



Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task B.7

B-HS7 Field System Monitoring Report No. 6

Progress Report

November 2014

442-27-001

HAZEN AND SAWYER
Environmental Engineers & Scientists

In association with:



AET
Applied Environmental Technology

**Otis Environmental
Consultants, LLC**

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK B.7 PROGRESS REPORT

B-HS7 Field System Monitoring Report No. 6

Prepared for:

Florida Department of Health
Division of Disease Control and Health Protection
Bureau of Environmental Health
Onsite Sewage Programs
4042 Bald Cypress Way Bin #A-08
Tallahassee, FL 32399-1713

FDOH Contract CORCL

November 2014

Prepared by:

HAZEN AND SAWYER
Environmental Engineers & Scientists

In Association With:

AET
Applied Environmental Technology



B-HS7 Field System Monitoring Report No. 6

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 sixth sample event of the passive nitrogen reduction system at a home site B-HS7 in Marion County, Florida.

2.0 Purpose

This monitoring report documents data collected from the sixth B-HS7 monitoring and sampling event conducted on October 22, 2014 (Experimental Day 337). This monitoring event consisted of conducting flow measurements from the household water use meter and the treatment system internal water meters, recording electricity use, monitoring of field parameters, collection of water samples from sixteen 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-HS7 field site is located in Marion County, FL. The nitrogen reducing onsite treatment system for the single family residence was installed in November 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 existing 900 gallon dual chamber septic tank will continue to provide primary treatment for the new PNRS system. The PNRS system consists of a 300 gallon concrete pump tank, low-pressure distribution network, and an in-ground Stage 1 nitrification biofilter directly over

c:\44237-001R004\Wpdocs\Report\Final

a lined Stage 2 denitrification biofilter. The treated effluent is discharged into the soil around the perimeter of the liner. There were no changes to the physical configuration of the treatment system or system operation since the last monitoring report.

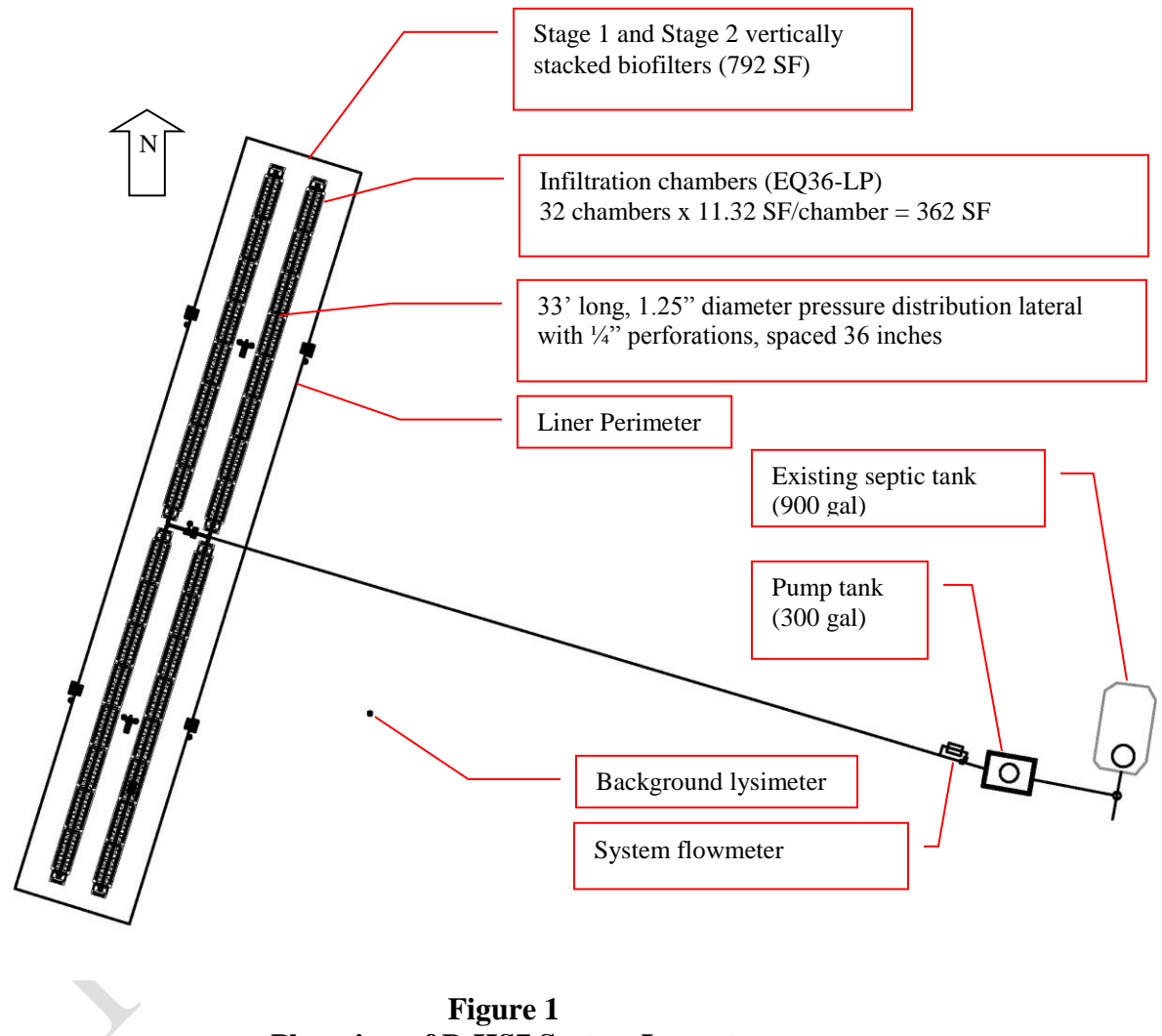


Figure 1
Plan view of B-HS7 System Layout

November 2014

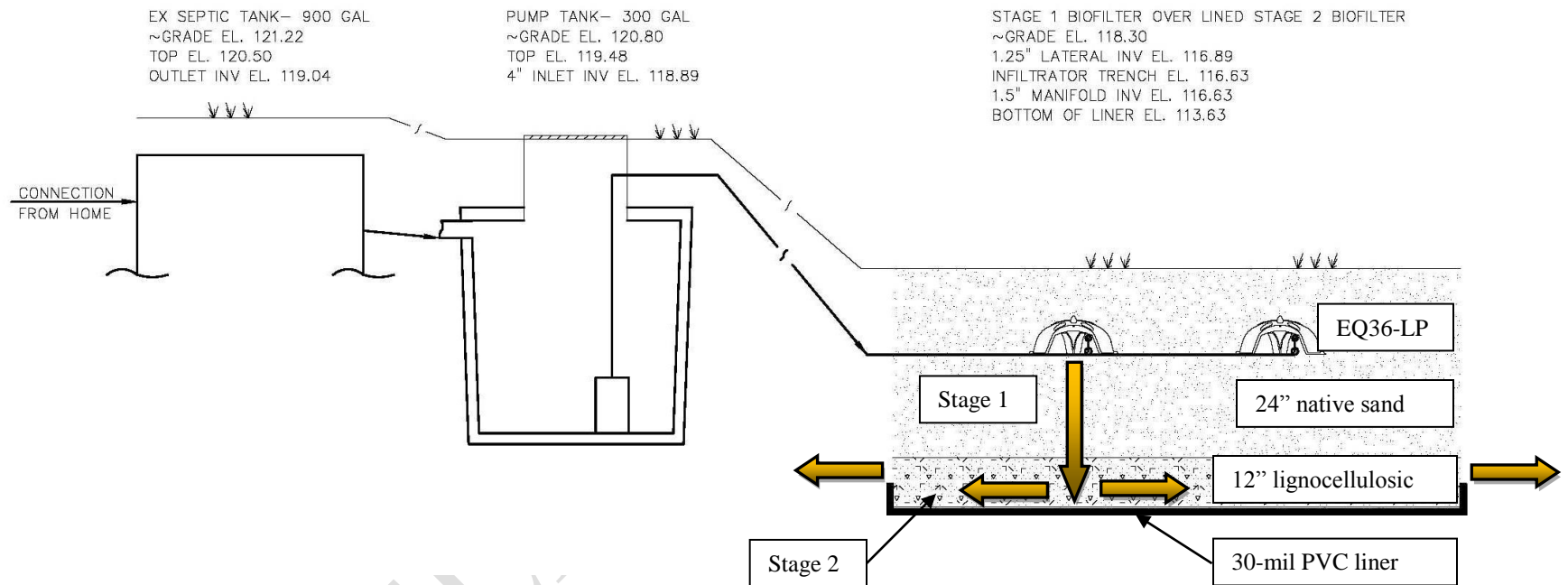


Figure 2
Flow Schematic of B-HS7 PNRS Installed in Marion County

3.3 Monitoring and Sample Locations and Identification

The monitoring points are shown in Figure 3. The monitoring points used for treatment evaluation are shown on a cross section in the southwest side of the treatment area on Figure 4.

PRELIMINARY

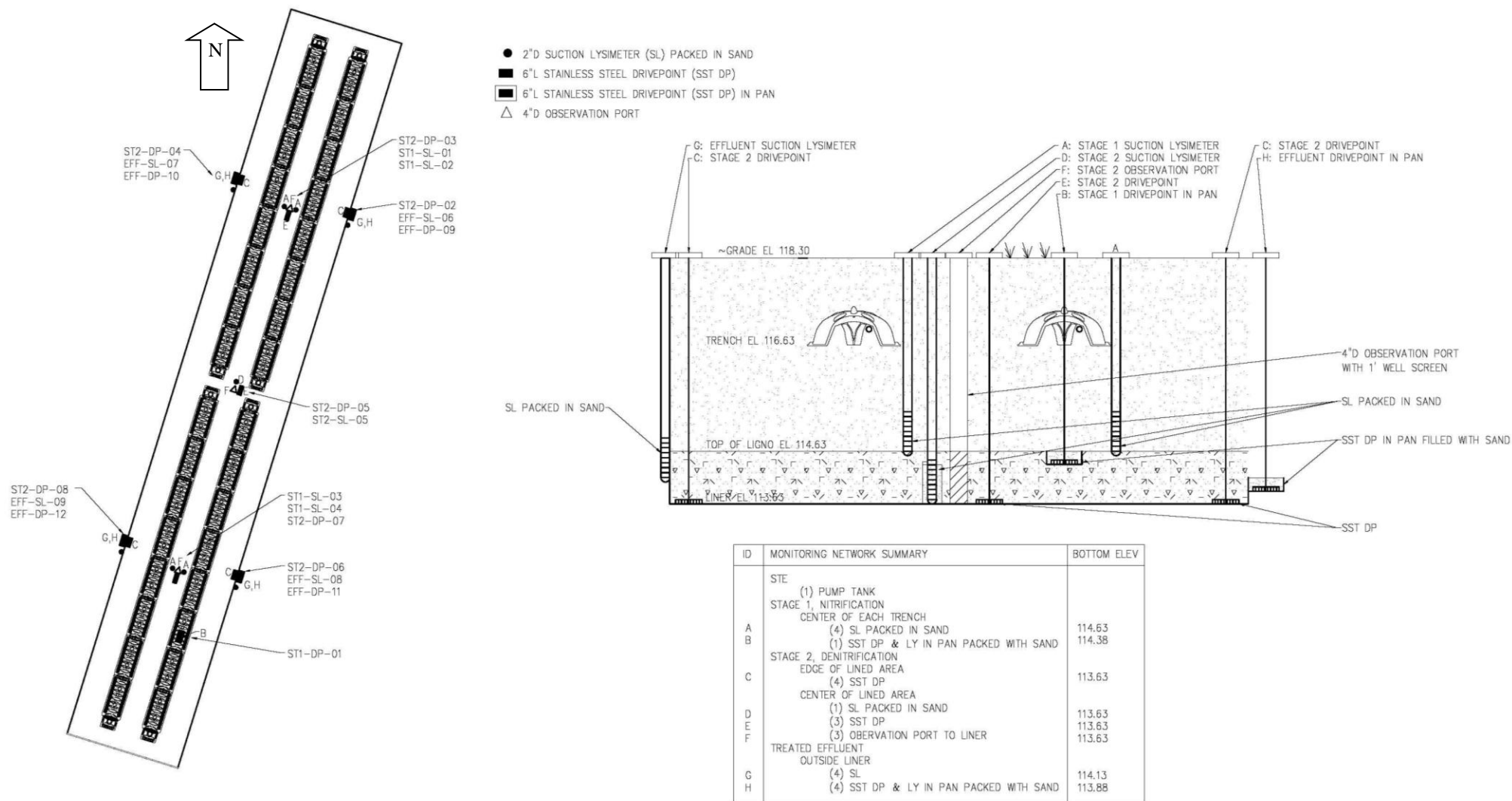


Figure 3
B-HS7 Sample and Monitoring Locations

November 2014

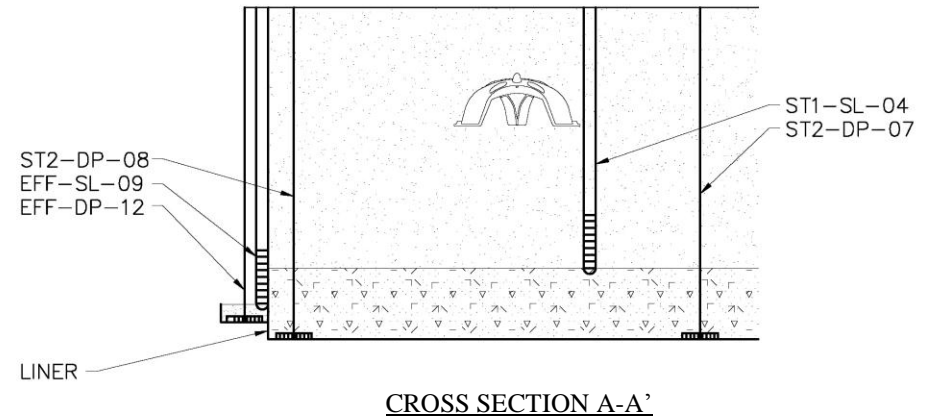
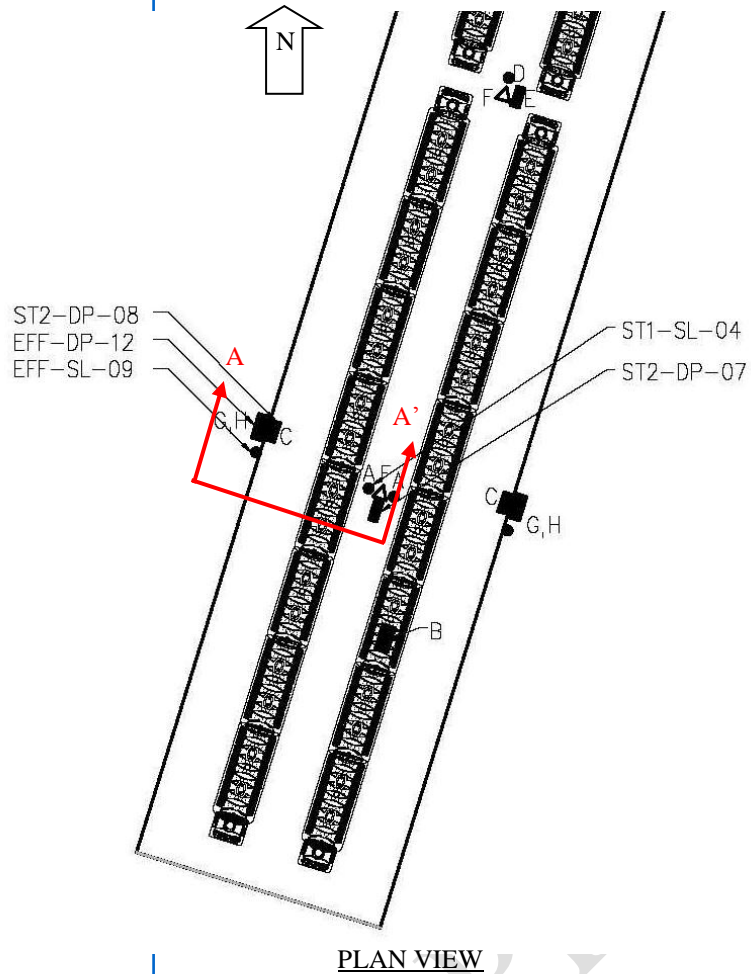


Figure 4
B-HS7 Treatment Evaluation Cross Section

Primary Effluent: Household wastewater enters the 1st chamber of the primary tank and exits the second chamber as septic tank effluent (STE) through an effluent screen. Screened effluent is directed to the pump tank which contains the pump and float switches. The first monitoring point, B-HS7-STE, is the STE sampled approximately 1.5 feet below the surface of the pump tank (Figure 5). Samples from monitoring point B-HS7-STE are the whole household wastewater after it has had some residence time in the primary tank.

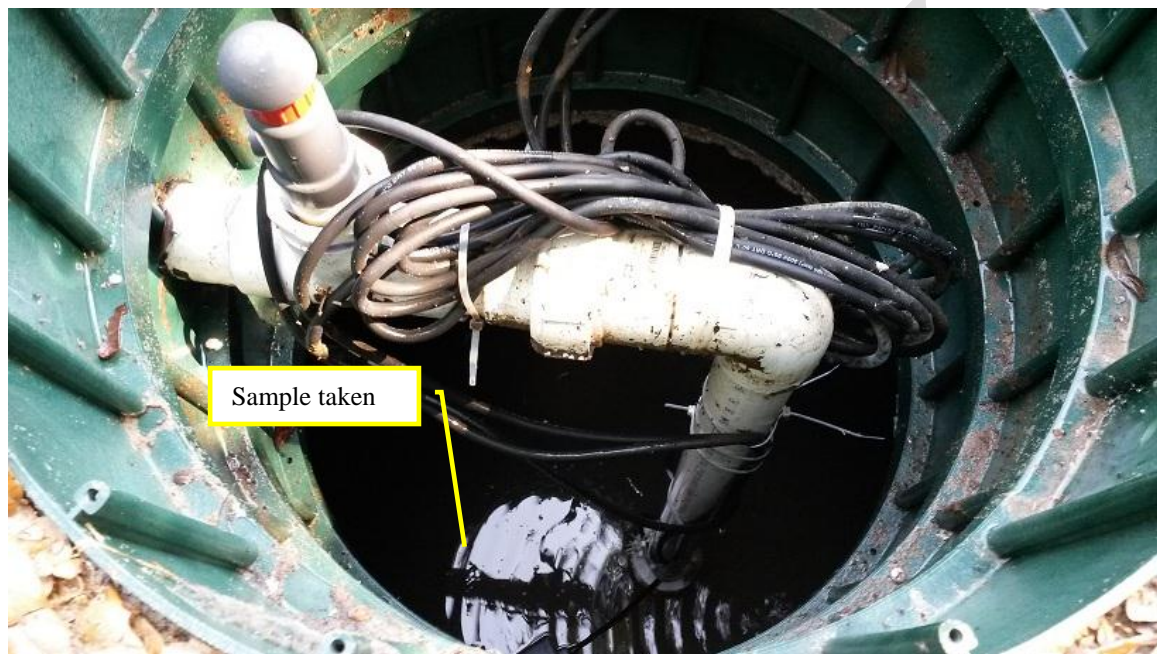


Figure 5
Pump Tank (B-HS7-STE sample)

Stage 1 Effluent: STE in the pump tank is discharged through a low-pressure distribution network installed inside Infiltrator EQ36-LP™ chambers. The low-pressure distribution network consists of a central manifold design with (4) 33-foot long, 1.25-inch diameter perforated laterals installed along the top of the 24-inch native sand media (unsaturated Stage 1 biofilter). In the Stage 1 biofilter, wastewater percolates downward through the unsaturated native sand media where nitrification occurs. Ceramic cup suction lysimeters (BHS7-ST1-SL-01, BHS7-ST1-SL-02, BHS7-ST1-SL-03, and BHS7-ST1-SL-04) were installed with the cup at the bottom of the native sand layer to represent water quality after downward passage through the sand layer (see Figure 6). In addition, one stainless steel drivepoint (BHS7-ST1-DP-01) was installed in a shallow pan at the bottom of the native sand layer (see Figure 7). However, during this sample

event the drivepoint did not produce any sample (dry). The Stage 1 monitoring point in the treatment evaluation cross section is BHS7-ST1-SL-04, which is located in the center of the south end of the lined area.



Figure 6
Stage 1 biofilter effluent sample taken from suction lysimeter (BHS7-ST1-SL samples)

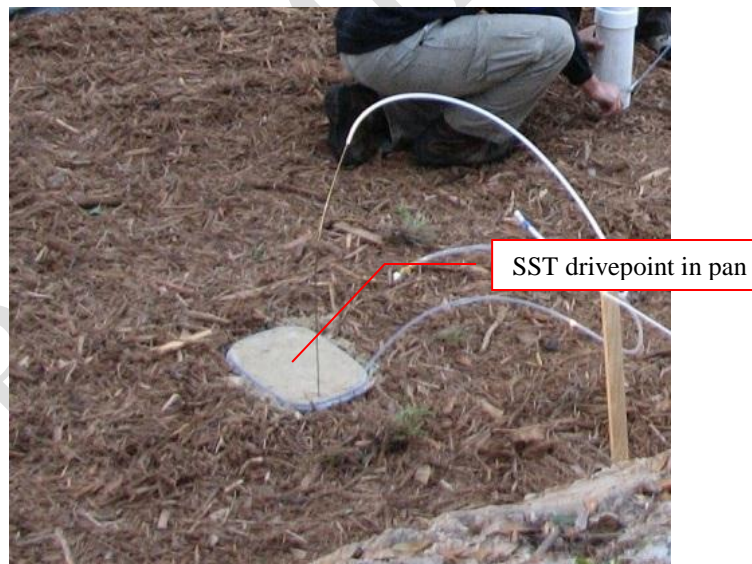


Figure 7
Stage 1 biofilter effluent sample taken from drivepoint in pan (BHS7-ST1-DP-01 sample)

Stage 2 Effluent: Directly below the 24-inch native sand Stage 1 biofilter is a 12-inch layer of lignocellulosic media as a supplemental carbon source for denitrification (Stage 2 biofilter), a blended urban waste wood from Wood Resource Recovery, Ocala, FL. The new Stage 2 biofilter treatment area was prepared with a 30 mil PVC liner installed below the lignocellulosic media. The liner was installed with a 6 inch lip around the outside perimeter. Therefore, approximately 6-inches of the lignocellulosic media can reach saturation from applied wastewater, promoting oxygen depletion and denitrification of the nitrified effluent. At the bottom of the Stage 2 biofilter lignocellulosic media, directly above the liner, stainless steel drivepoint samplers were installed (see Figure 8) including: BHS7-ST2-DP-02, BHS7-ST2-DP-03, BHS7-ST2-DP-04, BHS7-ST2-DP-05, BHS7-ST2-DP-06, BHS7-ST2-DP-07, and BHS7-ST2-DP-08. The Stage 2 monitoring points in the treatment evaluation cross section are BHS7-ST2-DP-07 (which is located in the center of the south end of the lined area) and BHS7-ST2-DP-08 (which is located on the southwest edge of the lined area).



Figure 8
Stage 2 biofilter effluent sample taken from drivepoint (BHS7-ST2-DP samples)

Perimeter Monitoring Points: The treated effluent is discharged from the liner under saturated conditions by flowing over the lip of the liner and into the soil surrounding the perimeter of the lined area. Ceramic cup suction lysimeters (BHS7-EFF-SL-06, BHS7-EFF-SL-07, BHS7-EFF-SL-08, and BHS7-EFF-SL-09) were installed around the perimeter of the liner, with the bottom of the cup approximately 6-inches below the lip of the liner within the native sand (see Figure 9) to represent treated effluent. In addition, stainless steel drivepoints (BHS7-EFF-DP-09, BHS7-EFF-DP-10, BHS7-EFF-DP-11, BHS7-EFF-DP-12) were installed in shallow pans adjacent to the lip of the liner (see Figure 10). The treated effluent monitoring points in the treatment evaluation cross section are BHS7-EFF-SL-09 and BHS7-EFF-DP-12, which are located adjacent to the southwest lined area.

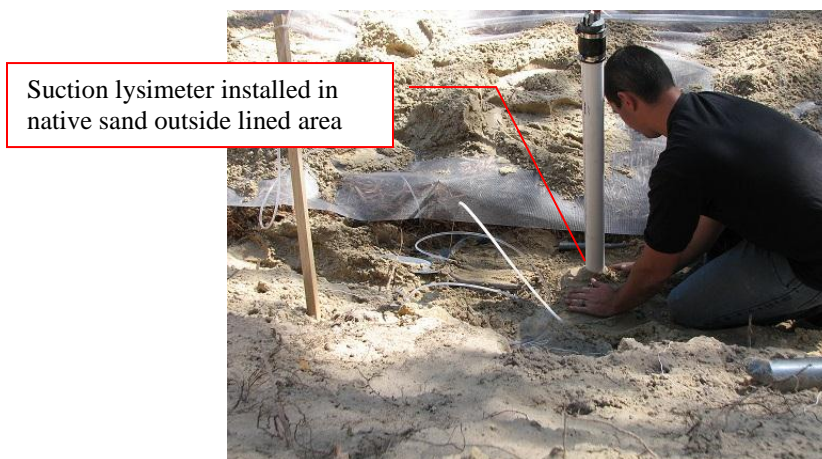


Figure 9
Treated effluent sample taken from suction lysimeter (BHS7-EFF-SL samples)



Figure 10
Treated effluent sample taken from drivepoint in pan (BHS7-EFF-DP samples)

3.4 Operational Monitoring

Start-up of the system occurred on November 19, 2013 (Experimental Day 0). However, during the Thanksgiving holiday, the homeowners projected having between thirty and forty additional people staying at the home. Therefore, since this was so soon after start-up, on November 26, 2013, the Bull Run™ diversion valve was flipped so that all the wastewater flow was diverted to the old drainfield. The diversion valve was flipped back to the PNRS system on December 2, 2013. Shortly thereafter, the homeowners planned a holiday party with a projected eighty people in attendance. Therefore on De-

cember 6, 2013, the diversion valve was flipped again so that all the wastewater flow was diverted to the old drainfield. The diversion valve was flipped back to the PNRS system on December 9, 2013, and the PNRS system has operated almost continually since that date. During July 2014, it was observed that the power breaker to the system had been flipped. This was likely due to a severe thunderstorm. With no power to the system, the pump had not run for several days, and the water elevation within the primary tank and pump tank was very high. Upon further inspection, the breaker that was installed within the panel was a GFI breaker. The contractor was contacted and came to the site to install a non-GFI breaker for the pump.

The sixth formal sampling event was conducted October 22, 2014 (Experimental Day 337). For this sixth formal sampling event, the water meter for the house and treatment system flow meters were read and recorded on October 22, 2014. The household water meter is located on the potable water line from the onsite well prior to entering the household plumbing following the water softener. 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.

The PNRS treatment system flow meter (Figure 11) is located on the pump tank discharge line and records the cumulative flow in gallons pumped from the pump chamber to the low-pressure distribution network.

Three observation ports are installed along the centerline of the Stage 2 biofilter lined area (north, center and south). The observation ports are 4-inch diameter well screens that were installed with the bottom positioned on the liner. Therefore, the water level within the lined area can be monitored within the observation ports.



Figure 11
PNRS system flow meter

3.5 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 pump in the pump tank. There are no chemicals added to the system. However, the Stage 2 biofilter media (lignocellulosic) is “reactive” media which will be consumed during operation. The Stage 2 biofilter was initially filled with 12 inches of lignocellulosic media, which ostensibly will last for many years without replenishment or replacement.

3.6 Water Quality Sample Collection and Analyses

The sixth formal sample event (Sample Event No. 6), which is the subject of this report, was conducted on October 22, 2014 (Experimental Day 337). 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 monitoring points described in Section 3.2. A peristaltic pump was used to collect samples and route them directly into analysis-specific containers after sufficient flushing of the tubing had occurred. Field parameters were then recorded.

In addition, equipment blank (B-HS7-EB) sample was taken. The equipment blank was collected by pumping deionized water through the cleaned pump tubing. This sample was then analyzed for the same parameters as the monitoring samples.

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

Field parameters were measured using portable electronic probes and included temperature (Temp), dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and specific conductance. The field parameters were measured by placing the analytical probes in a container overflowing with sample water. The influent, intermediate, and effluent samples were analyzed by the laboratory for: total alkalinity, chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH₃-N), nitrate nitrogen (NO₃-N), nitrite nitrogen (NO₂-N), total phosphorus (TP), orthophosphate (Ortho P), total suspended solids (TSS), volatile suspended solids (VSS), total organic carbon (TOC), fecal coliform (fecal), and E.coli. All analyses were performed by 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 (NO _x -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)	SM 2540E	1 mg/L
Chloride	EPA 300.0	0.50 mg/L
Fecal Coliform (fecal)	SM9222D	2 ct/100mL
E.coli	SM9223B	2 ct/100mL

p:\44237-001R004\Wpdocs\Report\Final

4.0 Results and Discussion

4.1 Operational Monitoring

Table 2 provides a summary of the household water use since the household water meter installation on October 15, 2013. The treatment system flow meter readings for the B-HS7 field site are also summarized in Table 2. The operation and maintenance log which includes actions taken since start-up is provided in Appendix B.

Table 2
Summary of Flowmeters

Date and Time Read	Household Water Meter Reading	Average Daily Household Flow between readings	PNRS Flow Meter Reading	Average Daily PNRS Flow between readings
	Cumulative Volume (gallons)	gallons/day	Cumulative Volume (gallons)	gallons/day
10/15/2013 13:51	2.9	XX		
10/23/2013 12:20	1,186.9	149.2		
11/14/2013 8:50	3,602.5	110.5		
11/15/2013 14:40	3,800.0	158.9		
11/19/2013 14:18	4,997.5	300.5	652.0	PNRS Start-up
11/26/2013 10:30	7,901.4	424.4	2,480.0	267.2
12/2/2013 9:45	9,148.6	209.0	2,480.0	0.0
12/6/2013 9:00	10,470.4	333.1	3,134.0	164.8
12/10/2013 10:00	11,218.9	Flow to PNRS	3,302.0	Flow to PNRS
12/12/2013 9:00	11,519.1	153.3	3,635.0	170.0
1/3/2014 10:50	14,722.0	145.1	6,774.0	142.2
1/17/2014 10:00	16,940.8	158.9	8,621.0	132.3
1/20/2014 12:37	17,483.4	174.5	9,134.0	165.0
3/5/2014 12:00	26,166.5	197.5	11,575.0	55.5
3/13/2014 13:30	27,382.4	150.8	12,609.0	128.2
3/19/2014 11:30	28,122.6	125.1	13,167.5	94.4
3/20/2014 12:30	28,281.8	152.8	13,318.0	144.5
4/28/2014 10:05	34,294.9	154.6	18,259.0	127.0
5/8/2014 9:00	36,055.4	176.9	19,521.0	126.8
5/27/2014 11:00	39,320.1	171.1	22,272.0	144.2
6/19/2014 12:00	43,520.7	182.3	25,837.0	154.7
7/16/2014 9:45	47,666.8	154.1	26,991.0	42.9
8/20/2014 12:20	53,342.4	161.7	32,037.0	143.7
9/23/2014 9:25	58,882.6	163.5	36,743.0	138.9
10/22/2014 8:45	62,854.7	137.1	40,005.0	112.6
Average since flow to PNRS through October 22, 2014		163.4		116.2

o:\44237-001R004\Wpdocs\Report\Final

As discussed in Section 3.4, there were two periods during the holidays when the wastewater was diverted to the old drainfield. Following these interruptions in flow, the household water use average was 163.4 gallons per day through October 22, 2014 with periods of higher and lower flows (Table 2). The average pumped flow to the PNRS system for the same time period was 116.2 gallons per day. The difference in flow could be due to outdoor water use such as filling the pool, car washing, hose bibbs for hand watering the garden, etc. The irrigation system is not part of the metered flow.

An additional water input to consider for evaluation of the system treatment performance is precipitation. A weather station was installed at the site on the roof of the home on January 6, 2014. Data from this weather station is available from the homeowner. Recorded meteorological data is provided in Appendix C, Table C.1. A summary of monthly precipitation is provided in Appendix C, Figure C.1. Table 3 provides daily precipitation totals leading up to and during the sample event.

Table 3
Precipitation Data Daily Totals Measured
October 1, 2014 through October 22, 2014

Date	Precipitation (inches)
October 1, 2014	0.03
October 2, 2014	0.01
October 3, 2014	0.04
October 4, 2014	0.02
October 5, 2014	0.00
October 6, 2014	0.00
October 7, 2014	0.00
October 8, 2014	0.00
October 9, 2014	0.00
October 10, 2014	0.01
October 11, 2014	0.01
October 12, 2014	0.00
October 13, 2014	0.01
October 14, 2014	0.81
October 15, 2014	0.39
October 16, 2014	0.01
October 17, 2014	0.00
October 18, 2014	0.00
October 19, 2014	0.01
October 20, 2014	0.00
October 21, 2014	0.00
October 22, 2014	0.01

As discussed in Section 3.4, three observation ports are installed along the centerline of the Stage 2 biofilter lined area (north, center and south). The observation port measurements are summarized in Table 4 which indicate that the monitored liner water level is continuously below the overflow elevation (114.03 ft). During this sample event, the water elevation was the lowest observed level at a range between 5.5 and 5.9 inches below the overflow elevation. There was no water in the north observation port.

Table 4
Liner Water Level within Observation Ports

Date Read	North Observation Port water elevation		Center Observation Port water elevation		South Observation Port water elevation		Range
	Water elevation (ft)	Depth below overflow (in)	Water elevation (ft)	Depth below overflow (in)	Water elevation (ft)	Depth below overflow (in)	Depth below overflow (in)
11/26/2014	113.65	4.6	113.70	4.0	113.69	4.1	4.0-4.6
12/2/2014	113.60	5.2	113.63	4.8	113.59	5.3	4.8-5.3
12/6/2014	113.64	4.7	113.67	4.3	113.64	4.7	4.3-4.7
12/12/2014	113.65	4.5	113.67	4.4	113.59	5.3	4.4-5.3
1/3/2014	113.67	4.3	113.69	4.1	113.61	5.0	4.1-5.0
1/17/2014	113.67	4.3	113.73	3.6	113.65	4.5	3.6-4.5
3/20/2014	113.67	4.3	113.73	3.6	113.76	3.3	3.3-4.3
4/28/2014	113.72	3.8	113.69	4.1	113.69	4.0	3.8-4.1
5/8/2014	113.74	3.5	113.73	3.6	113.69	4.0	3.5-4.0
5/27/2014	113.67	4.3	113.73	3.6	113.69	4.0	3.6-4.3
6/18/2014	113.69	4.0	113.69	4.1	113.65	4.5	4.0-4.5
6/19/2014	113.67	4.3	113.67	4.4	113.63	4.8	4.3-4.8
7/16/2014	113.74	3.5	113.71	3.9	113.65	4.5	3.5-4.5
8/19/2014	113.59	5.3	113.58	5.4	113.59	5.3	5.3-5.4
9/23/2014	113.58	5.4	113.59	5.2	113.59	5.3	5.2-5.5
10/22/2014	DRY	DRY	113.54	5.9	113.57	5.5	5.5-5.9

Overflow elevation is 114.03 ft which is 6 inches above the liner.

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 5.

Table 5
Summary of System Electrical Use

Date and Time Read	Electrical Meter Reading	Average Daily Electrical Use	Average Electrical Use per Gallon Treated
	Cumulative (kWh)	(kWh/day)	(kWh/ 1000 gal)
11/19/2013 14:18	0.2	0.03	PNRS Start-up
11/26/2013 10:30	0.6	0.06	0.219
12/2/2013 9:45	0.6	0.00	No flow
12/6/2013 9:00	0.8	0.05	0.306
12/9/2013			Flow to PNRS
12/10/2013 10:00	0.8	0.00	0.000
12/12/2013 9:00	0.9	0.05	0.300
1/3/2014 10:50	1.7	0.04	0.255
1/17/2014 10:00	2.3	0.04	0.325
1/20/2014 12:37	2.4	0.03	0.195
3/5/2014 12:00	3.1	0.02	0.287
3/13/2014 13:30	3.5	0.05	0.387
3/19/2014 11:30	3.7	0.03	0.358
3/20/2014 12:30	3.7	0.00	0.000
4/28/2014 10:05	5.5	0.05	0.364
5/8/2014 9:00	6.0	0.05	0.396
5/27/2014 11:00	6.9	0.05	0.327
6/19/2014 12:00	8.0	0.05	0.309
7/16/2014 9:45	8.1	0.00	0.087
8/20/2014 12:20	9.6	0.04	0.297
9/23/2014 9:25	11.1	0.04	0.319
10/22/2014 8:45	12.0	0.03	0.276
Average since flow to PNRS through October 22, 2014		0.04	0.305

The total average electrical use through October 22, 2014 was 0.04 kWh per day. The average electrical use per 1,000 gallons treated since start-up was 0.305 kWh per 1,000 gallons treated, and this parameter has been fairly stable since start-up.

4.3 Water Quality

Water quality results for the sixth sampling event (Sample Event No. 6) are listed in Table 6. A summary of the water quality data collected for the test system since start-up

o:\44237-001R004\Wpdocs\Report\Final

is presented in Table 7. Nitrogen results for the treatment evaluation cross section displayed in Figure 4 are graphically displayed in Figure 13. The laboratory report containing the raw analytical data is included in Appendix A. The following discussion summarizes the water quality analytical results for Sample Event No. 6. 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.

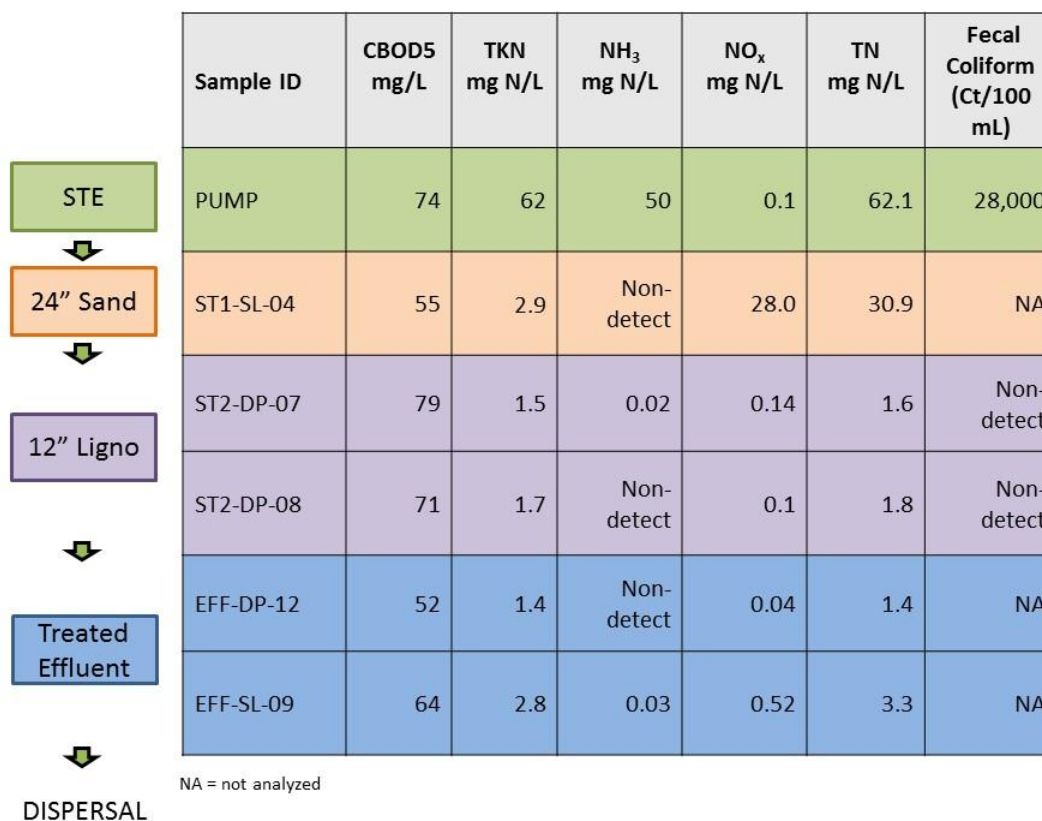


Figure 13
Graphical Representation of Water Quality Results

Septic Tank Effluent (STE) Quality: The water quality characteristics of STE collected in Sample Event 6 were within the typical range generally expected for domestic STE. The measured STE total nitrogen (TN) concentration was approximately 62 mg/L, which is within the range that has been typically reported for Florida single family residence STE.

Stage 1 Effluent (native sand): The sample points considered representative of Stage 1 effluent included: BHS7-ST1-SL-01, BHS7-ST1-SL-02, BHS7-ST1-SL-03, and BHS7-ST1-SL-04. Based on these samples (n=4), the mean concentration \pm the standard deviation are evaluated. Stage 1 effluent mean $\text{NH}_3\text{-N}$ level was 0.83 ± 1.52 mg/L with a mean DO level of 4.73 ± 0.79 mg/L in the Stage 1 effluent (Table 6). These results indicate a substantial reduction of ammonia through the Stage 1 biofilter. The Stage 1 effluent mean $\text{NO}_x\text{-N}$ concentration was 23.72 ± 15.23 mg/L, implying significant nitrification. The Stage 1 effluent CBOD_5 concentration of 55 mg/L is higher than expected.

Stage 2 Biofilter Effluent (lignocellulosic): The sample points considered representative of the effluent of the Stage 2 biofilter (lignocellulosic media) included: BHS7-ST2-DP-03, BHS7-ST2-DP-06, BHS7-ST2-DP-07, and BHS7-ST2-DP-08. Based on these samples (n=4), the mean concentration \pm the standard deviation are evaluated. The Stage 2 effluent mean $\text{NO}_x\text{-N}$ concentration was 0.18 ± 0.08 mg/L with a mean DO level at 2.7 ± 0.8 mg/L. The Stage 2 system achieved nearly complete $\text{NO}_x\text{-N}$ reduction. The mean total nitrogen (TN) concentration was 3.1 ± 1.8 mg/L. The effluent mean CBOD_5 was 75.0 ± 5.7 mg/L.

Perimeter Monitoring Points: The sample points considered representative of system effluent included: BHS7-EFF-SL-06, BHS7-EFF-SL-07, BHS7-EFF-SL-08, BHS7-EFF-SL-09, BHS7-EFF-DP-10, BHS7-EFF-DP-11, and BHS7-EFF-DP-12. Based on these samples (n=7), the mean concentration \pm the standard deviation are evaluated. The treated effluent mean TN was 11.3 ± 13.4 mg/L of which mean TKN was 2.2 ± 0.9 and mean $\text{NO}_x\text{-N}$ was 9.1 ± 12.8 mg/L.

It is still unclear why $\text{NO}_x\text{-N}$ levels in the perimeter monitoring points are higher than $\text{NO}_x\text{-N}$ levels in samples collected within Stage 2 media. The observation port measurements at the time of sampling showed that the water level within the liner was between 5.5 and 5.9 inches below the periphery overflow elevation, which are the lowest levels measured throughout the study period. The water sampled at the perimeter points is therefore not likely to be water that was recently discharged off of the liner. One hypothesis is that the $\text{NO}_x\text{-N}$ plume beneath the wastewater application zone extends laterally past the width of the Stage 2 biofilter liner area. The overlying Stage 1 biofilter is a 24-inch layer of native sand media which is classified as Candler fine sand. During site reconnaissance, two soil profiles indicated that the water table was below 72 inches, which would provide a free drainage condition for the Stage 1 domain. As depicted in the Task D.7 Hydrus 2-D Simulation, Scenario 45 graphic (Figure 14), it is possible that the nitrate plume may extend approximately +100 cm (3.28 ft) from the exterior trench wall. The Stage 2 biofilter was designed to extend only 2.5 ft from the exterior

trench wall, therefore a portion of the unsaturated plume could be missing the liner and causing the high NO_x-N results along the perimeter.

Scenario 45

Configuration: trench, equal distribution
 Soil Type: more permeable sand
 Loading Rate: 2.67 cm/d (0.65 gpd/ft²)
 Effluent Nitrogen: 60 mg-N/L as NH₄
 Depth to Water Table: free drainage

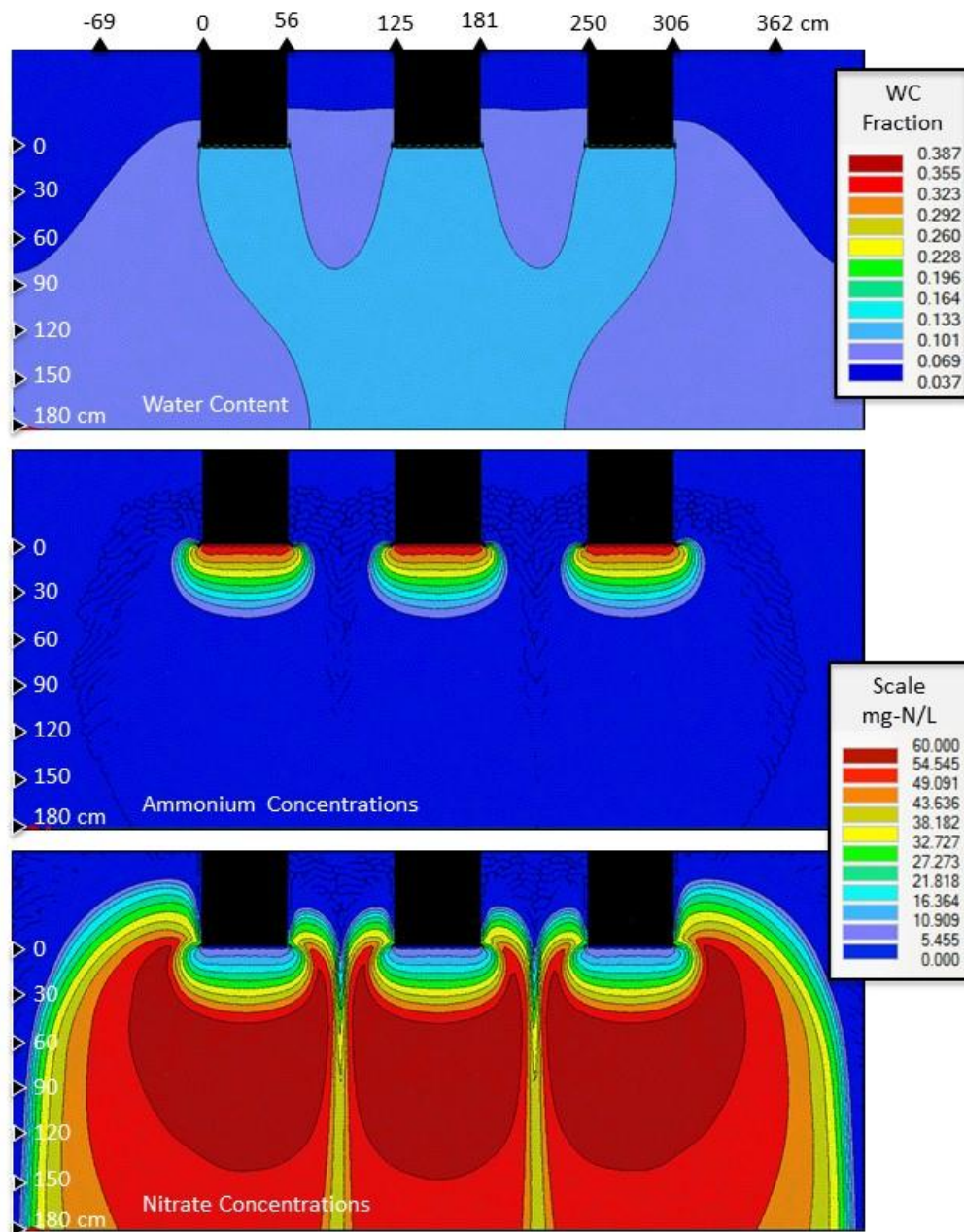


Figure 14
Graphic Representation of Task D.7 Hydrus 2-D Simulation, Scenario 45

Equipment Blank (EB): Described in Section 3.5, the equipment blank (EB) results for most of the parameters measured were at or below the method detection limit.

It is also unclear why chloride concentrations varied greatly across the system with several very high concentrations during this sample event. Historically the average STE chloride concentration is 433 mg/L with a maximum concentration of 700 mg/L. During the previous sample event (Sample Event No. 5), one sample location (SW-BHS7-EFF-SL-09) had a relatively high chloride concentration of 1,400 mg/L. During this sample event, five additional sample locations had relatively high chloride concentrations equal to or greater than 2,100 mg/L. The high chloride concentrations are not unique to a generalized system location, type of monitoring device, nor elevation.

Table 6
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)	NOx (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	Chloride (mg/L)
BHS7-PUMP	10/22/2014 11:20	23.8	7.25	1807	0.05	-229.8	280	22	22	74	250	62.10	62	12.00	50	0.02	0.08	0.1	50.10	7.7	5.3	28000	9600	410
BHS7-PUMP-DUP	10/22/2014 11:25	23.8	7.25	1807	0.05	-229.8	270	28	25	74	250	54.09	54	0.00	54	0.02	0.07	0.09	54.09	6.2	5.3	18000	8400	360
NC-BHS7-ST1-SL-01	10/22/2014 10:38	23.0	5.67	2370	5.60	186.7						21.61	2.6	2.45	0.15	19	0.01	19.01	19.16					2700
NC-BHS7-ST1-SL-02	10/22/2014 10:30	22.2	5.91	2062	3.71	151.3						10.82	5	1.90	3.1	5.8	0.02	5.82	8.92					2300
SC-BHS7-ST1-SL-03	10/22/2014 10:16	22.0	5.30	2280	4.96	231.8						44.52	2.5	2.46	0.042	42	0.02	42.02	42.06					
SC-BHS7-ST1-SL-04	10/22/2014 10:06	21.1	5.36	1633	4.63	221.0	26	1	1	55	23	30.91	2.9	2.89	0.009	28	0.01	28.01	28.02	0.13	0.032			390
NC-BHS7-ST2-DP-03	10/22/2014 10:55	22.1	6.00	1319	2.03	196.5						5.48	5.2	5.03	0.17	0.16	0.12	0.28	0.45					32
SE-BHS7-ST2-DP-06	10/22/2014 9:48	21.9	5.95	1092	3.86	153.5						3.41	3.2	3.13	0.068	0.11	0.1	0.21	0.28			1	2	32
SE-BHS7-ST2-DP-06-DUP	10/22/2014 9:55	21.9	5.95	1092	3.86	153.5						3.20	3	2.92	0.077	0.11	0.09	0.2	0.28			1	2	32
SC-BHS7-ST2-DP-07	10/22/2014 9:08	21.9	5.99	1520	2.36	181.5	180	11	11	79	95	1.64	1.5	1.48	0.018	0.06	0.08	0.14	0.16	1.5	1.3	1	2	380
SW-BHS7-ST2-DP-08	10/22/2014 9:08	21.8	5.97	1167	2.54	151.1	170	1	1	71	91	1.80	1.7	1.69	0.009	0.06	0.04	0.1	0.11	1	0.97	1	2	270
NE-BHS7-EFF-SL-06	10/22/2014 10:50	22.3	5.72	268	5.65	197.3						11.02	2.6	2.57	0.034	8.4	0.02	8.42	8.45					30
NW-BHS7-EFF-SL-07	10/22/2014 9:12	21.7	6.18	3970	6.57	199.8						2.08	1.5	1.49	0.009	0.57	0.01	0.58	0.59					3200
NW-BHS7-EFF-DP-10	10/22/2014 9:32	21.0	6.11	1986	6.66	140.1						0.93	0.89	0.29	0.6	0.03	0.01	0.04	0.64					2100
SE-BHS7-EFF-SL-08	10/22/2014 9:45	21.9	4.98	1898	6.01	201.8						33.71	2.7	2.60	0.1	31	0.01	31.01	31.11					2600
SE-BHS7-EFF-DP-11	10/22/2014 9:55	19.9	5.75	1678	6.02	202.4						26.22	3.2	3.17	0.026	23	0.02	23.02	23.05					450
SW-BHS7-EFF-SL-09	10/22/2014 10:25	22.0	6.14	6120	6.49	219.2	4800	1	1	64	120	3.32	2.8	2.77	0.028	0.49	0.03	0.52	0.55	0.14	0.026			3300
SW-BHS7-EFF-DP-12	10/22/2014 10:35	20.8	6.18	1854	4.64	211.9	4600	18	17	52	95	1.44	1.4	1.39	0.009	0.02	0.02	0.04	0.05	0.96	0.85			480
BHS7-EB	10/22/2014 11:00	20.0	5.73	1.42	8.36	157.6	2	1	1	2	10	0.08	0.05	0.04	0.009	0.02	0.01	0.03	0.04	0.01	0.012	1	2	1

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.

o:\44237-001R004\Wpdocs\Report\Final

Table 7
Summary of Water Quality Analytical Results

Sample ID		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)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	Cl (mg/L)
BHS7-PUMP	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	MEAN	23.22	7.23	2031.17	0.08	-174.97	281.67	33.67	31.00	88.33	165.33	50.55	50.50	9.85	40.65	0.03	0.02	0.05	40.70	6.88	4.60	31193	1641	433.33
	STD. DEV.	3.36		227.80	0.09	67.51	19.41	7.50	7.54	30.94	82.43	5.98	5.96	16.88	16.70	0.03	0.03	0.03	16.71	1.39	0.65			155.52
	MIN	18.60	6.92	1807.00	0.01	-240.10	250.00	22.00	22.00	38.00	22.00	46.02	46.00	0.00	6.90	0.01	0.01	0.02	6.92	5.70	3.90	20000	96	300.00
	MAX	27.82	7.63	2454.00	0.25	-95.20	310.00	43.00	40.00	120.00	250.00	62.10	62.00	43.10	50.00	0.07	0.08	0.10	50.10	9.30	5.40	51000	10000	700.00
BHS7-ST1-SL-01	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	5	6	6	6	0	0	0	0	4
	MEAN	23.22	5.44	1760.17	5.02	172.22						24.02	2.68	2.29	0.40	18.80	0.01	21.34	21.74					952.50
	STD. DEV.	4.78		492.87	0.53	31.63						13.73	1.02	0.41	0.74	12.98	0.00	13.16	13.60					1168.54
	MIN	15.50	5.23	1077.00	4.34	128.90						2.42	1.60	1.57	0.03	0.01	0.01	0.02	0.06					270.00
	MAX	28.90	5.67	2370.00	5.65	203.40						40.60	4.60	2.70	1.90	36.00	0.01	36.00	37.90					2700.00
BHS7-ST1-SL-02	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	6	6	6	6	0	0	0	0	4
	MEAN	22.92	5.36	1448.83	4.32	163.70						15.81	2.63	2.04	0.60	13.17	0.01	13.18	13.77					775.00
	STD. DEV.	4.77		345.20	0.93	26.84						19.19	1.30	0.60	1.23	19.34	0.00	19.34	19.27					1018.02
	MIN	15.40	5.04	1156.00	3.04	129.60						1.32	1.30	1.25	0.01	0.01	0.01	0.02	0.05					220.00
	MAX	28.60	5.91	2062.00	5.84	196.70						53.20	5.00	3.07	3.10	51.00	0.02	51.00	51.35					2300.00
BHS7-ST1-SL-03	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	5	6	6	6	0	0	0	0	3
	MEAN	23.26	5.34	1838.17	4.72	184.70						36.26	3.08	2.39	0.70	29.20	0.73	33.17	33.87					386.67
	STD. DEV.	5.31		377.32	0.91	39.54						17.93	2.01	0.58	1.57	16.88	1.75	17.27	17.67					68.07
	MIN	15.80	5.05	1348.00	3.95	115.20						2.22	1.60	1.49	0.02	0.01	0.01	0.02	0.10					310.00
	MAX	29.10	5.87	2280.00	6.33	231.80						50.30	7.10	3.20	3.90	42.00	4.30	48.00	48.02					440.00
BHS7-ST1-DP-01	n	2	2	2	2	2	0	0	0	0	0	2	2	2	2	2	2	2	2	0	0	0	0	0
	MEAN	17.85	5.08	1556.50	5.21	138.95						27.56	5.05	3.31	1.74	22.51	0.01	22.51	24.25					
	STD. DEV.	1.48		675.29	0.23	73.19						36.68	4.88	2.53	2.35	31.81	0.00	31.81	34.15					
	MIN	16.80	5.04	1079.00	5.05	87.20						1.62	1.60	1.52	0.08	0.01	0.01	0.02	0.10					
	MAX	18.90	5.12	2034.00	5.37	190.70						53.50	8.50	5.10	3.40	45.00	0.01	45.00	48.40					
BHS7-ST1-SL-04	n	6	6	6	6	6	4	5	5	6	6	6	6	6	6	5	6	6	6	6	6	3	4	5
	MEAN	22.93	5.37	1494.83	4.29	178.22	23.50	3.60	3.00	11.17	51.83	35.14	3.63	2.77	0.86	27.80	0.01	31.51	32.36	0.16	0.01	2	2	348.00
	STD. DEV.	5.48		472.60	0.79	40.22		2.70	2.12	21.48	58.84	19.99	3.03	1.14	1.98	18.63	0.00	18.96	19.55	0.12	0.01			82.89
	MIN	15.30	5.11	635.00	3.16	106.90	17.00	1.00	1.00	2.00	15.00	2.62	1.40	1.39	0.01	0.01	0.01	0.02	0.10	0.04	0.01	1	2	230.00
	MAX	29.50	5.80	1933.00	5.28	221.00	31.00	8.00	6.00	55.00	170.00	52.20	9.70	4.80	4.90	48.00	0.01	50.00	50.03	0.38	0.03	10	2	440.00

Table 7 (continued)
Summary of Water Quality Analytical Results

Sample ID		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)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	Cl (mg/L)
BHS7-ST2-DP-02	n	2	2	2	2	2	0	0	0	0	0	2	2	2	2	2	2	2	2	0	0	0	0	0
	MEAN	19.25	6.00	1732.50	0.12	24.70						10.74	10.40	9.73	0.68	0.34	0.06	0.34	1.02					
	STD. DEV.	0.35		369.82	0.01	142.69						8.00	7.92	8.27	0.35	0.08	0.06	0.08	0.26					
	MIN	19.00	5.99	1471.00	0.11	-76.20						5.08	4.80	3.88	0.43	0.28	0.01	0.28	0.83					
	MAX	19.50	6.01	1994.00	0.12	125.60						16.40	16.00	15.57	0.92	0.40	0.10	0.40	1.20					
BHS7-ST2-DP-03	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	6	6	6	6	0	0	0	0	4
	MEAN	22.91	6.07	1605.33	1.24	52.58						3.78	3.60	3.49	0.12	0.15	0.03	0.18	0.29					243.00
	STD. DEV.	2.90		371.82	1.30	106.56						1.62	1.65	1.61	0.05	0.15	0.04	0.16	0.18					163.74
	MIN	19.50	5.88	1059.00	0.13	-109.60						1.73	1.70	1.62	0.03	0.01	0.01	0.02	0.06					32.00
	MAX	27.28	6.44	2068.00	3.48	196.50						5.52	5.50	5.36	0.17	0.39	0.12	0.39	0.47					400.00
BHS7-ST2-DP-04	n	2	2	2	2	2	0	0	0	0	0	2	2	2	2	2	2	2	2	0	0	0	0	0
	MEAN	19.80	6.02	1828.50	0.08	-5.45						3.77	3.75	3.66	0.09	0.01	0.01	0.02	0.11					
	STD. DEV.	0.71		375.47	0.00	208.38						1.34	1.34	1.35	0.01	0.00	0.00	0.00	0.01					
	MIN	19.30	5.94	1563.00	0.08	-152.80						2.82	2.80	2.71	0.08	0.01	0.01	0.02	0.10					
	MAX	20.30	6.10	2094.00	0.08	141.90						4.72	4.70	4.62	0.09	0.01	0.01	0.02	0.11					
BHS7-ST2-DP-05	n	5	5	5	5	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	0	0	0	3
	MEAN	23.68	6.13	1701.80	1.22	-7.78						2.82	2.78	2.70	0.08	0.04	0.01	0.04	0.13					323.33
	STD. DEV.	3.69		366.24	1.90	104.82						0.55	0.55	0.56	0.03	0.03	0.00	0.02	0.02					70.24
	MIN	19.30	6.05	1183.00	0.08	-147.60						2.22	2.20	2.09	0.05	0.01	0.01	0.02	0.10					250.00
	MAX	28.31	6.20	2133.00	4.50	119.40						3.52	3.50	3.40	0.11	0.07	0.01	0.07	0.16					390.00
BHS7-ST2-SL-05	n	2	2	2	2	2	0	0	0	0	0	2	2	2	2	2	2	2	2	0	0	0	0	0
	MEAN	19.25	6.02	1585.50	2.30	97.20						8.80	3.45	3.36	0.09	5.35	0.01	5.35	5.44					
	STD. DEV.	4.60		651.25	1.56	59.40						2.26	1.63	1.66	0.03	0.64	0.00	0.64	0.61					
	MIN	16.00	5.94	1125.00	1.20	55.20						7.20	2.30	2.19	0.07	4.90	0.01	4.90	5.01					
	MAX	22.50	6.10	2046.00	3.40	139.20						10.40	4.60	4.53	0.11	5.80	0.01	5.80	5.87					
BHS7-ST2-DP-06	n	5	5	5	5	5	0	0	0	0	0	5	5	5	5	5	5	5	5	0	0	1	1	3
	MEAN	22.36	6.14	1756.60	1.04	30.92						4.92	4.84	4.71	0.13	0.06	0.03	0.08	0.21			1.00	2.00	277.33
	STD. DEV.	2.59		451.88	1.63	98.47						1.82	1.86	1.85	0.05	0.06	0.04	0.09	0.09					212.70
	MIN	19.90	5.95	1092.00	0.06	-120.40						3.41	3.20	3.13	0.07	0.01	0.01	0.02	0.13			1.00	2.00	32.00
	MAX	25.99	6.63	2280.00	3.86	153.50						7.92	7.90	7.76	0.20	0.14	0.10	0.21	0.34			1.00	2.00	410.00
BHS7-ST2-DP-07	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5
	MEAN	24.02	6.21	1894.83	1.03	26.18	203.33	13.67	9.83	34.00	193.33	3.41	3.37	3.27	0.10	0.02	0.02	0.04	0.14	13.75	8.40	9	3	424.00
	STD. DEV.	3.96		310.11	1.02	100.73	22.51	6.80	5.23	29.64	145.93	2.09	2.11	2.07	0.05	0.02	0.03	0.05	0.04	23.00	13.43			65.42
	MIN	19.90	5.99	1520.00	0.10	-117.30	180.00	8.00	1.00	9.00	50.00	1.42	1.40	1.36	0.02	0.01	0.01	0.02	0.06	1.30	0.82	1	2	330.00
	MAX	29.36	6.38	2350.00	2.36	181.50	240.00	27.00	17.00	79.00	380.00	7.22	7.20	7.07	0.15	0.06	0.08	0.14	0.17	60.00	35.00	1200	10	470.00
BHS7-ST2-DP-08	n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5
	MEAN	23.36	6.10	1640.33	0.91	10.02	190.00	9.67	6.17	39.83	316.83	2.68	2.62	2.54	0.07	0.05	0.02	0.06	0.13	9.87	5.74	1	2	354.00
	STD. DEV.	3.91		299.44	0.92	111.63	25.30	5.24	4.58	28.74	393.31	1.21	1.22	1.20	0.05	0.05	0.01	0.05	0.07	14.32	8.08			76.35
	MIN	18.40	5.97	1167.00	0.08	-161.00	150.00	1.00	1.00	11.00	91.00	1.35	1.30	1.27	0.01	0.01	0.01	0.02	0.08	1.00	0.68	1	2	270.00
	MAX	28.07	6.17	2070.00	2.54	151.10	220.00	16.00	13.00	78.00	1100.00	4.72	4.70	4.61	0.13	0.15	0.04	0.15	0.26	37.00	20.00	1	2	460.00

Table 7 (continued)
Summary of Water Quality Analytical Results

Sample ID		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)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	Cl (mg/L)
BHS7-EFF-SL-06	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	5	6	6	6	0	0	0	0	4
	MEAN	22.12	5.70	710.83	5.50	176.57						19.05	2.15	2.03	0.12	13.28	0.01	16.90	17.03					95.25
	STD. DEV.	5.25		321.94	0.31	35.37						11.06	0.95	1.02	0.13	7.26	0.00	10.99	10.92					57.53
	MIN	12.40	5.53	268.00	4.94	124.10						4.40	1.40	1.05	0.03	3.00	0.01	3.00	3.35					30.00
	MAX	27.50	5.94	1073.00	5.74	215.80						36.60	3.90	3.84	0.35	20.00	0.02	35.00	35.05					170.00
BHS7-EFF-DP-09	n	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0
	MEAN	17.70	6.06	431.00	6.36	131.50						7.20	2.50	1.59	0.91	4.70	0.01	4.70	5.61					
	STD. DEV.																							
	MIN	17.70	6.06	431.00	6.36	131.50						7.20	2.50	1.59	0.91	4.70	0.01	4.70	5.61					
	MAX	17.70	6.06	431.00	6.36	131.50						7.20	2.50	1.59	0.91	4.70	0.01	4.70	5.61					
BHS7-EFF-SL-07	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	5	6	6	6	0	0	0	0	4
	MEAN	22.38	5.38	1561.00	6.17	171.42						23.75	1.63	1.32	0.32	19.13	0.01	22.11	22.43					1037.50
	STD. DEV.	4.04		1281.93	0.47	30.66						17.78	0.39	0.59	0.63	18.03	0.00	17.69	17.46					1444.84
	MIN	15.50	4.61	367.00	5.51	126.70						2.08	1.20	0.40	0.01	0.57	0.01	0.58	0.59					230.00
	MAX	27.30	6.18	3970.00	6.75	199.80						40.60	2.20	2.15	1.60	39.00	0.01	39.00	39.01					3200.00
BHS7-EFF-DP-10	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	6	6	6	6	0	0	0	0	4
	MEAN	21.57	5.97	1646.50	5.76	141.05						20.51	2.05	1.89	0.16	18.46	0.01	18.46	18.61					807.50
	STD. DEV.	4.96		411.77	1.21	31.44						16.35	0.75	0.91	0.22	15.85	0.00	15.85	15.73					873.82
	MIN	13.30	5.74	1147.00	4.40	85.30						0.93	0.89	0.29	0.02	0.03	0.01	0.04	0.64					220.00
	MAX	27.30	6.18	2187.00	7.18	182.80						41.20	3.00	2.88	0.60	39.00	0.01	39.00	39.06					2100.00
BHS7-EFF-SL-08	n	6	6	6	6	6	0	0	0	0	0	6	6	6	6	5	6	6	6	0	0	0	0	4
	MEAN	22.40	5.22	1617.33	5.65	174.50						35.64	2.47	2.27	0.20	31.00	0.01	33.17	33.36					912.50
	STD. DEV.	4.39		241.55	0.79	36.39						9.49	0.86	0.57	0.34	8.09	0.00	8.98	9.14					1126.27
	MIN	15.80	4.88	1331.00	4.49	114.20						22.80	1.70	1.69	0.01	21.00	0.01	21.00	21.08					280.00
	MAX	27.60	6.25	1898.00	6.56	211.20						46.00	4.00	3.12	0.88	42.00	0.01	44.00	44.03					2600.00
BHS7-EFF-SL-09	n	6	6	6	6	6	3	5	5	5	5	4	4	4	6	5	6	6	6	5	6	0	1	5
	MEAN	23.18	5.64	2179.17	5.53	143.72	1608.00	1.00	1.40	19.40	50.40	26.36	2.23	2.01	0.18	21.90	0.01	27.25	27.43	0.12	0.05		2.00	979.80
	STD. DEV.	5.12		2501.78	0.69	73.48	2764.35	0.00	0.89	26.96	42.81	23.52	0.46	0.64	0.17	15.92	0.01	19.34	19.33	0.11	0.09			1419.92
	MIN	16.40	5.09	269.00	4.58	53.80	11.00	1.00	1.00	2.00	10.00	3.32	1.70	1.29	0.01	0.49	0.01	0.52	0.55	0.01	0.01		2.00	34.00
	MAX	29.10	6.14	6120.00	6.49	219.20	4800.00	1.00	3.00	64.00	120.00	56.30	2.80	2.77	0.41	40.00	0.03	54.00	54.06	0.29	0.24		2.00	3300.00
BHS7-EFF-DP-11	n	4	4	4	4	4	0	0	0	0	0	4	4	4	4	5	5	5	4	0	0	0	0	4
	MEAN	24.58	5.88	1665.00	5.23	168.40						25.78	3.03	2.81	0.22	25.40	0.01	25.40	22.97					380.00
	STD. DEV.	3.41		350.21	0.72	31.36						8.16	0.17	0.41	0.35	9.15	0.00	9.15	7.92					111.65
	MIN	19.90	5.75	1356.00	4.34	137.20						18.80	2.80	2.26	0.03	16.00	0.01	16.00	16.07					280.00
	MAX	28.00	6.06	2151.00	6.02	202.40						37.10	3.20	3.17	0.74	36.00	0.02	36.00	34.04					500.00
BHS7-EFF-DP-12	n	6	6	6	6	6	4	4	4	4	4	6	6	6	6	6	6	6	6	4	4	2	2	4
	MEAN	22.78	6.12	1751.17	4.31	112.62	1255.00	12.25	9.00	20.00	87.00	8.74	2.95	2.85	0.10	5.79	0.01	5.79	5.89	1.84	0.77	1.00	2.00	410.00
	STD. DEV.	4.31		289.72	0.47	91.12	2230.06	6.45	6.73	21.66	20.77	5.10	1.05	1.02	0.05	4.65	0.00	4.64	4.66	0.72	0.24			76.16
	MIN	17.20	5.90	1309.00	3.66	-36.30	120.00	3.00	1.00	4.00	56.00	1.44	1.40	1.39	0.01	0.02	0.01	0.04	0.05	0.96	0.44	1.00	2.00	330.00
	MAX	28.20	6.25	2173.00	5.01	211.90	4600.00	18.00	17.00	52.00	100.00	14.30	4.60	4.47	0.15	11.00	0.02	11.00	11.08	2.60	1.00	1.00	2.00	480.00

Table 7 (continued)
Summary of Water Quality Analytical Results

Sample ID		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)	Fecal (Ct/100 mL)	E-coli (Ct/100 mL)	Cl (mg/L)
BHS7-BKG-LY	n	3	3	3	3	3	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	1	2
	MEAN	27.07	5.71	78.87	5.92	182.07	11.00	1.00	8.50	16.00	30.50	3.25	0.89	0.82	0.08	2.36	0.01	2.36	2.44	0.05	0.01	1.00	2.00	3.90
	STD. DEV.	2.74		37.47	0.35	24.52		0.00	10.61		26.16	3.18	0.16	0.14	0.02	3.03	0.00	3.03	3.04	0.01	0.00			0.99
	MIN	24.10	5.43	35.80	5.67	155.60	11.00	1.00	1.00	16.00	12.00	1.00	0.78	0.72	0.06	0.22	0.01	0.22	0.28	0.04	0.01	1.00	2.00	3.20
	MAX	29.50	5.96	104.00	6.32	204.00	11.00	1.00	16.00	16.00	49.00	5.50	1.00	0.91	0.09	4.50	0.01	4.50	4.59	0.05	0.01	1.00	2.00	4.60
BHS7-TAP	n	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
	MEAN	21.40	7.21	176.60	6.49	99.75	82.50	2.00	2.00	2.00	10.00	0.24	0.05	0.04	0.01	0.11	0.08	0.19	0.20	0.15	0.12	1.00	2.00	4.00
	STD. DEV.	1.84		3.82	0.93	77.00	6.36	1.41	1.41	0.00	0.00	0.04	0.00	0.00	0.00	0.03	0.01	0.04	0.04	0.04	0.04			
	MIN	20.10	7.14	173.90	5.83	45.30	78.00	1.00	1.00	2.00	10.00	0.21	0.05	0.04	0.01	0.09	0.07	0.16	0.17	0.12	0.10	1.00	2.00	4.00
	MAX	22.70	7.28	179.30	7.15	154.20	87.00	3.00	3.00	2.00	10.00	0.27	0.05	0.04	0.01	0.13	0.09	0.22	0.23	0.17	0.15	1.00	2.00	4.00
BHS7-EB	n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4
	MEAN	23.96	6.17	1.81	7.59	108.16	2.06	1.00	1.00	2.00	10.00	0.10	0.08	0.07	0.02	0.01	0.01	0.02	0.03	0.01	0.01	1.00	2.00	0.29
	STD. DEV.	6.56		0.48	1.54	60.30	0.13	0.00	0.00	0.00	0.00	0.08	0.08	0.06	0.01	0.00	0.00	0.01	0.02	0.01	0.00			0.48
	MIN	15.90	4.62	1.20	5.16	43.10	2.00	1.00	1.00	2.00	10.00	0.06	0.05	0.04	0.01	0.01	0.01	0.01	0.02	0.01	0.01	1.00	2.00	0.05
	MAX	30.90	7.39	2.26	9.29	181.20	2.30	1.00	1.00	2.00	10.00	0.24	0.22	0.18	0.04	0.02	0.01	0.03	0.06	0.03	0.01	1.00	2.00	1.00

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.

5.0 B-HS7 Sample Event No. 6: Summary and Recommendations

5.1 Summary

The Sample Event No. 6 results indicate that:

- Septic tank effluent (STE) quality is characteristic of typical household STE quality. The total nitrogen concentration of approximately 62 mg/L is within the range of values typically reported for Florida single family residence STE.
- The Stage 1 biofilter converted the majority of ammonium to oxidized nitrogen; mean effluent values contained 3.3 ± 1.2 mg/L TKN, of which 0.83 ± 1.5 mg/L was ammonia.
- The Stage 2 biofilter mean effluent $\text{NO}_x\text{-N}$ within the biofilter media was 0.18 ± 0.08 mg N/L.
- The total nitrogen concentration in the perimeter monitoring points surrounding the treatment system was 11.3 ± 13.4 mg/L of which mean TKN was 2.2 ± 0.9 and mean $\text{NO}_x\text{-N}$ was 9.1 ± 12.8 mg/L. It is still unclear why several of the perimeter monitoring points show higher $\text{NO}_x\text{-N}$ levels than in samples taken from within the Stage 2 media. Since the observation port measurements indicated that the liner water level was between 5.5 and 5.9 inches below the overflow elevation at the time of sampling, the water sampled at the perimeter points is not likely to be water that was recently discharged off the liner. One hypothesis is that the unsaturated zone $\text{NO}_x\text{-N}$ plume extends past the width of the Stage 2 biofilter liner area. This hypothesis will be further evaluated as more data is collected and analyzed at the site.

5.2 Recommendations

Several of the perimeter monitoring point samples continue to show high total nitrogen mostly comprised of $\text{NO}_x\text{-N}$. It is possible that water sampled at the perimeter monitoring points may not be representative of water that has passed through the Stage 2 media. One possible method to track the wastewater plume without compromising nitrogen analyses is to introduce rhodamine dye or other tracer into the system.



Appendix A: Laboratory Report

PRELIMINARY

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

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS7-STE						
Matrix		Wastewater						
SAL Sample Number		1410919-01						
Date/Time Collected		10/22/14 11:20						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		7.25						
Temperature		23.8 °C						
Conductivity		1807 umhos						
Dissolved Oxygen		0.05 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	50	EPA 350.1	3.6	0.85		10/24/14 16:54	90
Carbonaceous BOD	mg/L	74	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	250	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	410	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	0.05	EPA 353.2	0.04	0.01		10/23/14 13:08	1
Nitrite (as N)	mg/L	0.08	SM 4500NO2-B	0.04	0.01		10/23/14 12:45	1
Orthophosphate as P	mg/L	5.3	SM 4500P-E	0.20	0.060		10/23/14 14:00	5
Phosphorous - Total as P	mg/L	7.7	SM 4500P-E	0.040	0.010	10/23/14 09:44	10/24/14 13:14	1
Total Alkalinity	mg/L	280	SM 2320B	8.0	2.0		10/27/14 15:36	1
Total Kjeldahl Nitrogen	mg/L	62	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Total Suspended Solids	mg/L	22	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	22	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.02 U	EPA 353.2	0.08	0.02		10/23/14 13:08	1
<u>Microbiology</u>								
E. Coli	MPN/100 mL	9,600	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	28,000	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

Sample Description **BHS7-STE-DUP**
 Matrix **Wastewater**
 SAL Sample Number **1410919-02**
 Date/Time Collected **10/22/14 11:25**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

Client Provided Field Data

pH 7.25
 Temperature 23.8 °C
 Conductivity 1807 umhos
 Dissolved Oxygen 0.05 mg/L

Inorganics

Ammonia as N	mg/L	54	EPA 350.1	3.6	0.85		10/29/14 14:18	90
--------------	------	----	-----------	-----	------	--	----------------	----

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS7-STE-DUP						
Matrix		Wastewater						
SAL Sample Number		1410919-02						
Date/Time Collected		10/22/14 11:25						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
Carbonaceous BOD	mg/L	74	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	250	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	360	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	0.07	EPA 353.2	0.04	0.01		11/07/14 17:14	1
Nitrite (as N)	mg/L	0.07	SM 4500NO2-B	0.04	0.01		10/23/14 12:46	1
Orthophosphate as P	mg/L	5.3	SM 4500P-E	0.20	0.060		10/23/14 14:00	5
Phosphorous - Total as P	mg/L	6.2	SM 4500P-E	0.040	0.010	10/23/14 09:44	10/24/14 13:14	1
Total Alkalinity	mg/L	270	SM 2320B	8.0	2.0		10/27/14 15:44	1
Total Kjeldahl Nitrogen	mg/L	54	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Total Suspended Solids	mg/L	28	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	25	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.02 U	EPA 353.2	0.08	0.02		11/07/14 17:14	1
Microbiology								
E. Coli	MPN/100 mL	8,400	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	18,000	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1
Sample Description		NC-BHS7-ST1-SL-01						
Matrix		Wastewater						
SAL Sample Number		1410919-03						
Date/Time Collected		10/22/14 10:38						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
Client Provided Field Data								
pH		5.67						
Temperature		28.0 °C						
Conductivity		2370 umhos						
Dissolved Oxygen		5.60 mg/L						
Inorganics								
Ammonia as N	mg/L	0.15	EPA 350.1	0.040	0.009		10/29/14 13:08	1
Chloride	mg/L	2,700	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	19	EPA 353.2	0.96	0.24		10/23/14 14:19	24
Nitrite (as N)	mg/L	0.01 I	SM 4500NO2-B	0.04	0.01		10/23/14 12:46	1
Total Kjeldahl Nitrogen	mg/L	2.6	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	19	EPA 353.2	1.0	0.25		10/23/14 14:19	24

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution

Sample Description **NC-BHS7-ST1-SL-02**
 Matrix **Wastewater**
 SAL Sample Number **1410919-04**
 Date/Time Collected **10/22/14 10:30**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

Client Provided Field Data

pH 5.91
 Temperature 22.2 °C
 Conductivity 2062 umhos
 Dissolved Oxygen 3.71 mg/L

Inorganics

Ammonia as N	mg/L	3.1	EPA 350.1	0.40	0.095		10/29/14 13:53	10
Chloride	mg/L	2,300	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	5.8	EPA 353.2	0.20	0.05		10/23/14 13:56	5
Nitrite (as N)	mg/L	0.02 I	SM	0.04	0.01		10/23/14 12:47	1
			4500NO2-B					
Total Kjeldahl Nitrogen	mg/L	5.0	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	5.8	EPA 353.2	0.24	0.06		10/23/14 13:56	5

Sample Description **SC-BHS7-ST1-SL-03**
 Matrix **Wastewater**
 SAL Sample Number **1410919-05**
 Date/Time Collected **10/22/14 10:16**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

Client Provided Field Data

pH 5.30
 Temperature 22.0 °C
 Conductivity 2280 umhos
 Dissolved Oxygen 4.96 mg/L

Inorganics

Ammonia as N	mg/L	0.042	EPA 350.1	0.040	0.009		10/29/14 13:11	1
Nitrate+Nitrite (N)	mg/L	42	EPA 353.2	0.96	0.24		10/23/14 14:20	24
Nitrite (as N)	mg/L	0.02 I	SM	0.04	0.01		10/23/14 14:28	1
			4500NO2-B					
Total Kjeldahl Nitrogen	mg/L	2.5	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	42	EPA 353.2	1.0	0.25		10/23/14 14:28	24

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		SC-BHS7-ST1-SL-04						
Matrix		Wastewater						
SAL Sample Number		1410919-07						
Date/Time Collected		10/22/14 10:06						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		5.36						
Temperature		21.1 °C						
Conductivity		1633 umhos						
Dissolved Oxygen		4.63 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		10/29/14 13:13	1
Carbonaceous BOD	mg/L	55	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	23 I	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	390	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	28	EPA 353.2	0.96	0.24		10/23/14 14:21	24
Nitrite (as N)	mg/L	0.01 U	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Orthophosphate as P	mg/L	0.032 I	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	0.13	SM 4500P-E	0.040	0.010	10/23/14 09:44	10/24/14 13:14	1
Total Alkalinity	mg/L	26	SM 2320B	8.0	2.0		10/27/14 15:49	1
Total Kjeldahl Nitrogen	mg/L	2.9	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	28	EPA 353.2	1.0	0.25		10/23/14 14:28	24

Sample Description **NC-BHS7-ST2-DP-03**
 Matrix **Wastewater**
 SAL Sample Number **1410919-08**
 Date/Time Collected **10/22/14 10:55**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

Client Provided Field Data

pH 6.00
 Temperature 22.1 °C
 Conductivity 1319 umhos
 Dissolved Oxygen 2.03 mg/L

Inorganics

Ammonia as N	mg/L	0.17	EPA 350.1	0.040	0.009		10/31/14 10:43	1
Chloride	mg/L	32	SM 4500Cl-E	5.0	1.0		10/24/14 11:01	1
Nitrate+Nitrite (N)	mg/L	0.28 I	EPA 353.2	0.40	0.10		10/23/14 13:23	10
Nitrite (as N)	mg/L	0.12	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		NC-BHS7-ST2-DP-03						
Matrix		Wastewater						
SAL Sample Number		1410919-08						
Date/Time Collected		10/22/14 10:55						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
Total Kjeldahl Nitrogen	mg/L	5.2	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	0.16 I	EPA 353.2	0.44	0.11		10/23/14 14:28	10

Sample Description	SE-BHS7-ST2-DP-06							
Matrix	Wastewater							
SAL Sample Number	1410919-11							
Date/Time Collected	10/22/14 09:48							
Collected by	Josefin Hirst							
Date/Time Received	10/22/14 15:17							

Client Provided Field Data

pH	5.95
Temperature	21.9 °C
Conductivity	1092 umhos
Dissolved Oxygen	3.86 mg/L

Inorganics

Ammonia as N	mg/L	0.068	EPA 350.1	0.040	0.009		10/31/14 10:45	1
Chloride	mg/L	32	SM 4500Cl-E	5.0	1.0		10/24/14 11:01	1
Nitrate+Nitrite (N)	mg/L	0.20 I	EPA 353.2	0.40	0.10		10/23/14 13:24	10
Nitrite (as N)	mg/L	0.10	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Total Kjeldahl Nitrogen	mg/L	3.2	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	0.11 U	EPA 353.2	0.44	0.11		10/23/14 14:28	10

Microbiology

E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

Sample Description	SE-BHS7-ST2-DP-06-DUP							
Matrix	Water							
SAL Sample Number	1410919-12							
Date/Time Collected	10/22/14 09:55							
Collected by	Josefin Hirst							
Date/Time Received	10/22/14 15:17							

Client Provided Field Data

pH	5.95
Temperature	21.9 °C
Conductivity	1092 umhos
Dissolved Oxygen	3.86 mg/L

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		SE-BHS7-ST2-DP-06-DUP						
Matrix		Water						
SAL Sample Number		1410919-12						
Date/Time Collected		10/22/14 09:55						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.077	EPA 350.1	0.040	0.009		10/31/14 10:46	1
Chloride	mg/L	32	SM 4500Cl-E	5.0	1.0		10/24/14 11:01	1
Nitrate+Nitrite (N)	mg/L	0.13 I	EPA 353.2	0.40	0.10		10/23/14 13:25	10
Nitrite (as N)	mg/L	0.09	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Total Kjeldahl Nitrogen	mg/L	3.0	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	0.11 U	EPA 353.2	0.44	0.11		10/23/14 14:28	10
<u>Microbiology</u>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

Sample Description		SC-BHS7-ST2-DP-07						
Matrix		Wastewater						
SAL Sample Number		1410919-13						
Date/Time Collected		10/22/14 09:08						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						

Client Provided Field Data

pH	5.99
Temperature	21.9 °C
Conductivity	1520 umhos
Dissolved Oxygen	2.36 mg/L

<u>Inorganics</u>								
Ammonia as N	mg/L	0.018 I	EPA 350.1	0.040	0.009		10/31/14 10:51	1
Carbonaceous BOD	mg/L	79	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	95	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	380	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	0.06 I	EPA 353.2	0.20	0.05		10/23/14 13:26	5
Nitrite (as N)	mg/L	0.08	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Orthophosphate as P	mg/L	1.3	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	1.5	SM 4500P-E	0.040	0.010	10/23/14 09:44	10/24/14 13:14	1
Total Alkalinity	mg/L	180	SM 2320B	8.0	2.0		10/27/14 16:03	1
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Total Suspended Solids	mg/L	11	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	11	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.06 U	EPA 353.2	0.24	0.06		10/23/14 14:28	5

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		SC-BHS7-ST2-DP-07						
Matrix		Wastewater						
SAL Sample Number		1410919-13						
Date/Time Collected		10/22/14 09:08						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						

Microbiology

E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

Sample Description		SW-BHS7-ST2-DP-08						
Matrix		Wastewater						
SAL Sample Number		1410919-14						
Date/Time Collected		10/22/14 09:08						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						

Client Provided Field Data

pH	5.97
Temperature	21.8 °C
Conductivity	1167 umhos
Dissolved Oxygen	2.54 mg/L

Inorganics

Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		10/28/14 16:17	1
Carbonaceous BOD	mg/L	71	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	91	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	270	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	0.05 U	EPA 353.2	0.20	0.05		10/23/14 13:27	5
Nitrite (as N)	mg/L	0.04	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Orthophosphate as P	mg/L	0.97	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	1.0	SM 4500P-E	0.040	0.010	10/23/14 09:44	10/24/14 13:14	1
Total Alkalinity	mg/L	170	SM 2320B	8.0	2.0		10/27/14 16:10	1
Total Kjeldahl Nitrogen	mg/L	1.7	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Total Suspended Solids	mg/L	1	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.06 U	EPA 353.2	0.24	0.06		10/23/14 14:28	5

Microbiology

E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		NE-BHS7-EFF-SL-06						
Matrix		Wastewater						
SAL Sample Number		1410919-18						
Date/Time Collected		10/22/14 10:50						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		5.72						
Temperature		22.3 °C						
Conductivity		268 umhos						
Dissolved Oxygen		5.65 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.034 I	EPA 350.1	0.040	0.009		10/28/14 16:19	1
Chloride	mg/L	30	SM 4500Cl-E	5.0	1.0		10/24/14 11:01	1
Nitrate+Nitrite (N)	mg/L	8.5	EPA 353.2	0.20	0.05		10/23/14 13:58	5
Nitrite (as N)	mg/L	0.02 I	SM	0.04	0.01		10/23/14 14:28	1
			4500NO2-B					
Total Kjeldahl Nitrogen	mg/L	2.6	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	8.4	EPA 353.2	0.24	0.06		10/23/14 14:28	5
Sample Description		NW-BHS7-EFF-SL-07						
Matrix		Wastewater						
SAL Sample Number		1410919-19						
Date/Time Collected		10/22/14 09:12						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		6.18						
Temperature		21.7 °C						
Conductivity		3.97 umhos						
Dissolved Oxygen		6.57 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		10/28/14 16:21	1
Chloride	mg/L	3,200	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	0.58	EPA 353.2	0.04	0.01		10/23/14 13:29	1
Nitrite (as N)	mg/L	0.01 I	SM	0.04	0.01		10/23/14 14:28	1
			4500NO2-B					
Total Kjeldahl Nitrogen	mg/L	1.5	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	0.57	EPA 353.2	0.08	0.02		10/23/14 14:28	1

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		NW-BHS7-EFF-DP-10						
Matrix		Wastewater						
SAL Sample Number		1410919-20						
Date/Time Collected		10/22/14 09:32						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						

Client Provided Field Data

pH		6.11
Temperature		21.0 °C
Conductivity		1986 umhos
Dissolved Oxygen		6.66 mg/L

Inorganics

Ammonia as N	mg/L	0.60	EPA 350.1	0.040	0.009		10/28/14 16:31	1
Chloride	mg/L	2,100	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	0.04	EPA 353.2	0.04	0.01		10/23/14 13:30	1
Nitrite (as N)	mg/L	0.01 I	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Total Kjeldahl Nitrogen	mg/L	0.89	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	0.03 I	EPA 353.2	0.08	0.02		10/23/14 14:28	1

Sample Description		SE-BHS7-EFF-SL-08						
Matrix		Wastewater						
SAL Sample Number		1410919-21						
Date/Time Collected		10/22/14 09:45						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						

Client Provided Field Data

pH		4.98
Temperature		21.9 °C
Conductivity		1898 umhos
Dissolved Oxygen		6.01 mg/L

Inorganics

Ammonia as N	mg/L	0.10	EPA 350.1	0.040	0.009		10/28/14 16:33	1
Chloride	mg/L	2,600	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	31	EPA 353.2	0.96	0.24	10/23/14 16:00	10/23/14 17:38	24
Nitrite (as N)	mg/L	0.01 U	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Total Kjeldahl Nitrogen	mg/L	2.7	EPA 351.2	0.20	0.05	10/23/14 09:44	10/24/14 13:14	1
Nitrate (as N)	mg/L	31	EPA 353.2	1.0	0.25	10/23/14 16:00	10/23/14 17:38	24

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		SE-BHS7-EFF-DP-11						
Matrix		Wastewater						
SAL Sample Number		1410919-22						
Date/Time Collected		10/22/14 09:55						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		5.75						
Temperature		19.9 °C						
Conductivity		1678 umhos						
Dissolved Oxygen		6.02 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.026 I	EPA 350.1	0.040	0.009		10/28/14 16:35	1
Chloride	mg/L	450	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	23	EPA 353.2	0.96	0.24	10/23/14 16:00	10/23/14 17:39	24
Nitrite (as N)	mg/L	0.02 I	SM	0.04	0.01		10/23/14 14:28	1
			4500NO2-B					
Total Kjeldahl Nitrogen	mg/L	3.2	EPA 351.2	0.20	0.05	10/23/14 10:02	10/24/14 13:28	1
Nitrate (as N)	mg/L	23	EPA 353.2	1.0	0.25	10/23/14 16:00	10/23/14 17:39	24
Sample Description		SW-BHS7-EFF-SL-09						
Matrix		Wastewater						
SAL Sample Number		1410919-23						
Date/Time Collected		10/22/14 10:25						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		6.14						
Temperature		22.0 °C						
Conductivity		6120 umhos						
Dissolved Oxygen		6.49 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.028 I	EPA 350.1	0.040	0.009		10/28/14 16:37	1
Carbonaceous BOD	mg/L	64	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	120	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	3,300	SM 4500Cl-E	500	100		10/24/14 11:01	100
Nitrate+Nitrite (N)	mg/L	0.52	EPA 353.2	0.04	0.01	10/23/14 16:00	10/23/14 16:22	1
Nitrite (as N)	mg/L	0.03 I	SM	0.04	0.01		10/23/14 14:28	1
			4500NO2-B					
Orthophosphate as P	mg/L	0.026 I	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	0.14	SM 4500P-E	0.040	0.010	10/23/14 10:02	10/24/14 13:28	1
Total Alkalinity	mg/L	4,800	SM 2320B	8.0	2.0		10/27/14 16:46	1
Total Kjeldahl Nitrogen	mg/L	2.8	EPA 351.2	0.20	0.05	10/23/14 10:02	10/24/14 13:28	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		SW-BHS7-EFF-SL-09						
Matrix		Wastewater						
SAL Sample Number		1410919-23						
Date/Time Collected		10/22/14 10:25						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.49	EPA 353.2	0.08	0.02	10/23/14 16:00	10/23/14 16:22	1

Sample Description **SW-BHS7-EFF-DP-12**
 Matrix **Wastewater**
 SAL Sample Number **1410919-24**
 Date/Time Collected **10/22/14 10:35**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

Client Provided Field Data

pH 6.18
 Temperature 20.8 °C
 Conductivity 1854 umhos
 Dissolved Oxygen 4.64 mg/L

Inorganics

Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		10/28/14 16:39	1
Carbonaceous BOD	mg/L	52	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	95	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	480	SM 4500Cl-E	50	10		10/24/14 11:01	10
Nitrate+Nitrite (N)	mg/L	0.02 I	EPA 353.2	0.04	0.01	10/23/14 16:00	10/23/14 16:24	1
Nitrite (as N)	mg/L	0.02 I	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Orthophosphate as P	mg/L	0.85	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	0.96	SM 4500P-E	0.040	0.010	10/23/14 10:02	10/24/14 13:28	1
Total Alkalinity	mg/L	4,600	SM 2320B	8.0	2.0		10/27/14 16:53	1
Total Kjeldahl Nitrogen	mg/L	1.4	EPA 351.2	0.20	0.05	10/23/14 10:02	10/24/14 13:28	1
Total Suspended Solids	mg/L	18	SM 2540D	1	1	10/24/14 09:13	10/27/14 15:54	1
Volatile Suspended Solids	mg/L	17	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.02 U	EPA 353.2	0.08	0.02	10/23/14 16:00	10/23/14 16:24	1

Sample Description **BHS7-EB**
 Matrix **Reagent Water**
 SAL Sample Number **1410919-25**
 Date/Time Collected **10/22/14 11:00**
 Collected by **Josefin Hirst**
 Date/Time Received **10/22/14 15:17**

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

November 11, 2014
Work Order: 1410919

Laboratory Report

Project Name		B-HS7 SE#6						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Dilution
Sample Description		BHS7-EB						
Matrix		Reagent Water						
SAL Sample Number		1410919-25						
Date/Time Collected		10/22/14 11:00						
Collected by		Josefin Hirst						
Date/Time Received		10/22/14 15:17						
<u>Client Provided Field Data</u>								
pH		5.73						
Temperature		20.0 °C						
Conductivity		1.42 umhos						
Dissolved Oxygen		8.36 mg/L						
<u>Inorganics</u>								
Ammonia as N	mg/L	0.009 U	EPA 350.1	0.040	0.009		10/28/14 16:41	1
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	10/23/14 13:13	10/28/14 11:28	1
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10	11/05/14 11:37	11/05/14 15:28	1
Chloride	mg/L	1.0 U	SM 4500Cl-E	5.0	1.0		10/24/14 11:01	1
Nitrate+Nitrite (N)	mg/L	0.01 U	EPA 353.2	0.04	0.01	10/23/14 16:00	10/23/14 16:26	1
Nitrite (as N)	mg/L	0.01 U	SM 4500NO2-B	0.04	0.01		10/23/14 14:28	1
Orthophosphate as P	mg/L	0.012 U	SM 4500P-E	0.040	0.012		10/23/14 14:00	1
Phosphorous - Total as P	mg/L	0.010 U	SM 4500P-E	0.040	0.010	10/23/14 10:02	10/24/14 13:28	1
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0		10/27/14 16:56	1
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	10/23/14 10:02	10/24/14 13:28	1
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	10/24/14 09:13	10/27/14 16:27	1
Volatile Suspended Solids	mg/L	1 U	EPA 160.4	1	1	10/24/14 09:13	10/27/14 15:54	1
Nitrate (as N)	mg/L	0.02 U	EPA 353.2	0.08	0.02	10/23/14 16:00	10/23/14 16:26	1
<u>Microbiology</u>								
E. Coli	MPN/100 mL	2.0 U	SM 9223B	2.0	2.0	10/22/14 16:28	10/23/14 10:32	1
Fecal Coliforms	CFU/100 ml	1 U	SM 9222D	1	1	10/22/14 16:34	10/23/14 15:08	1

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42306 - Ortho phosphorus SM4500P-E by seal										
Blank (BJ42306-BLK1)					Prepared & Analyzed: 10/23/14 14:00					
Orthophosphate as P	0.012 U	0.040	0.012	mg/L						
LCS (BJ42306-BS1)					Prepared & Analyzed: 10/23/14 14:00					
Orthophosphate as P	0.826	0.040	0.012	mg/L	0.80		103	90-110		
LCS (BJ42306-BS2)					Prepared & Analyzed: 10/23/14 14:00					
Orthophosphate as P	0.774	0.040	0.012	mg/L	0.80		97	90-110		
LCS (BJ42306-BS3)					Prepared & Analyzed: 10/23/14 14:00					
Orthophosphate as P	0.821	0.040	0.012	mg/L	0.80		103	90-110		
LCS (BJ42306-BS4)					Prepared & Analyzed: 10/23/14 14:00					
Orthophosphate as P	0.784	0.040	0.012	mg/L	0.80		98	90-110		
Matrix Spike (BJ42306-MS1)					Source: 1410919-25		Prepared & Analyzed: 10/23/14 14:00			
Orthophosphate as P	1.04	0.040	0.012	mg/L	1.0	ND	104	90-110		
Matrix Spike Dup (BJ42306-MSD1)					Source: 1410919-25		Prepared & Analyzed: 10/23/14 14:00			
Orthophosphate as P	0.989	0.040	0.012	mg/L	1.0	ND	99	90-110	5	20
Batch BJ42307 - Nitrite SM 4500NO2-B by seal										
Blank (BJ42307-BLK1)					Prepared & Analyzed: 10/23/14 10:03					
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
LCS (BJ42307-BS1)					Prepared & Analyzed: 10/23/14 10:03					
Nitrite (as N)	0.0843	0.04	0.01	mg/L	0.080		105	90-110		

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42307 - Nitrite SM 4500NO2-B by seal										
LCS (BJ42307-BS2)					Prepared & Analyzed: 10/23/14 14:28					
Nitrite (as N)	0.0801	0.04	0.01	mg/L	0.080		100	90-110		
LCS (BJ42307-BS3)					Prepared & Analyzed: 10/23/14 14:28					
Nitrite (as N)	0.0833	0.04	0.01	mg/L	0.080		104	90-110		
LCS (BJ42307-BS4)					Prepared & Analyzed: 10/23/14 14:28					
Nitrite (as N)	0.0832	0.04	0.01	mg/L	0.080		104	90-110		
Matrix Spike (BJ42307-MS1)					Source: 1410919-25		Prepared & Analyzed: 10/23/14 10:04			
Nitrite (as N)	0.0986	0.04	0.01	mg/L	0.10	ND	99	77-119		
Matrix Spike (BJ42307-MS2)					Source: 1410919-18		Prepared & Analyzed: 10/23/14 14:28			
Nitrite (as N)	0.105	0.04	0.01	mg/L	0.10	0.0191	86	77-119		
Matrix Spike Dup (BJ42307-MSD1)					Source: 1410919-25		Prepared & Analyzed: 10/23/14 10:04			
Nitrite (as N)	0.0978	0.04	0.01	mg/L	0.10	ND	98	77-119	0.8	20
Matrix Spike Dup (BJ42307-MSD2)					Source: 1410919-18		Prepared & Analyzed: 10/23/14 14:28			
Nitrite (as N)	0.106	0.04	0.01	mg/L	0.10	0.0191	87	77-119	1	20
Batch BJ42308 - Digestion for TP and TKN										
Blank (BJ42308-BLK1)					Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BJ42308-BS1)					Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Phosphorous - Total as P	1.06	0.040	0.010	mg/L	1.0		106	90-110		
Total Kjeldahl Nitrogen	1.04	0.20	0.05	mg/L	1.0		104	90-110		

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42308 - Digestion for TP and TKN										
Matrix Spike (BJ42308-MS1)		Source: 1410919-21			Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Total Kjeldahl Nitrogen	4.18	0.20	0.05	mg/L	1.0	2.68	149	90-110		
Phosphorous - Total as P	1.19	0.040	0.010	mg/L	1.0	0.0688	112	90-110		
Matrix Spike (BJ42308-MS2)		Source: 1411423-07			Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Total Kjeldahl Nitrogen	1.77	0.20	0.05	mg/L	1.0	0.700	107	90-110		
Phosphorous - Total as P	1.21	0.040	0.010	mg/L	1.0	0.192	102	90-110		
Matrix Spike Dup (BJ42308-MSD1)		Source: 1410919-21			Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Phosphorous - Total as P	1.12	0.040	0.010	mg/L	1.0	0.0688	105	90-110	6	25
Total Kjeldahl Nitrogen	3.65	0.20	0.05	mg/L	1.0	2.68	97	90-110	13	20
Matrix Spike Dup (BJ42308-MSD2)		Source: 1411423-07			Prepared: 10/23/14 Analyzed: 10/24/14 13:14					
Phosphorous - Total as P	1.21	0.040	0.010	mg/L	1.0	0.192	102	90-110	0.1	25
Total Kjeldahl Nitrogen	1.75	0.20	0.05	mg/L	1.0	0.700	105	90-110	0.9	20
Batch BJ42309 - Digestion for TP and TKN										
Blank (BJ42309-BLK1)		Prepared: 10/23/14 Analyzed: 10/24/14 13:28								
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 (BJ42309-BS1)		Prepared: 10/23/14 Analyzed: 10/24/14 13:28								
Phosphorous - Total as P	1.03	0.040	0.010	mg/L	1.0		103	90-110		
Total Kjeldahl Nitrogen	1.02	0.20	0.05	mg/L	1.0		102	90-110		
Matrix Spike (BJ42309-MS1)		Source: 1410919-25			Prepared: 10/23/14 Analyzed: 10/24/14 13:28					
Total Kjeldahl Nitrogen	1.03	0.20	0.05	mg/L	1.0	ND	103	90-110		
Phosphorous - Total as P	1.03	0.040	0.010	mg/L	1.0	ND	103	90-110		

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	Limits	RPD	RPD Limit
Batch BJ42309 - Digestion for TP and TKN										
Matrix Spike Dup (BJ42309-MSD1)		Source: 1410919-25			Prepared: 10/23/14 Analyzed: 10/24/14 13:28					
Total Kjeldahl Nitrogen	1.02	0.20	0.05	mg/L	1.0	ND	102	90-110	0.9	20
Phosphorous - Total as P	1.03	0.040	0.010	mg/L	1.0	ND	103	90-110	0.4	25
Batch BJ42316 - Nitrate 353.2 by seal										
Blank (BJ42316-BLK1)					Prepared & Analyzed: 10/23/14 12:38					
Nitrate+Nitrite (N)	0.01 U	0.04	0.01	mg/L						
LCS (BJ42316-BS1)					Prepared & Analyzed: 10/23/14 12:40					
Nitrate+Nitrite (N)	0.800	0.04	0.01	mg/L	0.80		100	90-110		
Matrix Spike (BJ42316-MS1)					Prepared & Analyzed: 10/23/14 12:42					
Nitrate+Nitrite (N)	1.02	0.04	0.01	mg/L	1.0	0.0430	98	90-110		
Matrix Spike (BJ42316-MS2)					Prepared & Analyzed: 10/23/14 12:59					
Nitrate+Nitrite (N)	0.995	0.04	0.01	mg/L	1.0	ND	100	90-110		
Matrix Spike Dup (BJ42316-MSD1)					Prepared & Analyzed: 10/23/14 12:44					
Nitrate+Nitrite (N)	1.03	0.04	0.01	mg/L	1.0	0.0430	99	90-110	0.8	20
Matrix Spike Dup (BJ42316-MSD2)					Prepared & Analyzed: 10/23/14 13:01					
Nitrate+Nitrite (N)	0.980	0.04	0.01	mg/L	1.0	ND	98	90-110	2	20
Batch BJ42323 - Nitrite SM 4500NO2-B by seal										
Blank (BJ42323-BLK1)					Prepared & Analyzed: 10/23/14 12:43					
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42323 - Nitrite SM 4500NO2-B by seal										
LCS (BJ42323-BS1)					Prepared & Analyzed: 10/23/14 12:44					
Nitrite (as N)	0.0775	0.04	0.01	mg/L	0.080		97	90-110		
Matrix Spike (BJ42323-MS1)					Source: 1410919-02 Prepared & Analyzed: 10/23/14 12:44					
Nitrite (as N)	0.122 J2	0.04	0.01	mg/L	0.080	0.0714	63	77-119		
Matrix Spike Dup (BJ42323-MSD1)					Source: 1410919-02 Prepared & Analyzed: 10/23/14 12:45					
Nitrite (as N)	0.124 J2	0.04	0.01	mg/L	0.080	0.0714	65	77-119	1	20
Batch BJ42325 - Chloride by Seal										
Blank (BJ42325-BLK1)					Prepared & Analyzed: 10/24/14 11:01					
Chloride	1.0 U	5.0	1.0	mg/L						
LCS (BJ42325-BS1)					Prepared & Analyzed: 10/24/14 11:01					
Chloride	39	5.0	1.0	mg/L	40		98	90-110		
Matrix Spike (BJ42325-MS1)					Source: 1410919-01 Prepared & Analyzed: 10/24/14 11:01					
Chloride	430 L2	50	10	mg/L	40	410	41	80-120		
Matrix Spike (BJ42325-MS2)					Source: 1410919-24 Prepared & Analyzed: 10/24/14 11:01					
Chloride	2,600 L2	500	100	mg/L	40	480	NR	80-120		
Matrix Spike Dup (BJ42325-MSD1)					Source: 1410919-01 Prepared & Analyzed: 10/24/14 11:01					
Chloride	370 L2	50	10	mg/L	40	410	NR	80-120	15	20
Matrix Spike Dup (BJ42325-MSD2)					Source: 1410919-24 Prepared & Analyzed: 10/24/14 11:01					
Chloride	2,200 L2	500	100	mg/L	40	480	NR	80-120	20	20

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42330 - BOD										
Blank (BJ42330-BLK1)					Prepared: 10/23/14 Analyzed: 10/28/14 11:28					
Carbonaceous BOD	2 U	2	2	mg/L						
LCS (BJ42330-BS1)					Prepared: 10/23/14 Analyzed: 10/28/14 11:28					
Carbonaceous BOD	226	2	2	mg/L	200		113	85-115		
LCS Dup (BJ42330-BSD1)					Prepared: 10/23/14 Analyzed: 10/28/14 11:28					
Carbonaceous BOD	225	2	2	mg/L	200		112	85-115	0.4	200
Duplicate (BJ42330-DUP1)					Prepared: 10/23/14 Analyzed: 10/28/14 11:28					
Carbonaceous BOD	450	2	2	mg/L		440			2	25
Batch BJ42334 - Nitrate 353.2 by seal										
Blank (BJ42334-BLK1)					Prepared & Analyzed: 10/23/14 16:04					
Nitrate+Nitrite (N)	0.01 U	0.04	0.01	mg/L						
LCS (BJ42334-BS1)					Prepared & Analyzed: 10/23/14 16:06					
Nitrate+Nitrite (N)	0.732	0.04	0.01	mg/L	0.80		92	90-110		
Matrix Spike (BJ42334-MS1)					Prepared & Analyzed: 10/23/14 16:09					
Nitrate+Nitrite (N)	0.923	0.04	0.01	mg/L	1.0	ND	92	90-110		
Matrix Spike (BJ42334-MS2)					Prepared & Analyzed: 10/23/14 16:13					
Nitrate+Nitrite (N)	1.03	0.04	0.01	mg/L	1.0	0.0530	97	90-110		
Matrix Spike Dup (BJ42334-MSD1)					Prepared & Analyzed: 10/23/14 16:11					
Nitrate+Nitrite (N)	0.944	0.04	0.01	mg/L	1.0	ND	94	90-110	2	20

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42334 - Nitrate 353.2 by seal										
Matrix Spike Dup (BJ42334-MSD2)		Source: 1411338-05			Prepared & Analyzed: 10/23/14 16:15					
Nitrate+Nitrite (N)	1.01	0.04	0.01	mg/L	1.0	0.0530	96	90-110	2	20
Batch BJ42411 - VSS Prep										
Blank (BJ42411-BLK1)					Prepared: 10/24/14 Analyzed: 10/27/14 15:54					
Total Suspended Solids	1 U	1	1	mg/L						
Volatile Suspended Solids	1 U	1		mg/L						
LCS (BJ42411-BS1)					Prepared: 10/24/14 Analyzed: 10/27/14 15:54					
Total Suspended Solids	49.0	1	1	mg/L	50		98	85-115		
Duplicate (BJ42411-DUP1)		Source: 1410747-01			Prepared: 10/24/14 Analyzed: 10/27/14 15:54					
Total Suspended Solids	41.0	1	1	mg/L		45.0			9	30
Volatile Suspended Solids	30.0 J3	1		mg/L		44.0			38	20
Batch BJ42422 - Ammonia by SEAL										
Blank (BJ42422-BLK1)					Prepared & Analyzed: 10/24/14 15:05					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BJ42422-BS1)					Prepared & Analyzed: 10/24/14 15:07					
Ammonia as N	0.48	0.040	0.009	mg/L	0.50		95	90-110		
Matrix Spike (BJ42422-MS1)		Source: 1410747-01			Prepared & Analyzed: 10/24/14 16:17					
Ammonia as N	2.7 L2	0.40	0.095	mg/L	0.50	66	NR	90-110		

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

November 11, 2014
 Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42422 - Ammonia by SEAL										
Matrix Spike (BJ42422-MS2)		Source: 1410752-08			Prepared & Analyzed: 10/24/14 15:22					
Ammonia as N	0.49	0.040	0.009	mg/L	0.50	0.038	91	90-110		
Matrix Spike Dup (BJ42422-MSD1)		Source: 1410747-01			Prepared & Analyzed: 10/24/14 16:19					
Ammonia as N	2.8 L2	0.40	0.095	mg/L	0.50	66	NR	90-110	3	10
Matrix Spike Dup (BJ42422-MSD2)		Source: 1410752-08			Prepared & Analyzed: 10/24/14 15:24					
Ammonia as N	0.52	0.040	0.009	mg/L	0.50	0.038	96	90-110	4	10
Batch BJ42439 - alkalinity										
Blank (BJ42439-BLK1)					Prepared & Analyzed: 10/27/14 11:24					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
Blank (BJ42439-BLK2)					Prepared & Analyzed: 10/27/14 11:27					
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
LCS (BJ42439-BS1)					Prepared & Analyzed: 10/27/14 11:36					
Total Alkalinity	130	8.0	2.0	mg/L	120		107	90-110		
LCS (BJ42439-BS2)					Prepared & Analyzed: 10/27/14 11:42					
Total Alkalinity	140	8.0	2.0	mg/L	120		109	90-110		
Matrix Spike (BJ42439-MS1)		Source: 1410747-10			Prepared & Analyzed: 10/27/14 12:52					
Total Alkalinity	130	8.0	2.0	mg/L	120	2.9	103	80-120		
Matrix Spike (BJ42439-MS2)		Source: 1410752-27			Prepared & Analyzed: 10/27/14 15:20					
Total Alkalinity	140	8.0	2.0	mg/L	120	ND	110	80-120		

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42439 - alkalinity										
Matrix Spike Dup (BJ42439-MSD1)		Source: 1410747-10			Prepared & Analyzed: 10/27/14 12:57					
Total Alkalinity	140	8.0	2.0	mg/L	120	2.9	106	80-120	3	26
Matrix Spike Dup (BJ42439-MSD2)		Source: 1410752-27			Prepared & Analyzed: 10/27/14 15:26					
Total Alkalinity	140	8.0	2.0	mg/L	120	ND	110	80-120	0.5	26
Batch BJ42822 - Ammonia by SEAL										
Blank (BJ42822-BLK1)					Prepared & Analyzed: 10/29/14 12:23					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BJ42822-BS1)					Prepared & Analyzed: 10/29/14 12:25					
Ammonia as N	0.55	0.040	0.009	mg/L	0.50		109	90-110		
Matrix Spike (BJ42822-MS1)		Source: 1410752-18			Prepared & Analyzed: 10/29/14 12:26					
Ammonia as N	1.1 J2	0.040	0.009	mg/L	0.50	0.73	71	90-110		
Matrix Spike (BJ42822-MS2)		Source: 1410752-22			Prepared & Analyzed: 10/29/14 12:40					
Ammonia as N	0.81	0.040	0.009	mg/L	0.50	0.31	100	90-110		
Matrix Spike Dup (BJ42822-MSD1)		Source: 1410752-18			Prepared & Analyzed: 10/29/14 12:28					
Ammonia as N	1.2 J2	0.040	0.009	mg/L	0.50	0.73	85	90-110	7	10
Matrix Spike Dup (BJ42822-MSD2)		Source: 1410752-22			Prepared & Analyzed: 10/29/14 12:42					
Ammonia as N	0.83	0.040	0.009	mg/L	0.50	0.31	104	90-110	3	10
Batch BJ42824 - Ammonia by SEAL										
Blank (BJ42824-BLK1)					Prepared & Analyzed: 10/28/14 16:09					
Ammonia as N	0.009 U	0.040	0.009	mg/L						

SOUTHERN ANALYTICAL LABORATORIES, INC.

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



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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42824 - Ammonia by SEAL										
LCS (BJ42824-BS1)					Prepared & Analyzed: 10/28/14 16:11					
Ammonia as N	0.55	0.040	0.009	mg/L	0.50		110	90-110		
Matrix Spike (BJ42824-MS1)					Source: 1410919-14 Prepared & Analyzed: 10/28/14 16:13					
Ammonia as N	0.50	0.040	0.009	mg/L	0.50	ND	100	90-110		
Matrix Spike (BJ42824-MS2)					Source: 1411615-05 Prepared & Analyzed: 10/28/14 16:27					
Ammonia as N	0.48	0.40	0.095	mg/L	0.50	ND	96	90-110		
Matrix Spike Dup (BJ42824-MSD1)					Source: 1410919-14 Prepared & Analyzed: 10/28/14 16:15					
Ammonia as N	0.56	0.040	0.009	mg/L	0.50	ND	113	90-110	12	10
Matrix Spike Dup (BJ42824-MSD2)					Source: 1411615-05 Prepared & Analyzed: 10/28/14 17:28					
Ammonia as N	0.65	0.40	0.095	mg/L	0.50	ND	131	90-110	31	10
Batch BJ42924 - Ammonia by SEAL										
Blank (BJ42924-BLK1)					Prepared & Analyzed: 10/31/14 10:16					
Ammonia as N	0.009 U	0.040	0.009	mg/L						
LCS (BJ42924-BS1)					Prepared & Analyzed: 10/31/14 10:17					
Ammonia as N	0.47	0.040	0.009	mg/L	0.50		93	90-110		
Matrix Spike (BJ42924-MS1)					Source: 1410919-08 Prepared & Analyzed: 10/31/14 10:19					
Ammonia as N	0.47 J5	0.040	0.009	mg/L	0.50	0.17	61	90-110		
Matrix Spike (BJ42924-MS2)					Source: 1410919-13 Prepared & Analyzed: 10/31/14 10:31					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	0.018	98	90-110		

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

November 11, 2014
Work Order: 1410919

Inorganics - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42924 - Ammonia by SEAL										
Matrix Spike Dup (BJ42924-MSD1)		Source: 1410919-08			Prepared & Analyzed: 10/31/14 10:21					
Ammonia as N	0.44 J5	0.040	0.009	mg/L	0.50	0.17	54	90-110	7	10
Matrix Spike Dup (BJ42924-MSD2)		Source: 1410919-13			Prepared & Analyzed: 10/31/14 13:58					
Ammonia as N	0.51	0.040	0.009	mg/L	0.50	0.018	98	90-110	0.4	10
Batch BK40522 - COD prep										
Blank (BK40522-BLK1)					Prepared & Analyzed: 11/05/14 15:28					
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BK40522-BS1)					Prepared & Analyzed: 11/05/14 15:28					
Chemical Oxygen Demand	54	25	10	mg/L	50		108	90-110		
Matrix Spike (BK40522-MS1)		Source: 1410919-25			Prepared & Analyzed: 11/05/14 15:28					
Chemical Oxygen Demand	52	25	10	mg/L	50	ND	104	85-115		
Matrix Spike Dup (BK40522-MSD1)		Source: 1410919-25			Prepared & Analyzed: 11/05/14 15:28					
Chemical Oxygen Demand	54	25	10	mg/L	50	ND	108	85-115	4	32

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

November 11, 2014
Work Order: 1410919

Microbiology - Quality Control

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BJ42246 - FC-MF										
Blank (BJ42246-BLK1)					Prepared: 10/22/14 Analyzed: 10/23/14 15:08					
Fecal Coliforms	1 U	1	1	CFU/100 ml						
Duplicate (BJ42246-DUP1)					Source: 1410919-25 Prepared: 10/22/14 Analyzed: 10/23/14 15:08					
Fecal Coliforms	1 U	1	1	CFU/100 ml		ND				200

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

November 11, 2014
Work Order: 1410919

* 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.

- L2 Analyte level in sample invalidated Matrix Spike.
- J5 Matrix spike of this sample was outside typical range. All other QC criteria were acceptable.
- J3 Quality control value for precision was outside control limits.
- J2 Quality control value for accuracy was outside control limits.

Questions regarding this report should be directed to :

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



Client Name Hazen and Sawyer						Josefin Hirst													
Project Name / Location BHS7 SE#6																			
Samplers: (Signature) <i>Josefin Hirst</i> <i>[Signature]</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		Date	Time	Matrix	Composite	Grab	125mLP, Na ₂ S ₂ O ₃ FC-MF, FC-QT	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, Cl, OP	125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP	125mLP, H ₂ SO ₄ TKN, NH ₃	500mLP, Cool NOx, Cl	250mLP, Cool NOx, Cl			Field pH	Field Temperature	Field Conductivity	Field DO	No. of Containers (Total per each location)
SAL Use Only Sample No.	Sample Description																		
01	BHS7-STE		11:20	WW		X	4	2	1						7.25	23.8	1807	2.05	
02	BHS7-STE-DUP		11:25	WW		X	4	2	1						7.25	23.8	1807	2.05	
03	NC-BHS7-ST1-SL-01		10:38	WW		X				1	1				5.67	28.0	2370	5.60	
04	NC-BHS7-ST1-SL-02		10:30	WW		X				1	1				5.91	22.2	2062	3.71	
05	SC-BHS7-ST1-SL-03		10:16	WW		X				1	1				5.30	22.0	2280	4.96	
06	SP-BHS7-ST1-DP-01 <i>Dry</i>			WW		X				1		1							
07	SC-BHS7-ST1-SL-04		10:06	WW		X		2	1						5.36	21.1	1633	4.63	
08	NC-BHS7-ST2-DP-03		10:55	WW		X				1	1				6.00	22.1	1319	2.03	
09	NC-BHS7-ST2-DP-03-DUP			WW		X				1	1								
10	C-BHS7-ST2-DP-05			WW		X				1	1								
11	SE-BHS7-ST2-DP-06		9:48	WW		X	2 add			1	1				5.95	21.9	1092	3.86	4
12	SE-BHS7-ST2-DP-06-DUP		9:55	WW		X	2 add			1	1				5.95	21.9	1092	3.86	4
Containers Prepared/Relinquished: <i>WTH</i>		Date/Time: 1600 100814	Received: <i>Josefin Hirst</i>		Date/Time: 11:45 10/01/14		Seal intact? <input checked="" type="radio"/> N N/A						Instructions / Remarks:						
Relinquished: <i>Josefin Hirst</i>		Date/Time: 12:35 10/22/14	Received: <i>Brian Walker</i>		Date/Time: 12:35 10/22/14		Samples intact upon arrival? <input checked="" type="radio"/> N N/A												
Relinquished: <i>Brian Walker</i>		Date/Time: 10-21-14 1517	Received: <i>[Signature]</i>		Date/Time: 10-21-14 1517		Received on ice? Temp. _____ <input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:		Proper preservatives indicated? <input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:		Rec'd w/in holding time? <input checked="" type="radio"/> N N/A												
		Date/Time:	Received:		Date/Time:		Volatiles rec'd w/out headspace? <input checked="" type="radio"/> N <input checked="" type="radio"/> Y												
		Date/Time:	Received:		Date/Time:		Proper containers used? <input checked="" type="radio"/> N N/A												

Client Name Hazen and Sawyer										Josefin Hirst										
Project Name / Location BHS7 SE#6																				
Samplers: (Signature) <i>Josefin Hirst</i>										PARAMETER / CONTAINER DESCRIPTION										
Matrix Codes: DW-Drinking Water WW-Wastewater SW-Surface Water SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water																				
SAL Use Only	Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	125mLP, Na ₂ S ₂ O ₃ FC-MF, FC-QT	500mLP, Cool Total Alkalinity, TSS, VSS, CBOD, NOx, Cl, OP	125mLP, H ₂ SO ₄ COD, TKN, NH ₃ , TP	125mLP, H ₂ SO ₄ TKN, NH ₃	500mLP, Cool NOx, Cl	250mLP, Cool NOx, Cl			Field pH	Field Temperature	Field Conductivity <i>u/m</i>	Field DO	No. of Containers (Total per each location)
	13	SC-BHS7-ST2-DP-07	10/22/14	9:08	WW		X	12	2	1						5.99	21.9	1520	2.36	
	14	SW-BHS7-ST2-DP-08		9:20	WW		X	12	2	1						5.97	21.8	1167	2.54	
	15	N-BHS7-ST2-OB-01			WW		X				1	1								
	16	G-BHS7-ST2-OB-02			WW		X				1	1								
	17	S-BHS7-ST2-OB-03			WW		X	4	2	1										
	18	NE-BHS7-EFF-SL-06		10:50	WW		X				1	1				5.72	22.3	268	5.65	
	19	NW-BHS7-EFF-SL-07		9:12	WW		X				1	1				6.18	21.7	3.97 ^{ms}	6.57	
	20	NW-BHS7-EFF-DP-10		9:22	WW		X				1		1			6.11	21.6	1986	6.66	
	21	SE-BHS7-EFF-SL-08		9:45	WW		X				1	1				4.98	21.9	1898	6.01	
	22	SE-BHS7-EFF-DP-11		9:55	WW		X				1		1			5.75	19.9	1678	6.02	
	23	SW-BHS7-EFF-SL-09		10:25	WW		X		2	1						6.14	22.0	6120	6.49	
	24	SW-BHS7-EFF-DP-12		10:35	WW		X		2	1						6.18	20.8	1854	4.64	
Containers Prepared/Relinquished:		Date/Time: 1600 100814	Received: <i>Josefin Hirst</i>		Date/Time: 11:45 10/21/14	Seal intact?		<input checked="" type="radio"/> N N/A		Instructions / Remarks:										
Relinquished: <i>Josefin Hirst</i>		Date/Time: 12:35 10/22/14	Received: <i>Brian Walden</i>		Date/Time: 12:35 10/22/14	Samples intact upon arrival?		<input checked="" type="radio"/> N N/A												
Relinquished: <i>Brian Walden</i>		Date/Time: 10-21-14 1317	Received: <i>[Signature]</i>		Date/Time: 10-21-14 1317	Received on ice? Temp _____		<input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:	Proper preservatives indicated?		<input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:	Rec'd within holding time?		<input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:	Volatiles rec'd w/out headspace?		<input checked="" type="radio"/> N N/A												
Relinquished:		Date/Time:	Received:		Date/Time:	Proper containers used?		<input checked="" type="radio"/> N N/A												

Chain of Custody



Appendix B: Operation & Maintenance Log

Table B.1
Operation and Maintenance Log

Date	Description
11/13/2013	Construction - Pump tank, liner and lignocellulosic media installed
11/14/2013	Construction - Pump, feed line, laterals, infiltrator chambers installed, wet pressure test
11/15/2013	Construction - final grading, hay and seed applied
11/18/2013	Construction - electrician finished electrical work
11/19/2013	System Start-up
	Bull run valve (BRV) switched from old drainfield to PNRS system
11/26/2013	Site visit. System ok
	Flipped BRV to old drainfield for Thanksgiving holiday ~ 30-40 people staying at the house
12/2/2013	Site visit. System ok
	Flipped BRV back to PNRS system
12/6/2013	Site visit. System ok
	Flipped BRV to old drainfield for holiday party ~ 80 people attending
12/9/2013	Homeowner flipped BRV back to PNRS system
12/10/2013	Site visit. System ok
	Preparation for preliminary sample event
12/12/2013	Preliminary sample event No. 1
1/3/2014	Site visit. System ok
1/17/2014	Preparation for Sample Event No. 1
1/20/2014	Sample Event No. 1
3/5/2014	Site visit. System ok
3/13/2014	Site visit. System ok
3/19/2014	Preparation for Sample Event No. 2
3/20/2014	Sample Event No. 2
4/28/2014	Site visit. System ok
5/7/2014	Preparation for Sample Event No. 3
5/8/2014	Sample Event No. 3
5/27/2014	Site visit. System ok
6/18/2014	Preparation for Sample Event No. 4
6/19/2014	Sample Event No. 4

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

Date	Description
7/16/2014	Site visit.
	Primary tank and pump tank high water level.
	System was still on GFI breaker which had tripped.
	Pump came on and lowered the levels.
	Cleaned primary tank effluent screen.
8/19/2014	Preparation for Sample Event No. 5
8/20/2014	Sample Event No. 5
	Checked primary tank effluent screen- ok no maintenance required.
9/23/2014	Site visit. System ok
10/20/2014	Preparation for Sample Event No. 6
10/22/2014	Sample Event No. 6
	Cleaned primary tank effluent screen.



Appendix C: Weather Station Data

Table C.1
Weather Station Data

MONTHLY CLIMATOLOGICAL SUMMARY FOR SEPTEMBER 2014												
DAY	RAIN (inches)	MEAN TEMP (F)	HIGH TEMP (F)	TIME	LOW TEMP (F)	TIME	HEAT DEG DAYS	COOL DEG DAYS	AVG. WIND SPEED (mph)	HIGH WIND SPEED (mph)	TIME	WIND DIR
1	0.00	82.3	98.2	3:30p	72.5	7:30a	0	17.3	0.5	11.0	6:00p	SSW
2	0.04	82.7	96.6	3:30p	72.9	6:30a	0	17.7	0.6	11.0	6:30p	ENE
3	0.04	80.5	95.0	2:30p	72.4	4:30a	0	15.5	0.5	10.0	5:30p	E
4	0.15	77.9	94.4	2:00p	71.2	7:30a	0	12.9	0.5	11.0	2:00p	ENE
5	0.68	75.6	89.3	1:30p	71.9	7:00a	0	10.6	0.2	11.0	2:00p	E
6	0.00	78.2	92.1	3:00p	71.5	1:30a	0	13.2	0.4	11.0	7:30p	SW
7	0.00	78.2	92.5	1:30p	72.1	7:30a	0	13.2	0.6	14.0	5:30p	SSW
8	0.00	78.5	94.9	5:00p	71.7	6:30a	0	13.5	0.3	7.0	6:00p	SW
9	0.72	76.4	91.9	1:00p	71.7	4:30a	0	11.4	0.3	9.0	5:00p	NE
10	0.01	79.6	94.0	3:00p	70.3	5:30a	0	14.6	0.6	10.0	5:30p	E
11	0.00	80.3	94.9	3:30p	70.9	6:30a	0	15.3	0.8	12.0	3:30p	E
12	0.00	79.7	91.7	3:00p	70.7	4:00a	0	14.7	1.4	14.0	2:00p	N
13	0.00	80.5	95.5	3:00p	72.5	6:00a	0	15.5	0.5	14.0	5:00p	E
14	0.01	81.9	95.6	3:30p	71.1	6:30a	0	16.9	0.9	10.0	12:00p	SSW
15	0.23	78.0	90.9	1:00p	72.5	7:30a	0	13.0	0.4	11.0	2:00p	NE
16	0.56	76.4	87.2	12:30p	72.3	8:00a	0	11.4	0.5	15.0	3:30p	SW
17	0.01	77.3	88.3	5:00p	70.6	12:00m	0	12.3	0.2	5.0	11:30a	SW
18	0.99	78.9	98.0	4:00p	69.4	7:00a	0	13.9	0.4	14.0	9:00p	NNW
19	0.14	73.5	81.2	2:30p	68.9	8:00p	0	8.5	0.3	16.0	5:00p	NE
20	0.14	73.7	85.5	3:00p	68.5	7:00a	0	8.7	0.8	18.0	4:30p	NNW
21	0.01	77.3	92.9	5:30p	67.5	7:00a	0	12.3	0.5	7.0	1:00a	NNW
22	0.10	75.1	90.1	12:30p	69.4	6:00a	0	10.1	0.4	13.0	4:30p	E
23	0.43	74.0	81.7	11:30a	70.0	6:00a	0	9.0	0.8	12.0	8:00p	NNW
24	0.00	71.7	78.1	5:00p	67.7	12:00m	0	6.7	1.9	12.0	12:00p	NNW
25	0.00	72.5	83.0	5:00p	66.2	7:30a	0	7.5	2.0	12.0	5:30a	NNW
26	0.37	74.5	86.0	2:30p	68.1	7:00a	0	9.5	1.6	16.0	4:00p	NNW
27	1.75	76.0	85.9	12:30p	73.0	3:30p	0	11.0	1.1	13.0	3:00p	NE
28	0.37	77.9	90.3	3:00p	73.4	12:00m	0	12.9	0.9	10.0	4:00p	NE
29	1.92	73.9	82.0	1:00p	71.7	3:30a	0	8.9	0.3	8.0	12:30a	ENE
30	1.50	75.6	85.8	2:00p	71.2	6:30a	0	10.6	0.5	9.0	2:30p	SW
TOTAL	10.17											

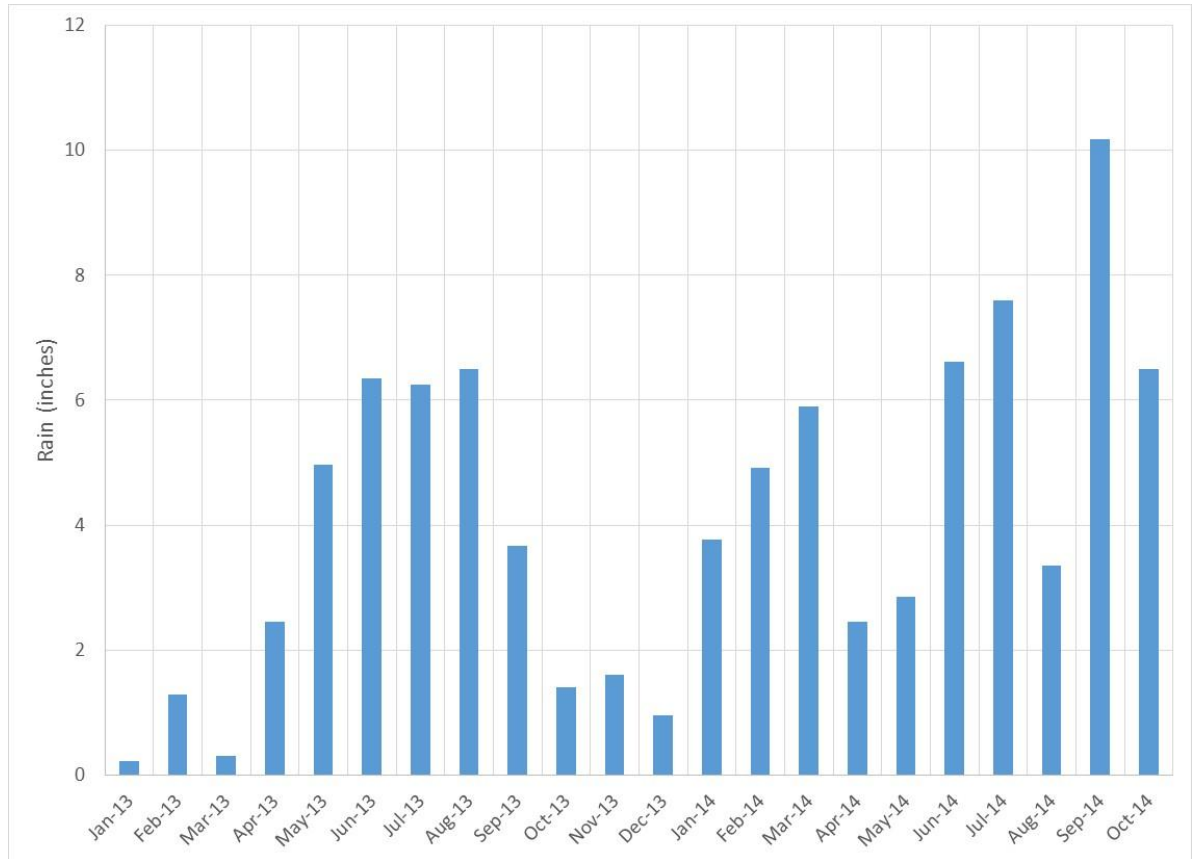
o:\44237-001\Wpdocs\Report\Draft

Table C.1
Weather Station Data (continued)

MONTHLY CLIMATOLOGICAL SUMMARY FOR OCTOBER 2014												
DAY	RAIN (inches)	MEAN TEMP (F)	HIGH TEMP (F)	TIME	LOW TEMP (F)	TIME	HEAT DEG DAYS	COOL DEG DAYS	AVG. WIND SPEED (mph)	HIGH WIND SPEED (mph)	TIME	WIND DIR
1	0.03	77.2	88.0	5:00p	70.7	6:00a	0.0	12.2	0.6	10.0	1:00p	NNW
2	0.01	78.4	93.2	2:00p	71.3	12:00m	0.0	13.4	0.6	11.0	5:00p	NNW
3	0.04	78.7	94.0	3:30p	70.0	5:30a	0.0	13.7	0.7	9.0	2:30p	SW
4	0.02	75.4	86.2	2:30p	63.0	12:00m	0.1	10.5	0.9	12.0	2:30p	SW
5	0.00	63.7	78.3	4:00p	51.4	8:00a	4.6	3.3	1.0	11.0	10:00a	NNW
6	0.00	66.3	83.5	3:00p	52.3	1:00a	4.2	5.5	0.4	11.0	12:00p	ENE
7	0.00	74.5	88.6	4:00p	65.0	2:00a	0.0	9.5	0.2	10.0	12:00p	ENE
8	0.00	77.1	91.8	5:30p	66.7	7:00a	0.0	12.1	0.3	7.0	3:00p	NE
9	0.00	75.8	90.8	4:00p	66.3	5:00a	0.0	10.8	0.6	11.0	5:30p	NE
10	0.01	76.2	92.7	3:30p	67.7	12:00m	0.0	11.2	0.4	8.0	11:30a	ENE
11	0.01	75.8	91.8	2:30p	63.4	7:00a	0.1	10.9	0.4	7.0	4:30p	ESE
12	0.00	77.2	92.0	3:30p	66.9	7:30a	0.0	12.2	0.7	14.0	6:00p	ENE
13	0.01	77.4	91.8	4:00p	67.2	6:30a	0.0	12.4	0.9	14.0	11:00a	SSW
14	0.81	76.6	89.5	1:30p	69.3	7:00a	0.0	11.6	1.2	18.0	12:00p	SSW
15	0.39	72.4	83.2	3:30p	59.3	12:00m	0.6	8.0	0.9	11.0	4:30p	SW
16	0.01	66.7	82.2	3:30p	56.5	8:30a	3.4	5.1	0.8	11.0	4:30p	SW
17	0.00	66.1	84.3	6:00p	52.4	7:00a	4.3	5.3	0.3	7.0	3:00p	SW
18	0.00	67.5	86.0	5:00p	52.9	5:30a	3.9	6.4	0.5	7.0	3:00p	SW
19	0.01	69.1	83.0	2:30p	60.4	8:00a	1.5	5.5	1.1	13.0	12:00p	NE
20	0.00	72.6	88.9	3:00p	61.1	6:30a	0.9	8.5	0.4	8.0	11:00a	ENE
21	0.00	71.9	85.1	3:30p	65.4	11:30p	0.0	6.9	0.3	6.0	1:30p	NNW
22	0.01	69.3	83.5	4:30p	59.7	8:00a	1.2	5.5	0.9	9.0	2:00p	N
23	0.00	65.6	79.5	5:00p	53.9	6:00a	3.4	4.0	1.3	13.0	11:30a	NE
24	0.00	64.5	79.2	4:30p	53.8	8:00a	4.4	3.9	0.9	10.0	1:30p	NNW
25	0.00	64.1	80.0	4:30p	51.5	8:00a	4.9	4.0	0.6	10.0	1:00p	N
26	0.01	64.4	84.4	4:00p	48.6	7:30a	6.0	5.4	0.3	7.0	3:00p	SW
27	0.00	69.1	88.8	3:30p	53.7	7:30a	3.3	7.4	0.4	9.0	2:00p	E
28	0.00	70.0	88.3	3:30p	57.1	6:30a	2.2	7.2	0.5	10.0	12:00p	E
29	0.01	72.3	89.0	3:00p	61.4	7:30a	0.6	7.9	0.2	7.0	1:30p	SW
30	0.00	70.9	84.3	5:00p	61.1	8:30a	0.6	6.5	0.3	9.0	9:00p	NNW
31	0.00	65.8	76.8	3:00p	54.2	12:00m	2.4	3.3	0.7	13.0	2:00p	NW
TOTAL	1.38											

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

Figure C.1
Summary of Monthly Precipitation
January 2013 through October 2014



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