

**Florida Department of Health  
Florida Onsite Sewage Nitrogen Reduction Strategies Study**

**Contract CORCL**

**TASK B.8**

**Operation, Maintenance and Repairs Report for  
Passive Nitrogen Reduction System  
B-HS4**

**January, 2015**

Task B of the Florida Onsite Sewage Nitrogen Reduction Strategies Study (FOSNRS) includes performing field experiments to critically evaluate the performance of nitrogen removal technologies that were identified in FOSNRS Task A.9 and pilot tested in Task A.26. To meet this objective, full-scale treatment systems were installed at various residential sites in Florida, operated on septic tank effluent (STE) under actual onsite conditions, and monitored over an extended timeframe.

This report summarizes the operation, maintenance, and repairs required for the passive nitrogen reduction system (PNRS) installed at a home site in Seminole County, Florida (B-HS4) in July, 2013. Design and construction details were presented previously in the Task B.6 Field System Installation Report for this system. The field system monitoring reports that document system performance, operation, and maintenance issues were presented previously in Task B.7 documents for each monitoring event. The B-HS4 system performance was monitored from September 2013 to December 2014.

Prior to the installation of the PNRS, the property had two existing onsite sewage treatment and disposal systems. The pre-existing 1,200 gallon concrete septic tank, located on the west side of the property, continues to provide primary treatment, now as part of the PNRS system. The pre-existing 900 gallon septic tank, located on the northeast side of the property, was converted to a lift station. In the new configuration, a fraction of the total wastewater flow is pumped from the 900 gallon lift station to the head end of the new gravity flow PNRS. All subsequent flow through the PNRS is by gravity. The passive nitrogen reduction system consists of the septic tank, two treatment tanks and a new drainfield. The B-HS4 PNRS tankage includes a 2,800 gallon concrete tank that houses a Stage 1 unsaturated media biofilter and 1,500 gallon two chamber concrete tank that houses a Stage 2 saturated media biofilter. The treated effluent from the Stage 2 biofilter is discharged into the soil via the new drainfield (EQ36-LP™ chambers).

Overall this system did require oversight and maintenance throughout the study period; however, most issues were related to the lift station flow into the primary tank. A Hazen and Sawyer technician visited the site on a monthly basis. Starting approximately halfway through the study period, the septic tank effluent screen required maintenance during each visit. It was noted during preliminary sampling that the incoming lift station wastewater flow into the single chamber primary tank was causing mixing in the primary tank and the carryover of solids into the Stage 1 biofilter d-box. Therefore a smaller pump

(lower horsepower) was installed in the lift station with a mechanical float switch and a ball valve was installed in the pressurized line prior to the primary tank inlet to allow control of the flow rate. These modifications resulted in more frequent and lower volume doses from the lift station to the primary tank and reduced mixing within the primary tank; however, mixing and stirring did still occur and is likely the cause of the continuous clogging of the septic tank effluent screen. In addition, during the study period the ball valve was clogged and needed to be flushed out.

The carryover of solids from the septic tank also led to a biomat and ponding in a small area near the distribution box within the Stage 1 biofilter. On April 29, 2014 an additional distribution pipe was installed along the centerline of the Stage 1 biofilter for better flow distribution. The Stage 1 biofilter effluent distribution pipes installed at the top of the expanded clay media were leveled a few times throughout the study period.

A description of the start-up issues, routine operation and maintenance items (O&M), the entity that performed the repair/maintenance, and the associated cost are included in Table 1. Table 2 is the summary log of repairs, maintenance actions, inspection results and system observations since start-up. This data, along with data from the other full-scale systems evaluated in Task B, will be used to estimate O&M effort and cost for full-scale passive nitrogen reduction systems (PNRS) in the Life Cycle Cost Analysis (Task B.13).

**Table 1. Site B-HS4: Summary of start-up, routine operation and maintenance issues, repairs and refinement actions**

Date	Start-up Issues	Routine Operations & Maintenance Issues	Repairs	System Refinement	Time Required (hr)	Estimated Cost <sup>1</sup>
8/6/13	H&S cleaned primary tank effluent screen				0.5	\$38
8/12/13	H&S cleaned primary tank effluent screen, shortened float swing on lift station pump				0.5	\$38
9/5/13	ME replaced lift station pump with a smaller pump				2	\$150
12/2/13		H&S cleaned primary tank effluent screen			0.5	\$38
1/23/14		H&S adjusted Stage 1 distribution pipes			0.5	\$38
1/31/14		H&S cleaned primary tank effluent screen; re-leveled Stage 1 distribution pipe; adjusted d-box weirs			1	\$75
4/3/14		H&S cleaned primary tank effluent screen			0.5	\$38
4/25/14		H&S leveled Stage 1 distribution pipes; adjusted Stage 1 d-box weirs		H&S installed Stage 1 piezometer to be able to monitor water level.	2	\$150
4/29/14		H&S cleaned primary tank effluent screen		Installed a third Stage 1 distribution pipe along centerline	4	\$300
5/19/14		H&S cleaned primary tank effluent screen	Pump runtime 13.5 minutes; cleared clog in ball valve from lift station; pump runtime back down to 2.5 minutes		1	\$75
7/11/14		H&S cleaned primary tank effluent screen			0.5	\$38
7/29/14		H&S cleaned primary tank effluent screen			0.5	\$38
8/22/14		H&S cleaned primary tank effluent screen; re-leveled Stage 1 distribution pipes			0.5	\$38
9/19/14		H&S cleaned primary tank effluent screen.			0.5	\$38
10/23/14		H&S cleaned primary tank effluent screen			0.5	\$38
11/21/14		H&S cleaned primary tank effluent screen			0.5	\$38
12/16/14		H&S cleaned primary tank effluent screen			0.5	\$38

ME = maintenance entity = Averett Septic Inc.

H&S = Hazen and Sawyer (field technician)

HO = homeowner

CHD = county health department

<sup>1</sup>An hourly rate of \$75 was assumed for maintenance entity labor.

**Table 2. Site B-HS4: System inspections, observations, maintenance actions, and repairs log**

Date	Description
6/19/2013	Construction - Stage 1 and Stage 2 tank installed
6/20/2013	Construction - drainfield installed
6/21/2013	Construction - electrical work
7/9/2013	System Start-up
	Bull run valve switched from drainfield to Stage 1 biofilter
7/17/2013	Site visit. System ok.
7/23/2013	Construction - sod installation
7/29/2013	Preliminary sampling event
8/6/2013	Site visit.
	Back-up in STE tank, water level above outlet effluent screen
8/12/2013	Back-up in STE tank again, removed filter screen
	Lift station pump causing lots of mixing in STE tank
	Shortened float swing on lift station pump to reduce pump runtime
	Lots of solids on the surface of the Stage 1 Biofilter in area around d-box
	During lift station pump dose, ponding in Stage 1 biofilter in area around d-box
8/15/2013	Bull run valve switched to drainfield
9/5/2013	Lift station pump replaced with smaller pump
	Smaller pump installed in second chamber of old septic tank
	Switched bull run valve to PNRS system
9/10/2013	Site visit. System ok.
9/30/2013	Sample Event No. 1
11/8/2013	Site visit. System ok.
11/27/2013	Site visit. System ok.
12/2/2013	Sample Event No. 2
	Cleaned STE effluent filter screen
	Slight ponding in Stage 1 biofilter influent side near d-box area
	No ponding in all 4 drainfield observation ports
	*homeowners were out of town for Thanksgiving holiday
12/23/2013	Site visit. System ok. No ponding in all 4 drainfield observation ports
1/23/2014	Site visit.
1/23/2014	Ponding near Stage 1 d-box, adjusted pipe and raked media
	No ponding in all 4 drainfield observation ports
1/31/2014	Site visit.
	Fixed Stage 1 biofilter distribution pipe (east side) which was off support
	No ponding in all 4 drainfield observation ports
2/3/2014	Sample Event No. 3 (formal No. 3)
	No ponding in all 4 drainfield observation ports
2/4/2014	Sample Event No. 4
	No ponding in all 4 drainfield observation ports
2/5/2014	Sample Event No. 5
	No ponding in all 4 drainfield observation ports

**Table 2 (cont.). Site B-HS4: System inspections, observations, maintenance actions, and repairs log**

Date	Description
2/6/2014	Sample Event No. 6
	No ponding in all 4 drainfield observation ports
2/7/2014	Sample Event No. 7
	No ponding in all 4 drainfield observation ports
2/12/2014	Site visit. System ok. No visible ponding in Stage 1 biofilter.
3/14/2014	Site visit. System ok. No visible ponding in Stage 1 biofilter.
4/3/2014	Sample Event No. 8 (formal No. 4)
	No ponding in all 4 drainfield observation ports
	No visible ponding in Stage 1 biofilter.
	High power meter reading. Checked lift station pump which was ok.
4/25/2014	Site visit. System ok.
	Installed piezometer in Stage 1 biofilter to monitor water level.
	Leveled Stage 1 biofilter distribution pipes
	Adjusted weirs inside Stage 1 d-box
4/29/2014	Site visit. System ok.
	Installed third Stage 1 distribution pipe along centerline of biofilter
5/19/2014	Septic tank effluent screen severely clogged.
	Cleaned STE effluent screen
	Also cleared clog within ball valve from lift station
5/29/2014	Sample Event No. 9 (formal No. 5)
	No ponding in all 4 drainfield observation ports
	No visible ponding in Stage 1 biofilter.
6/9/2014	Re-sampled B-HS4-ST2 for toxicity testing.
	Measured lift station dose runtime
7/11/2014	Site visit.
7/11/2014	STE effluent screen severely clogged again.
	Cleaned STE effluent screen
7/29/2014	Site visit. System ok.
	Cleaned STE effluent screen, it was not severely clogged.
	Black biomat present on surface of Stage 1 biofilter media in area near d-box
8/22/2014	Sample Event No. 10 (formal No. 6)
	Cleaned STE effluent screen, it was not severely clogged.
	Repositioned Stage 1 center distribution pipe.
	Stage 1 center distribution pipe seal in d-box should be replaced. Repositioned pipe in seal.
	No ponding in all 4 drainfield observation ports
9/19/2014	Site visit. System ok.
	Cleaned STE effluent screen.
	Black biomat present on surface of Stage 1 biofilter media in area near d-box

**Table 2 (cont.). Site B-HS4: System inspections, observations, maintenance actions, and repairs log**

Date	Description
10/23/2014	Sample Event No. 11 (formal No. 7)
	Cleaned STE effluent screen, it was not severely clogged.
	No ponding in all 4 drainfield observation ports
11/21/2014	Site visit. System ok.
	Cleaned STE effluent screen.
12/16/2014	Sample Event No. 12 (formal No. 8)
	Cleaned STE effluent screen, it was severely clogged.
	No ponding in all 4 drainfield observation ports