2024 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 451 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 2024 was 307 meters cubed per day, however, the 3-year average is 331 meters cubed per day, which represents 60% of the plant capacity. None of the individual system components exceeded the design flow rating.

Plant Operational Upsets or Process Failures

Event # 1-FBFJNH – Plant surcharged from heavy precipitation/infiltration
Event # 1-FEP9MC – Plant surcharged from excess waste from water treatment plant combined with infiltration

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 (and 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 was last completed in 2022 and is planned for 2027.

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 2024.

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)	41	554	136.01	42.09
Suspended Solids (mg/L)	49	683	152	40.96
Total Phosphorus (mg/L)	0.5	14.30	2.34	0.72
TKN (mg/L)	5.9	70	23.6	7.25
pH	7.17	8.50	7.64	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

Total Ammonia Nitrogen objective monthly average exceedance for the month of October, from a lab analysis result performed October 21, 2025.
Event # 1-FBFJNH – Plant surcharged from heavy precipitation/infiltration, 2 occurrences - December 29, 30, 2024
Event # 1-FEP9MC – Plant surcharged from excess waste from water treatment plant combined with precipitation/infiltration – December 31, 2024

Final Effluent Analysis Summary

Total Ammonia Nitrogen objective monthly average exceedance for the month of October, from a lab analysis result performed October 21, 2025.
All final effluent samples tested for CBOD5, suspended solids, 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	3.0	2.1	0.7
Suspended Solids (mg/L)	2.0	6.5	2.51	0.8
Ammonia (mg/L)	0.10	1.23	0.21	0.06
E. Coli (#/100 mL)	0	646	0.64	N/A

Parameter	Minimum	4 Week Average Maximum	Annual Average	Average Loading kg/day
Total Phosphorus (mg/L)	0.03	0.05	0.04	0.01
pH	6.54	7.60 (max)	6.91	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 2025 year, 24-hour composite samples will be collected on Tuesday rather than Monday of each week as was done in 2024.

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 by a contractor for disposal in 2024 and will continue to do so in 2025. It is not anticipated that there will be a significant increase in the total volume of bio solids produced in 2025.

Summary of Complaints received throughout the reporting period.

There were no complaints received in the reporting period.

Bala Wastewater Collection Summary 2024

New or Replaced Sewer Mains

There was no new sewer main installed in Bala 2024.

New Sewer Services:

4 new customers connected to existing municipal services.

Sewer Lateral Blockages:

There were no sewer lateral blockages in 2024.

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.

Main Line Sewer Blockages:

There were no main line sewer blockages in 2024.

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 in 2024.

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 2024.

Sewer Flushing and Video Inspections:

No Flushing or Video inspections for 2024.

Sewer Rehabilitation:

There was no MH rehab in Bala in 2024

Locates:

Field staff addressed 133 locates for Bala One Call in 2024.

Table 4 Effluent Flow Summary - 2024

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	8,346	269	352	205
February	9,541	329	632	241
March	13,942	450	836	306
April	17,178	573	974	317
May	10,340	334	707	227
June	7,679	256	576	172
July	9,434	304	427	237
August	7,630	246	327	191
September	5,089	170	237	129
October	5,160	166	257	110
November	5,548	185	356	119
December	12,193	393	1,036	206

Total Flow: 112,080 m^3
Average Day: 307 m^3
Maximum Day: 1,036 m^3
Minimum Day: 110 m^3

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
Feb-05-24	CA13175	81	164	0.03	0.88	98
May-06-24	CA13344	66	177	0.18	0.69	70
Aug-05-24	CA13265	238	254	1.53	4.06	254
Nov-04-24	CA12161	114	210	0.33	2.34	123
Yearly Average		125	202	0.52	1.99	136
Maximum		238	254	1.53	4.06	254
Minimum		66	164	0.03	0.69	70

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
05-Feb-24	CA13175	745	12.6	0.20	0.04	7.4	160
May 06-24	CA13344	582	11.4	0.06	0.03	10.2	63
Aug 05-24	CA13265	734	47.3	0.06	0.03	38.2	65
Nov 04-24	CA12161	634	27.4	0.06	0.03	22.2	57
Yearly Average		674	24.7	0.10	0.03	19.5	86.3
Maximum		745	47.3	0.20	0.04	38.2	160
Minimum		582	11.4	0.06	0.03	7.4	57

Table 7 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	104.2	1,943.0
February	107.8	1,927.2
March	105.7	3,049.2
April	108.6	3,715.8
May	101.6	2,303.4
June	51.1	1,425.6
July	58.0	2,251.9
August	104.6	2,118.6
September	77.5	1,755.6
October	72.5	1,588.0
November	52.1	1,108.8
December	47.8	2,145.0
Average	**82.6**	**2111.0**

Total Yearly Kilograms: 25,332 kg

Table 8 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	33.8	302.5
February	37.2	320
March	35.9	456.3
April	34.6	456.9
May	21.6	336.3
June	112.7	353.1
July	26.1	495.6
August	43.8	498.1
September	34.4	356.9
October	34.5	358.8
November	39.7	418.8
December	27	520.6
Average	**40.1**	**406.2**

Total Yearly Kilograms: 5,298 kg

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
5-Feb-24	CA13175	2	82	7.37	0.03	0.04	3
6-May-24	CA13344	2	76	7.40	< 0.03	0.03	2
5-Aug-24	CA13265	2	53	7.38	0.08	0.03	6
4-Nov-24	CA12161	2	43	7.41	< 0.03	0.03	2
Yearly Average		2	69.5	7.39	0.055	0.03	3.3
Maximum		2	100	7.41	0.08	0.04	6
Minimum		2	39	7.37	0.03	0.03	2

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
5-Feb-24	CA13265	778	1.0	10.7	0.03	0.1	150
6-May-24	CA13344	588	0.6	11.2	0.03	0.1	62
5-Aug-24	CA13265	712	1.6	35.8	0.44	0.1	55
4-Nov-24	CA12161	700	1.3	36.1	0.06	0.1	57
Yearly Average		694.5	1.1	23.45	0.14	0.1	81
Maximum		778	1.6	36.1	0.44	0.1	150
Minimum		588	0.6	10.7	0.03	0.1	55

Table 11 Effluent Loading and Concentration Summary 2024: CBOD5

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.00	0.54	0.70
February	2.00	0.66	1.26
March	2.00	0.90	1.67
April	2.00	1.15	1.95
May	2.00	0.67	1.41
June	2.00	0.51	1.15
July	2.00	0.61	0.85
August	2.00	0.49	0.65
September	2.00	0.34	0.47
October	2.00	0.33	0.51
November	2.25	0.42	0.80
December	2.00	0.79	2.07
Average Monthly	2.02	0.62	1.13
Effluent Objective	10		
Non-Compliance	15	8.25	8.25

Table 12 Effluent Loading and Concentration Summary 2024: Suspended Solids

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	2.20	0.59	0.77
February	2.25	0.74	1.42
March	2.00	0.90	1.67
April	2.40	1.37	2.34
May	2.25	0.75	1.59
June	2.25	0.58	1.30
July	3.60	1.10	1.54
August	2.25	0.55	0.74
September	2.20	0.37	0.52
October	2.00	0.33	0.51
November	2.25	0.42	0.80
December	3.1	1.36	4.39
Average Monthly	2.47	0.77	1.45
Effluent Objective	10.00		
Non-Compliance	15.00	8.25	8.25

Table 13 Effluent Loading and Concentration Summary 2024: Total Ammonia Nitrogen Summer

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
May	0.30	0.10	0.21
June	0.13	0.03	0.07
July	0.16	0.05	0.07
August	0.10	0.02	0.03
September	0.10	0.02	0.02
October	1.23	0.20	0.32
Average Monthly	0.34	0.07	0.12
Effluent Objective	0.5	0.28	0.28
Non-Compliance	5	2.75	2.75

Table 14 Effluent Loading and Concentration Summary 2024: Total Ammonia Nitrogen Winter

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.10	0.03	0.04
February	0.10	0.03	0.06
March	0.10	0.04	0.08
April	0.10	0.06	0.10
November	0.10	0.02	0.04
December	0.12	0.05	0.12
Average Monthly	0.10	0.04	0.07
Effluent Objective	2.00		
Non-Compliance	10.00	5.5	5.5

Table 15 Effluent Loading and Concentration Summary 2024: 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	1.00	1.00
July	1.15	2.00
August	0.00	0.00
September	0.00	0.00
October	1.98	15.00
November	0.00	0.00
December	0.00	0.00
Average Monthly	1.07	1.50
Effluent Objective	80.00	
Non-Compliance	100.00	

Table 16 Effluent Loading and Concentration Summary 2024: Total Phosphorus

Month	Average mg/L	Average kg/day	Maximum Daily kg/day
January	0.03	0.01	0.01
February	0.03	0.01	0.02
March	0.03	0.01	0.03
April	0.03	0.02	0.03
May	0.03	0.01	0.02
June	0.04	0.01	0.02
July	0.07	0.02	0.03
August	0.03	0.01	0.01
September	0.03	0.01	0.01
October	0.03	0.00	0.01
November	0.04	0.01	0.01
December	0.06	0.03	0.07
Average Monthly	0.04	0.01	0.02
Effluent Objective	0.30	0.165	0.165
Non-Compliance	0.30	0.165	0.165

Table 17 Final Effluent Summary pH 2024

Month	Minimum	Maximum	Average
January	6.99	7.52	7.08
February	6.71	7.09	6.94
March	6.65	7.05	6.87
April	6.83	7.19	6.96
May	6.62	7.04	6.87
June	6.59	7.03	6.80
July	6.54	7.02	6.75
August	6.53	6.98	6.78
September	6.53	6.96	6.75
October	6.56	6.95	6.72
November	6.60	7.00	6.79
December	6.65	7.09	6.91
Average Monthly	*6.65*	*7.08*	*6.85*
Effluent Objective	*6.5*	*8.5*	
Effluent Limit Minimum	*6.0*	*9.5*	

Table 18 Liquid Sludge Production Summary 2024

Month	Hauler	Liquid Volume m^3	Destination
January			
February	ROHES	109.2	ROHES - Lagoon
March			
April	ROHES	109.2	ROHES - Lagoon
May	ROHES	72.8	ROHES - Lagoon
June			
July	ROHES	72.8	ROHES - Lagoon
August			
September	ROHES	109.2	ROHES - Lagoon
October	ROHES	72.8	ROHES - Lagoon
November	ROHES	109.2	ROHES - Lagoon
December			

Yearly Total Volume: 655 m^3
Yearly Average Volume: 73 m^3
Maximum Volume: 109 m^3

Table 19 Sludge Quality Analysis 2024

Parameter Sampled (mg/L)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Date	Feb-05-2024	May-06-24	Aug-06-2024	Nov-04-24
Sample ID	CA13173	CA13341	CA13267	CA12158
Nitrate	37	27	65	3
Mercury	0.019	0.023	0.024	0.028
Chromium	0.15	0.13	0.18	0.14
Cobalt	0.03	0.02	0.03	0.02
Copper	4.1	3.3	4.7	4.3
Lead	0.2	0.1	0.2	0.10
Molybdenum	0.05	0.05	0.06	0.05
Nickel	0.16	0.12	0.16	0.12
Selenium	0.1	0.1	0.1	0.1
Arsenic	0.1	0.1	0.1	0.1
Zinc	4	3	5	4
Cadmium	0.006	0.005	0.006	0.007
Ammonia+ Ammonium	3.2	3.4	6.2	17.4
Total Kjeldahl Nitrogen	644	646	816	688
Total Phosphorus	270	230	390	350
Total Solids	13100	15000	19400	13000
TSS	12200	12200	17500	12400
Nitrite	3	3	3	3
PO4(sol)(Dissolved Reactive Phosphorous)	<0.75	0.75	0.75	0.75
TSS	12200	13700	17500	12400
COD	12000	9700	29000	12500
BOD	2550	1320	2510	4320

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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