

## 2021 Year End Report: MacTier Wastewater Treatment Plant (WWTP)



Environmental Compliance Approval: # 7599-7PCKPU

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## Introduction

The MacTier Wastewater Treatment Plant (WWTP), which services the Town of MacTier, is owned and operated by the District Municipality of Muskoka. The plant is located at 20 Conger Marsh Lane, and was commissioned in 2007. It currently services 246 customers.

The Plant operates under the MOE Certificate of Approval (Sewage) #7599-7PCKPU issued February 18, 2009 and MOE Certificate of Approval (Air) #0571-67WJB7 issued on December 22, 2004. Under the terms of the Certificate of Approval, the average rated capacity of the plant is 691 cubic meters per day (m<sup>3</sup>/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	0.50 mg/L
Total Ammonia Nitrogen Summer (May 15 to September 30)	2.0 mg/L
Total Ammonia Nitrogen Winter (October 01 to May 14)	4.0 mg/L
E. coli	100 CFU/mL
pH	6.0-9.5 inclusive at all times

The treatment process is comprised of two (2) sequencing batch reactors, phosphorus precipitation using aluminum sulphate, effluent tertiary filtration and ultraviolet disinfection. Treated effluent from the plant is discharged through a 300 millimeters effluent outfall line and discharge structure located in Conger Marsh.

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 2020.

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 (#7599-7PCKPU).

### Quantity of Flow Summary

The plant has a daily average flow design capacity of 691 meters cubed per day. The actual average daily flow for the 2021 was 145m<sup>3</sup>/day, however, the 3 year average was 155m<sup>3</sup>/day which represents 22.43% 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 infrared inspection of Motor Control panels.
- 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 22.43% 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)	48	302	191	28.17
Suspended Solids (mg/L)	51	394	255	37.73
Total Phosphorus (mg/L)	1.01	5.24	3.89	0.58
Total Kjeldahl Nitrogen (mg/L)	8.0	46.7	36.5	5.42
pH	7.24	7.81 (max)	7.38	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

The effluent objectives were met during all sample periods.

### 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	3.5	3.00	0.34
Suspended Solids (mg/L)	<2	4.0	2.73	0.34
Total Phosphorus (mg/L)	<0.03	0.11	0.07	0.07
Ammonia (mg/L)	<0.1	0.8	0.34	0.25
E. Coli (#/100 mL)	0.00	6.25	1.00	N/A
pH	7.39	8.05 (max)	7.69	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 bio solids produced in 2022.

#### Summary of Complaints received throughout the reporting period

There were no complaints received in the reporting period.

#### MacTier Wastewater Collection Summary

##### New Sewer Services:

There were no new customers connected to existing Municipal services in 2021.

##### New Sewer Mains:

There was one (1) new 504.2m HDPE LPS installed in 2021.

##### Sewer Main-Force Main Replacements:

There were no sewer main or force main replacements 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.

### Main Line Sewer Blockage

There were no sewer main blockages in 2021.

### Sewer Lateral Blockage

There were no lateral blockages on the Municipal service side in 2021.

### Low Pressure Sewer Service:

All low pressure sewage force mains within the collection system were flushed by operations staff as part of annual preventive maintenance in 2021.

### Sewage Pump Stations:

All sewage pump stations were cleaned using high pressure water equipment and all debris was vacuumed out and hauled to an appropriate disposal site. Two Air relief valve's were inspected at the SPS's as well.

### Air Release Valves:

All five (5) of the air release vacuum valves connected to the sewer force main were inspected and cleaned as required in 2021.

### Sewer Flushing/Video:

Approximately 520.3 meters of various size sanitary sewer mains were flushed using high pressure equipment and video inspected in 2021.

### Sewer Locates:

Operations staff addressed 23 Ontario OneCall utility locate requests in 2021.

Table 4 Effluent Flow Summary - 2021

<b>Month</b>	<b>Plant Total Monthly (m<sup>3</sup>)</b>	<b>Average Day Flow (m<sup>3</sup>/d)</b>	<b>Maximum Day Flow (m<sup>3</sup>/d)</b>	<b>Minimum Day Flow (m<sup>3</sup>/d)</b>
<b>January</b>	4,185	135	182	104
<b>February</b>	3,374	120	143	102
<b>March</b>	5,478	177	340	106
<b>April</b>	4,059	135	176	104
<b>May</b>	3,731	120	167	91
<b>June</b>	3,794	126	223	90
<b>July</b>	4,710	152	224	116
<b>August</b>	3,762	121	183	83
<b>September</b>	4,781	159	648	75
<b>October</b>	4,784	154	254	114
<b>November</b>	4,333	144	258	107
<b>December</b>	5,783	187	379	103

Total Flow: 52,775m<sup>3</sup>  
 Average Day: 145m<sup>3</sup>  
 Maximum Day: 648m<sup>3</sup>  
 Minimum Day: 75m<sup>3</sup>

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

Sample Date	Sample Identification Number	BOD5 mg/L	Total Kjeldahl Nitrogen mg/L	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-01-21	CA13037	206	32.7	3.85	224
May-03-21	CA12067	211	40.2	3.98	251
Aug-03-21	CA13142	200	41.4	5.79	455
Nov-01-21	CA13029	123	37.5	2.22	70
<b>Yearly Average</b>		185.0	38.0	4.0	250.0
<b>Maximum</b>		211.0	41.4	5.8	455.0
<b>Minimum</b>		123.0	32.7	2.2	70.0



Table 6 Chemical Usage Summary: Alum

Month	Average Dosage mg/L	Total kg (dry)
January	82.0	736.1
February	81.3	594.3
March	71.7	820.5
April	97.0	871.6
May	103.6	892.5
June	78.5	623.7
July	66.7	653.0
August	82.3	674.4
September	73.5	652.6
October	70.0	680.4
November	75.0	678.5
December	64.4	736.6
Average	78.8	717.8

Total Yearly Kilograms: 8,614kg

Table 7 Chemical Usage Summary: Soda Ash

Month	Average Dosage mg/L	Total kg (dry)
January	148.7	662.0
February	157.6	563.5
March	154.4	889.0
April	154.3	680.0
May	148.5	621.5
June	147.7	587.5
July	147.9	715.5
August	150.3	607.5
September	146.0	728.0
October	150.7	720.0
November	153.4	686.5
December	144.5	906.0
Average	150.3	687.3

Total Yearly Kilograms: 8,367kg

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

Sample Date	Sample Identification Number	CBOD5 mg/L	Total Ammonia Nitrogen mg/L	pH	Total Phosphorus mg/L	Suspended Solids mg/L
Feb-01-21	CA13037	<2	0.1	7.75	0.06	<2
May-03-21	CA12067	3	0.3	7.67	0.08	2
Aug-3-21	CA13142	<2	<0.1	7.84	0.06	<2
Nov-01-21	CA13029	2	<0.1	7.62	0.04	2
<b>Yearly Average</b>		2.3	0.175	7.72	0.06	2
<b>Maximum</b>		3.0	0.3	7.84	0.08	2
<b>Minimum</b>		2.0	0.1	7.62	0.04	2

Table 9 Effluent Loading and Concentration Summary 2021: COBD5

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	2.00	0.27	0.36
<b>February</b>	2.25	0.27	0.32
<b>March</b>	2.60	0.46	0.88
<b>April</b>	3.25	0.44	0.57
<b>May</b>	2.20	0.26	0.34
<b>June</b>	2.00	0.25	0.45
<b>July</b>	2.75	0.42	0.62
<b>August</b>	3.00	0.36	0.55
<b>September</b>	2.00	0.32	1.30
<b>October</b>	2.00	0.31	0.51
<b>November</b>	2.00	0.29	0.52
<b>December</b>	2.50	0.47	0.95
<b>Average Monthly</b>	2.38	0.34	
<b>Effluent Objective</b>	<b>5.0</b>		
<b>Non-Compliance</b>	<b>10.0</b>		

Table 10 Effluent Loading and Concentration Summary 2021: Suspended Solids

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	2.25	0.30	0.41
<b>February</b>	2.50	0.30	0.36
<b>March</b>	3.00	0.53	1.02
<b>April</b>	3.75	0.51	0.66
<b>May</b>	2.00	0.27	0.33
<b>June</b>	2.20	0.28	0.50
<b>July</b>	2.25	0.34	0.50
<b>August</b>	2.00	0.24	0.37
<b>September</b>	2.00	0.32	1.30
<b>October</b>	2.25	0.35	0.57
<b>November</b>	2.20	0.32	0.57
<b>December</b>	2.00	0.37	0.76
<b>Average Monthly</b>	2.37	0.34	
<b>Effluent Objective</b>	<b>5.0</b>		
<b>Non-Compliance</b>	<b>10.0</b>		

Table 11 Effluent Loading and Concentration Summary 2021: Total Ammonia Nitrogen Summer

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>April</b>	0.35	0.05	0.06
<b>May</b>	0.28	0.04	0.04
<b>June</b>	0.20	0.03	0.04
<b>July</b>	0.10	0.02	0.02
<b>August</b>	0.10	0.01	0.02
<b>September</b>	0.15	0.02	0.1
<b>October</b>	0.10	0.02	0.03
<b>Average Monthly</b>	0.18	0.027	
<b>Effluent Objective</b>	<b>1.0</b>		
<b>Non-Compliance</b>	<b>2.0</b>		

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

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	0.13	0.02	0.02
<b>February</b>	0.28	0.03	0.03
<b>March</b>	0.80	0.14	0.27
<b>November</b>	0.10	0.01	0.03
<b>December</b>	0.23	0.04	0.09
<b>Average Monthly</b>	0.31	0.048	
<b>Effluent Objective</b>	<b>1.0</b>		
<b>Non-Compliance</b>	<b>4.0</b>		

Table 13 Effluent Loading and Concentration Summary 2021: Fecal Coliform

<b>Month</b>	<b>Geomean (#/100mL)</b>	<b>Maximum Daily (#/100mL)</b>
<b>January</b>	0.25	1.00
<b>February</b>	0.75	2.00
<b>March</b>	2.80	6.00
<b>April</b>	4.25	15.00
<b>May</b>	0.40	2.00
<b>June</b>	0.25	1.00
<b>July</b>	0.00	0.00
<b>August</b>	0.00	0.00
<b>September</b>	2.50	1.00
<b>October</b>	0.75	3.00
<b>November</b>	0.00	0.00
<b>December</b>	0.25	1.00
<b>Average Monthly</b>	1.02	
<b>Effluent Objective</b>		
<b>Non-Compliance</b>	<b>100</b>	



Table 14 Effluent Loading and Concentration Summary 2021: Total Phosphorus

<b>Month</b>	<b>Average mg/L</b>	<b>Average kg/day</b>	<b>Maximum Daily kg/day</b>
<b>January</b>	0.04	0.01	0.01
<b>February</b>	0.09	0.01	0.01
<b>March</b>	0.10	0.02	0.03
<b>April</b>	0.11	0.01	0.02
<b>May</b>	0.06	0.01	0.01
<b>June</b>	0.06	0.01	0.01
<b>July</b>	0.09	0.02	0.02
<b>August</b>	0.05	0.01	0.01
<b>September</b>	0.06	0.01	0.04
<b>October</b>	0.05	0.01	0.01
<b>November</b>	0.04	0.01	0.01
<b>December</b>	0.04	0.01	0.02
<b>Average Monthly</b>	0.07	0.01	
<b>Effluent Objective</b>	<b>0.2</b>		
<b>Non-Compliance</b>	<b>0.5</b>		

Table 15 Liquid Sludge Production Summary 2021

Month	Hauler	Liquid Volume m <sup>3</sup>	Cake Weight kg	Destination
January	ROHES	218.4	N/A	ROHES Storage Site
February	N/A	N/A	N/A	N/A
March	N/A	N/A	N/A	N/A
April	N/A	N/A	N/A	N/A
May	N/A	N/A	N/A	N/A
June	N/A	N/A	N/A	N/A
July	N/A	N/A	N/A	N/A
August	N/A	N/A	N/A	N/A
September	N/A	N/A	N/A	N/A
October	N/A	N/A	N/A	N/A
November	N/A	N/A	N/A	N/A
December	N/A	N/A	N/A	N/A

**Yearly Total Volume: 218.4**  
**Yearly Average Volume: N/A**  
**Maximum Volume: N/A**  
**Minimum Volume: N/A**

Table 16 Sludge Quality Analysis 2021

<b>Parameter Sampled (mg/L)</b>	<b>First Quarter</b>	<b>Second Quarter</b>	<b>Third Quarter</b>	<b>Fourth Quarter</b>
<b>Date</b>	Feb-01-21	May-03-21	Aug-03-21	Nov-01-21
<b>Sample ID</b>	CA13038	CA12068	CA13143	CA13030
Nitrate	43	23	57	94
Mercury	0.002	0.002	0.002	0.003
Chromium	0.3	0.22	0.35	0.5
Cobalt	0.04	0.03	0.02	0.06
Copper	8.1	5.5	7.4	11
Lead	0.2	0.1	0.2	0.3
Molybdenum	0.08	< 0.070	0.1	0.17
Nickel	0.21	0.18	0.24	0.37
Selenium	<0.1	<0.1	<0.1	<0.1
Arsenic	<0.1	<0.1	<0.1	<0.1
Zinc	8	7	9	16
Cadmium	0.012	0.01	0.011	0.017
Ammonia+ Ammonium	4.2	6	1.3	<0.1
Total Kjeldahl Nitrogen	642	336	462	524
Total Phosphorus	354	330	520	860
Total Solids	14600	14200	16300	20500
Volitile Solids				
Nitrite	1.8	1	<0.2	<0.2
Potassium	49	51	59	72

## 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 Spicer  
Director, Water and Wastewater Services

Stewart Hurd  
Manager of Water and Wastewater Operations