Utilities Kingston

RAVENSVIEW
WASTEWATER TREATMENT PLANT
2022 ANNUAL REPORT

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1 EXECUTIVE SUMMARY

Ravensview Wastewater Treatment Plant (WWTP) operates under Ministry of the Environment, Conservation and Parks, ECA number 5556-BZFGZL. The facility was compliant with all conditions outlined in condition 7 of the above-mentioned ECA and are briefly described in the following sections of this report.

The average flow through the plant was 68,505 m^3/day.

The facility had four secondary bypass events during the reporting year totaling 11,961 m^3. The collection system had several wet weather overflow events which totaled 25,455.73 m^3. The overflow locations are listed in Table 2: Annual Overflow Summary.

Operational staff continually improve the operation of Ravensview WWTP taking full advantage of its state-of-the-art technology to protect the environment and maintain the quality of service our residents have come to know.

2 PLANT DESCRIPTION AND TREATMENT PROCESS

The following is a process overview and description of the treatment steps taken at Ravensview Wastewater Treatment Plant

2.1 RAW WASTEWATER RECEIVING

Raw wastewater from the central and east portions of Kingston is conveyed to the influent works. A Parshall flume metering device continuously measures the flow of raw wastewater into the plant. A newly constructed septage receiving station is now online and is located in the northeast corner of the property. The septage receiving station gives approved septic truck haulers a place to discharge the contents of their tanks. The septage receiving station monitors the quantity, origin, and contents being unloaded and provides some pre-treatment before the contents enter the treatment plant at the influent works.

2.2 SCREENING

Three large mechanical screens remove larger materials from the incoming wastewater stream. Screened material is conveyed to a screening press where the material is compacted and stored for offsite disposal.

2.3 GRIT REMOVAL

Grit settles out of the sewage as the water flows through the tanks which are covered to keep the odours in. Air is bubbled into the tank to speed up the settling of the sand, gravel, and other heavier, and inorganic materials. In the bottom of the tank, a corkscrew like system pushes the settled grit into a hopper at the end of the tank. A pump lifts the grit and a small amount of water up into a separator where the grit is rinsed and then placed into a dumpster where it awaits disposal at a landfill.

2.4 PRIMARY CLARIFIERS

After removing the screenings and grit, the only material left in the wastewater is organic material and dissolved contaminants. The wastewater flows very slowly from the one end of the tank to the other. As this happens, the solids, which are high in organic material, settle to the bottom. Large scrapers draw the material to one end of the tank where it is pumped across to the digesters for further processing. At the end of the primary clarifiers, the primary effluent flows into troughs which then direct it to the secondary treatment process. In the primary clarifiers, any grease, fats, or oils that are suspended are skimmed off by rakes and are pumped to the digesters. Any floatable materials that may have slipped through the bars in the screening process will be ground up before entering the digester.

2.5 BIOLOGICALLY AERATED FILTERS

The primary effluent flows to a pumping facility which lifts the wastewater up to a channel running along the centre of the Biologically Aerated Filters (BAF) facility. In each of the 11 available cells, the wastewater flows from the central channel to the bottom of the filters, and up through the filter. In the filter the water is aerated, this encourages growth of microorganisms which consume carbon dissolved in the water, as well as reducing ammonia and phosphorus. These microscopic organisms, referred to as biomass, stick onto the Bio Styrene media (4 mm diameter polystyrene beads), which also act to filter any suspended materials. The beads are held in place under a concrete floor with nozzles which let the clean water flow out on the surface. Like other filters, these are backwashed periodically to remove excess biomass growth and filtered particles. This helps to restore the filters' ability to process wastewater efficiently.

2.6 DISINFECTION

Disinfection is accomplished by adding sodium hypochlorite to the BAF facility effluent. The effluent flows by gravity to a chlorine contact chamber where ample time is provided for the chlorine to disinfect the BAF effluent. Just prior to exiting the chlorine contact tank, the wastewater is dosed with sodium bisulphite. This process de-chlorinates the water entering the receiving stream.

2.7 OUTFALL

After de-chlorination, the disinfected effluent from the chlorine contact tanks is discharged to the St. Lawrence River through a 1500mm diameter outfall sewer with fourteen 250mm elbow diffusers, approximately 240m offshore.

2.8 BAF BACKWASH RESIDUAL TREATMENT

As wastewater is filtered through the BAF filter beds, the media becomes increasingly clogged and requires backwashing to remove excess contaminants and biomass. After leaving the BAF cell, the backwash residual water follows the backwash channel to 2 backwash residual tanks, each large enough to accommodate the volume of backwash residual from a backwash. The water is pumped back to the head of the plant using one of two submersible backwash residual pumps.

2.9 ANAEROBIC DIGESTERS

The digester facility consists of 3 primary digesters and 1 secondary digester. Inside, the mixture is heated to allow microorganisms to grow and consume carbon and to produce methane gas and carbon dioxide. The first primary digester, digester 3, is heated to 55 degrees Celsius (thermophilic), which further assists in the destruction of harmful bacteria in the solids. After approximately 15 days, the solids are transferred in series to two other primary digesters, digesters 1 and 2, which are heated to 36 degrees Celsius (mesophilic), where they remain for an additional 15 days before being stored in the secondary digester, digester 4, before being sent to the dewatering facility.

Sludge in digesters 1 and 2 is mixed using four mechanical mixers mounted on each of the digester's roofs. The sludge from digesters 1 and 2 is recirculated through two sludge heat exchangers, this helps the digester maintain the correct temperature. Mixing in digester 3 is accomplished using only a mixing pump. The sludge from digester 3 is also recirculated through a heat exchanger to maintain the correct temperature as well. Digester 4 sludge is pumped to holding tanks in the dewatering building where it is recirculated until ready to be dewatered.

The methane gas produced is used as fuel for the boiler system which in turn provides heat for the digestion process through the sludge heat exchangers. If more gas is being generated than can be used in the boiler, the excess gas can be used in a combined heat and power generation system, Co-gen, to help offset the power purchased from the grid or burned using a flare stack.

2.10 DEWATERING

Liquid biosolids, which are about 2% solid and 98% water, is pumped from the secondary digester into 2 centrifuges. Polymer is added to the biosolids before it enters the centrifuge, this helps the solids stick together, aiding the dewatering process. The centrifuge spins at a high-speed, forcing solids, to the outer drum. This separates the solids, referred to as cake, from the liquid, called centrate. The cake, which now has a solids content of about 30%, is conveyed to a hopper. When enough material is in the hopper, a piston pump pushes the solid cake to the biosolids storage building. Alternatively, the cake materials can be loaded directly into a dump truck in a separate loading bay. The centrate, which contains many nutrients and some microorganisms, is returned to the headworks for treatment.

2.11 BIOSOLIDS STORAGE

The dry product, cake, that results from the treatment process may be stored for up to 240 days, based on ideal loading conditions. The cake can then be used on agricultural lands as a nutrient and soil conditioner when weather and crop conditions permit.

2.12 STANDBY EQUIPMENT

The power building houses two 575kW electric back-up generators that are designed to run the water pollution control plan in the event of a power outage. These units are powered by 12-cylinder, low emission natural gas engines that will start automatically in the event of a power failure. The aforementioned Co-gen is a combined heat and power generator. This 8-cylinder engine is designed to work on natural gas, digester gas which has been cleaned and the moisture removed, or a blend of these two fuels. The Co-gen unit is designed to run continuously and produce 375 kW of electric power and 500kW of heat reducing the amount of gas required to heat the digesters.

FIGURE 1 - RAVENSVIEW WASTEWATER TREATMENT PLANT GENERAL LAYOUT

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3 OPERATION

Adequate staffing as well as preventative maintenance and regular equipment inspections allowed operational problems to be diagnosed quickly and corrective actions to be taken immediately. Non flushable materials such as wipes, and grease continue to be more prominent in the sewer system resulting in some operational and maintenance challenges. Utilities Kingston is still implementing a public education program to make customers more aware of what materials should not be flushed down the sewers. This program has included radio and newspaper campaigns, social media campaigns such as Twitter and Facebook, bill stuffers, information on back of parking tickets, and bus information signs. This has been an ongoing campaign for the past several years with positive results.

4 PLANT PERFORMANCE

Ravensview WWTP did not exceed any of the limits set out in the ECA throughout the calendar year. Raw Influent, Final Effluent, and Sludge/Biosolids samples were collected and submitted to a third-party laboratory at or above the required frequencies based on the ECA.

5 BIO-SOLIDS MANAGEMENT

Ravensview WWTP processed 68,967.58 m^3 of liquid sludge through the centrifuge. Approximately 3,725.31 Metric Tonnes of sludge cake was stored on site until GFL Environmental applied it to land on licensed agricultural fields.

The location and date of land application of the Bio-solids produced largely depends on weather, and the crops being grown on the receiving lands. Table 1 contains active spreading locations and their appropriate Non-Agricultural Source Materials Plan (NASM).

6 MAINTENANCE

Staff continue to use our preventative maintenance program in accordance with manufacture's recommendations.

Additional Maintenance completed this year:

- Infrared scans of high voltage electrical was performed across the plant.
- Equipment and motors had routine vibration monitoring conducted.
- All primary clarifiers were cleaned and inspected.
- The gas Cogen alternator was serviced.
- The media in the septage odour control unit was replaced.
- Both grit tanks were cleaned and inspected.
- Digester 1 and 2 sludge recirculation line had all valves replaced.

7 CAPITAL WORKS

The major highlights for capital works were:

- One of the primary effluent pumps was sent out to be rebuilt.
- The scum pits had repairs completed.
- Concrete in the Biosolids building was repaired.
- Lighting upgrades have begun throughout the plant.
- Effluent water line supplying water throughout the plant was replaced.
- A blower in the BAF was replaced.
- The gas Cogen had the HMI replaced.

8 EQUIPMENT CALIBRATION

Third party contractors calibrated all plant flow meters, online analyzers, and lab equipment. As a result, the facility saw limited downtime of major equipment and saw very few mechanical or electrical failures this year. Calibration records are available upon request.

9 COMPLAINTS

In the 2022 reporting year, the Ravensview WWTP received no official complaints regarding the facility or treatment process.

10 BYPASS & OVERFLOW SUMMARY

The facility had four secondary bypass events during the reporting year. These secondary bypass events all coincided with power outages to or within the plant. The total volume that bypassed secondary treatment was 11,961 m^3. The collection system had several wet weather overflow events which totaled 25,455.73 m^3 for 2022. The overflow locations are listed in Table 2: Annual Overflow Summary.

For further information about this report or any questions regarding accessibility, contact Tim Bourne at tbourne@utilitieskingston.com or call 613-546-1181 Ext 2190.

11 BIOSOLIDS RECIPIENTS

Table 1 – Biosolids Recipients

Non-Agricultural Source Materials Plan (NASM)	Address
24405	Lot 24-25 Conc. 4 South Town of Greater Napanee
24326	Lot 26-31 Conc. 1 Stone Mills Township

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Table 2 – Annual Overflow Summary

PCP #	Location	Number of Events	Volume (m3)
1	Orchard-Emma Martin CSO	0	0.00
2	535 Rideau Belle Park Trunk	1	0.30
5	Dalton Ave PS	0	0.00
14	Barrack St E of King St	0	0.00
22	William St W of Ontario St	0	0.00
23	Earl St W of Ontario St	8	21.06
24	Gore St W of Ontario St	0	0.00
25	Lower Union W of Ontario St	9	247.01
26	West St S of King St	3	2014.00
28	King St (O'Kill) PS	0	0.00
34	Helen St at Mack St	0	0.00
35	Palace Rd PS	0	0.00
41	Morton St PS	0	0.00
43	King-Portsmouth PS	0	0.00
48	West end of Sherwood Dr	0	0.00
50	South end of Parkway	0	0.00
51	Clarence St W of King St	0	0.00
52	Raglan Rd at Rideau St	0	0.00
53	Union St at Division St	0	0.00
55	King-George CSO	4	6774.80
56	King-Collingwood CSO	2	11885.63
65	535 Rideau Belle Park Local	8	4512.94
68	Quebec St at Barrie St	0	0.00
69	Greenview Dr PS	0	0.00
70	Carlisle St at Chestnut St	0	0.00
74	Barrett Court	0	0.00
76	Ravensview Wastewater Treatment Plant	4	11961.00
79	Riverview Way PS	0	0.00
N/A	Total	39	37416.73

13 PLANT PERFORMANCE RESULTS

Table 3 – Annual Effluent Concentrations

Month	Objective (mg/L)	Limit (mg/L)	CBOD5 (mg/L)	Total Suspended Solids (mg/L)
January	15.00	25.00	3.00	3.30
February	15.00	25.00	1.80	4.60
March	15.00	25.00	1.70	4.40
April	15.00	25.00	3.00	3.60
May	15.00	25.00	4.70	4.30
June	15.00	25.00	3.00	4.10
July	15.00	25.00	1.80	4.80
August	15.00	25.00	1.80	8.10
September	15.00	25.00	2.20	5.80
October	15.00	25.00	2.00	8.80
November	15.00	25.00	2.00	5.40
December	15.00	25.00	1.90	6.40
Annual Average	N/A	N/A	2.41	5.30

Table 4 – Annual Effluent Concentrations (Total Ammonia Nitrogen)

Month	Objective (mg/L)	Total Ammonia Nitrogen (mg/L)
January	12.00	1.20
February	12.00	2.09
March	12.00	1.60
April	12.00	1.27
May	12.00	0.77
June	7.00	1.05
July	5.00	2.82
August	5.00	0.48
September	7.00	2.67
October	12.00	1.31
November	12.00	2.38
December	12.00	0.64
Annual Average	N/A	1.52

Table 5 – Final Effluent Results

(Monthly Average)

Month	CBOD5 (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)	Total Ammonia Nitrogen (mg/L)	pH	E Coli (CFU/100 mL)	Acute Lethality (Pass or Fail)
January	3.00	3.30	0.42	1.20	6.97	1	PASS
February	1.80	4.60	0.63	2.09	6.98	18	N/A
March	1.70	4.40	0.43	1.6	7.29	6	N/A
April	3.00	3.60	0.48	0.77	7.36	4	PASS
May	4.70	4.30	0.55	0.77	7.29	8	N/A
June	3.00	4.10	0.60	1.05	7.04	32	N/A
July	1.80	4.80	0.57	2.82	7.13	9	N/A
August	1.80	8.10	0.67	0.48	7.06	17	PASS
September	2.20	5.80	0.69	2.67	7.08	19	N/A
October	2.00	8.80	0.44	1.31	6.98	8	PASS
November	2.00	5.40	0.63	2.38	7.06	12	N/A
December	1.90	6.40	0.69	0.64	6.99	3	N/A
Annual Average	2.41	5.30	0.57	1.48	7.10	11.42	N/A

Table 6 – Effluent Loading Limits

Effluent Parameter	Limit	Loading Limit from Effluent	Annual Average
CBOD5	25.0 mg/L	2,375 kg/d	121 kg/d
Total Suspended Solids	25.0 mg/L	2,375 kg/d	279 kg/d
Total Phosphorus	1.0 mg/L	95 kg/d	31.5 kg/d
pH	6.0 - 9.5	N/A	7.12
Acute Lethality (PASS or FAIL)	N/A	N/A	PASS

Table 7 – Annual Plant Flows

Parameter	2016	2017	2018	2019	2020	2021	2022
Average (m3/day)	59,640	86,200	69,005	77,265	59,435	57,278	68,505
Max (m3/day)	179,987	169,266	181,067	160,459	141,016	146,486	153,434
Design (m3/day)	95,000	95,000	95,000	95,000	95,000	95,000	95,000
Design Peak (m3/day)	193,000	193,000	193,000	193,000	193,000	193,000	193,000
Daily/Design (%)	62.8	90.7	72.6	81.3	62.6	60.3	72.1
Max/Peak (%)	93.3	87.7	93.8	83.1	73.1	75.9	79.5