



**Florida Department of Health  
Bureau of Environmental Health  
Onsite Sewage Programs  
Research Review and Advisory Committee Meeting**

**DATE AND TIME:** September 11, 2013 at 1:00 p.m. ET

**PLACE:** Florida Department of Health Southwood Complex  
4025 Esplanade Way, Room #130 L  
Tallahassee, FL 32399

**Or via conference call / web conference:**

Toll free call in number: 1-888-670-3525

Conference pass code: 8605907413

Website: [http://connectpro22543231.na5.acrobat.com/rrac\\_new/](http://connectpro22543231.na5.acrobat.com/rrac_new/)

This meeting is open to the public

**AGENDA:** FINAL

1:00 – 1:10	Introductions and Housekeeping
1:10 – 2:00	Discussion on Draft Passive Nitrogen Reduction Strategies Phase II Report for the Nitrogen Study
2:00 – 2:45	Task Updates and Discussion on Nitrogen Study
2:45 – 2:55	Updates on Other Projects
2:55 – 3:10	Other Business
3:10 – 3:25	Public Comment
3:25 – 3:30	Closing Comments, Next Meeting, and Adjournment

NOTE: Time slots are approximate and may be subject to change.

**Florida Department of Health Research Review and Advisory Committee  
Division of Disease Control and Health Protection  
Bureau of Environmental Health - Onsite Sewage Programs Section**

Approved Minutes of the Meeting held at the Southwood Office Complex, Tallahassee, FL  
September 11, 2013

**In attendance:**

- **Committee Members and Alternates:**

- In person:**

- Bill Melton (member, Consumer)

- Via teleconference:**

- Quentin (Bob) Beitel (member, Real Estate Profession)
    - Taylor Brown (alternate, Division of Environmental Health)
    - Wayne (W.B.) Crotty (member, Septic Tank Industry)
    - Paul Davis (member, Division of Environmental Health)
    - Craig Diamond (member, Environmental Interest Group)
    - Carl Ludecke (vice-chairman, member, Home Building Industry)
    - Bob Himschoot (alternate, Septic Tank Industry)
    - Jim Peters (alternate, Professional Engineer)
    - Clay Tappan (chairman, member, Professional Engineer)

- Absent members and alternates:**

- Ed Dion (alternate, Home Building Industry)
    - John Dryden (alternate, State University System)
    - Nancy Gallinaro (alternate, Local Government)
    - Tom Higginbotham (alternate, Division of Environmental Health)
    - Geoff Luebkekmann (member, Restaurant Industry)
    - Tony Macaluso (alternate, Real Estate Profession)
    - Susan McKinley (alternate, Restaurant Industry)
    - Eanix Poole (alternate, Consumer)
    - David Richardson (member, Local Government)
    - John Schert (member, State University System)

- **Visitors:**

- In person:**

- Damann Anderson (Hazen and Sawyer)
    - Charles Gauthier (DEP)
    - Rick Hicks (DEP)
    - Josefin Hirst (Hazen and Sawyer)
    - Johnny Richardson (Leon County)
    - Daniel Smith (AET)

- Via teleconference:**

- Ann-Marie Norman
    - Alice Berkley (Orange County Commissioner Brummer's office)
    - Stephen Cioccia (DEP)
    - Rick Hicks (DEP)
    - Josefin Hirst (Hazen and Sawyer)
    - Sean McGlynn
    - Andrea Samson
    - Patti Sanzone
    - Shannin Speas-Frost
    - Jonathan Till (Rep. Bryan Nelson's office)
    - Pam Tucker

- **Department of Health (DOH), Onsite Sewage Program Section:**

- In person:**

- Eberhard Roeder, Professional Engineer
    - Elke Ursin, Environmental Health Program Consultant

**Florida Department of Health Research Review and Advisory Committee**  
**Division of Disease Control and Health Protection**  
**Bureau of Environmental Health - Onsite Sewage Programs Section**

1. **Introductions** – Seven out of ten groups were present, representing a quorum. The groups that were not represented were local governments, the state university system, and the restaurant industry. Vice Chairman Ludecke called the meeting to order shortly after 1 p.m. The agenda was outlined, introductions were made, and some housekeeping issues were discussed.
2. **Discussion on Draft Passive Nitrogen Reduction Strategies Phase II Report for the Nitrogen Study** – Elke Ursin gave a brief overview of the overall nitrogen study and then introduced Damann Anderson, the contract provider for the project to provide a discussion on the draft report for the results of phase II of the passive nitrogen reduction strategies study. Mr. Anderson presented a background of the project, summarized the results, outlined the next steps, and responded to any questions and answers. The work was done as a follow-up on the promising results of phase I of this work performed under a previous contract. The results of this work will provide design guidelines for the full-scale systems installed at actual home sites in another task for the project. He described the test facility set-up and construction, the various nitrification media used, the process groups established for the study, and the monitoring frequency. The results were given for each process group. The next steps are to use the results to guide the design for the full-scale systems. There were several questions asked during the presentation. Comments on the report are due on September 19, 2013 and are to be emailed to Elke Ursin. Paul Davis congratulated Mr. Anderson on a great report that has national implications.
3. **Task Updates and Discussion on Potential Nitrogen Study Contract Amendments** – Damann Anderson presented on the current project status. He went through the major project tasks: Task A –Pilot scale passive nitrogen systems, Task B –Full-scale passive nitrogen systems, Task C –Soil and groundwater monitoring, and Task D –Modeling of nitrogen in the soil and groundwater. Within each of the major project tasks he outlined what work has been completed, what work is in progress, and what work still needs to get started. Mr. Anderson said that there are several changes that will be proposed in an upcoming contract amendment to be discussed at the next meeting. Elke Ursin presented on the 2013-2014 legislative session results for the project. Funds in the amount of \$700,000 were provided for this fiscal year. The funds are to be spent on field monitoring performance and cost of technologies, sampling of the soil and groundwater, refinement of the nitrogen models, final reporting, and that a final report on the project is to be submitted when the project is done. A table was shown outlining the funding history and required funding that is subject to legislative appropriation.
4. **Other Business** – No other business was presented.
5. **Public Comment** – The public were allowed to comment throughout the meeting.
6. **Closing Comments, Next Meeting, and Adjournment** – The next RRAC meeting will be determined in the future to discuss any contract amendments for the nitrogen study. Bill Melton made a motion to adjourn, seconded by Quentin Beitel. The meeting adjourned at 3:00 p.m.



# **Research Review & Advisory Committee**

## **September 11, 2013**

Elke Ursin  
Florida Department of Health  
Bureau of Environmental Health  
Onsite Sewage Programs







# Agenda

1:00 – 1:10	Introductions and Housekeeping
1:10 – 2:00	Discussion on Draft Passive Nitrogen Reduction Strategies Phase II Report for the Nitrogen Study
2:00 – 2:45	Task Updates and Discussion on Potential Nitrogen Study Contract Amendments
2:45 – 2:55	Updates on Other Projects
2:55 – 3:10	Other Business
3:10 – 3:25	Public Comment
3:25 – 3:30	Closing Comments, Next Meeting, and Adjournment



# Introductions & Housekeeping

- Committee roll call
- Identification of audience
- How to view web conference
- Mute / unmute phone line = \*6
- Do not put phone on hold
- Download meeting material:

<http://www.myfloridaeh.com/ostds/research/Index.html>



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

## **Study Purpose:**

- Develop passive strategies for nitrogen reduction
- Complement use of conventional systems
- Develop cost-effective nitrogen reduction strategies



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

## Discussion on Draft Passive Nitrogen Reduction Strategies Phase II Report



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

## Task Updates and Discussion



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

## 2013-2014 Legislative Language

- \$700,000 provided
- Spend funds on:
  - Field monitoring performance and cost of technologies
  - Sampling soil and groundwater
  - Refine models
  - Final reporting on all tasks
  - Submit final report on project



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

Fiscal Year	Cash Appropriations	Budget Authority	Encumbered for Contract	Encumbered for DOH	Balance
2008-2009	\$900,000	\$900,000	\$213,727	\$21,029	\$665,244
2009-2010	\$0	\$540,000	\$485,720	\$6,845	\$172,679
2010-2011	\$2,000,000	\$2,000,000	\$742,016	\$4,153	\$1,426,510
2011-2012	\$0	\$2,725,000	\$678,773	\$29,467	\$718,270
2012-2013	\$1,500,000	\$1,500,000	\$1,103,566	\$38,506	\$679,764
2013-2014	\$700,000	\$1,000,000	\$1,000,000	\$0	\$379,764
2014-2015	\$394,434*	\$776,198*	\$776,198*	\$0	\$0
<b>TOTAL</b>	<b>\$5,100,000</b>		<b>\$5,000,000</b>	<b>\$100,000</b>	

\* FY 2014-2015 subject to legislative appropriation



# Updates on Other Projects





# Other Business



# Public Comment



# Next Meeting Information

Upcoming meeting topics:

- Nitrogen Study task updates
- Discussion on ongoing research projects

Proposed dates for next meeting:

- To be determined via email in the future



# Closing Comments and Adjournment

# FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES (FOSNRS) STUDY

## PNRS II Draft Report

RRAC Meeting Presentation  
September 11, 2013



OTIS  
ENVIRONMENTAL  
CONSULTANTS



# Presentation overview

- PNRS II Background
- PNRS II Results
- Next Steps
- Questions and Answers

# TASK A

## Passive Nitrogen Removal Study (PNRS) II

### Background



# PNRS II test facility was developed

- Follow up to PNRS I with larger, pilot scale units and various media combinations
- Established test facility at Gulf Coast Education and Research Center (University of Florida IFAS)
- Test program for in-vessel and in-situ pilot systems
- Various nitrification and denitrification biofilters tested
- Operated on septic tank effluent for 12+ months
- Produce scalable design criteria from pilot scale biofilters for subsequent full-scale testing





# Test facility included numerous treatment trains

- All used two-stage biofilters:
  - Stage 1 Nitrification
  - Stage 2 Denitrification
- Stage 1 unsaturated filters included 2 media layers and evaluated 15" and 30" media depths
- We also evaluated single pass vs recirculating stage 1 biofilters
- For denitrification, we evaluated both lignocellulosic and sulphur denitrification biofilters
- We also tested reactive media in a more in-situ/in-ground system approach



# Various nitrification media were studied

## Examples of Stage 1 Media



**Zeo-Pure clinoptilolite**



**Expanded polystyrene**



**Filter sand**



**Expanded clay**



# Various denitrification media were studied

## Examples of Stage 2 Media



**Lignocellulosics**

**Expanded  
Clay**



**Elemental  
Sulphur**





# PNRS II test facility construction



**Setting  
up tanks**



**Mixing Media Batches**



**Underdrain**



# Placing media in tanks



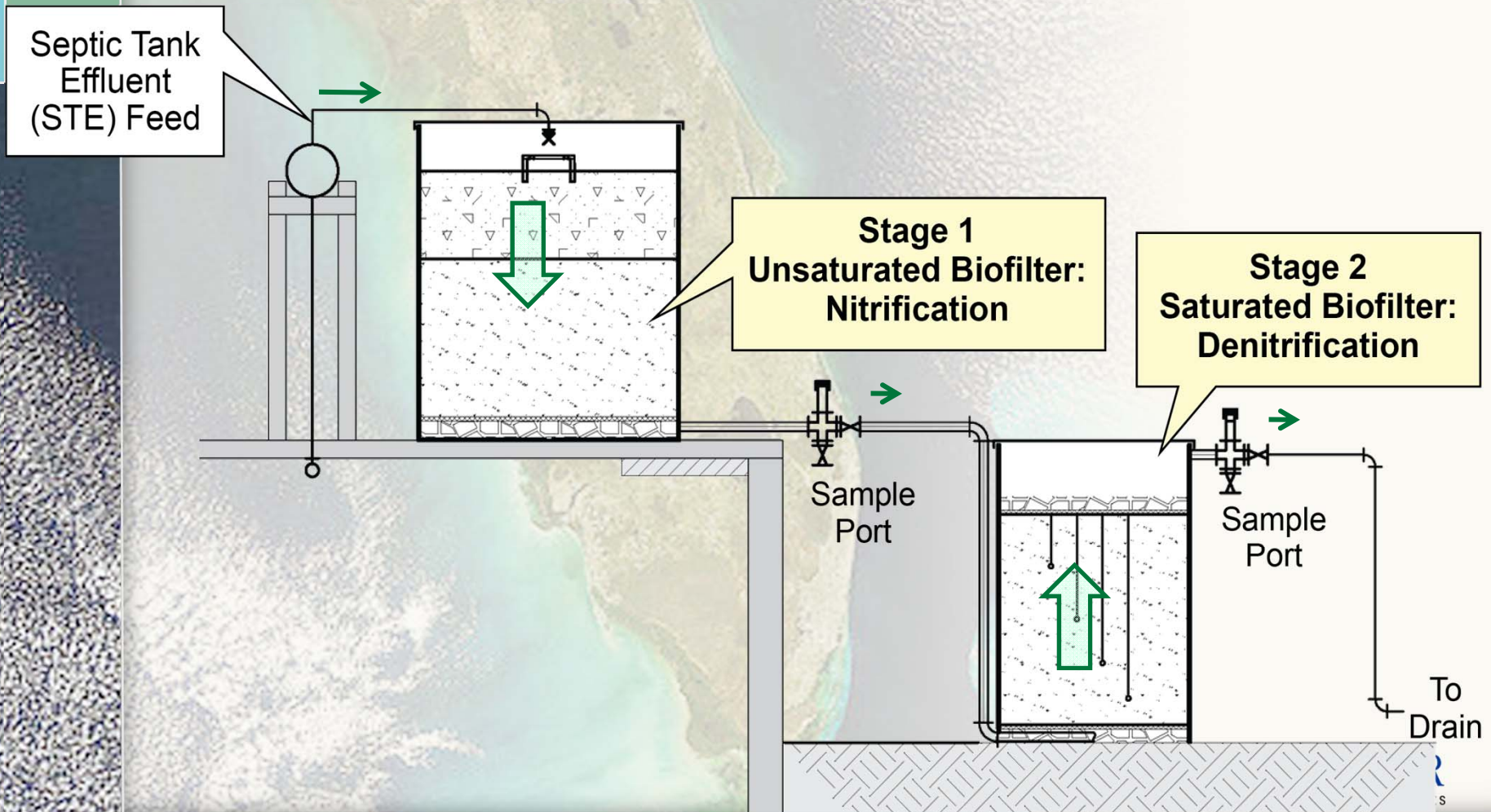


# Four process groups established for study

- Group A Systems (5): Single pass Stage 1 Biofilters directly connected to Stage 2 Upflow Biofilters
- Group B Systems (4): Recirculating Stage 1 Biofilters
- Group C Systems (4): Horizontal Stage 2 Biofilters
- Group D Systems (4): Stacked Unsaturated/Saturated (*in situ*) Biofilters

# Group A

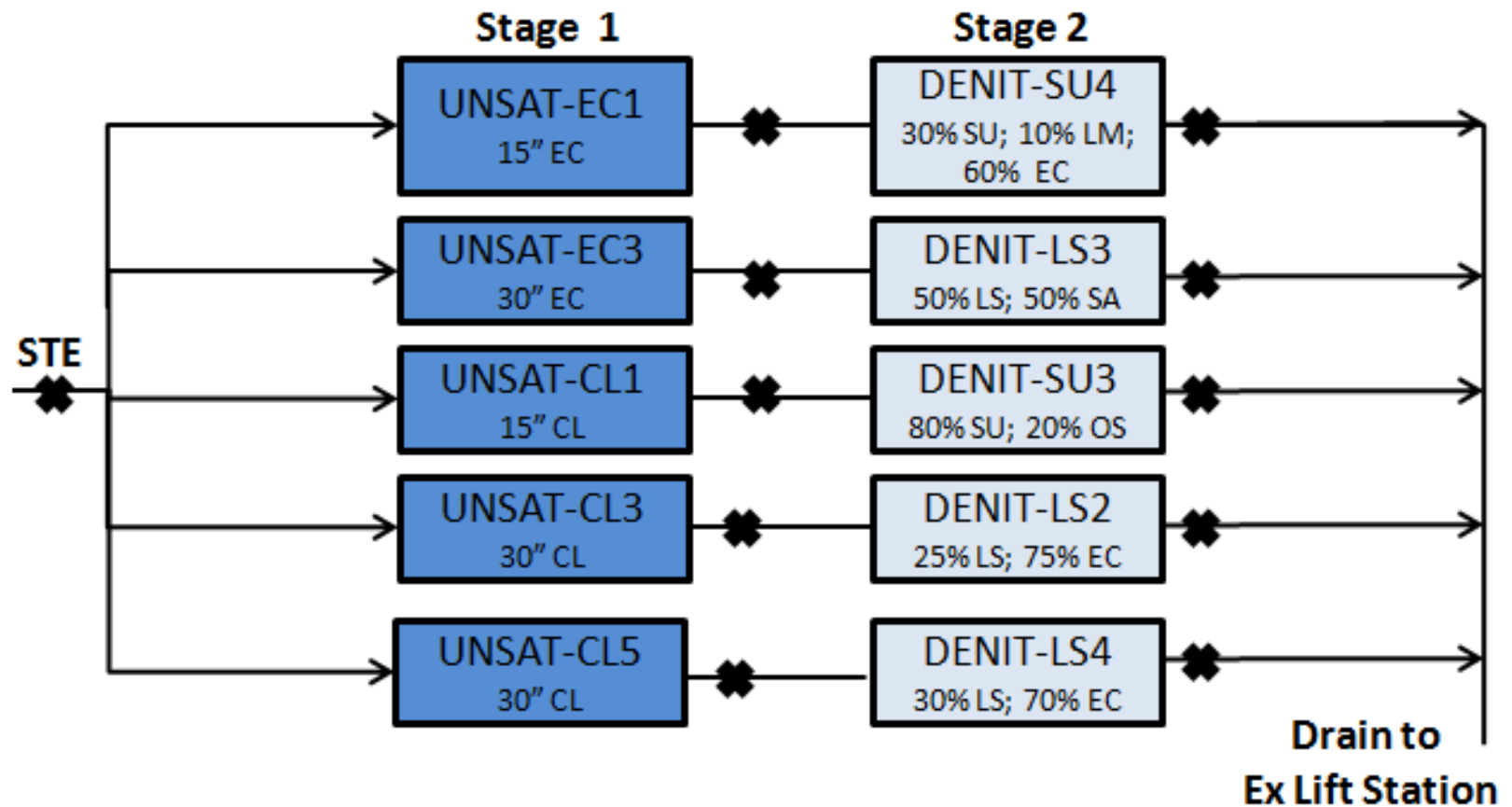
## Two stage single pass biofilter schematic





# Group A

## Two-stage single pass treatment trains



Stage 1 media: CL = clinoptilolite, EC = expanded clay

Stage 2 media: EC = expanded clay, LM = limerock, LS = lignocellulosic, OS = oyster shell, SA = sand, SU = sulphur



# Group A

## Two-stage single pass biofilters

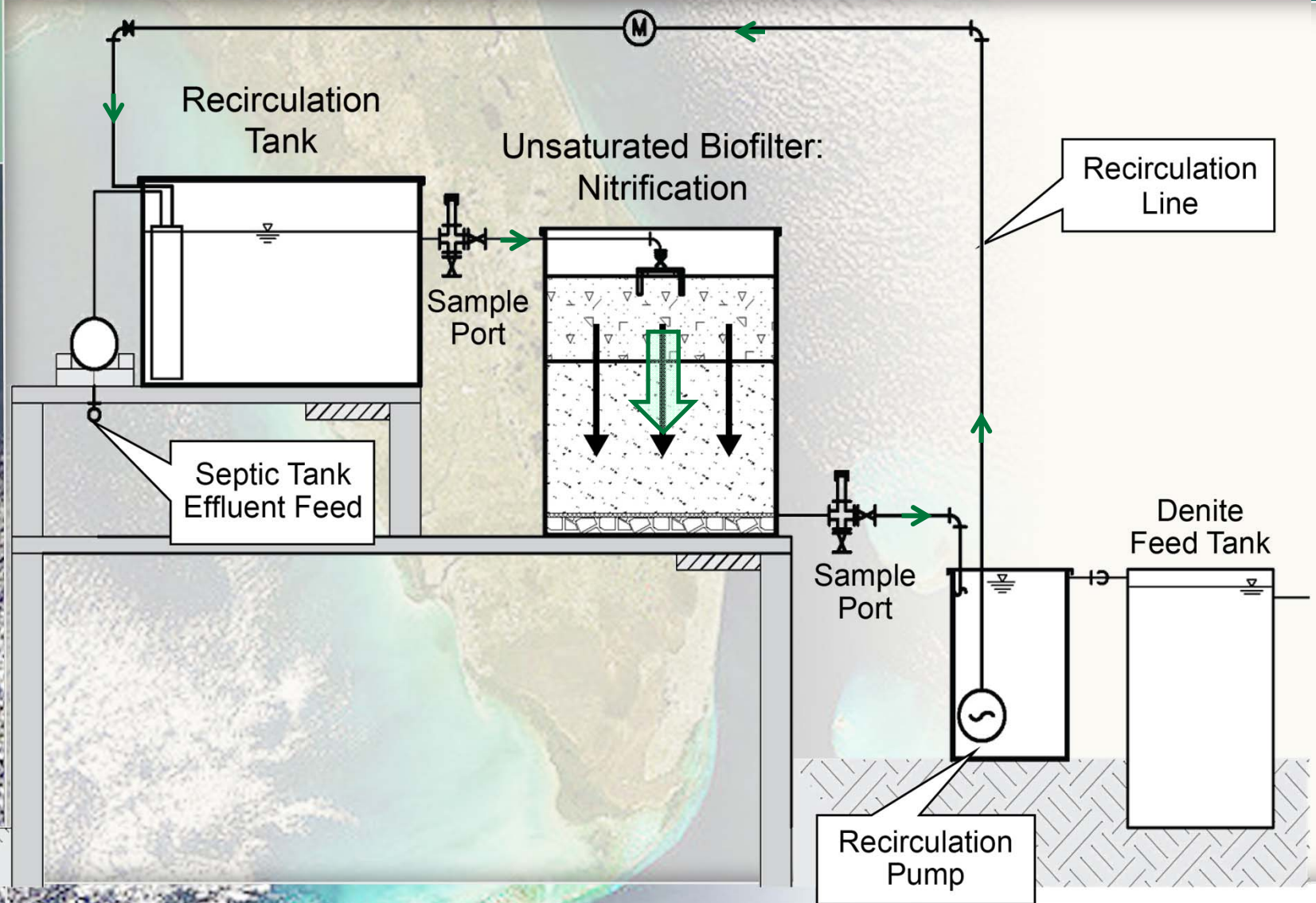


Stage 1 Unsaturated Biofilters - Nitrification

Stage 2 Saturated Upflow Biofilters - Denitrification

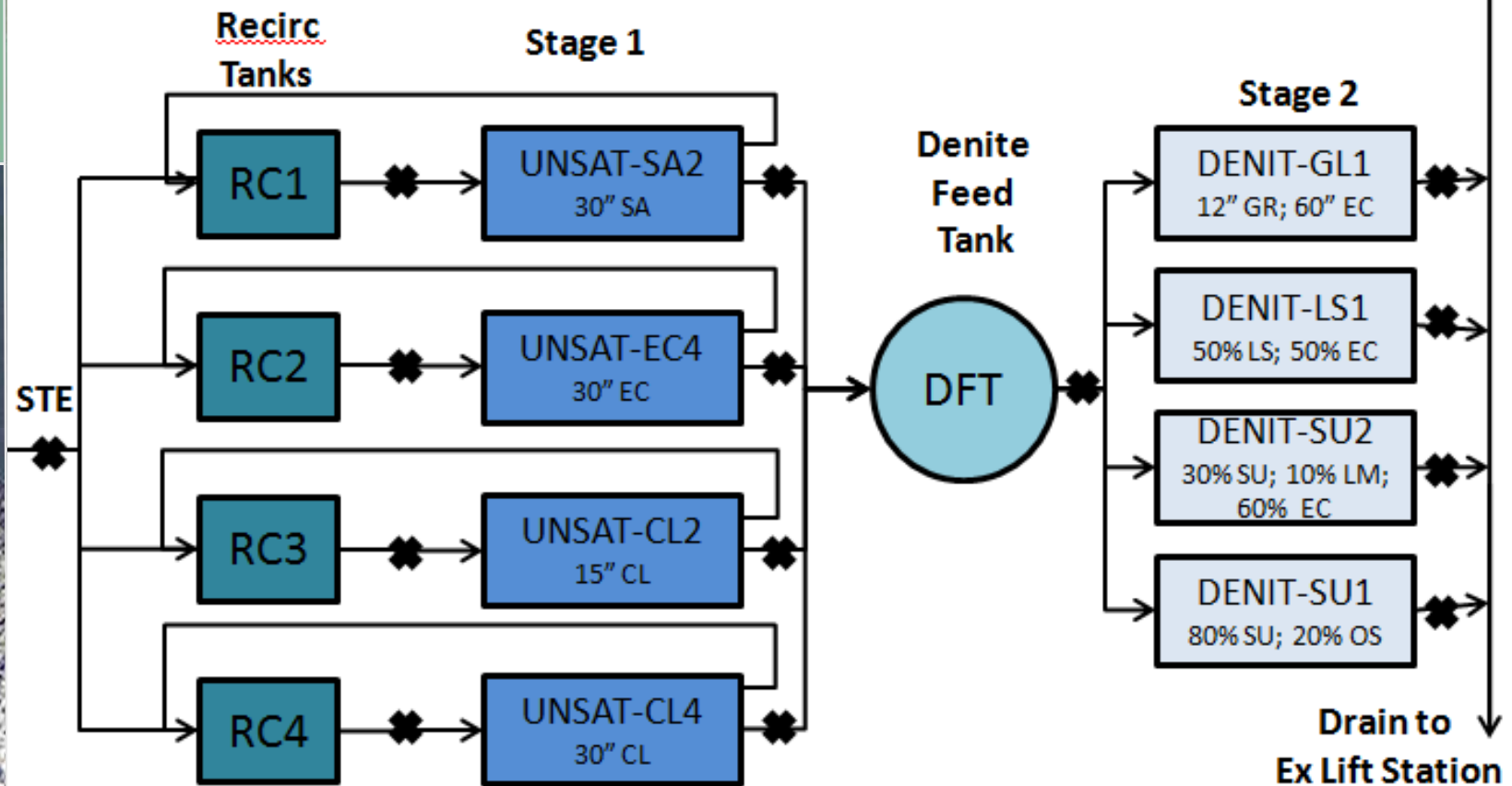
# Group B

## Stage 1 recirculating biofilters schematic





# Group B (recirculating Stage 1 biofilters) and Group C (saturated Stage 2 biofilters)

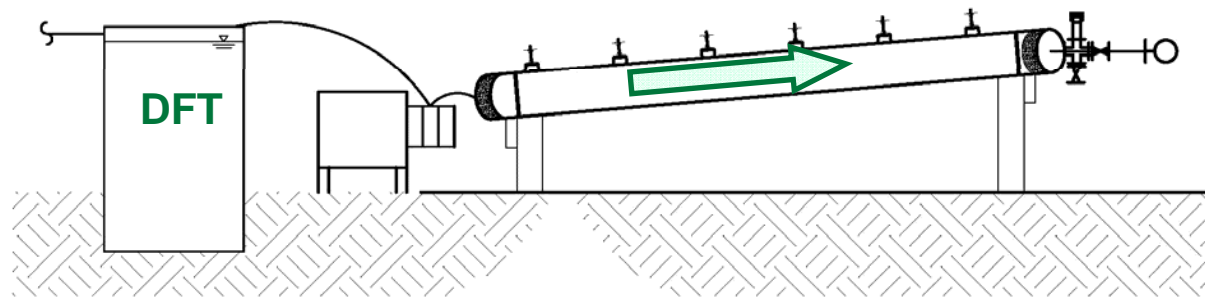
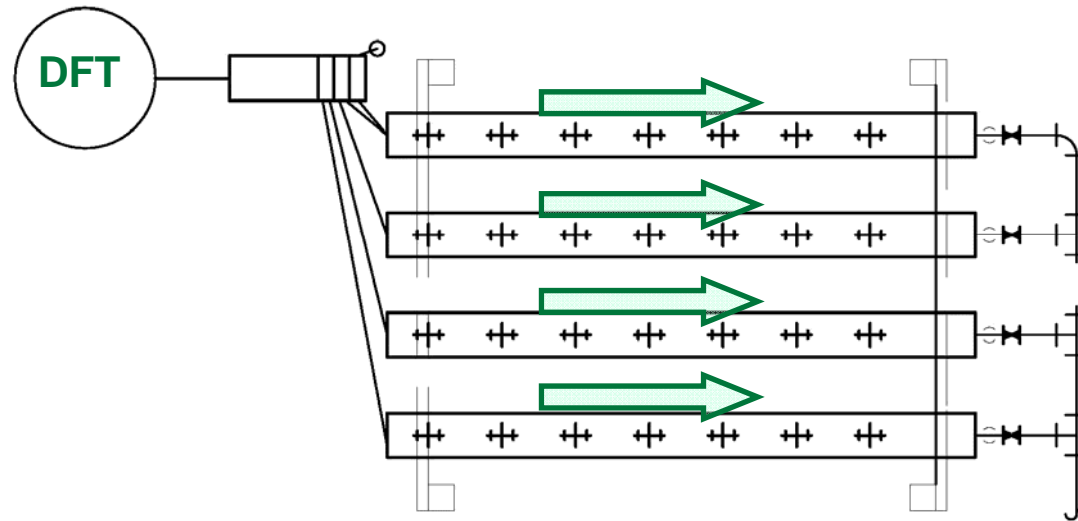


Stage 1 media: CL = clinoptilolite, EC = expanded clay, SA = sand

Stage 2 media: EC = expanded clay, GR = gravel, LM = limerock, LS = lignocellulosic,  
OS = oyster shell, SU = sulphur

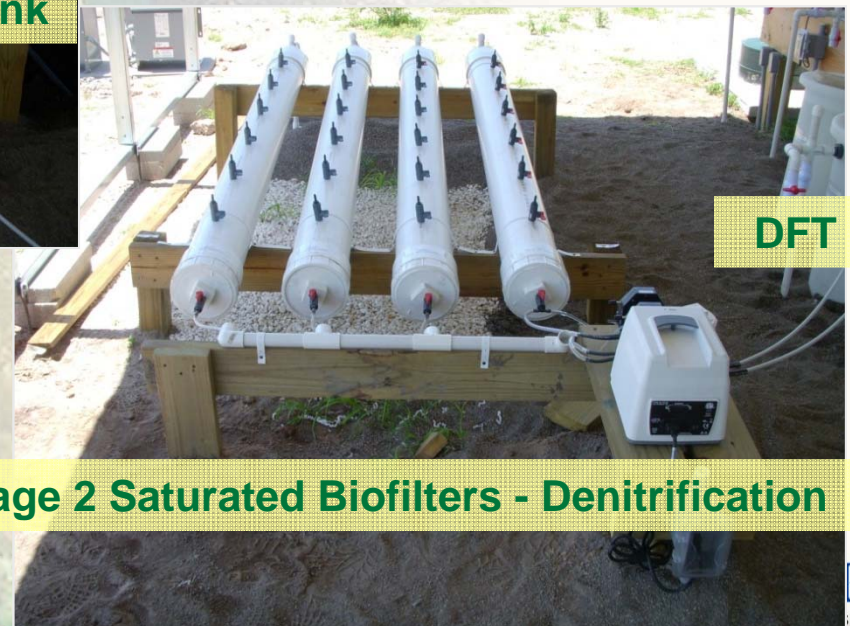
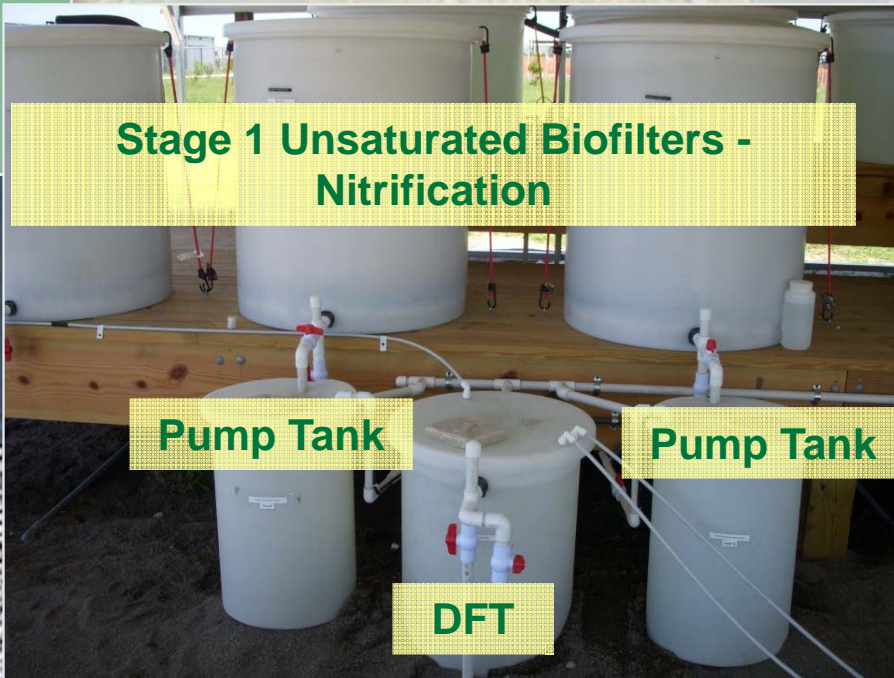
# Group C

## Horizontal Stage 2 biofilters schematic



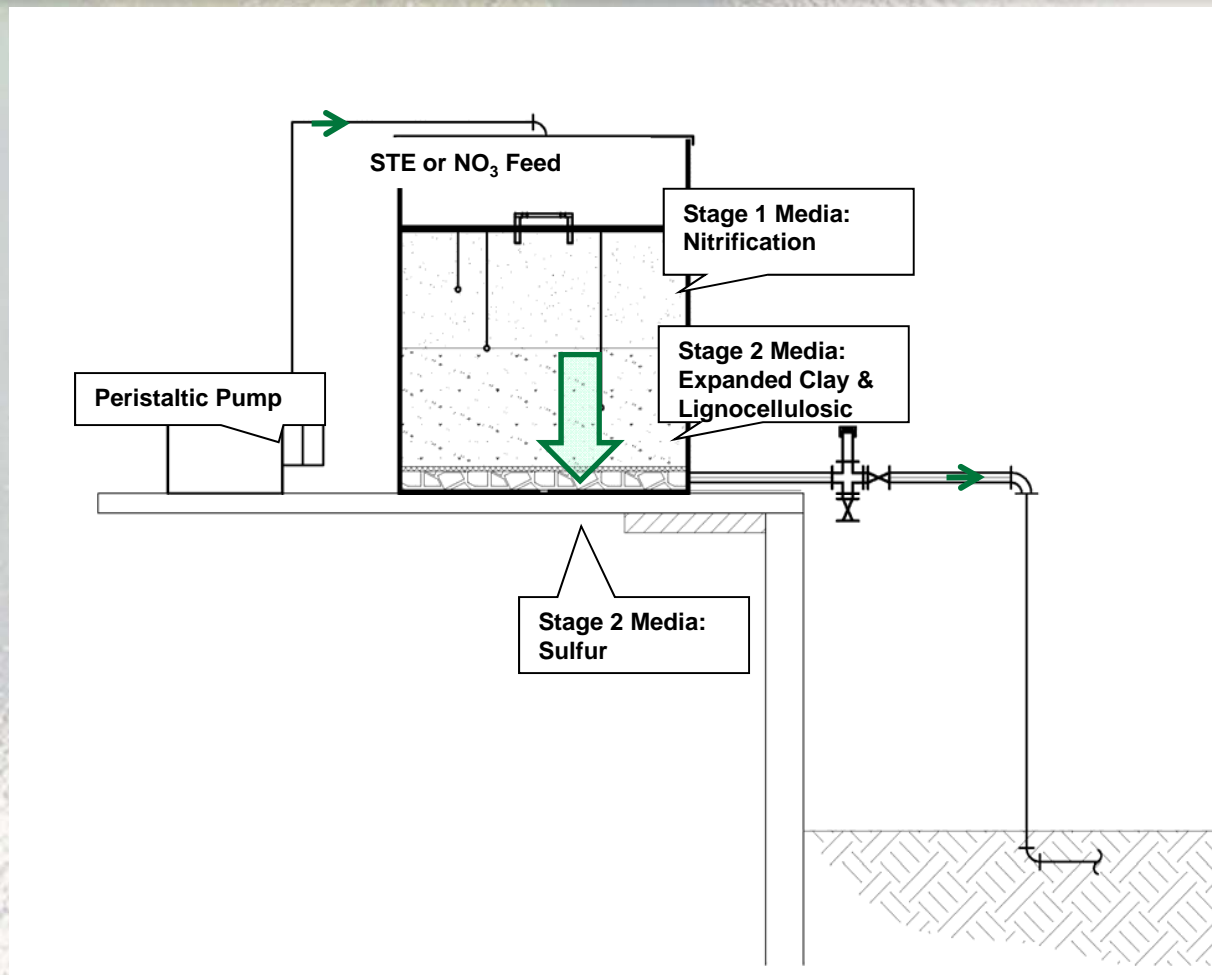


# Group B (Stage 1 recirculating biofilters) & Group C (Stage 2 saturated biofilters)



# Group D

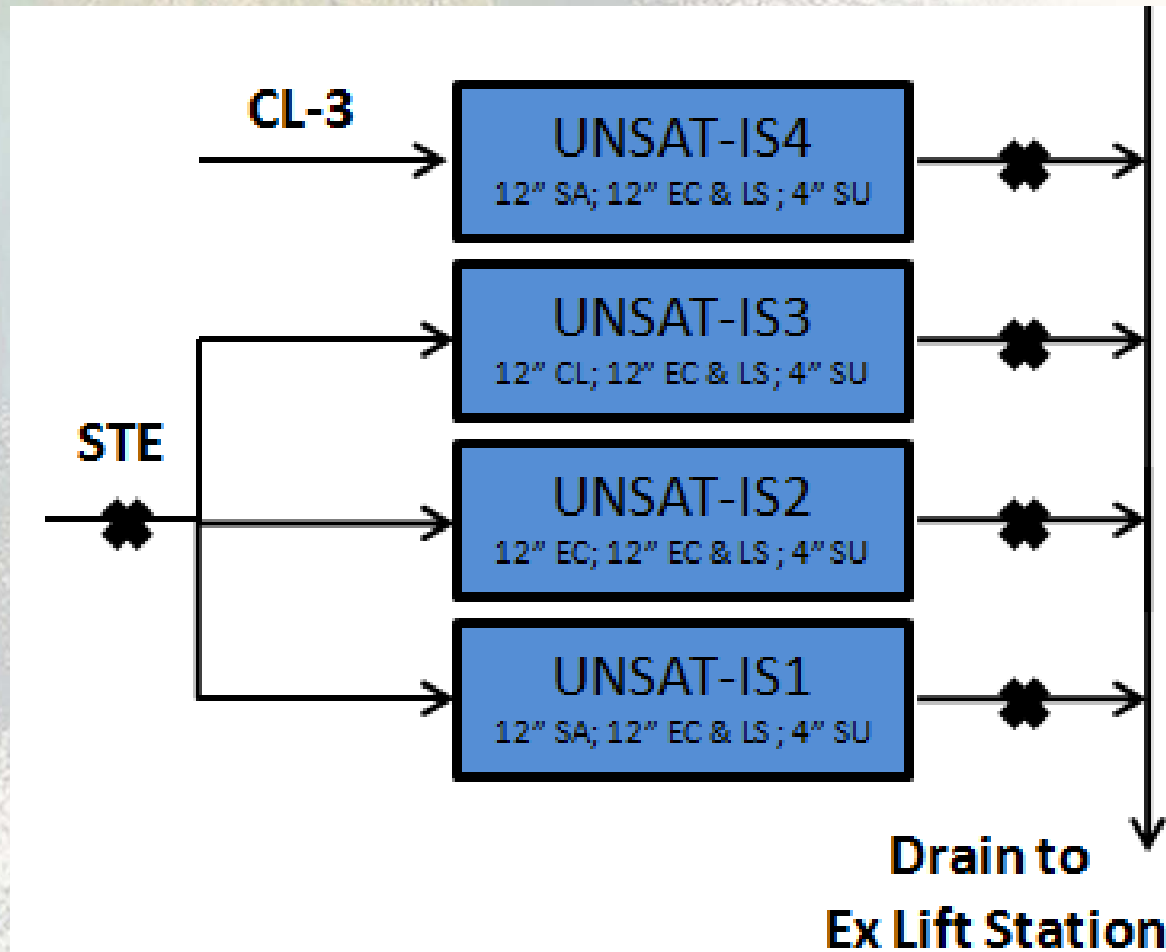
## Stacked saturated/unsaturated (*in situ*) biofilter schematic





# Group D

## Stacked saturated/unsaturated (*in situ*) biofilters



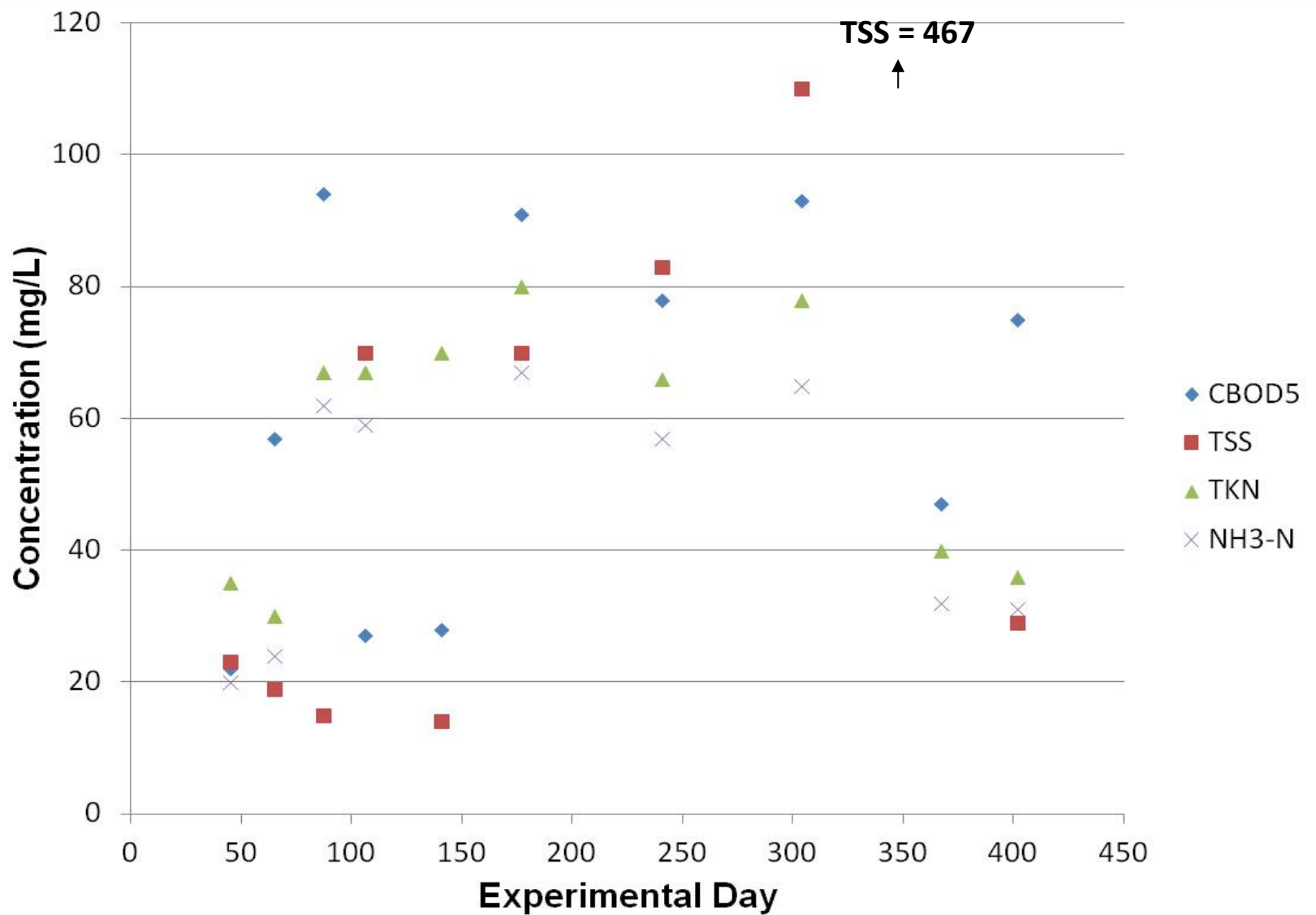
# PNRS II monitoring

Sample Event	Date	Experimental Day
Start-up	May 17, 2010	0
Sample Event 1	July 1, 2010	45
Sample Event 2	August 31, 2010	106
Sample Event 3	November 10, 2010	177
Sample Event 4	January 13, 2011	241
Sample Event 5	March 17, 2011	304
Sample Event 6	May 19, 2011	367
Sample Event 7	June 23, 2011	402
Sample Event 8	June 28, 2011	407
Sample Event 9	September 15, 2011	486
Sample Event 10	March 20, 2013	1,038



# PNRS II Results

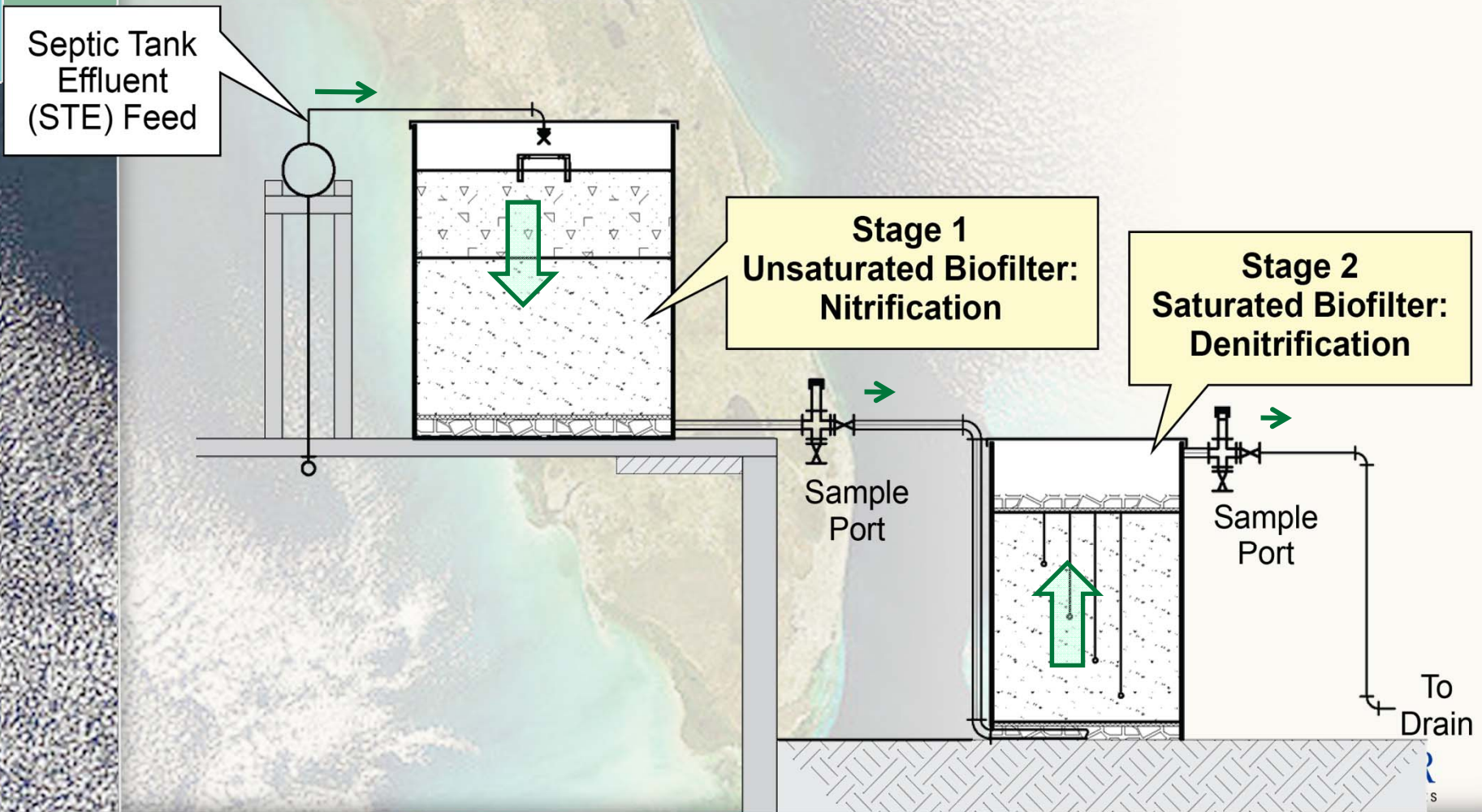
# PNRS II primary effluent quality





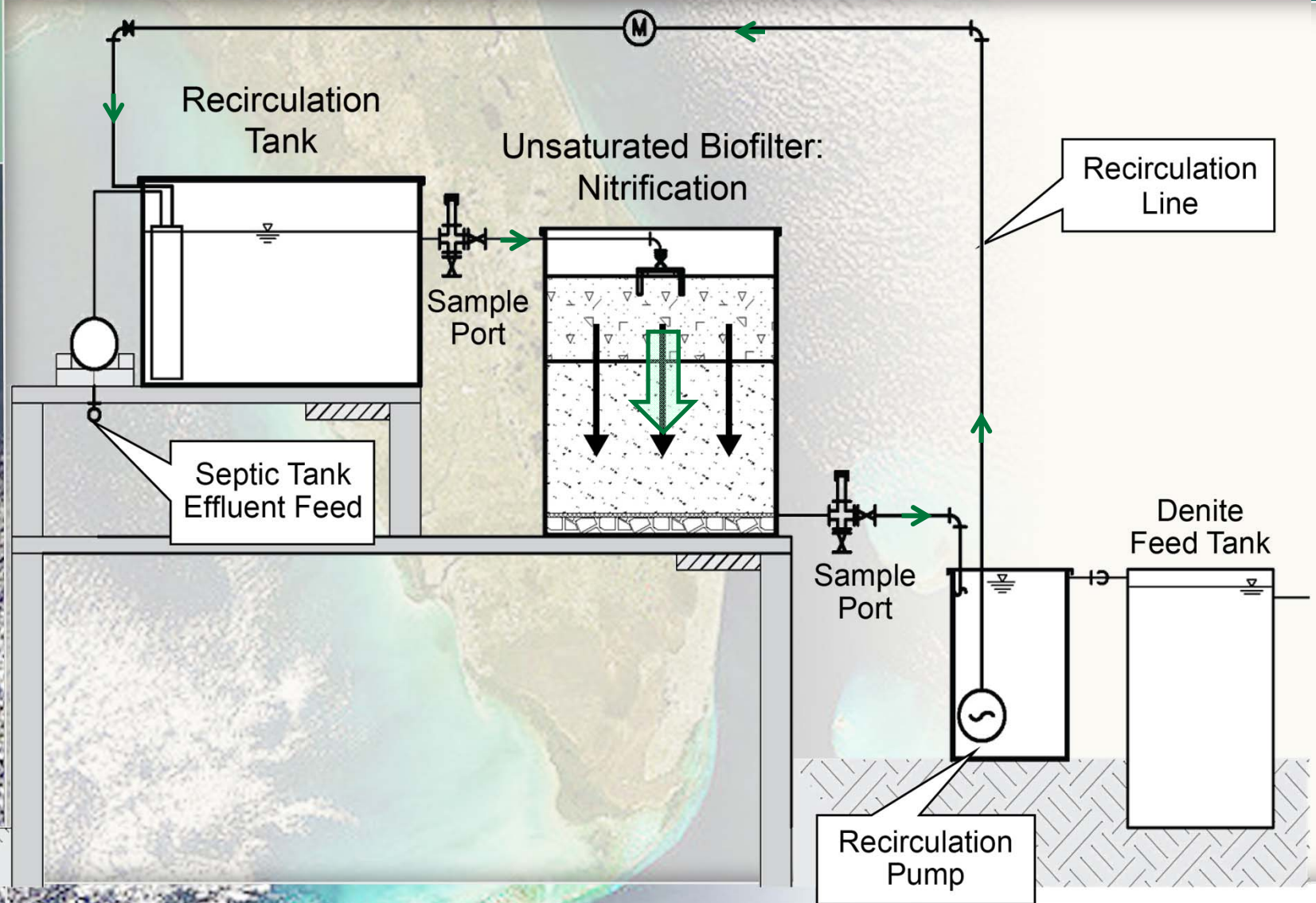
# Group A

## Two stage single pass biofilter schematic



# Group B

## Stage 1 recirculating biofilters schematic





# Stage 1 (unsaturated) biofilters

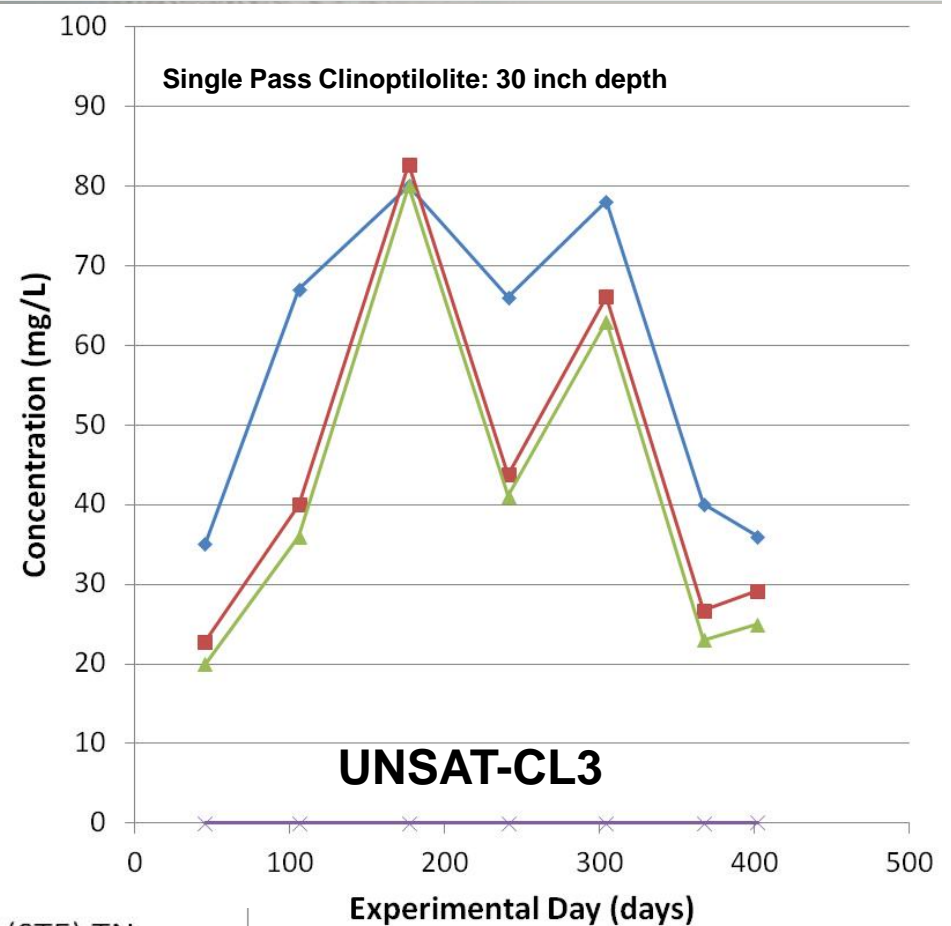
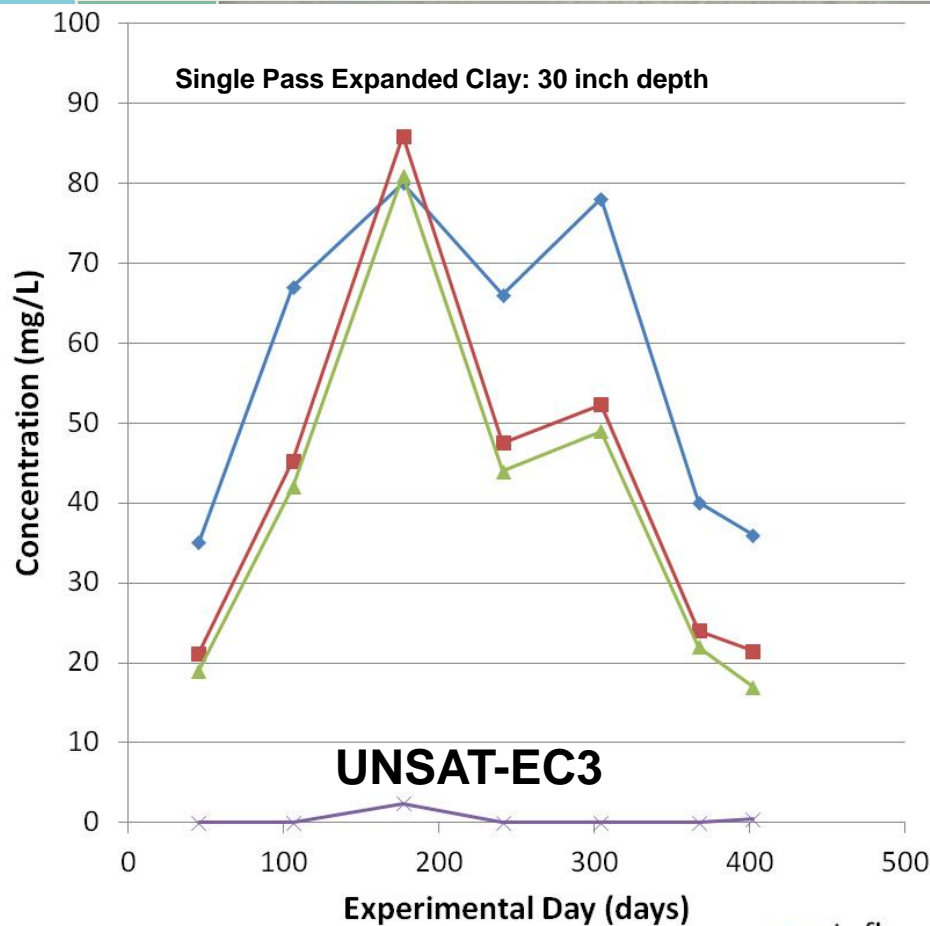
## Mean effluent values

	Biofilter	C-BOD <sub>5</sub>	COD	TSS	TN	TKN	Organic N	NH <sub>3</sub> -N	(NO <sub>3</sub> +NO <sub>2</sub> )-N	Dissolved Oxygen	pH	Total Alkalinity	Fecal coliform, cfu/100 ml
Group A Single Pass	UNSAT-EC1 (15")	2.0	10.0	1.2	44.7	3.5	3.0	0.510	41.2	6.6	7.0	152	1,307
	UNSAT-EC3 (30")	2.0	13.3	1.5	42.5	3.4	3.0	0.417	39.1	6.9	6.8	177	2
	UNSAT-CL1 (15")	2.0	17.0	2.2	41.0	3.1	3.1	0.012	37.9	6.3	7.4	207	44
	UNSAT-CL3 (30")	2.0	20.0	1.3	44.5	3.3	3.3	0.020	41.2	7.6	7.7	282	38
	UNSAT-CL5 (30")	2.0	-	1.0	15.2	2.9	2.7	0.228	12.3	6.8	7.8	280	24
Group B Recirculating	UNSAT-SA2 (30")	2.2	17.3	4.0	30.8	2.9	2.6	0.255	28.0	6.9	6.8	128	21
	UNSAT-EC4 (30")	2.0	14.3	2.2	34.5	2.4	2.4	0.015	32.1	7.9	7.1	137	8
	UNSAT-CL2 (15")	2.2	21.0	2.3	35.3	2.6	2.6	0.010	32.7	6.0	7.3	163	251
	UNSAT-CL4 (30")	2.0	13.3	2.5	33.0	4.0	4.0	0.010	29.0	8.1	7.4	192	7

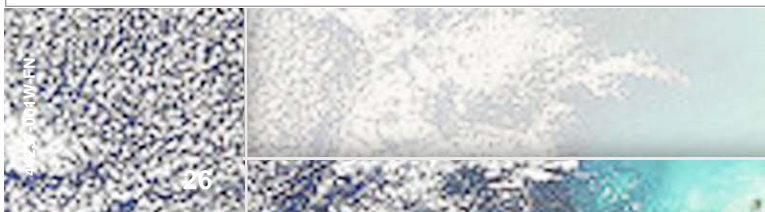
# Group A

## Stage 1 (unsaturated) single pass biofilters

### Nitrogen time series



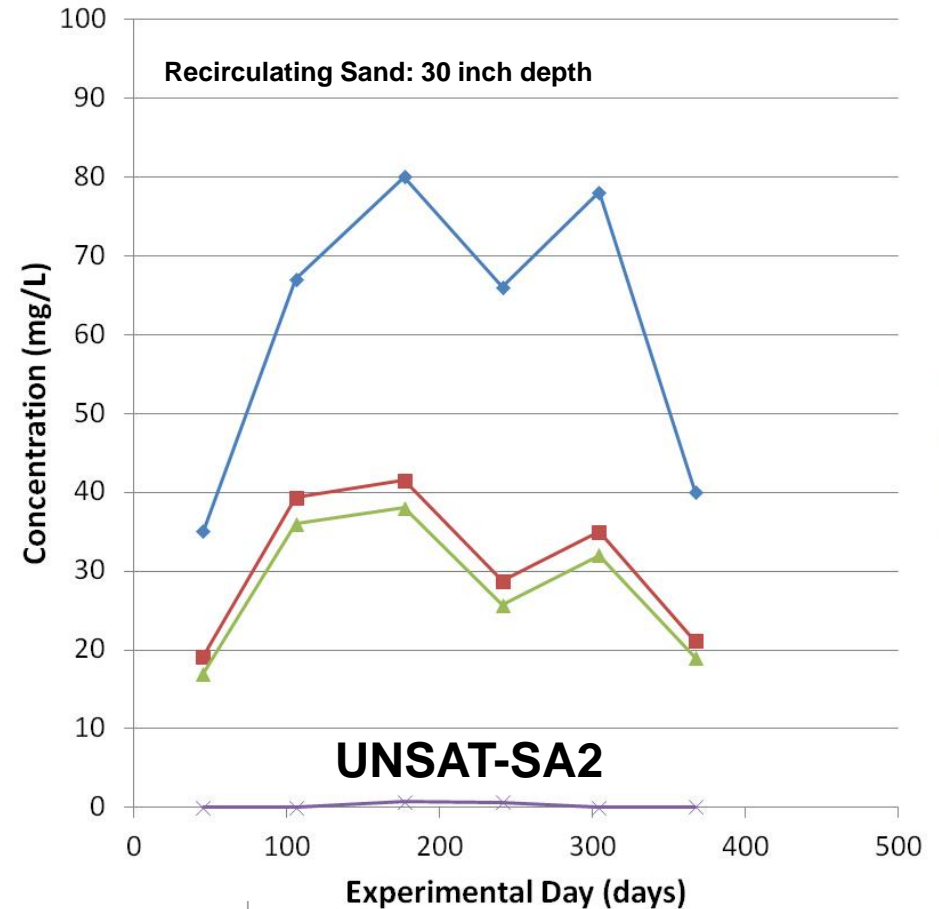
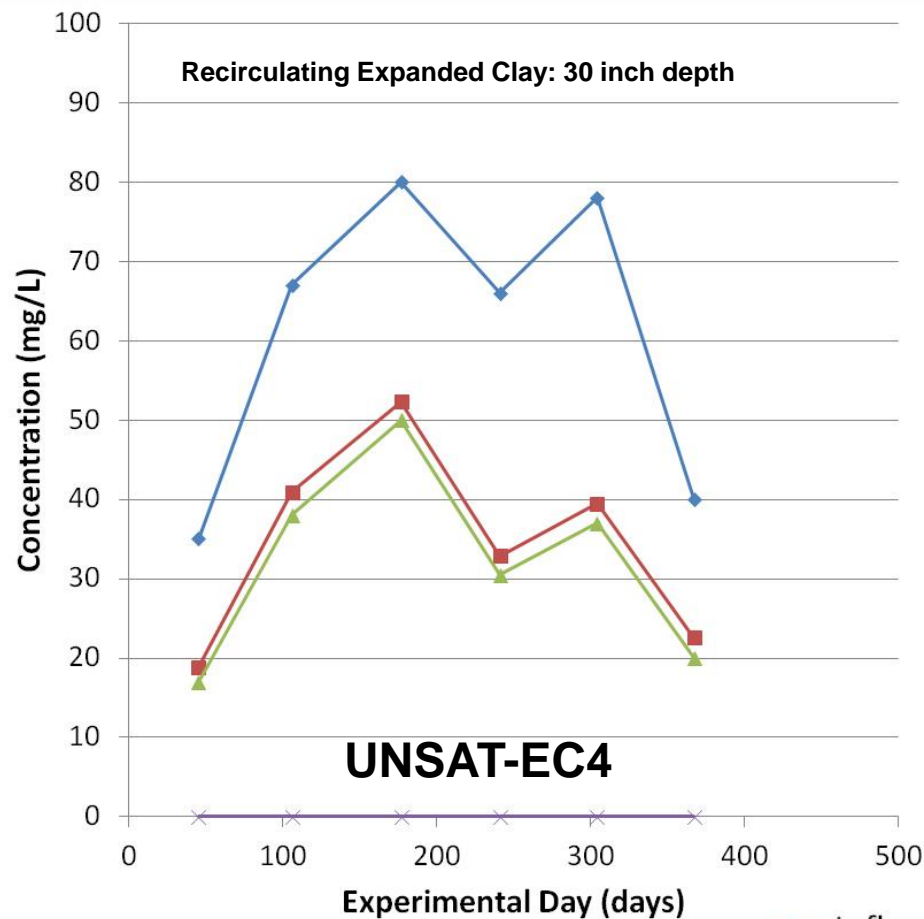
◆ Influent (STE) TN  
 ■ Effluent TN  
 ▲ Effluent (NO3+NO2)-N  
 ✕ Effluent NH3-N



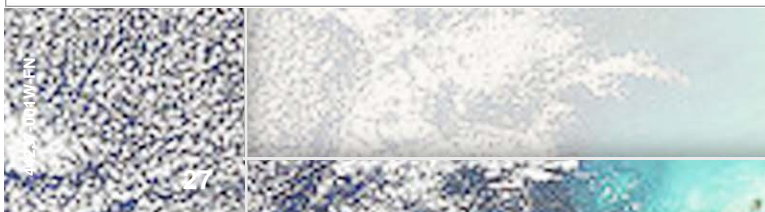
# Group B

## Stage 1 (Unsaturated) recirculating biofilters

### Nitrogen time series



- ◆— Influent (STE) TN
- Effluent TN
- ▲— Effluent (NO3+NO2)-N
- ×— Effluent NH3-N

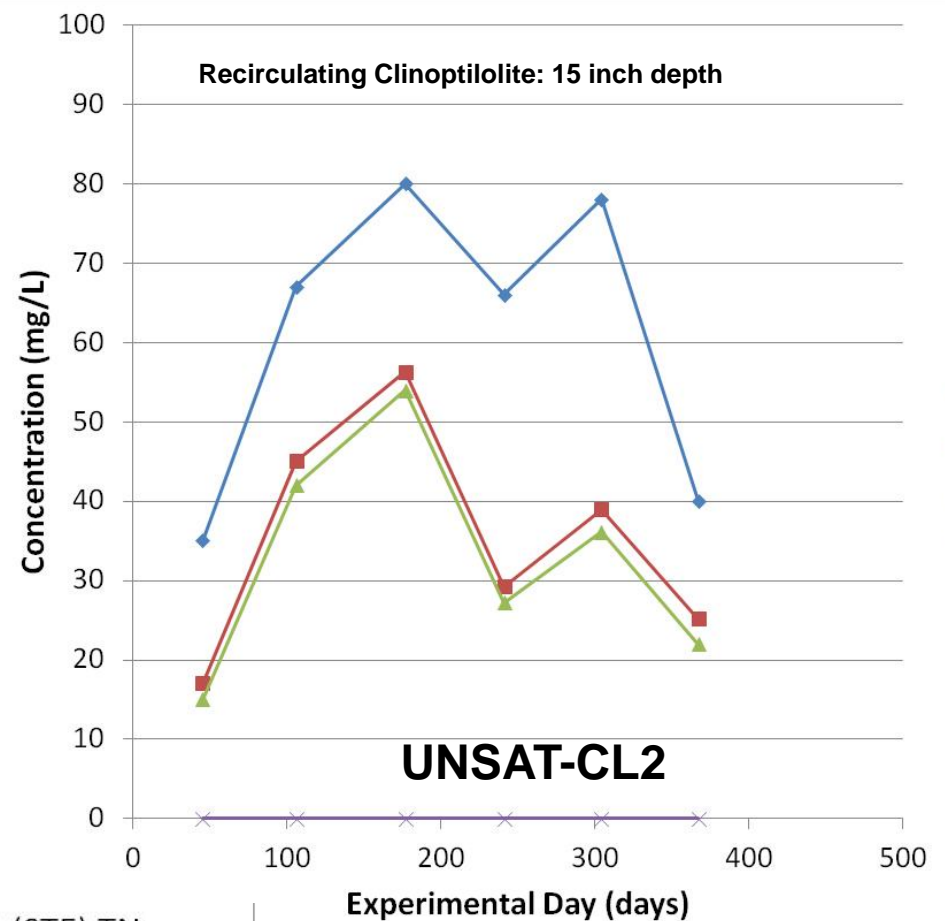
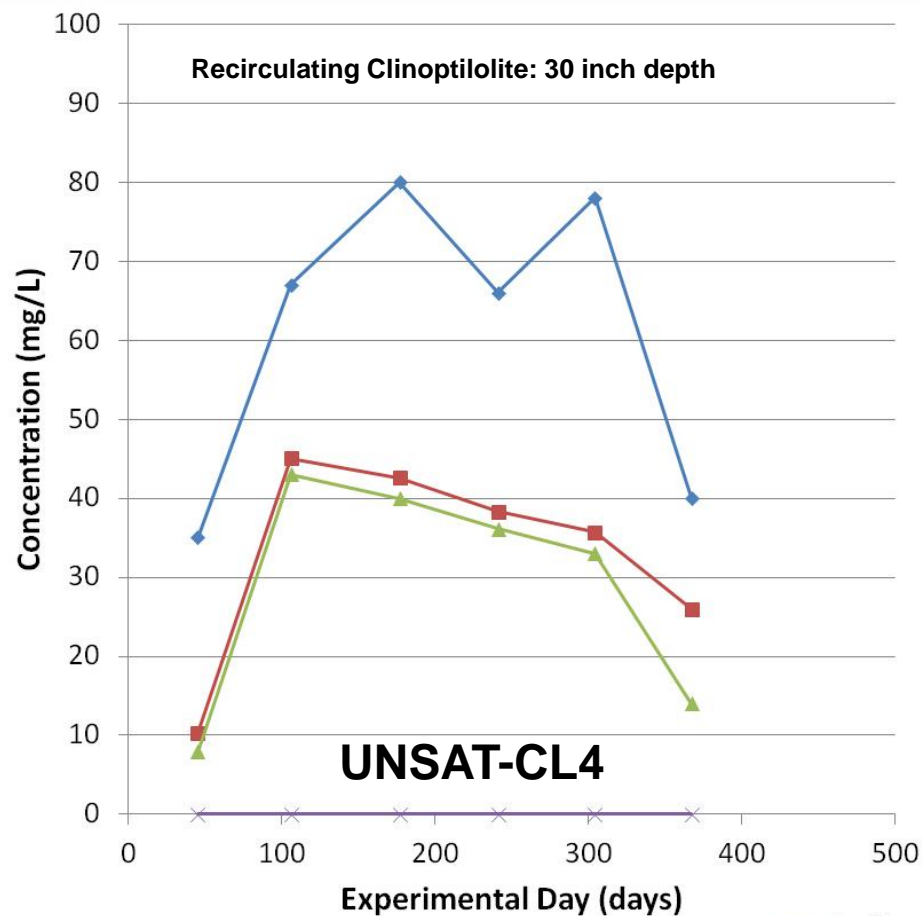




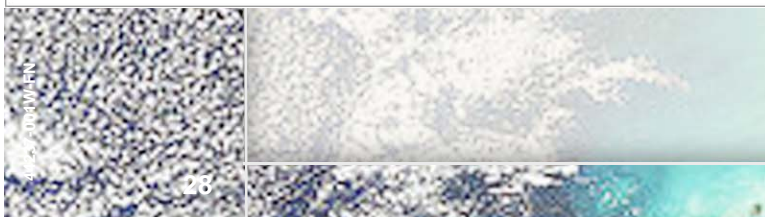
# Group B

## Stage 1 (unsaturated) recirculating biofilters

### Nitrogen time series



- ◆— Influent (STE) TN
- Effluent TN
- ▲— Effluent (NO3+NO2)-N
- ×— Effluent NH3-N

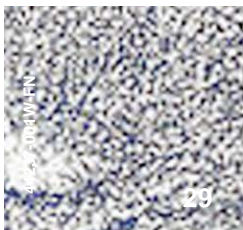
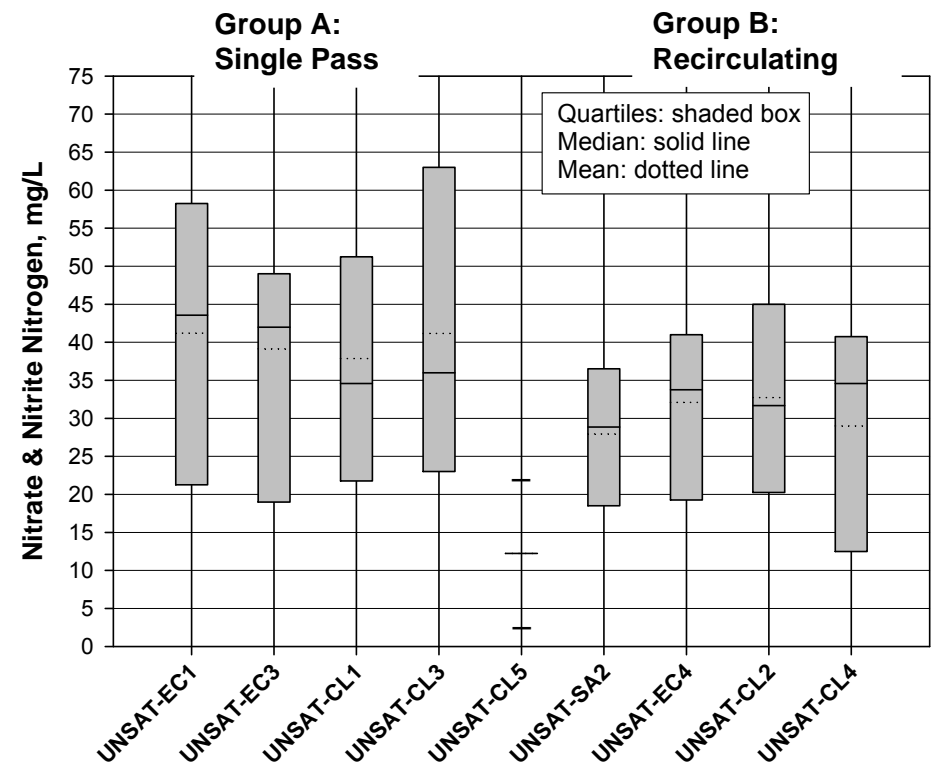
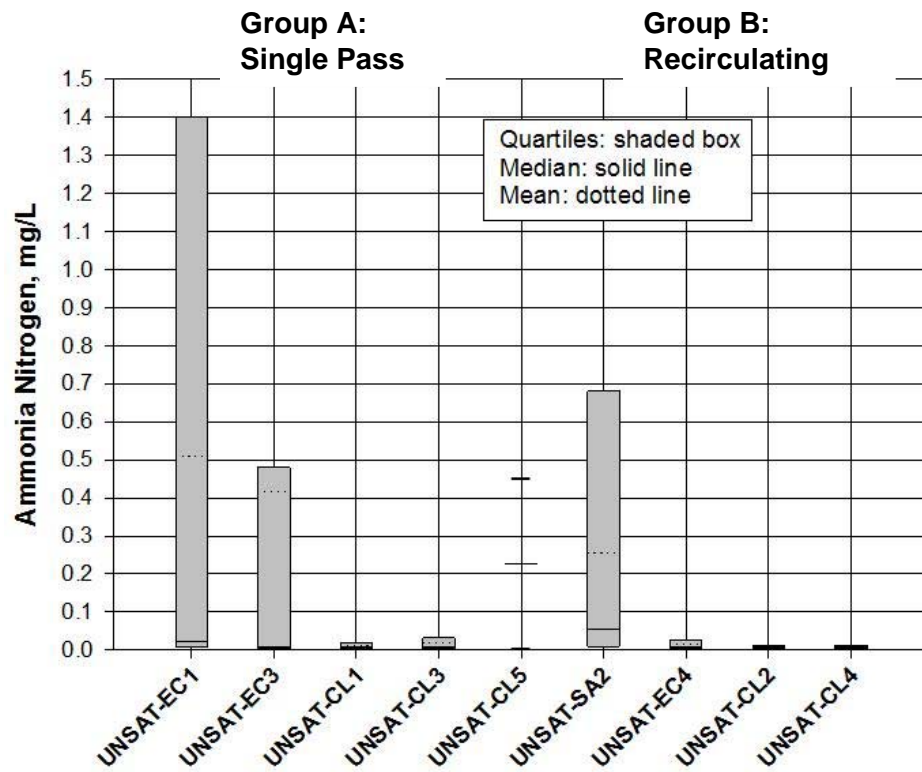




# Groups A and B

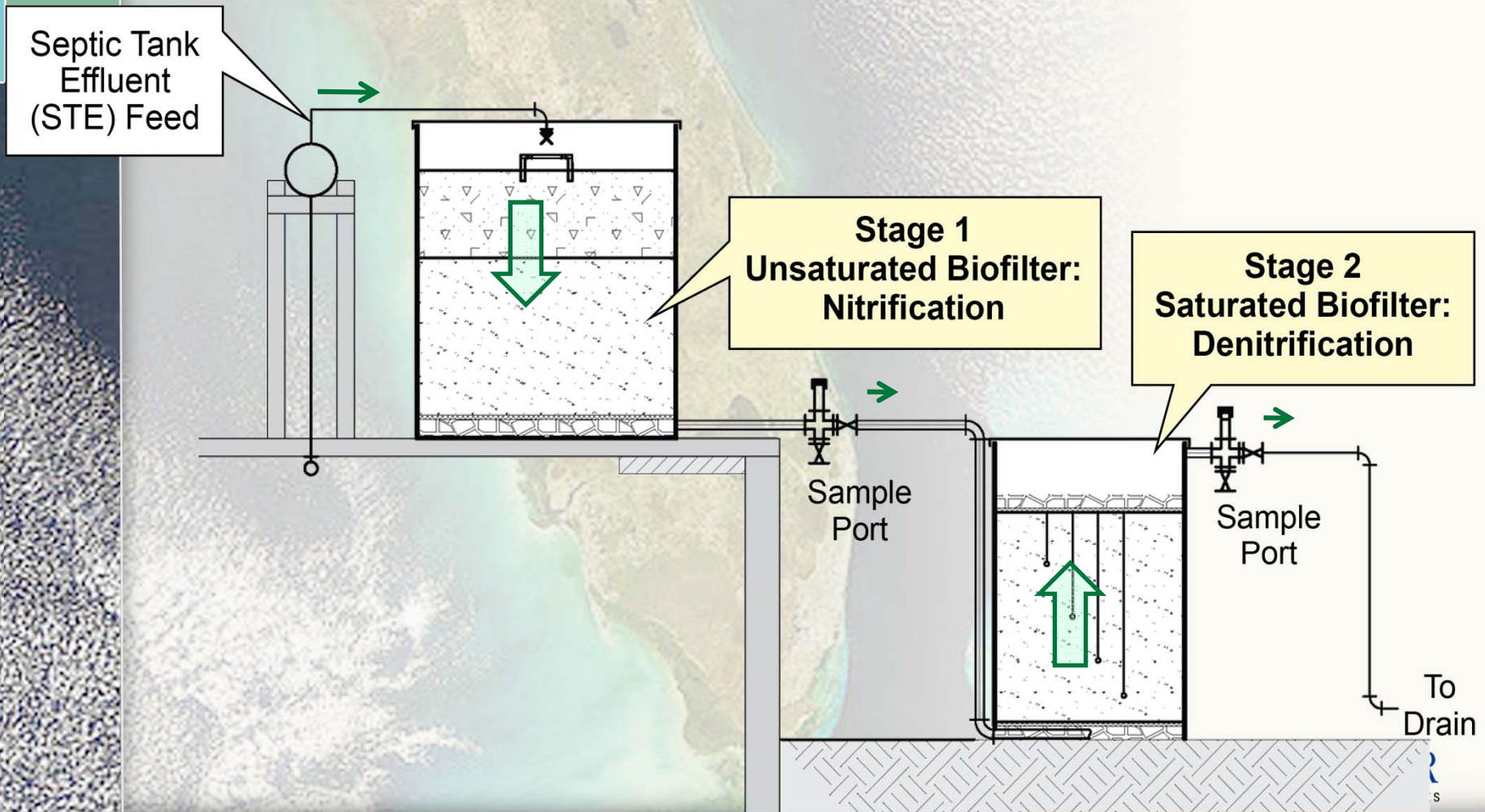
## Stage 1 (unsaturated) biofilters

### Effluent nitrogen: box and whisker plots



# Group A

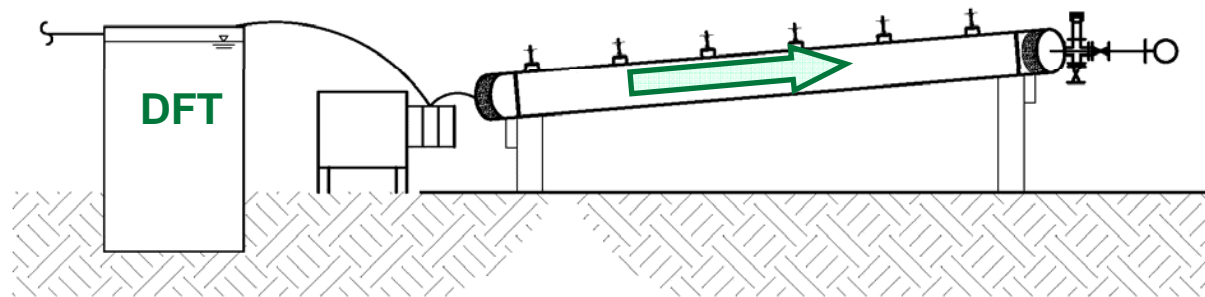
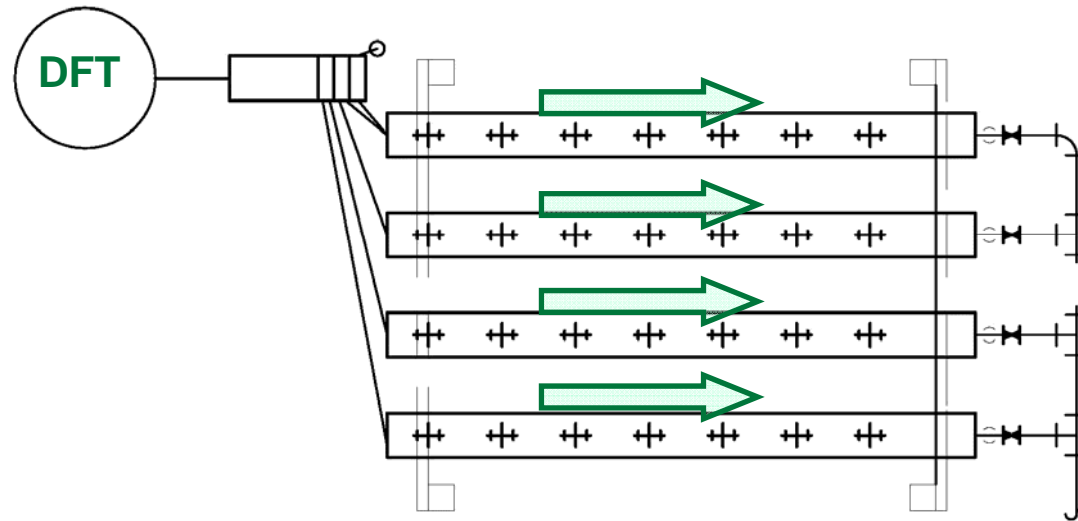
## Two stage single pass biofilter schematic





# Group C

## Horizontal Stage 2 biofilters schematic



# Groups A and C

## Stage 2 (saturated) biofilters

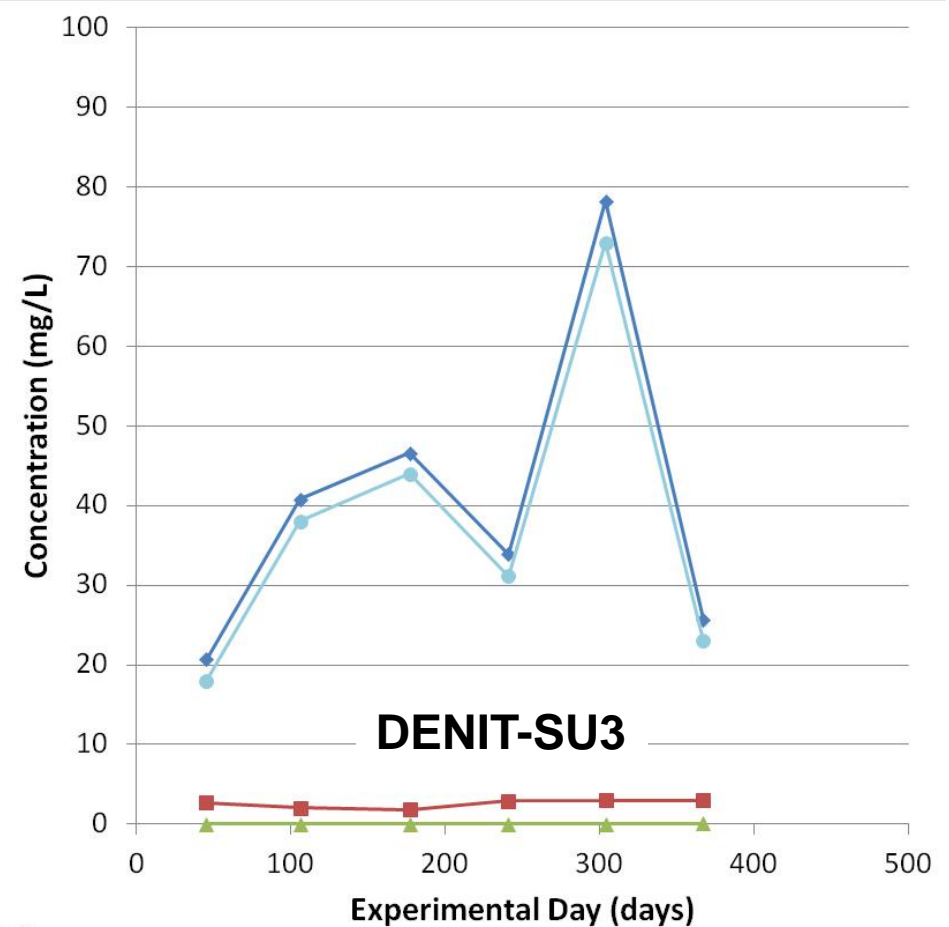
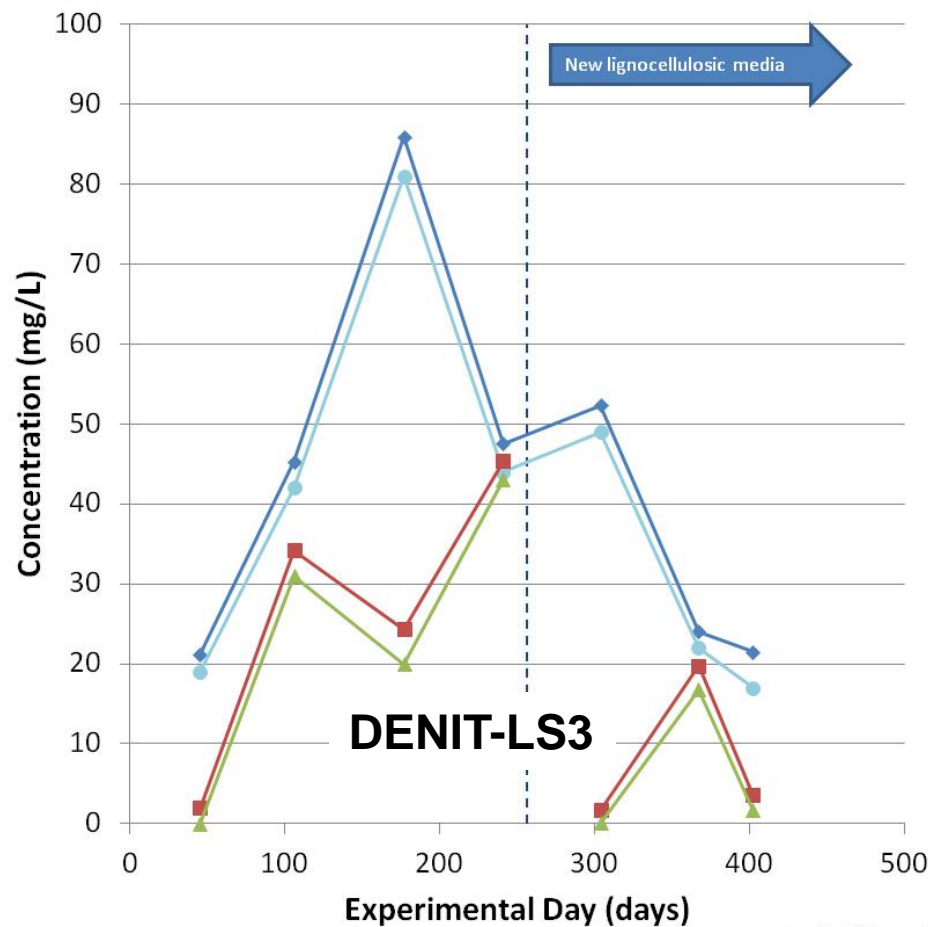
### Mean effluent values

Biofilter	C-BOD <sub>5</sub>	COD	TSS	TN	TKN	Organic N	NH <sub>3</sub> -N	(NO <sub>3</sub> +NO <sub>2</sub> ) - N	Dissolved Oxygen	pH	Total Alkalinity	Fecal coliform, cfu/100 ml
DENIT-SU4	2.0	21.7	2.8	1.3	1.2	0.9	0.32	0.075	2.3	7.1	220	89
DENIT-LS3	61.0	320	1.5	8.3	2.2	1.3	0.87	6.18	2.2	7.1	355	1
DENIT-SU3	6.0	38.5	6.2	2.6	2.6	1.4	1.14	0.047	1.4	7.1	235	3
DENIT-LS2	2.0	39.0	3.0	17.3	3.1	2.4	0.62	14.2	3.6	7.9	197	0
DENIT-LS4	4.5	90.0	7.5	5.9	5.6	0.9	4.71	0.22	1.3	7.8	315	1
DENIT-SU1	13.3	45.0	1.5	2.5	2.4	1.1	1.35	0.11	0.6	7.0	223	3
DENIT-SU2	8.5	29.7	3.5	1.6	1.6	1.0	0.58	0.035	0.6	7.0	215	2
DENIT-LS1	89.5	320	13.0	10.0	10.0	9.7	0.27	0.020	0.1	7.2	270	1
DENIT-GL1	148	257	18.5	3.8	3.8	0.63	3.12	0.07	0.59	6.94	402	600

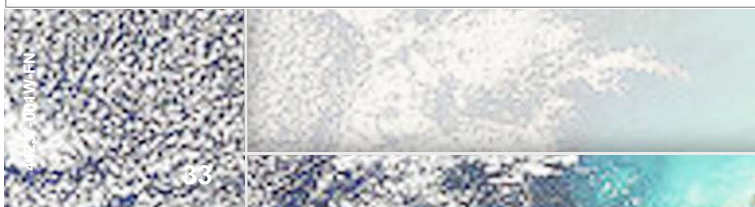
# Group A

## Stage 2 (saturated) upflow single pass biofilters

### Nitrogen time series



- ◆ Influent TN
- Influent (NO<sub>3</sub>+NO<sub>2</sub>)-N
- Effluent TN
- ▲ Effluent (NO<sub>3</sub>+NO<sub>2</sub>)-N

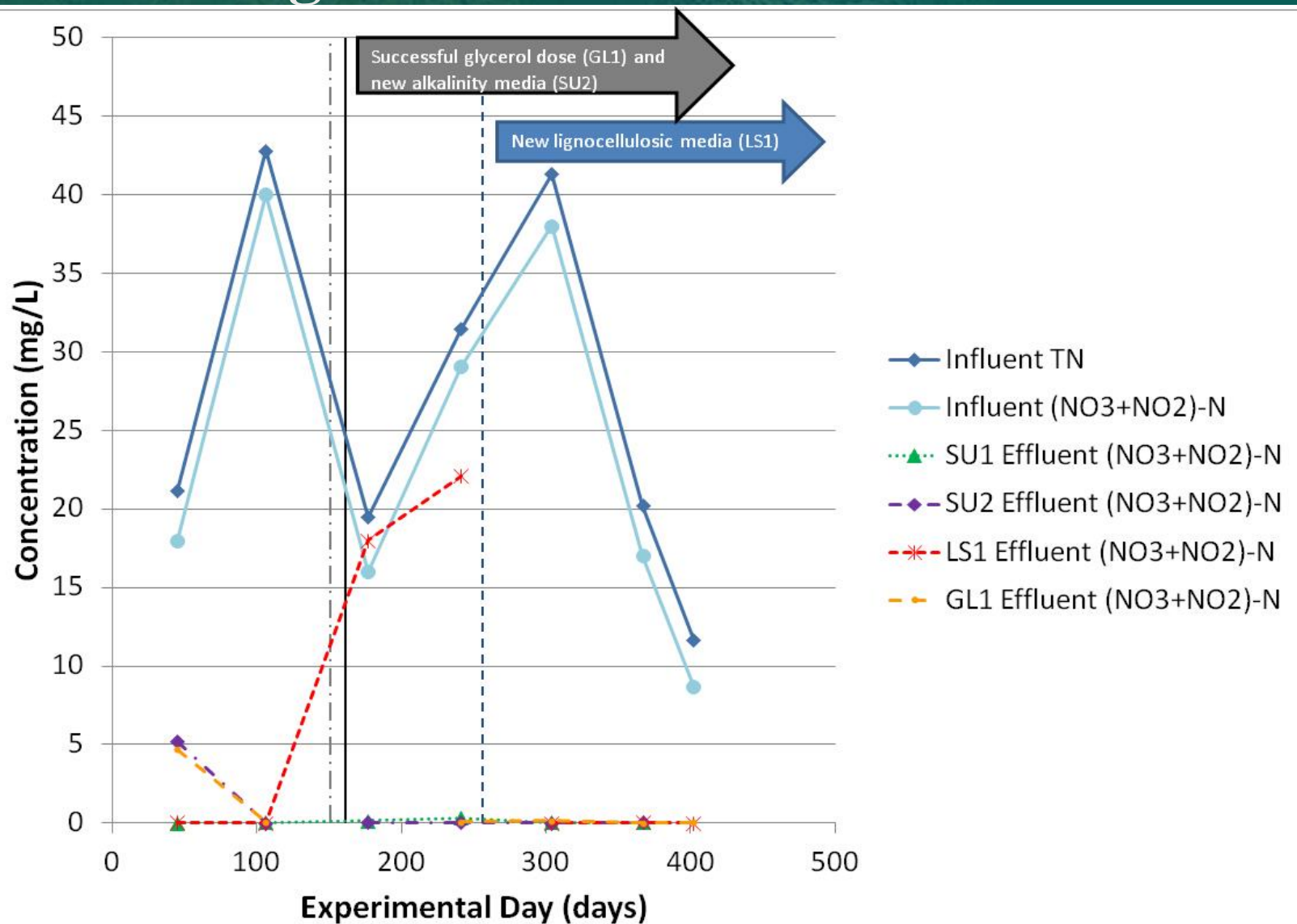




# Group C

## Stage 2 (saturated) horizontal biofilters

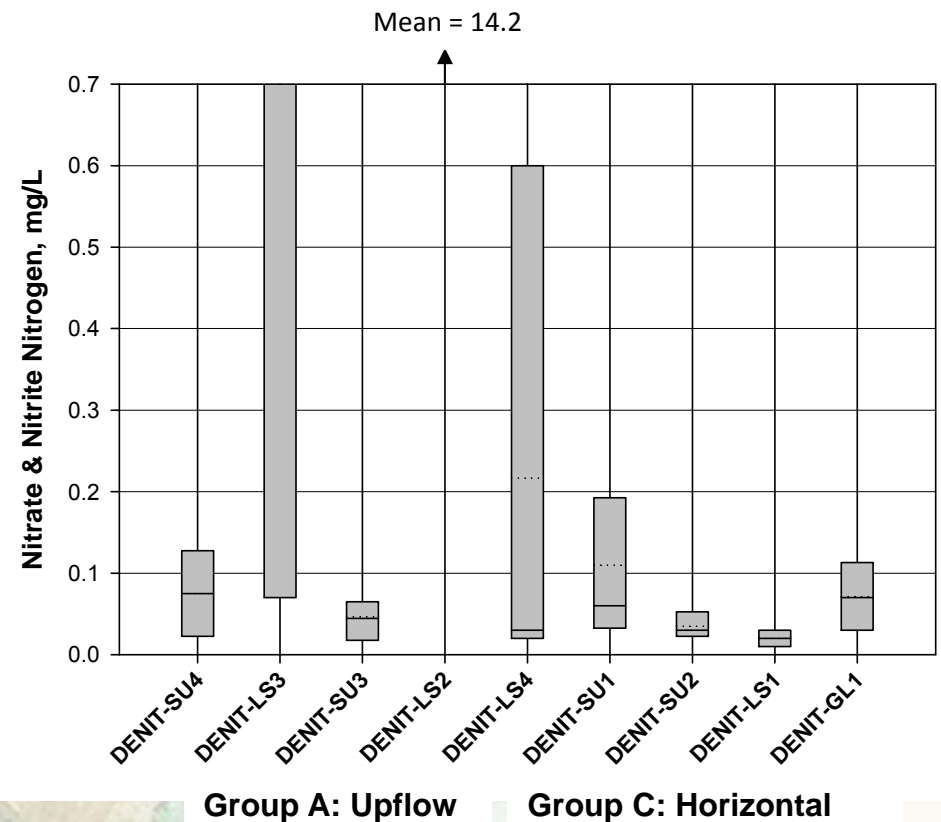
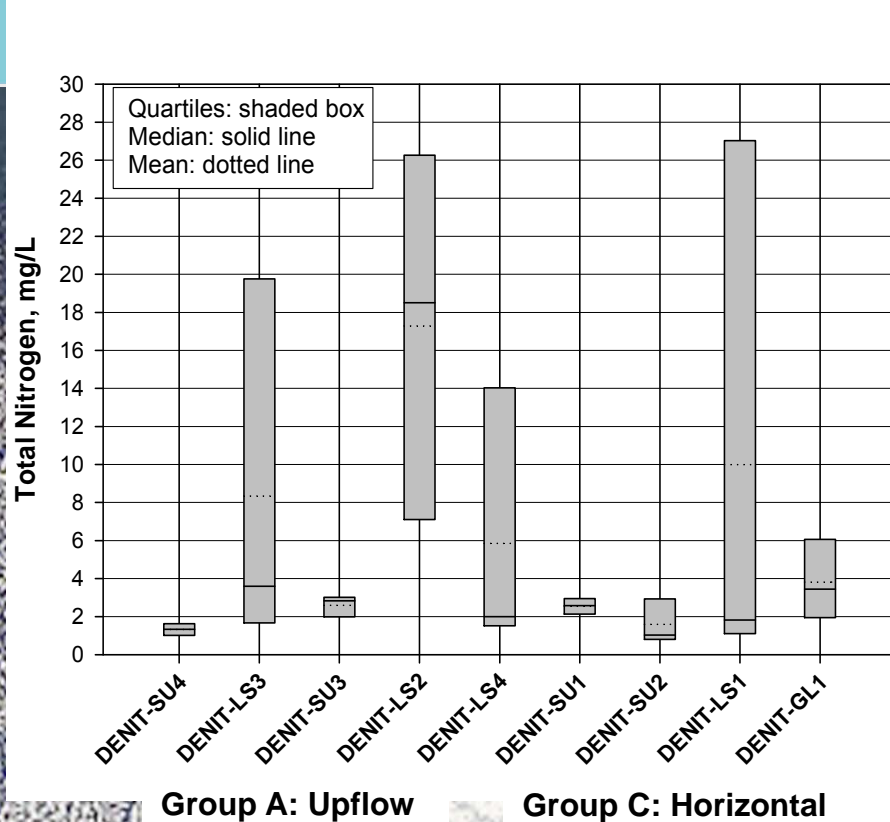
### Nitrate-nitrogen time series



# Groups A and C

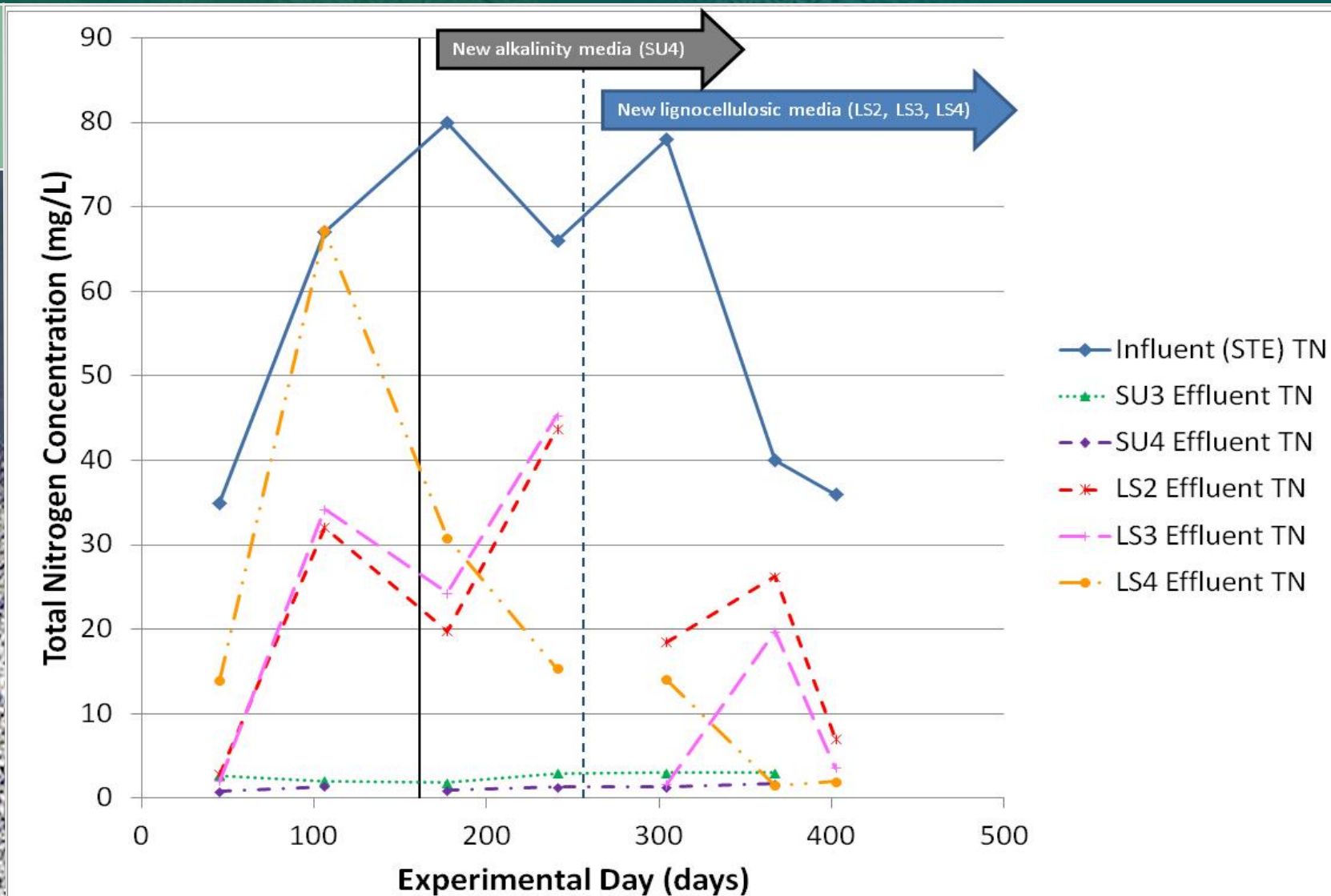
## Stage 2 (saturated) biofilters

### Effluent nitrogen: box and whisker plots



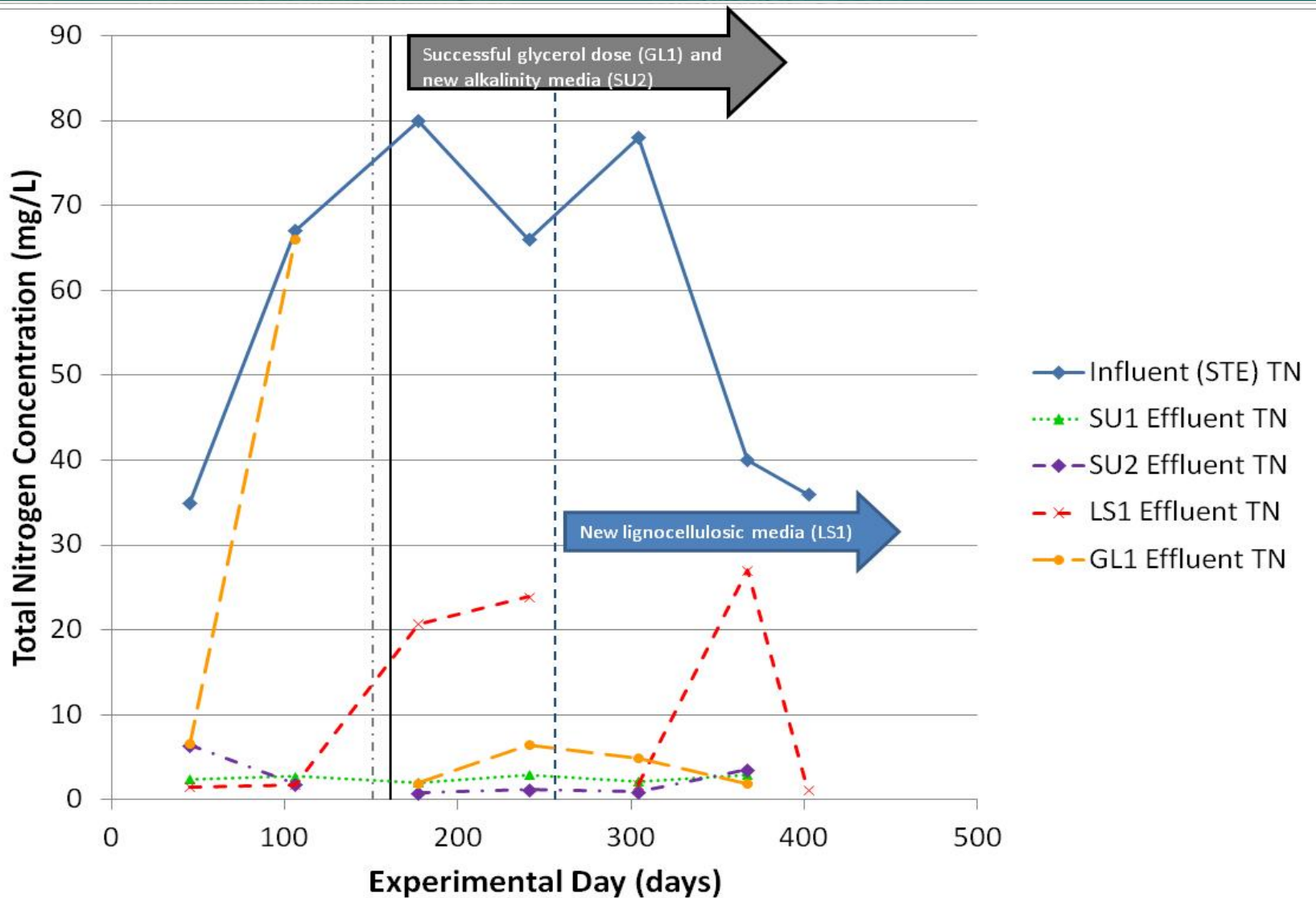
# Group A single pass systems

## Two-stage system: total nitrogen removal



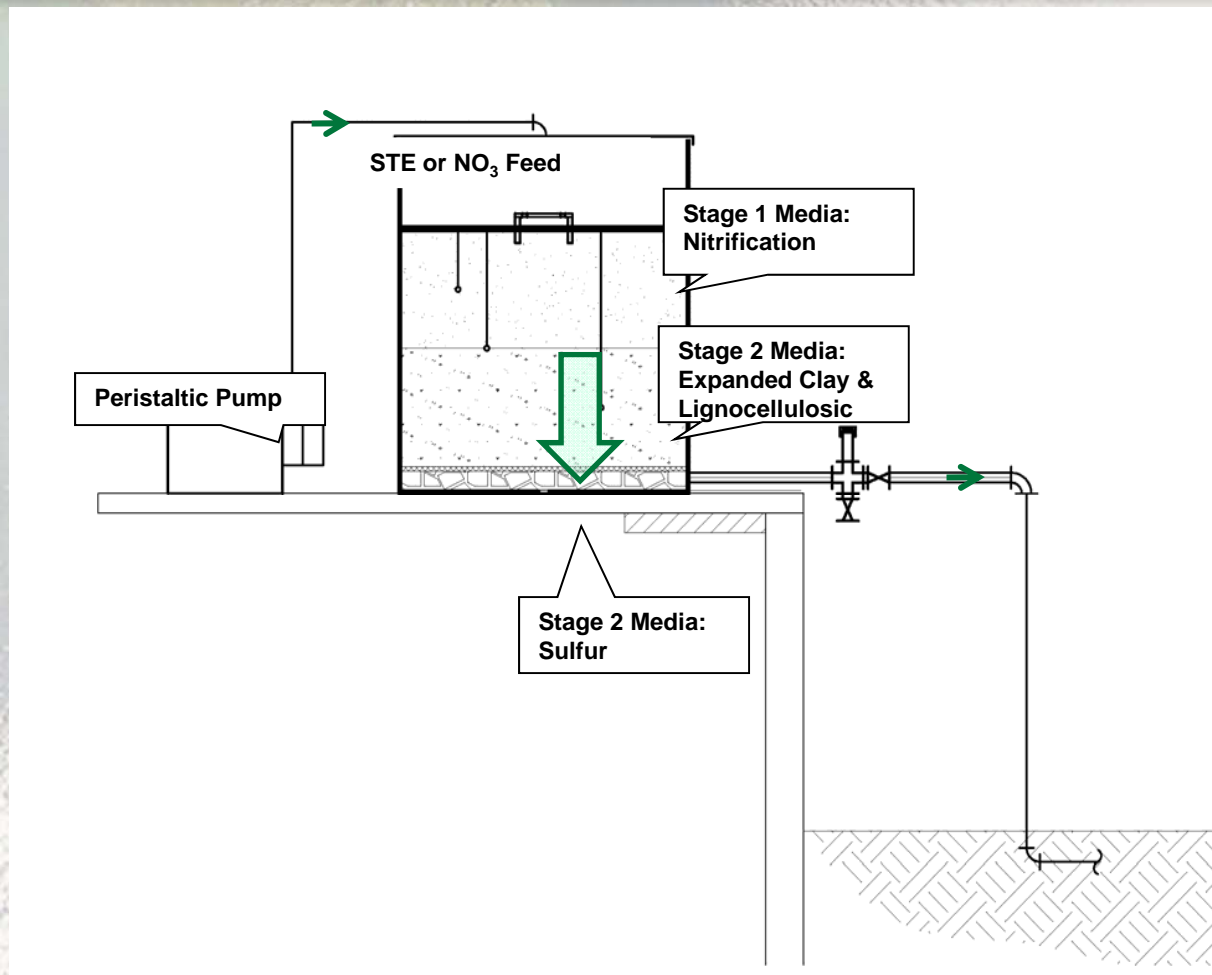


# Groups B (recirculating) and C (horizontal) Two-stage system: total nitrogen removal



# Group D

## Stacked saturated/unsaturated (*in situ*) biofilter schematic



# Group D

## Stacked saturated/unsaturated (*in situ*) biofilters

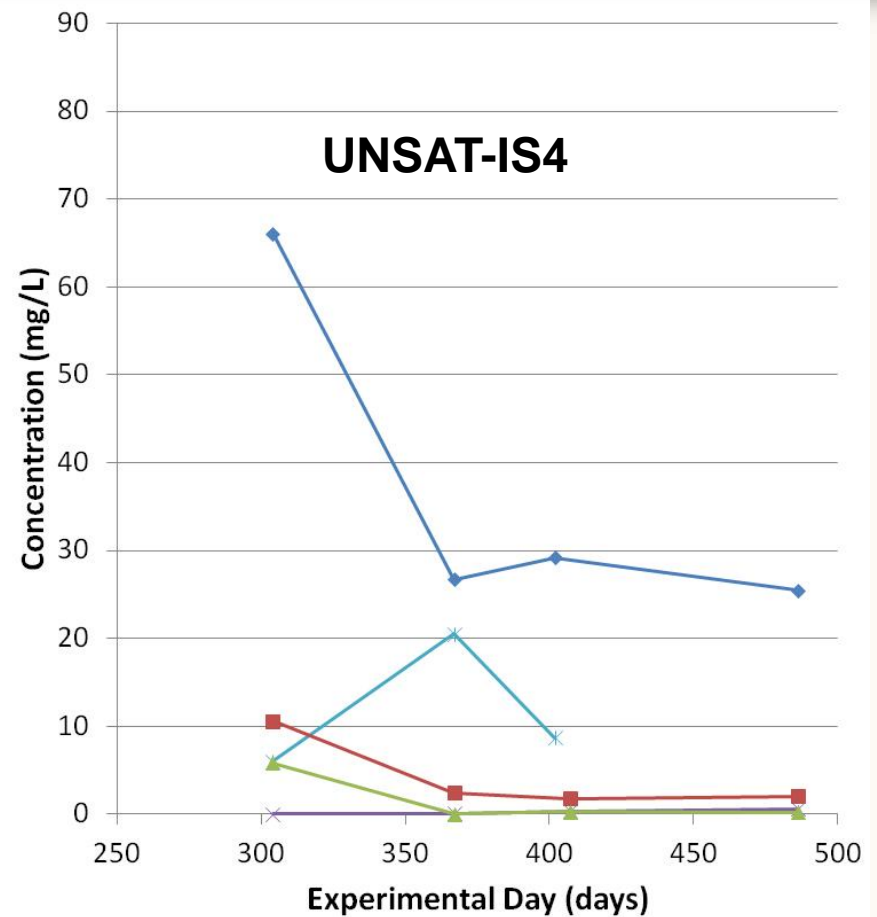
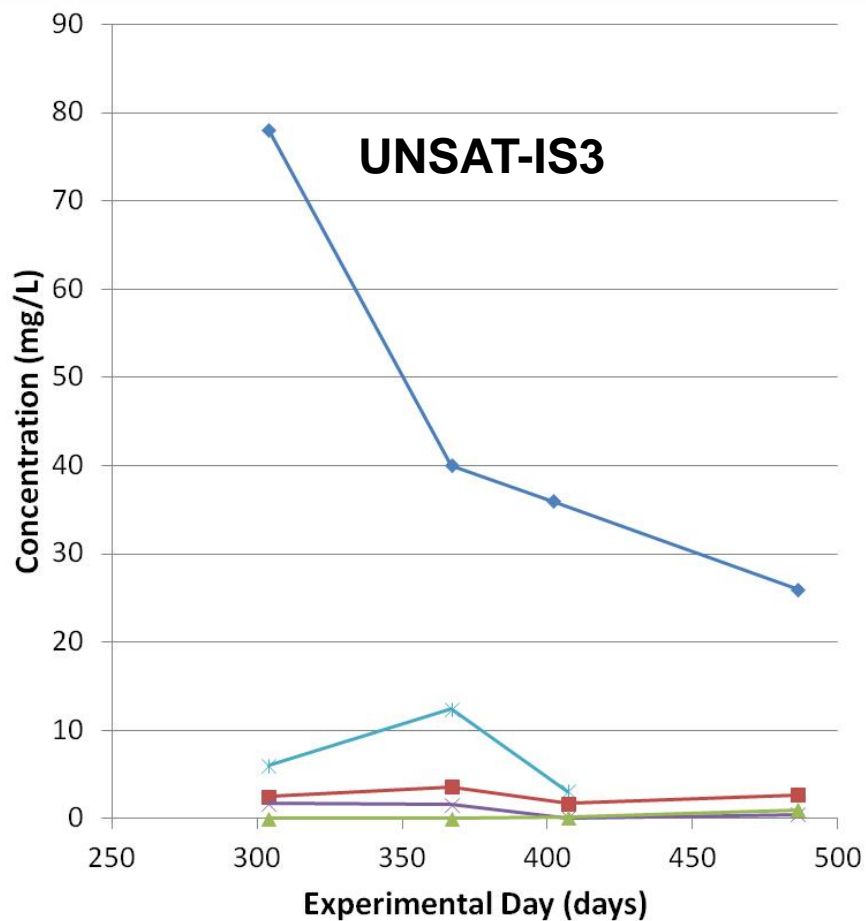
Biofilter	Influent	Sample Location	C-BOD <sub>5</sub>	COD	TSS	TN	TKN	Organic N	NH <sub>3</sub> -N	(NO <sub>3</sub> +NO <sub>2</sub> ) - N	Dissolved Oxygen	pH	Total Alkalinity	Fecal coliform, cfu/100 ml
UNSAT-IS1 (12"SA, 12"EC&LS, 4"SU)	Primary Effluent	Final Effluent	62	240	5.0	22.9	20.6	3.6	17.0	2.2	4.1	7.1	320	1
UNSAT-IS2 (12"SA, 12"EC&LS, 4"SU)	Primary Effluent	Above Sulfur	13	63	2.0	35.4	4.7	1.6	3.10	30.7	1.0	6.4	69	-
		Final Effluent	11	82	8.5	24.5	11.4	4.3	7.05	13.1	5.0	7.2	255	19
UNSAT-IS3 (12"CL, 12"EC&LS, 4"SU)	Primary Effluent	Above Sulfur	2.5	120	3.0	13.3	3.4	3.1	0.23	9.9	3.3	7.1	455	1
		Final Effluent	4.5	96	4.5	2.6	2.4	1.4	0.98	1.1	5.0	7.3	385	9
UNSAT-IS4 (12"SA, 12"EC&LS, 4"SU)	Nitrified Effluent (UNSAT-CL3)	Above Sulfur	6.0	80	12	12.0	2.9	2.5	0.37	9.1	2.1	7.0	325	1
		Final Effluent	24	88	39	2.6	2.4	1.4	0.98	1.1	1.2	6.8	495	7



# Group D

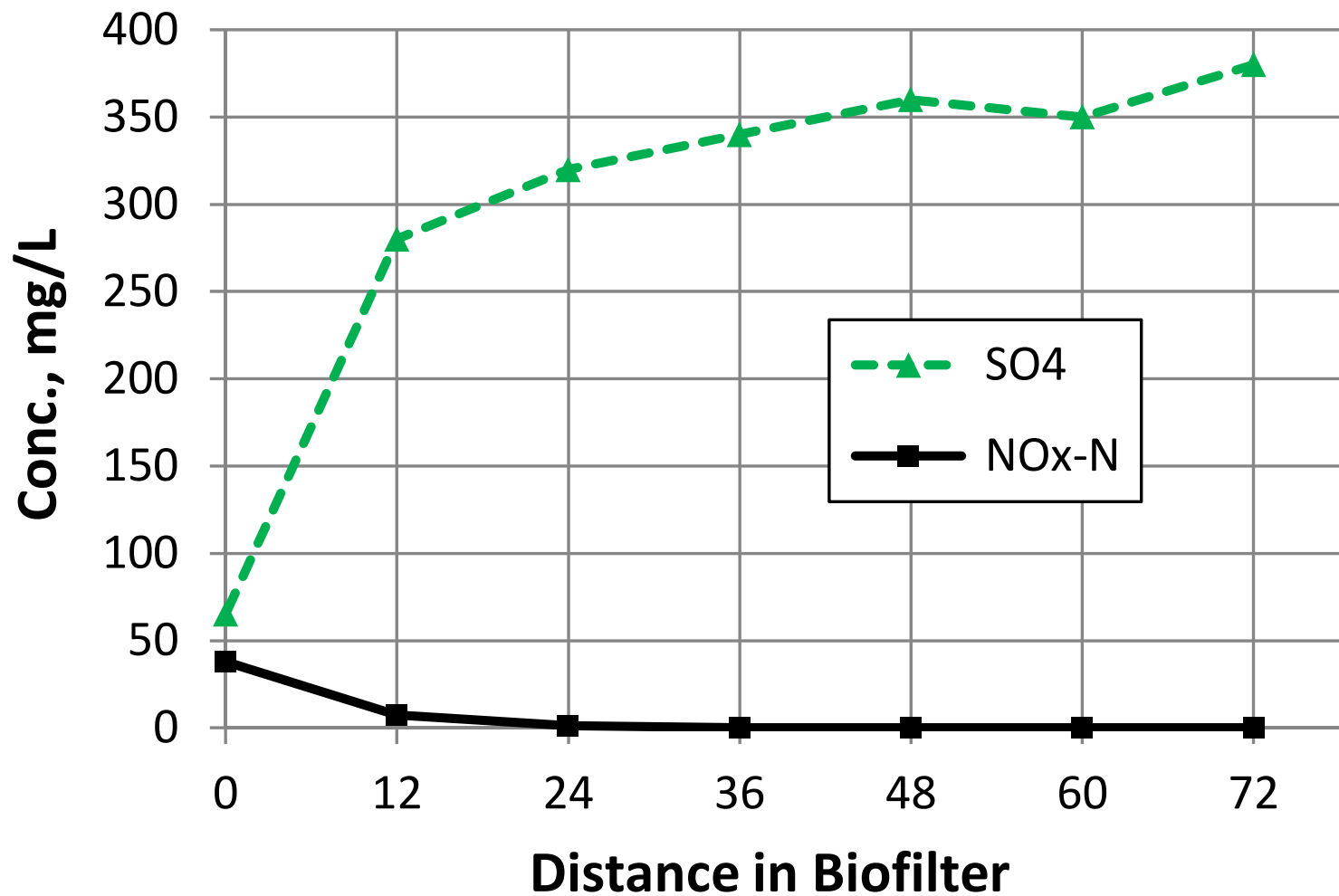
## Stacked saturated/unsaturated biofilters

### Nitrogen time series



- ◆ Influent TN
- ✱ Above Sulfur (NO<sub>3</sub>+NO<sub>2</sub>)-N
- Effluent TN
- ✕ Effluent NH<sub>3</sub>-N
- ▲ Effluent (NO<sub>3</sub>+NO<sub>2</sub>)-N

# Solute profile in DENIT-SU2 experimental day 305





# Group A – Stage 1 single pass biofilters increased hydraulic loading rate





# Group B – Stage 1 recirculating biofilters increased hydraulic loading rate





# Next Steps

# Preliminary guidance recommendations for full-scale testing of passive systems

## Unsaturated Recycle (Stage 1)

Media	Hydraulic Loading Rate, gal/ft <sup>2</sup> -day	Total Media Depth, inch	Media Stratification and Particle Size Distribution		
			Layer	Depth, inch	Particle Size Spec, mm
Expanded Clay	≤ 3.0	≥ 24	Upper	≥ 8	≥1.53
			Lower	≥ 16	<1.53
Clinoptilolite	≤ 3.0	≥ 24	Upper	≥ 8	≥ 1.4 - 2.3
			Lower	≥ 16	0.5 - 1.5
Sand	≤ 3.0	≥ 24	Upper	≥ 8	E.S. ≥ 0.8-1.2 U.C. ≤ 4
			Lower	≥ 16	E.S. 0.45 - 0.55 U.C. ≤ 4

## Unsaturated Single Pass (Stage 1)

Media	Forward Flow Hydraulic Loading Rate, gal/ft <sup>2</sup> -day	Total Media Depth, inch	Media Stratification and Particle Size Distribution		
			Layer	Depth, inch	Particle Size Spec, mm
Expanded Clay	≤ 3.0	≥ 24	Upper	≥ 8	≥1.53
			Lower	≥ 16	<1.53
Clinoptilolite	≤ 3.0	≥ 24	Upper	≥ 8	≥ 1.4 - 2.3
			Lower	≥ 16	0.5 - 1.5

## Saturated (Stage 2)

Media	%	Total Media Depth, inch	Empty Bed Residence Time, hour	Media Particle Size Distribution
				Particle Size Spec, mm
Elemental Sulfur	≥ 50	≥ 24	≥ 30	2.0 - 3.36 <0.5% fines
Limestone or oyster shell	0-20 <sup>1</sup>			0.5 - 5
Lignocellulosic media (SYP)	80-100	≥ 24	≥ 120	1 - 30



# B-HS2 construction photos





Questions?



# FOSNRS Project Status

**RRAC Meeting Presentation**  
**September 11, 2013**



**OTIS**  
**ENVIRONMENTAL**  
**CONSULTANTS**



# Task A Deliverables

Task	Completed	Remaining
A.1 Draft Lit Review	√	
A.2 Final Lit Review	√	
A.3 Draft Classification of Tech	√	
A.4 Draft Tech Ranking Criteria	√	
A.5 Draft Priority List for Testing	√	
A.6 Tech Class., Ranking & Prioritization Workshop	√	
A.7 Final Classification of Tech	√	
A.8 Final Tech Ranking Criteria	√	
A.9 Final Priority List for Testing	√	
A.10 Draft Innovative Systems Application		1
A.11 Final Innovative Systems Application		1
A.12 Identification of Test Facility Sites	√	
A.13 Draft QAPP PNRS II	√	
A.14 Recommendation for Process Forward	√	
A.15 Final QAPP PNRS II	√	
A.16 Materials Testing for FDOH Additives Rule	√	
A.17 PNRS II Specification Reports	√	

# Task A (continued)

Task	Completed	Remaining
A.18 PNRS II Test Facility Design 50%	√	
A.19 PNRS II Test Facility Design 100%	√	
A.20 PNRS II Test Facility Construction Support & Admin	√	
A.21 PNRS II Test Facility Construction 50%	√	
A.22 PNRS II Test Facility Construction 100%	√	
A.23 PNRS II Test Facility Construction Sub. Completion	√	
A.24 PNRS II Test Facility Accept Construction	√	
A.25 Monitoring and Sample Event Reports	√	
A.26 Data Summary Report	√	
A.27 Draft PNRS II Report	√	
A.28 Final PNRS II Report		1
A.29 Draft Task A Final Report		1
A.30 Task A Final Report		1
A.31 Change-order Allowance	70%	30%

# Task B Deliverables

Task	Completed	Remaining
B.1 Identification of Home Sites	√	
B.2 Vendor Agreement Report	1	1
B.3 Draft QAPP for Field Testing	√	
B.4 Recommendation for Process Forward	√	
B.5 Final QAPP for Field Testing	√	
B.6 Field System Installation Report	5	2
B.7 Field System Monitoring Report	12	44
B.8 Field System Op., Maintenance & Repairs Report		7
B.9 Technical Description of Nitrogen Reduction Tech. Report		1
B.10 Acceptance of System by Owner Report		7
B.11 Draft LCAA Template Report		1
B.12 Final LCCA Template Report		1
B.13 LCCA Report (per system)		7
B.14 Draft Task B Final Report		1
B.15 Task B Final Report		1
B.16 Change-order Allowance	50%	50%



# Task C Deliverables

Task	Completed	Remaining
C.1 Draft Literature Review on N Reduction in Soil	√	
C.2 Final Literature Review on N Reduction in Soil	√	
C.3 Draft QAPP Eval. of N Red. by Soils & Shallow GW	√	
C.4 Recommendation for Process Forward	√	
C.5 Final QAPP Eval. of N Red. by Soils & Shallow GW	√	
C.6 S&GW Test Facility Design 50%	√	
C.7 S&GW Test Facility Design 100%	√	
C.8 S&GW Test Facility Design Final	√	
C.9 S&GW Construction Support & Admin.	√	
C.10 S&GW Test Facility Construction 50%	√	
C.11 S&GW Test Facility Construction 100%	√	
C.12 S&GW Test Facility Con. Substantial Completion	√	
C.13 S&GW Test Facility Accept Construction	√	
C.14 Soils & Hydrogeologic & Monitoring Plan for S&GW	50%	50%
C.15 Tracer Testing at GCREC	2	1
C.16 S&GW Sample Event Reports	√	

# Task C (continued)

Task	Completed	Remaining
C.17 S&GW Data Summary Report	5	1
C.18 Test Facility Closeout Report		1
C.19 Field Site Selection	√	
C.20 Instrumentation of GCREC Mound System	√	
C.21 GCREC Mound Sample Event Report	√	
C.22 GCREC Mound Data Summary Report	√	
C.23 Instrumentation of Remaining Field Sites Report	√	
C.24 Field Sites Sample Event Reports	11	2
C.25 Field Sites Data Summary Report	11	2
C.26 Draft Site Summary and Close-Out Report	1	4
C.27 Final Site Close-Out Report	1	4
C.28 Draft Task C Final Report		1
C.29 Task C Final Report		1
C.30 Change-order Allowance	0	100%

# Task D Deliverables

Task	Completed	Remaining
D.1 Draft Lit Review on N Fate & Transport Model	√	
D.2 Final Lit Review on N Fate & Transport Model	√	
D.3 Selection of Existing Data Set for Calibration	√	
D.4 Draft QAPP N Fate & Transport Models	√	
D.5 Recommendation for Process Forward	√	
D.6 Final QAPP N Fate & Transport Models	√	
D.7 Simple Soil Tools	70%	30%
D.8 Complex Soil Model	80%	20%
D.9 Complex Soil Model Performance Evaluation		1
D.10 Validate/Refine Complex Soil Model		1
D.11 Aquifer Model Combined with Complex Soil Model Development	50%	50%
D.12 Aquifer-Complex Soil Model Performance Evaluation		1
D.13 Validate/Refine Aquifer-Complex Soil Model w/ Data Collection from Task C		1
D.14 Dev. of Aquifer-Complex Soil Model for Multiple Spatial Inputs		1
D.15 Decision-Making Framework Considering Uncertainty		1
D.16 Task D Guidance Manual (Draft)		1
D.17 Task D Guidance Manual (Final)		1
D.18 Change-order Allowance		100%



# Task E Deliverables

Task	Completed	Remaining
E.1 Project Kick-Off Meeting	√	
E.2 PM – Project Progress Reports	20	3
E.3 RRAC or TRAP Presentation	5	3
E.4 RRAC or TRAP Meeting Attendance	3	5
E.5 PAC Meeting		1

Questions?