Morrisburg Wastewater Treatment System

Sewage Works #120000168

Annual Report

Prepared for: Municipality of South Dundas

Reporting Period of January 1st – December 31st 2018

Issued: March 26, 2019

Revision: 0

This report has been prepared to meet the requirements set out in Certificate of Approval #2147-734L2K

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Operations and Compliance Reliability Indices

Compliance Event	# of Events
Ministry of Environment Inspections	0
Ministry of Labour Inspections	0
Non-Compliance	0
Spills	0
Sewer Main Blockages	0

System Process Description

Morrisburg's sewage collection system is a gravity fed sanitary sewage collection system. There is one pumping station which pumps wastewater from the collection system to the wastewater treament facility.

Morrisburg's wastewater treatment plant (WWTP) is a Class II wastewater treatment system owned and operated by the Municipality of South Dundas. Raw sewage is pumped to the WWTP from the plant pumping station which is equipped with four submersible pumps. From the pumping station, wastewater passes through the inlet works, including fine screens with a screw compactor and a grit removal and disposal system. Aluminum Sulphate is added to assist in phosphorous removal. The wastewater then moves through either of two parallel Sequencing Batch Reactors (SBRs) equipped with individual aeration systems, mixers, decanters and sludge removal pumps. Effluent decanted from the SBRs is treated by UV disinfection and subsequently passes through an outfall pipe to the St. Lawrence River.

The Morrisburg WWTP can receive septage. Septage can be transferred to the influent fine screens from the onsite holding tank by two dry-pit pumps.

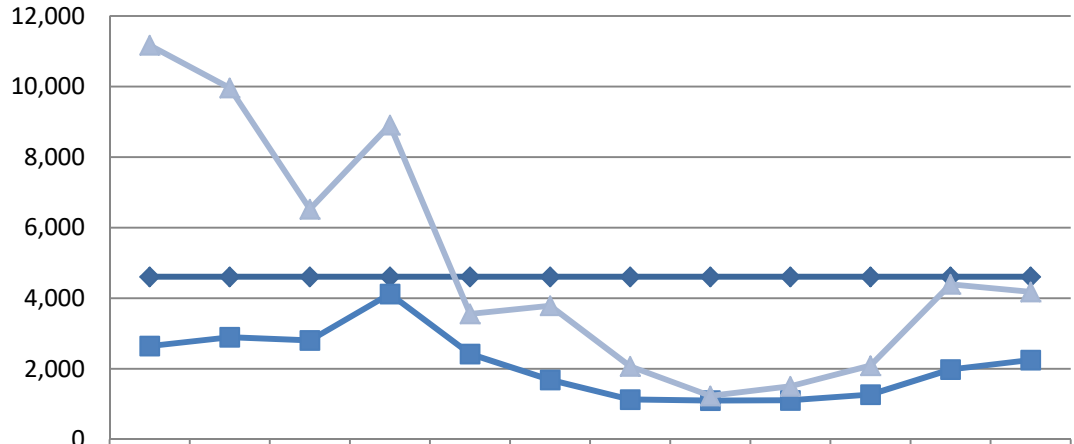
Sludge removed from the SBRs is transferred to a 140 m^3 storage tank. From the tank, the sludge enters a gravity belt thickener. The thickened sludge is then pumped to an Autothermal Thermophilic Aerobic Digestion (ATAD) system for stabilization. The digested sludge is subsequently pumped to a 1480 m^3 biosolids storage tank. From the storage tank, biosolids are hauled off site to be utilized as soil conditioner.

Wastewater System Flows

The hydraulic flows reaching the treatment facility in 2018 averaged 2,118 m^3/day which represents 46% of the 4,608 m^3/day design.

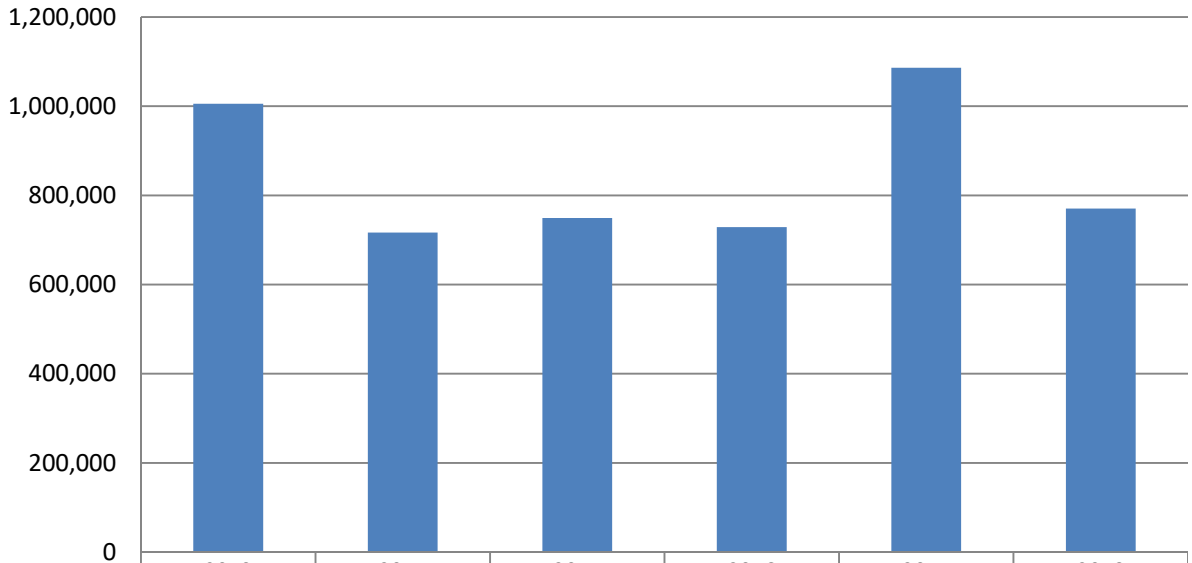
Raw Flows

2018 Raw Flows:



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Design Capacity (m3/d)	4,608	4,608	4,608	4,608	4,608	4,608	4,608	4,608	4,608	4,608	4,608	4,608
Avg Flow (m3/d)	2,647	2,897	2,806	4,122	2,421	1,687	1,129	1,100	1,107	1,271	1,983	2,251
Max Flow (m3/d)	11,171	9,961	6,525	8,911	3,557	3,790	2,071	1,235	1,506	2,092	4,396	4,181

Annual Raw Flow Comparison:



	2013	2014	2015	2016	2017	2018
Total Annual Flow (m3)	1,005,486	716,660	749,330	728,663	1,086,352	770,483

Effluent Flow

A total of 1,313,453 m^3 of effluent was discharged from Morrisburg's WWTP in 2018.

Effluent Quality Assurance or Control Measures

Effluent control measures include in-house sampling and testing for operational parameters. In-house testing provides real time results which are then used to enhance process and operational performance. Samples are collected by the Municipality of South Dundas' competent and licensed staff using approved methods and protocols for sampling including those specified in the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works", the Ministry's publication, "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" and the publication, "Standard Methods for the Examination of Water and Wastewater".

Effluent samples collected during the reporting period were submitted to Caduceon laboratory in Ottawa for analysis, with the exception of pH, temperature and unionized ammonia. Caduceon is accredited by the Canadian Association for Laboratory Accreditation (CALA). Accredited labs must meet strict provincial guidelines including an extensive quality assurance/quality control program. By choosing this laboratory, the Municipality of South Dundas is ensuring appropriate control measures are undertaken during sample analysis.

The pH and temperature parameters were analyzed in the field at the time of sample collection by certified operators to ensure accuracy and precision of the results obtained. Un-ionized ammonia was calculated using the total ammonia nitrogen concentration, pH and temperature as required by the facility's Certificate of Approval.

Effluent Quality

The monthly average concentrations of $CBOD_5$ and Total Suspended Solids (TSS) remained below the effluent objectives and limits outlined in the facility's Certificate of Approval during 2018. The geometric mean density of E. Coli in the effluent also remained below the limit and objective in 2018. In addition, effluent pH remained within the limits and objectives throughout the year.

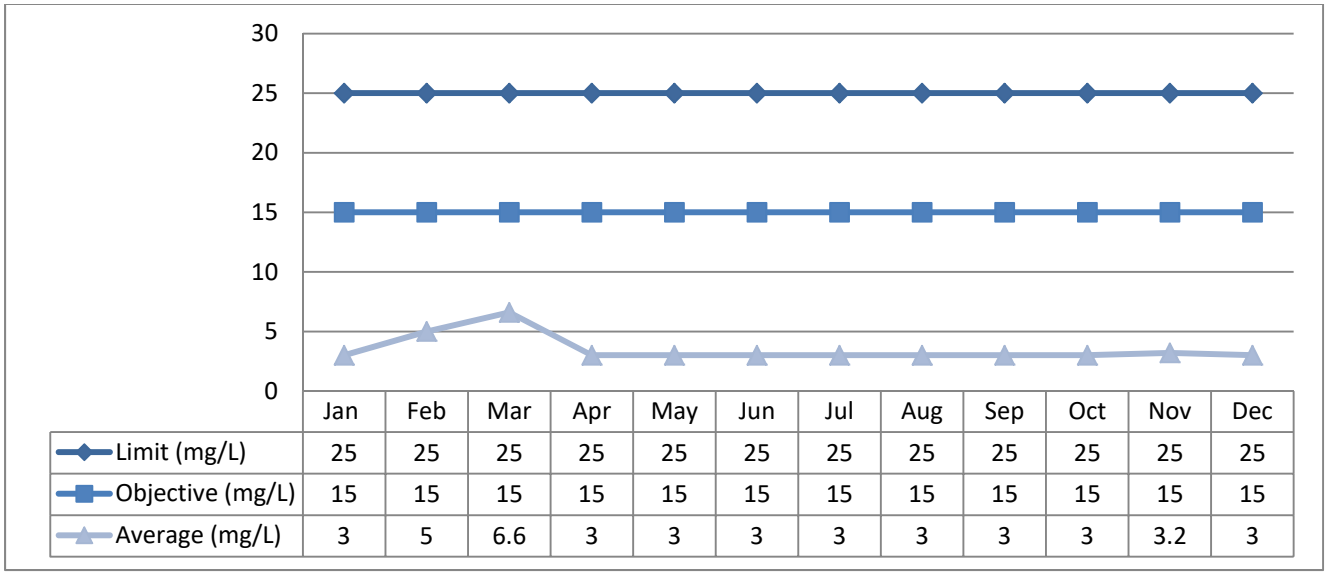
The monthly average concentration of Total Phosphorus (TP) remained below the limit and objective throughout 2018, with the exception of the month of September when the objective was marginally exceeded.

Effluent results from the wastewater treatment facility for 2018 are tabulated below. Additional data can be found in the Performance Assessment Reports attached in Appendix A.

Carbonaceous Biochemical Oxygen Demand (5-Day)

Monthly Average	C of A Limit	C of A Objective	Exceedance
Concentration (mg/L)	25	15	No

$CBOD_5$ Effluent Monthly Average Concentration:

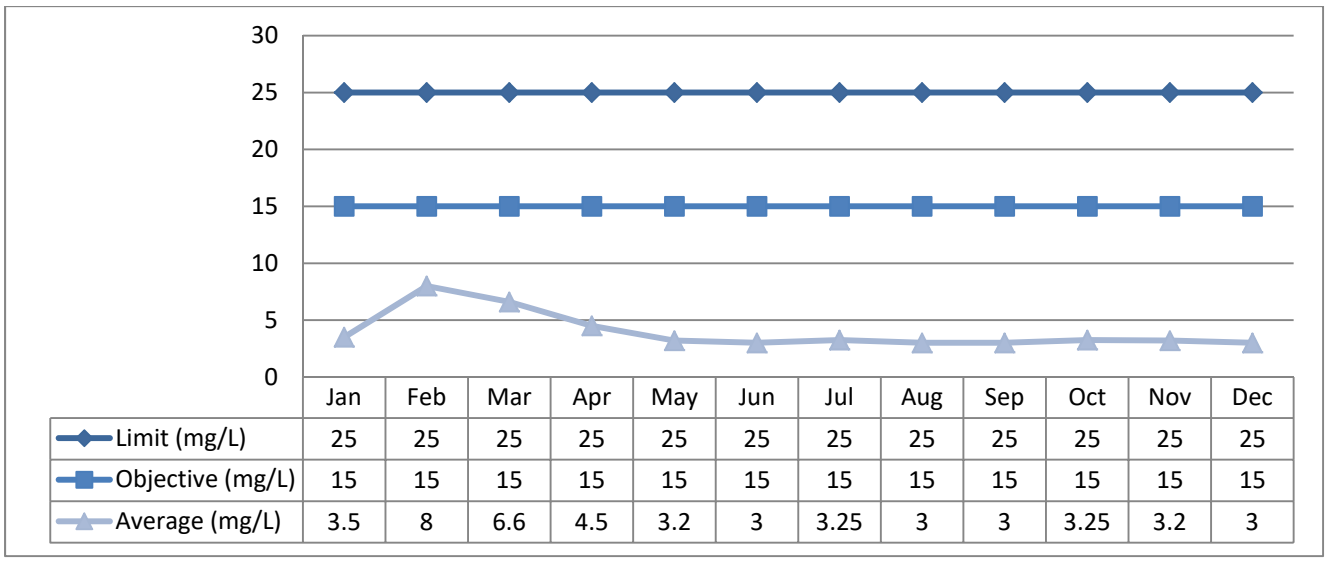


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit (mg/L)	25	25	25	25	25	25	25	25	25	25	25	25
Objective (mg/L)	15	15	15	15	15	15	15	15	15	15	15	15
Average (mg/L)	3	5	6.6	3	3	3	3	3	3	3	3.2	3

Total Suspended Solids

Monthly Average	C of A Limit	C of A Objective	Exceedance
Concentration (mg/L)	25	15	No

TSS Effluent Monthly Average Concentrations:



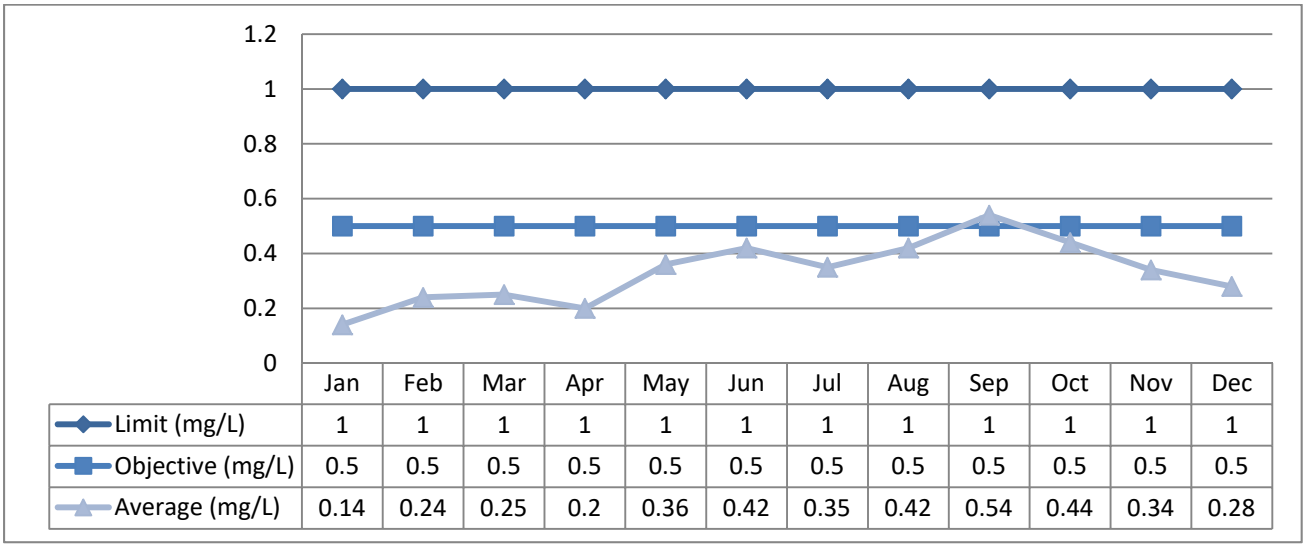
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit (mg/L)	25	25	25	25	25	25	25	25	25	25	25	25
Objective (mg/L)	15	15	15	15	15	15	15	15	15	15	15	15
Average (mg/L)	3.5	8	6.6	4.5	3.2	3	3.25	3	3	3.25	3.2	3

Total Phosphorus

Monthly Average	C of A Limit	C of A Objective	Exceedance
Concentration (mg/L)	1.0	0.5	Yes – Objective*

** The monthly average objective for TP was exceeded in September 2018. Please see the 'Operating Issues' section of this report for details.*

TP Effluent Monthly Average Concentrations:

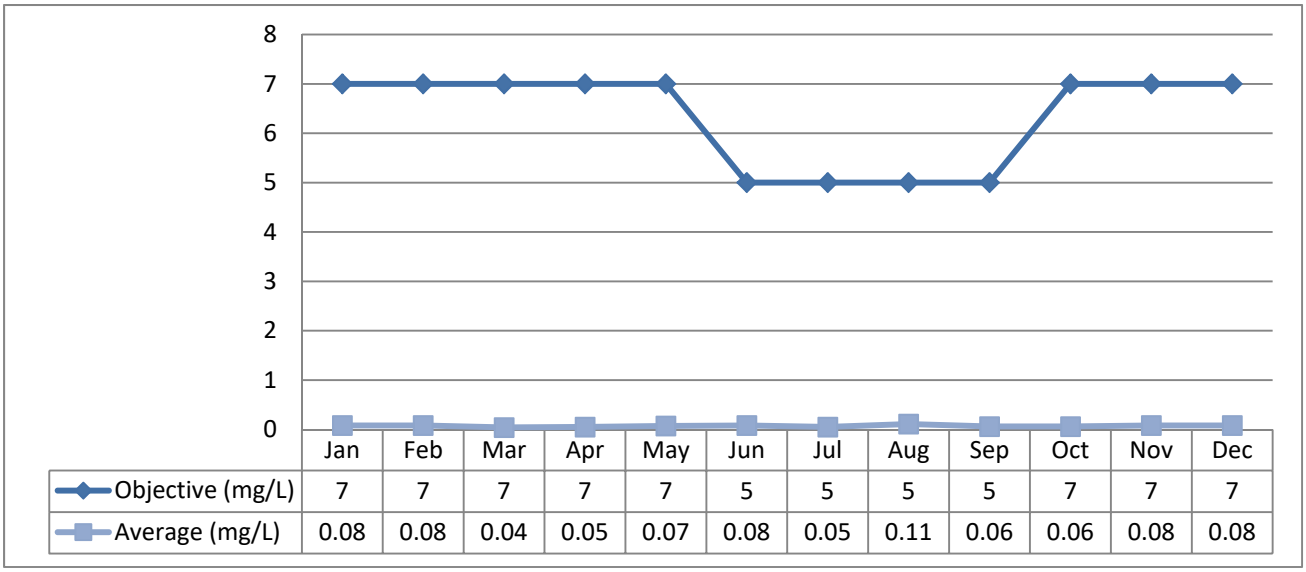


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Limit (mg/L)	1	1	1	1	1	1	1	1	1	1	1	1
Objective (mg/L)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Average (mg/L)	0.14	0.24	0.25	0.2	0.36	0.42	0.35	0.42	0.54	0.44	0.34	0.28

Total Ammonia Nitrogen

Discharge Period	C of A Limit	C of A Objective	Exceedance
June 1 – Sept 30	n/a	5.0	No
Oct 1 – May 31	n/a	7.0	No

TAN Effluent Monthly Average Concentrations:

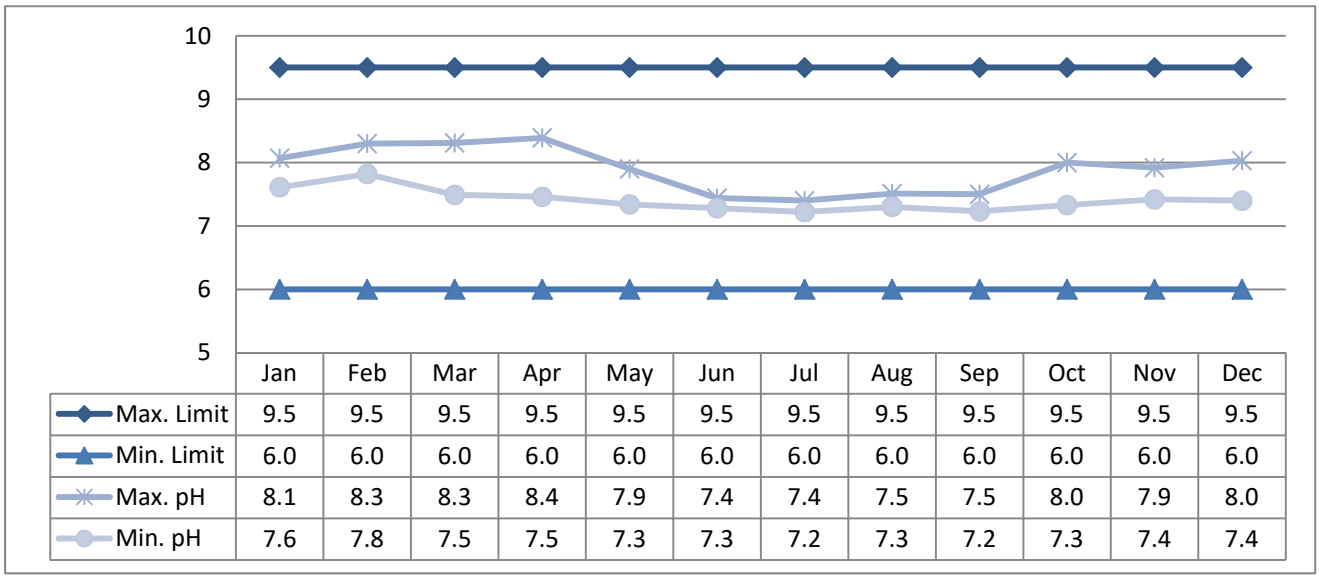


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Objective (mg/L)	7	7	7	7	7	5	5	5	5	7	7	7
Average (mg/L)	0.08	0.08	0.04	0.05	0.07	0.08	0.05	0.11	0.06	0.06	0.08	0.08

pH

Reporting Period	C of A Limit	C of A Objective	Exceedance
All results	6.0 – 9.5	6.0 – 9.5	No

Monthly Minimum and Maximum Effluent pH Results:

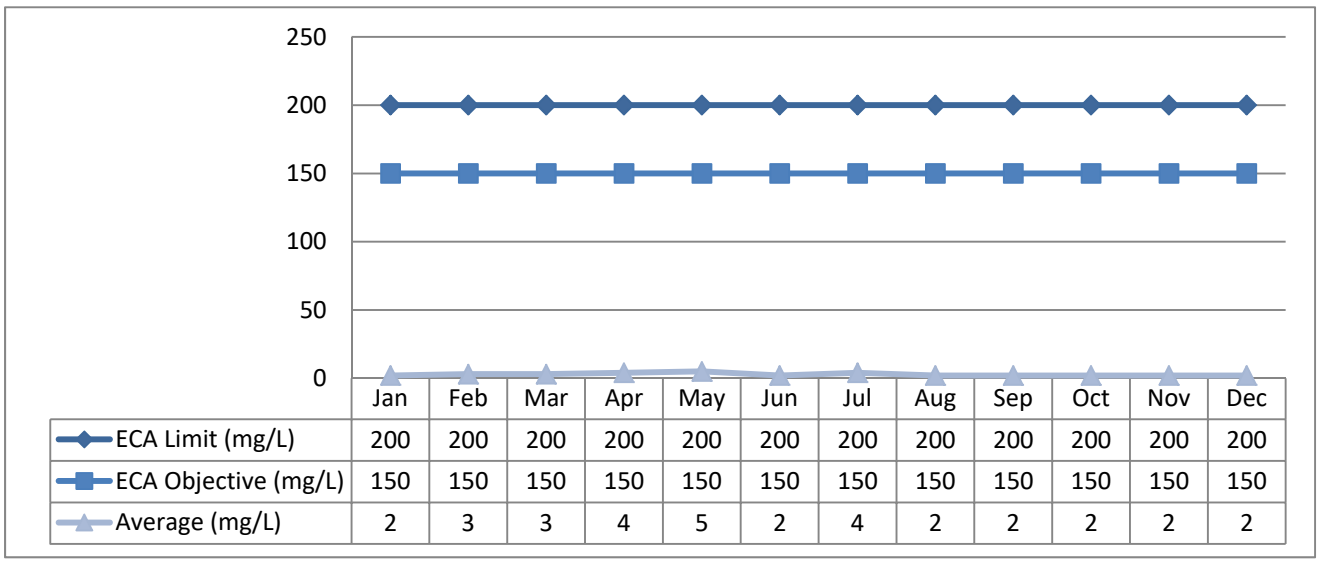


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max. Limit	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Min. Limit	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max. pH	8.1	8.3	8.3	8.4	7.9	7.4	7.4	7.5	7.5	8.0	7.9	8.0
Min. pH	7.6	7.8	7.5	7.5	7.3	7.3	7.2	7.3	7.2	7.3	7.4	7.4

E. Coli

Monthly Average	C of A Limit	C of A Objective	Exceedance
Geometric Mean Density	200	150	No

E. Coli Monthly Geometric Mean Density (cfu/100 mL):



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ECA Limit (mg/L)	200	200	200	200	200	200	200	200	200	200	200	200
ECA Objective (mg/L)	150	150	150	150	150	150	150	150	150	150	150	150
Average (mg/L)	2	3	3	4	5	2	4	2	2	2	2	2

Acute Lethality

Four samples were collected in 2018 and tested for acute lethality to Rainbow Trout and Daphnia Magna. Results are displayed as % mortality. An adverse result is indicated by a > 50% mortality rate.

Date	Rainbow Trout	Daphnia Magna
01-30-2018	0 %	0 %
04-10-2018	0 %	0 %
07-17-2018	0 %	0 %
10-02-2018	0 %	0 %

Operating Issues

The effluent objective for total phosphorus was slightly exceeded in September 2018. The alum dosage likely should have been adjusted to account for higher phosphorus in the influent. The phosphorus concentration in the raw sewage sample for September 2018 measured 5.09 mg/L which was higher than normal.

The maximum recorded flows during the months of January, February, March and April exceeded the average day design for the Morrisburg WWTP. Based on a historical review of flows, it appears this system is impacted by inflow and infiltration.

Maintenance

Flow Meter Calibration and Maintenance

Copies of the flow meter calibration certificates for 2018 are attached in Appendix B.

Maintenance Summary

Description
- replaced sprayer solenoid valves on screening unit - installed new pressure sensor in influent wet well - installed splash plates on SBR effluent valves - inspected and cleaned biofilter - removed and cleaned biofilter drain lines - replaced motor on polymer mixer - replaced fan motor on ozone oxidizing unit - replaced parshall flume flowmeter - installed mobile crane in UV room - installed new differential pressure rotameters on screening units - cleaned wet well

Notice of Modifications

Date	Process	Modification	Status
None to report.			

Sludge Generation

In 2018, a total of 975 m^3 of liquid sludge was utilized as soil conditioner. The sludge was removed from the WWTP by Terrapure Environmental in November (NASM Plan #22900). It is anticipated that approximately the same volume of sludge will be generated in 2019.

Summary of Complaints

Location	Date	Nature of Complaint	Actions Taken
No complaints were received during the reporting period.			

Summary of Abnormal Discharge Events

Bypass/Overflow

No bypasses or overflows occurred during the reporting period.

Spills

No spills occurred during the reporting period.

Appendix A

Performance Assessment Reports

MORRISBURG WWTP
PERFORMANCE ASSESSMENT REPORT

MUNICIPALITY: SOUTH DUNDAS
PROJECT: MORRISBURG WWTP
WORKS NUM.: 120000168
DESCRIPTION: TWO SEQUENTIAL BATCH REACTORS AND AEROBIC SLUDGE DIGESTION

YEAR: 2018
WATER COURSE: ST. LAWRENCE
DESIGN CAPACITY: 4,608 m^3/d

MONTH	RAW			RAW				SEPTAGE	GROUNDWATER	SLUDGE
	Total Flow m^3	Avg Day Flow m^3	Max Day Flow m^3/d	Raw BOD (mg/L)	Raw TSS (mg/L)	Raw PHOS. (mg/L)	Raw TKN (mg/L)	Volume Received m^3	Volume Pumped to Storm Sewer m^3	Liquid Sludge Hauled m^3
JAN	82,051	2,647	11,171	98	116	3.78	23.2	0	2453	0
FEB	81,114	2,897	9,961	26	63	2.19	19.0	0	2308	0
MAR	86,984	2,806	6,525	32	102	1.85	11.3	0	2392	0
APR	123,664	4,122	8,911	39	48	1.25	8.3	0	3209	0
MAY	75,062	2,421	3,557	41	60	1.43	12.3	0	2048	0
JUN	50,604	1,687	3,790	52	150	2.17	17.4	0	1635	0
JUL	35,006	1,129	2,071	109	112	3.10	24.3	0	1782	0
AUG	34,107	1,100	1,235	158	130	4.09	30.4	0	1711	0
SEPT	33,214	1,107	1,506	128	150	5.09	39.7	0	1610	0
OCT	39,411	1,271	2,092	99	90	4.17	34.8	0	1709	0
NOV	59,493	1,983	4,396	64	140	3.47	28.5	0	2285	975
DEC	69,773	2,251	4,181	221	560	5.49	30.1	0	2542	0
TOTAL	770,483							0		975
AVG		2,118		89	143	3.17	23.3		25,684	
MAX			11,171							
CRITERIA		**4,608**	**18,500**					**8.0**		
COMPLIANCE		**YES**	**YES**							

2018 - MORRISBURG WWTP EFFLUENT SAMPLING MONTHLY AVERAGES

MONTH	DATE	CBOD (mg/L)		TSS (mg/L)		TP (mg/L)		TAN (mg/L)		E. Coli (CFU/100ml)	
January	01/04/2018	<	3		3		0.12	<	0.01	<	2
	01/11/2018	<	3	<	3		0.12		0.18	<	2
	01/18/2018	<	3		5		0.12		0.07	<	2
	01/25/2018	<	3	<	3		0.20		0.08	<	2
	Monthly Average		3.0		3.5		0.14		0.09		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
February	02/01/2018	<	3	<	3		0.25		0.06	<	2
	02/08/2018		8		9		0.21		0.04	<	2
	02/15/2018		6	<	3		0.22		0.14	<	2
	02/22/2018	<	3		17		0.28		0.06		8
	Monthly Average		5.0		8.0		0.24		0.08		3
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
March	03/01/2018	<	3		16		0.32		0.03	<	2
	03/08/2018		21		6		0.36		0.05	<	2
	03/15/2018	<	3		5		0.19		0.03	<	2
	03/22/2018	<	3		3		0.18		0.05		8
	03/28/2018	<	3	<	3		0.19		0.02		2
	Monthly Average		6.6		6.6		0.25		0.04		3
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
April	04/05/2018	<	3	<	3		0.13		0.03		6
	04/12/2018	<	3		6		0.20		0.09		4
	04/19/2018	<	3		6		0.18		0.06		2
	04/26/2018	<	3		3		0.27		0.02		6
	Monthly Average		3		4.5		0.20		0.05		4
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
May	05/03/2018	<	3	<	3		0.19		0.05	<	2
	05/10/2018	<	3	<	3		0.38		0.07		2
	05/17/2018	<	3	<	3		0.37		0.09		6
	05/24/2018	<	3	<	3		0.33		0.10		30
	05/31/2018	<	3		4		0.53		0.03		4
	Monthly Average		3.0		3.2		0.36		0.07		5
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
June	06/07/2018	<	3	<	3		0.43		0.10	<	2
	06/14/2018	<	3	<	3		0.39		0.08	<	2
	06/21/2018	<	3	<	3		0.47		0.07	<	2
	06/28/2018	<	3	<	3		0.4		0.08	<	2
	Monthly Average		3.0		3.0		0.42		0.08		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
July	07/05/2018	<	3	<	3		0.38		0.03	<	2
	07/12/2018	<	3		4		0.39		0.07	<	2
	07/19/2018	<	3		3		0.36		0.04	<	2
	07/26/2018	<	3	<	3		0.27		0.07		46
	Monthly Average		3.0		3.25		0.35		0.05		4
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
August	08/02/2018	<	3	<	3		0.3		0.19	<	2
	08/09/2018	<	3	<	3		0.41		0.15	<	2
	08/16/2018	<	3		3		0.45		0.12	<	2
	08/23/2018	<	3	<	3		0.45		0.04	<	2
	08/30/2018	<	3	<	3		0.49		0.04		4
	Monthly Average		3.0		3		0.42		0.11		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
September	9/6/2018	<	3	<	3		0.34		0.04	<	2
	9/13/2018	<	3	<	3		0.48		0.10	<	2
	9/20/2018	<	3		3		0.69		0.08		*
	9/27/2018	<	3	<	3		0.65		0.02	<	2
	Monthly Average		3.0		3.0		0.54		0.06		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
October	10/04/2018	<	3	<	3		0.52		0.05	<	2
	10/11/2018	<	3	<	3		0.43		0.04	<	2
	10/18/2018	<	2		4		0.47		0.05	<	2
	10/25/2018		4	<	3		0.34		0.08	<	2
	Monthly Average		3.0		3.3		0.44		0.06		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
November	11/01/2018	<	3	<	3		0.32		0.07	<	2
	11/08/2018		3	<	3		0.35		0.22	<	2
	11/15/2018		4		4		0.37		0.04		2
	11/22/2018	<	3	<	3		0.45		0.05	<	2
	11/29/2018	<	3	<	3		0.21		0.03		2
	Monthly Average		3.2		3.2		0.34		0.08		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**
December	12/06/2018	<	3	<	3		0.22		0.06		2
	12/13/2018	<	3		3		0.30		0.09		4
	12/20/2018	<	3	<	3		0.33		0.10	<	2
	12/27/2018	<	3	<	3		0.27		0.06	<	2
	Monthly Average		3.0		3.0		0.28		0.08		2
	Compliant?		**YES**		**YES**		**YES**		**N/A**		**YES**

2018 - MORRISBURG WWTP LOADING CALCULATIONS

MONTH	Total Effluent Flow (m^3)		BOD	TSS	TP	TAN
January	82,051	Monthly Average (mg/L)	3.0	3.5	0.14	0.085
		Loading (kg/d)	7.94	9.26	0.37	0.22
		Compliant?	YES	YES	YES	N/A
February	81,114	Monthly Average (mg/L)	5.0	8	0.24	0.08
		Loading (kg/d)	13.08	20.93	0.63	0.20
		Compliant?	YES	YES	YES	N/A
March	86,984	Monthly Average (mg/L)	6.6	6.6	0.25	0.04
		Loading (kg/d)	18.52	18.52	0.70	0.10
		Compliant?	YES	YES	YES	N/A
April	123,664	Monthly Average (mg/L)	3.0	4.5	0.20	0.05
		Loading (kg/d)	11.97	17.95	0.78	0.20
		Compliant?	YES	YES	YES	N/A
May	75,062	Monthly Average (mg/L)	3.0	3.2	0.36	0.07
		Loading (kg/d)	7.26	7.75	0.87	0.16
		Compliant?	YES	YES	YES	N/A
June	50,604	Monthly Average (mg/L)	3.0	3.0	0.42	0.08
		Loading (kg/d)	4.90	4.90	0.69	0.13
		Compliant?	YES	YES	YES	N/A
July	35,006	Monthly Average (mg/L)	3.0	3.3	0.35	0.05
		Loading (kg/d)	3.39	3.67	0.40	0.06
		Compliant?	YES	YES	YES	N/A
August	34,107	Monthly Average (mg/L)	3.0	3.0	0.42	0.11
		Loading (kg/d)	3.30	3.30	0.46	0.12
		Compliant?	YES	YES	YES	N/A
September	33,214	Monthly Average (mg/L)	3.0	3.0	0.54	0.06
		Loading (kg/d)	3.21	3.21	0.58	0.06
		Compliant?	YES	YES	YES	N/A
October	39,411	Monthly Average (mg/L)	3.0	3.3	0.44	0.06
		Loading (kg/d)	3.81	4.13	0.56	0.07
		Compliant?	YES	YES	YES	N/A
November	59,493	Monthly Average (mg/L)	3.2	3.2	0.34	0.08
		Loading (kg/d)	6.14	6.14	0.65	0.16
		Compliant?	YES	YES	YES	N/A
December	69,773	Monthly Average (mg/L)	3.0	3.0	0.28	0.08
		Loading (kg/d)	6.75	6.75	0.63	0.17
		Compliant?	YES	YES	YES	N/A

2018 - MORRISBURG WWTP EFFLUENT UN-IONIZED AMMONIA

Sample Date	Sample Temperature ° C	Sample Temp. Kelvin	Dissociation Constant pK_a	Effluent Sample pH on-site	Fraction of Un-ionized Ammonia	Total Ammonia (mg/L) (NH3 + NH4 as N)		Un-ionized Ammonia (mg/L)
01/04/2018	10.9	284.05	9.70	7.6	0.0086	<	0.01	0.0001
01/11/2018	10.9	284.05	9.70	7.9	0.0142		0.18	0.0026
01/18/2018	11.7	284.85	9.67	7.9	0.0166		0.07	0.0012
01/25/2018	11.4	284.55	9.68	7.7	0.0110		0.08	0.0009
02/01/2018	12.7	285.85	9.64	7.9	0.0195		0.06	0.0012
02/08/2018	12.2	285.35	9.66	8.0	0.0197		0.04	0.0008
02/15/2018	12.2	285.35	9.66	8.0	0.0211		0.14	0.0029
02/22/2018	9.6	282.75	9.75	8.1	0.0221		0.06	0.0013
03/01/2018	9.6	282.75	9.75	8.1	0.0237		0.03	0.0007
03/08/2018	12.3	285.45	9.65	8.0	0.0198		0.05	0.0010
03/15/2018	12.7	285.85	9.64	7.8	0.0156		0.03	0.0005
03/22/2018	11.2	284.35	9.69	7.5	0.0063		0.05	0.0003
03/28/2018	11.6	284.75	9.68	7.5	0.0072		0.02	0.0001
04/05/2018	11.4	284.55	9.68	7.9	0.0148		0.03	0.0004
04/12/2018	12.4	285.55	9.65	8.1	0.0274		0.09	0.0025
04/19/2018	11.6	284.75	9.68	7.7	0.0107		0.06	0.0006
04/26/2018	12.4	285.55	9.65	7.5	0.0066		0.02	0.0001
05/03/2018	12.3	285.45	9.65	8.0	0.0198		0.05	0.0010
05/10/2018	13.1	286.25	9.63	7.4	0.0055		0.07	0.0004
05/17/2018	13.9	287.05	9.60	7.4	0.0056		0.09	0.0005
05/24/2018	14.7	287.85	9.57	7.3	0.0058		0.1	0.0006
05/31/2018	16.0	289.15	9.53	7.4	0.0067		0.03	0.0002
06/07/2018	15.7	288.85	9.54	7.4	0.0072		0.1	0.0007
06/14/2018	16.9	290.05	9.50	7.4	0.0073		0.08	0.0006
06/21/2018	16.9	290.05	9.50	7.3	0.0062		0.07	0.0004
06/28/2018	17.6	290.75	9.48	7.4	0.0075		0.08	0.0006
07/05/2018	19.7	292.85	9.41	7.3	0.0070		0.03	0.0002
07/12/2018	19.8	292.95	9.41	7.3	0.0074		0.07	0.0005
07/19/2018	19.4	292.55	9.42	7.3	0.0067		0.04	0.0003
07/26/2018	20.2	293.35	9.40	7.3	0.0087		0.07	0.0006
08/02/2018	22.2	295.35	9.33	7.5	0.0145		0.19	0.0027
08/09/2018	20.7	293.85	9.38	7.4	0.0092		0.15	0.0014
08/16/2018	21.1	294.25	9.37	7.4	0.0112		0.12	0.0013
08/23/2018	20.7	293.85	9.38	7.4	0.0106		0.04	0.0004
08/30/2018	21.3	294.45	9.36	7.3	0.0092		0.04	0.0004
09/06/2018	22.1	295.25	9.34	7.2	0.0078		27.8	0.2159
09/13/2018	21.2	294.35	9.36	7.3	0.0094		0.1	0.0009
09/20/2018	21.5	294.65	9.36	7.3	0.0089		0.08	0.0007
09/27/2018	20.1	293.25	9.40	7.4	0.0106		0.02	0.0002
10/04/2018	19.8	292.95	9.41	7.4	0.0091		0.05	0.0005
10/11/2018	19.7	292.85	9.41	7.5	0.0118		0.04	0.0005
10/18/2018	19.8	292.95	9.41	7.5	0.0130		0.05	0.0007
10/25/2018	19.1	292.25	9.43	7.6	0.0156		0.08	0.0012
11/01/2018	18.1	291.25	9.46	7.5	0.0105		0.07	0.0007
11/08/2018	17.6	290.75	9.48	7.5	0.0106		0.22	0.0023
11/15/2018	16.7	289.85	9.51	7.5	0.0093		0.04	0.0004
11/22/2018	16.2	289.35	9.52	7.4	0.0078		0.05	0.0004
11/29/2018	14.9	288.05	9.57	7.6	0.0100		0.03	0.0003
12/06/2018	14.6	287.75	9.58	7.7	0.0122		0.06	0.0007
12/13/2018	14.7	287.85	9.57	7.5	0.0090		0.09	0.0008
12/20/2018	14.4	287.55	9.58	7.9	0.0203		0.10	0.0020
12/27/2018	12.2	285.35	9.66	8.0	0.0231		0.06	0.0014

f = 1/(10^(pK_a - pH) +1), where f is the decimal fraction of un-ionized ammonia (NH_3).

pK_a = 0.09018 + 2729.92/T, where pK_a is the dissociation constant of ammonia at a given temperature.

T = (K = degrees C + 273.16), where T is the ambient water temperature in Kelvin.

2018 - MORRISBURG WWTP AEROBIC BIOSOLIDS RESULTS

SLUDGE RESULTS		04-Jan-18	01-Feb-18	01-Mar-18	05-Apr-18	03-May-18	07-Jun-18	05-Jul-18	02-Aug-19	09-Aug-18	06-Sep-18	04-Oct-18	01-Nov-18	06-Dec-18
Ammonia	mg/L	710	1590	1830	1430	2340	620	1700	1760	1460	1860	1870	1280	1200
Nitrate	mg/L	0.5	0.8	1	0.5	6.1	5	1.1	3	6	1.1	11.5	0.1	11.1
Ammonia + Nitrate	mg/L	711	1591	1831	1431	2346	625	1701	1763	1466	1861	1882	1280	1211
Total Phosphorus	mg/L	1130	1600	1740	1340	1480	1100	1240	1530	1410	1840	2060	1470	1580
Total Solids	mg/L	29300	30600	34000	37400	35300	26000	33200	31400	33500	33000	41000	41100	55700
Aluminum	mg/L	1640	1380	1220	1180	1260	1390	1110	1190	1560	1400	1690	1380	1240
Arsenic	mg/L	0.40	0.30	0.20	0.20	0.20	0.2	0.17	0.2	0.22	0.2	0.20	0.20	0.10
Cadmium	mg/L	0.040	0.030	0.030	0.030	0.030	0.03	0.03	0.030	0.040	0.04	0.040	0.040	0.030
Chromium	mg/L	1.81	1.51	1.35	1.37	1.62	0.88	1.14	1.13	1.48	1.22	1.30	1.21	1.08
Cobalt	mg/L	0.31	0.26	0.240	0.28	0.34	0.17	0.23	0.23	0.3	0.22	0.26	0.28	0.32
Copper	mg/L	64.0	49.7	37.0	39.5	39.9	28.9	37.7	52.0	63.5	55.0	66.5	65.5	58.5
Lead	mg/L	1.40	1.00	0.90	1.00	1.10	0.80	0.90	0.90	1.10	1.10	1.10	1.10	0.90
Mercury	mg/L	0.05	0.03	0.04	0.04	0.05	0.04	0.05	0.04	0.06	0.04	0.04	0.08	0.12
Molybdenum	mg/L	0.37	0.31	0.28	0.29	0.35	0.25	0.33	0.38	0.51	0.41	0.46	0.38	0.36
Nickel	mg/L	2.63	2.78	2.31	3.01	3.20	0.88	2.87	2.57	5.45	4.86	3.60	2.66	2.42
Selenium	mg/L	0.20	0.20	0.10	0.10	0.20	0.1	0.2	0.2	0.2	0.2	0.20	0.20	0.20
Zinc	mg/L	24.1	19.70	16.30	17.60	19.70	16.8	15.8	17.4	23.3	20.2	22.9	22.10	21.60

Appendix B

Flow Meter Calibration Reports

CapitalControls
Electrical/Control Panels – PLC/SCADA Programming – Instrumentation Calibrations

830 Industrial Ave. Ottawa, ON K1G-4B8 Ph. 613 248-1999 Fax: 613 248-1997

Instrument Calibrations
&
Verifications

3 Morrisburg W.P.C.P

Site Reports July, 2018

CapitalControls
Electrical/Control Panels – PLC/SCADA Programming – Instrumentation Calibrations

830 Industrial Ave. Ottawa, ON K1G-4B8 Ph. 613 248-1999 Fax: 613 248-1997

3.1 FIT-370 East Influent Channel Flow:

FIELD EQUIPMENT VERIFICATION / CALIBRATION REPORT

DATE: **July 24 / 2018**

DESCRIPTION : **Raw Sewage Influent.**	MODEL: **OCF 4.0-A1A1M2C**	TAG: ***FIT-370***
MANUFACTURER : **Greyline**	Serial # ***38588***	

Client Name: **Township of South Stormont**. Device Output Signal : **4.00 - 20.0 *mA***

INSTALLATION INSPECTION

	DESCRIPTION	FINDINGS				COMMENTS
		OK	FIXED	N/A	FAULTY	
	GENERAL					***Calibration by means of Simulating Channel Level***
1	TAGGING			X		**Grey Line *OCF 4.0 Configuration***
2						**Flume Type = Parshall Size = 12"**
	MECHANICAL					**Range = 547 LOE= 60 Sec.**
3	MOUNTING: check for proper fastening, etc.	X				**Mode = Flow Damping = 10%**
4	ORIENTATION: check for proper angle, etc.)	X				**Max. Range = 1.080 m Min. Range = 0.298 m**
5	POSITION: relative position to other components (ie. for proper flow, blanking distance), etc.	X				**Units = m Volume = m3 Time =Day Echo = 69% to 86%**
6						**Range = 42,043 m3/day**
	ELECTRICAL					**Relay 1 = Off Relay 2 = Off Relay 2 = Off**
7		X				
8	WIRE TAGGING: (exists and proper wire type)	X				**Actual process = 853 m^3/d @ 4.31 *mA***
9	QUALITY OF CONNECTIONS:	X				**$Head_{(Max)}$ = Max. Range - Min. Range**
10	GROUNDING:	X				**$Head_{(Max)}$ = (1.085m - 0.298m) =.787.m**
11	SHIELDING: (check if grounded only at PLC end of wire)	X				**Q (Max = 42,043 m3/day**
12	CERTIFICATION CSA, ULC:	X				
13						

SET-UP/CALIBRATION

	DIGITAL		ADJUSTMENT USING	VERIFIED USING	SETPOINT / RANGE
14	SETPOINT ADJUSTMENT	MECHANICAL TYPE		Level Target	
		ELECTRONIC TYPE		**Fluke 725 calibrator S/N 8759025**	**0 – 42043m^3/d**

Configuration Parameters:

Calibration Data Test **Tolerance: 15.00%**

		Input Variable	*Transmitter Var.*	*Cal. Value*	*% Error*	*Notes*
	(Calibration Jig set to 0.219 m)	**0.219 m**	**5876 m3/d**	**5798 m3/d**	**0.18%**	**Passed**
	(Calibration Jig set to 0.124 m)	**0.124m**	**2491 m3/d**	**2397 m3/d**	**0.21 %**	**Passed**
	(Calibration Jig set to 0.00 m)	**0.00 m**	**0 m3/d**	**0 m3/d**	**0.00 %**	**Passed**

Error (% Full Scale) = ((Transmitter Value - Calculated Value) / Full Scale) * 100

= ((5876-5798 / 42043)*100
= 0.18 % of full scale

Checked By: *Tim Stewart*

Cell: 613 325 9213
Email: tim.stewart@capitalcontrols.ca

CapitalControls
Electrical/Control Panels – PLC/SCADA Programming – Instrumentation Calibrations

830 Industrial Ave. Ottawa, ON K1G-4B8 Ph. 613 248-1999 Fax: 613 248-1997

3.2 FIT-380 West Influent Channel Flow:

FIELD EQUIPMENT VERIFICATION / CALIBRATION REPORT

DATE: **July 17 / 2018**

DESCRIPTION : **Raw Sewage Influent.**	MODEL: **OCF 4.0-A1A1M2B**	TAG: ***FIT-380***
MANUFACTURER : **Greyline**	Serial # ***38587***	

Client Name: **Township of South Stormont**. Device Output Signal : **4.00 - 20.0 *mA***

INSTALLATION INSPECTION

	DESCRIPTION	FINDINGS OK	FIXED	N/A	FAULTY	COMMENTS
	GENERAL					***Calibration by means of Simulating Channel Level***
1	TAGGING			X		**Grey Line *OCF 4.0 Configuration***
2						**Flume Type = Parshall Size = 12"**
	MECHANICAL					**Range = LOE= 60 Sec.**
3	MOUNTING: check for proper fastening, etc.	X				**Mode = Flow Damping = 10%**
4	ORIENTATION: check for proper angle, etc.)	X				**Max. Range = 1.09 m Min. Range = 0.282 m**
5	POSITION: relative position to other components (ie. for proper flow, blanking distance), etc.	X				**Units = m Volume = m3 Time =Day Echo quality = Good**
6						**Range = 43794 m3/day**
	ELECTRICAL					**Relay 1 = Off Relay 2 = Off Relay 2 = Off**
7		X				
8	WIRE TAGGING: (exists and proper wire type)	X				**Actual process = 1105 m^3/d @ 4.46 *mA***
9	QUALITY OF CONNECTIONS:	X				**$Head_{(Max)}$ = Max. Range - Min. Range**
10	GROUNDING:	X				**$Head_{(Max)}$ = (1.10m - 0.292m) = 0.808 m**
11	SHIELDING: (check if grounded only at PLC end of wire)	X				**Q $_{(Max}$ = 43,794 m3/day**
12	CERTIFICATION CSA, ULC:	X				

SET-UP/CALIBRATION

	DIGITAL		ADJUSTMENT USING	VERIFIED USING	SETPOINT / RANGE
14	SETPOINT ADJUSTMENT	MECHANICAL TYPE		Level Target	
		ELECTRONIC TYPE		**Fluke 725 calibrator S/N 8759025**	**0 – 43794 m^3/d**

Configuration Parameters:

Calibration Data Test **Tolerance: 15.00%**

	Input Variable	Transmitter Value.	Cal. Value	% Error	Notes
(Calibration Jig set to 0.071 m)	**0.071 m**	**1074 m3/d**	**1012 m3/d**	**0.14%**	**Passed**
(Calibration Jig set to 0.132 m)	**0.132m**	**2778 m3/d**	**2640 m3/d**	**0.33 %**	**Passed**
(Calibration Jig set to 0.00 m)	**0.00 m**	**0 m3/d**	**0 m3/d**	**0.00 %**	**Passed**

Error (% Full Scale) = ((Transmitter Value - Calculated Value) / Full Scale) * 100

= ((1074-1012 / 43794)*100
= 0.14 % of full scale

Checked By: *Tim Stewart*
Cell: 613 325 9213
Email: tim.stewart@capitalcontrols.ca

830 Industrial Ave. Ottawa, ON K1G-4B8 Ph. 613 248-1999 Fax: 613 248-1997

4.1 FIT-37201 Treated Water Flow:

DTM Version: 3.29.00 Page 1/3

Flowmeter Verification Certificate Transmitter

Customer	Plant
	FIT37201
Order code	Tag Name
PROMAG 53 W DN200	1.0514 - 1.0514
Device type	K-Factor
83035716000	0
Serial number	Zero point
V2.00.00	V1.04.00
Software Version Transmitter	Software Version I/O-Module
07/19/2018	08:24 AM
Verification date	Verification time

Verification result Transmitter: Passed

Test item	Result	Applied Limits
Amplifier	Passed	Basis: 0.55 %
Current Output 1	Passed	0.05 mA
Pulse Output 1	Not tested	0 P
Test Sensor	Passed	

FieldCheck Details	**Simubox Details**
240223	8784351
Production number	Production number
1.07.08	1.00.01
Software Version	Software Version
06/2018	06/2018
Last Calibration Date	Last Calibration Date

Date Operator's Sign Inspector's Sign

Overall results:

The achieved test results show that the instrumment is completely functional, and the measuring results lie within +/- 1% of the original calibration. [1)]

The calibration of the Fieldcheck test system is fully traceable to national standards.

1) Prerequisite is an additional proof of electrode integrity with a high voltage test.

Endress+Hauser

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FieldCheck - Result Tab Transmitter

Customer		Plant	
Order code		Tag Name	FIT37201
Device type	PROMAG 53 W DN200	K-Factor	1.0514 - 1.0514
Serial number	83035716000	Zero point	0
Software Version Transmitter	V2.00.00	Software Version I/O-Module	V1.04.00
Verification date	07/19/2018	Verification time	08:24 AM

Verification Flow end value (100 %): 125.664 l/s
Flow speed 4.00 m/s

Passed / Failed	Test item	Simul. Signal	Limit Value	Deviation
	Test Transmitter			
✓	Amplifier	6.283 l/s (5%)	1.50 %	-0.40 %
✓		12.566 l/s (10.0%)	1.00 %	0.04 %
✓		62.832 l/s (50.0%)	0.60 %	-0.06 %
✓		125.664 l/s (100%)	0.55 %	-0.05 %
✓	Current Output 1	4.000 mA (0%)	0.05 mA	-0.007 mA
✓		4.800 mA (5%)	0.05 mA	-0.005 mA
✓		5.600 mA (10.0%)	0.05 mA	-0.018 mA
✓		12.000 mA (50.0%)	0.05 mA	0.004 mA
✓		20.000 mA (100%)	0.05 mA	0.028 mA
–	Pulse Output 1	—	—	—
		Start value	**Limits range**	**Measured value**
	Test Sensor			
✓	Coil Curr. Rise	13.300 ms	0.000..27.625 ms	17.517 ms
✓	Coil Curr. Stability		—	—
✓	Electrode Integrity	mV	0.0..300.000 mV	3.289 mV

Legend of symbols

✓	✗	–	?	!
Passed	Failed	not tested	not testable	Attention

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FieldCheck: Parameters Transmitter

Customer		Plant	
Order code		Tag Name	FIT37201
Device type	PROMAG 53 W DN200	K-Factor	1.0514 - 1.0514
Serial number	83035716000	Zero point	0
Software Version Transmitter	V2.00.00	Software Version I/O-Module	V1.04.00
Verification date	07/19/2018	Verification time	08:24 AM

Curent Output	Assign	Current Range	Value 0 4mA	Value 20 mA		
Terminal 26/27	VOLUME FLOW	4-20 mA activ	0.0 l/s	300.00 l/s		
Pulse Output	**Assign**	**Pulse Value**	**Output signal**	**Pulse width**		
Terminal 24/25	VOLUME FLOW	37.854 l/P	Passive/Positive	100.00 ms		

Actual System Ident. 117.0

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4.2 FIT-37202 Bulk Loading:

DTM Version: 3.29.00 Page 1/3

Flowmeter Verification Certificate Transmitter

Customer	Plant
	FIT37202
Order code	Tag Name
PROMAG 53 W DN100	1.1633 - 1.1633
Device type	K-Factor
83035816000	0
Serial number	Zero point
V2.00.00	V1.04.00
Software Version Transmitter	Software Version I/O-Module
07/19/2018	08:07 AM
Verification date	Verification time

Verification result Transmitter: Passed

Test item	Result	Applied Limits
Amplifier	Passed	Basis: 0.55 %
Current Output 1	Passed	0.05 mA
Pulse Output 1	Not tested	0 P
Test Sensor	Passed	

FieldCheck Details	**Simubox Details**
240223	8784351
Production number	Production number
1.07.08	1.00.01
Software Version	Software Version
06/2018	06/2018
Last Calibration Date	Last Calibration Date

Date Operator's Sign Inspector's Sign

Overall results:

The achieved test results show that the instrumment is completely functional, and the measuring results lie within +/- 1% of the original calibration. [1)]

The calibration of the Fieldcheck test system is fully traceable to national standards.

1) Prerequisite is an additional proof of electrode integrity with a high voltage test.

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FieldCheck - Result Tab Transmitter

Customer		Plant	
Order code		Tag Name	FIT37202
Device type	PROMAG 53 W DN100	K-Factor	1.1633 - 1.1633
Serial number	83035816000	Zero point	0
Software Version Transmitter	V2.00.00	Software Version I/O-Module	V1.04.00
Verification date	07/19/2018	Verification time	08:07 AM

Verification Flow end value (100 %): 31.416 l/s
Flow speed 4.00 m/s

Passed / Failed	Test item	Simul. Signal	Limit Value	Deviation
	Test Transmitter			
✓	Amplifier	1.571 l/s (5%)	1.50 %	-0.44 %
✓		3.142 l/s (10.0%)	1.00 %	-0.37 %
✓		15.708 l/s (50.0%)	0.60 %	-0.02 %
✓		31.416 l/s (100%)	0.55 %	0.03 %
✓	Current Output 1	4.000 mA (0%)	0.05 mA	-0.010 mA
✓		4.800 mA (5%)	0.05 mA	-0.009 mA
✓		5.600 mA (10.0%)	0.05 mA	-0.022 mA
✓		12.000 mA (50.0%)	0.05 mA	0.003 mA
✓		20.000 mA (100%)	0.05 mA	0.030 mA
–	Pulse Output 1	—	—	—
		Start value	**Limits range**	**Measured value**
	Test Sensor			
✓	Coil Curr. Rise	5.000 ms	0.000..14.250 ms	6.532 ms
✓	Coil Curr. Stability		—	—
✓	Electrode Integrity	mV	0.0..300.000 mV	3.281 mV

Legend of symbols

✓	✗	–	?	!
Passed	Failed	not tested	not testable	Attention

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FieldCheck: Parameters Transmitter

Customer		Plant	
Order code		Tag Name	FIT37202
Device type	PROMAG 53 W DN100	K-Factor	1.1633 - 1.1633
Serial number	83035816000	Zero point	0
Software Version Transmitter	V2.00.00	Software Version I/O-Module	V1.04.00
Verification date	07/19/2018	Verification time	08:07 AM

Curent Output	Assign	Current Range	Value 0 4mA	Value 20 mA		
Terminal 26/27	VOLUME FLOW	4-20 mA activ	0.0 l/s	30.00 l/s		
Pulse Output	**Assign**	**Pulse Value**	**Output signal**	**Pulse width**		
Terminal 24/25	VOLUME FLOW	7.571 l/P	Passive/Positive	100.00 ms		

Actual System Ident. 115.0