

Corporation of the City of Quinte West

Frankford Wastewater Treatment Plant

2022 Annual Performance Report



A Natural Attraction



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The Corporation of the City of Quinte West
Public Works and Environmental Services
Water/Wastewater Division
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Frankford WWTP

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Executive Summary

The Frankford Wastewater Treatment Plant (FWWTP), assigned MOE Identifier number 110000267, is located at 174 North Trent Street. The facility operates in accordance with Environmental Compliance Approval number 5056-AE9QVC, issued on January 10, 2017.

The WWTP is a Class II Treatment Plant, and has a rated capacity of 2,800 cu.m/day. The facility is described as an extended aeration activated sludge treatment plant with tertiary treatment. The process comprises two circular treatment facilities with integrated extended aeration tanks, aerobic sludge digestion, aerobic sludge storage tanks, and interior circular secondary clarifiers. Secondary effluent enters the tertiary filter building through a filter inflow distribution channel before receiving tertiary treatment through two dual media gravity effluent filters. Final effluent is disinfected using UV irradiation before final discharge to the Trent River via outfall downstream of Dam 4. The Frankford Wastewater Collection System consists of three (3) Sewage Pumping Stations; two located on the West side of the Trent River, and one located on the East side of the Trent River.

In accordance with the ECA, an annual report shall be prepared by March 31 of the year following the end of the period being reported upon. This annual report contains the following information as per Reporting Condition of the ECA:

- *A summary and interpretation of all monitoring data and a comparison to the effluent limits outlined in Condition 7, including an overview of the success and adequacy of the Works;*
- *A description of any operating problems encountered and corrective actions taken;*
- *A summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;*
- *A summary of any effluent quality assurance or control measures undertaken in the reporting period;*
- *A summary of the calibration and maintenance carried out on all effluent monitoring equipment;*



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- *A description of efforts made and results achieved in meeting the Effluent Objectives of Condition 6;*
- *A tabulation of the volume of sludge generated in the reporting period and any steps taken to address the complaints;*
- *A summary of all by-pass, spill or abnormal discharge events;*
- *A copy of all Notice of Modifications submitted to the Water Supervisor as a result of Schedule B, Section 1, with a status report on the implementation of each modification;*
- *A report summarizing all modifications completed as a result of Schedule B, section 3; and,*
- *Any other information the Water Supervisor requires from time to time.*



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Summary and Interpretation of Monitoring Data

Final Effluent Parameter Monitoring - with Limits									
Month	[CBOD5] (mg/L)	[TSS] (mg/L)	[TP] (mg/L)	[TAN] (mg/L)	GMD E.Coli (cfu/100mL)	Acute Lethality RBT (% Mortality)	Acute Lethality DM (% Mortality)	pH - MIN	pH - MAX
	Limit: 25.0mg/L; Objective: 15.0mg/L	Limit: 25.0mg/L; Objective: 15.0mg/L	Limit: 0.25mg/L; Objective: 0.20mg/L	See TAN section for Limits	Limit: 200 cfu/100mL; Object.: 150 cfu/100mL	Non-lethal	Non-lethal	Limit: 6.0	Limit: 9.5
January	2.3	2.0	0.03	0.1	2.0	10	0	6.67	7.01
February	2.0	2.0	0.03	0.5	2.0	ND	ND	6.69	6.91
March	2.9	9.7	0.05	0.1	2.4	ND	ND	6.61	7.02
April	2.0	2.3	0.03	0.1	2.0	0	0	6.59	6.90
May	2.0	2.4	0.03	0.1	2.0	ND	ND	6.60	6.79
June	2.5	2.0	0.03	0.1	2.0	ND	ND	6.60	7.24
July	2.0	2.0	0.03	0.1	2.0	0	0	6.67	6.98
August	2.0	2.0	0.03	0.1	2.0	ND	ND	6.53	7.07
September	2.0	2.0	0.03	0.1	2.0	ND	ND	6.71	7.36
October	2.0	2.0	0.03	0.1	2.0	0	0	7.16	7.45
November	2.0	2.0	0.03	0.1	2.0	ND	ND	6.97	7.46
December	2.0	2.5	0.03	0.1	2.0	ND	ND	6.98	7.15



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Final Effluent parameter monitoring - without Limits

	Unionized Ammonia (mg/L)	Hydrogen Sulphide (mg/L)	Dissolved Oxygen (mg/L)	Temperature (deg.C)
January	0.001	0.02	9.31	7.6
February	0.001	0.02	9.03	7.5
March	0.001	0.02	9.37	8.1
April	0.001	0.02	8.70	10.1
May	0.001	0.02	7.76	13.9
June	0.001	0.02	7.73	17.3
July	0.001	0.02	7.14	20.1
August	0.001	0.02	7.19	21.2
September ¹	0.001	0.02		19.7
October	0.001	0.02	8.49	16.6
November	0.001	0.02	6.61	13.3
December ²	0.001	0.02	7.52	10.3

¹ Final Effluent Dissolved Oxygen grab(s) not completed for the month of September

² Final Effluent Dissolved Oxygen value is not representative of an average, reflects one grab sample in month of December



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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: 70.0 kg/d</i>	<i>Limit: 70.0 kg/d</i>	<i>Limit: 0.70 kg/d</i>	<i>See TAN section for Limits</i>
January	5.2	4.6	0.1	0.2
February	5.2	5.2	0.1	0.3
March ³	9.6	31.8	0.2	0.3
April	5.7	6.4	0.1	0.3
May	4.9	5.9	0.1	0.2
June	5.7	4.5	0.1	0.2
July	3.7	3.7	0.1	0.2
August	3.7	3.7	0.1	0.2
September	3.6	3.6	0.1	0.2
October	3.7	3.7	0.1	0.2
November	4.1	4.1	0.1	0.2
December	5.4	6.8	0.1	0.3

³ Two plant bypass events occurred in March, accounting for the higher CBOD5, TSS and TP values.



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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	92.3	157.0	1.6	12.4
February	108.8	165.0	1.9	12.5
March	106.8	108.8	0.9	8.4
April	100.0	182.5	1.2	9.8
May	86.6	131.0	1.2	10.2
June	150.0	195.0	2.4	11.7
July	116.5	165.3	1.9	15.6
August	107.0	156.6	1.3	13.9
September	100.3	193.0	1.8	13.3
October	134.5	297.0	3.1	19.8
November	96.0	159.6	1.9	15.2
December	91.5	143.0	1.7	15.8



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	Facility Influent Flow Monitoring			Facility Effluent Flow Monitoring		
Month	Average Daily Influent Flow (cu.m./day)	Month Max Daily Influent Flow (cu.m./day)	Total Influent Flow (cu.m./month)	Average Daily Effluent Flow (cu.m./day)	Month Max Daily Effluent Flow (cu.m./day)	Total Effluent Flow (cu.m./month)
	Rated Capacity: 2800 cu.m./day	Peak Rated Capacity: 9000 cu.m./day				
January	2117	2446	65630	2294	2687	71124
February	2443	3749	68406	2580	4056	72253
March	3159	4516	97928	3293	4832	102092
April	2758	3146	82734	2836	3244	85075
May	2349	3360	72812	2446	3535	75821
June	2170	2691	65105	2263	2810	67876
July	1760	1947	54548	1870	2085	57957
August	1717	2017	53235	1841	2303	57069
September	1710	1814	51312	1817	1924	54503
October	1757	1966	54481	1870	2097	57957
November	1949	3454	58460	2058	3591	61737
December	2615	4793	81072	2706	5106	83875
	Annual Avg = 2,209 cu.m./day	Annual Max = 4,793 cu.m./day	Total Annual = 805,723 cu.m.	Annual Avg = 2,323 cu.m./day	Annual Max = 5,106 cu.m./day	Total Annual = 847,339 cu.m.



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

On February 3, 2022 the City reported a small spill of the Frankford WWTP sludge storage tank. The spill resulted from a frozen start/ stop switch on the sludge haulage line. The event lasted approximately two (2) minutes, with the spill volume approximated to be 200 litres.

On March 20, 2022 the WWTP went into an unplanned partial Tertiary Bypass as a result of rapid seasonal temperature change and increased flow due to snow melt. The event ended March 22, 2022, lasting 47 hours and 22 minutes, with the estimated bypass volume calculated to be 1,866 cu.m.

Again, on March 24, 2022 the WWTP went into an unplanned partial Tertiary Bypass attributed to excessive rainfall and a failure of the traveling hood. The event ended on March 25, 2022, lasting 31 hours and 12 minutes, with the estimated bypass volume calculated to be 1,493 cu.m.

Summary of Operating Problems throughout Monitoring Period

During the reporting period there are no noteworthy operating problems. The plant performed well throughout the year. The City continues to seek out and repair Inflow and Infiltration (I&I) into the sanitary system to help better manage flows to the facility.

The following figure depicts Average Daily Flow and month Maximum Daily Flows against the facility Rated Capacity. Seasonal flow increases can be seen in March and December, and reflect the I&I challenges that face this system. A heavy rain event in December caused the highest Max Daily flow to reach 4,793 m³/day. In 2022 there was an increase in annual plant flow and a subsequent increase in Average Daily Flow (ADF) of 10%, however the 3-year ADF decreased by 2%, with the 5-year average remaining steady.



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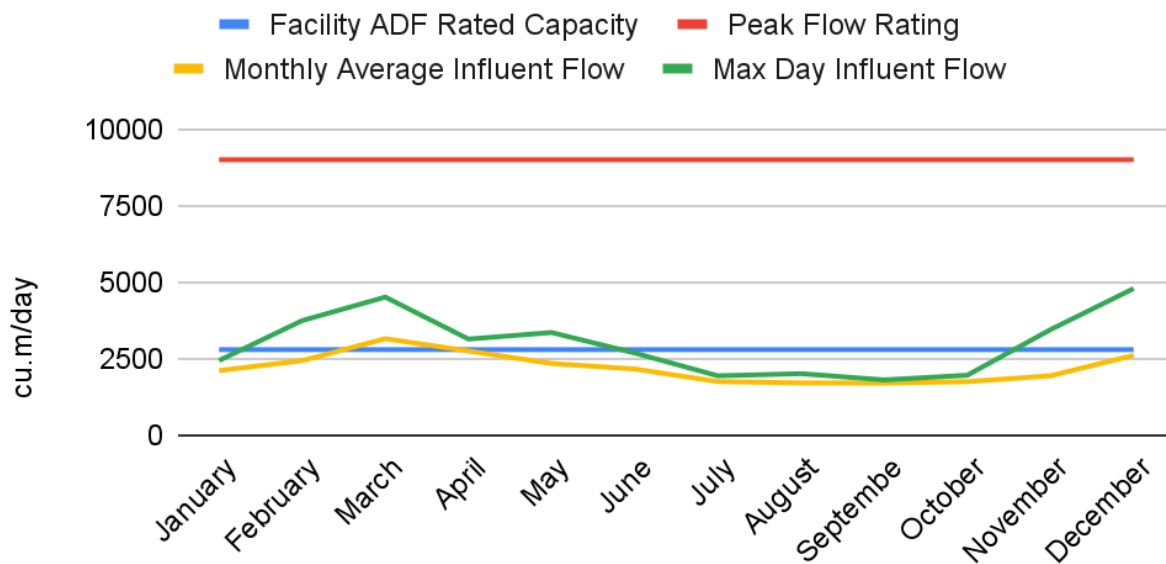
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2022 Facility Influent Flow Evaluation

Average Day & Peak Day Influent Flows



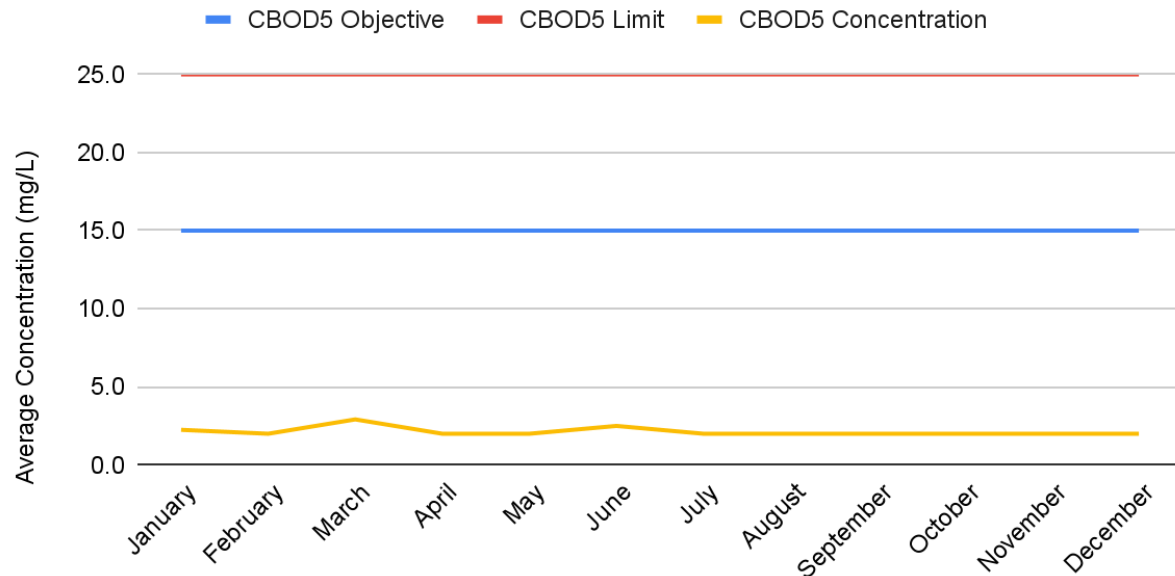
Analysis of Final Effluent Monitoring Dataset

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

The facility performed adequately to reduce BOD concentrations through the treatment process throughout the entire Reporting Period. Final Effluent Waste Loadings also remained below the allowable limits throughout the Reporting Period largely due to the low monthly average concentrations.

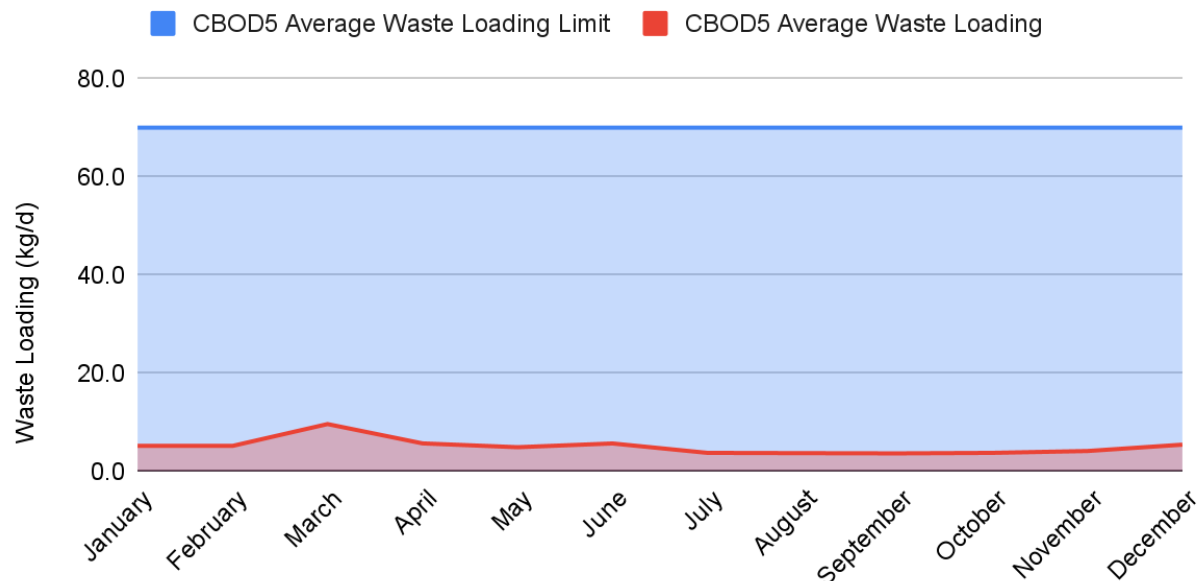
2022 Carbonaceous Biochemical Oxygen Demand

CBOD5 Concentration vs. Limit & Objective



2022 Final Effluent CBOD5 Waste Loading

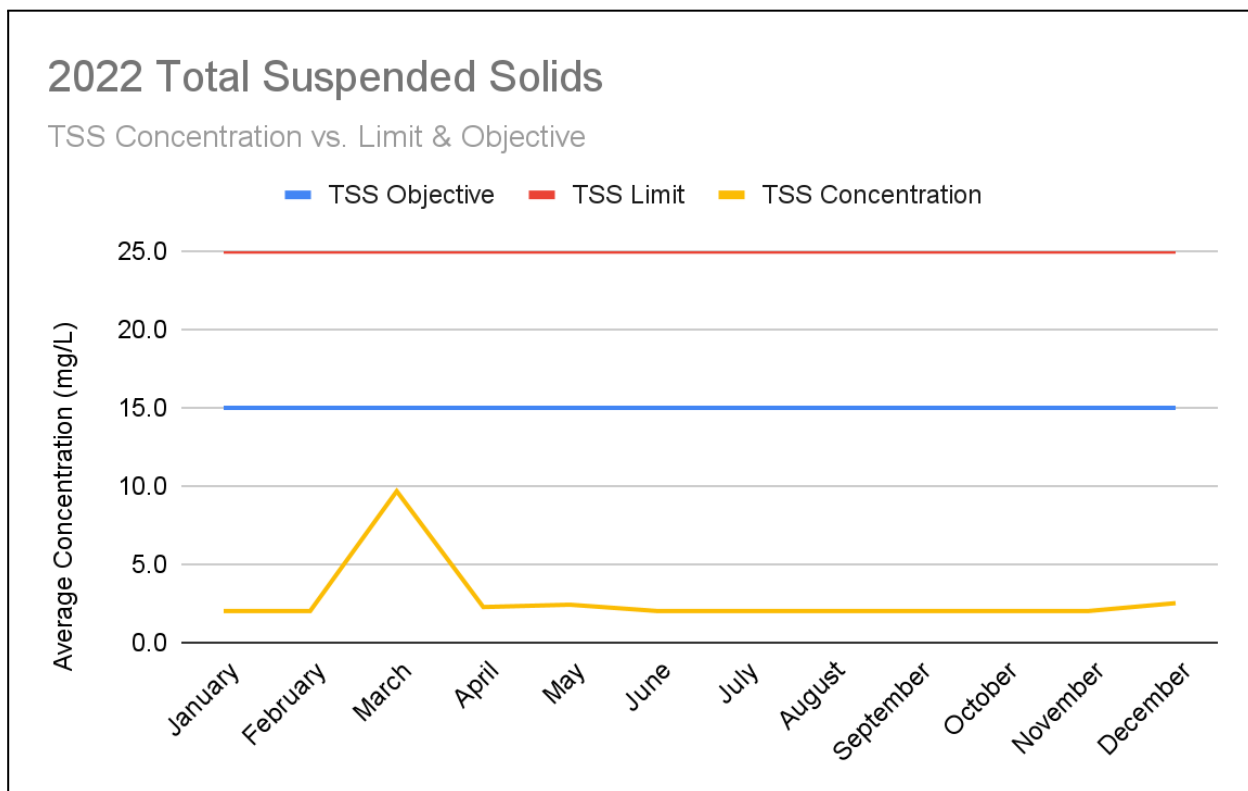
CBOD5 Monthly Average Waste Loading vs. Limit





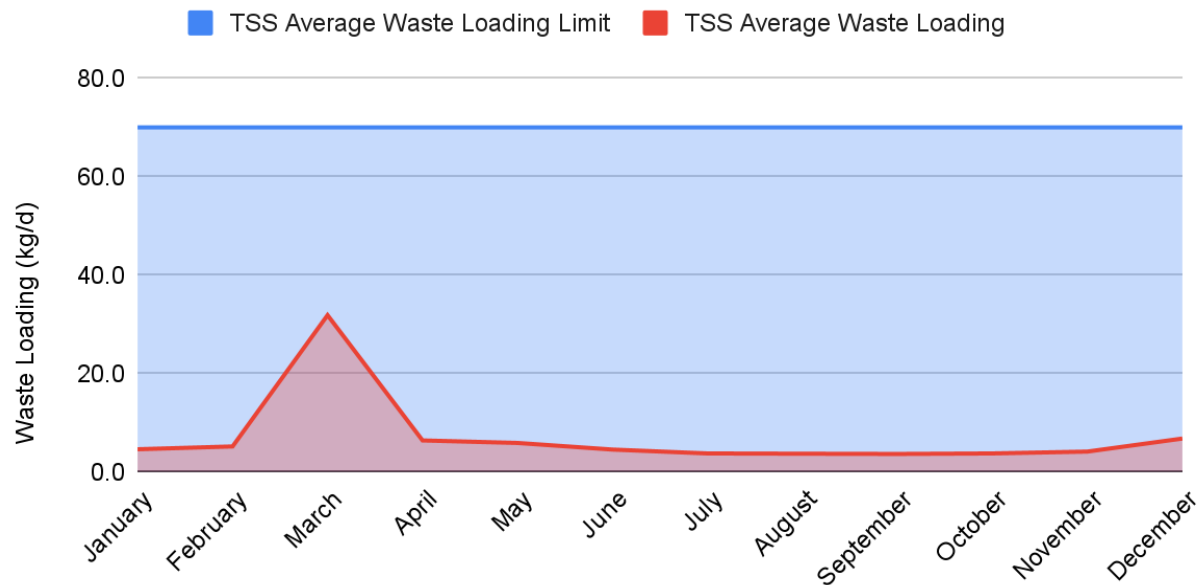
Total Suspended Solids (TSS)

Generally, the facility operated well throughout the Reporting Period to maintain compliance with the Effluent Limits and Objectives established in the ECA. As seen below in the figures, there is a notable increase in TSS concentration and subsequent TSS Waste Loading in the month of March, due to samples collected during two plant bypass events.



2022 Final Effluent TSS Waste Loading

TSS Monthly Average Waste Loading vs. Limit

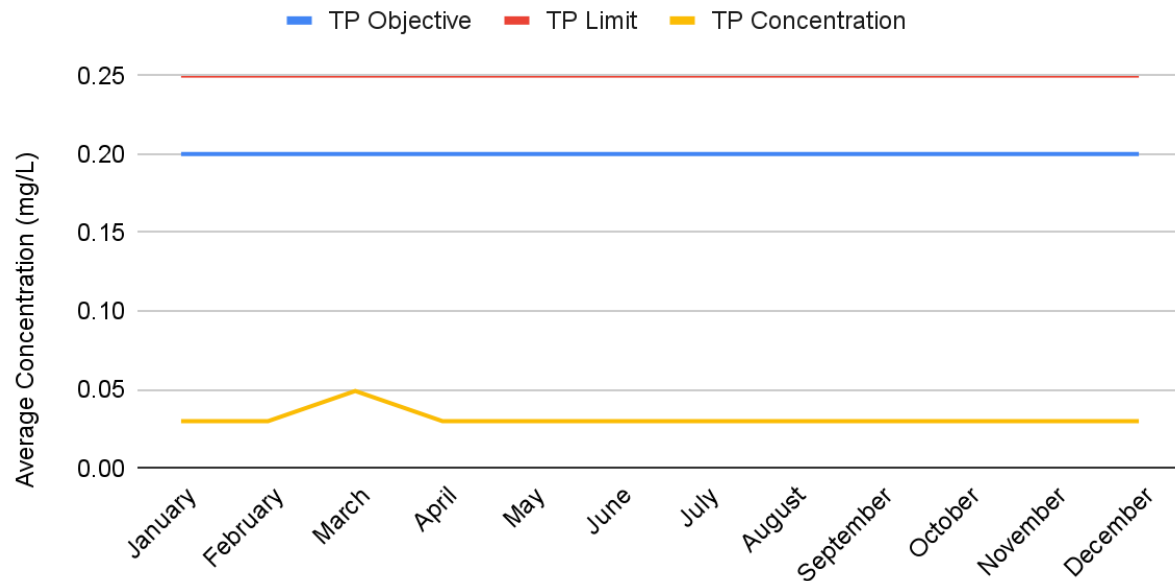


Total Phosphorus (TP)

Facility performance was generally stable throughout the Reporting Period in meeting Total Phosphorus Monthly Average Concentrations Objectives and Limits and Effluent Waste Loading Limits. As seen below in the figures, there is a notable increase in TP concentration and subsequent TP Waste Loading in the month of March, due to samples collected during two plant bypass events.

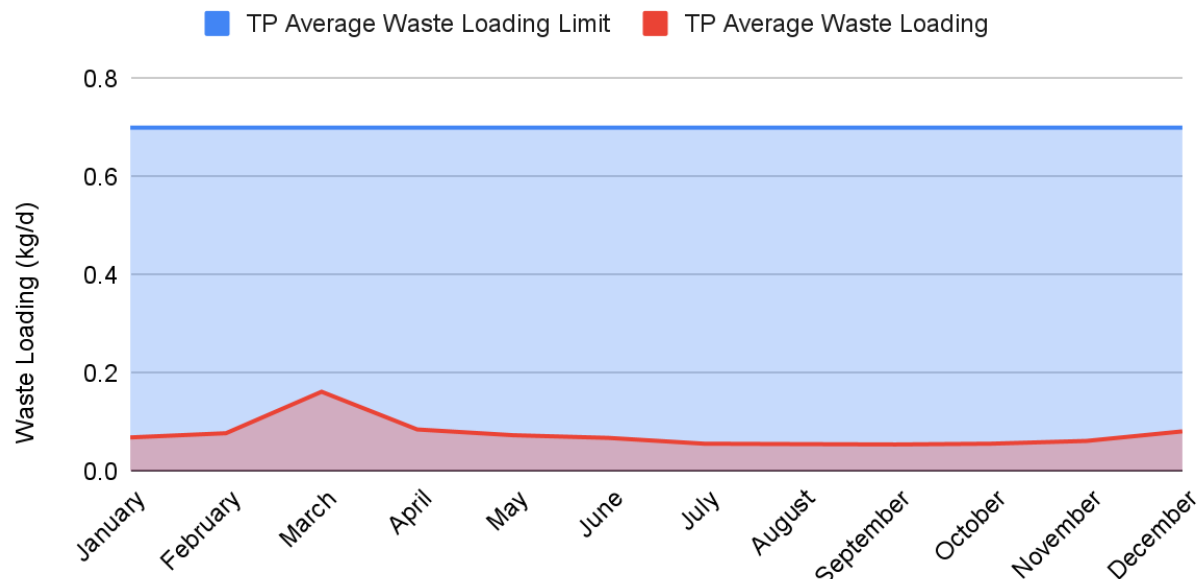
2022 Total Phosphorus

TP Concentration vs. Limit & Objective



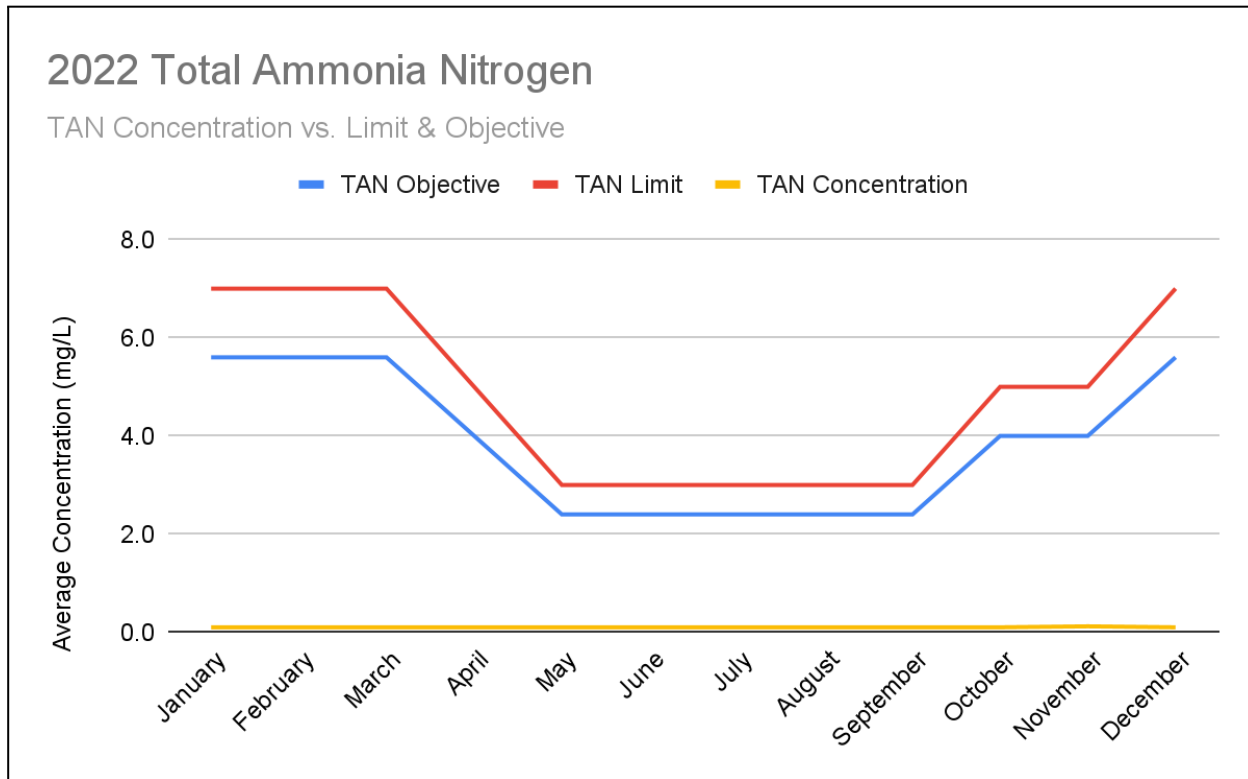
2022 Final Effluent TP Waste Loading

TP Monthly Average Waste Loading vs. Limit



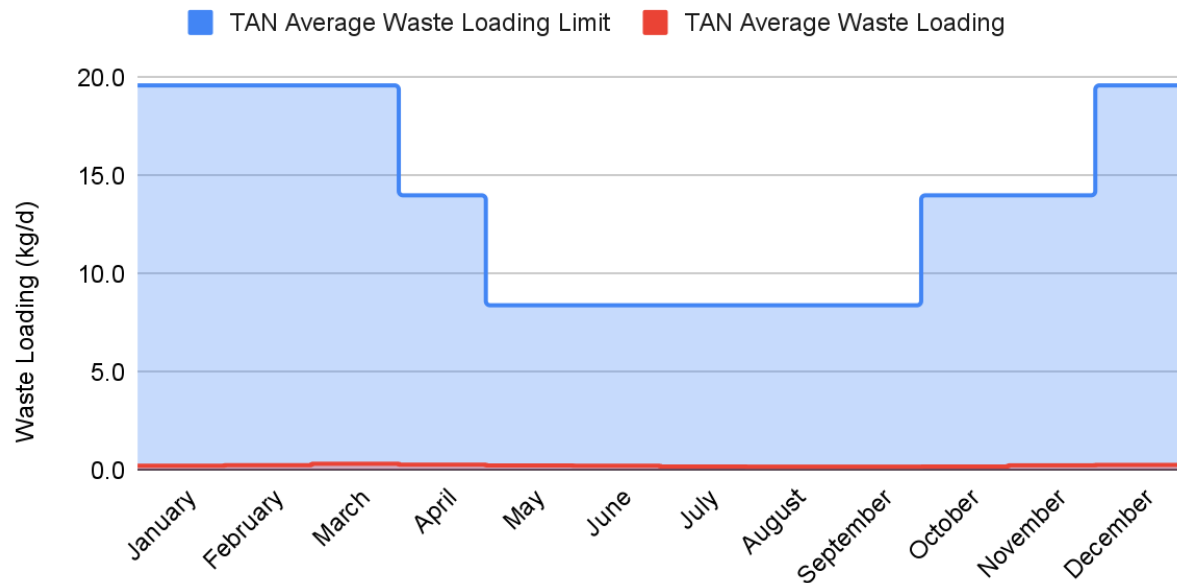
Total Ammonia Nitrogen (TAN) - Ammonia (NH_3) / Ammonium (NH_4^+)

The measure of both Ammonia and Ammonium is called the Total Ammonia Nitrogen (TAN) content. The neutral, unionized form of ammonia (NH_3) is highly toxic to fish and other aquatic life; Condition 9(5) of the ECA requires the Owner to monitor for this. The yearly average unionized ammonia concentration in the Final Effluent was 0.001 mg/L. The facility operated well throughout the entire year such that the Monthly Average TAN Concentrations and Waste Loadings remained well below the Effluent Objectives and Limits.



2022 Final Effluent TAN Waste Loading

TAN Monthly Average Waste Loading vs. Limit



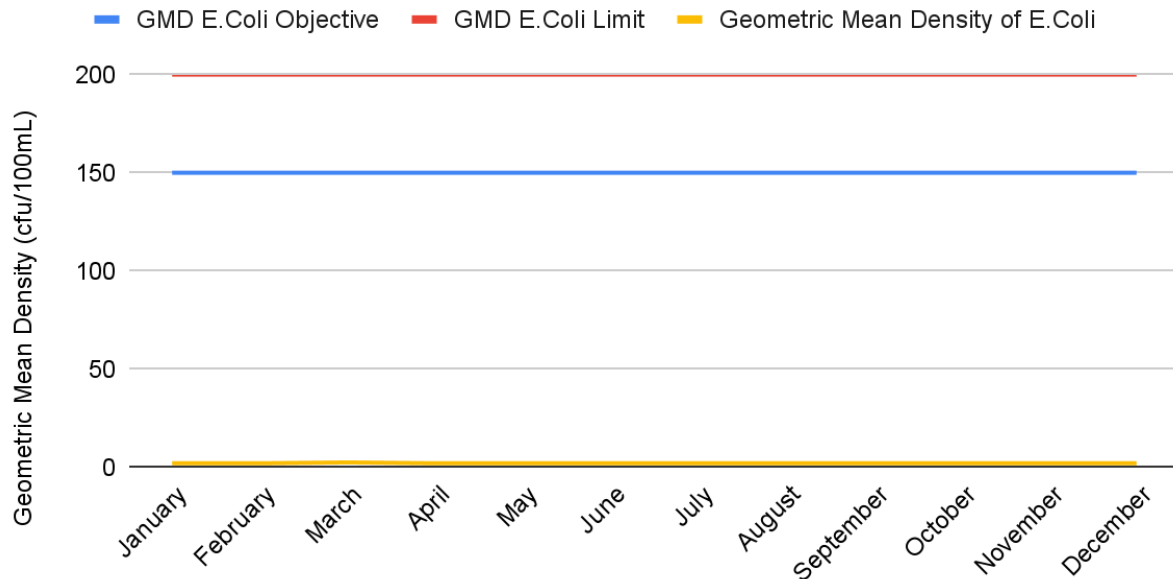
Geometric Mean Density of E. Coli

The Figure below demonstrates the facility's effectiveness in continuously disinfecting its Final Effluent discharge. The UV Disinfection process consists of two banks (one standby) of UV irradiation lamps, each bank having a Peak Rated Capacity of 9000 cu.m/day. Regular weekly sampling results generally measured at the MDL of 2 cfu/100mL. With regular preventative maintenance, the system continues to perform well.



Geometric Mean Density (GMD) of E.Coli

Monthly GMD of E.Coli vs. Limit & Objective

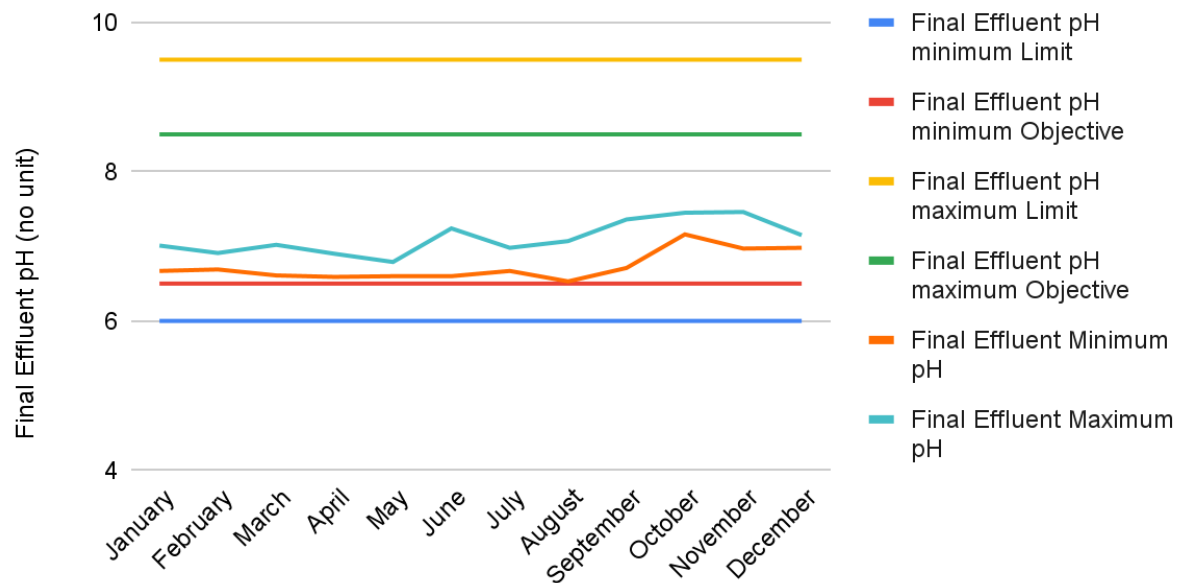


Final Effluent pH

As shown in the following chart, the Final Effluent pH remained within allowable limits established in the ECA. The ECA requires the Owner to collect a grab sample of the Final Effluent on a weekly basis and test for pH. The Operators collected some 253 samples of Final Effluent throughout the reporting period, and analyze the pH using in-house equipment.

2022 Final Effluent pH

pH vs. Limits & Objectives



Acute Lethality to Rainbow Trout and Daphnia Magna

The City contracts all Acute Lethality testing to *Aquatox Testing and Consulting Inc.* In January, the results from the sample collected yielded 0% mortality in Daphnia Magna at 100% Effluent Concentration and 10% mortality in Rainbow Trout at 100% Effluent Concentration. The remaining samples collected in April, July and October yielded 0% mortality In Daphnia Magna and Rainbow Trout. In accordance with the Wastewater Systems Effluent Regulations, effluent is deemed acutely lethal if there is greater than 50% mortality in Rainbow Trout at full strength effluent.

As Rainbow Trout are susceptible to ammonia, a review of the weekly sample results was conducted, and all sample results measured at or below the MDL each week during each month as outlined in the table below. Further, there were no other indicators in weekly sample results to suggest the Effluent quality was diminished.



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Final Effluent Ammonia Results

Date	TAN concentration (mg/L)	Calculated Unionized Ammonia Concentration (mg/L)
January 11, 2022	0.1	0.001
April 12, 2022	0.1	0.001
July 12, 2022	0.1	0.001
October 26, 2022	0.1	0.001

Effluent monitoring requirements without Limits

The City is responsible for sampling other parameters that do not have an established Effluent Limit. Those are listed below along with a short interpretation of associated facility performance, and sample results are summarized in the Table to section [Summary and Interpretation of Monitoring Data](#).

- **Hydrogen Sulfide:** Final Effluent sample results consistently measured below the lab MDL for the entire reporting period. In the next ECA amendment, the City will apply to have this monitoring requirement removed due to its redundancy.
- **Dissolved Oxygen:** While the City actively monitors and controls D.O. in the aeration basin to enhance the oxidation process, staff only collect Final Effluent samples for D.O. analysis weekly and analyze this parameter using in-house equipment. A total of 41 samples were collected throughout the Reporting Period and analyzed for D.O. The minimum Final Effluent DO was measured at 6.31 mg/L on November 17. The maximum D.O. was measured at 9.66 mg/L on March 23.
- **Temperature:** 253 samples of Final Effluent were collected throughout the Reporting Period and the temperature was taken using in-house equipment. The minimum measured reading was 6.1 deg.C on January 17, and the maximum measured was 23.2 deg.C on August 3.



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:

- Surge suppressors installed at Oxford PS and Riverside PS
- UV Maintenance, replace sleeves and fittings
- Maintenance of filter bridge tractors

Biosolids Management Summary

Date Hauled	Volume Hauled	Biosolids Destination
January 27	44	Trenton WWTP dewatering and storage
February 1-3	484	Trenton WWTP dewatering and storage
March 28	528	Trenton WWTP dewatering and storage
May 3-5	240	GFL Storage Facility (Smiths) ECA# S-3708-42
May 12-13	1040	Land Application - NASM Plan #23401
June 22-24	800	Land Application - NASM Plan #24306
August 31	240	GFL Storage Facility (Smiths) ECA# S-3708-42
September 12-16	320	GFL Storage Facility (Smiths) ECA# S-3708-42
September 21-22	1000	Land Application - NASM Plan #24787
November 2-3	956	Land Application - NASM Plan



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		#23513
Total Volume of Sludge generated in 2022 = 5652 cu.m		
Estimated Sludge generated in 2023 - 6000 cu.m.		

Summary of Effluent Quality Assurance and Control Measures

The City collects samples from Raw Sewage stream, Aeration Tanks, Secondary Clarifiers and Final Effluent on a routine basis throughout the week. The City satisfies its regulatory compliance requirements by submitting a set of samples to an accredited laboratory, SGS Canada Inc. on a weekly basis, normally on Tuesdays. These sample results are manually entered into a spreadsheet and evaluated for compliance with the ECA. In addition to these samples, Operators perform in-house analysis for Total Suspended Solids, pH, temperature, alkalinity, dissolved reactive phosphorus, and Final Effluent Dissolved Oxygen. Sample results are entered into a spreadsheet for facility evaluation and process optimization. On an annual basis, the spectrophotometer is calibrated by a third party. Operators calibrate other instrumentation, such as the bench top pH meter, regularly.

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 2023

Instrument Type

Open Channel

Method of verification

Head Simulation

Units:

LPS

Zero:

0.00

Span:

140.20

Totalizer:

M3

Flow Test

Head Applied	Sim Flow	Meter Display	Current Output	Disp Error%	mA Error %
0.000	0.000	0.000	3.987	0.000	0.325
0.100	15.801	14.410	5.631	0.992	2.968
0.200	45.630	45.910	9.240	0.200	0.353
0.300	84.854	84.680	13.678	0.124	0.043
0.400	131.774	129.940	18.832	1.308	1.085
Average Error%				0.52	0.95
Result:				PASS	PASS

Totalizer Test

Sim Flow Rate	131.774	LPS
Start Totalizer	10131215.000	M3
End Totalizer	10131225.000	M3
Volume Simulated	10.000	M3
Time(Seconds)	76.970	
Calculated Totalizer(MUT)	10.143	
Error%	-1.406	
Result:	PASS	

Comments:

Unit passes verification.
1021mm measured empty distance

Meter Information

Date of Test: 2022-08-10
Location: Frankford WWTP
Meter Under Test: Final Effluent
Client Tag: QW00001959
Manufacturer: Simens
Model: OCMIII
Serial Number: PBD/X8060040XV
Totalizer As Found: 10131205M3
Totalizer As Left: 10131229M3
Acceptable Error: 15%

Programming Parameters:

Max Flow: 140.199LPS
Max Head: .415M
Primary Device: Parshall 9"

Calibration Due:

Aug-23

Tower Electronics Canada Inc.
2687 Hwy 40
K0K 3M0
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 'Notice of Modifications' forms submitted to the Ministry during this Reporting Period.

Summary of complaints received throughout the reporting period

There were no complaints received by City staff regarding the Frankford WWTP throughout the reporting period.