Utilities Kingston

CANA

WASTEWATER TREATMENT PLANT

2020 ANNUAL REPORT

Table of Contents

REPORT CHECK LIST

Annual report submitted for the Environmental Compliance Approval number 4021-9WUKDE.

Condition 11(6). The first annual report shall cover the period from the commencement of operation of the sewage works to the end of the calendar year and shall be submitted within sixty (60) days following the end of such reporting period. Each subsequent annual report shall be submitted within sixty (60) days following the end of the calendar year being reported upon.

Condition 11(6) (a) to (l). Each annual report shall contain at least the following information:

- Executive Summary;
- Tabulation and comprehensive interpretation of all monitoring data and analytical results collected during the reporting period, and a comparison to the effluent quality and quantity.
- Summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism, or thing forming part of the works.
- Description of all operating problems encountered, and corrective actions taken during the reporting period.
- Evaluation of the calibration and maintenance procedures conducted on all monitoring equipment.
- A tabulation of the volume of sludge generated, and an outline of anticipated volumes to be generated in the next reporting year.
- Summary of effluent quality assurance or control measures undertaken.
- Summary of any complaints.
- Summary of all by-passes.
- A copy of all Notice of Modifications submitted to the Water Supervisor.

EXECUTIVE SUMMARY

ECA # 4021-9WUKDE was issued on July 22, 2015 for the newly constructed Wastewater Treatment Plant (WWTP) replacing the previous ECA for the 44-year-old plant.

Utilities Kingston had previously completed an Environmental Assessment Study for solutions to address the aging Cana WWTP in June 2013. The study identified that a new sewage treatment system using Sequencing Batch Reactor (SBR) technology would be the chosen alternative to replace the existing Cana WWTP. The replacement SBR system has incorporated chemical and physical phosphorus removal and increased design capacity for the facility. The new 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 70.10 m^3/d in 2020.

PLANT OVERVIEW

The following is a process overview and description of the treatment steps taken at the Cana wastewater treatment plant.

Raw Sewage Pumping Station

A pre-cast concrete wet well accepts sewage flows from the existing sewer system via an influent manhole, equipped with two pumps, one for duty and one for standby discharging to the preliminary treatment unit. The wet well has a control system and liquid level control system with alarms.

Preliminary Treatment Unit

The first step in the treatment process is the removal of large particles and floating debris such as wood, rags, and plastics from the raw water. This is accomplished by the preliminary treatment unit which consists of a splitter box housing a 15 mm manual bar screen, sized to handle the peak instantaneous flow of 4.6 L/sec. The splitter box has adjustable weir plates and a perforated drip tray. The flow goes from here to the SBR.

Secondary Treatment Unit

The second operation is the secondary treatment unit which consists of two SBRs. Each reactor is filled with raw sewage and then mixed and aerated to react (bacteria feeding on waste). Once the reaction has occurred, the solids are settled, and the water is decanted off the top and sent to the post equalization tank. The sludge that collects on the bottom of the tank is pumped goes to the digester unit for further treatment. Each tank operates at a different time so there is a tank always collecting the raw sewage.

Post Equalization Tank

The post equalization tank collects the decanted water from the sequencing batch reactors and discharges to the tertiary filter system.

Chemical Dosing Systems

Phosphorus removal is accomplished using alum, which is injected ahead of a static mixer. Polymer is used as a filter aid and is injected in the SBR effluent after the static mixer.

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.

Ultraviolet (UV) Disinfection

Two UV disinfection units operate in parallel. Each unit can handle the maximum flow of 200 m^3/day.

Outfall

The treated effluent from the plant is discharged into a 27.9-meter-long pipe into an existing watercourse that conveys flow into Colonel by Lake.

Building and Control Room

There is a control/chemical room which houses the tertiary filtration unit, chemical dosing systems, blowers and all associated electrical equipment.

Digester Unit

The digester unit consists of a digester tank equipped with fine bubble aeration used to stabilize and store the sludge that came from the SBRs. The supernatant is returned to the influent while the sludge is periodically hauled to Ravensview Wastewater Treatment Plant in the City of Kingston for further treatment.

PLANT PERFORMANCE

The following tables summarize the results obtained through monitoring of plant performance:

Table 1: Effluent Objective

Effluent Parameter	Objective (mg/l)	Limits (mg/l)
$CBOD_5$	5.0 (Monthly Average)	10 (Annual Average)
Total Suspended Solids (TSS)	5.0 (Monthly Average)	10 (Annual Average)
Total Phosphorus (TP)	0.1 (Monthly Average)	0.2
Total Ammonia Nitrogen	2.0 (Winter, Oct. to Mar.) 1.0 (summer, April to Sept.)	3 Winter 2 Summer
E. coli.	100 CFU/100 milliliters	200 CFU/100mL

Note: pH maintained between 6.5 to 8.5 at all times.

Table 2: Monthly Average Results

Month	CBOD5 mg/l	TSS mg/l	Total Phosphorus mg/l	Total Ammonia Nitrogen	pH	E.coli. CFU/100mL	Acute Lethality
January	2	8.4	0.09	0.31	7.90	1	
February	2	7.0	0.07	0.44	7.98	2	
March	2	6.0	0.07	0.25	7.93	1	
April	2	7.3	0.16	0.21	7.95	1	PASS
May	2	7	0.09	0.18	7.96	1	
June	2	8.5	0.10	0.06	7.99	0	
July	2	7.8	0.11	0.08	8.07	0	
August	2	4.0	0.07	0.23	8.06	0	
September	3	7.0	0.16	0.17	8.03	1	PASS
October	2	4.0	0.10	0.14	8.04	0	
November	2	8.4	0.15	0.11	7.98	0	
December	2	6.0	0.10	0.16	7.98	1	
Annual Average	2.2	6.78	0.11	0.20	7.99	0.67	

Table 3: Plant Flows

Parameter	2017	2018	2019	2020
Avg. m^3/day	137.67	126.58	100.05	70.10
Max. m^3/day	202.00	189.25	243	110.5
Design. m^3/day	125	125	125	125
Peak m^3/day	200	200	200	200
% (daily/design)	110.14%	101.26%	80.04%	56.08%

Table 4: Surface Water Monitoring

	CBOD mg/l	TSS mg/l	TP mg/l	Total Ammonia Nitrogen mg/l	Nitrate nitrogen mg/l	E.coli	pH	Temp
UPSTREAM								
1 5/ 0 5 / 20	**2**	**7**	**0.20**	**0.01**	**0.2**	**61**	**8.20**	**7.8**
17 / 0 9 / 20	**2**	**188**	**0.75**	**0.02**	**0.1**	**15**	**7.60**	**7.3**
DOWNSTREAM								
1 5 / 0 5 / 20	**2**	**5**	**0.06**	**0.06**	**1.9**	**10**	**8.17**	**8.2**
1 7/ 0 9 / 20	**2**	**7**	**0.11**	**0.10**	**6.8**	**4**	**7.73**	**7.1**

Table 5: Reportable Bypasses

Date	Start	Duration (hrs.)	Volume (m3)	Reason	Precip. (mm)
11/01/20	20:45	29.08	87.30	Rain/snow melt	45.8
13/04/20	17:30	6.93	45	Snow/rain	29.1
25/12/20	11:50	10.25	18.48	Rain/snow melt	20.2

Table 6: Reportable Bypass Sampling

Parameter	Units	Cana STP Annual Avg.
E coli	Cfu/100mL	5225
CBOD5	mg/l	4.5
TSS	mg/l	41
TP	mg/l	0.80
Total Ammonia	mg/l	0.32

OPERATING PROBLEMS

Staff continue to optimize the plant processes to ensure continuous, reliable operations.

SLUDGE GENERATED

There were 14 loads (total volume of 171 m^3) of sludge collected and brought to Ravensview Wastewater Treatment Plant. The sludge was discharged at the septage facility.

MAINTENANCE

In 2020 we continued with our preventative maintenance program in accordance with manufacturer's recommendations.

The following bullet points highlight additional maintenance completed this year.

- Modifications to routing of process piping to address operational issues.
- Heat traced alum piping to keep from freezing.

CAPITAL WORKS

There were no capital works done in 2020 as the plant is newly constructed.

OPERATIONS

Preventative maintenance and regular process/equipment inspections allow operational problems to be diagnosed quickly and corrective actions to be taken immediately.

EQUPMENT CALIBRATIONS

All Utilities Kingston plant flow meters, online analyzers and lab equipment are calibrated annually by third party contractors. As a result of this proactive approach, the facility saw limited downtime of major equipment and saw very few mechanical or electrical failures this year. Calibration records are available upon request.

COMPLAINTS

There were no official complaints related to the Cana WWTP for the 2020 reporting year.

BYPASS

There were three bypasses at the Cana WWTP in the 2020 reporting year. (See Tables 5 and 6).

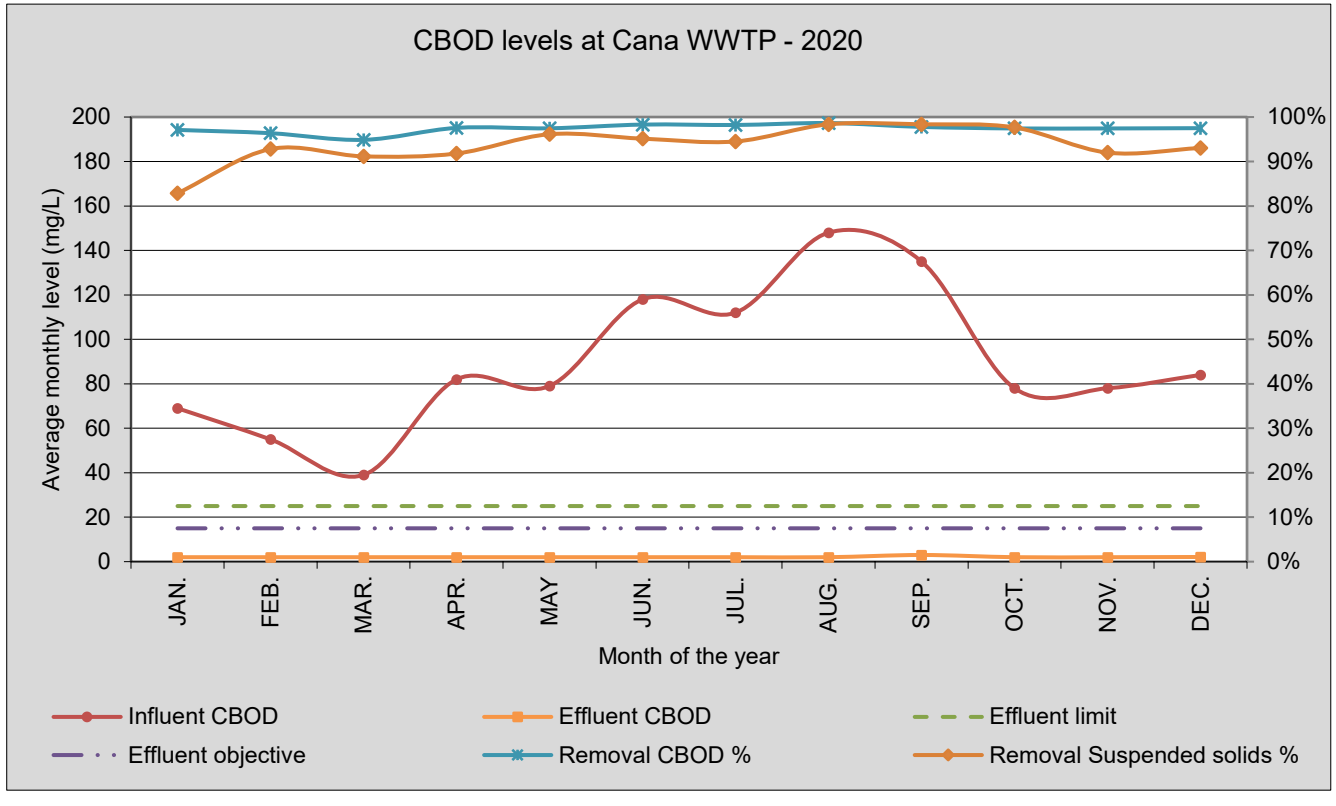
APPENDIX A – MONITORED PARAMETERS RESULTS AND GRAPHS

For further information about this report or any questions regarding accessibility contact Troy Dickerson at *tdickerson@utilitieskingston.com* , or call 613-546-1181 Ext 2 1 9 0.

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

Month		Raw sewage CBOD	Final Effluent CBOD	Removal CBOD	Raw sewage Suspended solids	Final Effluent Suspended solids	Removal Suspended solids
	Units	mg/L	mg/L	%	mg/L	mg/L	%
JAN.		69.0	2.0	97%	49.0	8.4	83%
FEB.		55.0	2.0	96%	68.0	4.9	93%
MAR.		39.0	2.0	95%	52.0	4.6	91%
APR.		82.0	2.0	98%	89.0	7.3	92%
MAY		79.0	2.0	97%	132.0	5.1	96%
JUN.		118.0	2.0	98%	175.0	8.5	95%
JUL.		112.0	2.0	98%	142.0	7.8	95%
AUG.		148.0	2.0	99%	208.0	3.4	98%
SEP.		135.0	3.0	98%	324.0	5.3	98%
OCT.		78.0	2.0	97%	124.0	2.9	98%
NOV.		78.0	2.0	97%	105.0	8.4	92%
DEC.		84.0	2.1	98%	69.0	4.8	93%
	Average	89.8	2.1	97%	128.1	6.0	95%
	Objective		5.0			5.0	
	Limit		10.0			10.0	

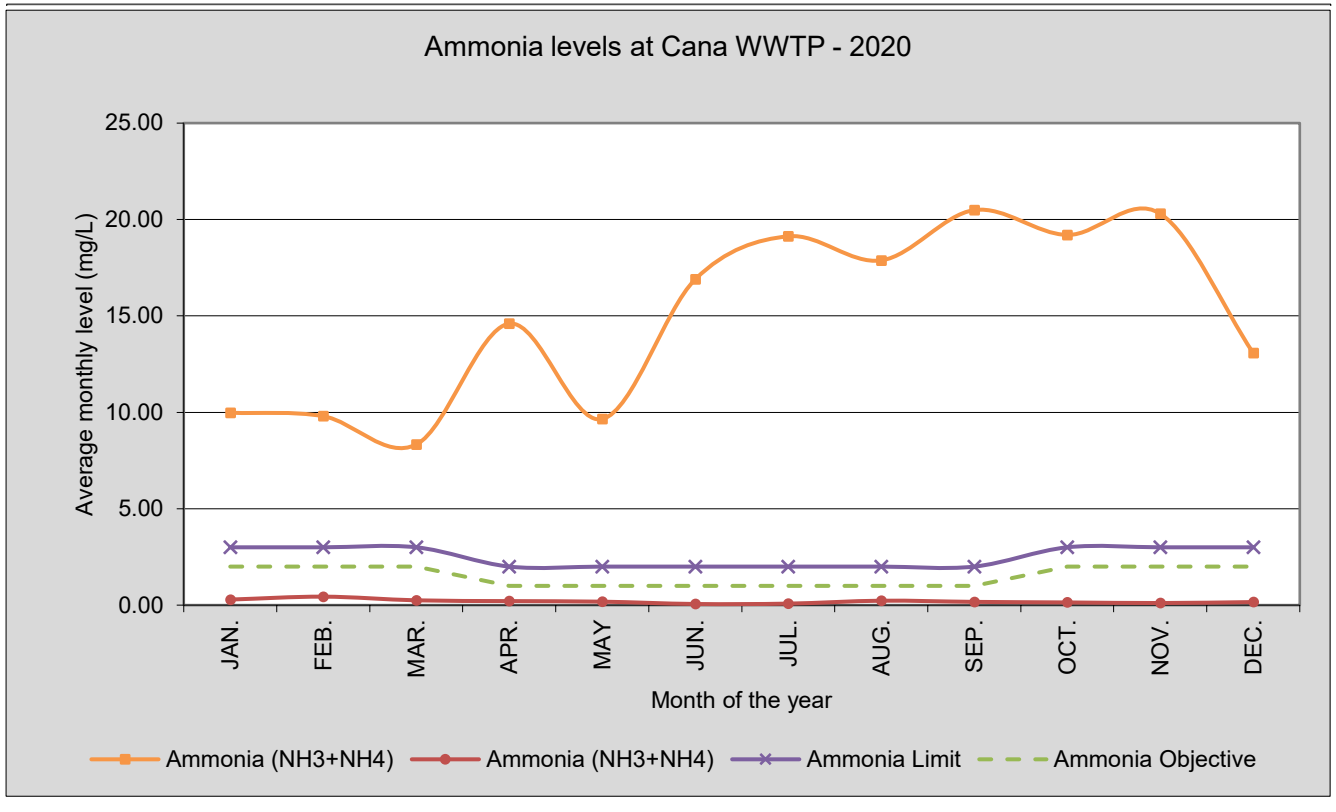
CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs



CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

			Final Effluent results			
		Raw sewage	Final Effluent	Final Effluent	Final Effluent	Final Effluent
Month		Ammonia (NH_3+NH_4)	Ammonia (NH_3+NH_4)	Ammonia Objective	Ammonia Limit	Acute lethality to trout
	Unit	mg/L	mg/L	mg/L	mg/L	pass / fail
JAN.		9.98	0.29	2.0	3.00	
FEB.		9.80	0.44	2.0	3.00	
MAR.		8.33	0.25	2.0	3.00	
APR.		14.60	0.21	1.0	2.00	pass
MAY		9.65	0.18	1.0	2.00	
JUN.		16.90	0.06	1.0	2.00	
JUL.		19.13	0.08	1.0	2.00	
AUG.		17.88	0.23	1.0	2.00	
SEP.		20.49	0.17	1.0	2.00	pass
OCT.		19.20	0.14	2.0	3.00	
NOV.		20.30	0.11	2.0	3.00	
DEC.		13.07	0.16	2.0	3.00	
Average		14.94	0.19			
Objective			Variable			
Limit			Variable			

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs



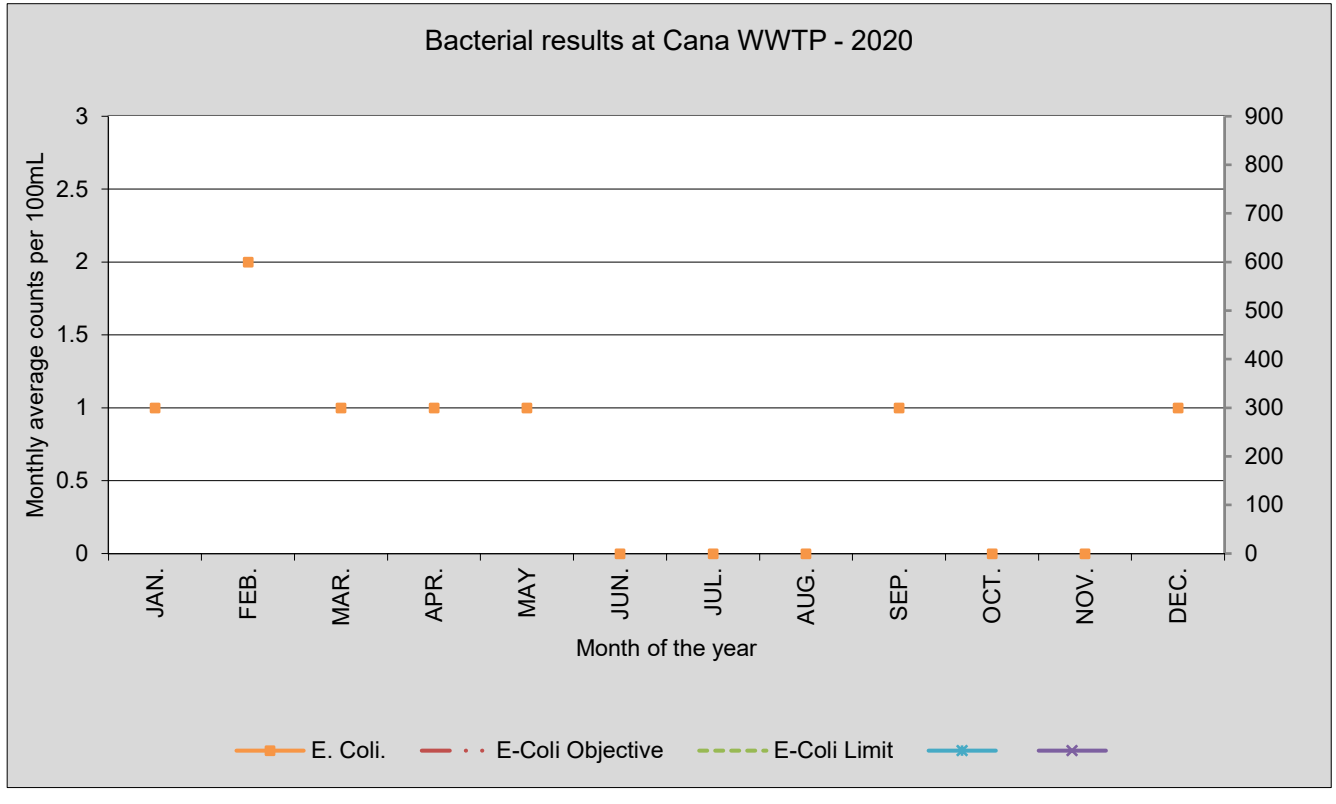
CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

Bacterial results

Final Effluent

Month	Unit	**E. Coli.** counts / 100mL	**E-Coli Objective** counts / 100mL	**E-Coli Limit** counts / 100mL
JAN.		1	100	200
FEB.		2	100	200
MAR.		1	100	200
APR.		1	100	200
MAY		1	100	200
JUN.		0	100	200
JUL.		0	100	200
AUG.		0	100	200
SEP.		1	100	200
OCT.		0	100	200
NOV.		0	100	200
DEC.		1	100	200
Average		0.67		
Objective		100		
Limit		200		

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs

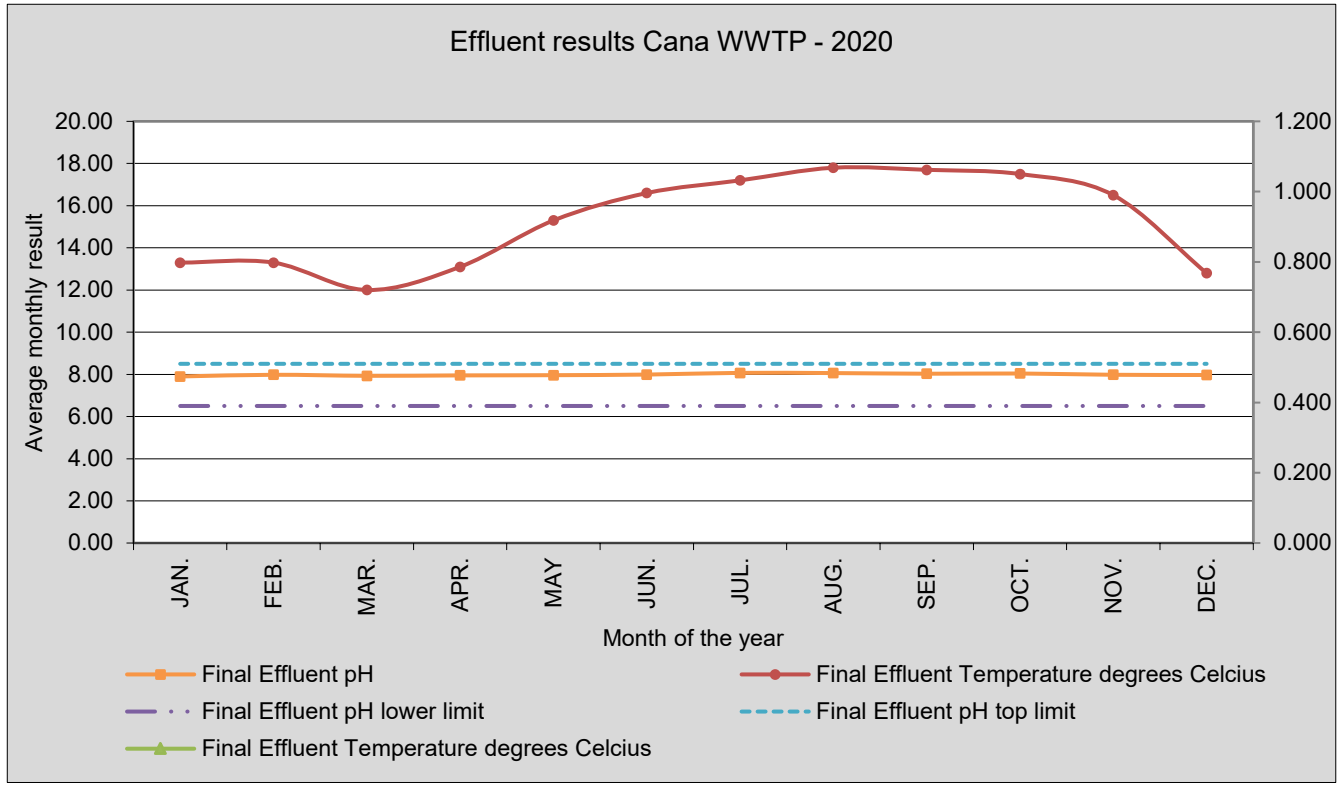


CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

Effluent Summary from daily samples

Month		Final Effluent pH	Final Effluent pH lower limit	Final Effluent pH top limit	Final Effluent Temperature
	Unit				degrees Celcius
JAN.		7.90	6.5	8.5	13.3
FEB.		7.98	6.5	8.5	13.3
MAR.		7.93	6.5	8.5	12.0
APR.		7.95	6.5	8.5	13.1
MAY		7.96	6.5	8.5	15.3
JUN.		7.99	6.5	8.5	16.6
JUL.		8.07	6.5	8.5	17.2
AUG.		8.06	6.5	8.5	17.8
SEP.		8.03	6.5	8.5	17.7
OCT.		8.04	6.5	8.5	17.5
NOV.		7.98	6.5	8.5	16.5
DEC.		7.97	6.5	8.5	12.8
Average		8.0			15.3
Objective Limit				6.6	

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs

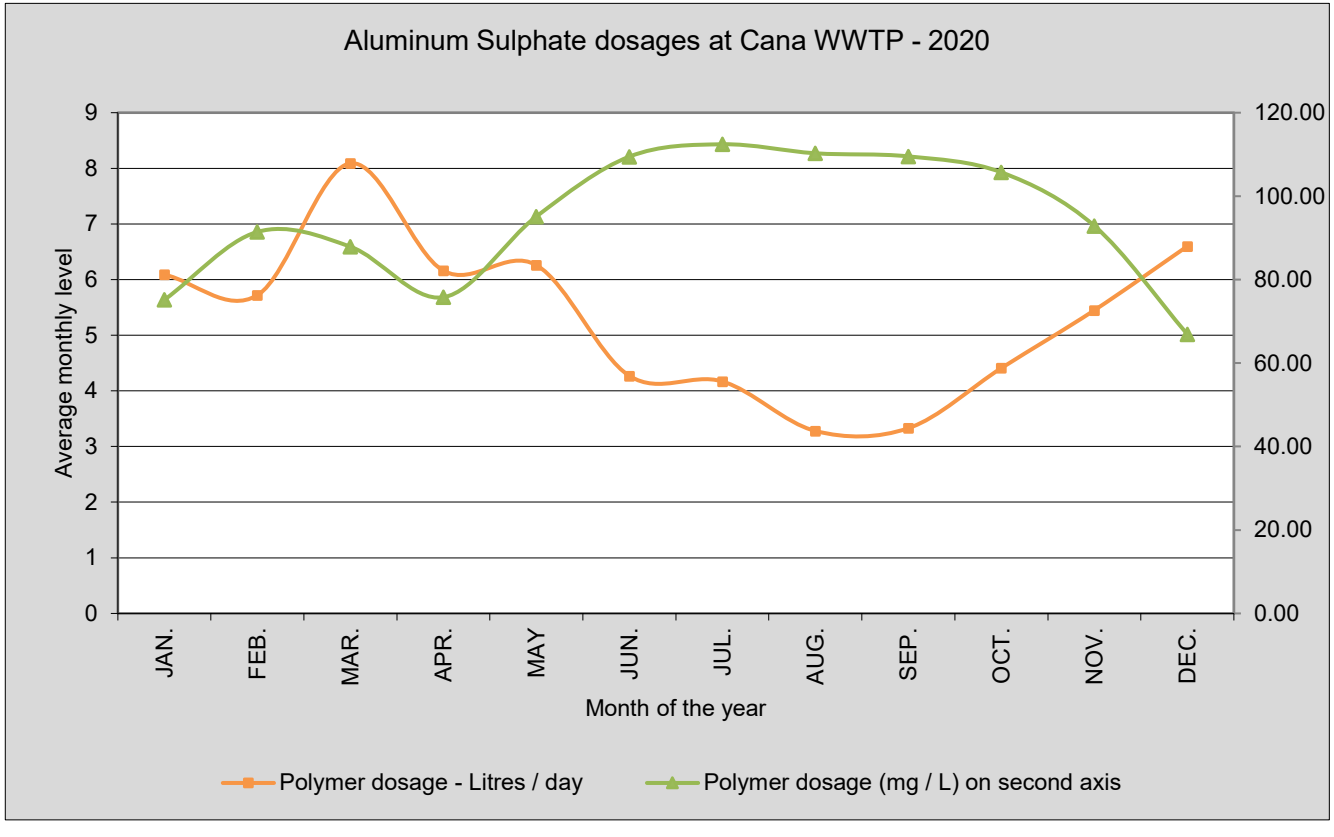


CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

Aluminum Sulphate dosage

Month	Unit	**Dosage*** Litres / day	**Dosage** Litres / month	**Dosage** mg / L
JAN.		6	189	75.15
FEB.		6	166	91.43
MAR.		8	251	87.89
APR.		6	170	75.77
MAY		6	188	95.13
JUN.		4	124	109.47
JUL.		4	129	112.43
AUG.		3	102	110.27
SEP.		3	97	109.53
OCT.		4	132	105.71
NOV.		5	164	92.87
DEC.		7	156	66.89
Average		5.32	156	94.38
Objective				
Limit				

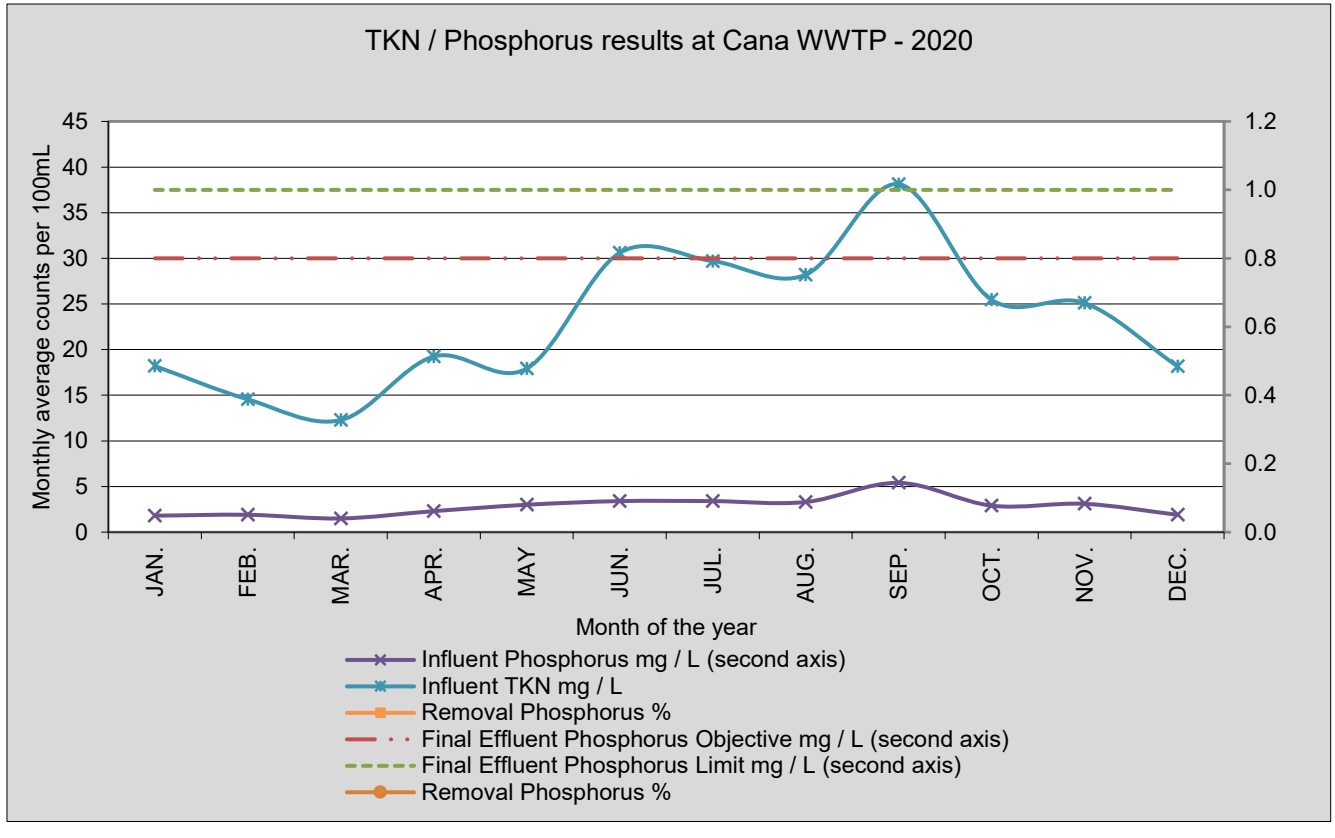
CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs



CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

		Influent TKN / Phosphorus			
		Influent	**Influent**	**Final Effluent**	**Removal**
Month		**TKN**	**Phosphorus**	**Phosphorus**	**Phosphorus**
	Unit	mg / L	mg / L (second axis)	mg / L (second axis)	%
JAN.		18.20	1.80	0.08	96%
FEB.		14.55	1.90	0.07	96%
MAR.		12.28	1.50	0.06	96%
APR.		19.25	2.30	0.11	95%
MAY		17.92	3.00	0.09	97%
JUN.		30.60	3.40	0.09	97%
JUL.		29.70	3.40	0.11	97%
AUG.		28.20	3.30	0.09	97%
SEP.		38.13	5.40	0.15	97%
OCT.		25.46	2.90	0.10	97%
NOV.		25.10	3.10	0.15	95%
DEC.		18.16	1.90	0.14	93%
Average		23.13	2.83	0.10	0.96
Objective				0.1	
Limit				0.2	

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs



CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly data

		Flows				
		Monthly	Monthly	Monthly	Monthly	Monthly
Month		Minimum Flow	Rated capacity Flow	Maximum Flow	Average Flow	Total Flow
	Unit	m3 / day	m3 / day	m3 / day	m3 / day	m3 / Month
JAN.		58	200	156	96	2,976
FEB.		46	200	172	68	1,983
MAR.		75	200	160	101	3,144
APR.		55	200	149	82	2,466
MAY		53	200	139	76	2,345
JUN.		22	200	65	45	3,224
JUL.		29	200	106	45	2,077
AUG.		21	200	54	34	1,321
SEP.		21	200	51	31	1,288
OCT.		25	200	84	45	2,507
NOV.		35	200	108	59	2,600
DEC.		44	200	130	81	2,433
Average		40	200	115	64	2,364
Objective						
Limit						

CANA Wastewater Treatment Plant
2020 ANNUAL REPORT
Monthly Graphs