Utilities Kingston

CANA

WASTEWATER TREATMENT PLANT

2019 ANNUAL REPORT

Utilities Kingston

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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, an outline of anticipated volumes to be generated in the next reporting year
- ✓ Summary of effluent quality assurance or control measures under taken;
- ✓ 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 new constructed WWTP plant to replace the 44 year old plant.

Utilities Kingston had previously completed an Environmental Study for solutions to address the aging Cana WWTP in June 2013. The study identified that a new sewage treatment system using SBR (Sequencing Batch Reactor) technology would be the chosen alternative to replace the existing Cana WWTP. The replacement SBR system has incorporated chemical / 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 100.05 m^3/d in 2019.

We have continued to provide training to staff members from other facilities and allow them to increase their knowledge of the new Cana WWTP process.

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 existing sewer system via a new 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 15mm 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 sequencing batch reactors (SBR).

Secondary Treatment Unit

The second operation is the secondary treatment unit which consists of two sequencing batch reactors (SBR). 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. Some of the sludge that collects on the bottom of the tank is pumped out for wasting while the rest goes to the digester unit for further treatment. The process is started over again. 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 system

The chemical dosing system has alum dosing for Phosphorus removal. The alum is injected ahead of a static mixer. There is also a polymer dosing system used for filter aid. The polymer 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 ultra violet disinfection system.

Ultra Violet (UV) Disinfection

There are two UV disinfection units in parallel, each can handle the maximum flow of 200 m3/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 for sludge stabilization and storage that came from the SBR's. The supernatant is returned back to the influent while the sludge is periodically hauled to either Ravensview Wastewater Treatment Plant or Cataraqui Bay Wastewater Treatment Plant in the City of Kingston for further treatment.

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PLANT PERFORMANCE

ECA # 4021-9WUKDE was issued on July 22, 2015 for the new constructed WPCP plant to replace the 44 year old plant. The conditions contained within ECA # 4021-9WUKDE apply to the new WWTP starting in January 2017.

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

Table 1: Effluent Objective

Effluent Objectives and Limits		
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	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 millilitres	200 CFU/100mL

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

Table 2: Monthly Average Results

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	4	0.05	0.56	8.03	0	
February	2	6	0.13	0.43	7.93	1	
March	2	5	0.12	0.34	7.99	0	
April	2	6	0.14	0.28	7.99	1	PASS
May	2	3	0.07	0.10	8.01	1	
June	2	6	0.04	0.04	7.98	0	
July	2	3	0.03	0.02	8.04	0	
August	2	9.8	0.20	0.05	8.00	1	
September	2	9.7	0.29	0.10	8.13	2	PASS
October	2	7	0.08	0.34	7.86	1	
November	2	9.8	0.13	0.30	8.03	1	
December	2	7	0.07	0.32	7.94	1	
Annual Average	2	6.36	0.12	0.24	7.99	0.75	

Table 3: Plant Flows

Flows				
Parameter	**2016**	**2017**	**2018**	**2019**
Avg. m^3/day	90.34	137.67	126.58	100.05
Max. m^3/day	275	202.00	189.25	243
Design. m^3/day	94.6	125	125	125
Peak m^3/day		200	200	200
% (daily/design)	95.5%	110.14%	101.26%	80.04%

Table 4: Surface Water Monitoring

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								
14/05/19	**2**	**4**	**0.14**	**0.02**	**0.3**	**276**	**8.00**	**7.6**
11/09/19	**NO**	**FLOW**						
DOWNSTREAM								
14/05/19	**2**	**8**	**0.15**	**0.02**	**0.5**	**264**	**7.98**	**8.7**
11/09/19	**2**	**10**	**0.24**	**0.09**	**7.2**	**168**	**8.07**	**8.2**

Table 5: Reportable Bypasses

Bypasses					
Date	**Start**	**Duration (hrs)**	**Volume (m3)**	**Reason**	**Precip. (mm)**
05/02/19	02:06	8.02	20.24	Rain/snow melt	7
24/02/19	19:30	7.67	70	Snow/rain	13.8
14/03/19	22:04	15.27	72.07	Rain/snow melt	2.5
31/03/19	00:05	17.75	63.9	Heavy rain	32
20/04/19	16:45	21.00	45.36	Rain	28

Table 6: Reportable Bypass Sampling

Bypass Event Sampling Results		
Parameter	**Units**	**CANA STP Annual Avg.**
E coli	Cfu/100mL	7.9
CBOD5	mg/l	2.6
TSS	mg/l	19.2
TP	mg/l	0.44
Total Ammonia	mg/l	0.33

OPERATING PROBLEMS

Modifications to the process piping and changing out of check valves helped to deal with operational challenges experience when the plant first came online in 2017. Flows were high due to infiltration and other extraneous flows. With the large flow change from high to low, it has caused the plant to react much differently to the wastewater being introduced. This resulted in an adverse in September for Total Phosphorus of 0.28mg/L. Staff continue to optimize the plant processes to ensure continuous, reliable operations.

SLUDGE GENERATED

There were 5 loads (total volume of 71 m^3) of sludge collected and brought to Ravensview Wastewater Treatment Plant. The sludge was discharged at the septage facility. There will be approximately the same amount of sludge removed in 2020.

MAINTENANCE

In 2019 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
- New alum line installed to deliver alum to head of plant.
- Heat traced piping to keep from freezing.

CAPITAL WORKS

There were no capital works done in 2019 as the plant is newly constructed.

OPERATIONS

Preventative maintenance and regular process and equipment inspections lead to operational problems being diagnosed quickly and corrective actions implemented 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 have been no official complaints about the CANA Wastewater Treatment Plant operations for the reporting year 2019

BYPASS

There have been five bypasses for the CANA Wastewater Treatment Plant operations for the reporting year 2019 (please see Tables 5 and 6).

APPENDIX A – MONITORED PARAMETERS RESULTS AND GRAPHS

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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.		52.0	2.0	96%	81.0	4.0	95%
FEB.		35.0	2.0	94%	48.0	6.0	88%
MAR.		56.0	2.0	96%	85.0	5.0	94%
APR.		44.0	2.0	95%	63.0	6.0	90%
MAY		50.0	2.0	96%	95.0	3.0	97%
JUN.		54.0	2.0	96%	79.0	6.0	92%
JUL.		42.0	2.0	95%	68.0	3.0	96%
AUG.		132.0	2.0	98%	240.0	10.0	96%
SEP.		185.0	2.0	99%	301.0	10.0	97%
OCT.		51.0	2.0	96%	125.0	7.0	94%
NOV.		47.0	2.0	96%	61.0	10.0	84%
DEC.		36.0	2.0	94%	40.0	7.0	83%
	Average	65.3	2.0	96%	107.2	6.4	94%
	Objective		5.0			5.0	
	Limit		10.0			10.0	

CANA Wastewater Treatment Plant
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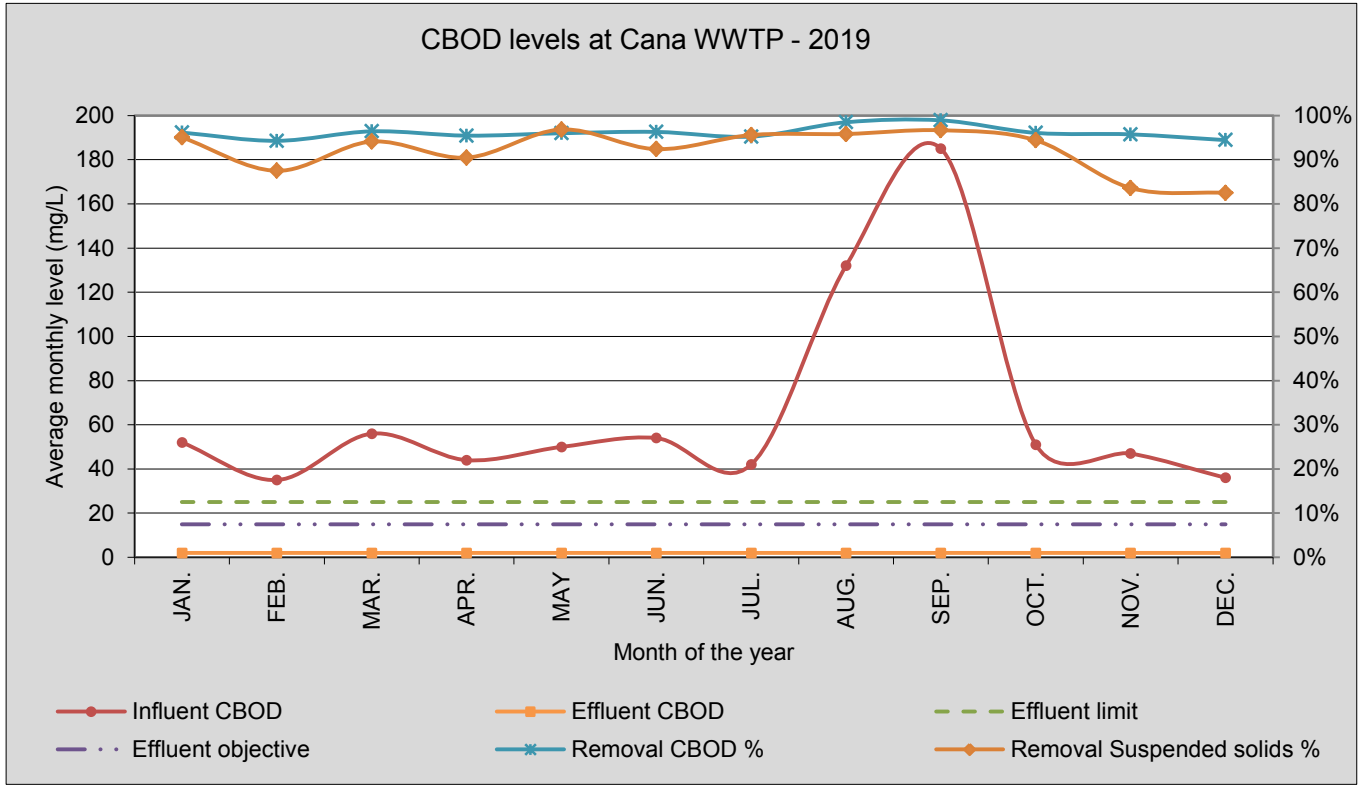
Monthly Graphs



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Final Effluent results

Month	Unit	Raw sewage Ammonia (NH_3+NH_4)	Final Effluent Ammonia (NH_3+NH_4)	Final Effluent Ammonia Objective	Final Effluent Ammonia Limit	Final Effluent Acute lethality to trout
		mg/L	mg/L	mg/L	mg/L	pass /
JAN.		6.39	0.56	2.0	3.00	
FEB.		6.35	0.43	2.0	3.00	
MAR.		7.62	0.34	2.0	3.00	
APR.		7.64	0.28	1.0	2.00	pass
MAY		11.05	0.10	1.0	2.00	
JUN.		9.79	0.04	1.0	2.00	
JUL.		10.63	0.02	1.0	2.00	
AUG.		23.80	0.05	1.0	2.00	
SEP.		26.00	0.10	1.0	2.00	pass
OCT.		8.42	0.34	2.0	3.00	
NOV.		11.30	0.30	2.0	3.00	
DEC.		8.80	0.32	2.0	3.00	
Average		11.48	0.24			
Objective			Variable			
Limit			Variable			

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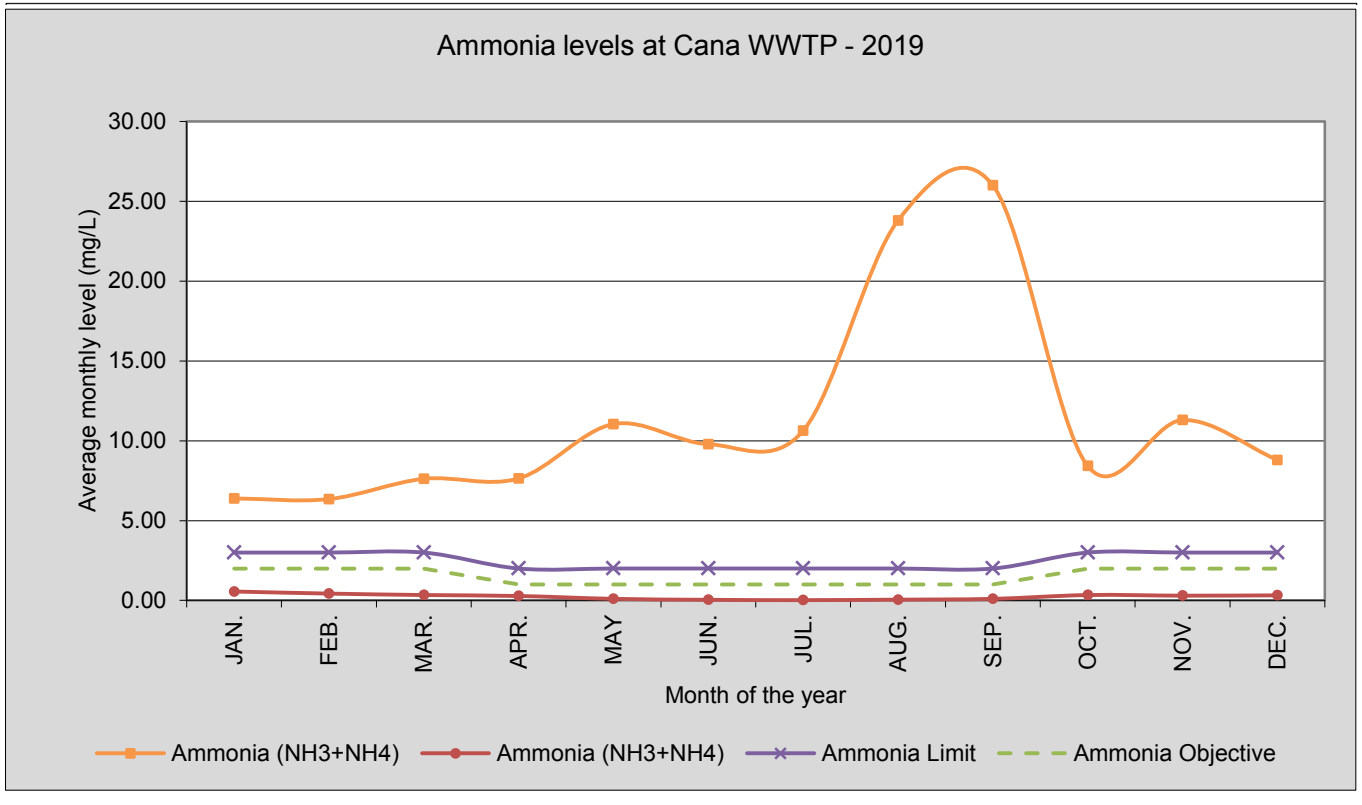

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Bacterial results

Final Effluent

Month	Unit	**E. Coli.** counts / 100mL	**E-Coli Objective** counts / 100mL	**E-Coli Limit** counts / 100mL
JAN.		0	100	200
FEB.		1	100	200
MAR.		0	100	200
APR.		1	100	200
MAY		1	100	200
JUN.		0	100	200
JUL.		0	100	200
AUG.		1	100	200
SEP.		2	100	200
OCT.		1	100	200
NOV.		1	100	200
DEC.		1	100	200
Average		0.75		
Objective		100		
Limit		200		

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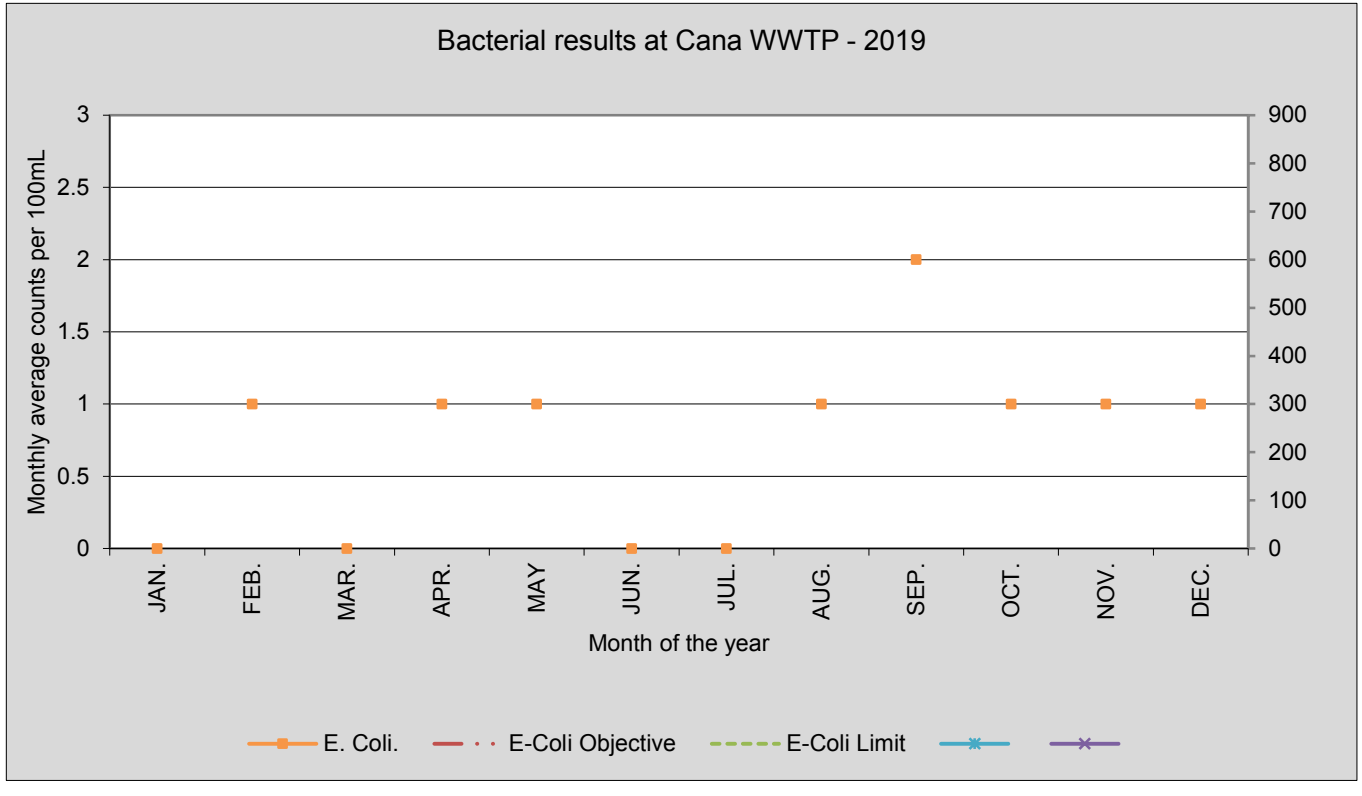

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Effluent Summary from daily samples

Month	Final Effluent pH	Final Effluent pH lower limit	Final Effluent pH top limit	Final Effluent Temperature
Unit				degrees Celcius
JAN.	8.03	6.5	8.5	10.3
FEB.	7.93	6.5	8.5	10.4
MAR.	7.99	6.5	8.5	10.9
APR.	7.99	6.5	8.5	10.8
MAY	8.01	6.5	8.5	14.0
JUN.	7.98	6.5	8.5	15.8
JUL.	8.04	6.5	8.5	18.5
AUG.	8.00	6.5	8.5	18.7
SEP.	8.13	6.5	8.5	18.3
OCT.	7.86	6.5	8.5	16.3
NOV.	8.03	6.5	8.5	13.0
DEC.	7.94	6.5	8.5	15.0
Average	8.0			14.3
Objective				
Limit				

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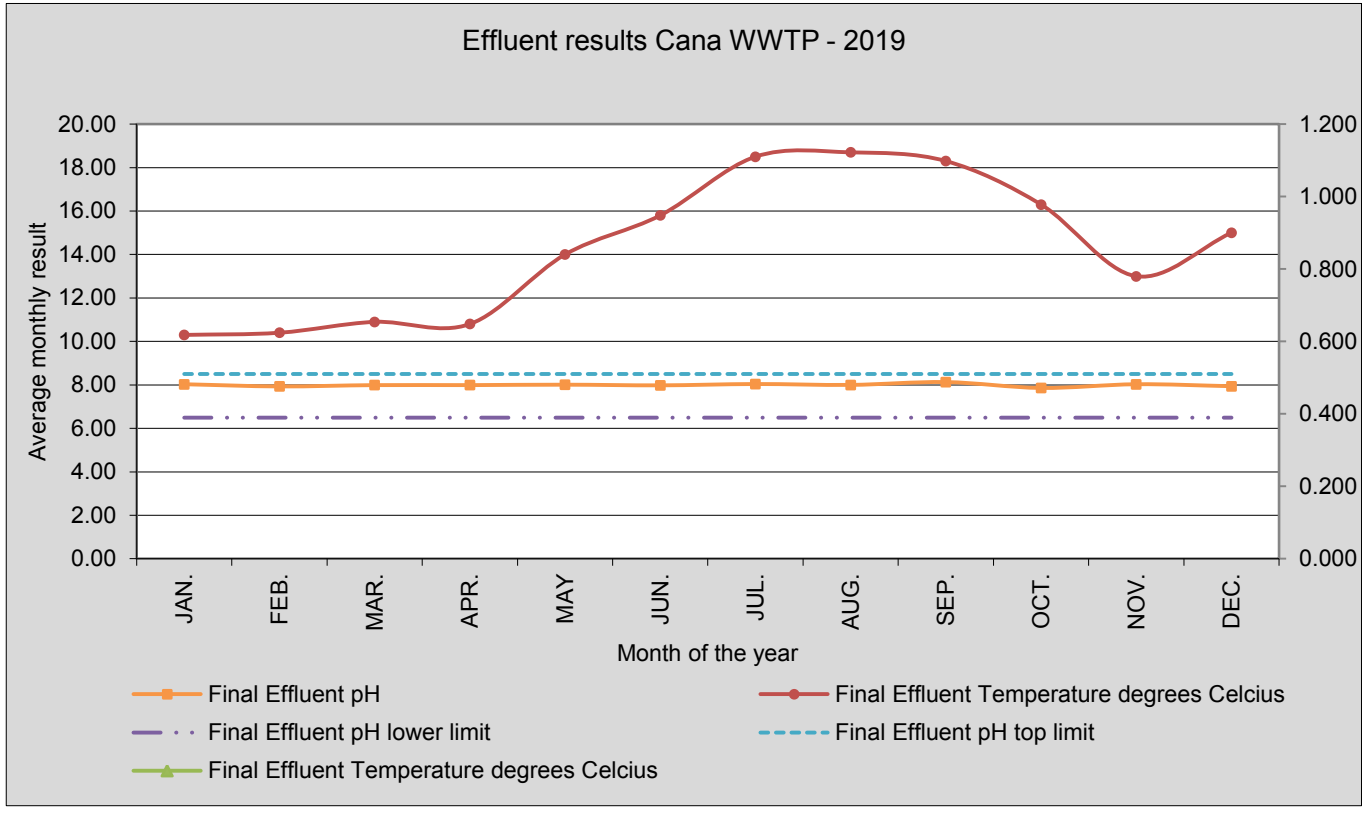

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Aluminum Sulphate dosage

Month	Unit	**Dosage*** Litres / day	**Dosage** Litres / month	**Dosage** mg / L
JAN.		4	137	42.00
FEB.		3	94	34.00
MAR.		4	134	39.00
APR.		5	136	55.40
MAY		4	129	56.00
JUN.		3	102	57.00
JUL.		2	60	61.00
AUG.		1	46	70.00
SEP.		2	53	78.00
OCT.		4	124	119.00
NOV.		4	126	90.00
DEC.		5	157	89.00
Average		3.56	108	65.87
Objective Limit				

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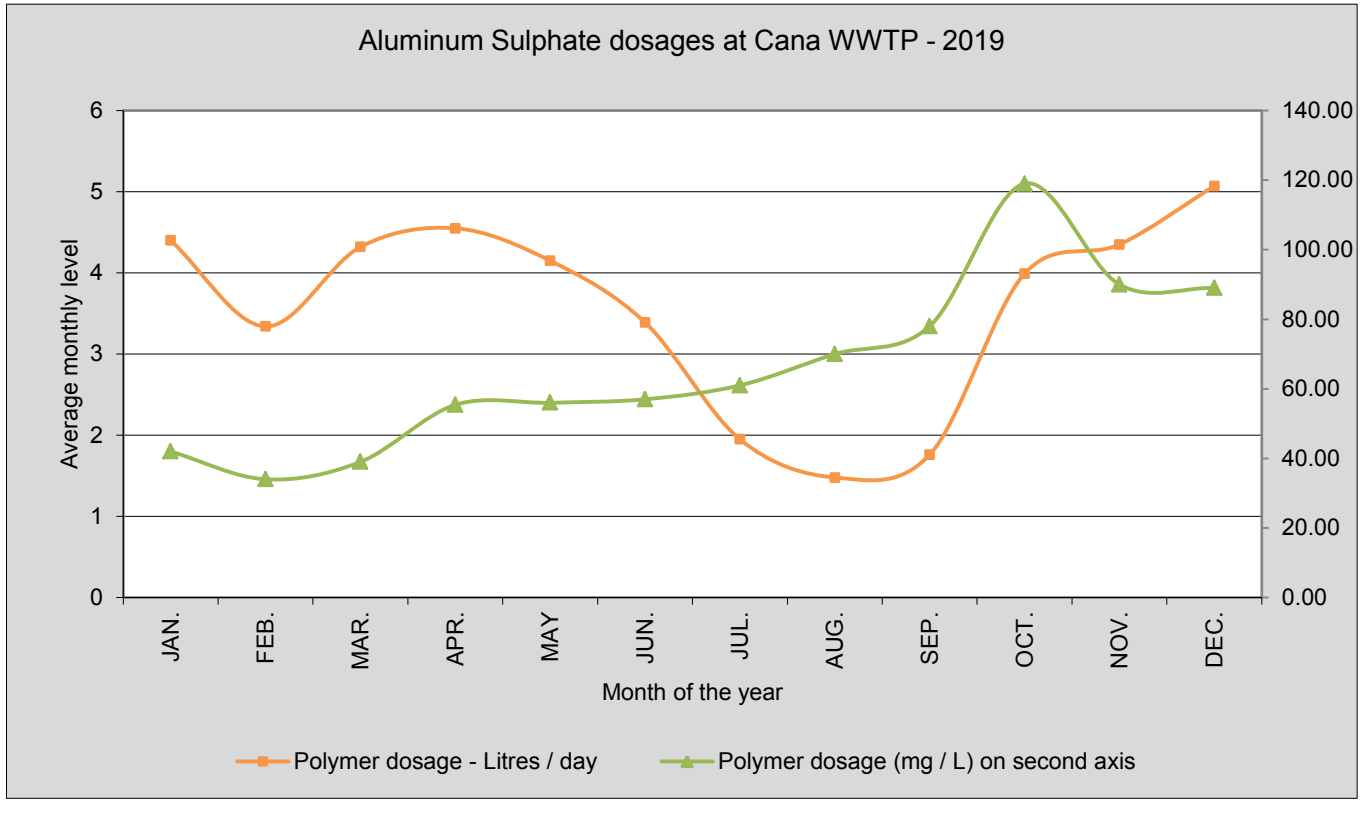

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		Influent TKN / Phosphorus			
		Influent	**Influent**	**Final Effluent**	**Removal**
Month		**TKN**	**Phosphorus**	**Phosphorus**	**Phosphorus**
	Unit	mg / L	mg / L (second axis)	mg / L (second axis)	%
JAN.		10.50	2.32	0.05	98%
FEB.		9.30	1.00	0.13	87%
MAR.		12.00	1.96	0.12	94%
APR.		10.90	1.53	0.14	91%
MAY		15.00	2.43	0.07	97%
JUN.		12.40	1.93	0.04	98%
JUL.		14.30	1.85	0.03	98%
AUG.		34.60	5.66	0.20	96%
SEP.		41.20	7.01	0.28	96%
OCT.		12.60	1.71	0.08	95%
NOV.		15.50	1.73	0.13	92%
DEC.		12.30	1.34	0.07	95%
Average		16.72	2.54	0.11	0.95
Objective				0.1	
Limit				0.2	

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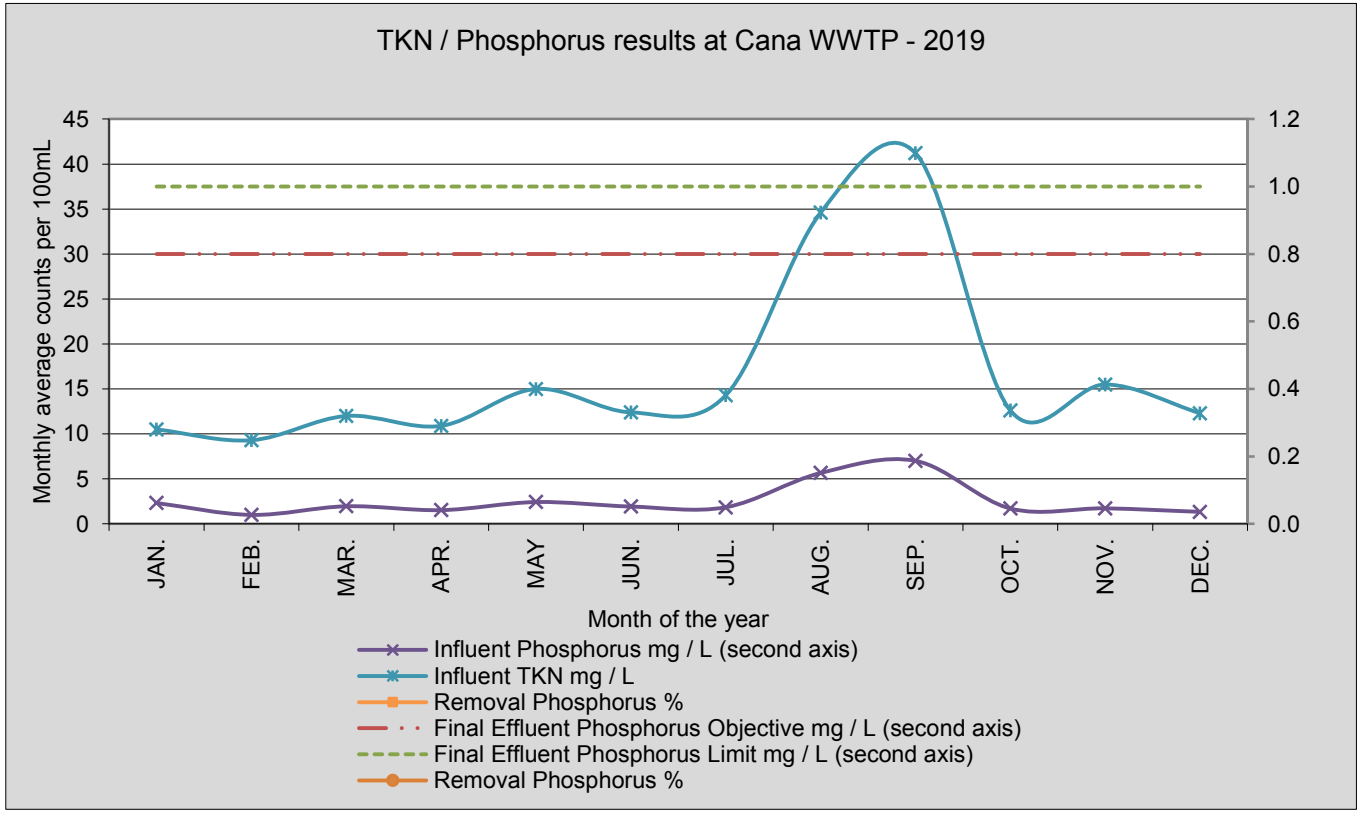

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		Flows				
		Monthly	**Monthly**	**Monthly**	**Monthly**	**Monthly**
Month		**Minimum Flow**	**Rated capacity Flow**	**Maximum Flow**	**Average Flow**	**Total Flow**
	Unit	m3 / day	m3 / day	m3 / day	m3 / day	m3 / Month
JAN.		106	200	189	135	4,197
FEB.		97	200	151	129	3,606
MAR.		82	200	243	148	4,573
APR.		87	200	197	134	4,012
MAY		91	200	199	125	3,865
JUN.		79	200	140	108	3,224
JUL.		41	200	89	67	2,077
AUG.		24	200	57	43	1,321
SEP.		17	200	67	43	1,288
OCT.		43	200	207	81	2,507
NOV.		62	200	120	90	2,600
DEC.		65	200	174	98	3,036
Average		66	200	153	100	3,026
Objective						
Limit						

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