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

DATE AND TIME: **January 4, 2012 at 10:00 a.m. ET**

PLACE: Florida Department of Health Southwood Complex
4042 Bald Cypress Way, Room #240P
Tallahassee, FL 32399

Or via conference call / web conference:
Toll free call in number: 1-888-808-6959
Conference code: 7427896255
Website: http://connectpro22543231.na5.acrobat.com/rrac/

This meeting is open to the public

AGENDA: FINAL

1. Introductions and Housekeeping
2. Review Minutes of Meeting November 15, 2011
3. Nitrogen Study Update
4. Update on 319 Grant: Performance of Advanced Onsite Sewage Treatment and Disposal Systems
5. Other Business
6. Public Comment
7. Closing Comments, Next Meeting, and Adjournment

Florida Department of Health
Research Review and Advisory Committee for the Bureau of Onsite Sewage Programs

Approved Minutes of the Meeting held at the Southwood Office Complex, Tallahassee, FL
January 4, 2012

In attendance:

- **Committee Members and Alternates:**
  - **In person:**
    - Craig Diamond (member, Environmental Interest Group)
    - Carl Ludecke (vice-chairman, member, Home Building Industry)
    - Bill Melton (member, Consumer)
    - Eanix Poole (alternate, Consumer)
  - **Via teleconference:**
    - Quentin (Bob) Beitel (alternate, Real Estate Profession)
    - Taylor Brown (alternate, Division of Environmental Health)
    - Wayne Crotty (member, Septic Tank Industry)
    - Susan McKinley (alternate, Restaurant Industry)
    - David Richardson (alternate, Local Government)
    - John Schert (member, State University System)
  - **Absent members and alternates:**
    - Paul Davis (member, Division of Environmental Health)
    - John Dryden (alternate, State University System)
    - Tom Higginbotham (alternate, Division of Environmental Health)
    - Bob Himschoot (alternate, Septic Tank Industry)
    - Kriss Kaye (alternate, Home Building Industry)
    - Tom Miller (member, Local Government)
    - Jim Peters (alternate, Professional Engineer)
    - Geoff Luebkemann (member, Restaurant Industry)
    - Clay Tappan (chairman, member, Professional Engineer)
- **Visitors:**
  - **Via teleconference:**
    - Damann Anderson (Hazen and Sawyer)
    - Josefin Hirst (Hazen and Sawyer)
    - Mary Howard (Seminole CHD)
    - Maria Pecoraro (Rep. Nelson)
    - Patti Sanzone (DEP)
    - Maurice Tobon
    - Pam Tucker
- **Department of Health (DOH), Bureau of Onsite Sewage Programs:**
  - **In person:**
    - Eberhard Roeder, Professional Engineer
    - Elke Ursin, Environmental Health Program Consultant

1. **Introductions** – Nine out of ten groups were present, representing a quorum. The group that was not represented was the Professional Engineers. Vice-Chairman Ludecke called the meeting to order at 10:05 a.m. Introductions were made and some housekeeping issues were discussed.

   Changes to the committee since the last meeting were that Craig Diamond is the new member for the Environmental Interest Group, Wayne Crotty is the new member and Bob Himschoot is now the alternate for the Septic Tank Industry, Paul Davis is the new member with Tom Higginbotham and Taylor Brown as the alternates for the Florida Department of Health, and Geoff Luebkemann is the new member with Susan McKinley as the alternate for the Restaurant Industry. Kim Dove, the Department of Health member, and Mike McInarnay, the Septic Tank Industry alternate have both left the committee and thank you letters have been sent from the Department of Health. Thank you letters from the RRAC were sent to Patti Sanzone and Sam Averett, per a motion at the last RRAC meeting.

2. **Review of previous meeting minutes** – The minutes of the November 15, 2011 meeting were reviewed.

   Motion by Bill Melton, seconded by Susan McKinley, to approve the minutes as presented. All were in favor, with Craig Diamond abstaining, and none opposed and the motion passed unanimously.

3. **Nitrogen Study Update** – Elke Ursin presented an update on the status of the letters of support for the nitrogen study. She stated that a support letter was drafted and sent to Lee Constantine, the Chairman of the Wekiva River Basin Commission. The Technical Review and Advisory Panel sent a letter of support to Senator Alexander, Speaker Cannon, Representative Grimsley, President Haridopolos, Senator Hays, Representative Hooper, Representative Hudson, Senator Negron, and Representative Williams on January 3, 2012. The RRAC letter of support is being drafted by Clay Tappan. Elke Ursin also stated that a presentation by Damann Anderson has been accepted on the nitrogen study at the University of Florida Water Institute Symposium on February 16, 2012. The Legislative Progress Report on the nitrogen study was sent on December 21, 2011 to the Governor, Speaker of the House, and President of the Senate. Quentin Beitel complimented the staff for putting this report together on a timely basis. Damann Anderson presented on some of the progress on the study since the last RRAC meeting in November. The last sampling event has been completed for the mound system at the Gulf Coast Research and Education Center (GCREC). Analysis of the data will show the soil and groundwater fate and transport of nitrogen around the existing mound system. A literature review was completed and data set specifications were made for a simulation model of bioreactor filtration treatment of onsite wastewater. This model will predict the performance of the tank-based systems tested at GCREC under the Passive Nitrogen Removal II (PNRS II) study. Design and construction has been completed for the passive in-situ in-ground test systems at the GCREC test facility. Damann Anderson went over some details on the construction of the soil and groundwater test facility. He stated that the PNRS II tank-based systems that were at the GCREC test facility have been tested and they are in the process now of developing the criteria to design those type of systems to be installed at individual homes. The next phase of work at the GCREC facility was to look at in-ground systems which are more of a drainfield system for passive nitrogen removal where nitrification occurs in one layer of soil and denitrification occurs in another. Two pilot scale in-ground systems have been constructed for testing. They are also developing test criteria to install these types of systems at individual homes. Also, four different in-situ systems were built to look at groundwater fate and transport of nitrogen. With these four systems they are looking at the difference between drainfields receiving nitrified

effluent versus conventional septic tank strength effluent as well as the difference between receiving drip irrigation versus a gravel trench. Josefin Hirst went through the soil and groundwater test facility construction progress report showing several photos of the construction. Damann Anderson explained how the pilot scale in-ground systems are constructed. There is nitrification expected to occur in the sand above the liner, then there is a layer of lignocellulosic and sand on the liner which is where some saturation occurs and the wastewater collects at the bottom of the liner and goes into a pipe which flows into a tank that is filled with sulphur and effluent for denitrification. The final denitrified effluent flows out of the tank into an Infiltrator chamber. Craig Diamond asked what the anticipated life-span is of the ligno material and Damann Anderson stated that that is one of the questions to be answered with the research but the hope is to design a system that will work for 15-20 years. Carl Ludecke asked whether this in-ground system could be installed under a drainfield in a non-mounded situation and Damann Anderson stated that if the groundwater is deeper this could be installed without a mound. Carl Ludecke stated that he wanted to make it clear that there is a simpler way to install these systems but that what Damann and his group are working on now is testing and developing the criteria for these in-ground systems. Eanix Poole asked how deep the ligno material was and Damann Anderson stated that the liner is a “V” shape, so the depth is variable but is about 10-12 inches in the middle tapering off at the outside edges. Damann Anderson stated that they have made good progress on this and that this will yield interesting results. In the next month or two they will be ready to install tank-based systems at homes sites now that the pilot testing has been done. Carl Ludecke stated that it is important for everyone to understand how far this project has come along. Quentin Beitel asked whether there is a no-pump passive system at the facility and Damann Anderson stated that there is no way to do that at the facility because of the groundwater but that one will be installed at an actual home site.

4. **Update on 319 Grant: Performance of Advanced Onsite Sewage Treatment and Disposal Systems** – Elke Ursin gave an update on the project. This project is to assess water quality protection by advanced (ATU, PBTS, etc.) systems throughout Florida. The grant period is now over, having ended on September 30, 2011. The final invoice and final progress report has been sent to DEP. Final reports have been submitted for the Monroe Diurnal and Seasonal Variability of Advanced Systems as well as the final report on the Database of Advanced Systems outlining the database development, database structure, and summary statistics.

   The executive summary of the Monroe County report was included in the presentation but not discussed in great detail as most of this had been discussed at the November meeting, had been sent to the RRAC, and is posted online. Eanix Poole complimented staff for a nice job on this report. Quentin Beitel asked if there has been any feedback from the agencies that received the report and Patti Sanzone stated that the report was submitted to EPA last Friday and that the study was done for DOH’s information and there was no expectation that EPA or DEP will come back with comments. Craig Diamond asked if this report will be shared with the Areas of Critical State Concern Program and DOH staff indicated that that would be a good idea and will send it to them. Eanix Poole brought up an observation he made while reading this report along with another report done in Wakulla County by DEP and FSU. He sees that very few systems are meeting the nitrogen and phosphorus standards that are enacted by local governments. He was wondering how the RRAC should respond to that as it involves so many different interest groups. He stated that these systems should meet the nutrient standards that they are expected to meet and are not. Damann Anderson stated that a lot of reports, not just in Florida, are showing the same thing: that the systems are not performing in the field. He stated that there are lots of issues and it is expensive to address. That is one of the reasons he is in favor of passive systems. Eanix Poole stated that the strength of the waste in the field is higher than NSF testing strength. Damann Anderson stated that the performance standard has to be measured and there is no real requirement to monitor these systems. He suggests monitoring quarterly for the first year and if the result is not in compliance then do more monitoring. This will weed out the systems that do not work. If the results are in compliance, then the monitoring requirement could be reduced. Bill Melton stated that sampling used to be a requirement but was taken out. Damann Anderson stated that it is very difficult to get the more complicated nutrient reducing systems to work without monitoring. He said that people will be spending a lot of money and will not get the results. Eb Roeder stated that the cost of these advanced system is variable, they are often less than $10,000 in Wakulla. One of the questions this study hopes to answer is whether it is the technology that is the problem or whether it is the usage of the systems, for example when they are turned off. He stated that the systems that are working remove three-quarters of the nitrogen but with a high influent strength they do not meet the performance standard. He said there are many factors at play and that one of the things that will be looked at with this study is whether the activated sludge systems perform differently from the fixed media systems.

Elke Ursin presented on some of the results of the summary statistics on the project database. Approximately 16,595 advanced systems were identified from four main sources (DOH's Environmental Health Database, Carmody, county health department databases, and innovative permit files). Over 60% of the advanced systems in Florida are contained in Monroe, Charlotte, Brevard, Franklin, and Lee counties. The samplers that were utilized from the county health departments for this project were located in each of these counties except for Franklin County, which was sampled by a DOH employee from Wakulla County who also sampled most of the rest of the state; and Brevard County, which was sampled by several employees from Volusia County. Elke Ursin went into some of the geocoding results which basically showed that the addresses in the database were good physical addresses. She also showed some statistics on how many of the records were associated with either a construction permit number, operating permit number, or both. Having these numbers increases the likelihood that there is further information on a system (i.e. type and size of system installed, when system was installed). She showed a table on the frequency of the type of advanced system, which demonstrated that the vast majority of the advanced systems in the state are aerobic treatment unit (ATU) systems. Of the systems that had a final system approval date, 75% were installed within 2-5 years of January 1, 2010. About 56% of the systems had technology information. Eighty-eight percent of these systems utilized extended aeration. The top five manufacturers in Florida are Consolidated, Aqua-Klear, Hoot, Norweco, and Clearstream.

Elke Ursin presented on the progress that has been made on the remaining tasks associated with this project. Data entry is ongoing with several bureau staff assisting. As of December 20, 2011 395 out of over 1,000 records need data entry and 707 records need a quality control review. There is a task looking at management practices that is currently ongoing. A database was created linking program evaluations over the past ten years with the survey results for regulators and system owners/users. There will also be links made between the county program evaluation, county survey information, and the sample results. Analysis on this has begun, and will be completed and summarized in the final task report and in a case study booklet format. The final project report is anticipated to be written after all the data entry and data analysis has been completed. The draft report will be presented to the RRAC for review prior to finalization and submission to DEP.

5. **Other Business** – Quentin Beitel requested that an update be given at the next RRAC meeting on the Carmody system: who's using it, the quality of the data, etc. Elke Ursin stated that she will see whether Scott Carmody might be able to come to the next meeting and if not will make sure there is someone from DOH staff to discuss some of this.

6. **Public Comment** – The public were allowed to comment throughout the meeting. There was no additional public comment.
7. **Closing Comments, Next Meeting, and Adjournment** – Quentin Beitel reminded RRAC members that the Legislature will start meeting next week and recommended that RRAC members contact legislators regarding the nitrogen study. The next RRAC meeting will occur at some point in the future, with a date to be determined via email. The meeting adjourned at 11:12 a.m.

Department of Health
Bureau of Onsite Sewage Programs
Research Review and Advisory Committee

Wednesday January 4, 2012

10:00 am – 1:00 pm

Agenda:

- Introductions and Housekeeping
- Review Minutes of Meeting November 15, 2011
- Nitrogen Study Update
- Update on 319 Grant
- Other Business
- Public Comment
- Closing Comments, Next Meeting, and Adjournment

Introductions & Housekeeping

- Roll call
- Identification of audience
- How to view web conference
- DO NOT PUT YOUR PHONE ON HOLD!!!!
- Download reports:

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

Introductions & Housekeeping

New appointments to the committee:

- Environmental Interest Group: Craig Diamond (member)
- Septic Tank Industry: Wayne Crotty (member), Bob Himschoot (alternate)
- Florida Department of Health: Paul Davis (member), Tom Higginbotham (alternate), Taylor Brown (alternate)
- Restaurant Industry: Geoff Luebkemann (member), Susan McKinley (alternate)

Who has left the committee (thank you letters from DOH sent):

- Kim Dove (DOH, member)
- Mike McInarnay (Septic Tank Industry, alternate)

Thank you letters sent from the RRAC to Patti Sanzone and Sam Averett

Review Minutes of Meeting November 15, 2011

- See draft minutes

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Purpose: Develop passive strategies for nitrogen reduction that complement use of conventional onsite sewage treatment and disposal systems, and further develop cost-effective nitrogen reduction strategies

Florida Onsite Sewage Nitrogen Reduction Strategies Study

- Wekiva River Basin Commission letter drafted and sent to Lee Constantine (Chair)
- TRAP letter of support sent 1/4/11 to Senator Alexander, Speaker Cannon, Representative Grimsley, President Haridopolos, Senator Hays, Representative Hooper, Representative Hudson, Senator Negron, and Representative Williams
- RRAC letter is being drafted by Clay Tappan (Chair)
- Presentation by Damann Anderson accepted for the University of Florida Water Institute Symposium on February 16, 2012

Florida Onsite Sewage Nitrogen Reduction Strategies Study

- Legislative Progress Report was sent on 12/21/11 to the Governor, Speaker of the House, and President of the Senate

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Progress since last meeting:

- Continuation of monitoring of mound system at GCREC
- Literature review and data set specification for the simulation of bioreactor filtration treatment of onsite wastewater
- Design and construction of passive in-situ in-ground test systems

Florida Onsite Sewage Nitrogen Reduction Strategies Study: Construction of Mini Mounds

- Switch to Soil and Groundwater Test Facility Construction Progress Report

319 Project on Performance and Management of Advanced Onsite Systems

Purpose: Assess water quality protection by advanced OSTDS throughout Florida

Progress:

- Granting period is now complete
- Final invoice sent to DEP
- Final report submitted for Monroe Diurnal and Seasonal Variability of Advanced Systems
- Final report submitted for Database of Advanced Systems

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Validation of a Sampling Protocol:

- Occasional spurious high concentrations were reported, in many cases for one analyte but not for others in the same sample. While this may influence means, median concentration results are less impacted by this and appear generally reliable. Review of sample results on the background of typical results and communication with the laboratory appear to be a way to resolve some of these. The conditions for such interaction were much improved for Task 4.
- Relative to target concentrations, results from analysis of blanks indicated that the approach to sampling using peristaltic pumps was successful. For Task 4, flushing volumes were increased in an attempt to further reduce TN in equipment blanks, which had been detected most frequently.
- TSS appeared to be the most variable parameter in replicate samples from an intermediate container with a median relative standard deviation of 12%, but for cBOD5, TN, and TP this measure was 3% and less. Concerns about samples obtained from intermediate containers are thus less warranted for nutrient analyses than for TSS analyses.

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Validation of a Sampling Protocol (cont.):

- Detailed characterization of the treatment systems and sampling locations are very important. Particularly in treatment systems with multiple treatment steps, "influent" and "effluent" need further qualification, and may be ambiguous to a sampler encountering the treatment system or to a data analyst. In the present study this required some reclassification during data analysis from "influent" to "intermediate". For Task 4, data fields for sample location description were more extensive, and a screen for the validity of "influent" samples was developed.
- The operational and maintenance conditions of a treatment system need to be better characterized if one wants to distinguish between technical limitations of treatment and shortcomings due to operator error or lack of maintenance. The assessment protocol for Task 4 included a more detailed assessment, including characterization if the power was on, observation of problems and the dissolved oxygen concentration as a measure of aeration.
- Assessments of variability between grab samples during each event showed that TSS had the highest variability, while TP and total alkalinity had the least, followed by TN. The first grab sample of a sampling event tended to be about 20% higher in TSS and 10% in cBOD5 than subsequent grab samples. This difference did not exist for nutrient species. Given that the emphasis of the project is on nutrient treatment effectiveness, grab sampling appeared appropriate for Task 4.

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Validation of a Sampling Protocol (cont.):

- There was no overall bias found between the effluent composite and average of grab samples during the same event, even though for any event there could be differences. These differences were the least for total alkalinity, TP, TN and nitrate, with more than 50% of events showing a relative difference of less that 10%.
- The between event variability as expressed by relative standard deviations, is at least twice as large as the within event variability for all parameters, except for TSS.
- Analysis for differences by weekday showed no consistent results. Flow measurements for a subset of systems, but not for all measurements, appeared to decrease from Monday through Thursday. Grab but not composite effluent sample results for TSS and cBOD5 indicated a decrease from Sunday through Thursday, but this was at least partly due to differences in the occurrence of first grab samples on each day.
- Differences in concentrations between the wet/hot and dry/cold seasons were not significant.
- Visual/olfactory assessments appeared to be able to discriminate a threshold-value of TSS (visual) and possibly TSS, ammonia, and TKN (olfactory). During Task 4, the assessment protocol was refined to use more standardized terminology.

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Validation of a Sampling Protocol (cont.):

- The Hach DR/890 colorimeter showed good agreement with laboratory nitrate and ammonia measurements and less so for ortho-phosphate compared to total phosphorus. In all cases there was an indication of between study-phase variability. To address these issues the recording forms for Task 4 were revised to better capture dilution and conversion factors.
- Taylor kits provided good agreement with laboratory measurements for total alkalinity. Task 4 relied largely on Taylor kits for this measurement, with some additional laboratory measurements for confirmation. Chlorine measurements by Taylor kit could not be independently assessed. They were utilized occasionally during the implementation of Task 4 to assess the effectiveness of chlorination devices.

Preliminary Assessment of Treatment Systems:

- Maintenance and operation of treatment systems appear to be important variables that were not systematically characterized in this study. Both the sampling results of processes that require replenishment of materials and anecdotes by the samplers indicated that this is an important, but not quantified, element of performance variability.
- Overall, the addition of a phosphorus reduction treatment step, usually a media filter, improved treatment for TSS, cBOD5, nitrite-nitrogen, and total phosphorus. Systems without that treatment step had median concentration results similar to an earlier survey of ATUs in the Keys.

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Preliminary Assessment of Treatment Systems (cont.):

- Typical influent concentrations of cBOD5 and TSS were consistent with domestic sewage, and total phosphorus slightly elevated. TN concentrations were about twice as high as concentrations during a study that established the feasibility of current treatment standards and as the septic tank effluent concentrations provided in Florida performance-based treatment system regulations as point of comparison. Overall, 50% of influent composite samples showed a TN concentration between 47 and 94 mg/L, compared to 15 and 43 mg/L for the effluent.
- Among the phosphorus treatment approaches sampled there were significant differences in effluent concentrations. While overall, total phosphorus was significantly reduced, the Keys treatment standard was not met in most cases, even for the better performing approaches.
- Within the treatment systems sampled, nitrification appeared to be a limiting step to nitrogen reduction. The sampling events with the most nitrified effluent achieved typically about a 75% reduction compared to their influents, while the events with the least nitrified effluent only achieved a typical TN-reduction of about 28% and did not eliminate cBOD5. Events with intermediate nitrification showed intermediate TN-reduction and some indications of occasional alkalinity limitation.

319 Project on Performance and Management of Advanced Onsite Systems: Keys Study Results

Preliminary Assessment of Treatment Systems (cont.):

- 25% of the obtained fecal coliform samples exceeded the secondary grab sample standard of 400 cfu/100 mL. Nearly half of the obtained chlorine measurements did not meet the system-required chlorine residual. Such observations confirm that aerobic treatment alone is not sufficient to meet secondary fecal coliform standards. The chlorine measurements also point to the need for monitoring the effectiveness of chlorination units.

319 Project on Performance and Management of Advanced Onsite Systems: Summary Statistics

- 16,595 systems from four main sources: the Department of Health's Environmental Health Database (EHD), the Carmody system, various county health department databases, and innovative permit files
- Over 60% of the advanced systems in Florida are contained in these five counties: Monroe, Charlotte, Brevard, Franklin, and Lee.
- Eighty-seven percent of the addresses geocoded correctly. Out of the issues that prevented an address from being geocoded, the main reasons were that the street was unable to be matched (6%), the system was unable to match the house number (4%), and that there were issues with the length of the data field (1%).
- Out of 16,595 records, 8,313 have a construction permit number, which may have different formats and 12,804 have an operating permit number. Of 16,595 records 4,649, or slightly more than a quarter, have both an operating permit and a construction permit number. 127 records did not have any permit number assigned, these were Carmody and county/innovative records that did not include such information.

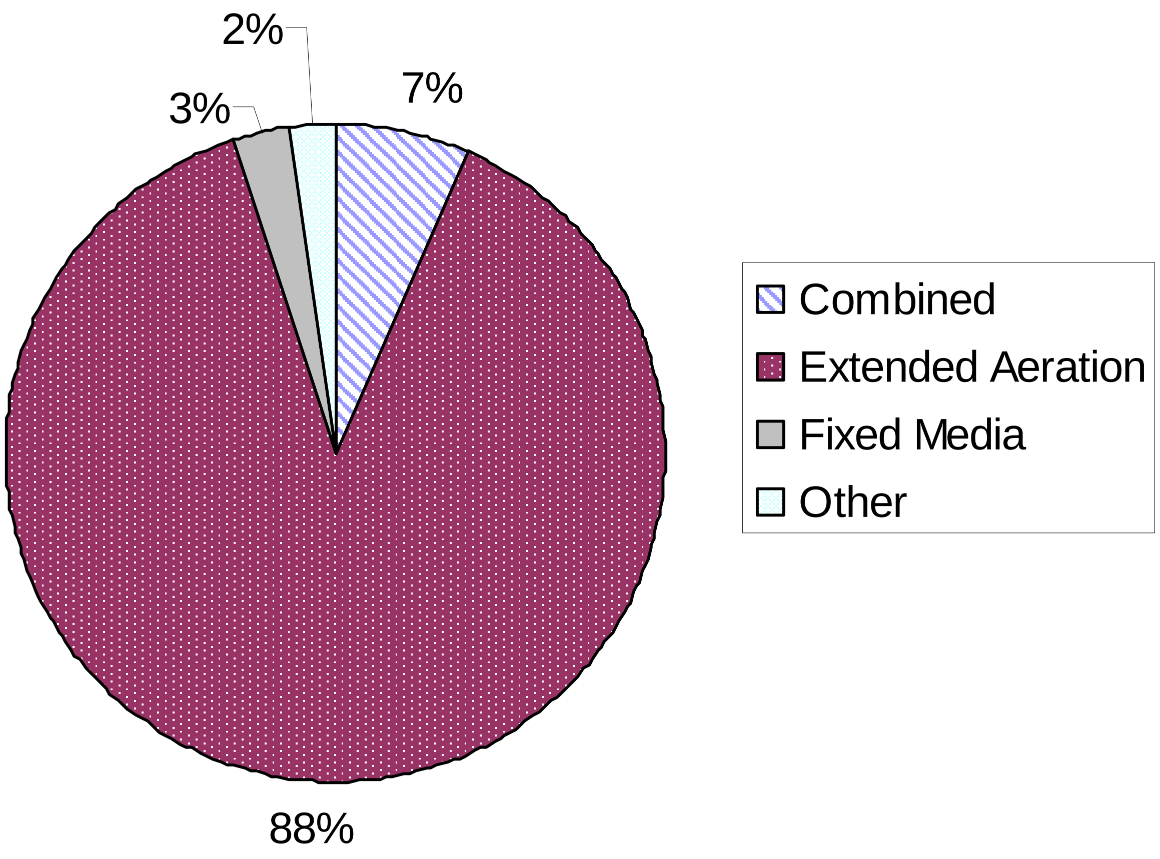
319 Project on Performance and Management of Advanced Onsite Systems: Summary Statistics

Frequency of Type of Advanced System (ATU, PBTS, Innovative, Unknown)

	Frequency	Percent
ATU	12660	76.3
Innovative	183	1.1
PBTS Non Innovative	1189	7.2
Unknown	2563	15.4
Total	**16595**	**100.0**

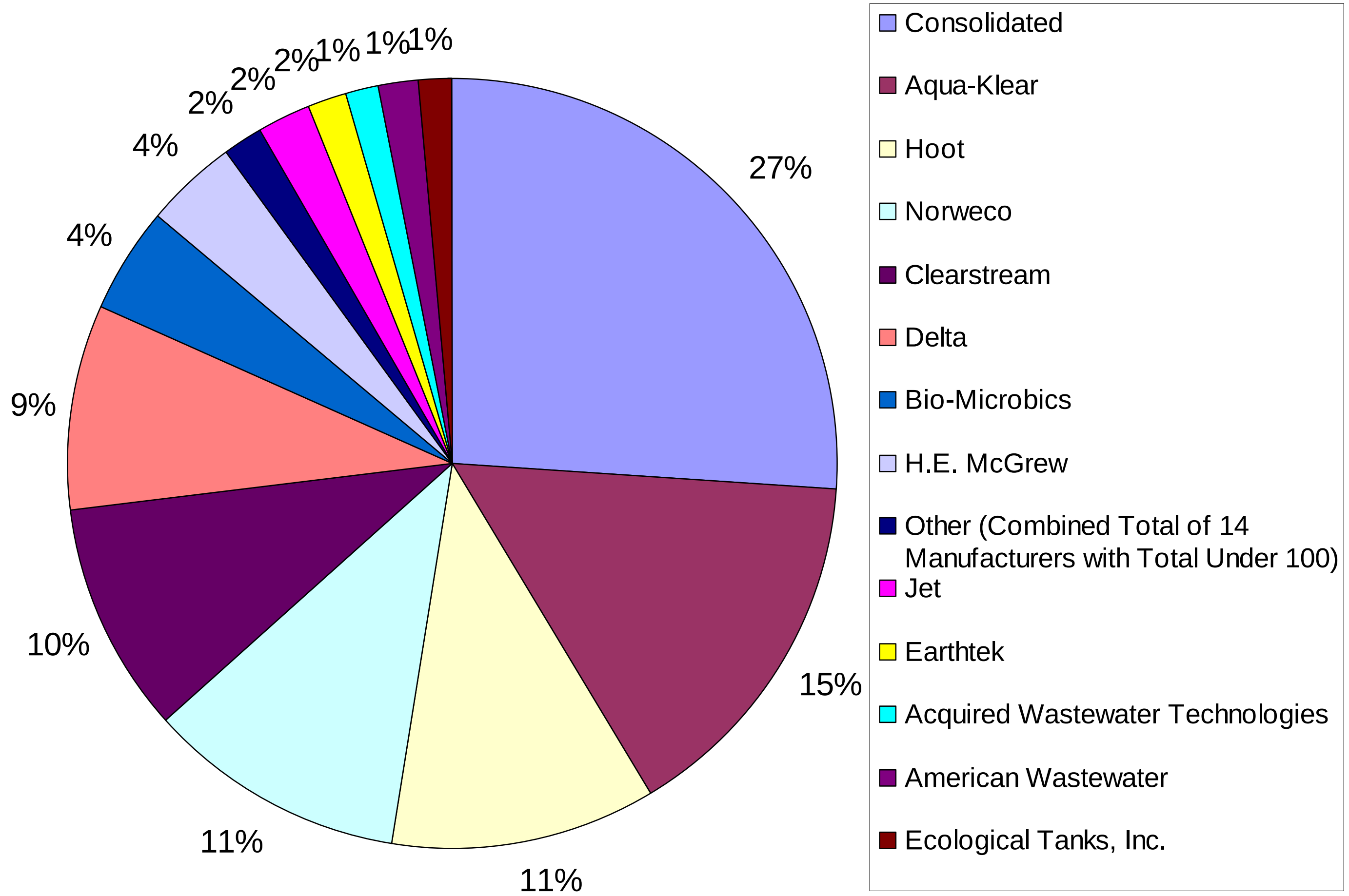
- A total of 7,173 systems in the database had a final system approval date. Of these systems, 75% were installed within 2-5 years of January 1, 2010.
- Out of a total of 16,595 systems, 9,206 (56%) had technology information

319 Project on Performance and Management of Advanced Onsite Systems: Summary Statistics



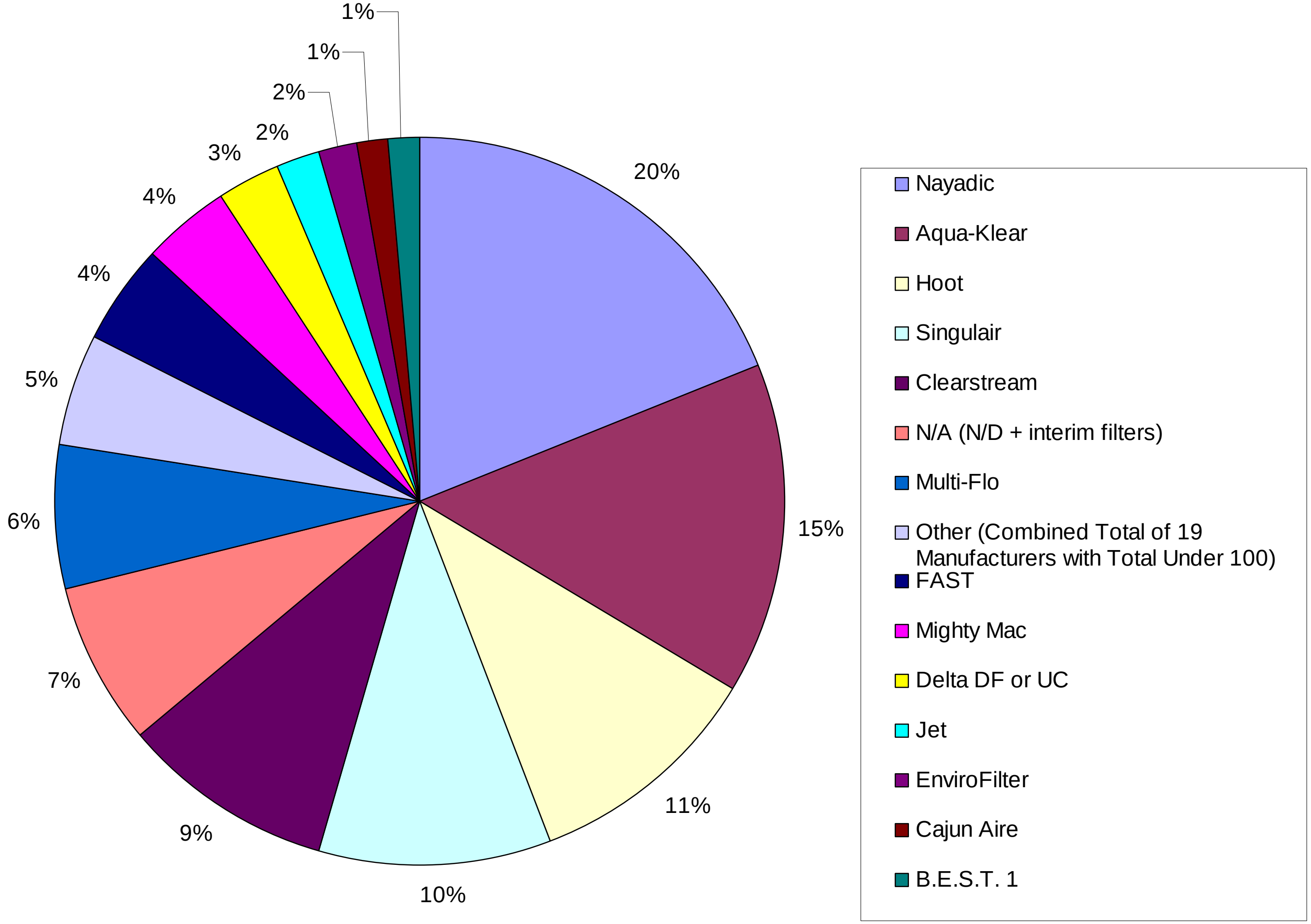
Technology Approach Information

319 Project on Performance and Management of Advanced Onsite Systems: Summary Statistics



Manufacturer Information

319 Project on Performance and Management of Advanced Onsite Systems: Summary Statistics



Product Technology Information

319 Project on Performance and Management of Advanced Onsite Systems

Progress cont. :

- Data Entry:
  - Data entry is ongoing with several bureau staff assisting
  - As of 12/20/11:
    - 395 systems need data entry
    - 707 system need a quality control review

319 Project on Performance and Management of Advanced Onsite Systems

Progress cont. :

- Management Practices
  - Database was created linking program evaluations over past 10 years with survey results for regulators and system owners/users
  - Analysis has been done and will be summarized in the final task report
  - Linking between this database and the sample results will also be done and summarized in the final task report

319 Project on Performance and Management of Advanced Onsite Systems

Progress cont. :

- Final Project Report
  - Anticipated to be written after all data entry and data analysis has been completed
  - Draft report to be presented to RRAC for review prior to finalization and submission to DEP

Other Business

Public Comment

Next Meeting

Upcoming meeting topics:

- Discussion on 319 grant report on the performance of advanced OSTDS in Florida
- Discussion on process forward with research priorities

Proposed dates for next meeting:

- Will send email to RRAC at a future date to determine next meeting

Closing Comments and Adjournment

Florida Department of Health
Onsite Nitrogen Reduction Strategies Study

Contract CORCL

S&GW TEST FACILITY CONSTRUCTION
TASK C.10, C.11 and C.12
PROGRESS REPORT

Date: November 30, 2011
NTP Date: September 8, 2011

Construction of the S&GW test facility was started November 8th. Below is a list of items completed to date.

I. S&GW Test Facility Construction JTD

A. Installed Monitoring Equipment

1. Test Area 1 (STE Trench System)
   - (1) (2'x 3.3') SST Pan Lysimeter
     1. Location - north end of mound
     2. Depth – sloped at natural grade (west @ EL 128.38, east @ EL 128.55)
   - (2) 4" Observation Ports
     1. Location – north and south end of mound
     2. Depth – bottom at natural grade @ EL 128.36
   - (2) 2"D Soil Moisture Access Tubes and Casing
     1. Location – north and south end of mound
     2. Depth – top at infiltrative surface @ EL 129.36, 1 meter deep
     3. 6" casing around tubes to infiltrative surface
   - (1) 1"D Standpipe Piezometers with 5' screen
     1. Location – center of mound
     2. Depth – bottom at spodic @ EL 118.14. Bentonite seal placed approximately 1' above screen.
   - (4) 2"D Soil Suction Lysimeters

1. Location – (1) center, (3) south end of mound
2. Elevation relative to center of 9” cup
    a. (1) shallow: 12” below infiltrative surface (IS) @ EL 128.36
    b. (2) middle: 24” below IS @ EL 127.36. Bentonite seal placed approximately 6” above ceramic cup.
    c. (1) deep: 42” below IS @ EL 125.86. Bentonite seal placed approximately 6” above ceramic cup.

- (10) Tensiometers
    1. Location – (5) center, (5) south end of mound
    2. Depths – (2) 6” below IS, (2) 12” below IS, (2) 24” below IS, (2) 36” below IS, (2) 42” below IS. Bentonite seal placed approximately 6” above ceramic cup for 24”, 36” and 42” tensiometers.

2. Test Area 2 (Nitrified Effluent Trench System)
    - (1) (2’x 3.3’) SST Pan Lysimeter
        1. Location - north end of mound
        2. Depth – sloped at natural grade (west @ EL 127.93, east @ EL 128.11)
    - (2) 4” Observation Ports
        1. Location – north and south end of mound
        2. Depth – north - bottom at infiltrative surface @ EL 128.88, south - bottom at natural grade @ EL 127.88
    - (1) Soil Moisture Access Tubes and Casing
        1. Location – center of mound
        2. Depth – top at infiltrative surface @ EL 128.88, 1 meter deep
        3. 6” casing around tubes to infiltrative surface
    - (1) 1”D Standpipe Piezometers with 5’ screen
        1. Location – center of mound
        2. Depth – bottom at spodic @ EL 118.48. Bentonite seal placed approximately 1’ above screen.
    - (4) 2”D Soil Suction Lysimeters
        1. Location – (1) center, (3) south end of mound
        2. Elevation relative to center of 9” cup
            a. (1) shallow: 12” below infiltrative surface (IS) @ EL 127.88

b. (2) middle: 24” below IS @ EL 126.88. Bentonite seal placed approximately 6” above ceramic cup.

c. (1) deep: 42” below IS @ EL 125.38. Bentonite seal placed approximately 6” above ceramic cup.

3. Test Area 3 (STE Drip System)

- (1) (2’x 3.3’) SST Pan Lysimeter
  1. Location - north end of mound
  2. Depth – sloped at natural grade (west @ EL 128.67, east EL @ 128.84)
- (2) 4” Observation Ports
  1. Location – north and south end of mound
  2. Depth – bottom at natural grade @ EL 128.71
- (2) Soil Moisture Access Tubes and Casing
  1. Location – north and south end of mound
  2. Depth – top at infiltrative surface @ EL 129.71, 1 meter deep
  3. 6” casing around tubes to infiltrative surface
- (2) 1”D Standpipe Piezometers with 5’ screen
  1. Location – center and south end of mound
  2. Depth – center: bottom at spodic @ EL 118.37. Bentonite seal placed approximately 1’ above screen. South: bottom at spodic @ EL 118.08. Bentonite seal placed approximately 1’ above screen.
- (4) 2”D Soil Suction Lysimeters
  1. Location – (1) center, (3) south end of mound
  2. Elevation relative to center of 9” cup
     a. (1) shallow: 12” below infiltrative surface (IS) @ EL 128.71.
     b. (2) middle: 24” below IS @ EL 127.71. Bentonite seal placed approximately 6” above ceramic cup.
     c. (1) deep: 42” below IS @ EL 126.21. Bentonite seal placed approximately 6” above ceramic cup.
- (10) Tensiometers
  1. Location – (5) center, (5) south end of mound
  2. Depths – (2) 6” below IS, (2) 12” below IS, (2) 24” below IS, (2) 36” below IS, (2) 42” below IS. Bentonite seal placed approximately 6” above ceramic cup for 24”, 36” and 42” tensiometers.

4. Test Area 4 (Nitrified Effluent Drip System)
    - (2'x 3.3') SST Pan Lysimeter Location - north end of mound
        1. Depth – sloped at natural grade (west @ EL 127.43, east @ EL 127.66)
    - (2) 4" Observation Ports
        1. Location – north and south end of mound
        2. Depth – bottom at natural grade @ EL 127.35
    - (1) Soil Moisture Access Tubes and Casing
        1. Location – center of mound
        2. Depth – top at infiltrative surface @ EL 128.35, 1 meter deep
        3. 6" casing around tubes to infiltrative surface
    - (1) 1"D Standpipe Piezometers with 5' screen
        1. Location – center of mound
        2. Depth – bottom at spodic @ EL 117.09. Bentonite seal placed approximately 1' above screen.
    - (4) 2"D Soil Suction Lysimeters
        1. Location – (1) center, (3) south end of mound
        2. Elevation relative to center of 9" cup
            a. (1) shallow: 12" below infiltrative surface (IS) @ EL 127.35
            b. (2) middle: 24" below IS @ EL 126.35. Bentonite seal placed approximately 6" above ceramic cup.
            c. (1) deep: 42" below IS @ EL 124.85. Bentonite seal placed approximately 6" above ceramic cup.
5. Test Area 5 (STE PNRS II System)
    - (2) 3" Observation Ports
        1. Location – north and south end of mound
        2. Depth – tee connection with collection pipe at bottom of sloped liner
    - (1) 1"D Standpipe Piezometers with 5' screen
        1. Location – south of infiltrator chambers
        2. Depth – bottom at spodic @ EL 117.79. Bentonite seal placed approximately 1' above screen.
    - (1) 2"D Soil Suction Lysimeters
        1. Location – center of mound

2. Depth – bottom of cup in mound sand at lignocellulosic mixture interface with mound sand

6. Test Area 6 (Nitrified Effluent PNRS II System)
   - (2) 3” Observation Ports
     1. Location – north and south end of mound
     2. Depth – tee connection with collection pipe at bottom of sloped liner
   - (1) 1”D Standpipe Piezometers with 5’ screen
     1. Location – south of infiltrator chambers
     2. Depth – bottom at spodic @ EL 118.00. Bentonite seal placed approximately 1’ above screen.
   - (1) 2”D Soil Suction Lysimeters
     1. Location – center of mound
     2. Depth – bottom of cup in mound sand at lignocellulosic mixture interface with mound sand

B. Nitrified Effluent Systems Tanks, Pumps and Accessories Installed

1. 1.25” STE feed line
2. ¾” potable water line
3. 1.25” disposal line to existing lift station
4. 500 gallon per day nitrification system
5. 300 gallon nitrified effluent lift station
   - Pump 12 nitrified effluent feed pump
   - Pump 15 little giant overflow discharge pump
6. Nitrified effluent drip system headworks (filters)
7. 1” pipe from headworks to TA2, TA4 and TA6
8. 1” ball valves for isolation of test areas after flow splitter
9. Drip emitter lines in TA2, TA4 and TA6
10. Flowmeter on return line

C. STE System Tanks, Pumps and Accessories Installed

1. 1.25” STE feed line
2. ¾” potable water line
3. 1.25” disposal line to existing lift station
4. 300 gallon STE lift station

- Pump 13 STE systems feed pump

5. STE drip system headworks (filters)
6. 1” pipe from headworks to TA1, TA3 and TA5
7. 1” ball valves for isolation of test areas after flow splitter
8. Drip emitter lines in TA1, TA3 and TA5
9. Flowmeter on return line

D. Mound Elevation (ft. above MSL)

	TA1	TA2	TA3	TA4	TA5	TA6
	STE Trench	NO3 Trench	STE Drip	NO3 Drip	STE PNRS II	NO3 PNRS II
	Elevation (ft above mean sea level (MSL))					
Cover	130.86	130.38	130.21	128.85	131.72	130.94
Top of Gravel	130.36	129.88				
Infiltrative Surface	129.36	128.88	129.71	128.35	131.22	130.44
Top of liner, tank end					129.33	128.51
Bottom of liner, tank end					128.58	127.76
Natural Grade	128.36	127.88	128.71	127.35	128.31	127.49

E. Electrical

1. Nitrification drip system control panel
   - Power receptacle for blower
   - Connected flowmeter signals to main control panel in PNRS II shed
2. STE drip system control panel
   - Connected floats and flowmeter signals to main control panel in PNRS II shed
3. Connected power for both new panels from main power feed panel.

II. Construction Status

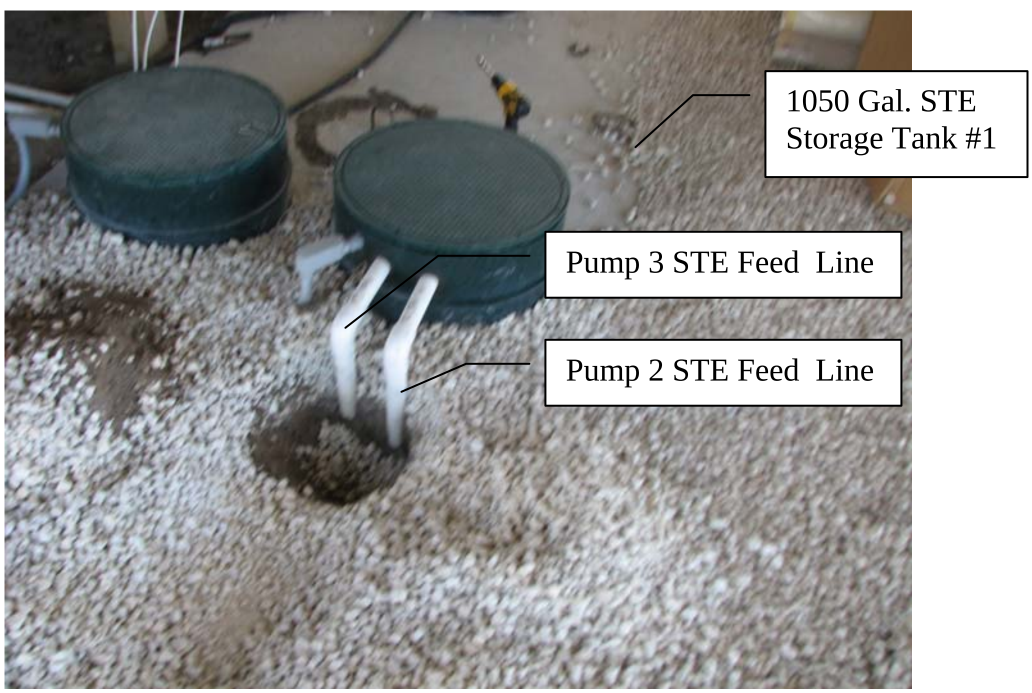
The soil and groundwater test facility construction is substantially complete. Hazen and Sawyer staff were onsite throughout construction and conducted a final site inspection of the facility on November 29, 2011 and completed a punch list of items for completion by the contractor prior to accepting construction. The nitrification tank, nitrified effluent lift station, and STE lift station tanks were filled with tap water and all pumps, valves, meters and other equipment were tested. The punch list developed is included in Section IV of this progress report. Completion of these items is underway and all items should be complete in late December.

Start up of the test facility is planned for the week of January 2nd. Final calibration of flows to the pilot systems will be completed, and the STE supply pumps (Pump #2 and Pump #3) in Tank 1 will be activated, which will then begin supplying wastewater to the system. Water quality monitoring is anticipated to begin in late February.

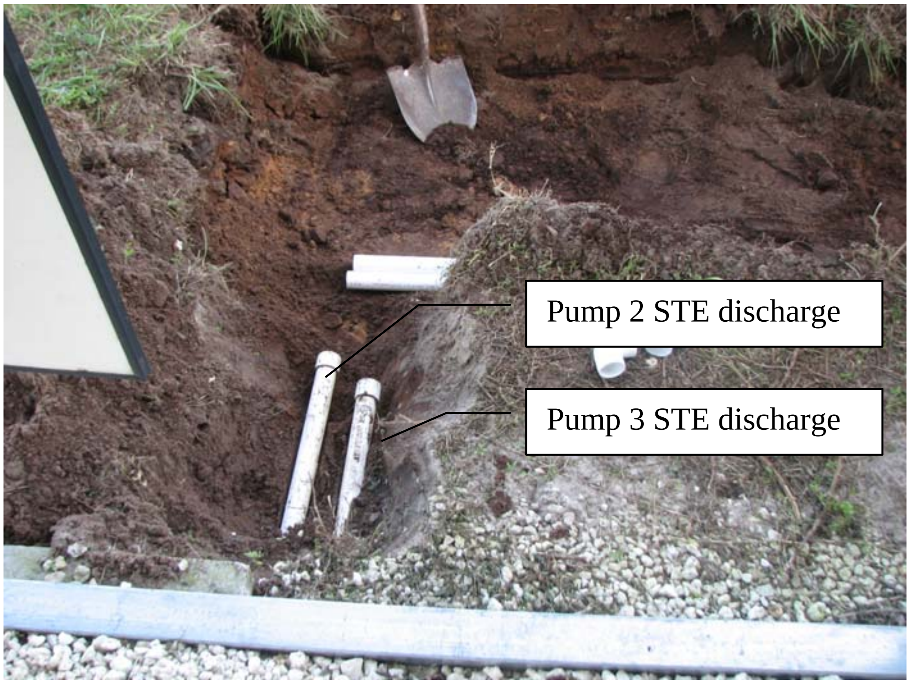
Additional experimental apparatus for evaluation of nitrogen uptake by turf is yet to be constructed. This will occur in early 2012 after a work plan is developed by GCREC staff.

III. Photos Showing Various Components of the Test Facility

Prepped mound construction area (cleared vegetation and O horizon)

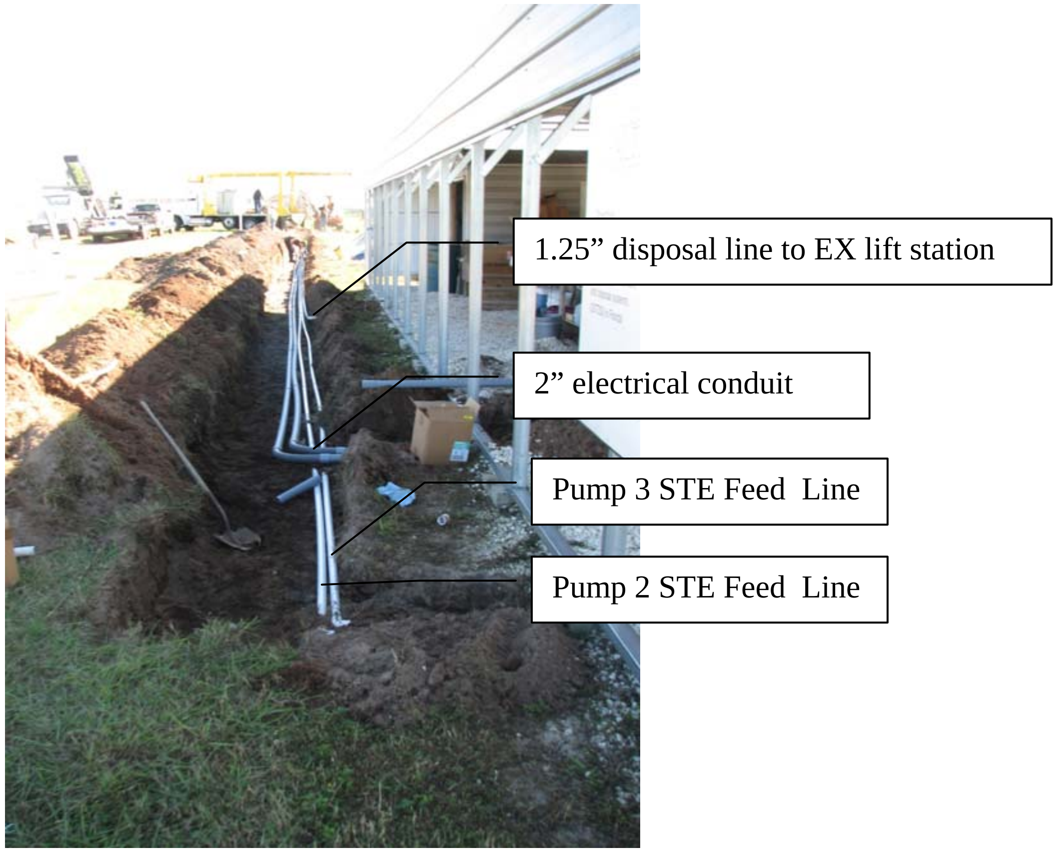


STE feed lines (pump 2 and pump 3 in tank 1)



Feed lines connected to trench out to drip systems

Potable water line connection



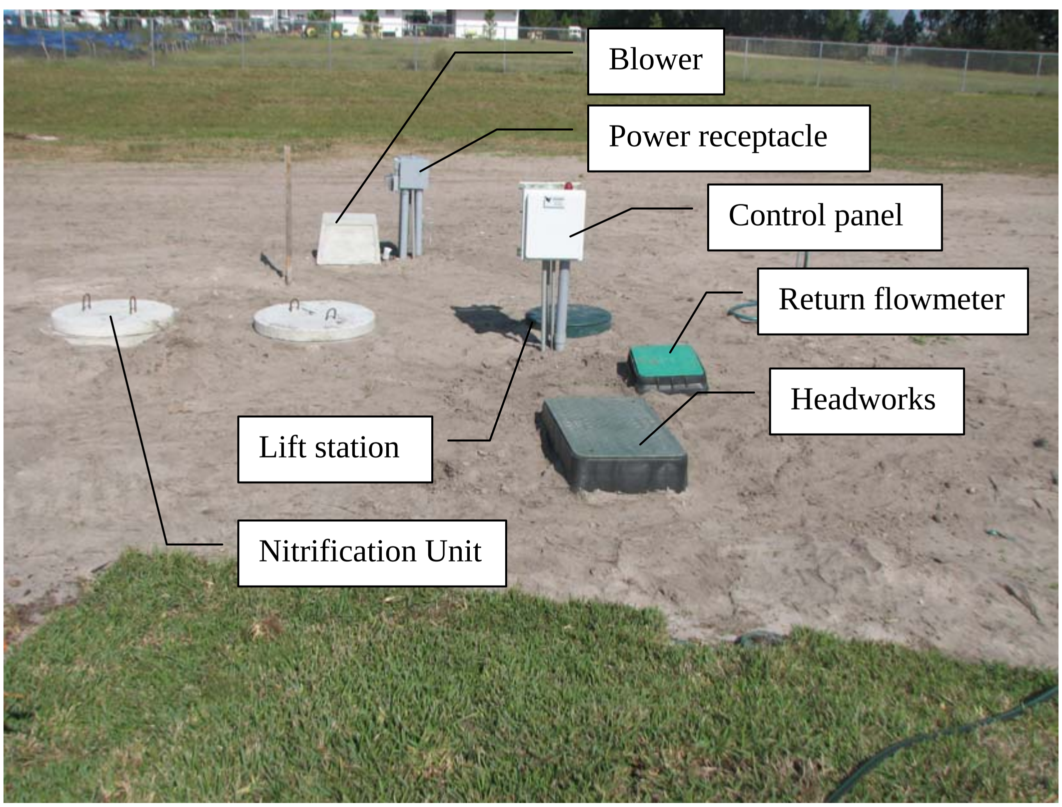
3’ trench to drip systems

3’ trench to nitrified effluent drip system

Nitrification unit and nitrified effluent lift station

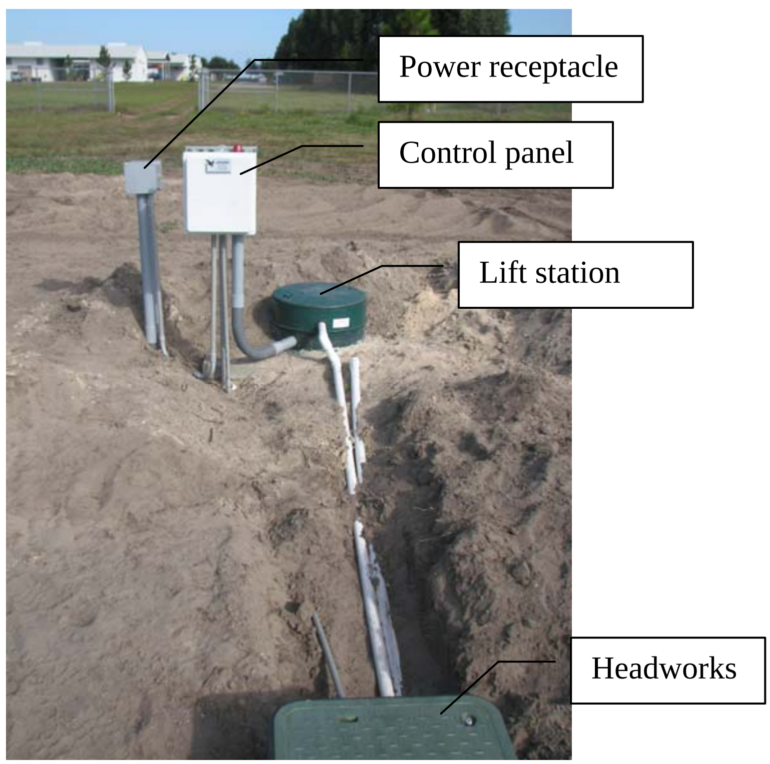
Nitrified effluent lift station pump and float tree

Nitrification unit blower

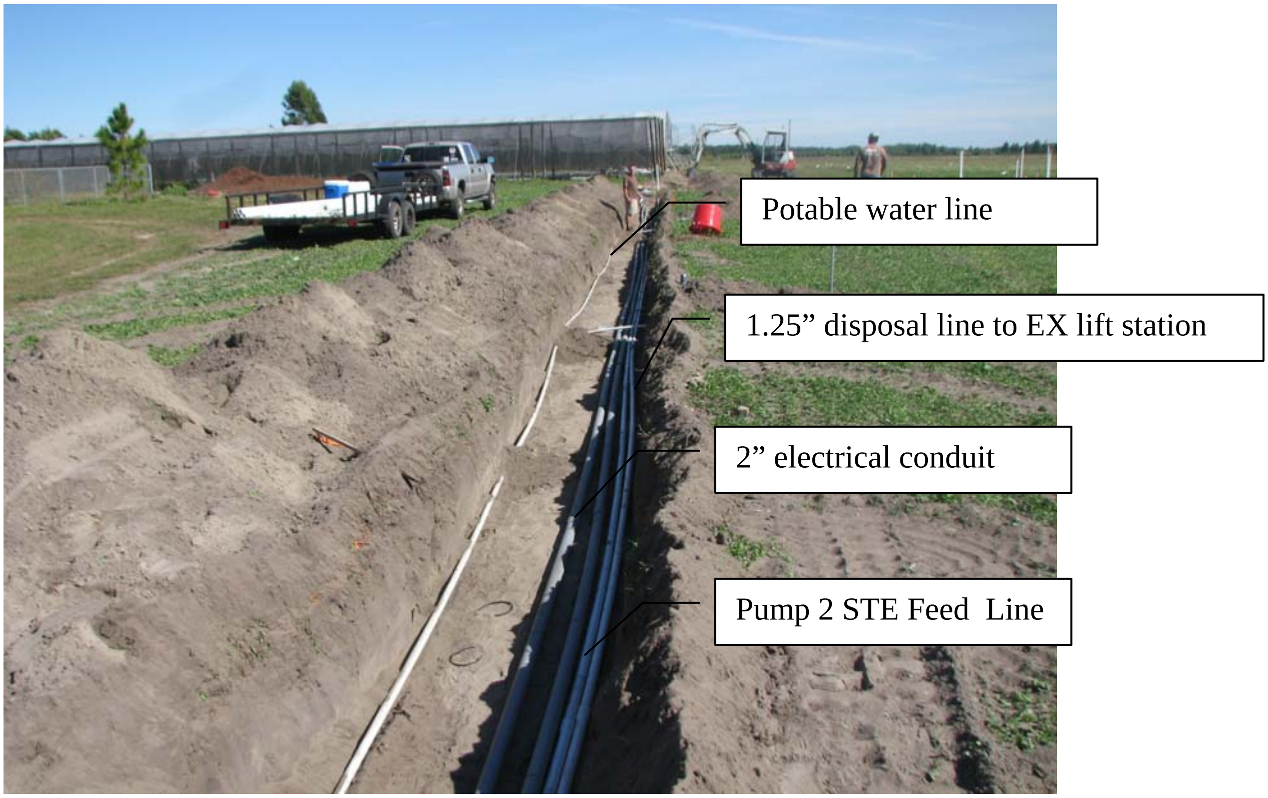


Nitrified effluent drip systems control panel

Drip system headworks

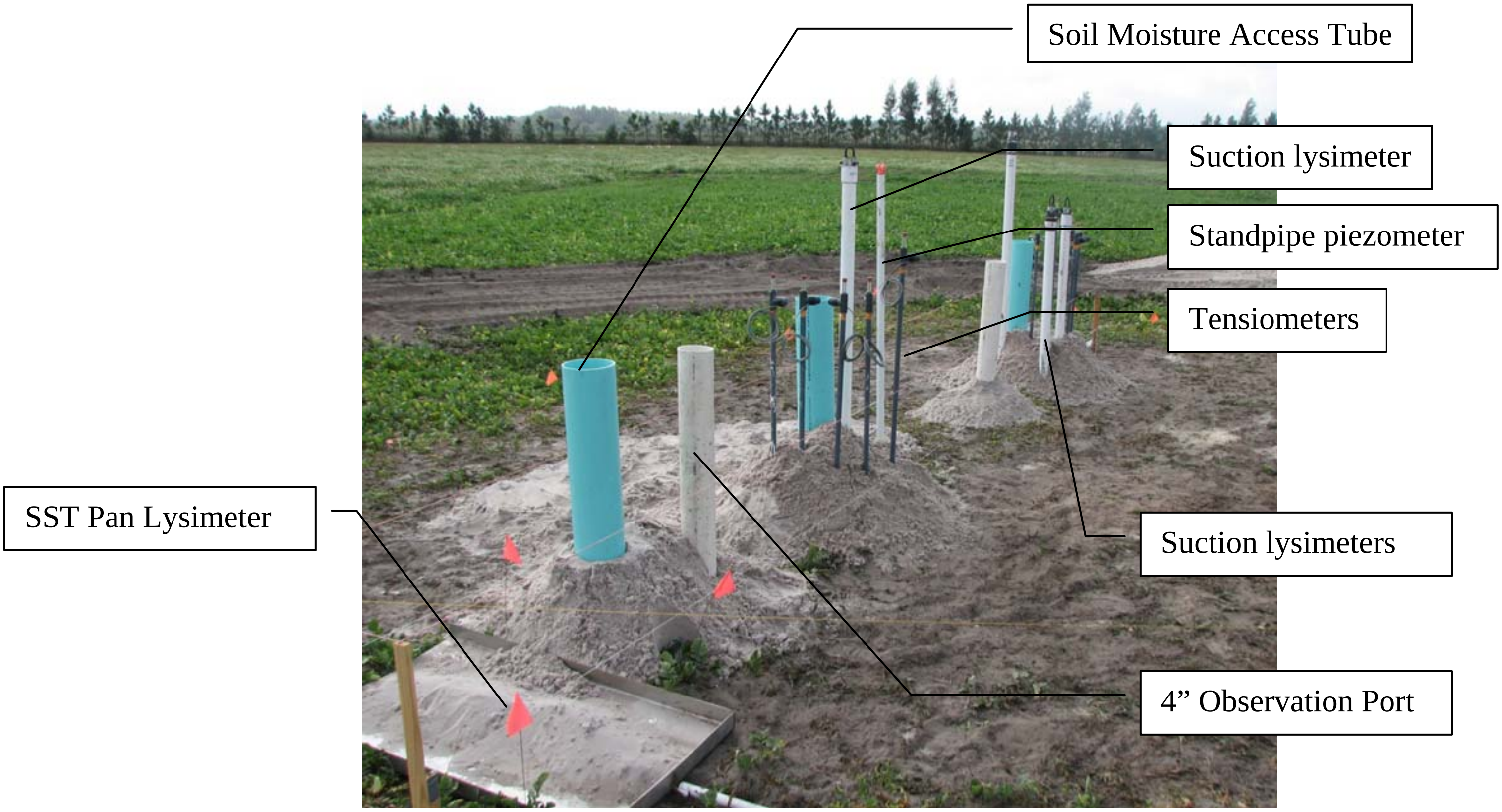


STE drip system control panel



3’ trench to STE drip system

STE lift station



Test Area 1 (STE trench system) monitoring equipment

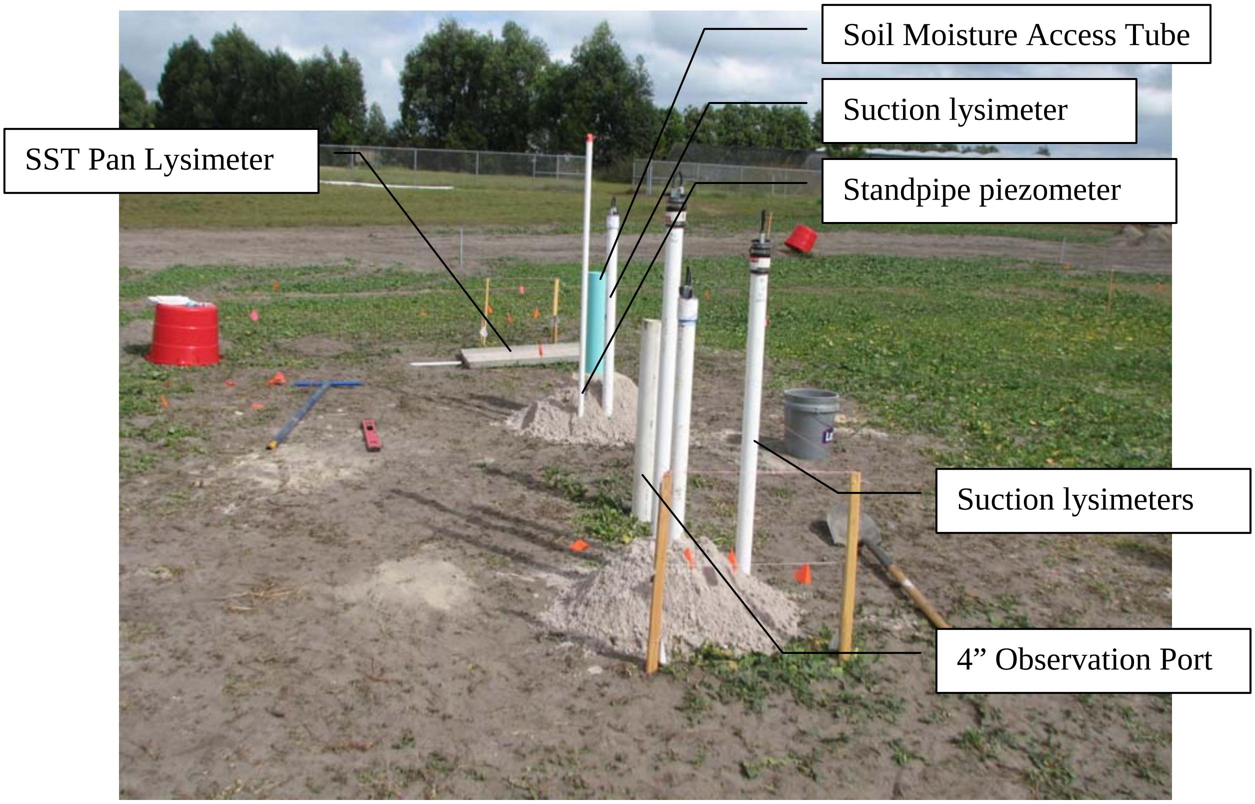
Test Area 1 (STE trench system) infiltrative surface

Test Area 1 (STE trench system) gravel installation

Test Area 1 (STE trench system) drip lines covered with filter paper

Test Area 1 (STE trench system) covered

Test Area 1 (STE trench system) sod



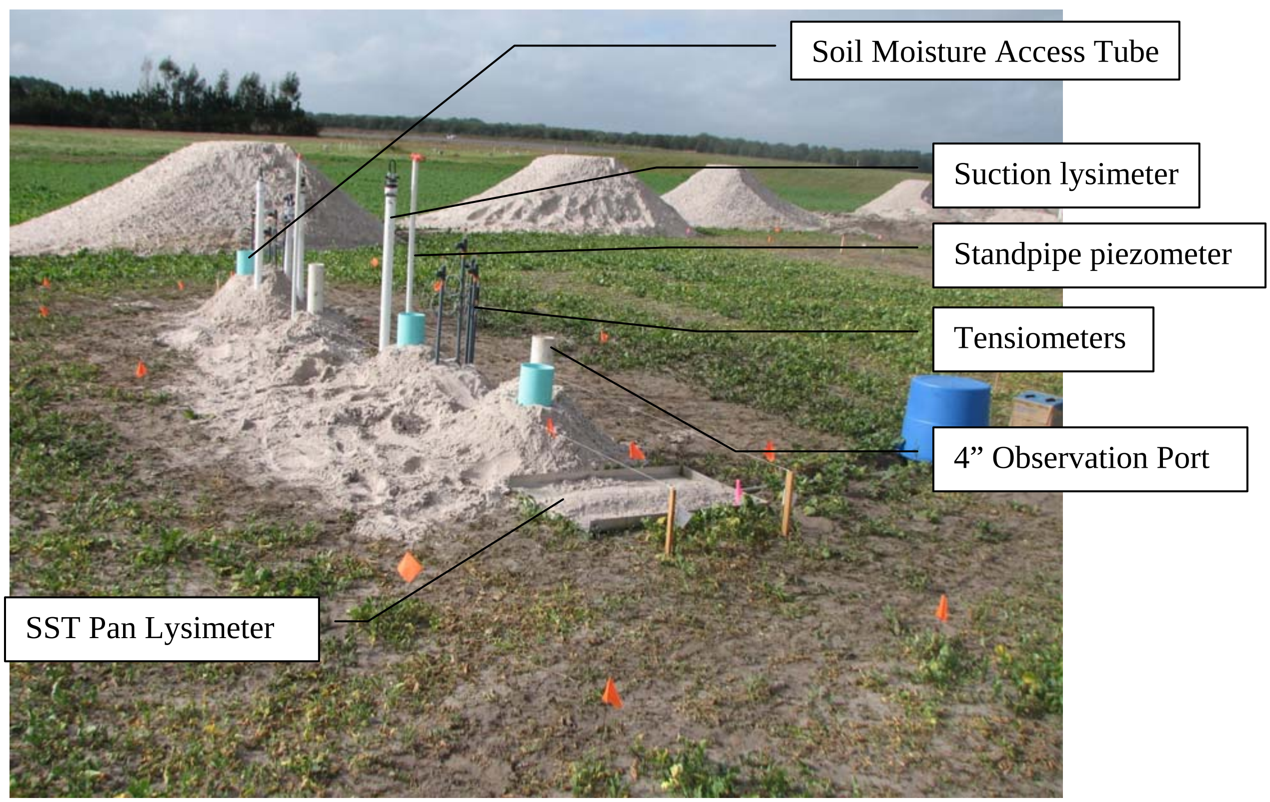
Test Area 2 (Nitrified effluent trench system) monitoring equipment

Test Area 2 (Nitrified effluent trench system) top of sand (infiltrative surface)

Test Area 2 (Nitrified effluent trench system) top of gravel and drip lines

Test Area 2 (Nitrified effluent trench system) covered

Test Area 2 (Nitrified effluent trench system) sod

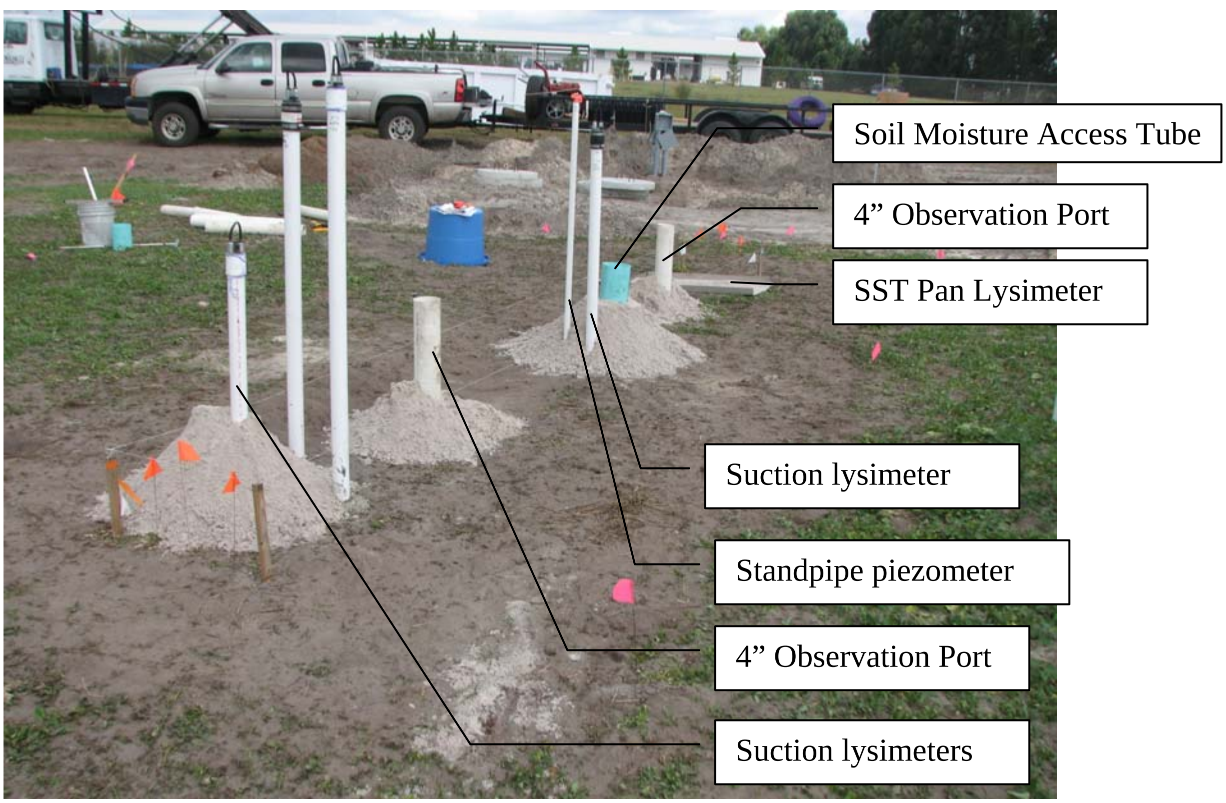


Test Area 3 (STE drip system) monitoring equipment

Test Area 3 (STE drip system) drip line [infiltrative surface]

Test Area 3 (STE drip system) covered

Test Area 3 (STE drip system) sod



Test Area 4 (Nitrified effluent drip system) monitoring equipment

Test Area 4 (Nitrified effluent drip system) drip tubing installed

Test Area 4 (Nitrified effluent drip system) drip influent pipe

Test Area 4 (Nitrified effluent drip system) cover

Test Area 4 (Nitrified effluent drip system) sod

Test Area 5 (STE PNRS II system) infiltrator

Test Area 5 (STE PNRS II system) liner v-area

Test Area 5 (STE PNRS II system) liner with effluent collection pipe on bottom and observation ports

Test Area 5 (STE PNRS II system) mound sand and lignocellulosic mixture

Test Area 5 (STE PNRS II system) denitrification tank and piping

Test Area 5 (STE PNRS II system) influent pipe

Test Area 5 (STE PNRS II system) sulfur and oyster shell mixture

Test Area 5 (STE PNRS II system) covered

Test Area 5 (STE PNRS II system) sod

Test Area 6 (Nitrified effluent PNRS II system) infiltrator area

Test Area 6 (Nitrified effluent PNRS II system) infiltrator cover and observation port

Test Area 6 (Nitrified effluent PNRS II system) liner v-area

Test Area 6 (Nitrified effluent PNRS II system) liner installed

Test Area 6 (Nitrified effluent PNRS II system) mound sand and lignocellulosic mixture

Test Area 6 (Nitrified effluent PNRS II system) drip tubing

Test Area 6 (Nitrified effluent PNRS II system) denitrification tank

Test Area 6 (Nitrified effluent PNRS II system) covered

Test Area 6 (Nitrified effluent PNRS II system) sod

IV. Punch List

PNRS II TEST FACILITY CONSTRUCTION CONTRACTOR PUNCH LIST

Location	Item	Description	Complete
Nitrified effluent systems	1.	Connect flowmeter signal wires to main control panel located in PNRS II shed	11/29/11
STE systems	2.	Connect flowmeter signal wires to main control panel located in PNRS II shed	11/29/11
STE systems	3.	Connect float signal wires back to main control panel located in PNRS II shed for Pump 2 operation	11/29/11
TA3 (STE drip)	4.	Install 1" tee with ball valve to influent line to allow for future tracer test dosing	11/18/11
TA5 (STE PNRS II)	5.	Install sample port on denitrification tank discharge line	Samples will be taken from tank
TA5 (Nitrified effluent PNRS II)	6.	Install sample port on denitrification tank discharge line	Samples will be taken from tank
STE systems	7.	Install globe valve for throttling on return line	To be completed when globe valve received
Nitrified effluent systems	8.	Install globe valve for throttling on return line	To be completed when globe valve received
Main Control Panel	9.	Programming changes to software to include STE and nitrified effluent system flowmeter logs	To be completed
Feed & Return lines for both systems	10.	Install air-release valves	To be completed
TA1 (STE trench) and TA2 (NO3 trench)	11.	Move observation ports so that bottom is at infiltrative surface rather than natural grade	To be completed