

Corporation of the City of Quinte West

Stonecrest Estates Wastewater Treatment Plant

2023 Annual Performance Report



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The Corporation of the City of Quinte West

Public Works and Environmental Services

Water/Wastewater Division

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Executive Summary

The Stonecrest Estates Sewage Treatment Plant, assigned MOE Identifier number 120003762, is located at 51 Aikins Road in Bayside. The facility currently operates in accordance with ECA number 3722-CS6K2J issued on December 18, 2023. Prior to the completion of Construction Phase 2 in June of 2023, the facility operated under ECA number 4460-AHBRVY issued on January 13, 2017.

Currently, the WWTP, is a Class II Treatment Plant, and has the hydraulic capacity to treat 425 cu.m/day. The facility is described as a Membrane Treatment facility. The process is described as having a Coarse influent screen discharging into two (2) Equalization (EQ) Tanks receiving wastewater from the Stonecrest Estates subdivision, and the Bayside Secondary School. Raw sewage in the EQ tanks is mixed and kept suspended using a coarse bubble diffuser grid, before it is run through a fine screen and discharged into one (1) pre-anoxic Tank equipped with one (1) submersible mixer. Mixed Liquor from the Anoxic tank continuously flows into two (2) Aeration tanks equipped with fine bubble aeration. Four (4) submersible pumps, pump mixed liquor from the aeration tank to each of the four (4) membrane tanks. Each membrane tank is equipped with sixteen (16) 500S hollow fibre membrane modules with integral coarse bubble diffusers, one (1) membrane aeration blower, and one (1) permeate extraction pump. The Permeate extraction pumps place a vacuum on the membrane modules operating in parallel. This pulls clear liquid through the membranes, while leaving sludge and organisms behind in the treatment process. Final Effluent receives a UV irradiation disinfection, before final discharge into the Bay of Quinte. Aluminum Sulphate for Phosphorus control, and Sodium Hydroxide for pH control are added to the mixed liquor for phosphorus removal and pH control.

In accordance with ECA number 3722-CS6K2J an annual report shall be prepared within 90 days following the end of the calendar year being reported upon. This annual report details the following information:

- *A summary and interpretation of all Influent monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;*



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- *A summary and interpretation of all Final Effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the Works;*
- *A summary of all operating issues encountered and corrective actions taken;*
- *A summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus, or mechanism or forming part of the Works;*
- *A summary of any effluent quality assurance or control measures undertaken;*
- *A summary of the calibration and maintenance carried out on all Influent and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer;*
- *A summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations;*
 - i. When any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;*
 - ii. When the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity;*
- *A tabulation of the volume of sludge generated, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;*
- *A summary of any complaints received and any steps taken to address the complaints;*
- *A summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;*
- *A summary Notice of Modifications to Sewage Works completed under Paragraph 1. D. of Condition 10, including a report on status of implementation of all modifications.*
- *A summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to*



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eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted;

- *Any changes or updates to the schedule for the completion of construction and commissioning operation of major process(es) / equipment groups in the Proposed Works;*
- *A summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year.*



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Summary and Interpretation of Monitoring Data

Final Effluent parameter monitoring									
Month	[CBOD5] (mg/L)	[TSS] (mg/L)	[TP] (mg/L)	[TAN] (mg/L)	GMD E.Coli (cfu/100mL)	Unionized Ammonia (mg/L)	pH - MIN	pH - MAX	Temp. - MAX (deg. C)
	Limit: 10.0mg/L; Objective: 5.0mg/L	Limit: 10.0mg/L; Objective: 5.0mg/L	Limit: 0.20mg/L; Objective: 0.10mg/L	Limit: 3.0mg/L; Objective: 2.0mg/L	Limit: 100 cfu/100mL; Object.: 100 cfu/100mL	No Limit	Limit: 6.0	Limit: 9.5	No Limit
January	2.0	2.3	0.04	0.13	2.0	0.001	6.68	6.84	12.9
February	2.3	2.8	0.04	0.15	1.7	0.001	6.65	8.25	12.5
March	2.0	2.0	0.04	0.14	2.0	0.001	6.60	6.99	12.4
April	2.0	2.0	0.04	0.10	1.7	0.001	6.55	6.70	14.5
May	2.0	2.7	0.03	0.10	1.6	0.001	6.57	6.67	16.3
June	2.0	2.0	0.03	0.25	2.0	0.001	6.46	6.80	20.9
July	2.0	2.0	0.07	0.10	2.0	0.001	6.57	6.95	23.8
August	2.4	2.2	0.05	0.10	2.0	0.001	6.58	6.91	23.2
September	2.0	2.0	0.04	0.10	1.7	0.001	6.60	7.14	22.3
October	2.0	2.0	0.07	0.10	1.4	0.001	6.56	6.79	20.3
November	2.0	2.8	0.05	0.10	1.5	0.001	6.51	6.76	17.0
December	2.5	2.3	0.03	0.10	2.0	0.001	6.66	6.87	15.7
Annual Avg.	2.1	2.2	0.04	0.12	1.8	0.001	6.58	6.97	17.6



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Monthly Average Effluent Waste Loadings				
Month	CBOD5 (kg/d)	Total Suspended Solids (kg/d)	Total Phosphorus (kg/d)	Total Ammonia Nitrogen (kg/d)
	<i>Limit: 4.25 kg/d</i>	<i>Limit: 4.25 kg/d</i>	<i>Limit: 0.09 kg/d</i>	<i>Limit: 1.28 kg/d</i>
January	0.3	0.3	0.004	0.02
February	0.3	0.4	0.005	0.02
March	0.2	0.2	0.004	0.02
April	0.2	0.2	0.003	0.01
May	0.2	0.3	0.003	0.01
June	0.2	0.2	0.004	0.03
July	0.2	0.2	0.008	0.01
August	0.3	0.2	0.006	0.01
September	0.2	0.2	0.005	0.01
October	0.2	0.2	0.008	0.01
November	0.3	0.4	0.007	0.01
December	0.4	0.3	0.004	0.01
Annual Avg	0.3	0.3	0.005	0.01



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Raw Sewage Monthly Average Concentrations				
	Monthly Average BOD5 Concentration (mg/L)	Monthly Average Total Suspended Solids Concentration (mg/L)	Monthly Average Total Phosphorus Concentration (mg/L)	Monthly Average Total Kjeldahl Nitrogen Concentration (mg/L)
January	415.0	327.8	7.9	69.4
February	282.5	243.8	6.7	69.8
March	259.0	265.8	7.6	70.4
April	310.0	318.0	7.3	67.3
May	289.0	253.4	6.8	74.7
June	263.5	346.5	7.1	64.6
July	237.3	391.5	8.1	71.4
August	285.6	317.4	6.7	69.0
September	522.8	346.3	8.9	82.2
October	321.3	361.3	8.9	78.2
November	267.2	365.2	8.7	78.4
December	320.8	326.0	5.8	57.3
Annual Avg	314.5	321.9	7.5	71.1



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Facility Flow Monitoring			
Month	Average Daily Flow (cu.m./day)	Month Max Daily Flow (cu.m./day)	Total Monthly Flow (cu.m./month)
	<i>Rated Capacity: 213 cu.m./day, from June 2023 425 cu.m./ day</i>	<i>Peak Rated Capacity: 436 cu.m./day, from June 2023 850 cu.m./ day</i>	
January	126	210	3900
February	131	210	3481
March	122	210	3658
April	98	210	3783
May	94	203	2939
June	125	255	2912
July	123	243	3740
August	111	195	3822
September	115	192	3446
October	111	162	3436
November	148	211	3456
December	143	276	4445
	Annual Average Daily Flow = 118	Annual Max Daily Flow = 276	Total Annual Flow = 43,018 cu.m.



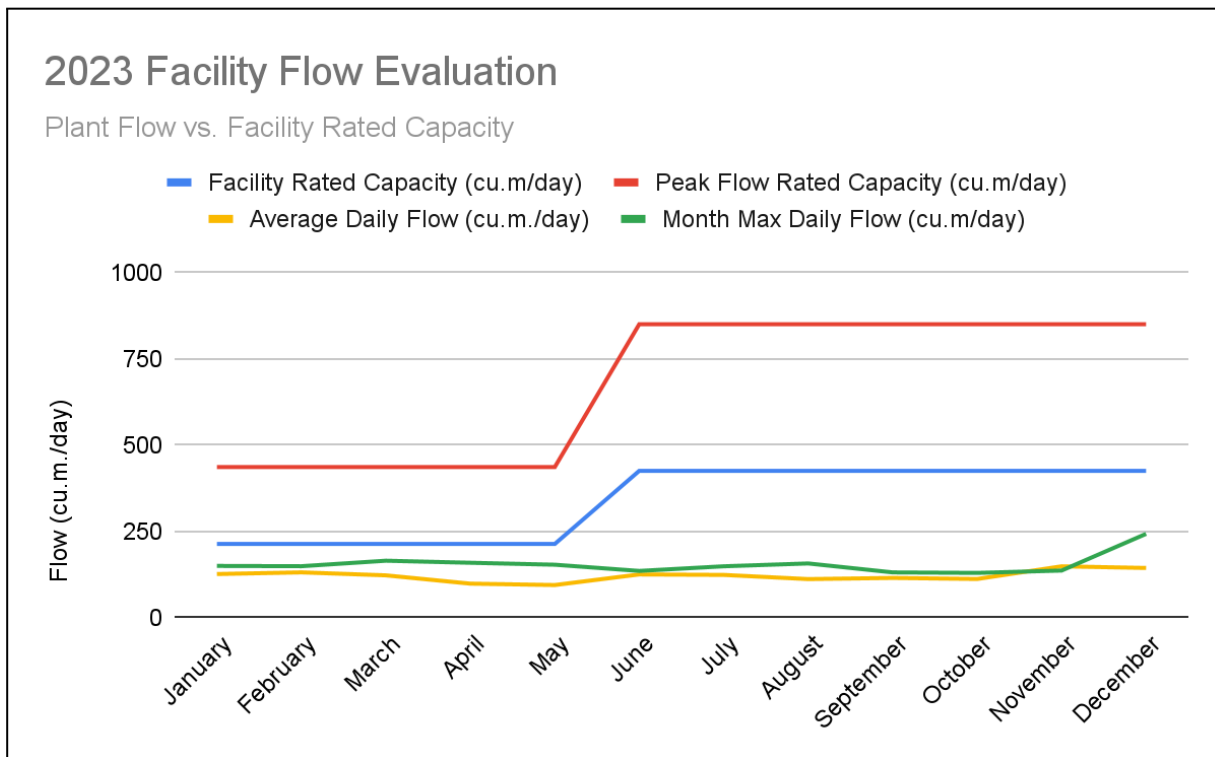
Summary of Bypass, Spill, or Abnormal Discharge Event(s)

No Bypasses, Spills, or Abnormal Discharge Events to report for the monitoring period.

Summary of Operating Problems throughout Monitoring Period

The Stonecrest Estates WWTP performed well throughout the reporting period. In 2022 and into 2023 the City continued to experience membrane fouling issues which limited the facility's hydraulic capacity. However, with the completion of Phase 2 construction in June of 2023 there have been significant improvements, including additional screening, upgraded membranes and increased operational flexibility.

The following figure depicts Average Daily Flow and monthly Maximum Daily Flows against the facility Rated Capacity. Notably, 2023 saw an increase in annual plant flow and a subsequent increase in Average Daily Flow (ADF) of 5%. From January to May the facility operated at 54% of its rated capacity. From June to December the facility operated at 29% of its rated capacity.



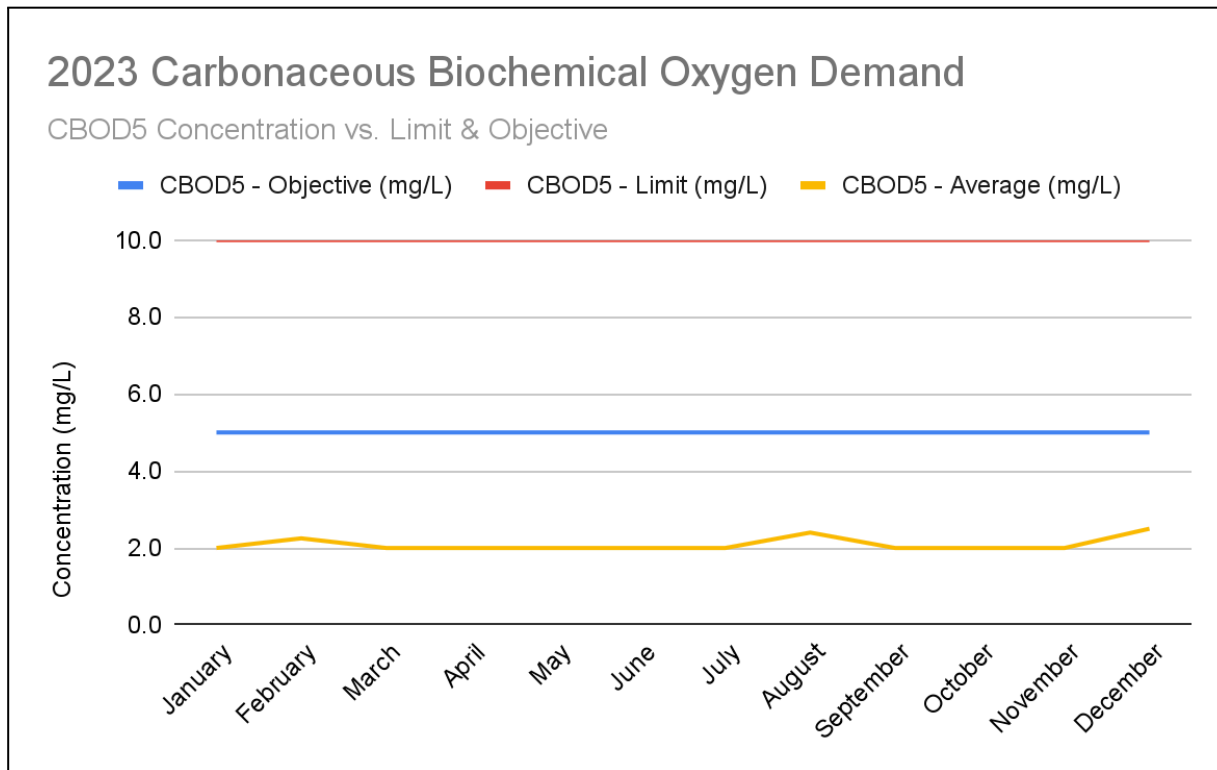


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Analysis of Final Effluent Monitoring Dataset

Carbonaceous Biochemical Oxygen Demand (CBOD5) / Biochemical Oxygen Demand (BOD5)

The following two Figures depict facility CBOD performance throughout the reporting period. It is apparent the facility operated efficiently to maintain monthly average Effluent concentrations and waste loadings below the Effluent Objectives and Limits. The Annual Average Concentration of CBOD5 was 2.1 mg/L.

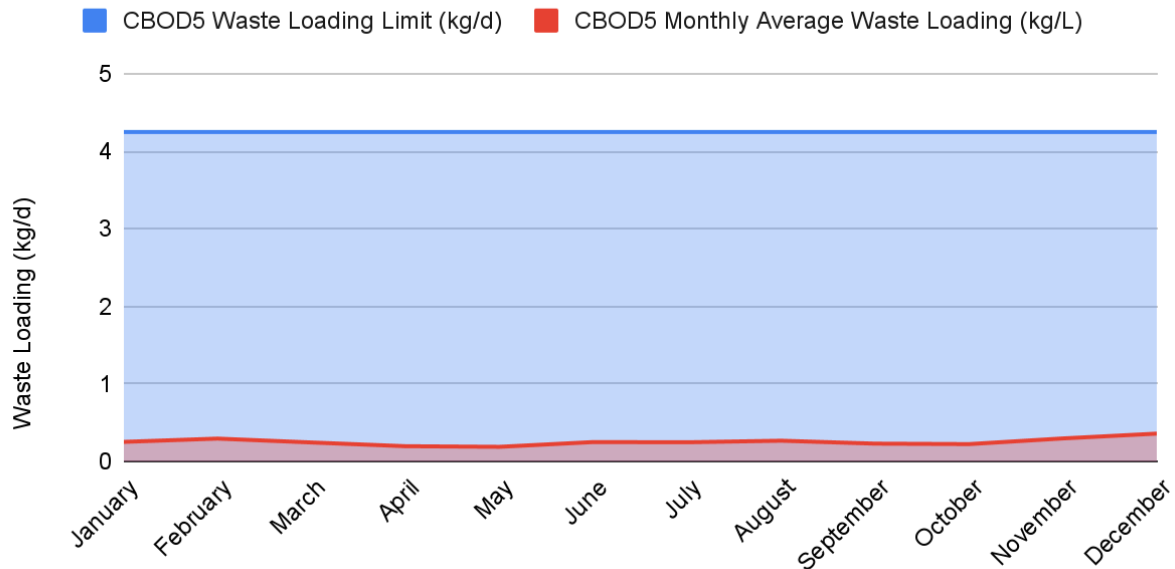




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2023 CBOD5 Waste Loading

CBOD5 Monthly Average Loading relative to Effluent Limit



Total Suspended Solids (TSS)

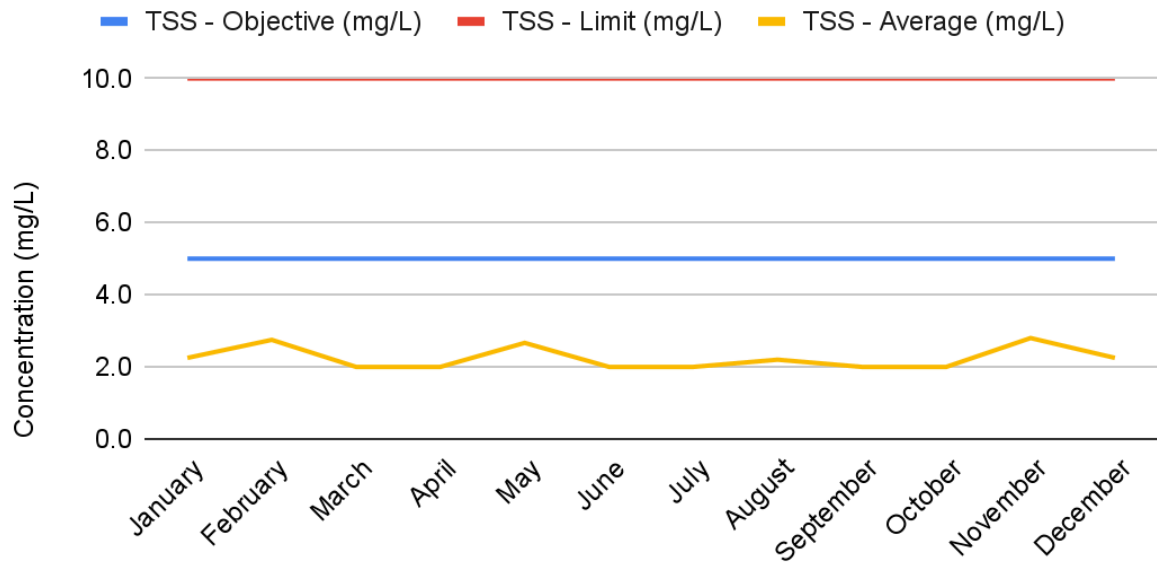
The facility performed quite well over the reporting period in maintaining compliance with the Effluent Limits and Objective for TSS with an Annual Average Concentration of 2.2 mg/L TSS. It is apparent in the following figures the facility was successful in maintaining a stable effluent quality over the reporting period.



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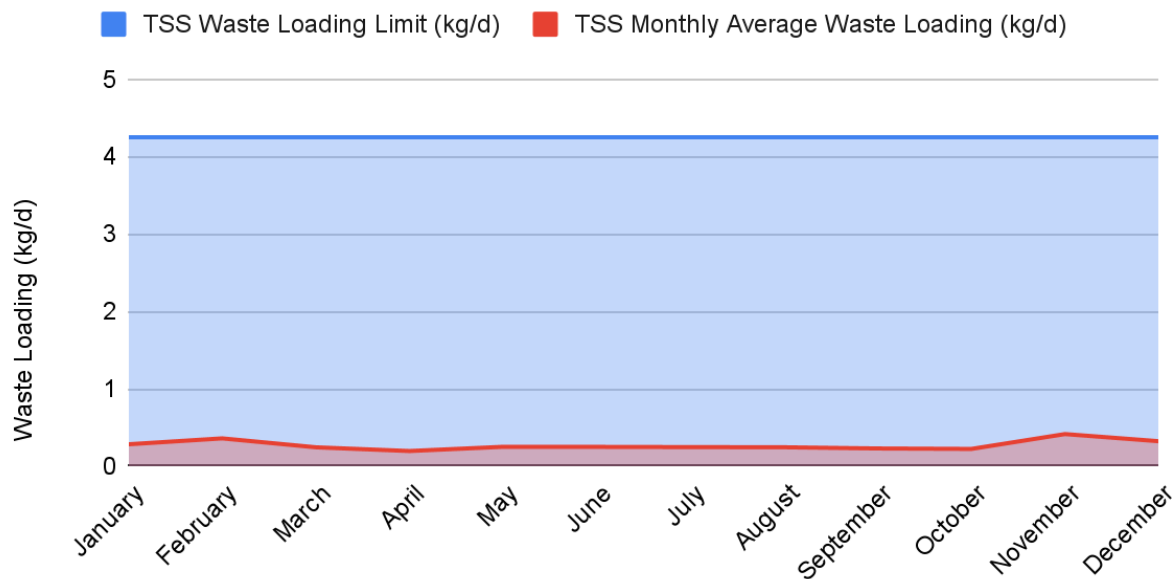
2023 Total Suspended Solids

TSS Concentration vs. Limit & Objective



2023 Total Suspended Solids Waste Loading

TSS Monthly Average Waste Loading relative to Effluent Loading Limit





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Total Phosphorus (TP)

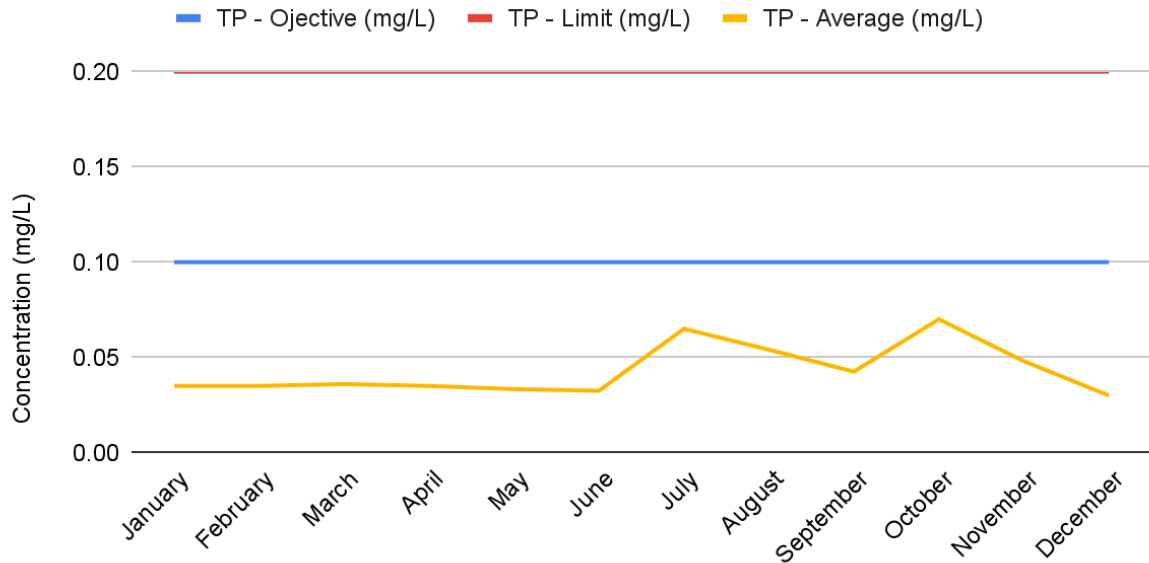
The facility performed quite well over the reporting period in maintaining compliance with the Effluent Limits and Objective for TP with an Annual Average Concentration of 0.04 mg/L TP. It is apparent in the following figures the facility was successful in maintaining a fairly stable effluent quality over the reporting period.



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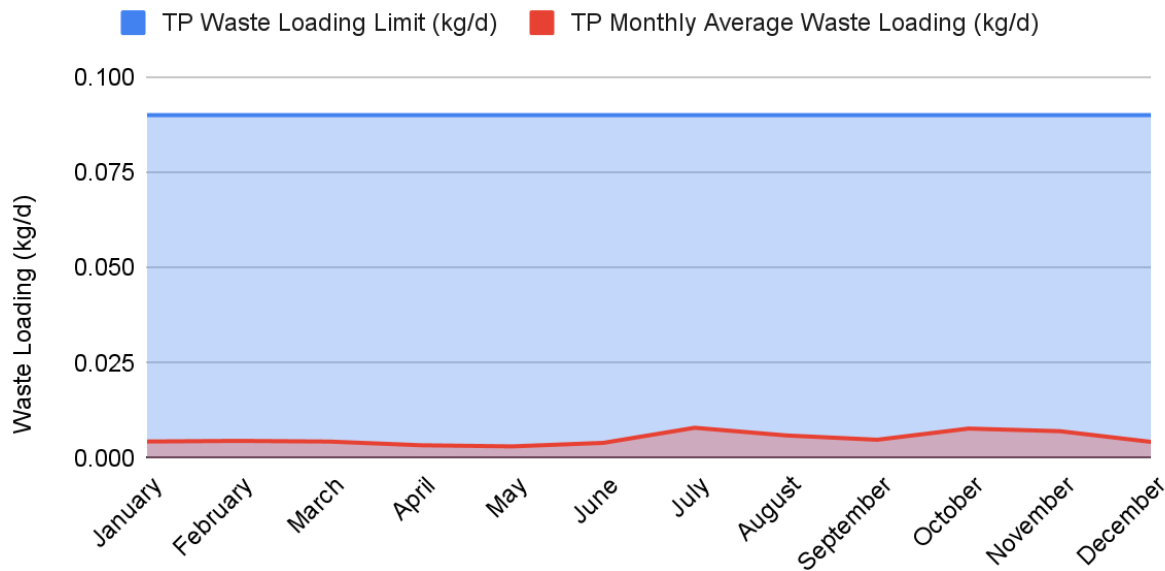
2023 Total Phosphorus

TP Concentration vs. Limit & Objective



2023 Total Phosphorus Waste Loading

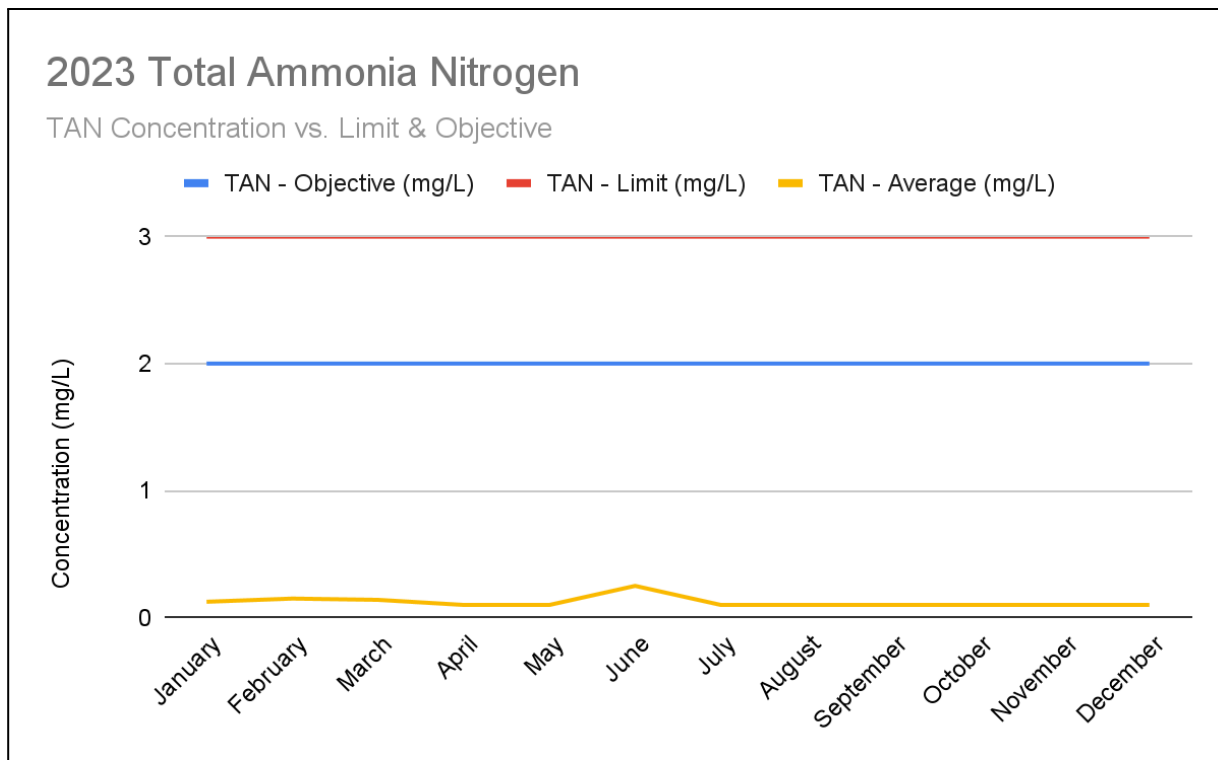
TP Monthly Average Waste Loading relative to Effluent Limit





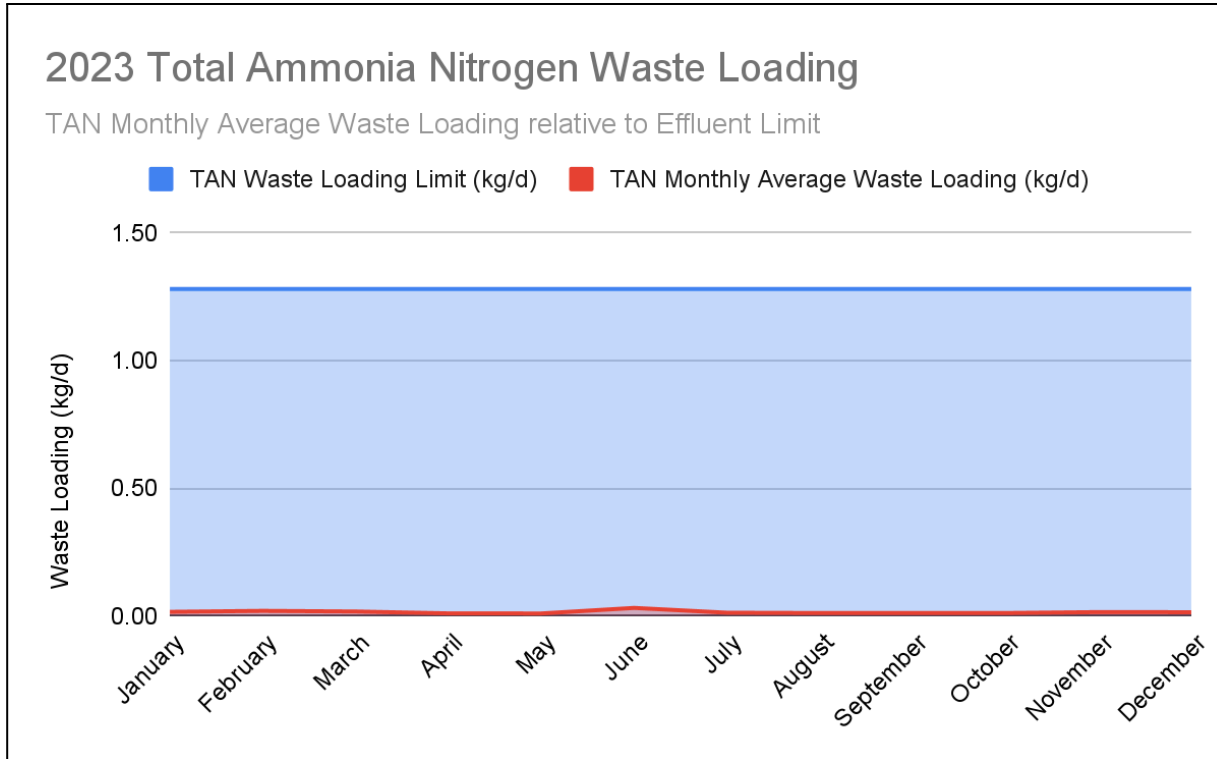
Total Ammonia Nitrogen (TAN) - Ammonia (NH₃) / Ammonium (NH₄⁺)

The measure of both Ammonia and Ammonium is called the Total Ammonia Nitrogen (TAN) content. Since the facility was designed to facilitate Nitrification, a Monthly Average TAN Effluent Limit and Objective have been established in the ECA. It is apparent in the figure below that the Nitrification process was well established and maintained throughout the Reporting Period. The annual average concentration of unionized ammonia was 0.001 mg/L, supporting the conclusion of the facility's effective performance.





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Geometric Mean Density of E. Coli

Membrane treatment technology is proven effective in pathogenic organism removal, specifically E. Coli, as the pore-size of the membrane plates are smaller than an E. Coli cell. This means that E. Coli can not readily pass through a membrane.

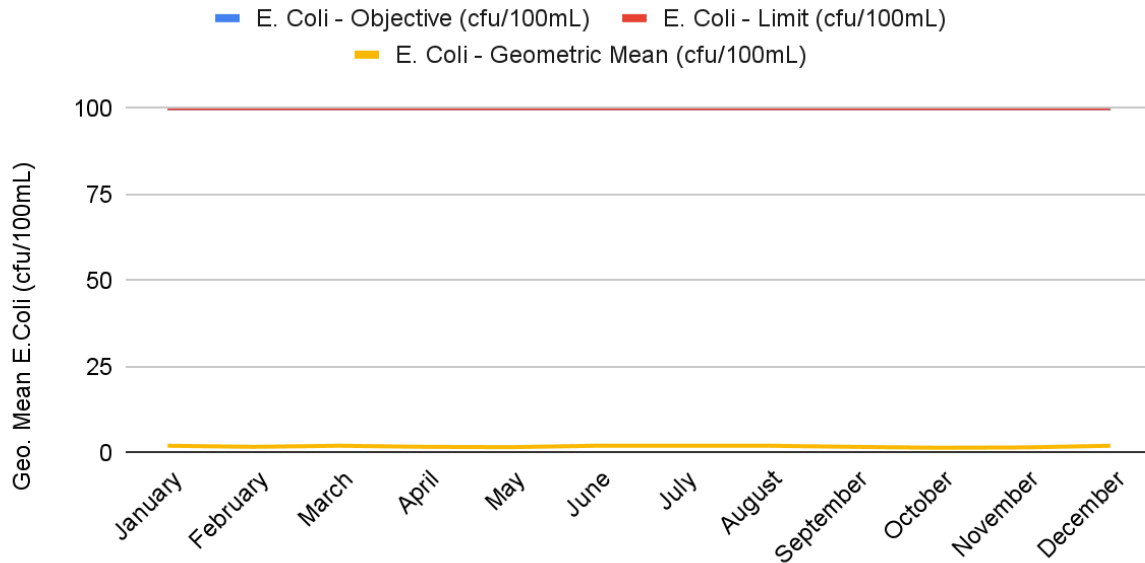
The figure below provides a clear representation that Final Effluent E.Coli concentrations are measured well below the allowable Limit throughout the Reporting Period.



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2023 Geometric Mean Density of E. Coli

GMD E. Coli vs. Limit & Objective



Final Effluent pH

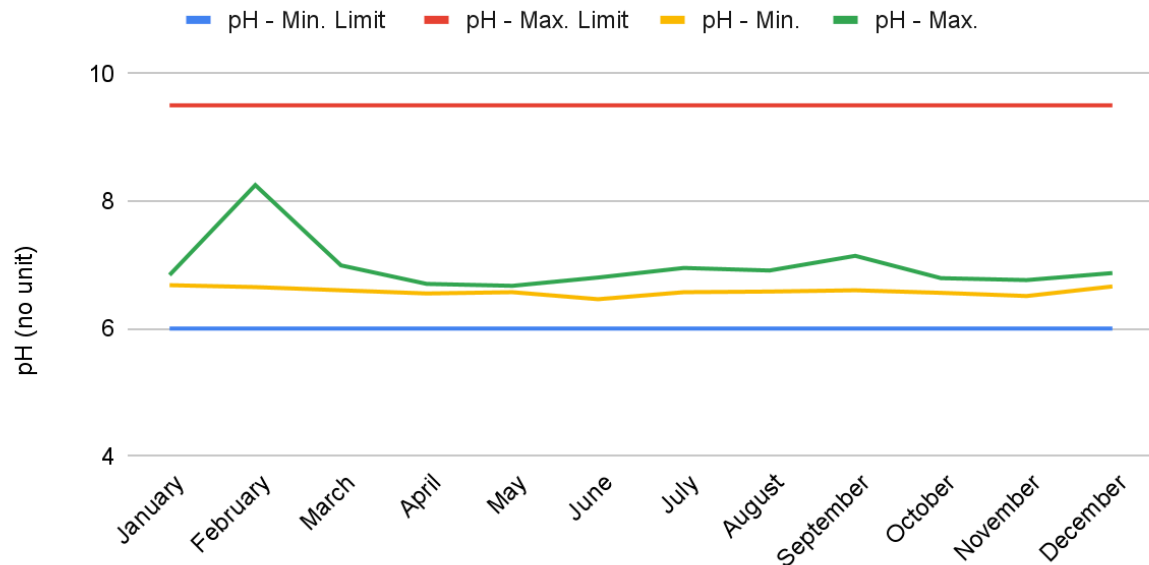
229 Final Effluent samples were collected and tested for pH throughout the Reporting Period. It is important to note that pH measurements used to determine compliance with the ECA have no quality assurance/ quality control (QA/QC) measures in place, other than routine calibration procedures of the pH probe. The figure below provides evidence the pH was maintained within compliance Limits throughout the monitoring period. The spike in February can be attributed to the pH being taken during post-caustic clean-in-place (CIP) of the membranes.



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2023 Final Effluent pH

pH vs. Limit & Objective



Summary of Maintenance performed throughout Reporting Period

The City continues to support an active Preventative Maintenance (PM) program to ensure the facility is maintained in a fit state of repair. Outside of Preventative Maintenance, the following Reactive Maintenance activities were completed by staff, or outside contractors as identified:

- Phase 2 Construction upgrades (50% funded by Developer)
- Air compressor
- Generator platform
- Aluminum stairs, railings, landing



Biosolids Management Summary

The onsite storage tank has a storage capacity of approximately 57 cu.m. This tank was emptied periodically from January to September and disposed of in the Trenton Wastewater Collection System for further treatment at the Trenton Wastewater Treatment Plant. This volume was approximately 348 cu.m. Below is a summary for the remainder of the reporting period when the storage tank was hauled to a certified storage facility. This volume was 172 cu.m. In total, the approximate volume of sludge taken from the facility during the reporting period was 520 cu.m.

Date Hauled	Volume Hauled	Biosolids Destination
Sept 26	44	Storage ECA# S-3708-42
Oct 6	44	
Oct 20	40	
Dec 18	44	
Total Volume of Sludge generated in 2023 = 172 cu.m.		
Estimated biosolids generation in 2024 = 200 cu.m.		

Summary of Effluent Quality Assurance and Control Measures

The Stonecrest Estates STP Operator collects samples from Raw Sewage, Anoxic Tank, Aeration Tank, Membrane Tank, and Final Effluent on a regular basis throughout the week. The samples are tested for various parameters in-house for process control and effluent quality assurance. A spreadsheet is used to track in-house lab results and plant performance data. In addition to the in-house analysis, samples are collected weekly, typically on Wednesday, and sent to a certified laboratory – SGS Environmental Services. These sample results are used to determine compliance with the ECA, as the City does not have approved QA/QC measures in place for their in-house testing to qualify accuracy of results. In 2024, samples will be collected and sent on Tuesdays of each week.



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Monitoring Schedule

The facility sampled in accordance with the ECA every Wednesday. In 2024, the facility will collect samples in accordance with the ECA, every Tuesday each week.

Final Effluent Monitoring Equipment Calibration and Maintenance

Works Orders are generated on an annual basis to calibrate the facility Flow Meter. This calibration is completed by a third party contractor. The following figure is a copy of the Calibration Certificate.



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Tower Electronics Canada Inc.
 Instrument Calibration Certificate

Customer:
 The City of Quinte West
 7 Creswell Drive
 PO Box 490
 Trenton, ON K8V 5R6

Calibration by:
 Dan Matchett

Standards:
 Fluke 289 S/N 96220182 NIST Cal Due April 2024
 Prosonic 91P Cal due April 2024

Instrument Type
 Magnet Flow Meter

Method of verification
 Volumetric comparison

Units: LPM
Zero: 0.00
Span: 400.00
Totalizer: M3

Meter Information
 Date: 2023-09-01
 Location: Stonecrest WWTP
 Meter Under Test: Waste Flow
 Client Tag: N/A
 Manufacturer: Sonic Pro
 Model: S3X1
 Serial Number: 11082016-1200
 Totalizer As Found: 147.548M3
 Totalizer As Left: 151.270M3
 Acceptable Error: 15%

Programming Parameters:
 Max Flow: 400lpm
 Pipe OD: 61mm
 Pipe Wall Thickness: 5.5mm

Calibration Due: Aug-23

Flow Test		Unit
Meter Under Test Totalizer Start	148.214	M3
Meter Under Test Totalizer Stop	150.207	
Total Volume of Test	1.993	
Calculated Volume:	2.051	
Error %	-2.910	
Result:	PASS	

Output Test(mA/Hz):		
Current Output Simulated	Current Meter	Error
4.000	4.006	-0.150
20.000	20.026	-0.130
Average Error %		-0.140
Result:		PASS

Comments:
 Unit passes verification.

Tower Electronics Canada Inc.
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 Wooler On
 Canada

Email: Dan@Tecanada.ca
 Website: www.tecanada.ca

Calibrations Service Sales
 Temporary and Permanent Meter Installations
 Instrumentation For Flow Level Pressure.



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Notice of Modifications

There were no Notices required for modification of the facility in accordance with the conditions under Limited Operational Flexibility.

Summary of complaints received throughout the reporting period

There were no complaints received by City staff with respect to the Stonecrest Estates WWTP throughout the reporting period.

Procedure F-5-1 compliance

The City will continue to consult its Asset Management Planning modeling tools in conjunction with Capital Planning exercises to determine reconstruction projects. Sanitary Collection rehabilitation projects are identified in the Sanitary Collection System 2023 Annual Report.

As outlined in Summary of [Bypass, Spill, or Abnormal Discharge Event\(s\)](#), there were no bypasses, spills or abnormal discharges to report during this monitoring period.