FLORIDA DEPARTMENT OF HEALTH

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task C.24

C-HS2 Monitoring Sample Event Report No. 1

Progress Report

July 2011

4423-001

HAZEN AND SAWYER
Environmental Engineers & Scientists

In association with

SCHOOL OF MINES 1874 COLORADO

AET
Applied Environmental Technology

OTIS ENVIRONMENTAL CONSULTANTS, LLC

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK C.24
PROGRESS REPORT

C-HS2 Monitoring
Sample Event Report No. 1

Prepared for:

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

FDOH Contract CORCL

July 2011

Prepared by:

HAZEN AND SAWYER
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In Association With:

SCHOOL OF MINES
1874
COLORADO

C-HS2 Monitoring
Sample Event Report No. 1

1.0 Background

Task C of the Florida Onsite Sewage Nitrogen Reduction Strategies Study includes monitoring at field sites in Florida to evaluate nitrogen reduction in soil and groundwater, to assess groundwater impacts from various onsite wastewater systems, and to provide data for parameter estimation, verification, and validation of models developed in Task D. The Task C.5 QAPP documents the objectives, monitoring framework, sample frequency and duration, and analytical methods to be used at the field sites. The Task C.23 C-HS2 Instrumentation report documents the field site layout, number and location of monitoring points, and preliminary field parameters from monitoring points for this field site located in the Wekiva Study area in Seminole County, Florida and preliminary sample collection and analyses.

2.0 Purpose

This sample event report documents data collected from the first C-HS2 monitoring and sampling event conducted July 25, 2011 through July 27, 2011. This monitoring event consisted of measurement of household water meters, groundwater elevation measured within the standpipe piezometers, measurement of field parameters, and collection of groundwater samples and their analyses by a NELAC certified laboratory.

3.0 Materials and Methods

3.1 Project Site

The C-HS2 field site is located in Seminole County, FL in a neighborhood less than a mile from the Little Wekiva River. The onsite sewage treatment and disposal system (OSTDS) for the residence consists of a 1,050 gallon fiberglass baffled septic tank located adjacent to the drainfield mound and has a gravity fed standard bed mounded drainfield.

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3.2 Monitoring and Sample Locations and Identification

A sampling grid for groundwater screening was developed downgradient of the OSTDS as depicted in Figure 1. A 10-foot by 40-foot grid was staked then locations surveyed (x, y, and z). Transect lines A through D were located perpendicular to the groundwater flow direction (southwest) and increase (higher letter identification) moving southward from the mound. Transect lines 0 through 15 were located parallel to the groundwater flow direction and increase moving from southeast to northwest. Groundwater monitoring points were installed in June and July 2011. One type of monitoring point was installed using either hand or drilling methods: standpipe piezometers. Standpipe piezometers consist of either ¾-inch or 2-inch diameter PVC with a 1-foot, 2-foot, or 4-foot screen (0.010-inch slots) and riser extending to the ground surface (refer to the Task C QAPP and Task C.23 C-HS2 Instrumentation Report for additional detail).

Each monitoring location was assigned a unique identification indicating grid location (self explanatory), and depth below ground surface (bottom of the drive point or well screen in feet). For example A09-7 is a standpipe piezometer sampler located on the grid at A09 at 7-feet below ground surface. A schematic of the C-HS2 monitoring network is shown in Figure 1. A complete list of all installed standpipe piezometers is included in Appendix A. A total of 62 specific monitoring locations were sampled during this first C-HS2 sampling event.

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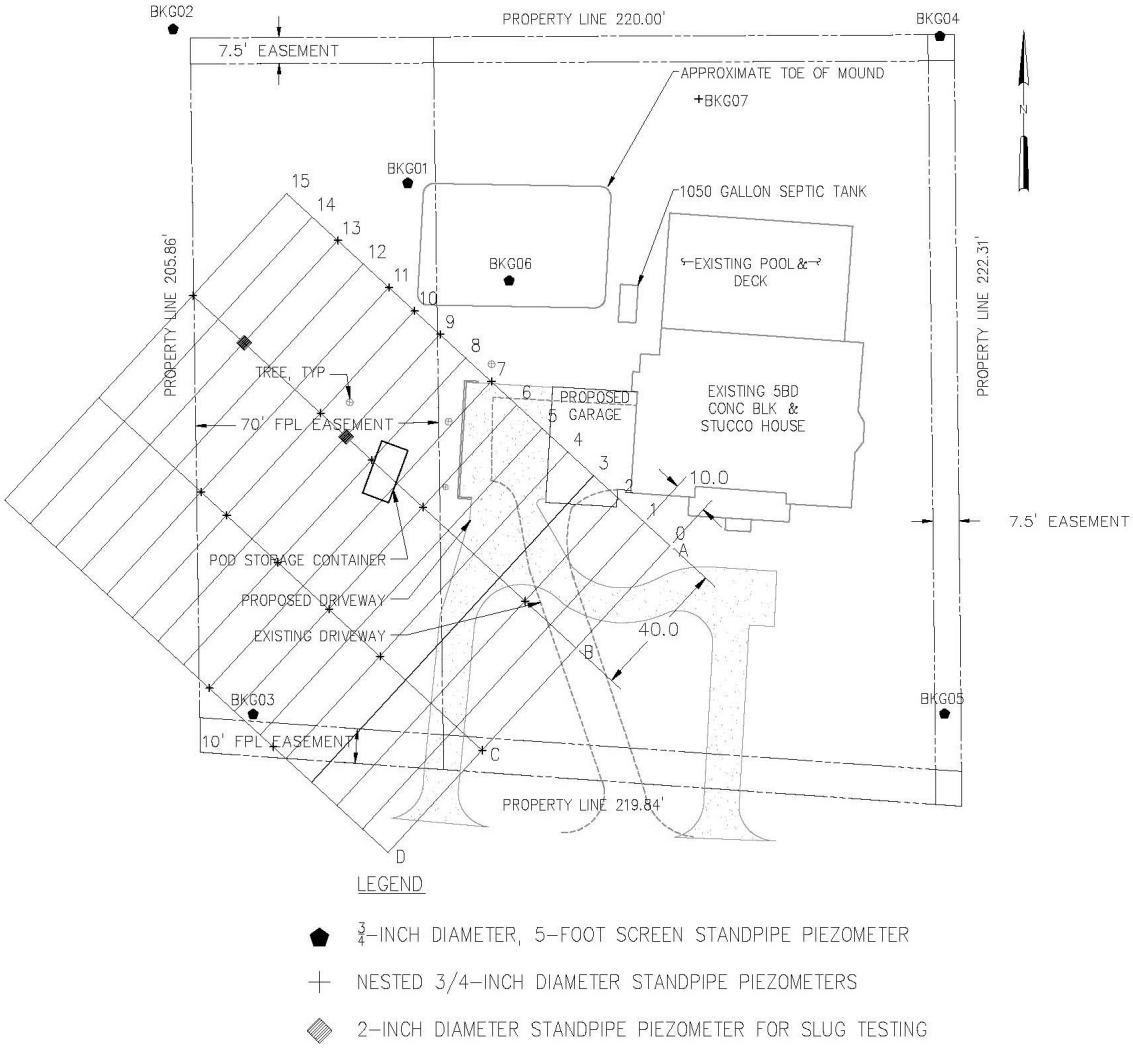

Figure 1
C-HS2 Monitoring Network

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3.3 Operational Monitoring

The water meter for the house site was read and recorded. The residence has a garden with irrigation thus the actual wastewater flow can only be estimated. A weather station (Sheffield in the Crossings, Longwood, FL) is located approximately 5 miles from the site. Data from this weather station is available at the following website: http://www.wunderground.com.

3.4 Groundwater Elevation Measurements

Groundwater level measurements are used to determine hydraulic gradients and directions of flow. Groundwater levels were measured using a flat tape water level meter graduated in feet (measurement accuracy is 0.01 feet). The groundwater level within all 62 standpipe piezometers was measured for this sampling event.

3.5 Water Quality Sample Collection and Analyses

Groundwater and septic tank effluent (STE) were collected July 25 through 27, 2011 for water quality analysis. A sample was collected from the septic tank outlet filter to represent the effluent delivered to the drainfield. A peristaltic pump was used to collect STE directly into the analysis-specific containers. Groundwater samples were obtained using a peristaltic pump, which was attached directly to dedicated standpipe piezometer tubing. Samples were collected after sufficient purging (the sample was clear and pH and conductivity readings had stabilized) had occurred. Field parameters were then recorded.

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 laboratory. 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 B, were used to document the transfer of samples from field personnel to the analytical laboratory. Also provided in Appendix B are groundwater sampling logs.

In addition, field sample duplicates were collected immediately subsequent to the regular samples. The field duplicate samples taken include:

- C-HS2-STE
- C-HS2-A09-7
- C-HS2-C00-7

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- C-HS2-C06-5
- C-HS2-C08-5
- C-HS2-D07-6

Field parameters (pH, specific conductance, temperature (Temp), and dissolved oxygen (DO)) were measured using portable electronic probes with probe tips placed in an overflowing plastic beaker as groundwater was being pumped. All samples were analyzed by the laboratory for: total alkalinity, total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH_3-N), nitrate/nitrite nitrogen (NO_X-N), chemical oxygen demand (COD), and total phosphorus (TP). Additionally, the STE sample was analyzed for carbonaceous biological oxygen demand ($CBOD_5$), total suspended solids (TSS), and total solids % by weight (TS), but not COD. All analyses were performed by an independent and fully certified analytical laboratory (Southern Analytical Laboratory). Table 1 lists the analytical parameters, analytical methods, and detection limits for these analyses.

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

Analytical Parameter	Method of Analysis	Laboratory 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/Nitrite Nitrogen (NO_X-N)	EPA 300.0	0.02 mg/L
Total Phosphorus (TP)	SM 4500P-E	0.01 mg/L
Carbonaceous Biological Oxygen Demand ($CBOD_5$)	SM5210B	2 mg/L
Total Solids (TS)	EPA 160.3	.01 % by wt
Total Suspended Solids (TSS)	SM 2540D	1 mg/L

4.0 Results

Once analytical results are obtained from the laboratory, the C-HS2 Data Summary Report No. 1 (Task C.25) will be prepared describing the results from this sampling event.

4.1 Operational Monitoring and Site Conditions

Table 2 summarizes the water meter readings and average daily water use for the residence at site C-HS2.

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Table 2
Water Meter Readings and Water Usage for C-HS2

Residence	Date and Time Read	Meter Reading	Gallons/day
C-HS2 Residence	7/13/2011 14:45	5302677.9	
	7/20/2011 17:50	5304207.8	215
	7/26/2011 15:19	5305257.9	178

Monthly recorded meteorological data is provided in Appendix C. Table 3 provides the daily averages leading up to and during the sample event.

Table 3
Meteorological Data Daily Averages Measured July 20, 2011 – July 27, 2011

Date	Temperature (°F)			Humidity (%)	Wind (mph)	Rain Total (inches)
	High	Avg	Low	Avg	Avg	Sum
7/20/11	99	90	75	54	1	0
7/21/11	100	91	75	55	2	0
7/22/11	98	91	76	61	1	0
7/23/11	94	89	73	69	2	0
7/24/11	99	89	78	70	2	0
7/25/11	98	89	79	63	2	0
7/26/11	88	84	78	71	1	0
7/27/11	95	83	80	72	3	0
7/28/11	95	85	75	74	2	0.41

4.2 Groundwater Levels

Water levels were measured at all standpipe piezometers on July 27, 2011 for this sampling event as summarized in Table 4. Figure 2 illustrates the surficial groundwater contours as measured within the standpipe piezometers on July 27, 2011. The groundwater elevations have been found to fluctuate due to periods of dry weather and/or heavy precipitation; however, the general flow-path does not change.

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Table 4
Standpipe Piezometer Groundwater Levels
Measured on July 27, 2011

Identification	Water Table Elevation (feet)	Identification	Water Table Elevation (feet)
C-HS2-BKG01	93.23	C-HS2-B15-5	92.92
C-HS2-BKG02	93.21	C-HS2-B15-7	92.93
C-HS2-BKG03	91.78	C-HS2-B15-10	92.90
C-HS2-BKG04	94.43	C-HS2-C00-5	92.06
C-HS2-BKG05	92.73	C-HS2-C00-7	92.05
C-HS2-BKG06	93.37	C-HS2-C00-10	92.06
C-HS2-A07-6	93.11	C-HS2-C04-5	92.19
C-HS2-A07-8	93.09	C-HS2-C04-7	92.19
C-HS2-A07-11	93.08	C-HS2-C04-10	92.21
C-HS2-A09-7	93.15	C-HS2-C06-5	92.28
C-HS2-A09-9	93.13	C-HS2-C06-7	92.29
C-HS2-A09-12	93.14	C-HS2-C06-10	92.33
C-HS2-A10-7	93.21	C-HS2-C08-5	92.36
C-HS2-A10-9	93.20	C-HS2-C08-7	92.44
C-HS2-A10-12	93.19	C-HS2-C08-10	92.38
C-HS2-A11-5	93.17	C-HS2-C10-6	92.46
C-HS2-A11-7	93.17	C-HS2-C10-8	92.48
C-HS2-A11-10	93.17	C-HS2-C10-11	92.48
C-HS2-A13-5	93.18	C-HS2-C11-5	92.49
C-HS2-A13-7	93.20	C-HS2-C11-7	92.49
C-HS2-A13-10	93.19	C-HS2-C11-10	92.51
C-HS2-B02-6	92.52	C-HS2-D04-5	91.83
C-HS2-B02-8	92.53	C-HS2-D04-7	91.84
C-HS2-B02-11	92.54	C-HS2-D04-10	91.85
C-HS2-B06-6	92.65	C-HS2-D07-6	91.98
C-HS2-B06-8	92.65	C-HS2-D07-8	91.99
C-HS2-B06-11	92.66	C-HS2-D07-11	92.02
C-HS2-B08-5	92.70	C-HS2-BKG07-5	93.96
C-HS2-B08-7	92.73	C-HS2-BKG07-7	93.96
C-HS2-B08-10	92.75	C-HS2-BKG07-10	93.96
C-HS2-B10-5	92.81	C-HS2-B09	93.38
C-HS2-B10-7	92.82	C-HS2-B13	93.53
C-HS2-B10-10	92.81	C-HS2-B15-5	92.92

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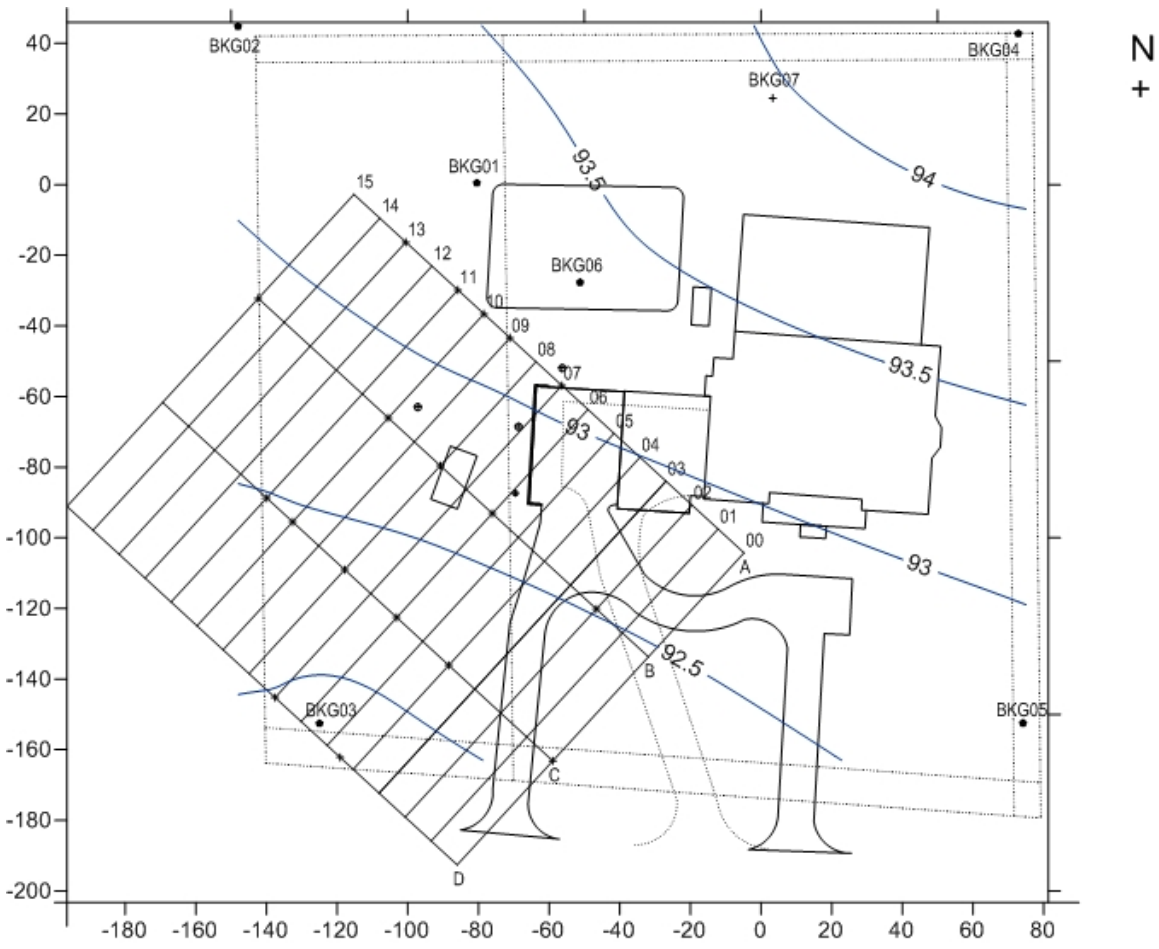

Figure 2
Surficial Groundwater Contours July 27, 2011

4.3 Water Quality

Field parameters were measured prior to sample collection and are listed in Appendix D. Once analytical results are obtained from the laboratory, C-HS2 Data Summary Report No. 1 (Task C25) will be prepared describing the results from this sampling event.

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Appendix A: C-HS2 Sample Identification

Table A.1
C-HS2 Sample Identification

	Sample ID	Type of Monitoring Point	Surface Elevation (ft)	Bottom Elevation (ft)
1	STE	Waste Water	N/A	N/A
2	C-HS2-SW-6 inch	Storm sewer catch basin southwest of home	N/A	N/A
3	C-HS2-SW-M	Storm sewer catch basin southwest of home	N/A	N/A
4	C-HS2-BKG01-7	3/4" Standpipe Piezometer, 5' screen	96.11	88.93
5	C-HS2-BKG02-6	3/4" Standpipe Piezometer, 5' screen	94.48	88.20
6	C-HS2-BKG03-7	3/4" Standpipe Piezometer, 5' screen	93.52	86.56
7	C-HS2-BKG04-7	3/4" Standpipe Piezometer, 5' screen	96.00	88.94
8	C-HS2-BKG05-8	3/4" Standpipe Piezometer, 5' screen	95.21	87.26
9	C-HS2-BKG06-12	3/4" Standpipe Piezometer, 5' screen	99.55	87.93
10	C-HS2-A07-6	3/4" Standpipe Piezometer, 2' screen	97.33	91.67
11	C-HS2-A07-8	3/4" Standpipe Piezometer, 1' screen	97.34	89.69
12	C-HS2-A07-11	3/4" Standpipe Piezometer, 1' screen	97.33	86.78
13	C-HS2-A09-7	3/4" Standpipe Piezometer, 2' screen	98.23	91.34
14	C-HS2-A09-9	3/4" Standpipe Piezometer, 1' screen	98.22	89.01
15	C-HS2-A09-12	3/4" Standpipe Piezometer, 1' screen	98.22	86.47
16	C-HS2-A10-7	3/4" Standpipe Piezometer, 2' screen	97.63	90.76
17	C-HS2-A10-9	3/4" Standpipe Piezometer, 1' screen	97.65	88.84
18	C-HS2-A10-12	3/4" Standpipe Piezometer, 1' screen	97.65	85.65
19	C-HS2-A11-5	3/4" Standpipe Piezometer, 2' screen	96.45	91.46
20	C-HS2-A11-7	3/4" Standpipe Piezometer, 1' screen	96.45	89.63
21	C-HS2-A11-10	3/4" Standpipe Piezometer, 1' screen	96.45	86.59
22	C-HS2-A13-5	3/4" Standpipe Piezometer, 2' screen	95.76	90.77
23	C-HS2-A13-7	3/4" Standpipe Piezometer, 1' screen	95.76	88.78
24	C-HS2-A13-10	3/4" Standpipe Piezometer, 1' screen	95.77	86.03
25	C-HS2-B02-6	3/4" Standpipe Piezometer, 2' screen	95.85	90.29
26	C-HS2-B02-8	3/4" Standpipe Piezometer, 1' screen	95.85	88.06
27	C-HS2-B02-11	3/4" Standpipe Piezometer, 1' screen	95.85	85.12
28	C-HS2-B06-6	3/4" Standpipe Piezometer, 2' screen	95.85	90.17

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Table A.1
C-HS2 Sample Identification

	Sample ID	Type of Monitoring Point	Surface Elevation (ft)	Bottom Elevation (ft)
29	C-HS2-B06-8	3/4" Standpipe Piezometer, 1' screen	95.85	88.03
30	C-HS2-B06-11	3/4" Standpipe Piezometer, 1' screen	95.84	85.08
31	C-HS2-B08-5	3/4" Standpipe Piezometer, 2' screen	95.38	90.41
32	C-HS2-B08-7	3/4" Standpipe Piezometer, 1' screen	95.40	88.62
33	C-HS2-B08-10	3/4" Standpipe Piezometer, 1' screen	95.42	85.52
34	C-HS2-B09-15	2" Standpipe Piezometer, 5' screen	95.37	80.20
35	C-HS2-B10-5	3/4" Standpipe Piezometer, 2' screen	95.40	90.42
36	C-HS2-B10-7	3/4" Standpipe Piezometer, 1' screen	95.40	88.60
37	C-HS2-B10-10	3/4" Standpipe Piezometer, 1' screen	95.40	85.55
38	C-HS2-B13-15	2" Standpipe Piezometer, 5' screen	95.34	80.12
39	C-HS2-B15-5	3/4" Standpipe Piezometer, 2' screen	95.28	90.43
40	C-HS2-B15-7	3/4" Standpipe Piezometer, 1' screen	95.28	88.78
41	C-HS2-B15-10	3/4" Standpipe Piezometer, 1' screen	95.26	85.60
42	C-HS2-C00-5	3/4" Standpipe Piezometer, 2' screen	94.50	89.81
43	C-HS2-C00-7	3/4" Standpipe Piezometer, 1' screen	94.50	87.69
44	C-HS2-C00-10	3/4" Standpipe Piezometer, 1' screen	94.51	84.66
45	C-HS2-C04-5	3/4" Standpipe Piezometer, 2' screen	94.61	89.91
46	C-HS2-C04-7	3/4" Standpipe Piezometer, 1' screen	94.60	87.79
47	C-HS2-C04-10	3/4" Standpipe Piezometer, 1' screen	94.61	84.76
48	C-HS2-C06-5	3/4" Standpipe Piezometer, 2' screen	94.53	89.55
49	C-HS2-C06-7	3/4" Standpipe Piezometer, 1' screen	94.53	87.74
50	C-HS2-C06-10	3/4" Standpipe Piezometer, 1' screen	94.53	84.68
51	C-HS2-C08-5	3/4" Standpipe Piezometer, 2' screen	95.18	90.21
52	C-HS2-C08-7	3/4" Standpipe Piezometer, 1' screen	95.25	88.47
53	C-HS2-C08-10	3/4" Standpipe Piezometer, 1' screen	95.20	85.33
54	C-HS2-C10-6	3/4" Standpipe Piezometer, 2' screen	95.77	90.12
55	C-HS2-C10-8	3/4" Standpipe Piezometer, 1' screen	95.78	88.00
56	C-HS2-C10-12	3/4" Standpipe Piezometer, 1' screen	95.78	84.01
57	C-HS2-C11-5	3/4" Standpipe Piezometer, 2' screen	95.30	90.63
58	C-HS2-C11-7	3/4" Standpipe Piezometer, 1' screen	95.30	88.51
59	C-HS2-C11-10	3/4" Standpipe Piezometer, 1' screen	95.31	85.46

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Table A.1
C-HS2 Sample Identification

	Sample ID	Type of Monitoring Point	Surface Elevation (ft)	Bottom Elevation (ft)
60	C-HS2-D04-5	3/4" Standpipe Piezometer, 2' screen	93.98	89.09
61	C-HS2-D04-7	3/4" Standpipe Piezometer, 1' screen	93.98	87.14
62	C-HS2-D04-10	3/4" Standpipe Piezometer, 1' screen	94.00	84.31
63	C-HS2-D07-6	3/4" Standpipe Piezometer, 2' screen	95.41	89.43
64	C-HS2-D07-8	3/4" Standpipe Piezometer, 1' screen	95.39	87.53
65	C-HS2-D07-11	3/4" Standpipe Piezometer, 1' screen	95.43	84.59
66	C-HS2-BKG07-5	3/4" Standpipe Piezometer, 2' screen	96.01	91.36
67	C-HS2-BKG07-7	3/4" Standpipe Piezometer, 1' screen	96.01	89.43
68	C-HS2-BKG07-10	3/4" Standpipe Piezometer, 1' screen	96.01	86.40

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Appendix B: Chain of Custody Forms

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SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
01	C-HS2-STE	72611	1535	GW		X	1	1					29.6	7.0	1028	1.25					
02	C-HS2-STE-DUP	72611	1540	GW		X	1	1					29.6	7.0	1028	1.25					
03	C-HS2-SW-6 inch	72611	0852	GW		X			1	1			28.0	5.4	264.5	3.37					
04	C-HS2-SW-M	72611	0859	GW		X			1	1			28.4	6.9	388.8	4.78					
05	C-HS2-PZ01	72511	0907	GW		X			1	1			26.5	4.9	247.8	0.78					
06	C-HS2-PZ02	72511	0927	GW		X			1	1			26.1	6.4	441.8	1.20					
07	C-HS2-PZ03	72611	1333	GW		X			1	1			27.5	5.7	435.7	0.09					
08	C-HS2-PZ04	72511	0946	GW		X			1	1			26.3	5.2	212.4	1.17					
09	C-HS2-PZ06	72511	1000	GW		X			1	1			26.7	6.1	425.1	1.26					
10	C-HS2-A07-S	72511	1051	GW		X			1	1			26.1	6.3	701	0.88					
11	C-HS2-A07-M	72511	1131	GW		X			1	1			25.8	6.0	508	0.83					
12	C-HS2-A07-D	72511	1217	GW		X			1	1			24.7	5.8	1462	0.26					

Relinquished:	Date/Time:	Received:	Date/Time:
Containers Prepared/ Relinquished: HH	1440 7-21-11		1530 7211 11
	1027 7 2711		

Seal intact? Y N N/A

Samples intact upon arrival? Y N N/A

Received on ice? Temp. 0.0 Y N N/A

Proper preservatives indicated? Y N N/A

Rec'd within holding time? Y N N/A

Volatiles rec'd w/out headspace? Y N N/A

Proper containers used? Y N N/A

Instructions / Remarks:

1106264

Chain of Custody xls
Rev Date 11/19/01

Chain of Custody

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
13	C-HS2-A09-S	072511	1458	GW		X			1	1			29.2	6.1	482	0.01					
14	C-HS2-A09-S-DUP		1505	GW		X			1	1			↓	↓	↓	↓					
15	C-HS2-A09-M		1600	GW		X			1	1			27.7	6.1	237.5	0.01					
16	C-HS2-A09-D		1610	GW		X			1	1			26.4	5.2	129.2	0.00					
17	C-HS2-A10-S		1255	GW		X			1	1			28.3	6.8	809	0.28					
18	C-HS2-A10-M		1313	GW		X			1	1			26.9	6.6	548	0.41					
19	C-HS2-A10-D		1320	GW		X			1	1			25.4	5.7	134.5	0.24					
20	C-HS2-A11-S		1445	GW		X			1	1			29.3	6.3	706	0.55					
21	C-HS2-A11-M		1413	GW		X			1	1			27.8	6.3	509	0.35					
22	C-HS2-A11-D		1546	GW		X			1	1			26.9	5.3	131.7	0.32					
23	C-HS2-A13-S		1511	GW		X			1	1			29.6	5.8	251.9	0.03					
24	C-HS2-A13-M		1524	GW		X			1	1			28.7	4.6	159.3	0.05					

Relinquished:	Date/Time:	Received:	Date/Time:
Containers Prepared/ Relinquished: HH	1440 7-21-11		1530 72111
Relinquished:	1022 72211		
Relinquished:			
Relinquished:			
Relinquished:			

Seal intact? Y N (N/A)

Samples intact upon arrival? (Y) N N/A

Received on ice? (Y) Temp 00 N N/A

Proper preservatives indicated? (Y) N N/A

Rec'd within holding time? (Y) N N/A

Volatiles rec'd w/out headspace? Y N (N/A)

Proper containers used? (Y) N N/A

Instructions / Remarks:

1106264

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Rev Date 11/19/01

Chain of Custody

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
25	C-HS2-A13-D	72611	1535	GW		X			1	1			27.9	4.7	124.9	0.0[illegible]					
26	C-HS2-B02-S	72611	1219	GW		X			1	1			27.8	6.2	392.5	0.17					
27	C-HS2-B02-M	72611	1230	GW		X			1	1			26.9	6.5	654	0.14					
28	C-HS2-B02-D	72611	1240	GW		X			1	1			26.1	6.0	266.5	0.22					
29	C-HS2-B06-S	72611	1017	GW		X			1	1			25.4	6.0	274.7	0.13					
30	C-HS2-B06-M	72611	1115	GW		X			1	1			24.8	5.8	143.8	0.09					
31	C-HS2-B06-D	72611	1131	GW		X			1	1			24.3	5.7	129.7	0.11					
32	C-HS2-B08-S	72511	1330	GW		X			1	1			26.4	5.5	506	0.04					
33	~~C-HS2-B08-S-DUP~~ CHS2-C06-S-Dup	7611	0915	GW		X			1	1			26.8	6.1	1.34	0.21					
34	C-HS2-B08-M	72511	1350	GW		X			1	1			26.5	5.9	51.6	0.0[illegible]					
35	C-HS2-B08-D	72511	1411	GW		X			1	1			27.0	5.5	131.5	0.23					
36	C-HS2-B10-S	72511	1110	GW		X			1	1			27.4	6.5	452.4	0.10					

Relinquished	Date/Time	Received	Date/Time
Containers Prepared/ Relinquished: HH	Date/Time: 1440 2-21-11	Received:	Date/Time: 1530 72111
Relinquished:	Date/Time: 1022 72711	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact?	Y N (N/A)
Samples intact upon arrival?	(Y) N N/A
Received on ice? Temp 0.0	(Y) N N/A
Proper preservatives indicated?	(Y) N N/A
Rec'd within holding time?	(Y) N N/A
Volatiles rec'd w/out headspace?	Y N (N/A)
Proper containers used?	(Y) N N/A

Instructions / Remarks:

1106264

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
37	C-HS2-B10-M	7/26/11	1130	GW		X			1	1			27.4	6.3	172.6	0.54					
38	C-HS2-B10-D		1228	GW		X			1	1			26.7	5.4	123.2	0.01					
39	C-HS2-B15-S		1629	GW		X			1	1			27.7	5.4	184.0	0.41					
40	C-HS2-B15-M		1130	GW		X			1	1			26.4	5.5	140.0	0.49					
41	C-HS2-B15-D	7/25/11	1200	GW		X			1	1			27.0	5.1	125.4	0.69					
42	C-HS2-C00-S	7/26/11	1144	GW		X			1	1		SH	27.6	4.4	290.9	0.01					
43	C-HS2-C00-M	7/26/11	1200	GW		X			1	1		SH	26.9	5.5	303.0	0.03					
44	C-HS2-C00-M-DUP	7/26/11	1205	GW		X			1	1			26.9	5.5	303.0	0.03					
45	C-HS2-C00-D	7/26/11	1251	GW		X			1	1			26.1	5.7	162.5	0.00					
46	C-HS2-C04-S	7/25/11	0753	GW		X			1	1			26.3	5.2	288.6	0.77					
47	C-HS2-C04-M		0809	GW		X			1	1			25.4	5.6	141.9	1.26					
48	C-HS2-C04-D		0820	GW		X			1	1			25.0	5.4	136.0	0.97					

Containers Prepared/ Relinquished:	Date/Time:	Received:	Date/Time:
HH	1400 7-21-11		1530 7/21/11
Relinquished:	Date/Time: 1022 7/27/11	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact? Y N N/A

Samples intact upon arrival? Y N N/A

Received on ice? Temp 0.0 Y N N/A

Proper preservatives indicated? Y N N/A

Rec'd within holding time? Y N N/A

Volatiles rec'd w/out headspace? Y N N/A

Proper containers used? Y N N/A

Instructions / Remarks:

1106264

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
49	C-HS2-C06-S	072611	0910	GW		X			1	1			26.8	6.1	654	0.21					
50	C-HS2-C06-M		0930	GW		X			1	1			25.7	5.4	305.7	0.50					
51	C-HS2-C06-D		0948	GW		X			1	1			24.7	5.1	140.9	0.02					
52	C-HS2-C08-S		0959	GW		X			1	1			27.2	6.0	557.7	0.02					
53	C-HS2-C08-S-DUP		1004	GW		X			1	1			27.2	6.0	557.7	0.02					
54	C-HS2-C08-M		1027	GW		X			1	1			26.6	6.1	576	0.03					
55	C-HS2-C08-D		1104	GW		X			1	1			25.9	5.3	122.6	-0.03					
56	C-HS2-C10-S		0753	GW		X			1	1			26.9	5.1	263.5	0.13					
57	C-HS2-C10-M		0821	GW		X			1	1			26.3	5.6	140.5	0.04					
58	C-HS2-C10-D		0940	GW		X			1	1			25.7	5.2	123.9	0.05					
59	C-HS2-C11-S		0742	GW		X			1	1			26.9	4.8	304.1	0.15					
60	C-HS2-C11-M		0830	GW		X			1	1			26.1	5.3	189.5	0.01					

Containers Prepared/ Relinquished:	Date/Time: 1440 7-21-11	Received:	Date/Time: 1530 72111
Relinquished:	Date/Time: 1022 72711	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact? Y N (N/A)

Samples intact upon arrival? (Y) N N/A

Received on (ice)? Temp [illegible] (Y) N N/A

Proper preservatives indicated? (Y) N N/A

Rec'd within holding time? (Y) N N/A

Volatiles rec'd w/out headspace? Y N (N/A)

Proper containers used? (Y) N N/A

Instructions / Remarks:

1106264

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer

Contact / Phone:

Project Name / Location: Seminole County C-HS2

Samplers: (Signature)

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO					
61	C-HS2-C11-D	7/26/11	0846	GW		X			1	1			25.2	5.0	125.1	0.08					
62	C-HS2-D04-S		1047	GW		X			1	1			26.6	5.8	478.4	0.08	Tem	Ph		Con	do
63	C-HS2-D04-M		~~1356~~ 1302	GW		X			1	1			~~26.2~~	~~5.8~~	~~294.3~~	~~0.01~~	25.4	5.9		311.9	0.07
64	C-HS2-D04-D		1404	GW		X			1	1			25.3	5.7	144.4	0.02					
65	C-HS2-D07-S		1313	GW		X			1	1			27.1	5.9	363.6	0.06					
66	C-HS2-D07-S-DUP		1318	GW		X			1	1			27.1	5.9	363.6	0.06					
67	C-HS2-D07-M		1350	GW		X			1	1			26.2	5.8	294.3	0.01					
68	C-HS2-D07-D		1437	GW		X			1	1			25.8	6.2	147.3	0.02					
69	C-HS2-BKG-S		1450	GW		X			1	1			26.4	5.2	88.6	0.14					
70	C-HS2-BKG-M		1507	GW		X			1	1			25.4	5.7	181.6	0.16					
71	C-HS2-BKG-D		1525	GW		X			1	1			25.2	5.2	130.5	0.11					
72	FB-Tap		1425	DW		X			1	1			29.4	6.9	325.3	4.98					

Relinquished	Date/Time	Received	Date/Time
Containers Prepared/ Relinquished: HH	Date/Time: 1440 7-21-11	Received:	Date/Time: 7/21/11 1530
Relinquished:	Date/Time: 1022 7/27/11	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact? Y N N/A

Samples intact upon arrival? Y N N/A

Received on ice? Temp C.C (Y) N N/A

Proper preservatives indicated? Y N N/A

Rec'd within holding time? Y N N/A

Volatiles rec'd w/out headspace? Y N N/A

Proper containers used? Y N N/A

Instructions / Remarks:

1106264

SOUTHERN ANALYTICAL LABORATORIES, INC.

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

SAL Project No. 1106264

Client Name: Hazen and Sawyer	Contact / Phone:
Project Name / Location: Seminole County C-HS2	
Samplers: (Signature)	

Matrix Codes: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water

PARAMETER / CONTAINER DESCRIPTION

SAL Use Only Sample No.	Sample Description	Date	Time	Matrix	Composite	Grab	1LP, Cool Total Alkalinity, TSS, TS, CBOD	250mL P, H_2SO_4 TKN, NH3, NOx, TP	1LP, Cool TotalAlkalinity	250mL P, H_2SO_4 COD, TKN, NH3, NOx, TP			Field Temperature	Field pH	Field Conductivity	Field DO				
73	FB-DI	72711	0934	R		X			1	1			26.0	8.9	4.5	1.99				
74	EB	72611	1411	R		X			1	1			30.2	6.6	2.6	1.99				

Containers Prepared/ Relinquished:	Date/Time: 1440 7-29-11	Received:	Date/Time: 72111 1530
Relinquished:	Date/Time: 1022 72711	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:
Relinquished:	Date/Time:	Received:	Date/Time:

Seal intact?	Y N N/A
Samples intact upon arrival?	Y N N/A
Received on ice? Temp 0.0	Y N N/A
Proper preservatives indicated?	Y N N/A
Rec'd within holding time?	Y N N/A
Volatiles rec'd w/out headspace?	Y N N/A
Proper containers used?	Y N N/A

Instructions / Remarks:

1106264

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Chain of Custody

Appendix C: Weather Station Data

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Table C.1
Monthly Recorded Meteorological Data
Sheffield in the Crossings, Longwood, FL

Period	Temp high (°F)	Temp avg (°F)	Temp low (°F)	Humidity high (%)	Humidity avg (%)	Humidity low (%)	Wind high (mph)	Wind avg (mph)	Rain max (in)	Rain total (in)
Jan-10	65	52	41	90	73	48	18	5	0.61	2.31
Feb-10	64	53	42	92	73	49	19	5	0.94	3.52
Mar-10	72	60	49	93	71	43	20	6	3.43	7.22
Apr-10	84	71	59	95	73	44	17	4	1.45	3.34
May-10	91	78	69	93	76	50	16	4	1.82	3.88
Jun-10	95	82	73	95	79	50	18	3	0.97	5.15
Jul-10	94	82	75	96	80	56	15	3	1.29	4.26
Aug-10	94	84	76	96	80	56	79	3	2.23	4.37
Sep-10	92	80	72	97	81	53	17	3	0.79	3.35
Oct-10	87	72	61	95	72	40	15	3	0.00	0.00
Nov-10	77	64	54	94	78	53	15	3	1.10	2.09
Dec-10	63	49	37	89	70	44	18	5	0.47	0.62
Jan-11	68	57	45	92	74	48	19	4	1.27	4.18
Feb-11	76	62	52	95	76	49	17	4	1.27	1.78
Mar-11	80	66	55	94	73	46	16	4	3.61	5.57
Apr-11	88	74	62	95	71	41	17	4	0.55	0.65
May-11	92	77	65	94	68	38	18	3	0.58	1.21
Jun-11	92	80	71	96	77	51	15	2	1.99	6.5
Jul-11	95	86	76	95	68	50	15	2	2.65	3.99

Source: www.wunderground.com

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Appendix D: Field Parameter Analyses

Table D.1
Field Parameter Results
(July 25, 2011 through July 27, 2011)

	Sample Identification	Temperature (°C)	pH	Specific Conductance (µS)	Dissolved Oxygen (mg/L)
1	C-HS2-STE	29.6	7.0	1028	1.3
2	C-HS2-STE-DUP	29.6	7.0	1028	1.3
3	C-HS2-SW-6 inch	28.0	5.4	285	3.4
4	C-HS2-SW-M	28.4	6.9	389	4.8
5	C-HS2-BKG01	26.5	4.9	248	0.8
6	C-HS2-BKG02	26.1	6.9	442	1.2
7	C-HS2-BKG03	27.5	5.7	436	0.1
8	C-HS2-BKG04	26.3	5.2	212	1.2
9	C-HS2-BKG06	26.7	6.1	425	1.3
10	C-HS2-A07-6	26.1	6.3	701	0.9
11	C-HS2-A07-8	25.8	6.0	508	0.8
12	C-HS2-A07-11	24.7	5.8	140	0.3
13	C-HS2-A09-7	29.2	6.1	482	0.0
14	C-HS2-A09-7-DUP	29.2	6.1	482	0.0
15	C-HS2-A09-9	27.7	6.1	238	0.0
16	C-HS2-A09-12	26.4	5.2	129	0.0
17	C-HS2-A10-7	28.3	6.8	809	0.3
18	C-HS2-A10-9	26.9	6.6	548	0.4
19	C-HS2-A10-12	25.9	5.7	135	0.3
20	C-HS2-A11-5	29.3	6.3	706	0.6
21	C-HS2-A11-7	27.8	6.3	509	0.3
22	C-HS2-A11-10	26.9	5.3	132	0.4
23	C-HS2-A13-5	29.6	5.8	252	0.0
24	C-HS2-A13-7	28.7	4.6	159	0.1
25	C-HS2-A13-10	27.9	4.7	125	0.1
26	C-HS2-B02-6	27.8	6.2	393	0.2

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	Sample Identification	Temperature (°C)	pH	Specific Conductance (µS)	Dissolved Oxygen (mg/L)
27	C-HS2-B02-8	26.9	6.5	654	0.2
28	C-HS2-B02-11	26.1	6.0	261	0.2
29	C-HS2-B06-6	25.4	6.0	275	0.1
30	C-HS2-B06-8	24.8	5.8	144	0.1
31	C-HS2-B06-11	24.3	5.7	130	0.1
32	C-HS2-B08-5	26.4	5.5	506	0.0
33	C-HS2-B08-7	26.5	5.9	518	0.1
34	C-HS2-B08-10	27.0	5.5	132	0.2
35	C-HS2-B10-5	27.4	6.5	452	0.1
36	C-HS2-B10-7	27.4	6.3	173	0.5
37	C-HS2-B10-10	26.7	5.4	123	0.0
38	C-HS2-B15-5	27.7	5.4	184	0.4
39	C-HS2-B15-7	26.4	5.5	140	0.5
40	C-HS2-B15-10	27.0	5.1	125	0.7
41	C-HS2-C00-5	27.6	4.4	291	0.0
42	C-HS2-C00-7	26.9	5.5	303	0.0
43	C-HS2-C00-7-DUP	26.9	5.5	303	0.0
44	C-HS2-C00-10	26.1	5.7	163	0.0
45	C-HS2-C04-5	26.3	5.8	289	0.8
46	C-HS2-C04-10	25.4	5.6	142	1.3
47	C-HS2-C04-7	25.0	5.4	136	1.0
48	C-HS2-C06-5	26.8	6.1	634	0.2
49	C-HS2-C06-5-DUP	26.8	6.1	634	0.2
50	C-HS2-C06-7	25.7	5.4	305	0.5
51	C-HS2-C06-10	24.7	5.1	141	0.0
52	C-HS2-C08-5	27.2	6.0	558	0.0
53	C-HS2-C08-5-DUP	27.2	6.0	558	0.0
54	C-HS2-C08-7	26.6	6.1	576	0.0
55	C-HS2-C08-10	25.9	5.3	123	0.0
56	C-HS2-C10-6	26.9	5.1	264	0.1
57	C-HS2-C10-8	26.3	5.6	141	0.0
58	C-HS2-C10-11	25.7	5.2	124	0.1
59	C-HS2-C11-5	26.4	4.8	304	0.2

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	Sample Identification	Temperature (°C)	pH	Specific Conductance (µS)	Dissolved Oxygen (mg/L)
60	C-HS2-C11-7	26.1	5.3	190	0.0
61	C-HS2-C11-10	25.2	5.0	125	0.1
62	C-HS2-D04-5	26.6	5.8	478	0.1
63	C-HS2-D04-7	25.4	5.9	312	0.1
64	C-HS2-D04-10	25.3	5.7	144	0.0
65	C-HS2-D07-6	27.1	5.9	364	0.1
66	C-HS2-D07-6-DUP	27.1	5.9	364	0.1
67	C-HS2-D07-8	26.2	5.8	294	0.0
68	C-HS2-D07-11	25.8	6.2	147	0.0
69	C-HS2-BKG07-5	26.4	5.2	189	0.1
70	C-HS2-BKG07-7	25.4	5.7	182	0.2
71	C-HS2-BKG07-10	25.2	5.2	131	0.1
72	FB-TAP	29.9	6.9	325	5.0
73	FB-DI	26.0	8.9	5	2.0
74	EB	30.8	6.6	3	2.0

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