

AQUA TREATMENT TECHNOLOGIES INC.

Treatment of Waterloo Biofilter System © effluent Six Nations Bingo Hall, Oshweken, Ontario, Canada

Wastewater type: Design flow: Pre-treatment: Discharge: Sanitary 50,000 L/day Waterloo Biofilter System © Surface water

In the fall of 2008 Aqua Treatment Technologies Inc. was retained by R.J. Burnside & Associates Limited to design and install the 'AQUA Wetland System' (AWS) to provide tertiary treatment of water discharged from an existing Waterloo Bioliter System © treating sanitary sewage from a Bingo Hall. Enhanced treatment of Waterloo Bioliter System © discharge water was required by Health Canada officials because treated water is being discharged to a ditch that drains into the Grand River.

Project description

The AWS is designed to treat 50,000 L/day of Waterloo Bioliter System © effluent. The AWS consists of three cells that are operated in series. Each cell measures 13.6 m L X 13.6 m W and 1.2 m in depth. Sanitary sewage receives septic tank pre-treatment treatment via the Waterloo Bioliter System © and final treatment within the AQUA Wetland System. Treated water from the AWS overflows into a ditch and subsequently into the Grand River. No external sterilization eg. UV is used.

Performance

The combined treatment system performance was assessed by means of a 13 month sampling program conducted by staff from R.J. Burnside & Associates Limited. Monthly water samples were collected from the discharge of the Waterloo Biofilter System © (i.e. AQUA Wetland System influent) and the discharge from the AQUA Wetland System. The performance data presented in tables 1 & 2 show that the after a brief maturation period the AQUA Wetland System can provide significant treatment to Waterloo Biofilter System © effluent. AQUA Wetland System effleunt CBOD, BOD, TSS and ammonia were often below detect.

Table 1	CBOD	BOD	pH	TSS	TP	TKN	NH3+ NH4	Nitrate	E.Coli
20-Mar-09									
21-Apr-09	52	14	7.02	26	8.17	121	140	0.05	380,000
22-May-09	31	32	8.16	21	8.48	117	110	0.05	76,000
18-Jun-09	30	46	8.03	14	8.92	108	109	0.05	34,000
22-Jul-09	14	15	7.95	13	9.96	89.7	81.7	2.78	71,000
28-Aug-09	6	6	7.42	13	8.09	24.3	20.1	14.5	620
16-Sep-09	8	10	7.9	12	10.2	36.8	37	26.7	980
21-Oct-09	22	15	7.38	63	9.86	43.9	46.3	31.1	2,500
19-Nov-09	7	8	7.57	12	11.3	57.7	46.6	50.7	11,000
18-Dec-09	12	13	7.39	11	13.7	44.6	36.6	51.6	48,000
22-Jan-10	16	14	7.4	18	11.5	56.1	45.7	37.1	30,000
25-Feb-10	25	15	7.79	8	11.4	51.6	44.1	36.2	22,000
16-Mar-10	9	10	7.37	8	8.52	26.4	28.2	28.6	13,000
22-Apr-10	15	23		10	12.5	45.6	43	30.6	48,000
Average	17.64	15.79	6.53	16.36	9.47	58.76	56.31	22.15	52.650
Table 2	CBOD	BOD	pН	TSS	TP	TKN	NH3+ NH4	Nitrate	E.Coli
Table 2 20-Mar-09	CBOD 2	BOD 2	pH 7.9	TSS 2	TP 0.03	TKN	NH3+ NH4 13.2	Nitrate 0.26	E.Coli 2
Table 2 20-Mar-09 21-Apr-09	CBOD 2 4	BOD 2 4	pH 7.9 7.28	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	TP 0.03 0.03	TKN 46.7	NH3+ NH4 13.2 46.1	Nitrate 0.26 0.45	E.Coli 2 32
Table 2 20-Mar-09 21-Apr-09 22-May-09	CBOD 2 4 2	BOD 2 4 6	pH 7.9 7.28 7.68	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 <th2< th=""> 2 <th2< th=""> <th2< th=""></th2<></th2<></th2<>	TP 0.03 0.03 0.03	TKN 46.7 27.2	NH3+ NH4 13.2 46.1 24.6	Nitrate 0.26 0.45 89.1	E.Coli 2 32 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09	CBOD 2 4 2 4 2 4	BOD 2 4 6 2	pH 7.9 7.28 7.68 7.6	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 <th2< th=""> 2 <th2< th=""> <th2< th=""></th2<></th2<></th2<>	TP 0.03 0.03 0.03 0.05	TKN 46.7 27.2 1	NH3+ NH4 13.2 46.1 24.6 1	Nitrate 0.26 0.45 89.1 111	E.Coli 2 32 2 4
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09	CBOD 2 4 2 4 2 4 2	BOD 2 4 6 2 4	pH 7.9 7.28 7.68 7.6 7.86	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 <th2< th=""> 2 <th2< th=""> <th2< th=""></th2<></th2<></th2<>	TP 0.03 0.03 0.03 0.05 0.03	TKN 46.7 27.2 1 2.1	NH3+ NH4 13.2 46.1 24.6 1 0.1	Nitrate 0.26 0.45 89.1 111 83.2	E.Coli 2 32 2 4 6
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09	CBOD 2 4 2 4 2 2 2	BOD 2 4 6 2 4 2 2	pH 7.9 7.28 7.68 7.6 7.86 7.83	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.03 0.03 0.05 0.03	TKN 46.7 27.2 1 2.1 1.9	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2	E.Coli 2 32 2 4 6 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09	CBOD 2 4 2 4 2 2 2 4	BOD 2 4 6 2 4 2 4 2 4	pH 7.9 7.28 7.68 7.6 7.86 7.83 7.83	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.05	TKN 46.7 27.2 1 2.1 1.9 0.5	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6	E.Coli 2 32 2 4 6 2 2 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09	CBOD 2 4 2 4 2 2 2 4 2 2 4 2	BOD 2 4 6 2 4 2 4 2 4 2	pH 7.9 7.28 7.68 7.6 7.86 7.83 7.88 7.88	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 <th2< th=""> 2 <th2< th=""> <th2< th=""></th2<></th2<></th2<>	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1	E.Coli 2 32 2 4 6 2 2 2 2 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09	CBOD 2 4 2 4 2 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 4 2 2 4 4 2 4 4 2 4 4 2 4 4 2 4 4 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 2 2 4 4 4 2 2 4 4 4 4 4 4 4 4 4 4 4 4 4	BOD 2 4 6 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4	pH 7.9 7.28 7.68 7.6 7.86 7.83 7.88 7.88 7.88 7.93	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1	E.Coli 2 32 2 4 6 2 2 2 2 2 2 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09 18-Dec-09	CBOD 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 4	BOD 2 4 6 2 4 2 4 2 4 2 4 2 4 4 4	pH 7.9 7.28 7.68 7.6 7.86 7.83 7.88 7.88 7.88 7.93 7.91	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.54 1.23	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1 66.6	E.Coli 2 32 2 4 6 2 2 2 2 2 2 2 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09 18-Dec-09 22-Jan-10	CBOD 2 4 2 4 2 4 2 4 2 4 4 2 4 4 4 4 4	BOD 2 4 6 2 4 2 4 2 4 2 4 2 4 2 4 2 4 4 4 4	pH 7.9 7.28 7.68 7.66 7.86 7.83 7.88 7.88 7.93 7.91 7.62	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.54 1.23 1.86	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1 66.6 77.1	E.Coli 2 32 2 4 6 2 2 2 2 2 2 2 8
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09 18-Dec-09 22-Jan-10 25-Feb-10	CBOD 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 4 4 4 4 4	BOD 2 4 6 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 2	pH 7.9 7.28 7.68 7.66 7.86 7.83 7.88 7.88 7.93 7.91 7.62 7.85	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.54 1.23 1.86 2.61	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 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 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1 66.6 77.1 72.6	E.Coli 2 32 2 4 6 2 2 2 2 2 2 8 2 2
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09 18-Dec-09 22-Jan-10 25-Feb-10 16-Mar-10	CBOD 2 4 2 4 2 4 2 4 2 4 4 4 4 4 2	BOD 2 4 6 2 4 2 4 2 4 4 4 4 2 2 2	pH 7.9 7.28 7.68 7.66 7.86 7.83 7.88 7.88 7.88 7.93 7.91 7.62 7.85 7.72	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.54 1.23 1.86 2.61 3.73	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	NH3+ NH4 13.2 46.1 24.6 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 0.1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1 66.6 77.1 72.6 47.7	E.Coli 2 32 2 4 6 2 2 2 2 2 2 8 2 14
Table 2 20-Mar-09 21-Apr-09 22-May-09 18-Jun-09 22-Jul-09 28-Aug-09 16-Sep-09 21-Oct-09 19-Nov-09 18-Dec-09 22-Jan-10 25-Feb-10 16-Mar-10 22-Apr-10	CBOD 2 4 2 4 2 2 4 2 2 4 2 4 4 4 2 2 2 4 2 2 2 4 2 2 2	BOD 2 4 6 2 4 2 4 2 4 4 4 2 4 2 4 2 4 4 2 4 4 2 4 4 2 4 4 2 4 4 4 2 4 4 4 5 6 6 6 6 6 6 6 6 6 6 6 6 6	pH 7.9 7.28 7.68 7.6 7.86 7.83 7.88 7.88 7.88 7.93 7.91 7.62 7.85 7.72	TSS 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TP 0.03 0.03 0.03 0.05 0.03 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.05 0.54 1.23 1.86 2.61 3.73 3.49	TKN 46.7 27.2 1 2.1 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.7	NH3+ NH4 13.2 46.1 24.6 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 0.1 0.1 0.1 0.1 0.1 0.1	Nitrate 0.26 0.45 89.1 111 83.2 41.2 39.6 52.1 71.1 66.6 77.1 72.6 47.7 46.8	E.Coli 2 32 2 4 6 2 2 2 2 2 2 8 2 14 2 14 2

Table 1. Discharge from theWaterloo Biofilter System © &into the AQUA Wetland System.

Table 2. Discharge from the AQUA Wetland System into surface water. XX = below lab detection limits.

* data analysis first 3 months only Aqua Treatment Technologies Inc. 4250 Fly Road, Campden, ON pH: 905-327-4571 Fax: 905-563-9980 email: <u>lrozema@aqua-tt.com</u>