5
December	93.7	996.1
Average	108.8	1107.7

Total Yearly Kilograms: 13,292k

Table 8 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	24.9	240.3
February	36.9	238.8
March	26.9	378.6
April	19.3	326.8
May	20.5	231.7
June	86.5	875.0
July	36.2	306.1
August	24.8	206.4
September	39.7	255.4
October	28.9	285.2
November	18.1	148.8
December	29.9	317.9
Average	32.7	317.6

Total Yearly Kilograms: 3811

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	Phosphate	Total Phosphorus mg/L	Suspended Solids mg/L
16-Feb-22	CA12652	2	69	7.66	0.03	0.03	2
4-May-22	CA14135	2	70	7.72	< 0.03	0.03	2
8-Aug-22	CA13544	2	50	7.31	<0.03	0.05	2
9-Nov-22	CA13430	3	74	7.89	< 0.03	0.03	6
Yearly Average		2.3	65.8	7.6	0.03	0.04	3.0
Maximum		3.0	74.0	7.9	0.03	0.05	6.0
Minimum		2.0	50.0	7.3	0.03	0.03	2.0

Table 10 Effluent Quarterly Analysis Summary – Weekly 24-Hour Composite Sample Part 2

Sample Date	Sample Identification Number	Conductivity mg/L	Total Kjeldahl Nitrogen mg/L	Nitrate Nitrogen mg/L	Nitrite Nitrogen mg/L	Total Ammonia Nitrogen mg/L	Chloride mg/L
16-Feb-22	CA12652	652	0.5	20	0.07	0.1	78
4-May-22	CA14135	504	0.5	7.7	0.03	0.1	75
8-Aug-22	CA13544	613	1.8	25.4	0.03	0.1	60
9-Nov-22	CA13430	600	0.5	15	0.03	0.1	58
Yearly Average		592.3	0.8	17.1	0.0	0.1	67.8
Maximum		652.0	1.8	25.4	0.1	0.1	78.0
Minimum		504.0	0.5	7.7	0.0	0.1	58.0

Table 11 Effluent Loading and Concentration Summary 2022: COBD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.62	0.89
February	2.00	0.46	0.64
March	2.00	0.91	1.86
April	2.00	1.13	1.47
May	2.00	0.73	1.00
June	2.00	0.67	0.93
July	2.00	0.55	0.76
August	2.00	0.54	0.67
September	2.00	0.43	0.59
October	2.00	0.64	1.20
November	2.20	0.60	0.93
December	2.00	0.69	2.50
Average Monthly	2.02	0.66	1.12
Effluent Objective	10	N/A	N/A
Non-Compliance	15	8.25	N/A

Table 12 Effluent Loading and Concentration Summary 2022: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.50	0.78	1.11
February	2.75	0.64	0.88
March	2.80	1.27	2.61
April	2.25	1.27	1.65
May	2.00	0.73	1.00
June	2.60	0.88	1.20
July	2.50	0.68	0.95
August	2.80	0.75	0.93
September	3.50	0.75	1.04
October	2.50	0.80	1.49
November	2.80	0.77	1.19
December		0.00	0.00
Average Monthly	2.64	0.78	1.17
Effluent Objective	10.00	N/A	N/A
Non-Compliance	15.00	8.25	N/A

Table 13 Effluent Loading and Concentration Summary 2022: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.10	0.04	0.05
June	0.10	0.03	0.05
July	0.10	0.03	0.04
August	0.12	0.03	0.04
September	0.10	0.02	0.03
October	0.10	0.03	0.06
Average Monthly	0.10	0.03	0.04
Effluent Objective	0.5	0.275	0.275
Non-Compliance	5	2.75	2.75

Table 14 Effluent Loading and Concentration Summary 2022: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	1.82	0.57	0.81
February	0.10	0.02	0.03
March	0.10	0.05	0.09
April	0.10	0.06	0.07
November	0.10	0.03	0.04
December	0.10	0.03	0.07
Average Monthly	0.39	0.13	0.19
Effluent Objective	2.00	1.1	1.1
Non-Compliance	10.00	5.5	5.5

Table 15 Effluent Loading and Concentration Summary 2022: 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	0.25	1.00
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	0.02	0.09
Effluent Objective	80.00	
Non-Compliance	100.00	

Table 16 Effluent Loading and Concentration Summary 2022: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.030	0.009	0.013
February	0.030	0.007	0.010
March	0.030	0.014	0.028
April	0.030	0.017	0.022
May	0.030	0.011	0.015
June	0.054	0.018	0.025
July	0.027	0.007	0.010
August	0.052	0.014	0.017
September	0.040	0.009	0.012
October	0.030	0.010	0.018
November	0.030	0.008	0.013
December	0.030	0.010	0.020
Average Monthly	0.03	0.01	0.02
Effluent Objective	0.30	0.165	0.165
Non-Compliance	0.30	0.165	0.165

Table 17 Liquid Sludge Production Summary 2022

Month	Hauler	Liquid Volume m ³	Destination
January			
February			
March	ROHES	109.2	ROHES - Lagoon
April			
May	ROHES	120	ROHES - Lagoon
June	ROHES	115	ROHES - Lagoon
July	ROHES	80	ROHES - Lagoon
August	ROHES	120	ROHES - Lagoon
September	ROHES	38	ROHES - Lagoon
October			
November	ROHES	114	ROHES - Lagoon
December			

Yearly Total Volume: 696m³
 Yearly Average Volume: 99m³
 Maximum Volume: 120m³

Table 18 Sludge Quality Analysis 2022

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb-22	May-22	Aug-22	Nov-22
Sample ID	BIPCPDIG2	BIPCPDIG2	BIPCPDIG2	BIPCPDIG2
Nitrate	35	80	52	84
Mercury	0.049	0.099	0.014	0.021
Chromium	0.16	0.24	0.19	0.16
Cobalt	0.03	0.04	0.03	0.04
Copper	5.1	6.3	4.7	5.9
Lead	0.2	0.2	0.3	0.40
Molybdenum	0.05	0.07	0.07	0.07
Nickel	0.16	0.20	0.16	0.17
Selenium	< 0.10	< 0.10	< 0.10	<0.10
Arsenic	< 0.1	< 0.1	< 0.1	<0.10
Zinc	5	6	5	7
Cadmium	0.008	0.01	0.008	0.011
Ammonia+ Ammonium	5.2	9.8	28.9	5.6
Total Kjeldahl Nitrogen	922	956	1150	1060
Total Phosphorus	300	490	354	490
Total Solids	16100	22300	19200	20100
TSS	14700	21100	13100	19400
Nitrite	2	38	4.8	0.5
PO4(sol)(Dissolved Reactive Phosphorous)	0.75	0.75	0.75	0.75

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
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