



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

B-HS5 Field System Monitoring Report No. 2

Progress Report

December 2013

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Environmental Engineers & Scientists

In association with:



AET
Applied Environmental Technology

**Otis Environmental
Consultants, LLC**

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TASK B.7 PROGRESS REPORT

B-HS5 Field System Monitoring Report No. 2

Prepared for:

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Environmental Health
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1.0 Background

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 PNRS II. To meet this objective, full scale treatment systems are being installed at various residential sites in Florida and monitored over an extended timeframe under actual onsite conditions. 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 second sample event of the passive nitrogen reduction system at home site B-HS5 in Seminole County, Florida.

2.0 Purpose

This monitoring report documents data collected from the second B-HS5 monitoring and sampling event conducted on December 4, 2013 (Experimental Day 148). This monitoring event consisted of collecting flow measurements from the household water use meter, treatment system flow meters, recording electricity use, monitoring of field parameters, collection of water samples from nine points in the treatment system, and sample analyses by a NELAC certified laboratory.

3.0 Materials and Methods

3.1 Project Site

The B-HS5 field site is located in Seminole County, FL. The nitrogen reducing onsite treatment system for the single family residence was installed in June 2013. Design and construction details were presented previously in the Task B.6 document. Figure 1 is a system schematic showing the system components and layout of the installation. A flow schematic of the system is shown in Figure 2. The PNRS system consists of the addition of three tanks to the existing permitted system: a 1500 gallon plastic tank Stage 1 unsaturated media filter; 300 gallon concrete pump tank; and 1,500 gallon two

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chamber concrete Stage 2 saturated media biofilter. The existing 1,350 gallon concrete septic tank continues to provide primary treatment for the PNRS system. Based on measured average wastewater flow and tank volumes, there is over a ten day transit time through the treatment system prior to dispersal. The denitrified treated effluent is discharged into the soil via the existing drainfield which is a standard bed.

PRELIMINARY

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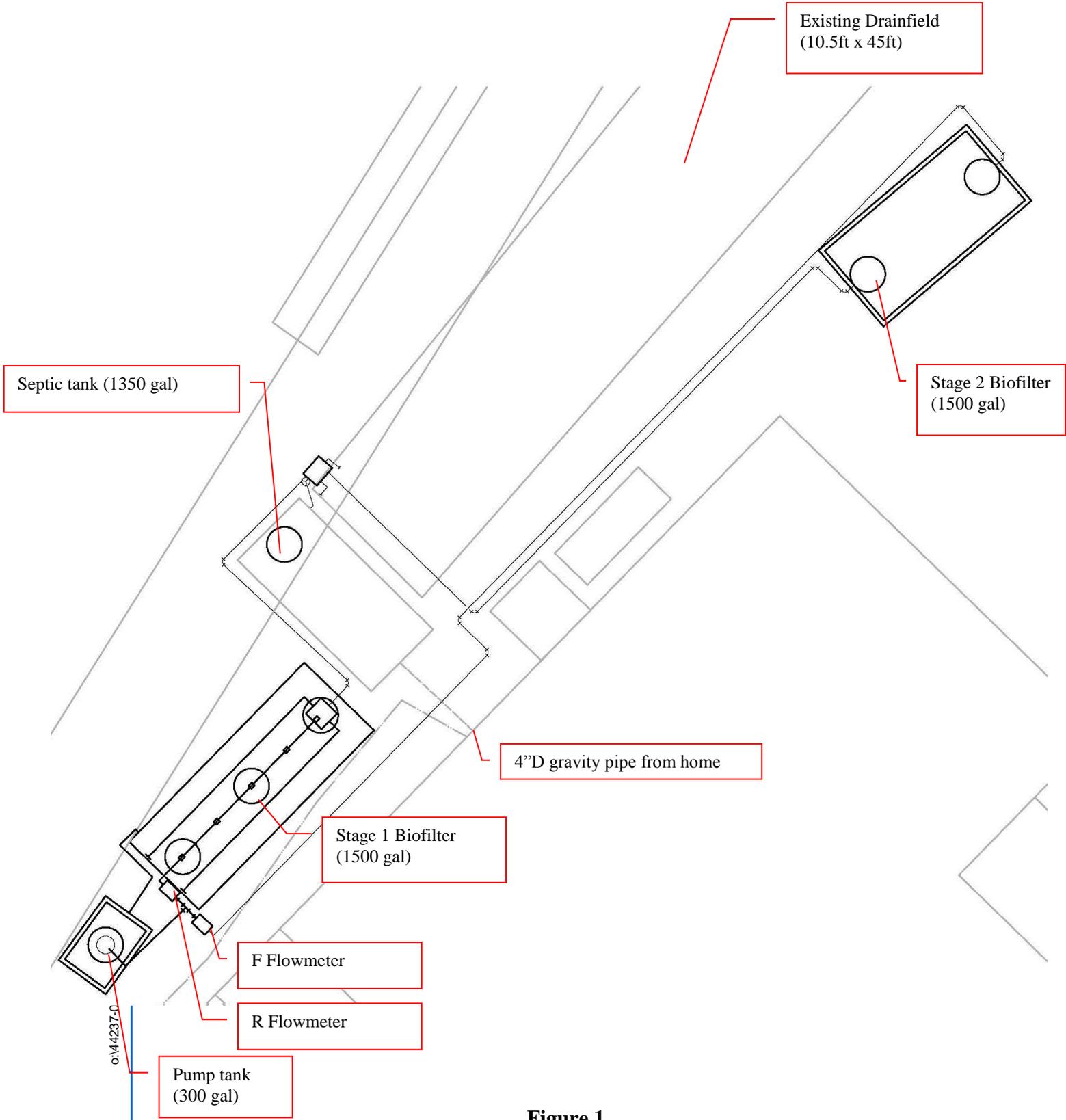


Figure 1
Plan view of B-HS5 system layout

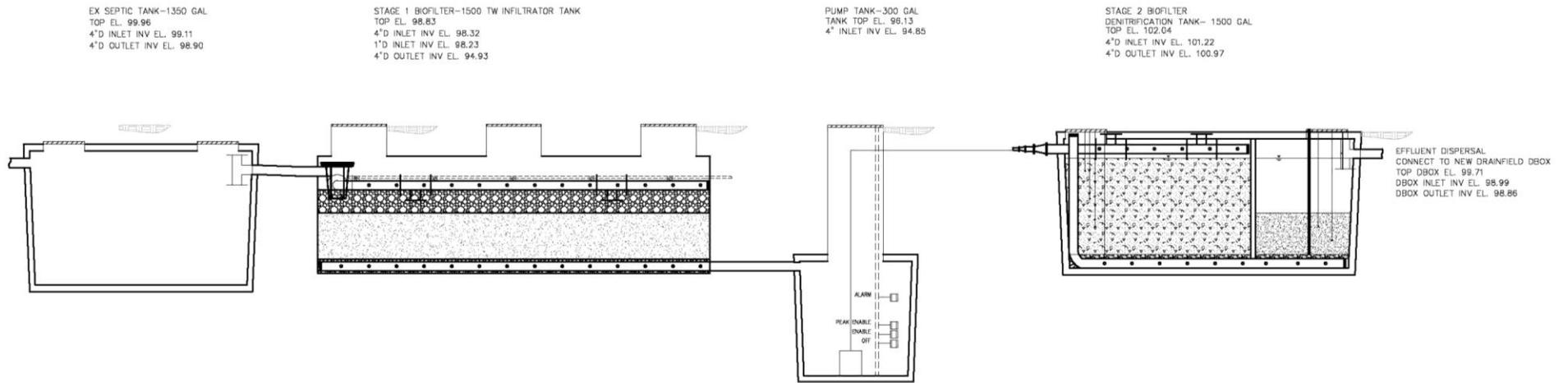
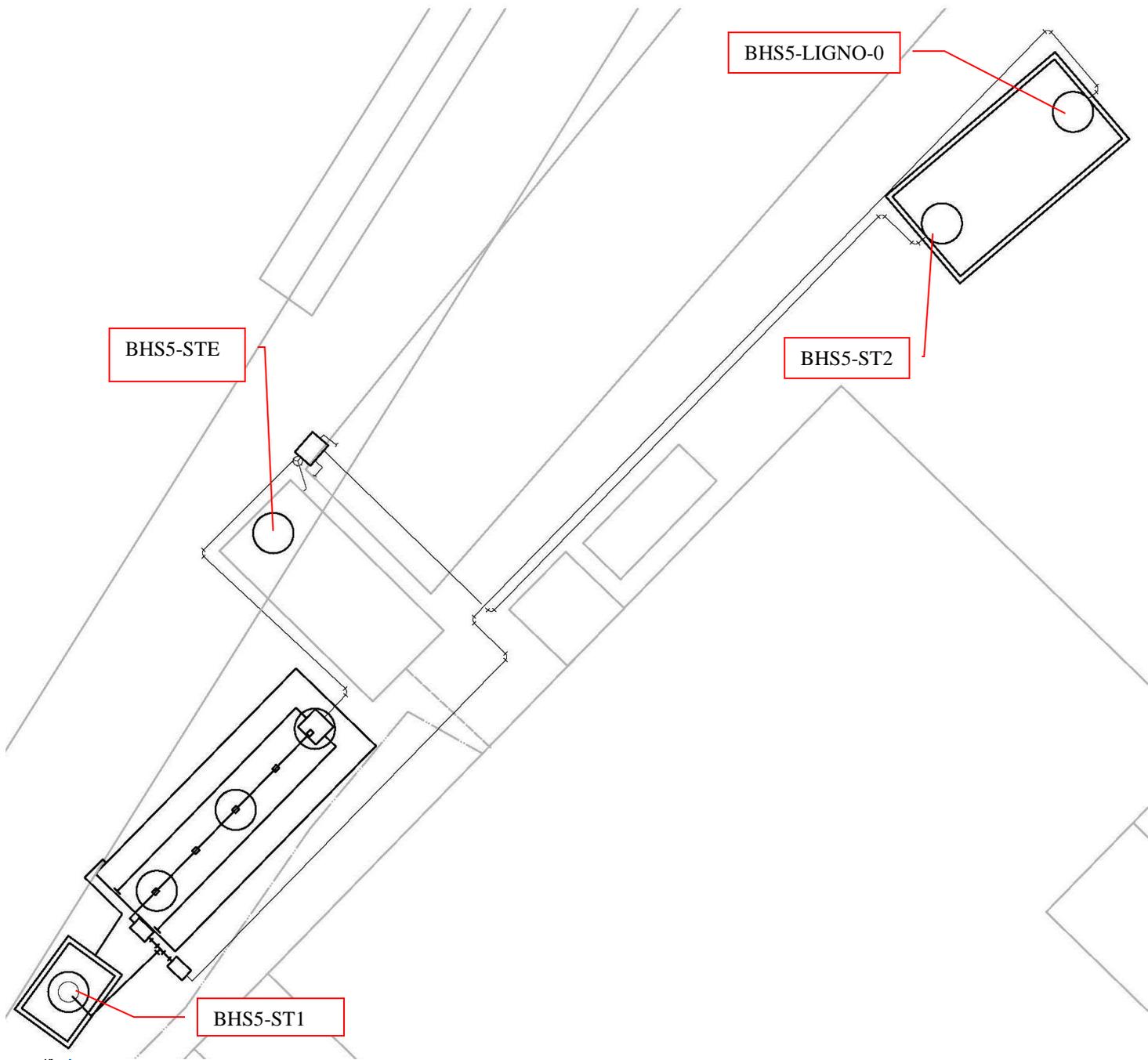


Figure 2
Flow Schematic of B-HS5 PNRS

PRELIMINARY

3.2 Monitoring and Sample Locations and Identification

The four primary monitoring points for the B-HS5 system are shown in Figure 3. Household wastewater enters the primary tank and exits as septic tank effluent through an effluent filter screen into the Stage 1 biofilter. The first primary monitoring point, B-HS5-STE, is the effluent sampled approximately 1.5 feet below the surface of the primary tank prior to the effluent filter (Figure 4), which is referred to as primary effluent or septic tank effluent (STE). Samples from monitoring point B-HS5-STE are representative of the whole household wastewater. The B-HS5-STE sample represents the influent to the remainder of the onsite nitrogen reduction system.



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Figure 3
B-HS5 Sample and Monitoring Locations

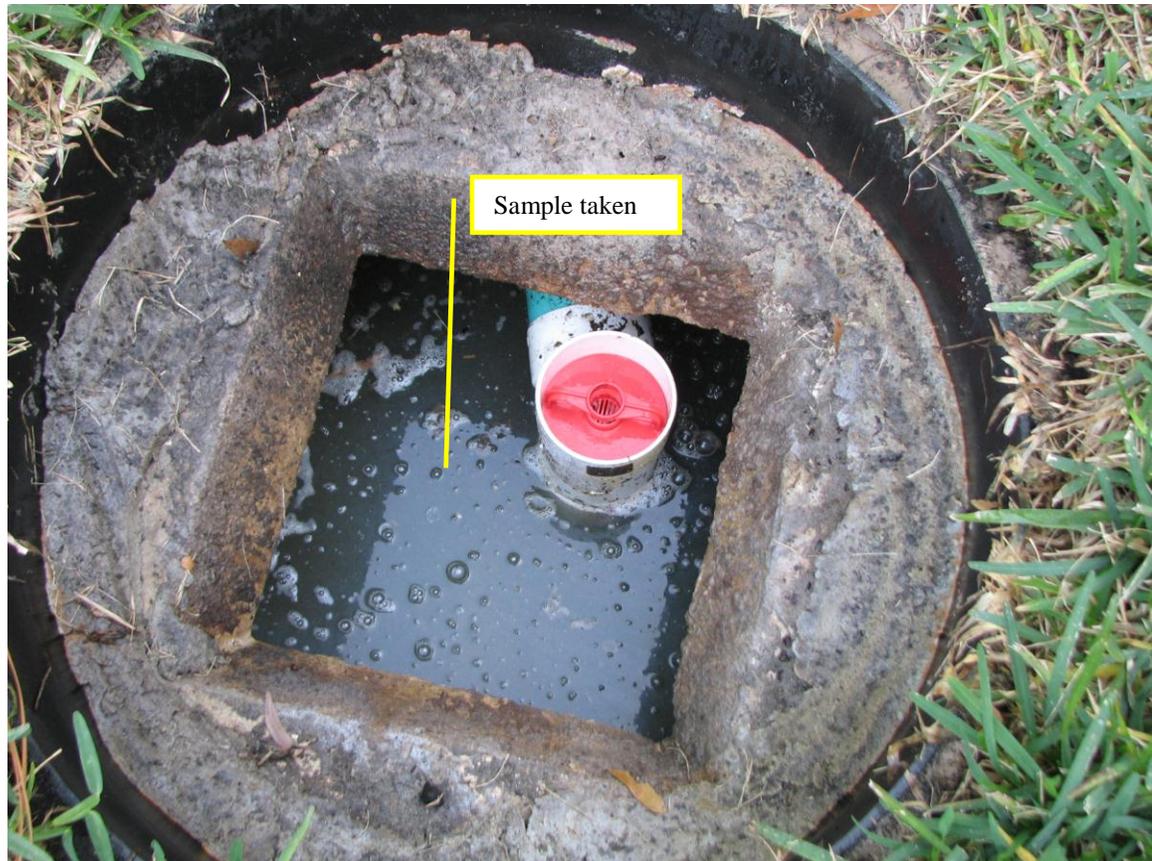


Figure 4
Primary Tank (B-HS5-STE sample)

The primary 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. In the Stage 1 biofilter, wastewater percolates downward through the unsaturated expanded clay media where nitrification occurs. The Stage 1 biofilter contains 12.8 inches of coarse expanded clay media (Riverlite™ 1/4; 1.1 to 4.8 mm) above 21 inches of finer expanded clay media (Riverlite™ 3/16; 0.6 to 2.4 mm). Stage 1 biofilter effluent flows into the pump tank by gravity. The second primary sampling point (B-HS5-ST1), is sampled approximately 1.5 feet below the surface of the pump tank representing the Stage 1 biofilter effluent (Figure 5).

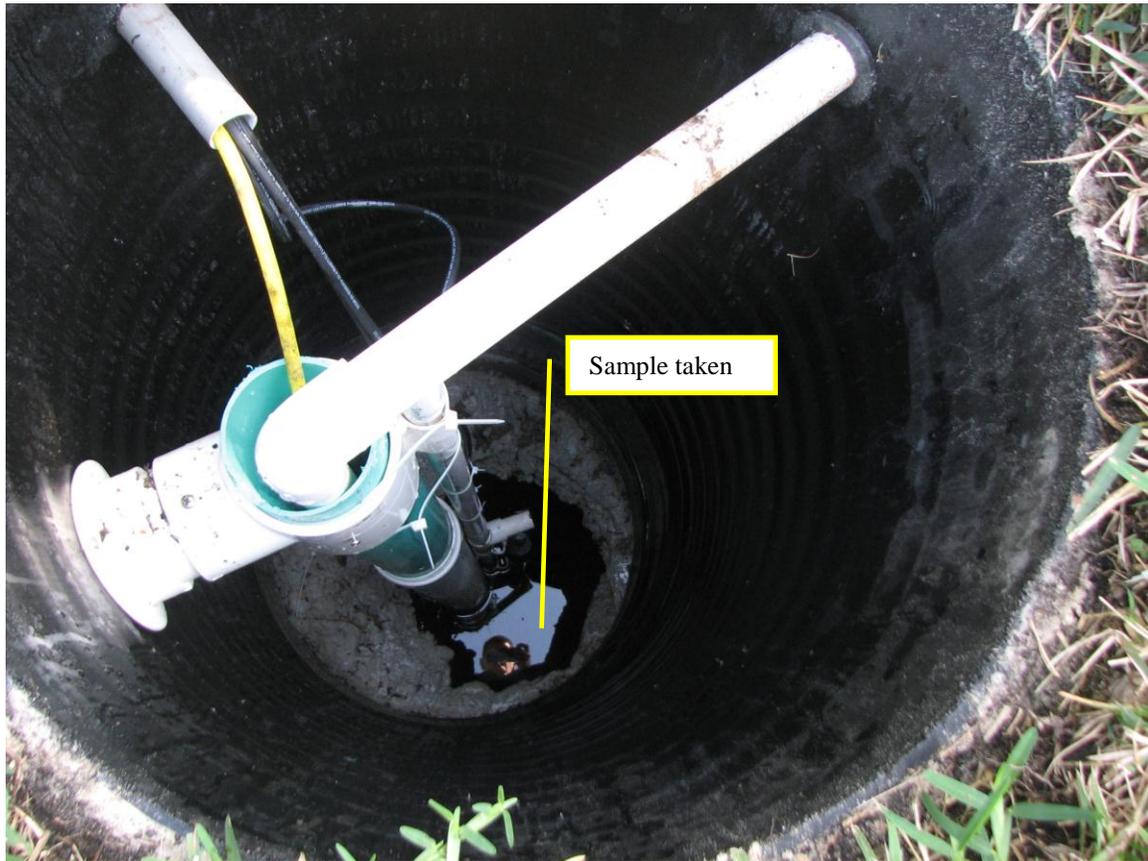


Figure 5
Stage 1 Effluent in Pump Tank (B-HS5-ST1 sample)

The pump tank discharge is split via two throttling gate valves which allow for optional recycling of a portion of the Stage 1 biofilter effluent with the balance proceeding to the Stage 2 biofilter. The system was designed with two operational modes. In the first mode, 100 percent of the Stage 1 effluent discharges to the Stage 2 biofilter. Initial operation of B-HS5 is in the non-recirculation mode. The second operating mode is to recirculate the Stage 1 effluent to the top of the Stage 1 biofilter and disperse it by five spray nozzles. The recirculated effluent would have an opportunity to mix with incoming septic tank effluent discharged by the distribution box. Recirculation back to the 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 first chamber of the Stage 2 biofilter contains 42-inches of lignocellulosic media. Stainless steel samplers are positioned at 12-inch increments for vertical profiling throughout the lignocellulosic media. The third primary sampling point is a stainless steel sampler positioned at the bottom of the lignocellulosic media (B-HS5-LIGNO-0) with tubing to the surface. Twelve inches above B-HS5-LIGNO-0 is another stainless steel drivepoint sampler B-HS5-LIGNO-12, and so forth (B-HS5-LIGNO-24 and B-HS5-LIGNO-36). The B-HS5-LIGNO-0 sample represents the lignocellulosic media effluent (Figure 6).

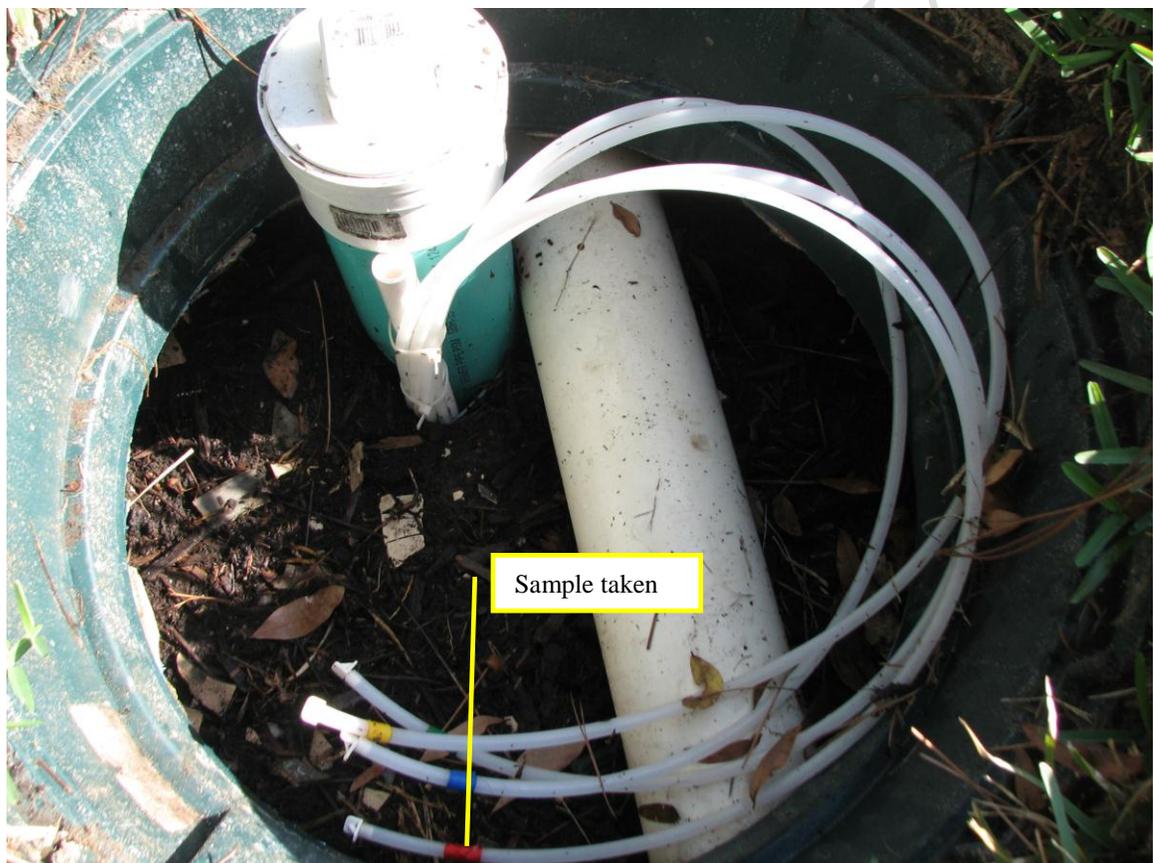


Figure 6
First chamber of Stage 2 biofilter (B-HS5-LIGNO-0" sample)

A collection pipe along the bottom transfers the first chamber (lignocellulosic media) effluent to the second chamber, which contains 18-inches of elemental sulfur mixed with

oyster shell media. Similar to the lignocellulosic media chamber, stainless steel drivepoint samplers are positioned to create a vertical profile. B-HS5-SULFUR-6 and B-HS5-SULFUR-12 are positioned 6-inches and 12-inches, respectively, above the bottom of the sulfur media. The fourth primary sampling point, B-HS5-ST2, is the second chamber of the Stage 2 biofilter effluent which is sampled approximately 1 foot below the surface of the effluent baffle tee. This sample location is after passage through the sulfur media; it is the final effluent from the treatment system prior to being discharged to the soil infiltration system, or drainfield (Figure 7).



Figure 7
Second chamber of Stage 2 biofilter (B-HS5-ST2 sample)

3.3 Operational Monitoring

Start-up of the system occurred on July 9, 2013 (Experimental Day 0). The PNRS system has operated continually since that date. For this second formal sampling event, the water meter for the house and treatment system flow meters were read and recorded on December 4, 2013. The household water meter is located on the potable water line from the onsite well prior to entering the household plumbing. The water meter does not include the irrigation water use. Therefore, the water meter reading should be indicative of the wastewater flow to the system.

As previously discussed, the pump tank discharge is split via two throttling gate valves which allow for a portion of the Stage 1 biofilter effluent to be sent back to the Stage 1 biofilter spray nozzles (for recirculation) with the rest proceeding to the Stage 2 biofilter. The treatment system flow meters (Figure 1) are located on the pump tank discharge lines following the flow split, and record the cumulative flow in gallons pumped from the pump chamber to the Stage 1 biofilter (R flowmeter) and Stage 2 biofilter (F flowmeter). Currently, the mode of operation is set to non-recirculation mode, where 100 percent of the pumped flow is directed to the Stage 2 biofilter. For this sample event, the F flowmeter (Figure 1), which is located following the split on the line from the pump tank, records the cumulative forward flow in gallons pumped to the Stage 2 biofilter. The control panel includes telemetry where reports are generated regarding alarms, pump cycles, and other information using a Vericomm control panel system.

3.4 Energy Consumption

Energy consumption was monitored using an electrical meter installed between the main power box for the house and the control panel. The electrical meter records the cumulative power usage of the system in kilowatt-hours. The power usage of the system is primarily due to the single lift station pump installed within the pump tank, although a small amount of power is used by the control panel itself. There are no chemicals added to the system. However, the Stage 2 biofilter media (lignocellulosic and sulfur) are “reactive” media which will be consumed during operation. The Stage 2 biofilter was initially filled with 42 inches of lignocellulosic media and 18 inches of sulfur and oyster shell mixture media, which ostensibly will last for many years without replenishment or replacement.

3.5 Water Quality Sample Collection and Analyses

The second formal sample event (Sample Event No. 2), was conducted on December 4, 2013 (Experimental Day 148). A full suite of influent, intermediate and effluent water quality samples were collected from the system for water quality analysis. Samples were collected at each of the nine monitoring points described in Section 3.2: B-HS5-

STE, B-HS5-ST1, B-HS5-LIGNO-36, B-HS5-LIGNO-24, B-HS5-LIGNO-12, B-HS5-LIGNO-0, B-HS5-SULFUR-6, B-HS5-SULFUR-12 and B-HS5-ST2. A peristaltic pump was used to collect samples and route them directly into analysis-specific containers after sufficient flushing of the tubing had occurred. Field parameters were then recorded.

Immediately subsequent to the regular samples for each primary monitoring point, additional sample was collected to be filtered at the laboratory (0.45 micron filter) for analysis of CBOD₅ and the nitrogen species to allow for comparison to the unfiltered sample water quality results.

Lastly, field blank (FB) and duplicate samples were taken. The field blank was collected by filling the sample containers with deionized water brought to the field. This sample was then analyzed for the same parameters as the monitoring samples. The field sample duplicate (B-HS4-ST1) was collected immediately subsequent to the regular samples.

The analysis-specific containers were supplied by the analytical laboratory and contained appropriate preservatives. The analysis-specific containers were labeled, placed in coolers and transported on ice to the analytical laboratories. Each sample container was secured in packing material as appropriate to prevent damage and spills, and was recorded on chain-of-custody forms supplied by the laboratory. Chain of custody forms, provided in Appendix A, were used to document the transfer of samples from field personnel to the analytical laboratory.

Field parameters were measured using portable electronic probes and included temperature (Temp), dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and specific conductance. The field parameters were measured by placing the analytical probes in a container overflowing with sample water. The influent, intermediate, and effluent samples were analyzed by the laboratory for: total alkalinity, chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH₃-N), nitrate nitrogen (NO₃-N), nitrite nitrogen (NO₂-N), total phosphorus (TP), orthophosphate (Ortho P), total suspended solids (TSS), volatile suspended solids (VSS), total organic carbon (TOC), fecal coliform (fecal), and E.coli. The influent and sulfur media samples included sulfate, sulfide, and hydrogen sulfide (unionized). All analyses were performed by an independent and fully NELAC certified analytical laboratory (Southern Analytical Laboratory). Table 1 lists the analytical parameters, analytical methods, and detection limits for laboratory analyses.

**Table 1
Analytical Parameters, Method of Analysis, and Detection Limits**

Analytical Parameter	Method of Analysis	Method Detection Limit (mg/L)
Total Alkalinity as CaCO ₃	SM 2320B	2 mg/L
Chemical Oxygen Demand (COD)	EPA 410.4	10 mg/L
Total Kjeldahl Nitrogen (TKN-N)	EPA 351.2	0.05 mg/L
Ammonia Nitrogen (NH ₃ -N)	EPA 350.1	0.005 mg/L
Nitrate Nitrogen (NO ₃ -N)	EPA 300.0	0.01 mg/L
Nitrite Nitrogen (NO ₂ -N)	EPA 300.0	0.01 mg/L
Nitrate+Nitrite Nitrogen (NOX-N)	EPA 300.0	0.02 mg/L
Total Phosphorus (TP)	SM 4500P-E	0.01 mg/L
Orthophosphate as P (Ortho P)	EPA 300.0	0.01 mg/L
Carbonaceous Biological Oxygen Demand (CBOD ₅)	SM5210B	2 mg/L
Total Solids (TS)	EPA 160.3	.01 % by wt
Total Suspended Solids (TSS)	SM 2540D	1 mg/L
Volatile Suspended Solids (VSS)	EPA 160.4	1 mg/L
Total Organic Carbon (TOC)	SM5310B	0.06 mg/L
Sulfate	EPA 300.0	2.0 mg/L
Sulfide	SM 4500SF	0.10 mg/L
Hydrogen Sulfide (unionized)	SM 4550SF	0.01 mg/L
Fecal Coliform (fecal)	SM9222D	1 ct/100mL
E.coli	SM9223B	2 ct/100mL

4.0 Results and Discussion

4.1 Operational Monitoring

Table 2 provides a summary of the household water use since the water meter installation on February 12, 2013. The treatment system flow meter readings for the B-HS5 field site are summarized in Table 3. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B. Summary tables of the Vericomm PLC recorded data are provided in Appendix C. These include daily and cumulative pump runtime and system alarms that are used to check general pump operation and performance.

Table 2
Summary of Household Water Use Flowmeter

Date	Cumulative Volume (gallons)	Average Daily Household Flow between readings, Q (gpd)
2/12/2013 10:30	166.0	INSTALLED
2/21/2013 10:45	1,130.3	107.0
2/28/2013 11:45	2,323.9	169.5
3/7/2013 10:25	2,832.1	73.2
6/14/2013 13:00	13,460.9	107.2
6/25/2013 8:53	14,860.1	129.2
7/23/2013 8:31	17,659.4	100.0
7/29/2013 11:10	18,769.2	181.6
8/15/2013 12:28	21,078.4	135.4
8/27/2013 9:15	22,427.8	113.7
9/27/2013 10:40	25,738.3	108.6
11/8/2013 10:30	31,992.8	130.9
11/27/2013 11:12	34,400.8	142.0
12/4/2013 14:34	35,292.8	126.1
Average through 12/4/13		119.0

From start-up through December 4, 2013, the average household water use was 119 gallons per day with periods of higher and lower flows (Table 2).

Table 3
Summary of Treatment System Flowmeters

Date	Recirculation Pumped Flow, R Water Meter Reading	Average Recirculation Ratio	Stage 2 Biofilter Pumped Flow, F Water Meter Reading	Average Daily Stage 2, Q between readings
	Cumulative Volume (gallons)	Recycle: Forward Flow	Cumulative Volume (gallons)	Gallons/Day
7/5/2013 12:00	386.1	0.0		Installed
7/9/2013 15:20	386.1	0.0	167.5	Following testing
7/12/2013 14:13	386.1	0.0	207.4	13.5
7/17/2013 9:02	386.1	0.0	995.6	164.8
7/23/2013 8:31	386.1	0.0	1,642.9	108.3
7/29/2013 11:10	386.1	0.0	2,733.4	178.5
8/6/2013 8:51	386.1	0.0	3,894.7	146.9
8/15/2013 11:40	386.1	0.0	4,884.6	108.6
8/27/2013 9:15	386.1	0.0	6,135.4	105.1
9/27/2013 10:40	386.1	0.0	9,035.2	93.4
11/8/2013 10:30	386.1	0.0	14,347.7	126.5
11/27/2013 10:55	386.1	0.0	16,591.6	118.0
12/4/2013 13:45	386.1	0.0	17,474.0	124.0
Total average start-up to 12/4/13		0.0		117.0

The two throttling gate valves control the fraction of Stage 1 effluent that is recirculated and the fraction sent to the Stage 2 biofilter. The gate valves were initially set so that 100 percent of the flow is to the Stage 2 tank (0 recycle ratio). From start-up through December 4, 2013, the average pumped flow (forward flow to the Stage 2 biofilter) was 117 gallons per day which correlates well with the household water use.

4.2 Energy Consumption

Energy consumption is monitored using an electrical meter installed between the main power box for the house and the control panel to record cumulative power usage of the pump in kilowatt-hours. The recorded electrical use for the system is summarized in Table 4.

**Table 4
Summary of System Electrical Use**

Date and Time Read	Electrical Meter Reading	Average Daily Electrical Use between readings	Average Electrical Use per Gallon Treated
	Cumulative (kWh)	(kWh/day)	(kWh/gal)
7/5/2013 12:00		Installed	
7/9/2013 15:20	0.3	Start-up	
7/12/2013 14:13	0.4	0.03	0.0025
7/17/2013 9:02	0.6	0.04	0.0004
7/23/2013 8:32	0.8	0.03	0.0003
7/29/2013 11:10	1.2	0.07	0.0005
8/6/2013 8:51	1.5	0.04	0.0003
8/15/2013 11:40	1.8	0.03	0.0003
8/27/2013 9:15	2.2	0.03	0.0003
9/27/2013 10:40	3.1	0.03	0.0003
11/8/2013 10:30	4.8	0.04	0.0003
11/27/2013 10:55	5.5	0.04	0.0003
12/4/2013 13:45	5.8	0.04	0.0003
Total average start-up to 12/4/13		0.04	0.0003

The total average electrical use through December 4, 2013 was 0.04 kWh per day. The average electrical use per gallon treated was 0.0003 kWh per gallon treated, and this parameter has been fairly stable since start-up.

4.3 Water Quality

Water quality analytical results for Sample Event No.2 are listed in Table 5. Nitrogen results are graphically displayed in Figure 8. A summary of the water quality data collected to date for the test system is presented in Table 6. The laboratory report containing the raw analytical data is included in Appendix A. The following discussion summarizes the water quality analytical results. The performance of the various system components was compared by considering the changes through treatment of nitrogen species (TKN-N, NH₃-N, and NO_x-N), as well as supporting water quality parameters.



Figure 8
Graphical Representation of Nitrogen Results
Sample Event No. 2, December 4, 2013 (Experimental Day 148)

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Septic Tank Effluent (STE) Quality: The water quality characteristics of STE collected in Sample Event 2 were within the typical range generally expected for domestic STE. The measured STE total nitrogen (TN) concentration was 77 mg/L, which is within the range that has been typically reported for Florida single family residence STE.

Stage 1 Effluent (ST1): The Stage 1 effluent $\text{NH}_3\text{-N}$ levels was 5.1 mg/L with a DO level at 3.39 mg/L (Table 5). The Stage 1 effluent TSS concentration was 1 mg/L and CBOD_5 was 5 mg/L. The Stage 1 effluent $\text{NO}_x\text{-N}$ was 49.5 mg/L. The Stage 1 biofilter showed incomplete nitrification with an effluent $\text{NH}_3\text{-N}$ concentration of 5.1 mg/L and TKN of 7.9 mg/L.

Stage 2 Biofilter Effluent (LIGNO-0" and ST2): Effluent $\text{NO}_x\text{-N}$ from the Stage 2 biofilter monitoring point was 0.05 mg/L. The low $\text{NO}_x\text{-N}$ was accompanied by a measured 0.17 mg/L DO and -256.7 mV ORP. The lignocellulosic media effluent $\text{NO}_x\text{-N}$ was 3.8 mg/L. The Stage 2 system produced a highly reducing environment and achieved essentially complete $\text{NO}_x\text{-N}$ reduction. Final total nitrogen (TN) in the treatment system effluent was 1.85 mg/L. The Stage 2 biofilter effluent and lignocellulosic media effluent CBOD_5 was below the method detection limit. The Stage 2 effluent sulfate concentration was 58 mg/L. The Stage 2 biofilter effluent fecal coliform and e-coli concentrations were below the method detection limit.

As previously discussed in Section 3.2, Sample Event 2 also included Stage 2 biofilter profile samples. As depicted in Figure 9, the unsaturated Stage 1 biofilter effluent is pumped to the top of the first chamber of the Stage 2 biofilter which contains lignocellulosic media. The effluent flows downward through the lignocellulosic media, moves laterally in a perforated 4-inch pipe through the baffle wall to the bottom of the second chamber, and upward through the sulfur media mixture in the second chamber. The nitrogen results at the various depths of the Stage 2 biofilter are graphically displayed in Figure 9. Each stainless steel drivepoint sampler was assigned a unique identification indicating the depth (in inches) the sampler was placed above the bottom of the media. For example LIGNO-36 is a stainless steel drivepoint sampler located at 36 inches above the bottom of the lignocellulosic media. The profile results from this event indicate that the $\text{NO}_x\text{-N}$ was effectively reduced below the method detection limit at profile sampler SULFUR-6. The $\text{NO}_x\text{-N}$ concentration progressively decreased with passage through the lignocellulosic media in the downflow biofilter, which accounted for the majority of $\text{NO}_x\text{-N}$ reduction. Residual $\text{NO}_x\text{-N}$ in the effluent of the downflow biofilter was reduced to non-detection at the 6-inch depth through the sulfur media.

FROM PUMP	TKN	NH3-N	NOX-N		TKN	NH3-N	NOX-N
Influent	7.9	5.1	49.5	Effluent	1.8	0.6	0.05
LIGNO-36	3.7	1.4	25.0				
LIGNO-24	3.4	1.3	26.0				
LIGNO-12	3.9	0.8	15.0	SULFUR-12	1.8	0.2	0.03
LIGNO-0	2.5	0.3	3.8	SULFUR-6	1.5	0.2	0.02

Figure 9
Graphical Representation of Stage 2 Biofilter Profile Nitrogen Results

FB: One field blank sample was collected by filling sample containers with deionized water brought to the field. This sample was then analyzed for the same parameters as the monitoring samples. As expected, all parameters measured were at or below the method detection limit.

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**Table 5
Water Quality Analytical Results**

Sample ID	Sample Date/Time	Temp (°C)	pH	Specific Conductance (uS/cm)	DO (mg/L)	ORP (mV)	Total Alkalinity (mg/L)	TSS (mg/L)	VSS (mg/L)	CBOD ₅ (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH ₃ -N (mg/L N)	NO ₃ -N (mg/L N)	NO ₂ -N (mg/L N)	NO _x (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	TOC (mg/L)	
BHSS-STE	12/4/13 13:45	23.3	7.23	1238	0.04	-333.8	410	28	26	58	41	77.02	77	9	68	0.01	0.01	0.02	68.02	8.7	5.4	3.8	2	5.1	76000	7300	29	
BHSS-STE-FILTERED	12/4/13 13:45									32		81.02	81	21	60	0.01	0.01	0.02	60.02									
BHSS-ST1	12/4/13 13:20	25.6	7.05	1237	3.39	54.7	210	1	1	5	10	57.43	7.9	2.8	5.1	49	0.53	49.53	54.63	2.8	1.9				3700	520	6.2	
BHSS-ST1-DUP	12/4/13 13:25						210	1	1	5	10	55.49	7	1.8	5.2	48	0.49	48.49	53.69	2.8	2.3				4100	2100	6.7	
BHSS-ST1-FILTERED	12/4/13 13:20									2		60.46	11	5.8	5.2	49	0.46	49.46	54.66									
BHSS-LIGNO-36	12/4/13 13:08	23.3	6.69	1149	0.31	-99.7						28.7	3.7	2.3	1.4	25	0.01	25	26.4			28						
BHSS-LIGNO-24	12/4/13 12:58	23.4	6.66	1154	0.28	-167.2						29.4	3.4	2.1	1.3	26	0.01	26	27.3			28						
BHSS-LIGNO-12	12/4/13 12:38	23.5	6.69	1117	0.12	-185.3						18.9	3.9	3.09	0.81	14	1.0	15	15.81			27						
BHSS-LIGNO-0	12/4/13 12:17	23.4	6.61	1102	0.14	-145.7	390	2	2	2	24	6.3	2.5	2.2	0.3	2.1	1.7	3.8	4.1	0.51	0.21	27			200	2	14	
BHSS-LIGNO-0-FILTERED	12/4/13 12:17									2		5.7	2	1.26	0.74	2.1	1.6	3.7	4.44									
BHSS-SULFUR-6	12/4/13 12:50	23.5	6.70	1158	0.12	-283.9						1.52	1.5	1.29	0.21	0.01	0.01	0.02	0.23									
BHSS-SULFUR-12	12/4/13 12:35	23.2	6.71	1168	0.09	-298.7						1.83	1.8	1.58	0.22	0.03	0.01	0.03	0.25									
BHSS-ST2	12/4/13 12:20	22.7	6.59	1195	0.17	-256.7	400	2	2	2	24	1.85	1.8	1.22	0.58	0.05	0.01	0.05	0.63	0.42	0.18	58	0.42	0.61	1	2	12	
BHSS-ST2-FILTERED	12/4/13 12:20									2		1.54	1.5	0.89	0.61	0.04	0.01	0.04	0.65			58						
BHSS-FB-DI	12/4/13 14:15	28.3	6.73	2.04	9.29	32.4	2.7	1	1	2	10	0.07	0.05	0.041	0.009	0.01	0.01	0.02	0.029	0.01	0.01	0.2	0.01	0.1	1	2	0.06	

Notes:

¹Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO_x.

²Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH₃.

³Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH₃ and NO_x.

Gray-shaded data points indicate values below method detection level (mdl), mdl value used for statistical analyses.

Yellow-shaded data points indicate the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit, value used for statistical analysis.

PRELIMINARY

**Table 6
Summary of Water Quality Data**

Sample ID	Sample Date/Time	Temp (°C)	pH	Specific Conductance (uS/cm)	DO (mg/L)	ORP (mV)	Total Alkalinity (mg/L)	TSS (mg/L)	VSS (mg/L)	CBOD ₅ (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH ₃ -N (mg/L N)	NO ₃ -N (mg/L N)	NO ₂ -N (mg/L N)	NO _x (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	TOC (mg/L)	
STE	n	4	4	4	4	4	2	4	2	4	2	4	4	3	4	4	4	4	4	2	2	4	4	4	4	2	2	2
	MEAN	27.13	7.12	1224.25	0.09	-304.48	420.00	44.50	40.00	83.50	95.50	79.77	79.75	16.67	67.25	0.01	0.01	0.02	67.27	10.35	5.45	3.65	3.40	8.15	81,314	13,236	39	
	STD. DEV.	2.61		56.43	0.03	52.96	14.14	15.78	19.80	26.71	77.07	4.99	4.99	8.02	9.43	0.00	0.00	0.00	9.43	2.33	0.07	0.66	1.29	3.12			13	
	MIN	23.30	6.99	1160.00	0.04	-341.90	410.00	28.00	26.00	58.00	41.00	76.02	76.00	9.00	54.00	0.01	0.01	0.02	54.02	8.70	5.40	2.70	2.00	5.10	76,000	7,300	29	
	MAX	28.90	7.23	1294.00	0.11	-226.80	430.00	58.00	54.00	120.00	150.00	87.02	87.00	25.00	76.00	0.01	0.01	0.02	76.02	12.00	5.50	4.20	4.50	12.00	87,000	24,000	48	
Stage 1	n	4	4	4	4	4	2	2	2	2	2	4	4	4	4	4	4	4	4	2	2	0	0	0	2	2	2	
	MEAN	26.93	7.01	1208.25	2.44	-19.95	220.00	2.50	2.50	8.50	10.00	53.93	9.30	3.03	6.28	44.25	0.65	44.63	50.91	2.95	1.85				2,980	714	9	
	STD. DEV.	1.10		69.67	0.72	120.04	14.14	2.12	2.12	4.95	0.00	7.91	0.97	1.23	1.36	8.38	0.80	8.04	6.90	0.21	0.07						4	
	MIN	25.60	6.89	1104.00	1.70	-127.90	210.00	1.00	1.00	5.00	10.00	43.40	7.90	2.00	5.10	33.00	0.01	34.00	41.40	2.80	1.80				2,400	520	6	
	MAX	28.20	7.18	1249.00	3.39	109.50	230.00	4.00	4.00	12.00	10.00	61.90	10.00	4.80	7.50	52.00	1.80	52.00	57.10	3.10	1.90				3,700	980	12	
Stage 2 Ligno	n	4	4	4	4	4	2	2	2	2	2	4	4	4	4	4	4	4	4	2	2	1	0	0	2	2	2	
	MEAN	27.55	6.44	1126.25	1.09	-109.98	400.00	10.25	4.00	17.75	37.00	6.21	4.65	2.40	2.25	0.53	1.03	1.56	3.81	0.54	0.17	27.00			400	38	22	
	STD. DEV.	3.00		41.65	1.01	102.56	14.14	9.60	2.83	14.97	18.38	2.48	3.24	1.75	1.85	1.05	0.72	1.60	0.81	0.04	0.06						11	
	MIN	23.40	6.25	1088.00	0.14	-230.80	390.00	2.00	2.00	2.00	24.00	2.70	1.40	0.00	0.30	0.01	0.01	0.02	2.70	0.51	0.13	27.00			200	2	14	
	MAX	30.20	6.61	1182.00	2.50	9.70	410.00	24.00	6.00	38.00	50.00	8.32	8.30	3.70	4.60	2.10	1.70	3.80	4.62	0.56	0.21	27.00			800	740	29	
Stage 2 Sulfur	n	4	4	4	4	4	2	2	2	2	2	4	4	4	4	4	4	4	4	2	2	4	4	4	4	2	2	
	MEAN	27.58	6.65	1405.00	0.20	-288.58	440.00	3.50	3.50	3.00	28.00	5.50	5.48	2.23	3.25	0.02	0.01	0.03	3.27	0.68	0.36	90.75	16.78	24.70	1	2	19	
	STD. DEV.	3.46		257.94	0.09	76.56	56.57	2.12	2.12	1.41	5.66	3.66	3.67	1.51	2.26	0.02	0.00	0.02	2.24	0.37	0.25	75.36	19.89	28.28			9	
	MIN	22.70	6.59	1195.00	0.14	-357.00	400.00	2.00	2.00	2.00	24.00	1.85	1.80	0.90	0.58	0.01	0.01	0.02	0.63	0.42	0.18	29.00	0.42	0.61	1	2	12	
	MAX	30.40	6.79	1781.00	0.33	-195.40	480.00	5.00	5.00	4.00	32.00	10.02	10.00	4.20	5.80	0.05	0.01	0.05	5.82	0.94	0.54	200.00	45.00	64.00	1	2	25	
Tap	n	3	3	3	3	3	1	1	1	1	1	3	3	3	3	3	3	3	3	1	1	3	1	1	1	1	1	
	MEAN	26.47	7.28	448.00	3.94	98.53	130.00	1.00	1.00	2.00	10.00	0.32	0.10	0.07	0.03	0.22	0.01	0.22	0.25	0.06	0.03	12.67	2.60	4.10	1	2	3	
	STD. DEV.	3.01		15.72	2.22	173.67						0.18	0.01	0.03	0.02	0.18	0.00	0.18	0.19			0.58						
	MIN	23.60	6.73	431.00	2.31	-65.30	130.00	1.00	1.00	2.00	10.00	0.12	0.09	0.04	0.01	0.01	0.01	0.02	0.03	0.06	0.03	12.00	2.60	4.10	1	2	3	
	MAX	29.60	7.60	462.00	6.47	280.60	130.00	1.00	1.00	2.00	10.00	0.44	0.11	0.09	0.05	0.33	0.01	0.33	0.37	0.06	0.03	13.00	2.60	4.10	1	2	3	

Notes:

¹Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO_x.

²Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH₃.

³Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH₃ and NO_x.

⁴Fecal coliform and pH values are reported as geometric mean.

Gray-shaded data points indicate values below method detection level (mdl), mdl value used for statistical analyses.

Yellow-shaded data points indicate the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit, value used for statistical analysis.

Too many colonies were present. The numeric value represents the filtration volume.



5.0 B-HS5 Sample Event No. 2: Summary and Recommendations

5.1 Summary

The results of the second sampling event indicate that the system is operating well and no adjustments are recommended at this time. The Sample Event No. 2 results indicate that:

- Septic tank effluent (STE) quality is characteristic of typical household STE quality. The total nitrogen concentration of 77 mg/L is within the range of values typically reported for Florida single family residence STE.
- The Stage 1 biofilter converted most of the ammonia N to oxidized nitrogen; effluent contained 7.9 mg/L TKN, of which 5.1 mg/L was ammonia.
- The Stage 2 biofilter produced a reducing environment and effluent NO_x-N was 0.05 mg N/L.
- The total nitrogen concentration in the final effluent from the total treatment system was 1.85 mg/L, an approximately 98% reduction from STE.

5.2 Recommendations

No operational adjustments are recommended at this time, and continued sampling should provide additional insight to system performance.



Appendix A: Laboratory Report

PRELIMINARY

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Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name		B-HS5 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-STE						
Matrix		Wastewater						
SAL Sample Number		1312964-01						
Date/Time Collected		12/04/13 13:45						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						
<u>Client Provided Field Data</u>								
pH		7.13						
Temperature		23.3 °C						
Conductivity		1238 umhos						
Dissolved Oxygen		0.04 mg/L						
<u>Inorganics</u>								
Hydrogen Sulfide (Unionized)	mg/L	2.0	SM 4550SF	0.04	0.01		12/10/13 11:00	1
Ammonia as N	mg/L	68	EPA 350.1	2.0	0.47		12/06/13 12:48	50
Carbonaceous BOD	mg/L	58	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	41	EPA 410.4	25	10	12/06/13 08:47	12/06/13 15:00	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 20:44	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 20:44	1
Orthophosphate as P	mg/L	5.4	EPA 300.0	0.040	0.010		12/05/13 20:44	1
Phosphorous - Total as P	mg/L	8.7	SM 4500P-E	0.40	0.10	12/05/13 09:41	12/08/13 15:12	10
Sulfate	mg/L	3.8	EPA 300.0	0.60	0.20		12/05/13 20:44	1
Sulfide	mg/L	5.1	SM 4500SF	0.40	0.10		12/10/13 11:00	1
Total Alkalinity	mg/L	410	SM 2320B	8.0	2.0		12/11/13 10:54	1
Total Kjeldahl Nitrogen	mg/L	77	EPA 351.2	0.20	0.05	12/05/13 09:39	12/09/13 16:39	20.83
Total Organic Carbon	mg/L	29	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	28	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1
Volatile Suspended Solids	mg/L	26	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/05/13 20:44	1
<u>Microbiology</u>								
E. Coli	MPN/100 mL	7,300	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	76,000	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

Sample Description **BHS5-STE-FILTERED**
 Matrix **Wastewater**
 SAL Sample Number **1312964-02**
 Date/Time Collected **12/04/13 13:45**
 Collected by **Sean Schmidt**
 Date/Time Received **12/04/13 16:50**

Client Provided Field Data

pH 7.23
 Temperature 23.3 °C
 Conductivity 1238 umhos
 Dissolved Oxygen 0.04 mg/L

Hazen and Sawyer
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Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name		B-HS5 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-STE-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312964-02						
Date/Time Collected		12/04/13 13:45						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						
Client Provided Field Data								
pH		7.23						
Temperature		23.3 °C						
Conductivity		1238 umhos						
Dissolved Oxygen		0.04 mg/L						
Inorganic, Dissolved								
Ammonia as N	mg/L	60	EPA 350.1	2.0	0.47		12/13/13 12:07	50
Carbonaceous BOD	mg/L	32	SM 5210B	2	2	12/06/13 09:25	12/11/13 08:44	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 20:54	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 20:54	1
Total Kjeldahl Nitrogen	mg/L	81	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 14:46	20.83
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/05/13 20:54	1
Lab filtration for diss. analytes							12/05/13 14:25	

Sample Description		BHS5-ST1						
Matrix		Wastewater						
SAL Sample Number		1312964-03						
Date/Time Collected		12/04/13 13:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						
Client Provided Field Data								
pH		7.05						
Temperature		25.6 °C						
Conductivity		1237 umhos						
Dissolved Oxygen		3.39 mg/L						
Inorganics								
Ammonia as N	mg/L	5.1	EPA 350.1	0.20	0.047		12/06/13 11:02	5
Carbonaceous BOD	mg/L	5	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	12/06/13 08:47	12/06/13 15:00	1
Nitrate (as N)	mg/L	49	EPA 300.0	0.40	0.10		12/05/13 21:03	10
Nitrite (as N)	mg/L	0.53	EPA 300.0	0.04	0.01		12/05/13 21:03	1
Orthophosphate as P	mg/L	1.9	EPA 300.0	0.040	0.010		12/05/13 21:03	1
Phosphorous - Total as P	mg/L	2.8	SM 4500P-E	0.20	0.050	12/05/13 09:41	12/08/13 15:13	5
Total Alkalinity	mg/L	210	SM 2320B	8.0	2.0		12/11/13 11:01	1
Total Kjeldahl Nitrogen	mg/L	7.9	EPA 351.2	0.20	0.05	12/05/13 09:39	12/09/13 16:02	5
Total Organic Carbon	mg/L	6.2	SM 5310B	1.0	0.060		12/09/13 10:53	1
Total Suspended Solids	mg/L	1	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1

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Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name	B-HS5 SE#2							
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution

Sample Description **BHS5-ST1**
 Matrix **Wastewater**
 SAL Sample Number **1312964-03**
 Date/Time Collected **12/04/13 13:20**
 Collected by **Sean Schmidt**
 Date/Time Received **12/04/13 16:50**

Client Provided Field Data

pH		7.05						
Temperature		25.6 °C						
Conductivity		1237 umhos						
Dissolved Oxygen		3.39 mg/L						
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	49	EPA 300.0	0.44	0.11		12/05/13 21:03	10

Microbiology

E. Coli	MPN/100 mL	520	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	3,700	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

Sample Description **BHS5-ST1-DUP**
 Matrix **Wastewater**
 SAL Sample Number **1312964-04**
 Date/Time Collected **12/04/13 13:25**
 Collected by **Sean Schmidt**
 Date/Time Received **12/04/13 16:50**

Client Provided Field Data

pH		7.05						
Temperature		25.6 °C						
Conductivity		1237 umhos						
Dissolved Oxygen		3.39 mg/L						

Inorganics

Ammonia as N	mg/L	5.2	EPA 350.1	0.20	0.047		12/06/13 11:04	5
Carbonaceous BOD	mg/L	5	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	12/09/13 08:30	12/09/13 13:15	1
Nitrate (as N)	mg/L	48	EPA 300.0	0.40	0.10		12/05/13 21:12	10
Nitrite (as N)	mg/L	0.49	EPA 300.0	0.04	0.01		12/05/13 21:12	1
Orthophosphate as P	mg/L	2.3	EPA 300.0	0.040	0.010		12/05/13 21:12	1
Phosphorous - Total as P	mg/L	2.8	SM 4500P-E	0.20	0.050	12/05/13 09:41	12/08/13 15:14	5
Total Alkalinity	mg/L	210	SM 2320B	8.0	2.0		12/11/13 11:08	1
Total Kjeldahl Nitrogen	mg/L	7.0	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 14:18	9.62
Total Organic Carbon	mg/L	6.7	SM 5310B	1.0	0.060		12/09/13 10:53	1
Total Suspended Solids	mg/L	1	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	49	EPA 300.0	0.44	0.11		12/05/13 21:12	10

Microbiology

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December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-ST1-DUP						
Matrix		Wastewater						
SAL Sample Number		1312964-04						
Date/Time Collected		12/04/13 13:25						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		7.05						
Temperature		25.6 °C						
Conductivity		1237 umhos						
Dissolved Oxygen		3.39 mg/L						
E. Coli	MPN/100 mL	2,100	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	4,100	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

Sample Description		BHS5-ST1-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312964-05						
Date/Time Collected		12/04/13 13:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		7.05						
Temperature		25.6 °C						
Conductivity		1237 umhos						
Dissolved Oxygen		3.39 mg/L						
Inorganic, Dissolved								
Ammonia as N	mg/L	5.2	EPA 350.1	0.20	0.047		12/13/13 11:13	5
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:25	12/11/13 08:44	1
Nitrate (as N)	mg/L	49	EPA 300.0	0.40	0.10		12/05/13 21:22	10
Nitrite (as N)	mg/L	0.46	EPA 300.0	0.04	0.01		12/05/13 21:22	1
Total Kjeldahl Nitrogen	mg/L	11	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 14:54	5
Nitrate+Nitrite (N)	mg/L	50	EPA 300.0	0.44	0.11		12/05/13 21:22	10
Lab filtration for diss. analytes							12/05/13 14:25	

Sample Description		BHS5-LIGNO-36						
Matrix		Wastewater						
SAL Sample Number		1312964-06						
Date/Time Collected		12/04/13 13:08						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.69						
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Hazen and Sawyer
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Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-LIGNO-36						
Matrix		Wastewater						
SAL Sample Number		1312964-06						
Date/Time Collected		12/04/13 13:08						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.69						
Temperature		23.3 °C						
Conductivity		1149 umhos						
Dissolved Oxygen		0.31 mg/L						

Inorganics

Ammonia as N	mg/L	1.4	EPA 350.1	0.040	0.009		12/06/13 10:05	1
Nitrate (as N)	mg/L	25	EPA 300.0	0.40	0.10		12/05/13 21:59	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 21:59	1
Sulfate	mg/L	28	EPA 300.0	0.60	0.20		12/05/13 21:59	1
Total Kjeldahl Nitrogen	mg/L	3.7	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 14:19	9.62
Nitrate+Nitrite (N)	mg/L	25	EPA 300.0	0.44	0.11		12/05/13 21:59	10

Sample Description		BHS5-LIGNO-24						
Matrix		Wastewater						
SAL Sample Number		1312964-07						
Date/Time Collected		12/04/13 12:58						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.66						
Temperature		23.4 °C						
Conductivity		1154 umhos						
Dissolved Oxygen		0.28 mg/L						

Inorganics

Ammonia as N	mg/L	1.3	EPA 350.1	0.040	0.009		12/06/13 10:07	1
Nitrate (as N)	mg/L	26	EPA 300.0	0.40	0.10		12/05/13 22:09	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 22:09	1
Sulfate	mg/L	28	EPA 300.0	0.60	0.20		12/05/13 22:09	1
Total Kjeldahl Nitrogen	mg/L	3.4	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 14:20	9.62
Nitrate+Nitrite (N)	mg/L	26	EPA 300.0	0.44	0.11		12/05/13 22:09	10

Hazen and Sawyer
10002 Princess Palm Ave, Suite 200
Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-LIGNO-12						
Matrix		Wastewater						
SAL Sample Number		1312964-08						
Date/Time Collected		12/04/13 12:38						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.69						
Temperature		23.5 °C						
Conductivity		1117 umhos						
Dissolved Oxygen		0.12 mg/L						

Inorganics

Ammonia as N	mg/L	0.81	EPA 350.1	0.040	0.009		12/06/13 10:09	1
Nitrate (as N)	mg/L	14	EPA 300.0	0.04	0.01		12/05/13 22:18	1
Nitrite (as N)	mg/L	1.0	EPA 300.0	0.04	0.01		12/05/13 22:18	1
Sulfate	mg/L	27	EPA 300.0	0.60	0.20		12/05/13 22:18	1
Total Kjeldahl Nitrogen	mg/L	3.9	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 13:15	1
Nitrate+Nitrite (N)	mg/L	15	EPA 300.0	0.08	0.02		12/05/13 22:18	1

Sample Description		BHS5-LIGNO-0						
Matrix		Wastewater						
SAL Sample Number		1312964-09						
Date/Time Collected		12/04/13 12:17						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.61						
Temperature		23.4 °C						
Conductivity		1102 umhos						
Dissolved Oxygen		0.14 mg/L						

Inorganics

Ammonia as N	mg/L	0.30	EPA 350.1	0.040	0.009		12/06/13 10:11	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	24 I	EPA 410.4	25	10	12/09/13 08:30	12/09/13 13:15	1
Nitrate (as N)	mg/L	2.1	EPA 300.0	0.04	0.01		12/05/13 22:28	1
Nitrite (as N)	mg/L	1.7	EPA 300.0	0.04	0.01		12/05/13 22:28	1
Orthophosphate as P	mg/L	0.21	EPA 300.0	0.040	0.010		12/05/13 22:28	1
Phosphorous - Total as P	mg/L	0.51	SM 4500P-E	0.040	0.010	12/05/13 09:41	12/08/13 14:39	1
Sulfate	mg/L	27	EPA 300.0	0.60	0.20		12/05/13 22:28	1
Total Alkalinity	mg/L	390	SM 2320B	8.0	2.0		12/11/13 11:21	1
Total Kjeldahl Nitrogen	mg/L	2.5	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 13:17	1
Total Organic Carbon	mg/L	14	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1

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Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-LIGNO-0						
Matrix		Wastewater						
SAL Sample Number		1312964-09						
Date/Time Collected		12/04/13 12:17						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.61						
Temperature		23.4 °C						
Conductivity		1102 umhos						
Dissolved Oxygen		0.14 mg/L						
Volatile Suspended Solids	mg/L	2	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	3.8	EPA 300.0	0.08	0.02		12/05/13 22:28	1

Microbiology

E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	200	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

Sample Description **BHS5-LIGNO-0-FILTERED**
 Matrix **Wastewater**
 SAL Sample Number **1312964-10**
 Date/Time Collected **12/04/13 12:17**
 Collected by **Sean Schmidt**
 Date/Time Received **12/04/13 16:50**

Client Provided Field Data

pH		6.61						
Temperature		23.4 °C						
Conductivity		1102 umhos						
Dissolved Oxygen		0.14 mg/L						
<u>Inorganic, Dissolved</u>								
Ammonia as N	mg/L	0.74	EPA 350.1	0.040	0.009		12/13/13 10:24	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:25	12/11/13 08:44	1
Nitrate (as N)	mg/L	2.1	EPA 300.0	0.04	0.01		12/05/13 22:37	1
Nitrite (as N)	mg/L	1.6	EPA 300.0	0.04	0.01		12/05/13 22:37	1
Total Kjeldahl Nitrogen	mg/L	2.0	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 15:37	1
Nitrate+Nitrite (N)	mg/L	3.7	EPA 300.0	0.08	0.02		12/05/13 22:37	1
Lab filtration for diss. analytes							12/05/13 14:25	

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Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-SULFUR-6						
Matrix		Wastewater						
SAL Sample Number		1312964-11						
Date/Time Collected		12/04/13 12:50						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.70						
Temperature		23.5 °C						
Conductivity		1158 umhos						
Dissolved Oxygen		0.12 mg/L						

Inorganics

Ammonia as N	mg/L	0.21	EPA 350.1	0.040	0.009		12/06/13 10:13	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 22:46	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 22:46	1
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 13:21	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/05/13 22:46	1

Sample Description		BHS5-SULFUR-12						
Matrix		Wastewater						
SAL Sample Number		1312964-12						
Date/Time Collected		12/04/13 12:35						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.71						
Temperature		23.2 °C						
Conductivity		1168 umhos						
Dissolved Oxygen		0.09 mg/L						

Inorganics

Ammonia as N	mg/L	0.22	EPA 350.1	0.040	0.009		12/06/13 10:15	1
Nitrate (as N)	mg/L	0.03 I	EPA 300.0	0.04	0.01		12/05/13 22:56	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 22:56	1
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 13:22	1
Nitrate+Nitrite (N)	mg/L	0.03 I	EPA 300.0	0.08	0.02		12/05/13 22:56	1

Sample Description		BHS5-ST2						
Matrix		Wastewater						
SAL Sample Number		1312964-13						
Date/Time Collected		12/04/13 12:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

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Laboratory Report

Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-ST2						
Matrix		Wastewater						
SAL Sample Number		1312964-13						
Date/Time Collected		12/04/13 12:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.59						
Temperature		22.7 °C						
Conductivity		1195 umhos						
Dissolved Oxygen		0.17 mg/L						

Inorganics

Hydrogen Sulfide (Unionized)	mg/L	0.42	SM 4550SF	0.04	0.01		12/10/13 11:00	1
Ammonia as N	mg/L	0.58	EPA 350.1	0.040	0.009		12/06/13 10:21	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	24 I	EPA 410.4	25	10	12/09/13 08:30	12/09/13 13:15	1
Nitrate (as N)	mg/L	0.05	EPA 300.0	0.04	0.01		12/05/13 23:05	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 23:05	1
Orthophosphate as P	mg/L	0.18	EPA 300.0	0.040	0.010		12/05/13 23:05	1
Phosphorous - Total as P	mg/L	0.42	SM 4500P-E	0.040	0.010	12/05/13 09:41	12/08/13 14:40	1
Sulfate	mg/L	58	EPA 300.0	0.60	0.20		12/05/13 23:05	1
Sulfide	mg/L	0.61	SM 4500SF	0.40	0.10		12/10/13 11:00	1
Total Alkalinity	mg/L	400	SM 2320B	8.0	2.0		12/11/13 11:33	1
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 13:23	1
Total Organic Carbon	mg/L	12	SM 5310B	1.0	0.060		12/09/13 10:53	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1
Volatile Suspended Solids	mg/L	2	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	0.05 I	EPA 300.0	0.08	0.02		12/05/13 23:05	1

Microbiology

E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

Sample Description		BHS5-ST2-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312964-14						
Date/Time Collected		12/04/13 12:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.59						
Temperature		22.7 °C						
Conductivity		1195 umhos						
Dissolved Oxygen		0.17 mg/L						



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Project Name **B-HS5 SE#2**

Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-ST2-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312964-14						
Date/Time Collected		12/04/13 12:20						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.59						
Temperature		22.7 °C						
Conductivity		1195 umhos						
Dissolved Oxygen		0.17 mg/L						

Inorganics

Sulfate	mg/L	58	EPA 300.0	0.60	0.20		12/05/13 23:15	1
Inorganic, Dissolved								
Ammonia as N	mg/L	0.61	EPA 350.1	0.040	0.009		12/13/13 10:26	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:25	12/11/13 08:44	1
Nitrate (as N)	mg/L	0.04	EPA 300.0	0.04	0.01		12/05/13 23:15	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 23:15	1
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 15:38	1
Nitrate+Nitrite (N)	mg/L	0.04 I	EPA 300.0	0.08	0.02		12/05/13 23:15	1
Lab filtration for diss. analytes							12/05/13 14:25	

Sample Description		BHS5-FB-DI						
Matrix		Reagent Water						
SAL Sample Number		1312964-15						
Date/Time Collected		12/04/13 14:15						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						

Client Provided Field Data

pH		6.73						
Temperature		28.3 °C						
Conductivity		2.04 umhos						
Dissolved Oxygen		9.29 mg/L						

Inorganics

Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01		12/10/13 11:00	1
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		12/06/13 10:22	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/06/13 09:00	12/11/13 08:44	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	12/09/13 08:30	12/09/13 13:15	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 23:33	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/05/13 23:33	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		12/05/13 23:33	1
Phosphorous - Total as P	mg/L	0.010 U	SM 4500P-E	0.040	0.010	12/05/13 09:41	12/08/13 14:41	1
Sulfate	mg/L	0.20 U	EPA 300.0	0.60	0.20		12/05/13 23:33	1

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Laboratory Report

Project Name		B-HS5 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS5-FB-DI						
Matrix		Reagent Water						
SAL Sample Number		1312964-15						
Date/Time Collected		12/04/13 14:15						
Collected by		Sean Schmidt						
Date/Time Received		12/04/13 16:50						
Client Provided Field Data								
pH		6.73						
Temperature		28.3 °C						
Conductivity		2.04 umhos						
Dissolved Oxygen		9.29 mg/L						
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		12/10/13 11:00	1
Total Alkalinity	mg/L	2.7 I	SM 2320B	8.0	2.0		12/11/13 11:36	1
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 14:22	1
Total Organic Carbon	mg/L	0.060 U	SM 5310B	1.0	0.060		12/09/13 10:53	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	12/05/13 14:39	12/10/13 10:53	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	12/05/13 14:39	12/10/13 10:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/05/13 23:33	1
Microbiology								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	12/04/13 18:50	12/05/13 13:01	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	12/04/13 18:15	12/05/13 16:15	1

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL30504 - COD prep										
Blank (BL30504-BLK1)					Prepared & Analyzed: 12/06/13					
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BL30504-BS1)					Prepared & Analyzed: 12/06/13					
Chemical Oxygen Demand	50	25	10	mg/L	50		100	90-110		
Matrix Spike (BL30504-MS1)					Source: 1312963-08 Prepared & Analyzed: 12/06/13					
Chemical Oxygen Demand	50	25	10	mg/L	50	ND	100	85-115		
Matrix Spike Dup (BL30504-MSD1)					Source: 1312963-08 Prepared & Analyzed: 12/06/13					
Chemical Oxygen Demand	52	25	10	mg/L	50	ND	104	85-115	4	32
Batch BL30506 - Digestion for TKN by EPA 351.2										
Blank (BL30506-BLK1)					Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BL30506-BS1)					Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	2.39	0.20	0.05	mg/L	2.5		94	90-110		
Matrix Spike (BL30506-MS1)					Source: 1312937-07 Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	3.42	0.20	0.05	mg/L	2.5	0.875	100	90-110		
Matrix Spike (BL30506-MS2)					Source: 1312915-01 Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	2.53	0.20	0.05	mg/L	2.5	ND	100	90-110		
Matrix Spike Dup (BL30506-MSD1)					Source: 1312937-07 Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	3.47	0.20	0.05	mg/L	2.5	0.875	102	90-110	1	20

SOUTHERN ANALYTICAL LABORATORIES, INC.

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL30506 - Digestion for TKN by EPA 351.2										
Matrix Spike Dup (BL30506-MSD2)		Source: 1312915-01			Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	2.50	0.20	0.05	mg/L	2.5	ND	99	90-110	1	20
Batch BL30507 - Digestion for TKN by EPA 351.2										
Blank (BL30507-BLK1)					Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BL30507-BS1)					Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	2.35	0.20	0.05	mg/L	2.5		93	90-110		
Matrix Spike (BL30507-MS1)		Source: 1312963-21			Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	2.75	0.20	0.05	mg/L	2.5	ND	108	90-110		
Matrix Spike (BL30507-MS2)		Source: 1312963-05			Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	4.03	0.20	0.05	mg/L	2.5	1.43	103	90-110		
Matrix Spike Dup (BL30507-MSD1)		Source: 1312963-21			Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	2.50	0.20	0.05	mg/L	2.5	ND	99	90-110	9	20
Matrix Spike Dup (BL30507-MSD2)		Source: 1312963-05			Prepared: 12/05/13 Analyzed: 12/09/13					
Total Kjeldahl Nitrogen	4.08	0.20	0.05	mg/L	2.5	1.43	105	90-110	1	20
Batch BL30508 - Digestion for TP by EPA 365.2/SM4500PE										
Blank (BL30508-BLK1)					Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
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Batch BL30508 - Digestion for TP by EPA 365.2/SM4500PE

LCS (BL30508-BS1)					Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	0.803	0.040	0.010	mg/L	0.80		100	90-110		
Matrix Spike (BL30508-MS1)					Source: 1312910-02 Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	1.05	0.040	0.010	mg/L	1.0	0.0218	103	90-110		
Matrix Spike (BL30508-MS2)					Source: 1312937-07 Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	1.02	0.040	0.010	mg/L	1.0	0.0454	98	90-110		
Matrix Spike Dup (BL30508-MSD1)					Source: 1312910-02 Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	1.05	0.040	0.010	mg/L	1.0	0.0218	103	90-110	0.4	25
Matrix Spike Dup (BL30508-MSD2)					Source: 1312937-07 Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	1.08	0.040	0.010	mg/L	1.0	0.0454	103	90-110	5	25

Batch BL30509 - TOC prep

Blank (BL30509-BLK1)					Prepared & Analyzed: 12/05/13					
Total Organic Carbon	0.060 U	1.0	0.060	mg/L						
LCS (BL30509-BS1)					Prepared & Analyzed: 12/05/13					
Total Organic Carbon	10.1	1.0	0.060	mg/L	10		101	90-110		
Matrix Spike (BL30509-MS1)					Source: 1312927-02 Prepared & Analyzed: 12/05/13					
Total Organic Carbon	9.57	1.0	0.060	mg/L	10	ND	96	85-115		
Matrix Spike Dup (BL30509-MSD1)					Source: 1312927-02 Prepared & Analyzed: 12/05/13					
Total Organic Carbon	9.48	1.0	0.060	mg/L	10	ND	95	85-115	0.9	10

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December 23, 2013
Work Order: 1312964

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
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Batch BL30511 - Ion Chromatography 300.0 Prep

Blank (BL30511-BLK1) Prepared & Analyzed: 12/05/13

Sulfate	0.20 U	0.60	0.20	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		

LCS (BL30511-BS1) Prepared & Analyzed: 12/05/13

Nitrate (as N)	1.74	0.04	0.01	mg/L	1.7		103	85-115		
Nitrite (as N)	1.48	0.04	0.01	mg/L	1.4		106	85-115		
Sulfate	8.54	0.60	0.20	mg/L	9.0		95	85-115		
Orthophosphate as P	0.816	0.040	0.010	mg/L	0.90		91	85-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		

LCS Dup (BL30511-BSD1) Prepared & Analyzed: 12/05/13

Nitrite (as N)	1.45	0.04	0.01	mg/L	1.4		103	85-115	2	200
Sulfate	8.55	0.60	0.20	mg/L	9.0		95	85-115	0.1	200
Nitrate (as N)	1.73	0.04	0.01	mg/L	1.7		102	85-115	0.9	200
Orthophosphate as P	0.819	0.040	0.010	mg/L	0.90		91	85-115	0.4	200
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch BL30511 - Ion Chromatography 300.0 Prep

Matrix Spike (BL30511-MS1)		Source: 1312964-05			Prepared & Analyzed: 12/05/13					
Orthophosphate as P	2.44	0.040	0.010	mg/L	0.90	1.61	92	85-115		
Nitrite (as N)	1.72	0.04	0.01	mg/L	1.4	0.459	90	85-115		
Nitrate (as N)	17.0 L	0.04	0.01	mg/L	1.7	44.1	NR	85-115		
Sulfate	38.5	0.60	0.20	mg/L	9.0	30.5	90	85-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		

Matrix Spike (BL30511-MS2)		Source: 1312964-14			Prepared & Analyzed: 12/05/13					
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7	0.0380	99	85-115		
Nitrite (as N)	1.50	0.04	0.01	mg/L	1.4	ND	107	85-115		
Sulfate	66.9	0.60	0.20	mg/L	9.0	58.2	96	85-115		
Orthophosphate as P	0.967	0.040	0.010	mg/L	0.90	0.120	94	85-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		

Batch BL30527 - VSS Prep

Blank (BL30527-BLK1)		Prepared: 12/05/13 Analyzed: 12/10/13								
Total Suspended Solids	1 U	1	1	mg/L						
Volatile Suspended Solids	1 U	1		mg/L						

LCS (BL30527-BS1)		Prepared: 12/05/13 Analyzed: 12/10/13								
Total Suspended Solids	51.0	1	1	mg/L	50		102	85-115		

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch BL30527 - VSS Prep

Duplicate (BL30527-DUP1)		Source: 1312963-01			Prepared: 12/05/13 Analyzed: 12/10/13					
Total Suspended Solids	57.0	1	1	mg/L		61.0			7	30
Volatile Suspended Solids	51.0	1		mg/L		55.0			8	20

Batch BL30535 - Ammonia by SEAL

Blank (BL30535-BLK1)		Prepared & Analyzed: 12/06/13								
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BL30535-BS1)		Prepared & Analyzed: 12/06/13								
Ammonia as N	0.49	0.040	0.009	mg/L	0.50		99	90-110		
Matrix Spike (BL30535-MS1)		Source: 1313019-07			Prepared & Analyzed: 12/06/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	101	90-110		
Matrix Spike (BL30535-MS2)		Source: 1312736-12			Prepared & Analyzed: 12/06/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	101	90-110		
Matrix Spike Dup (BL30535-MSD1)		Source: 1313019-07			Prepared & Analyzed: 12/06/13					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	ND	101	90-110	0.4	10
Matrix Spike Dup (BL30535-MSD2)		Source: 1312736-12			Prepared & Analyzed: 12/06/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	100	90-110	0.7	10

Batch BL30536 - Ammonia by SEAL

Blank (BL30536-BLK1)		Prepared & Analyzed: 12/06/13								
Ammonia as N	0.009 U	0.040	0.009	mg/L						

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
Batch BL30536 - Ammonia by SEAL										
LCS (BL30536-BS1)					Prepared & Analyzed: 12/06/13					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50		102	90-110		
Matrix Spike (BL30536-MS1)					Source: 1313004-20 Prepared & Analyzed: 12/06/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	100	90-110		
Matrix Spike (BL30536-MS2)					Source: 1312963-21 Prepared & Analyzed: 12/06/13					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	98	90-110		
Matrix Spike Dup (BL30536-MSD1)					Source: 1313004-20 Prepared & Analyzed: 12/06/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	100	90-110	0.5	10
Matrix Spike Dup (BL30536-MSD2)					Source: 1312963-21 Prepared & Analyzed: 12/06/13					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	99	90-110	0.4	10
Batch BL30633 - BOD										
Blank (BL30633-BLK1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	2 U	2	2	mg/L						
Blank (BL30633-BLK2)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	2 U	2	2	mg/L						
LCS (BL30633-BS1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	184	2	2	mg/L	200		92	85-115		
LCS (BL30633-BS2)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	188	2	2	mg/L	200		94	85-115		

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
Batch BL30633 - BOD										
LCS Dup (BL30633-BSD1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	187	2	2	mg/L	200		93	85-115	1	200
LCS Dup (BL30633-BSD2)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	190	2	2	mg/L	200		95	85-115	1	200
Duplicate (BL30633-DUP1)					Source: 1312938-01 Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	25	2	2	mg/L		26			3	25
Duplicate (BL30633-DUP2)					Source: 1312989-01 Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	110	2	2	mg/L		110			6	25
Batch BL30635 - Ion Chromatography 300.0 Prep										
Blank (BL30635-BLK1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	0.967			mg/L	1.0		97	90-115		
LCS (BL30635-BS1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
LCS Dup (BL30635-BSD1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.76	0.04	0.01	mg/L	1.7		103	85-115	0.2	200
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Matrix Spike (BL30635-MS1)					Source: 1313027-02 Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.66	0.04	0.01	mg/L	1.7	0.0410	95	85-115		
Surrogate: Dichloroacetate	0.970			mg/L	1.0		97	90-115		

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch BL30635 - Ion Chromatography 300.0 Prep

Matrix Spike (BL30635-MS2)		Source: 1313027-04			Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.64	0.04	0.01	mg/L	1.7	ND	96	85-115		
Surrogate: Dichloroacetate	0.978			mg/L	1.0		98	90-115		

Batch BL30654 - COD prep

Blank (BL30654-BLK1)		Prepared & Analyzed: 12/09/13								
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BL30654-BS1)		Prepared & Analyzed: 12/09/13								
Chemical Oxygen Demand	45	25	10	mg/L	50		90	90-110		
Matrix Spike (BL30654-MS1)		Source: 1312964-15			Prepared & Analyzed: 12/09/13					
Chemical Oxygen Demand	45	25	10	mg/L	50	ND	90	85-115		
Matrix Spike Dup (BL30654-MSD1)		Source: 1312964-15			Prepared & Analyzed: 12/09/13					
Chemical Oxygen Demand	52	25	10	mg/L	50	ND	104	85-115	14	32

Batch BL30929 - TOC prep

Blank (BL30929-BLK1)		Prepared & Analyzed: 12/09/13								
Total Organic Carbon	0.060 U	1.0	0.060	mg/L						
LCS (BL30929-BS1)		Prepared & Analyzed: 12/09/13								
Total Organic Carbon	10.8	1.0	0.060	mg/L	10		108	90-110		
Matrix Spike (BL30929-MS1)		Source: 1313027-04			Prepared & Analyzed: 12/09/13					
Total Organic Carbon	13.2	1.0	0.060	mg/L	10	3.13	101	85-115		

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
Batch BL30929 - TOC prep										
Matrix Spike Dup (BL30929-MSD1)		Source: 1313027-04			Prepared & Analyzed: 12/09/13					
Total Organic Carbon	13.4	1.0	0.060	mg/L	10	3.13	102	85-115	1	10
Batch BL31028 - Sulfide prep										
Blank (BL31028-BLK1)		Prepared & Analyzed: 12/10/13								
Sulfide	0.10 U	0.40	0.10	mg/L						
Blank (BL31028-BLK2)		Prepared & Analyzed: 12/10/13								
Sulfide	0.10 U	0.40	0.10	mg/L						
LCS (BL31028-BS1)		Prepared & Analyzed: 12/10/13								
Sulfide	4.92	0.40	0.10	mg/L	5.0		98	85-115		
LCS (BL31028-BS2)		Prepared & Analyzed: 12/10/13								
Sulfide	4.71	0.40	0.10	mg/L	5.0		94	85-115		
Matrix Spike (BL31028-MS1)		Source: 1313000-01			Prepared & Analyzed: 12/10/13					
Sulfide	4.51	0.40	0.10	mg/L	5.0	ND	90	85-115		
Matrix Spike (BL31028-MS2)		Source: 1313004-20			Prepared & Analyzed: 12/10/13					
Sulfide	4.92	0.40	0.10	mg/L	5.0	ND	98	85-115		
Matrix Spike Dup (BL31028-MSD1)		Source: 1313000-01			Prepared & Analyzed: 12/10/13					
Sulfide	4.71	0.40	0.10	mg/L	5.0	ND	94	85-115	4	14
Matrix Spike Dup (BL31028-MSD2)		Source: 1313004-20			Prepared & Analyzed: 12/10/13					
Sulfide	4.71	0.40	0.10	mg/L	5.0	ND	94	85-115	4	14

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Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL31101 - alkalinity										
Blank (BL31101-BLK1)					Prepared & Analyzed: 12/11/13					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
LCS (BL31101-BS1)					Prepared & Analyzed: 12/11/13					
Total Alkalinity	140	8.0	2.0	mg/L	120		109	90-110		
Matrix Spike (BL31101-MS1)					Source: 1313054-01 Prepared & Analyzed: 12/11/13					
Total Alkalinity	280	8.0	2.0	mg/L	120	160	99	80-120		
Matrix Spike Dup (BL31101-MSD1)					Source: 1313054-01 Prepared & Analyzed: 12/11/13					
Total Alkalinity	290	8.0	2.0	mg/L	120	160	102	80-120	1	26

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Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit
Batch BL30511 - Ion Chromatography 300.0 Prep										
Blank (BL30511-BLK1)					Prepared & Analyzed: 12/05/13					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
LCS (BL30511-BS1)					Prepared & Analyzed: 12/05/13					
Nitrate (as N)	1.74	0.04	0.01	mg/L	1.7		103	85-115		
Nitrite (as N)	1.48	0.04	0.01	mg/L	1.4		106	85-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
Surrogate: Dichloroacetate	1.07			mg/L	1.0		107	90-115		
LCS Dup (BL30511-BSD1)					Prepared & Analyzed: 12/05/13					
Nitrate (as N)	1.73	0.04	0.01	mg/L	1.7		102	85-115	0.9	200
Nitrite (as N)	1.45	0.04	0.01	mg/L	1.4		103	85-115	2	200
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Matrix Spike (BL30511-MS1)					Source: 1312964-05		Prepared & Analyzed: 12/05/13			
Nitrite (as N)	1.72	0.04	0.01	mg/L	1.4	0.459	90	85-115		
Nitrate (as N)	17.0 L	0.04	0.01	mg/L	1.7	49.3	NR	85-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Matrix Spike (BL30511-MS2)					Source: 1312964-14		Prepared & Analyzed: 12/05/13			
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7	0.0380	99	85-115		
Nitrite (as N)	1.50	0.04	0.01	mg/L	1.4	ND	107	85-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		

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Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch BL30635 - Ion Chromatography 300.0 Prep

Blank (BL30635-BLK1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	0.967			mg/L	1.0		97	90-115		
LCS (BL30635-BS1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
LCS Dup (BL30635-BSD1)					Prepared & Analyzed: 12/06/13					
Nitrate (as N)	1.76	0.04	0.01	mg/L	1.7		103	85-115	0.2	200
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Matrix Spike (BL30635-MS1)					Source: 1313027-02		Prepared & Analyzed: 12/06/13			
Nitrate (as N)	1.66	0.04	0.01	mg/L	1.7	0.0410	95	85-115		
Surrogate: Dichloroacetate	0.970			mg/L	1.0		97	90-115		
Matrix Spike (BL30635-MS2)					Source: 1313027-04		Prepared & Analyzed: 12/06/13			
Nitrate (as N)	1.64	0.04	0.01	mg/L	1.7	ND	96	85-115		
Surrogate: Dichloroacetate	0.978			mg/L	1.0		98	90-115		

Batch BL30636 - BOD Dissolved

Blank (BL30636-BLK1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	2 U	2	2	mg/L						
LCS (BL30636-BS1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	188	2	2	mg/L	200		94	85-115		

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Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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Batch BL30636 - BOD Dissolved

LCS Dup (BL30636-BSD1)					Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	190	2	2	mg/L	200		95	85-115	1	200
Duplicate (BL30636-DUP1)					Source: 1312963-02 Prepared: 12/06/13 Analyzed: 12/11/13					
Carbonaceous BOD	89	2	2	mg/L		91			2	25

Batch BL30935 - Digestion for TKN by EPA 351.2

Blank (BL30935-BLK1)					Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	0.050 U	0.20	0.050	mg/L						
LCS (BL30935-BS1)					Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	2.59	0.20	0.050	mg/L	2.5		102	90-110		
Matrix Spike (BL30935-MS1)					Source: 1312816-14 Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	4.55	0.20	0.050	mg/L	2.5	1.94	103	90-110		
Matrix Spike (BL30935-MS2)					Source: 1312964-10 Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	4.54	0.20	0.050	mg/L	2.5	2.02	99	90-110		
Matrix Spike Dup (BL30935-MSD1)					Source: 1312816-14 Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	4.68	0.20	0.050	mg/L	2.5	1.94	108	90-110	3	20
Matrix Spike Dup (BL30935-MSD2)					Source: 1312964-10 Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	4.77	0.20	0.050	mg/L	2.5	2.02	109	90-110	5	20

Batch BL31305 - Ammonia by SEAL

Blank (BL31305-BLK1)					Prepared & Analyzed: 12/13/13					
Ammonia as N	0.009 U	0.040	0.009	mg/L						

Hazen and Sawyer
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Tampa, FL 33619

December 23, 2013
Work Order: 1312964

Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL31305 - Ammonia by SEAL										
LCS (BL31305-BS1)					Prepared & Analyzed: 12/13/13					
Ammonia as N	0.47	0.040	0.009	mg/L	0.50		94	90-110		
Matrix Spike (BL31305-MS1)					Source: 1312964-10 Prepared & Analyzed: 12/13/13					
Ammonia as N	1.2	0.040	0.009	mg/L	0.50	0.74	91	90-110		
Matrix Spike (BL31305-MS2)					Source: 1312816-10 Prepared & Analyzed: 12/13/13					
Ammonia as N	1.4	0.040	0.009	mg/L	0.50	0.91	99	90-110		
Matrix Spike Dup (BL31305-MSD1)					Source: 1312964-10 Prepared & Analyzed: 12/13/13					
Ammonia as N	1.2	0.040	0.009	mg/L	0.50	0.74	97	90-110	2	10
Matrix Spike Dup (BL31305-MSD2)					Source: 1312816-10 Prepared & Analyzed: 12/13/13					
Ammonia as N	1.4	0.040	0.009	mg/L	0.50	0.91	98	90-110	0.3	10

SOUTHERN ANALYTICAL LABORATORIES, INC.

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 Tampa, FL 33619

December 23, 2013
 Work Order: 1312964

Microbiology - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL30502 - FC-MF										
Blank (BL30502-BLK1)					Prepared: 12/04/13 Analyzed: 12/05/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml						
Duplicate (BL30502-DUP1)					Source: 1312963-21 Prepared: 12/04/13 Analyzed: 12/05/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200
Duplicate (BL30502-DUP2)					Source: 1312964-15 Prepared: 12/04/13 Analyzed: 12/05/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200

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December 23, 2013
Work Order: 1312964

*** Qualifiers, Notes and Definitions**

Results followed by a "U" indicate that the sample was analyzed but the compound was not detected. Results followed by "I" indicate that the reported value is between the laboratory method detection limits and the laboratory practical quantitation limit.

A statement of estimated uncertainty of test results is available upon request.

For methods marked with **, all QC criteria have been met for this method which is equivalent to a SAL certified method.

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below.

L Off-scale high. Result exceeded highest calibration standard.

Questions regarding this report should be directed to :

Kathryn Nordmark
Telephone (813) 855-1844 FAX (813) 855-2218
Kathryn@southernanalyticalabs.com



SOUTHERN ANALYTICAL LABORATORIES, INC.

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SAL Project No. 1312964

Client Name Hazan and Sawyer	Contact / Phone: Josefin Hirst 813-630-4498
--	---

Project Name / Location BHS5 SE#2	
---	--

Samplers: (Signature) *[Handwritten signatures]*

Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water		PARAMETER / CONTAINER DESCRIPTION																	
SAL Use Only	Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	125mLP, Na ₂ S ₂ O ₃ FC-MF, FC-QT	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP, SO ₄	125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP	500mLP, NaOH & Zn Acetate H ₂ S	40mL aV, HCl TOC	1LP, Cool Dissolved-Filter in lab (CBOD, TKN, NH ₃ , NOx)	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP	125mLP, H ₂ SO ₄ TKN, NH ₃	500mLP, Cool NOx	pH	Temperature	Conductivity
	01	BHS5-STE	12/4/13	13:45	WW		X	4	1	1	1	2				0.01	7.23	23.3	1237
	02	BHS5-STE-FILTERED * 0.45		13:45	WW		X						1			0.01	7.05	23.3	1237
	03	BHS5-ST1		13:20	WW		X	4		1		2		1		3.37	7.05	25.6	1237
	04	BHS5-ST1-DUP		13:25	WW		X	4		1		2		1		3.39	7.05	25.6	1237
	05	BHS5-ST1-FILTERED * 0.45		13:20	WW		X						1			3.39	7.05	25.6	1237
	06	BHS5-LIGNO-36		13:08	WW		X								1	8.31	6.69	23.3	1149
	07	BHS5-LIGNO-24		12:58	WW		X								1	0.28	6.66	23.4	1154
	08	BHS5-LIGNO-12		12:38	WW		X								1	0.12	6.67	23.5	1117
	09	BHS5-LIGNO-0		12:17	WW		X	4		1		2		1		0.14	6.61	23.4	1102
	10	BHS5-LIGNO-0-FILTERED * 0.45		12:17	WW		X						1			0.14	6.61	23.4	1102
	11	BHS5-SULFUR-6		12:50	WW		X								1	0.12	6.70	23.5	1158
	12	BHS5-SULFUR-12		12:35	WW		X								1	0.09	6.71	23.2	1168

Containers Prepared/Relinquished:	Date/Time: 11:25AM 11/12	Received: <i>[Signature]</i>	Date/Time: 11/26/13	Seal intact? <input checked="" type="radio"/> N <input type="radio"/> NA	Instructions / Remarks
Relinquished:	Date/Time:	Received:	Date/Time: 1650 12-4-13	Samples intact upon arrival? <input checked="" type="radio"/> N <input type="radio"/> NA	
Relinquished:	Date/Time:	Received:	Date/Time:	Received on ice? Temp _____ <input type="radio"/> N <input type="radio"/> NA	
Relinquished:	Date/Time:	Received:	Date/Time:	Proper preservatives indicated? <input checked="" type="radio"/> N <input type="radio"/> NA	
Relinquished:	Date/Time:	Received:	Date/Time:	Rec'd w/within holding time? <input checked="" type="radio"/> N <input type="radio"/> NA	
Relinquished:	Date/Time:	Received:	Date/Time:	Volatiles rec'd w/out headspace <input type="radio"/> N <input checked="" type="radio"/> NA	
Relinquished:	Date/Time:	Received:	Date/Time:	Proper containers used? <input checked="" type="radio"/> N <input type="radio"/> NA	

SOUTHERN ANALYTICAL LABORATORIES, INC.

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SAL Project No. 1312964

Client Name Hazan and Sawyer	Contact / Phone: Josefin Hirst 813-630-4498
Project Name / Location BHS5 SE#2	

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water		PARAMETER / CONTAINER DESCRIPTION																	
SAL Use Only	Sample Description	Date	Time	Matrix	Composite	Grab	125mLP, Na ₂ S ₂ O ₃ FC-MF, FC-QT	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP, SO ₄	125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP	500mLP, NaOH & Zn Acetate H ₂ S	40mLaV, HCl TOC	1LP, Cool Dissolved-Filter in lab (CBOD, TKN, NH ₃ , NOx, SO ₄)	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP	125mLP, H ₂ SO ₄ TKN, NH ₃	500mLP, Cool NOx	pH	Temperature	Conductivity	
	BHS5-ST2	12/9/13	12:20	WW		X	4	1	1	1	2					0.17	6.59	22.7	1195
	BHS5-ST2-FILTERED	↓	12:20	WW		X						1				0.17	6.59	22.7	1175
	BHS5- ST2 FB-DI	↓	1415	R		X	4	1	1	1	2					9.29	6.73	28.3	204

Containers Prepared/Relinquished:	Date/Time: 11:25AM 11/12	Received: <i>[Signature]</i>	Date/Time: 11/24/13	Seal intact? <input checked="" type="checkbox"/> N N/A	Instructions / Remarks Samples intact upon arrival? <input checked="" type="checkbox"/> N N/A Received on ice? Temp _____ <input checked="" type="checkbox"/> N N/A Proper preservatives indicated? <input checked="" type="checkbox"/> N N/A Rec'd w/ithin holding time? <input checked="" type="checkbox"/> N N/A Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/> N N/A Proper containers used? <input checked="" type="checkbox"/> N N/A
Relinquished:	Date/Time:	Received:	Date/Time: 1650 12-4-13	Received on ice? Temp _____ <input checked="" type="checkbox"/> N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Proper preservatives indicated? <input checked="" type="checkbox"/> N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Rec'd w/ithin holding time? <input checked="" type="checkbox"/> N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Volatiles rec'd w/out headspace? <input checked="" type="checkbox"/> N N/A	

Chain of Custody sds
Rev Date 11/18/01

Chain of Custody

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Appendix B: Operation & Maintenance Log

Table B.1
Operation and Maintenance Log

Date	Description
6/24/2013	Construction - Stage 1 and Stage 2 tanks installed
6/25/2013	Construction - Drainfield distribution box installed and all pipework
7/9/2013	System Start-up
	Bull run valve switched from drainfield to Stage 1 biofilter
7/17/2013	System check
7/23/2013	Construction - sod installation
7/29/2013	Preliminary sample event No. 1
8/6/2013	System check
	Need to add soil around low side of pump tank riser
8/15/2013	Preliminary sample event No. 2
9/27/2013	Sample Event No. 1
11/8/2013	System check
11/27/2013	System check
12/4/2013	Sample Event No. 2

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Appendix C: Vericomm PLC Data

System Status		12/4/2013	11/27/2013	11/8/2013	10/23/2013	10/4/2013
Point	Description	Value	Value	Value	Value	Value
1	Alarm Status	OK	OK	OK	OK	OK
2	Alert Status	OK	OK	OK	OK	OK
3	System Mode	Normal	Normal	Normal	Normal	Normal
5	Timer Mode	Off	Normal	Off	Off	Off
6	Active Off Time	60.0 Minutes				
7	Active On Time	0.7 Minutes				
9	Pump Mode	Off	OffCycl	Off	Off	Off
10	Pump Status	Off	Off	Off	Off	Off
12	Pump Cycles Today	3.0 Cycles	4.0 Cycles	2.0 Cycles	0.0 Cycles	2.0 Cycles
13	Override Cycles Today	0.0 Cycles				
14	Pump Run Time Today	2.1 Minutes	2.9 Minutes	1.4 Minutes	0.0 Minutes	1.3 Minutes
Settings						
Point	Description	Value	Value	Value	Value	Value
17	Off Cycle Time	60.0 Minutes				
18	On Cycle Time	0.7 Minutes				
19	Override Off Cycle Time	30.0 Minutes				
20	Override On Cycle Time	0.7 Minutes				
21	Minimum Override Cycles	3.0 Cycles	3.0 Cycles	3.0 Cycles	3.0 Cycles	3.0 Cycles
23	Override Cycle Limit per Day	7.0 Cycles				
24	Time Limit per Day	16.0 Minutes				
25	High Level Pump Test	2.0 Minutes				
28	Alarm Update Interval	120.0 Minutes				
29	Page Delay	960.0 Minutes				
30	Page Interval	30.0 Minutes				
31	Local Alarm Delay	1140.0 Minutes				
32	Local Reactivate Delay	120.0 Minutes				
Troubleshooting						
Point	Description	Value	Value	Value	Value	Value
33	Top Float Status	OK	OK	OK	OK	OK
34	Middle Float Status	OK	OK	OK	OK	OK
35	Bottom Float Status	OK	OK	OK	OK	OK
37	Contactor Status	OK	OK	OK	OK	OK
38	Pump Status	OK	OK	OK	OK	OK
40	Filter Status	OK	OK	OK	OK	OK
41	Tank Status	OK	OK	OK	OK	OK
43	Power Status	OK	OK	OK	OK	OK
Flow Data						
Point	Description	Value	Value	Value	Value	Value
49	Pump Run Time Today	2.1 Minutes	2.9 Minutes	1.4 Minutes	0.0 Minutes	1.3 Minutes
50	Override Cycles Today	0	0	0	0	0
51	Pump Cycles Today	3.0 Cycles	4.0 Cycles	2.0 Cycles	0.0 Cycles	2.0 Cycles
52	Average Run Time per Cycle Today	0.7 Minutes	0.7 Minutes	0.7 Minutes	0.0 Minutes	0.7 Minutes
54	Brownouts Today	0	0	0	0	0

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		12/4/2013	11/27/2013	11/8/2013	10/23/2013	10/4/2013
30-Day History Data						
Point	Description	Value	Value	Value	Value	Value
65	30 Day Average Run Time per Day	4.3 Minutes	4.5 Minutes	4.7 Minutes	4.2 Minutes	3.5 Minutes
66	30 Day Average Override Cycles per Day	0.0 Cycles				
67	30 Day Average Cycles per Day	6.1 Cycles	6.3 Cycles	6.6 Cycles	5.9 Cycles	5.0 Cycles
68	30 Day Average Run Time per Cycle	0.7 Minutes				
71	30 Day Total Pump Run Time	130.4 Minutes	134.7 Minutes	141.3 Minutes	126.2 Minutes	104.6 Minutes
72	30 Day Total Override Cycles	0.0 Cycles	0.0 Cycles	0.0 Cycles	0.0 Cycles	0.0 Cycles
73	30 Day Total Cycles	183.0 Cycles	189.0 Cycles	198.0 Cycles	178.0 Cycles	149.0 Cycles
76	30 Day Total Brownouts	0	0	0	0	0
Totalized Pump Data						
Point	Description	Value	Value	Value	Value	Value
82	Pump Total Run Time	11.2 Hours	10.7 Hours	9.3 Hours	8.1 Hours	6.6 Hours
83	Pump Total Cycles	947.0 Cycles	903.0 Cycles	789.0 Cycles	683.0 Cycles	561.0 Cycles
Miscellaneous						
Point	Description	Value	Value	Value	Value	Value
145	Pump On Auto	Off	Off	Off	Off	Off
147	Pump Test Today	Off	Off	Off	Off	Off
148	Pump Check Enable	Off	Off	Off	Off	Off
149	Total Override Cycles	0	0	0	0	0
150	High Level Condition	Off	Off	Off	Off	Off
151	Leak Check Enable	Off	On	Off	Off	Off
152	Brownout State	Off	Off	Off	Off	Off
153	Test Mode	Off	Off	Off	Off	Off
Alarm Points						
Point	Description	Value	Value	Value	Value	Value
161	General Alarm	Off	Off	Off	Off	Off
162	New Alarm	Off	Off	Off	Off	Off
163	Update Central Enable	On	On	On	On	On
167	Page Alarm Start	Off	Off	Off	Off	Off
168	Pager Signal	Off	Off	Off	Off	Off
169	Local Alarm Start	Off	Off	Off	Off	Off
170	Local Alarm Silence	Off	Off	Off	Off	Off
Inputs & Outputs						
Point	Description	Value	Value	Value	Value	Value
177	High Level/Override Timer Float Input	Off	Off	Off	Off	Off
178	Timer Float Input	Off	On	Off	Off	Off
179	Redundant Off Float & Low Level Alarm Input	On	On	On	On	On
181	Push To Silence Input	Off	Off	Off	Off	Off
182	Auxiliary Contact Input	Off	Off	Off	Off	Off
186	Pump Output	Off	Off	Off	Off	Off
188	Alarm Light Output	Off	Off	Off	Off	Off
189	Audible Alarm Output	Off	Off	Off	Off	Off

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