Executive Summary

The Guelph Wastewater Treatment Plant (WWTP) Operating within the Wastewater Services Department provides treatment of domestic, commercial, institutional and industrial wastewater collected from the City of Guelph and the neighbouring community of the Township of Guelph/Eramosa. The facility, located at 530 Wellington Street West, provides tertiary treatment with disinfected effluent being discharged to the Speed River.

This report documents the performance of the sewage works as specified in the Amended Environmental Compliance Approval 8835-9QJKSD.

The WWTP provides preliminary screening and grit removal, primary treatment by sedimentation, secondary treatment by conventional and extended aeration activated sludge and two stage tertiary treatments utilizing rotating biological contactors (RBC) followed by sand filtration. Dewatering filtrate is treated through the Anammox process to reduce ammonia loading and waste activated sludge is thickened prior to being pumped to primary digesters. Disinfection of the final effluent is a requirement and is accomplished by the addition of sodium hypochlorite followed by the addition of sodium bisulphite for de-chlorination prior to discharge to the receiving stream.

Process loading to the facility in 2017 was within typical values and the sludge accountability for the facility closed at 5% .The average total daily wastewater flow for this reporting period was 57.800 ML/day. The maximum total daily flow was 102.914ML on March 1st 2017.

Overall, the WWTP performed satisfactorily during the reporting period. A summary of effluent quality data is included as Table 3.1 of this report. The data indicates that the facility recorded annual removal efficiencies for $cBOD_5$ – 98.9%, TSS – 99.1%, TP – 97.2%, TKN – 95.5% and TAN – 96.7%.

Solids generated during treatment were stabilized by anaerobic digestion and subsequently mechanically dewatered. During the reporting period a total of 4345 dry tonnes of dewatered biosolids were generated. All material was diverted from landfill and was beneficially land applied.

The facility has no provision for primary treatment or raw sewage bypass directly to the Speed River. The facility does have provision for secondary treatment bypass, complete tertiary bypass and partial tertiary bypass. In 2017, all flow through the facility received at a minimum complete secondary treatment. . There were three partial sandfilter bypasses in 2017. Please see section 5.0 for details.

A plant flow diagram of the facilities process operations is presented as Appendix A of this report

Introduction

A key component of a Comprehensive Performance Evaluation (CPE) is to perform a process loading assessment. This evaluation examines the measured flow and mass loading for the population and compares it to typical per capita contributions.

As seen by the table below the City of Guelph WWTP was overall typical in terms of process loading for 2017.

Process Loading Evaluation 2017
Population : 134,894 (includes Rockwood)

Parameter	Actual	Typical
Per Capita Flows and Loads		
Per Capita Wastewater Flow	429 L/d per person	350-500 L/d per person
Per Capita BOD_5 Loading	105 g/d per person	80 g/d per person
Per Capita TSS Loading	93 g/d per person	90 g/d per person
Per Capita TKN Loading	15 g/d per person	13 g/d per person
Ratios		
Flows: Peak Day/Annual Average	1.78	2.5-4.0
Raw: TSS/BOD_5	0.89	0.8-1.2
Raw: TKN/BOD_5	0.14	0.1-0.2

Another important part of the CPE is to conduct a Sludge Accountability on the process. Sludge accountability compares measured sludge production from the data collected and compares it to projected sludge production results. This comparison, which has a best practice acceptable range of plus/minus 15%, is valuable in measuring the reliability of the data being collected to properly represent the facility performance. Contributing factors to successful sludge accountability include accurate sampling and a knowledgeable facility staff to take care of the day to day process requirements.

For 2017 the City of Guelph sludge accountability resulted in a 5% data accuracy which is well within the acceptable variability and therefore validates the reliability of the data collection and analysis.

Sludge Accountability Summary 2017

Reported Sludge	kg/d	**Projected Sludge**	kg/d
Intentional Wasting	13286.41	Primary Sludge Production	7,877
Unintentional Wasting	115.7	Biological Sludge Production	4,248
Sidestream	997	Chemical Sludge Production	839
Total	12,405		12,964
Sludge Accountability	**-5%**		

Note: plus/minus 15% is best practice

Appendix E demonstrates the calculations that were made to obtain the above results.

1.0 Wastewater Flow

A Parshall flume complete with secondary instrumentation is provided immediately downstream of the facilities chlorine contact chamber. The effluent flow rate through the flume is continuously measured, integrated and totalized on a daily basis in the facilities Supervisory Control and Data Acquisition System (SCADA). This daily data is manipulated electronically in spreadsheet software to calculate and report the average total daily flow and maximum total daily flow for each month. Flow data for the 2017 reporting period is included as Table 1.1 of this report as well as represented in chart 1.0. A comparison of total flow per month between 2016 and 2017 can be seen in chart 1.2

The average total daily flow for the year 2017 is 57.800 MLD. A maximum total daily flow of 102.914ML was recorded on March 1st 2017.

Table 1.1
City of Guelph Wastewater Treatment Plant
Wastewater Flow Data, Year 2017

2017	Average Total Daily Flow ML	Maximum Total Daily Flow ML
January	61.452	87.105
February	60.674	80.999
March	68.324	102.914
April	75.009	98.757
May	71.345	101.721
June	58.769	68.667
July	53.045	56.961
August	50.771	56.594
September	49.489	53.592
October	48.766	56.115
November	50.324	56.165
December	46.029	52.067
Annual Average	57.833	x
Winter Average	57.361	x
Summer Average	58.170	x

Chart 1.1

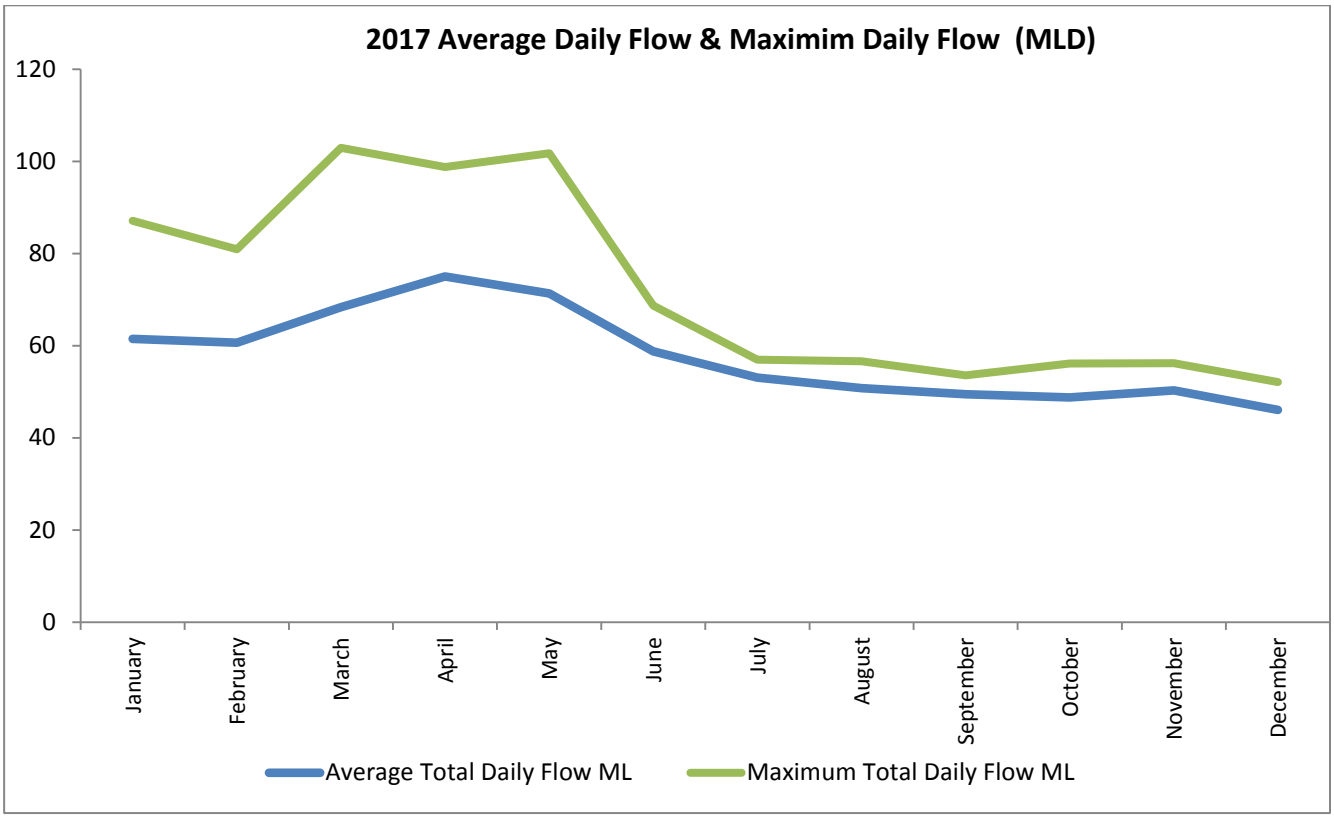
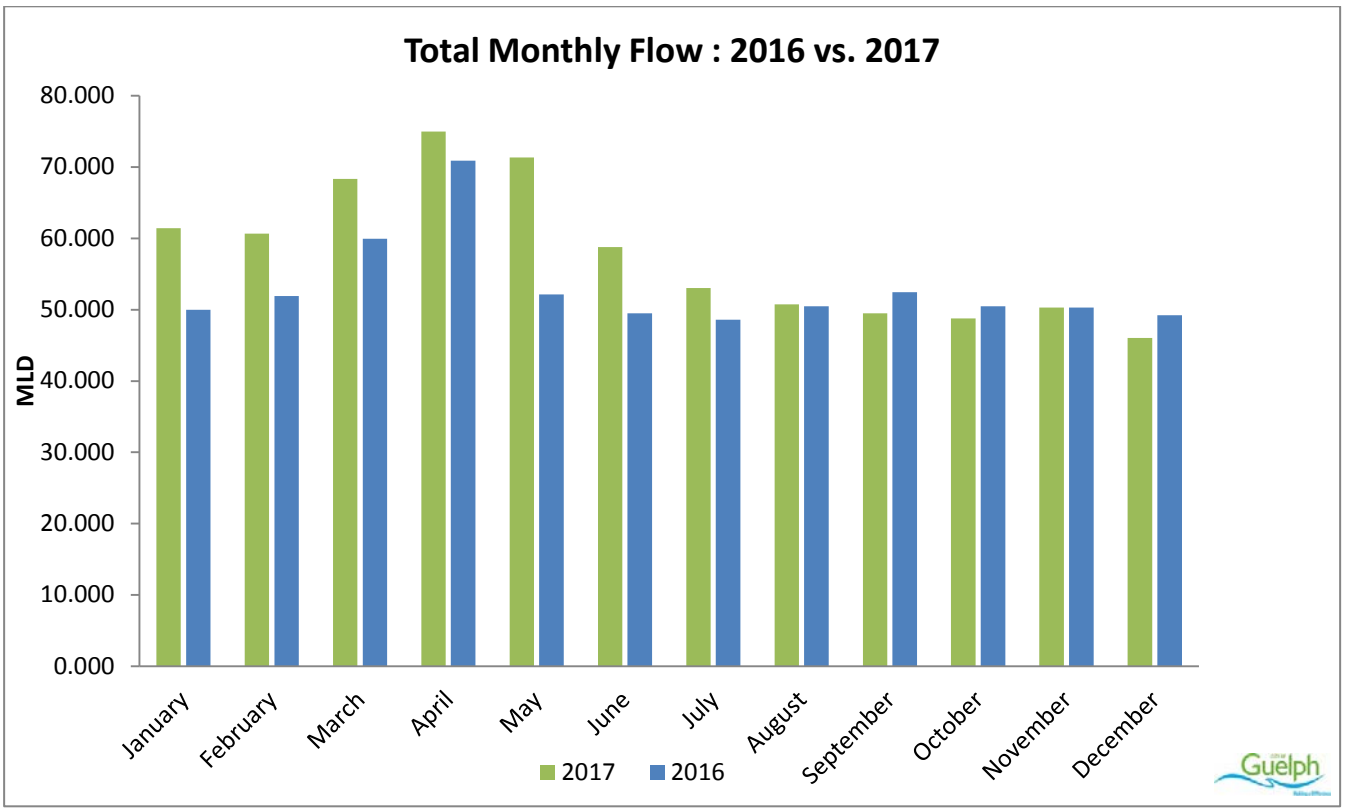


Chart 1.2 illustrates the total average monthly flow comparison between 2016 and 2017; to which the facility saw an 8.8% increase in total flow.

Chart 1.2



2.0 Raw Influent Wastewater Quality

Considerable effort is undertaken in monitoring the characteristics of WWTP influent, effluent and intermediate process streams to provide the necessary data for process optimization by plant staff and meet Environmental Compliance Approval monitoring and reporting requirements. Twenty-four hour flow proportional composite samples are routinely collected and analyzed. The raw influent wastewater data analyzed by the Guelph WWTP and CALA (Canadian Association for Laboratory Accreditation) certified outside laboratories is combined and a monthly summary is presented in Table 2.1.

Table 2.1
City of Guelph Wastewater Treatment Plant
Raw Influent Wastewater Quality Data, Year 2017

2017	pH	[1]$cBOD_5$ (mg/L)	BOD_5 (mg/L)	TSS (mg/L)	P_{Tot} (mg/L)	TKN (mg/L)	TAN (mg/L)
January	7.64	213	253	221	4.34	36.9	23.5
February	7.64	227	243	226	3.60	38.1	23.5
March	7.60	183	219	209	3.97	34.9	20.6
April	7.64	181	206	194	3.39	28.5	17.6
May	7.69	142	167	198	3.71	27.5	15.6
June	7.66	206	185	315	4.51	36.1	19.7
July	7.69	165	220	254	4.51	34.6	19.2
August	7.65	160	216	228	4.68	36.1	22.3
September	7.70	204	270	236	5.14	39.4	25.0
October	7.69	231	292	270	5.17	44.0	25.5
November	7.69	251	280	227	4.96	43.8	28.1
December	7.65	312	292	282	5.57	46.2	29.4
Annual Average	7.66	206	237	238	4.46	37.2	22.5
Winter Average	7.64	237	257	233	4.49	40.0	25.0
Summer Average	7.67	184	222	242	4.44	35.2	20.7

3.0 Final Effluent Quality

Primary sedimentation and secondary activated sludge treatment is provided by four separate treatment trains namely Plants 1, 2, 3 and 4. Plants 1, 2, and 3 incorporate conventional activated sludge with the secondary effluent from each of these three plants directed to a common pump well. The combined secondary effluent is lifted by vertical turbine pumps to the rotating biological contactors (RBC) influent distribution channel and evenly split to each of the four RBC trains. Each of the four RBC trains consists of eight shafts in series. The process objective of the RBC's is to provide additional biological treatment for the oxidation of ammonia. Effluent from the RBC trains is discharged to a common sand filter influent channel and distributed to the sand filters for additional suspended solids capture. The Plant 4 treatment train incorporates extended aeration activated sludge and is capable of complete nitrification. As such plant 4 secondary effluent can be directed to a separate pump well which discharges to the common sand filter influent channel for distribution to the sand filters for additional suspended solids capture. Plant 4 secondary effluent can also be directed through the RBC's as plants 1, 2 and 3.

The final treated effluent passes through a Parshall flume and is measured by an ultrasonic transmitter. The transmitter is calibrated yearly to ensure accuracy of total flows. (See appendix C) A Plant Flow Diagram is included as Appendix A. Design data for the treatment units are listed in Appendix B.

Effluent quality requirements as specified in the Environmental Compliance Approval differ for summer and winter conditions. These limits and performance charts can be reviewed in Appendix H.

An automatic sampling system collects a series of flow paced aliquots from the chlorine contact chamber and combines them in a container within a refrigerated compartment to produce a 24-hour flow proportional composite sample of the treated WWTP effluent. This composite sample is then analyzed by the Guelph WWTP laboratory, which is ISO 17025 accredited by the Canadian Association for Laboratory Accreditation (CALA). The results from the Guelph WWTP laboratory are tabulated in Table 3.1. This table provides a monthly summary of final effluent quality data.

Residual chlorine and sodium bisulphite are constantly monitored in the chlorine contact chamber in keeping with the year round requirement for disinfection. Both sodium hypochlorite and sodium bisulphite application and control is provided by ORP instrumentation. The objective of 200 E. Coli CFU/100mL of sample was met. Performance data is presented in Table 3.1.

As mandated by Environment Canada, the facility has optimized the disinfection/de-chlorination system to reduce the total residual chlorine to the speed river to 0.02 mg/L or less.

In 2014, the Wastewater Services Laboratory received formal ISO/IEC 17025 Accreditation by CALA (certificate A3222) which is shown in Appendix I. The fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results.

The scope of testing the laboratory provides includes; TSS/VSS, Ammonia, Total Phosphorus, pH, Alkalinity, Nitrate + Nitrite, $COD_{5,}$ Total and Volatile Solids, TKN, $BOD/cBOD_5$, Reactive Phosphorus. The formal scope of accreditation can be found in the CALA Directory of Laboratories at www.cala.ca under the membership number 3222.

The quality system measures and best practices that have been put in place that qualify the laboratory for formal accreditation include, but are not limited to the following:

- All test methods on the laboratory scope of testing have been validated to prove method performance on site and prove any modifications to test methods are technically valid.

- A quality control program has been instituted for all test methods that have undergone validation. Typical QC samples introduced in a batch of 20 samples includes as appropriate: a method blank, a quality control standard, a calibration check standard, and a sample duplicate. Matrix spike samples are also analysed to monitor sample matrix interferences. Control limits for QC samples are statistically determined. When control limits are exceeded, corrective action is taken and either the analysis is repeated or the data is qualified.

- Participation in an external proficiency testing regime provided by CALA or other proficiency testing providers.

- Internal training program to ensure laboratory analysts are adequately trained when performing a test method and have proven proficient at the test methods they perform.

- A Continual improvement program is in place to provide a systematic method of identifying and addressing issues that would bring about change and eventually impede the consistent production of valid test results.

- Annual ISO/IEC 17025 calibration of key measurement instruments for lab balances, pipettes, and thermometers. A daily monitoring program ensures verification of calibration for these instruments.

- A formal document control and records management program is in place to ensure changes to documents are authorized and controlled and laboratory records are managed to ensure integrity.

Table 3.1
City of Guelph Wastewater Treatment Plant
Final Effluent Quality Data, Year 2017

2017	pH	Temp	[1]$cBOD_5$		BOD5		TSS		P_{Tot}		TKN	TAN		NO_3-N	NO_2-N	[5]E. Coli	TCR	SBR
			Concentration	Loading	Concentration	Loading	Concentration	Loading	Concentration	Loading		Concentration	Loading					
		^0C	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(kg/d)	(mg/L)	(mg/L)		(mg/L)	(mg/L)	(CFU/100 mL)	(mg/L)	(mg/L)
Jan	7.84	13.3	2.50	157	6.40	426	2.00	126	0.11	7	2.56	2.03	114	23.9	0.26	13	0.00	0.89
Feb	7.81	13.0	2.10	129	5.10	317	2.00	122	0.08	5	2.54	1.73	103	24.8	0.22	11	0.00	0.75
March	7.73	12.5	2.20	154	5.80	409	2.00	136	0.11	8	1.52	0.94	69	24.5	0.26	10	0.00	1.14
Apr	7.71	13.5	2.20	169	4.90	381	2.10	159	0.11	8	2.21	1.05	84	21.2	0.26	10	0.00	1.04
May	7.84	14.8	2.20	163	5.20	396	2.00	143	0.08	6	2.11	1.29	94	18.6	0.27	13	0.00	0.71
June	7.93	18.4	2.00	118	3.10	187	2.10	121	0.11	6	0.99	0.19	6	25.7	0.05	13	0.00	4.48
July	7.98	19.7	2.00	105	2.60	140	2.00	104	0.11	6	1.11	0.10	5	25.8	0.04	84	0.00	1.36
Aug	7.99	20.6	2.00	101	2.40	120	2.00	103	0.17	9	1.05	0.08	4	26.7	0.09	43	0.00	1.82
Sept	7.97	20.7	2.00	101	2.90	147	2.00	102	0.15	8	1.14	0.19	8	27.9	0.04	30	0.00	1.28
Oct	7.91	19.9	2.00	98	3.20	157	2.00	100	0.16	8	1.42	0.20	7	31.0	0.08	58	0.00	1.36
Nov	7.93	17.8	2.10	104	2.50	124	2.00	103	0.17	9	1.10	0.20	8	30.1	0.08	14	0.00	1.76
Dec	7.98	14.8	2.10	96	2.58	119	2.00	92	0.15	7	1.23	0.16	5	31.8	0.04	24	0.00	1.20
Annual Average	7.89	16.58	2.12	124.53	3.89	243.57	2.02	117.54	0.13	7.10	1.58	0.68	42.12	26.00	0.14	26.92	0.00	1.48
Winter Average	7.86	14.3	2.20	128	4.48	279	2.00	116	0.12	7	1.79	1.01	60	27.0	0.17	14	0.00	1.15
Summer Average	7.90	18.2	2.06	119	3.47	218	2.03	119	0.13	7	1.43	0.44	30	25.3	0.12	36	0.00	1.72
Notes:	1	All $cBOD_5$ and BOD5 analysis conducted by independent CAEAL accredited laboratory only.																
	2	SBR, sodium bisulphite residual																
	3	All analyses based on 24-hour flow paced composite samples.																
	4	The Summer period is April 1 to October 31. The Winter period is November 1 to March 31.																
	5	Escherichia Coli values are calculated geometric means.																

4.0 Solids Handling and Disposal

The raw sludge produced at the WWTP is thickened in the primary clarifiers and pumped to the anaerobic digestion system which consists of four primary digesters and one secondary digester. The waste activated sludge from all Plants are thickened in a rotary drum thickener and then transferred to one of the primary digesters.

Following stabilization by anaerobic digestion, biosolids are transferred from the secondary digester to the dewatering facility. The dewatering facility consists of four belt filter presses and associated auxiliary equipment. Dewatering filtrate is treated in the Anammox process before being returned to headworks. Stabilized biosolids are either dewatered and removed from site as a cake to a non-landfill destination or further treated on site through the Lystek process. The Lystek material is then land applied as a Non-agricultural source material (NASM) or as a fertilizer as per the Canadian Food Inspection Agency (CFIA) fertilizer registration.

A simplified solids flow diagram of the WWTP is presented in Appendix A.

A summary of solids production, handling and disposal is presented in Table 4.1. The results of routine laboratory analysis of the dewatered biosolids are presented in Table 4.2. The results of routine E. coli analysis of the dewatered biosolids are presented in Table 4.3. In reference to Table 4.3 only biosolids that received the Lystek treatment were land applied.

The Rotary Drum Thickener (to thicken Waste Activated Sludge) is automated to run 24hrs/day, provided sufficient waste activated sludge is available. The unit used a combination of cationic and anionic polymers at a ratio of approximately 1.51:1 to assist in thickening the waste activated sludge to 4.51% solids. Table 4.4 will reveal in more detail the monthly totals.

During the reporting period 4345 dry tonnes of dewatered biosolids were generated. The facility anticipates a similar quantity of bio-solids generation for the next reporting period. This reporting period resulted in 100% biosolids diversion from landfill. All dewatered biosolids were land applied during land application season or stored and processed for land application. Land application of this Class A equivalent bio-solid material (US EPA 503, CFR Part 40) to registered site numbers TOR-11018, GLP-7513, GLP-6016 and GLP-6067 occurred through the haulage and application services provided by Terratec Environmental Incorporated. The quality of the Lystek material can be found in Table 4.2.

The compost infrastructure was utilized as required to load trucks with dewatered biosolids cake to support the landfill diversion aspect of the biosolids program.

Tables 4.1
City of Guelph Wastewater Treatment Plant
Solids Handling and Disposal, Year 2017

Month	Average Digested Solids Total Solids (%)	Digested Solids Pumped to Dewatering (m^3/month)	Average Dewatered Cake Total Solids (%)	Cake Production (wet tonne)	Cake Production (dry tonne)	Average Lystek Total Solids (%)	Lystek to Land Application (m3/month)	Cake Equivalent (dry tonne)	Cake to Lystek (wet tonne)	Cake & Bulking to Landfill (wet tonne)	Cake to Landfill (wet tonne)	Processed for Land Application (wet tonne)
Jan	1.73	21,379	20.78	1,877	390	-	-	-	-	-	-	1,268.90
Feb	1.70	21,057	21.24	1,774	377	-	-	-	-	-	-	1,313.40
Mar	1.68	18,523	21.41	1,528	327	-	-	-	-	-	-	1,241.44
Apr	2.29	17,931	22.01	1,960	431	-	-	-	-	-	-	1,256.42
May	1.92	20,508	21.37	1,936	414	14.30	340.93	49	228	-	-	1,440.89
Jun	1.66	11,289	22.28	884	197	14.40	413.13	59	267	-	-	924.35
Jul	1.73	20,067	23.52	1,554	365		113.72	0	0	-	-	941.96
Aug	1.78	18,969	24.77	1,433	355	15.40	341.35	53	212	-	-	953.52
Sep	1.60	19,425	21.30	1,536	327	14.10	181.01	26	120	-	-	1,101.46
Oct	1.73	19,692	22.27	1,613	359		103.11			-	-	1,197.80
Nov	2.11	21,019	20.32	2,299	467	-	-	-	-	-	-	1,381.61
Dec	1.54	20,662	22.55	1,483	334	-	-	-	-	-	-	1,277.52
Totals	**-**	**230,523**	**-**	**19,878**	**4,345**	**-**	**1,493.25**	**186**	**827**	**-**	**-**	**14,299.27**
Average	**1.79**		**21.99**			**14.63**				**-**	**-**	

Benifical Re-use	**1,380.05**
Terratec Environmental Terratec Environmental 200 Eastport Bld. Hamilton, Ontario, L8H 7S4	**Wet Tonnes**

Total Volume for Procees Land Application	**14,299.27**
Dundalk - Lystek International Lystek International Inc. 191 Eco Park Way Dundalk, Ontario, N0C 1B0	**Wet Tonnes**

Table 4.2
City of Guelph Wastewater Treatment Plant
Biosolids Metal Analysis, Year 2017

2017	Total Solids (mg/L)		Total Volatile Solids (%)		pH (Units)		C:N Ratio		TKN (ug/g)		NH3 + NH4 as N (Total Ammonium Nitrogen) (ug/g)		NO3- + NO2- as N (Nitrate + Nitrite as Nitrogen) (ug/g)	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan	20.8	-	63.8	-	7.4	-	5.3	-	61,300	-	8,200	-	20.0	-
Feb	21.2	-	64.7	-	8.1	-	5.0	-	64,450	-	10,450	-	20.0	-
Mar	21.4	-	-	-	-	-	5.5	-	-	-	-	-	-	-
Apr	22.0	-	60.8	-	7.9	-	-	-	51,500	-	10,500	-	20.0	-
May	21.4	14.30	62.7	54.8	7.6	9.9	4.9	5.2	58,400	49,557	9,960	9,106	20.0	200.0
Jun	22.3	14.40	62.5	54.0	7.3	9.8	5.6	6.0	51,950	43,267	10,235	8,647	20.0	200.0
Jul	23.5		61.8	-	7.2	-	5.4	-	51,200	-	8,630	-	4.5	-
Aug	24.8	15.40	59.0	54.3	7.6	9.5	5.6	10.0	49,100	32,300	9,970	10,058	40.0	165.0
Sep	21.3	14.10	-	55.4	-	9.4	-	6.9	-	37,550	-	11,200	-	200.0
Oct	22.3		62.0	-	8.0	-	5.7	-	52,050	-	10,550	-	20.0	-
Nov	20.3	-	62.3	-	7.6	-	5.9	-	52,900	-	8,390	-	14.0	-
Dec	22.6	-	63.0	-	8.1	-	5.5	-	55,400	-	8,500	-	20.0	-

2017	Organic N (mg/kg)		Total P (Total Phosphorous)		Total K (Potassium) (ug/g)		Cd (mg/kg) (Cadmium)		Cr (mg/kg) (Chromium)		Co (mg/kg) (Cobalt)		Cu (mg/kg) (Copper)	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan	42,000	-	32,000	-	800	-	0.97	-	57	-	6.10	-	660	-
Feb	54,000	-	29,500	-	1,000	-	1.01	-	56	-	5.25	-	605	-
Mar	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr	41,000		29,000	-	1,100	-	1.10	-	76	-	6.40	-	630	-
May	48,500	40,286	25,500	22,857	1,100	64,000	1.25	1.10	71	63	6.35	6.10	550	506
Jun	42,000	35,000	28,500	24,000	950	69,000	1.15	1.07	78	73	7.25	7.37	595	553
Jul	42,500	-	28,000	-	950	-	1.04	-	80	-	8.60	-	605	-
Aug	39,500	22,225	27,000	23,750	750	58,750	0.98	0.99	80	73	8.75	9.03	625	618
Sep	-	26,500	-	24,500	-	59,500	-	0.96	-	64	-	9.25	-	630
Oct	41,500	-	28,000	-	750	-	1.01	-	71	-	8.60	-	670	-
Nov	44,500	-	29,500	-	800	-	0.99	-	73	-	8.15	-	680	-
Dec	47,000	11,274	30,000	8,646	800	22,841	1.00	0.37	89	25	8.10	2.89	670	210

2017	Pb (mg/kg) (Lead)		Mo (mg/kg) (Molybdenum)		Ni (mg/kg) (Nickel)		Zn (mg/kg) (Zinc)		Hg (mg/kg) (Mercury)		As (mg/kg) (Aresenic)		Se (mg/kg) Selenium	
	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek	Cake	Lystek
Jan	17.0	-	17.0	-	26.0	-	940	-	0.36	-	2.5	-	2.90	-
Feb	16.5	-	11.0	-	25.0	-	925	-	0.40	-	2.8	-	2.85	-
Mar	-	-	9.9	-	-	-	-	-	-	-	-	-	-	-
Apr	24.0	-	9.7	-	30.0	-	950	-	0.51	-	3.5	-	3.30	-
May	23.5	23.1	10.5	9.7	26.5	26.4	955	819	0.45	0.50	3.1	3.1	3.25	2.96
Jun	22.0	21.3	11.5	10.6	30.5	30.3	950	903	0.53	0.43	3.1	3.7	3.00	2.90
Jul	20.5	-	13.5	-	28.5	-	1,000	-	0.37	-	4.4	-	2.85	-
Aug	21.0	20.0	-	14.0	34.0	33.5	1,015	953	0.54	0.49	3.2	3.4	2.90	2.93
Sep		17.5	15.5	13.5	-	29.0	-	940	-	0.58	-	2.6	-	3.05
Oct	18.0	-	23.0	-	32.5	-	1,050	-	0.47	-	2.5	-	3.10	-
Nov	19.5	-	18.0	-	34.0	-	985	-	0.40	-	2.5	-	3.05	-
Dec	17.0	7.5	12.7	4.3	44.0	10.8	970	329	0.33	0.18	2.6	1.2	3.00	1.08

Table 4.3
City of Guelph Wastewater Treatment Plant
Dewatered Biosolids Analysis, Year 2017

E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean	E.coli DWCC (Presses)		4 Sample Geomean
Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)		Date	CFU/gm dry weight)	
2017-Jan-06	2800	27101	2017-Apr-07	35000	31305	2017-Jul-07	130000	73943	2017-Oct-23	24000	25684	-	-	-
2017-Jan-09	30000	28088	2017-Apr-10	45000	33335	2017-Jul-10	48000	66585	2017-Oct-30	29000	23012	-	-	-
2017-Jan-16	40000	21101	2017-Apr-21	7500	31179	2017-Jul-14	5300000	223167	2017-Nov-02	140000	52673	-	-	-
2017-Jan-20	33000	18248	2017-Apr-24	5600	16037	2017-Jul-21	9500	133136	2017-Nov-17	25000	39507	-	-	-
2017-Feb-02	52000	37881	2017-Apr-28	65000	18722	2017-Jul-24	40000	99157	2017-Nov-20	42000	45439	-	-	-
2017-Feb-06	20000	34230	2017-May-01	10000	12854	2017-Jul-28	1400000	230434	2017-Nov-24	21000	41916	-	-	-
2017-Feb-10	26000	30735	2017-May-08	20000	16426	2017-Jul-31	61000	75476	2017-Dec-01	25000	27248	-	-	-
2017-Feb-13	5300	19457	2017-May-12	46000	27808	2017-Aug-11	82000	129370	2017-Dec-08	91000	37637	-	-	-
2017-Feb-24	69000	20882	2017-May-15	11000	17836	2017-Aug-14	23000	112655	2017-Dec-15	12000	27517	-	-	-
2017-Feb-27	25000	22081	2017-May-19	330000	42749	2017-Aug-18	410000	82873	2017-Dec-18	53000	34682	-	-	-
2017-Mar-03	260000	39265	2017-May-26	230000	78722	2017-Aug-21	57000	81480	2017-Dec-29	26000	35024	-	-	-
2017-Mar-06	8600	44316	2017-May-29	6200	47699	2017-Aug-28	110000	87689	-	-	-	-	-	-
2017-Mar-14	86000	46825	2017-Jun-02	43000	67070	2017-Sep-01	89000	122987	-	-	-	-	-	-
2017-Mar-17	48000	55119	2017-Jun-05	2800	20356	2017-Sep-11	73000	79890	-	-	-	-	-	-
2017-Mar-20	24000	30382	2017-Jun-12	8400	8899	2017-Sep-15	560000	141440	-	-	-	-	-	-
2017-Mar-24	35000	43152	2017-Jun-19	73000	16484	2017-Sep-22	45000	113117	-	-	-	-	-	-
2017-Mar-27	9800	25072	2017-Jun-23	42000	16387	2017-Sep-25	5100	55344	-	-	-	-	-	-
2017-Mar-30	80000	28487	2017-Jun-30	75000	37280	2017-Oct-13	79000	56448	-	-	-	-	-	-

E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean	E.coli Lystek		4 Sample Geomean
Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)	Date	CFU/gm dry weight)	CFU/gm dry weight)
9-May-17	10	12	9-Aug-17	10	10	-	-	-	-	-	-	-	-	-
9-May-17	10	12	17-Aug-17	10	10	-	-	-	-	-	-	-	-	-
10-May-17	10	10	22-Aug-17	10	10	-	-	-	-	-	-	-	-	-
11-May-17	10	10	31-Aug-17	10	10	-	-	-	-	-	-	-	-	-
17-May-17	10	10	14-Sep-17	10	10	-	-	-	-	-	-	-	-	-
24-May-17	10	10	20-Sep-17	10	10	-	-	-	-	-	-	-	-	-
31-May-17	10	10	-	-	-	-	-	-	-	-	-	-	-	-
7-Jun-17	10	10	-	-	-	-	-	-	-	-	-	-	-	-
14-Jun-17	10	10	-	-	-	-	-	-	-	-	-	-	-	-
29-Jun-17	10	10	-	-	-	-	-	-	-	-	-	-	-	-

Table 4.4
City of Guelph Wastewater Treatment Plant
Thickened Waste Activated Sludge Report (TWAS) Year 2017

2017	Volume to TWAS	Volume from TWAS	Reduction	Solids	Cationic Polymer Consumption	Anionic Polymer Consumption
	m^3	m^3	%	% D.S.	m^3	m^3
Jan	16,681	344	98	-	47.00	34.00
Feb	22,872	2,003	91	-	127.00	98.00
Mar	24,461	4,028	84	4.59	161.00	104.00
Apr	18,669	4,077	78	5.43	107.00	77.00
May	25,186	5,703	77	4.23	162.30	91.81
Jun	11,568	2,339	80	3.78	76.00	45.00
Jul	-	-	-	-		
Aug	-	-	-	-		
Sep	-	-	-	-		
Oct	-	-	-	-		
Nov	-	-	-	-		
Dec	-	-	-	-		
Average	**-**	**-**	**-**	**4.51**		
Totals	**119,437**	**18,494**			**680**	**450**

An investigation commenced after observing a decline in the ability to remove solids from Plant #1 primary clarifiers and as a result it was determined that the TWAS process was a contributing factor and was shut down in early June 2017. The remainder of 2017 was spent investigating potential causes which resulted in the following actions:

- Scheduled raw sludge lines to be cleaned using high pressure water
- Installed pressure gauges, solids meters to monitor raw sludge
- Scheduled pump inspection and repair

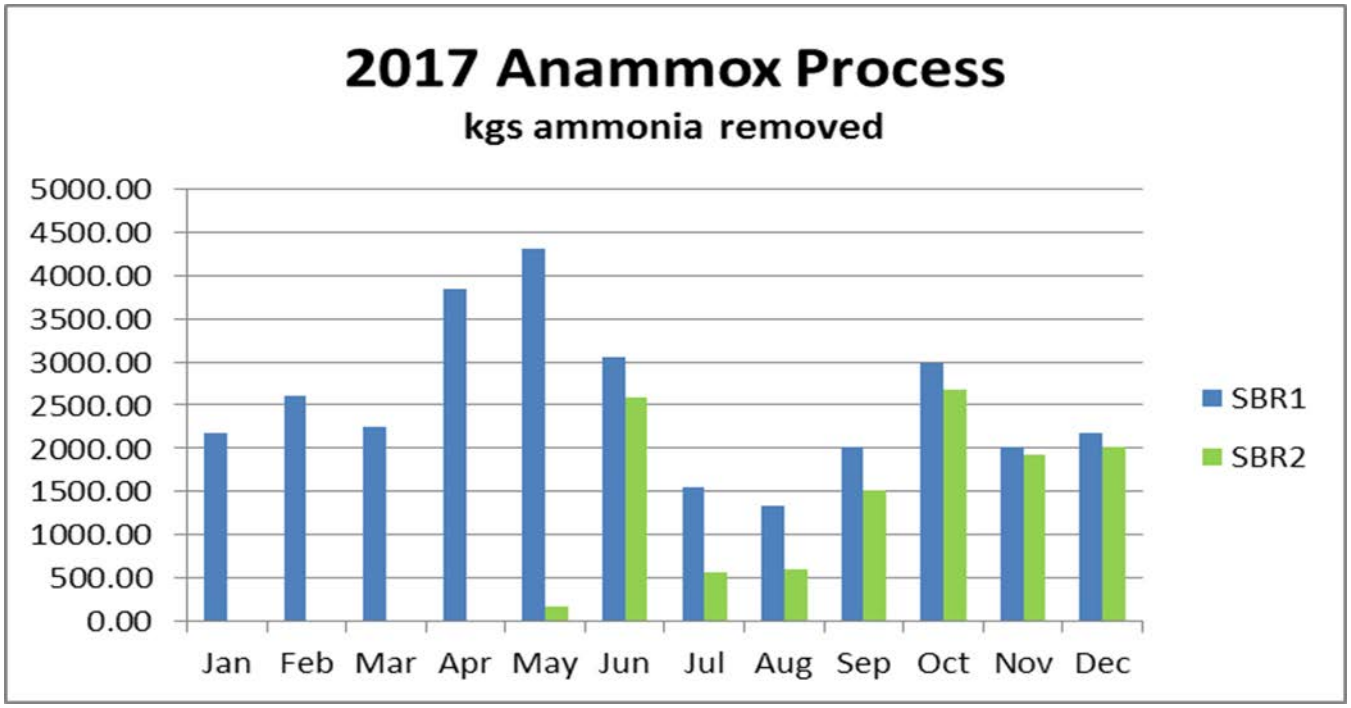
To assist in diagnosing this problem in the future additional trending of the raw sludge flow rates has been added to and monitored through SCADA.

4.1 Side Stream Treatment

Anammox

The Anammox process is a side stream treatment of filtrate from solids dewatering consisting of two Sequencing Batch Reactors (SBR). Each is designed to remove 173 kg/day of ammonia from the side stream filtrate. SBR #1 was commissioned on May 26, 2017 and SBR #2 on May 30th 2017 both are currently in full operation. Chart 6.3 represents the kilograms removed per month in each SBR.

CHART 4.1
City of Guelph Wastewater Treatment Plant
Anammox Process



5.0 Unusual Events/Process Upsets

The facility has no provision for primary treatment or raw sewage bypass directly to the Speed River. The facility does have provision for secondary treatment bypass, complete tertiary bypass or partial tertiary bypass. During this reporting period there were three (3) partial sandfilter bypasses and one (1) digester gas release as reported below in Table 5.1. These events are listed in Table 5.1 and were reported to the MOECC Spills Action Centre as per standard operating protocol.

Table 5.1
City of Guelph Wastewater Treatment Plant
Bypass Summary 2017

Date	Occurrence Number	Duration hrs:min	m_3	$cBOD_5$ mg/L	TSS mg/L	NH_3-N mg/L	TP mg/L	Partial or Full Tertairy Bypass	Chlorinated
January 12, 2017	900351	1:18	959.1	4.0	3.0	5.94	0.17	Partial	yes
March 12, 2017	900503	1:10	521	N/A	N/A	N/A	N/A	N/A	N/A
March 23, 2017	7223AKQR9L	0:05	7	6.0	2.0	0.54	0.13	Partial	yes
June 23,2017	901189	1:48	511	<2	<2	<0.66	0.11	Partial	yes

**Partial Sandfilter Bypass :*

All effluent receives RBC treatment, is chlorinated and de-chlorinated. The volumes listed indicate that amount that did not receive full sandfilter treatment.

Occurrence #900503 was reported as a digester gas release.

6.0 WWTP Projects and Upgrades

The following is a summary of Capital Projects, upgrades and major maintenance conducted during the reporting period.

TABLE 6.1
City of Guelph Wastewater Treatment Plant
Capital Project Summary, Year 2017

Project	Status
• SCADA upgrade at the plant	Planning
• Installation of backup generators	In progress
• Digester 3 Gas proofing and repairs/refurbishment Project	In progress completion 2019
• Aeration Blower Efficiency Study	Planning

TABLE 6.2
City of Guelph Wastewater Treatment Plant
Maintenance Project Summary, Year 2017

Project	Status
• Installation of new scum troughs Plant #2 & Plant #3 East primary and secondary	In progress
• Chain&Flight Replacement Program	Planning /phase 1 completion 2018
• Install gas cleaning (aeration) for plant 1 East	Planning

Optimization

The City of Guelph wastewater facility continued throughout 2017 to strive for a comprehensive optimization program. The main objective of the program is to work with City staff, regulatory agencies, external partners and stakeholders to achieve exemplary, sustainable and economical performance from physical and human assets.

Data has been generated to support a capacity demonstration. The demonstration involves placing several unit processes on standby while treating the current wastewater flow in the tanks remaining in service. This data may potentially demonstrate the capability greater than the current rated capacities of each liquid train. The existing four liquid trains have a combined nominal rated capacity of 64 MLD. A re-rating application has been submitted to the MOECC approvals branch seeking a re-rated capacity of the existing facility to 73.3MLD.

Capacity that is demonstrated through re-rating would extend the timelines of the current upgrade program and schedule. Strategically, any demonstrated capacity that results in either capital cost deferral or savings supports the City's Strategic Objective of the "City that makes a difference".

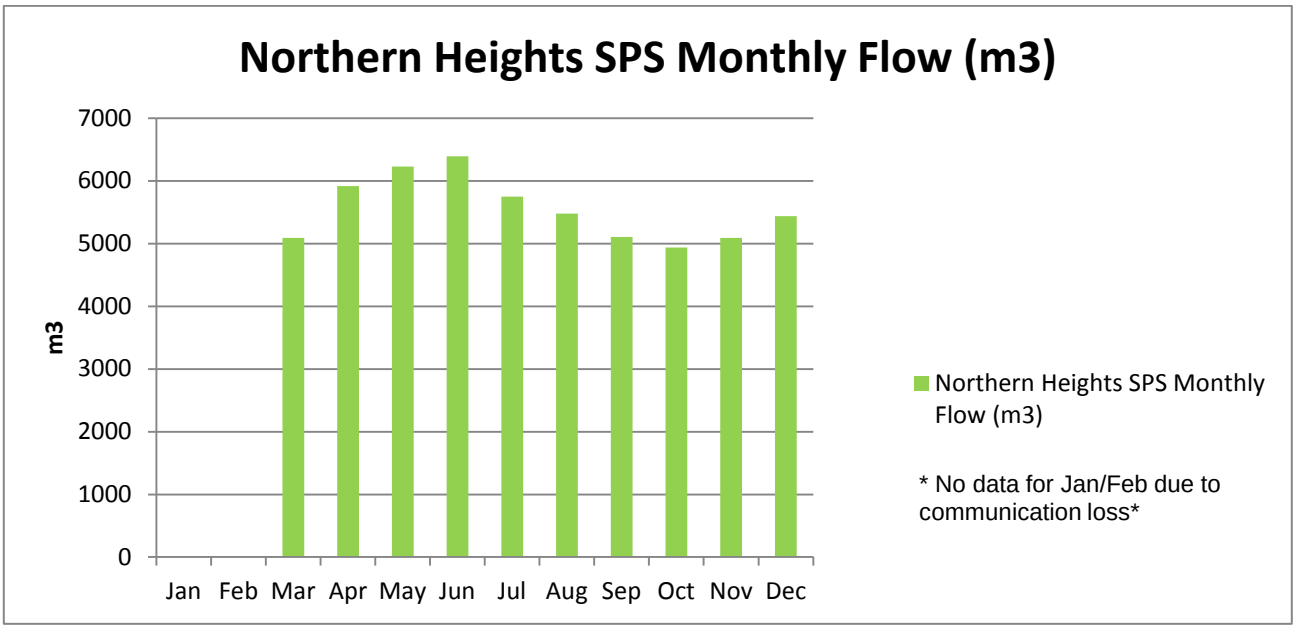
The facility is recognized as one of the leading wastewater treatment plants along the Grand River Watershed. A commitment to the optimization of all aspects of the process so to continue to be a leader in the protection of the environment and to establish best management practices is firmly in place.

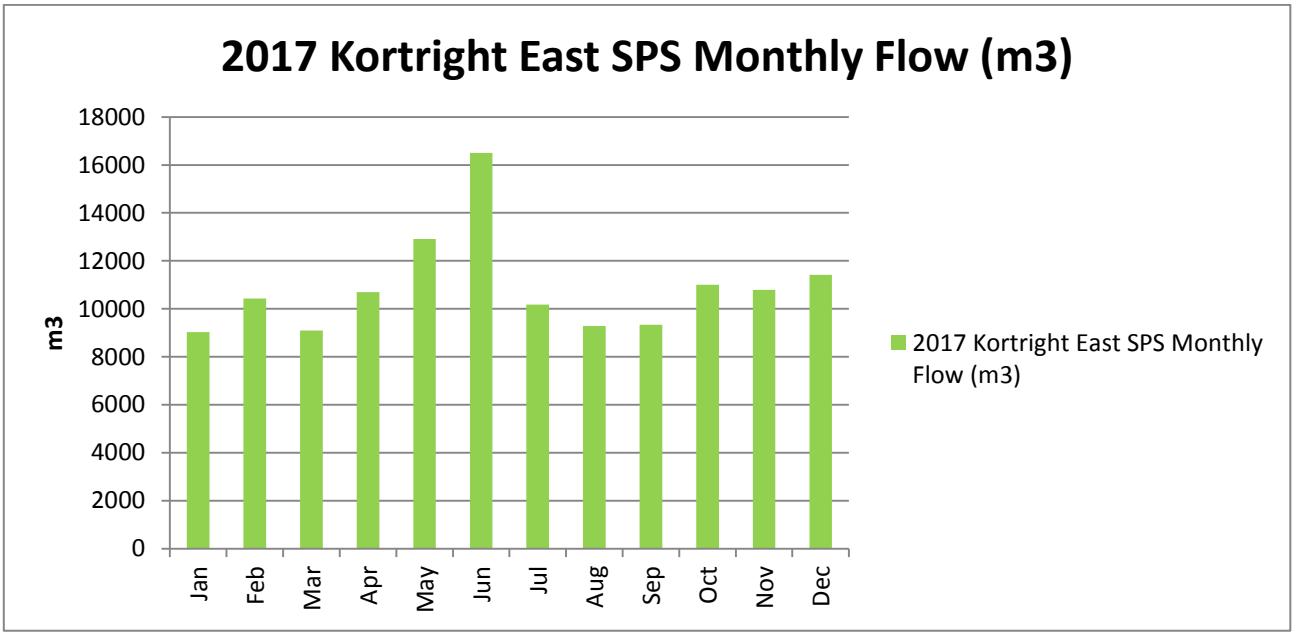
7.0 Sewage Pumping Stations

Summary and interpretation of monitoring data, including an overview of the adequacy of the works:

All sewage pumping stations performed adequately and as designed throughout the reporting period.

CHARTS 7.1
City of Guelph Wastewater Treatment Plant
Sewage Pumping Station Monthly Flow





Operating problems encountered and corrective actions taken:

Intermittent SCADA communications at sewage pumping stations due to aging Bell infrastructure. This was corrected through new cellular routers installed in March 2017.

TABLE 7.1
City of Guelph Wastewater Treatment Plant
Summary of Maintenance Performed

Date	Maintenance Performed
Jul-17	Kortright SPS inlet grinder rebuilt and reinstalled
August 14-18, 2017	Wetwell cleanouts at Gordon SPS, Terraview SPS, Kortright SPS, Gazer Mooney SPS, Northern Heights SPS
18-Sep-17	Wetwell cleanout at Barton SPS
27-Sep-17	Replace guide rails on Barton SPS inlet basket
December	Installed intrusion alarms at Gazer Mooney and Terraview SPS

TABLE 7.2
City of Guelph Wastewater Treatment Plant
Summary of Complaints Received

Date	Location	Complaint	Resolution
04-Aug-17	Terraview SPS	Outside light shining into neighbouring house	Reviewing alternative lighting solutions.

TABLE 7.3
City of Guelph Wastewater Treatment Plant
Summary of Spills or Abnormal Discharge Events

Date	Event Description	MOECC/SAC Reference Number
13-Feb-17	Grove Street Sanitary sewer surcharge and spill.	3376-AJJT5K
27-Mar-17	Massey Road/Lewis Road/ Hanlon Expressway Sanitary sewer surcharge and spill.	8371-AKULE8
12-Apr-17	Edinburgh Rd Sanitary surcharge and spill.	2265-ALD24B