



# **2022 Annual Report Sewage Treatment Plants**

**Loyalist Township Utilities Division**



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## Introduction

Under Environmental Compliance Approval (ECA) agreements issued by the Ministry of Environment, Conservation and Parks (MECP), Loyalist Township is required to report annually on the values and parameters indicated in the ECAs for both operated facilities in Amherstview and Bath.

The report covers the period of January 1, 2022, to December 31, 2022, and is prepared and submitted to the MECP by March 31, 2023 and to Council. The report is also made available for the public via the Township website.

The ECA lists in section 10 (6) the reporting requirements for Amherstview WPCP and in section 10.6 the requirements for Bath STP. The following is to be included in the annual report:

- a. a summary and interpretation of all monitoring data and a comparison to the effluent limits in conditions described in the Approval, including an overview of the success and adequacy of the Works;
- b. a description of any operating problems encountered, and corrective action taken;
- c. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;
- d. a summary of any effluent quality assurance or control measures undertaken in the reporting period;
- e. a summary of the calibration and maintenance carried out on all effluent monitoring equipment; and
- f. a description of efforts made, and results achieved in meeting the Effluent Objectives of the Approval;
- g. 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;
- h. a summary of any complaints received during the reporting period and any steps taken to address the complaints;
- i. a summary of all By-pass, spill or abnormal discharge events;
- j. for Amherstview WPCP additionally, 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
- k. for Amherstview WPCP additionally, a report summarizing all modifications completed as a result of Schedule B, section 3; and
- l. any other information the Water Supervisor/District Manager requires from time to time.



The wastewater treatment processes, and their effectiveness are monitored and tested by on-line instrumentation, Supervisory Control and Data Acquisition (SCADA) system, chemical and physical measurements and are operated and maintained by Township staff who have successfully completed training and testing to become licensed Wastewater Treatment and Wastewater Collection Operators.

## 1. Executive Summary

In 2022 the average daily flow into the Amherstview Water Pollution Control Plant (Amherstview WPCP) is at 53% of the rated capacity for the system. The maximum daily treated raw water was recorded at 12,421 m<sup>3</sup>/d for Amherstview WPCP, and 78% of its maximum rated capacity as per Environmental Compliance Approval, ECA. The highest flows occurred during periods of heavy rain and melting snow/ice which confirms that the system is subject to inflow and infiltration (I/I).

For Bath Sewage Treatment Plant (Bath STP), the average daily flow is calculated to 60% of the rated capacity for the plant. The maximum daily treated raw water was recorded to 6,150 m<sup>3</sup>/d for Bath STP or 51% of its maximum rated capacity. Bath STP sees the highest flows during periods of heavy rain and melting snow/ice. This confirms that the systems is subject to inflow and infiltration (I/I).

Efforts to reduce I/I of both sewage collection systems are continuing to improve the efficiency of the treatment process, and to delay a costly expansion of both treatment facilities.

The ECA limit for E. coli in the final effluent at AWPCP was exceeded in July, August, September, and October 2022. The instances were likely the result of significant wildlife activity in the wetland. Once temperatures decreased and flows increased again, no further issues could be observed. pH in the final effluent of the AWPCP increased in September, and peaked in October and November 2022, occasionally exceeding the ECA limit of 9.5. By ensuring that effluent is distributed evenly through all wetland trains, pH decreased quickly to the normal operating range. Monthly summaries of the daily pH-measurements were provided to the MECP District Office.

As required by the ECA, notifications of the exceedances were made verbally and in written to the MECP District Office and the Spills Action Centre (SAC). No further action is required at that time.

For the Bath STP all ECA limits were met in 2022, except for one slight exceedance of the total phosphorous (TP) monthly average concentration in January 2022. The facility experienced process performance issues at that time and resulted in elevated TP concentrations in the final effluent. By diligently adjusting the processes at the plant the TP concentrations quickly decreased. The exceedance was reported to the MECP's district office and SAC as required. No further action is required at that time.

Both treatment plants were operated in compliance with federal requirements in 2022.

**Loyalist's wastewater facilities are treating sewage in accordance with provincial and federal requirements**

## 2. Process Overview

### 2.1. Amherstview Water Pollution Control Plant (AWPCP)

Environmental Compliance Approval	2888-9RNM62 dated January 29, 2015
Project Number:	110000196
Design Capacity:	6,400 m <sup>3</sup> /d (average day flow) 16,000 m <sup>3</sup> /d (maximum day flow)

The Amherstview WPCP services Odessa, the Loyalist East Business Park and Amherstview. Its rated capacity is 6,400 m<sup>3</sup>/d and it has a peak flow capacity of 16,000 m<sup>3</sup>/d. It is discharging continuously to a leg of the Bayview Bog after disinfection and pH attenuation of the effluent in two polishing ponds (Cell 2 and Cell 1) and a wetland.

Wastewater from Odessa, the Loyalist East Business Park and Amherstview is pumped to the plant via 4 pumping stations. The raw wastewater enters the headworks for grit removal. The removed grit is hauled away for disposal. The influent then receives secondary treatment through a conventional, suspended biomass activated sludge process in two aeration tanks with fine bubble aeration. The mixed liquor consists of influent mixed with return activated sludge (RAS). RAS is sludge removed from the final clarification tanks and contains microorganisms that naturally occur in wastewater and facilitates its degradation. In the presence of oxygen, these microorganisms break down organic material in the wastewater. The aeration tanks are equipped with ceramic disk diffusers and the air is supplied to the aeration tanks through electrically driven blowers. Phosphorous is removed by adding aluminum sulfate to the mixed liquor.

The mixed liquor from the aeration tank proceeds to the final clarifier where the remaining solids settle to the bottom of the tank. A part of the sludge is returned as RAS to the aeration tank, the rest undergoes thickening via a Gravity Belt Thickener (GBT) by adding polymer and stabilization in an Autothermal Thermophilic Aerobic Digester (ATAD) before being stored at the biosolids storage and hauled by a licensed third party (refer to section 11).

The septage receiving station is not operating due to financial constraints.

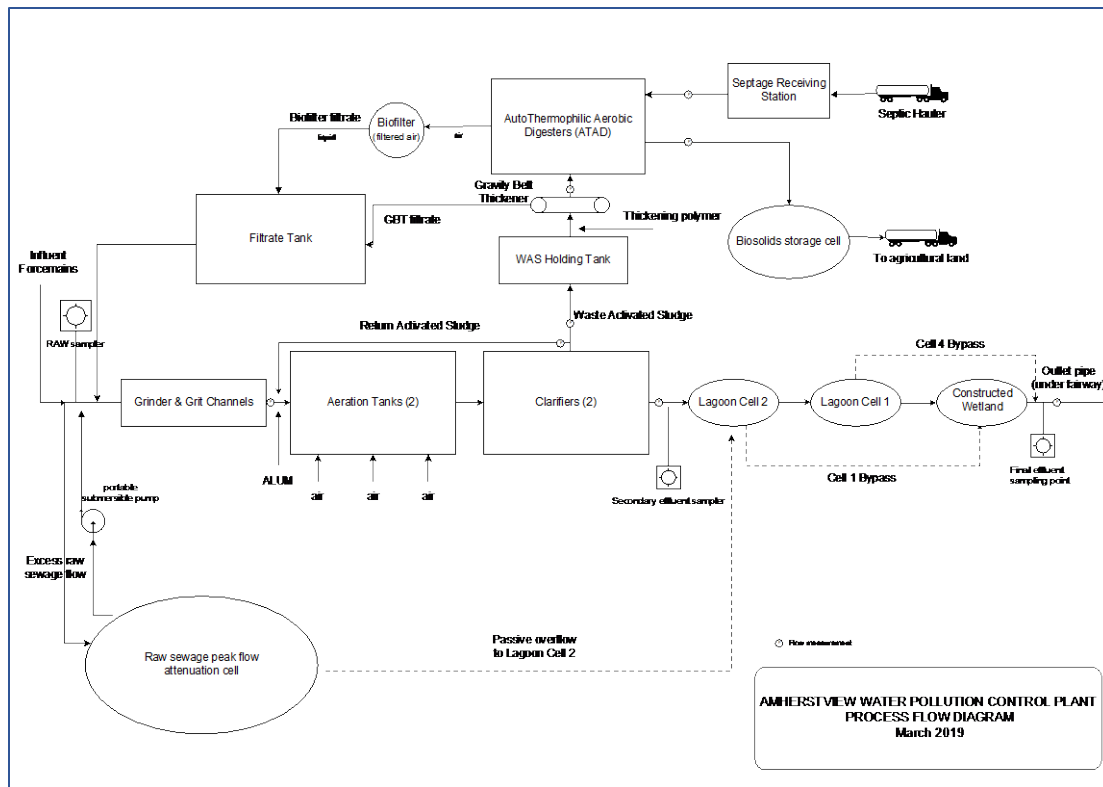


Figure 1 Schematic Process - Amherstview WPCP

## 2.2. Bath Sewage Treatment Plant (BSTP)

Environmental Compliance Approval	1869-94XQH6 dated March 14, 2013
Project Number:	120000177
Design Capacity:	3,008 m <sup>3</sup> /d (average day flow)
	12,032 m <sup>3</sup> /d (maximum day flow)

The Bath Sewage Treatment Plant (Bath STP), servicing the Village of Bath and the Bath and Millhaven Institutions operated by Correctional Service Canada, has a rated capacity of 3,008 m<sup>3</sup>/d and a peak flow capacity of 12,032 m<sup>3</sup>/d. It is continuously discharging to Lake Ontario after disinfection of the final effluent with UV.

The wastewater is pumped via four pumping stations and also flows via common gravity sewer to the wastewater treatment plant. The raw sewage enters the headworks for primary treatment (screening and grit removal). In the secondary treatment, the

dissolved and suspended organic material is digested in three aeration tanks, each equipped with a fine bubble diffuser network and related appurtenances. The nutrient phosphorous is removed by adding aluminum sulfate. The solids settle in the larger of two circular clarifiers before the effluent is disinfected by UV and then discharged to Lake Ontario.

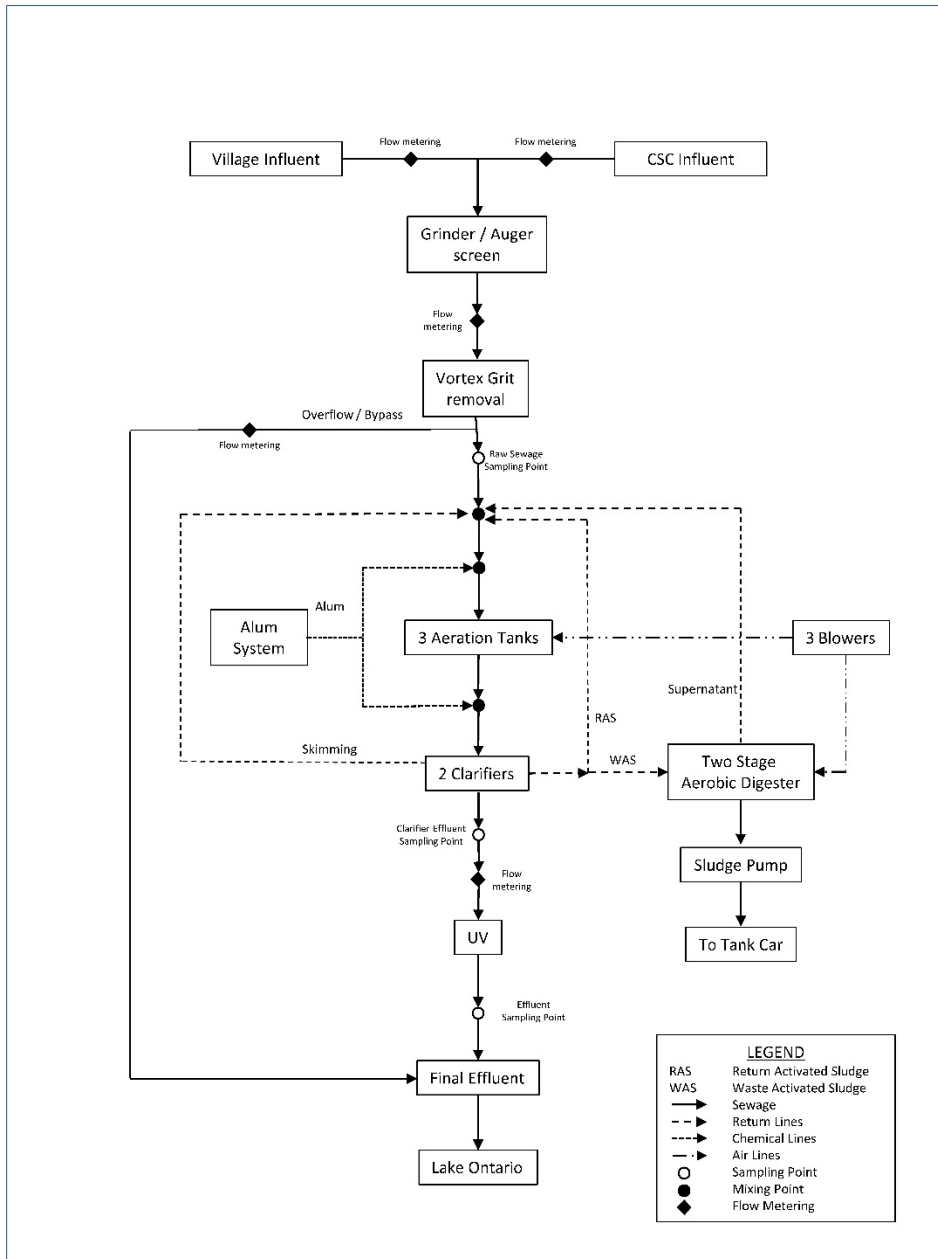


Figure 2 Schematic Process Bath STP



A part of the produced sewage sludge is returned as RAS to the aeration tanks. The excess undergoes sludge treatment in an aerobic sludge digester. The sludge is thickened with a polymer and regularly hauled by a licensed third party (refer to Section 11).

### 3. Sewage Collection System

#### 3.1. Loyalist East Collection System

Raw sewage from Odessa is pumped via Bridge Street pumping station, from Amherstview via Islandview pumping station and Lakeview pumping station and from the Business Park via Taylor Kidd Pumping Station to the Amherstview WPCP. The total and monthly volume of sewage pumped from Bridge Street and from Amherstview in 2022 is summarized in Table 1.

	FLOW 2022 (m <sup>3</sup> )					
	TOTAL FLOW	AVG DAY	MAX DAY	TOTAL FLOW	AVG DAY	MAX DAY
	Bridge St SPS	Bridge St SPS	Bridge St SPS	Lakeview SPS	Lakeview SPS	Lakeview SPS
	ODESSA	ODESSA	ODESSA	AMHERSTVIEW	AMHERSTVIEW	AMHERSTVIEW
JAN	23,289	751	1,170	69,594	2,245	3,075
FEB	35,469	1,267	2,676	86,289	3,082	8,928
MAR	58,429	1,885	3,289	125,611	4,085	6,136
APR	50,188	1,673	3,050	120,790	7,026	7,418
MAY	38,988	1,258	2,064	89,361	2,883	4,969
JUN	41,472	1,382	3,777	111,424	3,714	15,924
JUL	17,003	548	746	66,391	2,142	2,888
AUG	16,688	538	764	63,484	2,048	2,889
SEPT	17,485	583	865	68,030	2,268	4,667
OCT	22,091	749	1,160	70,367	2,365	2,785
NOV	35,214	1,174	2,952	85,116	2,837	5,237
DEC	54,510	1,758	4,492	118,949	3,837	9,761
YEARLY TOTAL	410,826			1,075,406		
MAX MONTH			4,492			15,924
AVERAGE MONTH		1,131			3,211	

Table 1 Sewage Volumes in the Loyalist East Collection System 2022

A total of 410,826 m<sup>3</sup> was pumped from the Bridge Street pumping station in 2022. The maximum volume recorded was 4,492 m<sup>3</sup> in December during a significant storm event. The daily average calculated was 1,131 m<sup>3</sup>/d. The pump station is designed for 7,430 m<sup>3</sup>/d.

In 2022, from the Lakeview sewage pumping station the total volume of sewage pumped was 1,075,406 m<sup>3</sup> for an average of 3,211 m<sup>3</sup>/d and a maximum day of 15,924 m<sup>3</sup> in June. The pump station is designed for a peak flow of 23,000 m<sup>3</sup>/d.

Peak flows are recorded during heavy precipitation events, which indicate a significant amount of inflow and infiltration (I/I) in the sewage catchment area of this pumping station. Township staff is continuing with infiltration reduction work such as manhole and sewer lateral repairs.

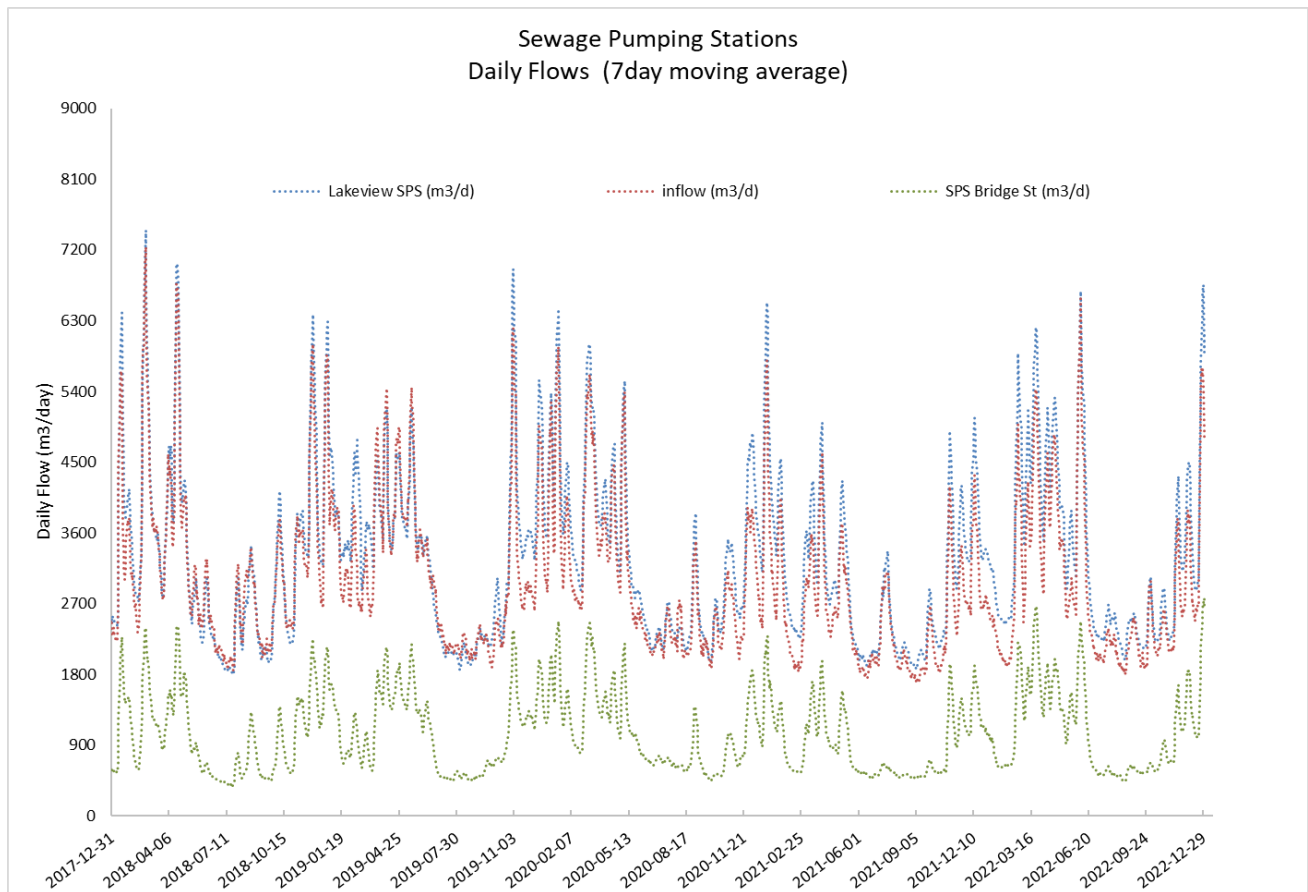
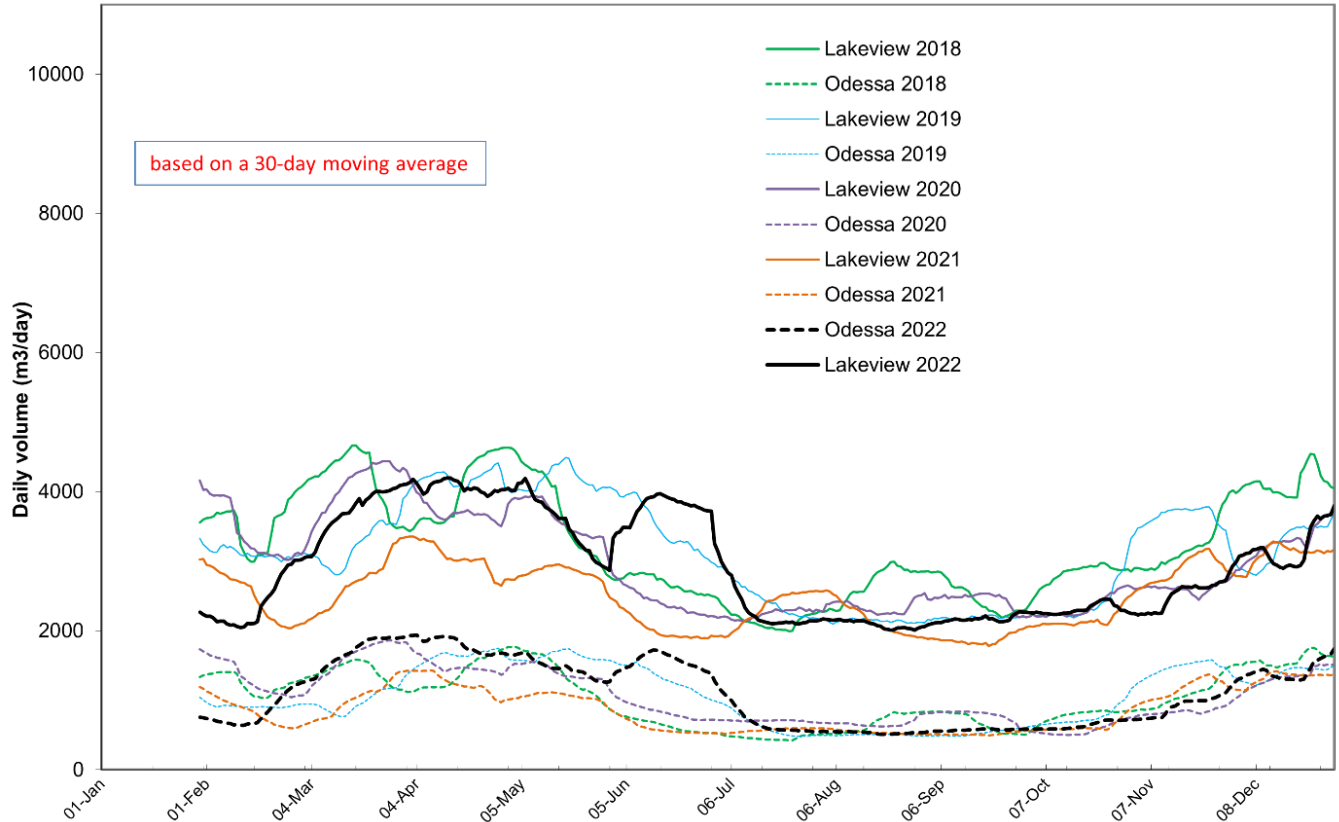


Chart 1 AWPCP Sewage Pumping Stations - Daily Flows (7-day moving average) 2018-2022

**Amherstview WPCP - Raw flow trends by SPS**



*Chart 2 AWPWP Collection System - Raw Flow Trends 2018-2022*

The pumping station flow meters at Lakeview Sewage Pumping Station, Bridge Street Sewage Pumping Station and Taylor Kidd Sewage Pumping Station were checked and calibrated by an external provider on April 12, 2022.

No complaints were received from the operation of the pumping stations in 2022.

Station maintenance at the pumping station of the Loyalist East Collection System included:

- Vibration analysis on larger pumps and blowers
- Preventive maintenance program on all major equipment at all four pumping stations
- Annual generator service
- Upgrade of the generator fuel system at the Bridge Street Pumping Station to meet standard

### 3.2. Bath Collection System

The raw sewage is pumped via four pumping stations to the Bath STP. The average daily pumping hours are summarized in the following chart. The data indicates inflow and infiltration (I/I) during periods of heavy rain and mild spring weather due to melting snow and ice.

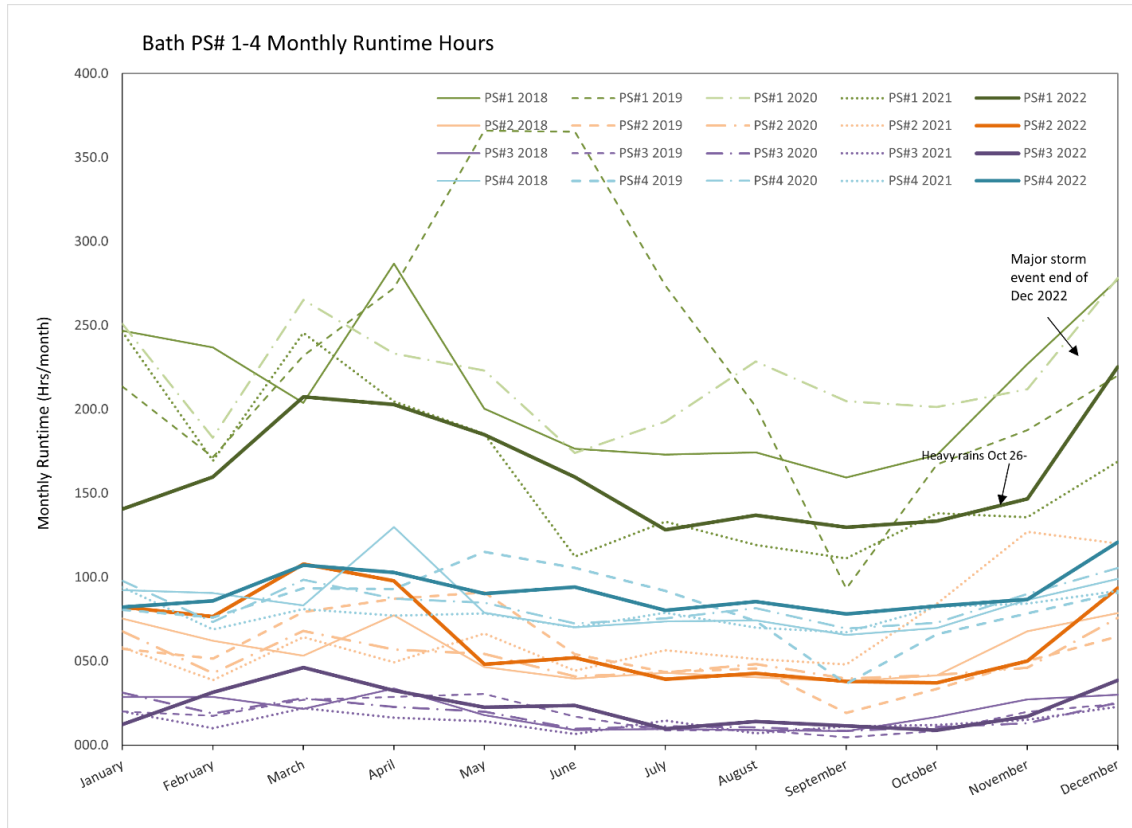


Chart 3 Bath Collection System - Monthly Pumping Hours SPS 1-4, 2018-2022

The following maintenance activities occurred at the Bath Sewage Pumping Stations:

- Vibration analysis on larger pumps and blowers
- Preventive maintenance program on all major equipment at all four pumping stations
- Annual generator service
- Replaced PLC and HMI at Sewage Pumping Station 1
- Pump replacement at Sewage Pumping Station 2

Monitoring equipment was checked and calibrated by a third-party provider on April 11, 2022.

## 4. Pumping Stations Overflow Events

There are no pumping station overflow events to report for the collection systems of Loyalist East or Bath in 2022.



*Figure 3 Cleaning of Islandview SPS*



## 5. Flow Monitoring

### 5.1. Influent

#### Amherstview WPCP

As defined by the Environmental Compliance Approval (ECA), the rated capacity of the system at Amherstview WPCP is the flow of sewage into the sewage treatment plant, so the influent flow is used to determine capacity compliance.

The annual average flow to the treatment system (influent) for 2022 was 3,399 m<sup>3</sup>/d, 53% of the plant's rated capacity of 6,400 m<sup>3</sup>/d (refer to Table 2).

The maximum daily flow to the plant in 2022 was 12,421 m<sup>3</sup>/d in December 2022 and calculated to 78 % of the maximum rated daily capacity of 16,000 m<sup>3</sup>/d.

	UNIT	INFLUENT Amherstview WPCP 2022			INFLUENT Bath STP 2022		
		TOTAL	AVG DAY	MAX DAY	TOTAL	AVG DAY	MAX DAY
ECA CRITERIA	m <sup>3</sup>		6,400	16,000		3,008	12,032
JAN	m <sup>3</sup>	85,848	2,769	3,464	45,521	1,468	1,833
FEB	m <sup>3</sup>	106,338	3,798	7,688	49,600	1,771	3,182
MAR	m <sup>3</sup>	149,833	4,833	7,220	63,323	2,043	3,275
APR	m <sup>3</sup>	136,986	4,566	6,791	69,044	2,301	3,514
MAY	m <sup>3</sup>	106,301	3,429	4,698	58,038	1,872	2,655
JUN	m <sup>3</sup>	123,015	4,101	11,301	58,363	1,945	4,610
JUL	m <sup>3</sup>	74,387	2,400	3,299	46,721	1,507	2,333
AUG	m <sup>3</sup>	71,183	2,296	2,965	49,435	1,595	3,651
SEPT	m <sup>3</sup>	71,920	2,397	3,685	46,394	1,546	2,093
OCT	m <sup>3</sup>	76,289	2,461	3,570	48,441	1,563	1,961
NOV	m <sup>3</sup>	97,978	3,266	6,133	52,608	1,754	2,976
DEC	m <sup>3</sup>	138,674	4,473	12,421	71,814	2,317	6,150
YEARLY TOTAL	m <sup>3</sup>	1,238,752			659,302		
MAX MONTH	m <sup>3</sup>			12,421			6,150
AVERAGE MONTHLY	m <sup>3</sup>		3,399			1,807	
Percentage of rated capacity	%		53	78		60	51

Table 2 Sewage Inflow - Amherstview WPCP & Bath STP 2022

Inflow and infiltration (I&I) identification efforts are continuing.

The flow trend pattern, peak flows (Chart 4 and 5) and the low concentration of the parameters, analyzed in the raw sewage (refer to Section 6), continue to indicate significant I&I into the Loyalist East sewage collection system, especially during periods of heavy rain, snow melt, and mild spring weather.

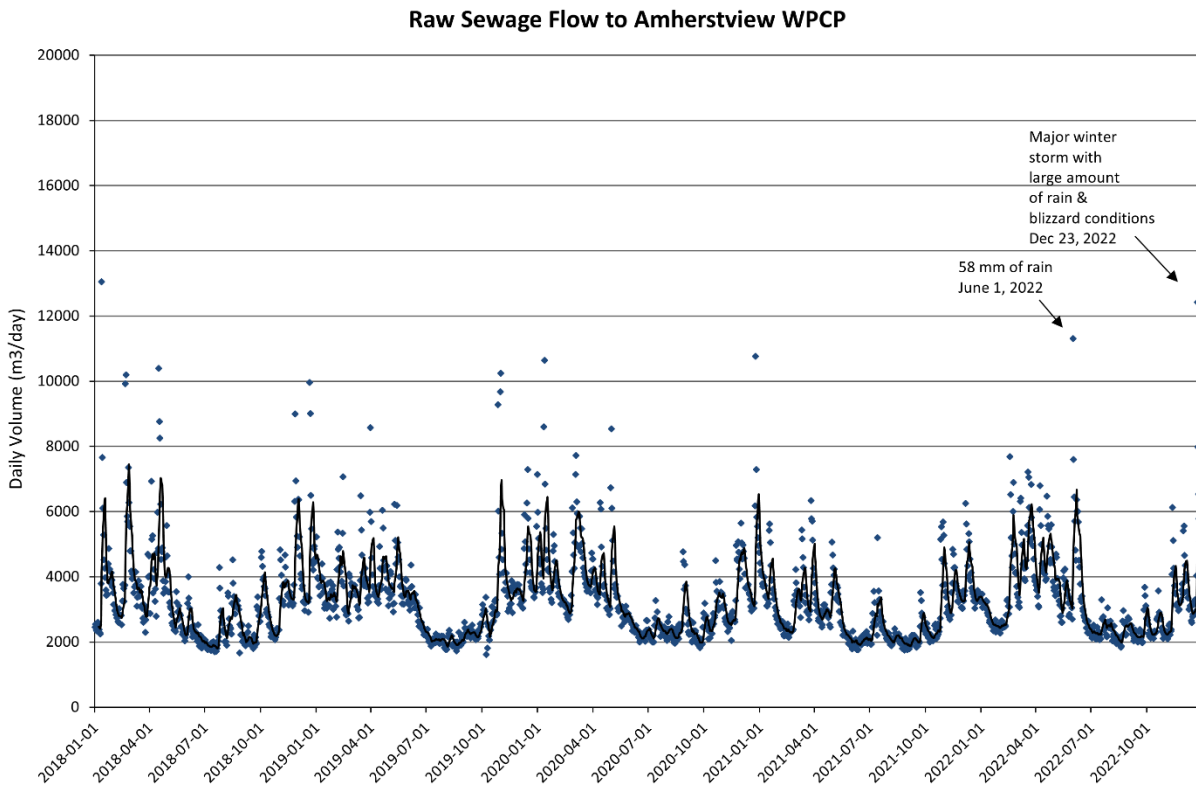


Chart 4 Raw Sewage Flow (m³/d) to Amherstview WPCP 2018-2022

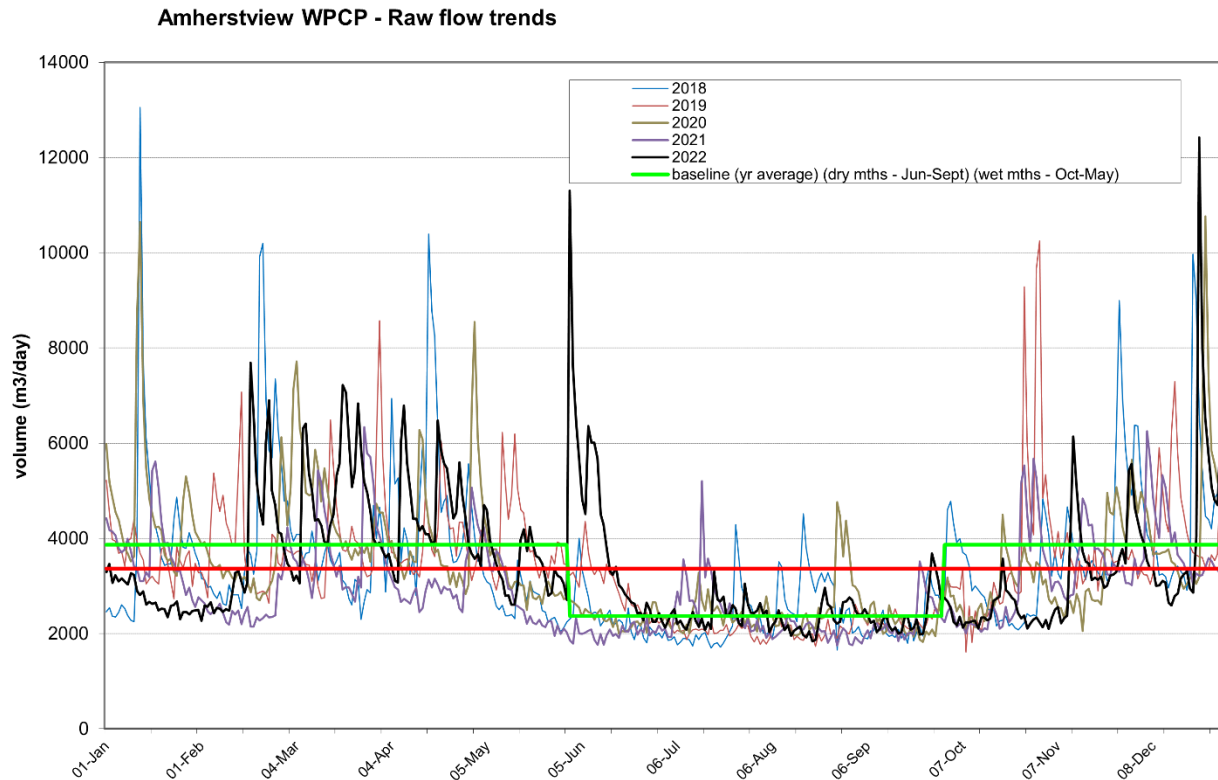


Chart 5 Raw Flow Trend (m<sup>3</sup>/d) Amherstview WPCP 2018-2022

## Bath STP

As defined by the Environmental Compliance Approval (ECA), the rated capacity of the system in Bath is the flow for which it is approved to handle. We have interpreted this to mean the flow of sewage into the sewage treatment plant, so the influent flow is used to determine capacity compliance.

The annual average daily flow to the Bath sewage treatment plant (Bath STP) for 2022 was 1,807 m<sup>3</sup>/d and just about the half of the flow came from Correctional Services Canada (CSC) Millhaven and Bath Institutions. The plant is designed to treat an average of 3,008 m<sup>3</sup> per day; therefore, it is at 60 % of its designed capacity (see Table 2). The annual maximum daily flow to the plant was 6,150 m<sup>3</sup>/d in December 2022 due to I&I.



BSTP - Raw Sewage Flow to Plant

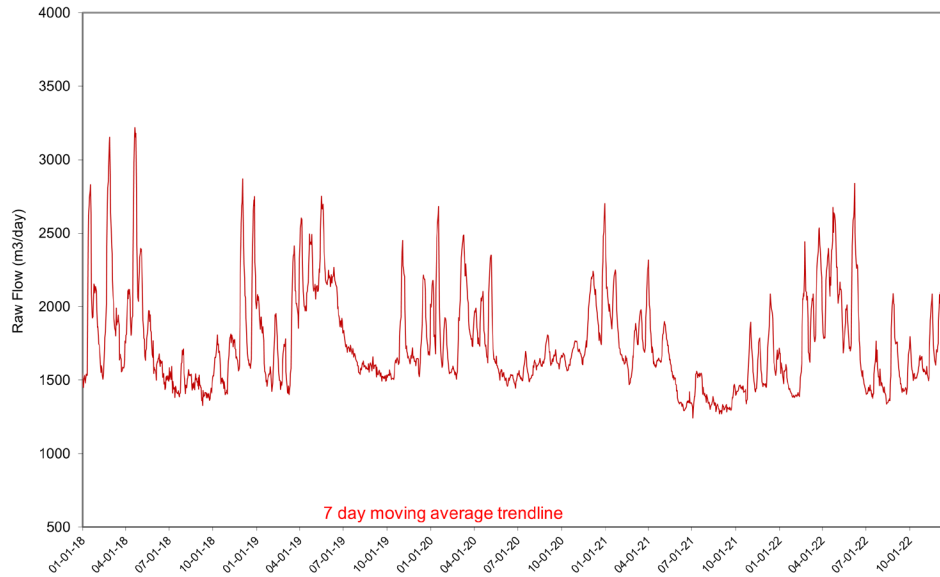


Chart 6 Raw Sewage Flow (m<sup>3</sup>/d) to Bath STP 2018-2022

Peak flows are also on the rise for the Bath system during periods of heavy rain. Staff will focus suspected main sources of inflow and infiltration.

BSTP - Raw Flow Trend 2018-2022

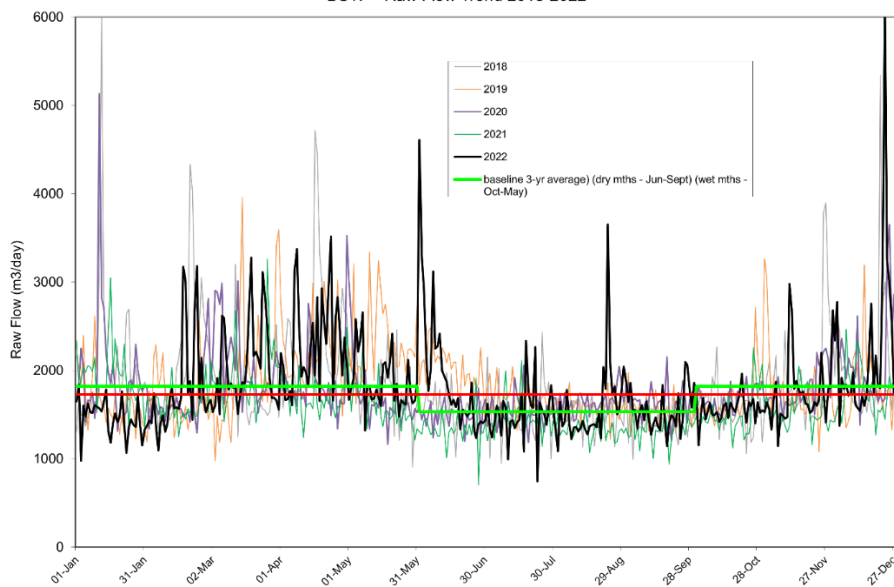


Chart 7 Bath STP - Raw Flow Trend (m<sup>3</sup>/d) 2018-2022

## 5.2. Effluent

In accordance with the ECA, flow meters are installed at the final outfall of both sewage treatment systems.

At Amherstview WPCP the final effluent V-notch weir, located at the end of the polishing lagoon and pH attenuation process, was checked and calibrated by a third-party provider on April 12, 2022.

From the lagoon and wetland an annually amount of 1,198,546 m<sup>3</sup> was discharged to the bog. The annual daily discharge average was calculated to 3,290 m<sup>3</sup>/d and the maximum daily volume discharged was 15,607 m<sup>3</sup>/d in December 2022.

The yearly plant effluent at Bath STP was calculated to 561,403 m<sup>3</sup>. An annual average daily volume of 1,539 m<sup>3</sup>/d was discharged to Lake Ontario. A maximum day flow of 5,896 m<sup>3</sup>/d was registered in December 2022.

In Table 3 the effluent flows in 2022 are summarized for Amherstview WPCP and Bath STP.

	AMHERSTVIEW WPCP 2022						BATH STP 2022		
	PLANT EFFLUENT			FINAL EFFLUENT*			PLANT EFFLUENT		
	TOTAL (m <sup>3</sup> )	AVG DAY (m <sup>3</sup> /d)	MAX DAY (m <sup>3</sup> /d)	TOTAL (m <sup>3</sup> )	AVG DAY (m <sup>3</sup> /d)	MAXDAY (m <sup>3</sup> /d)	TOTAL (m <sup>3</sup> )	AVG DAY (m <sup>3</sup> /d)	MAXDAY (m <sup>3</sup> /d)
JAN	81,588	2,632	3,224	79,807	2,574	3,221	39,622	1,278	1,600
FEB	100,972	3,606	8,630	104,147	3,720	7,683	43,559	1,556	2,898
MAR	148,239	4,782	7,838	127,329	4,107	6,057	54,973	1,773	2,916
APR	134,632	4,488	6,430	127,705	4,257	6,928	58,610	1,954	3,081
MAY	100,858	3,253	4,607	124,694	4,022	7,522	50,083	1,616	2,281
JUN	124,135	4,138	14,012	131,856	4,395	9,893	49,567	1,652	4,320
JUL	65,139	2,101	2,999	55,334	1,785	3,396	38,778	1,251	2,150
AUG	65,388	2,109	2,867	64,913	2,094	3,739	41,354	1,334	3,321
SEPT	69,779	2,326	4,434	67,527	2,251	5,789	37,641	1,255	1,857
OCT	73,071	2,357	4,042	74,934	2,417	3,418	39,889	1,287	1,593
NOV	93,677	3,123	6,857	101,829	3,394	5,879	44,357	1,479	2,663
DEC	142,982	4,612	15,607	138,471	4,467	15,607	62,970	2,031	5,896
YEARLY TOTAL	1,200,460			1,198,546			561,403		
MAX MONTH			15,607			15,607			5,896
AVERAGE MONTH		<b>3,294</b>			<b>3,290</b>			<b>1,539</b>	

\*Final Effluent flows at the AWPCP for January, February, March and December are a combination of measured SE flows and actual measured flows at the final effluent weir.

Table 3 Final Effluent Flow - Amherstview WPCP and Bath STP 2022

## 6. Performance Monitoring and Effluent Quality Control Measures

All samples listed in section 9 of each ECA are collected by certified operators at locations and frequencies listed in that same section and, except for pH and temperature, are analyzed by Caduceon Environmental Laboratories, federally accredited to conduct these analyses.

Temperature and pH, as well as additional samples collected for operational control and effluent quality assurance, are analyzed in house by certified operators. Where applicable, if a specific parameter is analyzed by the contracted lab and in house, the analytical results for both are included in the calculation of averages as required by the ECA.

Standard Operation Procedures, emergency plans, equipment preventative and predictive maintenance help ensure a rapid and effective response to issues and maintain the high quality of the effluent and biosolids.

### 6.1. Amherstview WPCP

Raw sewage is sampled and tested as listed in the ECA section 9 (3) for BOD<sub>5</sub>, total suspended solids, total phosphorous, TKN, alkalinity, pH and temperature. The average concentrations are summarized in the following table 4.

Metcall & Eddy, 2003 lists expected concentrations in municipal wastewater:

TSS: 120-370 mg/l	BOD <sub>5</sub> : 120-380 mg/l
TP: 4-12 mg/l	TKN: 20-705 mg/l

A comparison of these values with the average concentration measured at the Amherstview WPCP indicates significant inflow and infiltration during periods of high precipitation, snow melt and mild spring weather.

	RAW SEWAGE AWPCP – AVERAGE 2022						
	ALKALINITY	BOD <sub>5</sub>	pH	TOTAL PHOSPHOROUS	TEMP.	TKN	TOTAL SUSPENDED SOLIDS
	mg/l	mg/l	-	mg/l	°C	mg/l	mg/l
JAN	340	135	7.6	4.3	11.4	30	169
FEB	287	108	7.8	3.8	9.2	38	103
MAR	262	59	7.5	2.3	8.5	19	65
APR	294	79	7.9	2.7	10.3	30	133
MAY	270	98	8.0	3.6	13.1	28	127
JUN	319	111	7.8	2.9	16.0	10	115
JUL	331	218	7.5	4.9	18.8	57	153
AUG	327	157	7.4	4.4	19.4	38	171
SEPT	301	167	7.8	5.4	19.2	39	171
OCT	311	138	7.8	4.7	17.6	31	150
NOV	320	102	7.7	3.5	14.5	38	106
DEC	252	126	7.8	3.9	12.3	46	142
MIN MONTH	252	59	7.4	2.3	8.5	10	65
MAX MONTH	340	218	8.0	5.4	19.4	57	171
AVERAGE MONTH	301	125	7.7	3.9	14.2	34	134

Table 4 Raw Sewage Sampling Amherstview WPCP 2022

Before the treated water leaves the plant to the lagoons and the wetland, a secondary effluent sample is taken and analyzed for alkalinity, total ammonia, CBOD<sub>5</sub>, nitrate, nitrite, pH, total phosphorous, temperature and total suspended solids.

In Table 5 the average concentration is listed. Sampling at this location assists in making process adjustment so the final effluent, at the end of the wetland, meets the ECA’s performance criteria and objectives.

For 2022 the monthly average CBOD<sub>5</sub> concentration was calculated to less than 3 mg/l in the secondary effluent (SE). Total Phosphorous (TP) was 0.49 mg/L and Total Suspended Solids (TSS) were determined to be 6 mg/L in the secondary effluent (details see Table 5).

The maximum monthly average concentration of CBOD<sub>5</sub> was determined to be 4 mg/L, 0.81 mg/L for TP and 11 mg/L for TSS. The monthly TP concentration of 0.81 mg/L in the secondary effluent in November was caused by maintenance activities and repairs to the North Clarifier.

	SECONDARY EFFLUENT PLANT – AVERAGE 2022								
	ALKALINITY	T. AMMONIA	CBOD <sub>5</sub>	NITRATE	NITRITE	pH	TP	TEMP	TSS
	mg/l	mg/l	mg/l	mg/l	mg/l	-	mg/l	°C	mg/l
JAN	212	1.08	<3	17.60	<0.1	7.3	0.34	9.4	3
FEB	109	0.32	<3	15.60	<0.1	7.6	0.27	8.3	7
MAR	152	1.90	<3	9.20	<0.1	7.3	0.37	7.8	9
APR	187	0.09	<3	13.30	<0.1	7.0	0.38	9.7	8
MAY	186	0.29	<3	17.20	0.20	7.0	0.39	13.3	4
JUN	169	0.08	4	23.20	0.40	6.9	0.62	16.5	11
JUL	69	0.56	<3	28.10	0.23	6.7	0.62	19.8	6
AUG	58	0.51	<3	26.90	0.10	6.8	0.75	21.3	4
SEPT	63	0.08	<3	27.70	<0.1	7.1	0.43	20.0	4
OCT	90	0.07	<3	22.70	<0.1	7.0	0.42	17.5	4
NOV	122	0.06	<3	18.40	<0.1	6.9	0.81	14.8	6
DEC	125	0.03	<3	16.40	<0.1	7.0	0.43	11.5	6
MIN MONTH	58	0.03	<3	9.20	<0.1	6.7	0.27	7.8	3
MAX MONTH	212	1.90	<3	28.10	<0.1	7.6	0.81	21.3	11
AVERAGE MONTH	128	0.42	<3	19.69	<0.1	7.0	0.49	14.2	6

Table 5 Secondary Effluent (Plant) Amherstview WPCP 2022

The plant's effluent is disinfected in 2 polishing lagoons (Cell 2 followed by Cell 1) and pH attenuation occurs in the wetland downstream from the lagoons. The passive disinfection and pH attenuation natural process traditionally performs well by producing final effluent with results that meet the performance criteria and objectives specified in the ECA (monthly average concentrations and annual average loadings). The process can observe seasonal challenges though (see Table 6):

Active algae blooms in the disinfection lagoons are presumed to be causing elevated pH in the final effluent. At the end of September 2022, pH increased and peaked in October and November, occasionally exceeding the ECA limit of 9.5 (see Chart 8). Although operators adjusted flows throughout the wetland when pH started to climb, the first pH limit exceedance occurred on October 4<sup>th</sup> and was measured to be 9.64. As per protocol samples were then analyzed daily until December 2<sup>nd</sup>. During this period, 8 samples exceeded the ECA limit of 9.5. A pH maximum of 9.81 was measured on the 17<sup>th</sup> of November 2022.

	FINAL EFFLUENT PLANT - AVERAGE								
	E. coli**	T. AMMONIA	CBOD <sub>5</sub>	NITRATE	NITRITE	pH	TP	TEMP	TSS
	cfu/100 ml	mg/l	mg/l	mg/l	mg/l	-	mg/l	°C	mg/l
JAN	28	0.38	<3	12.60	<0.1	7.67	0.26	0.8	4
FEB	65	0.36	<3	13.30	<0.1	7.81	0.31	1.1	5
MAR	13	0.10	<3	6.93	<0.1	7.81	0.22	2.0	5
APR	5	0.06	<3	6.10	<0.1	7.46	0.11	8.4	5
MAY	39	0.07	<3	4.06	0.16	7.95	0.29	16.8	4
JUN	197	0.12	<3	2.68	<0.1	7.60	0.27	19.8	4
JUL	422	0.18	<3	0.08	<0.1	7.50	0.34	21.7	6
AUG	1,124	0.09	<3	0.06	<0.1	7.47	0.29	22.4	5
SEPT	408	0.08	<3	1.70	<0.1	8.12	0.26	17.9	3
OCT	224	0.05	<3	8.80	<0.1	9.33	0.25	11.4	4
NOV	49	0.04	<3	11.90	0.10	9.22	0.23	5.6	3
DEC	31	0.06	<3	13.70	<0.1	8.3	0.17	1.4	4
MIN MONTH	5	0.04	0.00	0.06	<0.1	7.46	0.11	0.8	3
MAX MONTH	1,124	0.38	0.00	13.70	<0.1	9.33	0.34	22.4	6
AVERAGE MONTH	217	0.13	<3	6.83	<0.1	8.02	0.25	10.8	4
ECA LIMIT	200**	3*/5**	15**			6.0 - 9.5	0.9**		25**
ECA OBJECTIVE	100**	2*/4**	10			6.5 - 9.0	0.7**		15
FEDERAL WSER			25						25***

3\* mg/l from Jun to Aug, 5 mg/l Sep to May

\*\* monthly average / geometric mean (for E.coli)

\*\*\* quarterly average & exemption for the 3<sup>rd</sup> quarter

Table 6 Amherstview WPCP - Final Effluent Average Concentration 2022

By ensuring that effluent is distributed evenly through all wetland trains, especially ensuring flow through the two southern-most trains that contain peat as the substrate, and a modification to the Wetland South Train inlet, pH decreased quickly to the normal operating range (see Chart 8). No further action was requested by the MECP.

As required by the ECA, notifications of the exceedances were made verbally and in written to the MECP District Office and the Spills Action Centre. Monthly summaries of the daily pH-measurements were provided to the MECP District Office.

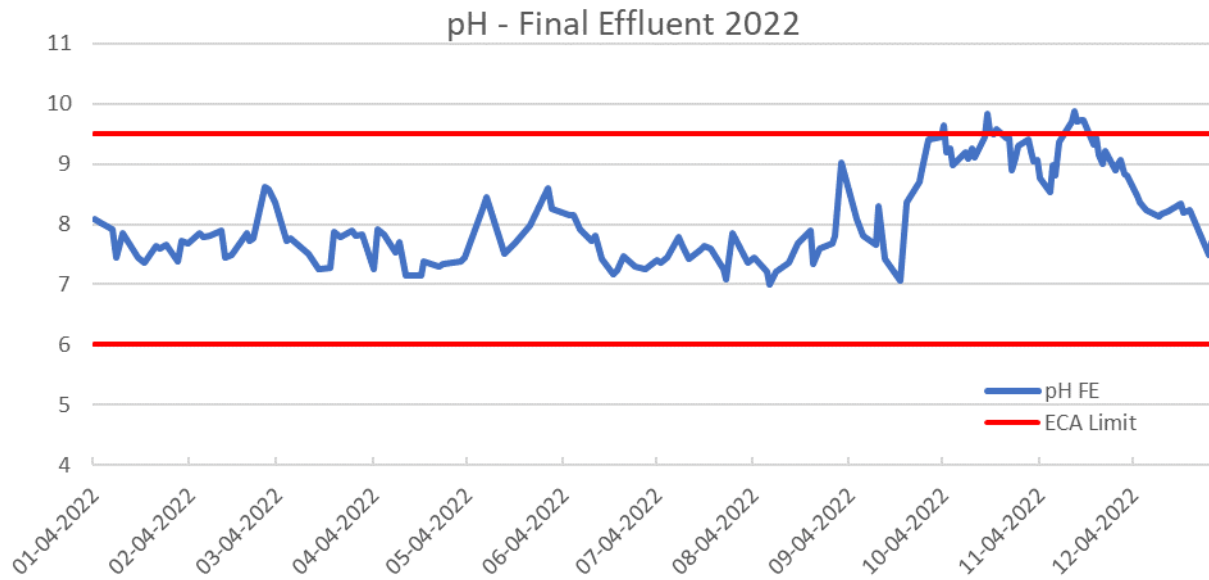


Chart 8 AWPCP – pH in the Final Effluent 2022

Grab samples for E.coli are taken at the outfall of each Disinfection Cell, and, as required by the ECA, at the final effluent outfall. In Chart 9 the bacti results for Cell I and the final effluent outfall are plotted. The graph for Cell I confirms that the polishing lagoons are disinfecting the effluent as intended before it is discharged to the wetland. The maximum monthly average for E.coli was calculated to be 89 CFU/100 ml at the outfall of Cell I. This is well below the limit (200 CFU/100 ml) and below the objective (100 CFU/100 ml) for the final effluent concentration set in the respective ECA.

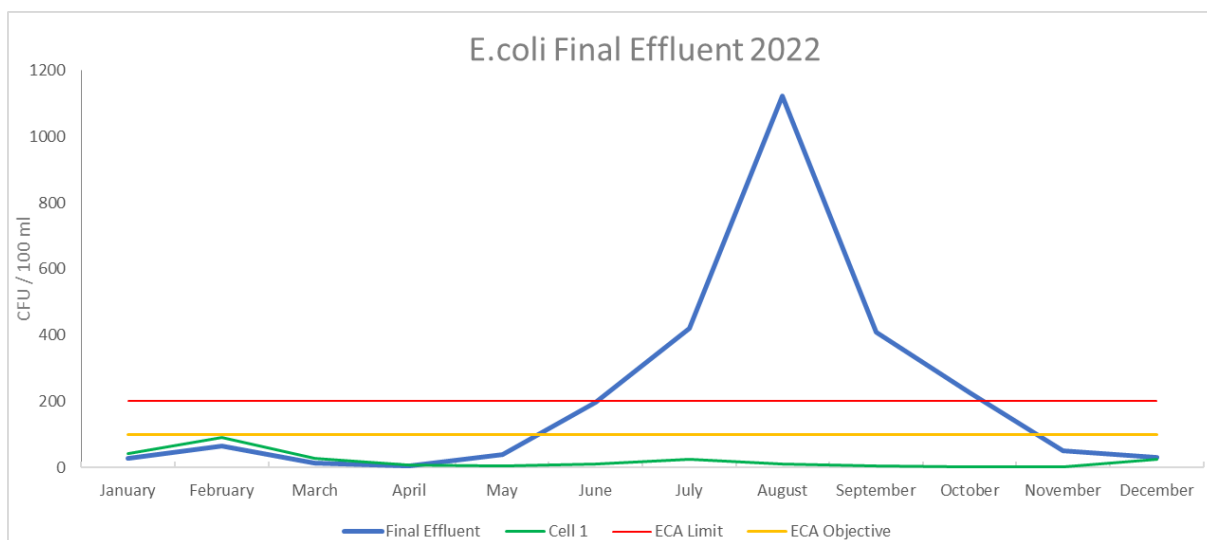


Chart 9 AWPCP – E. coli at the end of the disinfection process (Cell I) and the Final Effluent 2022



Although the disinfection process was working, the hot and dry summer in 2022, correlated low flows and animals (birds, waterfowl and small mammals) that frequented the wetland very likely led to exceedances of the monthly limit of 200 CFU/100 ml for E. coli in July, August, September, and October.

The geometric mean density of E. coli in the final effluent was calculated as follows for the exceedances: 422 CFU/100ml in July; 1124 CFU/100ml in August; 408 CFU/100ml in September; and 224 CFU/100ml in October. As required by the ECA, notification was made verbally and in writing to the MECP District office and Spills Action Centre. No further action was requested by the MECP.

As per ECA definition, the loading concentration value is obtained by multiplying the concentration of the contaminant by the average daily flow. Final effluent loadings were well below the ECA limit in 2022 (see Table 7).

	FINAL EFFLUENT LOADINGS (kg/day)			
	AVERAGE CBOD5	AVERAGE SUSPENDED SOLIDS	AVERAGE TOTAL PHOSPHOROUS	AVERAGE TOTAL AMMONIA
JAN	4	10	0.7	1.0
FEB	6	19	1.2	1.3
MAR	6	21	0.9	0.4
APR	6	21	0.5	0.3
MAY	6	16	1.2	0.3
JUN	7	18	1.2	0.5
JUL	3	11	0.6	0.3
AUG	3	10	0.6	0.2
SEPT	3	6	0.6	0.2
OCT	4	10	0.6	0.1
NOV	5	11	0.8	0.1
DEC	7	18	0.8	0.3
MIN MONTH	3	6	0.5	0.1
MAX MONTH	7	21	1.2	1.3
AVERAGE MONTH	5	14	0.8	0.4
ECA LIMIT	96	160	5.7	19.2 / 32.0*

Table 7 AWPCP – Final Effluent Loadings – Monthly Average 2022

To keep the concentration and loading of each required parameter under the set objectives, some of our efforts include:

- Annual review of the infrastructure needs where recommendations for maintenance, rehabilitation and renewal programs are considered



- Monitoring of inflow and infiltration and long-term financial commitment to correct excessive flows into the wastewater collection system
- Provision of back up equipment and contingency processes to handle emergencies and maintenance shutdowns
- Preventive maintenance
- Certification and training of our operators to operate the systems efficiently and effectively.
- Additional in-house operational sampling beyond regulatory requirements



Figure 5 AWPCP Wetland

## 6.2. Bath STP

Raw sewage is sampled and tested as listed in the ECA section 9.4 for BOD<sub>5</sub>, total suspended solids (TSS) and total phosphorous (TP). The average concentrations are summarized in the Table 8 and indicate inflow and infiltration during periods of high precipitation and mild spring weather.

	RAW SEWAGE – MONTHLY AVERAGE		
	BOD <sub>5</sub>	TSS	TP
UNIT	mg/l	mg/l	mg/l
JAN	122	148	3.6
FEB	122	281	2.9
MAR	78	358	2.2
APR	91	435	2.4
MAY	88	170	3.2
JUN	99	142	3.0
JUL	275	244	5.0
AUG	118	195	3.6
SEPT	125	193	3.4
OCT	142	188	4.9
NOV	118	117	3.0
DEC	97	194	3.0
AVERAGE MONTH	123	222	3.4

Table 8 Bath STP - Average Raw Sewage Concentration 2022

Grab samples are collected for pH, temperature, and E. coli. Composite samples are collected for all other parameters (CBOD<sub>5</sub>, TSS, TP, total ammonia (as N, T-NH<sub>4</sub>), unionized ammonia (NH<sub>3</sub>)).

Results confirmed that the performance of the treatment facility is meeting the effluent limits as set in the respective ECA (see Table 9).

Final effluent sample results for 2022, expressed as:

- annual average concentration and loading for total suspended solids and carbonaceous biological oxygen demand (CBOD<sub>5</sub>);
- annual average loading for total phosphorous; and
- monthly geometric mean density for E.coli.

	CBOD <sub>5</sub>	TSS	TP	Loadings			T.NH <sub>4</sub> (N)	NH <sub>3</sub>	T	pH	E. coli
				CBOD <sub>5</sub>	TSS	TP					
	mg/l	kg/d	mg/l	mg/l	mg/l	°C	-	CFU/100 ml			
JAN	4	27	1.1	5	34	1.4	6.28	<0.01	8.0	7.0	3
FEB	<3	12	0.4	2	19	0.6	9.01	0.03	7.2	7.1	<1
MAR	<3	14	0.3	3	24	0.5	6.43	0.02	8.0	7.0	<1
APR	<3	13	0.2	3	25	0.4	5.20	0.02	10.0	7.1	<1
MAY	<3	10	0.3	2	16	0.4	0.51	0.09	14.2	6.9	<1
JUN	<3	11	0.4	2	18	0.6	0.04	<0.01	17.6	7.1	<1
JUL	<3	5	0.2	2	6	0.3	0.13	0.01	21.3	7.1	<1
AUG	<3	5	0.2	2	7	0.3	0.13	<0.01	22.7	7.2	<1
SEPT	<3	9	0.3	2	11	0.3	0.11	<0.01	21.0	7.2	<1
OCT	3	17	0.4	4	21	0.5	0.16	<0.01	17.6	7.3	4
NOV	<3	18	0.4	2	27	0.6	0.09	<0.01	15.3	7.4	<1
DEC	<3	17	0.4	3	35	0.8	0.10	<0.01	12.0	7.4	<1
<b>AVERAGE MONTH</b>	<b>3.7</b>	<b>13</b>	<b>0.4</b>	<b>2.8</b>	<b>20.3</b>	<b>0.5</b>	<b>2.35</b>	<b>&lt;0.01</b>	<b>14.6</b>	<b>7.1</b>	<b>4*</b>
ECA LIMITS	25	25	1**	75.2	75.2	3.0					200*
ECA OBJECTIVES	15	15	1**	45	45	3.0					
Federal WSER	25***	25***									

Table 9 Final Effluent Sample Results - Bath STP 2022

In 2022, the total suspended solids annual average concentration in the final effluent of the sewage treatment plant was well below the ECA objective. It was also below the allowable quarterly limit of 25 mg/l under the federal regulation for wastewater system effluent for all four quarters of 2022.

The Bath STP final effluent total phosphorous monthly average for January 2022 exceeded slightly the ECA limit of 1 mg/L. The facility experienced process performance issues in January. As a result, suspended solids concentration in the final effluent were elevated, which led to elevated total phosphorous (TP) residuals. Staff adjusted the processes at the plant very diligently and TP decreased to normal operational levels at the end of January, when suspended solids decreased as well. The exceedance was reported to the MECP district office and Spills Action Centre. No further action was required.

In a continued effort to address previous suspended solids and total phosphorous exceedances, the following steps were taken in 2022:

- Continued with additional monitoring of processes
- Continued operation with low retention time in the aeration cells
- Continued to biweekly haul the sludge in 2022

- Adjusted air flow to the aeration tanks as much as possible with the existing equipment – an upgrade to the aeration system to make further meaningful adjustments is planned for 2023/24
- Cover the clarifier weir to reduce algae growth
- Met with CSC to discuss the impact of the institutions on the sewage treatment facility – ongoing

The activated sludge process continues to operate in the low range of typical operating parameters for an activated sludge process, i.e., low loading rates, with longer hydraulic retention times (HRT) and thin sludge blanket. This reduces the system's ability to handle sudden variations such as higher flows, higher loadings and/or toxic loadings. Through observation and additional lab analysis, the increase in suspended solids concentration in the final effluent is most likely caused by pin floc and carryover of foam from the aeration tanks.

The specialized microbial analysis confirmed that the filamentous bacteria *Nocardia* is causing excessive foam. *Nocardia* proliferates in high fat, oil, and grease (FOG) environment and long retention time. The treatment plant is not designed to handle excessive volumes of FOG and we are currently developing a plan to reduce FOG reaching the facility. Preliminary observations suggest most of the FOG comes from the correctional institutions. Discussions are continuing to develop a plan to address FOG.

The occasional high total phosphorous concentration in the final effluent is linked to high suspended solids concentration in that same period. To keep the concentration of each required parameter under the set objectives, some efforts include:

- annual review of the infrastructure needs where recommendations for maintenance, rehabilitation and renewal programs are considered
- monitor inflow and infiltration and long-term financial commitment to correct excessive flows into the wastewater collection system
- provide back up equipment and contingency processes to handle emergencies and maintenance shutdowns
- certification and training of our operators to operate the systems efficiently and effectively
- additional in-house operational sampling beyond regulatory requirements
- engage a process consultant to evaluate process data to help develop an action plan to address performance deficiencies re: suspended solids removal
- as needed foam removal at the aeration cell and clarifier to decrease *Nocardia* concentrations in the solids.
- preventive maintenance

## 7. Chemical Usage

Polymer and aluminum sulphate are used during the treatment process at both wastewater treatment plants. The polymer is used to thicken the sludge and the aluminum sulphate is used to remove the nutrient phosphorous from the wastewater.

The following Table 10 outlines the annual chemical consumption for 2022.

	AMHERSTVIEW WPCP 2022				BATH STP 2022			
	SLUDGE THICKENING		PHOS. REMOVAL		SLUDGE THICKENING		PHOS. REMOVAL	
	POLYMER USED (l)	POLYMER DOSAGE (mg/l)	ALUM USED (l)	ALUM DOSAGE (mg/l)	POLYMER USED (kg)	POLYMER DOSAGE (kg/t)	ALUM USED (l)	ALUM DOSAGE (dry) (mg/l)
JAN	111	43.4	7,381	57.4	38	5.2	4,453	58.7
FEB	127	46.4	7,860	51.2	30	4.9	5,308	63.8
MAR	160	51.1	10,179	43.9	40	4.5	6,931	65.4
APR	231	76.3	9,503	43.8	31	4.6	7,345	63.9
MAY	208	71.3	8,507	50.6	35	5.0	6,031	62.5
JUN	70	23.8	9,927	60.1	34	4.4	5,833	62.2
JUL	50	16.6	8,243	70.0	28	4.5	4,997	65.5
AUG	88	26.2	9,000	79.8	21	3.8	5,198	63.0
SEPT	70	21.7	9,850	87.3	20	3.8	5,047	65.0
OCT	95	26.6	10,160	84.8	23	4.1	5,786	67.1
NOV	156	55.0	10,918	74.8	18	3.3	6,401	72.9
DEC	188	55.3	13,394	67.5	31	4.0	8,472	71.8
YEARLY TOTAL	1554		114,922		349		71,802	
AVERAGE	130	43	9,577	64.3	29	4.3	5,984	65.2

Table 10 Chemical Usage at Amherstview WPCP and Bath STP 2022

## 8. Notice of Modification

There were no notices of modification submitted to the MECP District Office in 2022 for Amherstview WPCP because no modifications pre-approved under Schedule B Section 1 took place.

For Lakeview pumping station there were no notices of modification submitted to the MECP District Office in 2022 because no modifications pre-approved under Schedule A Section 1 took place.





Ministry of  
the Environment

## Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA AND SEND A COPY TO THE WATER SUPERVISOR (FOR MUNICIPAL PLANTS) OR DISTRICT MANAGER (FOR INDUSTRIAL PLANTS)

### Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility

(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)

ECA Owner	ECA number	Issuance Date (mm/dd/yy)	Notice number
-----------	------------	-----------------------------	---------------

### Part 2 – Description of the modifications as part of the Limited Operational Flexibility

(Attach a detailed description of the sewage works)

Description shall include:

1. A detail description above of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. An assessment of the anticipated environmental effects
3. Updated versions of, or amendments to, all relevant technical documents required by this ECA that are affected by the modifications as applicable, e.g. site plan, design brief, drawings, emergency and spill prevention plan, etc.

### Part 3 – Declaration by Professional Engineer

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:

1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act, and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name (Print)	PEO License Number
Signature	Date (mm/dd/yy)
Name of Employer	

### Part 4 – Declaration by Owner

I hereby declare that:

1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name of Owner Representative (Print)	Owner representative's title (Print)
Owner Representative's Signature	Date (mm/dd/yy)

EAB Form June 20, 2013

Figure 6 Notice of Modification - Template

## 9. Bypass Spill, or Abnormal Discharge Events

There were no reportable bypass, spill, or abnormal discharge events in 2022 at Amherstview WPCP or Bath STP.

## 10. Monitoring Equipment Calibration, Verification, and Maintenance

Laboratory equipment is verified and/or calibrated as per the manufacturer's instructions. Furthermore, lab equipment was verified on site in April 2022 by a certified service technician. All lab equipment at Amherstview WPCP and Bath STP is functioning accurately and properly.

Flow meters at Amherstview WPCP were verified by a certified technician in April 2022. The verified flowmeters were within the acceptable range of accuracy.

All flow meters at Bath STP were also calibrated by a third-party provider in April 2022 and found to be within the accuracy range of  $\pm 15\%$ .

## 11. Sludge Removal

Smith Septic Services Limited (Smith's) is the Township's MECP-approved biosolids haulage contractor and is obligated to maintain and abide by ECA # 6069-5BXNTB, as amended, issued for a waste management system for the collection, transportation, or handling of processed organic waste and non-agricultural source material (NASM) and ECA # S-3708-42, as amended, issued for a waste disposal transfer site for the temporary storage of processed organic waste and NASM.

The Amherstview WPCP produced 21,574 m<sup>3</sup> of waste activated sludge in 2022, all of which was directed through a thickening process for further treatment in the Autothermal Thermophilic Aerobic Digestion (ATAD) units. The digested sludge is stored in the biosolids storage cell located east of the attenuation pond. The biosolids storage cell is designed to store up to 16,100 m<sup>3</sup> of stabilized sludge and is divided into 3 sections for maintenance purposes. Through thickening and digestion, a total of 3,309 m<sup>3</sup> of digested sludge was directed to the storage cell in 2022. Loyalist Township is not anticipating a significant change in the volume of biosolids produced in 2022.

At Amherstview WPCP a total of 7,184 m<sup>3</sup> of biosolids were hauled away in 2022 to Smiths' waste disposal transfer site, as mentioned above, for future land application as a soil conditioner to Wemp Farm under NASM plan #25209, to Barview Farms under NASM plan #23950, and to Bayview Farm under NASM plan # 25196.





Figure 7 AWPCP - Solids lagoon





Smith's hauled a total of 4,418 m<sup>3</sup> of stabilized sludge from the Bath STP to their certified storage lagoons. The material is blended with other processed organic waste and NASM generated within the Province of Ontario, to be ultimately land-applied on NASM sites.

Loyalist Township is not anticipating a significant change in the volume of biosolids produced in 2022 at Bath STP.

As a generator of biosolids, Loyalist Township has the obligation to test the sludge and communicate the results to the broker. Biosolids' acceptability for land application is determined by averaging the results of all samples taken in a four-month period preceding the transfer. At least 2 samples need to be taken within the 2-month period before hauling.

In 2022, the acceptable concentration levels were met for pathogens and all regulated metals at Amherstview WPCP and at Bath STP. Please refer to the Tables 11 to 13 in the Appendix (Section 15).

## 12. Plants Quarterly Reports

Quarterly reports (MUMP) for both wastewater treatment plants are submitted electronically to [wastewaterreporting@ontario.ca](mailto:wastewaterreporting@ontario.ca) and the MECP District Office on the prescribed forms supplied by the Ministry.

## 13. Complaints Arising from Operation of the Works

In 2022, Loyalist Township received a total of sixteen customer requests for the collection system of Amherstview WPCP.

One call was received for sewage smell on a private property caused by private plumbing issues. No action was required by the Township.

Nine requests were made in respect to odour at the Amherstview WPCP. The Township implemented odour tracking at the sewage treatment plant: Seven of the complaints were directly related to maintenance activities at the aeration cell, the biofilter and the biosolids pond. The other two odour complaints could be attributed to farmers spreading fertilizer on fields.

Six service requests were related to lateral sewer blockages. All of lateral sewer backups were private issues and no further action was required by the Township.

Two requests were received for the sewage collection system in Bath. One was due to odour in a home and the other one was related to a lateral sewer backup. No further action was required by the Township.

## 14. Maintenance on Major Structures and Equipment

### 14.1. Amherstview WPCP

This section also includes modifications completed as per the ECA's Schedule B Section 3:

- Routine Preventive Maintenance Activities
- Vibration analysis on larger pumps and blowers
- Drained, cleaned and inspected the South Aeration Cell and South and North Clarifier
- Replaced the GBT belt
- Drained, cleaned and inspected Biofiter Humidification Chamber
- Drained, cleaned and repaired ATAD 1
- Replaced ORP for ThermAer 2
- Cleared debris and installed rock at Southern-most Wetland Inlet
- Continued weed removal and trapping program in wetland

### 14.2. Bath STP

- Routine Preventive Maintenance Activities
- Vibration analysis on larger pumps and blowers
- Drained, cleaned, and inspected raw well and large clarifier
- Replaced flight scrapers in large clarifier
- Replaced clarifier sampler enclosure

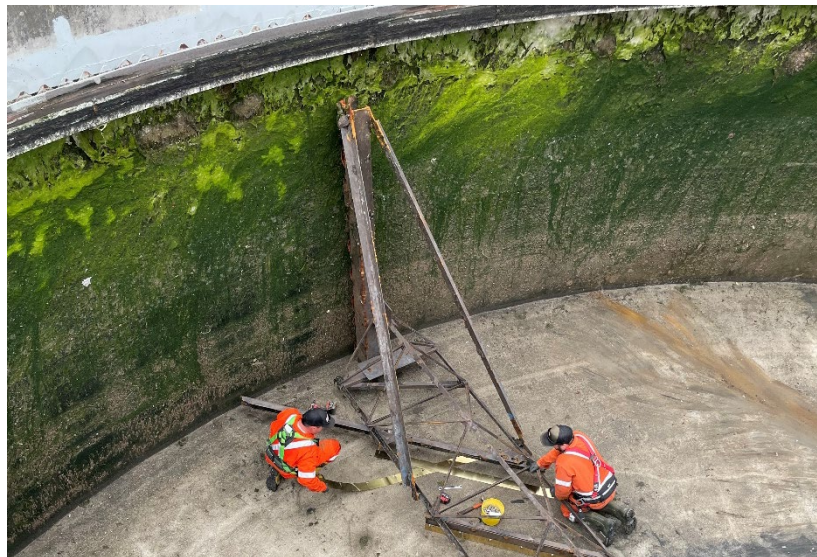


Figure 8 BSTP – Large Clarifier Maintenance

## 15. Appendix

<b>ATAD SLUDGE SAMPLING RESULTS</b>										
TEST DATE	29-Apr-22		26-May-22		28-Jun-22		08-Aug-22		29-Aug-22	
	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg
TS	15200		11300		11000		20400		22100	
TP	663		568		465		896		1040	
AMMONIA	864		1030		785		747		1040	
TKN	1650		1770		1400		1580		1990	
NITRITE	<1		<1		<1		<1		<1	
NITRATE	<1		1.3		<1		<1		1.3	
E-Coli (CFU/g)		<700		9000		2,000		<1000		<900
ARSENIC	<0.1	3.3	<0.1	4.4	<0.1	4.5	0.1	2.5	0.1	2.3
CADMIUM	<0.03	1.0	<0.03	1.3	<0.03	1.4	<0.03	0.7	<0.03	0.7
CHROMIUM	0.24	15.8	0.14	12.4	0.12	10.9	0.34	16.7	0.35	15.8
COBALT	<0.03	1.0	<0.03	1.3	0.03	1.4	0.04	0.7	0.07	0.7
COPPER	21	1381.6	13.2	1168.1	10.9	990.9	26.9	1318.6	32.6	1475.1
LEAD	0.2	6.6	<0.1	4.4	<0.1	4.5	0.2	2.5	0.2	2.3
MERCURY	0.008	0.5	0.004	0.4	0.003	0.3	0.009	0.0	0.009	0.0
MOLYBDENUM	0.16	1.6	0.09	8.0	0.08	7.3	0.14	1.2	0.23	1.1
NICKEL	0.28	18.4	0.18	15.9	0.15	13.6	0.38	18.6	0.37	1.1
SELENIUM	0.1	3.3	<0.1	4.4	<0.1	4.5	0.1	2.5	0.2	2.3
ZINC	8.24	542.1	4.82	426.5	4.18	380.0	9.45	463.2	11.9	538.5
<b>REGULATED METALS and PATHOGENS CONCENTRATION</b>										
		HAULING DATES	24-Aug-22	25-Aug-22	26-Aug-22	29-Aug-22	30-Aug-22	31-Aug-22	6-Sep-22	7-Sep-22
		VOLUME (m <sup>3</sup> )	240	520	400	240	280	280	560	560
		<b>ACCEPTABLE CONCENTRATION</b>	4-month Average*							
E-Coli (CFU/g)	2,000,000	cfu/g	4243	4243	4243	4243	4243	4243	4243	4243
ARSENIC	170	mg/kg	2.94	2.94	2.94	2.74	2.74	2.74	2.74	2.74
CADMIUM	34	mg/kg	1.10	1.10	1.10	0.82	0.82	0.82	0.82	0.82
CHROMIUM	2,800	mg/kg	13.9	13.9	13.9	11.2	11.2	11.2	11.2	11.2
COBALT	340	mg/kg	1.10	1.10	1.10	0.82	0.82	0.82	0.82	0.82
COPPER	1,700	mg/kg	1215	1215	1215	991	991	991	991	991
LEAD	1,100	mg/kg	4.50	4.50	4.50	2.74	2.74	2.74	2.74	2.74
MERCURY	11	mg/kg	0.30	0.30	0.30	0.14	0.14	0.14	0.14	0.14
MOLYBDENUM	94	mg/kg	4.53	4.53	4.53	3.52	3.52	3.52	3.52	3.52
NICKEL	420	mg/kg	16.7	16.7	16.7	9.9	9.9	9.9	9.9	9.9
SELENIUM	34	mg/kg	3.68	3.68	3.68	2.74	2.74	2.74	2.74	2.74
ZINC	4,200	mg/kg	453	453	453	362	362	362	362	362
means the guideline is exceeded										
* Allowable concentration based on the average all results (geomean for E-Coli) within 4-months before hauling date										
		HAULING DATES	8-Sep-22	14-Sep-22	15-Sep-22	16-Sep-22	20-Sep-22	21-Sep-22		
		VOLUME (m <sup>3</sup> )	1016	780	360	652	520	776		
		<b>ACCEPTABLE CONCENTRATION</b>	4-month Average*							
E-Coli (CFU/g)	2,000,000	cfu/g	4243	4243	4243	4243	4243	4243		
ARSENIC	170	mg/kg	2.74	2.74	2.74	2.74	2.74	2.74		
CADMIUM	34	mg/kg	0.82	0.82	0.82	0.82	0.82	0.82		
CHROMIUM	2,800	mg/kg	11.2	11.2	11.2	11.2	11.2	11.2		
COBALT	340	mg/kg	0.82	0.82	0.82	0.82	0.82	0.82		
COPPER	1,700	mg/kg	991	991	991	991	991	991		
LEAD	1,100	mg/kg	2.74	2.74	2.74	2.74	2.74	2.74		
MERCURY	11	mg/kg	0.14	0.14	0.14	0.14	0.14	0.14		
MOLYBDENUM	94	mg/kg	3.52	3.52	3.52	3.52	3.52	3.52		
NICKEL	420	mg/kg	9.9	9.9	9.9	9.9	9.9	9.9		
SELENIUM	34	mg/kg	2.74	2.74	2.74	2.74	2.74	2.74		
ZINC	4,200	mg/kg	362	362	362	362	362	362		
means the guideline is exceeded										
* Allowable concentration based on the average all results (geomean for E-Coli) within 4-months before hauling date										

Table 11 AWPCP - Biosolids Sampling Results & Hauling 2022

HAULED SLUDGE SAMPLING RESULTS - 2022													
TEST DATE	04-Jan-21		14-Feb-22		14-Mar-22		11-Apr-22		09-May-22		06-Jun-22		
	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	
TS	16300		19100		19100		17000		16300		13600		
TP	409		294		448		402		435		352		
AMMONIA	12.2		8.44		62.3		106		13.8		16.3		
TKN	1020		715		1240		1120		1210		754		
NITRITE	6.4		<1		<1		<1		1.7		<1		
NITRATE	88		<1		<1		1.7		<1		2.1		
E-Coli (CFU/g)		250,000		210,000		415,000		360,000		330,000		200,000	
ARSENIC	<0.1	3.1	<0.1	2.6	<0.1	2.6	<0.1	2.9	<0.1	3.1	<0.1	3.7	
CADMIUM	<0.03	0.9	<0.3	0.8	<0.3	0.8	<0.3	0.9	<0.03	0.9	<0.03	1.1	
CHROMIUM	0.16	9.8	0.17	8.9	0.15	7.9	0.14	8.2	0.19	11.7	0.14	10.3	
COBALT	0.04	2.5	<0.03	0.8	0.04	0.8	<0.03	0.9	0.04	0.9	0.03	2.2	
COPPER	5.15	316.0	6.22	325.7	5.1	267.0	3.93	231.2	5.55	340.5	4.16	305.9	
LEAD	<0.1	3.1	0.1	5.2	<0.1	2.6	<0.1	2.9	<0.1	3.1	<0.1	3.7	
MERCURY	0.006	0.4	0.003	0.2	0.003	0.2	0.005	0.3	0.004	0.2	0.002	0.1	
MOLYBDENUM	0.06	3.7	0.07	3.7	0.05	2.6	<0.05	1.5	0.06	3.7	<0.05	1.8	
NICKEL	0.12	7.4	0.11	5.8	0.1	5.2	0.11	6.5	0.16	9.8	0.12	8.8	
SELENIUM	<0.1	3.1	<0.1	2.6	<0.1	2.6	<0.1	2.9	<0.1	3.1	<0.1	3.7	
ZINC	4.82	295.7	5.38	281.7	4.66	244.0	3.43	201.8	4.63	284.0	3.36	247.1	

HAULED SLUDGE SAMPLING RESULTS - 2022													
TEST DATE	12-Jul-22		02-Aug-22		06-Sep-22		03-Oct-22		07-Nov-22		05-Dec-22		
	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	mg/l	mg/kg	
TS	15900		16900		13800		14100		16700		15000		
TP	411		459		397		449		197		277		
AMMONIA	9.81		30.1		11.5		13.4		16.0		5.72		
TKN	798		814		553		750		326		635		
NITRITE	<1		<1		3.7		0.1		<1		2.3		
NITRATE	<1		100		153		62		46.7		94.6		
E-Coli (CFU/g)		160,000		50,000		45,000		60,000		60,000		215,000	
ARSENIC	<0.1	3.1	<0.1	2.6	<0.1	3.6	<0.1	3.5	<0.1	3.0	<0.1	3.3	
CADMIUM	<0.03	0.9	<0.03	0.8	<0.03	1.1	<0.03	1.1	<0.03	0.9	<0.03	1.0	
CHROMIUM	0.17	3.1	0.27	14.1	0.12	8.7	0.15	10.6	0.17	10.2	0.23	15.3	
COBALT	<0.03	0.9	0.03	0.8	<0.03	1.1	0.04	1.1	0.04	0.9	0.05	3.3	
COPPER	5.15	316.0	5.4	282.7	3.19	231.2	4.81	341.1	5.4	323.4	4.93	328.7	
LEAD	0.1	6.1	0.1	5.2	<0.1	3.6	<0.1	3.5	0.1	6.0	0.1	6.7	
MERCURY	0.004	0.2	0.003	0.2	0.005	0.4	0.004	0.3	0.01	0.6	0.003	0.2	
MOLYBDENUM	0.07	4.3	0.09	4.7	<0.05	1.8	0.06	4.3	0.06	3.6	0.06	4.0	
NICKEL	0.12	7.4	0.15	7.4	0.08	5.8	0.12	8.5	0.16	9.6	0.2	13.3	
SELENIUM	<0.1	3.1	<0.1	2.6	<0.1	3.6	<0.1	3.5	<0.1	3.0	<0.1	3.3	
ZINC	4.61	282.8	4.73	247.6	2.85	206.5	3.26	231.2	3.22	192.8	3.58	238.7	

Table 12 BSTP - Biosolids Sampling Results 2022

REGULATED METALS and PATHOGENS CONCENTRATION														
HAULING DATE	4-Jan-22	20-Jan-22	4-Feb-22	14-Feb-22	3-Mar-22	15-Mar-22	1-Apr-22	14-Apr-22	26-Apr-22	12-May-22	26-May-22	7-Jun-22	23-Jun-22	5-Jul-22
HAULING DATE	4-Aug-22	18-Aug-22	1-Sep-22	6-Sep-22	13-Sep-22	27-Sep-22	13-Oct-22	27-Oct-22	10-Nov-22	25-Nov-22	8-Dec-22	22-Dec-22	29-Dec-22	
VOLUME (m <sup>3</sup> )	176	200	160	120	40	80	160	160	154	160	144.5	176	176	132
ACCEPTABLE CONCENTRATION	4-month Average*													
E-Coli (CFU/g)	162,000	155,521	155,521	222,639	222,639	274,344	274,344	297,596	297,596	318,986	318,986	315,118	315,118	315,118
ARSENIC	170	2.81	2.81	2.75	2.75	2.75	2.75	2.81	2.81	2.81	2.81	3.08	3.08	3.08
CADMIUM	34	0.84	0.84	0.83	0.83	0.82	0.82	0.84	0.84	0.84	0.84	0.92	0.92	0.92
CHROMIUM	2,800	9.06	9.12	9.20	9.20	8.96	8.96	8.70	8.70	9.16	9.16	9.51	9.51	9.51
COBALT	340	1.17	1.23	1.21	1.21	1.21	1.21	1.23	1.23	0.84	0.84	1.20	1.20	1.20
COPPER	1,700	309.2	315.6	322.7	322.7	314.6	314.6	284.9	284.9	291.1	291.1	286.1	286.1	286.1
LEAD	1,100	4.0	4.2	4.0	4.0	3.4	3.4	3.5	3.5	3.5	3.5	3.1	3.1	3.1
MERCURY	11	0.260	0.215	0.211	0.211	0.212	0.212	0.244	0.244	0.213	0.213	0.211	0.211	0.211
MOLYBDENUM	94	4.56	4.60	4.23	4.23	3.72	3.72	2.86	2.86	2.86	2.86	2.40	2.40	2.40
NICKEL	420	6.80	7.40	7.27	7.27	6.50	6.50	6.21	6.21	6.82	6.82	7.59	7.59	7.59
SELENIUM	34	2.9	2.8	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	3.1	3.1	3.1
ZINC	4,200	279.9	284.0	288.0	288.0	280.5	280.5	255.8	255.8	252.9	252.9	244.2	244.2	244.2
HAULING DATE	19-Jul-22	4-Aug-22	18-Aug-22	1-Sep-22	6-Sep-22	13-Sep-22	27-Sep-22	13-Oct-22	27-Oct-22	10-Nov-22	25-Nov-22	8-Dec-22	22-Dec-22	29-Dec-22
VOLUME (m <sup>3</sup> )	176	200	160	120	40	80	160	160	154	160	144.5	176	176	132
ACCEPTABLE CONCENTRATION	4-month Average*													
E-Coli (CFU/g)	248,309	151,586	151,586	151,586	92,116	92,116	92,116	88,173	88,173	53,348	53,348	76,822	76,822	76,822
ARSENIC	170	3.21	3.21	3.21	3.35	3.35	3.35	3.32	3.32	3.28	3.28	3.37	3.37	3.37
CADMIUM	34	0.96	0.96	0.96	1.01	1.01	1.01	1.00	1.00	0.98	0.98	1.01	1.01	1.01
CHROMIUM	2,800	8.33	10.27	10.27	9.53	9.53	9.53	9.61	9.61	11.37	11.37	11.21	11.21	11.21
COBALT	340	1.24	1.24	1.24	1.28	1.28	1.28	1.00	1.00	0.98	0.98	1.60	1.60	1.60
COPPER	1,700	300.4	322.4	322.4	295.1	295.1	295.1	303.9	303.9	303.8	303.8	306.1	306.1	306.1
LEAD	1,100	4.0	4.7	4.7	4.7	4.9	4.9	4.8	4.8	4.8	4.8	5.0	5.0	5.0
MERCURY	11	0.235	0.205	0.205	0.205	0.235	0.235	0.289	0.289	0.356	0.356	0.361	0.361	0.361
MOLYBDENUM	94	2.85	3.81	3.81	3.34	3.34	3.34	3.95	3.95	3.75	3.75	3.41	3.41	3.41
NICKEL	420	8.16	8.77	8.77	8.77	7.76	7.76	7.68	7.68	8.19	8.19	9.31	9.31	9.31
SELENIUM	34	3.2	3.2	3.2	3.2	3.4	3.4	3.3	3.3	3.3	3.3	3.4	3.4	3.4
ZINC	4,200	255.7	275.2	275.2	275.2	255.8	255.8	251.9	251.9	227.6	227.6	217.3	217.3	217.3

\* means the guideline is exceeded  
 \* Allowable concentration based on the average of all results (geomean for E-Coli) within 4-months before hauling date

Table 13 BSTP - Hauling 2022

## 16. Regulations, References, and Key Contacts

- *Environmental Assessment Act (EAA)*
- *Ontario Water Resources Act (OWRA)*
- *Clean Water Act (CWA)*
- *Nutrient Management Act (NMA)*
- *Environmental Protection Act (EPA)*
- *Environmental Bill of Rights (EBR)*
- *Fisheries Act*
- MECP ([www.ontario.ca](http://www.ontario.ca))
- Canadian Water and Wastewater Association
- Ontario Water and Wastewater Certification Office ([www.owwco.ca](http://www.owwco.ca))

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