Port Darlington Water Pollution Control Plant

2024 Annual Performance Report

The Regional Municipality of Durham
Port Darlington Water Pollution Control Plant 2024 Annual Performance Report

Environmental Compliance Approval (ECA): 0114-8S8RTA Dated April 24, 2012
Environmental Compliance Approval (Air): 2242-8TFNN3 Dated June 19, 2012

The Port Darlington Water Pollution Control Plant (WPCP) 2024 Annual Performance Report provides staff, stakeholders, and customers a performance overview of the Port Darlington 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 Port Darlington WPCP is located in the Municipality of Clarington (Bowmanville) and is owned and operated by the Regional Municipality of Durham (Region). The plant operates in accordance with the terms and conditions of the ECAs. Port Darlington WPCP treats wastewater from the Bowmanville service area. Two process trains were added in November 2015 and are treating all incoming wastewater. The four existing trains have been removed from service for refurbishment. The plant treats wastewater from approximately 49,560 residents in the Bowmanville service area. The Port Darlington WPCP is designed to treat wastewater at an average daily flow rate of 27,276 cubic metres per day (m^3/d). The plant is an MECP Class 3 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)
- Solids management

Raw Influent Pumping

Wastewater is collected through approximately 163 kilometres of sanitary sewers in Bowmanville and is conveyed to the Port Darlington WPCP by gravity to the raw sewage pumping station located at the WPCP.

Preliminary Treatment

Screening: Two automatic, mechanically cleaned screens remove paper products and large material that could harm pumps and process equipment. Screenings removed in this process are compacted for landfill disposal.
Grit Removal: Heavy suspended material such as sand and small stones (grit) is removed in the two vortex grit tanks. The velocity of the wastewater swirling in the tanks is controlled by the velocity of influent flow to 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 dewatered and transported to landfill.

Primary Treatment

The two primary clarifiers utilize the physical process of sedimentation which allows 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 phosphorus level in the final effluent by adding a chemical coagulant, ferrous chloride, into various locations throughout the Water Pollution Control Plant. In 2024, ferrous chloride was dosed only in the primary effluent.

Secondary Treatment

Aeration Tanks: The aeration tanks are comprised of two distinct sections. The first section is an anoxic zone, where no oxygen is introduced and allows for denitrification. Subsequently, the flow 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 single chlorine contact chamber. Disinfected effluent is dechlorinated with a sodium bisulphite solution before being discharged through a 1,350 millimetre (mm) diameter land section of effluent sewer extending 525 metres (m) to a 1,200 mm diameter marine section of effluent outfall which extends 1,055 m into Lake Ontario.

Solids Management

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 biosolids, water, carbon dioxide, methane, and hydrogen sulphide. The supernatant is returned to the head of the plant for further treatment.
Sludge Management: All stabilized sludge produced at the Port Darlington Water Pollution Control Plant (WPCP) is hauled to the Duffin Creek WPCP for incineration.

Environmental Compliance Approval (ECA)

Under Condition 10(6) of ECA #0114-8S8RTA 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 Port Darlington WPCP effluent was determined to be compliant with the ECA approval limits during the reporting period. The plant operated at 49% of its annual average rated flow capacity and received a maximum daily flow of 44,577 cubic metres per day (m^3/d) on April 12, 2024. See tables 3 and 4 for effluent results.

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

Operating problems encountered and corrective actions taken in 2024 included:

- Secondary 6B chain and flight system broke in December of 2024.The system is planned to be replaced in spring 2025.
- Submersible raw sewage pump was damaged in February of 2024. It currently remains out of service and is scheduled to be replaced in 2025.

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 2024 included:

- Repaired Headworks grit conveyor 201
- Replaced ferrous chloride lines to train 6

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.

Online instrumentation is verified by WPCP operators using field or lab test equipment. On-line instrumentation is verified by WPCP operators using various field or lab test equipment.

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

The raw influent flow meter was calibrated on November 13, 2024.

Calibration of in-house laboratory equipment was conducted on November 28, 2024.

Calibration of the in-house lab pH meter is conducted regularly.

f) A 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 Environmental Compliance Approval:

- The annual average daily flow did not exceed the rated capacity of 27,276 cubic metres per day (m3/d) during the reporting period
- The pH objective lower limit was exceeded in 6 of 366 samples (1.4%)

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 Port Darlington Water Pollution Control Plant (WPCP) in 2024 was 20,876 cubic metres.

Outline of anticipated volumes to be generated in the next reporting period

Even with the increase in population on a year-to year basis, no significant changes to flows or processing are anticipated. Therefore, no significant changes in sludge generation are expected for the next year.

Summary of locations to where sludge was disposed

All stabilized sludge produced at the Port Darlington WPCP was hauled to the Duffin Creek WPCP for incineration.

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 2024.

i) A summary of all By-pass, Spills or Abnormal Discharge events

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

There were no spills during the reporting period.

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

This plant was last inspected by the MECP on February 1, 2024.

Table 1 Raw Influent Flows

Month	Total Flow to Plant* - cubic metre	Average Daily Flow cubic metre per day (m^3/d)	Maximum Daily Flow m^3/d
January	483,751	15,605	23,310
February	388,456	13,395	15,748
March	457,840	14,769	18,442
April	589,652	19,655	44,577
May	399,274	12,880	14,834
June	370,438	12,348	16,261
July	401,277	12,944	25,620
August	349,403	11,271	12,387
September	345,333	11,511	14,139
October	347,255	11,202	12,512
November	337,081	11,236	13,156
December	404,690	13,055	22,097
Total	4,874,450		
Average	406,204	13,355**	
Minimum	337,081		
Maximum	589,652		44,577
ECA Limit		27,276	
Met Compliance		Yes	

*Metered at the raw influent

**Annual Average Daily Flow

Table 2 Raw Influent Analyses

Month	Biochemical Oxygen Demand average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids avg. conc. mg/L	Total Phosphorus avg. conc. mg/L	Total Kjeldahl Nitrogen avg. conc. mg/L
January	168	253	5.4	55.15
February	182	244	5.6	57.23
March	160	232	4.6	47.28
April	140	183	3.7	39.11
May	186	230	5.8	52.02
June	175	258	6.1	53.80
July	148	229	5.4	46.98
August	164	239	6.4	58.31
September	177	289	6.5	55.90
October	168	272	5.8	55.92
November	172	271	6.0	58.31
December	189	222	5.6	57.42
Average	169	243	5.6	53.12
Minimum	140	183	3.7	39.11
Maximum	189	289	6.5	58.31
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes

Table 3 Final Effluent Analyses

Month	Carbonaceous Biochemical Oxygen Demand average (avg.) concentration (conc.) milligram per litre (mg/L)	Total Suspended Solids avg. conc. mg/L	Total Phosphorus (TP) avg. conc. mg/L	Total Ammonia Nitrogen avg. conc. mg/L summer	Total Ammonia Nitrogen avg. conc. mg/L winter
January	2.2	5.1	0.35		2.87
February	2.2	4.9	0.32		1.66
March	3.2	7.3	0.31		1.46
April	3.6	8.0	0.29		0.64
May	4.0	5.8	0.27		0.19
June	3.7	5.4	0.25	0.18	
July	1.8	2.7	0.21	0.18	
August	2.0	3.9	0.18	0.34	
September	2.1	4.9	0.30	2.06	
October	2.5	6.5	0.28	0.60	
November	3.1	8.0	0.30		0.34
December	3.6	5.6	0.32		1.99
Average	2.8	5.7	0.28	1.31	0.46
Minimum	1.8	2.7	0.18	0.19	0.21
Maximum	4.0	8.0	0.35	2.87	0.82
ECA Limit	25.0	25.0	0.8	14.0	24.0
ECA Objective	15.0	15.0	0.6	8.0	12.0
Annual Loading			3.8 kilograms per day		
Within Compliance	Yes	Yes	Yes	Yes	Yes
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes

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	0.0	0.00	6.8	7.8	12.9
February	0.0	0.00	6.5	7.7	11.9
March	0.0	0.00	6.5	7.7	12.2
April	0.0	0.00	6.5	7.6	12.6
May	0.0	0.00	6.5	7.5	15.8
June	0.0	0.00	6.3	7.4	18.4
July	0.0	0.00	6.9	7.5	19.8
August	0.0	0.00	6.5	7.6	20.5
September	0.0	0.00	6.8	7.6	20.2
October	0.0	0.00	7.0	8.2	17.8
November	0.0	0.00	6.8	8.7	16.0
December	0.0	0.00	6.5	8.9	12.4
Average	0.0	0.00			15.9
Minimum	0.0	0.00	6.3		11.9
Maximum	0.0	0.00		8.9	20.5
ECA Limit		0.02	6.0	9.5	
ECA Objective		0.01	6.5	9.0	
Within Compliance		Yes	Yes	Yes	
Sampling Frequency Requirement Met	Yes	Yes	Yes	Yes	Yes

Table 4 *Escherichia coli* Sampling

Month	Number of Samples	Monthly Geometric Mean Density
January	9	3
February	9	2
March	8	2
April	9	16
May	9	19
June	8	17
July	9	3
August	9	4
September	8	26
October	10	11
November	8	2
December	9	11
ECA Limit		200
ECA Objective		100
Within Compliance		Yes
Sampling Frequency Requirement Met	Yes	

Table 5 Energy and Chemical Usage

Month	Total Plant Flow cubic metre (m^3)	Ferrous Chloride Litre (L)	Sodium Hypochlorite kilogram as chlorine	Sodium Bisulphite L	Hydro kilowatt hours	Natural Gas m^3
January	483,751	37,295	1,383	5,487	340,793	79,590
February	388,456	37,138	877	5,246	320,430	67,449
March	457,840	39,911	1,217	5,172	346,892	70,871
April	589,652	44,257	2,045	5,230	346,007	50,286
May	399,274	42,645	2,149	5,748	322,684	34,560
June	370,438	42,708	2,670	5,631	295,406	28,144
July	401,277	42,747	1,782	5,856	287,811	19,086
August	349,403	22,664	438	5,894	282,398	20,033
September	345,333	32,980	1,545	5,601	276,726	26,814
October	347,255	38,306	1,945	5,709	309,224	48,473
November	337,081	34,936	2,149	5,628	318,163	44,905
December	404,690	38,163	1,729	5,847	341,934	75,452
Total	4,874,450	453,750	19,928	67,049	3,788,467	565,663

Table 6 Summary of Raw Water Bacteriological Analyses at the Bowmanville Water Supply Plant

Month	*Escherichia coli* (*E. coli*) Number of Samples	*E. coli Colony Forming Units per 100 millilitre (CFU/100ml) Results Range*	Total Coliform Number of Samples	Total Coliform Results Range
January	18	Non-Detect (ND) - 1	18	ND - 330
February	16	ND	16	ND - 52
March	16	ND	16	ND - 4
April	17	ND - 1	17	ND - 340
May	17	ND - 1	17	ND - 2
June	16	ND – 1	16	ND - 6
July	18	ND - 2	18	ND - 560
August	16	ND - 1	16	ND - 28
September	15	ND - 2	15	ND - 300
October	18	ND - 1	18	ND - 12
November	15	ND	15	ND - 6
December	15	ND	15	ND - 10