Newcastle Water Pollution Control Plant
2025 Annual Performance Report

The Regional Municipality of Durham
Newcastle Water Pollution Control Plant 2025 Annual Performance Report

Environmental Compliance Approval (ECA): A-500-5222303834 Dated June 13, 2024
Environmental Compliance Approval (Air): 8-3083-93-006 Dated March 22, 1993

The Newcastle Water Pollution Control Plant (WPCP) 2025 Annual Performance Report provides staff, stakeholders and customers a performance overview of the Newcastle WPCP. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment, Conservation and Parks (MECP). This report demonstrates the Regional Municipality of Durham's commitment to ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

Water Pollution Control Plant Process Description
General

The Newcastle WPCP is located in the Municipality of Clarington (Newcastle) and is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECAs noted above. The plant treats wastewater from approximately 13,123 residents in the Newcastle service area. The Newcastle WPCP is designed to treat wastewater at an average flow rate of 4,086 cubic metres per day (m^3/d). The plant is an MECP Class 3 conventional activated sludge treatment plant that utilizes the following processes to treat wastewater:

- Raw influent pumping
- Preliminary treatment
- Primary treatment
- Phosphorus removal
- Secondary treatment
- Disinfection (chlorination/dechlorination)
- Solids management

Raw Influent Pumping

Wastewater collected through approximately 52 kilometres of sanitary sewers in Newcastle is conveyed to the Newcastle WPCP by gravity and the Sunset Sanitary Sewage Pumping Station located in the collection system.

Preliminary Treatment

Screening: One automatic mechanically cleaned screen and one emergency manual screen remove paper products and large material that could harm pumps and process equipment. Screenings removed in this process are transported to landfill.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the aerated grit tank. The velocity of the wastewater rolling in the tanks is controlled by the quantity of air added to produce conditions that allow heavy grit material to settle, while keeping the lighter organic material in suspension to proceed to the next process tank. The grit removed in this process is dewatered and transported to landfill.

Primary Treatment

The primary clarifier utilizes the physical process of sedimentation which allows suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with the excess activated sludge from the secondary treatment process is collected by a sweep arm mechanism which pushes the sludge into a hopper. The sludge is then pumped to the sludge holding tank for transportation to the Courtice Water Pollution Control Plant (WPCP) or the Duffin Creek WPCP. Any material floating on the surface of the clarifier is also removed to the sludge holding tank.

Phosphorus Removal

The phosphorus removal system lowers the total phosphorus level in the final effluent by adding a chemical coagulant, aluminum sulphate (alum), into various locations within the plant. In 2025, alum was dosed post aeration.

Secondary Treatment

Aeration Tanks: The two aeration tanks are each comprised of two distinct sections. The first section is an anoxic zone, where no oxygen is introduced and allows for denitrification. Subsequently, the flow leaves the anoxic zone and enters the aerated zone where fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics, and nutrients.

Secondary Clarifier: The effluent from the aeration tanks is directed to the two secondary clarifiers where the solids settle to the bottom as activated sludge, leaving clear supernatant on top. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tanks and the excess activated sludge is wasted to the primary clarifier.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite is metered into the secondary effluent stream for pathogen control. Adequate contact time is provided by the single chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through a 900 millimetre (mm) diameter outfall extending 130 metres (m) to a 600 mm diameter pipe which extends another 800 m into Lake Ontario.

Solids Management

All sludge produced at the Newcastle Water Pollution Control Plant (WPCP) is stored in a sludge holding tank. The sludge is shipped to the Courtice WPCP or the Duffin Creek WPCP for anaerobic digestion. This year, some sludge went to Harmony Creek WPCP to feed their digester while their primary clarifier was out of service for repairs.

Environmental Compliance Approval (ECA)

Under Condition 11(4) of ECA A-500-5222303834 the Regional Municipality of Durham (the Region) must produce an annual performance report that contains the following information:

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

The raw wastewater flowing into the plant is analyzed for its chemical and physical composition. Monitoring of the raw wastewater is performed in accordance with the conditions in the ECA. Table 2 and Figures 1-5 summarize the raw wastewater characteristics during the reporting period.

b) 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

The Newcastle WPCP effluent was determined to be compliant with the ECA approval limits in Schedules 2, 3 and 4 during the reporting period.
The plant operated at an average of 83% of its annual average daily flow rated capacity.

c) A summary of all operating issues encountered, and corrective actions taken

Blower number (No.) 1 began faulting and not resetting in March 2025. These issues were intermittent. The problem was eventually found to be an electrical failure, the repair parts for which were difficult to source. The inconsistent air supply led to elevated effluent ammonia in August 2025. The blower issue was corrected and the ammonia levels returned to normal.

d) A summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or mechanism forming part of the Works

Major maintenance items in 2025 included:

- Repaired blower No. 1
- Cleaned out the contact chamber on November 20, 2025

e) Summary of any effluent quality assurance or control measures undertaken in the reporting period

In-house laboratory test results are compared to the results of the Regional Environmental Laboratory on comparable samples to determine the in-house accuracy.

Online instrumentation is verified by Water Pollution Control Plant (WPCP) operators using field and/or laboratory (lab) testing equipment.

f) 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

Calibration of the raw influent flow meter was conducted on November 12, 2025.
Calibration of in-house laboratory equipment was conducted on June 17, 2025.

Calibration of the pH meter is conducted regularly.

g) 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

a. 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;

b. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity

The Regional Municipality of Durham continually strives to achieve the best effluent quality and remain below the objectives specified in the Environmental Compliance Approval (ECA):

- The average daily rated flow capacity of 4,086 cubic metres per day (m^3/d) was not exceeded.
- The lower pH objective of greater than 6.5 was exceeded in 11 out of 365 samples (3.01%).
- The average daily flow reached 80 percent of the plant capacity. The WPCP is currently undergoing an expansion which, upon completion, will increase the rated capacity to 7,200 m3/d. The expected completion date is April of 2027.

Best efforts will continue to be applied to maintain results below the objectives.

h) 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

The volume of sludge removed from Newcastle Water Pollution Control Plant (WPCP) in 2025 was 10,968 cubic metres (m^3). Tables 5 and 7 summarize sludge quality and disposal during the reporting period.

Even with the increase in population on a year-to year basis, no significant changes to flows or processing are anticipated. Therefore, no significant changes in sludge generation are expected for the next year.

The sludge produced at this facility was transferred to Duffin Creek WPCP for incineration or Harmony WPCP for anaerobic digestion.

Receiving facilities included:
Duffin Creek WPCP – 10,328 m^3 or 94.2%
Harmony WPCP – 640 m^3 or 5.8%

i) Summary of any complaints received during the reporting period and any steps taken to address the complaints

All complaints received from the public are administered and tracked through a central database. No complaints were received in 2025.

j) 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

The Ministry of the Environment, Conservation and Parks (MECP) approved a bypass of the chlorine contact chamber that was conducted on November 20, 2025 for cleaning. The MECP York Durham District Office supervisor was notified at the completion of the bypass.

k) Summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modification

No notice of modifications were submitted in 2025.

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

Industrial Wastes

The Regional Municipality of Durham's Sewer Use By-Law (55-2013) outlines concentration limits for discharge into land drainage works or the sanitary sewer system. Violations of the by-law can result in fines of up to $100,000 for personal or corporate offences. The Regional Municipality of Durham may establish a Compliance Program that will permit an industrial user to discharge non-complying sewage upon such terms and conditions deemed appropriate by the Regional Municipality of Durham's Commissioner of Works. The compliance program allows industries not to be prosecuted for violating the concentration limits outlined in the by-law. The compliance program outlines the length of time necessary to plan, design, construct or install facilities to eliminate the non-compliance. A Sewage Surcharge Agreement is an agreement between the Regional Municipality of Durham (the Region) and a company, that permits the discharge of overstrength sewage to the Region's sanitary sewer collection system. Companies are billed for the overstrength sewage to pay for the additional cost of treatment and collection. The eligible parameters for a sewage Surcharge Agreement are Biochemical Oxygen Demand, Total Suspended Solids, Total Phosphorus, Total Kjeldahl Nitrogen, Animal/Vegetable Oil & Grease, and Sulphates. Sewer use by-law office staff

routinely monitor and sample the wastewater collection system to ensure compliance with the by-law.

m) 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

Contract Number	Project Description	Original Projected Completion Date	Updated Projection Completion Date
D2025-58	Newcastle WPCP Capacity Re-Rating Upgrades	June 1, 2023	May, 2027

n) A summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year

There were no deviations from the monitoring schedule in 2025.

The following table demonstrates the 2026 sample schedule with the following definitions:

- SIM1 – Carbonaceous biochemical oxygen demand (CBOD5), suspended solids
- SIM2 – Biochemical oxygen demand (BOD5), suspended solids, Total Kjeldahl Nitrogen (TKN), Total Phosphorous (TP)
- SIM3M - BOD5, suspended solids, TKN, TP, Total Ammonia Nitrogen (TAN), Nitrite (NO2), Nitrite + Nitrate (NO2+NO3), dissolved phosphorous, Aluminum (Al), Arsenic (As), Cadmium (Cd), Cobalt (Co), Chromium (Cr), Copper (Cu), Iron (Fe), Manganese (Mn), Molybdenum (Mo), Nickel (Ni), Lead (Pb), Antimony (Sb), Selenium (Se), Zinc (Zn)
- SIM3C - CBOD5, suspended solids, TKN, TP, TAN, NO2, NO2+NO3, dissolved phosphorous
- SIM3MC - CBOD5, suspended solids, TKN, TP, TAN, NO2, NO2+NO3, dissolved phosphorous, Al, As, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Se, Zn
- SLU2 - Total solids, ashed total solids, volatile total solids, TKN, TP, TAN, NO2+NO3, Mercury (Hg), As, Cd, Co, Cr, Cu, Potassium (K), Mo, Ni, Pb, Se, Zn
- MFECS – E.coli
- MFEC-WW – E.coli

Sample Location	Monday	Wednesday
Raw	SIM3M (Monthly) SIM2	SIM2
Primary Effluent	SIM1 (Monthly)	Not Applicable (N/A)
Return Activated Sludge	SLU2 (Bi-weekly) MFECS (Bi-weekly)	N/A

Final Effluent Contact Chamber	SIM3C SIM3MC MFEC-WW	SIM3C MFEC-WW

MECP Inspection

This plant was last inspected by the MECP on November 16, 2017.

Table 1 Raw Influent Flows

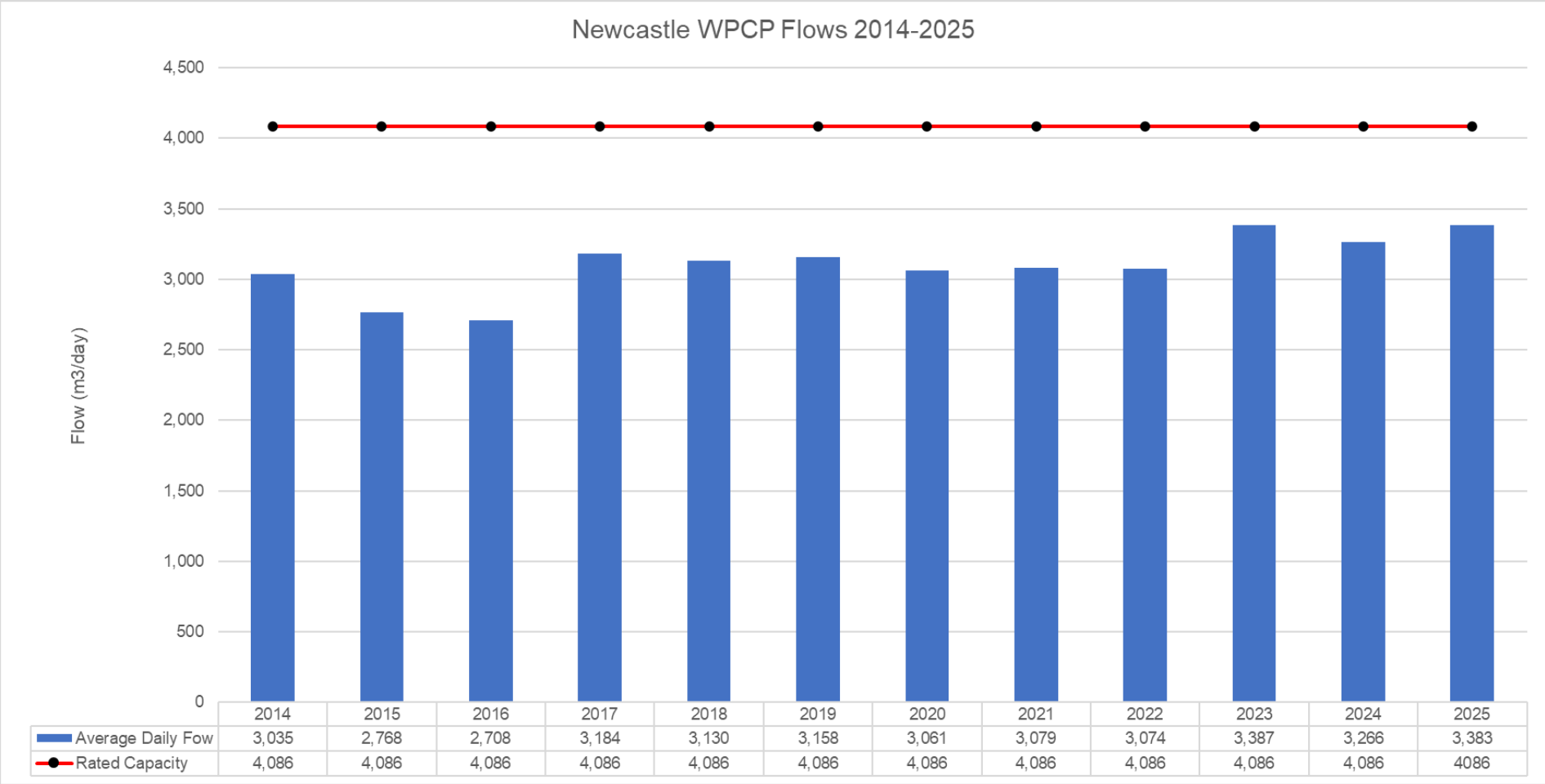
Month	Total Flow to Plant* - cubic metre	Average Day Flow cubic metre per day (m^3/d)	Maximum Day Flow m^3/d
January	96,893	3,126	4,181
February	77,307	2,761	3,067
March	145,450	4,692	8,776
April	134,310	4,477	12,141
May	144,009	4,645	11,018
June	103,223	3,441	4,594
July	89,413	2,884	3,194
August	83,883	2,706	3,181
September	81,935	2,731	3,240
October	85,982	2,774	3,278
November	87,410	2,914	3,734
December	104,867	3,383	6,664
Total	1,234,682		
Average	102,890	3,383**	
Minimum	77,307		
Maximum	145,450		12,141
ECA Limit		4,086	
Met Compliance		Yes	

*Metered at the raw influent

**Annual Average Daily Flow

Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids avg. conc. mg/L	Total Phosphorus avg. conc. mg/L	Total Kjeldahl Nitrogen avg. conc. mg/L
January	350	305	9.1	43.98
February	336	320	10.0	53.83
March	219	178	5.7	36.48
April	380	238	7.6	44.58
May	294	279	11.4	50.96
June	323	367	11.0	53.64
July	241	484	15.4	65.49
August	235	394	10.1	56.86
September	207	250	8.3	55.69
October	202	282	8.3	53.14
November	208	262	6.8	46.40
December	235	395	11.2	54.10
Average	269	313	9.6	51.26
Minimum	202	178	5.7	36.48
Maximum	380	484	15.4	65.49



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Average Daily Fow	3,035	2,768	2,708	3,184	3,130	3,158	3,061	3,079	3,074	3,387	3,266	3,383
Rated Capacity	4,086	4,086	4,086	4,086	4,086	4,086	4,086	4,086	4,086	4,086	4,086	4086

Figure 1 - Annual Average Flow 2014 - 2025

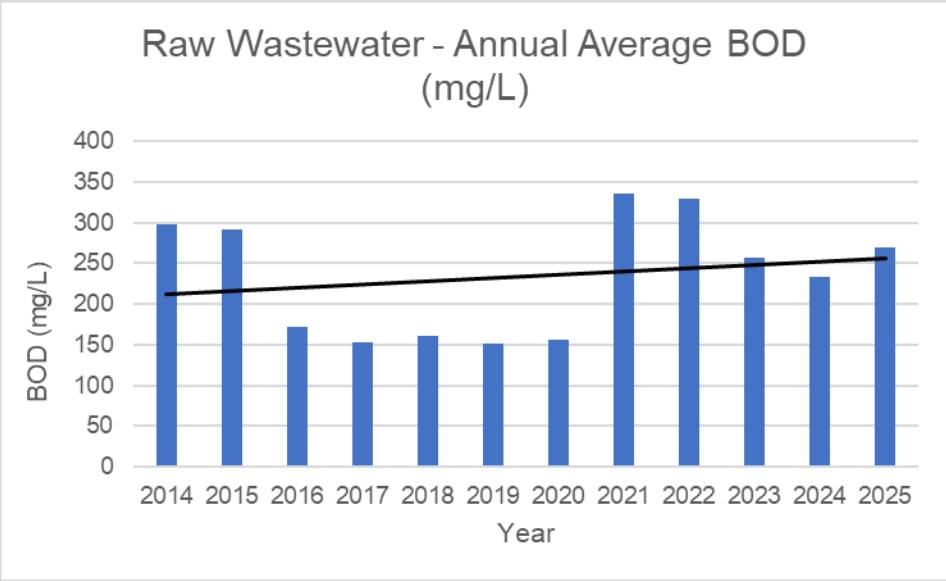


Figure 2 - Raw Influent - Annual Average Biochemical Oxygen Demand (BOD)

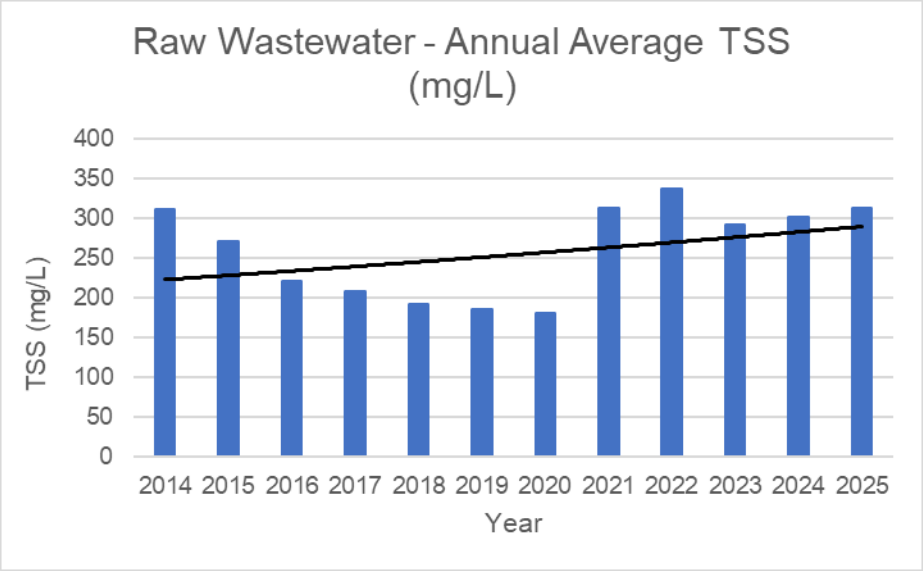


Figure 3 – Raw Influent – Annual Average Total Suspended Solids (TSS)

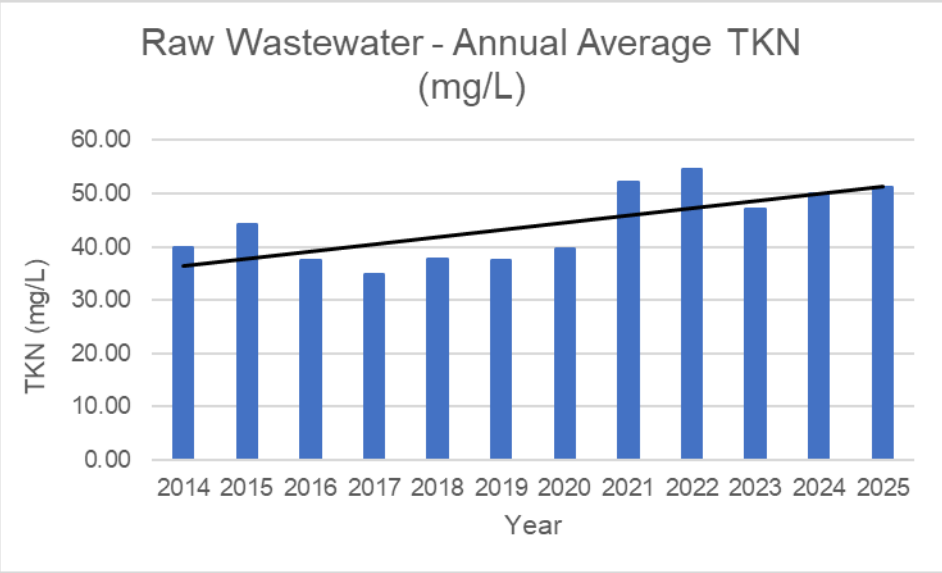


Figure 2 - Raw Influent - Annual Average Total Kjeldahl Nitrogen (TKN)

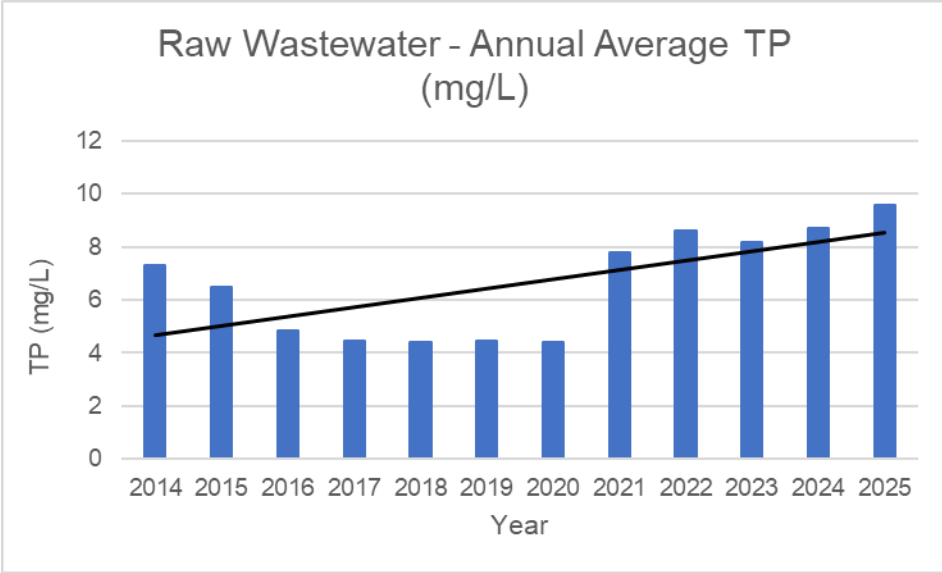


Figure 3 - Raw Influent - Annual Average Total Phosphorous (TP)

Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand (CBOD5) average (avg.) concentration (conc.) milligrams per litre (mg/L)	Total Suspended Solids (TSS) avg. conc. mg/L
January	2.8	6.5
February	2.7	6.3
March	2.7	7.2
April	1.5	5.1
May	1.7	3.5
June	2.0	3.6
July	3.0	5.3
August	1.4	3.3
September	1.2	2.2
October	1.6	3.0
November	1.7	3.7
December	2.5	7.7
Average	2.1	4.8
Minimum	1.2	2.2
Maximum	3.0	7.7
ECA Limit	25.0*	25.0*
ECA Objective	15.0	15.0
Annual Conc.	2.09	4.86
Annual Loading	7.07	16.42
Within Compliance	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes

*Annual Average Concentration

Table 3 Final Effluent Analyses Continued

Month	Total Phosphorus (TP) average (avg.) concentration (conc.) mg/L milligrams per litre (mg/L)	Total Ammonia Nitrogen (TAN) avg. conc. mg/L summer	TAN avg. conc. mg/L winter	Total Kjeldahl Nitrogen avg. conc. milligram per litre mg/L
January	0.46		0.75	1.79
February	0.27		8.77	10.13
March	0.28		4.05	5.06
April	0.31		0.93	1.83
May	0.60	0.70		1.78
June	0.53	3.33		4.14
July	0.26	9.52		9.78
August	0.18	19.00		20.99
September	0.18	1.60		2.45
October	0.21	2.24		3.25
November	0.30		1.10	2.24
December	0.32		4.23	5.64
Average	0.33	6.06	4.45	5.76
Minimum	0.18	0.70	0.75	1.78
Maximum	0.62	19.00	8.77	20.99
ECA Limit (seasonal average)		15	20	
ECA Objective	1.0	10	15	
Within Compliance		Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes

Table 3 Final Effluent Analyses continued

Month	Total Chlorine Residual maximum concentration (conc.) mg/L	Nitrate plus Nitrite average (avg.) conc. mg/L	pH minimum	pH maximum	Temperature Degree Celsius avg.
January	Non-Detect (ND)	15.5	6.6	7.2	12.0
February	ND	13.2	6.4	7.3	11.4
March	ND	9.5	6.8	8.1	11.8
April	ND	12.6	6.5	8.0	12.7
May	ND	13.2	6.6	7.1	15.3
June	ND	12.3	6.4	7.0	17.1
July	ND	12.6	6.4	6.8	19.1
August	ND	10.6	6.0	6.9	20.2
September	ND	19.8	6.4	7.1	19.7
October	ND	18.0	6.4	6.9	18.4
November	ND	17.8	6.4	6.9	15.5
December	ND	17.5	6.4	7.3	13.5
Average	ND	14.4			15.6
Minimum	ND	9.5	6.0		11.4
Maximum	ND	19.8		8.1	20.2
ECA Limit	0.02		6.0	9.5	
ECA Objective	ND*		6.5	8.5	
Within Compliance	Yes		Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes

Non-

*Non-detect is any value less than 0.02 mg/L.

Table 4 Summary of *Escherichia coli* Sampling

Month	Escherichia coli Number of Samples	Escherichia coli Monthly Geometric Mean Density
January	9	8
February	8	10
March	12	5
April	9	16
May	9	16
June	9	13
July	9	31
August	8	12
September	9	7
October	9	2
November	8	2
December	10	4
ECA Limit		200
ECA Objective		200
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 5 Sludge Quality and Disposal

Month	Total Volume Removed cubic metre (m^3)	Total Volume Hauled to Duffin Creek WPCP (m3)	Total Volume Hauled to Harmony WPCP (m^3)
January	952	352	600
February	828	788	40
March	960	960	0
April	908	908	0
May	924	924	0
June	924	924	0
July	968	968	0
August	880	880	0
September	872	872	0
October	968	968	0
November	836	836	0
December	948	948	0
Total	10,968	10,328	640
Average	914	861	53

Table 6 Energy and Chemical Usage

Month	Total Plant Flow cubic metre	Aluminum Sulphate litres	Sodium Hypochlorite kilograms as chlorine	Sodium Bisulphite litres	Hydro kilowatt hour	Natural Gas cubic metre
January	96,893	7,032	798.9	1,605	94,052	22,071
February	77,307	7,676	601.8	3,958	104,189	18,190
March	145,450	8,227	849.3	2,871	87,228	6,859
April	134,310	8,676	705.2	2,160	89,015	10,383
May	144,009	7,492	814.5	2,061	83,689	10,628
June	103,223	7,522	484.1	1,329	80,892	276
July	89,413	8,466	545.5	1,340	73,693	296
August	83,883	8,068	824.5	1,393	88,353	299
September	81,935	7,809	772.3	1,516	82,993	293
October	85,982	7,738	794.4	1,317	95,996	11,517
November	87,410	7,971	550.8	1,386	93,015	14,580
December	104,867	8,930	628.5	1,653	114,940	18,776
Total	1,234,682	95,607	8,370	22,588	1,088,055	114,168

Table 7 Sludge Analysis

Parameter	Quarter 1 Concentration milligrams/litre (mg/L)	Quarter 1 Concentration milligrams/litre (mg/L)	Quarter 3 Concentration milligrams/litre (mg/L)	Quarter 4 Concentration milligrams/litre (mg/L)
Ammonia (total, as N)	244	331	228	205
Arsenic (total)	0.061	0.095	0.067	0.031
Cadmium (total)	0.015	0.015	0.015	0.011
Chromium (total)	0.261	0.319	0.156	0.166
Cobalt (total)	0.25	0.25	0.25	0.135
Copper (total)	7.30	7.42	8.26	5.46
Lead (total)	0.374	0.360	0.450	0.161
Mercury (total)*	3.8	2.525	3.100	2.292
Molybdenum (total)	0.25	0.25	0.25	0.149
Nickel (total)	0.173	0.203	0.152	0.105
Nitrate (total)	0.46	0.513	0.4	0.4
Phosphorous (total)	689	908	441	565
Potassium (total)	91.2	87.3	84.1	76.3
Selenium (total)	0.095	0.128	0.075	0.051
Total Solids	38605	44483	23734	27870
Zinc (total)	16.17	19.3	12.47	7.83

*ug/L