

2025 City of Kelowna Wastewater Treatment Annual Report



Prepared for: BC Ministry of Environment and City of Kelowna

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Executive Summary

The Kelowna Wastewater Treatment Facility (WWTF) is a Level IV Environmental Operators Certification program (EOCP) designated treatment facility - owned and operated by the City of Kelowna (COK). The facility, first constructed in 1913, services approximately 170,000 residents and is located at 951 Raymer Ave., Kelowna BC. It currently utilizes modified Bardenpho technology to biologically reduce and remove nutrients from the sewage stream and has a rated capacity of 70,000 m³/day (70 MLD). The treatment facility discharges into Lake Okanagan and is operated under Certificate Approval 12211 in accordance with BC Environmental Management Act.

The total influent flow to the plant in 2025 was 14,190,160 m³ (14,190 ML) or an average of 38,877 m³/day (38.9 MLD), which represents a 3% increase relative to 2024. The equivalent daily rate of discharge was below the allowable effluent discharge listed in the operational certificate of 42,747 m³/day (42.7 MLD), which is used to calculate the permit fee.

Effluent water quality in 2025 was monitored and measured against the standards specified in the plant's Operational Certificate of Approval. Wastewater treatment produced the following effluent results:

	Operational Certificate Limit	2025 Treated Effluent
Total Suspended Solids (TSS) - Monthly Maximum	≤ 10 mg/L	All monthly results < 10 mg/L
Biochemical Oxygen Demand (BOD) - Monthly Maximum	≤ 10 mg/L	All monthly results < 10 mg/L
Total Phosphorus (TP) - Annual Average	≤ 0.25 mg/L	Annual Average 0.27 mg/L
Total Phosphorus (TP) - Daily Max. Concentration	≤ 2.0 mg/L	All daily max. < 2 mg/L
Total Nitrogen (TN) - Annual Average	≤ 6.0 mg/L	Annual Average 5.01 mg/L
Total Nitrogen (TN) - Daily Max. Concentration	< 10.0 mg/L	All daily max. < 10 mg/L
Fecal Coliforms – Monthly Max. Geometric Mean	≤ 50 CFU/100ml	All monthly results < 50 CFU/100ml

Table 1. Effluent quality standards relative to permit

Analytical results for grab samples and 24-hour composite results are reported to the Ministry of Environment monthly and assessed for compliance and trending purposes. Monitored parameters include:

- Total Phosphorus (TP)
- Ortho-Phosphorus (OP₄)
- Total Nitrogen (TN) and Organic Nitrogen (ON)
- Total Kjeldahl Nitrogen (TKN)
- Nitrite (NO₂) and Nitrate (NO₃)
- Ammonia (NH₃)
- Chemical Oxygen Demand (COD)
- Biochemical Oxygen Demand (BOD)
- Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS)
- pH
- Total, Fecal Coliform and E.coli.

The wasted activated sludge produced at the WWTF was removed from the facility and utilized at the Commonage composting facility in the production of Ogogrow. A total of 21,401 metric tons of activated sludge was removed in 2025, which represents a 2.2% increase from the previous year.

Introduction

As required by the *Ministry of Environment – Operational Certificate 12211*, the COK provides the following annual report in accordance with our conditions on permit.

This report provides an overview of our service area, processing volumes, disinfection procedures, maintenance of works, staff certification program, sampling and analytical testing procedures, authorized discharges, emergency procedures, and collaborative lake monitoring as part of the Ministry Memorandum of Understanding (MOU).

The City of Kelowna’s WWTF primary focus is to ensure that sanitary services are held to high standards, meets all permitting requirements and to ensure that our natural water resources are protected. For further details on the content of this report or to request additional information, please contact the City of Kelowna at 250-469-8502 or email ask@kelowna.ca.

Wastewater System Overview



Initially constructed on the city outskirts in 1913 to service a population of 10,000, the treatment plant has continually been upgraded and expanded to meet the needs of the community. The treatment facility underwent a significant, pioneering wastewater treatment conversion in 1982 to a Bardenpho process – a chemical free, biological nutrient removal process.



In 2011, the City completed a large infrastructure project to increase the capacity to treat water from 40,000 to 70,000 m³/day, which should accommodate the City’s sewer servicing needs beyond 2030 ([Appendix A](#)).

Treatment Process

On average, it takes 18-20 hours for sanitary sewage to pass through the complete treatment stages from initial screening through to final discharge. Each of the treatment steps are designed to be exclusively independent from the use of chemicals and to effectively reduce the nutrient and biological loading into receiving waters.



Preliminary Treatment

Raw wastewater that enters the treatment facility is initially screened through a climbing bar screen and passed through a vortex grit removal system and the resulting grit and debris is collected, washed, dewatered, and transported to the landfill for disposal.



Primary Treatment

Primary clarifiers are designed to separate larger organic solids from the waste stream by gravity sedimentation. Sludge is removed from the bottom of the tanks by scrapers and pumped to Fermenter tanks. During peak flows, a steady flow is maintained by diverting excess flow into equalization basins.



Advanced Nutrient Removal

The Biological Nutrient Removal (BNR) system is a modified Bardenpho design consisting of various size bioreactors and cells that consist of three zones: anoxic, anaerobic, and aerobic which reduce ammonia and nitrate to nitrogen gas. Fermenter effluent, rich in Volatile Fatty Acids (VFA's) aids in phosphorus removal, flows into the beginning of each reactor along with the internal recycle. Each liter that enters the reactor is recycled 4 to 6 times and eventually wasted at a rate of 2,000 m³/day to the Dissolved Air Flootation (DAF).



Secondary Treatment

The effluent from the bioreactor then proceeds to the secondary clarifiers where the remaining larger solids settle to the bottom of the tank. The clarifiers are fitted with a return system where all the settled solids return to the bioreactor to feed the incoming flow with bacteria while the effluent proceeds to the final tertiary treatment process.



Tertiary Treatment

Effluent is processed through a series of 10-micron disk filters to reduce remaining suspended material to below discharge limits. Filtration is followed by bacterial inactivation by effluent exposure to low pressure, medium intensity UV treatment system prior to final discharge.



Sludge Conditioning and Composting

Sludge from the primary clarifiers is thickened in fermenters and the resulting waste activated sludge from the bioreactor is further thickened in the four DAF units. The thickened sludge is then pumped separately to the dewatering building where they are blended with polymer and centrifuged into a ~15-20 % solids cake. The resulting cake is trucked to the biosolids composting site where it is mixed with wood waste and composted to create Class A soil conditioner called Ogogrow and sold to businesses, agricultural farmers, and public from the commonage and landfill sites.



Sewage Conveyance Collection System

More than 600 km of gravity sewer mains collect and convey sewage to 44 pump stations throughout Kelowna where wastewater is directed through a series of gravity and force mains to the WWTF for treatment. The Utility has an on-going asset management program designed to replace and repair damaged and leaking pipes in the sewer system - both proactively and on demand in the collection system as well as within the treatment facility. The City uses an internationally accepted condition rating system to evaluate the condition of existing pipes, facilitated using a CCTV video imaging system which, in conjunction with age considerations, establishes a replacement schedule.



Source Control

Under the authority of the Sanitary Sewer/Storm Drain Regulation Bylaw 6618-90 and the Sewerage System User Bylaw 3480, the City sets out the requirements for wastewater discharge monitoring, permitting, and enforcement. To minimize excessive nutrient and chemical loading from entering the treatment process, the city has a dedicated Source Control Technician who oversees a monitoring program that samples known high strength industrial and commercial business discharges. The measured concentrations are compared to bylaw discharge limits and offending industries are both educated on reduction options as well as surcharged relative to the volume of over-permitted high strength flow discharged.

2025 Discharge Permit Compliance Monitoring:

- 13 temporary discharge permits issued.
- 8 active continuous discharge permits maintained.
 - Monitoring done semi-annually to ensure compliance with permit limits and confirm the effectiveness and efficiency of required treatment works and waste reduction measures.
 - 60 permit compliance monitoring events

Key Manhole Sampling

- System wide monitoring program to measure and track wastewater strength; measure the concentration and loading of regulated parameters; measure the concentration of toxic substances; monitor pH and H₂S.
- Three consecutive 24-hour composite samples collected bi-annually from nine sampling sites:

Sewer Data Logging

The city expanded the use of remote, cellular based sensors for sewer monitoring of flows, rain gauges and H₂S in 2025. These include:

- Eight Hydrogen Sulfide sensors to detect elevated sewer gas and nuisance odors.
- Five flow sensors to determine sewer flow and pipe capacity.
- Three rain gauges determine the contribution of storm water to sewer flow.



These provided instant, up to date information on sewer conditions and play a vital role in staff safety and a reduction in GHG emissions by reducing the number of vehicle trips required.

FOG Management

The Source Control program has a similar mandate to monitor and enforce restrictions on the discharge of Fats, Oils, and Grease (FOG) into the drainage systems. This primarily includes the inspection of Food Service Establishments (FSE) for use and maintenance records on mandatory Grease Trap devices as per bylaw stipulation. FOG enforcement focused on the Food Service Establishments (FSEs) sector to ensure proper management of Fats, Oil, and Grease (FOG). Best Management Practice (BMP) document was provided to assist FSEs in complying with FOG control requirements.



FOG Public Education

The 'FOG cup' initiative continued in 2025 using both FOG and Fire department logo:

- Educational boots set-up at the University of British Columbia, City Hall, Downtown Library, various apartment buildings, and Okanagan College..
- Social marketing campaigns through social media, mail-outs, PSAs, focusing on educating the public on issues of improper disposal of FOG, hazardous waste, 'flushable' wipes.



Vehicle Wash Operations

Vehicle wash operations were inspected, and samples collected to assess for TSS, BOD, COD, FOG, Phenolics, pH, and Metals. Actions conducted through 2025 included:

- Best Management Practice (BMP) document was provided to assist in complying with Bylaw requirements
- Twelve vehicle wash operations inspected
- Requirement to keep Oil and Grease separator maintenance log
- Signage was provided for operations with self-serve wash bays in hope to deter illegal dumping



Storm-Sanitary Interconnects

Wastewater Operations is responsible for infrastructure repair and replacement and follow-up on reports of possible storm to sanitary interconnection and infiltration issues in conjunction with the City storm drainage technician. Interconnects are typically noted by the presence of sewage material in the storm collection system during routine cleaning. Investigation may involve the use of CCTV footage, smoke tests, dye tests, and sample analysis to detect the presence of high bacteria counts related to sewage.

Two interconnects were diagnosed by City staff and repairs made by owners in 2025.

Operations

Water Quality and Treatment Performance

Wastewater quality and flow are monitored through a series of in-line sensors, composite samplers, and grab samples taken by operators and laboratory staff. Most of the sample analysis is conducted in the dedicated laboratory facility on site. Total Phosphorus, Total Nitrogen, and Metals analysis is sublet to a third-party accredited laboratory as per permit requirements.

Kelowna Wastewater Treatment Facility - ME #12211 - 2025																			
Date	Influent Flow		Final Effluent 24-Hour Composite														Effluent Grab		
	Total	Avg	Ortho P			Total P			NO3	NH3	TKN	Org N	Total N	BOD	Solids	COD	pH		Faecal Bacteria
			Avg	Total	Avg	Total	min	max											
																	mg/L	kg/day	
Jan	1132	36.53	0.05	1.83	57	0.20	7.18	223	4.17	0.25	1.89	1.64	5.66	1.9	1.5	35.6	6.65	6.86	<1.0
Feb	1022	36.49	0.01	0.36	10	0.22	8.04	233	3.45	0.45	2.16	1.71	5.44	2.9	3.5	38.5	6.72	6.87	1.0
Mar	1208	38.97	0.08	3.12	97	0.25	9.62	298	3.33	0.30	1.89	1.59	4.86	2.7	2.1	37.4	6.79	6.95	<1.0
Apr	1216	40.55	0.10	4.06	122	0.24	9.80	294	3.74	0.26	1.75	1.49	5.12	2.1	2.0	35.0	6.84	7.02	<1.0
May	1230	39.68	0.14	5.56	172	0.27	10.61	329	3.30	0.15	1.63	1.48	4.69	2.1	1.6	36.2	6.89	7.04	<1.0
Jun	1213	40.42	0.26	10.51	315	0.39	15.93	478	3.43	0.18	1.70	1.52	4.73	2.0	2.0	36.9	6.94	7.08	1.0
Jul	1252	40.40	0.20	8.08	250	0.32	12.70	394	4.16	0.14	1.64	1.50	4.44	1.6	1.2	35.3	6.98	7.16	<1.0
Aug	1231	39.70	0.15	5.96	185	0.26	10.46	324	3.21	0.12	1.57	1.45	4.05	2.3	1.1	36.1	6.99	7.21	<1.0
Sep	1185	39.49	0.21	8.29	249	0.32	12.69	381	4.19	0.18	1.69	1.51	5.18	2.0	1.3	37.5	6.51	6.69	<1.0
Oct	1222	39.43	0.14	5.52	171	0.21	14.70	456	5.28	0.21	1.75	1.54	5.66	1.6	1.2	36.7	6.52	6.68	<1.0
Nov	1124	37.45	0.06	2.25	67	0.16	6.12	184	4.13	0.40	1.82	1.42	5.43	2.5	1.6	37.0	6.53	6.69	1.0
Dec	1155	37.27	0.07	2.61	81	0.18	6.76	210	3.36	0.45	1.97	1.52	4.93	2.8	2.0	37.4	6.59	6.75	<1.0
2025	14,190	38.88	0.12	4.84	1776	0.27	10.30	3803	3.81	0.26	1.79	1.53	5.01	2.2	1.7	36.6	6.75	6.92	1.0

Table 2. Summary of monthly flow and Effluent water quality

Influent Quantity and Quality

The WWTF treats wastewater converging from three primary wastewater collection networks throughout the city that include the Gyro trunk, Northeast trunk and Ethel Street trunk. An average of 38,877 m³/day (38.9 MLD) of influent was received daily in 2025.

Flows coming into the treatment plant have increased over the past 2 years and proportional to the population growth of the service area (Figure 1). An additional 113,000 m³ (113 ML) of treated effluent from District of Lake Country were directed into the Kelowna sanitary service in 2025 to alleviate capacity strain from their treatment plant, which represents an increase of 0.8% of the total flow received by the Kelowna WWTF.

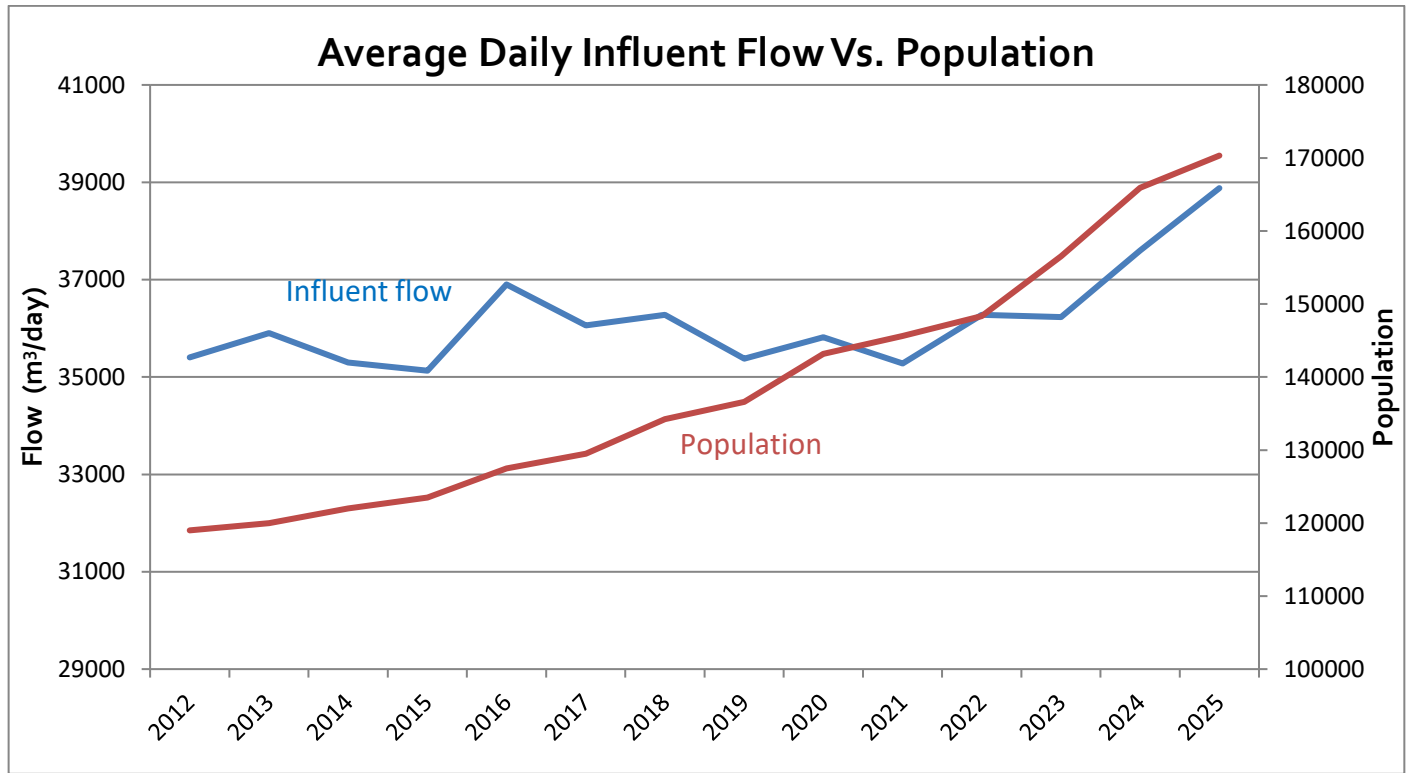


Figure 1. Influent flow relative to population

The nutrient and physical properties of the influent are monitored throughout the month to ensure that the biological removal process is balanced with loading demand. A summary of the 2025 monthly averages is listed in Table 3 with supporting data.

Raw Influent Monthly Averages - 2025								
Date	Raw Influent Grab			Raw Influent Composite				
	pH		NO3	NH3	Total N	Ortho P	Total P	BOD
	min	max	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Jan	7.07	8.09	2.35	40.6	55.6	3.89	6.88	464
Feb	6.96	8.07	3.03	45.6	56.4	4.11	6.86	405
Mar	6.45	7.85	2.71	43.6	56.9	4.20	6.58	211
Apr	6.72	7.80	1.80	38.2	46.4	3.42	5.26	239
May	6.93	8.06	1.48	38.2	52.5	3.35	6.40	93
Jun	7.25	8.26	0.99	39.8	53.8	3.72	6.52	169
Jul	7.21	8.04	1.79	42.2	59.6	3.81	7.69	248
Aug	7.17	8.00	3.50	38.4	48.4	3.66	6.36	307
Sep	7.10	8.20	0.33	39.4	48.0	3.79	5.65	159
Oct	7.22	8.21	1.14	42.3	51.2	3.83	6.03	137
Nov	7.34	8.30	0.57	43.6	48.8	3.12	5.62	191
Dec	7.46	8.33	1.12	45.9	56.2	4.17	6.84	599
2025 Avg.	7.07	8.10	1.73	41.5	52.8	3.76	6.39	267

Table 3 – Monthly average Influent water quality concentrations

Effluent Quality and Nutrient Removal

The final effluent is treated to meet condition 1.1.2 (Table 1) of the operating permit that stipulates maximum discharge concentrations for Total Phosphorus, Total Nitrogen, Suspended Solids, BOD, and Fecal Coliform. In addition to the operational conditions, the plant must also meet all the Federal Government Wastewater System Effluent Regulation (WSER) monitoring and reporting requirements.

Total Phosphorus

Managing Phosphorus discharge from municipal and industrial wastewater treatment is a key factor in preventing eutrophication of surface waters (excessive algae growth and oxygen depletion). Its presence in higher concentrations may cause a variety of water quality problems including increased purification costs, affecting growth of microorganisms and algae on drinking water (Microcystin).

Municipal wastewater influent typically contains between 5 to 20 mg/L of Total Phosphorus (TP), of which 1-5 mg/L is organic and the remainder inorganic. Orthophosphate, a subset of TP, is the main phosphorus chemical form measured, which is in direct proportion to the total phosphorus concentration. The daily composite discharge of TP peaked at 1.28 mg/L and a low value of 0.11 mg/L (Figure 2) with the day-to-day variability in concentrations higher than historical. The yearly average TP concentration was 0.27 mg/L, above the annual average permit level set at 0.25 mg/L (Figure 3). The annual average TP concentrations have been noted to be generally increasing over the past 20 years.

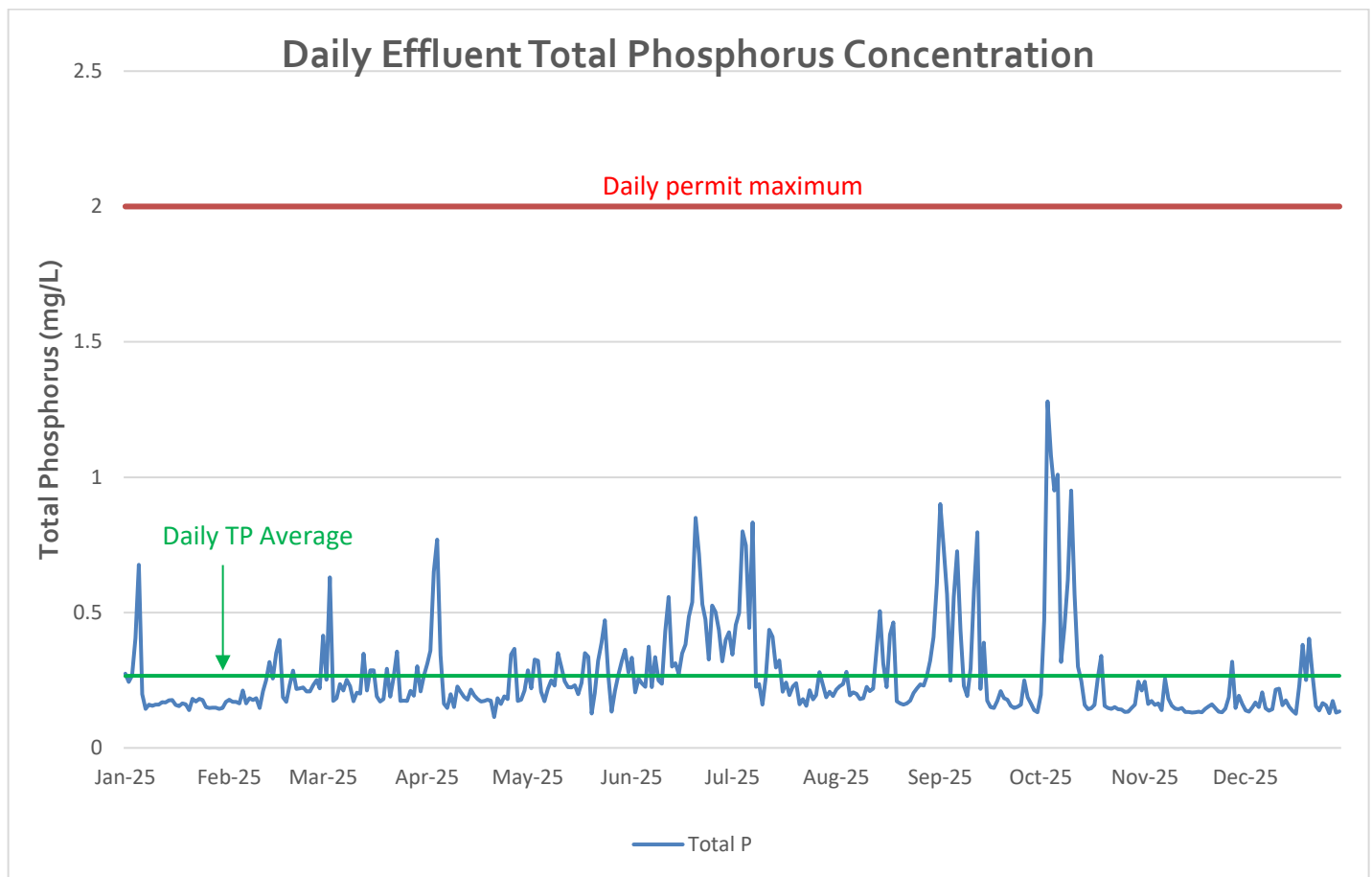


Figure 2. Daily Total Phosphorus concentration relative to permit levels

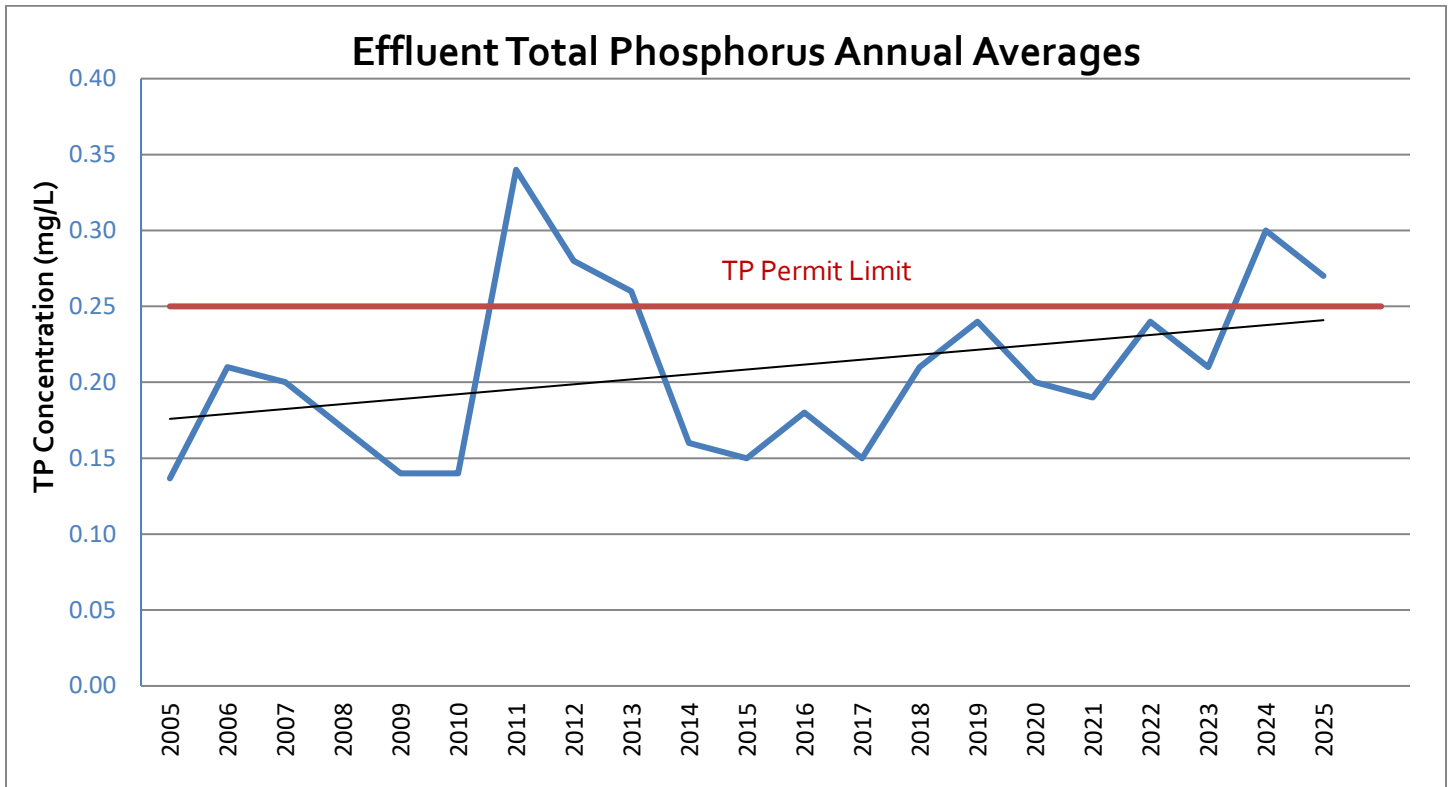


Figure 3. Total Phosphate annual average concentrations

The efficiency of the BNR process to remove Total Phosphorus from the waste stream averaged 95.7% in 2025 and a decrease from the previous two years (Figure 4).

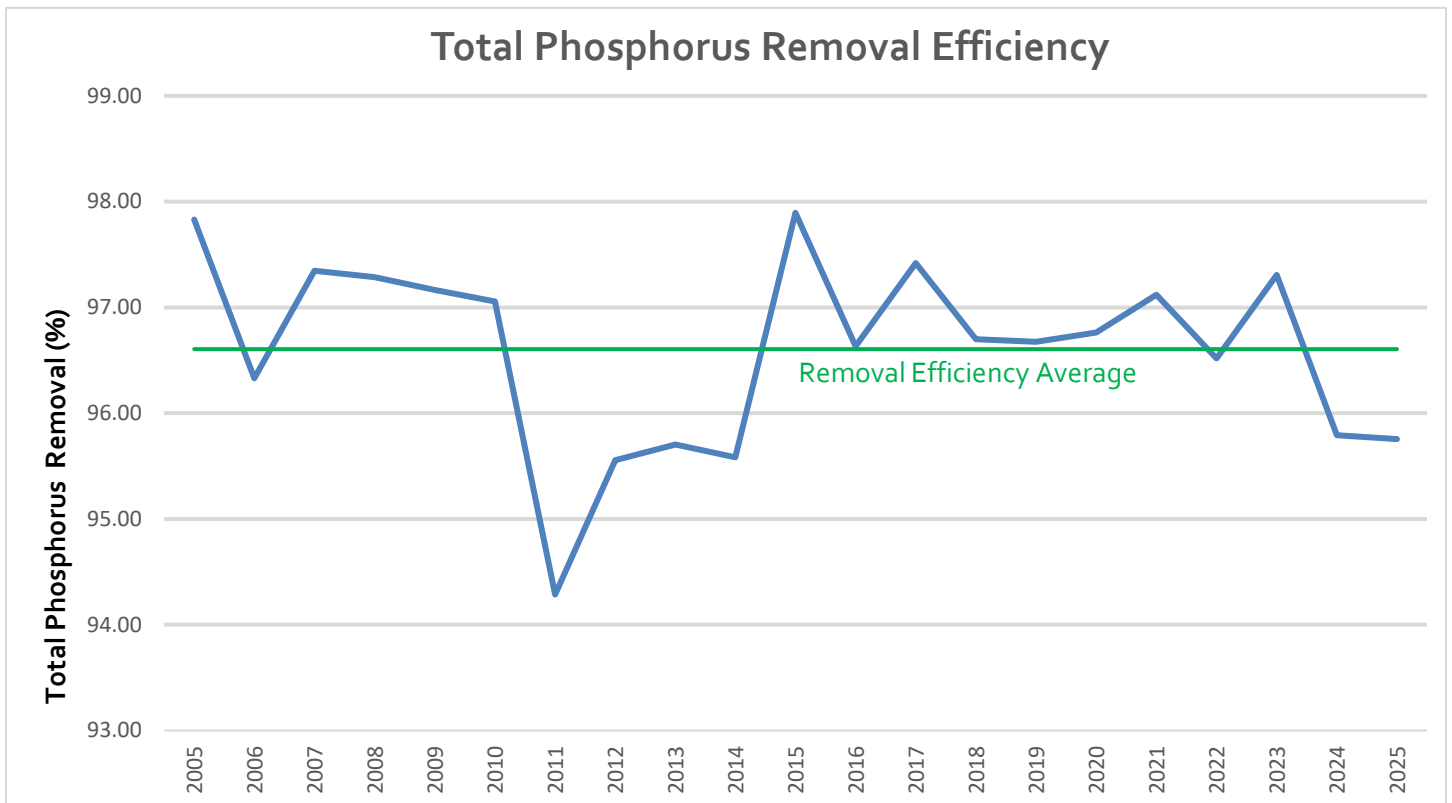


Figure 4. BNR Total Phosphorus removal efficiency from Influent

Total Nitrogen

Excessive Nitrogen release into waterways can have eutrophication effects similar to Phosphorus as well as having direct impacts to human health. The Canadian Drinking Water Quality guidelines have stipulated upper concentration limits for both Nitrite and Nitrate in drinking water sources. Considering that the effluent discharge to a drinking water source (Okanagan Lake), limiting the contribution of nitrogen loading discharged to this source is of utmost importance to the treatment process.

The BNR process consists of an aerobic nitrification process that converts Ammonium (NH_4) to Nitrite (NO_2) and subsequent Nitrate (NO_3). This process is followed by an anoxic denitrification process that takes the Nitrate Nitrogen form and converts it to Nitrogen gas (N_2) and Oxygen (O_2) that is released into the atmosphere. Each of these steps are facilitated by use of specific bacteria that are cycled and maintained in the biological process.

The TN concentration in the effluent is a calculated addition of the various nitrogen forms in the Nitrogen cycle and reported relative to a daily and annual average maximum concentration. The TN daily concentration, measured from composite samples, had no exceedances over 10 mg/L and the annual average was below the permit of 6.0 mg/L (Figure 5). TN removal appeared to be more seasonally consistent between spring and fall.

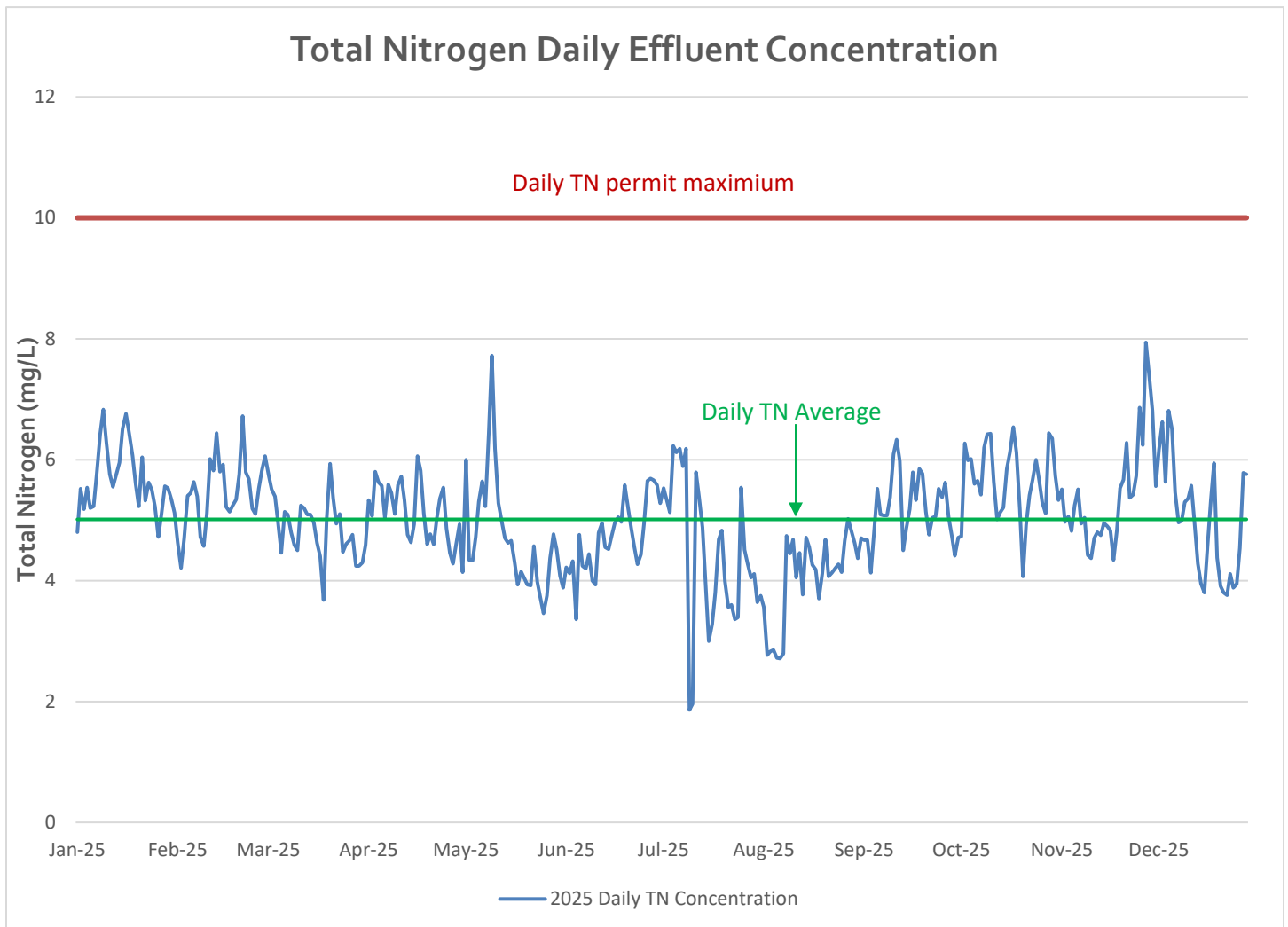


Figure 5. Average daily Total Nitrogen concentration in discharge

The average daily TN concentration discharged was 5.01 mg/L in 2025, which represents a 17.3 % decrease since 2020, below the permit maximum, and similar to the historical 20-year average (Figure 6).

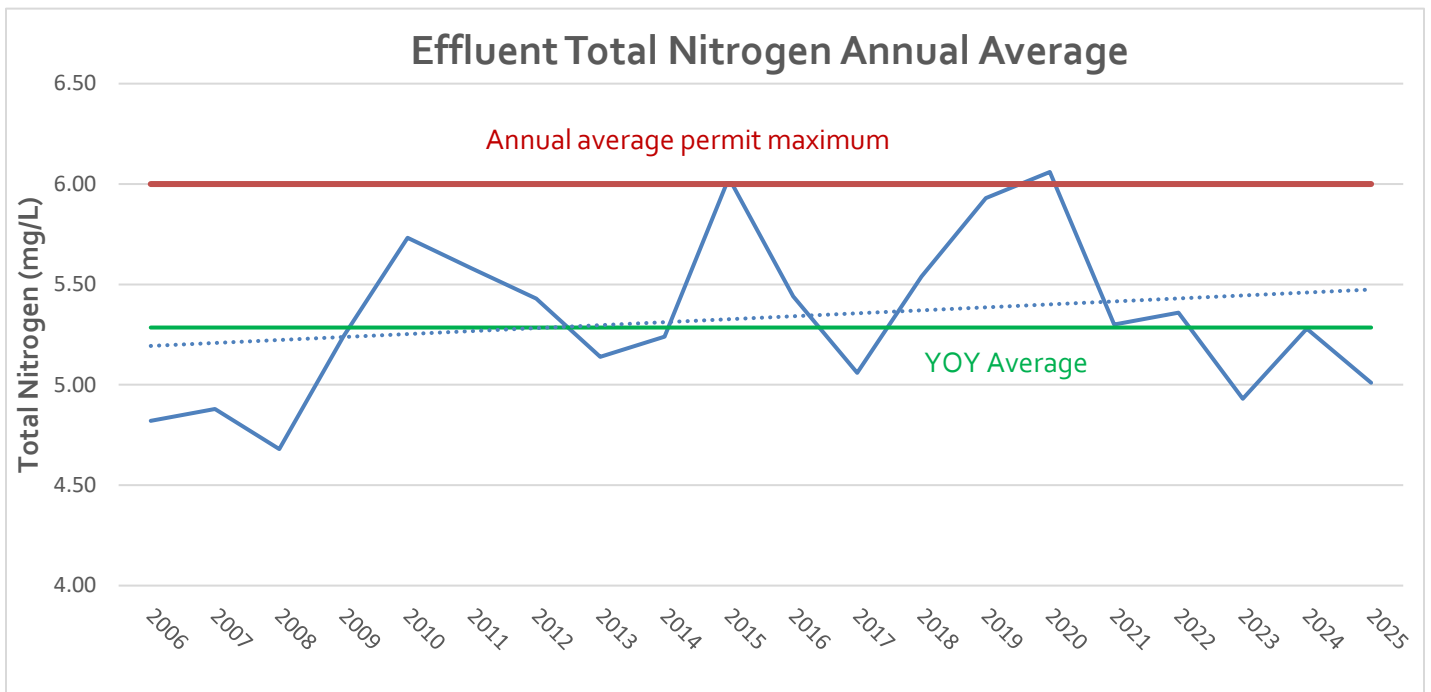


Figure 6. Historical annual average Total Nitrogen concentration in Effluent

The efficiency of the BNR process to remove Total Nitrogen from the waste stream averaged 90.5% in 2025, which represents a 0.5% decrease from the previous year (Figure 7).

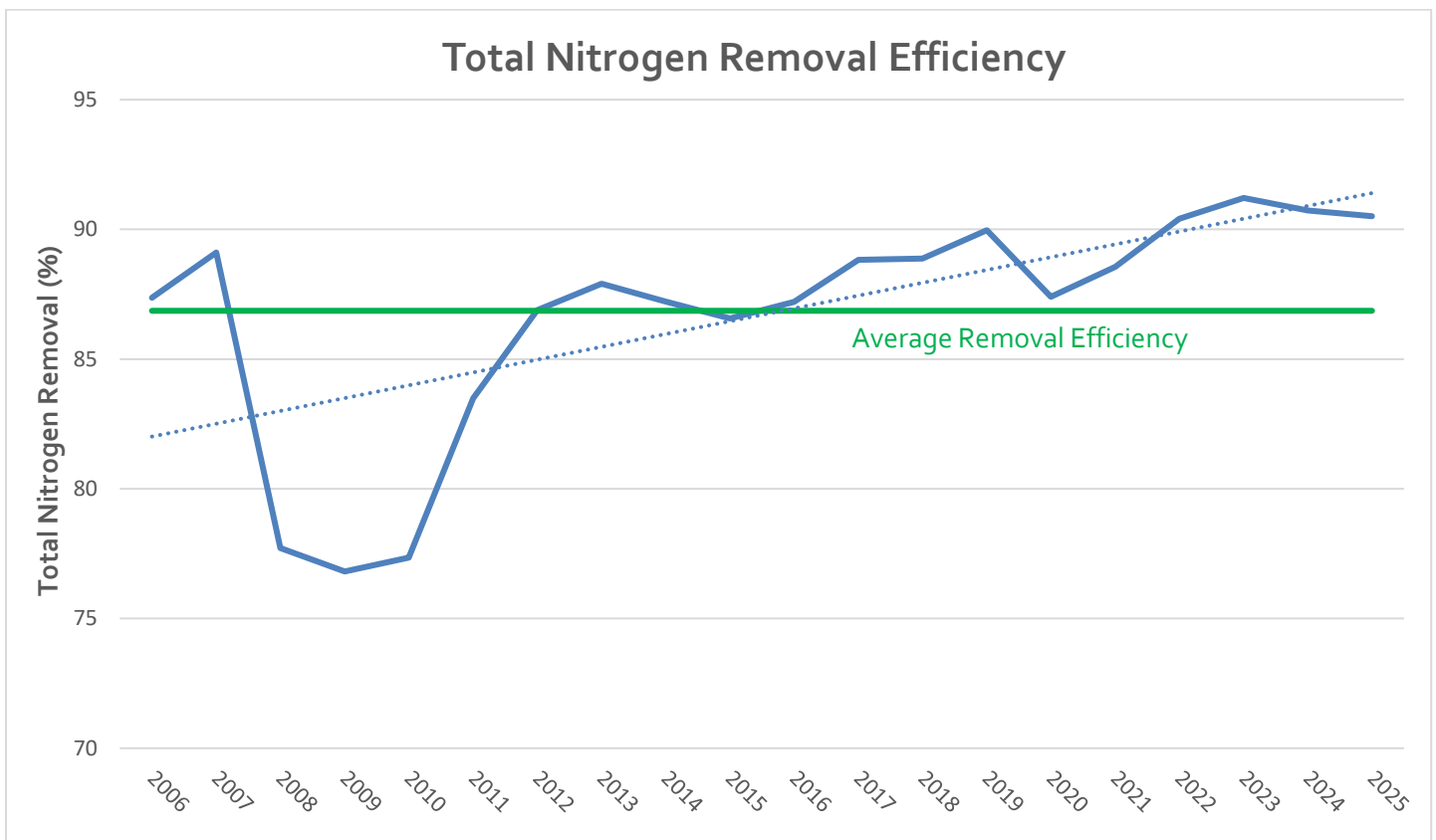


Figure 7. Total Nitrogen removal efficiency

Total Suspended Solids

The TSS data is critical in determining the operational behavior of the wastewater treatment system. They are generally indicative of the amount of nutrients available for the bacteria in the nitrifying and denitrifying process. Although critical to biological treatment, excessive suspended solids must be removed through successive settling processes followed by filtration before being discharged from the plant.

High TSS values in effluent are often related to the excessive solids generation due to an increase in Biochemical Oxygen Demand (BOD) loading or can indicate problems with nutrient deficiency. High TSS values can also be attributed to high flows, insufficient settling times, or may indicate aeration adjustments are needed.

In addition to operational optimization, suspended solids are also a measure used to assess risks associated with bacterial discharge into natural waters. Particles can harbor various forms of protozoa, bacteria, and viruses on the surface and can impede effective UV disinfection by shielding the organisms from radiated light exposure and subsequent inactivation.

Suspended solids are sampled from the various points in the treatment process as well as daily from the effluent discharged. There were no TSS values above 10 mg/L at any point in 2025.

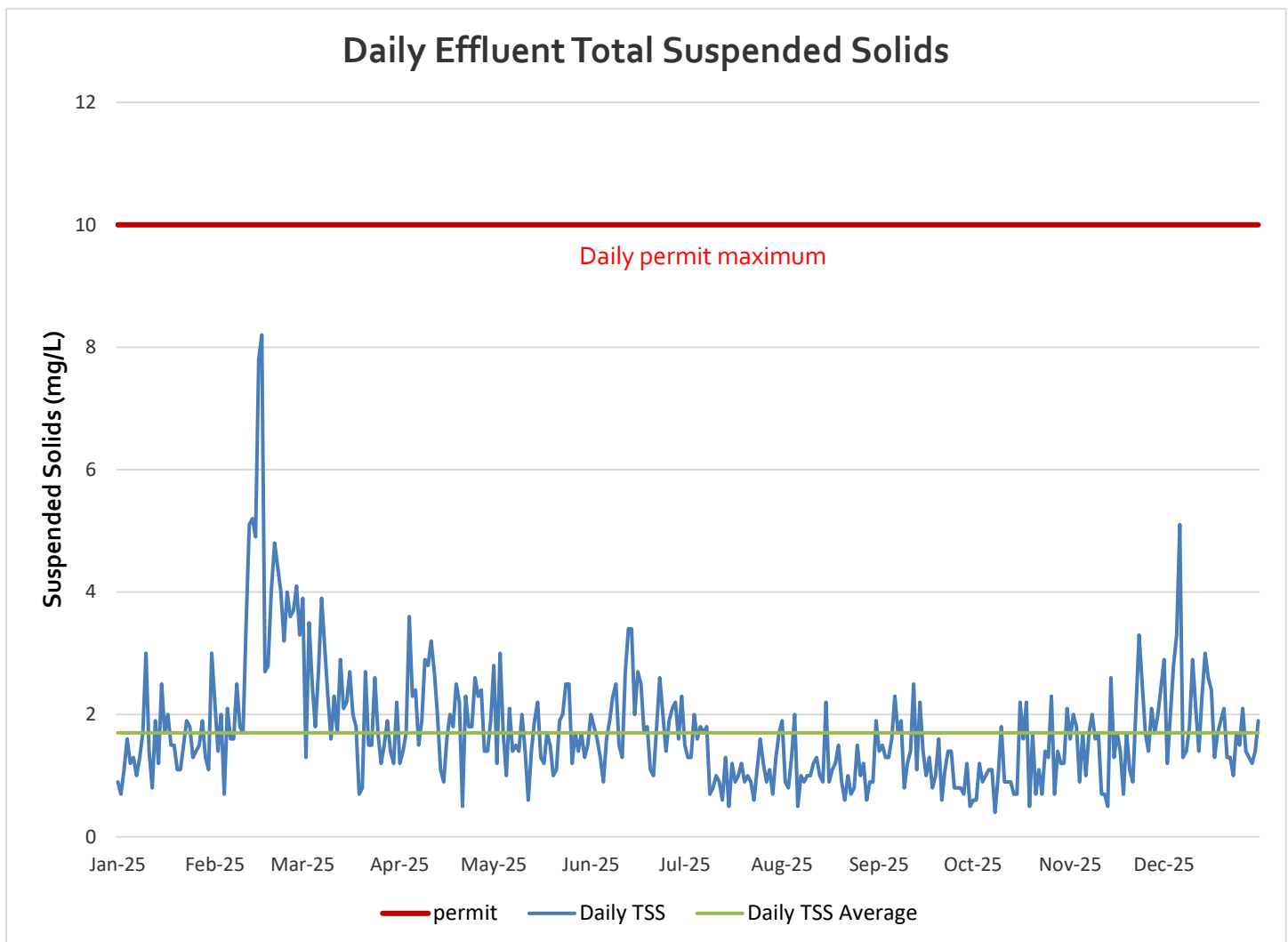


Figure 8. Total Daily Suspended Solid concentration

The 2025 average annual effluent TSS value was 1.6 mg/L and consistent with the historical average over the past 20 years (Figure 9).

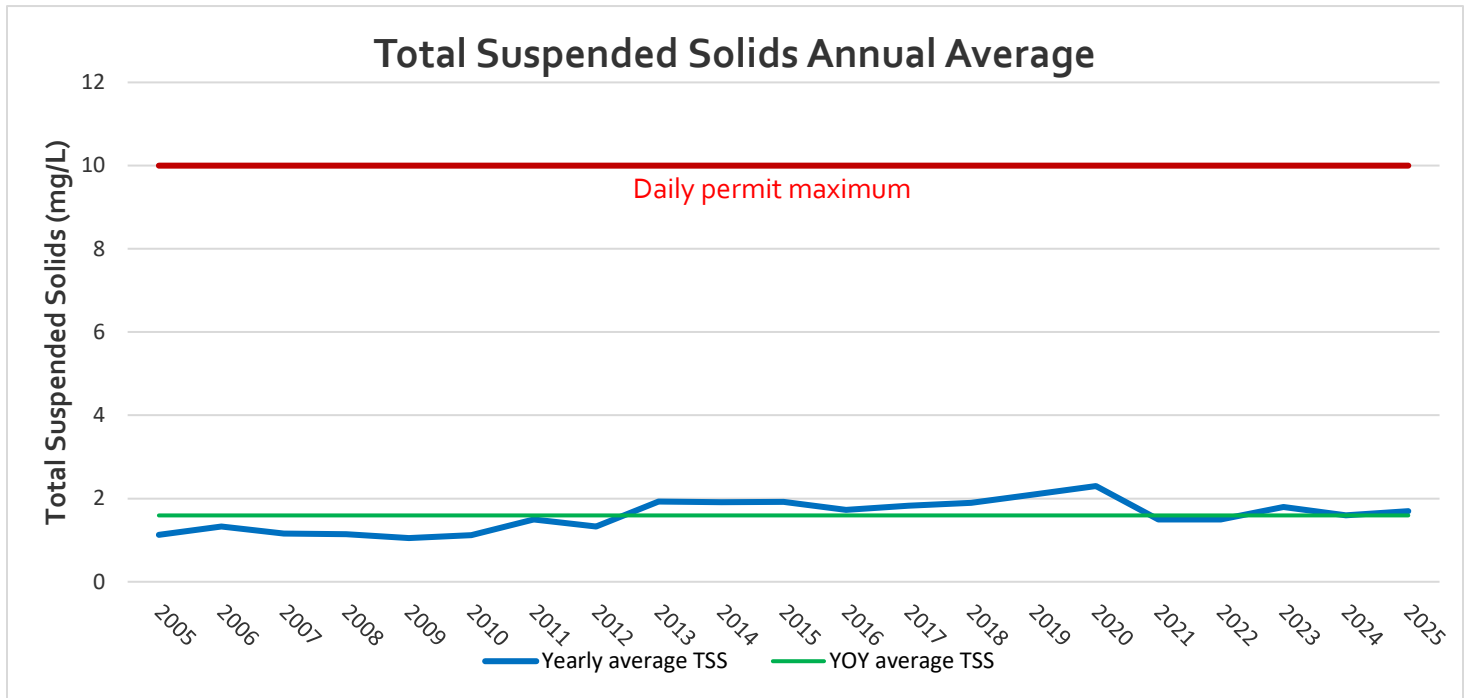


Figure 9. Annual average Total Suspended Solid concentration in effluent.

The TSS removal efficiency of the treatment process was 99.48%, which represents a 0.1% decrease from 2024. Notable that removal efficiency has remained +/-0.5% over the past 20 years (Figure 10).

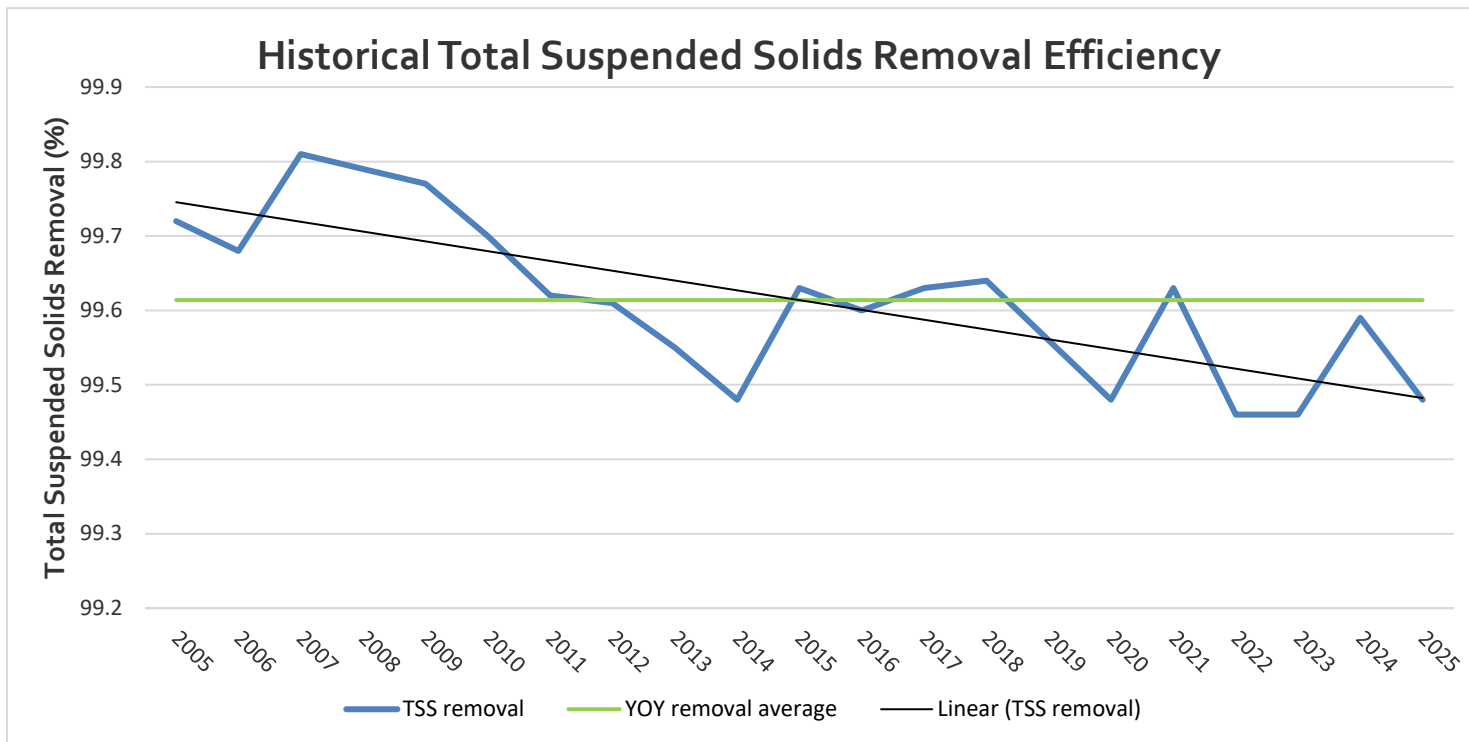


Figure 10. Total Suspended Solid process removal efficiency from Influent flow

Biochemical Oxygen Demand

BOD has traditionally been used to measure the strength of effluent released in natural receiving waters since sewage high in BOD can deplete oxygen and can result in fish stress and ecosystem changes.

Wastewater is made up of a variety of inorganic and organic substances from carbon compounds such as fecal matter, detergents, soaps, fats, greases, and food particles. These large organic molecules are easily decomposed by bacteria, but the process requires the consumption of oxygen. The amount of oxygen required to convert these compounds into carbon dioxide and water is the biochemical oxygen demand (BOD). The 5-day BOD, or commonly referred to as BOD₅, is measured by the quantity of oxygen depleted over 5 days and is the benchmark for measuring sewage strength.

It is also important to note that BOD serves as the food source for the denitrifying bacteria during the secondary stage of the nitrogen removal process. In these situations, BOD is desired as necessary to support the growth of the beneficial bacteria.

Effluent BOD is typically measured on a bi-weekly basis with no measurement excursion above the monthly permit level of 10 mg/L (Figure 11).

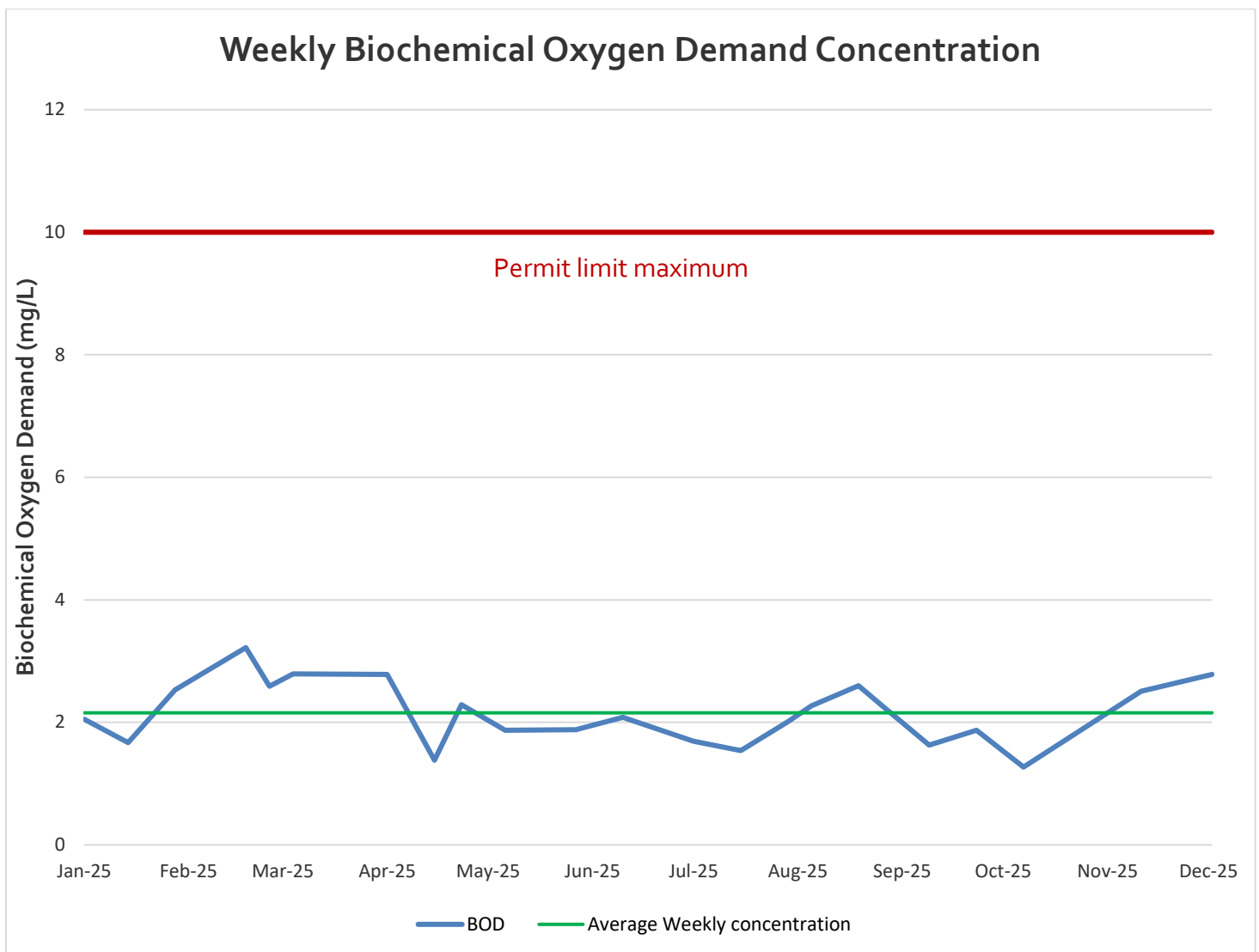


Figure 11. Weekly BOD Effluent concentration relative to permit

The 2025 annual average BOD discharge was 2.06 mg/L, lower than the 20-year historical BOD annual concentration average (Figure 12).

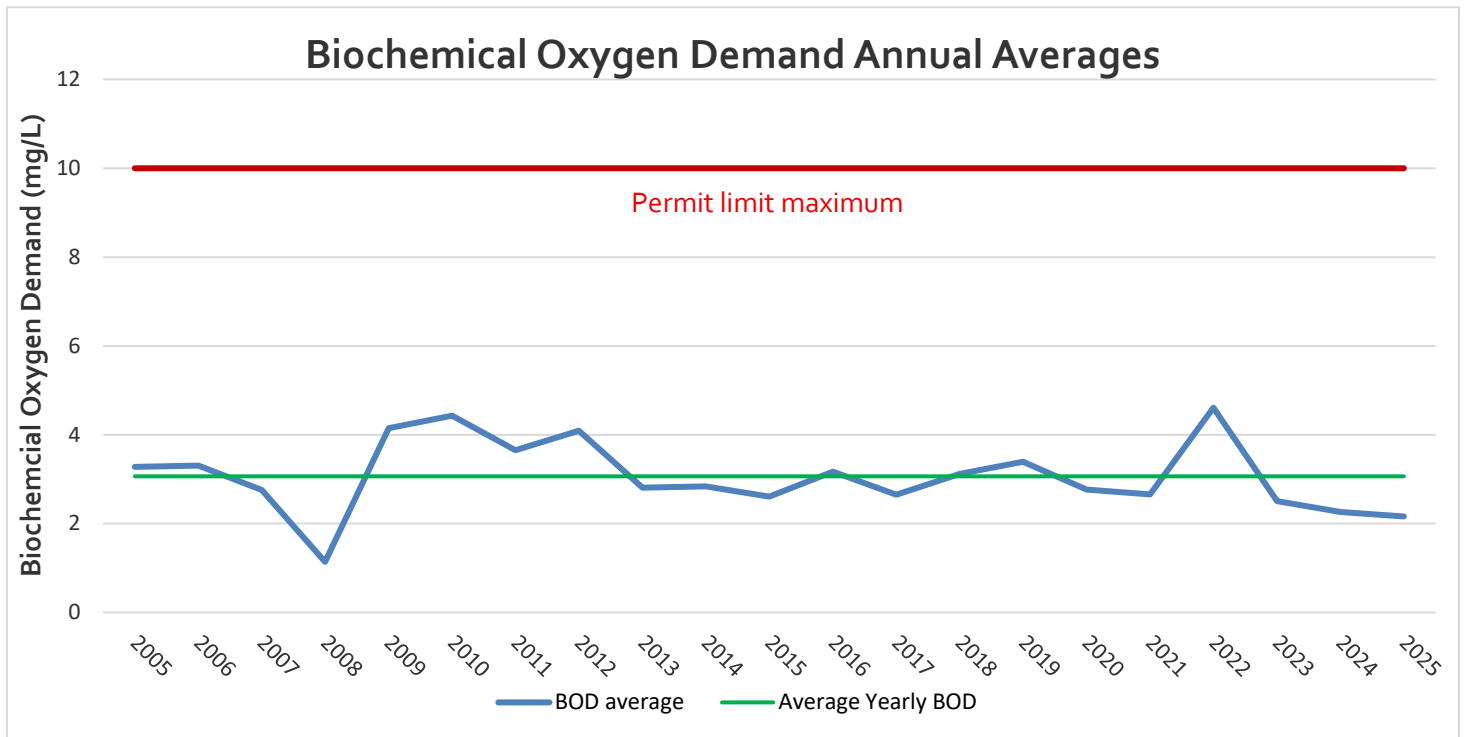


Figure 12. Annual average BOD concentration in effluent

The BOD removal efficiency for 2025 was 99.2% which represents a 0.3% decrease over 2024 (Figure 13). The overall BOD removal efficiency trend has generally improved over the past 20 years.

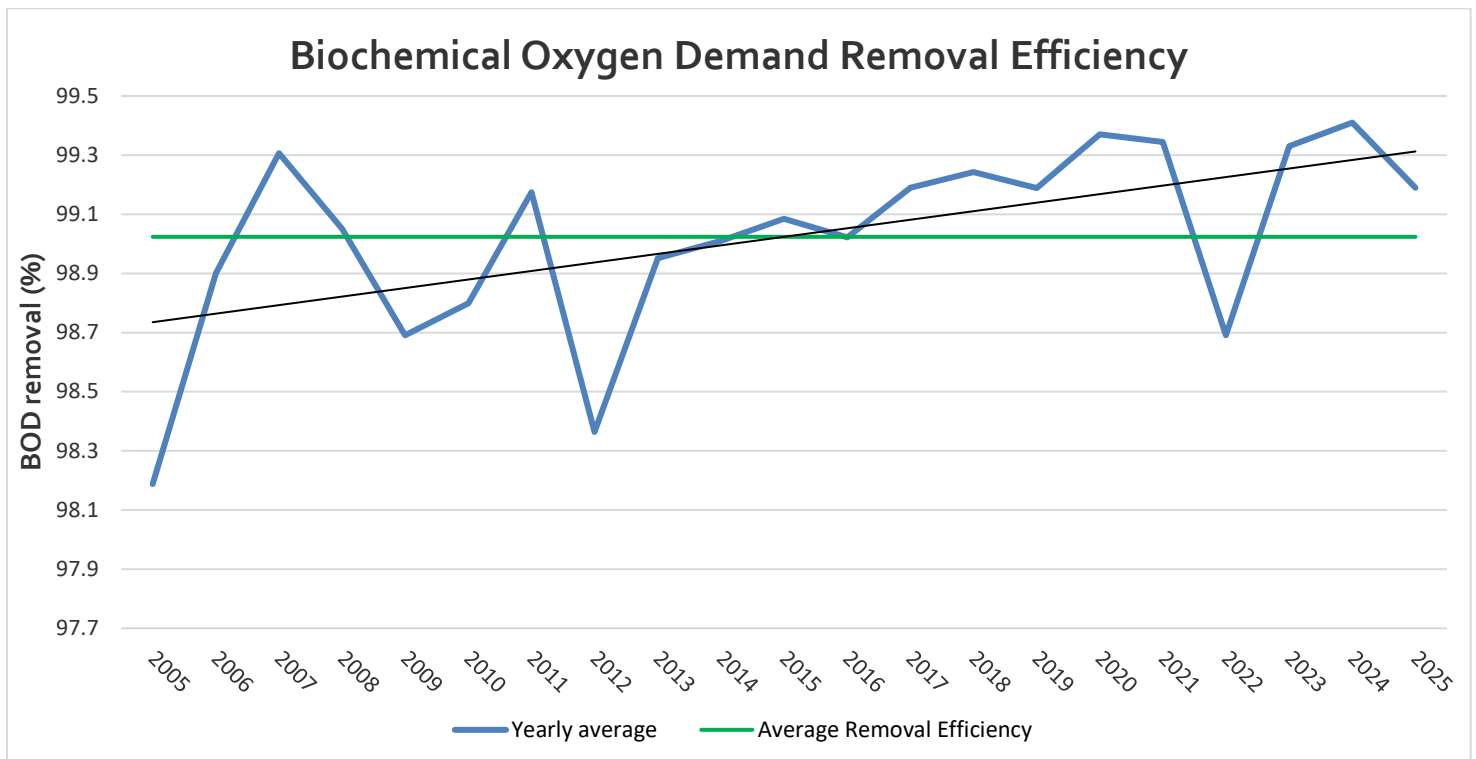


Figure 13 – Treatment BOD removal efficiency

Fecal Coliform

The effectiveness of the effluent UV disinfection is measured weekly through the monitoring of Fecal Coliform bacteria in the UV channels. All values throughout 2025 were well below the monthly permit level of 50 counts/100ml.

There has been a consistent, high level of effective disinfection over the past 22 years and at no time has the annual average Fecal concentration exceeded 5 CFU/100mL.

Acute Toxicity

To gauge the influence of WWTF discharge on fish in natural receiving waters, acute toxicity is measured and reported on an annual basis to the Federal Government. This analysis effectively measures the cumulative impact of all chemical and biological stresses on trout fish stock by directly exposing the fry to the effluent dilutions over a 96-hour period. Effluent samples were sent to an accredited aquatic laboratory facility and results submitted to the WSER database (Table 6). Results indicate that there was no mortality or stress reported for any of the fish exposed and met all health and regulatory guidelines in 2025.

Acute Lethality	Date	LC50 (%v/v)
WWTF Final Effluent Grab	22-Aug-24	>100

Table 4. Effluent Acute Lethality

Metal Concentrations

Comparative results between the influent and effluent composite measurements indicate that the biological treatment process is effectively removing a wide range of heavy metals from the influent. For each metal parameter, the effluent water quality met all the requirements of the Canadian Drinking Water Guidelines for 2025.

Total Metals (Effluent)	Units	Canadian Drinking Water Guidelines	Influent Composite Jan 20, 2025	Effluent Composite Jan 20, 2025	Influent Composite July 22, 2025	Effluent Composite July 22, 2025
Aluminum (Al)-Total	mg/L	AO=0.1	0.391	0.0147	1.84	0.0217
Antimony (Sb)-Total	mg/L	MAC=0.006	0.00086	0.00046	0.00099	0.00057
Arsenic (As)-Total	mg/L	MAC=0.01	0.00076	<.00050	0.00137	<.00050
Barium (Ba)-Total	mg/L	MAC=1	0.0425	0.019	0.0624	0.0202
Boron (B)-Total	mg/L	MAC=5	0.102	0.115	0.108	0.11
Cadmium (Cd)-Total	mg/L	MAC=0.005	0.000249	0.000049	0.000233	0.000033
Calcium (Ca)-Total	mg/L		51.7	46.8	53.4	45.6
Chromium (Cr)-Total	mg/L	MAC=0.05	0.00331	0.00087	0.00445	<.00050
Copper (Cu)-Total	mg/L	AO=15	0.146	0.0125	0.156	0.00718
Iron (Fe)-Total	mg/L	AO=0.3	0.869	0.084	3.04	0.046
Lead (Pb)-Total	mg/L	MAC=0.01	0.00286	0.00042	0.0033	0.00032
Magnesium (Mg)-Total	mg/L		15.4	12.9	16.6	14
Manganese (Mn)-Total	mg/L	AO=0.05	0.0646	0.0419	0.179	0.0391
Mercury (Hg)-Total	mg/L	MAC=0.001	0.000019	<0.000010	0.000021	<0.000010
Potassium (K)-Total	mg/L		17.8	15.2	18.9	16.4
Selenium (Se)-Total	mg/L	MAC=0.05	0.00106	<0.00050	0.00112	<0.00050
Sodium (Na)-Total	mg/L	AO=200	69.8	66.1	70.2	69.9
Uranium (U)-Total	mg/L	MAC=0.02	0.00282	0.000516	0.00345	0.000864
Zinc (Zn)-Total	mg/L	AO=5	0.16	0.0629	0.188	0.0568

MAC= Maximum Acceptable Concentration related to Health Concerns

AO = Aesthetic Objective related to Taste, Odor, Appearance

*Indicates the usage of alum for settling on Secondary Clarifiers

Table 5. Metal concentrations in Influent and Effluent Composite samples

Quality Control

To ensure quality control, the WWTF lab participates in a biannual Canadian Association of Laboratory Accreditation (CALA) proficiency testing program as well as an in-house developed quality control program that has standards for acceptable precision and accuracy of test results. All results of the Quality Control program were classified as being acceptable in 2025.

Lake Monitoring Program

In addition to internal testing program, the COK is part of an annual *Collaborative Okanagan Lake Water Quality Study* that is administered by the Okanagan Basin Water Board and conducted by Larratt Aquatic on behalf of various municipalities and districts that discharge into Okanagan Lake. This report is submitted to the Ministry of Environment as part of the condition on permitting wastewater operations. The report examines the general physical, chemical, and biological health of Lake Okanagan and water quality trends that may be influenced by tributaries as well as outfalls from treatment plants. Parameters generally fell within water quality objectives published (Nordin, 2005) with increasing trends noted in Phosphorus, and Algae biovolume concentrations. Nitrogen concentration remained consistent over the past year resulting in a lower N:P ratio factor and contributing factor to increased algae growth. In response to this trend, an Algae monitoring network will be established over the next two years and will include real-time water quality monitoring and reporting by various municipalities at water intake systems. The project is supported will be funded by Environment and Climate Change Canada.

Biosolids Management

A total of 21,401 metric tons of activated sludge was removed in 2025, which represents a 2.2% increase from the previous year. residual was transferred directly to the Commonage composting facility to produce Ogogrow compost product in accordance with the Organic Matter Recycling Regulation (OMRR). A separate compliance report for the composting facility is issued to the Ministry of Environment under authorization permit #108537. A breakdown of composite moisture, solids, and metal concentrations analyzed monthly are included in Table 6.

Dewatered Sludge for Composting - 2025															
Total Solids	Moisture Content	Volatile Solids	PCB's	Potassium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Mercury	Molybdenum	Nickel	Lead	Selenium	Zinc
g/L	%	g/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
184	81.6	154	0.0	5357	1.4	0.4	8.7	1.4	369	0.3	5.0	8.2	5.1	2.5	251

Table 6. Average monthly Biosolids composite concentrations

Reclaimed Wastewater

The City is committed to water conservation, the WWTF is situated on 21.27 acres of landscaped property. To help, the WWTF irrigation system was converted to use reclaimed wastewater effluent to water landscaping around the treatment plant grounds. The effluent is treated with chlorine and routinely tested to meet Ministry water quality guidelines. In 2025 the WWTF used a total of 13,244 m³ (13 ML) of reclaimed wastewater effluent for general outdoor operations of the facility and onsite irrigation from March to October as well as year-round for mechanical bearing cooling, pump packing along, and foam control.

Staffing

The WWTF operates with a skilled staff that have been certified to a level that meets Ministry of Environment regulations. This includes one EOCP Level IV Manager, one EOCP Level IV Supervisor, one EOCP Level III Operations Foreman, three EOCP Level IV Operators, five EOCP Level III Operators, six EOCP Level II Operators, one Level I Operator, one Control System Specialist (CSS), one Maintenance Foreman, three Millwrights, one Instrumentation/Electrical Foreman, three Instrumentation/Electrical Technicians, and two Laboratory Technicians (Figure 14)

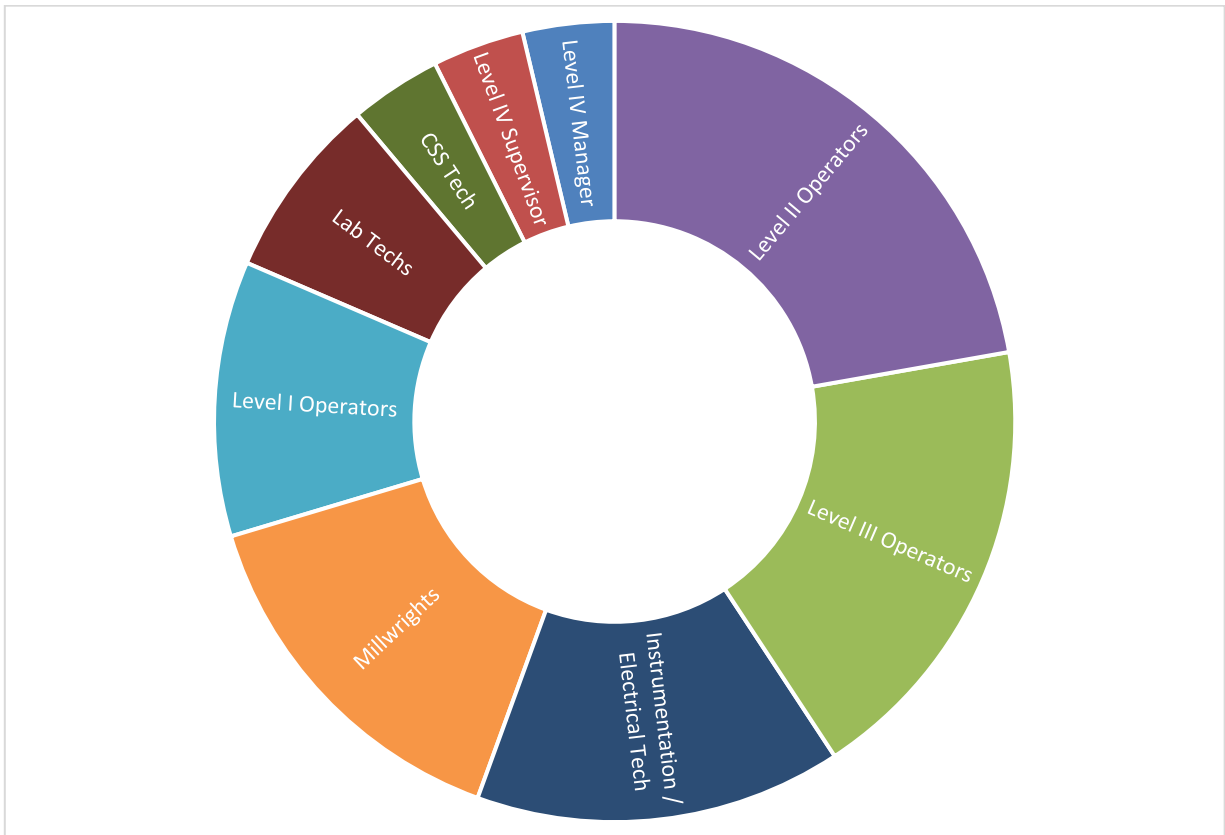
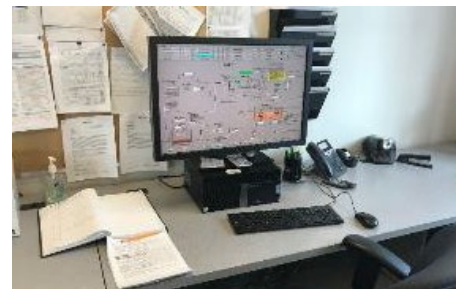


Figure 14. Overview of WWTF Operators certification level and support staff

System Control

The operational monitoring of the wastewater facility is conducted using a Supervisory Control and Data Acquisition Software (SCADA) program. Connected by wireless links, the SCADA software remotely collects information from monitors and sensors at strategic points in the wastewater processing plant. The software interprets the receiving data and automatically adjusts pumps and system settings to maintain pre-defined operating requirements. When an issue is detected within the system, the SCADA system issues alerts and alarms to wastewater system operators who then respond to the concern. This software platform also allows COK to collect and track the historical performance of our system for auditing and future optimization of the wastewater system. The SCADA system was upgraded at Brandt's Creek to allow for flow and load notifications, previously not available.



Operational Maintenance

Valued at more than \$100 million, the WWTF infrastructure requires thorough condition assessment, preventative maintenance, and scheduled replacement of aging components. To support this, the City has developed and continues to reassess a comprehensive asset management plan that ensures that WWTF is maintained in good condition. For day-to-day maintenance, the WWTF utilizes an asset management and scheduling system that highlights facility and equipment work that needs to be maintained. The maintenance is delegated by wastewater foreman and is reviewed by the supervisor for compliance.

Odour Management

The WWTF employs a centralized odor control system that consists of a mechanical bio-filter lined with a patented, engineered media. This biological process eliminates the need for additional chemical treatment and has proven to be highly effective. Foul air is extracted from designated buildings and tanks throughout the plant and cycled through the bio-filter and discharged via a 14-meter stack on-site.



To further reduce H₂S odor release in the distribution system, new UV lamp technology was trialed at a lift station with moderately effective results. Future implementation to be determined.

WWTF has a dedicated service request program whereby the public can provide feedback or register complaints regarding our wastewater treatment process. There was no reported odor complaints registered from residents or businesses regarding the treatment plant in the neighboring area throughout 2025. Several H₂S sensors have been strategically deployed throughout the distribution system and assist in determining where and when odor neutralizing Bioxide needs to be introduced.

Emergency Response Plan

A thorough review of the WWTF Emergency Response Plan was conducted in 2025 by staff and updated to reflect current practices and policies and aligns with the permit requirements of the COK treatment plant. Operators and technicians are informed of and carry out mock exercises of the Emergency Response Plan that contains information on course of actions, list of appropriate contacts, and procedures necessary to assist operators and staff to make timely and informed decisions.

Technology and Efficiency Improvements

An asset management assessment was completed in 2025 to evaluate the physical assets to better understand their current condition, value, and performance, helping to balance costs, risks, and opportunities for better decision-making and strategic alignment, often using maturity models or readiness scales to identify gaps and improve lifecycle management from acquisition to disposal. It involves inventorying assets, analyzing condition, assessing value, and comparing practices against standards like ISO 55000 or GFMAM subjects, using tools from organizations like the Institute of Asset Management (IAM) or the Federation of Canadian Municipalities (FCM).

Process stress testing was completed in 2025 to evaluate how the system processes perform under extreme or unusual conditions that go beyond normal operating parameters. The goal is to identify vulnerabilities, breaking points, and how effectively the subject can recover from failure, allowing for the development of risk mitigation and contingency plans. In addition, an updated process modeling is being developed to allow benchtop simulation of operational and process changes to deal with changing influent conditions enabling staff to test proposed changes without effecting the facility.

The WWTF continues to participate in the annual National Water Benchmarking Initiative (NWBI) that highlights performance relative to other wastewater treatment facilities across the country. Strengths referenced include below average Operational and Maintenance costs per volume treated, zero accidents with lost time on site, below average reactive maintenance, and very minimal regulated tests out of compliance.

Conclusion

Both Total Phosphorus (TP) and Nitrogen (TN) indicated an increasing concentration trend in wastewater effluent in 2025 relative to 2024 (Table 7), however, annual Total Phosphorus average concentration exceeded the annual permit limit. Percentage of both the flow and population proportionately increased.

Total P	Total N	TSS	BOD	Fecal	Flow	Population
Down 0.03 mg/L	Down 0.27 mg/L	Up 0.1 mg/L	Down 0.1 mg/L	Down 1 MPN/100mL	Up 3%	Up 2.6%

Table 7. 2025 Effluent nutrient discharge concentrations comparative to 2024

Longer 5-year data analysis indicates that Phosphorus concentrations in the effluent are trending higher while Nitrogen, suspended solids and BOD are on the decline (Table 8).

Total P	Total N	TSS	BOD	Fecal
Increasing	Decreasing	Decreasing	Decreasing	No Change

Table 8. Effluent nutrient concentration trend since 2020

The city is committed to continually improving wastewater services to all its residents, industrial, and commercial stakeholders. Protecting our water source is not an option – it is a priority, for our current generation and those to come. This requires extensive planning, funding, collaboration, vision and leadership from City Council all the way through to the wastewater utility staff and operators working diligently to support the Kelowna vision statement:

"Kelowna, a City of the Future"



The city of Kelowna is pleased to present the 2025 Annual Wastewater Report, detailing the health and direction of our wastewater system. If you have any questions about this report or wish to have additional information provided, please contact us at 250-469-8502 or email at ask@kelowna.ca.