Lombardo Associates, Inc.

Representative Nitrogen Removal Project Descriptions

Test Centers & Independent Evaluations

- Massachusetts Alternative Septic System Test Center (MASSTC)
- Polson, MT – State of Montana Study
- La Pine, OR – State of Oregon Study
- Suffolk County New York

Environmental Engineers/ Consultants

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Independent Testing at MASSTC

NITREX™ COMES OUT ON TOP AT MASSTC TESTING FOR NITROGEN REMOVAL

Project Description

The Nitrex™ system is one of a number of alternative septic systems technologies being assessed at the Massachusetts Septic System Test Center.

Project Application Data

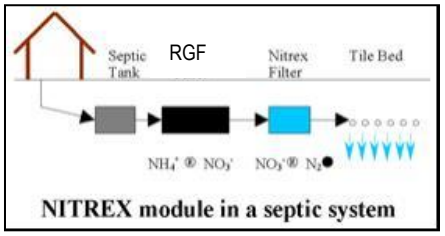
- Location: Otis Air Force Base, Massachusetts
- Site Application: Massachusetts Alternative Septic System Test Center
- Installation Date: October 4, 2001

Design Profile

- Design Wastewater Flow: 330 gpd
- Wastewater Treatment Process: Septic Tank – Recirculating Gravel Filter (RGF) – Nitrex™

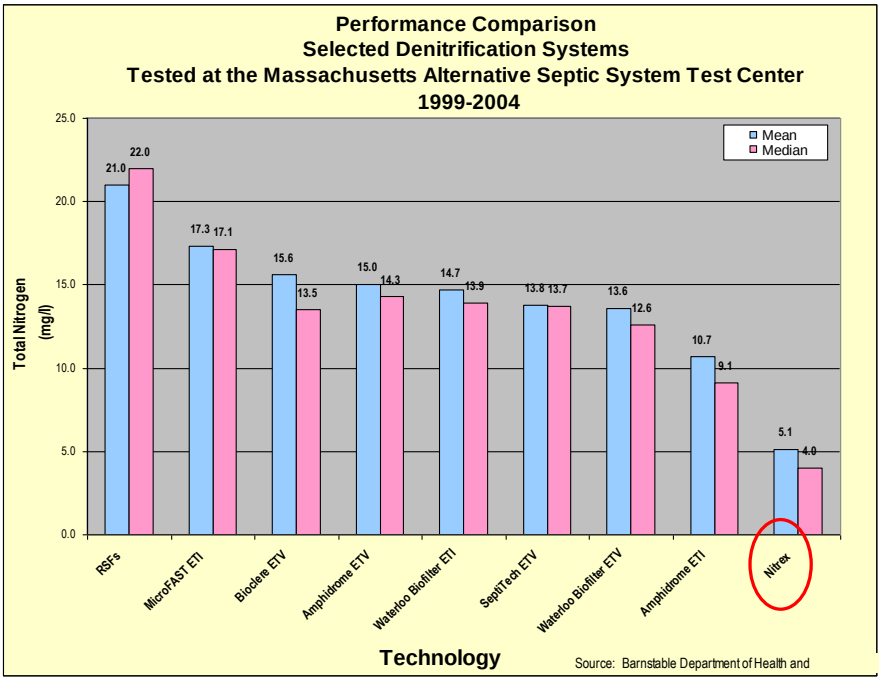
Nitrex™ Treatment Performance

The Nitrex™ filter installed at Otis Air Force base has reduced nitrogen in the effluent by an average of 74.1% over the two years that it has been in operation. The following figures illustrate the nitrate in the effluent and % of nitrate removed from the effluent due to the Nitrex™ filter. The Table provides the actual data measured by an independent laboratory. The lower winter 2003 wastewater temperature from the RGF reduced the performance of the Nitrex™ filter.



Nitrex™ System Performance Summary

	Total Nitrogen Median (mg/l)	
	Nitrex™ Influent	Effluent
Otis, MA	19.7	4.5



Reference Contact:
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Polson, Montana Residential System

Project Description

This Nitrex™ system was installed as a demonstration sponsored by the Montana Environmental Health Dept. for the purpose of evaluating alternative wastewater systems for enhanced NO_3 removal.

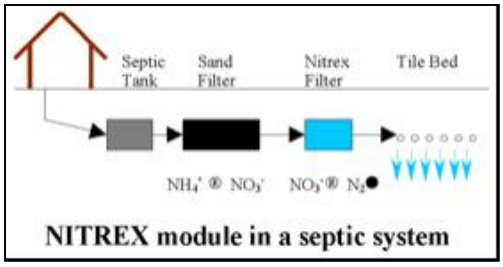
	Total Nitrogen (mg/l)	
	Influent	Effluent
Polson, MT	32.8	3.4

Project Application Data

- Location: Polson, Montana
- Site Application: Single Family Residence
- Installation Date: June 1, 1999

Design Profile

- Design Wastewater Flow: 264 gpd
- Wastewater Treatment Process: Septic Tank – ISF – Nitrex™



Nitrex™ Treatment Performance

The Nitrex™ filter installed at Polson has reduced the nitrogen by an average of 88.7% from the sand filter effluent over the two and a half years that it has been in operation. The following figures illustrate the nitrate in the effluent and % of nitrate removed from the effluent due to the Nitrex™ filter. The Table provides the actual data measured by an independent laboratory.

		Septic Tank Influent				Nitrex™ Effluent Effluent				
Date	Temp (oC)	TN	NO3-N (mg/L)	NH4-N (mg/L)	TKN (mg/L)	TN	NO3-N (mg/L)	NH4-N (mg/L)	TKN (mg/L)	% TN Removal (mg/L)
Oct1/99	19	19	12	1.3	7.3	1.8	0.1	0.1	1.7	90.5%
Oct2/99	10	19	17	0.3	1.6	1.3	0.1	0.1	1.2	93.0%
Oct3/99	15	8	7	0.3	1.6	1.3	0.1	0.1	1.2	84.0%
Oct4/99	14	20	17	0.2	2.5	3.1	0.1	0.1	3.0	84.3%
Oct5/99	12	18	16	0.2	1.4	1.5	0.1	0.1	1.4	91.5%
Nov7/99	9	16	14	0.9	1.8	1.6	0.1	0.2	1.5	89.9%
Nov8/99	10	18	16	0.8	2.5	1.8	0.1	0.2	1.7	90.1%
Nov9/99	9	17	14	1.1	3.4	2.0	0.1	0.3	1.9	88.4%
Nov10/99	10	20	18	1.2	2.1	1.3	0.1	0.4	1.2	93.5%
Dec2/99	9	37	31	0.5	6.0	1.9	0.1	0.5	1.8	94.9%
Dec3/99	7	38	35	0.2	2.6	1.8	0.1	0.2	1.7	95.2%
Dec4/99	9	52	37	0.3	14.5	2.0	0.1	0.2	1.9	96.1%
Dec5/99	8	41	36	0.3	4.7	1.7	0.1	0.1	1.6	95.8%
Dec6/99		40	38	0.2	2.1	1.9	0.1	0.2	1.8	95.3%
Jan7/00	10	48	48	1.1	0.1	2.0	0.1	0.3	1.9	95.8%
Jan8/00	11	50	49	0.1	1.2	1.7	0.1	0.4	1.6	96.6%
Jan9/00	9	51	50	0.1	1.1	2.1	0.1	0.5	2.0	95.9%
Jan10/00	10	50	48	0.1	1.5	2.8	0.2	0.1	2.6	94.3%
Feb3/00	8	23	22	0.2	1.2	9.0	7.9	0.3	1.1	61.2%
Feb4/00	6	30	29	0.7	0.9	8.5	5.6	1.0	2.9	71.6%
Feb5/00	8	34	33	0.2	1.3	5.1	2.7	0.3	2.4	85.1%
Feb6/00	9	35	33	0.2	1.5	3.0	1.2	0.1	1.8	91.3%
Feb7/00	10	32	31	0.7	0.8	2.3	0.6	0.2	1.7	92.8%
Mar10/00	11	34	32	0.3	2.2	2.3	0.2	0.5	2.1	93.3%
Mar11/00	7	36	32	0.3	4.3	2.1	0.1	0.5	2.0	94.2%
Mar12/00	9	33	32	0.2	0.9	2.1	0.1	0.5	2.0	93.6%
Mar13/00	9	34	33	0.3	0.8	2.2	0.1	0.5	2.1	93.5%
Mar14/00	9	35	32	0.5	2.6	2.3	0.1	0.3	2.2	93.4%
Apr6/00	11	40	39	0.2	1.1	3.8	0.5	0.8	3.3	90.5%
Apr7/00		47	44	0.1	3.0	9.1	0.1	0.8	9.0	80.6%
Apr8/00	11	47	46	0.1	1.2	2.4	0.1	0.9	2.3	94.9%
Apr9/00	12	49	46	0.3	2.7	2.4	0.1	1.0	2.3	95.1%
Apr10/00	15	45	44	0.1	1.4	2.8	0.2	1.0	2.6	93.8%
May13/00	14	40	39	0.2	0.7	2.5	0.1	1.1	2.4	93.7%
May14/00	12	42	41	0.2	1.4	2.7	0.1	1.6	2.6	93.6%
May15/00	19	41	40	0.1	1.2	3.0	0.1	1.2	2.9	92.7%
May16/00	16	41	40	0.2	1.2	2.9	0.1	1.3	2.8	93.0%
May17/00	12	41	40	0.2	0.7	2.8	0.1	1.4	2.7	93.1%
Jun7/00	22	32	31	0.1	0.9	2.9	0.3	0.8	2.6	90.9%
Jun8/00	16	33	31	2.1	2.4	3.8	0.3	0.9	3.5	88.6%
Jun9/00	16	32	31	0.1	0.6	2.8	0.3	1.0	2.5	91.1%
Jun10/00	17	32	31	0.1	0.5	2.8	0.3	0.7	2.5	91.1%
Jun11/00	13	36	35	0.1	0.9	2.7	0.4	1.2	2.3	92.5%
Jul08/00	15	22	21	0.4	1.2	2.3	0.1	0.7	2.2	89.6%
Jul09/00	20	26	25	0.1	1.2	2.2	0.1	0.6	2.1	91.6%
Jul10/00	20	26	25	0.8	1.1	2.4	0.1	0.6	2.3	90.8%
Jul11/00	23	26	25	0.2	0.9	2.3	0.1	0.7	2.2	91.1%
Jul12/00	21	25	24	0.2	0.9	3.0	0.1	0.5	2.9	88.0%
Aug03/00	21	31	28	0.2	3.1	2.4	0.1	0.2	2.3	92.3%
Aug04/00	24	32	29	0.3	2.7	2.5	0.1	0.3	2.4	92.1%
Aug05/00	20	27	25	0.3	2.0	2.5	0.1	0.3	2.4	90.7%
Sept10/00	14	12	11	0.2	1.3	4.2	0.1	2.3	4.1	65.9%
Oct08/00	21	25	23	0.2	1.9	2.6	0.1	0.8	2.5	89.6%
Nov04/00	8	9	8.9	0.1	0.4	2.1	0.1	0.1	2.0	77.4%
Dec09/00	6	30	29	0.3	0.5	2.4	1.8	0.6	0.6	91.9%
Jan07/01	5	42	40	0.3	2.3	18.8	18.0	0.4	0.8	55.6%
Feb11/01	7	47	47	0.1	0.2	16.2	16.0	0.1	0.2	65.7%
Apr08/01	6	21	19	0.6	1.5	12.7	10.2	1.1	2.5	38.0%
May13/01	13	47	46	0.3	0.8	3.0	1.4	0.5	1.6	93.6%
Jun10/01	13	32	31	0.2	0.8	1.3	0.1	0.1	1.2	95.9%
Jul28/01	21	29	27	0.4	2.3	2.5	0.1	0.1	2.4	91.5%
Aug18/01	22	42	41	0.3	1.3	1.8	0.1	0.4	1.7	95.7%
Avg	12.9	32.8	30.9	0.4	1.9	3.4	1.2	0.6	2.2	88.7%
St Dev	5.1	11.1	11.0	0.4	2.1	3.3	3.4	0.4	1.1	10.8%

Reference Contact:

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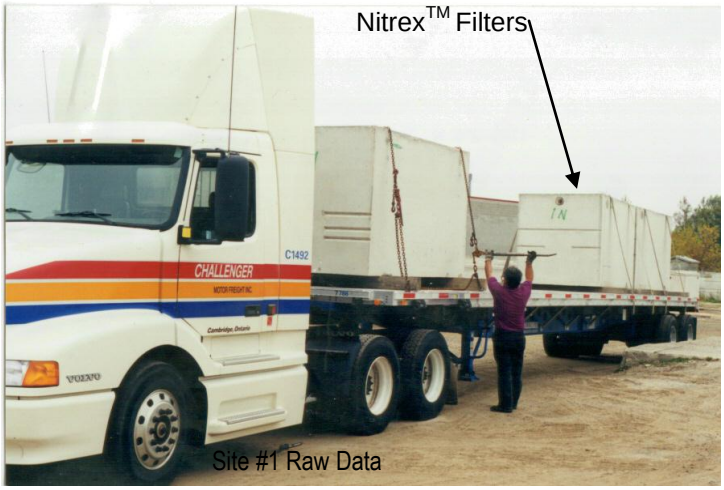
Oregon DEQ
Nitrogen Removal Testing

Nitrex™ Effluent TN < 2.4 mg/l



Project Description

The US EPA funded the La Pine National Decentralized Wastewater Demonstration Project, a collaborative effort between the Oregon Dept. of Environmental Quality (DEQ), Deschutes County Environmental Health and the US Geological Survey (USGS), to accomplish innovative on-site (decentralized) wastewater systems with enhanced nitrogen-reducing capabilities. The Nitrex™ filter was a chosen technology to be evaluated on its capability to protect groundwater from the impacts of on-site septic systems.

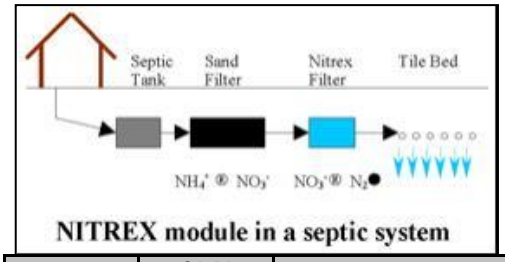
Project Application Data

- Location: La Pine, Oregon
- Site Application: Two Single Family Residences
- Installation Date: November, 2000

Wastewater Engineer: Lombardo Associates, Inc.
Boston, MA & Malibu, CA
www.LombardoAssociates.com

Design Profile

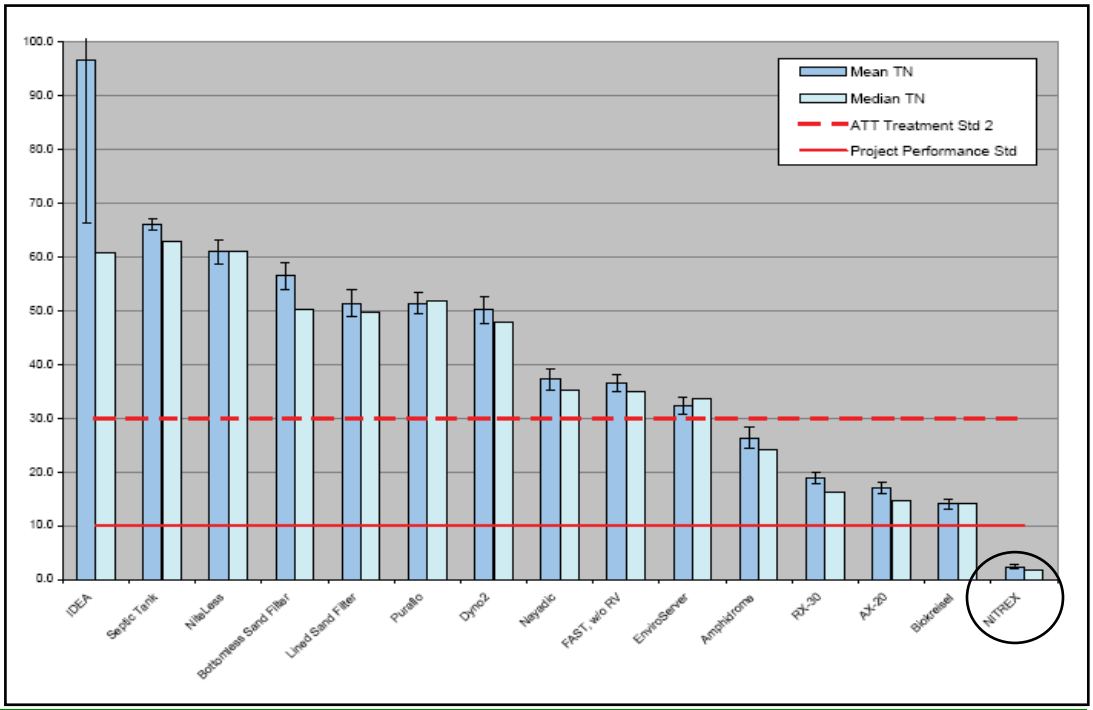
- Design Wastewater Flow: Site #1: 132 gpd
  Site #2: 210 gpd
- Wastewater Treatment Process: Septic Tank – ISF – Nitrex™



Nitrex™ Treatment Performance

The Nitrex™ filter installed at La Pine, Oregon has provided almost complete (average of 94.3% at) removal of nitrate from the sand filter effluent. The performance of the fifteen (15) technologies tested in the Project is shown below.
http://www.epa.gov/owow/NPS/chesbay502/pdf/chesbay

	% N Removal	Total Nitrogen (mg/l)	
		Influent	Effluent
Site #1	95%	53.2	2.7
Site #2	92%	58.5	4.4



Reference Contact:
Barbara Rich
brbrrich946@gmail.com
541-617-4713

Alternative Wastewater Systems Achieving TN < 10 mg/l Study Suffolk County NY

Project Application Data:

- Location: Suffolk County New York
- Testing Period: September 2011

Wastewater Engineer: H2M Melville, NY

Project Description:

The Suffolk County Department of Health Services (SCDHS) retained the engineering firm of Hollzmacher, McLendon and Murrell (H2M) to investigate the ability of alternative on-site sewage treatment and disposal systems to meet the effluent requirement for total nitrogen of 10 mg/l or less. Upon evaluation and approval by SCDHS, these systems could be implemented in place of currently approved on-site treatment systems in residential and commercial applications. Based upon a wide-ranging comprehensive evaluation, four (4) technologies were identified by a joint panel of experts from SCDHS and H2M, as potentially capable of achieving effluent TN < 10 mg/l, with Nitrex™ system having the most promising capability.

Sampling of the candidate sites of the various technologies was then undertaken with the results for the Nitrex™ installations presented below.

On November 29, 2011, the Suffolk County Department of Health Services (SCDHS) approved the Nitrex™ system for use in Suffolk County to achieve effluent TN < 10 mg/l. As stated in the SCDHS News release:

"The Nitrex system, which was installed at Scully Estate County Park and evaluated as part of the county's study, is now available for use on other commercial projects. Health officials have completed sampling of this system and the results have been exceptional, commonly reducing nitrogen to the range of two to three milligrams per liter of wastewater discharge."

		Nitrex™ EFFLUENT TN (mg/l) Sampled		
No.	Site Name	1st sampling	2nd sampling	Average
1	Eastham MA 40 unit subdivision	1.33	1.37	1.35
2	Mashpee MA 24 unit subdivision with 5,200 sf commercial	0.54	1.57	1.055
3	Harvard MA 2 family installation	0.63	1.4	1.015
4	Malibu CA 16,000 gpd Shopping Center restaurants & retail	1.58	1.28	1.43
5	St. Leonard, MD MA single family installation	2.3	3.68	2.99
	Average all sites	1.28	1.86	

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