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Town of Arnprior 2023 – Water Pollution Control Centre Summary Report

January 11, 2023

Please find below a discussion of the operational undertakings of the Town of Arnprior's Water Pollution Control Centre (WPCC) for the 2023 calendar year. This report also includes a summary of all relevant sampling collected during 2023. This report is provided to meet the Town's requirements to report annually on the operation of the WPCC, as per Environmental Compliance Approval Number A-500-6176111914 Version: 1.0 Issue Date: July 18, 2023 and to provide residents of the Town of Arnprior with information on an important piece of the Town's municipal infrastructure.

1.0 Preliminary Treatment

1.1 Screen Units

There are three screening units, two automatic mechanical screen and a standby manual screen. All screens have openings of 13 mm between bars and are enclosed with an odour enclosure where the air is discharged to the exterior atmosphere through a carbon filter.

The screenings are then transferred onto a conveyer that empties into a container for disposal at the Arnprior landfill.

1.2 Grit Removal

Grit removal is achieved by a pair of rectangular aerated spiral roll 90 m³ tanks. Each tank has a grit screw conveyer which pushes settled grit into the grit hoppers. Grit is then pumped into a grit dewatering classifier unit where dense grit particles are separated from light organic solids.

2.0 Primary Treatment

2.1 Primary Sedimentation

There are four rectangular primary clarifiers at the WPCC: two with a surface overflow area of 142 m² and two with an overflow area of 154 m². All units are equipped with chain and flight sludge collection and manual scum removal.

Raw sludge is pumped from the primary clarifiers to Anaerobic Digesters using plunger type positive displacement pumps.

3.0 Secondary Treatment

3.1 Activated Sludge Treatment

The activated sludge treatment process includes two rectangular aeration tank and three

separate rectangular secondary clarifiers, each made up of two units in parallel. The aeration tank volumes are 1,303 m³ each, and are equipped with four inlet gates and one outlet slide plate for isolation. The secondary clarifiers have a surface area of 310 m² each. They are equipped with longitudinal and cross chain and flight collector mechanisms which collect the activated sludge into a sump where it is returned to the aeration tank.

3.2 Phosphorous Removal

The phosphorous control system consists of two 12,100 L indoor ferric chloride chemical storage tanks and two chemical feed pumps complete with calibration cylinders. The ferric chloride is added to either the aeration tank or preliminary discharge depending on operational requirements.

3.3 Chlorination System

Disinfection of the plant discharge is done through the addition of Sodium Hypochlorite (NaOCl). The NaOCl is stored in a pair of 12,100 L tanks, and a bank of three variable speed metering pumps are used to deliver the chlorine to the chlorine contact chamber.

3.4 De-chlorination System

The chlorinated water must be de-chlorinated before discharge into the Ottawa River. This is achieved through the addition of sodium bisulphite. The sodium bisulphite system is made up of one 1,336 L storage tank and a pair of feed pumps.

3.5 Sludge Dewatering

A Centrifuge capable of processing 7 L/s of sludge is used for dewatering anaerobically digested sludge. The sludge from this unit is loaded onto a dump truck and delivered to the Arnprior landfill.

3.6 Auxiliary Power

The Arnprior WPCW is equipped with a 400 Kw diesel generator and automatic transfer switch. This generator will automatically start when a power outage occurs, and can supply power to run the entire plant.

4.0 Plant Performance Summary

Environmental Compliance Approval Number A-500-6176111914 Version: 1.0 Issue Date: July 18, 2023, section 11.4 requires the Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:

11.4.a. a summary and interpretation of all Influent, Imported Sewage and Processed Organic Waste monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;

Figures 1 and 2 show historical trends for the influent characteristics from 2023.

Figure 1. 2023 Influent Averages of pH level and Flow (×1000 m³)

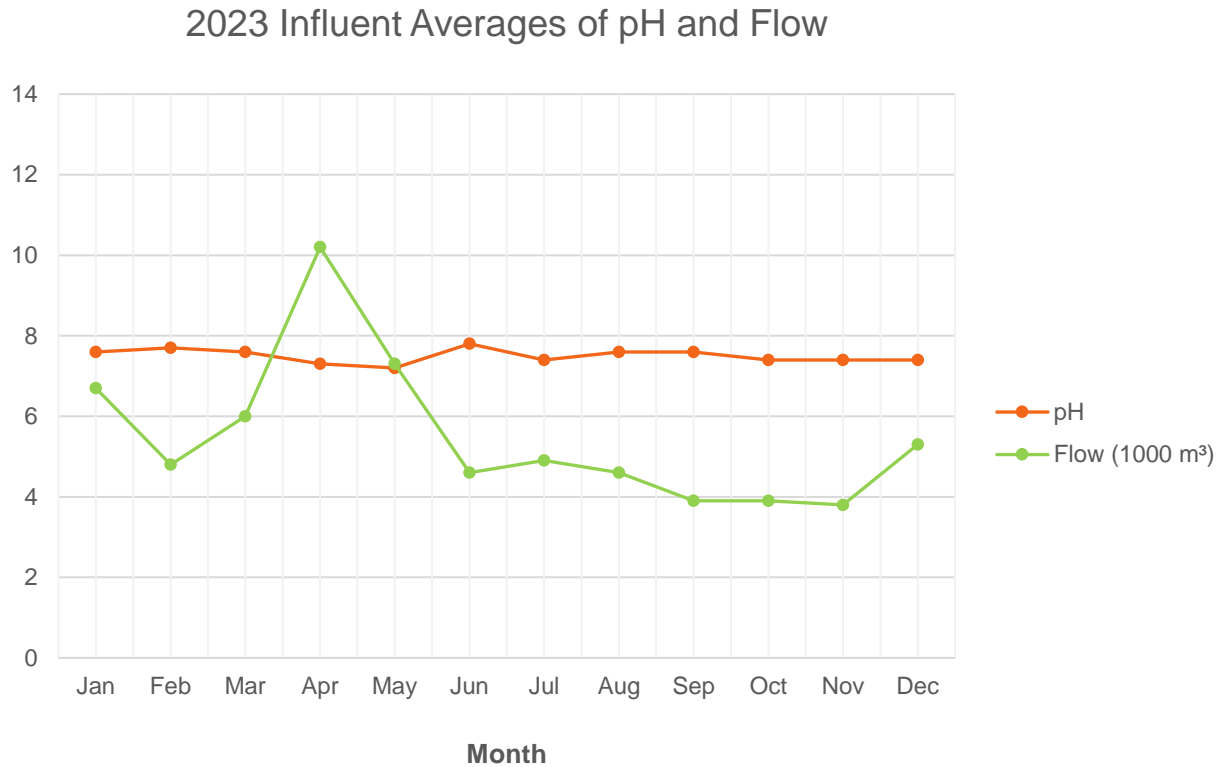


Figure 1 shows the pH and the influent flow rate. Flow rate increased steeply in April due to the spring freshet. The pH dipped slightly during the months of April and May following the increased influent flows.

Figure 2. 2023 Influent Averages of BOD and TSS

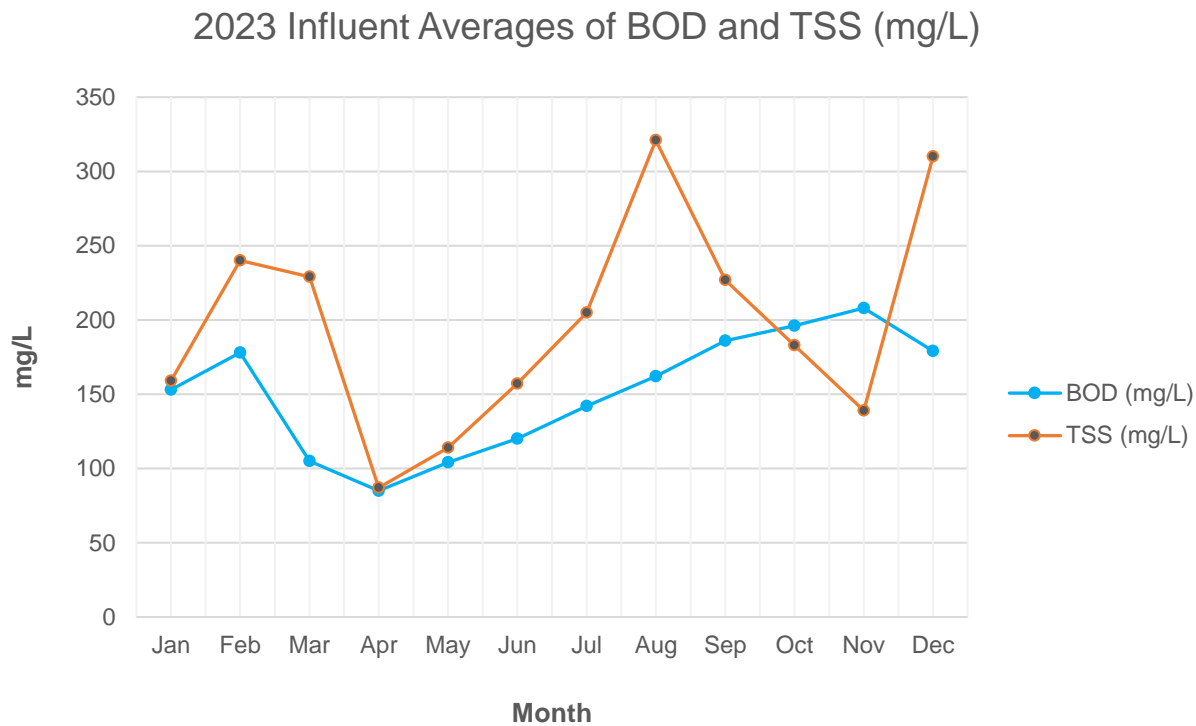


Figure 2 shows a drop in both biological oxygen demand (BOD) and total suspended solids (TSS) in April due to the spring freshet where plant flows experienced increased surface water runoff from combined sewers. The monthly averages of TSS in August and December appear higher due to single samples (outliers) each month.

11.4.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;

4.1 Effluent Flows and Loading

Table 4-1 below indicates the effluent criteria for average monthly flows, CBOD, Total Suspended Solids, Phosphorus and their respective loadings of the WPCC. All monthly concentrations and loadings meet the effluent objectives and limits.

Table 4-1 - Summary of WPCC 2023 Final Effluent Flows and Loading

	Daily Total (m ³ /Day)	CBOD ₅ (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	CBOD ₅ Loading (kg/Day)	Total Suspended Solids Loading (kg/Day)	Total Phosphorus Loading (kg/Day)
Objective	N/A	15.0	15.0	0.75	142.5	142.5	9.5
Limit	9700	25.0	25.0	1.0	243.0	243.0	9.7
Compliance Assessment Basis	Annual Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average	Monthly Average
January	6688	3.60	7.20	0.21	24.08	48.15	1.38
February	4845	3.00	9.25	0.24	14.54	44.82	1.15
March	6029	3.00	5.50	0.15	18.09	33.16	0.89
April	10,172	3.50	5.25	0.15	35.60	53.40	1.50
May	7312	3.60	7.80	0.26	26.32	57.03	1.87
June	4562	4.50	6.65	0.29	20.53	30.34	1.31
July	4879	3.25	6.00	0.19	15.86	29.28	0.91
August	4581	3.40	7.20	0.38	15.58	32.99	1.74
September	3917	3.00	6.75	0.47	11.75	26.44	1.82
October	3854	3.00	7.00	0.41	11.56	26.97	1.60
November	3833	3.25	8.00	0.30	12.46	30.66	1.15
December	5291	3.50	6.50	0.18	18.52	34.39	0.97
Annual Average	5496.95	3.38	6.93	0.27	18.74	37.30	1.36

4.2 Monitoring Data Interpretation

- 4.2.1** Five day Carbonaceous Biological Oxygen Demand (CBOD5) is sampled once per week from a composite sample. The effluent reporting criteria is 25 mg/L and the plant objective is 15 mg/L. The monthly average high was 4.50 mg/L in June. The CBOD5 objective loading rate is 142.5 kg/d, and in 2023 the plant maximum monthly average loading was 35.60 kg/d in April.
- 4.2.2** The Total Suspended Solids (TSS) in the raw and effluent wastewater is usually measured 4 times per month from a composite sample. The effluent reporting criteria is 25 mg/L and the plant objective is 15 mg/L. The maximum monthly average in 2023 was 9.25 mg/L in February. The objective with respect to plant effluent loading of TSS is 142.5 kg/d. The WPCC had a maximum monthly average effluent loading of 57.03 kg/d in May.
- 4.2.3** The Total Phosphorous (TP) in the raw and effluent wastewater is sampled and tested each week from composite samples. The reporting criteria is 1.0 mg/L and the plant objective is 0.75 mg/L. The maximum monthly average of TP levels in 2023 was 0.47 mg/L in September. The Total Phosphorous objective loading rate is 9.5 kg/d and in 2023 the maximum monthly average TP loading rate was 1.87 kg/d in May.

5.0 Effluent Objectives and Effluent Quality Assurance

11.4.e. a summary of any effluent quality assurance or control measures undertaken;

11.4.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;*

11.4.m.a summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year;

5.1 Effluent Monitoring

Table 5-1 below lists the objectives, limits and results of the final effluent monitoring parameters.

Table 5-1 - 2023 Final Effluent Sampling Results

	Total Ammonia Nitrogen (mg/L)	Total Residual Chlorine (mg/L)	E.Coli (CFU/100ml)	pH	Temperature (°C)	Un-Ionized Ammonia (Note #2)	Lethality Test
Objective	10.0 (May-Oct) 15.0 (Nov-Apr)	Non-Detect	100	6.5 - 8.5	N/A	N/A	Note #1
Limit	Note #1	N/A	200	6.0 - 9.5	N/A	N/A	Pass/ Fail
Compliance Assessment Basis	Monthly Average	Min/Max	Monthly Geometric Mean Density	Min/Max	Monthly Average	Monthly Average	Single Sample
January	4.43	0.00/0.09	14.9	6.39/7.33	12	0.0084	Pass
February	16.13	0.00/0.07	5.4	6.60/7.55	12	0.0545	Pass
March	9.49	0.00/0.06	8.9	6.65/7.55	15	0.0328	Pass
April	10.88	0.00/0.08	4.6	6.74/7.34	14	0.0293	Pass
May	3.84	0.00/0.02	32.0	6.34/7.29	16	0.0138	Pass
June	6.21	0.00/0.03	19.9	6.19/7.12	20	0.0058	Pass
July	3.30	0.01/0.06	10.0	6.28/7.03	22	0.0080	Pass
August	1.29	0.00/0.03	31.6	6.29/6.99	22	0.0044	Pass
September	1.47	0.00/0.02	55.0	6.20/6.78	21	0.0018	Pass
October	0.50	0.00/0.02	6.5	6.00/6.95	20	0.1024	Pass
November	14.98	0.00/0.03	24.2	6.51/6.99	17	0.0303	Pass
December	13.13	0.00/0.43	17.1	6.79/7.14	15	0.0313	Pass
Note #1- Non- Acutely Lethal to Rainbow Trout and Daphnia Magna							
Note #2- Un-Ionized Ammonia calculated using pH and temperature at time of sampling for Total Ammonia Nitrogen							

- 5.1.1** Total Ammonia Nitrogen has an objective of 10.0 mg/L throughout the months of May to October and 15.0 mg/L throughout the months of November to April. The effluent limit is to be non-acutely lethal to rainbow trout and daphnia magna year-round on a monthly test. The maximum monthly concentration was 16.13 mg/L in the month of February due to loss of nitrification in the colder temperatures. In April 2023, the monthly averages resumed falling under the established objective continuing until November. All lethality tests throughout the year passed.
- 5.1.2** Total Residual Chlorine objective is to be non-detectable. A residual was detected in all months but at no time in the year did the value exceed 0.5 mg/L.
- 5.1.3** E.coli is measured in the unit of CFU/100mL as a monthly geometric mean density and the objective is 100 CFU/100mL. This objective was met in all months with the highest monthly geometric mean being 55 CFU/100mL in September. The limit for E.coli is 200 CFU/100mL.
- 5.1.4** pH is the negative log of the concentration of hydrogen. The objective for pH is 6.5 – 8.5 at all times. Exceedances noted are based on daily sampling. Soda ash is dosed in the aeration effluent channels to raise the pH and at all times the effluent pH was within the limit of 6.0 – 9.5. The WPCC effluent pH is sometimes too low because the raw sewage does not contain sufficient alkalinity to fully nitrify the incoming nitrogen.

There were no deviations from the monitoring schedule for the current reporting year.

6.0 Bypass Summary

11.4.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;

11.4.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;

- On June 26th, due to heavy precipitation, a bypass of 0.17 m³ occurred at 1 Elgin Street.
- On July 13th, due to heavy precipitation, 3 locations (Albert Street manhole, LS #1, and LS #3) were bypassed for a volume of 52.4 m³.
- On July 13th, due to heavy precipitation, a bypass of 0.48 m³ occurred at 233 Albert Street.
- On July 28th, heavy precipitation caused bypasses at both LS #3, and Albert Street manhole, the total amount being 220.5 m³. A beach closure took effect due to the occurrence.
- On September 7th, due to heavy precipitation, a secondary bypass with a volume of 6.37 m³ occurred at 233 Albert Street (WPCC).
- On September 7th, due to heavy precipitation, 3 locations (LS #1, LS #3, and Albert Street manhole) were bypassed for a total volume of 983.8 m³. A beach closure took effect due to the occurrence.
- On December 8th, an equipment failure of the sodium bisulphite pump caused a secondary bypass incurring 3204 m³ at 233 Albert Street. Samples were collected and in-house laboratory analysis was conducted.

Required samples were collected for all by-passes and lab results were received. All by-passes were reported to the MECP and the local health unit.

Levels at pump station #3 were not being accurately represented by the settings in the SCADA, which caused bypasses to be reported erroneously. Physical observation allowed us to assess and correct these level setpoints which were adjusted in SCADA to correct the error.

2024 planned capital works includes the Reconstruction of MacDonald Street which will result in the block of existing combined sewer between William Street and McGonigal Street being separated into dedicated sanitary and storm sewers. The total estimated cost of this project is \$4.2 million.

7.0 Operating Problems

11.4.c. a summary of all operating issues encountered and corrective actions taken;

11.4.k. a 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;

An increased number of hydro power events has caused more electrical control equipment failures than in the past. A surge protector was installed at the Madawaska Blvd. lift station, eliminating hydro electricity surges. All generator stations have had batteries changed out to ensure they will start in emergency situations.

Levels at pump station #3 were not being accurately represented by the settings in the SCADA, which caused bypasses to be reported erroneously. Physical observation allowed us to assess and correct these level setpoints which were adjusted in SCADA to correct the error.

8.0 Plant Maintenance

11.4.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;

Both a monthly and a weekly maintenance schedule are printed out and the maintenance personnel initial the schedule as tasks are completed. If any major repairs are required, the operator communicates these to the ORO supervisor who then contacts the appropriate licensed contractor.

A summary of major repairs or maintenance carried out in 2023 is as follows:

- Annual certification of laboratory instruments.
- Annual certification of backflow preventers.
- Annual certification of flow meters.
- Rebuild of digester heat pump.
- Replacement of gas LEL sensor in screen room.
- Rebuild of primary sewage pump.
- Replacement of effluent sampler.
- Various health and safety supplies purchased.
- Purchase of spare digester supernatant pump.
- Purchase of DeviceNet cards.
- Purchase of spare DeZURIK valve and actuator.
- Purchase of HACH chemical reagents.
- Purchase and installation of centrifuge main auger.
- Contractor serviced digester gas blower.
- Damaged davit base relocated and re-secured by contractor.
- One set of flights and chains repaired on a final clarifier.

9.0 Sludge Processing

11.4.h. a tabulation of the volume of sludge generated in the reporting period, 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.

Combined primary and secondary waste activated sludge is collected from all four primary settling tanks and pumped into the anaerobic digesters. From the digesters, sludge is pumped into holding tanks, it is then conditioned and processed in the centrifuge. Sludge is dewatered to approximately 22% and loaded onto a truck and transferred to the Arnprior landfill.

A total of approximately 196,208 kg dry weight of sludge was transported to the Arnprior Waste Disposal Site. Sludge production in 2024 is expected to be higher than 2023. Table 9-1 below provides a summary of the 2023 centrifuge operation and sludge management totals.

Table 9-1 - Centrifuge Operation and Summary of Sludge Totals

Month	Sludge To Storage m³	Sludge To Centrifuge m³	% Solids Avg.	Dry Solids (kg)
January	1,342	599	2.55	15,277
February	986	642	2.65	17,024
March	696	853	2.43	20,738
April	444	563	2.74	15,398
May	393	835	2.46	20,510
June	609	1,049	1.75	18,356
July	323	1,242	1.60	19,912
August	292	706	2.09	14,733
September	271	630	2.77	17,464
October	250	739	2.18	16,112
November	289	769	1.66	12,759
December	690	466	1.70	7,925
Avg	549	758	2.21	16,351
Max	1,342	1,242	2.77	20,738
Min	250	466	1.60	7,925
Total	6,585	9,093		196,208

10.0 Monitoring Equipment Calibration

11.4.f. a summary of the calibration and maintenance carried out on all Influent, Imported Sewage 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;

All flow meters were calibrated by an outside contractor and all flow meters passed calibration.

The benchtop chlorine analyzer is certified annually, and samples are taken daily to test for effluent total chlorine residual.

11.0 Complaints

11.4.i. a summary of any complaints received and any steps taken to address the complaints;

There were no complaints received during the reporting period.

12.0 Conclusion

The Arnprior WPCC met all MECP sewage effluent limits. The objective of 15 mg/L for the monthly average of Total Ammonia Nitrogen for November to April was exceeded in the month of February at 16.13 mg/L due to limited nitrification during the colder temperatures.

For inquiries regarding this report, please contact Scott Matthews at 623-4231 Ext. 1834.

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