Florida Department of Health  
Onsite Nitrogen Reduction Strategies Study  

Contract CORCL  

TASK B.6  

Installation Report for Passive Nitrogen Reduction System  
B-HS2  

September 2012

Task B of the Florida Onsite Nitrogen Reduction Strategies Study (FOSNRS) includes performing field experiments to critically evaluate the performance of nitrogen removal technologies that were identified and pilot tested in FOSNRS Task A. To meet this objective, full scale treatment systems will be installed at various residential sites in Florida, operated on septic tank effluent under actual onsite conditions, and monitored over an extended timeframe. The Task B Quality Assurance Project Plan (Task B.5) documents the objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the home sites. This report documents the installation of a passive nitrogen reduction system at a home site in Hillsborough County, Florida (B-HS2).

System Overview

The B-HS2 system was installed in Hillsborough County, Florida in September 2012. It consists of a replacement 1,050 gallon two chamber concrete primary tank; 300 gallon concrete recirculation tank; 900 gallon concrete Stage 1 unsaturated media filter; 300 gallon concrete pump tank; and 1,500 gallon two chamber concrete Stage 2 saturated media biofilter. Figure 1 is a site schematic showing the system components and layout of the installation. The complete as-built system drawings are included in the attached Appendix A.

Household wastewater enters the 1st chamber of the primary tank and exits the second chamber as septic tank effluent through an effluent screen into the recirculation tank. The recirculation tank contents are discharged by gravity to a distribution box, located inside the Stage 1 biofilter, which splits the flow between two perforated distribution pipes along the top of the unsaturated Stage 1 biofilter media. The Stage 1 biofilter contains 10 inches of coarse expanded clay media (Riverlite™ 1/4; 1.1 to 4.8 mm) above 20 inches of finer expanded clay media (Riverlite™ 3/16; 0.6 to 2.4 mm). Wastewater proceeds downward through the expanded clay media where nitrification occurs. Stage 1 biofilter effluent then flows into the pump tank (which contains the pump and float switches). The pump tank discharge is split via two throttling globe valves which allow for a portion of the Stage 1 biofilter effluent to be sent back for recirculation with the rest proceeding to the Stage 2 biofilter. The system was designed with two recirculation modes of operation. The first option (which will initially be tested) is to have the recirculated effluent return to the recirculation tank for mixing with incoming septic tank effluent. The second option is to have the recirculated effluent return to the top of the Stage 1 biofilter,
dispersed by three spray nozzles. Recirculation back to either the recirculation tank or Stage 1 biofilter increases the hydraulic loading on the Stage 1 biofilter. Effluent from the unsaturated (Stage 1) media tank enters the denitrification (Stage 2) biofilter into a standing water column lying above the media in the first chamber (lignocellulosic media), flows downward through the media, moves laterally through the baffle wall to the bottom of the second chamber, and upward through the media in the second chamber (elemental sulfur and oyster shell). The Stage 2 biofilter contains 42-inches of lignocellulosic media in the first chamber. A collection pipe along the bottom transfers the effluent to the second chamber which contains 24-inches of elemental sulfur mixed with oyster shell media. The Stage 2 biofilter effluent discharges near the top of the tank; therefore denitrification occurs in the saturated environment. The denitrified treated effluent is discharged into the soil via the existing mounded drainfield (P.T.I.™ bundles). A flow schematic of the system is shown on Figure 2.
Figure 1
Schematic of B-HS2 PNRS installed in Hillsborough county
Figure 2
Flow Schematic of B-HS2 PNRS installed in Hillsborough county
Installation

Installation of the system commenced September 10, 2012 and was completed on September 12, 2012. The installation began with a pump out and removal of the existing 1,050 gallon septic tank, which was found to be cracked during the system evaluation. After the pump out was completed, the old septic tank was removed (Figure 3).

![Figure 3](image-url)
Old septic tank removed

A 1,050 gallon, two compartment replacement concrete primary tank was installed. The first larger chamber serves as a primary receiving tank, receiving the raw sewage from the household. The sewer pipe from the house was plumbed into the 4”D (diameter) inlet hole shown in Figure 4. An effluent screen (Polylok™, PL-68) was installed in the outlet tee of the second chamber (Figure 5).
Figure 4
1,050 gallon, two chamber, primary Tank

Figure 5
Primary tank effluent screen

4”D inlet pipe connection
Following the primary tank installation, the remaining passive nitrogen reduction system components were installed (Table 1). A single chamber (900 gallon) concrete tank was installed beside the primary tank (Figure 6). The purpose of this tank is to hold the Stage 1 expanded clay media. The 4"D inlet of the tank is connected (gravity flow) to the recirculation tank discharge. The 2"D inlet is connected (pressurized flow) to the recirculation pipe from the pump tank. The 4"D outlet (Figure 7) of the pipe is located near the bottom of the tank to allow for unsaturated operation. The 4"D underdrain pipe (perforated) with gravel surrounding was installed along the centerline of the bottom of the tank for effluent collection (Figure 8). Following gravel installation and leveling, 20-inches of fine (3/16 Riverlite™) expanded clay media was installed (Figure 9). Above the fine media, 10-inches of coarse (1/4 Riverlite™) expanded clay media was installed (Figure 10). Following media installation and leveling, the influent distribution network was installed. The 4"D influent pipe, connected to the recirculation tank discharge, discharges into a distribution box which flows to two 4"D perforated pipes across the top of the media (Figure 11). The distribution box includes two Polylok equalizer™ weirs to allow for the adjustment of the flow split (Figure 12). The 2"D influent pipe is reduced to a 1"D pipe along the centerline with three spray nozzles attached to distribute the recirculated effluent. The spray nozzles are removable for cleaning in the event clogging occurs (Figure 13).

Table 1  
Passive Nitrogen Reduction System Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Tank Volume (gal)</th>
<th>Surface Area (ft²)</th>
<th>Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Tank</td>
<td>1,050</td>
<td>37</td>
<td>none</td>
</tr>
<tr>
<td>Recirculation Tank</td>
<td>300</td>
<td>12</td>
<td>none</td>
</tr>
</tbody>
</table>
| Stage 1 Biofilter                | 900               | 37                 | • 10" Riverlite 1/4  
• 20" Riverlite 3/16 |
| Pump Tank                        | 300               | 12                 | none                                     |
| Stage 2a Biofilter, downflow     | 1,000 (1,500 total) | 36 (54 total)     | 42" lignocellulosic (Southern yellow pine) |
| Stage 2b Biofilter, upflow       | 500 (1,500 total) | 18 (54 total)      | 24" Elemental sulfur (90%) & oyster shell mixture (10%) |
Figure 6
900 gallon, single chamber, stage 1 biofilter tank

Figure 7
Stage 1 biofilter 4”D outlet pipe, with cleanout
Figure 8
Stage 1 biofilter gravel underdrain

Figure 9
Stage 1 biofilter 20-inches of fine media (3/16 Riverlite™)
Figure 10
Stage 1 biofilter 10-inches of coarse media (1/4 Riverlite™)

Figure 11
Stage 1 biofilter influent distribution system
Figure 12
Stage 1 biofilter d-box

Figure 13
Removable spray nozzle
The 300 gallon concrete recirculation tank was then installed (Figure 14). The 4"D inlet is connected to the septic tank effluent discharge, and the 2" D inlet is connected to the recirculation pipe from the pump tank. A bull run valve™ (Figure 15) was installed following the septic tank outlet to allow the flow to either be completely directed to the new passive system (to the recirculation tank) or to the existing distribution box (to the existing drainfield). A riser pipe was installed to grade over the valve, so that the valve can be turned after installation is complete. The valve is turned with a wrench on a rod which is long enough to reach with the riser installed (Figure 15).

![Figure 14](image)

Figure 14
300 gallon recirculation tank
Next, the 300 gallon concrete pump tank was installed downgradient of the Stage 1 biofilter (Figure 16). The outlet pipe connection was plugged since the pump discharge pipe is installed through the riser. The pump was installed within a holding bracket which also supports the float tree (Figure 17). Three float switches were installed to maintain the effluent level in the pump tank and are attached to a float tree installed in the pump tank and connected to the control panel. The height of the floats is adjustable and once the proper heights were established, screws were used to secure the floats to the float tree.

Two inline flow meters were installed following the pump discharge. The first inline flow meter was installed prior to the recirculation flow split, to record the cumulative flow in gallons pumped from the pump tank (Figure 18). At this location, the flowmeter measurement includes the forward wastewater flow (F) and the recirculation flow (R). Two throttling globe valves were installed to allow for the adjustment of F and R flow to achieve the target recirculation ratio (initially set at approximately 3:1). The second flowmeter installed downstream of the F globe valve measures the forward wastewater flow to the Stage 2 biofilter (Figure 18). As previously discussed, the design includes two modes of operation for the recirculation of Stage 1 effluent: 1) to the recirculation tank or 2) to the Stage 1 biofilter spray nozzles. Two ball valves were installed (Figure 19) which either shut on or off the recirculation mode desired (initially set so that all the recirculation flow returns to the recirculation tank).
Figure 16
300 gallon pump tank

Figure 17
300 gallon pump tank (pump and float tree)
Figure 18
Recirculation flow split and monitoring

Figure 19
Recirculation mode of operation flow split
The last tank installed was a two chamber (1,500 gallon) concrete tank (Figure 20). The purpose of this tank is to hold the Stage 2 lignocellulosic and sulfur media. The 1"D pipe downstream of the F flowmeter is expanded to 4"D and connects to a perforated pipe which distributes nitrified effluent over the lignocellulosic media within the first chamber of the Stage 2 biofilter. The nitrified effluent flows downward through the lignocellulosic media (within first chamber) and upward through the sulfur media mixture (within second chamber).

A 4"D underdrain pipe (perforated) with gravel surrounding was installed along the centerline of the bottom of the tank for transfer from the first chamber to the second chamber (Figure 21). The tank arrived with a coupling cast into the baffle wall near the bottom to connect both chambers of the tank. Following the underdrain gravel installation (Figure 22) and leveling, 24-inches of elemental sulfur and oyster shell media was installed and mixed (Figure 23) within the second chamber. A stainless steel drivepoint sampler tree (Figure 24) was installed for sampling at 3, 7, 12, and 18-inches above the bottom of the sulfur media mixture (Figure 23).

Above the gravel underdrain within the first chamber of the tank, 42-inches of lignocellulosic media was installed (Figure 25). A stainless steel drivepoint sampler tree was installed for sampling at 0, 6, 12, 18, 24, 30, and 36-inches above the bottom of the lignocellulosic media. A 4"D perforated pipe was connected to the inlet of the tank for effluent dispersal above the lignocellulosic media. A 4"D tee was installed at the outlet of the tank which allows for saturated operating conditions across the biofilter (Figure 26). The 4"D outlet is connected to the distribution box to the existing drainfield.

Figure 20
1,500 gallon stage 2 biofilter tank
Figure 21
Stage 2 biofilter tank perforated pipe along bottom (lignocellulosic chamber)

Figure 22
Stage 2 biofilter tank gravel underdrain (sulfur chamber)
Figure 23
Stage 2 biofilter tank (sulfur mixed with oyster shell)

Figure 24
Stage 2 biofilter tank SST drivepoint sampler tree (sulfur chamber)
Figure 25
Stage 2 biofilter tank (lignocellulosic media)

Figure 26
Stage 2 biofilter tank outlet tee
A power meter was installed between the main power box of the house and the control panel to record cumulative power usage of the system in kilowatts. The equipment connected to the power meter are the recirculation pump and the control panel. Figure 27 shows the power meter installed inside the control panel.

The system control panel (Figure 27) allows for a timed pump cycle which can be overridden if the effluent levels are too low or too high in the pump tank. If the floats indicate a low effluent level in the tank, the timed cycle is turned off to protect the pump. If the floats indicate a high effluent tank level, then the pump cycles faster (off cycle reduced) until the water level reaches the optimal range. An alarm will indicate if the water level goes above a critical level. The control panel is connected to a phone line which transmits data to Vericomm for monitoring.

Figure 27
Control Panel

During final testing of the system, the system operated with no visible signs of leaks, etc. The system area was filled and all disturbed areas on the property were graded (Figure 28) and covered with sod (Figure 29).
Figure 28
Overall PNRS system installed
Figure 29
Sod cover over PNRS system
Operation and Verification

On September 25, 2012, the pump tank was filled with potable water for system operational testing. The pump was tested, and the globe valves were set to an approximate 3 to 1 recirculation split, with 3 parts going back to the recirculation tank and 1 part going to the Stage 2 biofilter tank. Through the Vericomm system, the on and off pump cycles were set. A call to Vericomm was initiated from the control panel to transmit the data following the testing. In addition, the two flowmeters and electric meter were read and recorded (Table 1).

Table 1
Initial Settings and Readings Recorded

<table>
<thead>
<tr>
<th>Recirculation Ratio</th>
<th>September 25, 2012 11:45am</th>
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<tr>
<td>Control Panel Settings</td>
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<tr>
<td>Pump Run Time (hr:min)</td>
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<tr>
<td>Pump Cycles Today</td>
<td>5</td>
</tr>
<tr>
<td>Override Cycles Today</td>
<td>1</td>
</tr>
<tr>
<td>On time cycle (min:sec)</td>
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</tr>
<tr>
<td>Off time cycle (min:sec)</td>
<td>60:00</td>
</tr>
<tr>
<td>Electric Meter Reading</td>
<td></td>
</tr>
<tr>
<td>Electric Meter (kWh)</td>
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</tr>
<tr>
<td>Flowmeter Readings</td>
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</tr>
<tr>
<td>Household use flowmeter (gal)</td>
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<tr>
<td>Combined flowmeter (R+F) (gal)</td>
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<tr>
<td>Stage 2 flowmeter (F) (gal)</td>
<td>00000102.2</td>
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Estimated Cost

The final construction cost for the installed system was $19,142.18 as detailed in Appendix B.

System Start-up

The system was started up September 25, 2012, when all flow was diverted to the new passive system. Routine checks of the system were made for the first two weeks to ensure the system was functioning as intended. Tanks were noted to be full on October 5, 2012. Preliminary sampling will begin in October to monitor nitrification.
FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY B-HS2 RECORD DRAWINGS

LIST OF DRAWINGS

<table>
<thead>
<tr>
<th>SHEET COUNT</th>
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<th>SHEET TITLE</th>
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<tr>
<td>1</td>
<td>C-1</td>
<td>COVER SHEET AND INDEX OF DRAWINGS</td>
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<tr>
<td>2</td>
<td>C-1</td>
<td>OVERALL PROPOSED SITE PLAN</td>
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<tr>
<td>3</td>
<td>C-2</td>
<td>PROPOSED SYSTEM LAYOUT</td>
</tr>
<tr>
<td>4</td>
<td>C-3</td>
<td>STAGE 1 AND 2 BIOFILTER CROSS SECTIONS</td>
</tr>
<tr>
<td>5</td>
<td>C-4</td>
<td>RECIRCULATION TANK CROSS SECTIONS</td>
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<tr>
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<td>C-5</td>
<td>OVERALL SYSTEM CROSS SECTION</td>
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<td>7</td>
<td>C-6</td>
<td>SYSTEM FLOW DIAGRAM</td>
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<td>8</td>
<td>E-1</td>
<td>ELECTRICAL SITE PLAN</td>
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PROJECT LOCATION
B-HS2
Gibsonia, FL

FLORIDA DEPARTMENT OF HEALTH
4052 BALD CYPRESS WAY, Rm 408
TALLAHASSEE, FLORIDA 32399-1713
(850) 245-4070

NOTICE: THESE "RECORD DRAWINGS" REPRESENT THE FINAL CONDITIONS OF THE CONSTRUCTION PROJECT BASED UPON THE LOCATIONS, DOCUMENTATION, AND INFORMATION FURNISHED TO HAZEN AND SAWYER BY OTHERS, FIELD OBSERVATION AND SUPPORTING PROJECTS RECORDS.

HAZEN AND SAWYER
Environmental Engineers & Scientists
10000 Princess Palm Ave, Suite 200
Tampa, Florida 33619
Certificate of Authorization Number: 2771
IN ASSOCIATION WITH

OTIS ENVIRONMENTAL CONSULTANTS, LLC

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY B-HS2 RECORD DRAWINGS

LOCATION MAP
N.T.S.

FLORIDA DEPARTMENT OF HEALTH
4052 BALD CYPRESS WAY, Rm 408
TALLAHASSEE, FLORIDA 32399-1713
(850) 245-4070

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HAZEN AND SAWYER
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10000 Princess Palm Ave, Suite 200
Tampa, Florida 33619
Certificate of Authorization Number: 2771
IN ASSOCIATION WITH

OTIS ENVIRONMENTAL CONSULTANTS, LLC
PROPOSED SITE PLAN

EXISTING WATER AERATOR

EXISTING WATER WELL

3 BEDROOM RESIDENCE

SWIMMING POOL

ICE DRAINAGE DITCH

PROPOSED SITE PLAN

FLORIDA DEPARTMENT OF HEALTH

OVERALL PROPOSED SITE PLAN

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer

FLORIDA DEPARTMENT OF HEALTH

Hazen_and_Sawyer
3 BEDROOM, 3 BATH RESIDENCE

EXISTING VEGETATION TO AVOID (POTENTIALLY LARGE ROOTS)

PUMP CONTROL PANEL

EXISTING CONCRETE SUMP TANK

300 GALLON, PUMP TANK

PUMP: OREN CO PF1503 HIGH HEAD EFFLUENT PUMP

3 FLOATS, LOW, DISENABLE, HIGH

24" DIAMETER MANHOLE RISER TO GROUND SURFACE WITH POLYETHYLENE LID AT GROUND SURFACE

300 GALLON, RECIRCULATION TANK

EXISTING 1050 GALLON SEPTIC TO BE REMOVED

EXISTING DISTRIBUTION BOX

EXISTING MOUNTED DRAINFIELD

4 TRENCHES - 3' X 3' X 3'

PROPOSED SYSTEM LAYOUT

NOTES:

1. 45 DEGREE ELBOWS SHALL BE USED. 90 DEGREE ELBOWS SHALL NOT BE USED.
2. ALL GATE VALVES AND FLOWMETERS SHALL BE INSTALLED WITH VALVE BOX COVER, WITH RISER AS APPLICABLE, FOR ACCESS AT GROUND SURFACE.
3. GLOBE VALVES SHALL BE SPEARS T-GLOBE VALVES OR EQUIVALENT. VALVES SHALL BE CONSTRUCTED FROM PVC. ALL VALVES SHALL HAVE A MINIMUM PRESSURE RATING OF 90 PSI.
4. ALL 4" TANK INLET AND OUTLET CONNECTIONS SHALL INCLUDE POLYLOK IV EPDM SEALS.
5. ALL TANK LIDS SHALL BE SEALED WITH APPROPRIATE SEALANTS TO ENSURE WATER TIGHTNESS.
DESIGN CALCULATIONS

A. FLOW CALCULATIONS

NUMBER OF BEDROOMS = 3
BUILDING AREA = 2542 SF

Q = (3 BR x 100 GPD/BR) + ((2542 SF - 2250 SF) x 100 GPD/750 SF)

F.A.C. MINIMUM DESIGN FLOW = 400 GPD

B. TREATMENT DESIGN

STAGE 1 BIOFILTER = 900 GAL = 37.1 SF
STAGE 2 BIOFILTER = 1500 GAL = 61.3 SF

SULFUR = 20.4 SF

C. SYSTEM FLOWS

RECYCLE RATIO = 3:1

RECYCLE FLOW = 1200 GPD

NUMBER OF DOSES = 24

TOTAL G.P.D PER DOSE = 66.7

DESIGN MINIMUM PUMP FLOW RATE = 5.5 GPM

FORWARD FLOW = 16.7 GAL/DOSE

RECYCLE FLOW = 50 GALLON/DOSE

MINUTES PER CYCLE = 12.8

D. HYDRAULIC LOADING RATE

STAGE 1 FORWARD FLOW = 10.8 GAL/DAY/ SF

STAGE 1 TOTAL FLOW = 43.2 GAL/DAY/ SF

STAGE 2 LOSMO = 1.8 GAL/DAY/ SF

STAGE 2 RECYCLE = 15.6 GAL/DAY/ SF

E. TWO MODES OF OPERATION

1. RECIRCULATION TANK MODE = ALL RECYCLE FLOW TO RECIRCULATION TANK

2. SPRAYER MODE = ALL RECYCLE FLOW TO STAGE 1 BIOFILTER SPRAY NOZZLES

NOTE: HGL SHOWN IS FOR RECIRCULATION TANK MODE OF OPERATION.
APPENDIX B

CONSTRUCTION COSTS
### Table B.1
#### Construction Cost Summary

**PROJECT:** FOSNRS Study Field Site Installation B-HS2  
**CLIENT:** FDOH

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>ENGINEER OR CONTRACTOR</th>
<th>QUANTITY</th>
<th>UNIT</th>
<th>UNIT PRICE</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td><strong>STE Tank</strong></td>
<td>1 Inlet pipe (4&quot;D) and connection to existing 4&quot; SDR</td>
<td>Contractor</td>
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<td>LS</td>
<td>$100.00</td>
<td>$100.00</td>
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<td></td>
<td>2 1050 gallon concrete septic tank (2 polyethylene lids and risers to grade)</td>
<td>Contractor</td>
<td>1</td>
<td>EA</td>
<td>$680.00</td>
<td>$680.00</td>
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<tr>
<td></td>
<td>3 4&quot; tee on outlet pipe for sample collection with grade access</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
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<td>$20.00</td>
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<td></td>
<td>4 4&quot; outlet pipe</td>
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<td>LS</td>
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<td>$30.00</td>
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<td></td>
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<td>7 1&quot;D pressure pipe connection (seal)</td>
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<td>8 4&quot;D outlet pipe, baffle tee</td>
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<td><strong>Stage 1 Biofilter</strong></td>
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<td>EA</td>
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<td>10 Polylok distribution box and accessories</td>
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<td>LS</td>
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<td>CY</td>
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<td>19 4&quot; sanitary wye, 45 elbow, and clean out to grade</td>
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<td></td>
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<tr>
<td></td>
<td>22 Effluent pump</td>
<td>Engineer</td>
<td>1</td>
<td>LS</td>
<td>$531.00</td>
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</tr>
<tr>
<td></td>
<td>23 Float assembly</td>
<td>Engineer</td>
<td>1</td>
<td>EA</td>
<td>$202.40</td>
<td>$202.40</td>
</tr>
<tr>
<td></td>
<td>24 Vericomm Control panel</td>
<td>Engineer</td>
<td>1</td>
<td>EA</td>
<td>$900.00</td>
<td>$900.00</td>
</tr>
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<td></td>
<td>25 Power meter</td>
<td>Engineer</td>
<td>1</td>
<td>EA</td>
<td>$267.90</td>
<td>$267.90</td>
</tr>
<tr>
<td></td>
<td>26 2 flowmeters</td>
<td>Engineer</td>
<td>2</td>
<td>EA</td>
<td>$151.40</td>
<td>$302.80</td>
</tr>
<tr>
<td></td>
<td>27 2 globe valves</td>
<td>Engineer</td>
<td>1</td>
<td>LS</td>
<td>$159.37</td>
<td>$159.37</td>
</tr>
<tr>
<td></td>
<td>28 1&quot;D Ball valves</td>
<td>Contractor</td>
<td>2</td>
<td>EA</td>
<td>$7.50</td>
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<tr>
<td></td>
<td>29 1&quot;D Check valves</td>
<td>Contractor</td>
<td>2</td>
<td>EA</td>
<td>$10.00</td>
<td>$20.00</td>
</tr>
<tr>
<td></td>
<td>30 1&quot;D pipe</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$100.00</td>
<td>$100.00</td>
</tr>
<tr>
<td></td>
<td>31 Fittings to expand from 1&quot;D to 4&quot;D</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$15.00</td>
<td>$15.00</td>
</tr>
<tr>
<td></td>
<td>32 Electrical wire to panel, conduit (for flowmeters, floats, pump connection)</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$100.00</td>
<td>$100.00</td>
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<tr>
<td><strong>Stage 2 Biofilter</strong></td>
<td>33 1500 gallon concrete tank (2 polyethylene lids and risers to grade)</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$1,000.00</td>
<td>$1,000.00</td>
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<tr>
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<td>34 Baffle wall pipe connection (4&quot;D)</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$60.00</td>
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<tr>
<td></td>
<td>35 4&quot;D baffle tee on outlet</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$20.00</td>
<td>$20.00</td>
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<tr>
<td></td>
<td>36 4&quot;D perforated pipe (inlet and outlet)</td>
<td>Engineer</td>
<td>1</td>
<td>LS</td>
<td>$45.19</td>
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<tr>
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<td>37 Stainless steel drivepoint samplers, tubing</td>
<td>Engineer</td>
<td>1</td>
<td>LS</td>
<td>$10.00</td>
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<td>38 Media - sawdust</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
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<tr>
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<td>39 Media - elemental sulfur</td>
<td>Engineer</td>
<td>1</td>
<td>LS</td>
<td>$969.96</td>
<td>$969.96</td>
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<tr>
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<td>40 Media - oyster shell</td>
<td>Engineer</td>
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<td>EA</td>
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<td>41 4&quot;D outlet pipe</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
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<tr>
<td></td>
<td>42 4&quot;D Tee for STE pipe and outlet pipe connection to existing d-box</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$25.00</td>
<td>$25.00</td>
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<tr>
<td><strong>Miscellaneous</strong></td>
<td>43 Onsite system contractor Labor (8 hr day onsite)</td>
<td>Contractor</td>
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<td>EA</td>
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<tr>
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<td>44 Onsite system contractor mobilization and transport</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$5,000.00</td>
<td>$5,000.00</td>
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<tr>
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<td>45 Fill around tanks</td>
<td>Contractor</td>
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<td>LS</td>
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<td>46 St. Augustine grass restoration</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
<td>$1,000.00</td>
<td>$1,000.00</td>
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<tr>
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<td>47 Pump out old septic tank</td>
<td>Contractor</td>
<td>1</td>
<td>LS</td>
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<td>48 Existing system evaluation</td>
<td>Contractor</td>
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<td>LS</td>
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</table>

**TOTAL** $19,142.18

**LS = Lump Sum**