



Courtice Water Pollution Control Plant 2020 Annual Performance Report





The Regional Municipality of Durham Courtice Water Pollution Control Plant 2020 Annual Performance Report

Environmental Compliance Approval (ECA): 3393-68RLD4 Dated January 28, 2005
Amendment: Dated April 18, 2007

Environmental Compliance Approval (Air): 7446-6AGNQZ Dated April 30, 2005

The Courtice Water Pollution Control Plant (WPCP) 2020 Annual Performance Report provides staff, stakeholders and customers a performance overview of the Courtice WPCP. Further, this report fulfills the annual reporting requirements of the Ontario Ministry of the 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 Courtice WPCP is located in the Municipality of Clarington (Courtice) and is owned and operated by the Regional Municipality of Durham (Region). The plant is operated according to the terms and conditions of the ECAs.

The Courtice WPCP treats wastewater from the Oshawa and Courtice service areas in the Region. The Courtice WPCP receives the majority of its flow from the Harmony Creek catchment area via the Harmony Creek Sanitary Sewage Pumping Station (SSPS). The plant treats wastewater from approximately 148,513 residents or 77.9% of the total catchment population and the remaining 22.1% of the flow was treated at the Harmony Creek WPCP.

The Courtice WPCP is designed to treat wastewater at an average daily flow rate of 68,200 cubic metres per day (m^3/d) with a peak flow rate of 180,000 m^3/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 collected through approximately 639.4 km of sanitary sewers in Oshawa and Courtice is conveyed to the Harmony Creek SSPS located at the Harmony Creek WPCP. Approximately 77.9%



of the Harmony Creek WPCP influent flow is diverted to the Harmony Creek Sanitary Sewage Pumping Station (SSPS) and conveyed 6.4 kilometres in a 1,050 mm diameter forcemain to the Courtice Water Pollution Control Plant (WPCP).

In addition, an existing small service area in Courtice is serviced by gravity to the Courtice WPCP which includes the Durham York Energy Centre, and surrounding businesses and industries.

Preliminary Treatment

Screening: Two automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings removed in the process are compacted for landfill disposal.

Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the two aerated grit tanks. The velocity of the wastewater rolling 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 the process is dewatered and transported to landfill.

Primary Treatment

The two primary clarifiers utilize the physical process of sedimentation which allows the suspended material to settle to the bottom of the tank as sludge. This raw sludge, along with the 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 digesters 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 phosphorous level in the final effluent by adding a chemical coagulant, ferrous chloride, at various locations within the plant. In 2020 ferrous chloride was dosed only in the aeration tanks.

Secondary Treatment

Aeration Tank: The aeration tanks are comprised of two distinct zones. The first is an anoxic zone, where no oxygen is introduced and allows for denitrification. Subsequently, the wastewater leaves the anoxic zone and enters the aerated zone where fine bubbled air is diffused into the wastewater to assist bacteria in removing dissolved and suspended organics and nutrients.

Secondary Clarifier: The effluent from the aeration tanks is directed to the two secondary clarifiers where the solids settle 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 tanks and the excess activated sludge is wasted to the primary clarifiers.



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 two chlorine contact chambers. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through the 1,676 mm diameter outfall extending 770 metres into Lake Ontario.

Solids Treatment

Anaerobic Digestion: The raw sludge that is collected from the primary clarifiers is pumped into the anaerobic digesters where anaerobic bacteria reduce the volume of sludge. As a result of digestion, the plant produces a more stabilized sludge, water, carbon dioxide, methane, and hydrogen sulphide. The supernatant is returned to the head of the plant for further treatment and the methane is used to meet the heating requirements of the digesters and for heating areas of the treatment facility.

Sludge Management: All digested sludge produced at the Courtice 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 10.(6) of ECA #3393-68RLD4 the Region 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. Table 2 summarizes the raw wastewater characteristics during the reporting period.

The Courtice WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at 56.4% of its annual average rated flow capacity and received a maximum daily flow of 144,502 m³/d on January 12, 2020. See tables 3 and 4 for effluent results.

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

A Request for Pandemic Related Temporary Relief (Alternative Arrangement) for Municipal Wastewater Systems was submitted to the Ministry of the Environment, Conservation and Parks (MECP) on March 31, 2020. The request was made for relief of influent sampling to assist in managing workload and for the health and safety of staff.

The Director granted relief on April 29, 2020. Courtice WPCP returned to normal sampling practices on June 1, 2020.



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

Major maintenance items in 2020 included:

- Replaced solenoid on compactor headworks,
- Replaced check valve flapper on return sludge pump 1201,
- Replaced liners on screen conveyor,
- Replaced sodium hypochlorite pump 102,
- Replaced ferrous tank 1 level indicator,
- Replaced sump 2 at headworks,
- Rebuilt digester recirculation pump 4104,
- Installed new liners in sodium bisulfite tanks,
- Installed new soft start on aeration blower 3,
- Repaired compactor screw conveyor shaft,
- Repaired guywires on waste gas burner stack,
- Installed flow meter on sodium hypochlorite line,
- Installed new breaker on raw sludge pump 1202,
- Installed new hydrant at septage receiving station,
- Installed new power supply on actuated valve in biosolid building,
- Dewatered aeration tank 100 for inspection,
- Installed belts on head works blower 6101 and 6102,
- Installed bearings on aeration blower 4,
- Installed hose on ferrous chloride pump 1,
- Installed limit switch on secondary collector 205,
- Installed new filters in secondary blower air supply room,
- Installed new impeller and mechanical seal on return activated sludge pump 1102,
- Repaired chain and replaced shoes on primary clarifier 100,
- South chlorine contact chamber taken out of service for inspection,
- Installed plate on anoxic zone outlet in aeration tank 200,
- Installed Supervisory Control and Data Acquisition program to trim the dosage of sodium hypochlorite,
- Rebuilt motor on aeration blower 1102.



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

- In-house laboratory (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 a comparable range.
- On-line instrumentation is verified by Water Pollution Control Plant (WPCP) operators using various field or lab test equipment.

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

- Calibration of the effluent flow meter was conducted October 14, 2020.
- Calibration of in-house lab equipment was conducted on September 3, 2020.
- Calibration of the in-house lab pH meter was conducted regularly.

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

The Region continually strives to achieve the best effluent quality at all times and remain below the objectives specified in the ECA.

- The average daily rated flow capacity of 68,200 m³/d was not exceeded. The rated peak flow capacity of 180,000 m³/d was not exceeded.
- The total phosphorus objective of 0.8 mg/L was exceeded in 9 out of 338 samples (2.7%).
- The suspended solid objective of 15.0 mg/L was exceeded in 3 of 483 samples (0.6%).
- The total ammonia nitrogen summer objective of 8 mg/L was exceeded in 3 of 342 samples (0.9%).
- The effluent pH was below the minimum effluent objective of 6.5 in 2 of 366 samples (0.6%).

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

g) Biosolids Production;

Tabulation of Volume of Sludge Generated;

The volume of sludge removed from Courtice WPCP in 2020 was 68,761 m³. The volume of sludge decreased significantly due to the commissioning of the existing digesters at the Harmony Creek WPCP.

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;

Due to one of the digesters being out of service for maintenance, only primary digestion is occurring before the sludges are pumped to the sludge holding facility. The sludge produced at



Courtice Water Pollution Control Plant 2020 Annual Performance Report

this facility was applied on agricultural fields and transferred to Duffin Creek Water Pollution Control Plant (WPCP) for incineration.

Receiving facilities included:

Agricultural Fields – 30,558 m³ or 44.4%

Duffin Creek WPCP – 38,203 m³ or 55.6%

h) 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 2020.

Courtice WPCP maintains a meteorological evaluation tower (MET) as well as a comprehensive odour tracking procedure in conjunction with surrounding industries and businesses. This ensures all odour complaints are thoroughly tracked, investigated and reported as soon as possible.

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

There were no by-passes during the reporting period. There are no anticipated by-passes planned for the next reporting period.

There were no spills during the reporting period.

j) Any other information the District Manager requires from time to time;

No additional information was requested.

k) Ministry of the Environment, Conservation and Parks (MECP) Inspection

This plant was last inspected by the MECP on June 22, 2017.



**Courtice Water Pollution Control Plant
2020 Annual Performance Report**

Table 1 Final Effluent Flows

Month	Total Flow to Plant - metered at the final effluent cubic metre (m³)	Average Daily Flow cubic metre per day (m³/d)	Maximum Daily Flow m³/d
January	2,033,180	65,586	144,502
February	1,278,932	44,101	54,045
March	1,776,321	57,301	78,002
April	1,386,069	46,202	64,998
May	1,077,176	34,748	43,243
June	844,684	28,156	33,238
July	830,152	26,779	35,509
August	775,187	25,006	30,062
September	890,806	29,694	33,498
October	972,422	31,368	35,278
November	988,879	32,963	45,341
December	1,217,068	39,260	47,554
Total	14,070,876		
Average	1,172,573	38,445*	
Minimum	775,187		
Maximum	2,033,180		144,502
ECA Limit		68,200	180,000
Met Compliance		Yes	Yes

*Annual Average Daily Flow



**Courtice Water Pollution Control Plant
2020 Annual Performance Report**

Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand average concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids average conc. mg/L	Total Phosphorus average conc. mg/L	Dissolved Reactive Phosphorus average conc. mg/L	Total Kjeldahl Nitrogen average conc. mg/L
January	367	490	3.5	1.61	36.29
February	254	386	3.8	1.92	40.09
March	161	273	3.1	1.84	31.59
April	196	296	3.9	2.00	39.06
May	230	415	4.8	2.80	47.70
June	359	509	5.3	2.87	51.01
July	309	401	5.2	3.05	51.73
August	244	296	5.1	3.04	51.20
September	264	334	5.3	3.06	53.28
October	297	386	5.5	3.11	52.66
November	274	373	5.6	3.13	51.21
December	227	278	5.1	2.81	45.99
Average	271	370	4.7	2.60	46.42
Minimum	161	273	3.1	1.61	31.59
Maximum	367	509	5.6	3.13	53.28
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes



**Courtice Water Pollution Control Plant
2020 Annual Performance Report**

Table 2 Raw Influent Analyses continued

Month	Total Ammonia Nitrogen average concentration (conc.) milligram per litre (mg/L)	Alkalinity average conc. mg/L	pH minimum	pH maximum	Temperature degree Celsius average
January	21.2	299	6.9	8.1	12.9
February	24.0	299	6.9	7.9	12.9
March	21.4	276	7.3	8.1	13.5
April	25.0	302	7.4	8.0	15.0
May	30.1	298	7.4	8.0	17.1
June	31.9	280	7.5	7.8	18.8
July	33.0	257	7.4	7.7	20.7
August	34.8	263	7.1	8.0	21.1
September	35.1	261	7.5	7.7	19.9
October	36.1	271	7.3	7.8	18.0
November	36.4	263	7.5	7.9	17.1
December	33.0	284	7.5	7.9	14.3
Average	30.2	279			16.8
Minimum	21.2	257	6.9		12.9
Maximum	36.4	302		8.1	21.1
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes



Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand average concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids average conc. mg/L	Total Phosphorus average conc. mg/L	Total Ammonia Nitrogen average conc. mg/L winter	Total Ammonia Nitrogen average conc. mg/L summer
January	1.0	3.2	0.67	0.10	
February	1.2	3.2	0.74	0.07	
March	1.1	2.7	0.66	0.35	
April	1.1	1.9	0.68	0.21	
May	1.0	2.3	0.72		0.08
June	1.0	2.6	0.71		0.11
July	1.0	2.5	0.70		2.16
August	1.0	3.3	0.71		0.26
September	1.1	3.2	0.78		1.08
October	1.2	4.5	0.79		1.41
November	1.0	3.9	0.70	0.63	
December	1.0	2.8	0.58	0.10	
Average	1.1	3.0	0.70	0.24	0.85
Minimum	1.0	1.9	0.6	0.07	0.08
Maximum	1.2	4.5	0.8	0.63	2.16
ECA Limit	25	25	1.0	24	15
ECA Objective	15	15	0.8	12	8
Within Compliance	Yes	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes



Table 3 Final Effluent Analyses continued

Month	Dissolved Reactive Phosphorus average concentration (conc.) milligram per litre (mg/L)	Unionized Ammonia Nitrogen average conc. mg/L	Nitrate Nitrogen average conc. mg/L	Alkalinity average conc. mg/L
January	0.60	0.0	17.57	147
February	0.63	0.0	19.65	115
March	0.59	0.0	17.27	131
April	0.60	0.0	20.94	112
May	0.67	0.0	21.79	89
June	0.63	0.0	22.65	66
July	0.61	0.0	18.94	72
August	0.63	0.0	20.95	49
September	0.70	0.0	22.62	47
October	0.70	0.0	22.76	52
November	0.61	0.0	24.38	41
December	0.50	0.0	21.76	68
Average	0.62	0.0	20.94	82
Minimum	0.50	0.0	17.27	41
Maximum	0.70	0.0	24.38	147
ECA Limit		0.2		
ECA Objective		0.1		
Within Compliance		Yes		
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes



Table 3 Final Effluent Analyses continued

Month	Total Chlorine Residual average concentration (conc.) milligram per litre (mg/L)	pH minimum	pH maximum	Temperature degree Celsius average
January	0.00	6.8	7.5	12.8
February	0.00	6.7	7.5	12.4
March	0.00	6.7	7.3	13.3
April	0.00	6.9	7.2	15.2
May	0.00	6.7	7.7	16.6
June	0.00	6.8	7.2	19.6
July	0.01	6.7	7.2	21.6
August	0.00	6.7	7.1	21.7
September	0.00	6.4	7.0	20.6
October	0.00	6.5	6.9	18.7
November	0.00	6.5	7.1	16.2
December	0.00	6.8	7.2	13.5
Average	0.00			16.9
Minimum	0.00	6.4		12.4
Maximum	0.01		7.7	21.7
ECA Limit		6.0	9.5	
ECA Objective		6.5	9.0	
Within Compliance		Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes



**Courtice Water Pollution Control Plant
2020 Annual Performance Report**

Table 4 *Escherichia coli* Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	13	24
February	12	12
March	10	38
April	5	25
May	4	22
June	9	6
July	9	6
August	8	9
September	9	20
October	9	46
November	8	25
December	10	4
ECA Objective		200
Sampling Frequency Requirement Met	Yes	



**Courtice Water Pollution Control Plant
2020 Annual Performance Report**

Table 5 Energy and Chemical Usage

Month	Total Flow to Plant - metered at the final effluent cubic metre (m ³)	Ferrous Chloride Litres (L)	Sodium Hypochlorite kilograms as chlorine	Sodium Bisulphite L	Hydro kilowatt hours	Natural Gas m ³
January	2,033,180	61,502	4,329.2	8,467	672,918	28,077
February	1,278,932	74,528	3,421.6	5,777	598,391	41,602
March	1,776,321	62,503	4,308.5	8,813	632,447	22,196
April	1,386,069	68,400	3,577.1	10,135	610,414	16,116
May	1,077,176	73,728	3,479.8	6,787	618,225	10,495
June	844,684	76,779	3,293.8	4,312	594,424	5,129
July	830,152	81,693	3,544.1	5,230	628,365	10,446
August	775,187	77,565	2,337.5	5,847	597,015	9,107
September	890,806	94,020	3,068.8	5,477	590,925	9,836
October	972,422	99,954	3,535.8	5,945	636,962	13,497
November	988,879	105,651	3,742.3	5,535	595,266	10,706
December	1,217,068	88,347	4,155.1	6,420	667,875	60,252
Total	14,070,876	964,670	42,794	78,745	7,443,227	237,459