



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

## **B-HS4 Field System Monitoring Report No. 2**

### **Progress Report**

December 2013

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**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

In association with:



**AET**  
Applied Environmental Technology

**Otis Environmental  
Consultants, LLC**

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## **TASK B.7 PROGRESS REPORT**

### **B-HS4 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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FDOH Contract CORCL

**December 2013**

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**HAZEN AND SAWYER**  
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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-HS4 in Seminole County, Florida.

### **2.0 Purpose**

This monitoring report documents data collected from the second B-HS4 monitoring and sampling event conducted on December 2, 2013 (Experimental Day 146). This monitoring event consisted of collecting flow measurements from the household water use meter, 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**

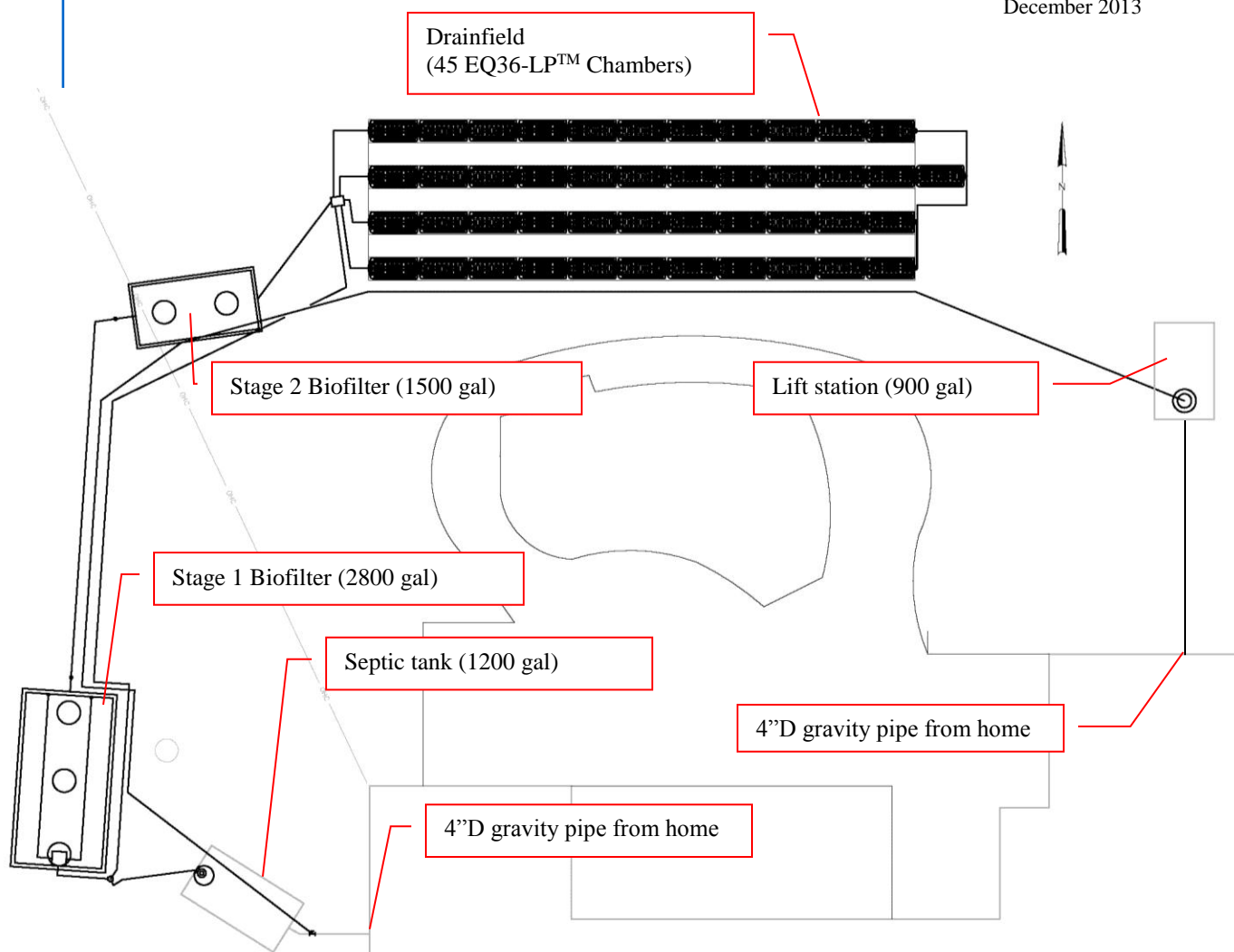
#### **3.1 Project Site**

The B-HS4 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 property had two existing onsite sewage treatment and disposal systems. The existing 1,200 gallon concrete septic tank, located on the west side of the property, continues to provide primary treatment for the

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PNRS system. The existing 900 gallon septic tank, located on the northeast side of the property, was converted to a lift station, and pumps the raw sewage from that system to the head end of the new gravity flow PNRS. All subsequent flow is by gravity. The passive nitrogen reduction system consists of an addition of two tanks and a new drainfield to the existing permitted systems. The B-HS4 tankage includes a 2,800 gallon concrete Stage 1 unsaturated media biofilter and 1,500 gallon two chamber concrete Stage 2 saturated media biofilter. 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 new drainfield (EQ36-LP™ chambers).

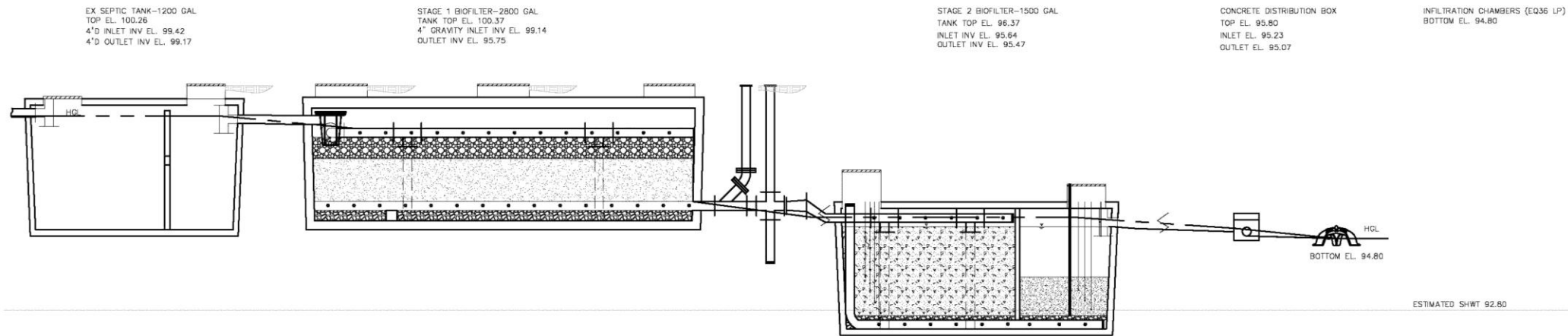
December 2013



**Figure 1**  
**Plan view of B-HS4 system layout**

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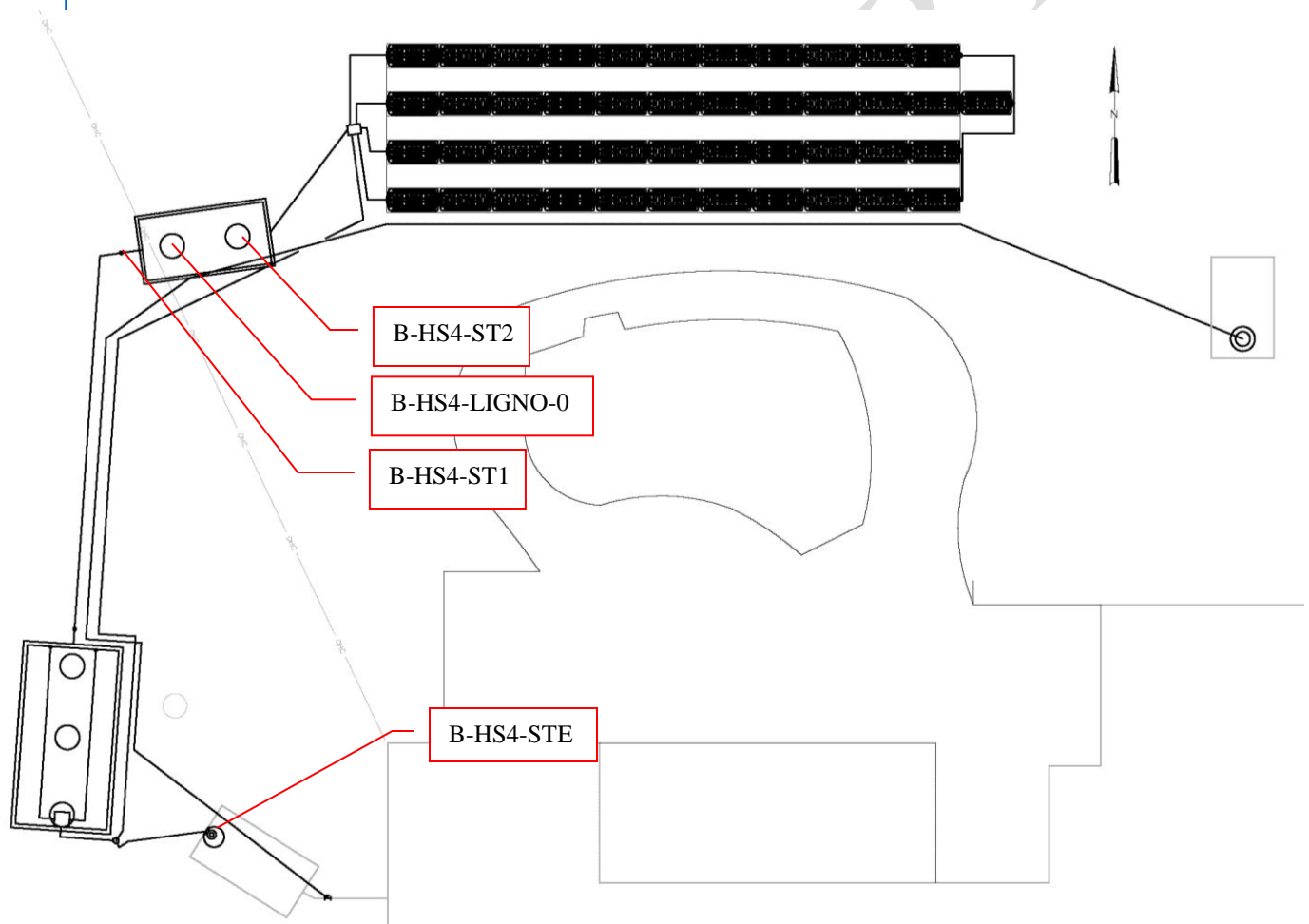
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**Figure 2**  
**Flow Schematic of B-HS4 PNRS**

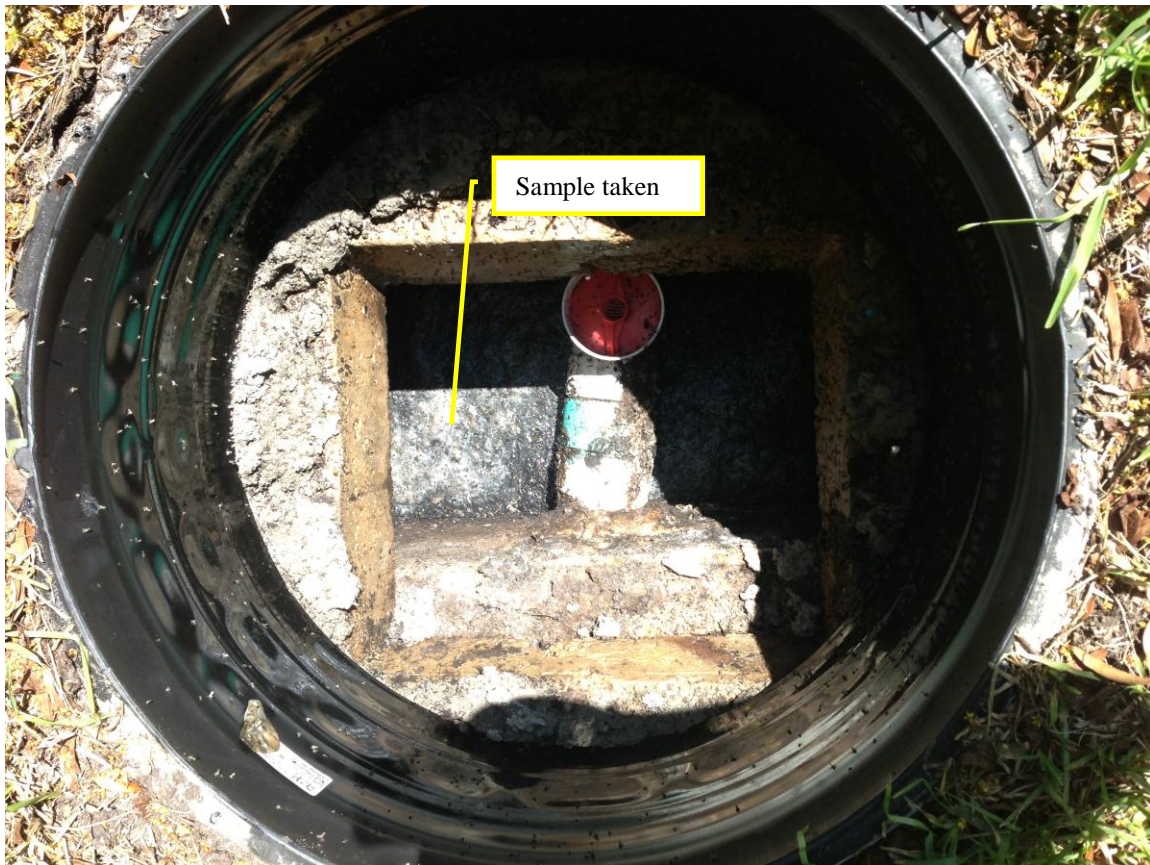
### 3.2 Monitoring and Sample Locations and Identification

The four primary monitoring points for the B-HS4 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-HS4-STE, is the effluent sampled approximately 1.5 feet below the surface of the primary tank before the effluent filter screen (Figure 4), which is referred to as primary effluent or septic tank effluent (STE). The lift station wastewater is pumped into the inlet side of the primary tank; therefore, samples from monitoring point B-HS4-STE are representative of the whole household wastewater. The B-HS4-STE sample represents the influent to the remainder of the onsite nitrogen reduction system.



**Figure 3**  
**B-HS4 Sample and Monitoring Locations**

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**Figure 4**  
**Primary Tank (B-HS4-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. Stage 1 biofilter effluent flows into the Stage 2 biofilter by gravity. The second primary sampling point (B-HS4-ST1) is taken from a sample port in the gravity pipe connecting the Stage 1 biofilter outlet to the Stage 2 biofilter inlet representing the Stage 1 biofilter effluent.

Effluent from the unsaturated (Stage 1) media tank enters the saturated 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 in a



perforated 4-inch pipe 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-HS4-LIGNO-0) with tubing to the surface. Twelve inches above B-HS4-LIGNO-0 is another stainless steel drivepoint sampler B-HS4-LIGNO-12, and so forth (B-HS4-LIGNO-24 and B-HS4-LIGNO-36). The B-HS4-LIGNO-0 sample represents the lignocellulosic media effluent (Figure 5).



**Figure 5**  
**First chamber of Stage 2 biofilter (B-HS4-LIGNO-0 sample)**

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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 drive-point samplers are positioned to create a vertical profile. B-HS4-SULFUR-6 and B-HS4-SULFUR-12 are positioned 6-inches and 12-inches, respectively, above the bottom of the sulfur media. The fourth primary sampling point, B-HS4-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 6).



**Figure 6**  
**Second chamber of Stage 2 biofilter (B-HS4-ST2 sample)**



### 3.3 Operational Monitoring

Start-up of the system occurred on July 9, 2013 (Experimental Day 0). Preliminary sampling for several key parameters was conducted July 29, 2013 (Experimental Day 20) to evaluate start-up performance. It was noted during sampling that the incoming lift station wastewater flow into the primary tank was causing mixing in the primary tank and the carryover of solids into the Stage 1 biofilter d-box. Therefore, the PNRS system was bypassed on August 15, 2013. On September 5, 2013 a smaller (less horsepower) pump was installed in the lift station with a mechanical float switch to cause the lift station to dose less volume but more frequent doses to the primary tank which resulted in less mixing within the primary tank. The PNRS system has operated continually since that date. For the second formal sampling event, Sample Event No. 2, the water meter for the house was read and recorded on December 2, 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.

### 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 second chamber of the lift station. 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 was conducted on December 2, 2013. A full suite of samples were collected for water quality analysis, including influent, intermediate and effluent points. Samples were collected at each of the nine monitoring points described in Section 3.2: B-HS4-STE, B-HS4-ST1, B-HS4-LIGNO-36, B-HS4-LIGNO-24, B-HS4-LIGNO-12, B-HS4-LIGNO-0, B-HS4-SULFUR-6, B-HS4-SULFUR-12, and B-HS4-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 CBOD<sub>5</sub> and the nitrogen species to allow for comparison to the unfiltered sample water quality results.

Lastly, equipment blank (EB) and duplicate samples were taken. The equipment blank was collected by pumping deionized water through the cleaned pump tubing. 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 (NH<sub>3</sub>-N), nitrate nitrogen (NO<sub>3</sub>-N), nitrite nitrogen (NO<sub>2</sub>-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**

<b>Analytical Parameter</b>	<b>Method of Analysis</b>	<b>Method Detection Limit (mg/L)</b>
Total Alkalinity as CaCO <sub>3</sub>	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 <sub>3</sub> -N)	EPA 350.1	0.005 mg/L
Nitrate Nitrogen (NO <sub>3</sub> -N)	EPA 300.0	0.01 mg/L
Nitrite Nitrogen (NO <sub>2</sub> -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 <sub>5</sub> )	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 8, 2013. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B.

**Table 2**  
**Summary of Household Water Use**

Date	Cumulative Volume (gallons)	Average Daily Household Flow between readings, Q (gpd)
2/8/2013 13:45	0.0	INSTALLED
2/21/2013 11:25	4,391.0	340.3
2/28/2013 12:00	6,292.5	270.7
6/7/2013 8:00	34,417.4	284.6
6/14/2013 8:00	36,179.5	251.7
6/20/2013 12:40	37,981.2	290.9
7/17/2013 14:30	45,422.8	274.8
7/23/2013 13:32	47,051.9	273.4
7/29/2013 11:25	48,658.8	271.8
8/6/2013 12:15	50,922.9	281.8
8/12/2013 10:24	52,614.2	285.6
8/15/2013 8:20	53,328.4	245.1
8/27/2013 10:20	56,550.0	266.6
9/5/2013 9:59	58,748.1	244.6
9/30/2013 13:15	65,633.7	273.9
11/8/2013 11:00	76,559.6	280.8
11/27/2013 11:15	82,039.9	288.3
12/2/2013 13:30	83,048.8	198.1
Total average through 12/2/13		279.6

From start-up through December 2, 2013, the household water use average was 279.6 gallons per day with periods of higher and lower flows (Table 2).

## **4.2 Energy Consumption**

Energy consumption is monitored using an electrical meter installed between the main power box for the house and the lift station pump outlet to record cumulative power usage of the pump in kilowatt-hours. The recorded electrical use for the system is summarized in Table 3.

**Table 3**  
**Summary of System Electrical Use**

<b>Date and Time Read</b>	<b>Electrical Meter Reading</b>	<b>Average Daily Electrical Use between readings</b>
	Cumulative (kWh)	(kWh/day)
6/20/2013 14:00		Installed
7/9/2013 15:45	0.3	Start Up
7/17/2013 10:41	0.5	0.026
7/23/2013 13:34	0.6	0.016
7/29/2013 11:30	0.8	0.034
8/6/2013 11:42	0.9	0.012
8/12/2013 10:24	1.2	0.050
8/15/2013 8:20	1.3	0.034
8/27/2013 10:20	1.8	0.041
9/5/2013 9:59	2.2	0.045
9/30/2013 13:15	5.8	0.143
11/8/2013 11:00	12.3	0.167
11/27/2013 11:15	14.1	0.095
12/2/2013 12:55	14.5	0.079
Total average through 12/2/13		0.097

The total average electrical use through December 2, 2013 was 0.097 kWh per day.

### 4.3 Water Quality

Water quality analytical results, for Sample Event No. 2 are listed in Table 4 and nitrogen results are graphically displayed in Figure 7. A summary of the water quality data collected to date for the test system is presented in Table 5. 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,  $\text{NH}_3\text{-N}$ , and  $\text{NO}_x\text{-N}$ ), as well as supporting water quality parameters.



**Figure 7**  
**Graphical Representation of Nitrogen Results**  
**Sample Event No. 2 December 2, 2013 (Experimental Day 146)**

**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 78 mg/L, which is within the range that has been typically reported for Florida single family residence STE.

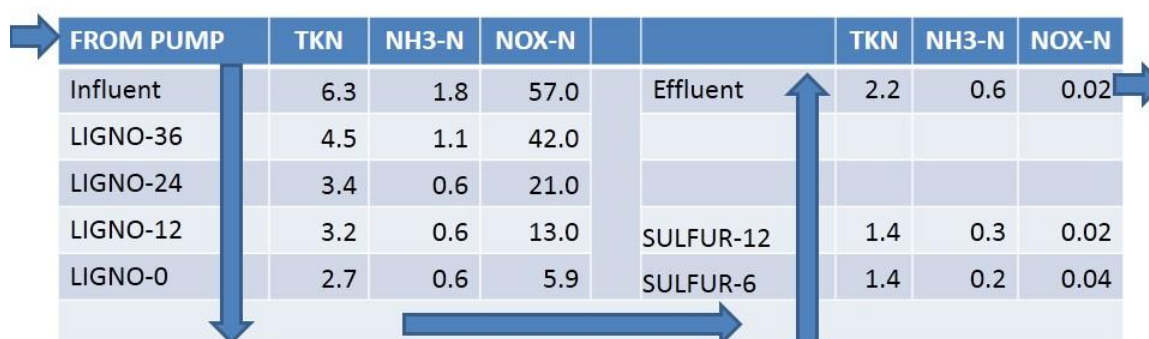
**Stage 1 Effluent (ST1):** The Stage 1 effluent  $\text{NH}_3\text{-N}$  level was 1.8 mg/L with a DO level at 4.61 mg/L (Table 4). The Stage 1 effluent TSS concentration was 6 mg/L and CBOD<sub>5</sub> was 3 mg/L. The Stage 1 effluent  $\text{NO}_x\text{-N}$  was 57 mg/L. The Stage 1 biofilter showed



fairly complete nitrification with an effluent  $\text{NH}_3\text{-N}$  concentration of 1.8 mg/L and TKN of 6.3 mg/L.

**Stage 2 Biofilter Effluent (LIGNO-0" and ST2):** Effluent  $\text{NO}_x\text{-N}$  from the Stage 2 biofilter monitoring point was below the method detection limit of 0.02 mg/L. The low  $\text{NO}_x\text{-N}$  was accompanied by a measured 0.12 mg/L DO and -223.9 mV ORP. The lignocellulosic media effluent  $\text{NO}_x\text{-N}$  was 5.9 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 2.2 mg/L. The Stage 2 biofilter lignocellulosic media effluent and sulfur media effluent  $\text{CBOD}_5$  were both 3 mg/L. The Stage 2 effluent sulfate concentration was 50 mg/L.

As previously discussed in Section 3.2, Sample Event 2 also included Stage 2 biofilter profile samples. As depicted in Figure 8, 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 8. 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-12. The major portion of  $\text{NO}_x\text{-N}$  reduction occurred in the downflow chamber, while remaining  $\text{NO}_x\text{-N}$  was removed by the 6 inch depth in the upflow biofilter.



**Figure 8**  
**Graphical Representation of Stage 2 Biofilter Profile Nitrogen Results**

**EB:** The equipment blank (EB) was collected by pumping deionized water through the cleaned pump tubing. 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.

Table 4  
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 <sub>5</sub> (mg/L)	COD (mg/L)	TN (mg/L N) <sup>1</sup>	TKN (mg/L N)	Organic N (mg/L N) <sup>2</sup>	NH <sub>3</sub> -N (mg/L N)	NO <sub>3</sub> -N (mg/L N)	NO <sub>2</sub> -N (mg/L N)	NO <sub>x</sub> (mg/L N)	TIN (mg/L N) <sup>3</sup>	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)
BHS4-STE	12/2/2013 12:10:00 PM	22.2	6.94	1277	0.01	-321.8	470	38	38	98	250	78.02	78	3	75	0.02	0.01	0.02	75.02	13	7.5	0.86	3	5.8	37,000	10,000	52
BHS4-STE-FILTERED	12/2/2013 12:10:00 PM	22.2	6.94	1277	0.01	-321.8				61		80.07	80	12	68	0.04	0.04	0.07	68.07								
BHS4-ST1	12/2/2013 11:20:00 AM	22.3	6.98	1385	4.61	71.9	290	6	5	3	21	63.3	6.3	4.5	1.8	57	0.01	57	58.8	1.9	1.7				27,100	24,000	12
BHS4-ST1-DUP	12/2/2013 11:25:00 AM	22.3	6.98	1385	4.61	71.9	300	6	5	4	28	61.8	5.8	4	1.8	56	0.01	56	57.8	1.7	1.7				25,000	24,000	13
BHS4-ST1-FILTERED	12/2/2013 11:20:00 AM	22.3	6.98	1385	4.61	71.9				3		64.8	6.8	4.5	2.3	58	0.01	58	60.3								
BHS4-LIGNO-36	12/2/2013 11:50:00 AM	23	6.85	1298	0.11	-128.4						46.5	4.5	3.4	1.1	42	0.01	42	43.1			28					
BHS4-LIGNO-24	12/2/2013 11:40:00 AM	23.2	6.86	1232	0.16	-126.2						24.4	3.4	2.79	0.61	21	0.01	21	21.61			29					
BHS4-LIGNO-12	12/2/2013 11:30:00 AM	23.5	6.66	1227	0.16	-149.9						16.2	3.2	2.64	0.56	13	0.01	13	13.56			30					
BHS4-LIGNO-0	12/2/2013 11:10:00 AM	23.7	6.66	1217	0.15	-238	460	3	3	3	30	8.6	2.7	2.12	0.58	5.9	0.01	5.9	6.48	0.42	0.18	23			17,200	3,700	13
BHS4-LIGNO-0-FILTERED	12/2/2013 11:10:00 AM	23.7	6.66	1217	0.15	-238				3		9	3.1	2.19	0.91	5.9	0.01	5.9	6.81								
BHS4-SULFUR-6	12/2/2013 11:00:00 AM	23.9	6.66	1270	0.1	-264.5						1.44	1.4	1.18	0.22	0.04	0.01	0.04	0.26			75					
BHS4-SULFUR-12	12/2/2013 10:50:00 AM	23.9	6.67	1298	0.12	-250.2						1.42	1.4	1.07	0.33	0.01	0.01	0.02	0.35			74					
BHS4-ST2	12/2/2013 10:30:00 AM	23.2	6.81	1306	0.12	-223.9	510	2	1	3	30	2.22	2.2	1.64	0.56	0.01	0.01	0.02	0.58	1	0.7	50	1.3	1.3	5,400	1,300	13
BHS4-ST2-FILTERED	12/2/2013 10:30:00 AM	23.2	6.81	1306	0.12	-223.9				2		1.92	1.9	1.12	0.78	0.01	0.01	0.02	0.8			50					
BHS4-EB	12/2/2013 1:20:00 PM	22.7	8.07	1.81	8.08	30.1	2	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:

<sup>1</sup>Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO<sub>x</sub>.

<sup>2</sup>Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH<sub>3</sub>.

<sup>3</sup>Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH<sub>3</sub> and NO<sub>x</sub>.

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.

Results based on colony counts outside the ideal range.

**Table 5**  
**Summary of Water Quality Data**

Sample ID	Statistical Parameter	Temp (°C)	pH	Specific Conductance (uS/cm)	DO (mg/L)	ORP (mV)	Total Alkalinity (mg/L)	TSS (mg/L)	VSS (mg/L)	CBOD <sub>5</sub> (mg/L)	COD (mg/L)	TN (mg/L N) <sup>1</sup>	TKN (mg/L N)	Organic N (mg/L N) <sup>2</sup>	NH <sub>3</sub> -N (mg/L N)	NO <sub>3</sub> -N (mg/L N)	NO <sub>2</sub> -N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) <sup>3</sup>	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	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	MEAN	25.00	6.73	1274.00	0.08	-313.35	460.00	46.00	46.00	95.00	190.00	82.58	82.50	13.00	69.50	0.08	0.01	0.08	69.58	13.50	3.76	1.98	3.60	5.75	29,172	12,649	58.00
	STD. DEV.	3.96	0.00	4.24	0.10	11.95	14.14	11.31	11.31	4.24	84.85	6.45	6.36	14.14	7.78	0.08	0.00	0.08	7.69	0.71	5.30	1.58	0.85	0.07			8.49
	MIN	22.20	6.52	1271.00	0.01	-321.80	450.00	38.00	38.00	92.00	130.00	78.02	78.00	3.00	64.00	0.02	0.01	0.02	64.14	13.00	0.01	0.86	3.00	5.70	23,000	10,000	52.00
	MAX	27.80	6.94	1277.00	0.15	-304.90	470.00	54.00	54.00	98.00	250.00	87.14	87.00	23.00	75.00	0.14	0.01	0.14	75.02	14.00	7.50	3.10	4.20	5.80	37,000	16,000	64.00
Stage 1	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	1	1	2	2	2
	MEAN	24.95	6.87	1374.00	4.23	52.90	290.00	4.50	4.00	4.00	15.50	59.10	6.60	5.51	1.09	52.50	0.01	52.50	53.59	1.85	1.60		0.00	0.00	1,646	992	12.50
	STD. DEV.	3.75	0.00	15.56	0.54	26.87	0.00	2.12	1.41	1.41	7.78	5.94	0.42	1.43	1.00	6.36	0.00	6.36	7.37	0.07	0.14						0.71
	MIN	22.30	6.76	1363.00	3.85	33.90	290.00	3.00	3.00	3.00	10.00	54.90	6.30	4.50	0.38	48.00	0.01	48.00	48.38	1.80	1.50		0.00	0.00	100	41	12.00
	MAX	27.60	6.98	1385.00	4.61	71.90	290.00	6.00	5.00	5.00	21.00	63.30	6.90	6.52	1.80	57.00	0.01	57.00	58.80	1.90	1.70		0.00	0.00	27,100	24,000	13.00
Stage 2 Ligno	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2
	MEAN	25.60	6.68	1232.00	1.16	-228.55	455.00	2.50	2.50	2.50	30.00	8.30	3.05	2.28	0.78	5.25	0.01	5.25	6.03	0.50	0.19	23.00	0.00	0.00	718	192	15.00
	STD. DEV.	2.69	0.00	21.21	1.42	13.36	7.07	0.71	0.71	0.71	0.00	0.42	0.49	0.22	0.28	0.92	0.00	0.92	0.64	0.11	0.01						2.83
	MIN	23.70	6.66	1217.00	0.15	-238.00	450.00	2.00	2.00	2.00	30.00	8.00	2.70	2.12	0.58	4.60	0.01	4.60	5.57	0.42	0.18	23.00	0.00	0.00	30	10	13.00
	MAX	27.50	6.71	1247.00	2.16	-219.10	460.00	3.00	3.00	3.00	30.00	8.60	3.40	2.43	0.97	5.90	0.01	5.90	6.48	0.57	0.20	23.00	0.00	0.00	17,200	3,700	17.00
Stage 2 Sulfur	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	MEAN	25.15	6.71	1291.50	0.15	-248.65	495.00	2.00	1.50	3.00	35.50	1.77	1.75	1.02	0.73	0.01	0.01	0.02	0.75	0.85	0.51	42.50	1.55	1.95	73	51	15.50
	STD. DEV.	2.76	0.00	20.51	0.04	35.00	21.21	0.00	0.71	0.00	7.78	0.64	0.64	0.88	0.24	0.00	0.00	0.00	0.24	0.21	0.27	10.61	0.35	0.92			3.54
	MIN	23.20	6.61	1277.00	0.12	-273.40	480.00	2.00	1.00	3.00	30.00	1.32	1.30	0.40	0.56	0.01	0.01	0.02	0.58	0.70	0.32	35.00	1.30	1.30	1	2	13.00
	MAX	27.10	6.81	1306.00	0.18	-223.90	510.00	2.00	2.00	3.00	41.00	2.22	2.20	1.64	0.90	0.01	0.01	0.02	0.92	1.00	0.70	50.00	1.80	2.60	5,400	1,300	18.00
Well	n	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MEAN	27.90	7.32	529.00	5.10	101.30	150.00	1.00	1.00	2.00	10.00	1.58	0.18	0.16	0.02	1.40	0.01	1.40	1.42	0.49	0.20	8.70	0.13	0.41	1	2	2.10
	STD. DEV.																										
	MIN	27.90	7.32	529.00	5.10	101.30	150.00	1.00	1.00	2.00	10.00	1.58	0.18	0.16	0.02	1.40	0.01	1.40	1.42	0.49	0.20	8.70	0.13	0.41	1	2	2.10
	MAX	27.90	7.32	529.00	5.10	101.30	150.00	1.00	1.00	2.00	10.00	1.58	0.18	0.16	0.02	1.40	0.01	1.40	1.42	0.49	0.20	8.70	0.13	0.41	1	2	2.10

Notes:

<sup>1</sup>Total Nitrogen (TN) is a calculated value equal to the sum of TKN and NO<sub>x</sub>

<sup>2</sup>Organic Nitrogen (ON) is a calculated value equal to the difference of TKN and NH<sub>3</sub>

<sup>3</sup>Total Inorganic Nitrogen (TIN) is a calculated value equal to the sum of NH<sub>3</sub> and NO<sub>x</sub>

<sup>4</sup>Fecal 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.



## **5.0 B-HS4 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 78 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 6.3 mg/L TKN, of which 1.8 mg/L was ammonia.
- The Stage 2 biofilter produced a reducing environment and effluent NO<sub>x</sub>-N was below the method detection limit of 0.02 mg N/L.
- The total nitrogen concentration in the final effluent from the total treatment system was 2.2 mg/L, an approximately 97% 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**

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PRELIMINARY

o:\44237-001\Wpdocs\Report\Draft

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

**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-STE						
Matrix		Wastewater						
SAL Sample Number		1312816-01						
Date/Time Collected		12/02/13 12:10						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.94						
Temperature		22.2 °C						
Conductivity		1277 umhos						
Dissolved Oxygen		0.01 mg/L						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	3.0	SM 4550SF	0.04	0.01		12/03/13 09:00	1
Ammonia as N	mg/L	75	EPA 350.1	2.0	0.47		12/04/13 16:56	50
Carbonaceous BOD	mg/L	98	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	250	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	0.02 I	EPA 300.0	0.04	0.01		12/03/13 16:12	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 16:12	1
Orthophosphate as P	mg/L	7.5	EPA 300.0	0.040	0.010		12/03/13 16:12	1
Phosphorous - Total as P	mg/L	13	SM 4500P-E	0.40	0.10	12/05/13 09:41	12/08/13 15:08	10
Sulfate	mg/L	0.86	EPA 300.0	0.60	0.20		12/03/13 16:12	1
Sulfide	mg/L	5.8	SM 4500SF	0.40	0.10		12/03/13 09:00	1
Total Alkalinity	mg/L	470	SM 2320B	8.0	2.0		12/05/13 13:30	1
Total Kjeldahl Nitrogen	mg/L	78	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 15:51	20.83
Total Organic Carbon	mg/L	52	SM 5310B	1.0	0.060		12/04/13 12:16	1
Total Suspended Solids	mg/L	38	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1
Volatile Suspended Solids	mg/L	38	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	0.02 I	EPA 300.0	0.08	0.02		12/03/13 16:12	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	10,000	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	37,000	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

Sample Description **BHS4-STE-FILTERED**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-02**  
 Date/Time Collected **12/02/13 12:10**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

**Client Provided Field Data**

pH 6.94  
 Temperature 22.2 °C  
 Conductivity 1277 umhos  
 Dissolved Oxygen 0.01 mg/L

**Hazen and Sawyer**  
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**Tampa, FL 33619**

**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-STE-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312816-02						
Date/Time Collected		12/02/13 12:10						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.94						
Temperature		22.2 °C						
Conductivity		1277 umhos						
Dissolved Oxygen		0.01 mg/L						
<b><u>Inorganic, Dissolved</u></b>								
Ammonia as N	mg/L	68	EPA 350.1	2.0	0.47		12/13/13 12:04	50
Carbonaceous BOD	mg/L	61	SM 5210B	2	2	12/04/13 09:00	12/09/13 15:48	1
Nitrate (as N)	mg/L	0.04	EPA 300.0	0.04	0.01		12/03/13 16:22	1
Nitrite (as N)	mg/L	0.04	EPA 300.0	0.04	0.01		12/03/13 16:22	1
Total Kjeldahl Nitrogen	mg/L	80	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 14:34	20.83
Nitrate+Nitrite (N)	mg/L	0.07 I	EPA 300.0	0.08	0.02		12/03/13 16:22	1
Lab filtration for diss. analytes							12/02/13 16:00	

Sample Description **BHS4-ST-1**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-03**  
 Date/Time Collected **12/02/13 11:20**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

**Client Provided Field Data**

pH 6.98  
 Temperature 22.3 °C  
 Conductivity 1385 umhos  
 Dissolved Oxygen 4.61 mg/L

**Inorganics**

Ammonia as N	mg/L	1.8	EPA 350.1	0.040	0.009		12/04/13 16:57	1
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	21 I	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	57	EPA 300.0	0.40	0.10		12/03/13 16:31	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 16:31	1
Orthophosphate as P	mg/L	1.7	EPA 300.0	0.040	0.010		12/03/13 16:31	1
Phosphorous - Total as P	mg/L	1.9	SM 4500P-E	0.040	0.010	12/05/13 09:41	12/08/13 15:09	1
Total Alkalinity	mg/L	290	SM 2320B	8.0	2.0		12/05/13 13:39	1
Total Kjeldahl Nitrogen	mg/L	6.3	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 15:52	5
Total Organic Carbon	mg/L	12	SM 5310B	1.0	0.060		12/04/13 12:16	1
Total Suspended Solids	mg/L	6	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1



**Hazen and Sawyer**  
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**Tampa, FL 33619**

**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-ST-1						
Matrix		Wastewater						
SAL Sample Number		1312816-03						
Date/Time Collected		12/02/13 11:20						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<u>Client Provided Field Data</u>								
pH		6.98						
Temperature		22.3 °C						
Conductivity		1385 umhos						
Dissolved Oxygen		4.61 mg/L						
Volatile Suspended Solids	mg/L	5	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	57	EPA 300.0	0.44	0.11		12/03/13 16:31	10
<u>Microbiology</u>								
E. Coli	MPN/100 mL	24,000	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	27,100	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

Sample Description **BHS4-ST1-DUP**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-04**  
 Date/Time Collected **12/02/13 11:25**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

**Client Provided Field Data**

pH 6.98  
 Temperature 22.3 °C  
 Conductivity 1385 umhos  
 Dissolved Oxygen 4.61 mg/L

**Inorganics**

Ammonia as N	mg/L	1.8	EPA 350.1	0.040	0.009		12/04/13 16:59	1
Carbonaceous BOD	mg/L	4	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	28	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	56	EPA 300.0	0.40	0.10		12/03/13 16:40	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 16:40	1
Orthophosphate as P	mg/L	1.7	EPA 300.0	0.040	0.010		12/03/13 16:40	1
Phosphorous - Total as P	mg/L	1.7	SM 4500P-E	0.040	0.010	12/04/13 08:53	12/05/13 13:27	1
Total Alkalinity	mg/L	300	SM 2320B	8.0	2.0		12/05/13 13:48	1
Total Kjeldahl Nitrogen	mg/L	5.8	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 15:54	5
Total Organic Carbon	mg/L	13	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	6	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1
Volatile Suspended Solids	mg/L	5	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	56	EPA 300.0	0.44	0.11		12/03/13 16:40	10

**Microbiology**

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**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution

Sample Description **BHS4-ST1-DUP**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-04**  
 Date/Time Collected **12/02/13 11:25**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

### Client Provided Field Data

pH		6.98						
Temperature		22.3 °C						
Conductivity		1385 umhos						
Dissolved Oxygen		4.61 mg/L						
E. Coli	MPN/100 mL	24,000	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	25,000	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

Sample Description **BHS4-ST1-FILTERED**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-05**  
 Date/Time Collected **12/02/13 11:20**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

### Client Provided Field Data

pH		6.98						
Temperature		22.3 °C						
Conductivity		1385 umhos						
Dissolved Oxygen		4.61 mg/L						
<b><u>Inorganic, Dissolved</u></b>								
Ammonia as N	mg/L	2.3	EPA 350.1	0.20	0.047		12/13/13 11:05	5
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	12/04/13 09:00	12/09/13 15:48	1
Nitrate (as N)	mg/L	58	EPA 300.0	0.40	0.10		12/03/13 16:50	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 16:50	1
Total Kjeldahl Nitrogen	mg/L	6.8	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 14:36	5
Nitrate+Nitrite (N)	mg/L	58	EPA 300.0	0.44	0.11		12/03/13 16:50	10
Lab filtration for diss. analytes							12/02/13 16:00	

Sample Description **BHS4-LIGNO-36**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-06**  
 Date/Time Collected **12/02/13 11:50**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

### Client Provided Field Data

pH	6.85
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**Hazen and Sawyer**  
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**Tampa, FL 33619**

**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-LIGNO-36						
Matrix		Wastewater						
SAL Sample Number		1312816-06						
Date/Time Collected		12/02/13 11:50						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.85						
Temperature		23.0 °C						
Conductivity		1298 umhos						
Dissolved Oxygen		0.11 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	1.1	EPA 350.1	0.040	0.009		12/04/13 15:46	1
Nitrate (as N)	mg/L	42	EPA 300.0	0.40	0.10		12/03/13 16:59	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 16:59	1
Sulfate	mg/L	28	EPA 300.0	0.60	0.20		12/03/13 16:59	1
Total Kjeldahl Nitrogen	mg/L	4.5	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 14:54	1
Nitrate+Nitrite (N)	mg/L	42	EPA 300.0	0.44	0.11		12/03/13 16:59	10
Sample Description		BHS4-LIGNO-24						
Matrix		Wastewater						
SAL Sample Number		1312816-07						
Date/Time Collected		12/02/13 11:40						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.86						
Temperature		23.2 °C						
Conductivity		1232 umhos						
Dissolved Oxygen		0.16 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.61	EPA 350.1	0.040	0.009		12/04/13 15:48	1
Nitrate (as N)	mg/L	21	EPA 300.0	0.40	0.10		12/03/13 17:08	10
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 17:08	1
Sulfate	mg/L	29	EPA 300.0	0.60	0.20		12/03/13 17:08	1
Total Kjeldahl Nitrogen	mg/L	3.4	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 14:55	1
Nitrate+Nitrite (N)	mg/L	21	EPA 300.0	0.44	0.11		12/03/13 17:08	10

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

**December 20, 2013**  
**Work Order: 1312816**

## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-LIGNO-12						
Matrix		Wastewater						
SAL Sample Number		1312816-08						
Date/Time Collected		12/02/13 11:30						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.66						
Temperature		23.5 °C						
Conductivity		1227 umhos						
Dissolved Oxygen		0.16 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.56	EPA 350.1	0.040	0.009		12/04/13 15:50	1
Nitrate (as N)	mg/L	13	EPA 300.0	0.04	0.01		12/03/13 17:18	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 17:18	1
Sulfate	mg/L	30	EPA 300.0	0.60	0.20		12/03/13 17:18	1
Total Kjeldahl Nitrogen	mg/L	3.2	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 14:56	1
Nitrate+Nitrite (N)	mg/L	13	EPA 300.0	0.08	0.02		12/03/13 17:18	1
Sample Description		BHS4-LIGNO-0						
Matrix		Wastewater						
SAL Sample Number		1312816-09						
Date/Time Collected		12/02/13 11:10						
Collected by		Josefin Hirst						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.66						
Temperature		23.7 °C						
Conductivity		1217 umhos						
Dissolved Oxygen		0.15 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.58	EPA 350.1	0.040	0.009		12/04/13 15:52	1
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	30	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	5.9	EPA 300.0	0.04	0.01		12/03/13 17:27	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 17:27	1
Orthophosphate as P	mg/L	0.18	EPA 300.0	0.040	0.010		12/03/13 17:27	1
Phosphorous - Total as P	mg/L	0.42	SM 4500P-E	0.040	0.010	12/04/13 08:53	12/05/13 13:28	1
Sulfate	mg/L	23	EPA 300.0	0.60	0.20		12/03/13 17:27	1
Total Alkalinity	mg/L	460	SM 2320B	8.0	2.0		12/05/13 14:02	1
Total Kjeldahl Nitrogen	mg/L	2.7	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 14:58	1
Total Organic Carbon	mg/L	13	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	3	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1

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## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		<b>BHS4-LIGNO-0</b>						
Matrix		<b>Wastewater</b>						
SAL Sample Number		<b>1312816-09</b>						
Date/Time Collected		<b>12/02/13 11:10</b>						
Collected by		<b>Josefin Hirst</b>						
Date/Time Received		<b>12/02/13 15:30</b>						

### Client Provided Field Data

pH		6.66						
Temperature		23.7 °C						
Conductivity		1217 umhos						
Dissolved Oxygen		0.15 mg/L						
Volatile Suspended Solids	mg/L	3	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	5.9	EPA 300.0	0.08	0.02		12/03/13 17:27	1

### Microbiology

E. Coli	MPN/100 mL	3,700	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	17,200	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

Sample Description		<b>BHS4-LIGNO-0-FILTERED</b>						
Matrix		<b>Wastewater</b>						
SAL Sample Number		<b>1312816-10</b>						
Date/Time Collected		<b>12/02/13 11:10</b>						
Collected by		<b>Josefin Hirst</b>						
Date/Time Received		<b>12/02/13 15:30</b>						

### Client Provided Field Data

pH		6.66						
Temperature		23.7 °C						
Conductivity		1217 umhos						
Dissolved Oxygen		0.15 mg/L						

### Inorganic, Dissolved

Ammonia as N	mg/L	0.91	EPA 350.1	0.040	0.009		12/13/13 10:02	1
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	12/04/13 09:00	12/09/13 15:48	1
Nitrate (as N)	mg/L	5.9	EPA 300.0	0.04	0.01		12/03/13 18:05	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:05	1
Total Kjeldahl Nitrogen	mg/L	3.1	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 15:28	1
Nitrate+Nitrite (N)	mg/L	5.9	EPA 300.0	0.08	0.02		12/03/13 18:05	1
Lab filtration for diss. analytes							12/02/13 16:00	



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## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution

Sample Description **BHS4-SULFUR-6**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-11**  
 Date/Time Collected **12/02/13 11:00**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

### Client Provided Field Data

pH 6.66  
 Temperature 23.9 °C  
 Conductivity 1270 umhos  
 Dissolved Oxygen 0.10 mg/L

### Inorganics

Ammonia as N	mg/L	0.22	EPA 350.1	0.040	0.009		12/04/13 15:55	1
Nitrate (as N)	mg/L	0.04	EPA 300.0	0.04	0.01		12/03/13 18:14	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:14	1
Sulfate	mg/L	75	EPA 300.0	0.60	0.20		12/03/13 18:14	1
Total Kjeldahl Nitrogen	mg/L	1.4	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 14:59	1
Nitrate+Nitrite (N)	mg/L	0.04 I	EPA 300.0	0.08	0.02		12/03/13 18:14	1

Sample Description **BHS4-SULFUR-6-12**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-12**  
 Date/Time Collected **12/02/13 10:50**  
 Collected by **Josefin Hirst**  
 Date/Time Received **12/02/13 15:30**

### Client Provided Field Data

pH 6.67  
 Temperature 23.9 °C  
 Conductivity 1298 umhos  
 Dissolved Oxygen 0.12 mg/L

### Inorganics

Ammonia as N	mg/L	0.33	EPA 350.1	0.040	0.009		12/04/13 16:05	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:24	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:24	1
Sulfate	mg/L	74	EPA 300.0	0.60	0.20		12/03/13 18:24	1
Total Kjeldahl Nitrogen	mg/L	1.4	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 15:00	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/03/13 18:24	1

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## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-ST2						
Matrix		Wastewater						
SAL Sample Number		1312816-13						
Date/Time Collected		12/02/13 10:30						
Collected by		Sean Schmidt						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.81						
Temperature		23.2 °C						
Conductivity		1306 umhos						
Dissolved Oxygen		0.12 mg/L						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	1.3	SM 4550SF	0.04	0.01		12/03/13 09:00	1
Ammonia as N	mg/L	0.56	EPA 350.1	0.040	0.009		12/04/13 16:07	1
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	30	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:33	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:33	1
Orthophosphate as P	mg/L	0.70	EPA 300.0	0.040	0.010		12/03/13 18:33	1
Phosphorous - Total as P	mg/L	1.0	SM 4500P-E	0.040	0.010	12/04/13 08:53	12/05/13 13:29	1
Sulfate	mg/L	50	EPA 300.0	0.60	0.20		12/03/13 18:33	1
Sulfide	mg/L	1.3	SM 4500SF	0.40	0.10		12/03/13 09:00	1
Total Alkalinity	mg/L	510	SM 2320B	8.0	2.0		12/05/13 14:17	1
Total Kjeldahl Nitrogen	mg/L	2.2	EPA 351.2	0.20	0.05	12/05/13 09:37	12/07/13 12:47	1
Total Organic Carbon	mg/L	13	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/03/13 18:33	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	1,300	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	5,400	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

Sample Description **BHS4-ST2-FILTERED**  
 Matrix **Wastewater**  
 SAL Sample Number **1312816-14**  
 Date/Time Collected **12/02/13 10:30**  
 Collected by **Sean Schmidt**  
 Date/Time Received **12/02/13 15:30**

**Client Provided Field Data**

pH 6.81  
 Temperature 23.2 °C  
 Conductivity 1306 umhos  
 Dissolved Oxygen 0.12 mg/L

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## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-ST2-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1312816-14						
Date/Time Collected		12/02/13 10:30						
Collected by		Sean Schmidt						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		6.81						
Temperature		23.2 °C						
Conductivity		1306 umhos						
Dissolved Oxygen		0.12 mg/L						
<b><u>Inorganics</u></b>								
Sulfate	mg/L	50	EPA 300.0	0.60	0.20		12/03/13 18:42	1
<b><u>Inorganic, Dissolved</u></b>								
Ammonia as N	mg/L	0.78	EPA 350.1	0.040	0.009		12/13/13 10:04	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/04/13 09:00	12/09/13 15:48	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:42	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:42	1
Total Kjeldahl Nitrogen	mg/L	1.9	EPA 351.2	0.20	0.050	12/09/13 16:46	12/16/13 15:29	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/03/13 18:42	1
Lab filtration for diss. analytes							12/02/13 16:00	
Sample Description		BHS4-EB						
Matrix		Reagent Water						
SAL Sample Number		1312816-15						
Date/Time Collected		12/02/13 13:20						
Collected by		Sean Schmidt						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		8.07						
Temperature		22.7 °C						
Conductivity		1.81 umhos						
Dissolved Oxygen		8.08 mg/L						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01		12/03/13 09:00	1
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		12/04/13 16:09	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	12/04/13 07:00	12/09/13 14:18	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	12/03/13 09:00	12/03/13 15:57	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:52	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		12/03/13 18:52	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		12/03/13 18:52	1
Phosphorous - Total as P	mg/L	0.010 U	SM 4500P-E	0.040	0.010	12/04/13 08:53	12/05/13 13:30	1
Sulfate	mg/L	0.20 U	EPA 300.0	0.60	0.20		12/03/13 18:52	1

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## Laboratory Report

Project Name		B-HS4 SE#2						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS4-EB						
Matrix		Reagent Water						
SAL Sample Number		1312816-15						
Date/Time Collected		12/02/13 13:20						
Collected by		Sean Schmidt						
Date/Time Received		12/02/13 15:30						
<b><u>Client Provided Field Data</u></b>								
pH		8.07						
Temperature		22.7 °C						
Conductivity		1.81 umhos						
Dissolved Oxygen		8.08 mg/L						
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		12/03/13 09:00	1
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0		12/05/13 14:20	1
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	12/04/13 09:01	12/05/13 16:16	1
Total Organic Carbon	mg/L	0.060 U	SM 5310B	1.0	0.060		12/05/13 13:56	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	12/03/13 09:14	12/05/13 10:03	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	12/03/13 09:14	12/05/13 10:03	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		12/03/13 18:52	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	12/02/13 16:18	12/03/13 11:01	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	12/02/13 16:12	12/03/13 15:06	1

# SOUTHERN ANALYTICAL LABORATORIES, INC.

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Work Order: 1312816

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30230 - COD prep</b>										
<b>Blank (BL30230-BLK1)</b>					Prepared & Analyzed: 12/03/13					
Chemical Oxygen Demand	10 U	25	10	mg/L						
<b>LCS (BL30230-BS1)</b>					Prepared & Analyzed: 12/03/13					
Chemical Oxygen Demand	47	25	10	mg/L	50		94	90-110		
<b>Matrix Spike (BL30230-MS1)</b>					Source: 1312816-09 Prepared & Analyzed: 12/03/13					
Chemical Oxygen Demand	78	25	10	mg/L	50	30	96	85-115		
<b>Matrix Spike Dup (BL30230-MSD1)</b>					Source: 1312816-09 Prepared & Analyzed: 12/03/13					
Chemical Oxygen Demand	80	25	10	mg/L	50	30	100	85-115	3	32
<b>Batch BL30301 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BL30301-BLK1)</b>					Prepared & Analyzed: 12/03/13					
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Sulfate	0.20 U	0.60	0.20	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
<b>LCS (BL30301-BS1)</b>					Prepared & Analyzed: 12/03/13					
Nitrite (as N)	1.50	0.04	0.01	mg/L	1.4		108	85-115		
Sulfate	8.59	0.60	0.20	mg/L	9.0		95	85-115		
Orthophosphate as P	0.810	0.040	0.010	mg/L	0.90		90	85-115		
Nitrate (as N)	1.74	0.04	0.01	mg/L	1.7		102	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		



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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30301 - Ion Chromatography 300.0 Prep</b>										
<b>LCS Dup (BL30301-BSD1)</b>					Prepared & Analyzed: 12/03/13					
Nitrite (as N)	1.52	0.04	0.01	mg/L	1.4		109	85-115	1	200
Orthophosphate as P	0.832	0.040	0.010	mg/L	0.90		92	85-115	3	200
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115	0.7	200
Sulfate	8.65	0.60	0.20	mg/L	9.0		96	85-115	0.7	200
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
<b>Matrix Spike (BL30301-MS1)</b>					<b>Source: 1312816-09</b>		Prepared & Analyzed: 12/03/13			
Nitrite (as N)	1.52	0.04	0.01	mg/L	1.4	ND	109	85-115		
Nitrate (as N)	7.70	0.04	0.01	mg/L	1.7	5.87	108	85-115		
Orthophosphate as P	1.04	0.040	0.010	mg/L	0.90	0.178	96	85-115		
Sulfate	32.3	0.60	0.20	mg/L	9.0	23.3	99	85-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
<b>Matrix Spike (BL30301-MS2)</b>					<b>Source: 1312818-01</b>		Prepared & Analyzed: 12/03/13			
Orthophosphate as P	0.812	0.040	0.010	mg/L	0.90	ND	90	85-115		
Nitrite (as N)	1.50	0.04	0.01	mg/L	1.4	ND	107	85-115		
Nitrate (as N)	1.88	0.04	0.01	mg/L	1.7	0.0250	109	85-115		
Sulfate	9.12	0.60	0.20	mg/L	9.0	0.614	94	85-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	90-115		

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30306 - VSS Prep</b>										
<b>Blank (BL30306-BLK1)</b>					Prepared: 12/03/13 Analyzed: 12/05/13					
Total Suspended Solids	1 U	1	1	mg/L						
Volatile Suspended Solids	1 U	1		mg/L						
<b>LCS (BL30306-BS1)</b>					Prepared: 12/03/13 Analyzed: 12/05/13					
Total Suspended Solids	49.8	1	1	mg/L	50		100	85-115		
<b>Duplicate (BL30306-DUP1)</b>					<b>Source: 1312816-01</b>		Prepared: 12/03/13 Analyzed: 12/05/13			
Volatile Suspended Solids	40.0	1		mg/L		38.0			5	20
Total Suspended Solids	40.0	1	1	mg/L		38.0			5	30
<b>Batch BL30313 - Sulfide prep</b>										
<b>Blank (BL30313-BLK1)</b>					Prepared & Analyzed: 12/03/13					
Sulfide	0.10 U	0.40	0.10	mg/L						
<b>LCS (BL30313-BS1)</b>					Prepared & Analyzed: 12/03/13					
Sulfide	4.64	0.40	0.10	mg/L	5.0		93	85-115		
<b>Matrix Spike (BL30313-MS1)</b>					<b>Source: 1312816-15</b>		Prepared & Analyzed: 12/03/13			
Sulfide	4.44	0.40	0.10	mg/L	5.0	ND	89	85-115		
<b>Matrix Spike Dup (BL30313-MSD1)</b>					<b>Source: 1312816-15</b>		Prepared & Analyzed: 12/03/13			
Sulfide	4.44	0.40	0.10	mg/L	5.0	ND	89	85-115	0	14
<b>Batch BL30403 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BL30403-BLK1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	0.993			mg/L	1.0		99	90-115		

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December 20, 2013  
Work Order: 1312816

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30403 - Ion Chromatography 300.0 Prep</b>										
<b>LCS (BL30403-BS1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	1.73	0.04	0.01	mg/L	1.7		102	85-115		
Surrogate: Dichloroacetate	0.992			mg/L	1.0		99	90-115		
<b>LCS Dup (BL30403-BSD1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115	0.9	200
Surrogate: Dichloroacetate	1.01			mg/L	1.0		101	90-115		
<b>Matrix Spike (BL30403-MS1)</b>					<b>Source: 1312847-04</b>		Prepared & Analyzed: 12/04/13			
Nitrate (as N)	37.0	0.80	0.20	mg/L	34	1.22	105	85-115		
Surrogate: Dichloroacetate	0.977			mg/L	1.0		98	90-115		
<b>Matrix Spike (BL30403-MS2)</b>					<b>Source: 1312924-04</b>		Prepared & Analyzed: 12/05/13			
Nitrate (as N)	1.70	0.04	0.01	mg/L	1.7	0.0280	98	85-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
<b>Batch BL30409 - Digestion for TP by EPA 365.2/SM4500PE</b>										
<b>Blank (BL30409-BLK1)</b>					Prepared: 12/04/13 Analyzed: 12/05/13					
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						
<b>LCS (BL30409-BS1)</b>					Prepared: 12/04/13 Analyzed: 12/05/13					
Phosphorous - Total as P	0.770	0.040	0.010	mg/L	0.80		96	90-110		
<b>Matrix Spike (BL30409-MS1)</b>					<b>Source: 1312816-15</b>		Prepared: 12/04/13 Analyzed: 12/05/13			
Phosphorous - Total as P	0.986	0.040	0.010	mg/L	1.0	ND	99	90-110		
<b>Matrix Spike (BL30409-MS2)</b>					<b>Source: 1312845-02</b>		Prepared: 12/04/13 Analyzed: 12/05/13			
Phosphorous - Total as P	0.988	0.040	0.010	mg/L	1.0	0.0137	97	90-110		

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL30409 - Digestion for TP by EPA 365.2/SM4500PE										
Matrix Spike Dup (BL30409-MSD1)		Source: 1312816-15			Prepared: 12/04/13 Analyzed: 12/05/13					
Phosphorous - Total as P	1.01	0.040	0.010	mg/L	1.0	ND	101	90-110	2	25
Matrix Spike Dup (BL30409-MSD2)		Source: 1312845-02			Prepared: 12/04/13 Analyzed: 12/05/13					
Phosphorous - Total as P	1.00	0.040	0.010	mg/L	1.0	0.0137	99	90-110	1	25
Batch BL30412 - Digestion for TKN by EPA 351.2										
Blank (BL30412-BLK1)					Prepared: 12/04/13 Analyzed: 12/05/13					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BL30412-BS1)					Prepared: 12/04/13 Analyzed: 12/05/13					
Total Kjeldahl Nitrogen	2.61	0.20	0.05	mg/L	2.5		103	90-110		
Matrix Spike (BL30412-MS1)		Source: 1312816-15			Prepared: 12/04/13 Analyzed: 12/05/13					
Total Kjeldahl Nitrogen	2.41	0.20	0.05	mg/L	2.5	ND	95	90-110		
Matrix Spike Dup (BL30412-MSD1)		Source: 1312816-15			Prepared: 12/04/13 Analyzed: 12/05/13					
Total Kjeldahl Nitrogen	2.47	0.20	0.05	mg/L	2.5	ND	98	90-110	3	20
Batch BL30417 - TOC prep										
Blank (BL30417-BLK1)					Prepared & Analyzed: 12/04/13					
Total Organic Carbon	0.060 U	1.0	0.060	mg/L						
LCS (BL30417-BS1)					Prepared & Analyzed: 12/04/13					
Total Organic Carbon	9.08	1.0	0.060	mg/L	10		91	90-110		

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**Inorganics - Quality Control**

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30417 - TOC prep</b>										
<b>Matrix Spike (BL30417-MS1)</b>		<b>Source: 1312813-01</b>			Prepared & Analyzed: 12/04/13					
Total Organic Carbon	8.67	1.0	0.060	mg/L	10	ND	87	85-115		
<b>Matrix Spike Dup (BL30417-MSD1)</b>		<b>Source: 1312813-01</b>			Prepared & Analyzed: 12/04/13					
Total Organic Carbon	8.57	1.0	0.060	mg/L	10	ND	86	85-115	1	10
<b>Batch BL30426 - BOD</b>										
<b>Blank (BL30426-BLK1)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	2 U	2	2	mg/L						
<b>Blank (BL30426-BLK2)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	2 U	2	2	mg/L						
<b>LCS (BL30426-BS1)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	201	2	2	mg/L	200		100	85-115		
<b>LCS (BL30426-BS2)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	199	2	2	mg/L	200		99	85-115		
<b>LCS Dup (BL30426-BSD1)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	203	2	2	mg/L	200		101	85-115	1	200
<b>LCS Dup (BL30426-BSD2)</b>		Prepared: 12/04/13 Analyzed: 12/09/13								
Carbonaceous BOD	208	2	2	mg/L	200		104	85-115	5	200
<b>Duplicate (BL30426-DUP1)</b>		<b>Source: 1312831-03</b>			Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	140	2	2	mg/L		140			0.8	25



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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BL30426 - BOD										
Duplicate (BL30426-DUP2)		Source: 1312816-03			Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	4	2	2	mg/L		3			2	25
Batch BL30432 - Ammonia by SEAL										
Blank (BL30432-BLK1)					Prepared & Analyzed: 12/04/13					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BL30432-BS1)					Prepared & Analyzed: 12/04/13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50		99	90-110		
Matrix Spike (BL30432-MS1)		Source: 1312816-15			Prepared & Analyzed: 12/04/13					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	ND	101	90-110		
Matrix Spike (BL30432-MS2)		Source: 1312888-07			Prepared & Analyzed: 12/04/13					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	ND	101	90-110		
Matrix Spike Dup (BL30432-MSD1)		Source: 1312816-15			Prepared & Analyzed: 12/04/13					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	99	90-110	3	10
Matrix Spike Dup (BL30432-MSD2)		Source: 1312888-07			Prepared & Analyzed: 12/04/13					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	98	90-110	3	10
Batch BL30505 - alkalinity										
Blank (BL30505-BLK1)					Prepared & Analyzed: 12/05/13					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30505 - alkalinity</b>										
<b>LCS (BL30505-BS1)</b>					Prepared & Analyzed: 12/05/13					
Total Alkalinity	140	8.0	2.0	mg/L	120		109	90-110		
<b>Matrix Spike (BL30505-MS1)</b>					Source: 1312794-03 Prepared & Analyzed: 12/05/13					
Total Alkalinity	280	8.0	2.0	mg/L	120	140	108	80-120		
<b>Matrix Spike Dup (BL30505-MSD1)</b>					Source: 1312794-03 Prepared & Analyzed: 12/05/13					
Total Alkalinity	270	8.0	2.0	mg/L	120	140	107	80-120	0.3	26
<b>Batch BL30506 - Digestion for TKN by EPA 351.2</b>										
<b>Blank (BL30506-BLK1)</b>					Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
<b>LCS (BL30506-BS1)</b>					Prepared: 12/05/13 Analyzed: 12/07/13					
Total Kjeldahl Nitrogen	2.39	0.20	0.05	mg/L	2.5		94	90-110		
<b>Matrix Spike (BL30506-MS1)</b>					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		
<b>Matrix Spike (BL30506-MS2)</b>					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		
<b>Matrix Spike Dup (BL30506-MSD1)</b>					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
<b>Matrix Spike Dup (BL30506-MSD2)</b>					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

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30508 - Digestion for TP by EPA 365.2/SM4500PE</b>										
<b>Blank (BL30508-BLK1)</b>					Prepared: 12/05/13 Analyzed: 12/08/13					
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						
<b>LCS (BL30508-BS1)</b>					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		
<b>Matrix Spike (BL30508-MS1)</b>					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		
<b>Matrix Spike (BL30508-MS2)</b>					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		
<b>Matrix Spike Dup (BL30508-MSD1)</b>					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
<b>Matrix Spike Dup (BL30508-MSD2)</b>					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
<b>Batch BL30509 - TOC prep</b>										
<b>Blank (BL30509-BLK1)</b>					Prepared & Analyzed: 12/05/13					
Total Organic Carbon	0.060 U	1.0	0.060	mg/L						
<b>LCS (BL30509-BS1)</b>					Prepared & Analyzed: 12/05/13					
Total Organic Carbon	10.1	1.0	0.060	mg/L	10		101	90-110		
<b>Matrix Spike (BL30509-MS1)</b>					Source: 1312927-02 Prepared & Analyzed: 12/05/13					
Total Organic Carbon	9.57	1.0	0.060	mg/L	10	ND	96	85-115		

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30509 - TOC prep</b>										
<b>Matrix Spike Dup (BL30509-MSD1)</b>		<b>Source: 1312927-02</b>			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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## Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30301 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BL30301-BLK1)</b>					Prepared & Analyzed: 12/03/13					
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	1.04			mg/L	1.0		104	90-115		
Surrogate: Dichloroacetate	1.04			mg/L	1.0		104	90-115		
<b>LCS (BL30301-BS1)</b>					Prepared & Analyzed: 12/03/13					
Nitrate (as N)	1.74	0.04	0.01	mg/L	1.7		102	85-115		
Nitrite (as N)	1.51	0.04	0.01	mg/L	1.4		108	85-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
<b>LCS Dup (BL30301-BSD1)</b>					Prepared & Analyzed: 12/03/13					
Nitrite (as N)	1.52	0.04	0.01	mg/L	1.4		109	85-115	1	200
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115	0.7	200
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		
<b>Matrix Spike (BL30301-MS1)</b>					<b>Source: 1312816-09</b>		Prepared & Analyzed: 12/03/13			
Nitrite (as N)	1.52	0.04	0.01	mg/L	1.4	ND	109	85-115		
Nitrate (as N)	7.70	0.04	0.01	mg/L	1.7	5.87	108	85-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.952			mg/L	1.0		95	90-115		
<b>Matrix Spike (BL30301-MS2)</b>					<b>Source: 1312818-01</b>		Prepared & Analyzed: 12/03/13			
Nitrite (as N)	1.50	0.04	0.01	mg/L	1.4	ND	107	85-115		
Nitrate (as N)	1.88	0.04	0.01	mg/L	1.7	0.0250	109	85-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.947			mg/L	1.0		95	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
<b>Batch BL30403 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BL30403-BLK1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	0.993			mg/L	1.0		99	90-115		
<b>LCS (BL30403-BS1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	1.73	0.04	0.01	mg/L	1.7		102	85-115		
Surrogate: Dichloroacetate	0.992			mg/L	1.0		99	90-115		
<b>LCS Dup (BL30403-BSD1)</b>					Prepared & Analyzed: 12/04/13					
Nitrate (as N)	1.75	0.04	0.01	mg/L	1.7		103	85-115	0.9	200
Surrogate: Dichloroacetate	1.01			mg/L	1.0		101	90-115		
<b>Matrix Spike (BL30403-MS1)</b>					<b>Source: 1312847-04</b>		Prepared & Analyzed: 12/04/13			
Nitrate (as N)	37.0	0.80	0.20	mg/L	34	1.22	105	85-115		
Surrogate: Dichloroacetate	0.977			mg/L	1.0		98	90-115		
<b>Matrix Spike (BL30403-MS2)</b>					<b>Source: 1312924-04</b>		Prepared & Analyzed: 12/05/13			
Nitrate (as N)	1.70	0.04	0.01	mg/L	1.7	0.0280	98	85-115		
Surrogate: Dichloroacetate	1.02			mg/L	1.0		102	90-115		
<b>Batch BL30438 - BOD Dissolved</b>										
<b>Blank (BL30438-BLK1)</b>					Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	2 U	2	2	mg/L						
<b>LCS (BL30438-BS1)</b>					Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	193	2	2	mg/L	200		96	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
<b>Batch BL30438 - BOD Dissolved</b>										
<b>LCS Dup (BL30438-BSD1)</b>					Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	195	2	2	mg/L	200		98	85-115	1	200
<b>Duplicate (BL30438-DUP1)</b>					Source: 1312816-02 Prepared: 12/04/13 Analyzed: 12/09/13					
Carbonaceous BOD	64	2	2	mg/L		61			5	25
<b>Batch BL30935 - Digestion for TKN by EPA 351.2</b>										
<b>Blank (BL30935-BLK1)</b>					Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	0.050 U	0.20	0.050	mg/L						
<b>LCS (BL30935-BS1)</b>					Prepared: 12/09/13 Analyzed: 12/16/13					
Total Kjeldahl Nitrogen	2.59	0.20	0.050	mg/L	2.5		102	90-110		
<b>Matrix Spike (BL30935-MS1)</b>					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		
<b>Matrix Spike (BL30935-MS2)</b>					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		
<b>Matrix Spike Dup (BL30935-MSD1)</b>					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
<b>Matrix Spike Dup (BL30935-MSD2)</b>					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
<b>Batch BL31305 - Ammonia by SEAL</b>										
<b>Blank (BL31305-BLK1)</b>					Prepared & Analyzed: 12/13/13					
Ammonia as N	0.009 U	0.040	0.009	mg/L						

# SOUTHERN ANALYTICAL LABORATORIES, INC.

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Hazen and Sawyer  
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Tampa, FL 33619

December 20, 2013  
Work Order: 1312816

## Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL31305 - Ammonia by SEAL</b>										
<b>LCS (BL31305-BS1)</b>					Prepared & Analyzed: 12/13/13					
Ammonia as N	0.47	0.040	0.009	mg/L	0.50		94	90-110		
<b>Matrix Spike (BL31305-MS1)</b>					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		
<b>Matrix Spike (BL31305-MS2)</b>					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		
<b>Matrix Spike Dup (BL31305-MSD1)</b>					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
<b>Matrix Spike Dup (BL31305-MSD2)</b>					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

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December 20, 2013  
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## Microbiology - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BL30232 - FC-MF</b>										
<b>Blank (BL30232-BLK1)</b>					Prepared: 12/02/13 Analyzed: 12/03/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml						
<b>Duplicate (BL30232-DUP1)</b>					<b>Source: 1312816-15</b> Prepared: 12/02/13 Analyzed: 12/03/13					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200

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

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## \* Qualifiers, Notes and Definitions

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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.

Questions regarding this report should be directed to :

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



# SOUTHERN ANALYTICAL LABORATORIES, INC.

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SAL Project No. 1312816

Client Name Hazan and Sawyer						Contact / Phone: Josefin Hirst 813-630-4498														
Project Name / Location BHS4 SE#2																				
Samplers: (Signature) <i>Josefin Hirst</i>						PARAMETER / CONTAINER DESCRIPTION														
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water																				
SAL Use Only	Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	125mLP, Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> FC-MF, FC-QT	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP, SO <sub>4</sub>	125mLP, H <sub>2</sub> SO <sub>4</sub> COD, TKN, TP, NH <sub>3</sub>	500mLP, NaOH & Zn Acetate H <sub>2</sub> S	40mL aV, HCl TOC	1LP, Cool Dissolved-Filter in lab (CBOD, TKN, NH <sub>3</sub> , NOx)	1LP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP	125mLP, H <sub>2</sub> SO <sub>4</sub> TKN, NH <sub>3</sub>	500mLP, Cool NOx	500mLP, Cool NOx, SO <sub>4</sub>	pH	Temperature	Conductivity
	01	BHS4-STE	12/2/13	12:10	WW		X	4	1	1	1	2					0.01	6.94	22.2	1277
	02	BHS4-STE-FILTERED		12:10	WW		X						1				0.01	6.94	22.2	1277
	03	BHS4-ST1		11:20	WW		X	4		1		2		1			4.61	6.98	22.3	1385
	04	BHS4-ST1-DUP		11:25	WW		X	4		1*		2		1			4.61	6.98	22.3	1385
	05	BHS4-ST1-FILTERED		11:20	WW		X						1				4.61	6.98	22.3	1385
	06	BHS4-LIGNO-36		11:50	WW		X								1	1	0.11	6.85	23.0	1298
	07	BHS4-LIGNO-24		11:40	WW		X								1	1	0.16	6.86	23.2	1232
	08	BHS4-LIGNO-12		11:30	WW		X								1	1	0.16	6.66	23.5	1227
	09	BHS4-LIGNO-0		11:10	WW		X	4		1		2		1			0.15	6.66	23.7	1217
	10	BHS4-LIGNO-0-FILTERED		11:10	WW		X						1				0.15	6.66	23.7	1217
	11	BHS4-SULFUR-6		11:20	WW		X								1		0.16	6.66	23.9	1270
	12	BHS4-SULFUR-6-12		10:50	WW		X								1		0.12	6.67	23.9	1298
Containers Prepared/Relinquished:		Date/Time: 10:55AM 11/12	Received: <i>Josefin Hirst</i>		Date/Time: 11/26/13	Seal intact? <input checked="" type="radio"/> N N/A		Instructions / Remarks Samples 02, 05, and 10 used 0.45 micron filtering												
Relinquished:		Date/Time: 5:30 12/2/13	Received: <i>K. Hudnuth</i>		Date/Time: 1530 12/2/13	Samples intact upon arrival? <input checked="" type="radio"/> N N/A														
Relinquished:		Date/Time:	Received:		Date/Time:	Received on ice? Temp _____ <input checked="" type="radio"/> N N/A														
Relinquished:		Date/Time:	Received:		Date/Time:	Proper preservatives indicated? <input checked="" type="radio"/> N N/A														
Relinquished:		Date/Time:	Received:		Date/Time:	Rec'd w/ in holding time? <input checked="" type="radio"/> N N/A														
Relinquished:		Date/Time:	Received:		Date/Time:	Volatiles rec'd w/ out headspace <input checked="" type="radio"/> N N/A														
Relinquished:		Date/Time:	Received:		Date/Time:	Proper containers used? <input checked="" type="radio"/> N N/A														

Chain of Custody.xls  
Rev. Date 11/19/01

Chain of Custody

\* sample collected in bottle had suspended solids not consistent w/ other samples therefore contents were poured out. Therefore acid needs to be added at the laboratory for preservation.



[illegible]



## Appendix B: Operation & Maintenance Log

**Table B.1**  
**Operation and Maintenance 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	System check
7/23/2013	Construction - sod installation
7/29/2013	Preliminary sampling event
8/6/2013	System check
	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 in Stage 1 Biofilter
	During lift station pump dose, ponding in Stage 1 biofilter
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	System check
9/30/2013	Sample Event No. 1
11/8/2013	System check
11/27/2013	System check
12/2/2013	Sample Event No. 2
	Cleaned STE effluent filter screen
	A little bit of ponding in Stage 1 biofilter influent side
	No ponding in all 4 drainfield observation ports
	*homeowners were out of town for Thanksgiving holiday

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