



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

B-HS5 Field System Monitoring Report No. 4

Progress Report

May 2014

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In association with:



AET
Applied Environmental Technology

**Otis Environmental
Consultants, LLC**

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK B.7 PROGRESS REPORT

B-HS5 Field System Monitoring Report No. 4

Prepared for:

Florida Department of Health
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Bureau of Environmental Health
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1.0 Background

Task B of the Florida Onsite Sewage Nitrogen Reduction Strategies Study (FOSNRS) includes performing field experiments to critically evaluate the performance of nitrogen removal technologies that were identified in FOSNRS Task A.9 and pilot tested in Task A.26. 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 the passive nitrogen reduction system at home site B-HS5 in Seminole County, Florida.

2.0 Purpose

Operation of the B-HS5 system was initiated on July 9, 2013. This monitoring report documents data collected from the fourth B-HS5 monitoring and sampling event conducted on April 11, 2014 (Experimental Day 276). This monitoring event consisted of collecting flow measurements from the household water use meter, treatment system flow meters, recording electricity use, monitoring of field parameters, collection of water samples from four 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-HS5 field site is located in Seminole County, FL. The nitrogen reducing onsite treatment system for the single family residence was installed in June 2013. Design and construction details were presented previously in the Task B.6 document. Figure 1 is a system schematic showing the system components and layout of the installation. A flow schematic of the system is shown in Figure 2. The PNRS system consists of the addition of three tanks to the existing permitted system: a 1500 gallon plastic tank Stage 1 unsaturated media filter; 300 gallon concrete pump tank; and 1,500 gallon two

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

PRELIMINARY

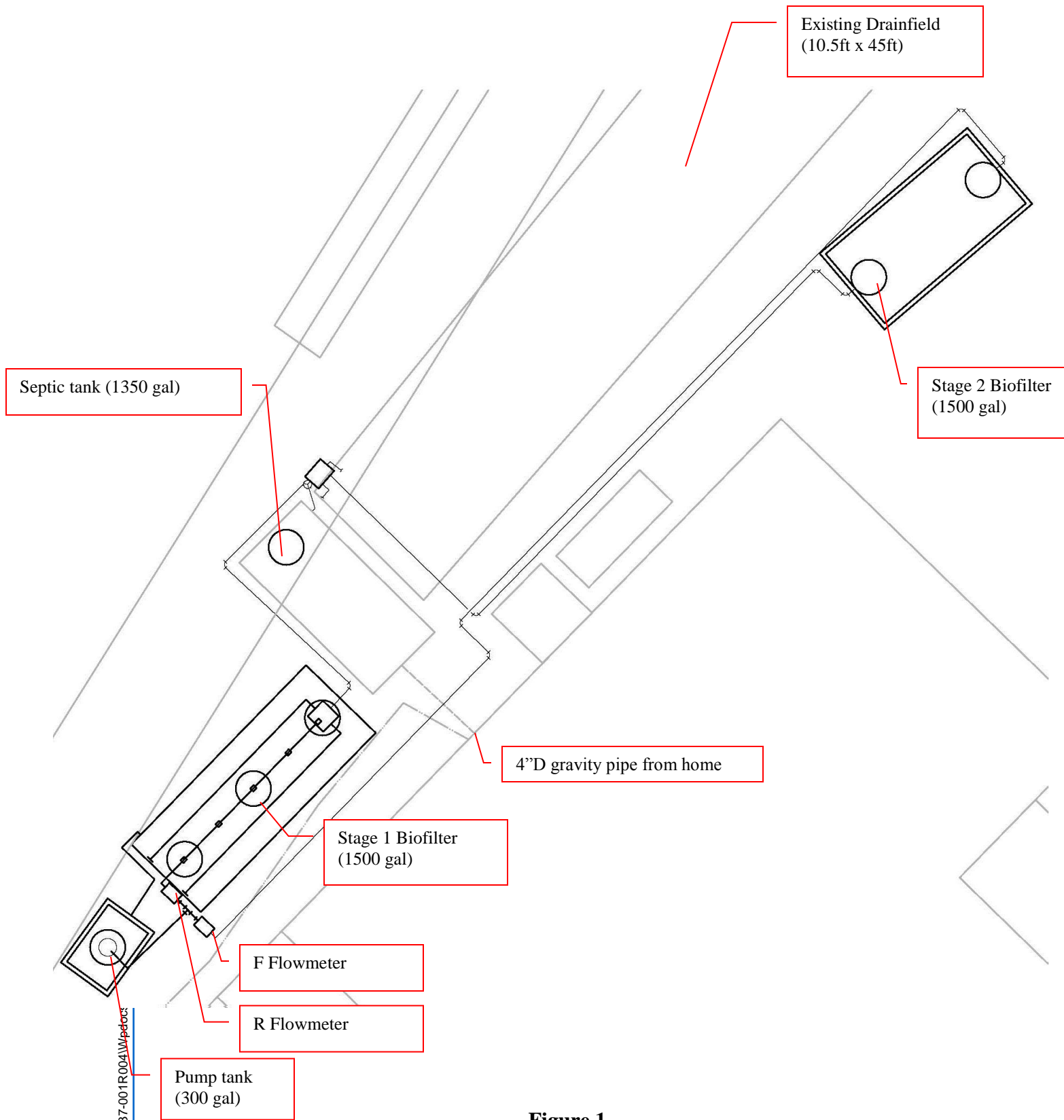


Figure 1
Plan View of B-HS5 System Layout

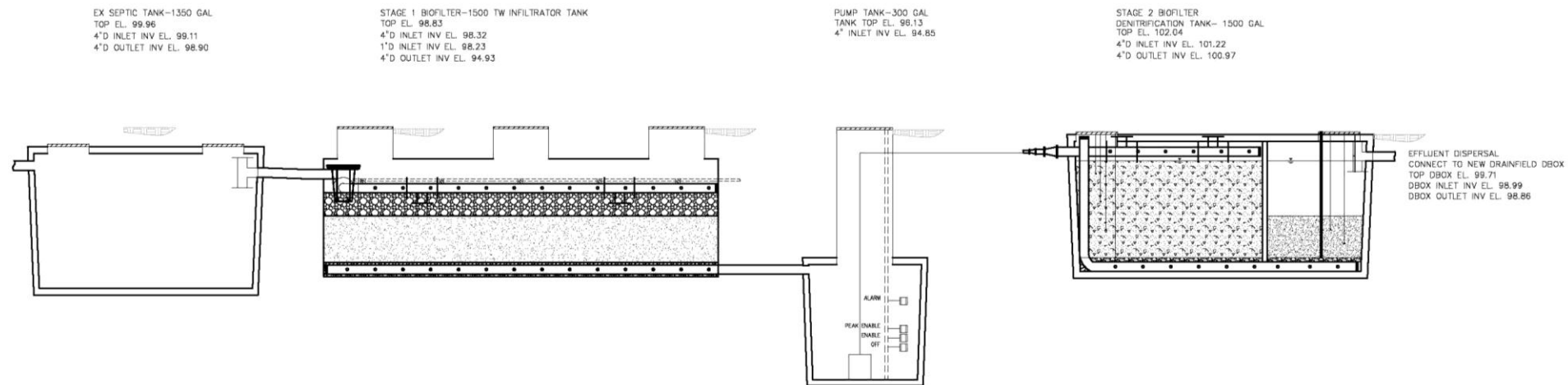


Figure 2
Flow Schematic of B-HS5 PNRS

3.2 Monitoring and Sample Locations and Identification

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

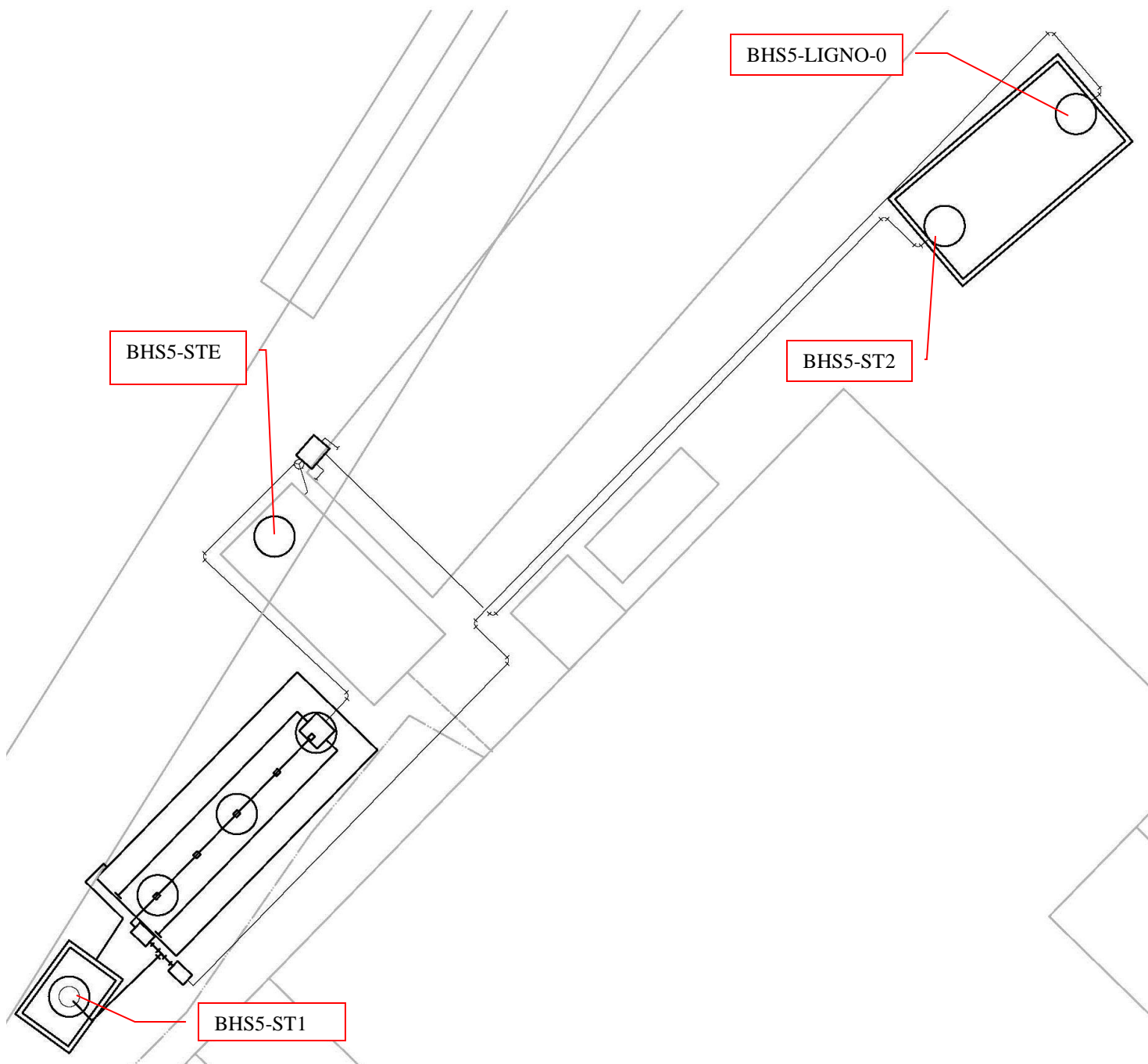


Figure 3
B-HS5 Sample and Monitoring Locations

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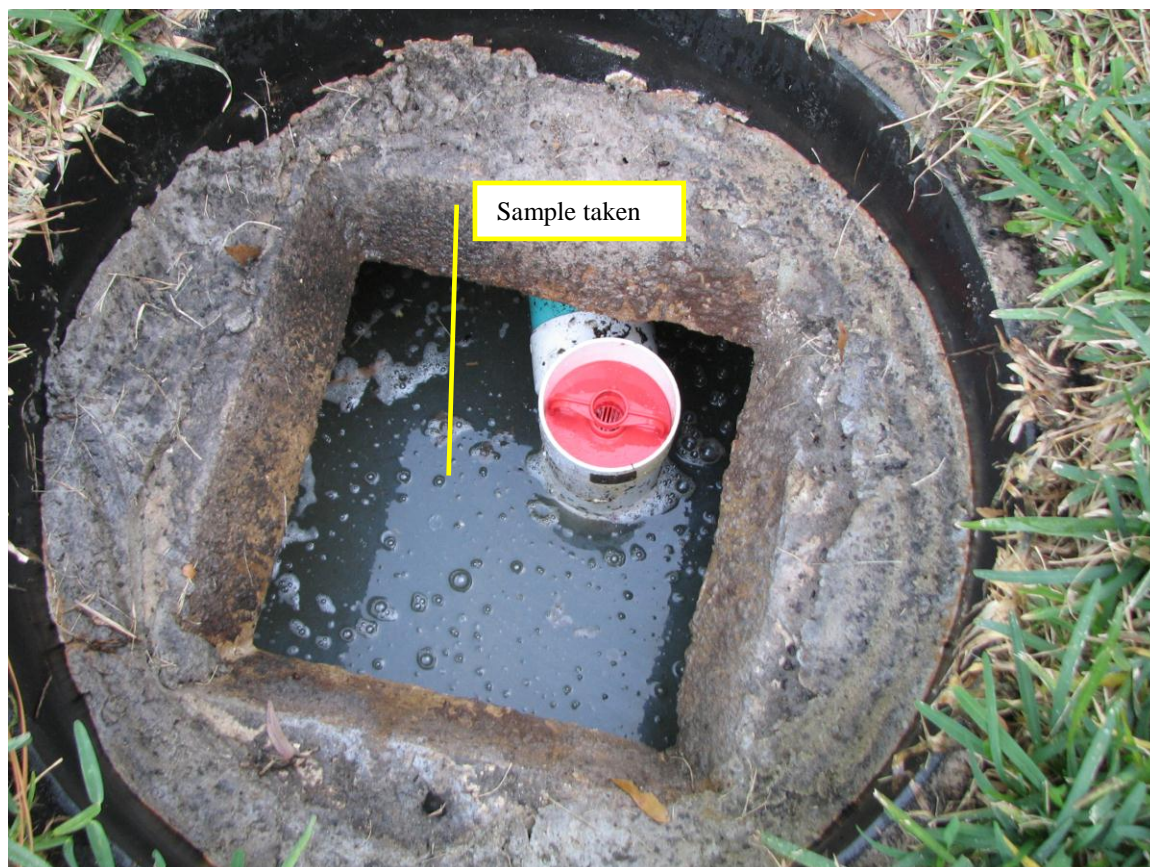


Figure 4
Primary Tank (B-HS5-STE sample)

The primary tank contents are discharged by gravity to a distribution box, located inside the Stage 1 biofilter, which splits the flow between two perforated distribution pipes along the top of the unsaturated Stage 1 biofilter media. In the Stage 1 biofilter, wastewater percolates downward through the unsaturated expanded clay media where nitrification occurs. The Stage 1 biofilter contains 12.8 inches of coarse expanded clay media (Riverlite™ 1/4; 1.1 to 4.8 mm) above 21 inches of finer expanded clay media (Riverlite™ 3/16; 0.6 to 2.4 mm). Stage 1 biofilter effluent flows into the pump tank by gravity. The second sampling point (B-HS5-ST1), is sampled approximately 1.5 feet below the surface of the pump tank representing the Stage 1 biofilter effluent (Figure 5).

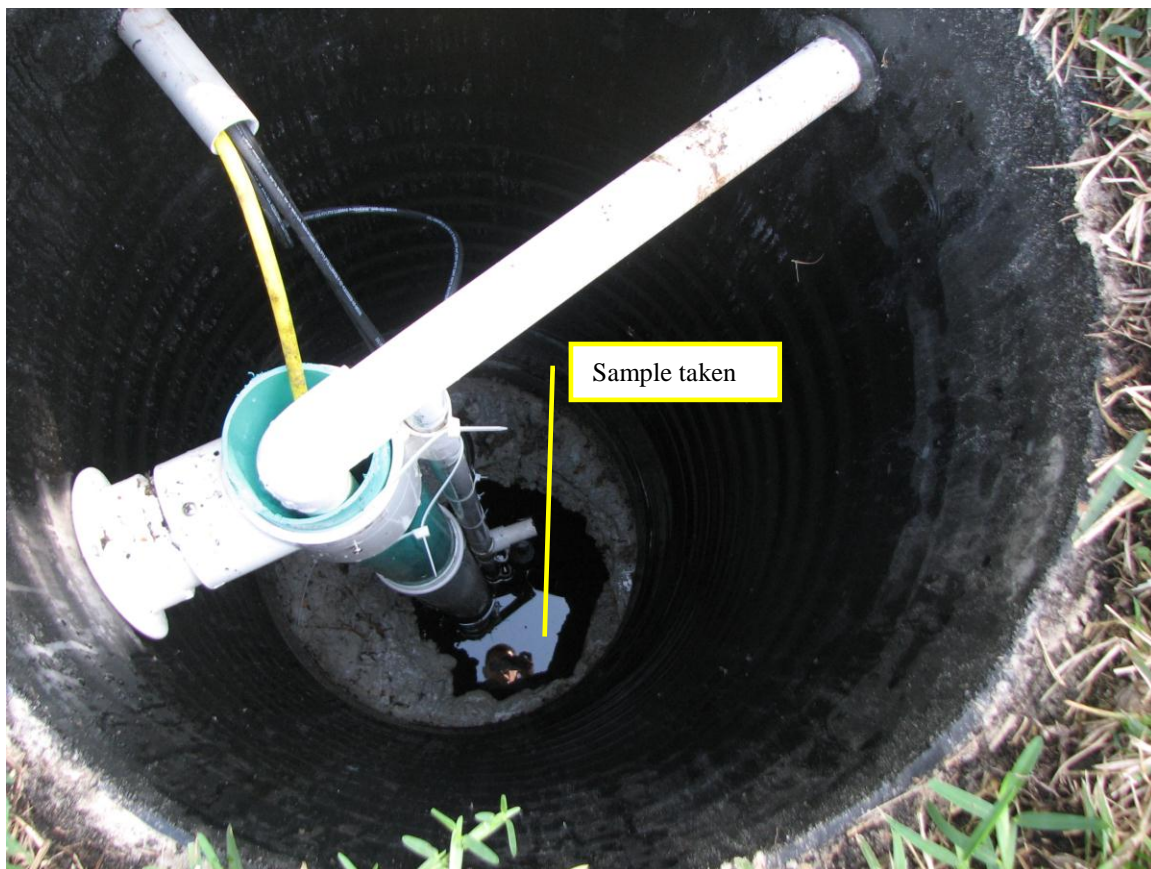


Figure 5
Stage 1 Effluent in Pump Tank (B-HS5-ST1 sample)

The pump tank discharge is split via two throttling gate valves which allow for optional recycling of a portion of the Stage 1 biofilter effluent with the balance proceeding to the Stage 2 biofilter. The system was designed with two operational modes. In the first mode, 100 percent of the Stage 1 effluent is discharged to the Stage 2 biofilter. Initial operation of B-HS5 has been in the non-recirculation mode, which has been in effect since system start-up including the period leading up to this monitoring event. The second operating mode is to recirculate the Stage 1 effluent to the top of the Stage 1 biofilter and disperse it by five spray nozzles. The recirculated effluent would have an opportunity to mix with incoming septic tank effluent discharged by the distribution box. Recirculation back to the Stage 1 biofilter increases the hydraulic loading on the Stage 1 biofilter.

Effluent from the unsaturated (Stage 1) media tank enters the denitrification (Stage 2) biofilter into a standing water column lying above the media in the first chamber (lignocellulosic media), flows downward through the media, moves laterally through the

baffle wall to the bottom of the second chamber, and upward through the media in the second chamber (elemental sulfur and oyster shell).

The first chamber of the Stage 2 biofilter contains 42-inches of lignocellulosic media as a supplemental carbon source for denitrification, a blended urban waste wood from Mother's Organics, Inc., Thonotosassa, FL. Stainless steel samplers are positioned at 12-inch increments for vertical profiling throughout the lignocellulosic media. The third monitoring point is a stainless steel sampler positioned at the bottom of the lignocellulosic media (B-HS5-LIGNO-0) with tubing to the surface. The B-HS5-LIGNO-0 sample represents the lignocellulosic media effluent (Figure 6).

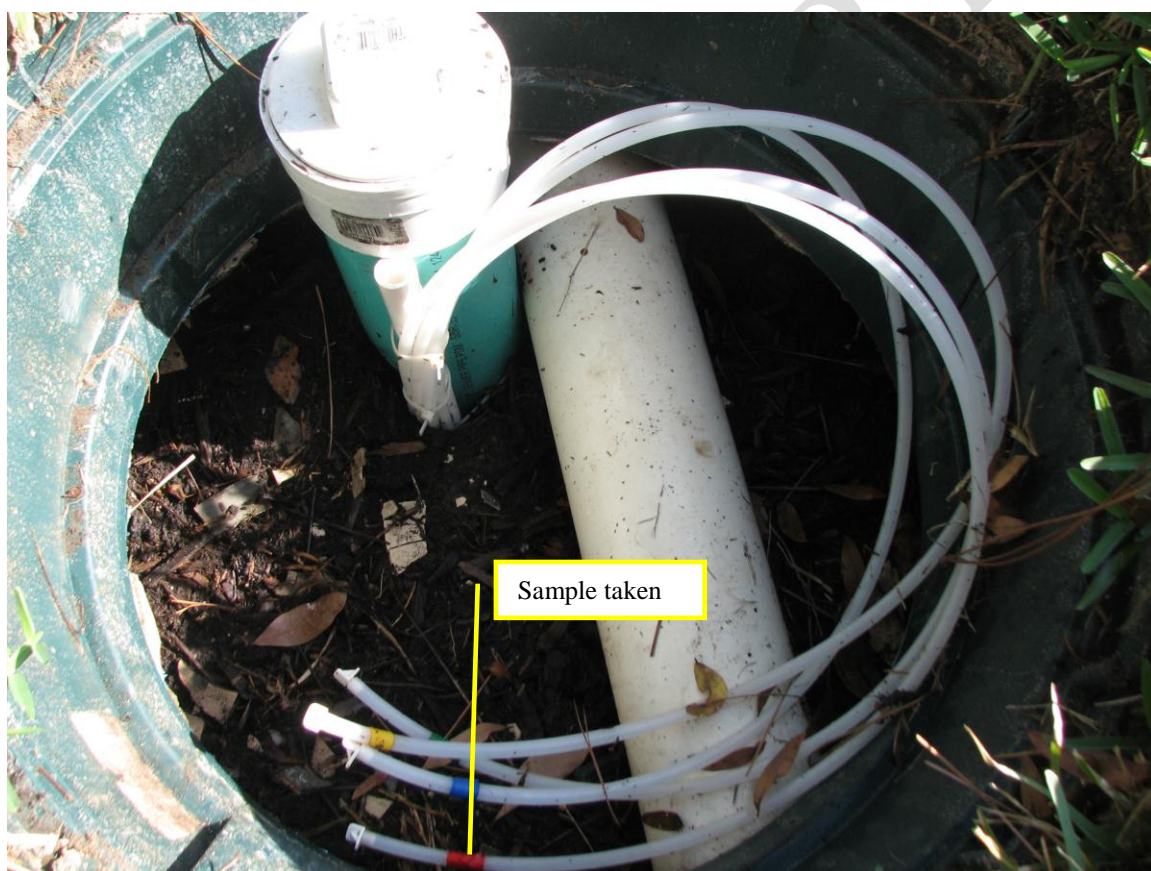


Figure 6
First chamber of Stage 2 biofilter (B-HS5-LIGNO-0" sample)

A collection pipe along the bottom transfers the first chamber (lignocellulosic media) effluent to the second chamber, which contains 18-inches of elemental sulfur mixed with oyster shell media. The fourth monitoring point, B-HS5-ST2, is the second chamber of the Stage 2 biofilter effluent which is sampled approximately 1 foot below the surface of the effluent baffle tee. This sample location is after passage through the sulfur media; it is the final effluent from the treatment system prior to being discharged to the soil infiltration system, or drainfield (Figure 7).



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

3.3 Operational Monitoring

Start-up of the system occurred on July 9, 2013 (Experimental Day 0). The PNRS system has operated continually since that date. For this fourth formal sampling event, the water meter for the house and treatment system flow meters were read and recorded on April 11, 2014. The household water meter is located on the potable water line from the onsite well prior to entering the household plumbing. The water meter does not include the irrigation water use. Therefore, the water meter reading should be indicative of the wastewater flow to the system.

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

3.4 Energy Consumption

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

3.5 Water Quality Sample Collection and Analyses

The fourth formal sample event (Sample Event No. 8) was conducted on April 11, 2014 (Experimental Day 276). A full suite of influent, intermediate and effluent water quality samples were collected from the system for water quality analysis. Samples were collected at each of the four monitoring points described in Section 3.2: B-HS5-STE, B-

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

Immediately subsequent to the regular samples for each primary monitoring point, additional sample was collected to be filtered at the laboratory (0.45 micron filter) for analysis of CBOD₅ and the nitrogen species to allow for comparison to the unfiltered sample water quality results. In addition, a field sample duplicate was taken. The field sample duplicate (B-HS5-ST1) was collected immediately subsequent to the regular samples.

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

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

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

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

4.0 Results and Discussion

4.1 Operational Monitoring

Table 2 provides a summary of the household water use since the water meter installation on February 12, 2013. The treatment system flow meter readings for the B-HS5 field site are summarized in Table 3. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B. Summary tables of the Vericomm PLC recorded data are provided in Appendix C, Table C.1 and Table C.2. These include daily and cumulative pump runtime and system alarms that are used to check general pump operation and performance.

Table 2
Summary of Household Water Use Flowmeter

| Date and Time Read | Cumulative Volume (gallons) | Average Daily Household Flow between readings, Q (gpd) | Average Daily Household Flow Since start-up, Q (gpd) |
|---------------------------|--|---|---|
| 2/12/2013 10:30 | 166.0 | INSTALLED | INSTALLED |
| 2/21/2013 10:45 | 1,130.3 | 107.0 | 107.0 |
| 2/28/2013 11:45 | 2,323.9 | 169.5 | 134.4 |
| 3/7/2013 10:25 | 2,832.1 | 73.2 | 115.9 |
| 6/14/2013 13:00 | 13,460.9 | 107.2 | 108.9 |
| 6/25/2013 8:53 | 14,860.1 | 129.2 | 110.5 |
| 7/23/2013 8:31 | 17,659.4 | 100.0 | 108.7 |
| 7/29/2013 11:10 | 18,769.2 | 181.6 | 111.4 |
| 8/15/2013 12:28 | 21,078.4 | 135.4 | 113.6 |
| 8/27/2013 9:15 | 22,427.8 | 113.7 | 113.6 |
| 9/27/2013 10:40 | 25,738.3 | 106.6 | 112.6 |
| 11/8/2013 10:30 | 31,992.8 | 148.9 | 118.3 |
| 11/27/2013 11:12 | 34,400.8 | 126.5 | 118.9 |
| 12/4/2013 14:34 | 35,292.8 | 124.9 | 119.0 |
| 12/23/2013 12:38 | 37,649.1 | 124.5 | 119.3 |
| 1/23/2014 10:00 | 42,526.6 | 157.9 | 122.8 |
| 1/31/2014 13:00 | 43,688.6 | 143.0 | 123.3 |
| 2/3/2014 8:40 | 43,688.6 | 0.0 | 122.3 |
| 2/4/2014 11:45 | 43,841.1 | 135.1 | 122.3 |
| 2/5/2014 9:45 | 43,928.5 | 95.3 | 122.3 |
| 2/6/2014 8:20 | 44,029.1 | 106.9 | 122.2 |
| 2/7/2014 10:30 | 44,175.2 | 134.0 | 122.2 |
| 2/12/2014 11:00 | 44,987.4 | 161.8 | 122.8 |
| 3/14/2014 9:50 | 48,684.9 | 123.5 | 122.8 |
| 4/11/2014 9:00 | 52,272.6 | 128.3 | 123.2 |

From start-up through April 11, 2014, the average household water use was 123.2 gallons per day with periods of higher and lower flows (Table 2).

Table 3
Summary of Treatment System Flowmeters

| Date | Recirculation Pumped Flow, R Water Meter Reading | Average Recirculation Ratio | Stage 2 Biofilter Pumped Flow, F Water Meter Reading | Average Daily Stage 2, Q between readings |
|--------------------------------------|---|-----------------------------------|---|--|
| | Cumulative Volume (gallons) | Recycle: Forward Flow | Cumulative Volume (gallons) | Gallons/Day |
| 7/5/2013 12:00 | 386.1 | 0.0 | | Installed |
| 7/9/2013 15:20 | 386.1 | 0.0 | 167.5 | Following testing |
| 7/12/2013 14:13 | 386.1 | 0.0 | 207.4 | 13.5 |
| 7/17/2013 9:02 | 386.1 | 0.0 | 995.6 | 164.8 |
| 7/23/2013 8:31 | 386.1 | 0.0 | 1,642.9 | 108.3 |
| 7/29/2013 11:10 | 386.1 | 0.0 | 2,733.4 | 178.5 |
| 8/6/2013 8:51 | 386.1 | 0.0 | 3,894.7 | 146.9 |
| 8/15/2013 11:40 | 386.1 | 0.0 | 4,884.6 | 108.6 |
| 8/27/2013 9:15 | 386.1 | 0.0 | 6,135.4 | 105.1 |
| 9/27/2013 10:40 | 386.1 | 0.0 | 9,035.2 | 93.4 |
| 11/8/2013 10:30 | 386.1 | 0.0 | 14,347.7 | 126.5 |
| 11/27/2013 10:55 | 386.1 | 0.0 | 16,591.6 | 118.0 |
| 12/4/2013 13:45 | 386.1 | 0.0 | 17,474.0 | 124.0 |
| 12/23/2013 12:38 | 386.1 | 0.0 | 19,610.1 | 112.7 |
| 1/23/2014 10:00 | 386.1 | 0.0 | 24,359.1 | 153.7 |
| 1/31/2014 13:00 | 386.1 | 0.0 | 25,506.3 | 141.2 |
| 2/3/2014 8:40 | 386.1 | 0.0 | 25,551.0 | 15.9 |
| 2/4/2014 11:45 | 386.1 | 0.0 | 25,659.1 | 95.7 |
| 2/5/2014 9:45 | 386.1 | 0.0 | 25,737.2 | 85.3 |
| 2/6/2014 8:20 | 386.1 | 0.0 | 25,836.3 | 105.3 |
| 2/7/2014 10:30 | 386.1 | 0.0 | 25,952.1 | 106.2 |
| 2/12/2014 11:00 | 386.1 | 0.0 | 26,756.2 | 160.2 |
| 3/14/2014 9:50 | 386.1 | 0.0 | 30,148.2 | 113.3 |
| 4/11/2014 9:00 | 386.1 | 0.0 | 33,578.8 | 122.7 |
| Total average start-up to 4/11/14 | | 0.0 | | 121.2 |

The two throttling gate valves control the fraction of Stage 1 effluent that is recirculated and the fraction sent to the Stage 2 biofilter. The gate valves were initially set so that 100 percent of the flow is to the Stage 2 tank (0 recycle ratio). From start-up through April 11, 2014, the average pumped flow (forward flow to the Stage 2 biofilter) was 121.2 gallons per day which correlates well with the household water use.

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4.2 Energy Consumption

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

Table 4
Summary of System Electrical Use

| Date and Time Read | Electrical Meter Reading | Average Daily Electrical Use between readings | Average Electrical Use per Gallon Treated | Average Electrical Use Per 1,000 Gallons Treated |
|-----------------------------------|--------------------------|---|---|--|
| | Cumulative (kWh) | (kWh/day) | (kWh/gal) | (kWh/1000 gal) |
| 7/5/2013 12:00 | | Installed | | |
| 7/9/2013 15:20 | 0.3 | Start-up | | |
| 7/12/2013 14:13 | 0.4 | 0.03 | 0.0025 | 2.5063 |
| 7/17/2013 9:02 | 0.6 | 0.04 | 0.0003 | 0.2537 |
| 7/23/2013 8:32 | 0.8 | 0.03 | 0.0003 | 0.3089 |
| 7/29/2013 11:10 | 1.2 | 0.07 | 0.0004 | 0.3669 |
| 8/6/2013 8:51 | 1.5 | 0.04 | 0.0003 | 0.2583 |
| 8/15/2013 11:40 | 1.8 | 0.03 | 0.0003 | 0.3030 |
| 8/27/2013 9:15 | 2.2 | 0.03 | 0.0003 | 0.3198 |
| 9/27/2013 10:40 | 3.1 | 0.03 | 0.0003 | 0.3104 |
| 11/8/2013 10:30 | 4.8 | 0.04 | 0.0003 | 0.3200 |
| 11/27/2013 10:55 | 5.5 | 0.04 | 0.0003 | 0.3119 |
| 12/4/2013 13:45 | 5.8 | 0.04 | 0.0003 | 0.3400 |
| 12/23/2013 12:38 | 6.5 | 0.04 | 0.0003 | 0.3277 |
| 1/23/2014 10:00 | 8.0 | 0.05 | 0.0003 | 0.3159 |
| 1/31/2014 13:00 | 8.4 | 0.05 | 0.0003 | 0.3487 |
| 2/3/2014 8:40 | 8.4 | 0.00 | 0.0000 | 0.0000 |
| 2/12/2014 11:00 | 8.8 | 0.04 | 0.0002 | 0.2487 |
| 3/14/2014 9:50 | 9.9 | 0.04 | 0.0003 | 0.3243 |
| 4/11/2014 9:00 | 11 | 0.04 | 0.0003 | 0.3206 |
| Total average start-up to 4/11/14 | | 0.04 | 0.0003 | 0.3203 |

The total average electrical use through April 11, 2014 was 0.04 kWh per day. The average electrical use per 1,000 gallons treated was 0.3203 kWh per 1,000 gallons treated, and this parameter has been fairly stable since start-up.

4.3 Water Quality

Water quality analytical results for Sample Event No. 4 are listed in Table 5. Nitrogen results are graphically displayed in Figure 8. A summary of the water quality data collected to date for the test system is presented in Table 6. The laboratory report containing the raw analytical data is included in Appendix A. The following discussion summarizes the water quality analytical results. The performance of the various system components was compared by considering the changes through treatment of nitrogen species (TKN, $\text{NH}_3\text{-N}$, and $\text{NO}_x\text{-N}$), as well as supporting water quality parameters.



Figure 8
Graphical Representation of Nitrogen Results
Sample Event No. 4, April 11, 2014 (Experimental Day 276)

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

Stage 1 Effluent (ST1): The Stage 1 effluent $\text{NH}_3\text{-N}$ levels was 1.6 mg/L with a DO level at 3.44 mg/L (Table 5). The Stage 1 effluent TSS concentration was 3 mg/L and CBOD₅ was 2 mg/L. The Stage 1 biofilter showed incomplete nitrification with an effluent $\text{NH}_3\text{-N}$ concentration of 1.6 mg/L and TKN of 8.1 mg/L. The Stage 1 effluent $\text{NO}_x\text{-N}$ was 39 mg/L. The Stage 1 effluent TN of 47.1 mg/L was 29% lower than that in STE, suggesting denitrification in the Stage 1 biofilter.

Stage 2 Biofilter Effluent (LIGNO-0" and ST2): The Stage 2 system produced a highly reducing environment and achieved essentially complete $\text{NO}_x\text{-N}$ reduction. Effluent

NO_x-N from the Stage 2 biofilter monitoring point was 0.06 mg/L. The low NO_x-N was accompanied by a measured 0.03 mg/L DO and -286 mV ORP. The lignocellulosic media effluent NO_x-N was 12 mg/L. Final total nitrogen (TN) in the treatment system effluent was 1.16 mg/L. The Stage 2 biofilter lignocellulosic media effluent and sulfur media effluent CBOD₅ were 8 and 19 mg/L, respectively. The Stage 2 effluent sulfate concentration was 67 mg/L.

Table 5
Water Quality Analytical Results

| Sample ID | Sample Date/Time | Temp (°C) | pH | Specific Conductance (uS/cm) | DO (mg/L) | ORP (mV) | Total Alkalinity (mg/L) | TSS (mg/L) | VSS (mg/L) | CBOD ₅ (mg/L) | COD (mg/L) | TN (mg/L N) ¹ | TKN (mg/L N) | Organic N (mg/L N) ² | NH ₃ -N (mg/L N) | NO ₃ -N (mg/L N) | NO ₂ -N (mg/L N) | NO _x (mg/L N) | TIN (mg/L N) ³ | TP (mg/L) | Ortho P (mg/L P) | Sulfate (mg/L) | Hydrogen Sulfide (mg/L) | Sulfide (mg/L) | Fecal (Ct/100 mL) | E-coli (Ct/100 mL) | TOC (mg/L) |
|-----------------------|------------------|-----------|------|------------------------------|-----------|----------|-------------------------|------------|------------|--------------------------|------------|--------------------------|--------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-----------|------------------|----------------|-------------------------|----------------|-------------------|--------------------|------------|
| BHSS-STE | 4/11/14 9:25 | 23.1 | 7.03 | 1151 | 0.06 | -288.2 | 370 | 60 | 56 | 110 | 150 | 66.02 | 66 | 10.00 | 56 | 0.01 | 0.01 | 0.02 | 56.02 | 6.8 | 4.3 | 14 | 3.6 | 7.2 | 160000 | 24000 | 49 |
| BHSS-STE-FILTERED | 4/11/14 9:25 | 23.1 | 7.03 | 1151 | 0.06 | -288.2 | | | | 41 | | 59.02 | 59 | 6.00 | 53 | 0.01 | 0.01 | 0.02 | 53.02 | | | | | | | | |
| BHSS-ST1 | 4/11/14 9:02 | 21.7 | 6.82 | 1166 | 3.44 | 79.9 | 200 | 3 | 3 | 2 | 10 | 47.10 | 8.1 | 6.50 | 1.6 | 39 | 0.01 | 39 | 40.60 | 2.8 | 1.8 | 33 | | | 1600 | 97 | 5.3 |
| BHSS-ST1-DUP | 4/11/14 9:10 | 21.7 | 6.82 | 1166 | 3.44 | 79.9 | 190 | 2 | 2 | 2 | 10 | 46.10 | 8.1 | 6.40 | 1.7 | 38 | 0.01 | 38 | 39.70 | 2.6 | 1.9 | 35 | | | 3300 | 160 | 5.9 |
| BHSS-ST1-FILTERED | 4/11/14 9:02 | 21.7 | 6.82 | 1166 | 3.44 | 79.9 | | | | 2 | | 47.90 | 6.9 | 5.40 | 1.5 | 41 | 0.01 | 41 | 42.50 | | | | | | | | |
| BHSS-LIGNO-O | 4/11/14 8:45 | 22.4 | 6.69 | 1073 | 0.13 | -190.6 | 310 | 2 | 2 | 8 | 140 | 15.30 | 3.3 | 2.79 | 0.51 | 12 | 0.01 | 12 | 12.51 | 1.6 | 1 | 27 | 0.13 | 0.2 | 200 | 2 | 12 |
| BHSS-LIGNO-O-FILTERED | 4/11/14 8:45 | 22.4 | 6.69 | 1073 | 0.13 | -190.6 | | | | 4 | | 15.40 | 2.4 | 1.95 | 0.45 | 13 | 0.01 | 13 | 13.45 | | | | | | | | |
| BHSS-ST2 | 4/11/14 8:30 | 21.8 | 6.81 | 1156 | 0.03 | -285.7 | 350 | 1 | 1 | 19 | 37 | 1.16 | 1.1 | 0.88 | 0.22 | 0.06 | 0.01 | 0.06 | 0.28 | 0.99 | 0.71 | 67 | 0.25 | 0.4 | 10 | 2 | 12 |
| BHSS-ST2-FILTERED | 4/11/14 8:30 | 21.8 | 6.81 | 1156 | 0.03 | -285.7 | | | | 2 | | 0.84 | 0.82 | 0.61 | 0.21 | 0.01 | 0.01 | 0.02 | 0.23 | | | 68 | | | | | |
| BHSS-EB | 4/11/14 10:05 | 22.1 | 8.25 | 2.79 | 8.11 | 38.3 | 2 | 1 | 1 | 2 | 10 | 0.07 | 0.05 | 0.04 | 0.009 | 0.01 | 0.01 | 0.02 | 0.03 | 0.01 | 0.01 | 0.2 | 0.01 | 0.1 | 1 | 2 | 0.06 |

Notes:

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

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

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

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

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

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

Table 6
Summary of Water Quality Data

| Sample ID | Statistics | Temp (°C) | pH | Specific Conductance (uS/cm) | DO (mg/L) | ORP (mV) | Total Alkalinity (mg/L) | TSS (mg/L) | VSS (mg/L) | CBOD ₅ (mg/L) | COD (mg/L) | TN (mg/L N) ¹ | TKN (mg/L N) | Organic N (mg/L N) ² | NH ₃ -N (mg/L N) | NO ₃ -N (mg/L N) | NO ₂ -N (mg/L N) | NOx (mg/L N) | TIN (mg/L N) ³ | TP (mg/L) | Ortho P (mg/L P) | Sulfate (mg/L) | Hydroge n Sulfide (mg/L) | Sulfide (mg/L) | Fecal (Ct/100 mL) | E-coli (Ct/100 mL) | TOC (mg/L) |
|----------------|------------|-----------|------|------------------------------|-----------|----------|-------------------------|------------|------------|--------------------------|------------|--------------------------|--------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------|---------------------------|-----------|------------------|----------------|--------------------------|----------------|-------------------|--------------------|------------|
| STE | n | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 8 | 10 | 8 | 10 | 10 | 9 | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 10 | 10 | 10 | 8 | 8 | 8 |
| | MEAN | 23.11 | 7.26 | 1180.70 | 0.07 | -286.21 | 406.25 | 39.80 | 35.38 | 77.20 | 141.00 | 71.63 | 71.60 | 9.67 | 62.90 | 0.02 | 0.01 | 0.03 | 62.93 | 7.46 | 5.00 | 3.79 | 3.41 | 8.47 | 42,035 | 4,908 | 36 |
| | STD. DEV. | 3.91 | | 64.66 | 0.03 | 40.74 | 20.66 | 14.32 | 13.55 | 24.84 | 76.63 | 7.78 | 7.79 | 6.96 | 6.82 | 0.02 | 0.00 | 0.02 | 6.82 | 2.04 | 0.65 | 3.73 | 1.57 | 2.15 | | | 10 |
| | MIN | 19.10 | 6.99 | 1048.00 | 0.01 | -341.90 | 370.00 | 22.00 | 22.00 | 32.00 | 37.00 | 62.08 | 62.00 | 2.00 | 54.00 | 0.01 | 0.01 | 0.02 | 54.02 | 5.90 | 3.70 | 1.30 | 1.60 | 5.10 | 3,100 | 1,700 | 20 |
| | MAX | 28.90 | 7.63 | 1294.00 | 0.11 | -226.80 | 430.00 | 60.00 | 56.00 | 120.00 | 270.00 | 87.02 | 87.00 | 25.00 | 76.00 | 0.08 | 0.01 | 0.08 | 76.02 | 12.00 | 5.50 | 14.00 | 6.90 | 12.00 | 160,000 | 24,000 | 49 |
| Stage 1 | n | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 6 | 5 | 5 | 8 | 8 | 8 |
| | MEAN | 23.12 | 6.89 | 1145.40 | 2.35 | -13.17 | 212.50 | 2.25 | 2.00 | 10.25 | 16.25 | 49.31 | 6.71 | 3.02 | 3.69 | 42.30 | 0.45 | 42.60 | 46.29 | 2.51 | 1.70 | 29.33 | 0.26 | 0.44 | 2,406 | 171 | 7 |
| | STD. DEV. | 3.38 | | 77.06 | 0.74 | 96.62 | 8.86 | 1.04 | 1.20 | 5.12 | 8.33 | 7.30 | 2.68 | 1.53 | 2.54 | 6.52 | 0.52 | 6.48 | 7.10 | 0.45 | 0.20 | 6.50 | 0.32 | 0.45 | | | 2 |
| | MIN | 20.11 | 6.75 | 1057.00 | 1.64 | -127.90 | 200.00 | 1.00 | 1.00 | 2.00 | 10.00 | 37.60 | 3.60 | 1.60 | 0.39 | 33.00 | 0.01 | 34.00 | 34.39 | 2.00 | 1.40 | 21.00 | 0.01 | 0.10 | 1,000 | 10 | 5 |
| | MAX | 28.20 | 7.18 | 1249.00 | 3.44 | 130.00 | 230.00 | 4.00 | 4.00 | 18.00 | 33.00 | 61.90 | 10.00 | 6.50 | 7.50 | 52.00 | 1.80 | 52.00 | 57.10 | 3.10 | 1.90 | 37.00 | 0.79 | 1.20 | 8,100 | 3,600 | 12 |
| Stage 2 Ligno | n | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 8 | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 7 | 6 | 6 | 8 | 8 | 8 |
| | MEAN | 23.07 | 6.63 | 1064.60 | 0.67 | -107.85 | 373.75 | 5.90 | 3.00 | 14.60 | 44.13 | 6.91 | 3.22 | 2.20 | 1.02 | 2.67 | 1.03 | 3.69 | 4.71 | 1.05 | 0.53 | 24.14 | 0.13 | 0.25 | 416 | 36 | 13 |
| | STD. DEV. | 4.38 | | 71.38 | 0.73 | 83.46 | 30.68 | 6.76 | 1.60 | 9.48 | 41.24 | 3.46 | 2.49 | 1.41 | 1.51 | 3.78 | 0.78 | 3.64 | 3.19 | 0.39 | 0.28 | 3.29 | 0.21 | 0.28 | | | 6 |
| | MIN | 18.40 | 6.25 | 946.00 | 0.13 | -230.80 | 310.00 | 2.00 | 1.00 | 2.00 | 12.00 | 2.70 | 0.88 | 0.00 | 0.05 | 0.01 | 0.01 | 0.02 | 0.42 | 0.51 | 0.13 | 18.00 | 0.01 | 0.10 | 200 | 2 | 9 |
| | MAX | 30.20 | 7.38 | 1182.00 | 2.50 | 9.70 | 410.00 | 24.00 | 6.00 | 38.00 | 140.00 | 15.30 | 8.30 | 4.32 | 4.60 | 12.00 | 2.00 | 12.00 | 12.51 | 1.60 | 1.00 | 27.00 | 0.54 | 0.81 | 1,000 | 740 | 29 |
| Stage 2 Sulfur | n | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 8 | 8 | 10 | 10 | 10 | 8 | 8 | 8 |
| | MEAN | 22.55 | 6.77 | 1191.00 | 0.17 | -259.47 | 381.25 | 2.25 | 2.25 | 9.38 | 33.00 | 3.04 | 3.00 | 1.51 | 1.49 | 0.04 | 0.01 | 0.04 | 1.54 | 1.09 | 0.66 | 81.30 | 8.32 | 12.62 | 23 | 9 | 12 |
| | STD. DEV. | 4.86 | | 243.50 | 0.11 | 54.75 | 43.90 | 1.39 | 1.39 | 6.07 | 6.99 | 3.00 | 3.02 | 1.10 | 2.00 | 0.05 | 0.00 | 0.05 | 1.98 | 0.33 | 0.27 | 45.57 | 13.66 | 19.48 | | | 6 |
| | MIN | 18.30 | 6.59 | 991.00 | 0.03 | -357.00 | 350.00 | 1.00 | 1.00 | 2.00 | 23.00 | 1.12 | 1.00 | 0.65 | 0.16 | 0.01 | 0.01 | 0.02 | 0.18 | 0.42 | 0.18 | 29.00 | 0.25 | 0.40 | 1 | 2 | 7 |
| | MAX | 30.40 | 7.04 | 1781.00 | 0.38 | -195.40 | 480.00 | 5.00 | 5.00 | 19.00 | 43.00 | 10.02 | 10.00 | 4.20 | 5.80 | 0.17 | 0.01 | 0.18 | 5.82 | 1.50 | 0.96 | 200.00 | 45.00 | 64.00 | 1,000 | 52 | 25 |
| Tap | n | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 |
| | MEAN | 26.47 | 7.28 | 448.00 | 3.94 | 98.53 | 130.00 | 1.00 | 1.00 | 2.00 | 10.00 | 0.32 | 0.10 | 0.07 | 0.03 | 0.22 | 0.01 | 0.22 | 0.25 | 0.06 | 0.03 | 12.67 | 2.60 | 4.10 | 1 | 2 | 3 |
| | STD. DEV. | 3.01 | | 15.72 | 2.22 | 173.67 | | | | | | 0.18 | 0.01 | 0.03 | 0.02 | 0.18 | 0.00 | 0.18 | 0.19 | | | 0.58 | | | | | |
| | MIN | 23.60 | 6.73 | 431.00 | 2.31 | -65.30 | 130.00 | 1.00 | 1.00 | 2.00 | 10.00 | 0.12 | 0.09 | 0.04 | 0.01 | 0.01 | 0.01 | 0.02 | 0.03 | 0.06 | 0.03 | 12.00 | 2.60 | 4.10 | 1 | 2 | 3 |
| | MAX | 29.60 | 7.60 | 462.00 | 6.47 | 280.60 | 130.00 | 1.00 | 1.00 | 2.00 | 10.00 | 0.44 | 0.11 | 0.09 | 0.05 | 0.33 | 0.01 | 0.33 | 0.37 | 0.06 | 0.03 | 13.00 | 2.60 | 4.10 | 1 | 2 | 3 |

Notes:

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

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

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

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

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

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

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

Sample held beyond the acceptable holding time

5.0 B-HS5 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 66 mg/L is within the range of values typically reported for Florida single family residence STE.
- The Stage 1 biofilter converted most of the ammonia N to oxidized nitrogen; effluent contained 8.1 mg/L TKN, of which 1.6 mg/L was ammonia.
- The Stage 2 biofilter effluent NO_x-N was 0.06 mg N/L.
- The total nitrogen concentration in the final effluent from the total treatment system was 1.16 mg/L, an approximately 98% reduction from STE.

5.2 Recommendations

The results of Sample Events No. 1 through 4 were used to formulate recommendations for adjustments and modifications to the experimental system.

5.2.1 Recirculation Mode of Operation

As previously discussed in Section 3.2, the pump tank discharge is split via two throttling gate valves which allow for a portion of the Stage 1 biofilter effluent to be sent back for recirculation with the rest proceeding to the Stage 2 biofilter. The system was designed with two modes of operation: recirculation and non-recirculation. In the non-recirculation mode (which has been tested since start-up), 100 percent of the Stage 1 effluent discharges to the Stage 2 biofilter. In the recirculation mode, a portion of Stage 1 effluent is discharged to the Stage 2 biofilter. It is recommended to modify the mode of operation to evaluate the recirculation mode. In recirculation mode, recirculated effluent is returned to the top of the Stage 1 biofilter and dispersed by five spray nozzles. Operation in the recirculation mode will ascertain the effects of recirculation on nitrification and denitrification in the Stage 1 biofilter.



Appendix A: Laboratory Report

PRELIMINARY

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

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

May 1, 2014
Work Order: 1403802
Revised Report

Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|--|------------|----------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-STE | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-01 | | | | | | |
| Date/Time Collected | | 04/11/14 09:25 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 7.03 | | | | | | |
| Temperature | | 23.1 °C | | | | | | |
| Conductivity | | 1151 umhos | | | | | | |
| Dissolved Oxygen | | 0.06 mg/L | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 3.6 | SM 4550SF | 0.04 | 0.01 | 04/17/14 09:36 | 04/17/14 09:38 | 1 |
| Ammonia as N | mg/L | 56 | EPA 350.1 | 2.0 | 0.47 | | 04/22/14 11:41 | 50 |
| Carbonaceous BOD | mg/L | 110 | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 150 | EPA 410.4 | 25 | 10 | 04/28/14 10:11 | 04/28/14 14:38 | 1 |
| Nitrate (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 06:56 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 06:56 | 1 |
| Orthophosphate as P | mg/L | 4.3 | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 06:56 | 1 |
| Phosphorous - Total as P | mg/L | 6.8 | SM 4500P-E | 0.80 | 0.20 | 04/16/14 16:53 | 04/21/14 11:20 | 20 |
| Sulfate | mg/L | 14 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 06:56 | 1 |
| Sulfide | mg/L | 7.2 | SM 4500SF | 0.40 | 0.10 | | 04/16/14 08:50 | 1 |
| Total Alkalinity | mg/L | 370 | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:04 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 66 | EPA 351.2 | 4.0 | 1.0 | 04/16/14 16:53 | 04/21/14 11:20 | 20 |
| Total Organic Carbon | mg/L | 49 | SM 5310B | 1.0 | 0.060 | | 04/16/14 10:57 | 1 |
| Total Suspended Solids | mg/L | 60 | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 56 | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.02 U | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 06:56 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 24,000 Z | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 160,000 | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |

Sample Description **BHS5-STE-FILTERED**
 Matrix **Wastewater**
 SAL Sample Number **1403802-02**
 Date/Time Collected **04/11/14 09:25**
 Collected by **Josefin Hirst**
 Date/Time Received **04/11/14 12:20**

Client Provided Field Data

pH 7.03
 Temperature 23.1 °C
 Conductivity 1151 umhos
 Dissolved Oxygen 0.06 mg/L

Inorganic, Dissolved

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

May 1, 2014
Work Order: 1403802
Revised Report

Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|-----------------------------------|-------|--------------------------|-----------|------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-STE-FILTERED | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-02 | | | | | | |
| Date/Time Collected | | 04/11/14 09:25 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| Ammonia as N | mg/L | 53 | EPA 350.1 | 2.0 | 0.47 | | 04/22/14 15:35 | 50 |
| Carbonaceous BOD | mg/L | 41 | SM 5210B | 2 | 2 | 04/11/14 16:31 | 04/17/14 15:11 | 1 |
| Nitrate (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:07 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:07 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 59 | EPA 351.2 | 0.20 | 0.050 | 04/18/14 09:13 | 04/21/14 16:04 | 20 |
| Nitrate+Nitrite (N) | mg/L | 0.02 U | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 07:07 | 1 |
| Lab filtration for diss. analytes | | | | | | | 04/11/14 16:04 | |

| | |
|---------------------|-----------------------|
| Sample Description | BHS5-ST1 |
| Matrix | Wastewater |
| SAL Sample Number | 1403802-03 |
| Date/Time Collected | 04/11/14 09:02 |
| Collected by | Josefin Hirst |
| Date/Time Received | 04/11/14 12:20 |

Client Provided Field Data

| | |
|------------------|------------|
| pH | 6.82 |
| Temperature | 21.7 °C |
| Conductivity | 1166 umhos |
| Dissolved Oxygen | 3.44 mg/L |

Inorganics

| | | | | | | | | |
|---------------------------|------|--------|------------|-------|-------|----------------|----------------|----|
| Ammonia as N | mg/L | 1.6 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 09:46 | 1 |
| Carbonaceous BOD | mg/L | 2 | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 10 U | EPA 410.4 | 25 | 10 | 04/28/14 10:11 | 04/28/14 14:38 | 1 |
| Nitrate (as N) | mg/L | 39 | EPA 300.0 | 0.40 | 0.10 | | 04/12/14 07:19 | 10 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:19 | 1 |
| Orthophosphate as P | mg/L | 1.8 | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 07:19 | 1 |
| Phosphorous - Total as P | mg/L | 2.8 | SM 4500P-E | 0.40 | 0.10 | 04/16/14 16:53 | 04/21/14 11:25 | 10 |
| Sulfate | mg/L | 33 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 07:19 | 1 |
| Total Alkalinity | mg/L | 200 | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:10 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 8.1 | EPA 351.2 | 2.0 | 0.50 | 04/16/14 16:53 | 04/21/14 11:25 | 10 |
| Total Organic Carbon | mg/L | 5.3 | SM 5310B | 1.0 | 0.060 | | 04/17/14 15:06 | 1 |
| Total Suspended Solids | mg/L | 3 | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 3 | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 39 | EPA 300.0 | 0.44 | 0.11 | | 04/12/14 07:19 | 10 |

Microbiology

| | | | | | | | | |
|-----------------|------------|-------|----------|-----|-----|----------------|----------------|---|
| E. Coli | MPN/100 mL | 97 | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 1,600 | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |

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

May 1, 2014
Work Order: 1403802
Revised Report

Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|--|------------|----------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-ST1-DUP | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-04 | | | | | | |
| Date/Time Collected | | 04/11/14 09:10 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 6.82 | | | | | | |
| Temperature | | 21.7 °C | | | | | | |
| Conductivity | | 1166 umhos | | | | | | |
| Dissolved Oxygen | | 3.44 mg/L | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Ammonia as N | mg/L | 1.7 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 11:45 | 1 |
| Carbonaceous BOD | mg/L | 2 | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 10 U | EPA 410.4 | 25 | 10 | 04/28/14 10:11 | 04/28/14 14:38 | 1 |
| Nitrate (as N) | mg/L | 38 | EPA 300.0 | 0.40 | 0.10 | | 04/12/14 07:30 | 10 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:30 | 1 |
| Orthophosphate as P | mg/L | 1.9 | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 07:30 | 1 |
| Phosphorous - Total as P | mg/L | 2.6 | SM 4500P-E | 0.20 | 0.050 | 04/16/14 09:15 | 04/17/14 13:53 | 5 |
| Sulfate | mg/L | 35 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 07:30 | 1 |
| Total Alkalinity | mg/L | 190 | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:15 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 8.1 | EPA 351.2 | 1.0 | 0.25 | 04/16/14 09:15 | 04/17/14 13:53 | 5 |
| Total Organic Carbon | mg/L | 5.9 | SM 5310B | 1.0 | 0.060 | | 04/17/14 15:19 | 1 |
| Total Suspended Solids | mg/L | 2 | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 2 | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 38 | EPA 300.0 | 0.44 | 0.11 | | 04/12/14 07:30 | 10 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 160 | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 3,300 | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |

Sample Description **BHS5-ST1-FILTERED**
 Matrix **Wastewater**
 SAL Sample Number **1403802-05**
 Date/Time Collected **04/11/14 09:02**
 Collected by **Josefin Hirst**
 Date/Time Received **04/11/14 12:20**

Client Provided Field Data

pH 6.82
 Temperature 21.7 °C
 Conductivity 1166 umhos
 Dissolved Oxygen 3.44 mg/L

Inorganic, Dissolved

| | | | | | | | | |
|------------------|------|-----|-----------|-------|-------|----------------|----------------|---|
| Ammonia as N | mg/L | 1.5 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 16:42 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 04/11/14 16:31 | 04/17/14 15:11 | 1 |

Hazen and Sawyer
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Tampa, FL 33619

May 1, 2014
Work Order: 1403802
Revised Report

Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|--|------------|-------------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-ST1-FILTERED | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-05 | | | | | | |
| Date/Time Collected | | 04/11/14 09:02 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| Nitrate (as N) | mg/L | 41 | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:41 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:41 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 6.9 | EPA 351.2 | 0.20 | 0.050 | 04/18/14 09:13 | 04/21/14 16:04 | 2 |
| Nitrate+Nitrite (N) | mg/L | 41 | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 07:41 | 1 |
| Lab filtration for diss. analytes | | | | | | | 04/11/14 16:04 | |
| Sample Description | | BHS5-LIGNO-0 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-06 | | | | | | |
| Date/Time Collected | | 04/11/14 08:45 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 6.69 | | | | | | |
| Temperature | | 22.4 °C | | | | | | |
| Conductivity | | 1073 umhos | | | | | | |
| Dissolved Oxygen | | 0.13 mg/L | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.13 | SM 4550SF | 0.04 | 0.01 | 04/17/14 09:36 | 04/17/14 09:38 | 1 |
| Ammonia as N | mg/L | 0.51 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 09:59 | 1 |
| Carbonaceous BOD | mg/L | 8 | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 140 | EPA 410.4 | 25 | 10 | 04/24/14 14:17 | 04/25/14 09:00 | 1 |
| Nitrate (as N) | mg/L | 12 | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:53 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 07:53 | 1 |
| Orthophosphate as P | mg/L | 1.0 | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 07:53 | 1 |
| Phosphorous - Total as P | mg/L | 1.6 | SM 4500P-E | 0.20 | 0.050 | 04/16/14 09:15 | 04/17/14 13:58 | 5 |
| Sulfate | mg/L | 27 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 07:53 | 1 |
| Sulfide | mg/L | 0.20 I | SM 4500SF | 0.40 | 0.10 | | 04/16/14 08:50 | 1 |
| Total Alkalinity | mg/L | 310 | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:23 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 3.3 | EPA 351.2 | 1.0 | 0.25 | 04/16/14 09:15 | 04/17/14 13:58 | 5 |
| Total Organic Carbon | mg/L | 12 | SM 5310B | 1.0 | 0.060 | | 04/16/14 11:38 | 1 |
| Total Suspended Solids | mg/L | 2 | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 2 | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 12 | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 07:53 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 200 | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |

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May 1, 2014
Work Order: 1403802
Revised Report

Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|--|-------|-----------------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-LIGNO-0-FILTERED | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-07 | | | | | | |
| Date/Time Collected | | 04/11/14 08:45 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 6.69 | | | | | | |
| Temperature | | 22.4 °C | | | | | | |
| Conductivity | | 1073 umhos | | | | | | |
| Dissolved Oxygen | | 0.13 mg/L | | | | | | |
| <u>Inorganic, Dissolved</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.45 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 16:43 | 1 |
| Carbonaceous BOD | mg/L | 4 | SM 5210B | 2 | 2 | 04/11/14 16:31 | 04/17/14 15:11 | 1 |
| Nitrate (as N) | mg/L | 13 | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:04 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:04 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 2.4 | EPA 351.2 | 0.20 | 0.050 | 04/18/14 09:13 | 04/21/14 16:04 | 1 |
| Nitrate+Nitrite (N) | mg/L | 13 | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 08:04 | 1 |
| Lab filtration for diss. analytes | | | | | | | 04/11/14 16:04 | |
| | | | | | | | | |
| Sample Description | | BHS5-ST2 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-08 | | | | | | |
| Date/Time Collected | | 04/11/14 08:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 6.81 | | | | | | |
| Temperature | | 21.8 °C | | | | | | |
| Conductivity | | 1156 umhos | | | | | | |
| Dissolved Oxygen | | 0.03 mg/L | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.25 | SM 4550SF | 0.04 | 0.01 | 04/17/14 09:36 | 04/17/14 09:38 | 1 |
| Ammonia as N | mg/L | 0.22 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 10:01 | 1 |
| Carbonaceous BOD | mg/L | 19 | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 37 | EPA 410.4 | 25 | 10 | 04/24/14 14:17 | 04/25/14 09:00 | 1 |
| Nitrate (as N) | mg/L | 0.06 | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:15 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:15 | 1 |
| Orthophosphate as P | mg/L | 0.71 | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 08:15 | 1 |
| Phosphorous - Total as P | mg/L | 0.99 | SM 4500P-E | 0.20 | 0.050 | 04/16/14 09:15 | 04/17/14 13:59 | 5 |
| Sulfate | mg/L | 67 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 08:15 | 1 |
| Sulfide | mg/L | 0.40 | SM 4500SF | 0.40 | 0.10 | | 04/16/14 08:50 | 1 |
| Total Alkalinity | mg/L | 350 | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:31 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 1.1 | EPA 351.2 | 1.0 | 0.25 | 04/16/14 09:15 | 04/17/14 13:59 | 5 |

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Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|-----------------------------------|------------|-------------------|-----------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-ST2 | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-08 | | | | | | |
| Date/Time Collected | | 04/11/14 08:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| Total Organic Carbon | mg/L | 12 | SM 5310B | 1.0 | 0.060 | | 04/16/14 11:51 | 1 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 1 U | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.06 I | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 08:15 | 1 |
| <u>Microbiology</u> | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 10 | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |
| Sample Description | | BHS5-ST2-FILTERED | | | | | | |
| Matrix | | Wastewater | | | | | | |
| SAL Sample Number | | 1403802-09 | | | | | | |
| Date/Time Collected | | 04/11/14 08:30 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| <u>Client Provided Field Data</u> | | | | | | | | |
| pH | | 6.81 | | | | | | |
| Temperature | | 21.8 °C | | | | | | |
| Conductivity | | 1156 umhos | | | | | | |
| Dissolved Oxygen | | 0.03 mg/L | | | | | | |
| <u>Inorganics</u> | | | | | | | | |
| Sulfate | mg/L | 68 | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 08:27 | 1 |
| <u>Inorganic, Dissolved</u> | | | | | | | | |
| Ammonia as N | mg/L | 0.21 | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 16:45 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 04/11/14 16:31 | 04/17/14 15:11 | 1 |
| Nitrate (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:27 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:27 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.82 | EPA 351.2 | 0.20 | 0.050 | 04/18/14 09:13 | 04/21/14 16:04 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.02 U | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 08:27 | 1 |
| Lab filtration for diss. analytes | | | | | | | 04/11/14 16:04 | |

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Laboratory Report

| Project Name | | B-HS5 SE#8 | | | | | | |
|-----------------------------------|------------|----------------|------------|-------|-------|----------------|----------------|----------|
| Parameters | Units | Results * | Method | PQL | MDL | Prepared | Analyzed | Dilution |
| Sample Description | | BHS5-EB | | | | | | |
| Matrix | | Reagent Water | | | | | | |
| SAL Sample Number | | 1403802-10 | | | | | | |
| Date/Time Collected | | 04/11/14 10:05 | | | | | | |
| Collected by | | Josefin Hirst | | | | | | |
| Date/Time Received | | 04/11/14 12:20 | | | | | | |
| Client Provided Field Data | | | | | | | | |
| pH | | 8.25 | | | | | | |
| Temperature | | 22.1 °C | | | | | | |
| Conductivity | | 2.79 umhos | | | | | | |
| Dissolved Oxygen | | 8.11 mg/L | | | | | | |
| Inorganics | | | | | | | | |
| Hydrogen Sulfide (Unionized) | mg/L | 0.01 U | SM 4550SF | 0.04 | 0.01 | 04/17/14 09:36 | 04/17/14 09:38 | 1 |
| Ammonia as N | mg/L | 0.009 U | EPA 350.1 | 0.040 | 0.009 | | 04/22/14 12:17 | 1 |
| Carbonaceous BOD | mg/L | 2 U | SM 5210B | 2 | 2 | 04/11/14 14:26 | 04/16/14 08:45 | 1 |
| Chemical Oxygen Demand | mg/L | 10 U | EPA 410.4 | 25 | 10 | 04/24/14 14:17 | 04/25/14 09:00 | 1 |
| Nitrate (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:38 | 1 |
| Nitrite (as N) | mg/L | 0.01 U | EPA 300.0 | 0.04 | 0.01 | | 04/12/14 08:38 | 1 |
| Orthophosphate as P | mg/L | 0.010 U | EPA 300.0 | 0.040 | 0.010 | | 04/12/14 08:38 | 1 |
| Phosphorous - Total as P | mg/L | 0.010 U | SM 4500P-E | 0.040 | 0.010 | 04/16/14 09:15 | 04/17/14 14:00 | 1 |
| Sulfate | mg/L | 0.20 U | EPA 300.0 | 0.60 | 0.20 | | 04/12/14 08:38 | 1 |
| Sulfide | mg/L | 0.10 U | SM 4500SF | 0.40 | 0.10 | | 04/16/14 08:50 | 1 |
| Total Alkalinity | mg/L | 2.0 U | SM 2320B | 8.0 | 2.0 | | 04/18/14 10:34 | 1 |
| Total Kjeldahl Nitrogen | mg/L | 0.05 U | EPA 351.2 | 0.20 | 0.05 | 04/16/14 09:15 | 04/17/14 14:00 | 1 |
| Total Organic Carbon | mg/L | 0.060 U | SM 5310B | 1.0 | 0.060 | | 04/16/14 13:49 | 1 |
| Total Suspended Solids | mg/L | 1 U | SM 2540D | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:06 | 1 |
| Volatile Suspended Solids | mg/L | 1 U | EPA 160.4 | 1 | 1 | 04/15/14 10:14 | 04/17/14 09:11 | 1 |
| Nitrate+Nitrite (N) | mg/L | 0.02 U | EPA 300.0 | 0.08 | 0.02 | | 04/12/14 08:38 | 1 |
| Microbiology | | | | | | | | |
| E. Coli | MPN/100 mL | 2.0 U | SM 9223B | 2.0 | 2.0 | 04/11/14 13:15 | 04/12/14 11:40 | 1 |
| Fecal Coliforms | CFU/100 ml | 1 U | SM 9222D | 1 | 1 | 04/11/14 13:04 | 04/12/14 14:06 | 1 |

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Work Order: 1403802

Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|---------|-------|-------|-------|-------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41122 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Blank (BD41122-BLK1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| 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 | | | | | | |
| 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 | | |
| Blank (BD41122-BLK2) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Sulfate | 0.20 U | 0.60 | 0.20 | mg/L | | | | | | |
| Orthophosphate as P | 0.010 U | 0.040 | 0.010 | mg/L | | | | | | |
| Nitrite (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| Nitrate (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| Surrogate: Dichloroacetate | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| LCS (BD41122-BS1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Sulfate | 8.86 | 0.60 | 0.20 | mg/L | 9.0 | | 98 | 85-115 | | |
| Nitrate (as N) | 1.67 | 0.04 | 0.01 | mg/L | 1.7 | | 98 | 85-115 | | |
| Orthophosphate as P | 0.915 | 0.040 | 0.010 | mg/L | 0.90 | | 102 | 85-115 | | |
| Nitrite (as N) | 1.37 | 0.04 | 0.01 | mg/L | 1.4 | | 98 | 85-115 | | |
| 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 | | |

SOUTHERN ANALYTICAL LABORATORIES, INC.

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May 1, 2014

Work Order: 1403802

Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|-------|-------|-------|-------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41122 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| LCS (BD41122-BS2) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Orthophosphate as P | 0.990 | 0.040 | 0.010 | mg/L | 0.90 | | 110 | 85-115 | | |
| Sulfate | 8.97 | 0.60 | 0.20 | mg/L | 9.0 | | 100 | 85-115 | | |
| Nitrite (as N) | 1.38 | 0.04 | 0.01 | mg/L | 1.4 | | 98 | 85-115 | | |
| Nitrate (as N) | 1.72 | 0.04 | 0.01 | mg/L | 1.7 | | 101 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| LCS Dup (BD41122-BSD1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Nitrite (as N) | 1.36 | 0.04 | 0.01 | mg/L | 1.4 | | 97 | 85-115 | 0.8 | 200 |
| Nitrate (as N) | 1.66 | 0.04 | 0.01 | mg/L | 1.7 | | 98 | 85-115 | 0.5 | 200 |
| Orthophosphate as P | 0.902 | 0.040 | 0.010 | mg/L | 0.90 | | 100 | 85-115 | 1 | 200 |
| Sulfate | 8.81 | 0.60 | 0.20 | mg/L | 9.0 | | 98 | 85-115 | 0.6 | 200 |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |
| LCS Dup (BD41122-BSD2) | | | | | Prepared & Analyzed: 04/14/14 | | | | | |
| Sulfate | 8.91 | 0.60 | 0.20 | mg/L | 9.0 | | 99 | 85-115 | 0.7 | 200 |
| Nitrate (as N) | 1.66 | 0.04 | 0.01 | mg/L | 1.7 | | 97 | 85-115 | 4 | 200 |
| Nitrite (as N) | 1.39 | 0.04 | 0.01 | mg/L | 1.4 | | 99 | 85-115 | 0.7 | 200 |
| Orthophosphate as P | 0.864 | 0.040 | 0.010 | mg/L | 0.90 | | 96 | 85-115 | 14 | 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 | | |

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May 1, 2014

Work Order: 1403802

Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|---------------------------|-------|-------|-------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41122 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Matrix Spike (BD41122-MS1) | | Source: 1403789-04 | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Sulfate | 25.4 | 0.60 | 0.20 | mg/L | 9.0 | 15.8 | 106 | 85-115 | | |
| Nitrate (as N) | 17.0 L | 0.04 | 0.01 | mg/L | 1.7 | 38.1 | NR | 85-115 | | |
| Nitrite (as N) | 1.92 | 0.04 | 0.01 | mg/L | 1.4 | 0.635 | 92 | 85-115 | | |
| Orthophosphate as P | 3.80 | 0.040 | 0.010 | mg/L | 0.90 | 2.95 | 95 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Matrix Spike (BD41122-MS2) | | Source: 1403789-10 | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Sulfate | 74.1 | 0.60 | 0.20 | mg/L | 9.0 | 64.2 | 110 | 85-115 | | |
| Nitrate (as N) | 1.77 | 0.04 | 0.01 | mg/L | 1.7 | ND | 104 | 85-115 | | |
| Nitrite (as N) | 1.30 | 0.04 | 0.01 | mg/L | 1.4 | ND | 93 | 85-115 | | |
| Orthophosphate as P | 3.94 | 0.040 | 0.010 | mg/L | 0.90 | 3.04 | 100 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Matrix Spike (BD41122-MS3) | | Source: 1403802-10 | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Nitrate (as N) | 1.73 | 0.04 | 0.01 | mg/L | 1.7 | ND | 102 | 85-115 | | |
| Nitrite (as N) | 1.46 | 0.04 | 0.01 | mg/L | 1.4 | ND | 104 | 85-115 | | |
| Orthophosphate as P | 0.812 | 0.040 | 0.010 | mg/L | 0.90 | ND | 90 | 85-115 | | |
| Sulfate | 9.45 | 0.60 | 0.20 | mg/L | 9.0 | ND | 105 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.999 | | | mg/L | 1.0 | | 100 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.999 | | | mg/L | 1.0 | | 100 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.999 | | | mg/L | 1.0 | | 100 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.999 | | | mg/L | 1.0 | | 100 | 90-115 | | |

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May 1, 2014

Work Order: 1403802

Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---------|--------|-----|-----|-------|-------------|---------------|------|-------------|-----|-----------|
|---------|--------|-----|-----|-------|-------------|---------------|------|-------------|-----|-----------|

Batch BD41122 - Ion Chromatography 300.0 Prep

| Matrix Spike (BD41122-MS4) | | Source: 1402967-10 | | | Prepared & Analyzed: 04/14/14 | | | | | |
|----------------------------|-------|--------------------|-------|------|-------------------------------|----|-----|--------|--|--|
| Nitrite (as N) | 1.39 | 0.04 | 0.01 | mg/L | 1.4 | ND | 99 | 85-115 | | |
| Sulfate | 8.88 | 0.60 | 0.20 | mg/L | 9.0 | ND | 99 | 85-115 | | |
| Nitrate (as N) | 1.64 | 0.04 | 0.01 | mg/L | 1.7 | ND | 97 | 85-115 | | |
| Orthophosphate as P | 0.874 | 0.040 | 0.010 | mg/L | 0.90 | ND | 97 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |

Batch BD41128 - BOD

| Blank (BD41128-BLK1) | | Prepared: 04/11/14 Analyzed: 04/16/14 | | | | | | | | |
|--------------------------|-----|---------------------------------------|---|------|---------------------------------------|-----|----|--------|---|-----|
| Carbonaceous BOD | 2 U | 2 | 2 | mg/L | | | | | | |
| LCS (BD41128-BS1) | | Prepared: 04/11/14 Analyzed: 04/16/14 | | | | | | | | |
| Carbonaceous BOD | 192 | 2 | 2 | mg/L | 200 | | 96 | 85-115 | | |
| LCS Dup (BD41128-BS1) | | Prepared: 04/11/14 Analyzed: 04/16/14 | | | | | | | | |
| Carbonaceous BOD | 197 | 2 | 2 | mg/L | 200 | | 98 | 85-115 | 2 | 200 |
| Duplicate (BD41128-DUP1) | | Source: 1403793-01 | | | Prepared: 04/11/14 Analyzed: 04/16/14 | | | | | |
| Carbonaceous BOD | 150 | 2 | 2 | mg/L | | 140 | | | 6 | 25 |

Batch BD41511 - VSS Prep

| Blank (BD41511-BLK1) | | Prepared: 04/15/14 Analyzed: 04/17/14 | | | | | | | | |
|---------------------------|-----|---------------------------------------|---|------|--|--|--|--|--|--|
| Total Suspended Solids | 1 U | 1 | 1 | mg/L | | | | | | |
| Volatile Suspended Solids | 1 U | 1 | | mg/L | | | | | | |

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Tampa, FL 33619

May 1, 2014
Work Order: 1403802
Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|---------|-------|-------|-------|--|---------------|--------|-------------|-----|-----------|
| Batch BD41511 - VSS Prep | | | | | | | | | | |
| LCS (BD41511-BS1) | | | | | Prepared: 04/15/14 Analyzed: 04/17/14 | | | | | |
| Total Suspended Solids | 52.0 | 1 | 1 | mg/L | 50 | 104 | 85-115 | | | |
| Duplicate (BD41511-DUP1) | | | | | Source: 1403754-02 Prepared: 04/15/14 Analyzed: 04/17/14 | | | | | |
| Total Suspended Solids | 3,200 | 1 | 1 | mg/L | | 3280 | | | 3 | 30 |
| Volatile Suspended Solids | 1 U | 1 | | mg/L | | 2900 | | | | 20 |
| Batch BD41520 - Ammonia by SEAL | | | | | | | | | | |
| Blank (BD41520-BLK1) | | | | | Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.009 U | 0.040 | 0.009 | mg/L | | | | | | |
| LCS (BD41520-BS1) | | | | | Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.47 | 0.040 | 0.009 | mg/L | 0.50 | 93 | 90-110 | | | |
| Matrix Spike (BD41520-MS1) | | | | | Source: 1403802-10 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.49 | 0.040 | 0.009 | mg/L | 0.50 | ND | 98 | 90-110 | | |
| Matrix Spike (BD41520-MS2) | | | | | Source: 1403789-11 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.46 | 0.040 | 0.009 | mg/L | 0.50 | ND | 92 | 90-110 | | |
| Matrix Spike Dup (BD41520-MSD1) | | | | | Source: 1403802-10 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.54 | 0.040 | 0.009 | mg/L | 0.50 | ND | 108 | 90-110 | 10 | 10 |
| Matrix Spike Dup (BD41520-MSD2) | | | | | Source: 1403789-11 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.46 | 0.040 | 0.009 | mg/L | 0.50 | ND | 91 | 90-110 | 1 | 10 |

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May 1, 2014
Work Order: 1403802
Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---------|-------|-------|-------|---------------------------------------|---------------|---------------------------------------|-------------|-----|-----------|
| Batch BD41602 - TOC prep | | | | | | | | | | |
| Blank (BD41602-BLK1) | | | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Total Organic Carbon | 0.060 U | 1.0 | 0.060 | mg/L | | | | | | |
| LCS (BD41602-BS1) | | | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Total Organic Carbon | 9.14 | 1.0 | 0.060 | mg/L | 10 | | 91 | 90-110 | | |
| Matrix Spike (BD41602-MS1) | | | | | Source: 1403890-05 | | Prepared & Analyzed: 04/16/14 | | | |
| Total Organic Carbon | 18.3 | 1.0 | 0.060 | mg/L | 10 | 8.14 | 101 | 85-115 | | |
| Matrix Spike Dup (BD41602-MSD1) | | | | | Source: 1403890-05 | | Prepared & Analyzed: 04/16/14 | | | |
| Total Organic Carbon | 18.4 | 1.0 | 0.060 | mg/L | 10 | 8.14 | 103 | 85-115 | 0.8 | 10 |
| Batch BD41604 - Digestion for TP and TKN | | | | | | | | | | |
| Blank (BD41604-BLK1) | | | | | Prepared: 04/16/14 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 (BD41604-BS1) | | | | | Prepared: 04/16/14 Analyzed: 04/17/14 | | | | | |
| Phosphorous - Total as P | 0.489 | 0.040 | 0.010 | mg/L | 0.50 | | 98 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.06 | 0.20 | 0.05 | mg/L | 1.0 | | 106 | 90-110 | | |
| Matrix Spike (BD41604-MS1) | | | | | Source: 1403880-02 | | Prepared: 04/16/14 Analyzed: 04/17/14 | | | |
| Total Kjeldahl Nitrogen | 1.84 | 0.20 | 0.05 | mg/L | 1.0 | 0.878 | 97 | 90-110 | | |
| Phosphorous - Total as P | 0.592 | 0.040 | 0.010 | mg/L | 0.50 | 0.0800 | 102 | 90-110 | | |
| Matrix Spike (BD41604-MS2) | | | | | Source: 1403918-07 | | Prepared: 04/16/14 Analyzed: 04/17/14 | | | |
| Total Kjeldahl Nitrogen | 1.85 | 0.20 | 0.05 | mg/L | 1.0 | 0.857 | 99 | 90-110 | | |
| Phosphorous - Total as P | 0.706 | 0.040 | 0.010 | mg/L | 0.50 | 0.191 | 103 | 90-110 | | |

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May 1, 2014
Work Order: 1403802
Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|-------------------------------|-------|-------|---------------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41604 - Digestion for TP and TKN | | | | | | | | | | |
| Matrix Spike Dup (BD41604-MSD1) | | Source: 1403880-02 | | | Prepared: 04/16/14 Analyzed: 04/17/14 | | | | | |
| Phosphorous - Total as P | 0.582 | 0.040 | 0.010 | mg/L | 0.50 | 0.0800 | 100 | 90-110 | 2 | 25 |
| Total Kjeldahl Nitrogen | 1.87 | 0.20 | 0.05 | mg/L | 1.0 | 0.878 | 99 | 90-110 | 1 | 20 |
| Matrix Spike Dup (BD41604-MSD2) | | Source: 1403918-07 | | | Prepared: 04/16/14 Analyzed: 04/17/14 | | | | | |
| Total Kjeldahl Nitrogen | 1.85 | 0.20 | 0.05 | mg/L | 1.0 | 0.857 | 100 | 90-110 | 0.2 | 20 |
| Phosphorous - Total as P | 0.732 | 0.040 | 0.010 | mg/L | 0.50 | 0.191 | 108 | 90-110 | 4 | 25 |
| Batch BD41610 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Blank (BD41610-BLK1) | | Prepared & Analyzed: 04/16/14 | | | | | | | | |
| Nitrate (as N) | 0.01 U | 0.04 | 0.01 | mg/L | | | | | | |
| Surrogate: Dichloroacetate | 0.955 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| LCS (BD41610-BS1) | | Prepared & Analyzed: 04/16/14 | | | | | | | | |
| Nitrate (as N) | 1.70 | 0.04 | 0.01 | mg/L | 1.7 | | 100 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.05 | | | mg/L | 1.0 | | 105 | 90-115 | | |
| LCS Dup (BD41610-BSD1) | | Prepared & Analyzed: 04/16/14 | | | | | | | | |
| Nitrate (as N) | 1.70 | 0.04 | 0.01 | mg/L | 1.7 | | 100 | 85-115 | 0.2 | 200 |
| Surrogate: Dichloroacetate | 1.05 | | | mg/L | 1.0 | | 105 | 90-115 | | |
| Matrix Spike (BD41610-MS1) | | Source: 1403314-09 | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Nitrate (as N) | 1.76 | 0.04 | 0.01 | mg/L | 1.7 | ND | 103 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.945 | | | mg/L | 1.0 | | 94 | 90-115 | | |
| Matrix Spike (BD41610-MS2) | | Source: 1402967-08 | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Nitrate (as N) | 15.9 | 0.40 | 0.10 | mg/L | 17 | 0.0630 | 93 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.14 | | | mg/L | 1.0 | | 114 | 90-115 | | |

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May 1, 2014
Work Order: 1403802
Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---------|-------|-------|-------|---------------------------------------|---------------|---------------------------------------|-------------|-----|-----------|
| Batch BD41618 - Sulfide prep | | | | | | | | | | |
| Blank (BD41618-BLK1) | | | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Sulfide | 0.10 U | 0.40 | 0.10 | mg/L | | | | | | |
| LCS (BD41618-BS1) | | | | | Prepared & Analyzed: 04/16/14 | | | | | |
| Sulfide | 4.80 | 0.40 | 0.10 | mg/L | 5.0 | | 96 | 85-115 | | |
| Matrix Spike (BD41618-MS1) | | | | | Source: 1403802-10 | | Prepared & Analyzed: 04/16/14 | | | |
| Sulfide | 4.60 | 0.40 | 0.10 | mg/L | 5.0 | ND | 92 | 85-115 | | |
| Matrix Spike Dup (BD41618-MSD1) | | | | | Source: 1403802-10 | | Prepared & Analyzed: 04/16/14 | | | |
| Sulfide | 4.60 | 0.40 | 0.10 | mg/L | 5.0 | ND | 92 | 85-115 | 0 | 14 |
| Batch BD41635 - Digestion for TP and TKN | | | | | | | | | | |
| Blank (BD41635-BLK1) | | | | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | | | |
| 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 (BD41635-BS1) | | | | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | | | |
| Phosphorous - Total as P | 0.534 | 0.040 | 0.010 | mg/L | 0.50 | | 107 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.03 | 0.20 | 0.05 | mg/L | 1.0 | | 103 | 90-110 | | |
| Matrix Spike (BD41635-MS1) | | | | | Source: 1403789-11 | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | |
| Phosphorous - Total as P | 0.543 | 0.040 | 0.010 | mg/L | 0.50 | ND | 109 | 90-110 | | |
| Total Kjeldahl Nitrogen | 1.04 | 0.20 | 0.05 | mg/L | 1.0 | ND | 104 | 90-110 | | |
| Matrix Spike (BD41635-MS2) | | | | | Source: 1403934-02 | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | |
| Total Kjeldahl Nitrogen | 1.68 | 0.20 | 0.05 | mg/L | 1.0 | 0.676 | 100 | 90-110 | | |
| Phosphorous - Total as P | 0.552 | 0.040 | 0.010 | mg/L | 0.50 | 0.0772 | 95 | 90-110 | | |

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May 1, 2014
Work Order: 1403802
Revised Report

Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|--------|---------------------------|-------|-------|---------------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41635 - Digestion for TP and TKN | | | | | | | | | | |
| Matrix Spike Dup (BD41635-MSD1) | | Source: 1403789-11 | | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 1.08 | 0.20 | 0.05 | mg/L | 1.0 | ND | 108 | 90-110 | 3 | 20 |
| Phosphorous - Total as P | 0.537 | 0.040 | 0.010 | mg/L | 0.50 | ND | 107 | 90-110 | 1 | 25 |
| Matrix Spike Dup (BD41635-MSD2) | | Source: 1403934-02 | | | Prepared: 04/16/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 1.70 | 0.20 | 0.05 | mg/L | 1.0 | 0.676 | 102 | 90-110 | 1 | 20 |
| Phosphorous - Total as P | 0.590 | 0.040 | 0.010 | mg/L | 0.50 | 0.0772 | 103 | 90-110 | 7 | 25 |
| Batch BD41750 - alkalinity | | | | | | | | | | |
| Blank (BD41750-BLK1) | | | | | Prepared & Analyzed: 04/18/14 | | | | | |
| Total Alkalinity | 2.0 U | 8.0 | 2.0 | mg/L | | | | | | |
| LCS (BD41750-BS1) | | | | | Prepared & Analyzed: 04/18/14 | | | | | |
| Total Alkalinity | 140 | 8.0 | 2.0 | mg/L | 120 | | 110 | 90-110 | | |
| Matrix Spike (BD41750-MS1) | | Source: 1403802-10 | | | Prepared & Analyzed: 04/18/14 | | | | | |
| Total Alkalinity | 140 | 8.0 | 2.0 | mg/L | 120 | ND | 113 | 80-120 | | |
| Matrix Spike Dup (BD41750-MSD1) | | Source: 1403802-10 | | | Prepared & Analyzed: 04/18/14 | | | | | |
| Total Alkalinity | 140 | 8.0 | 2.0 | mg/L | 120 | ND | 109 | 80-120 | 4 | 26 |
| Batch BD42413 - COD prep | | | | | | | | | | |
| Blank (BD42413-BLK1) | | | | | Prepared: 04/24/14 Analyzed: 04/25/14 | | | | | |
| Chemical Oxygen Demand | 10 U | 25 | 10 | mg/L | | | | | | |

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Inorganics - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|-----|-----|-------|--|---------------|------|-------------|-----|-----------|
| Batch BD42413 - COD prep | | | | | | | | | | |
| LCS (BD42413-BS1) | | | | | Prepared: 04/24/14 Analyzed: 04/25/14 | | | | | |
| Chemical Oxygen Demand | 49 | 25 | 10 | mg/L | 50 | | 98 | 90-110 | | |
| Matrix Spike (BD42413-MS1) | | | | | Source: 1403802-10 Prepared: 04/24/14 Analyzed: 04/25/14 | | | | | |
| Chemical Oxygen Demand | 49 | 25 | 10 | mg/L | 50 | ND | 98 | 85-115 | | |
| Matrix Spike Dup (BD42413-MSD1) | | | | | Source: 1403802-10 Prepared: 04/24/14 Analyzed: 04/25/14 | | | | | |
| Chemical Oxygen Demand | 52 | 25 | 10 | mg/L | 50 | ND | 104 | 85-115 | 6 | 32 |
| Batch BD42811 - COD prep | | | | | | | | | | |
| Blank (BD42811-BLK1) | | | | | Prepared & Analyzed: 04/28/14 | | | | | |
| Chemical Oxygen Demand | 10 U | 25 | 10 | mg/L | | | | | | |
| LCS (BD42811-BS1) | | | | | Prepared & Analyzed: 04/28/14 | | | | | |
| Chemical Oxygen Demand | 49 | 25 | 10 | mg/L | 50 | | 98 | 90-110 | | |
| Matrix Spike (BD42811-MS1) | | | | | Source: 1403846-02 Prepared & Analyzed: 04/28/14 | | | | | |
| Chemical Oxygen Demand | 52 | 25 | 10 | mg/L | 50 | ND | 104 | 85-115 | | |
| Matrix Spike Dup (BD42811-MSD1) | | | | | Source: 1403846-02 Prepared & Analyzed: 04/28/14 | | | | | |
| Chemical Oxygen Demand | 52 | 25 | 10 | mg/L | 50 | ND | 104 | 85-115 | 0 | 32 |

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Work Order: 1403802

Revised Report

Inorganic, Dissolved - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|------|------|-------|-------------------------------|---------------|------|-------------|-----|-----------|
| Batch BD41122 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| Blank (BD41122-BLK1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| 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 | 0.969 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.969 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Blank (BD41122-BLK2) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| 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 | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.972 | | | mg/L | 1.0 | | 97 | 90-115 | | |
| LCS (BD41122-BS1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Nitrate (as N) | 1.67 | 0.04 | 0.01 | mg/L | 1.7 | | 98 | 85-115 | | |
| Nitrite (as N) | 1.37 | 0.04 | 0.01 | mg/L | 1.4 | | 98 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.14 | | | mg/L | 1.0 | | 114 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.14 | | | mg/L | 1.0 | | 114 | 90-115 | | |
| LCS (BD41122-BS2) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Nitrate (as N) | 1.72 | 0.04 | 0.01 | mg/L | 1.7 | | 101 | 85-115 | | |
| Nitrite (as N) | 1.38 | 0.04 | 0.01 | mg/L | 1.4 | | 98 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.10 | | | mg/L | 1.0 | | 110 | 90-115 | | |
| LCS Dup (BD41122-BSD1) | | | | | Prepared & Analyzed: 04/12/14 | | | | | |
| Nitrate (as N) | 1.66 | 0.04 | 0.01 | mg/L | 1.7 | | 98 | 85-115 | 0.5 | 200 |
| Nitrite (as N) | 1.36 | 0.04 | 0.01 | mg/L | 1.4 | | 97 | 85-115 | 0.8 | 200 |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.12 | | | mg/L | 1.0 | | 112 | 90-115 | | |

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

May 1, 2014
Work Order: 1403802
Revised Report

Inorganic, Dissolved - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|------|------|-------|-------------------------------|---------------|-------------------------------|-------------|-----|-----------|
| Batch BD41122 - Ion Chromatography 300.0 Prep | | | | | | | | | | |
| LCS Dup (BD41122-BSD2) | | | | | Prepared & Analyzed: 04/14/14 | | | | | |
| Nitrate (as N) | 1.66 | 0.04 | 0.01 | mg/L | 1.7 | | 97 | 85-115 | 4 | 200 |
| Nitrite (as N) | 1.39 | 0.04 | 0.01 | mg/L | 1.4 | | 99 | 85-115 | 0.7 | 200 |
| Surrogate: Dichloroacetate | 1.14 | | | mg/L | 1.0 | | 114 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.14 | | | mg/L | 1.0 | | 114 | 90-115 | | |
| Matrix Spike (BD41122-MS1) | | | | | Source: 1403789-04 | | Prepared & Analyzed: 04/12/14 | | | |
| Nitrite (as N) | 1.92 | 0.04 | 0.01 | mg/L | 1.4 | 0.635 | 92 | 85-115 | | |
| Nitrate (as N) | 17.0 L | 0.04 | 0.01 | mg/L | 1.7 | 40.9 | NR | 85-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.934 | | | mg/L | 1.0 | | 93 | 90-115 | | |
| Matrix Spike (BD41122-MS2) | | | | | Source: 1403789-10 | | Prepared & Analyzed: 04/12/14 | | | |
| Nitrate (as N) | 1.77 | 0.04 | 0.01 | mg/L | 1.7 | ND | 104 | 85-115 | | |
| Nitrite (as N) | 1.30 | 0.04 | 0.01 | mg/L | 1.4 | ND | 93 | 85-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Surrogate: Dichloroacetate | 0.960 | | | mg/L | 1.0 | | 96 | 90-115 | | |
| Matrix Spike (BD41122-MS3) | | | | | Source: 1403802-10 | | Prepared & Analyzed: 04/12/14 | | | |
| Nitrite (as N) | 1.46 | 0.04 | 0.01 | mg/L | 1.4 | ND | 104 | 85-115 | | |
| Nitrate (as N) | 1.73 | 0.04 | 0.01 | mg/L | 1.7 | ND | 102 | 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 (BD41122-MS4) | | | | | Source: 1402967-10 | | Prepared & Analyzed: 04/14/14 | | | |
| Nitrate (as N) | 1.64 | 0.04 | 0.01 | mg/L | 1.7 | ND | 97 | 85-115 | | |
| Nitrite (as N) | 1.39 | 0.04 | 0.01 | mg/L | 1.4 | ND | 99 | 85-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |
| Surrogate: Dichloroacetate | 1.13 | | | mg/L | 1.0 | | 113 | 90-115 | | |

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Tampa, FL 33619

May 1, 2014
Work Order: 1403802
Revised Report

Inorganic, Dissolved - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---------|-------|-------|-------|--|---------------|------|-------------|------|-----------|
| Batch BD41139 - BOD Dissolved | | | | | | | | | | |
| Blank (BD41139-BLK1) | | | | | Prepared: 04/11/14 Analyzed: 04/17/14 | | | | | |
| Carbonaceous BOD | 2 U | 2 | 2 | mg/L | | | | | | |
| LCS (BD41139-BS1) | | | | | Prepared: 04/11/14 Analyzed: 04/17/14 | | | | | |
| Carbonaceous BOD | 183 | 2 | 2 | mg/L | 200 | | 92 | 85-115 | | |
| LCS Dup (BD41139-BSD1) | | | | | Prepared: 04/11/14 Analyzed: 04/17/14 | | | | | |
| Carbonaceous BOD | 194 | 2 | 2 | mg/L | 200 | | 97 | 85-115 | 6 | 200 |
| Duplicate (BD41139-DUP1) | | | | | Source: 1403802-09 Prepared: 04/11/14 Analyzed: 04/17/14 | | | | | |
| Carbonaceous BOD | 2 U | 2 | 2 | mg/L | | ND | | | | 25 |
| Batch BD41806 - Digestion for TP and TKN | | | | | | | | | | |
| Blank (BD41806-BLK1) | | | | | Prepared: 04/18/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 0.050 U | 0.20 | 0.050 | mg/L | | | | | | |
| LCS (BD41806-BS1) | | | | | Prepared: 04/18/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 0.975 | 0.20 | 0.050 | mg/L | 1.0 | | 97 | 90-110 | | |
| Matrix Spike (BD41806-MS1) | | | | | Source: 1403802-07 Prepared: 04/18/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 3.31 | 0.20 | 0.050 | mg/L | 1.0 | 2.37 | 93 | 90-110 | | |
| Matrix Spike Dup (BD41806-MSD1) | | | | | Source: 1403802-07 Prepared: 04/18/14 Analyzed: 04/21/14 | | | | | |
| Total Kjeldahl Nitrogen | 3.31 | 0.20 | 0.050 | mg/L | 1.0 | 2.37 | 93 | 90-110 | 0.05 | 20 |
| Batch BD42119 - Ammonia by SEAL | | | | | | | | | | |
| Blank (BD42119-BLK1) | | | | | Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.009 U | 0.040 | 0.009 | mg/L | | | | | | |

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Tampa, FL 33619

May 1, 2014
Work Order: 1403802
Revised Report

Inorganic, Dissolved - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|--|--------|-------|-------|-------|--|---------------|------|-------------|-----|-----------|
| Batch BD42119 - Ammonia by SEAL | | | | | | | | | | |
| LCS (BD42119-BS1) | | | | | Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.51 | 0.040 | 0.009 | mg/L | 0.50 | | 102 | 90-110 | | |
| Matrix Spike (BD42119-MS1) | | | | | Source: 1403802-09 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.74 | 0.040 | 0.009 | mg/L | 0.50 | 0.21 | 105 | 90-110 | | |
| Matrix Spike Dup (BD42119-MSD1) | | | | | Source: 1403802-09 Prepared & Analyzed: 04/22/14 | | | | | |
| Ammonia as N | 0.72 | 0.040 | 0.009 | mg/L | 0.50 | 0.21 | 101 | 90-110 | 3 | 10 |

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May 1, 2014
Work Order: 1403802
Revised Report

Microbiology - Quality Control

| Analyte | Result | PQL | MDL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---------------------------------|--------|-----|-----|------------|--|---------------|------|-------------|-----|-----------|
| Batch BD41124 - FC-MF | | | | | | | | | | |
| Blank (BD41124-BLK1) | | | | | Prepared: 04/11/14 Analyzed: 04/12/14 | | | | | |
| Fecal Coliforms | 1 U | 1 | 1 | CFU/100 ml | | | | | | |
| Duplicate (BD41124-DUP1) | | | | | Source: 1403792-02 Prepared: 04/11/14 Analyzed: 04/12/14 | | | | | |
| Fecal Coliforms | 1 U | 1 | 1 | CFU/100 ml | | ND | | | | 200 |
| Duplicate (BD41124-DUP2) | | | | | Source: 1403802-10 Prepared: 04/11/14 Analyzed: 04/12/14 | | | | | |
| Fecal Coliforms | 1 U | 1 | 1 | CFU/100 ml | | ND | | | | 200 |

Hazen and Sawyer**10002 Princess Palm Ave, Suite 200****Tampa, FL 33619****May 1, 2014****Work Order: 1403802****Revised Report**

*** Qualifiers, Notes and Definitions**

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

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

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

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

- Z Too many colonies were present for accurate counting.
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@southernanalyticallabs.com



| | | | | | | | | | | | | | | | | | | | |
|--|------------|-----------------------|---------|--------------------------------|--------|------------------|------|--|--|--|---|--------------------|--|--|--|------|-------------|--------------|------|
| Client Name Hazan and Sawyer | | | | | | | | | | Contact / Phone: Josefin Hirst 813-630-4498 | | | | | | | | | |
| Project Name / Location BHS5 SE#8 | | | | | | | | | | | | | | | | | | | |
| Samplers: (Signature) <i>Josefin Hirst</i> | | | | | | | | | | PARAMETER / CONTAINER DESCRIPTION | | | | | | | | | |
| Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater 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 ₂ S ₂ O ₃ FC-MF, FC-QT | 500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, OP, SO ₄ | 125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP | 500mLP, NaOH, Zn Acetate H ₂ S | 40mLaV, HCl TOC | 500mLP, Cool Lab Filtered (CBOD, TKN, NH ₃ , NOx) | 500mLP, Cool Lab Filtered (CBOD, TKN, NH ₃ , NOx, SO ₄) | | pH | Temperature | Conductivity | DO |
| | 01 | BHS5-STE | 4/11/14 | 9:25 | WW | | X | 4 | 2 | 1 | 1 | 2 | | | | 7.03 | 23.1 | 1151 | 0.06 |
| | 02 | BHS5-STE-FILTERED | | 9:25 | WW | | X | | | | | | 1 | | | 7.03 | 23.1 | 1151 | 0.06 |
| | 03 | BHS5-ST1 | | 9:02 | WW | | X | 4 | 2 | 1 | | 2 | | | | 6.82 | 20.7 | 1166 | 3.44 |
| | 04 | BHS5-ST1-DUP | | 9:10 | WW | | X | 4 | 2 | 1 | | 2 | | | | 6.82 | 20.7 | 1166 | 3.44 |
| | 05 | BHS5-ST1-FILTERED | | 9:02 | WW | | X | | | | | | 1 | | | 6.82 | 21.7 | 1166 | 3.44 |
| | 06 | BHS5-LIGNO-0 | | 8:45 | WW | | X | 4 | 2 | 1 | 1 | 2 | | | | 6.69 | 22.4 | 1073 | 0.13 |
| | 07 | BHS5-LIGNO-0-FILTERED | | 8:45 | WW | | X | | | | | | 1 | | | 6.69 | 22.4 | 1073 | 0.13 |
| | 08 | BHS5-ST2 | | 8:30 | WW | | X | 4 | 2 | 1 | 1 | 2 | | | | 6.81 | 21.8 | 1156 | 6.03 |
| | 09 | BHS5-ST2-FILTERED | | 8:30 | WW | | X | | | | | | | 1 | | 6.81 | 21.8 | 1156 | 0.03 |
| | 10 | BHS5-EB | | 10:05 | R | | X | 4 | 2 | 1 | 1 | 2 | | | | 8.25 | 22.1 | 2.79 | 8.11 |
| | | | | | | | | | | | | | | | | | | | |
| Containers Prepared / Relinquished: | | Date/Time: 4/11/14 | | Received: <i>Josefin Hirst</i> | | Date/Time: 12:00 | | Seal intact? <input checked="" type="radio"/> N NA | | Instructions / Remarks | | | | | | | | | |
| Relinquished: | | Date/Time: 4/11/14 | | Received: <i>K. Madman</i> | | Date/Time: 12:20 | | Samples intact upon arrival? <input checked="" type="radio"/> N NA | | | | | | | | | | | |
| Relinquished: | | Date/Time: | | Received: | | Date/Time: | | Received on ice? Temp <input checked="" type="radio"/> N NA | | | | | | | | | | | |
| Relinquished: | | Date/Time: | | Received: | | Date/Time: | | Proper preservatives indicated? <input checked="" type="radio"/> N NA | | | | | | | | | | | |
| Relinquished: | | Date/Time: | | Received: | | Date/Time: | | Rec'd within holding time? <input checked="" type="radio"/> N NA | | | | | | | | | | | |
| Relinquished: | | Date/Time: | | Received: | | Date/Time: | | Volatiles rec'd w/out headspace? <input checked="" type="radio"/> N NA | | | | | | | | | | | |
| Relinquished: | | Date/Time: | | Received: | | Date/Time: | | Proper containers used? <input checked="" type="radio"/> N NA | | | | | | | | | | | |



Appendix B: Operation & Maintenance Log

Table B.1
Operation and Maintenance Log

| Date | Description |
|------------|---|
| 6/24/2013 | Construction - Stage 1 and Stage 2 tanks installed |
| 6/25/2013 | Construction - Drainfield distribution box installed and all pipework |
| 7/9/2013 | System Start-up |
| | Bull run valve switched from drainfield to Stage 1 biofilter |
| 7/17/2013 | System check |
| 7/23/2013 | Construction - sod installation |
| 7/29/2013 | Preliminary sample event No. 1 |
| 8/6/2013 | System check |
| | Need to add soil around low side of pump tank riser |
| 8/15/2013 | Preliminary sample event No. 2 |
| 9/27/2013 | Sample Event No. 1 |
| 11/8/2013 | System check |
| 11/27/2013 | System check |
| 12/4/2013 | Sample Event No. 2 |
| 12/23/2013 | System check |
| 1/23/2014 | System check |
| 1/31/2014 | System check |
| 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 |
| 4/11/2014 | Sample Event No. 8 |

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Appendix C: Vericomm PLC Data

Table C.1
Vericomm Data February 12, 2014 through April 11, 2014

| System Status | | 4/11/2014 | 3/14/2014 | 2/12/2014 |
|-----------------|----------------------------------|----------------|----------------|----------------|
| Point | Description | Value | Value | Value |
| 1 | Alarm Status | OK | OK | OK |
| 2 | Alert Status | OK | OK | OK |
| 3 | System Mode | Normal | Normal | Normal |
| 5 | Timer Mode | Normal | Normal | Off |
| 6 | Active Off Time | 60.0 Minutes | 60.0 Minutes | 60.0 Minutes |
| 7 | Active On Time | 0.7 Minutes | 0.7 Minutes | 0.7 Minutes |
| 9 | Pump Mode | OffCycl | OffCycl | Off |
| 10 | Pump Status | Off | Off | Off |
| 12 | Pump Cycles Today | 1.0 Cycles | 2.0 Cycles | 2.0 Cycles |
| 13 | Override Cycles Today | 0.0 Cycles | 0.0 Cycles | 0.0 Cycles |
| 14 | Pump Run Time Today | 0.7 Minutes | 1.4 Minutes | 1.4 Minutes |
| Settings | | | | |
| Point | Description | Value | Value | Value |
| 17 | Off Cycle Time | 60.0 Minutes | 60.0 Minutes | 60.0 Minutes |
| 18 | On Cycle Time | 0.7 Minutes | 0.7 Minutes | 0.7 Minutes |
| 19 | Override Off Cycle Time | 30.0 Minutes | 30.0 Minutes | 30.0 Minutes |
| 20 | Override On Cycle Time | 0.7 Minutes | 0.7 Minutes | 0.7 Minutes |
| 21 | Minimum Override Cycles | 3.0 Cycles | 3.0 Cycles | 3.0 Cycles |
| 23 | Override Cycle Limit per Day | 7.0 Cycles | 7.0 Cycles | 7.0 Cycles |
| 24 | Time Limit per Day | 16.0 Minutes | 16.0 Minutes | 16.0 Minutes |
| 25 | High Level Pump Test | 2.0 Minutes | 2.0 Minutes | 2.0 Minutes |
| 28 | Alarm Update Interval | 120.0 Minutes | 120.0 Minutes | 120.0 Minutes |
| 29 | Page Delay | 960.0 Minutes | 960.0 Minutes | 960.0 Minutes |
| 30 | Page Interval | 30.0 Minutes | 30.0 Minutes | 30.0 Minutes |
| 31 | Local Alarm Delay | 1140.0 Minutes | 1140.0 Minutes | 1140.0 Minutes |
| 32 | Local Reactivate Delay | 120.0 Minutes | 120.0 Minutes | 120.0 Minutes |
| Troubleshooting | | | | |
| Point | Description | Value | Value | Value |
| 33 | Top Float Status | OK | OK | OK |
| 34 | Middle Float Status | OK | OK | OK |
| 35 | Bottom Float Status | OK | OK | OK |
| 37 | Contactor Status | OK | OK | OK |
| 38 | Pump Status | OK | OK | OK |
| 40 | Filter Status | OK | OK | OK |
| 41 | Tank Status | OK | OK | OK |
| 43 | Power Status | OK | OK | OK |
| Flow Data | | | | |
| Point | Description | Value | Value | Value |
| 49 | Pump Run Time Today | 0.7 Minutes | 1.4 Minutes | 1.4 Minutes |
| 50 | Override Cycles Today | 0 | 0 | 0 |
| 51 | Pump Cycles Today | 1.0 Cycles | 2.0 Cycles | 2.0 Cycles |
| 52 | Average Run Time per Cycle Today | 0.7 Minutes | 0.7 Minutes | 0.7 Minutes |
| 54 | Brownouts Today | 0 | 0 | 0 |

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Table C.1 (continued)
Vericomm Data February 12, 2014 through April 11, 2014

| | | 4/11/2014 | 3/14/2014 | 2/12/2014 |
|-----------------------------|---|---------------|---------------|---------------|
| 30-Day History Data | | | | |
| Point | Description | Value | Value | Value |
| 65 | 30 Day Average Run Time per Day | 4.5 Minutes | 4.2 Minutes | 4.5 Minutes |
| 66 | 30 Day Average Override Cycles per Day | 0.0 Cycles | 0.0 Cycles | 0.0 Cycles |
| 67 | 30 Day Average Cycles per Day | 6.3 Cycles | 5.8 Cycles | 6.4 Cycles |
| 68 | 30 Day Average Run Time per Cycle | 0.7 Minutes | 0.7 Minutes | 0.7 Minutes |
| 71 | 30 Day Total Pump Run Time | 134.9 Minutes | 124.6 Minutes | 136.0 Minutes |
| 72 | 30 Day Total Override Cycles | 0.0 Cycles | 0.0 Cycles | 0.0 Cycles |
| 73 | 30 Day Total Cycles | 189.0 Cycles | 175.0 Cycles | 191.0 Cycles |
| 76 | 30 Day Total Brownouts | 0 | 0 | 0 |
| Totalized Pump Data | | | | |
| Point | Description | Value | Value | Value |
| 82 | Pump Total Run Time | 21.0 Hours | 18.9 Hours | 16.8 Hours |
| 83 | Pump Total Cycles | 1773.0 Cycles | 1596.0 Cycles | 1421.0 Cycles |
| Miscellaneous | | | | |
| Point | Description | Value | Value | Value |
| 145 | Pump On Auto | Off | Off | Off |
| 147 | Pump Test Today | Off | Off | Off |
| 148 | Pump Check Enable | Off | Off | Off |
| 149 | Total Override Cycles | 0 | 0 | 0 |
| 150 | High Level Condition | Off | Off | Off |
| 151 | Leak Check Enable | On | On | Off |
| 152 | Brownout State | Off | Off | Off |
| 153 | Test Mode | Off | Off | Off |
| Alarm Points | | | | |
| Point | Description | Value | Value | Value |
| 161 | General Alarm | Off | Off | Off |
| 162 | New Alarm | Off | Off | Off |
| 163 | Update Central Enable | On | On | On |
| 167 | Page Alarm Start | Off | Off | Off |
| 168 | Pager Signal | Off | Off | Off |
| 169 | Local Alarm Start | Off | Off | Off |
| 170 | Local Alarm Silence | Off | Off | Off |
| Inputs & Outputs | | | | |
| Point | Description | Value | Value | Value |
| 177 | High Level/Override Timer Float Input | Off | Off | Off |
| 178 | Timer Float Input | On | On | Off |
| 179 | Redundant Off Float & Low Level Alarm Input | On | On | On |
| 181 | Push To Silence Input | Off | Off | Off |
| 182 | Auxiliary Contact Input | Off | Off | Off |
| 186 | Pump Output | Off | Off | Off |
| 188 | Alarm Light Output | Off | Off | Off |
| 189 | Audible Alarm Output | Off | Off | Off |

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