MUNICIPALITY OF WEST ELGIN
WEST LORNE WASTEWATER TREATMENT PLANT

2013 ANNUAL REPORT
January 1 to December 31, 2013

Environmental Compliance Approval # 3-0442-90-938

Prepared by:

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

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Section 1: Overview

Overall the West Lorne Wastewater Treatment Plant provided effective wastewater treatment in 2013. The wastewater treatment plant was operated under Environmental Compliance Approval 3-0042-90-938 dated November 8, 1993 with amendments July 6, 1994 and September 24, 1998.

Collection System

As of May 2013, the collection system maintenance is carried out by the Ontario Clean Water Agency. It contains gravity sewers that lead to the Main Pumping Station located on Marsh Line. It contains a wet well with three submersible pumps that pump to the treatment plant. There is a receptacle for a portable generator should the need arise for backup power. In emergencies, the wetwell contains an overflow pipe that discharges to the West Lorne Lagoon.

Plant Description

The West Lorne Wastewater Treatment Plant is an extended aeration facility which consists of: grit removal and screening, extended aeration, settling, phosphorus removal, filtration and UV disinfection (seasonal). The extended aeration process is designed to remove carbonaceous and nitrogenous organic compounds (BOD). Aluminum Sulphate is used for phosphorus removal. After the clarifier the effluent is seasonally disinfected using ultraviolet light, then discharged to Zoller Drain. Zoller Drain is connected to Brock's Creek and then from there it goes to Lake Erie. Sludge is directed to the lagoon for storage and settling. Decant liquid off the lagoon is returned to the influent of the plant for treatment.

Process Details

- Wastewater is directed into the sewage lift station from the Village of West Lorne by gravity. Wastewater is then pumped from the sewage lift station located on Mash Line into a reinforced concrete inlet channel, provided with a mechanical rake bar screen.
- The secondary treatment system consists of two trains each consisting of: aeration tank, clarifier tank, and two return activated sludge pumps.
- The phosphorous removal system consists of one 15,000L plastic tank with 2 diaphragm type metering pumps 1 duty and 1 standby.
- Lime system for pH and alkalinity control (currently not in use)
- The objective of the system is to remove organics, total Kjeldahl nitrogen (TKN), phosphorous and ammonia-nitrogen.
- Two rotary lobe blowers one duty and one standby supply low pressure air to the aeration tanks.
- The tertiary treatment system consists of three continuous back wash, up flow, deep bed, granular single media sand filtration units housed in the filter building. The disinfection system consists of a ultra-violet (UV) unit through which the effluent is discharged.
- Operations are controlled by a programmable logic controller (PLC). A data logging computer system with local monitoring capability
- Laboratory space is also located at the WWTP to allow for basic laboratory analyses to be conducted by the plant operator

Section 2: Monitoring Data

Sample Collection and Testing

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

Raw sewage is sampled bi-weekly and tested for BOD_5, total suspended solids, total phosphorus, total Kjeldahl nitrogen, and alkalinity. The raw samples are collected as 24 hour composite samples.

Final effluent is sampled bi-weekly and tested for BOD_5, total suspended solids, total phosphorus, free ammonia nitrogen, total Kjeldahl nitrogen, nitrite, nitrate, pH and alkalinity. Samples are collected using an automatic composite sampler and collected over a 24 hour period. A grab sample of temperature and dissolved oxygen is collected bi-weekly. A grab sample for E. coli is sampled bi-weekly during the disinfection period from April 15 to October 15.

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 as required.

In 2013, all chemical and microbiological sample analyses were conducted by SGS Lakefield Research. Temperature, pH and dissolved oxygen were conducted by operators at the treatment plant.

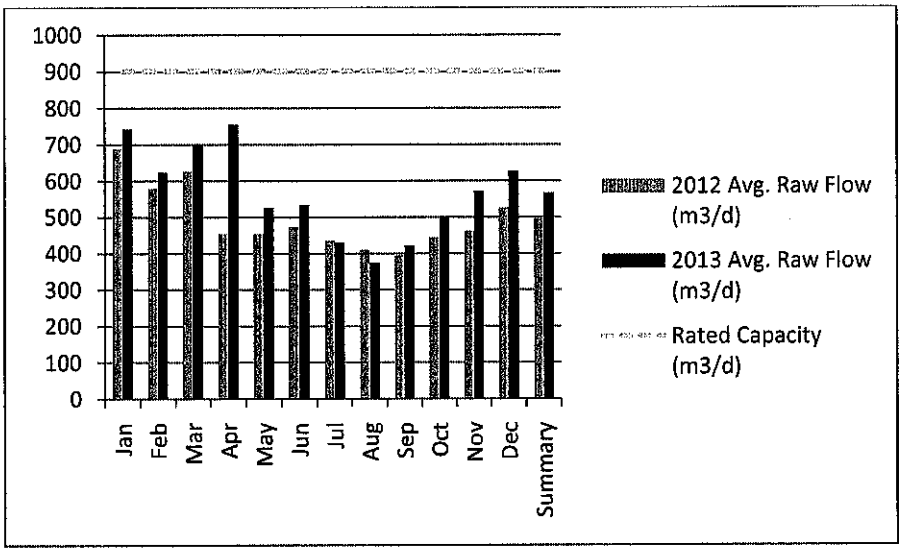
The receiving stream temperature is monitored.

Flows

Detailed monthly flow information is summarized in Appendix A.

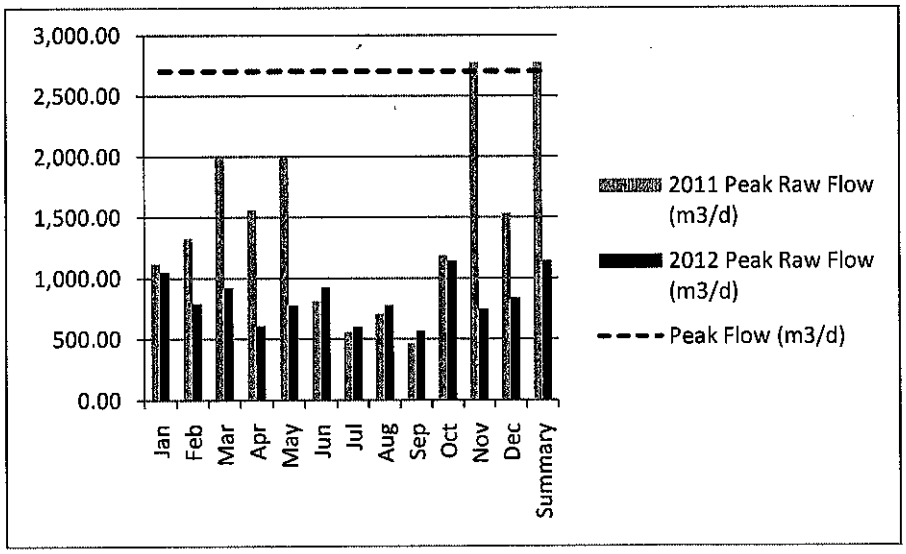
The total flow treated in 2012 was 206,843.2m^3, which corresponds to a 14% increase from 2012 raw flows, see Chart 1. This increase in flow in 2013 is attributed to higher precipitation received in 2013 compared to 2012. The annual average daily flow in 2013 was 566.7m^3/day, or 63% of the plant's rated design capacity of 900m^3/day.

Chart 1. Average raw flow for 2013 compared to 2012.



The design average daily flow for the plant was exceeded 24 times during the year, compared to 6 times in 2012 (refer to Table 3). The hydraulic peak flow of 2,700m^3/day for the plant was not exceeded in 2013, refer to Chart 2.

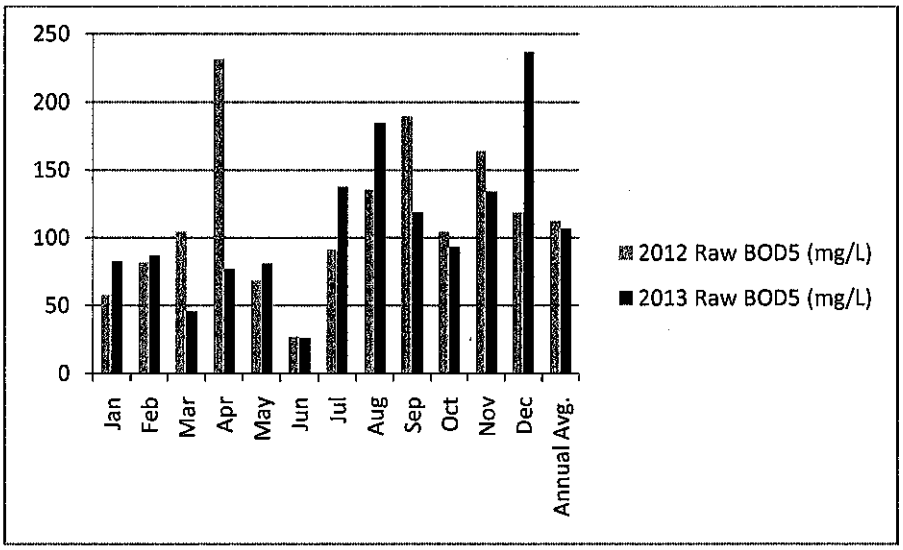
Chart 2. The maximum flow each month in 2013 compared to 2012.



Raw Sewage Quality

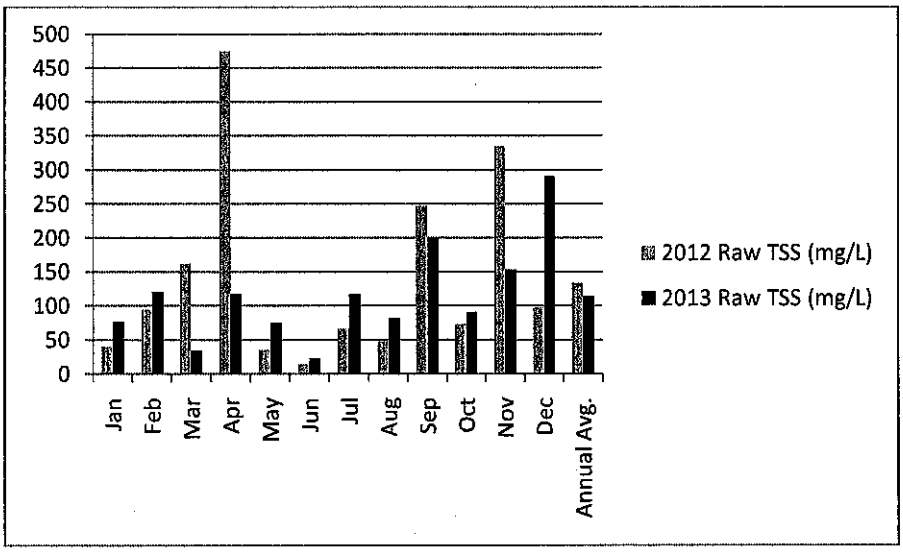
The annual average raw sewage BOD_5 concentration to the plant was 106.9mg/L with a maximum concentration of 359mg/L. The average concentration of BOD_5 has decreased 4.8% from 2012, see Chart 3. The average BOD_5 loading to the plant was 60.6kg/d for 2013. Refer to Appendix A for detailed analytical data.

Chart 3. Raw sewage average monthly concentration of BOD_5 for 2013 compared to 2012 concentrations.



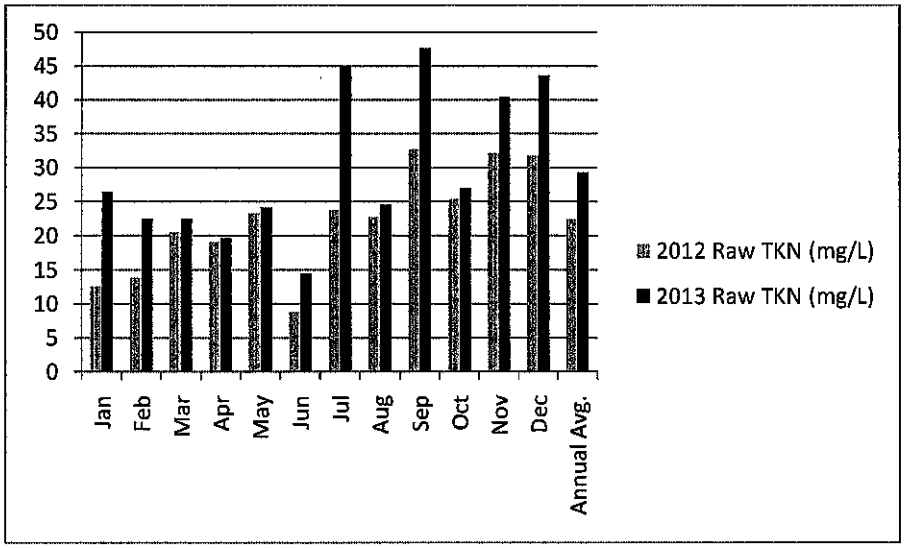
The annual average raw sewage suspended solids (TSS) concentration to the plant was 114mg/L, which is a 14.7% decrease from 2012 (see Chart 4). This corresponds to an average TSS loading to the plant of 64.8kg/day. Refer to Appendix A for detailed analytical data.

Chart 4. Raw sewage average monthly concentration of TSS for 2013 compared to 2012 concentrations.



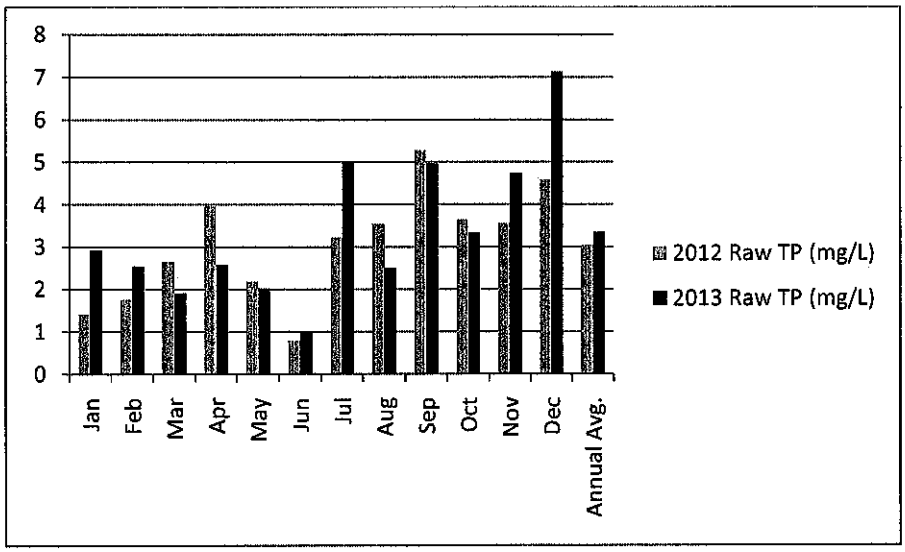
The annual average raw sewage nitrogen concentration (as represented by TKN) to the plant was 29.3mg/L with a loading of 16.6kg/d. This is an increase of 30.9% from the 2012 annual average concentration, see Chart 5. Refer to Appendix A for detailed analytical data.

Chart 5. Raw sewage average monthly concentration of TKN for 2013 compared to 2012 concentrations.



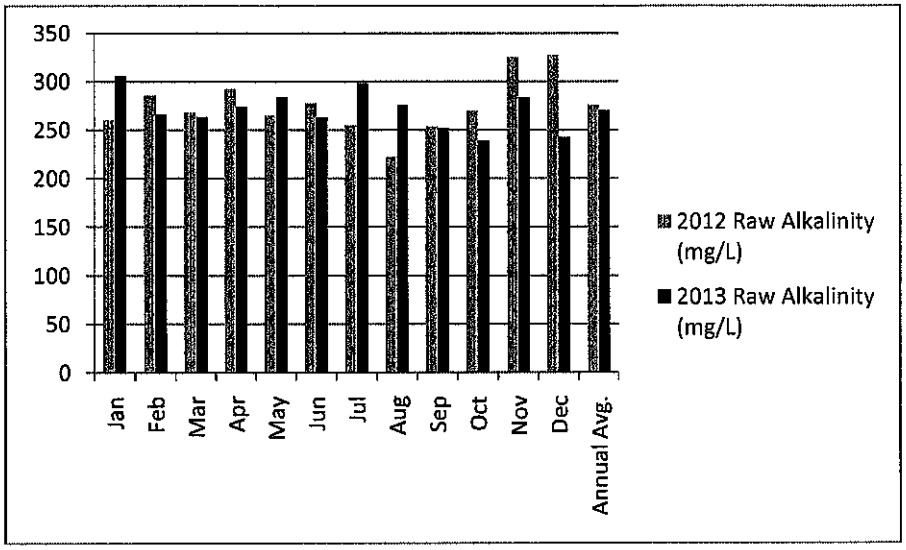
The annual average raw sewage total phosphorus (TP) to the plant was 3.35mg/L, with a loading of 1.90kg/d. This is an increase of 10.3% from 2012 annual average of TP, see Chart 6. Refer to Appendix A for detailed analytical data.

Chart 6. Raw sewage monthly average concentrations of TP for 2013 compared to 2012 concentrations.



The annual average raw sewage alkalinity to the plant was 270mg/L. This is a decrease of 2.1% from 2012 annual average alkalinity, see Chart 7. Refer to Appendix A for detailed analytical data.

Chart 7. Raw sewage average monthly concentrations of alkalinity for 2013 compared to 2012 concentrations.



Overall the annual average raw concentrations of BOD_5, TSS and alkalinity have decreased where as TKN and TP have increased.

Effluent Limits

Detailed analytical data is attached to this report as Appendix A. The following table provides a summary of monthly average effluent result ranges and loading ranges compared to the compliance limits in the Environmental Compliance Approval.

Summary and Comparison of Compliance Data

Table 1. Monthly average Effluent limits and monthly average loading limits compared to sample results received at the West Lorne WWTP.

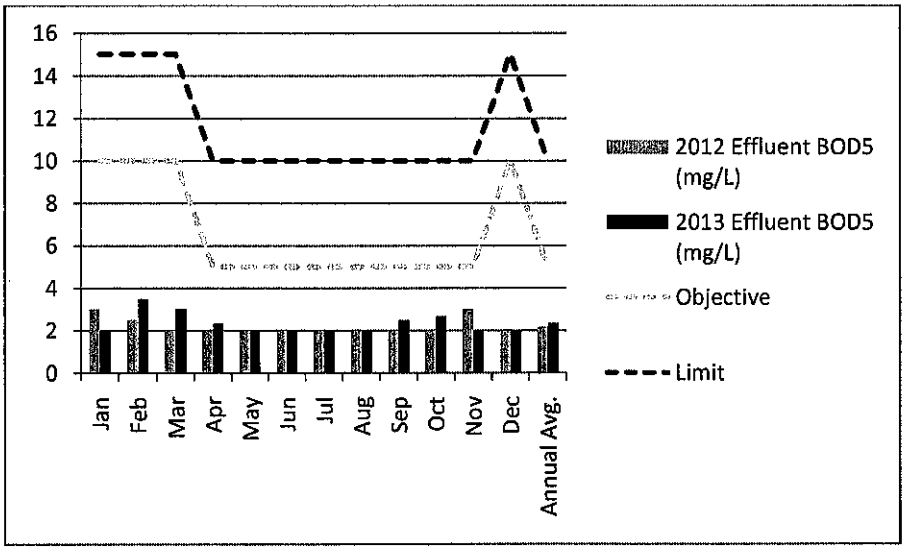
Parameter	Monthly Average Effluent Limit (mg/L)	Monthly Average Effluent Result Ranges (mg/L)	Average Monthly Loading Limit (kg/d)	Monthly Average Loading Ranges (kg/d)
BOD_5	10(a)	<2 – <3	9.0(a)	0.7 – 1.8
	15(b)	<2 – 4	13.5(b)	1.3 – 2.2
Suspended Solids	10(a)	<2 - 7	9(a)	0.9 – 3.7
	15(b)	<2 - 3	13.5(b)	1.2 – 2.2
Total Phosphorus	0.5(a)	0.06 – 0.17	0.45(a)	0.02 -0.08
	1.0(b)	0.06 – 0.11	0.9(b)	0.04 – 0.07
Total (Ammonia + Ammonium) Nitrogen	3.0(a)	<0.1 – <0.2	2.7(a)	0.04 – 0.08
	5.0(b)	<0.1	4.5(b)	0.06 – 0.07
E. coli	200	0 - 210		

NOTE: (a) limit applies during the non-freezing period
(b) limit applies during the freezing period

Discussion on Monitoring Data as Compared to the Effluent Limits

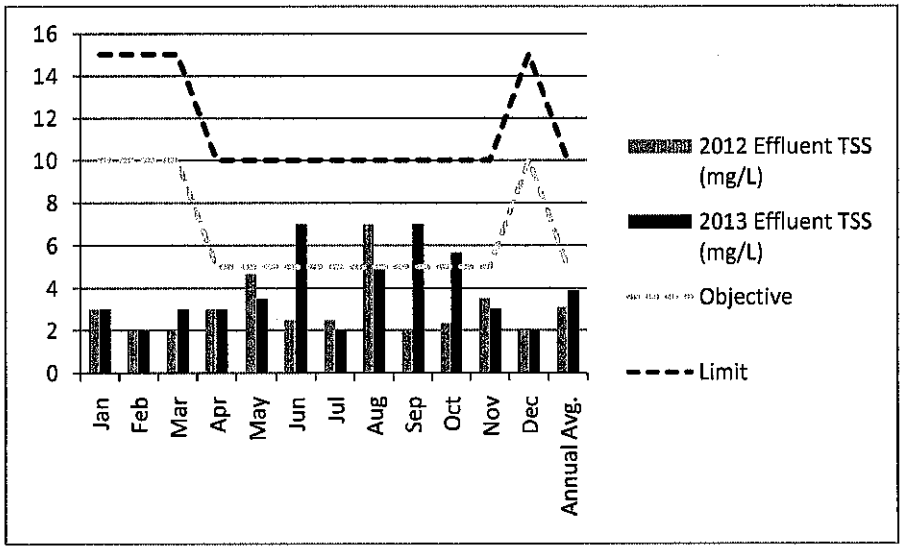
The annual average effluent BOD_5 in 2013 was 2.35mg/L, which is an increase by 7% from 2012 (see Chart 8). The annual loading of BOD_5 was 1.33kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 8. The effluent monthly average concentration of BOD_5 in 2013 compared to 2012 concentrations.



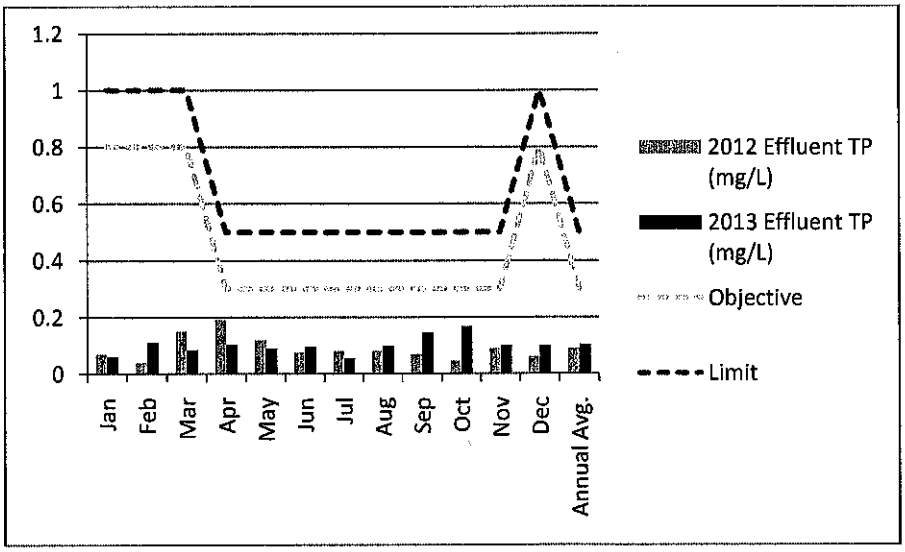
The annual average effluent Total Suspended Solids (TSS) for 2013 was 3.9mg/L, which is a 26.3% increase from 2012 (see Chart 9). The annual loading of TSS at the plant in 2013 was 2.2 kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 9. The effluent monthly average concentration of TSS in 2013 compared to 2012 concentrations.



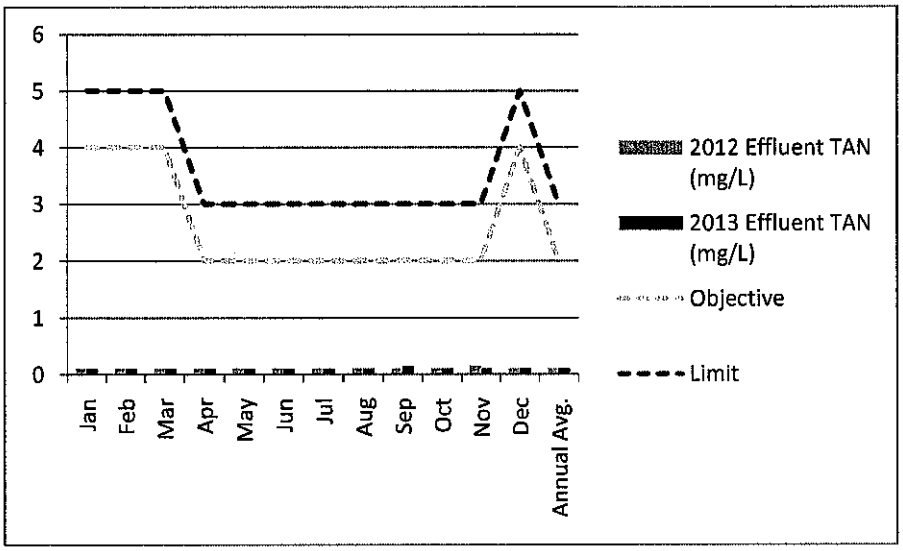
The annual average effluent Total Phosphorus (TP) for 2013 was 0.10mg/L, which is a 16.6% increase from 2012 (see Chart 10). The annual loading of TP at the plant in 2013 was 0.06kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 10. The effluent monthly average concentration of TP in 2013 compared to 2012 concentrations.



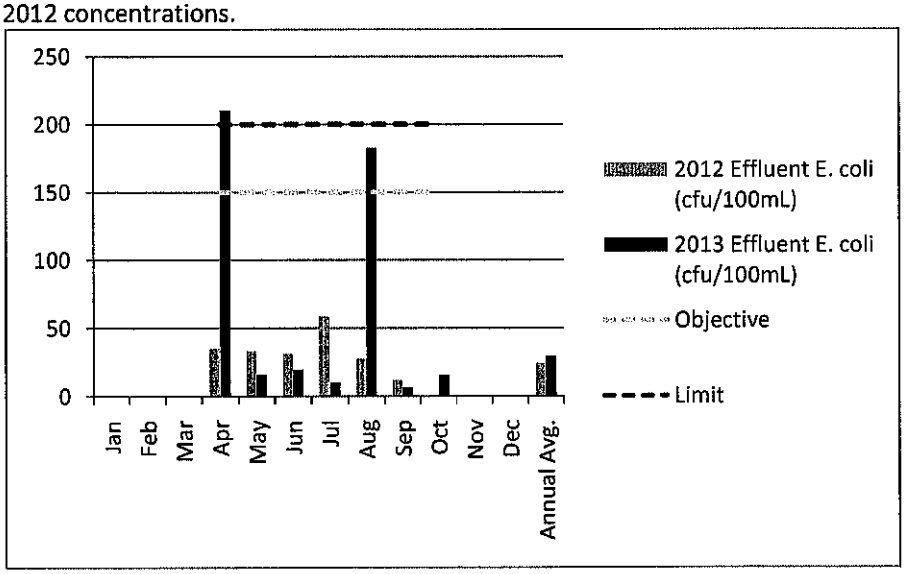
The annual average effluent Total Ammonia + Ammonium Nitrogen (TAN) for 2013 was 0.1mg/L, which is consistent with 2012 (see Chart 11). The annual loading of TAN at the plant in 2013 was 0.06kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 11. The effluent monthly average concentration of TAN in 2013 compared to 2012 concentrations.



The annual geometric mean effluent E. coli for 2013 was 29cfu/100mL, which is a 21.2% increase from 2012 (see Chart 12). E. coli is monitored only during the disinfection season which is from April 15th to October 15th. There was one limit exceedance in April for the E. coli, this was reported to the MOE. Refer to Table 1 for a list of monthly average effluent limits.

Chart 12. The effluent monthly geometric mean concentration of E. coli in 2013 compared to 2012 concentrations.



The West Lorne WWTP provides an effective treatment process complying with all the monthly average limit requirements set out in the Environmental Compliance Approval with the exception of one non-compliance for E. coli. The monthly geometric mean exceeded the 200cfu/100mL limit in April with a geometric mean of 210cfu/100mL. The system was thoroughly cleaned and no further issue. This non-compliance was reported to the MOE with no further action required.

Section 3: Operating Problems and Corrective Actions

The UV System required a lot of maintenance and part replacements in 2013, mainly due to age. It has been recommended for replacement/upgrade in 2015.

The SCADA system had issues in 2013 and is obsolete, an upgrade will be considered for 2014.

The sand filters continue to be an ongoing issue. They will be going through an overhaul over the next few years to make the necessary upgrades for operation.

Despite these issues, the plant operated very well in 2013 with only one non-compliance.

Section 4: Maintenance

Regular scheduled monthly preventative maintenance is assigned and monitored using the Workplace Management System (WMS) program. The following is a summary of maintenance performed other than WMS work orders:

-repaired RAS Pump P108
-repaired effluent hydrants
-replaced 8 quartz sleeves on UV system
-repaired Pump #1 at Pump Station

Section 5: Effluent Quality Assurance

Effluent quality assurance is evaluated by monitoring parameters and changes throughout the plant processes. The operators monitor the aeration tank by performing weekly tests on the mixed liquor. These tests include dissolved oxygen, pH, temperature, settling tests, Mixed Liquor Suspended Solids (MLSS), and Mixed Liquor Volatile Suspended Solids (MLVSS). As well, monitoring of the alum dosages, wasting volumes and Return Activated Sludge suspended solids is completed. Data collected from these tests provide information to the operator to make the appropriate adjustments in the treatment process and take corrective actions before the plant reaches its effluent limits.

Section 6: Calibration and Maintenance

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

Annual maintenance on the generator was completed in June by Albert's Generator Service. Flow Metrix Technical Services Inc. performed the annual calibration on the flow meter in April. In house meters for pH and dissolved oxygen are calibrated by OCWA operators as per manufacturer's instructions.

Section 7: Effluent Quality

Effluent Objectives

The following table represents the monthly average effluent result ranges and the monthly average loading ranges compared to the objectives outlined in the Environmental Compliance Approval.

Table 2. Effluent objectives compared to monthly average concentrations and loadings.

Parameter	Effluent Objective (mg/L)	Monthly Average Effluent Ranges (mg/L)	Monthly Loading Objective (kg/day)	Monthly Average Loading Ranges (kg/d)
BOD_5	5(a)	<2 – <3	4.5(a)	0.7 – 1.8
	10(b)	<2 – 4	9.0(b)	1.3 – 2.2
Suspended Solids	5(a)	<2 - 7	4.5(a)	0.9 – 3.7
	10(b)	<2 - 3	9.0(b)	1.2 – 2.2
Total Phosphorus	0.3(a)	0.06 – 0.17	0.27(a)	0.02 -0.08
	0.8(b)	0.06 – 0.11	0.72(b)	0.04 – 0.07
Total (Ammonia + Ammonium) Nitrogen	2.0(a)	<0.1 – <0.2	1.8(a)	0.04 – 0.08
	4.0(b)	<0.1	3.6(b)	0.06 – 0.07
E. coli	150	0 - 210		
Dissolved Oxygen	5	7.2 – 10.0		
Design Flow (m^3/d)	900	375 - 756		

Note: (a) objective applies during the non-freezing period
(b) objective applies during the freezing period
Dissolved Oxygen objective is expressed as a minimum, where all other parameters are expressed as maximums.

Discussion of Effluent Objectives

The West Lorne WWTP didn't meet all of its effluent objectives and design flow criteria, the following table shows the objectives that were not met in 2013.

Table 3. Objectives exceeded in 2013 along with possible cause/comment.

Parameter	Result	Date	Comments/Cause
Flow	1434m^3/d	January 12	High Precipitation/Snow Melt
Flow	1434m^3/d	January 13	High Precipitation/Snow Melt
Flow	1806m^3/d	January 14	High Precipitation/Snow Melt
Flow	1293m^3/d	January 15	High Precipitation/Snow Melt
Flow	1017m^3/d	January 16	High Precipitation/Snow Melt
Flow	1016m^3/d	January 30	High Precipitation/Snow Melt
Flow	1072m^3/d	January 31	High Precipitation/Snow Melt
Flow	926m^3/d	February 20	High Precipitation/Snow Melt
Flow	1111m^3/d	February 28	High Precipitation/Snow Melt
Flow	1096m^3/d	March 12	High Precipitation
Flow	1114m^3/d	March 13	High Precipitation
Flow	912m^3/d	March 14	High Precipitation
Flow	993m^3/d	April 10	High Precipitation
Flow	1272m^3/d	April 11	High Precipitation
Flow	1991m^3/d	April 12	High Precipitation
Flow	1265m^3/d	April 13	High Precipitation
Flow	957m^3/d	April 14	High Precipitation
E. coli	210cfu/100mL	April	UV System Failure
Flow	1068m^3/d	May 28	High Precipitation
Flow	1220m^3/d	May 29	High Precipitation
Total Suspended Solids	7mg/L	June	Algae Growth
Flow	926m^3/d	August 27	High Precipitation
Total Suspended Solids	7mg/L	September	Algae Growth
Total Suspended Solids	6mg/L	October	Algae Growth
Flow	1228m^3/d	December 20	High Precipitation/Snow Melt
Flow	1228m^3/d	December 21	High Precipitation/Snow Melt
Flow	1228m^3/d	December 22	High Precipitation/Snow Melt
Flow	1252m^3/d	December 23	High Precipitation/Snow Melt

There were four monthly average objectives exceeded in 2013, compared to one in 2012. Three of the four objectives that were exceeded were for suspended solids in June, September and October. These objectives were all attributed to algae growth on the clarifiers and poor performance of the filters. The fourth objective exceedance was for the monthly geometric mean concentration of E. coli in April, this resulted in a limit exceedance as well. There were no monthly average loading effluent objectives exceeded in the 2013.

The annual average flow for 2013 was 567m^3/d, which is below the design flow of 900m^3/d. However, there were 24 instances where the daily design flow was exceeded compared to 6 instances in 2012. These were all due to infiltration into the collection system when there was snow melt and rain.

Section 8: Biosolids

The lagoon is used for sludge digestion and storage as per the Environmental Compliance Approval. The waste activated sludge is transferred to the lagoon. The sludge settles on the bottom of the lagoon and the liquid is pumped to the head of the plant for treatment. The lagoon has ample storage for the sludge and will not require cleanout in the coming year.

Section 9: Community Complaints

There was no community complaints received in 2013.

Section 10: Bypasses, Spills, and Abnormal Discharges

There was no by-pass, spill or abnormal discharge events for the West Lorne WWTP or for the Pumping Station during 2013.

Section 11: Summary

Overall the West Lorne Wastewater Treatment Plant provided effective treatment in 2013. No alterations to the system have been made in 2013.

APPENDIX A

Analytical Data

		Objective Concentration	Objective Loading	Limits	Loading Limits	February 2013 Stream < 5°C		February 2013 Stream < 5°C		March 2013 Stream <5°C		April 2013 Stream >5°C		May 2013 Stream >5°C		June 2013 Stream >5°C		July 2013 Stream >5°C		August 2013 Stream >5°C		September 2013 Stream >5°C		October 2013 Stream >5°C		November 2013 Stream >5°C		December 2013 Stream <5°C		Summary	Annual Loading
						Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading	Results	Loading		
Raw Flow (m3/d)	Avg	[redacted]				743.7		623.8		697.1		755.9		525.5		534.1		429.3		375.0		420.8		502.0		572.4		626.8		566.7	
	Max					1,806.0		1,111.0		1,114.0		1,991.0		1,220.0		882.0		518.0		926.0		742.0		762.0		761.0		1252.0		1,991.0	
	Min					483.0		451.0		538.0		455.0		359.0		434.0		267.0		266.0		253.0		305.0		349.0		340.0		253.0	
	Sum					23,056.0		17,467.0		21,611.0		22,676.0		16,289.0		16,024.0		13,308.0		11,624.0		12,624.0		15,561.0		17,172.5		19430.7		206843.2	
Effluent Flow (m3/d)	Avg					743.7		623.8		697.1		755.9		525.5		534.1		429.3		375.0		420.8		502.0		572.4		626.8		566.7	
	Max					1,806.0		1,111.0		1,114.0		1,991.0		1,220.0		882.0		518.0		926.0		742.0		762.0		761.0		1252.0		1991.0	
	Min					483.0		451.0		538.0		455.0		359.0		434.0		267.0		266.0		253.0		305.0		349.0		340.0		253.0	
	Sum					23,056.0		17,467.0		21,611.0		22,676.0		16,289.0		16,024.0		13,308.0		11,624.0		12,624.0		15,561.0		17,172.5		19430.7		206843.2	
Raw BOD5 (mg/L)	Avg					83	61.7	87	54.27	46	31.72	77	58.20	81	42.56	< 26	13.89	138	59.03	185	69.37	119	50.08	93	46.85	134	76.70	236.5	148.24	106.9231	60.59
	Max					106		104		57		107		128		< 40		164		260		147		180		135		359		359	
	Min					60		70		34		43		34		< 12		111		110		91		37		133		114		12	
Raw SS (mg/L)	Avg					77	57.3	121	75.17	34	23.70	117	88.69	76	39.67	24	12.55	117	50.23	83	30.93	201	84.37	91	45.51	153	87.6	291	182.08	114	64.78
	Max					100		166		45		213		138		29		155		125		244		204		178		471		471	
	Min					54		75		23		28		13		18		79		40		157		28		128		110		13	
Raw TKN (mg/L)	Avg					26.5	19.7	22.6	14.1	22.5	15.7	19.6	14.8	24.1	12.7	14.5	7.7	45.0	19.3	24.6	9.2	47.6	20.0	27.0	13.6	40.5	23.2	43.7	27.4	29.3	16.6
	Max					32.8		30.4		27.4		27.9		40.7		15.3		52.1		31.4		62.1		48.1		41.2		66.0		66.0	
	Min					20.2		14.7		17.5		15.0		7.5		13.6		37.9		17.7		33.1		15.2		39.7		21.3		7.5	
Raw TP (mg/L)	Avg					2.93	2.18	2.54	1.58	1.91	1.33	2.57	1.95	2.02	1.06	1.02	0.54	4.99	2.14	2.50	0.94	4.97	2.09	3.34	1.67	4.74	2.71	7.13	4.47	3.35	1.90
	Max					3.62		2.74		2.18		3.67		3.40		1.12		6.21		3.61		6.11		6.44		4.94		12.60		12.60	
	Min					2.24		2.34		1.63		1.16		0.64		0.91		3.76		1.39		3.82		1.76		4.53		1.66		0.64	
Raw Alkalinity (mg/L)	Avg					306		266		264		274		284		263		298		276		252		239		284		242		270	
	Max					320		290		310		300		326		290		340		344		262		308		318		276		344	
	Min					290		210		224		260		260		232		206		222		232		208		230		180		180	
Effluent BOD5 (mg/L)	Avg	[redacted]				< 2	1.5	4	2.2	< 3	2.1	< 2	1.8	< 2	1.1	< 2	1.1	< 2	0.9	< 2	0.7	< 3	1.1	< 3	1.3	< 2	1.1	< 2	1.3	< 2	1.33
	Max					< 2		4		4		3		< 2		< 2		< 2		< 2		3		4		2		< 2		4	
	Min					< 2		3		< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2	
Effluent SS (mg/L)	Avg	[redacted]				3	2.2	< 2	1.2	3	2.1	3	2.3	4	1.8	[redacted]	3.7	< 2	0.9	5	1.9	[redacted]	2.9	[redacted]	2.8	< 3	1.7	< 2	1.3	< 4	2.20
	Max					4		2		3		4		4		7		2		6		9		6		4		2		9	
	Min					2		< 2		3		2		3		7		< 2		4		5		5		< 2		< 2		< 2	
Effluent TAN (mg/L)	Avg	[redacted]				< 0.1	0.07	< 0.1	0.06	< 0.1	0.07	< 0.1	0.08	< 0.1	0.05	< 0.1	0.05	< 0.1	0.04	< 0.1	0.04	< 0.2	0.06	< 0.1	0.05	< 0.1	0.06	< 0.1	0.06	< 0.1	0.06
	Max					< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		0.2		< 0.1		< 0.1		< 0.1		0.2	
	Min					< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1		< 0.1	
Effluent TKN (mg/L)	Avg					< 2.5		< 1.3		< 0.5		< 1.5		1.7		2.4		< 0.7		< 0.7		< 0.6		< 1.1		< 1.7		< 0.5		< 1.3	
	Max					4.4		2.1		< 0.5		3		2.6		3.7		0.9		0.8		0.7		1.8		2.8		< 0.5		4.4	
	Min					< 0.5		< 0.5		< 0.5		< 0.5		0.8		1		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Effluent NO2 (mg/L)	Avg					< 0.06		< 0.06		< 0.06		< 0.03		< 0.03		< 0.04		0.04		< 0.03		< 0.03		< 0.03		< 0.03		< 0.03		< 0.04	
	Max					< 0.06		< 0.06		< 0.06		< 0.03		< 0.03		0.04		0.04		< 0.03		< 0.03		0.04		< 0.03		< 0.03		< 0.06	
	Min					< 0.06		< 0.06		< 0.06		< 0.03		< 0.03		< 0.03		0.03		< 0.03		< 0.03		< 0.03		< 0.03		< 0.03		< 0.03	
Effluent NO3 (mg/L)	Avg					20.2		20.2		18.2		18.1		24.6		21.1		18.7		12.8		12.0		14.3		16.3		20.9		18.0	
	Max					22.7		22.2		19.2		23.3		25.2		23.8		22.5		14.3		12.9		15.0		19.6		24.3		25.2	
	Min					17.7		18.2		17.2		13.7		23.9		18.4		14.8		11.2		11.1		13.8		13.0		17.5		11.1	
Effluent TP (mg/L)	Avg	[redacted]	[redacted]			0.06	0.04	0.11	0.07	0.09	0.06	0.10	0.08	0.09	0.05	0.10	0.05	0.06	0.02	0.10	0.04	0.15	0.06	0.17	0.08	0.10	0.06	0.10	0.06	0.10	0.06
	Max					0.08		0.16		0.09		0.11		0.10		0.11		0.06		0.10		0.15		0.18		0.12		0.12		0.18	
	Min					0.04		0.06		0.08		0.10		0.08		0.08		0.05		0.10		0.14		0.14		0.08		0.08		0.04	
Effluent pH	Avg					7.46		7.43		7.53		7.53		7.38		7.21		7.06		7.19		7.58		7.65		7.76		7.64		7.46	
	Max					7.81		7.61		8.02		7.77		7.61		7.36		7.27		7.73		8.14		7.81		7.95		7.78		8.14	
	Min					7.16		7.26		7.33		7.24		6.99		6.97		6.83		7.00		7.18		7.37		7.60		7.42		6.83	
Effluent Alkalinity (mg/L)	Avg					129		119		128		125		76		83		54		47		56		58		103		77		89	
	Max					135		130		138		150		140		94		60		54		76		74		122		106		150	
	Min					125		110		110		98		40		56		40		40		40		50		90		58		40	
Effluent E. coli (cfu/100	Geomean	[redacted]										[redacted]		16		< 20		< 10		183		< 7		15						< 29	
	Max											254		128		194		258		880		22		24						880	
	Min											174		2		< 2		< 2		33		< 2		10						< 2	
Effluent Temp. (oC)	Avg					9.2		8.1		8.2		9.9		14.7		17.2		19.1		21.5		20.1		16.9		12.4		10.2		13.8	
	Max					11.0		8.9		8.8		11.1		16.6		20.2		21.4		23.5		22.4		20.4		14.5		11.9		23.5	
	Min					7.7		7.4		7.7		8.3		11.6		15.6		7.1		14.5		18.3		12.5		10.2		8.5		7.1	
Effluent DO (mg/L)	Avg					10.0		9.6		10.3		9.8		8.6		8.4		8.5		8.1		8.3		8.4		9.3		9.3		9.1	
	Max					10.5		10.4		10.7		10.2		9.2		8.9		8.8		8.9		8.8		9.3		10.0		10.0		10.7	
	Min	[redacted]				9.3		7.2		10.0		9.4		7.6		8.0		8.3		7.5		8.0		8.1		8.5		8.7		7.2	