

**MUNICIPALITY OF SOUTHWEST MIDDLESEX
WARDSVILLE WASTEWATER TREATMENT PLANT AND
COLLECTION SYSTEM**

**2008 ANNUAL REPORT
January 1 to December 31, 2008**

**Certificate of Approval # 2772-5QBNCF
Certificate of Approval # 5516-7JBQ37**

Prepared by:



**Ontario Clean Water Agency
Agence Ontarienne Des Eaux**

Overview

Overall the Wardsville Wastewater Treatment Plant provided effective wastewater treatment in 2008. The wastewater treatment plant was operated under Certificate of Approval 2772-5QBNCf dated May 2000 until the amended Certificate of Approval 5516-7JBQ37 was issued September 25, 2008. There were some changes made to the sampling requirements.

On a monthly basis Compliance Reports are compiled and sent to the Ministry of Environment, attention Dave Thompson. The reports are attached as Appendix B.

There were no bypass events in 2008.

No community complaints with regard to plant operations were received in 2008.

Collection System

The collection system consists of a Small Bore Sewer (SBS) system rather than a conventional sanitary sewer system. This system uses on-site SBS clarifier for each individual lot, consisting of approximately 145 residential and 6 commercial/institutional properties. The SBS clarifiers overflow in the SBS system into two pumping stations. The pumping stations then are directed to the main pumping station and this forcemain directs flow the Wastewater Treatment Plant.

Plant Description

Sewage enters a splitter box equipped with a manually cleaned bar screen. The splitter box is designed for a peak flow of 1100m³/day and includes two side gates to divide and direct the sewage into two parallel extended aeration treatment trains. Lime is manually added at the splitter box for alkalinity adjustment.

Each individual extended aeration treatment train includes the following components:

- i) A 9m × 4.5m × 4.5m extended aeration tank sized for 24 hours detention time assuming an average daily flow of 150m³/day. The tank is designed to achieve dissolved oxygen (DO) concentration of 2mg/L.
- ii) A secondary clarifier tank sized for a peak hydraulic loading of 550m³/day together with stilling well, baffles and air lift sludge pump that directs sludge into the on-site sludge management facilities.
- iii) A continuous backwash down flow granular sand filter sized for a peak hydraulic loading rate of 550m³/day. Approximately 6 to 8% of the effluent that flows through the filter is backwashed.

The backwash water from each treatment train's sand filter is combined and directed into a 1m x 5.6m x 4.5m post-aeration tank designed to achieve a DO concentration of at least 5mg/L in the effluent. Following the aeration the effluent is directed to an in-ground chamber housing a UV disinfection system designed for a peak hydraulic flow of 1100m³/day. The outfall is located less than 500m from the sewage works and discharges to the Thames River.

Phosphorus and solids removal is achieved by the addition of aluminum sulphate (alum) from two metering pumps that inject into the aeration tanks. The alum is stored in a 3400L storage tank.

Sample Collection and Testing

All samples are collected and tested as per the requirements of the Certificate of Approval.

Raw sewage is sampled twice per month and tested for BOD₅, total suspended solids, total phosphorus, and total Kjeldahl nitrogen. The raw samples are collected as grab samples.

Final effluent is sampled weekly and tested for BOD₅, total suspended solids, total phosphorus, total ammonium nitrogen, and E. coli, according to the previous Certificate of Approval. Samples are collected using an automatic composite sampler and collected over a twenty-four hour period. Three times per week grab samples are collected and tested in-house for pH and temperature. The current Certificate of Approval specifies weekly sampling for cBOD₅, total suspended solids, total phosphorus, and total (ammonia + ammonium) nitrogen as a composite sample. As well, a weekly grab sample for E. coli. In house grab samples are collected and tested for pH, dissolved oxygen, and temperature.

In-house tests are conducted on a weekly basis on the final effluent, raw influent and the mixed liquor suspended solids at the plant to check plant performance and to make any operational changes required.

Extra samples were collected on the raw sewage and tested for total (ammonia + ammonium) nitrogen and alkalinity. Alkalinity tests are done on the final effluent as well, for better operational control.

In 2008, all chemical and microbiological sample analyses were conducted by SGS Lakefield Research. Temperature, pH and dissolved oxygen were conducted by staff at the treatment plant.

The receiving stream temperature and dissolved oxygen levels were tested twice per month at the Thames River.

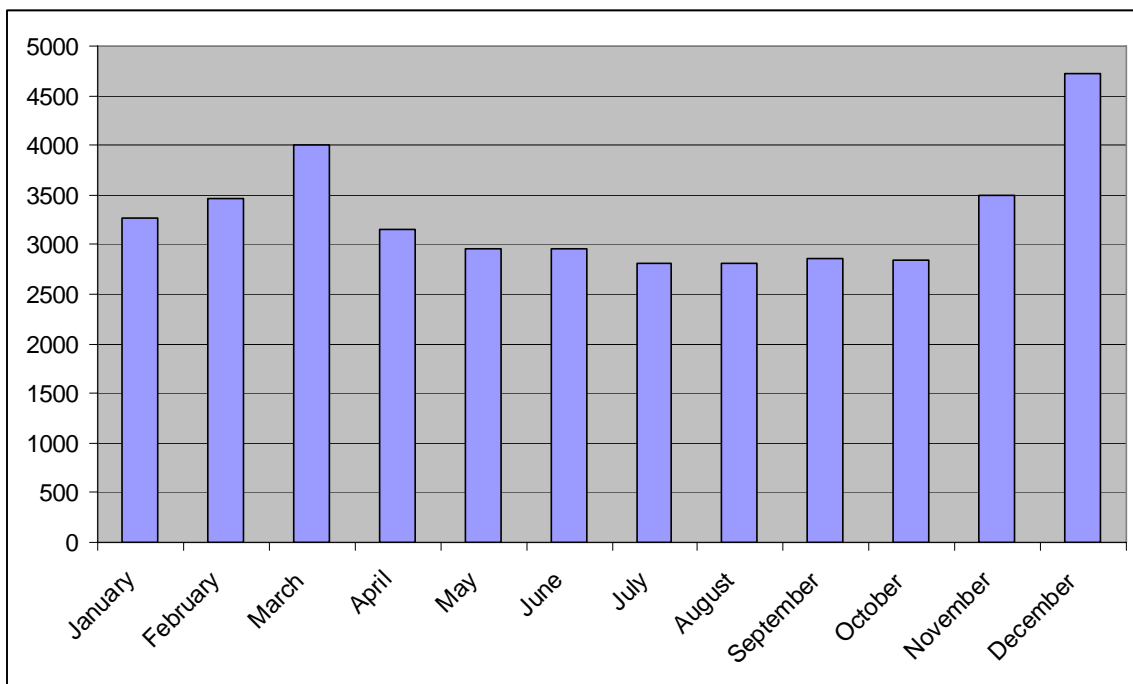
Flows

Detailed monthly flow information is summarized as an attachment.

The total flow treated in 2008 was 39,326m³, which corresponds to a 14% increase to 2007 raw flows. The annual average daily flow was 107.4 m³/day, or 35.8% of the plant's rated design capacity of 300 m³/day.

The design average daily flow for the plant was exceeded in March with a flow of 448m³/day. The hydraulic peak flow of 1100m³/day for the plant was not exceeded 2008.

Chart 1. Monthly raw flows (m³/month) for Wardsville Wastewater Treatment plant for 2008.



Raw Sewage Quality

The annual average raw sewage BOD₅ concentration to the plant was 119.8mg/L with a maximum concentration of 171.5mg/L. The average concentration of BOD₅ has decreased 13% from 2007. The average BOD₅ loading to the plant was 12.9kg/d for 2008.

The annual average raw sewage suspended solids (TSS) concentration to the plant was 53.8mg/L, which is a 44% increase from 2007. This corresponds to an average TSS loading to the plant of 5.8kg/day.

The annual average raw sewage nitrogen concentration (as represented by TKN) to the plant was 36.7mg/L with a loading of 3.94kg/d. This is a decrease of 14% in 2007. For five months out of the year the TKN concentrations were above 40mg/L. The plant is not designed to treat TKN concentrations above 40mg/L.

Plant Performance & Effluent Quality

Detailed analytical data is provided in the excel spreadsheet attached to this report. The following table summarizes the annual averages and maximum single sample results.

Summary and Comparison of Compliance Data

Parameter	Monthly Average Effluent Limit (mg/L)	Single Sample Effluent Limit (mg/L)	Effluent Objective (mg/L)	Annual Average Effluent Results (mg/L)	Annual Maximum Effluent Results (mg/L)
BOD5	10(a)	15(a)	5(a)	<2.7	5.0
	15(b)	25(b)	10(b)		
Suspended Solids	10(a)	15(a)	5(a)	<3.1	6.0
	15(b)	25(b)	10(b)		
Total Phosphorus	0.5(a)	1.0(a)	0.3(a)	<0.17	0.32
	1.0(b)	1.5(b)	0.8(b)		
Total (Ammonia + Ammonium) Nitrogen	3.0(a)	4.5(a)	2.0(a)	<0.47	3.1
	5.0(b)	7.5(b)	4.0(b)		
E. coli	200	1000		<3.0	1320

NOTE: (a) limit applies when receiving stream temps are above 5°C
(b) limit applies when receiving stream temps are below 5°C

There were no effluent limit exceedances for the reporting period of 2008. There was one effluent single sample limit exceedances for E. coli in March 2008. The geometric mean for the month was 14 cfu/100mL. The plant is showing great improvement from the previous year where there were twelve single sample exceedances and 4 monthly effluent exceedances. This is most likely due to a better handle on the alkalinity and pH issues seen in the past.

Biosolids Management

Aerobically digested biosolids produced at the Wardsville WWTP currently meet the quality criteria specified in the Ontario Guidelines for Sewage Biosolids Utilization on Agricultural Lands. Land application was arranged for the biosolids produced at the plant, however, due to issues with spreading this was not completed. Biosolids will be hauled in 2009.

Bypassing and Abnormal Conditions

There were no by-pass events for the Wardsville WWTP for the reporting period.

Maintenance and Calibration Activities

Regular scheduled monthly preventative maintenance is assigned and monitored using the Workplace Management System program.

Annual maintenance on the generator at the Main Pumping Station was completed in July by Albert's Generator Service. R&R instrumentation performed the annual calibration on the flow meter in September.

In house meters for pH and dissolved oxygen are calibrated by OCWA operators as per manufacturer's instructions.

Maintenance Summary

The following is a summary of maintenance performed other than WMS work orders:

- high level float at Pump Station #3 replaced
- added sand to filters
- blower maintenance by Pencon Equipment
- replaced two reject pumps
- Benko flushed sewer mains
- replaced UV bulbs and one ballast

Operating Problems

Cold influent temperatures continue to be a problem for the treatment plant causing aeration temperatures below 5°C. With the temperatures below 5°C the biological treatment process is ineffective in treating the raw sewage. These low temperatures also cause freezing of the contents in the tanks and filters. As well, it causes freezing of the air, wasting, reject and alum lines. Thus making it extremely difficult to operate the plant and keep the plant within the compliance limits.

There have also been several occasions where the raw flow rates have exceeded the design flow rate causing the plant to be washed out.

Alteration

The new Certificate of Approval addresses the addition of hydrated lime to augment the alkalinity levels.

Discussion

Conestoga Rovers and Associates have been hired by the municipality and they have reviewed the data compiled by OCWA from the last 5 years. A report was prepared by the consultants.

The recommendations to ensure compliance with effluent requirements are:

- Maintain effluent alkalinity of at least 50mg/L; consider using an automated feed system and switching from lime to soda ash
- Replace/modify blowers and air supply piping
- Monitor WAS total and volatile solids concentration
- Monitor total and volatile solids concentration and DO of the aerobic digester
- Use carrier water stream for alum addition to minimize freezing
- New chemical building to house alum addition system and soda ash feed system

Other significant observations noted by the consultants are:

- Additional filtration area
- Removing single sample criteria from Certificate of Approval
- Changing effluent conditions based on months of the year, not on receiving stream temperature
- Measure influent and effluent wastewater temperatures to quantify the magnitude of heat lost
- Increase air supply to extended aeration process during cold weather months
- Cover entire biological treatment tanks
- Alter treatment facility to reduce process HRT

Some of these recommendations and observations will be addressed in 2009.

APPENDIX A

Performance Assessment Report



Ontario Clean Water Agency Performance Assessment Report - Wastewater Treatment

Printed on: 3/20/2009

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Municipality: Village of Wardsville
 Facility: [6640] - Wardsville Wastewater Collection and Treatment System
 Works: [120002692] - Wardsville Wastewater Collection and Treatment System
 Classification: Class 2 Wastewater Treatment
 Receiver: Thames River

Period: 01/01/2008 to 12/31/2008
 Serviced Population: 432
 Total Design Capacity(m³/day): 300.0
 Raw Flow Group Selected: Raw
 Effluent Group Selected: Eff

	Jan/2008	Feb/2008	Mar/2008	Apr/2008	May/2008	Jun/2008	Jul/2008	Aug/2008	Sep/2008	Oct/2008	Nov/2008	Dec/2008	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
Flow																
Raw: Total Flow(m3/mth)	3,265.0	3,464.0	3,998.0	3,146.0	2,955.0	2,951.4	2,803.0	2,814.0	2,862.0	2,845.0	3,495.0	4,728.0	39,326.4			
Raw: Avg. Day Flow(m3/day)	105.3	119.4	129.0	104.9	95.3	98.4	90.4	90.8	95.4	91.8	116.5	152.5		107.4		
Raw: Max. Day Flow(m3/day)	153.0	250.0	448.0	159.0	126.0	137.0	139.0	120.0	145.0	106.0	175.0	296.0			448.0	
Eff.: Total Flow(m3/mth)	3,265.0	3,464.0	3,998.0	3,146.0	2,955.0	2,951.4	2,803.0	2,814.0	2,862.0	2,845.0	3,495.0	4,728.0	39,326.4	107.4	4,728.0	
Biochemical O2 Demand																
Raw: Avg. BOD(mg/L)	112.7	142.0	81.7	131.0	89.0	156.0	171.5	112.0	139.0	145.0	100.0	78.3		119.8	171.5	0
Eff.: Avg. Eff. BOD(mg/L)	< 2.4	< 2.0	< 4.6	< 2.0	< 2.3	< 2.5	< 1.5	< 5.0	< 2.2	< 2.0	< 2.0	< 2.0		< 2.7	< 5.0	10.0
BOD Loading(kg/d)	< 0.25	< 0.24	< 0.59	< 0.21	< 0.22	< 0.25	< 0.14	< 0.45	< 0.21	< 0.18	< 0.23	< 0.31		< 0.27	< 0.59	
Percent Removal	97.87	98.59	94.37	98.47	97.38	98.4	99.13	95.54	98.42	98.62	98.0	97.45		97.69		
Eff.: Avg. CBOD(mg/L)											< 2.0	< 2.0		< 2.0	< 2.0	0
CBOD Loading(kg/d)											< 0.23	< 0.31		< 0.27	< 0.31	
Suspended Solids																
Raw: Avg. SS(mg/L)	23.7	22.5	227.3	28.0	21.0	50.5	24.5	28.0	52.5	52.0	42.0	15.7		53.8	227.3	0
Eff.: Avg. SS(mg/L)	< 3.6	< 4.5	< 6.0	< 2.0	< 2.3	< 3.8	< 2.5	< 2.3	< 2.2	< 2.0	< 2.5	< 3.0		< 3.1	< 6.0	10.0
SS Loading(kg/d)	< 0.38	< 0.54	< 0.77	< 0.21	< 0.22	< 0.37	< 0.23	< 0.2	< 0.21	< 0.18	< 0.29	< 0.46		< 0.34	< 0.77	
Percent Removal	84.79	80.0	97.36	92.86	88.89	92.57	89.8	91.96	95.81	96.15	94.05	80.85		90.42		
Phosphorus																
Raw: Avg. PHOS(mg/L)	6.18	5.57	4.42	6.97	4.43	7.53	7.7	5.74	5.73	6.49	4.52	3.18		5.65	7.7	0
Eff.: Avg. PHOS(mg/L)	0.13	0.21	0.23	0.15	0.22	0.26	0.2	0.32	0.15	0.08	< 0.08	0.13		< 0.17	< 0.32	0.5
Phos. Loading(kg/d)	0.01	0.02	0.03	0.02	0.02	0.03	0.02	0.03	0.01	0.01	< 0.01	0.02		< 0.02	< 0.03	
Percent Removal	97.9	96.32	94.8	97.9	95.1	96.58	97.37	94.51	97.41	98.77	98.34	96.04		96.75		
Nitrogen Series																
Raw: Avg. NH3+NH4(mg/L)	28.5	32.7	32.8	34.15	21.45	37.55	45.95	42.4	44.2	45.97	32.2	21.47		35.05	45.97	0
Eff.: Avg. NH3+NH4(mg/L)	< 0.52	< 0.93	< 3.1	< 0.2	< 0.2	< 0.18	< 0.1	< 0.1	< 0.12	< 0.1	< 0.15	< 0.12		< 0.47	< 3.1	3.0
NH3+NH4 Loading(kg/d)	< 0.05	< 0.11	< 0.4	< 0.02	< 0.02	< 0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.02	< 0.02		< 0.06	< 0.4	



**Ontario Clean Water Agency
Performance Assessment Report - Wastewater Treatment**

Printed on: 3/20/2009

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	Jan/2008	Feb/2008	Mar/2008	Apr/2008	May/2008	Jun/2008	Jul/2008	Aug/2008	Sep/2008	Oct/2008	Nov/2008	Dec/2008	<-- Total -->	<-- Avg. -->	<-- Max. -->	<--Criteria-->
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Disinfection

Eff.: Geo.Mean E.Coli per 100mL	<	2.0	<	3.0	<	14.0	<	3.0	<	3.0	<	5.0	<	2.0	<	4.0	<	2.0	<	2.0	<	3.0	<	5.0		<	3.0	<	14.0		200.0
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Note: ? Calculation not verifiable. At least one result reported as < and at least one result reported >. -1 Analysis result less than detectable limit

Legend:

Raw Group Selected: Raw - Raw Sewage

Effluent Group Selected: Eff - Final Effluent

APPENDIX B

Monthly Compliance Summaries

Daily Process Data Report For July 2008

Municipality: Village of Wardsville
 Daily Process Data Report for July 2008

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 Works: 120002692] - Wardsville Wastewater Collection and Treatment System
 Classification: Class 2 Wastewater Treatment
 Receiver: Thames River
 Total Design Capacity(m3/day): 300.00
 Population Served: 432.00

	7/1	7/2	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	Total	min	max	avg	Criteria >5°C																															
																																2803	62	139	90.419	300	300																														
Raw Sewage/Flows [Raw - Raw Sewage]																																																																			
Raw Flow: Sum (m ³ /d)	86	110	109	84	84	83	86	92	81	101	84	84	84	80	116	62	88	89	89	89	90	80	123	74	99	99	99	74	62	139	83	2803	62	139	90.419	300	300																														
Raw Sewage/Raw Sewage [Raw - Raw Sewage]																																																																			
BOD5 (mg/L)	182														161																				161	182	171.5																														
Suspended Solids (mg/L)	22														27																			22	27	24.5																															
Total Phosphorus (mg/L)	7.48														7.92																			7.48	7.92	7.7																															
TKN (mg/L)	45.9														43.7																			43.7	45.9	44.8																															
Phosphorus Removal/Chem. Add [-]																																																																			
Dosage (mg/L)	171.72	134.25	135.49	146.25	146.25	148.8	128.79	120.39	136.74	146.22	102.53	102.53	102.53	92.3	127.31	119.1	125.86	124.45	124.45	124.45	123.07	138.45	90.049	99.784	111.88	111.88	111.88	111.88	99.784	119.1	53.122	177.93	53.122	177.93	122.49																																
Coagulant (L)	22.72	22.72	22.72	18.9	18.9	19	17.04	17.04	17.04	22.72	13.25	13.25	13.25	11.36	22.72	11.36	17.04	17.04	17.04	17.04	17.04	17.04	17.04	11.36	17.04	17.04	17.04	17.04	11.36	11.36	22.72	522.55	11.36	22.72	16.856																																
Disinfection/Effluent [Eff - Final Effluent]																																																																			
E. Coli. (cfu/100 mL)	2														2																			2	2	2	1000	200																													
Final Effluent/Effluent [Eff - Final Effluent]																																																																			
BOD5 (mg/L)	3						<1.0								1							<1.0												1	3	1.6667	15	10																													
Suspended Solids (mg/L)	4						<2.0								2							<2.0											2	4	2.6667	15	10																														
Total Phosphorus (mg/L)	0.18						0.21								0.24							0.18											0.18	0.28	0.218	1	0.5																														
NH3 + NH4 as N (mg/L)	0.1						<0.1								0.1							<0.1										0.1	0.1	0.1	4.5	3																															
pH	6.63	6.41	6.54				7.01	6.62	6.89						6.99		7	6.85				6.78	6.56	7.01								6.48	7.22	6.41	7.22	6.785	6 to 9.5	6 to 9.5																													
DO (mg/L)	8.75	8.68	8.81				8.15	9.31	14.83						5.01		6.73	6.42				8.13	17.79	17.68								5.01	17.79	9.5557	4	5.0																															
Temperature (C)	19.7	19.6	19.6				19.6	19.7	21.4						21.6		22.3	22.3				22.8	22.8	22.8								19.6	23.1	21.443																																	
Final Effluent/Downstream [Down - Downstream]																																																																			
Receiving Stream Temp. (C)																	25.2																25.5		25.5	25.5																															
Final Effluent/Effluent [Eff - Final Effluent]																																																																			
Alkalinity (mg/L)	74		72				71		80						51		94																60		51	94	72.556																														
Raw Sewage/Raw Sewage [Raw - Raw Sewage]																																																																			
Alkalinity (mg/L)	333						278								327																		308		278	333	311.5																														