

THE TOWNSHIP OF ST. JOSEPH

RICHARDS LANDING
WATER POLLUTION CONTROL PLANT

2017 ANNUAL OPERATING REPORT

JANUARY 1, 2017 – DECEMBER 31, 2017



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Introduction

The Richards Landing Water Pollution Control Plant (WPCP) Performance Report provides staff, stakeholders and customers an overview of the performance of the Richards Landing WPCP in 2017. Furthermore, this report fulfills the annual reporting requirements of the Ontario Ministry of the Environment and Climate Change (MOECC). The enclosed 2017 report for the above reference facility summarizes the performance and related activities in accordance with C of A #3-0545-93-006. The performance report demonstrates the commitment of ensuring that the WPCP continues to deliver wastewater services to our customers in an environmentally responsible manner. The certificate of Classification for the plant can be seen at Appendix B of this report.

The Sewage Treatment Plant is situated at the west side of the community at the end of Shore Road. The plant forms part of the sewage collection and treatment system comprising of the underground sewage collection system and Sewage Pumping Station located on Hwy 548 and Russell Street.

For a description of terms and abbreviations used in this report, refer to the glossary at the end of the report.

Water Pollution Control Plant Process General Description

The Township of St. Joseph operates a sewage treatment plant that is situated at the east side of the community on Marguerite Street and forms part of the sewage collection and treatment system which includes the underground sewer collection system and a sewage pumping station located on Russell Street. The sewage flows by gravity to the sewage pumping station from where it is pumped to the sewage treatment plant. The sewage pumping station is designed for a 20-year peak flow and is supplied with emergency power from the generator located at the water plant. The sewage treatment plan is a modern rotating biological contactor RBC design followed by a secondary clarification system. The disinfected effluent is then discharged by gravity via a sewage outfall line to a diffuser located 450m offshore which is designed to dilute and disperse the effluent away from the shore to protect downstream domestic and recreational users.

Wastewater is collected in sanitary sewers in the Richards Landing service area and is conveyed to the treatment facility. Aluminum sulphate is added at the station to enhance the settling of solids and phosphorus removal.



Sewage Works

The Sewage Pumping Station is designed for a 20-year peak flow of 17.8L/s (282 USgpm) at a total discharge head of 46.0m (151ft) and is supplied with emergency power from the generator located at the Water Plant.

The Ministry of Environment has approved treatment to secondary level (15 mg/L BOD₅, 15 mg/L SS & 1mg/L Phosphorous) for discharge of effluent to St. Mary's River. The disinfected effluent is discharged by gravity via a sewage outfall line to a diffuser located 450m offshore and designed to provide adequate dispersion and dilution of the effluent to ensure the effluent is directed away from the shore, to protect downstream domestic and recreational users. The plant is equipped with a 75KW generator for emergency power. A brief description of the sewage plant and a Process Flow Diagram follows.

Primary Clarification

The Sewage Treatment Plant comprises of a sewage flow splitter box with a manually raked bar screen. Adjacent to the splitter box is a composite sampler which collects composite samples of raw sewage for testing purposes. The flow is directed into two primary clarification and sludge storage septic tanks with a total volume of approximately 450m³ (119,000 USgal) which includes approximately six months' storage volume for primary and secondary sludge. These tanks overflow through two weirs into the equalization tanks.

Flow Equalization

Flow is directed into the two aerated equalization tanks, with a total flow equalization capacity of approximately 230m³ (60,750 US gal) equipped with three submersible pumps (two duty and one standby) each having a rated capacity of 6.7 L/s (106 USgpm) at 3.3m (10.8ft.) T.D.H., and coarse bubble air-diffusion system equipped with air blower having a capacity of 230m³/h (135 cfm) against 38 kPa (5.5 psi).

Secondary Treatment

Comprising of three 3.6m (12ft) diameter by 6.1m (20ft) long Rotating Biological Contactor Units with a total of 22,850 m² (245,800 ft²) bio support media divided into four separate stages and equipped with one air blower and supplementary air diffusion system for the first two stages and having a capacity of 255 m³/h (150 cfm) against 23.5 kPa (3.50 psi).

Secondary Clarification

Three secondary clarifiers, each approximately 3.5m x 3.5m (11.5ft x 11.5ft) dimensions and each equipped with one air-lift sludge return pump and one air lift surface skimmer.



Phosphorous Removal

Chemical phosphorous removal system comprising one aluminum sulfate (alum) storage tank, day tank, transfer pump and three positive displacement diaphragm metering pumps feeding alum to the head of the clarifiers.

Disinfection

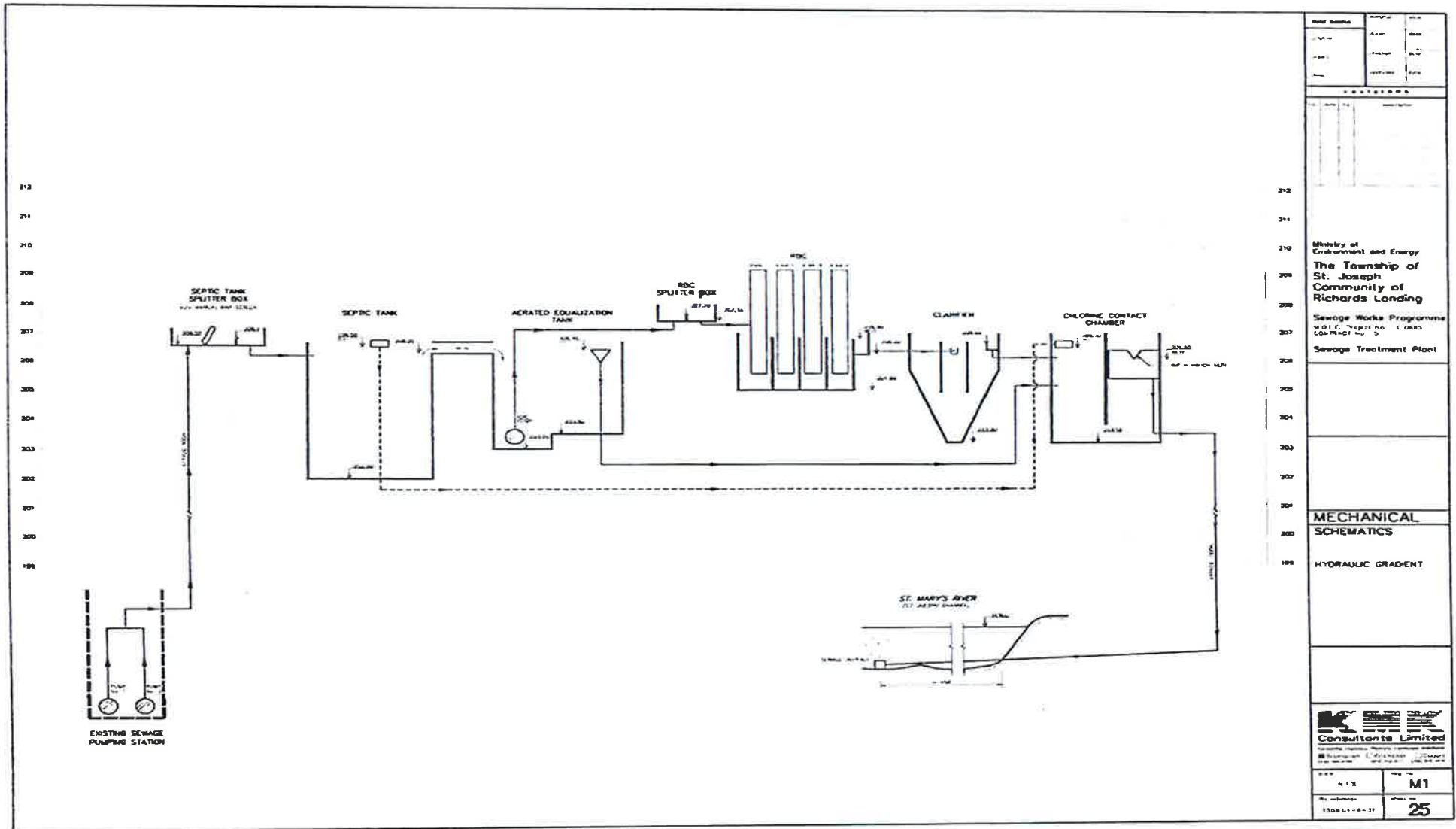
Sodium Hypochlorite (chlorine) disinfection system comprising of one day tank and a metering pump feeding chlorine into the chlorine contact chamber having a detention time of 30 minutes.

Control Building

A 135m² control building situated on top of the equalization tanks and housing the chemical storage and feeding facilities, air blowers, standby power, electrical and control panels. The overall plant has been designed to run manually with automatic controls for pump, air lift pumps and scum skimmer. Levels are monitored automatically, and the plant effluent flow charted electronically. The plant effluent flow in turn controls the level of alum dosage to the clarifier. All major components of the plant are monitored, and alarms are activated via a telephone line to the relevant personnel in case of an emergency. Overall the plant is very functional in terms of the original design criteria of simplicity in design and maintenance with low operational costs.



Figure 1 - Process Flow Diagram



Compliance Approval

In compliance with section 17 of C of A # 3-0545-93-006, The Township of St. Joseph produces this annual report. Below is an overview of the success and adequacy of the sewage treatment program. The Based on the information in Table 1 the plant far surpassed all objectives that the plant was designed and required to perform.

Table 1 – Summary and Overview of Adequacy of Sewage Treatment Program

Richards Landing WWTP Plant Performance								
Date	Total Monthly Flow (m3)	# days	Average Daily Flow (m3)	Lab Results			Plant Performance - A	
				BOD5 (mg/L)	TP (mg/L)	TSS (mg/L)	BOD5 (kg/d)	TP (kg/d)
Jan-17	3845	30	128.16667	4	0.38	8	0.5126667	0.0487033
Feb-17	3799	28	135.67857	7	0.27	9	0.94975	0.0366332
Mar-17	4301	31	138.74194	4	0.42	9	0.5549677	0.0585716
Apr-17	5315	30	177.16667	4	0.53	9	0.7086667	0.0938983
May-17	5041	31	162.6129	4	0.65	9	0.6504516	0.1056984
Jun-17	4301	30	143.46667	12	0.59	5	1.7216	0.0846453
Jul-17	4444	31	143.35484	4	0.7	5	0.5734194	0.1003484
Aug-17	4.441	31	0.1432581	4	0.85	7	0.000573	0.0001175
Sep-17	3485	30	116.16667	4	0.65	8	0.4646667	0.0755083
Oct-17	4320	31	139.35484	4	0.46	8	0.5574194	0.0641032
Nov-17	3691	30	123.13333	4	0.44	5	0.4925333	0.0541787
Dec-17	3073	31	99.129032	4	0.3	6	0.3965161	0.0297387
Non compliance Limits				25	25	1	10.5	10.5
Effluent Objectives				15	15	1	6.3	6.3

	Average (mg/l)
Effluent Parameter - BOD ₅	<5
Suspended Solid - 15	7.33
Total Phosphorus - 1	.52


Based on the information in Table 1 the plant far surpassed all objectives that the plant was designed and required to perform.



Effluent quality at all times surpassed the objectives set out in the C of A based on the information in Table 1. Flows through the sewage treatment plant did not exceed the specified average daily flow of 422.5m³/d in any month in 2016. The average daily flow being 110m³ in 2016 which is 26% of the design flow. The maximum daily flow of 175m³ was recorded on August 10, 2016 and was 11% of Maximum daily flow designed of 1537.9m³/d.

Table 2 – Annual Flow Through

	Flow m ³	Alum (Litre)	Cl (Litre)	Dosage	Avg Flow	Max Flow
January	3845	929	102	3.4	124	179
February	3799	884	94	2.96	136	160
March	4301	932	92.9	2.59	139	163
April	5315	1144	95.8	2.16	139	183
May	5041	926	102	2.49	163	175
June	4304	787	84.4	2.35	144	169
July	4444	833	98.3	2.65	143	163
August	4441	79	97.9	2.64	143	167
September	3485	740	91	9.2	116	128
October	4320	1055	98	2.7	139	160
November	3694	1142	97	3.2	123	173
December	3073	1077	104	4.6	99	133
	50,062	10,528	1,157.3	40.94		

Maximum 

Sludge

When the sludge tanks are full, the sludge is hauled and disposed of at drying beds located at the Township of St. Joseph Landfill Site C of A No. A561701. In 2017, 52 500 gallons of sludge were removed from the plant and in 2018 it is anticipated that approximately 50 000gallons of sludge will be generated. The sludge was hauled by licensed hauler Edwin Karhi, Licence #900494, and it is anticipated that the same contractor and location will be used for sludge removal for the upcoming 2018 reporting period.



Testing

Raw and treated parameters set out by the C of A are analyzed at SGS Lakefield Research an accredited laboratory located in Lakefield Ontario. In house testing is done by a Licensed Operator.

The information generated from this program is used to monitor the treatment efficiency of the treatment process and to assist with changes to improve the quality of the effluent from the plant. There were no bypasses through the plant of any kind and no exceedances in 2017.

The testing includes, but is not limited to, the following parameters; carbonaceous biochemical oxygen demand (CBOD5), total suspended solids (TSS), total and soluble phosphorus (TP and SP), pH, total solids (TS), volatile solids (VS), volatile acids, ammonia, chemical oxygen demand (COD), capillary suction time (CST), alkalinity and ultraviolet transmittance (UVT). An external accredited laboratory also conducts monthly (bimonthly for metals) tests for metals, COD, ammonia, and total Kjeldahl nitrogen (TKN). The laboratory also provided the analytical support for the Sewer Use Control Program.


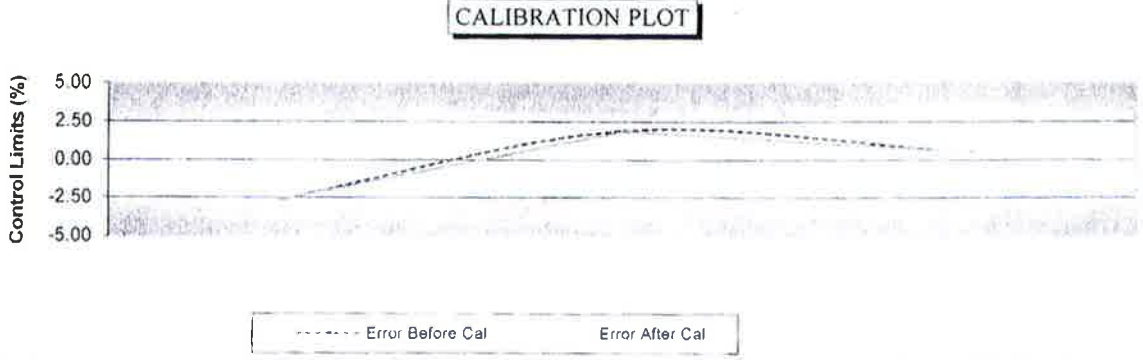
As seen in Figure 2, the meters used for the in-house testing were calibrated by the Sault Ste. Marie Public Utility Commission (PUC) Services Inc. on February 17, 2017.

A new Hach PH meter was purchased to do the in-house monitoring of PH & temperature.

Due to the efficient operations of the plant, there were no complaints from any of the nearby neighbours of odour or noise generated by the plant in 2017.



Figure 2 – Instrument Verification Certificate

	INSTRUMENT VERIFICATION CERTIFICATE	Cal Date: Feb 17/17 Due Date: Feb 17/18 Frequency: 1/yr																												
Instrument ID: Richard's Landing Waste Water Flow Instrument Number: FIT-300 Instrument Range: 0 - 16 L/s Accuracy (%+/-): +/- 15.00%	Type: Multiranger Plus (OCM)/60 Deg. V-notch PUC Asset: 300016 Output: 4 - 20mA Note: Ops/Mtce Manual PL-313																													
Calibration Standard: Stainless ruler and flowrate calculation for 60 degree V-Notch weir	Recertification Date: N/A																													
Calibration/Verification Data																														
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>OCM Depth m</th> <th>Reference flow L/s</th> <th>Flow as found L/s</th> <th>% error before</th> <th>As found Pass/Fail</th> <th>Flow as left L/s</th> <th>% error after</th> </tr> </thead> <tbody> <tr> <td>0.030</td> <td>0.124</td> <td>0.121</td> <td>-2.57</td> <td>PASS</td> <td>0.121</td> <td>2.57</td> </tr> <tr> <td>0.107</td> <td>2.984</td> <td>3.040</td> <td>1.89</td> <td>PASS</td> <td>3.040</td> <td>1.89</td> </tr> <tr> <td>0.130</td> <td>4.855</td> <td>4.880</td> <td>0.52</td> <td>PASS</td> <td>4.880</td> <td>0.52</td> </tr> </tbody> </table>			OCM Depth m	Reference flow L/s	Flow as found L/s	% error before	As found Pass/Fail	Flow as left L/s	% error after	0.030	0.124	0.121	-2.57	PASS	0.121	2.57	0.107	2.984	3.040	1.89	PASS	3.040	1.89	0.130	4.855	4.880	0.52	PASS	4.880	0.52
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CALIBRATION PLOT																														
																														
Remarks: Distance was measured using tape measure then compared to milltronics input Flow formula used ($Q=796.7 H^{2.5}$) Depth of water = span - measured distance from top of water to transducer face. Weir Depth 0.66 m, to determine OCM Depth: $0.66 - (\text{distance from sensor face to surface}) = \text{OCM Depth}$																														
Conformity <div style="display: flex; align-items: center; margin-left: 20px;"> <div style="width: 20px; height: 20px; background-color: black; margin-right: 5px;"></div> Instrument calibration is within acceptable tolerance </div> <div style="display: flex; align-items: center; margin-left: 20px; margin-top: 5px;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> Instrument calibration not within acceptable tolerance </div>																														
Calform Richard's Landing Waste Flow 2017 Instrumentation Technician: Jeremy Callahan																														



Maintenance and Repairs

All maintenance is scheduled using information supplied by the equipment manufacturer and taken from the O & M Manuals. Aside from routine maintenance outlined in the manuals, there were no major repairs undertaken on any major structure, equipment or mechanism of the works in 2017.

What's Planned for 2018

The Township of St. Joseph received funds in 2017 from the Ontario Community Infrastructure Fund (OCIF) to install an Ultra Violet (UV) disinfection system. This new disinfection system is replacing the hypo system planned alterations for the year 2018. The new UV system will provide a final disinfection of the effluent prior to sending the water to the St. Joseph Channel of St. Mary's River.

There are numerous permits that are required for the extent of the work being done. Once all permits are in place, Kresin Engineering has been contracted to do the project. This work is scheduled to be completed in 2018.

Information provided from records by:

B. Elliott Superintendent of Water & Sewer Services



Carol O. Trainor, AMCT
Clerk Administrator
March 24, 2018



Appendix A - Copy of the Operators Certificate



Appendix B – Certificate of Classification



CERTIFICATE OF CLASSIFICATION / CERTIFICAT DE CATÉGORIE

TOWNSHIP OF ST. JOSEPH
COMMUNITY OF RICHARDS LANDING
SEWAGE TREATMENT PLANT
WASTEWATER TREATMENT

CLASS 2

Date issued / Délivré le **MARCH 21, 1995**

Certificate No. / Certificat n° **2366**


Director
Directeur(trice)


Minister of Environment and Energy
Ministre de l'Environnement et de l'Énergie



Appendix C – Glossary of Terms

Annual Average Concentration

An arithmetic mean of the monthly average concentrations of a contaminant in the effluent calculated for any particular year.

Annual Average Loading

The value obtained by multiplying the annual average concentration of a contaminant by the average daily flow over the same calendar year.

Average Daily Flow

The cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year.

Avg – Average

An arithmetic mean of the average concentrations and loadings.

Biosolids

Organic material recovered from wastewater sludge.

Bioreactor

A bioreactor is a vessel in which a biological process is carried out which involves bacterial organisms or biochemically active substances derived from such organisms.

BOD5 Five Day Biochemical Oxygen Demand

(also known as total BOD5) a five-day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand.

By-pass

Any discharge from the works that does not undergo any treatment or only undergoes partial treatment before it is discharged to the environment.

CBOD5 -Five Day Carbonaceous Biochemical Oxygen Demand

A five-day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample.

Conc. - Concentration

The abundance of a constituent divided by the total volume of a mixture.

Daily Concentration

The concentration of a contaminant in the effluent discharged over any single day, as measured by a composite or grab sample, whichever is required.

DP - Dissolved Phosphorus

This is the soluble form of phosphorus present in the wastewater.

ECA - Environmental Compliance Approval

The primary regulatory instrument for each water pollution control plant.



E. - coli - (Escherichia coli)

Refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius.

Final Effluent

Sewage discharge through the water pollution control plant outfall after undergoing the full train of unit processes as listed in the Environmental Compliance Approval.

Grab Sample

A single sample taken at a specific moment in time, when tested provides a snapshot of the conditions at the time the sample was retrieved.

kg - kilogram

Basic unit of mass in the metric system

kg/d – kilogram per day

The kilograms recorded in a 24-hour period

LSPRS - Lake Simcoe Phosphorus Reduction Strategy

The ECA issued on June 28, 2012 introduced additional phosphorus objectives to comply with the requirements of the Lake Simcoe Phosphorus Reduction Strategy (2010) prepared under the Lake Simcoe Protection Plan (2009).

m³ - (Cubic Metre)

Volume measurement, 1 m³ = 1000 litres or 220 imperial gallons.

m³/d - (Cubic Metre Per Day)

Flow measurement, 1 m³ = 1000 litres or 220 imperial gallons. Volume of liquid treated in a 24 hour period.

Max. – Maximum

The highest amount, value, or degree attained or recorded.

Maximum Flow Rate

The peak or highest flow recorded during a specific period; usually in a 24-hour period.

mg/L - (Milligram Per Litre)

This is a measure of the concentration of a parameter in water, sometimes referred to as parts per million (ppm).

Min. – Minimum

The least quantity or amount possible, assignable, allowable, or the like.

mm.-(millimetre)

Is a unit of length in the metric system, equal to one thousandth of a metre.

MOECC - (Ministry of the Environment and Climate Change)

The Provincial regulatory agency responsible for overseeing the water and wastewater industries in Ontario. Their primary functions include approval for new or expanding facilities, inspections and investigations.

Monthly average concentration

The arithmetic mean of all daily concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar month.

Monthly average loading

Is calculated by multiplying the monthly average concentration of a contaminant by the monthly average daily flow over the same calendar month.

Nitrate Nitrogen

Is a salt or ester of nitric acid, containing the NO_3 ion. Nitrates are the most water soluble of salts, and play a major part in the nitrogen cycle and nitrate pollution.

N/A - Not Applicable

Peak Flow Rate

The maximum rate of sewage flow for which the plant or process unit was designed.

pH

Index of hydrogen ion activity, pH is defined as the negative logarithm of hydrogen ion concentration in moles per litre. The pH may range from 0 – 14, where 0 is most acidic, 14 most basic and 7 neutral.

Rated Capacity

The average daily flow for which the works are approved to handle.

Raw Influent

Raw wastewater entering the water pollution control plant before treatment.

RBC

Rotating Biological Contactor

Septage

Partially treated sludge from a septic tank.

Sludge

The settleable solids separated from liquids during processing.

TAN - Total Ammonia Nitrogen

Ammonia exists in two forms in the water: NH_3 (this is called unionized ammonia) NH_4^+ (this is called ionized ammonia) Together, these two forms of ammonia are called TAN which means total ammonia nitrogen.



Temp. – Temperature

A measure of the warmth or coldness of an object or substance with reference to some standard value.

Total Annual Loading

Is calculated by adding the calculated total monthly load discharged for each calendar year.

Total Monthly Loading

Is calculated by multiplying the total monthly flow by the monthly average concentration.

TP - Total Phosphorus

A laboratory analyses to determine the total amount of non-soluble and soluble phosphorus present in the wastewater.

TSS - Total Suspended Solids

A laboratory analyses to measure particles that are larger than 2 microns found in the wastewater.

TS - Total Solids

Is a measure of the suspended and dissolved solids in the wastewater and in biosolids.

Un-ionized Ammonia Nitrogen

Un-ionized ammonia refers to all forms of ammonia in water with the exception of the ammonium ion (NH_4^+).

WPCP - Water Pollution Control Plant

A facility composed of a variety of treatment processes that collectively treat wastewater



