CANA WASTEWATER TREATMENT PLANT

2023 ANNUAL REPORT

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

Cana Wastewater Treatment Plant (WWTP) operates under Ministry of the Environment, Conservation and Parks, ECA number 4021-9WUKDE. In the month of February, the facility was out of compliance with one of the effluent limits outlined in condition 7 of the above-mentioned ECA. The facility was compliant during all other months through 2023.

The sewage works has a rated capacity of 125 m^3/d, and a maximum day design flow of 200 m^3/d. The average flow through the plant was 62.7 m^3/d, and the maximum daily flow through the plant was 180 m^3/d in 2023.

2 PLANT OVERVIEW

The following is a process overview and description of the treatment steps taken at the Cana WWTP

2.1 RAW SEWAGE PUMPING STATION

A pre-cast concrete wet well accepts sewage flows from the existing sewer system for the Cana Subdivision. The wet well has two pumps which discharge into the preliminary treatment unit.

2.2 PRELIMINARY TREATMENT UNIT

Preliminary treatment involves the removal of large particles and floating debris such as wood, rags, and plastics from the raw sewage. This is accomplished with a manual bar screen installed inside a splitter box.

2.3 SECONDARY TREATMENT UNIT

The sewage flows through the splitter box and bar screen, it then discharges into the two Sequencing Batch Reactors (SBR). Each reactor is essentially an activated sludge process with aeration and settling taking place in the same tank. The decanted effluent from the SBR is then stabilized in a Post Equalization Tank. The sludge that settles out in the SBR is then pumped directly to the Digester.

2.4 POST EQUALIZATION TANK

The Post Equalization Tank collects the decanted water from the Sequencing Batch Reactors and discharges to the tertiary filter system.

2.5 CHEMICAL DOSING SYSTEMS

Phosphorus removal is accomplished using Aluminum Sulfate, which is injected directly into the splitter box during pump cycles.

2.6 TERTIARY FILTRATION UNIT

The discharge of the post equalization tanks goes into a continuous backwash up-flow sand filter to polish the water before going through the ultraviolet disinfection system. Filtrate then passes through one of the two UV disinfection units.

2.7 ULTRAVIOLET (UV) DISINFECTION

The filtrate then passes through one of the two UV disinfection units. Each unit can handle the maximum flow of 200 m^3/day.

2.8 OUTFALL

The treated effluent from the plant is discharged into a 27.9-meter-long pipe into an existing creek which flows into Colonel By Lake.

2.9 BUILDING AND CONTROL ROOM

There is one building that houses the tertiary filtration unit, chemical dosing systems, blowers, and all associated electrical equipment.

2.10 DIGESTER UNIT

The waste sludge generated from the SBRs is pumped into the digester for stabilization and storage. The digester supernatant is returned to the influent manhole and the sludge is hauled approximately every 30 days to Ravensview WWTP in the City of Kingston for further treatment.

2.11 STANDBY EQUIPMENT

A diesel generator on the property of the Cana WWTP provides backup electrical supply in case of power outages. This generator is directly connected to both the Cana Water and Cana Wastewater facilities and is capable of fully powering both systems in the event of a power outage.

3 MONITORING DATA

All required samples were collected and sent to a third-party laboratory for testing. The semiannual upstream surface water monitoring sample could not be collected in October due to a lack of flow in the existing water course. The downstream sample was collected in October, and both the upstream and downstream samples were collected in April and the results are shown in Table 5 and 6.

Monthly plant flows can be found in Table 10. The flow into the plant was much higher in the beginning of the year and dropped as the year went on. The concentration of the raw influent (Table 2) increases as the volume of flow decreases. The increased flow during the wet season, as well as the differences in concentrations that correlate to changes in volumes indicates there is likely ground water infiltration or illegal sump connections in the system. Efforts were made to remove illegal connections in 2020, Table 9 shows that the flows have been much more manageable since.

In February 2023, the average monthly concentration of Total Phosphorus was 0.22 mg/L, exceeding the limit of 0.10 mg/L as per the ECA. This exceedance was reported to the MECP, the efforts to reduce the effluent concentrations were detailed (listed below) and no further action was required. Details are shown in Table 1. Additionally, there were several months where the Total Suspended Solids, and Total Phosphorous exceeded the monthly objectives, but were below the compliance limit. The concentration of CBOD5, Total Ammonia Nitrogen, E.Coli and pH have been well below both compliance and objective limits. The final effluent results summary is shown in Table 3 and 4. Operators were able to reduce the effluent concentrations of Total Suspended Solids, and Total Phosphorous, and have confidence that improvements will be sustained in 2024.

4 OPERATION

Staff continue to optimize the plant process to ensure continuous and reliable operations. Cana WWTP exceeded the monthly average limit of Total Phosphorous during the month of February. The raw sewage pumping station was cleaned out to reduce the loading to the plant and improved the effluent quality. Since then, the operations staff continued to clean out the raw sewage pumping station which has improved the effluent of the plant throughout the year. In April the plant saw a peak daily flow of 180 m3/day, the maximum daily flow to the plant approved by the ECA is 200 m3/day. As discussed above, efforts to reduce illegal sump pump connections in 2020 reduced the peak flows dramatically. Staff have begun reviewing CCTV footage and started to complete spot checks to find the source of the increased flows.

Effluent quality began deteriorating again in November and December, staff flushed and rinsed the sand filter, which did not show any immediate impact. Staff noted older biomass in the SBR's and increased wasting to remove the older sludge. A load of sludge from the Ravensview WWTP was used to seed the SBR's in early 2024 with healthy biomass.

5 BIOSOLIDS MANAGEMENT

There were 8 loads, totaling 82.6 m^3 in volume, of sludge collected and brought to Ravensview WWTP. The sludge was discharged at the septage facility.

6 MAINTENANCE

Staff continue to use our preventative maintenance program in accordance with manufacturer's recommendations.

Additional Maintenance completed this year:

- Routine equipment maintenance took place throughout the plant.
- EQ tank check valve was replaced.
- Compressor head was replaced.

7 CAPITAL WORKS

- There was no capital work required for the plant this year.

8 EQUIPMENT CALIBRATIONS

All of the treatment facility flow meters are calibrated annually by third party contractors. Calibration records are available upon request.

9 COMPLAINTS

In the 2023 reporting year, the Cana WWTP received no official complaints regarding the facility or treatment process.

10 BYPASS SUMMARY

There were no bypass events in the system this year. However, it should be noted that bypass discharges have a high bacteria count due to the lack of disinfection. $CBOD_5$, TP, and TSS results are typical raw sewage influent levels. When bypasses occur, best efforts are made to capture the debris contained in any discharges to the lake. After each bypass event, shoreline inspections near discharge points are done to monitor any debris that may come ashore, and clean-up is done if debris is found.

For further information about this report or any questions regarding accessibility, contact Tim Bourne at tbourne@utilitieskingston.com or call 613-546-1181 Ext 2190.

11 EFFLUENT OBJECTIVES AND LIMITS

Table 1 – Effluent Objectives and Limits

Effluent Parameter	Objective	Limits
CBOD5	5.00 mg/L (Monthly Average)	10.00 mg/L (Monthly Average)
Total Suspended Solids	5.00 mg/L (Monthly Average)	10.00 mg/L (Monthly Average)
Total Phosphorus	0.10 mg/L (Monthly Average)	0.20 mg/L
Total Ammonia Nitrate (Winter)	2.00 mg/L (October to March)	3.00 mg/L
Total Ammonia Nitrate (Summer)	1.00 mg/L (April to September)	2.00 mg/L
E. Coli	100 CFU/100mL	200 CFU/100mL

Note: pH maintained between 6.5 to 8.5 at all times

12 PLANT PERFORMANCE RESULTS

Table 2 – Raw Influent Results

(Monthly Average)

Month	BOD5 (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Ammonia Nitrogen (mg/L)	Total Kjeldahl Nitrogen (mg/L)	pH
January	50	63	2.10	13.45	17.50	7.64
February	49	81	1.80	11.81	16.73	7.51
March	74	89	3.20	14.96	22.70	7.79
April	57	89	1.70	10.05	14.55	7.30
May	42	72	1.60	10.04	11.80	7.33
June	51	78	2.30	16.50	19.60	7.87
July	44	96	2.30	17.21	20.43	7.21
August	45	62	2.60	20.50	23.72	7.43
September	95	125	4.10	29.00	35.53	7.38
October	70	162	4.40	32.20	33.63	7.15
November	77	124	3.50	25.68	31.06	7.17
December	37	68	1.60	12.32	14.20	7.10
Annual Average	58	92	2.60	17.81	21.79	7.41

Table 3 – Final Effluent Results (Part 1)

(Monthly Average)

Month	CBOD5 (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Ammonia (mg/L)
January	3.00	4.10	0.10	0.37
February	3.00	9.10	0.22	0.22
March	3.00	8.80	0.13	0.4
April	1.90	4.30	0.11	0.62
May	1.90	4.30	0.09	0.04
June	3.00	9.60	0.08	0.05
July	2.40	2.80	0.08	0.08
August	1.80	3.90	0.09	0.05
September	3.00	4.10	0.13	0.03
October	3.00	5.30	0.14	0.05
November	1.80	6.70	0.11	0.07
December	3.00	6.00	0.09	0.05
Annual Average	2.57	5.75	0.11	0.17

Table 4 – Final Effluent Results (Part 2)

Month	Nitrate (mg/L)	pH	E Coli (CFU/100mL)	Acute Lethality (Pass or Fail)
January	3.23	7.73	1	N/A
February	4.2	7.86	1	N/A
March	4.22	7.79	0	N/A
April	3.74	7.89	1	PASS
May	2.98	7.77	0	N/A
June	5.66	8.04	1	N/A
July	12.37	7.42	0	N/A
August	5.59	7.7	0	N/A
September	8.19	7.6	1	N/A
October	8.58	7.49	1	PASS
November	6.07	7.43	0	N/A
December	4.63	7.56	0	N/A
Annual Average	5.79	7.69	0.50	PASS

Table 5 – Upstream Surface Water Monitoring

Date	CBOD (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Ammonia Nitrate (mg/L)	Nitrate Nitrogen (mg/L)	E. Coli (CFU/100 mL)	pH
April 12th 2023	<3	3.00	0.09	<0.05	0.18	0	7.99
October 4th 2023	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 6 – Downstream Surface Water Monitoring

Date	CBOD (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Ammonia Nitrate (mg/L)	Nitrate Nitrogen (mg/L)	E. Coli (CFU/100 mL)	pH
April 12th 2023	<3	6.00	0.07	0.4	1.92	0	8.03
October 4th 2023	6.00	12.00	0.15	0.08	6.74	7	8.19

Table 7 – Reportable Bypasses

Date	Start Time	Duration (hours)	Volume (m3)	Reason	Precipitation (mm)
No bypass events to report for 2023					

Table 8 – Reportable Bypass Sampling

Date	Start Time	Duration (hours)	Volume (m3)	Reason	Precipitation (mm)
No bypass events to report for 2023					

Table 9 – Annual Plant Flows

Parameter	2019	2020	2021	2022	2023
Average (m3/day)	100.05	70.10	60.00	62.70	62.70
Max (m3/day)	243.00	110.50	97.00	160.00	180.00
Design (m3/day)	125.00	125.00	125.00	125.00	125.00
Design Peak (m3/day)	200.00	200.00	200.00	200.00	200.00
Daily/Design (%)	80.04	56.08	48.00	50.16	50.16
Max/Peak (%)	100.05	70.10	60.00	62.70	62.70

Table 10 – Monthly Flows

Month	Rated Capacity Flow (m3/day)	Minimum Flow (m3/day)	Maximum Flow (m3/day)	Average Flow (m3/day)	Total Flow (m3/month)
January	125	50.0	140.0	75.0	2,320
February	125	39.0	136.0	84.4	2,364
March	125	53.0	138.0	96.0	2,978
April	125	61.0	180.0	93.0	2,799
May	125	52.0	146.0	82.0	2,538
June	125	36.0	82.0	55.0	1,664
July	125	29.0	87.0	49.2	1,524
August	125	24.0	89.0	48.0	1,475
September	125	27.0	51.0	36.0	1,069
October	125	15.0	58.0	27.0	824
November	125	19.0	115.0	36.0	1,078
December	125	44.0	153.0	71.0	2,208
Annual Average	125	37.4	114.6	62.7	1,903