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Data Summary for Waterloo Biofilter® Model 4 Bedroom Under the EPA ETV Water Quality Protection Center

The following is a preliminary summary of the test results obtained for the Waterloo Biofilter® Model 4 Bedroom for nutrient reduction under the ETV Water Quality Protection Center. These results have been QA reviewed, but will not be considered final until all EPA reviews have been completed. The testing was completed at the Massachusetts Septic Systems Test Center during the period of March 2001 through April 2002. A full report for this testing will be completed soon and posted on the EPA (www.epa.gov/etv) and NSF (www.nsf.org/etv) web sites.

Table 1. BOD_5/$CBOD_5$ and TSS Data Summary

	BOD_5	$CBOD_5$		TSS		
	Influent (mg/L)	Effluent (mg/L)	Removal Percent	Influent (mg/L)	Effluent (mg/L)	Removal Percent
Samples	53	53	53	53	53	52
Average	210	10	95	150	7	95
Median	200	7.4	96	130	5	97
Max	370	43	99	340	55	>99
Min	67	1.0	71	61	<1	51
Std. Dev.	73	9.0	6.0	66	8	8

Table 2. Nitrogen Data Summary

	TKN (mg/L)		NH4 (mg/L)		Total Nitrogen (mg/L)		Nitrate (mg/L)	Nitrite (mg/L)	Temperature (C)
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Effluent	Effluent	Effluent
Samples	53	53	53	53	53	53	53	53	51
Average	37	3.7	23	2.4	37	14	10	0.19	15
Median	37	1.6	23	0.7	37	13	10	0.14	14
Maximum	45	31	29	24	45	45	33	0.84	24
Minimum	24	<0.5	18	<0.2	24	6.8	0.6	<0.05	5.2
Std. Dev.	4.2	5.5	2.4	4.0	4.2	6.0	5.0	0.20	5.9

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ETI Independent Testing

Buzzard's Bay Test Facility, MA

24-Month Waterloo Biofilter Testing with 50% Recirculation in Triplicate for the Period of June 1999-June 2001

Results

- The Waterloo Biofilter can be loaded at very high rates
- Tertiary quality effluent
- ~60% total nitrogen removal
- Fecal coliforms are reduced by 99% in the Waterloo Biofilter and 99.99% with an additional foot of coarse sand or >99.999% with 10" of fine sand
- 10" of soil or fine sand after the Biofilter is equivalent to an under-drained 60" thick Title 5 sand filter system, but with much better nitrogen removal
- Very low power consumption; less than a re-circulating sand filter and 1/3 of a standard ATU producing secondary effluent (www.buzzardsbay.org/etiresults.htm)

Biofilter organic results including start-up period (124-133 samples)

	$_{c+n}BOD_5$ mg/L	TSS mg/L	Fecals cfu/100 mL	NH_4-N mg/L	TN mg/L
Influent Median	162	161	3100K	24.2	34.6
Effluent Median	9	6	32K	0.5	13.9
% Removal	**94.4**	**96.3**	**99.0**	**97.9**	**59.8**

Fecal coliform results for 12" and 10" lysimeter testing (25-31 samples)

	Lysimeter A1 May '00 — Jul '01 cfu/100 mL	Lysimeter A2 June '00 — July '01 cfu/100 mL	Lysimeter A3 June '00 — July '01 cfu/100 mL
Influent Sewage	3 700 000	3 800 000	3 700 000
Effluent After Waterloo + 12" of T = 0.8 min/cm Sand	400	295	100
% Removal	**99.989**	**99.992**	**99.997**
Effluent After Waterloo + 10" of T = 5 min/cm Sand	-	-	<1
% Removal	**-**	**-**	**>99.999**

21-Month Single-Pass Waterloo Biofilter Testing (No Recirculation)

Results

- A single pass through the Waterloo Biofilter is very effective at removing dissolved organics and solids
- ~40% total nitrogen removal
- Very low power consumption; about half that of a re-circulating sand filter and 1/6 of a standard ATU producing secondary effluent

Biofilter single pass organic results from September 2001 - June 2002

	# of Samples	cBOD mg/L	TSS mg/L	DO mg/L	TN mg/L
Influent Median	37	214	130	0	37
Effluent Median	19	6.4	3.0	5.6	23.1
% Removal	**-**	**97.0**	**97.7**	**-**	**42.4**

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