



Harmony Creek Water Pollution Control Plant

2022 Annual Performance Report





The Regional Municipality of Durham

Harmony Creek Water Pollution Control Plant 2022 Annual Performance Report

Environmental Compliance Approval (ECA): 2407-AK8KJH Dated May 23, 2017

Environmental Compliance Approval (Air): 5562-AM9RPN Dated May 18, 2017

The Harmony Creek Water Pollution Control Plant (WPCP) 2022 Performance Report provides staff, stakeholders, and customers a performance overview of the Harmony Creek WPCP. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment, Conservation and Parks (MECP). This report demonstrates our commitment to 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 Harmony Creek WPCP, located in the City of Oshawa, is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECA's.

The Harmony Creek WPCP treats wastewater from the Oshawa and Courtice (Municipality of Clarington) service area. The Harmony Creek WPCP shares its catchment area flows with the Courtice WPCP. The Harmony Creek WPCP services approximately 66,399 residents or 33.4% of the total catchment population.

The Harmony Creek WPCP is designed to treat wastewater at an average flow rate of 34,100 cubic metres per day (m³/d). The plant is a MECP Class 4 conventional activated sludge treatment plant that utilizes the following processes to treat wastewater;

- raw influent pumping,
- preliminary treatment,
- primary treatment,
- phosphorus removal,
- secondary treatment,
- disinfection (chlorination/dechlorination), and
- solids management.

Raw Influent Pumping

Wastewater is collected through approximately 643 kilometres of sanitary sewers in Oshawa and Courtice and is conveyed to the Harmony Creek WPCP and the Harmony Creek Sanitary Sewage Pumping Station (SSPS). Approximately 66.6% of the influent flow is diverted to the Harmony Creek Sanitary Sewage Pumping Station and conveyed to the Courtice WPCP. The remaining flow (33.4%) is treated at the Harmony Creek WPCP.



Preliminary Treatment

Screening: One mechanically cleaned screen and one emergency manual screen remove rags and large debris that could harm pumps and process equipment. Screenings are compacted for landfill disposal.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the aerated grit tank. The velocity of the wastewater flowing in the tanks is controlled by the quantity of air added to produce conditions that allow heavy grit material to settle, while keeping the lighter organic material in suspension to proceed to the next process tank. The grit removed in this process is transported to landfill.

Primary Treatment

The primary clarifier utilizes the physical process of sedimentation which allows suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with excess activated sludge from the secondary treatment process is collected by a flight and chain mechanism which pushes the sludge into hoppers. The sludge is then pumped to the anaerobic digester for further treatment. Any material floating on the surface of the clarifier is also removed to the digester.

Phosphorus Removal

The phosphorus removal system lowers the total phosphorus level in the final effluent by adding a chemical coagulant, ferrous chloride, into the primary clarifier effluent.

Secondary Treatment

Aeration: The Harmony Creek WPCP has a flexible aeration system which can operate as two individual aeration tanks or as one large aeration tank. The current configuration is one large aeration tank. The effluent from the primary clarifier flows into the aeration tanks. Fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics, and nutrients from the wastewater.

Secondary Clarifier: The effluent from the aeration tank is directed to the two secondary clarifiers where the solids settle quickly to the bottom as activated sludge leaving clear supernatant. A portion of the activated sludge collected on the bottom of the clarifier is pumped back to the head of the aeration tank and the excess activated sludge is wasted to the primary clarifier.

Disinfection (chlorination/dechlorination)

Chlorine in the form of liquid sodium hypochlorite, is metered into the secondary effluent stream for pathogen control. Adequate contact time is provided by the chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged to Lake Ontario.



Solids Management

Anaerobic Digestion: The raw sludge that is collected from the primary clarifier is pumped into the anaerobic digester where anaerobic bacteria reduce the volume of sludge. As a result of digestion, the plant produces biosolids, water, carbon dioxide, methane, and hydrogen sulphide. The supernatant is returned to the head of the plant for further treatment. The digester gas is used for heating of the digester to offset the natural gas requirements or is flared off.

Sludge Management: All digested sludge produced at the Harmony Creek Water Pollution Control Plant (WPCP) is pumped to the sludge holding facility. From there, the treated sludge can be utilized on approved agricultural fields or be transferred to the Duffin Creek WPCP for incineration.

Environmental Compliance Approval (ECA)

Under Condition 11.(4) of ECA 2407-AK8KJH the Region of Durham must produce an annual performance report that contains the following information:

a) Summary and interpretation of all monitoring data and a comparison to the effluent limits;

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. The plant operated at an average of 54% of its annual average rated flow capacity and received a maximum daily flow of 25,047 cubic metres per day (m³/d) on February 17, 2022. Tables 1 and 2 summarize the flow and raw wastewater characteristics during the reporting period.

b) Summary and interpretation of all Final Effluent monitoring data and a comparison to the compliance limits condition;

The Harmony Creek WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. See Tables 3 and 4 for the final effluent results.

c) Description of any operating problems encountered and corrective actions taken;

There were no operating problems during the reporting period.

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

Major maintenance items in 2022 included:

- Replaced level indicators for biosolids tanks,
- Annual substation maintenance,
- Cleaned out east contact chamber,
- Rebuilt pump 130 for Harmony Creek Sanitary Sewage Pumping Station.



e) Summary of any effluent quality assurance or control measures undertaken in the reporting period;

In-house lab test results are compared to the results of the Regional Environmental Laboratory on comparable samples to determine the in-house accuracy. All results were found to be within an acceptable range.

f) Summary of the calibration and maintenance carried out on all influent and final effluent monitoring equipment;

Calibration of the secondary effluent flow meter occurred on February 9, 2022.

Calibration of the in-house laboratory equipment was conducted regularly.

g) Description of efforts made and results achieved in meeting the design objectives condition;

The Region continually strives to always achieve the best effluent quality and remain below the limits specified in the Environmental Compliance Approval:

- The average daily rated flow capacity of 34,100 cubic metres per day (m³/d) was not exceeded,
- There were no objective exceedances for 2022.

Best efforts will continue to be applied to maintain results below objectives.

h) Biosolids Production;

Tabulation of volume of sludge generated:

The volume of sludge generated at the Harmony Creek Water Pollution Control Plant (WPCP) in 2022 was 22,444 cubic metres (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:

All digested sludge produced at the Harmony Creek WPCP is pumped to the sludge holding facility. All sludge produced at this facility was transferred to Duffin Creek WPCP for incineration.

i) Summary of any complaints received during the reporting period and any steps taken to address the complaints;

A summary of complaints received from the public is administered through a central database. No complaints were received in 2022.



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j) Summary of By-passes, Overflows, reportable spills or abnormal discharge events;
There were no by-pass, overflow, reportable spills or abnormal discharge events for the reporting period.

k) Schedule 'B', Section 1 Notice of Modifications and Status Update;
No schedule 'B', Section 1 Notice of Modifications were submitted in 2022.

l) Schedule 'B', Section 3 Modifications;
No schedule 'B', Section 3 Modifications were completed in 2022.

m) Information Required by Ministry of the Environment, Conservation and Parks (MECP) Water Supervisor.

No additional information was requested.

MECP Inspection

This plant was last inspected by the MECP on January 26, 2016.



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Table 1 Final Effluent Flows

Month	Total Flow to Plant* cubic metre (m ³)	Average Daily Flow cubic metre per day (m ³ /d)	Maximum Daily Flow m ³ /d
January	576,826	18,607	20,090
February	538,003	19,214	25,047
March	623,370	20,109	24,925
April	536,305	17,877	20,009
May	531,364	17,141	22,780
June	518,510	17,284	19,186
July	584,888	18,867	23,713
August	558,050	18,002	19,555
September	582,110	19,404	21,200
October	581,559	18,760	21,768
November	547,875	18,263	19,648
December	539,291	17,396	24,668
Total	6,718,151		
Average	559,846	18,406**	
Minimum	518,510		
Maximum	623,370		25,047
ECA Limit		34,100	
Met Compliance		Yes	

*Metered at the secondary clarifier

**Annual Average Daily Flow



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Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand (BOD ₅) average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids (TSS) avg. conc. mg/L	Total Phosphorus (TP) avg. conc. mg/L	Total Kjeldahl Nitrogen (TKN) average avg. conc. mg/L
January	161	199	4.5	47.13
February	149	197	4.1	48.00
March	122	150	3.2	35.58
April	110	165	3.6	39.68
May	156	161	4.4	48.80
June	170	227	4.7	43.28
July	175	218	4.7	48.93
August	170	236	5.2	47.72
September	170	222	4.7	44.40
October	159	227	4.4	44.73
November	140	175	4.7	50.54
December	178	176	4.3	45.63
Average	155	196	4.4	45.37
Minimum	110	150	3.2	35.58
Maximum	178	236	5.2	50.54
Sampling Frequency Requirement Met	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 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	Total Ammonia Nitrogen (TAN) avg. conc. mg/L
January	5.4	100.5	11.8	219.6	0.50	9.3	2.68
February	5.5	105.7	9.4	180.6	0.55	10.6	9.88
March	6.1	122.7	11.4	229.2	0.42	8.4	5.23
April	4.9	87.6	10.8	193.1	0.43	7.7	0.73
May	2.5	42.9	5.5	94.3	0.61	10.5	0.18
June	2.2	38.0	4.4	76.0	0.68	11.8	0.26
July	1.3	24.5	4.9	92.4	0.62	11.7	0.24
August	1.4	25.2	3.1	55.8	0.63	11.3	0.26
September	1.1	21.3	3.9	75.7	0.66	12.8	0.45
October	1.3	24.4	4.7	88.2	0.61	11.4	0.16
November	2.0	36.5	6.9	126.0	0.74	13.5	0.58
December	2.1	36.5	4.0	69.6	0.43	7.5	1.06
Average	3.0	54.8	6.7	123.6	0.57	10.5	1.81
Minimum	1.1	21.3	3.1	55.8	0.42	7.5	0.16
Maximum	6.1	122.7	11.8	229.2	0.74	13.5	9.88
ECA Limit	25.0	852.5	25.0	852.5	1.0	34.1	
ECA Objective	15.0		15.0		0.8		
Within Compliance	Yes	Yes	Yes	Yes	Yes	Yes	
Sampling Frequency Requirement Met	Yes		Yes		Yes		Yes



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Table 3 Final Effluent Analyses continued

Month	Unionized Ammonia average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Chlorine Residual avg. conc. mg/L	pH minimum	pH maximum	Temperature degree Celsius avg.
January	0.02	0.00	7.4	7.8	12.7
February	0.06	0.00	7.3	7.8	13.0
March	0.03	0.00	7.3	7.7	13.2
April	0.00	0.00	7.2	7.9	15.4
May	0.00	0.00	7.4	7.9	17.2
June	0.00	0.00	7.4	7.7	19.2
July	0.00	0.00	7.3	7.9	20.9
August	0.00	0.00	7.3	7.7	21.7
September	0.00	0.00	7.2	7.9	20.4
October	0.00	0.00	7.1	8.0	18.6
November	0.00	0.00	6.6	7.8	16.7
December	0.00	0.00	6.8	7.6	15.7
Average	0.01	0.00			17.0
Minimum	0.00	0.00	6.6		12.7
Maximum	0.06	0.00		8.0	21.7
ECA Limit		0.02	6.0	9.5	
ECA Objective		0.01	6.5	8.5	
Within Compliance		Yes	Yes	Yes	
Sampling Frequency Requirement Met		Yes	Yes	Yes	Yes



Table 4 *Escherichia coli* Sampling

Month	Number of Samples	Geometric Mean Density
January	8	2
February	8	1
March	9	1
April	9	2
May	8	2
June	10	3
July	8	2
August	9	2
September	9	2
October	8	7
November	9	2
December	9	3
ECA Limit		200
ECA Objective		150
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	



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Table 5 Energy and Chemical Usage

Month	Ferrous Chloride litre (L)	Sodium Hypochlorite (L)	Sodium Bisulphite (L)	Hydro kilowatt hour	Natural Gas cubic metres
January	28,017	15,416	6,773	517,609	17,703
February	22,899	10,862	6,519	489,417	13,633
March	28,499	11,675	7,008	361,534	9,634
April	17,280	15,069	6,500	471,516	6,884
May	12,777	13,872	6,438	422,541	3,553
June	15,903	12,026	6,271	401,637	2,382
July	23,309	16,224	6,754	373,919	5,167
August	26,219	13,868	6,339	364,617	2,799
September	24,607	13,340	6,347	365,588	3,027
October	23,953	13,690	6,739	430,218	7,977
November	28,961	13,148	6,002	456,886	9,657
December	25,655	13,417	5,732	528,325	13,600
Total	278,079	162,607	77,422	5,183,807	96,016