



# Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

**B-HS3 Field System Monitoring Report No. 4**

**Progress Report**

April 2014

442-27-001

**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

In association with:



**AET**  
Applied Environmental Technology

**Otis Environmental  
Consultants, LLC**

# **Florida Onsite Sewage Nitrogen Reduction Strategies Study**

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

### **B-HS3 Field System Monitoring Report No. 4**

#### **Prepared for:**

Florida Department of Health  
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Bureau of Environmental Health  
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FDOH Contract CORCL

**April 2014**

#### **Prepared by:**

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## **B-HS3 Field System Monitoring Report No. 4**

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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 fourth sample event of a passive nitrogen reduction system at home site B-HS3 in Seminole County, Florida.

### **2.0 Purpose**

Operation of the B-HS3 system was initiated on July 12, 2013. This monitoring report documents data collected from the fourth monitoring and sampling event conducted on April 3, 2014 (Day 265). The fourth monitoring event consisted of collecting flow measurements from the household water use meter and the treatment system flow meters, recording electricity use, monitoring of field parameters, collection of water samples from nine points in the treatment system, and chemical analyses of water samples by a NELAC certified laboratory.

### **3.0 Materials and Methods**

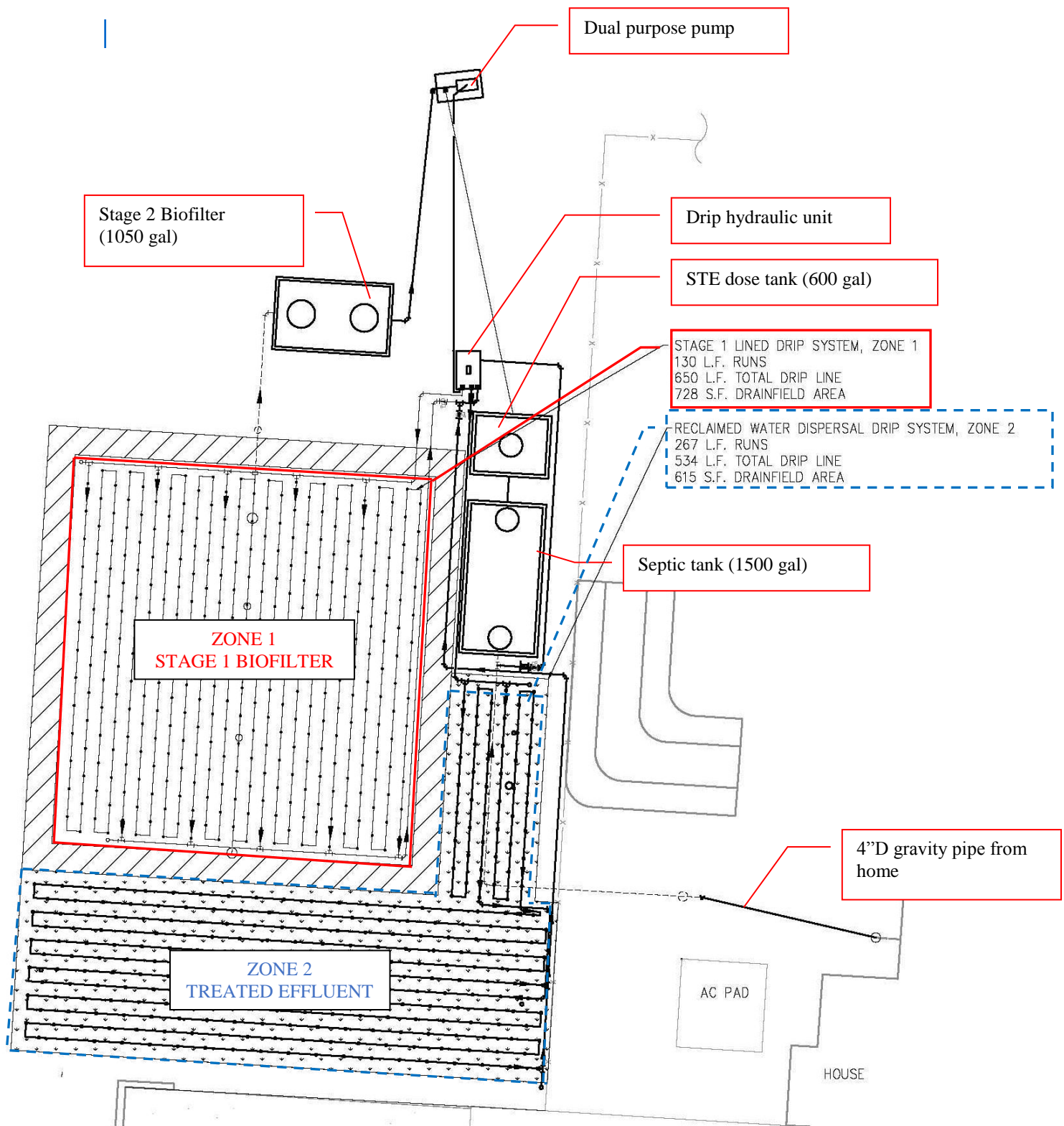
#### **3.1 Project Site**

The B-HS3 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. The B-HS3 system consists of a replacement septic tank (which was a 1,500 gallon two chamber concrete primary tank); a 600 gallon concrete STE dose tank; a two zone drip system; a Stage 1 lined drip zone; a 1,050 gallon concrete tank Stage 2 saturated media biofilter; and a treated effluent dispersal drip zone. Figure 1 is a system schematic

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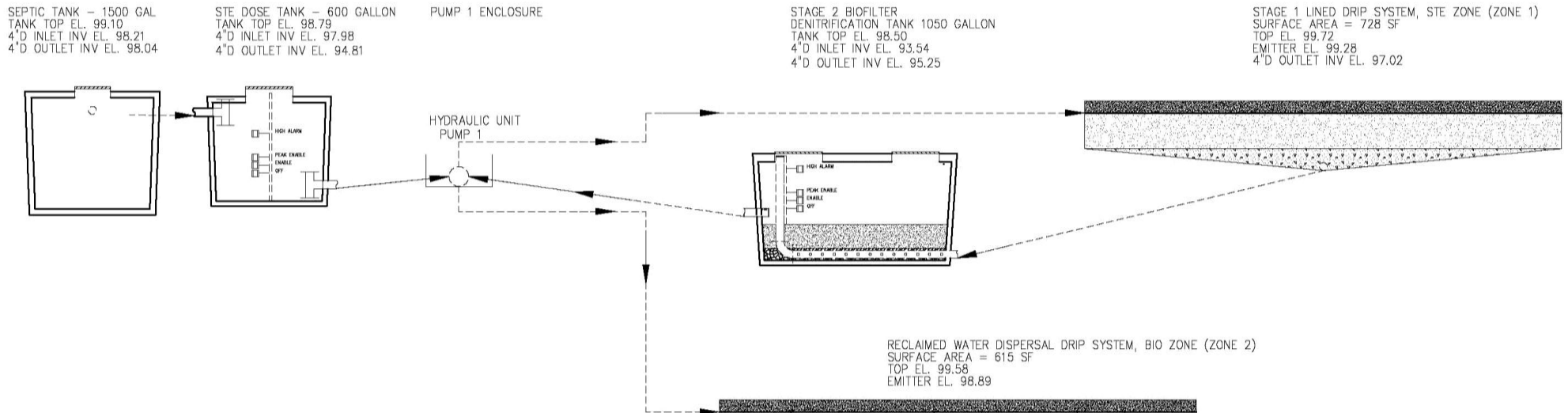
showing the system components and layout of the installation. A flow schematic of the system is shown in Figure 2.

PRELIMINARY



**Figure 1**  
**Plan View of B-HS3 System Layout**

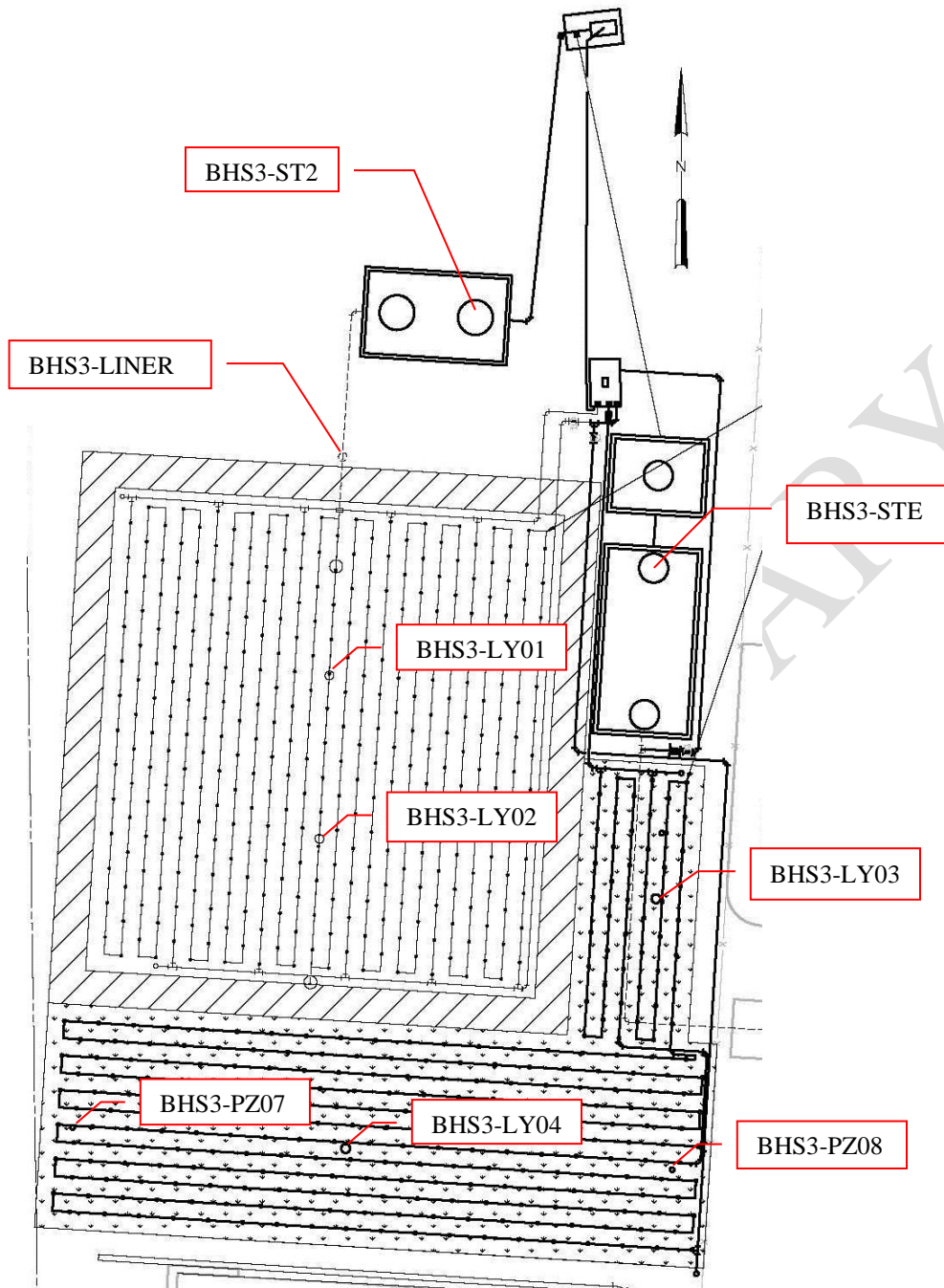
April 2014



**Figure 2**  
**Flow Schematic of B-HS3 PNRS Installed in Seminole County**

### 3.2 Monitoring and Sample Locations and Identification

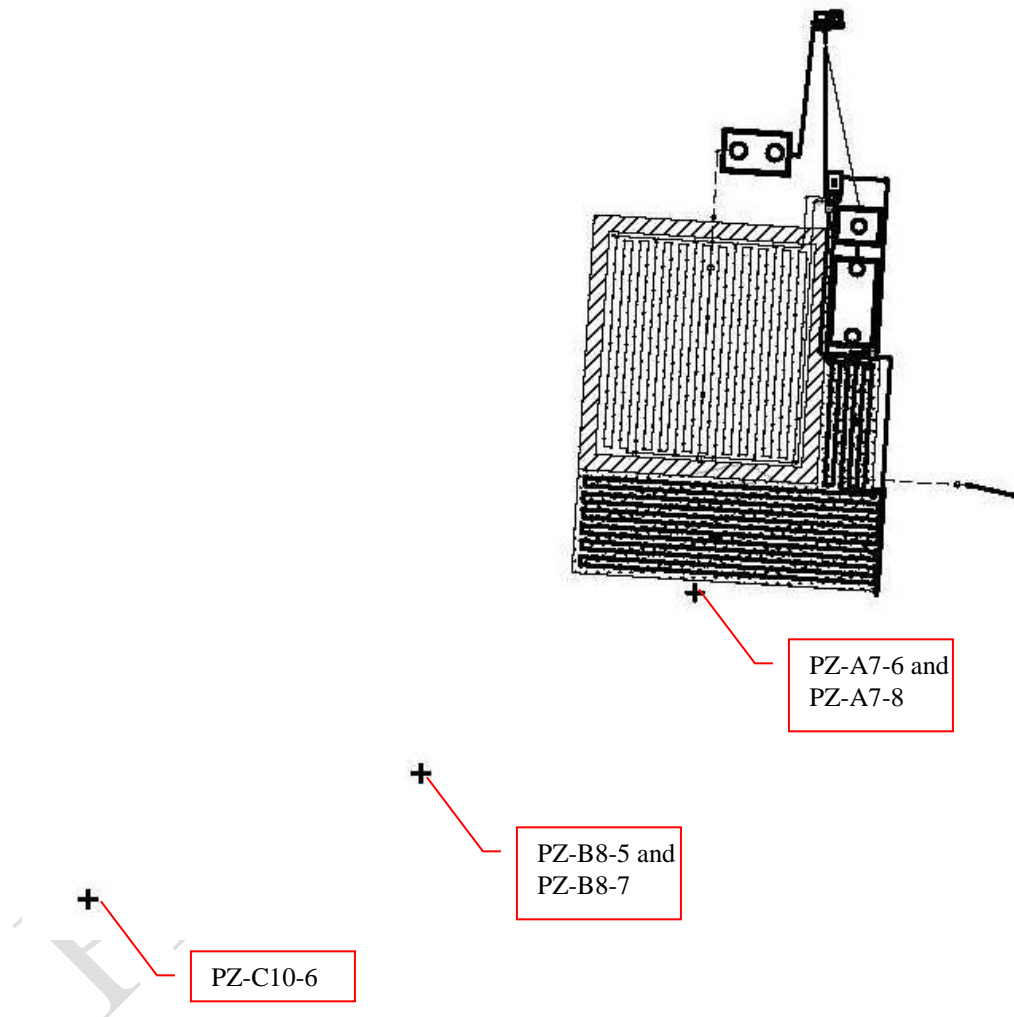
This monitoring event included sample collection from nine points within the treatment system (Figure 3). The B-HS3 installation also includes five downgradient groundwater monitoring points which are standpipe piezometers that were installed as part of the C-HS2 groundwater monitoring network (Figure 4). In the treatment system, household wastewater enters the 1<sup>st</sup> chamber of the primary tank and exits the second chamber as septic tank effluent through an effluent screen into the STE dose tank. The first monitoring point, B-HS3-STE, is the effluent sampled approximately 1.5 feet below the surface of the second chamber of the primary tank (Figure 5) before the effluent filter, which is referred to as primary effluent or septic tank effluent (STE). Samples from monitoring point B-HS3-STE are of whole household wastewater after it has had some residence time in the primary tank and represent the influent to the remainder of the onsite nitrogen reduction system.



**Figure 3**  
**BHS-3 Treatment System Sampling and Monitoring Locations**

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**Figure 4**  
**BHS-3 PNRS Downgradient Groundwater Sampling Locations**



**Figure 5**  
**Second Chamber of Primary Tank (B-HS3-STE Sample)**

The STE dose tank effluent is pumped through the drip system hydraulic unit and discharged to the Stage 1 drip system emitters (Zone 1). In the Stage 1 drip area, wastewater proceeds downward through an 18-inch layer of sand and a layer of lignocellulosic and sand media (9-inch maximum thickness) placed above a 30 mil PVC liner. The second and third sampling points are two suction lysimeters (BHS3-LY01 and BHS3-LY02) located at the interface of the overlying sand and underlying lignocellulosic/sand mixture. These sample locations ostensibly represent wastewater that has been nitrified by passage through the overlying sand layer (Figure 6).



**Figure 6**  
**Stage 1 Suction Lysimeter (BHS3-LY01 and -LY02)**

The Stage 1 drip system area was prepared by grading a V-shape so that effluent would collect on the liner and flow to the center where a perforated pipe within a gravel underdrain conveys the effluent to the Stage 2 denitrification tank through a pipe boot within the liner. The fourth sampling point (BHS3-LINER) is a sample port of the Stage 1 lined area effluent prior to the Stage 2 biofilter. At the BHS3-LINER sample point, wastewater would ostensibly be denitrified by passage through the lignocellulosic media mixture.

The liner effluent is conveyed to a Stage 2 biofilter, a concrete 1,050 gallon tank, containing elemental sulfur reactive media for additional treatment (denitrification). The fifth sampling point, BHS3-ST2, is the Stage 2 biofilter effluent which is sampled approximately 6 inches below the water surface of the Stage 2 biofilter tank (Figure 7).



**Figure 7**  
**Second Chamber of Stage 2 Biofilter (B-HS3-ST2 Sample)**

The Stage 2 biofilter effluent is pumped through the drip system hydraulic unit and discharged to the treated effluent drip system emitters (Zone 2) to the natural soil. The sixth and seventh sampling points are two suction lysimeters (BHS3-LY03 and BHS3-LY04) located in the treated effluent drip area with the top of the 9 inch ceramic cup located 24 inches below the drip emitters to represent treatment through 24-inches of unsaturated soil (Figure 8). Also located within the treated effluent drip area, are the eighth, ninth and tenth sampling points which are standpipe piezometers (BHS3-PZ07, BHS3-PZ08, and BHS3-PZ09) positioned so that the top of the 5-foot screen is 24-inches below the drip emitters (Figure 9). Unfortunately, during this sample event BHS3-PZ09 was dry.

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**Figure 8**  
**Treated Effluent Suction Lysimeter (B-HS3-LY03 and -LY04 sample)**



**Figure 9**  
**Treated Effluent Area Standpipe Piezometers (B-HS3-PZ07, -PZ08 and -PZ09)**

### **3.3 Operational Monitoring**

Start-up of the system occurred on July 12, 2013 (Experimental Day 0) and the system has almost operated continually since that date. Between September 10, 2013 and Sep-

tember 17, 2013 the system was not operating because a replacement part for the hydraulic unit was required. The fourth formal sampling event was conducted April 3, 2014 (Experimental Day 265). For the fourth formal sampling event, the water meter for the house and the treatment system flow meters were read and recorded on April 3, 2014.

The household potable water use is recorded via a water meter located in the front yard. The combined pump flow meter is located inside the hydraulic unit following the hydraulic unit filters prior to the split between the two zones, and records the cumulative pumped flow in gallons pumped from both the STE dose tank and Stage 2 biofilter tank. Therefore, the measurement of the combined flow meter includes both the STE flow from the household and the treated effluent flow from the Stage 2 biofilter. The Stage 2 treated effluent flow meter is located following the split on the line from the pump to the treated effluent drip system and records the cumulative flow in gallons pumped from the Stage 2 biofilter tank. The control panel includes telemetry which logs alarms, cumulative pump cycles, and cumulative field flush cycles.

### **3.4 Energy, Chemical and/or Additives 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 pump, although a small amount of power is used by the control panel itself. There are no chemicals added to the system. However, the denitrification media (lignocellulosic and sulfur) are “reactive” media which will be consumed during operation. The Stage 1 lined area was initially filled with 9 inches of lignocellulosic and sand media mixture and the Stage 2 biofilter was initially filled with 12 inches of sulfur and oyster shell media mixture, which ostensibly will last for many years without replenishment or replacement.

### **3.5 Water Quality Sample Collection and Analyses**

The fourth formal sample event was conducted on April 3, 2014 and included a full suite of influent, intermediate and effluent water quality samples from the system. Samples were collected at each of the fourteen monitoring points described previously in Section 3.2 and illustrated in Figures 3 and 4: nine treatment system monitoring points and five groundwater sampling points. 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.

In addition, an equipment blank (EB) sample and field blank (FB) were taken. The equipment blank was collected by pumping deionized water through the cleaned pump

tubing. One field blank was collected by filling sample containers with deionized water that had been transported into the field along with the sample equipment. These samples were then analyzed for the same parameters as the monitoring 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 ( $\text{NH}_3\text{-N}$ ), nitrate nitrogen ( $\text{NO}_3\text{-N}$ ), nitrite nitrogen ( $\text{NO}_2\text{-N}$ ), total phosphorus (TP), orthophosphate (Ortho P), total suspended solids (TSS), volatile suspended solids (VSS), total organic carbon (TOC), chloride, 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 these 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 Suspended Solids (TSS)	SM 2540D	1 mg/L
Volatile Suspended Solids (VSS)	SM 2540E	1 mg/L
Total Organic Carbon (TOC)	SM5310B	0.06 mg/L
Chloride	EPA 300.0	0.50 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)	SM 9222D	2 ct/100mL
E.coli	SM 9223B	2 ct/100mL

## 4.0 Results and Discussion

### 4.1 Operational Monitoring

Table 2 provides a summary of the household water use since July 13, 2011. The treatment system flow meter readings for the B-HS3 field site are summarized in Table 3. 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, Q Between readings (gpd)	Comments
7/13/2011 14:45	5302677.9		Installed
7/20/2011 17:50	5304207.8	214.6	
7/26/2011 15:19	5305257.9	178.1	
10/27/2011 15:19	5327920.4	243.7	
11/30/2011 8:00	5355610.4	821.8	
3/13/2012 8:10	5378780.2	222.8	
7/10/2012 16:15	5453899.3	629.5	
10/18/2012 15:30	5470593.1	167.0	
3/7/2013 14:00	5488517.4	128.1	
6/7/2013 14:00	5504725.9	176.2	
7/9/2013 12:50	5508873.0	129.8	
PNRS System Start-up			PNRS start-up
7/12/13 14:01	5509172.1	98.1	
7/17/13 13:55	5509884.1	142.5	
7/29/13 9:50	5510830.9	80.0	
8/6/13 10:40	5511588.8	94.3	
8/12/13 11:07	5512244.8	109.0	
8/15/13 8:48	5513128.8	304.5	Prelim Event No. 1
9/5/13 15:31	5514810.2	79.0	
9/10/13			Septic tank pumped
9/17/13			System running again
9/27/13 8:00	5517331.9	116.3	
9/30/13 8:00	5517622.5	96.9	Sample Event No. 1
10/11/13 8:30	5518421.6	72.5	
10/17/13 11:00	5519187.0	125.4	
11/15/2013 10:00	5524455.0	181.9	
11/27/2013 9:10	5525784.8	111.1	
12/2/2013 8:30	5527623.5	369.8	Several guests stayed in the home over the Thanksgiving holiday
12/4/2013 8:51	5527809.2	92.2	Sample Event No. 2
12/23/2013 11:45	5529755.3	101.8	
1/23/2014 11:00	5532487.5	88.2	
1/30/2014 9:00	5533156.8	96.8	
2/3/2014 8:00	5533482.0	82.2	Sample Event No. 3
2/4/2014 8:15	5533499.6	17.4	Sample Event No. 4

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

Date	Cumulative Volume (gallons)	Average Daily Household Flow, Q Between readings (gpd)	Comments
2/5/2014 10:45	5533558.4	53.3	Sample Event No. 5
2/6/2014 10:45	5533690.6	132.2	Sample Event No. 6
2/7/2014 8:00	5533788.6	110.7	Sample Event No. 7
2/12/14 10:00	5534282.7	97.2	
3/14/14 8:24	5537363.8	102.9	
4/3/14 8:45	5539932.0	128.3	Sample Event No. 8 (formal No. 4)
Total average PNRS start-up to 4/3/14		116.2	

**Table 3**  
**Summary of System Flow**

Date and Time Read	Combined Pumped Flow, Stage 1 and Treated Effluent Drip Zones	Average Daily Combined Pumped Flow between readings	Calculated Flow to Stage 1	Average Daily Calculated Flow to Stage 1 between readings	Treated Effluent Flow	Average Daily Treated Effluent Flow between readings	Difference in Stage 1 and Treated Effluent Flow between readings [(+)Rainfall/Precipitation/ (-) ET]
	Cumulative Volume (gallons)	Gallons/ day	Cumulative Volume (gallons)	Gallons/ Day	Cumulative Volume (gallons)	Gallons/ Day	Gallons/ Day
7/12/2013	206.9	Start-up	Start-up	Start-up	58.6	Start-up	Start-up
7/17/2013	423.0	44.0	40.6		234.2	35.7	
7/29/2013	3,345.1	245.3	765.3	60.8	2,431.6	184.5	123.6
8/6/2013	6,541.1	399.7	1,045.1	35.0	5,347.8	364.8	329.8
8/12/2013	8,953.1	398.2	2,360.0	217.1	6,444.9	181.1	-36.0
8/15/2013	10,131.2	405.8	3,084.3	249.4	6,898.7	156.3	-93.1
9/5/2013	18,696.5	402.5	7,734.4	218.5	10,813.8	184.0	-34.5
9/9/2013	19,884.6	318.7	8,287.6	148.4	11,448.8	170.3	22.0
9/17/2013	20,912.4	127.7	8,785.2	61.8	11,979.0	65.9	4.0
9/27/2013	22,142.0	124.1	9,239.3	45.8	12,754.5	78.3	32.4
9/30/2013	22,885.0	247.7	9,692.2	151.0	13,044.6	96.7	-54.2
10/11/2013	26,428.9	321.6	11,417.0	156.5	14,863.7	165.1	8.5
10/17/2013	28,781.4	385.4	12,823.8	230.5	15,809.4	154.9	-75.5
11/8/2013	34,278.1	249.1	15,844.0	136.9	18,285.9	112.2	-24.6
11/27/2013	39,031.1	252.0	18,656.6	149.1	20,226.3	102.9	-46.2
12/2/2013	42,081.5	613.5	20,437.6	358.2	21,495.7	255.3	-102.9
12/4/2013	42,599.8	257.3	20,729.5	144.9	21,722.1	112.4	-32.6
12/23/2013	47,135.0	237.2	23,494.6	144.6	23,640.5	100.3	-44.3
1/23/2014	54,702.9	244.4	27,634.5	133.7	27,068.4	110.7	-23.0
1/30/2014	56,954.9	325.6	28,768.0	163.9	28,187.0	161.7	-2.2
2/3/2014	58,390.4	362.7	29,353.4	147.9	29,037.1	214.8	66.9
2/4/2014	58,688.7	295.2	29,446.4	92.0	29,242.4	203.2	111.1
2/5/2014	58,870.7	164.8	29,542.1	86.7	29,328.6	78.1	-8.6
2/6/2014	59,118.7	248.0	29,702.1	159.9	29,416.7	88.1	-71.9
2/7/2014	59,354.0	265.8	29,852.9	170.4	29,501.1	95.4	-75.0
2/12/2014	61,023.9	328.5	30,284.0	84.8	30,739.9	243.7	158.9
3/14/2014	67,901.2	229.8	34,539.3	142.2	33,361.9	87.6	-54.6
4/3/2014	73,953.4	302.4	37,614.2	153.6	36,339.2	148.8	-4.9
Avg start-up to 4/3/14		278.5		137.0		144.6	2.8

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The average household water use since the PNRS system start-up was 116.2 gallons per day with periods of higher and lower flows. Since the PNRS system start-up, the average combined pumped flow (flow to the Stage 1 drip system and treated effluent drip system) was 278.5 gallons per day, the average calculated Stage 1 drip system (STE) flow was 137.0 gallons per day and the average treated effluent drip system (Stage 2 biofilter effluent) flow was 144.6 gallons per day. The average calculated Stage 1 drip system (STE) flow correlates with the household water use water meter.

The difference between the flow to the Stage 1 drip system (STE) and the treated effluent drip system (Stage 2 biofilter effluent) are due to water inputs and outputs. Water inputs include precipitation, overland flow, and irrigation water collected in the Stage 1 lined area. Water outputs include evapotranspiration. The last column in Table 3 summarizes the difference in the Stage 1 and treated effluent flows for each time period. The positive values indicate higher treated effluent flow (water inputs) which are likely attributed to precipitation and irrigation water collected in the lined area. The negative values indicate higher Stage 1 flow (water outputs) which is likely attributed to evapotranspiration.

Unfortunately, instrument failure of the onsite rain gauge occurred between Sample Event No. 3 and Sample Event No. 4. A weather station (Lake Wayman Heights, Longwood, FL) is located approximately 5 miles from the site. Data from this weather station is available at the following website: <http://www.wunderground.com>. Recorded meteorological data is provided in Appendix C, Table C.1 from this weather station. Table 4 provides daily precipitation totals leading up to and during the sample event.



**Table 4**  
**Precipitation Data Daily Totals Measured March 16, 2014 through April 3, 2014**  
**Sample Event No. 4**

Date	Precipitation (inches)
3/16/2014	0
3/17/2014	0.28
3/18/2014	0.09
3/19/2014	0.04
3/20/2014	0.04
3/21/2014	0.01
3/22/2014	0.01
3/23/2014	0
3/24/2014	0.01
3/25/2014	0
3/26/2014	0
3/27/2014	0
3/28/2014	0
3/29/2014	1.24
3/30/2014	0.11
3/31/2014	0
4/1/2014	0
4/2/2014	0
4/3/2014	0

#### 4.2 Energy, Chemical and/or Additives 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 5. The total average electrical use through April 3, 2014 was 0.94 kWh per day. The average electrical use per 1,000 gallons pumped was 3.359 kWh per 1,000 gallons, and this parameter appears fairly stable since start-up.

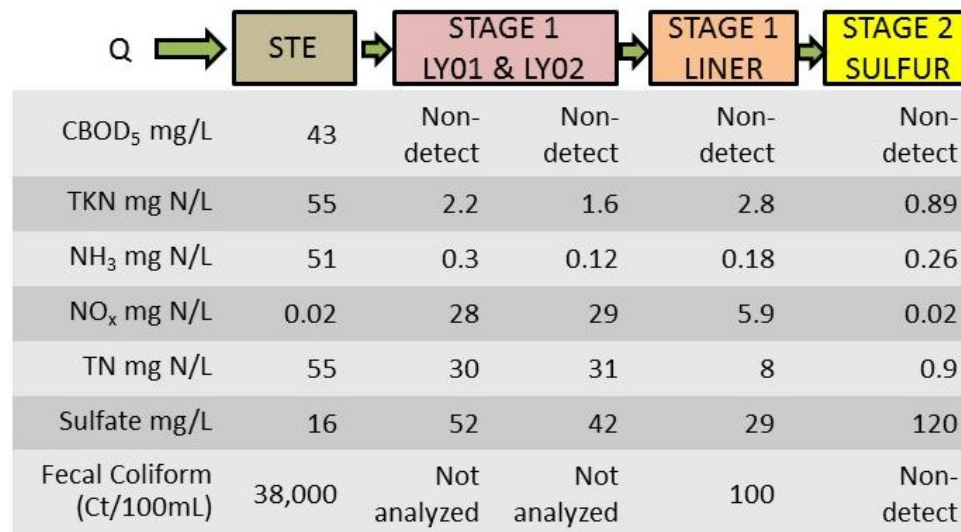
**Table 5**  
**Summary of System Electrical Use**

Date and Time Read	Electrical Meter Reading	Average Daily Electrical Use between readings	Average Electrical Use per Gallon Pumped between readings	Average Electrical Use per 1,000 Gallons Pumped between readings
	Cumulative (kWh)	(kWh/day)	(kWh/gal)	(kWh/1,000 gal)
7/12/13 14:01	0.6	Start-up	Start-up	Start-up
7/17/13 11:57	1.1	0.10	0.002	2.314
7/29/13 9:52	8.9	0.65	0.003	2.669
8/6/13 9:45	19.1	1.28	0.003	3.191
8/12/13 11:07	27.9	1.45	0.004	3.648
8/15/13 8:48	32.5	1.58	0.004	3.905
9/5/13 15:31	69.6	1.74	0.004	4.331
9/9/13 9:00	82.3	3.41	0.011	10.689
9/17/13 10:12	86.2	0.48	0.004	3.795
9/27/13 8:00	88.8	0.26	0.002	2.115
9/30/13 8:00	90.6	0.60	0.002	2.423
10/11/13 8:30	98.5	0.72	0.002	2.229
10/17/13 11:00	104.7	1.02	0.003	2.635
11/8/13 12:30	121.1	0.74	0.003	2.984
11/27/13 9:10	135.6	0.77	0.003	3.051
12/2/13 8:30	145.1	1.91	0.003	3.114
12/4/13 8:51	146.8	0.84	0.003	3.280
1/23/14 11:00	185.1	0.76	0.003	3.129
1/30/14 9:00	192.3	1.04	0.003	3.197
2/3/14 8:00	197.0	1.09	0.003	3.017
2/4/14 8:15	198.0	1.15	0.004	3.886
2/5/14 10:45	198.6	0.76	0.005	4.590
2/6/14 10:45	199.3	0.63	0.003	2.546
2/7/14 8:00	200.2	0.85	0.003	3.193
2/12/14 10:00	205.7	1.07	0.003	3.249
3/14/14 8:24	228.2	0.80	0.003	3.480
4/3/14 8:45	248.3	0.85	0.003	2.820
Total average start-up to 4/3/14		0.94	0.003	3.359

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### 4.3 Water Quality

Water quality analytical results, for Sample Event No. 4 are listed in Table 6 and graphically displayed in Figure 10. A summary of the water quality data collected to date for the test system is presented in Table 7. The laboratory report containing the raw analytical data is included in Appendix A. The following discussion summarizes the water quality analytical results for the Sample Event No. 4. The performance of the various system components was compared by considering the changes through treatment of nitrogen species (TKN,  $\text{NH}_3\text{-N}$ , and  $\text{NO}_x\text{-N}$ ), as well as supporting water quality parameters.



**Figure 10**  
**Graphical Representation of Water Quality Results**  
**Sample Event No. 4, April 3, 2014**

**Septic Tank Effluent (STE) Quality:** The water quality characteristics of STE collected in Sample Event 4 were within the typical range generally expected for domestic STE. The measured STE total nitrogen (TN) concentration was 55 mg/L, which is within the range that has been typically reported for Florida single family residence STE.

**Stage 1 (Bottom of Sand Layer) Soil Suction Lysimeters (LY01 and LY02):** The soil suction lysimeters effluent  $\text{NH}_3\text{-N}$  levels were 0.3 mg/L and 0.12 mg/L, respectively (Table 6). CBOD<sub>5</sub> was below the method detection limit of 2 mg/L. The  $\text{NO}_x\text{-N}$  was 28 mg/L and 29.5 mg/L, respectively. Total inorganic nitrogen was substantially reduced by passage through the unsaturated sand layer. The Stage 1 biofilter showed nearly com-

plete nitrification and some denitrification with an effluent  $\text{NH}_3\text{-N}$  of 0.3 mg/L,  $\text{NO}_x\text{-N}$  of 28 mg/L and TKN of 30.2 mg/L.

**Stage 1 Liner Effluent (Liner):** The Stage 1 effluent  $\text{NH}_3\text{-N}$  level was 0.18 mg/L with a DO level at 3.16 mg/L (Table 6). TSS and  $\text{CBOD}_5$  was equal to or below 4 mg/L. The Stage 1 effluent  $\text{NO}_x\text{-N}$  was 6 mg/L. These results indicate significant denitrification by passage through the lignocellulosic/sand layer in the Stage 1 lined area (approximately 79% reduction  $\text{NO}_x\text{-N}$ ). The combined Stage 1/liner area biofilter showed nearly complete ammonium removal and substantial removal of ( $\text{NO}_3+\text{NO}_2$ ) with an effluent  $\text{NH}_3\text{-N}$  of 0.18 mg/L,  $\text{NO}_x\text{-N}$  of 6 mg/L and TKN of 2.8 mg/L.

**Stage 2 Biofilter Effluent (ST2):** Effluent  $\text{NO}_x\text{-N}$  from the Stage 2 biofilter was below the method detection limit of 0.02 mg/L with a DO level at 0.01 mg/L DO and ORP at -244.2 mV. Final total nitrogen (TN) in the passive nitrogen removal system effluent was 0.91 mg/L. The Stage 2 biofilter effluent  $\text{CBOD}_5$  concentration was below the method detection limit of 2 mg/L, TSS was 2 mg/L and sulfate was 120 mg/L.

**Treated Effluent Soil Suction Lysimeters (LY03 and LY04):** The treated effluent drip system monitoring devices LY03 and LY04  $\text{NO}_x\text{-N}$  concentrations were 7.5 mg/L and 3.1 mg/L, respectively, which is higher than the Stage 2 effluent concentration.

**Treated Effluent Groundwater wells (PZ07 and PZ08):** The treated effluent drip system groundwater monitoring devices PZ07 and PZ08  $\text{NO}_x\text{-N}$  concentrations were 3.3 mg/L and 2.3 mg/L, respectively, which is higher than the Stage 2 effluent concentration.



**Table 6**  
**Sample Event 4 Water Quality 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)	NOx (mg/L N)	TIN (mg/L N) <sup>3</sup>	TP (mg/L)	Ortho P (mg/L P)	Chloride (mg/L)	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)
BHS3-STE	4/3/14 10:32	20.7	6.95	978	0.08	-268	410	14	14	43	220	55.0	55	4.0	51	0.01	0.01	0.02	51.0	5.4	3.9	48	16	3.2	5.9	38,000	20,000
BHS3-STE-FILTERED	4/3/14 10:32	20.7	6.95	978	0.08	-268				30		51.0	51	5.0	46	0.01	0.01	0.02	46.0								
BHS3-LY01	4/3/14 11:15	22.4	7.05	711				1	1	2	180	30.2	2.2	1.9	0.3	28	0.01	28.01	28.3	0.12	0.01	44	52				
BHS3-LY02	4/3/14 11:00	22.8	6.43	780	5.44	138.9		1	1	2	29	31.1	1.6	1.5	0.12	29	0.47	29.47	29.6	3.2	2.8	45	42				
BHS3-LINER	4/3/14 10:25	23.3	6.98	809	3.16	72.5	270	4	4	2	22	8.7	2.8	2.6	0.18	5.9	0.01	5.91	6.1	0.064	0.01	39	29			100	2
BHS3-LINER-FILTERED	4/3/14 10:25	23.3	6.98	809	3.16	72.5				2		8.2	2.3	2.2	0.11	5.9	0.01	5.91	6.0								
BHS3-ST2	4/3/14 9:40	20.6	7.03	927	0.01	-244	270	2	2	2	37	0.9	0.89	0.6	0.26	0.01	0.01	0.02	0.3	0.03	0.01	38	120	1.6	3.2	1	2
BHS3-ST2-DUP	4/3/14 9:50	20.6	7.03	927	0.01	-244	280	2	2	2	33	0.9	0.86	0.6	0.26	0.01	0.01	0.02	0.3	0.029	0.01	36	110	1.6	3.2	1	2
BHS3-ST2-FILTERED	4/3/14 9:40	20.6	7.03	927	0.01	-244				2		0.8	0.78	0.6	0.14	0.01	0.01	0.02	0.2				110				
BHS3-LY03	4/3/14 10:45	22.6	6.64	892	5.01	132		1	1	110	150	9.3	1.8	1.7	0.055	7.5	0.01	7.51	7.6	0.2	0.01	34	110				
BHS3-LY04	4/3/14 10:40	22.7	6.58	818	3.67	115	230	1	1	2	27	4.6	1.5	1.4	0.052	3.1	0.01	3.11	3.2	0.1	0.01	35	98				
BHS3-PZ07	4/3/14 9:38	21.9	6.38	693	4.85	65.6	260	10	6	2	31	4.9	1.6	1.5	0.067	3.3	0.01	3.31	3.4	0.18	0.17	20	59				
BHS3-PZ08	4/3/14 10:08	20.6	5.67	527	3.43	110.2	170	4	2	2	45	3.5	1.2	1.2	0.05	2.3	0.01	2.31	2.4	0.47	0.052	22	69	0.01	0.1	1	2
PZ-A7-6	4/3/14 9:18	20.2	5.99	655	0.74	56.1	190					1.9	0.89	0.7	0.16	0.92	0.06	0.98	1.1			30	0.2				
PZ-A7-8	4/3/14 9:33	20.6	5.90	536	0.64	-1.5	160					4.8	3.8	2.4	1.4	0.92	0.12	1.04	2.4			28	61				
PZ-B8-5	4/3/14 9:05	20.8	5.96	388	1.19	75.7	100					2.3	2.2	2.0	0.17	0.01	0.12	0.13	0.3			18	32				
PZ-B8-5-DUP	4/3/14 9:10	20.8	5.96	388	1.19	75.7	99					2.2	2.1	1.9	0.17	0.01	0.12	0.13	0.3			18	32				
PZ-B8-7	4/3/14 9:20	20.9	6.03	291	0.26	98.2	45					1.1	1.1	1.0	0.13	0.01	0.01	0.02	0.2			41	6.1				
PZ-C10-6	4/3/14 8:58	20.3	6.18	493	0.86	11.4	230					7.4	4.6	3.2	1.4	2.8	0.01	2.81	4.2			14	8.5				
EB	4/3/14 11:19	29.0	7.28	2	7.54	91.1	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	0.05	0.2	0.01	0.1	1	2

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.

Sample held beyond the acceptable holding time

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**Table 7**  
**Summary of Water Quality Data**

Sample ID	Statistic	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)	Chloride	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	
STE	n	14	14	14	14	9	13	10	8	10	9	14	14	14	14	12	11	14	14	10	10	12	11	9	9	10	7	
	MEAN	23.48	7.23	1080.86	0.36	-298.08	410.00	25.60	21.13	87.40	198.89	62.24	62.07	11.86	50.21	0.09	0.09	0.17	50.38	5.58	3.99	53.17	18.85	4.32	9.08	69,718	28,671	
	STD. DEV.	4.12		151.91	0.48	31.61	42.23	16.03	14.52	51.15	79.13	20.86	20.72	12.22	16.45	0.23	0.28	0.47	16.53	2.00	1.64	9.09	13.49	2.71	2.50			
	MIN	18.50	6.88	868.00	0.00	-341.70	330.00	12.00	9.00	43.00	140.00	30.05	30.00	0.00	27.00	0.01	0.01	0.02	27.05	3.50	2.20	41.00	0.82	1.70	5.10	36,400	10,000	
	MAX	29.60	7.82	1322.00	1.20	-253.90	490.00	61.00	55.00	210.00	400.00	110.06	110.00	45.00	85.00	0.82	0.94	1.80	85.06	9.00	7.50	75.00	39.00	8.90	12.00	420,000	240,000	
Stage 1 LY01	n	8	8	8	7	7	1	2	2	3	7	8	8	8	8	8	8	8	8	7	7	7	8	0	0	0	0	
	MEAN	22.19	6.78	528.25	6.89	127.10	100.00			2.00	44.86	15.44	1.70	1.63	0.07	13.71	0.03	13.75	13.82	0.10	0.03	34.14	39.38					
	STD. DEV.	4.60	0.00	128.44	2.26	47.82					60.92	8.77	0.54	0.52	0.10	8.54	0.04	8.53	8.58	0.04	0.04	10.07	11.87					
	MIN	15.80	6.33	330.00	2.39	36.20	100.00			2.00	10.00	2.50	0.99	0.93	0.01	1.30	0.01	1.30	1.38	0.05	0.01	15.00	24.00					
	MAX	30.90	7.24	711.00	9.92	180.50	100.00			2.00	180.00	30.21	2.70	2.66	0.30	28.00	0.13	28.01	28.31	0.14	0.12	45.00	54.00					
Stage 1 LY02	n	9	9	9	9	9	2	5	5	5	8	9	9	9	9	9	9	9	9	8	8	8	8	0	0	1	1	
	MEAN	22.05	6.62	760.89	5.37	104.10	135.00	2.80	2.00	2.60	18.13	29.80	1.84	1.64	0.20	27.79	0.10	27.96	28.16	2.32	1.80	42.75	39.63			1,000	2	
	STD. DEV.	4.50	0.00	108.82	2.61	64.84	49.50	1.64	1.73	1.34	7.38	8.64	0.85	1.03	0.53	9.12	0.18	9.24	9.42	1.05	1.00	8.84	9.94					
	MIN	14.60	6.41	559.00	1.50	-25.30	100.00	1.00	1.00	2.00	10.00	9.90	1.00	0.10	0.01	7.10	0.01	7.10	7.12	0.18	0.01	23.00	26.00			1,000	2	
	MAX	30.20	6.99	871.00	10.23	182.00	170.00	5.00	5.00	5.00	29.00	37.70	3.70	3.69	1.60	35.00	0.47	36.00	37.60	3.20	2.80	52.00	54.00			1,000	2	
Stage 1 Liner	n	9	9	9	9	9	8	8	8	8	8	9	9	9	9	9	9	9	9	8	8	8	8	7	5	5	8	7
	MEAN	22.33	6.80	701.11	3.39	8.72	258.75	7.38	5.38	3.50	24.50	8.63	2.04	1.88	0.16	6.57	0.01	6.58	6.74	0.23	0.01	36.13	27.50	0.42	0.66	59	4	
	STD. DEV.	4.68	0.00	92.78	2.58	98.88	34.82	3.89	2.50	4.24	10.38	3.85	0.48	0.44	0.18	4.00	0.01	4.00	4.00	0.39	0.00	8.85	12.91	0.42	0.60			
	MIN	18.10	6.44	552.00	1.32	-199.70	210.00	4.00	3.00	2.00	10.00	2.42	1.40	1.29	0.05	0.01	0.01	0.02	0.07	0.01	0.01	15.00	5.50	0.01	0.10	1	2	
	MAX	31.80	7.15	811.00	9.09	124.50	310.00	15.00	9.00	14.00	37.00	16.01	2.80	2.62	0.63	14.00	0.05	14.01	14.07	1.20	0.01	43.00	47.00	1.10	1.60	6,800	310	
Stage 2	n	9	9	9	9	9	8	8	8	8	8	9	9	9	9	9	9	9	9	8	8	8	8	9	9	8	7	
	MEAN	21.64	6.88	830.89	0.29	-208.89	275.00	5.13	3.63	14.88	31.00	2.17	1.31	0.97	0.34	0.49	0.37	0.87	1.20	0.08	0.01	36.50	106.00	2.68	4.31	8	3	
	STD. DEV.	4.04	0.00	89.90	0.30	100.14	27.77	3.52	2.13	26.95	13.43	2.03	0.40	0.40	0.24	1.05	0.76	1.80	1.74	0.12	0.00	9.15	45.53	3.76	5.15			
	MIN	18.70	6.53	653.00	0.01	-299.90	240.00	2.00	1.00	2.00	10.00	0.91	0.89	0.44	0.10	0.01	0.01	0.02	0.15	0.01	0.01	15.00	27.00	0.01	0.10	1	2	
	MAX	29.70	7.15	942.00	0.91	38.20	310.00	12.00	6.00	81.00	45.00	7.10	1.80	1.58	0.87	3.20	2.10	5.30	5.52	0.39	0.01	45.00	150.00	12.00	16.00	300	10	
Treated Effluent LY03	n	5	5	5	5	5	2	3	3	4	4	5	5	5	5	5	5	5	5	4	4	4	5	3	3	1	1	
	MEAN	24.30	6.36	842.00	4.87	124.20	250.00	3.00	3.00	30.50	57.00	13.84	2.50	2.47	0.03	11.34	0.02	11.34	11.37	0.15	0.04	28.75	81.80	0.32	0.41	1	2	
	STD. DEV.	2.89	0.00	68.19	2.62	22.46	0.00	1.73	1.73	53.08	63.91	6.27	0.72	0.73	0.02	5.68	0.02	5.68	5.68	0.03	0.05	11.00	31.80	0.30	0.31			
	MIN	21.81	6.27	770.00	2.05	103.30	250.00	1.00	1.00	2.00	10.00	8.61	1.80	1.75	0.01	6.10	0.01	6.11	6.12	0.12	0.01	13.00	50.00	0.01	0.10	1	2	
	MAX	29.00	6.64	934.00	9.09	159.00	250.00	4.00	4.00	110.00	150.00	21.60	3.60	3.57	0.06	18.00	0.05	18.00	18.04	0.20	0.11	38.00	120.00	0.60	0.71	1	2	
Treated Effluent LY04	n	5	5	5	5	5	3	3	3	4	4	5	5	5	5	5	5	5	5	4	4	4	5	3	3	1	1	
	MEAN	24.94	6.43	787.00	4.30	109.22	250.00	1.33	1.33	3.75	33.50	8.04	1.92	1.88	0.03	6.12	0.01	6.12	6.16	0.11	0.01	31.25	79.00	0.28	0.37	1	2	
	STD. DEV.	2.89	0.17	51.12	3.34	21.45	20.00	0.58	0.58	3.50	15.93	7.91	1.33	1.30	0.04	6.59	0.00	6.59	6.62	0.10	0.00	11.00	35.74	0.24	0.25			
	MIN	22.10	6.21	698.00	1.41	71.20	230.00	1.00	1.00	2.00	19.00	1.79	0.80	0.79	0.01	0.99	0.01	0.99	1.00	0.03	0.01	16.00	40.00	0.01	0.10	1	2	
	MAX	29.40	6.61	821.00	9.98	122.30	270.00	2.00	2.00	9.00	56.00	21.00	4.00	3.91	0.09	17.00	0.01	17.00	17.09	0.25	0.01	42.00	130.00	0.48	0.60	1	2	
Groundwater PZ07	n	4	4	4	4	4	2	2	2	3	3	4	4	4	4	4	4	4	4	3	3	3	3	2	2	2	2	
	MEAN	24.53	6.32	786.50	2.87	-40.23	275.00	6.50	4.50	2.67	24.00	7.72	2.19	1.96	0.22	5.53	0.01	5.53	5.75	0.12	0.07	25.67	71.33	0.35	0.41	1	2	
	STD. DEV.	3.38	0.12	63.27	1.94	141.89				1.15	12.12	4.67	1.35	1.04	0.35	3.70	0.00	3.69	3.82	0.07	0.09	12.50	43.82	0.01	0.01			
	MIN	21.31	6.18	693.00	0.59	-248.70	260.00	3.00	3.00	2.00	10.00	2.65	0.84	0.83	0.01	1.80	0.01	1.81	1.82	0.04	0.01	17.00	35.00	0.34	0.40	1	2	
	MAX	27.50	6.44	833.00	4.85	65.60	290.00	10.00	6.00	4.00	31.00	12.30	4.00	3.26	0.74	10.00	0.01	10.00	10.08	0.18	0.17	40.00	120.00	0.35	0.41	1	2	

**Table 7 (continued)**  
**Summary of Water Quality Data**

Sample ID	Statistic	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)	Chloride	Sulfate (mg/L)	Hydrogen Sulfide (mg/L)	Sulfide (mg/L)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)
Groundwater PZ08	n	4	4	4	4	4	2	2	2	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3
	MEAN	23.41	6.19	708.75	3.18	51.75	180.00	13.50	6.00	5.00	26.67	9.96	1.78	1.76	0.02	8.18	0.01	8.18	8.20	0.39	0.16	25.67	78.00	0.17	0.24	2	2
	STD. DEV.	3.60	0.00	190.35	1.29	57.43				5.20	17.56	8.46	0.84	0.84	0.02	7.76	0.00	7.76	7.75	0.09	0.17	12.90	48.14	0.16	0.16		
	MIN	20.04	5.67	527.00	2.12	-21.90	170.00	4.00	2.00	2.00	10.00	3.51	0.93	0.92	0.01	2.30	0.01	2.31	2.36	0.29	0.05	15.00	35.00	0.01	0.10	1	2
Groundwater PZ09	MAX	27.00	6.44	962.00	4.90	110.20	190.00	23.00	10.00	11.00	45.00	21.50	2.50	2.48	0.05	19.00	0.01	19.00	19.02	0.47	0.36	40.00	130.00	0.32	0.41	10	2
	n	3	3	3	3	3	1	1	1	2	2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2
	MEAN	25.00	5.52	534.67	2.94	51.30	120.00	11.00	11.00	2.00	167.50	14.57	2.47	2.42	0.05	12.10	0.01	12.10	12.15	2.85	2.12	29.50	72.50	0.48	0.51	1	2
	STD. DEV.	3.21	0.00	15.89	2.13	14.80				0.00	187.38	3.10	0.65	0.62	0.04	2.48	0.00	2.47	2.50	2.33	1.95	16.26	53.03	0.15	0.13		
Groundwater PZA7-6	MIN	21.30	5.09	525.00	0.62	38.30	120.00	11.00	11.00	2.00	35.00	11.11	1.80	1.79	0.01	9.30	0.01	9.31	9.32	1.20	0.74	18.00	35.00	0.37	0.41	1	2
	MAX	27.00	5.94	553.00	4.81	67.40	120.00	11.00	11.00	2.00	300.00	17.10	3.10	3.03	0.07	14.00	0.01	14.00	14.07	4.50	3.50	41.00	110.00	0.58	0.60	1	2
	n	8	8	8	8	4	8	0	0	0	3	8	8	8	8	5	4	8	8	2	1	7	5	0	0	1	1
	MEAN	22.64	6.04	462.13	1.97	12.10	109.00				186.67	5.58	2.20	2.01	0.19	0.64	0.02	3.39	3.58	0.62	1.00	22.67	39.44			1	2
Groundwater PZA7-8	STD. DEV.	3.26	0.00	193.19	2.23	69.19	49.80				15.28	6.70	1.06	1.04	0.11	0.68	0.03	5.98	6.00	0.51		12.23	41.87				
	MIN	18.50	5.80	242.00	0.09	-51.40	58.00				170.00	1.54	0.89	0.73	0.07	0.04	0.01	0.04	0.23	0.26	1.00	5.70	0.20			1	2
	MAX	26.30	6.30	701.00	5.50	85.90	190.00				200.00	20.60	3.60	3.30	0.35	1.70	0.06	17.00	17.30	0.98	1.00	42.00	110.00			1	2
	n	9	9	9	9	4	9	0	0	0	4	9	9	9	9	7	7	9	9	2	2	8	6	0	0	1	1
Groundwater PZB8-5	MEAN	23.24	5.95	526.56	0.54	-35.38	99.22				90.50	16.27	3.61	2.59	1.02	8.39	0.04	12.65	13.68	5.00	3.00	24.24	41.00			1	2
	STD. DEV.	2.28	0.00	155.05	0.46	130.90	104.69				57.88	12.89	1.31	1.28	1.38	9.69	0.04	13.02	12.96	0.42	1.41	12.88	19.80				
	MIN	20.00	5.60	186.00	0.11	-200.20	2.00				36.00	4.25	2.20	0.70	0.01	0.74	0.01	0.75	2.09	4.70	2.00	3.90	14.00			1	2
	MAX	26.00	6.38	726.00	1.60	115.30	270.00				150.00	39.20	5.80	4.87	4.10	23.00	0.12	37.00	37.01	5.30	4.00	40.00	66.00			1	2
Groundwater PZB8-7	n	9	9	9	9	4	9	0	0	0	5	9	9	9	9	8	7	9	9	2	3	8	8	0	0	1	1
	MEAN	23.19	5.80	438.33	0.69	127.95	77.89				86.20	15.49	3.11	3.03	0.08	8.79	0.07	12.38	12.47	0.75	0.70	22.13	31.75			1	2
	STD. DEV.	2.45	0.23	78.40	0.64	69.28	47.91				51.74	14.59	0.93	0.96	0.05	10.13	0.07	13.94	13.92	0.92	0.26	7.16	15.22				
	MIN	19.79	5.50	296.00	0.10	67.60	21.00				0.00	2.33	2.20	2.03	0.03	0.01	0.01	0.13	0.30	0.10	0.49	13.00	0.00			1	2
Groundwater PZC10-6	MAX	26.40	6.16	579.00	2.19	213.30	180.00				130.00	39.70	4.70	4.67	0.17	28.00	0.18	35.00	35.03	1.40	0.99	34.00	48.00			1	2
	n	9	9	9	8	4	8	0	0	0	4	9	9	9	9	5	5	9	9	2	0	8	4	0	0	1	1
	MEAN	23.29	5.87	359.22	0.44	129.68	50.75				55.25	7.16	1.74	1.66	0.09	3.47	0.07	5.42	5.50	0.50		27.86	19.53			1	2
	STD. DEV.	2.06	0.00	98.35	0.34	72.22	26.66				23.82	6.87	0.57	0.54	0.11	7.02	0.13	6.42	6.47	0.38		12.53	10.71				
Groundwater PZC10-6	MIN	20.84	5.46	249.00	0.10	45.00	2.00				36.00	1.09	1.00	0.96	0.01	0.01	0.01	0.02	0.13	0.23		6.90	6.10			1	2
	MAX	26.50	6.10	518.00	1.13	207.00	93.00				90.00	18.00	2.50	2.36	0.38	16.00	0.30	16.00	16.02	0.77		44.00	30.00			1	2
	n	9	9	9	9	4	9	0	0	0	4	9	9	9	9	6	5	9	9	2	1	8	5	0	0	1	2
	MEAN	23.69	5.84	347.08	0.95	55.00	112.44				97.75	5.98	3.42	2.64	0.78	1.67	0.03	2.56	3.34	0.10	0.01	17.13	14.08			1	2
Groundwater PZC10-6	STD. DEV.	2.81	0.00	127.15	1.09	126.25	100.95				17.75	2.73	0.64	0.54	0.47	1.02	0.05	2.79	2.65	0.02		9.14	6.85				
	MIN	19.19	5.10	200.70	0.10	-68.40	15.00				77.00	2.98	2.70	1.50	0.11	0.03	0.01	0.03	0.98	0.08	0.01	8.00	6.90			1	2
	MAX	27.00	6.18	551.00	2.78	230.00	270.00				120.00	11.90	4.60	3.35	1.40	2.80	0.12	9.20	9.51	0.11	0.01	32.00	23.00			1	2

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.

## **5.0 B-HS3 Sample Event No. 4: Summary and Recommendations**

### **5.1 Summary**

The results of the fourth sampling event indicate that the system is operating well and no adjustments are recommended at this time. The Sample Event No. 4 results indicate that:

- Septic tank effluent (STE) quality is characteristic of typical household STE quality. The total nitrogen concentration of 55 mg/L is within the range of values typically reported for Florida single family residence STE.
- The combined Stage 1 and lined drip system was effective in converting ammonium to oxidized nitrogen; effluent contained 2.8 mg/L TKN, of which 0.18 mg/L was ammonia. The system produced a reducing environment and effluent  $\text{NO}_x\text{-N}$  was 6 mg/L.
- The Stage 2 biofilter effluent  $\text{NO}_x\text{-N}$  was below the method detection limit of 0.02 mg/L.
- The total nitrogen concentration in the final effluent from the total treatment system was approximately 0.91 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**

**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-STE						
Matrix		Wastewater						
SAL Sample Number		1403468-01						
Date/Time Collected		04/03/14 10:32						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		6.95						
Temperature		20.7 °C						
Conductivity		978 umhos						
Dissolved Oxygen		0.08 mg/L						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	3.2	SM 4550SF	0.04	0.01	04/08/14 16:57	04/17/14 09:38	1
Ammonia as N	mg/L	51	EPA 350.1	2.0	0.47		04/10/14 13:22	50
Carbonaceous BOD	mg/L	43	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	220	EPA 410.4	25	10	04/07/14 10:00	04/07/14 13:59	1
Chloride	mg/L	48	EPA 300.0	2.0	0.50		04/15/14 16:41	10
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 22:15	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 22:15	1
Orthophosphate as P	mg/L	3.9	EPA 300.0	0.040	0.010		04/04/14 22:15	1
Phosphorous - Total as P	mg/L	5.4	SM 4500P-E	0.80	0.20	04/10/14 12:25	04/15/14 13:23	20
Sulfate	mg/L	16	EPA 300.0	0.60	0.20		04/04/14 22:15	1
Sulfide	mg/L	5.9	SM 4500SF	0.40	0.10		04/08/14 16:57	1
Total Alkalinity	mg/L	410	SM 2320B	8.0	2.0		04/11/14 10:33	1
Total Kjeldahl Nitrogen	mg/L	55	EPA 351.2	4.0	1.0	04/10/14 12:25	04/15/14 13:23	20
Total Suspended Solids	mg/L	14	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	14	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 22:15	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	20,000	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	38,000	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1

Sample Description **BHS3-STE-FILTERED**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-02**  
 Date/Time Collected **04/03/14 10:32**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

**Client Provided Field Data**

pH 6.98  
 Temperature 20.7 °C  
 Conductivity 978 umhos  
 Dissolved Oxygen 0.08 mg/L

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

**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-STE-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1403468-02						
Date/Time Collected		04/03/14 10:32						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Inorganic, Dissolved</u></b>								
Ammonia as N	mg/L	46	EPA 350.1	2.0	0.47		04/10/14 14:48	50
Carbonaceous BOD	mg/L	30	SM 5210B	2	2	04/04/14 10:39	04/09/14 09:43	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 22:26	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 22:26	1
Total Kjeldahl Nitrogen	mg/L	51	EPA 351.2	0.20	0.050	04/10/14 13:39	04/15/14 15:20	20
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 22:26	1
Lab filtration for diss. analytes							04/03/14 16:00	
Sample Description		BHS3-LY01						
Matrix		Wastewater						
SAL Sample Number		1403468-03						
Date/Time Collected		04/03/14 11:15						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		7.05						
Temperature		22.4 °C						
Conductivity		711 umhos						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.30	EPA 350.1	0.20	0.047		04/10/14 15:52	5
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	180	EPA 410.4	25	10	04/07/14 10:00	04/07/14 13:59	1
Chloride	mg/L	44 L	EPA 300.0	0.20	0.050		04/04/14 22:37	1
Nitrate (as N)	mg/L	28	EPA 300.0	0.04	0.01		04/04/14 22:37	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 22:37	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/04/14 22:37	1
Phosphorous - Total as P	mg/L	0.12	SM 4500P-E	0.040	0.010	04/15/14 08:45	04/17/14 11:13	1
Sulfate	mg/L	52	EPA 300.0	0.60	0.20		04/04/14 22:37	1
Total Kjeldahl Nitrogen	mg/L	2.2	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:13	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	28	EPA 300.0	0.08	0.02		04/04/14 22:37	1

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

**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-LY02						
Matrix		Wastewater						
SAL Sample Number		1403468-04						
Date/Time Collected		04/03/14 11:00						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		6.43						
Temperature		22.8 °C						
Conductivity		780 umhos						
Dissolved Oxygen		5.44 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.12	EPA 350.1	0.080	0.019		04/10/14 15:30	2
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	29	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	45	EPA 300.0	2.0	0.50		04/15/14 17:00	10
Nitrate (as N)	mg/L	29	EPA 300.0	0.04	0.01		04/04/14 22:49	1
Nitrite (as N)	mg/L	0.47	EPA 300.0	0.04	0.01		04/04/14 22:49	1
Orthophosphate as P	mg/L	2.8	EPA 300.0	0.040	0.010		04/04/14 22:49	1
Phosphorous - Total as P	mg/L	3.2	SM 4500P-E	0.080	0.020	04/15/14 08:45	04/17/14 11:14	2
Sulfate	mg/L	42	EPA 300.0	0.60	0.20		04/04/14 22:49	1
Total Kjeldahl Nitrogen	mg/L	1.6	EPA 351.2	0.40	0.10	04/15/14 08:45	04/17/14 11:14	2
Total Suspended Solids	mg/L	1	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	29	EPA 300.0	0.08	0.02		04/04/14 22:49	1

Sample Description **BHS3-LINER**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-05**  
 Date/Time Collected **04/03/14 10:25**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

**Client Provided Field Data**

pH 6.98  
 Temperature 23.3 °C  
 Conductivity 809 umhos  
 Dissolved Oxygen 3.16 mg/L

**Inorganics**

Ammonia as N	mg/L	0.18	EPA 350.1	0.040	0.009		04/10/14 13:28	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	22 I	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	39	EPA 300.0	2.0	0.50		04/15/14 17:10	10
Nitrate (as N)	mg/L	5.9	EPA 300.0	0.04	0.01		04/04/14 23:00	1

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**Tampa, FL 33619**

**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-LINER						
Matrix		Wastewater						
SAL Sample Number		1403468-05						
Date/Time Collected		04/03/14 10:25						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:00	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/04/14 23:00	1
Phosphorous - Total as P	mg/L	0.064	SM 4500P-E	0.040	0.010	04/15/14 08:45	04/17/14 11:15	1
Sulfate	mg/L	29	EPA 300.0	0.60	0.20		04/04/14 23:00	1
Total Alkalinity	mg/L	270	SM 2320B	8.0	2.0		04/11/14 10:41	1
Total Kjeldahl Nitrogen	mg/L	2.8	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:15	1
Total Suspended Solids	mg/L	4	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	4	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	5.9	EPA 300.0	0.08	0.02		04/04/14 23:00	1
<b>Microbiology</b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	100	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1
Sample Description		BHS3-LINER-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1403468-06						
Date/Time Collected		04/03/14 10:25						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b>Client Provided Field Data</b>								
pH		6.98						
Temperature		23.3 °C						
Conductivity		809 umhos						
Dissolved Oxygen		3.16 mg/L						
<b>Inorganic, Dissolved</b>								
Ammonia as N	mg/L	0.11	EPA 350.1	0.040	0.009		04/10/14 14:50	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:39	04/09/14 09:43	1
Nitrate (as N)	mg/L	5.9	EPA 300.0	0.04	0.01		04/04/14 23:11	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:11	1
Total Kjeldahl Nitrogen	mg/L	2.3	EPA 351.2	0.20	0.050	04/10/14 13:39	04/15/14 15:21	1
Nitrate+Nitrite (N)	mg/L	5.9	EPA 300.0	0.08	0.02		04/04/14 23:11	1
Lab filtration for diss. analytes		04/03/14 16:00						

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

April 25, 2014  
 Work Order: 1403468

### Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-ST2						
Matrix		Wastewater						
SAL Sample Number		1403468-07						
Date/Time Collected		04/03/14 09:40						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		7.03						
Temperature		20.6 °C						
Conductivity		927 umhos						
Dissolved Oxygen		0.00 mg/L						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	1.6	SM 4550SF	0.04	0.01	04/08/14 16:57	04/17/14 09:38	1
Ammonia as N	mg/L	0.26	EPA 350.1	0.040	0.009		04/10/14 11:53	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	37	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	38	EPA 300.0	2.0	0.50		04/15/14 17:19	10
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:23	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:23	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/04/14 23:23	1
Phosphorous - Total as P	mg/L	0.030 I	SM 4500P-E	0.040	0.010	04/15/14 08:45	04/17/14 11:16	1
Sulfate	mg/L	120	EPA 300.0	6.0	2.0		04/15/14 17:19	10
Sulfide	mg/L	3.2	SM 4500SF	0.40	0.10		04/08/14 16:57	1
Total Alkalinity	mg/L	270	SM 2320B	8.0	2.0		04/11/14 10:48	1
Total Kjeldahl Nitrogen	mg/L	0.89	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:16	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	2	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 23:23	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1

Sample Description **BHS3-ST2-DUP**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-08**  
 Date/Time Collected **04/03/14 09:50**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

#### Client Provided Field Data

pH 7.03  
 Temperature 20.6 °C  
 Conductivity 927 umhos  
 Dissolved Oxygen 0.00 mg/L



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**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-ST2-DUP						
Matrix		Wastewater						
SAL Sample Number		1403468-08						
Date/Time Collected		04/03/14 09:50						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Inorganics</u></b>								
Hydrogen Sulfide (Unionized)	mg/L	1.6	SM 4550SF	0.04	0.01	04/08/14 16:57	04/17/14 09:38	1
Ammonia as N	mg/L	0.26	EPA 350.1	0.040	0.009		04/10/14 11:27	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	33	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	36	EPA 300.0	2.0	0.50		04/15/14 17:28	10
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:34	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:34	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/04/14 23:34	1
Phosphorous - Total as P	mg/L	0.029 I	SM 4500P-E	0.040	0.010	04/15/14 08:45	04/17/14 11:17	1
Sulfate	mg/L	110	EPA 300.0	6.0	2.0		04/15/14 17:28	10
Sulfide	mg/L	3.2	SM 4500SF	0.40	0.10		04/08/14 16:57	1
Total Alkalinity	mg/L	280	SM 2320B	8.0	2.0		04/11/14 10:55	1
Total Kjeldahl Nitrogen	mg/L	0.86	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:17	1
Total Suspended Solids	mg/L	2	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	2	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 23:34	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1

Sample Description **BHS3-ST2-FILTERED**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-09**  
 Date/Time Collected **04/03/14 09:40**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

**Client Provided Field Data**

pH 7.03  
 Temperature 20.6 °C  
 Conductivity 927 umhos  
 Dissolved Oxygen 0.00 mg/L

<b><u>Inorganics</u></b>								
Sulfate	mg/L	110	EPA 300.0	6.0	2.0		04/15/14 17:38	10
<b><u>Inorganic, Dissolved</u></b>								
Ammonia as N	mg/L	0.14	EPA 350.1	0.040	0.009		04/10/14 14:51	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:39	04/09/14 09:43	1

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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-ST2-FILTERED						
Matrix		Wastewater						
SAL Sample Number		1403468-09						
Date/Time Collected		04/03/14 09:40						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:45	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 23:45	1
Total Kjeldahl Nitrogen	mg/L	0.78	EPA 351.2	0.20	0.050	04/10/14 13:39	04/15/14 15:22	5
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 23:45	1
Lab filtration for diss. analytes							04/03/14 16:00	

Sample Description **BHS3-LY03**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-10**  
 Date/Time Collected **04/03/14 10:45**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

### Client Provided Field Data

pH 6.64  
 Temperature 22.6 °C  
 Conductivity 892 umhos  
 Dissolved Oxygen 5.01 mg/L

### Inorganics

Ammonia as N	mg/L	0.055 I	EPA 350.1	0.080	0.019		04/10/14 15:32	2
Carbonaceous BOD	mg/L	110	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	150	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	34	EPA 300.0	0.20	0.050		04/05/14 00:31	1
Nitrate (as N)	mg/L	7.5	EPA 300.0	0.04	0.01		04/05/14 00:31	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 00:31	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/05/14 00:31	1
Phosphorous - Total as P	mg/L	0.20	SM 4500P-E	0.040	0.010	04/10/14 12:25	04/15/14 13:24	1
Sulfate	mg/L	110	EPA 300.0	6.0	2.0		04/15/14 18:53	10
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	04/10/14 12:25	04/15/14 13:24	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	7.5	EPA 300.0	0.08	0.02		04/05/14 00:31	1

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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-LY04						
Matrix		Wastewater						
SAL Sample Number		1403468-11						
Date/Time Collected		04/03/14 10:40						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		6.58						
Temperature		22.7 °C						
Conductivity		818 umhos						
Dissolved Oxygen		3.67 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.052	EPA 350.1	0.040	0.009		04/04/14 16:04	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	27	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	35	EPA 300.0	0.20	0.050		04/05/14 00:42	1
Nitrate (as N)	mg/L	3.1	EPA 300.0	0.04	0.01		04/05/14 00:42	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 00:42	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/05/14 00:42	1
Phosphorous - Total as P	mg/L	0.10	SM 4500P-E	0.040	0.010	04/10/14 12:25	04/15/14 13:25	1
Sulfate	mg/L	98	EPA 300.0	0.60	0.20		04/05/14 00:42	1
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0		04/11/14 11:02	1
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.05	04/10/14 12:25	04/15/14 13:25	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	3.1	EPA 300.0	0.08	0.02		04/05/14 00:42	1

Sample Description **BHS3-PZ-07**  
 Matrix **Wastewater**  
 SAL Sample Number **1403468-12**  
 Date/Time Collected **04/03/14 09:38**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

**Client Provided Field Data**

pH 6.38  
 Temperature 21.9 °C  
 Conductivity 693 umhos  
 Dissolved Oxygen 4.85 mg/L

**Inorganics**

Ammonia as N	mg/L	0.067	EPA 350.1	0.040	0.009		04/04/14 16:14	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	31	EPA 410.4	25	10	04/07/14 16:41	04/11/14 15:55	1
Chloride	mg/L	20	EPA 300.0	0.20	0.050		04/05/14 07:35	1

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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-PZ-07						
Matrix		Wastewater						
SAL Sample Number		1403468-12						
Date/Time Collected		04/03/14 09:38						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Nitrate (as N)	mg/L	3.3	EPA 300.0	0.04	0.01		04/05/14 07:35	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 07:35	1
Orthophosphate as P	mg/L	0.17 Q	SM 4500P-E	0.040	0.012		04/23/14 08:42	1
Phosphorous - Total as P	mg/L	0.18	SM 4500P-E	0.040	0.010	04/10/14 12:25	04/15/14 13:26	1
Sulfate	mg/L	59	EPA 300.0	0.60	0.20		04/05/14 07:35	1
Total Alkalinity	mg/L	260	SM 2320B	8.0	2.0		04/11/14 11:14	1
Total Kjeldahl Nitrogen	mg/L	1.6	EPA 351.2	0.20	0.05	04/10/14 12:25	04/15/14 13:26	1
Total Suspended Solids	mg/L	10	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	6	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	3.3	EPA 300.0	0.08	0.02		04/05/14 07:35	1
Sample Description		BHS3-PZ08						
Matrix		Wastewater						
SAL Sample Number		1403468-13						
Date/Time Collected		04/03/14 10:08						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Client Provided Field Data								
pH		5.67						
Temperature		20.6 °C						
Conductivity		527 umhos						
Dissolved Oxygen		3.43 mg/L						
Inorganics								
Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01	04/08/14 16:57	04/17/14 09:38	1
Ammonia as N	mg/L	0.050	EPA 350.1	0.040	0.009		04/04/14 16:16	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	45	EPA 410.4	25	10	04/16/14 12:30	04/16/14 16:00	1
Chloride	mg/L	22	EPA 300.0	0.20	0.050		04/07/14 07:47	1
Nitrate (as N)	mg/L	2.3	EPA 300.0	0.04	0.01		04/05/14 07:47	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 07:47	1
Orthophosphate as P	mg/L	0.052	EPA 300.0	0.040	0.010		04/05/14 07:47	1
Phosphorous - Total as P	mg/L	0.47	SM 4500P-E	0.040	0.010	04/10/14 12:25	04/15/14 13:29	1
Sulfate	mg/L	69	EPA 300.0	0.60	0.20		04/05/14 07:47	1
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		04/08/14 16:57	1
Total Alkalinity	mg/L	170	SM 2320B	8.0	2.0		04/11/14 11:20	1
Total Kjeldahl Nitrogen	mg/L	1.2	EPA 351.2	0.20	0.05	04/10/14 12:25	04/15/14 13:29	1
Total Suspended Solids	mg/L	4	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1

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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS3-PZ08						
Matrix		Wastewater						
SAL Sample Number		1403468-13						
Date/Time Collected		04/03/14 10:08						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Volatile Suspended Solids	mg/L	2	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	2.3	EPA 300.0	0.08	0.02		04/05/14 07:47	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1
Sample Description		PZ-A7-6						
Matrix		Wastewater						
SAL Sample Number		1403468-15						
Date/Time Collected		04/03/14 09:18						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		5.99						
Temperature		20.2 °C						
Conductivity		655 umhos						
Dissolved Oxygen		0.74 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.16	EPA 350.1	0.040	0.009		04/04/14 16:19	1
Chloride	mg/L	30	EPA 300.0	0.20	0.050		04/05/14 07:58	1
Nitrate (as N)	mg/L	0.92	EPA 300.0	0.04	0.01		04/05/14 07:58	1
Nitrite (as N)	mg/L	0.06	EPA 300.0	0.04	0.01		04/05/14 07:58	1
Sulfate	mg/L	0.20 U	EPA 300.0	0.60	0.20		04/05/14 07:58	1
Total Alkalinity	mg/L	190	SM 2320B	8.0	2.0		04/11/14 11:27	1
Total Kjeldahl Nitrogen	mg/L	0.89	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:18	1
Nitrate+Nitrite (N)	mg/L	0.98	EPA 300.0	0.08	0.02		04/05/14 07:58	1
Sample Description		PZ-A7-8						
Matrix		Wastewater						
SAL Sample Number		1403468-16						
Date/Time Collected		04/03/14 09:33						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		5.90						
Temperature		20.6 °C						



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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		PZ-A7-8						
Matrix		Wastewater						
SAL Sample Number		1403468-16						
Date/Time Collected		04/03/14 09:33						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Conductivity		536 umhos						
Dissolved Oxygen		0.64 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	1.4	EPA 350.1	0.040	0.009		04/04/14 16:21	1
Chloride	mg/L	28	EPA 300.0	0.20	0.050		04/05/14 08:09	1
Nitrate (as N)	mg/L	0.92	EPA 300.0	0.04	0.01		04/05/14 08:09	1
Nitrite (as N)	mg/L	0.12	EPA 300.0	0.04	0.01		04/05/14 08:09	1
Sulfate	mg/L	61	EPA 300.0	0.60	0.20		04/05/14 08:09	1
Total Alkalinity	mg/L	160	SM 2320B	8.0	2.0		04/11/14 11:34	1
Total Kjeldahl Nitrogen	mg/L	3.8	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:19	1
Nitrate+Nitrite (N)	mg/L	1.0	EPA 300.0	0.08	0.02		04/05/14 08:09	1
Sample Description		PZ-B8-5						
Matrix		Wastewater						
SAL Sample Number		1403468-17						
Date/Time Collected		04/03/14 09:05						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		5.96						
Temperature		20.8 °C						
Conductivity		388 umhos						
Dissolved Oxygen		1.19 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.17	EPA 350.1	0.040	0.009		04/05/14 08:18	1
Chloride	mg/L	18	EPA 300.0	0.20	0.050		04/05/14 08:21	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 08:21	1
Nitrite (as N)	mg/L	0.12	EPA 300.0	0.04	0.01		04/05/14 08:21	1
Sulfate	mg/L	32	EPA 300.0	0.60	0.20		04/05/14 08:21	1
Total Alkalinity	mg/L	100	SM 2320B	8.0	2.0		04/11/14 11:40	1
Total Kjeldahl Nitrogen	mg/L	2.2	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:20	1
Nitrate+Nitrite (N)	mg/L	0.12	EPA 300.0	0.08	0.02		04/05/14 08:21	1

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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		PZ-B8-5-DUP						
Matrix		Wastewater						
SAL Sample Number		1403468-18						
Date/Time Collected		04/03/14 09:10						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		5.96						
Temperature		20.8 °C						
Conductivity		388 umhos						
Dissolved Oxygen		1.19 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.17	EPA 350.1	0.040	0.009		04/05/14 08:20	1
Chloride	mg/L	18	EPA 300.0	0.20	0.050		04/05/14 08:32	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 08:32	1
Nitrite (as N)	mg/L	0.12	EPA 300.0	0.04	0.01		04/05/14 08:32	1
Sulfate	mg/L	32	EPA 300.0	0.60	0.20		04/05/14 08:32	1
Total Alkalinity	mg/L	99	SM 2320B	8.0	2.0		04/16/14 09:09	1
Total Kjeldahl Nitrogen	mg/L	2.1	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:25	1
Nitrate+Nitrite (N)	mg/L	0.12	EPA 300.0	0.08	0.02		04/05/14 08:32	1
Sample Description		PZ-B8-7						
Matrix		Wastewater						
SAL Sample Number		1403468-19						
Date/Time Collected		04/03/14 09:20						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b><u>Client Provided Field Data</u></b>								
pH		6.03						
Temperature		20.9 °C						
Conductivity		291 umhos						
Dissolved Oxygen		0.26 mg/L						
<b><u>Inorganics</u></b>								
Ammonia as N	mg/L	0.13	EPA 350.1	0.040	0.009		04/04/14 16:27	1
Chloride	mg/L	41	EPA 300.0	2.0	0.50		04/15/14 19:02	10
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 08:43	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 08:43	1
Sulfate	mg/L	6.1	EPA 300.0	0.60	0.20		04/05/14 08:43	1
Total Alkalinity	mg/L	45	SM 2320B	8.0	2.0		04/16/14 09:14	1
Total Kjeldahl Nitrogen	mg/L	1.1	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:26	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/05/14 08:43	1

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**April 25, 2014**  
**Work Order: 1403468**

## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		PZ-C10-6						
Matrix		Wastewater						
SAL Sample Number		1403468-20						
Date/Time Collected		04/03/14 08:58						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
<b>Client Provided Field Data</b>								
pH		6.18						
Temperature		20.3 °C						
Conductivity		493 umhos						
Dissolved Oxygen		0.86 mg/L						
<b>Inorganics</b>								
Ammonia as N	mg/L	1.4	EPA 350.1	0.040	0.009		04/04/14 16:29	1
Chloride	mg/L	14	EPA 300.0	0.20	0.050		04/05/14 08:55	1
Nitrate (as N)	mg/L	2.8	EPA 300.0	0.04	0.01		04/05/14 08:55	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/05/14 08:55	1
Sulfate	mg/L	8.5	EPA 300.0	0.60	0.20		04/05/14 08:55	1
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0		04/16/14 09:23	1
Total Kjeldahl Nitrogen	mg/L	4.6	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:27	1
Nitrate+Nitrite (N)	mg/L	2.8	EPA 300.0	0.08	0.02		04/05/14 08:55	1

Sample Description **EB**  
 Matrix **Reagent Water**  
 SAL Sample Number **1403468-21**  
 Date/Time Collected **04/03/14 11:19**  
 Collected by **Client**  
 Date/Time Received **04/03/14 15:35**

**Client Provided Field Data**

pH 7.28  
 Temperature 29.0 °C  
 Conductivity 2 umhos  
 Dissolved Oxygen 7.54 mg/L

**Inorganics**

Hydrogen Sulfide (Unionized)	mg/L	0.01 U	SM 4550SF	0.04	0.01	04/08/14 16:57	04/17/14 09:38	1
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		04/05/14 08:22	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	04/04/14 10:38	04/09/14 09:40	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	04/16/14 12:30	04/16/14 16:00	1
Chloride	mg/L	0.050 U	EPA 300.0	0.20	0.050		04/04/14 13:26	1
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 13:26	1
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		04/04/14 13:26	1
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		04/04/14 13:26	1
Phosphorous - Total as P	mg/L	0.010 U	SM 4500P-E	0.040	0.010	04/15/14 08:45	04/17/14 11:28	1
Sulfate	mg/L	0.20 U	EPA 300.0	0.60	0.20		04/04/14 13:26	1

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**April 25, 2014**  
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## Laboratory Report

Project Name		BHS3 SE#8						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		EB						
Matrix		Reagent Water						
SAL Sample Number		1403468-21						
Date/Time Collected		04/03/14 11:19						
Collected by		Client						
Date/Time Received		04/03/14 15:35						
Sulfide	mg/L	0.10 U	SM 4500SF	0.40	0.10		04/08/14 16:57	1
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0		04/16/14 09:26	1
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	04/15/14 08:45	04/17/14 11:28	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	04/07/14 09:06	04/09/14 16:50	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	04/07/14 09:06	04/09/14 16:53	1
Nitrate+Nitrite (N)	mg/L	0.02 U	EPA 300.0	0.08	0.02		04/04/14 13:26	1
<b><u>Microbiology</u></b>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	04/03/14 17:07	04/04/14 11:07	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	04/03/14 16:56	04/04/14 14:56	1

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Tampa, FL 33619

April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD40409 - BOD</b>										
<b>Blank (BD40409-BLK1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	2 U	2	2	mg/L						
<b>Blank (BD40409-BLK2)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	2 U	2	2	mg/L						
<b>LCS (BD40409-BS1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	202	2	2	mg/L	200		101	85-115		
<b>LCS (BD40409-BS2)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	195	2	2	mg/L	200		98	85-115		
<b>LCS Dup (BD40409-BSD1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	203	2	2	mg/L	200		101	85-115	0.2	200
<b>LCS Dup (BD40409-BSD2)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	206	2	2	mg/L	200		103	85-115	5	200
<b>Duplicate (BD40409-DUP1)</b>					Source: 1403476-01 Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	140	2	2	mg/L		140			0.1	25
<b>Duplicate (BD40409-DUP2)</b>					Source: 1403509-01 Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	210	2	2	mg/L		240			13	25
<b>Batch BD40415 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BD40415-BLK1)</b>					Prepared & Analyzed: 04/04/14					
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Sulfate	0.20 U	0.60	0.20	mg/L						
Chloride	0.050 U	0.20	0.050	mg/L						
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		



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**April 25, 2014**  
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**Inorganics - Quality Control**

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD40415 - Ion Chromatography 300.0 Prep</b>										
<b>LCS (BD40415-BS1)</b>					Prepared & Analyzed: 04/04/14					
Sulfate	8.80	0.60	0.20	mg/L	9.0		98	85-115		
Orthophosphate as P	0.984	0.040	0.010	mg/L	0.90		109	85-115		
Nitrite (as N)	1.36	0.04	0.01	mg/L	1.4		97	85-115		
Nitrate (as N)	1.71	0.04	0.01	mg/L	1.7		100	85-115		
Chloride	2.72	0.20	0.050	mg/L	3.0		91	85-115		
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		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
<b>LCS Dup (BD40415-BSD1)</b>					Prepared & Analyzed: 04/04/14					
Nitrite (as N)	1.38	0.04	0.01	mg/L	1.4		98	85-115	2	200
Sulfate	9.00	0.60	0.20	mg/L	9.0		100	85-115	2	200
Nitrate (as N)	1.77	0.04	0.01	mg/L	1.7		104	85-115	3	200
Orthophosphate as P	0.968	0.040	0.010	mg/L	0.90		108	85-115	2	200
Chloride	2.83	0.20	0.050	mg/L	3.0		94	85-115	4	200
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
<b>Matrix Spike (BD40415-MS1)</b>					<b>Source: 1403468-09</b>		Prepared & Analyzed: 04/04/14			
Sulfate	90.0 L	0.60	0.20	mg/L	9.0	108	NR	85-115		
Nitrate (as N)	1.59	0.04	0.01	mg/L	1.7	ND	94	85-115		
Chloride	30.0 L	0.20	0.050	mg/L	3.0	36.7	NR	80-120		
Orthophosphate as P	0.880	0.040	0.010	mg/L	0.90	ND	98	85-115		
Nitrite (as N)	1.38	0.04	0.01	mg/L	1.4	ND	99	85-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	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 BD40415 - Ion Chromatography 300.0 Prep**

Matrix Spike (BD40415-MS2)		Source: 1403468-20			Prepared & Analyzed: 04/07/14					
Nitrite (as N)	1.55	0.04	0.01	mg/L	1.4	ND	111	85-115		
Orthophosphate as P	0.897	0.040	0.010	mg/L	0.90	ND	100	85-115		
Chloride	17.0	0.20	0.050	mg/L	3.0	14.1	97	80-120		
Sulfate	17.6	0.60	0.20	mg/L	9.0	8.54	101	85-115		
Nitrate (as N)	4.48	0.04	0.01	mg/L	1.7	2.83	97	85-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		

**Batch BD40422 - Ammonia by SEAL**

Blank (BD40422-BLK1)		Prepared & Analyzed: 04/04/14								
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BD40422-BS1)		Prepared & Analyzed: 04/04/14								
Ammonia as N	0.52	0.040	0.009	mg/L	0.50		104	90-110		
Matrix Spike (BD40422-MS1)		Source: 1403464-07			Prepared & Analyzed: 04/04/14					
Ammonia as N	0.56	0.040	0.009	mg/L	0.50	0.057	100	90-110		
Matrix Spike (BD40422-MS2)		Source: 1403468-21			Prepared & Analyzed: 04/04/14					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	ND	102	90-110		
Matrix Spike Dup (BD40422-MSD1)		Source: 1403464-07			Prepared & Analyzed: 04/04/14					
Ammonia as N	0.56	0.040	0.009	mg/L	0.50	0.057	100	90-110	0.1	10

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April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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### Batch BD40422 - Ammonia by SEAL

Matrix Spike Dup (BD40422-MSD2) Source: 1403468-21 Prepared & Analyzed: 04/04/14

Ammonia as N	0.53	0.040	0.009	mg/L	0.50	ND	106	90-110	4	10
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### Batch BD40434 - Ion Chromatography 300.0 Prep

Blank (BD40434-BLK1) Prepared & Analyzed: 04/04/14

Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Nitrite (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						
Chloride	0.050 U	0.20	0.050	mg/L						
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		

LCS (BD40434-BS1) Prepared & Analyzed: 04/04/14

Orthophosphate as P	0.833	0.040	0.010	mg/L	0.90		93	85-115		
Nitrate (as N)	1.67	0.04	0.01	mg/L	1.7		98	85-115		
Chloride	2.94	0.20	0.050	mg/L	3.0		98	85-115		
Nitrite (as N)	1.35	0.04	0.01	mg/L	1.4		96	85-115		
Sulfate	8.90	0.60	0.20	mg/L	9.0		99	85-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		

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April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
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### Batch BD40434 - Ion Chromatography 300.0 Prep

#### LCS Dup (BD40434-BSD1)

Prepared & Analyzed: 04/04/14

Nitrite (as N)	1.31	0.04	0.01	mg/L	1.4		94	85-115	3	200
Chloride	2.86	0.20	0.050	mg/L	3.0		95	85-115	3	200
Sulfate	8.73	0.60	0.20	mg/L	9.0		97	85-115	2	200
Nitrate (as N)	1.60	0.04	0.01	mg/L	1.7		94	85-115	5	200
Orthophosphate as P	0.845	0.040	0.010	mg/L	0.90		94	85-115	1	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		
Surrogate: Dichloroacetate	1.03			mg/L	1.0		103	90-115		

#### Matrix Spike (BD40434-MS1)

Source: 1403317-09

Prepared & Analyzed: 04/04/14

Orthophosphate as P	9.79	0.40	0.10	mg/L	9.0	ND	109	85-115		
Nitrate (as N)	18.2	0.40	0.10	mg/L	17	1.10	100	85-115		
Sulfate	154	6.0	2.0	mg/L	90	56.1	109	85-115		
Nitrite (as N)	15.1	0.40	0.10	mg/L	14	ND	108	85-115		
Chloride	99.0	2.0	0.50	mg/L	30	66.2	109	80-120		
Surrogate: Dichloroacetate	0.962			mg/L	1.0		96	90-115		
Surrogate: Dichloroacetate	0.962			mg/L	1.0		96	90-115		
Surrogate: Dichloroacetate	0.962			mg/L	1.0		96	90-115		
Surrogate: Dichloroacetate	0.962			mg/L	1.0		96	90-115		
Surrogate: Dichloroacetate	0.962			mg/L	1.0		96	90-115		

### Batch BD40451 - COD prep

#### Blank (BD40451-BLK1)

Prepared & Analyzed: 04/07/14

Chemical Oxygen Demand	10 U	25	10	mg/L						
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April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD40451 - COD prep</b>										
<b>LCS (BD40451-BS1)</b>					Prepared & Analyzed: 04/07/14					
Chemical Oxygen Demand	52	25	10	mg/L	50		104	90-110		
<b>Matrix Spike (BD40451-MS1)</b>					Source: 1403453-02 Prepared & Analyzed: 04/07/14					
Chemical Oxygen Demand	52	25	10	mg/L	50	ND	104	85-115		
<b>Matrix Spike Dup (BD40451-MSD1)</b>					Source: 1403453-02 Prepared & Analyzed: 04/07/14					
Chemical Oxygen Demand	54	25	10	mg/L	50	ND	108	85-115	4	32
<b>Batch BD40705 - TSS prep</b>										
<b>Blank (BD40705-BLK1)</b>					Prepared: 04/07/14 Analyzed: 04/09/14					
Volatile Suspended Solids	1 U	1		mg/L						
Total Suspended Solids	1 U	1	1	mg/L						
<b>LCS (BD40705-BS1)</b>					Prepared: 04/07/14 Analyzed: 04/09/14					
Total Suspended Solids	51.5	1	1	mg/L	50		103	85-115		
<b>Duplicate (BD40705-DUP1)</b>					Source: 1403467-01 Prepared: 04/07/14 Analyzed: 04/09/14					
Volatile Suspended Solids	61.0	1		mg/L		57.0			7	20
Total Suspended Solids	63.0	1	1	mg/L		62.0			2	30
<b>Batch BD40736 - COD prep</b>										
<b>Blank (BD40736-BLK1)</b>					Prepared: 04/07/14 Analyzed: 04/11/14					
Chemical Oxygen Demand	10 U	25	10	mg/L						

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110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



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

April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD40736 - COD prep</b>										
<b>LCS (BD40736-BS1)</b>					Prepared: 04/07/14 Analyzed: 04/11/14					
Chemical Oxygen Demand	49	25	10	mg/L	50		98	90-110		
<b>Matrix Spike (BD40736-MS1)</b>					Source: 1403468-04 Prepared: 04/07/14 Analyzed: 04/11/14					
Chemical Oxygen Demand	72	25	10	mg/L	50	29	86	85-115		
<b>Matrix Spike Dup (BD40736-MSD1)</b>					Source: 1403468-04 Prepared: 04/07/14 Analyzed: 04/11/14					
Chemical Oxygen Demand	75	25	10	mg/L	50	29	92	85-115	4	32
<b>Batch BD40840 - Sulfide prep</b>										
<b>Blank (BD40840-BLK1)</b>					Prepared & Analyzed: 04/08/14					
Sulfide	0.10 U	0.40	0.10	mg/L						
<b>LCS (BD40840-BS1)</b>					Prepared & Analyzed: 04/08/14					
Sulfide	4.65	0.40	0.10	mg/L	5.0		93	85-115		
<b>Matrix Spike (BD40840-MS1)</b>					Source: 1403468-21 Prepared & Analyzed: 04/08/14					
Sulfide	4.85	0.40	0.10	mg/L	5.0	ND	97	85-115		
<b>Matrix Spike Dup (BD40840-MSD1)</b>					Source: 1403468-21 Prepared & Analyzed: 04/08/14					
Sulfide	4.65	0.40	0.10	mg/L	5.0	ND	93	85-115	4	14
<b>Batch BD40909 - Ammonia by SEAL</b>										
<b>Blank (BD40909-BLK1)</b>					Prepared & Analyzed: 04/10/14					
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 Limits	RPD	RPD Limit
<b>Batch BD40909 - Ammonia by SEAL</b>										
<b>LCS (BD40909-BS1)</b>					Prepared & Analyzed: 04/10/14					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50		102	90-110		
<b>Matrix Spike (BD40909-MS1)</b>					Source: 1403536-01 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.54	0.040	0.009	mg/L	0.50	ND	108	90-110		
<b>Matrix Spike (BD40909-MS2)</b>					Source: 1403524-01 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	98	90-110		
<b>Matrix Spike Dup (BD40909-MSD1)</b>					Source: 1403536-01 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	101	90-110	7	10
<b>Matrix Spike Dup (BD40909-MSD2)</b>					Source: 1403524-01 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	ND	97	90-110	1	10
<b>Batch BD40935 - Ammonia by SEAL</b>										
<b>Blank (BD40935-BLK1)</b>					Prepared & Analyzed: 04/10/14					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
<b>LCS (BD40935-BS1)</b>					Prepared & Analyzed: 04/10/14					
Ammonia as N	0.54	0.040	0.009	mg/L	0.50		107	90-110		
<b>Matrix Spike (BD40935-MS1)</b>					Source: 1403467-10 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	ND	102	90-110		
<b>Matrix Spike (BD40935-MS2)</b>					Source: 1403663-07 Prepared & Analyzed: 04/10/14					
Ammonia as N	0.53	0.040	0.009	mg/L	0.50	0.031	99	90-110		

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April 25, 2014  
Work Order: 1403468

## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BD40935 - Ammonia by SEAL										
Matrix Spike Dup (BD40935-MSD1)		Source: 1403467-10			Prepared & Analyzed: 04/10/14					
Ammonia as N	0.54	0.040	0.009	mg/L	0.50	ND	108	90-110	6	10
Matrix Spike Dup (BD40935-MSD2)		Source: 1403663-07			Prepared & Analyzed: 04/10/14					
Ammonia as N	0.53	0.040	0.009	mg/L	0.50	0.031	101	90-110	1	10
Batch BD41015 - Digestion for TP and TKN										
Blank (BD41015-BLK1)					Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						
LCS (BD41015-BS1)					Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	0.909	0.20	0.05	mg/L	1.0		91	90-110		
Phosphorous - Total as P	0.474	0.040	0.010	mg/L	0.50		95	90-110		
Matrix Spike (BD41015-MS1)		Source: 1403453-02			Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	1.15	0.20	0.05	mg/L	1.0	0.125	103	90-110		
Phosphorous - Total as P	0.533	0.040	0.010	mg/L	0.50	0.0211	102	90-110		
Matrix Spike (BD41015-MS2)		Source: 1403467-10			Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	0.979	0.20	0.05	mg/L	1.0	ND	98	90-110		
Phosphorous - Total as P	0.518	0.040	0.010	mg/L	0.50	ND	104	90-110		
Matrix Spike Dup (BD41015-MSD1)		Source: 1403453-02			Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	1.15	0.20	0.05	mg/L	1.0	0.125	102	90-110	0.6	20
Phosphorous - Total as P	0.519	0.040	0.010	mg/L	0.50	0.0211	100	90-110	3	25

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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BD41015 - Digestion for TP and TKN										
Matrix Spike Dup (BD41015-MSD2)		Source: 1403467-10			Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	0.990	0.20	0.05	mg/L	1.0	ND	99	90-110	1	20
Phosphorous - Total as P	0.506	0.040	0.010	mg/L	0.50	ND	101	90-110	2	25
Batch BD41104 - alkalinity										
Blank (BD41104-BLK1)				Prepared & Analyzed: 04/11/14						
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
LCS (BD41104-BS1)				Prepared & Analyzed: 04/11/14						
Total Alkalinity	130	8.0	2.0	mg/L	120		104	90-110		
Matrix Spike (BD41104-MS1)		Source: 1403467-10			Prepared & Analyzed: 04/11/14					
Total Alkalinity	130	8.0	2.0	mg/L	120	ND	105	80-120		
Matrix Spike Dup (BD41104-MSD1)		Source: 1403467-10			Prepared & Analyzed: 04/11/14					
Total Alkalinity	130	8.0	2.0	mg/L	120	ND	107	80-120	2	26
Batch BD41421 - Ion Chromatography 300.0 Prep										
Blank (BD41421-BLK1)				Prepared & Analyzed: 04/15/14						
Sulfate	0.20 U	0.60	0.20	mg/L						
Chloride	0.050 U	0.20	0.050	mg/L						
Surrogate: Dichloroacetate	0.946			mg/L	1.0		95	90-115		
Surrogate: Dichloroacetate	0.946			mg/L	1.0		95	90-115		
LCS (BD41421-BS1)				Prepared & Analyzed: 04/15/14						
Sulfate	8.82	0.60	0.20	mg/L	9.0		98	85-115		
Chloride	2.92	0.20	0.050	mg/L	3.0		97	85-115		
Surrogate: Dichloroacetate	0.979			mg/L	1.0		98	90-115		
Surrogate: Dichloroacetate	0.979			mg/L	1.0		98	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 BD41421 - Ion Chromatography 300.0 Prep</b>										
<b>LCS Dup (BD41421-BSD1)</b>					Prepared & Analyzed: 04/15/14					
Sulfate	8.83	0.60	0.20	mg/L	9.0		98	85-115	0.08	200
Chloride	2.90	0.20	0.050	mg/L	3.0		97	85-115	0.7	200
Surrogate: Dichloroacetate	0.982			mg/L	1.0		98	90-115		
Surrogate: Dichloroacetate	0.982			mg/L	1.0		98	90-115		
<b>Matrix Spike (BD41421-MS1)</b>					<b>Source: 1403703-03</b>		Prepared & Analyzed: 04/15/14			
Chloride	321	2.0	0.50	mg/L	30	293	92	80-120		
Sulfate	98.5	6.0	2.0	mg/L	90	18.6	89	85-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
<b>Matrix Spike (BD41421-MS2)</b>					<b>Source: 1403468-09</b>		Prepared & Analyzed: 04/15/14			
Sulfate	195	6.0	2.0	mg/L	90	108	97	85-115		
Chloride	66.9	2.0	0.50	mg/L	30	37.7	97	80-120		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
Surrogate: Dichloroacetate	1.09			mg/L	1.0		109	90-115		
<b>Batch BD41423 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BD41423-BLK1)</b>					Prepared & Analyzed: 04/15/14					
Sulfate	0.20 U	0.60	0.20	mg/L						
Chloride	0.050 U	0.20	0.050	mg/L						
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
Surrogate: Dichloroacetate	0.987			mg/L	1.0		99	90-115		
<b>LCS (BD41423-BS1)</b>					Prepared & Analyzed: 04/15/14					
Sulfate	8.90	0.60	0.20	mg/L	9.0		99	85-115		
Chloride	2.93	0.20	0.050	mg/L	3.0		98	85-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	1.00			mg/L	1.0		100	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 BD41423 - Ion Chromatography 300.0 Prep****LCS Dup (BD41423-BSD1)**

Prepared &amp; Analyzed: 04/15/14

Sulfate	8.89	0.60	0.20	mg/L	9.0		99	85-115	0.1	200
Chloride	2.93	0.20	0.050	mg/L	3.0		98	85-115	0.03	200
Surrogate: Dichloroacetate	1.01			mg/L	1.0		101	90-115		
Surrogate: Dichloroacetate	1.01			mg/L	1.0		101	90-115		

**Matrix Spike (BD41423-MS1)**

Source: 1403507-04

Prepared &amp; Analyzed: 04/15/14

Chloride	30.0 L	0.20	0.050	mg/L	3.0	2820	NR	80-120		
Sulfate	90.0 L	0.60	0.20	mg/L	9.0	1520	NR	85-115		
Surrogate: Dichloroacetate	0.999			mg/L	1.0		100	90-115		
Surrogate: Dichloroacetate	0.999			mg/L	1.0		100	90-115		

**Matrix Spike (BD41423-MS2)**

Source: 1403776-02

Prepared &amp; Analyzed: 04/16/14

Chloride	10,700	200	50	mg/L	3000	7880	94	80-120		
Sulfate	8,980	600	200	mg/L	9000	975	89	85-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		
Surrogate: Dichloroacetate	1.11			mg/L	1.0		111	90-115		

**Batch BD41501 - Digestion for TP and TKN****Blank (BD41501-BLK1)**

Prepared: 04/15/14 Analyzed: 04/17/14

Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						

**LCS (BD41501-BS1)**

Prepared: 04/15/14 Analyzed: 04/17/14

Phosphorous - Total as P	0.490	0.040	0.010	mg/L	0.50		98	90-110		
Total Kjeldahl Nitrogen	1.02	0.20	0.05	mg/L	1.0		102	90-110		

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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 BD41501 - Digestion for TP and TKN

<b>Matrix Spike (BD41501-MS1)</b>		<b>Source: 1403468-21</b>			Prepared: 04/15/14 Analyzed: 04/17/14					
Phosphorous - Total as P	0.478	0.040	0.010	mg/L	0.50	ND	96	90-110		
Total Kjeldahl Nitrogen	0.947	0.20	0.05	mg/L	1.0	ND	95	90-110		
<b>Matrix Spike (BD41501-MS2)</b>		<b>Source: 1403704-01</b>			Prepared: 04/15/14 Analyzed: 04/17/14					
Phosphorous - Total as P	0.472	0.040	0.010	mg/L	0.50	ND	94	90-110		
Total Kjeldahl Nitrogen	0.997	0.20	0.05	mg/L	1.0	ND	100	90-110		
<b>Matrix Spike Dup (BD41501-MSD1)</b>		<b>Source: 1403468-21</b>			Prepared: 04/15/14 Analyzed: 04/17/14					
Total Kjeldahl Nitrogen	0.900	0.20	0.05	mg/L	1.0	ND	90	90-110	5	20
Phosphorous - Total as P	0.475	0.040	0.010	mg/L	0.50	ND	95	90-110	0.7	25
<b>Matrix Spike Dup (BD41501-MSD2)</b>		<b>Source: 1403704-01</b>			Prepared: 04/15/14 Analyzed: 04/17/14					
Total Kjeldahl Nitrogen	0.935	0.20	0.05	mg/L	1.0	ND	94	90-110	6	20
Phosphorous - Total as P	0.490	0.040	0.010	mg/L	0.50	ND	98	90-110	4	25

### Batch BD41534 - alkalinity

<b>Blank (BD41534-BLK1)</b>		Prepared & Analyzed: 04/16/14								
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
<b>LCS (BD41534-BS1)</b>		Prepared & Analyzed: 04/16/14								
Total Alkalinity	130	8.0	2.0	mg/L	120		108	90-110		
<b>Matrix Spike (BD41534-MS1)</b>		<b>Source: 1403468-21</b>			Prepared & Analyzed: 04/16/14					
Total Alkalinity	130	8.0	2.0	mg/L	120	ND	107	80-120		
<b>Matrix Spike Dup (BD41534-MSD1)</b>		<b>Source: 1403468-21</b>			Prepared & Analyzed: 04/16/14					
Total Alkalinity	130	8.0	2.0	mg/L	120	ND	108	80-120	0.6	26



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## Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD41536 - COD prep</b>										
<b>Blank (BD41536-BLK1)</b>					Prepared & Analyzed: 04/16/14					
Chemical Oxygen Demand	10 U	25	10	mg/L						
<b>LCS (BD41536-BS1)</b>					Prepared & Analyzed: 04/16/14					
Chemical Oxygen Demand	47	25	10	mg/L	50		94	90-110		
<b>Matrix Spike (BD41536-MS1)</b>					<b>Source: 1403468-21</b>		Prepared & Analyzed: 04/16/14			
Chemical Oxygen Demand	49	25	10	mg/L	50	ND	98	85-115		
<b>Matrix Spike Dup (BD41536-MSD1)</b>					<b>Source: 1403468-21</b>		Prepared & Analyzed: 04/16/14			
Chemical Oxygen Demand	49	25	10	mg/L	50	ND	98	85-115	0	32
<b>Batch BD42301 - Ortho phosphorus SM4500P-E by seal</b>										
<b>Blank (BD42301-BLK1)</b>					Prepared & Analyzed: 04/23/14					
Orthophosphate as P	0.012 U	0.040	0.012	mg/L						
<b>LCS (BD42301-BS1)</b>					Prepared & Analyzed: 04/23/14					
Orthophosphate as P	0.729	0.040	0.012	mg/L	0.80		91	90-110		
<b>Matrix Spike (BD42301-MS1)</b>					<b>Source: 1404096-01</b>		Prepared & Analyzed: 04/23/14			
Orthophosphate as P	1.41	0.040	0.012	mg/L	1.0	0.365	104	90-110		
<b>Matrix Spike Dup (BD42301-MSD1)</b>					<b>Source: 1404096-01</b>		Prepared & Analyzed: 04/23/14			
Orthophosphate as P	1.37	0.040	0.012	mg/L	1.0	0.365	100	90-110	3	20

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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 BD40410 - BOD Dissolved</b>										
<b>Blank (BD40410-BLK1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	2 U	2	2	mg/L						
<b>LCS (BD40410-BS1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	195	2	2	mg/L	200		98	85-115		
<b>LCS Dup (BD40410-BSD1)</b>					Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	197	2	2	mg/L	200		98	85-115	0.8	200
<b>Duplicate (BD40410-DUP1)</b>					Source: 1403468-09 Prepared: 04/04/14 Analyzed: 04/09/14					
Carbonaceous BOD	2 U	2	2	mg/L		ND				25
<b>Batch BD40415 - Ion Chromatography 300.0 Prep</b>										
<b>Blank (BD40415-BLK1)</b>					Prepared & Analyzed: 04/04/14					
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.912			mg/L	1.0		91	90-115		
<b>LCS (BD40415-BS1)</b>					Prepared & Analyzed: 04/04/14					
Nitrite (as N)	1.36	0.04	0.01	mg/L	1.4		97	85-115		
Nitrate (as N)	1.71	0.04	0.01	mg/L	1.7		100	85-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
Surrogate: Dichloroacetate	1.08			mg/L	1.0		108	90-115		
<b>LCS Dup (BD40415-BSD1)</b>					Prepared & Analyzed: 04/04/14					
Nitrite (as N)	1.38	0.04	0.01	mg/L	1.4		98	85-115	2	200
Nitrate (as N)	1.77	0.04	0.01	mg/L	1.7		104	85-115	3	200
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	90-115		
Surrogate: Dichloroacetate	1.14			mg/L	1.0		114	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 BD40415 - Ion Chromatography 300.0 Prep</b>										
<b>Matrix Spike (BD40415-MS1)</b>		<b>Source: 1403468-09</b>			Prepared & Analyzed: 04/04/14					
Nitrate (as N)	1.59	0.04	0.01	mg/L	1.7	ND	94	85-115		
Nitrite (as N)	1.38	0.04	0.01	mg/L	1.4	ND	99	85-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
Surrogate: Dichloroacetate	0.910			mg/L	1.0		91	90-115		
<b>Matrix Spike (BD40415-MS2)</b>		<b>Source: 1403468-20</b>			Prepared & Analyzed: 04/07/14					
Nitrate (as N)	4.48	0.04	0.01	mg/L	1.7	2.83	97	85-115		
Nitrite (as N)	1.55	0.04	0.01	mg/L	1.4	ND	111	85-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
Surrogate: Dichloroacetate	0.969			mg/L	1.0		97	90-115		
<b>Batch BD40936 - Ammonia by SEAL</b>										
<b>Blank (BD40936-BLK1)</b>		Prepared & Analyzed: 04/10/14								
Ammonia as N	0.009 U	0.040	0.009	mg/L						
<b>LCS (BD40936-BS1)</b>		Prepared & Analyzed: 04/10/14								
Ammonia as N	0.51	0.040	0.009	mg/L	0.50		102	90-110		
<b>Matrix Spike (BD40936-MS1)</b>		<b>Source: 1403468-06</b>			Prepared & Analyzed: 04/10/14					
Ammonia as N	0.62	0.040	0.009	mg/L	0.50	0.11	101	90-110		
<b>Matrix Spike Dup (BD40936-MSD1)</b>		<b>Source: 1403468-06</b>			Prepared & Analyzed: 04/10/14					
Ammonia as N	0.64	0.040	0.009	mg/L	0.50	0.11	106	90-110	4	10
<b>Batch BD41020 - Digestion for TP and TKN</b>										
<b>Blank (BD41020-BLK1)</b>		Prepared: 04/10/14 Analyzed: 04/15/14								
Total Kjeldahl Nitrogen	0.050 U	0.20	0.050	mg/L						

# SOUTHERN ANALYTICAL LABORATORIES, INC.

110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 FAX 813-855-2218



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

April 25, 2014  
Work Order: 1403468

## Inorganic, Dissolved - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD41020 - Digestion for TP and TKN</b>										
<b>LCS (BD41020-BS1)</b>					Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	1.08	0.20	0.050	mg/L	1.0		108	90-110		
<b>Matrix Spike (BD41020-MS1)</b>					Source: 1403467-07 Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	9.55	0.20	0.050	mg/L	1.0	8.66	89	90-110		
<b>Matrix Spike Dup (BD41020-MSD1)</b>					Source: 1403467-07 Prepared: 04/10/14 Analyzed: 04/15/14					
Total Kjeldahl Nitrogen	9.64	0.20	0.050	mg/L	1.0	8.66	99	90-110	1	20

# SOUTHERN ANALYTICAL LABORATORIES, INC.

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10002 Princess Palm Ave, Suite 200  
Tampa, FL 33619

April 25, 2014  
Work Order: 1403468

## Microbiology - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
<b>Batch BD40401 - FC-MF</b>										
<b>Blank (BD40401-BLK1)</b>					Prepared: 04/03/14 Analyzed: 04/04/14					
Fecal Coliforms	1 U	1	1	CFU/100 ml						
<b>Duplicate (BD40401-DUP1)</b>					<b>Source: 1403467-10</b> Prepared: 04/03/14 Analyzed: 04/04/14					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200
<b>Duplicate (BD40401-DUP2)</b>					<b>Source: 1403468-21</b> Prepared: 04/03/14 Analyzed: 04/04/14					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200

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

**April 25, 2014**  
**Work Order: 1403468**

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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.

- Q Sample held beyond the accepted holding time.  
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





Client Name Hazan and Sawyer										Contact / Phone: Josefin Hirst 813-630-4498									
Project Name / Location BHS3 SE#8																			
Samplers: (Signature) <i>[Signature]</i>										PARAMETER / CONTAINER DESCRIPTION									
<p>Matrix Codes:            DW-Drinking Water WW-Wastewater            SW-SurfaceWater SL-Sludge SO-Soil            GW-Groundwater SA-Saline Water O-Other            R-Reagent Water</p>																			
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	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, Cl, OP, SO <sub>4</sub>	125mLP, H <sub>2</sub> SO <sub>4</sub> COD, TKN, NH <sub>3</sub> , TP	500mLP, NaOH & Zn Acetate H <sub>2</sub> S	500mLP, Cool Lab Filtered (CBOD, TKN, NH <sub>3</sub> , NOx)	500mLP, Cool Lab Filtered (CBOD, TKN, NH <sub>3</sub> , NOx, SO <sub>4</sub> )			pH	Temperature	Conductivity	DO
	01	BHS3-STE	4/3/14	10:32	WW		X	4	2	1	1					6.95	20.7	978	0.08
	02	BHS3-STE-FILTERED		10:32	WW		X					2				6.95	20.7	978	0.08
	03	BHS3-LY01		11:15	WW		X		21	1						7.05	22.4	711	NR
	04	BHS3-LY02		11:00	WW		X		21	1						6.43	22.8	780	5.44
	05	BHS3-LINER		10:25	WW		X	4	2	1						6.98	23.3	809	3.16
	06	BHS3-LINER-FILTERED		10:25	WW		X					2				6.98	23.3	809	3.16
	07	BHS3-ST2		9:40	WW		X	4	2	1	1					7.03	20.6	927	0.00
	08	BHS3-ST2-DUP		9:50	WW		X	4	2	1	1					7.03	20.6	927	0.00
	09	BHS3-ST2-FILTERED		9:40	WW		X						2			7.03	20.6	927	0.00
	10	BHS3-LY03		10:45	WW		X		21	1						6.64	22.6	892	5.01
	11	BHS3-LY04		10:40	WW		X		21	1						6.58	22.7	818	3.67
	12	BHS3-PZ-01		9:38	WW		X		21	1						6.38	21.9	693	4.85
Containers Prepared		Date/Time: 1500	Received: <i>[Signature]</i>		Date/Time: 03-27-14		Seal intact? Y N <input checked="" type="checkbox"/> Samples intact upon arrival? <input checked="" type="checkbox"/> N NA Received on ice? Temp. <input checked="" type="checkbox"/> N NA Proper preservatives indicated? <input checked="" type="checkbox"/> N NA Rec'd within holding time? <input checked="" type="checkbox"/> N NA Volatiles rec'd w/out headspace? Y N <input checked="" type="checkbox"/> Proper containers used? <input checked="" type="checkbox"/> N NA												
Relinquished: <i>[Signature]</i>		Date/Time: 03-26-14	Received: <i>[Signature]</i>		Date/Time: 1535														
Relinquished: <i>[Signature]</i>		Date/Time: 4/3/14	Received: <i>[Signature]</i>		Date/Time: 4/3/14														
Relinquished:		Date/Time:	Received:		Date/Time:														
Relinquished:		Date/Time:	Received:		Date/Time:														
Relinquished:		Date/Time:	Received:		Date/Time:		Instructions / Remarks												
Relinquished:		Date/Time:	Received:		Date/Time:														
Relinquished:		Date/Time:	Received:		Date/Time:														
Relinquished:		Date/Time:	Received:		Date/Time:														
Relinquished:		Date/Time:	Received:		Date/Time:														

Client Name <b>Hazan and Sawyer</b>										Contact / Phone: <b>Josefin Hirst 813-630-4498</b>									
Project Name / Location <b>BHS3 SE#8</b>																			
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	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, Cl, OP, SO <sub>4</sub>	125mLP, H <sub>2</sub> SO <sub>4</sub> , COD, TKN, NH <sub>3</sub> , TP	500mLP, NaOH & Zn Acetate H <sub>2</sub> S	500mLP, Cool Lab Filtered (CBOD, TKN, NH <sub>3</sub> , NOx)	500mLP, Cool Lab Filtered (CBOD, TKN, NH <sub>3</sub> , NOx, SO <sub>4</sub> )	500mLP, Cool Total Alkalinity, NOx, Cl, SO <sub>4</sub>	125mLP, H <sub>2</sub> SO <sub>4</sub> , TKN, NH <sub>3</sub>	pH	Temperature	Conductivity	DO
	13	BHS3-PZ08	4/3/14	10:08	WW		X	2	1	1						5.67	20.6	527	3.43
	14	BHS3-PZ09			WW		X	4	2	1	1								
	15	PZ-A7-6		9:18	WW		X							1	1	5.99	20.2	655	0.74
	16	PZ-A7-8		9:33	WW		X							1	1	5.90	20.6	536	0.64
	17	PZ-B8-5		9:05	WW		X							1	1	5.96	20.8	388	1.19
	18	PZ-B8-5-DUP		9:10	WW		X							1	1	5.96	20.8	388	1.19
	19	PZ-B8-7		9:20	WW		X							1	1	6.03	20.9	291	0.26
	20	PZ-C10-6		8:58	WW		X							1	1	6.18	20.3	493	0.86
	21	EB		11:19	R		X	4	2	1	1					7.28	24.0	2	7.54

Containers Prepared/Relinquished:	Date/Time: 1/6/00	Received:	Date/Time: 03-26-14	Received:	Date/Time: 03-27-14 12:42	Seal intact?	Y N <input checked="" type="radio"/> N/A	Instructions / Remarks
Relinquished:	Date/Time: 03-26-14	Received:	Date/Time: 03-27-14	Received:	Date/Time: 12:42	Samples intact upon arrival?	<input checked="" type="radio"/> Y N N/A	
Relinquished:	Date/Time: 4/3/14	Received:	Date/Time: 4/3/14	Received:	Date/Time: 1535	Received on ice? Temp	<input checked="" type="radio"/> Y N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Received:	Date/Time:	Proper preservatives indicated?	<input checked="" type="radio"/> Y N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Received:	Date/Time:	Rec'd within holding time?	<input checked="" type="radio"/> Y N N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Received:	Date/Time:	Volatiles rec'd w/out headspace?	<input checked="" type="radio"/> Y N <input checked="" type="radio"/> N/A	
Relinquished:	Date/Time:	Received:	Date/Time:	Received:	Date/Time:	Proper containers used?	<input checked="" type="radio"/> Y N N/A	



## Appendix B: Operation & Maintenance Log

**Table B.1**  
**Operation and Maintenance Log**

Date	Description
7/25/2011	C-HS2 Groundwater Sample Event 1
11/30/2011	C-HS2 Groundwater Sample Event 2
3/13/2012	C-HS2 Groundwater Sample Event 3
7/10/2012	C-HS2 Groundwater Sample Event 4
6/14/2013	PNRS Pre-construction sample event
6/17/2013	PNRS construction. Old septic tank removed, new septic tank installed
	Stage 2 biofilter installed
6/18/2013	PNRS construction - backfill to set tanks, anchor trench for liner area
6/19/2013	PNRS construction - liner installed by Comanco
	Ligno and sand 50/50 filled to toe of lined area, fill dirt to grade
6/24/2013	New piezometers PZ-07, PZ-08, and PZ-09 installed and developed
	4 Lysimeters installed
6/26/2013	Both drip systems covered
7/9/2013	Electrician installed panel for system
7/11/2013	Electrician set up panel for hydraulic unit
	Dose times and volumes set
7/12/2013	System start-up
	Installed priming tee on pump. Installed reclaimed water flowmeter
7/17/2013	System check
7/22/2013	Repaired leaks in feed and return lines
	Installed new fittings for air release valves
7/29/2013	System check
7/31/2013	Sod installation
8/15/2013	Preliminary SE#1
9/5/2013	Checked system
9/8/2013	Homeowner reported alarm went off at 9 pm
9/9/2013	System check - high water level in STE dose tank
	Both filters severely clogged - not able to dose
9/10/2013	System check, still high alarm - high water level in STE dose tank

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Date	Description
9/10/2013	Not able to fix system - need replacement part for hydraulic unit
	Septic tank was pumped at 4 pm
9/11/2013	Homeowner reported no alarms
9/13/2013	System check
9/17/2013	Installed replacement solenoid coil on backwash filter valve #2
	System operational again, septic tank very low volume
9/27/2013	SE#1 prep
	Applied vacuum to lysimeters
	Cleaned STE outlet filter screen
9/30/2013	Sample Event No. 1
10/11/2013	System check
	Uploaded new program
10/17/2013	System check
	Bio valve ahead of pump had sand under the diaphragm in valve
11/8/2013	System check
11/15/2013	System check
11/27/2013	System check
12/2/2013	Sample Event No. 2 preparation
12/4/2013	Sample Event No. 2
12/23/2013	System check
1/23/2014	System check
1/30/2014	Sample Event No. 3 preparation
2/3/2014	Sample Event No. 3
2/4/2014	Sample Event No. 4
2/5/2014	Sample Event No. 5
2/6/2014	Sample Event No. 6
2/7/2014	Sample Event No. 7
2/12/2014	System check
3/14/2014	System check
4/3/2014	Sample Event No. 8 (formal No. 4)

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## Appendix C: Weather Station Data

**Table C.1**  
**Weather Station Data**

2014 Feb	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Pressure (in)			Wind (mph)			Precip (in)
	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	gust	sum
<a href="#">1</a>	75	68	60	73	66	59	97	94	91	29.68	29.62	29.56	0	0	0	0.06
<a href="#">2</a>	81	73	67	74	69	65	95	89	69	29.7	29.65	29.6	0	0	0	0
<a href="#">3</a>	83	73	66	75	68	63	95	86	62	29.66	29.61	29.57	7	0	8	0.08
<a href="#">4</a>	84	75	67	74	70	-3	95	85	3	30	29.78	29.57	5	0	5	0
<a href="#">5</a>	85	77	71	74	72	69	93	84	66	29.61	29.56	29.51	12	0	12	0
<a href="#">6</a>	75	63	53	72	59	0	93	87	74	29.71	29.65	29.58	16	0	16	0.19
<a href="#">7</a>	60	57	53	58	56	51	95	94	92	29.71	29.67	29.63	10	0	10	0.2
<a href="#">8</a>	60	59	57	59	57	55	95	94	93	29.69	29.64	29.58	0	0	8	0.31
<a href="#">9</a>	106	62	4	62	50	-22	93	68	4	30.22	29.85	29.48	16	0	16	6.78
<a href="#">10</a>	71	62	58	55	54	50	85	74	48	29.97	29.95	29.94	0	0	0	0
<a href="#">11</a>	78	66	55	61	57	48	92	74	44	30.08	29.98	29.88	5	0	5	6.02
<a href="#">12</a>	78	66	60	64	60	29	94	84	57	30.06	29.88	29.69	18	0	18	1.08
<a href="#">13</a>	64	58	49	62	52	44	95	81	62	30	29.84	29.68	12	2	17	0
<a href="#">14</a>	66	53	44	49	43	36	95	72	37	30.1	30.02	29.94	5	0	5	0
<a href="#">15</a>	70	58	53	57	48	34	93	73	29	30.15	30.02	29.9	8	1	13	0
<a href="#">16</a>	71	55	46	48	44	32	90	71	26	30.22	30.17	30.12	7	0	7	3.93
<a href="#">17</a>	77	58	46	50	45	37	91	67	25	30.27	30.22	30.16	1	0	1	0
<a href="#">18</a>	79	65	52	57	53	48	86	66	40	30.25	30.2	30.16	1	0	3	0
<a href="#">19</a>	82	69	58	64	59	55	94	72	40	30.21	30.14	30.07	1	0	2	0
<a href="#">20</a>	85	69	60	67	62	57	96	81	45	30.18	30.12	30.06	5	0	5	0
<a href="#">21</a>	80	71	68	71	67	65	96	88	72	30.08	30.03	29.99	6	0	6	0
<a href="#">22</a>	75	70	64	72	67	61	96	93	86	30.12	30.08	30.03	4	0	4	0.65
<a href="#">23</a>	82	69	62	70	65	60	96	88	62	30.1	30.03	29.97	10	0	10	0.02
<a href="#">24</a>	73	68	63	66	64	60	96	87	76	30.09	30.03	29.97	4	0	6	0
<a href="#">25</a>	67	62	61	63	60	59	95	93	83	30.08	30.04	30	3	0	3	0.01
<a href="#">26</a>	69	65	61	64	62	59	95	91	78	29.91	29.82	29.73	7	0	7	0.66
<a href="#">27</a>	64	58	53	62	53	47	96	85	64	29.99	29.89	29.79	7	0	7	0.09
<a href="#">28</a>	71	58	48	53	48	42	90	72	42	30.13	30.04	29.96	7	0	7	0

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**Table C.1**  
**Weather Station Data (continued)**

2014	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Pressure (in)			Wind (mph)			Precip (in)
Mar	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	gust	sum
1	74	61	51	61	54	49	96	81	57	30.25	30.17	30.1	7	0	7	0
2	79	67	56	63	59	53	95	77	53	30.23	30.15	30.07	1	0	2	0
3	83	71	58	63	60	56	93	71	43	30.08	30.01	29.95	8	0	12	0
4	79	68	59	65	62	57	95	82	60	30.08	30.02	29.97	5	0	5	0
5	73	63	59	63	59	57	94	86	68	30.09	30.03	29.98	6	0	6	0
6	69	64	59	68	62	57	96	93	81	30.06	29.88	29.71	3	0	6	0.15
7	62	57	49	60	53	44	95	86	76	30.08	29.94	29.79	12	1	12	0
8	74	60	49	57	51	45	90	74	48	30.18	30.12	30.07	6	0	6	0
9	80	66	54	56	54	49	91	68	36	30.22	30.15	30.08	7	0	7	0
10	82	66	56	57	54	45	88	69	30	30.15	30.06	29.97	6	0	6	0
11	84	67	56	60	55	50	95	69	32	30.02	29.93	29.84	6	0	6	0
12	80	72	66	68	64	58	94	76	51	29.86	29.79	29.72	9	1	13	0.21
13	71	64	54	61	50	34	86	64	30	30.23	30.03	29.84	10	1	10	0
14	76	61	47	54	49	43	87	66	44	30.3	30.24	30.17	4	0	4	0
15	82	68	55	58	54	49	89	64	32	30.21	30.12	30.04	2	0	4	0
16	85	73	62	63	60	58	90	66	42	30.06	29.9	29.75	6	0	7	0
17	76	73	69	72	68	63	96	84	69	29.8	29.74	29.67	7	0	7	0.28
18	77	68	61	71	62	54	96	82	46	30.07	29.84	29.61	10	1	12	0.09
19	80	67	59	62	58	56	92	75	45	30.14	30.08	30.02	4	0	4	0.04
20	82	69	60	63	59	57	94	73	46	30.1	30.03	29.97	4	0	5	0.04
21	82	68	61	63	60	56	94	77	42	30.12	30.08	30.03	2	0	4	0.01
22	86	72	68	68	63	54	91	75	39	30.08	30.01	29.94	8	0	8	0.01
23	82	72	65	68	64	57	86	75	62	30.06	29.99	29.92	12	0	12	0
24	75	69	65	67	63	59	90	81	67	30.09	30.01	29.93	6	0	6	0.01
25	77	67	60	62	55	35	93	70	32	30.04	29.94	29.83	18	1	18	0
26	67	55	46	44	34	26	77	47	33	30.32	30.18	30.04	10	0	10	0
27	68	58	50	60	52	44	88	81	64	30.34	30.28	30.23	0	0	0	0
28	82	71	62	67	63	59	93	76	51	30.23	30.13	30.03	5	0	6	0
29	75	70	68	72	68	65	96	91	78	30.06	29.97	29.88	14	0	14	1.24
30	78	66	56	66	53	-18	93	66	33	30.1	30.01	29.92	9	1	9	0.11
31	80	65	53	55	50	42	90	63	26	30.17	30.12	30.08	3	0	5	0
2014	Temp. (°F)			Dew Point (°F)			Humidity (%)			Sea Level Pressure (in)			Wind (mph)			Precip (in)
Apr	high	avg	low	high	avg	low	high	avg	low	high	avg	low	high	avg	gust	sum
1	87	71	52	59	52	39	95	57	21	30.21	30.15	30.1	4	0	4	0
2	87	71	57	62	57	52	96	66	31	30.21	30.16	30.11	2	0	3	0
3	89	74	60	67	62	58	95	68	39	30.17	30.1	30.03	5	0	5	0

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