MUNICIPALITY OF WEST ELGIN
WEST LORNE WASTEWATER TREATMENT PLANT

2014 ANNUAL REPORT
January 1 to December 31, 2014

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 2014. 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

The collection system 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 2014, 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.

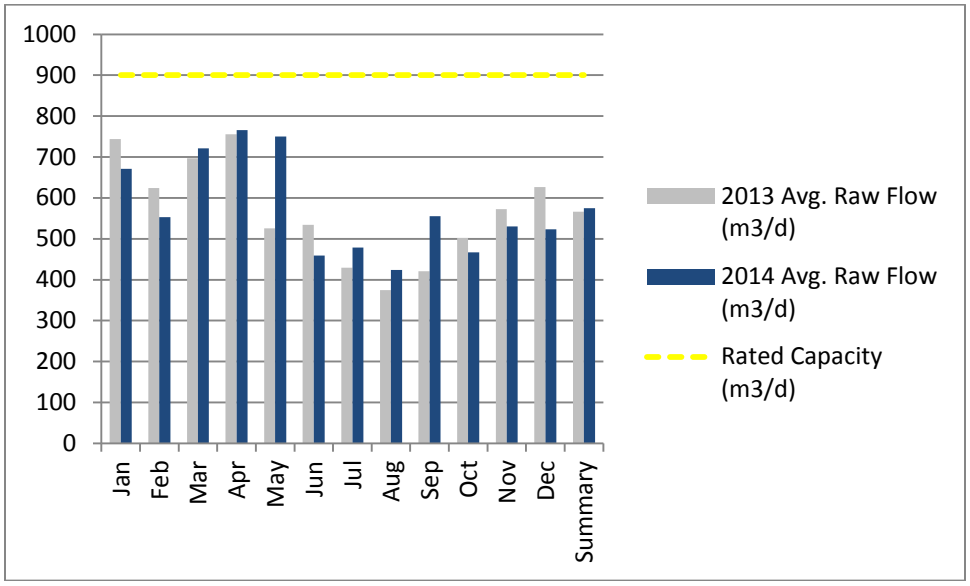
The receiving stream temperature is monitored.

Flows

Detailed monthly flow information is summarized in Appendix A.

The total flow treated in 2014 was 209,885m^3, which corresponds to a 1.5% increase from 2013 raw flows, refer to Chart 1. The annual average daily flow in 2014 was 575m^3/day, or 63.9% of the plant's rated design capacity of 900m^3/day.

Chart 1. Average daily raw flow for 2014 compared to 2013.



The design average daily flow for the plant was exceeded 32 times during the year, compared to 26 times in 2013 (refer to Table 1). The hydraulic peak flow of 2,700m^3/day for the plant was not exceeded in 2014.

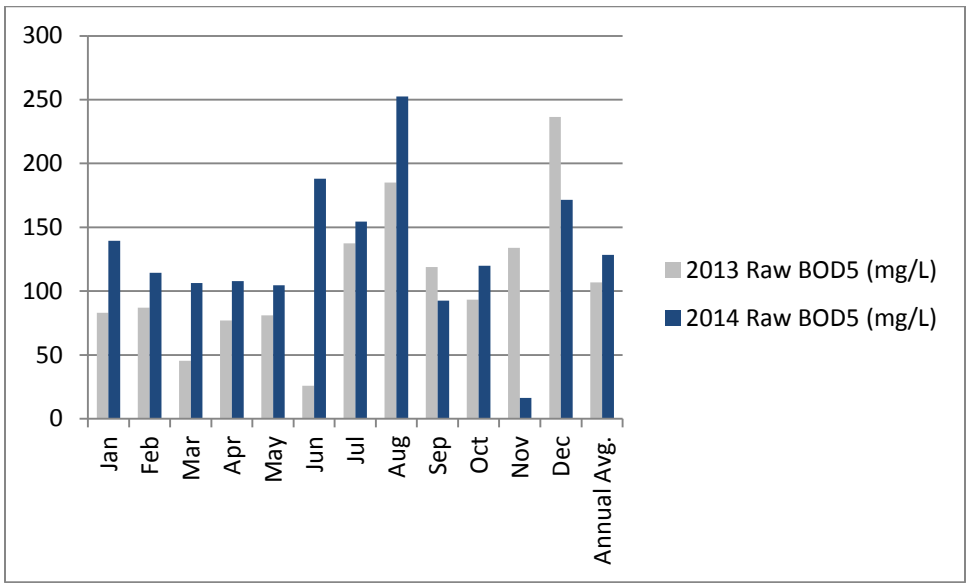
Table 1. Daily design flow exceedances in 2014.

Date	Flow (m^3/day)	Date	Flow (m^3/day)
January 10	1148	April 2	919
January 11	1149	April 7	1067
January 12	1149	April 9	959
January 13	927	April 10	955
January 14	953	April 15	1111
February 20	1302	April 29	1093
March 11	1160	April 30	1063
March 12	1049	May 12	933
March 14	914	May 15	1350
March 15	913	May 20	932
March 16	913	May 21	995
March 19	1293	May 22	1351
March 21	956	September 2	950
March 22	955	September 10	1119
March 23	955	September 11	1143
March 31	919	November 24	1198

Raw Sewage Quality

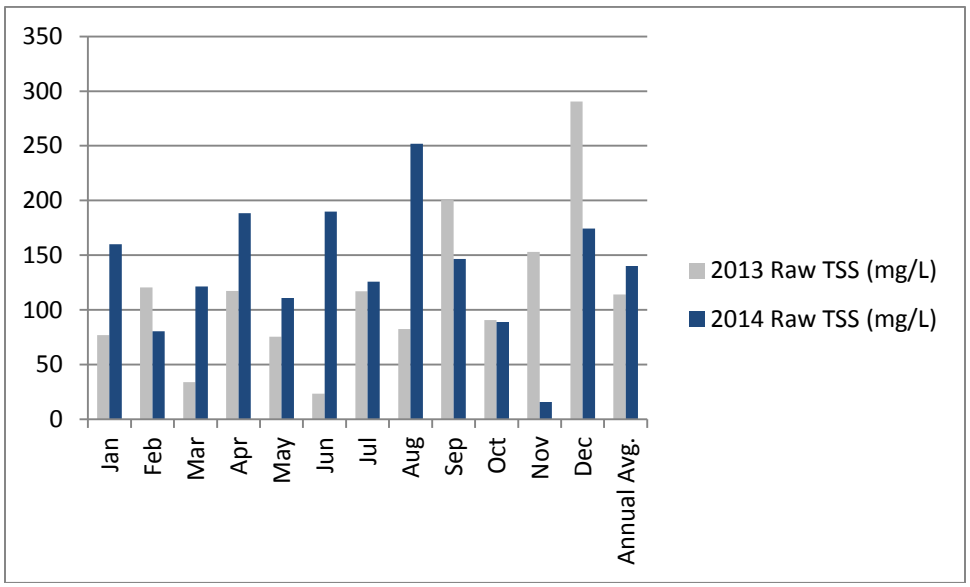
The annual average raw sewage BOD_5 concentration to the plant was 128.4mg/L with a maximum concentration of 258mg/L. The average concentration of BOD_5 has increased 20% from 2013, refer to Chart 3. The average BOD_5 loading to the plant was 73.8kg/d for 2014. Refer to Appendix A for detailed analytical data.

Chart 3. Raw sewage average monthly concentration of BOD_5 for 2014 compared to 2013 concentrations.



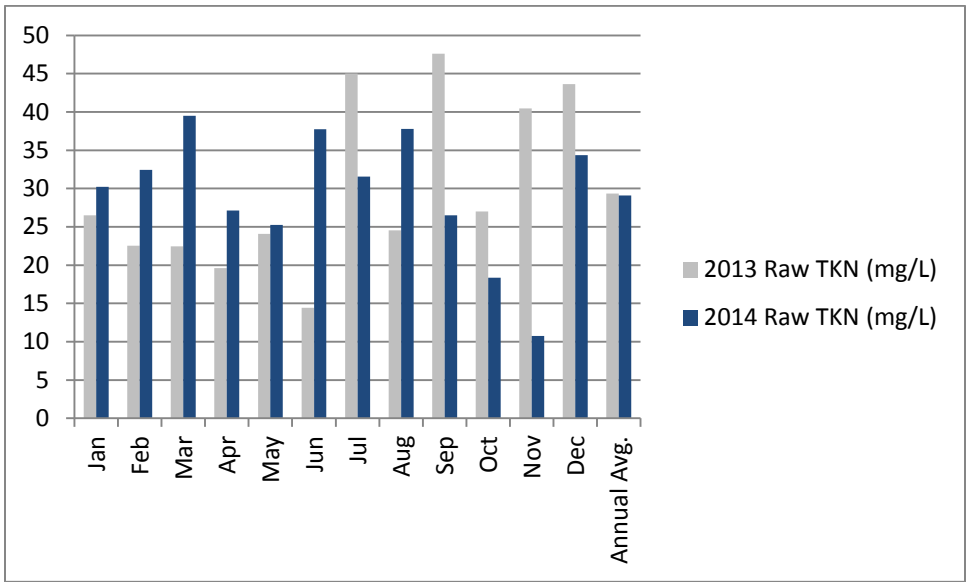
The annual average raw sewage suspended solids (TSS) concentration to the plant was 140.2mg/L, which is a 22.7% increase from 2013 (refer to Chart 4). This corresponds to an average TSS loading to the plant of 80.6kg/day. Refer to Appendix A for detailed analytical data.

Chart 4. Raw sewage average monthly concentration of TSS for 2014 compared to 2013 concentrations.



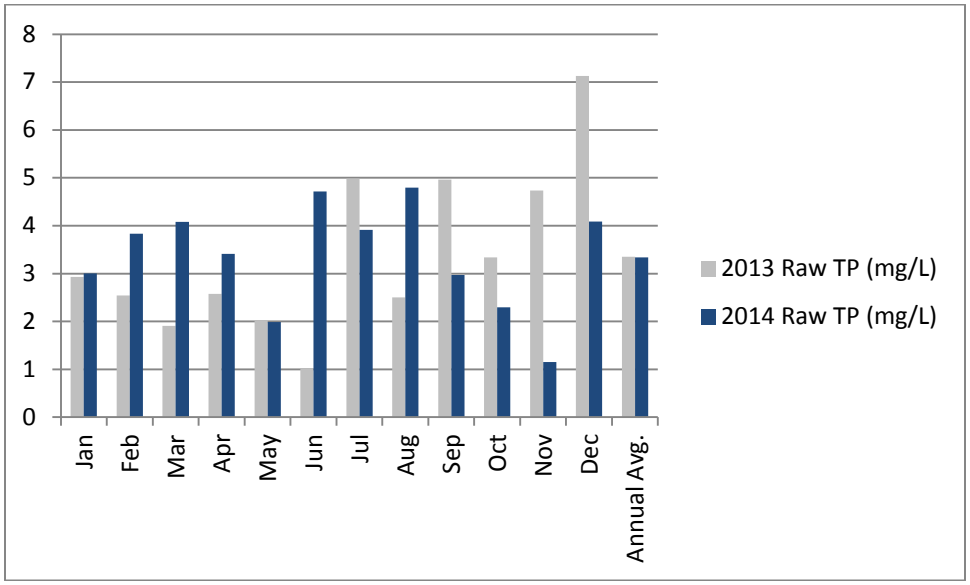
The annual average raw sewage nitrogen concentration (as represented by TKN) to the plant was 29.1mg/L with a loading of 16.7kg/d. This is a decrease of 0.7% from the 2013 annual average concentration, refer to Chart 5. Refer to Appendix A for detailed analytical data.

Chart 5. Raw sewage average monthly concentration of TKN for 2014 compared to 2013 concentrations.



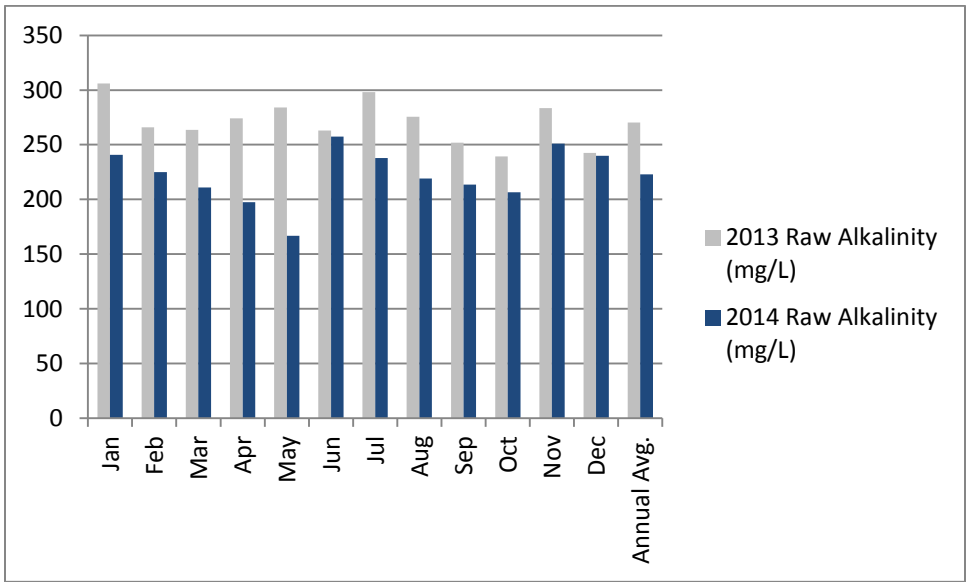
The annual average raw sewage total phosphorus (TP) to the plant was 3.34mg/L, with a loading of 1.92kg/d. This is an decrease of 0.4% from 2013 annual average of TP, refer to Chart 6. Refer to Appendix A for detailed analytical data.

Chart 6. Raw sewage monthly average concentrations of TP for 2014 compared to 2013 concentrations.



The annual average raw sewage alkalinity to the plant was 223mg/L. This is a decrease of 17.5% from 2013 annual average alkalinity, refer to Chart 7. Refer to Appendix A for detailed analytical data.

Chart 7. Raw sewage average monthly concentrations of alkalinity for 2014 compared to 2013 concentrations.



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.

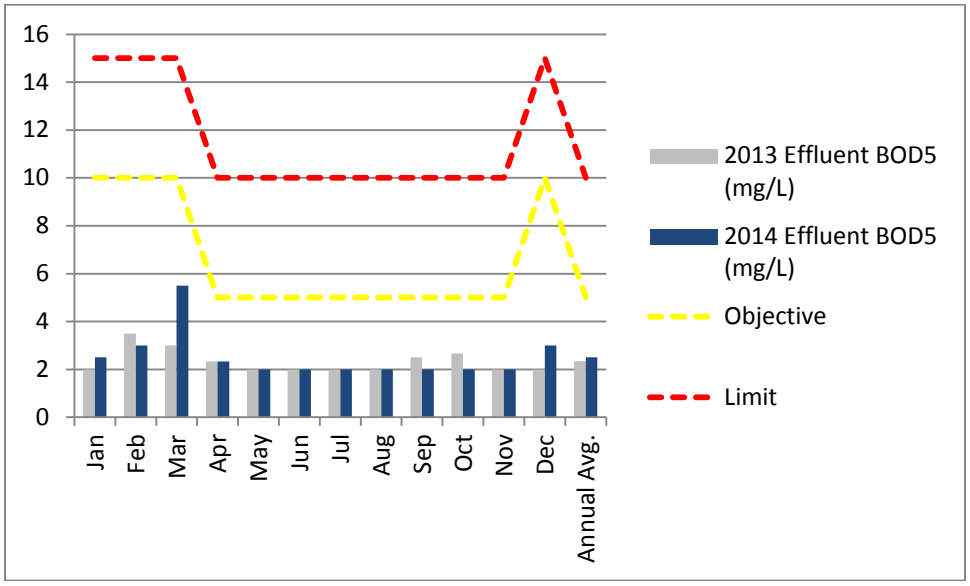
Parameter	Monthly Average Effluent Limit (mg/L)	Monthly Average Effluent Result Ranges (mg/L)	Average Monthly Loading Limit (kg/d)	Monthly Average Loading Ranges (kg/d)
BOD_5	10(a)	<2 – <2.3	9.0(a)	0.8 – 1.8
	15(b)	<2 – 5.5	13.5(b)	1.7 – 4.0
Suspended Solids	10(a)	<2 – 5.7	9(a)	0.9 – 4.3
	15(b)	<2 – 7	13.5(b)	1.3 – 5.0
Total Phosphorus	0.5(a)	<0.03 – 0.17	0.45(a)	0.02 -0.08
	1.0(b)	0.07 – 0.18	0.9(b)	0.03 – 0.13
Total (Ammonia + Ammonium) Nitrogen	3.0(a)	<0.1 – <0.2	2.7(a)	0.04 – 0.13
	5.0(b)	<0.1 - <1.9	4.5(b)	0.05 – 1.02
E. coli	200	<2 - 149		

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

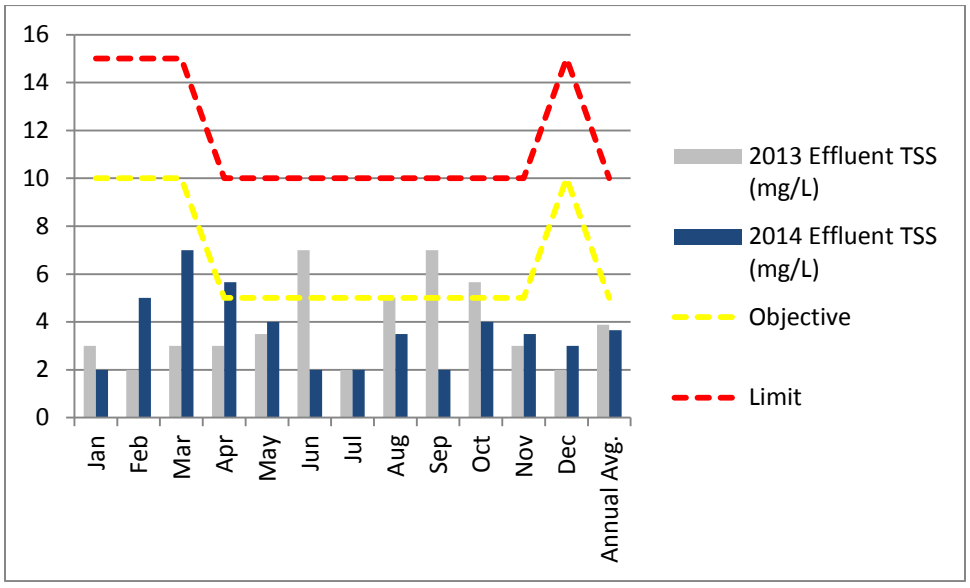
The annual average effluent BOD_5 in 2014 was 2.5mg/L, which is an increase by 6.6% from 2013 (refer to Chart 8). The annual loading of BOD_5 was 1.44kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 8. The effluent monthly average concentration of BOD_5 in 2014 compared to 2013 concentrations.



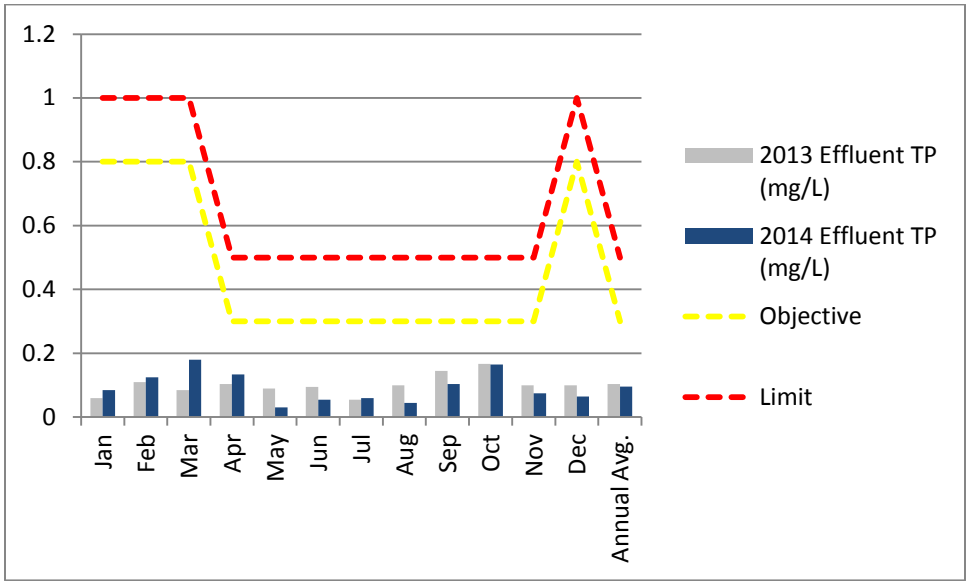
The annual average effluent Total Suspended Solids (TSS) for 2014 was 3.6mg/L, which is a 5.9% decrease from 2013 (refer to Chart 9). The annual loading of TSS at the plant in 2014 was 2.1kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 9. The effluent monthly average concentration of TSS in 2014 compared to 2013 concentrations.



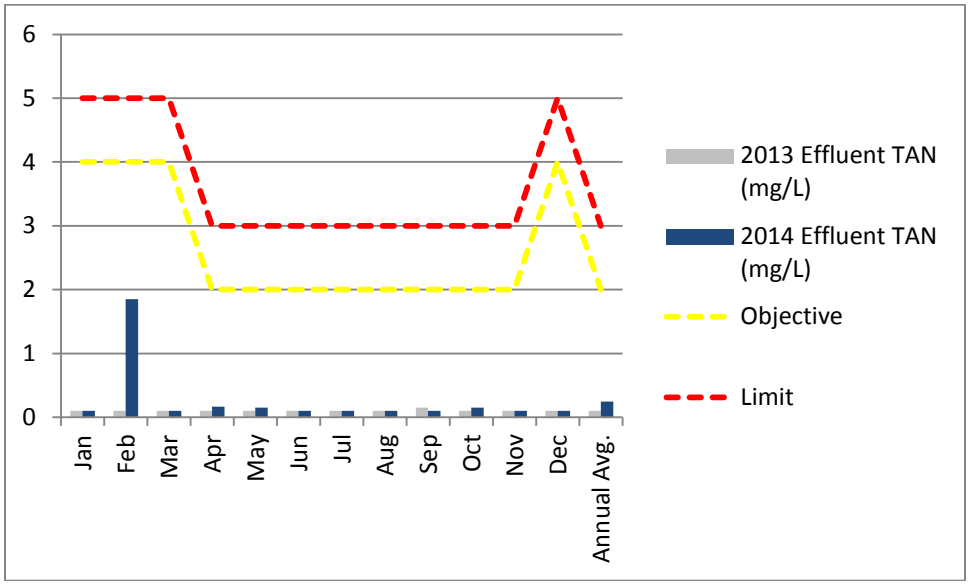
The annual average effluent Total Phosphorus (TP) for 2014 was 0.10mg/L, which is a 7.8% decrease from 2013 (refer to Chart 10). The annual loading of TP at the plant in 2014 was 0.05kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

Chart 10. The effluent monthly average concentration of TP in 2014 compared to 2013 concentrations.



The annual average effluent Total Ammonia + Ammonium Nitrogen (TAN) for 2014 was 0.25mg/L, which is a 140% increase from 2013 (refer to Chart 11). This very large increase is attributed to cold temperatures that inhibited nitrification in February. Despite the large increase the plant met objectives and limits for TAN. The annual loading of TAN at the plant in 2014 was 0.14kg/d. Refer to Table 1 for a list of monthly average effluent limits and loading limits.

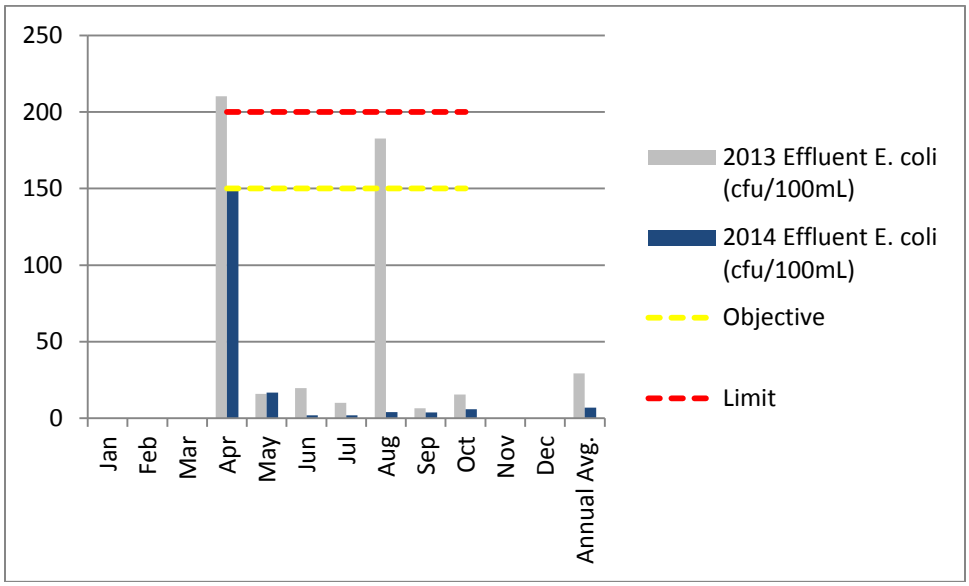
Chart 11. The effluent monthly average concentration of TAN in 2014 compared to 2013 concentrations.



The annual geometric mean effluent E. coli for 2014 was 7cfu/100mL, which is a 76% decrease from 2013 (refer to Chart 12). The very large decrease is attributed to the non-compliance

reported the in April 2013 and the high result in August 2013. E. coli is monitored only during the disinfection season which is from April 15th to October 15th. Refer to Table 1 for a list of monthly average effluent limits.

Chart 12. The effluent monthly geometric mean concentration of E. coli in 2014 compared to 2013 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.

Section 3: Operating Problems and Corrective Actions

The UV System required a lot of maintenance and part replacements in 2013 and 2014, 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 2015.

The sand filters continue to be an ongoing issue. They are also on the capital list for upgrades.

In 2014, there were issues with freezing causing damage to the clarifier floats. The cold temperatures also caused some nitrification issues, this didn't result in a non-compliance though.

Despite these issues, the plant operated very well in 2014 with no non-compliances.

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 clarifier flight
-Replaced generator battery
-Rebuilt pump at pump station
-Replaced UV ballast and bulbs

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 July by Albert's Generator Service. Flow Metrix Technical Services Inc. performed the annual calibration on the flow meter in May.

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 – <2.3	4.5(a)	0.8 – 1.8
	10(b)	<2 – 5.5	9.0(b)	1.7 – 4.0
Suspended Solids	5(a)	<2 – 5.7	4.5(a)	0.9 – 4.3
	10(b)	<2 – 7	9.0(b)	1.3 – 5.0
Total Phosphorus	0.3(a)	<0.03 – 0.17	0.27(a)	0.02 -0.08
	0.8(b)	0.07 – 0.18	0.72(b)	0.03 – 0.13
Total (Ammonia + Ammonium) Nitrogen	2.0(a)	<0.1 – <0.2	1.8(a)	0.04 – 0.13
	4.0(b)	<0.1 - <1.9	3.6(b)	0.05 – 1.02
E. coli	150	<2 - 149		
Dissolved Oxygen*	5	7.01 – 9.68		
Design Flow (m^3/d)**	900	190 - 1351		

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.
**design flow are average daily flows, not monthly average flows.

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 2014.

Table 3. Objectives exceeded in 2014 along with possible cause/comment.

Parameter	Result	Date	Comments/Cause
Flow	1148m^3/d	January 10	High Precipitation/Snow Melt
Flow	1149m^3/d	January 11	High Precipitation/Snow Melt
Flow	1149m^3/d	January 12	High Precipitation/Snow Melt
Flow	927m^3/d	January 13	High Precipitation/Snow Melt
Flow	953m^3/d	January 14	High Precipitation/Snow Melt
Flow	1302m^3/d	February 20	High Precipitation/Snow Melt
Flow	1160m^3/d	March 11	High Precipitation/Snow Melt
Flow	1049m^3/d	March 12	High Precipitation/Snow Melt
Flow	914m^3/d	March 14	High Precipitation/Snow Melt
Flow	913m^3/d	March 15	High Precipitation/Snow Melt
Flow	913m^3/d	March 16	High Precipitation/Snow Melt
Flow	1293m^3/d	March 19	High Precipitation
Flow	956m^3/d	March 21	High Precipitation
Flow	955m^3/d	March 22	High Precipitation
Flow	955m^3/d	March 23	High Precipitation
Flow	919m^3/d	March 31	High Precipitation
Flow	919m^3/d	April 2	High Precipitation
Flow	1067m^3/d	April 7	High Precipitation
Flow	959m^3/d	April 9	High Precipitation
Flow	955m^3/d	April 10	High Precipitation
Flow	1111m^3/d	April 15	High Precipitation
Flow	1093m^3/d	April 29	High Precipitation
Flow	1063m^3/d	April 30	High Precipitation
Total Suspended Solids	5.7mg/L	April	Carry over from clarifier
Flow	933m^3/d	May 12	High Precipitation
Flow	1350m^3/d	May 15	High Precipitation
Flow	932m^3/d	May 20	High Precipitation
Flow	995m^3/d	May 21	High Precipitation
Flow	1351m^3/d	May 22	High Precipitation
Flow	950m^3/d	September 2	High Precipitation
Flow	1119m^3/d	September 10	High Precipitation
Flow	1143m^3/d	September 11	High Precipitation
Flow	1198m^3/d	November 24	High Precipitation

There was only one monthly average objectives exceeded in 2014, compared to four in 2013. The objective that was exceeded was for suspended solids in April and is attributed to floc carry over in the clarifier. There were no monthly average loading effluent objectives exceeded in the 2014.

The annual average flow for 2014 was 575m^3/d, which is below the design flow of 900m^3/d. However, there were 32 instances where the daily design flow was exceeded compared to 24 instances in 2013. 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 (WAS) 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. In 2014, the total amount of WAS transferred to the lagoon was approximately 3,300m^3. For 2015 this amount will be similar (approximately 3,000m^3). The lagoon has ample storage for the sludge and will not require cleanout in the coming year.

Section 9: Community Complaints

There were no community complaints received in 2014.

Section 10: Bypasses, Spills, and Abnormal Discharges

There were no by-pass, spill or abnormal discharge events for the West Lorne WWTP or for the Pumping Station during 2014.

Section 11: Proposed Alteration, Extension or Replacement of Works

Over the next reporting period it is not expected that any alterations, extensions or replacements of works will require approval.

Section 12: Modifications to Works

An evaluation of the sand filter system and UV system will be made to determine upgrades necessary for reliable performance in 2015.

Section 13: Summary

Overall the West Lorne Wastewater Treatment Plant provided effective treatment in 2014. No alterations to the system have been made in 2014.

APPENDIX A

Analytical Data

						January 2014 Stream < 5°C		February 2014 Stream < 5°C		March 2014 Stream <5°C		April 2014 Stream >5°C		May 2014 Stream >5°C		June 2014 Stream >5°C		July 2014 Stream >5°C		August 2014 Stream >5°C		September 2014 Stream >5°C		October 2014 Stream >5°C		November 2014 Stream >5°C		December 2014 Stream <5°C		Summary	Annual Loading
		Objective Concentration	Objective Loading	Limits	Loading Limits	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	900		900 (ann)		670.8		553.2		720.8		765.6		749.8		459.0		479.1		424.1		555.4		467.1		530.6		523.1		575.0	
	Max			2700		1,149		1,302		1,293		1,111		1,351		592		842		677		1,143		727		1,198		715		1,351	
	Min					414		302		297		454		457		318		297		297		291		261		190		343		190	
	Sum					20,794		15,489		22,346		22,969		23,243		13,771		14,851		13,146		16,661		14,479		15,919		16,217		209,885	
Effluent Flow (m3/d)	Avg					671		553		721		766		750		459		479		424		555		467		531		523		575	
	Max					1,149		1,302		1,293		1,111		1,351		592		842		677		1,143		727		1,198		715		1,351	
	Min					414		302		297		454		457		318		297		297		291		261		190		343		190	
	Sum					20,794		15,489		22,346		22,969		23,243		13,771		14,851		13,146		16,661		14,479		15,919		16,217		209,885	
Raw BOD5 (mg/L)	Avg					139.5	93.6	114.5	63.34	106.5	76.77	108	82.69	104.5	78.35	188	86.30	154.5	74.02	252.5	107.08	92.7	51.46	120	56.05	16.5	8.76	171.5	89.72	128.4	73.82
	Max					160		172		134		123		113		244		179		258		126		181		17		200		258	
	Min					119		57		79		79		96		132		130		247		56		59		16		143		16	
Raw SS (mg/L)	Avg					160	107.3	80.5	44.53	121.5	87.58	188.3	144.19	111	83.22	190	87.22	126	60.36	252	106.86	146.7	81.45	89	41.57	16	8.5	174.5	91.29	140.2	80.64
	Max					160		113		156		325		112		223		129		404		251		152		25		209		404	
	Min					160		48		87		94		110		157		123		100		77		26		7		140		7	
Raw TKN (mg/L)	Avg					30.2	20.3	32.5	18.0	39.5	28.5	27.1	20.8	25.3	18.9	37.8	17.3	31.6	15.1	37.8	16.0	26.5	14.7	18.4	8.6	10.8	5.7	34.4	18.0	29.1	16.7
	Max					33.1		40.3		56.7		33.8		26.2		42.2		31.6		38		38.2		18.7		11.2		37.9		56.7	
	Min					27.3		24.6		22.3		20.7		24.3		33.3		31.5		37.6		18.2		18.0		10.3		30.8		10.3	
Raw TP (mg/L)	Avg					3.01	2.02	3.83	2.12	4.08	2.94	3.41	2.61	1.99	1.49	4.72	2.16	3.92	1.88	4.80	2.03	2.97	1.65	2.30	1.07	1.15	0.61	4.09	2.14	3.34	1.92
	Max					3.33		5.54		6.21		3.61		2.21		5.46		3.96		6.25		4.15		2.43		1.40		4.12		6.25	
	Min					2.68		2.12		1.95		3.21		1.77		3.97		3.87		3.34		2.02		2.16		0.90		4.05		0.90	
Raw Alkalinity(mg/L)	Avg					240.7		225		211		197.6		166.7		257.5		238		219		213.6		206.5		251		240		223.0	
	Max					276		282		238		218		170		290		278		272		254		260		320		252		320	
	Min					210		188		178		182		162		206		196		174		178		166		220		224		162	
Effluent BOD5 (mg/L)	Avg	5 (10)	4.5 (9.0)	10 (15)	9 (13.5)	< 2.5	1.7	3	1.7	5.5	4.0	< 2.3333	1.8	< 2	1.5	< 2	0.9	< 2	1.0	< 2	0.8	< 2	1.1	< 2	0.9	< 2	1.1	3	1.6	< 2.5	1.44
	Max					3		4		6		3		< 2		< 2		< 2		< 2		2		< 2		< 2		4		6	
	Min					< 2		2		5		< 2		< 2		< 2		< 2		< 2		< 2		< 2		< 2		2		< 2	
Effluent SS (mg/L)	Avg	5 (10)	4.5 (9.0)	10 (15)	9 (13.5)	< 2	1.3	5	2.8	7	5.0	5.7	4.3	4	3.0	< 2	0.9	2	1.0	< 3.5	1.5	< 2	1.1	4	1.9	3.5	1.9	3	1.6	3.7	2.10
	Max					2		7		7		7		5		2		2		5		2		6		4		3		7	
	Min					< 2		3		7		4		3		< 2		2		< 2		< 2		< 2		3		3		< 2	
Effluent TAN (mg/L)	Avg	2 (4)	1.8 (3.6)	3 (5)	2.7 (4.5)	< 0.1	0.07	< 1.9	1.02	< 0.1	0.07	< 0.2	0.13	< 0.2	0.11	< 0.1	0.05	< 0.1	0.05	< 0.1	0.04	< 0.1	0.06	< 0.2	0.07	< 0.1	0.05	< 0.1	0.05	< 0.3	0.14
	Max					< 0.1		3.6		< 0.1		0.2		0.2		< 0.1		0.1		0.1		< 0.1		0.2		< 0.1		0.1		3.6	
	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					< 0.8		< 2.9		< 1.7		1.0		1.2		< 1.0		< 0.5		0.9		< 0.5		< 0.5		< 0.7		< 1.0		< 1.0	
	Max					1.0		5.3		2.8		1.5		1.4		1.4		< 0.5		1.0		< 0.5		< 0.5		0.8		1.5		5.3	
	Min					< 0.5		< 0.5		< 0.5		0.8		0.9		< 0.5		< 0.5		0.7		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	
Effluent NO2 (mg/L)	Avg					< 0.03		4.76		5.44		0.34		0.04		< 0.04		0.03		< 0.03		< 0.04		< 0.03		< 0.03		< 0.05		< 0.85	
	Max					< 0.03		7.47		7.83		0.61		0.05		0.04		0.03		0.03		0.06		< 0.03		< 0.03		0.06		7.83	
	Min					< 0.03		2.04		3.05		0.15		0.03		< 0.03		0.03		< 0.03		< 0.03		< 0.03		< 0.03		< 0.03		< 0.03	
Effluent NO3 (mg/L)	Avg					19.7		14.6		13.0		16.7		18.7		20.0		20.7		16.0		17.5		21.4		12.8		19.8		17.5	
	Max					21.6		16.8		13.2		22.1		20.0		21.2		21.2		17.0		23.5		22.9		15.1		23.7		23.7	
	Min					17.7		12.4		12.8		13.9		17.4		18.7		20.2		14.9		11.9		19.8		10.4		15.9		10.4	
Effluent TP (mg/L)	Avg	0.3 (0.8)	0.27 (0.72)	0.5 (1.0)	0.45 (0.9)	0.09	0.06	0.13	0.07	0.18	0.13	0.13	0.10	< 0.03	0.02	0.06	0.03	< 0.06	0.03	0.05	0.02	0.10	0.06	0.17	0.08	0.08	0.04	0.07	0.03	< 0.10	0.05
	Max					0.09		0.15		0.18		0.18		0.03		0.06		0.09		0.05		0.12		0.18		0.10		0.09		0.18	
	Min					0.08		0.10		0.18		0.10		< 0.03		0.05		< 0.03		0.04		0.09		0.15		0.05		0.04		< 0.03	
Effluent pH	Avg					7.97		8.12		7.83		7.93		7.77		7.55		7.69		7.78		7.84		7.46		7.15		7.3338		7.7026	
	Max					8.20		8.39		8.08		8.31		8.06		7.68		8.11		8.03		8.11		7.69		7.46		7.49		8.39	
	Min					7.62		7.91		7.21		7.56		7.55		7.37		7.38		7.57		7.07		7.29		6.85		7.18		6.85	
Effluent Alkalinity (mg/L)	Avg					63.3		78.5		73		94.8		74.7		54		39.6		35.5		35.6		72.5		77		114.8		68	
	Max					72		110		84		108		78		68		48		42		56		90		90		232		232	
	Min					50		32		52		62		70		36		20		30		20		54		60		80		20	
Effluent E. coli (cfu/100	Geomean	150		200								148.5934		< 16.8122		< 2		< 2		< 4		< 3.8858		6						< 7.0441	
	Max											960		198		< 2		2		8		19		6						960	
	Min											23		< 2		< 2		< 2		< 2		< 2		6						< 2	
Effluent Temp. (oC)	Avg					7.6		6.6		7.3		9.2		12.9		17.6		20.3		21.2		19.7		16.5		9.8		10.0		13.4	
	Max					9.6		7.8		8.5		10.1		15.5		19.1		21.4		23.3		22.4		19.3		13.5		11.3		23.3	
	Min					5.7		4.5		5.8		8.2		10.5		15.2		19.2		19.4		18.2		14.6		5.3		8.6		4.5	
Effluent DO (mg/L)	Avg					10.23		10.16		9.69		9.06		8.68		8.03		7.80		7.57		8.27		8.05		9.42		9.29		8.83	
	Max					11.29		11.31		10.09		10.05		9.26		8.35		8.28		7.96		8.71		8.45		10.61		10.20		11.31	
	Min	5				9.68		9.44		9.17		7.58		8.17		7.44		7.01		7.13		7.65		7.57		8.55		8.46		7.01	