



Uxbridge Brook Water Pollution Control Plant

2018 Annual Performance Report





The Regional Municipality of Durham

Uxbridge Brook Water Pollution Control Plant 2018 Annual Performance Report

Environmental Compliance Approval (ECA): 8357-8CTQ5V Dated June 28, 2012

Environmental Compliance Approval (Air): 6581-67GRPR Dated December 10, 2004

The Uxbridge Brook Water Pollution Control Plant (WPCP) 2018 Annual Performance Report provides staff, stakeholders and customers an overview of the performance of the Uxbridge Brook WPCP in 2018. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of Environment, Conservation and Parks (MECP). This report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner.

Water Pollution Control Plant Process Description

General

The Uxbridge Brook WPCP located in the Township of Uxbridge is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECA. This MECP Class Three wastewater treatment plant utilizes an extended aeration process with tertiary treatment and is designed to treat wastewater at a rated capacity of 5,221 cubic metres per day (m³/d). The Uxbridge Brook WPCP has a service population of 11,563 residents.

Uxbridge Brook WPCP treats wastewater from the Uxbridge service area utilizing the following processes;

- raw influent pumping,
- preliminary treatment,
- phosphorus removal,
- secondary treatment,
- tertiary filtration,
- disinfection and
- solids treatment.

Raw Influent Pumping

Wastewater is collected through approximately 50.4 km of sanitary sewers in Uxbridge and is conveyed to the WPCP by gravity and the Sandy Hook Sanitary Sewage Pumping Station.

Preliminary Treatment

Screening: There are two bar screens in the screening room for the removal of paper products and large material that could harm pumps and process equipment. One channel contains an automatic, mechanically raked bar screen and the other is equipped with a manually raked bar screen to provide



screening on an emergency basis. Screenings are removed in this process and transported to landfill for disposal.

Grit Removal: Vortex grit removal is provided to remove sand and small stones (grit) for protection of mechanical equipment from unnecessary wear and reduce formation of heavy deposits in pipelines, channels and process tanks. The vortex grit removal chamber uses centrifugal force to separate the grit from the wastewater. Grit is collected in the lower portion of the grit tank and is pumped to a grit classifier for dewatering. The dewatered grit is conveyed to the grit/screenings bin for landfill disposal.

Phosphorus Removal

The phosphorous removal system lowers the total phosphorous level in the final effluent by adding a chemical coagulant (aluminum sulphate) as part of the treatment process. Aluminum sulphate can be added at multiple locations throughout the plant.

Secondary Treatment

Aeration Tanks: Preliminary effluent flow is directed to two aeration tanks. Fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients.

Secondary Clarifiers: The effluent from the aeration tanks is directed to three secondary clarifiers where solids settle quickly as activated sludge leaving a clear effluent. A portion of the activated sludge collected on the bottom of the clarifiers is pumped back to the front of the aeration tanks and any excess activated sludge is sent to the aerobic digester.

Tertiary Treatment

Tertiary Sand Filter: Effluent from the secondary clarifiers is filtered through two automatic self-cleaning sand filters. The automatic backwash is initiated by an increase in head pressure or on a programmed timer. The backwash water is returned to the front of the plant for further treatment.

Disinfection

Ultra Violet (UV) Irradiation: The effluent flow from the sand filter is then directed to the UV channel for disinfection. The effluent passes two banks of UV lamps connected in series. The treated final effluent is discharged to the Uxbridge Brook.

Solids Treatment

Aerobic Digester: Waste activated sludge from the secondary clarifiers is pumped to a two stage aerobic digester for stabilization. A coarse bubble diffuser provides oxygen for the microorganisms. The diffusers are turned off to allow solids to settle for removal and the supernatant is returned to the front of the plant for further treatment.



Biosolids Management: Stabilized biosolids from the digester is transported to Duffin Creek WPCP for incineration.

Environmental Compliance Approval

Under Condition 9 (5) of ECA #8357-8CTQ5V the Region of Durham must produce an annual performance report that must contain the following information:

a) Summary and interpretation of all monitoring data and a comparison to the effluent limits, including an overview of the success and adequacy of the works

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

The Uxbridge Brook WPCP effluent was compliant with the approval limits during the reporting period. The plant operated at 67.4% of its rated capacity and received a maximum daily flow of 6,227 m³/d on April 16, 2018.

b) Description of any operating problems encountered and corrective actions taken

There were no operating problems encountered in 2018.

c) Summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the works

Replaced digester blower #3 and the associated valve.

d) Summary of any effluent quality assurance or control measures

In-house lab test results are compared to the results of the Regional Environmental Laboratory on comparable samples to determine the in-house accuracy. Results were found to be in an acceptable range. On-line instrumentation is verified by WPCP operators using various field or laboratory test equipment.

e) Summary of the calibration and maintenance carried out on all effluent monitoring equipment

- Calibration of the plant flow meter was conducted in May 28 and October 17 of 2018.
- Calibration of the in-house laboratory equipment was conducted on July 30, 2018.
- Calibration of the pH meter is conducted regularly.

f) Description of efforts made and results achieved in meeting the effluent objectives

The Region of Durham strives to achieve the best effluent quality at all times and produce results below the ECA compliance limits.

The Uxbridge Brook WPCP effluent met all ECA objectives except for:

- The effluent objective for total suspended solids was exceeded in five of 296 samples (1.7%)
 - The effluent objective for total phosphorus was exceeded in 14 of 308 samples (4.5%). Results were monitored and adjustments were made to the treatment process.
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- The effluent pH was below the minimum effluent objective of 6.5 in four of 257 samples (1.9%). Maintenance and cleaning of the pH electrode probe is performed regularly. Best efforts and process adjustments will continue to be applied as the Region of Durham endeavours to maintain results below the objectives.

g) Tabulation of Volume of Sludge Generated

The volume of sludge removed from Uxbridge Brook WPCP in 2018 was 17,072 m³.

Outline of Anticipated Volumes to be Generated in the Next Reporting Period

There is no increase of sludge volume expected in the next reporting period.

Summary of Locations to Where Sludge was Disposed

The sludge produced was transported to Duffin Creek WPCP for incineration.

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

A summary of complaints received from the public is administered through a central database. There were no complaints received during the reporting period.

i) Summary of all By-pass, Spill or Abnormal Discharge Events

On August 6th significant rainfall resulted in a recording of flow on the by-pass flow meter indicating that flow began from 16:25 hours and ceased at 16:35 hours. This was reported as a by-pass to the MECP. Upon investigation of events leading up to and following the by-pass it was determined that raw sewage did not actually by-pass as two additional alarm points located upstream of the by-pass flow meter would have been activated as well and were not. These alarms were tested and proven to be in working order. Further investigation is in progress to determine what contributed to the flow reading.

j) Status Update of the Initial Effluent Characterization

The initial effluent characterization report was submitted in 2016.

k) Information Required by MECP District Manager

No additional information was requested.

MECP Inspection

This plant was last inspected by the MECP in November 2013.



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Table 1 Final Effluent Flows

Month	Total Plant Flow metered at the Final Effluent cubic metre (m ³)	Average Daily Flow In cubic metres per day (m ³ /d)	Maximum Daily Flow m ³ /d
January	100,208	3,233	4,292
February	93,226	3,330	5,025
March	102,893	3,319	3,650
April	138,608	4,620	6,227
May	123,975	3,999	4,644
June	102,359	3,412	3,957
July	97,053	3,131	4,342
August	107,236	3,459	4,164
September	96,093	3,203	3,453
October	97,622	3,149	3,492
November	108,203	3,607	4,238
December	116,356	3,753	4,218
Total	1,283,832		
Average	106,986	3,517*	
Minimum	93,226		
Maximum	138,608		6,227
ECA Limit		5,221	15,110
Met Compliance		Yes	Yes

*Annual average



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Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand (BOD ₅) average (avg.) concentration (conc.) milligram per litre (mg/L)	BOD ₅ loading kilogram per day (kg/d)	Total Suspended Solids (TSS) avg. conc. mg/L	TSS loading kg/d	Total Phosphorus (TP) avg. conc. mg/L	TP loading kg/d	Dissolved Phosphorus avg. conc. mg/L
January	208	671	181	586	4.3	14	2.7
February	116	386	154	512	3.6	12	2.0
March	127	421	188	623	4.0	13	2.0
April	123	566	175	807	3.0	14	1.8
May	131	524	122	486	3.4	14	2.1
June	151	515	169	577	3.5	12	1.7
July	136	426	163	510	3.5	11	2.1
August	144	500	207	717	3.7	13	2.0
September	127	405	133	425	4.3	14	2.4
October	160	504	155	487	4.7	15	2.7
November	122	441	131	472	3.9	14	2.6
December	131	492	122	456	3.4	13	2.1
Average	140	490	158	555	3.8	13	2.2
Minimum	116	386	122	425	3.0	11	1.7
Maximum	208	671	207	807	4.7	15	2.7
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes



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Table 2 Raw Influent Analyses continued

Month	Total kjeldahl nitrogen (TKN) average (avg.) concentration (conc) (mg/L)	Total ammonia nitrogen (TAN) avg. conc. mg/L	TAN loading kilogram per day	Alkalinity Calcium Carbonate mg/L	pH minimum	pH maximum	Temp. Degrees Celsius avg.
January	36.14	24.6	79.6	325	7.4	8.6	13.4
February	29.75	21.3	70.8	274	7.3	8.6	12.8
March	31.00	23.8	79.0	370	7.2	8.4	12.2
April	22.90	18.7	86.3	330	7.5	8.5	12.4
May	31.05	21.6	86.2	364	7.0	8.4	13.5
June	31.58	20.7	70.8	305	7.3	8.3	16.8
July	31.65	23.1	72.4	305	7.6	8.2	18.1
August	29.00	21.9	75.9	288	7.7	8.1	18.7
September	33.48	22.7	72.8	310	7.9	8.4	19.1
October	36.86	26.4	83.2	324	7.2	8.5	17.3
November	36.13	22.9	82.7	336	7.4	8.4	15.1
December	31.05	21.6	80.9	364	7.0	8.4	13.5
Average	31.71	22.4	78.7	324			
Minimum	22.90	18.7	70.8	274	7.0		12.2
Maximum	36.86	26.4	86.3	370		8.6	19.1
Sampling Frequency Requirement Met	Yes	Yes		Yes	Yes	Yes	Yes



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Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand (CBOD ₅) average (avg.) concentration (conc.) milligram per litre (mg/L)	CBOD ₅ loading monthly avg. kilogram per day (kg/d)	Total Suspended Solids (TSS) avg. conc. mg/L	TSS loading monthly avg. kg/d	Total Phosphorus (TP) avg. conc. mg/L	TP loading avg. kg/d	TP loading kilogram per month
January	1.0	3.2	1.5	4.9	0.04	0.12	4
February	1.0	3.3	2.1	6.9	0.07	0.22	6
March	1.0	3.3	1.6	5.2	0.06	0.19	6
April	1.0	4.6	1.1	5.0	0.05	0.24	7
May	1.0	4.0	1.3	5.0	0.03	0.13	4
June	1.0	3.4	1.4	4.6	0.04	0.13	4
July	1.0	3.1	0.9	2.8	0.04	0.13	4
August	1.0	3.5	0.9	3.1	0.04	0.13	4
September	1.0	3.2	0.4	1.3	0.06	0.18	5
October	1.0	3.1	0.7	2.1	0.08	0.26	8
November	1.0	3.6	1.3	4.6	0.06	0.22	7
December	1.0	3.8	1.7	6.4	0.07	0.26	8
Total							68***
Average	1.0	3.5	1.2	4.3	0.05	0.19	6
Minimum	1.0	3.1	0.4	1.3	0.03	0.12	4
Maximum	1.0	4.6	2.1	6.9	0.08	0.26	8
ECA Limit	8.5*	30.9**	10*	36.3**	0.15*	0.78**	286***
ECA Objective	5		5		0.1		
Lake Simcoe Phosphorus Reduction Strategy					0.15****		286***
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Monthly Average Concentration
 **Monthly Average Loading, kg/day
 ***Total Annual Loading, kg/year
 ****Annual Average Concentration



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Table 3 Final Effluent Analyses continued

Month	Dissolved Phosphorus average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Ammonia Nitrogen (TAN) Winter avg. conc. mg/L	TAN Winter loading monthly avg. kilogram per day (kg/d)	TAN Summer avg. conc. mg/L	TAN Summer loading monthly avg. kg/d	Total Kjeldahl Nitrogen (TKN) avg. conc. mg/L	Un-ionized Ammonia Nitrogen avg. conc. mg/L
January	0.01	0.02	0.05			0.60	0.0
February	0.02	0.04	0.12			0.76	0.0
March	0.01	0.05	0.16			0.74	0.0
April	0.01	0.07	0.30			0.63	0.0
May	0.01			0.08	0.30	0.68	0.0
June	0.01			0.04	0.12	0.51	0.0
July	0.01			0.02	0.07	0.65	0.0
August	0.01			0.02	0.05	0.61	0.0
September	0.01			0.02	0.06	0.60	0.0
October	0.04			0.03	0.10	0.69	0.0
November	0.03			0.02	0.09	0.66	0.0
December	0.03	0.03	0.13			0.71	0.0
Average	0.02	0.04	0.15	0.03	0.11	0.65	0.0
Minimum	0.01	0.02	0.05	0.02	0.05	0.51	0.0
Maximum	0.04	0.07	0.30	0.08	0.30	0.76	0.0
ECA Limit		6*	21.8**	3*	10.9**		0.1*
ECA Objective		5		2			
Within Compliance		Yes	Yes	Yes	Yes		Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes		Yes

*Monthly Average Concentration

**Monthly Average Loading, kg/day



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Table 3 Final Effluent Analyses continued

Month	Nitrate Nitrogen average (avg.) concentration (conc.) milligram per litre (mg/L)	Alkalinity calcium carbonate mg/L	pH minimum.	pH maximum.	Temp. Degrees Celsius avg.
January	26.1	108	6.4	7.1	8.8
February	24.5	126	6.5	7.3	9.1
March	25.1	127	6.5	7.4	9.5
April	21.0	140	6.6	7.8	9.3
May	23.0	124	6.6	7.2	13.2
June	26.4	107	6.6	7.2	15.5
July	28.1	96	6.3	7.2	18.6
August	24.5	105	6.6	7.2	18.9
September	25.7	114	6.6	7.3	17.3
October	27.4	118	6.5	7.1	14.7
November	25.8	115	6.6	7.3	11.0
December	23.8	134	6.8	7.2	11.8
Average	25.1	118			15.2
Minimum	21.0	96	6.3		11.2
Maximum	28.1	140		7.8	19.9
ECA Limit			6.0	9.5	
ECA Objective			6.5	9.0	
Within Compliance			Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes



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Table 4 *Escherichia coli* Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	5	1
February	4	2
March	4	1
April	4	0
May	5	0
June	4	1
July	4	0
August	5	1
September	4	0
October	5	1
November	4	0
December	4	1
ECA Objective		200 organisms/100ml
Sampling Frequency Requirement Met	Yes	



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Table 5 Energy and Chemical Usage

Month	Aluminum Sulphate (litres)	Hydro kilowatt hours (kWh)	Natural Gas (cubic metres)
January	17,523	146,709	2,010
February	15,222	127,030	2,877
March	18,172	140,904	1,925
April	25,134	139,552	201
May	44,604	134,606	273
June	17,287	130,887	306
July	16,638	134,851	68
August	20,473	129,334	124
September	13,806	124,059	158
October	14,868	128,301	2,725
November	17,051	126,280	1,438
December	17,600	134,119	1,269
Total	238,378	1,596,632	13,374